the TAPE RECORDER

price 2/-

APRIL 1963
VOL. 5 NO. 3

INCORPORATING "SOUND AND CINE"

■ A GUIDE TO THE AUDIO SHOW ■ HOW TO BUILD THE TW/PA TAPE AMPLIFIER

MADE IN HOLLAND

Capture a moment of delight on holiday . . . capture happy times anywhere, any time, exactly as they happen. With Philips Battery Tape Recorder you can take instant, lifelike snapshots in sound all summer long. Come September, you'll own an album of sounds you'll keep playing for years to come. See your Philips dealer about this fine recorder today.

24 GNS (excluding batteries)

Supplied complete with microphone, 3″ reel of DP tape and empty 3″ spool. Optional extra: carrying case and strap 45/- complete.

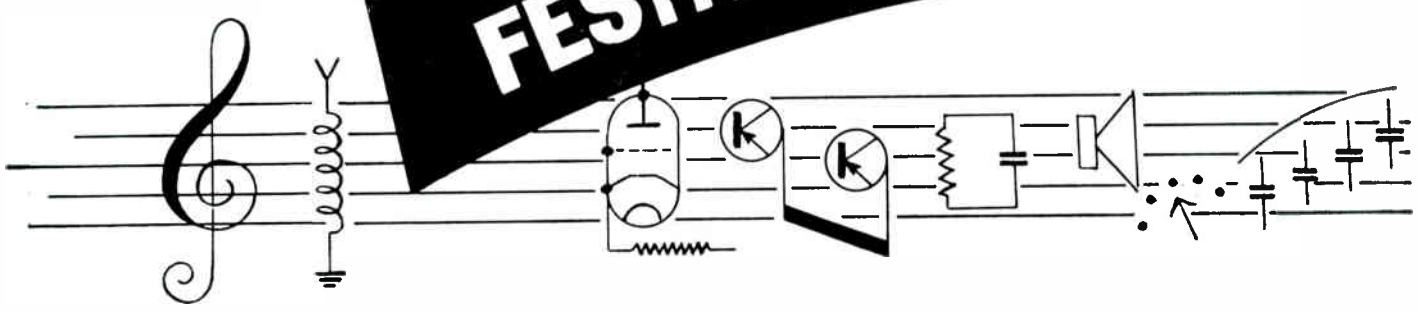
PHILIPS Battery Portable Tape Recorder

RECORDS AND PLAYS BACK ANYWHERE ANY TIME

PTR4089

Take your Ears to the 1963

INTERNATIONAL Audio FESTIVAL & FAIR



where you will hear a wonderful array of sound reproducing equipment for the home. At this year's International Audio Festival and Fair the world's finest loudspeakers, amplifiers, tape recorders, pickups, discs, tapes and many new and unusual accessories will be continually demonstrated. There is as much for the newcomer to the world of quality sound as for the expert . . . with equipment at prices to suit all pockets. No one whose pleasure is to make harmony in the home, should miss this "Audio Fair".

APRIL

THURS 18	4 p.m. — 9 p.m.
FRI 19	11 a.m. — 9 p.m.
SAT 20	11 a.m. — 9 p.m.
SUN 21	11 a.m. — 8 p.m.

★ TO OBTAIN COMPLIMENTARY INVITATIONS

Just ask at your nearest Audio, Radio, Music or Record Shop, or write direct (enclosing stamped and addressed envelope) to:
AUDIO HOUSE, 42 Manchester Street, London, W.1.

At the

HOTEL RUSSELL

RUSSELL SQUARE, LONDON, W.C.1

MAKE HARMONY IN THE HOME

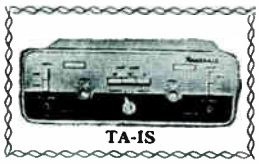
Visit the special **HEATHKIT DEMONSTRATION** and display of our models.

Heathkit
DAYSTROM

At the GRAND HOTEL Southampton Row, London W.C.1. Audio Festival Week April 18—21.

TO ALL MUSIC LOVERS AND HI-FI ENTHUSIASTS

No electronic or soldering experience is necessary *to build any Heathkit model: our simple, well illustrated manual guides you step by step.* **A FREE CATALOGUE of the full range,** *and detailed specifications of any item, will be gladly sent without obligation on your part, on request.*



TA-IS

TAPE AMPLIFIER UNITS Models TA-IM and TA-IS

The monophonic version (TA-IM) can be modified to the stereo version (TA-IS) by modification kit (TA-IC). Special features include the provision of a bias level control; easy-to-read thermometer-type recording level indicators; large printed circuit boards. Both models have identical presentation. TA-IM £19.2.6
TA-IS £24.10.0 TA-IC £6.15.0

TRUVOX D83 AND D84

Tape Decks. High quality mono/stereo tape decks. D83, 2-track for highest fidelity £31.10.0
With TA-IM £47.2.6
With TA-IS £52.6.0

D84, 4-track, for most economical use of tape (same presentation). £29.8.0 With TA-IM £45.5.0 With TA-IS £50.9.6

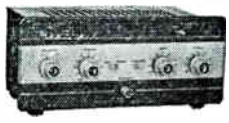
"COTSWOLD" SPEAKER SYSTEM

This is an acoustically designed enclosure 26in. × 23in. × 14in. housing a 12in. bass speaker with 2in. speech coil, elliptical middle speaker, and a pressure unit to cover the full frequency range of 30-20,000 c/s. Capable of doing justice to the finest programme source. Delivered complete with speakers, cross-over unit, level control, Tygan grille cloth, etc.

"COTSWOLD" MFS SPEAKER SYSTEM

A minimum floor space model. Size 36in. high × 16½in. wide × 14½in. deep with performance similar to the standard model. Specially designed for small rooms. Either Model £23.4.0

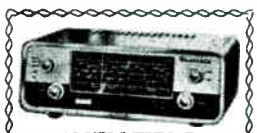
HI-FI STEREO 6-WATT AMPLIFIER Model S-33. Attractively styled, completely self-contained. Printed circuit makes it easy to build. Only 0.3% distortion at 2½ W/chal. 20 dB N.F.B.; sensitivity 200 mV. U/L output, ganged controls. £13.7.6



S-33

NEW DE LUXE STEREO AMPLIFIER

Model S-33 H. De luxe version of S-33 with many refinements. Ideal for use with Decca Deram pick-up. Two-tone perspex panel. £15.17.6



AM/FM TUNER

HI-FI AM/FM TUNER. Model AFM-1

Available in two units: Tuning heart (AFM-TI—£4.13.6, including P.T.) and I.F. amplifier (AFM-AI—£20.13.0), range 88-108 Mc/s (FM) 16-50, 200-550, 900-2,000 metres. Printed circuit board; own power supply; 8 valves; consecutive FM limiting and ratio detector. Total £25.6.6

POWER AMPLIFIER 12-WATT. Model MA-12. Single channel, ideal for stereo conversion, or for use with USC.1. £11.9.6

COLLARO "STUDIO"

TAPE DECK. Operating speeds: 1⅞ in., 3¾ in. and 7½ in. p.s. Wow and flutter not greater than 0.15% at 7½ in. p.s. £17.10.0

With TA-IM £30.10.0

OVER 50 MODELS TO CHOOSE FROM — EVEN A NOVICE CAN BUILD ANY KIT-SET

STEREO CONTROL UNIT Model USC.1

Push-button selection, accurately matched ganged controls to ± 1dB. Negative feedback, rumble and variable low-pass filters. Printed circuit boards. Accepts inputs from most tape heads and any stereo or mono pick-up. £19.10.0

"MOHICAN" GENERAL COVERAGE RECEIVER Model GC-1U. Fully transistorised. 4 piezo-electric transfilters. To overcome the problems of alignment, etc., the R.F. "front end" is supplied as a pre-assembled and pre-aligned unit. £39.17.6

GOLDRING-LENCO TRANSCRIPTION RECORD PLAYER Model G.L.58. Fitted with the G.60 pick-up arm, it has infinitely variable speed adjustment between 33⅓ and 80 r.p.m. and four fixed speeds. 3½ lb. turntable to reduce rumble, "wow" and "flutter". With Ronette 105. £18.19.2

HI-FI FM TUNER, Model FM-4U

For your convenience, this model is available in two units sold separately: Tuning Unit (FMT-4U—£2.15.0 including P.T. with 10.7 Mc/s I.F. output, and Amplifier Unit (FMA-4U—£12.6.0). Built-in power supply; 7 valves.

Total £15.1.0

MALVERN

HI-FI EQUIPMENT CABINETS

A range of over a dozen equipment cabinets is now available to meet the differing needs of enthusiasts. Designed for maximum operating convenience or for where room space is an over-riding consideration, this range includes kits, ready assembled cabinets or assembled and fully finished cabinets, and has at least one model to meet your requirements. Why not send for full details? Prices from £6.19.6—£29.8.0

HI-FI MONO AMPLIFIER. Model MA-5. A general purpose 5 w. amplifier with inputs for Gram., Radio. Presentation similar to S-33. £10.19.6

TRANSISTOR PORTABLE RADIO. Model UXR-1

Covers Long and Medium W. Bands. Presented in elegant real hide case with gold relief. Can be assembled in 4 to 6 hours. Pre-aligned I.F. transformers, printed circuit and a 7 in. × 4 in. high-flux speaker. £13.12.1

HEATHKIT ELECTRONIC WORKSHOP KIT, Model EW.1. This kit will help your boy to understand electronics, by making at least 20 exciting experiments, including Transistor Radios, Intercom Sets, Burglar Alarm, Electric Eye, etc. £7.13.6

GARRARD AUTO/RECORD PLAYER. Model AT-6. 4-speed stereo and mono unit, manual or automatic record selection, Ronette 105 cartridge £13.12.1
With Decca Deram cartridge £14.6.1

WE GUARANTEE PERFORMANCE TO OUR PUBLISHED SPECIFICATIONS

AUDIO SIGNAL GENERATOR Model AG-9U. Delivers up to 10 volts pure sine-wave (less than 0.1% distortion, 20 c/s to 20 kc/s). Decade switch-selected frequencies from 10 to 100,000 c/s. Internal 600 Ohm N/I load, or external. £21.9.6

AUDIO SINE/SQUARE WAVE GENERATOR AO-1U. Covers 20 c/s—150 kc/s in four ranges. Choice of sine or square waves, the latter up to 50 kc/s. £13.15.0

SUGDEN MOTOR UNIT "CONNOISSEUR CRAFTSMEN". Heavy duty motor operating at 33⅓ and 45 r.p.m. Very heavy 12 in. turn-table. Virtually no rumble. £16.6.6

HI-FI STEREO 18 WATT AMPLIFIER Model S-99. Within its power rating, this is the finest stereo amplifier available, regardless of price. Printed circuit board construction; ganged controls. U/L push-pull output. 0.2% distn. at 9 W/chal. £27.19.6

TRANSISTORISED TELEPHONE AMPLIFIER, Model TTA-1. Provides instant group listening and conversation. Freely portable for use with any telephone; hands-free operation; automatic switch; 9v battery operated; compact and elegant cabinet. £7.9.6

TRANSISTOR INTERCOM, Models XI-IU AND XIR-IU. Designed for use in the business office or the home, the Master unit (XI-IU) can operate up to five Remote units (XIR-IU) which give instant service without warming-up delay. "Private" switch. 9 volt battery operated. Supplied with assembled sapele-mahogany cabinets XIR-IU £4.7.6. XI-IU £10.19.6

HI-FI SPEAKER SYSTEM Model SSU-1. This kit is easily assembled. It contains two speakers and balance control in its ducted port reflex cabinet. It is equally suitable for stereo or mono in average room. (Legs 14/6.) Less legs. £10.17.6

A WHOLE RANGE OF PACKAGED DEALS (INCLUDING "CONNOISSEUR CRAFTSMAN" TURNTABLE and DECCA ffss PICK-UP) NOW AVAILABLE TO SAVE YOU FURTHER MONEY.

ALL MODELS ARE ALSO AVAILABLE ASSEMBLED — PRICES ON REQUEST

All prices include free delivery in U.K. Deferred terms available on orders over £10

JUST POST THIS COUPON FOR FURTHER INFORMATION

Without obligation please send me TICK HERE

★ **FREE BRITISH HEATHKIT CATALOGUE . . . .** ☐

FULL DETAILS OF MODEL(S) ..... ☐

NAME .....

ADDRESS .....

.....HT.4

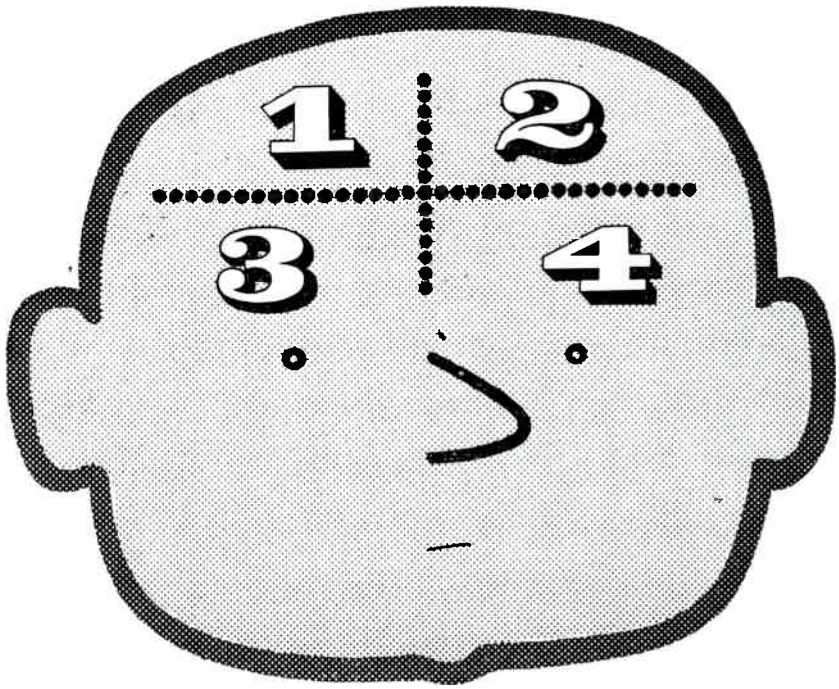
SOME OTHER HEATHKIT MODELS AVAILABLE

World's largest-selling **VALVE VOLTMETER** ...	Model V-7A	£13.18.6
G/P OSCILLOSCOPE (5 in. Flat-face screen) ...	Model O-12U	£38.10.0
VARIABLE FREQUENCY OSCILLATOR ...	Model VF-1U	£11.17.6
TRANSISTOR RADIO for the youngsters ...	Model UJR-1	£2.7.6
RESISTANCE/CAPACITANCE BRIDGE ...	Model C-3U	£9.5.0
AUDIO VALVE MILLIVOLTMETER	Model AV-3U	£14.17.6
AUDIO WATTMETER	Model AW-1U	£15.15.0

DAYSTROM LTD., DEPT. HT.4 GLOUCESTER, ENGLAND

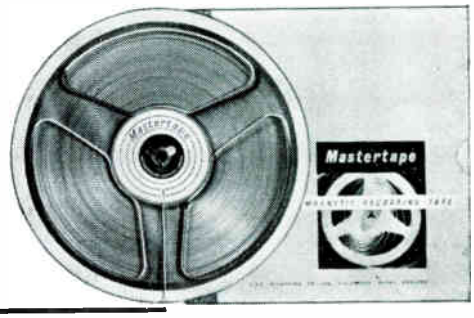
A member of the Daystrom Group, manufacturers of

THE LARGEST-SELLING ELECTRONIC KITS IN THE WORLD



FOUR TRACK MIND ?

Obsessed with problems of reproduction?
If it is unrepeatable, capture it on
Mastertape magnetic recording tape. For both
¼ track and ⅛ track recordings there is nothing better.
Don't spoil them for a ha'porth of tape.



Mastertape

MAGNETIC RECORDING TAPE

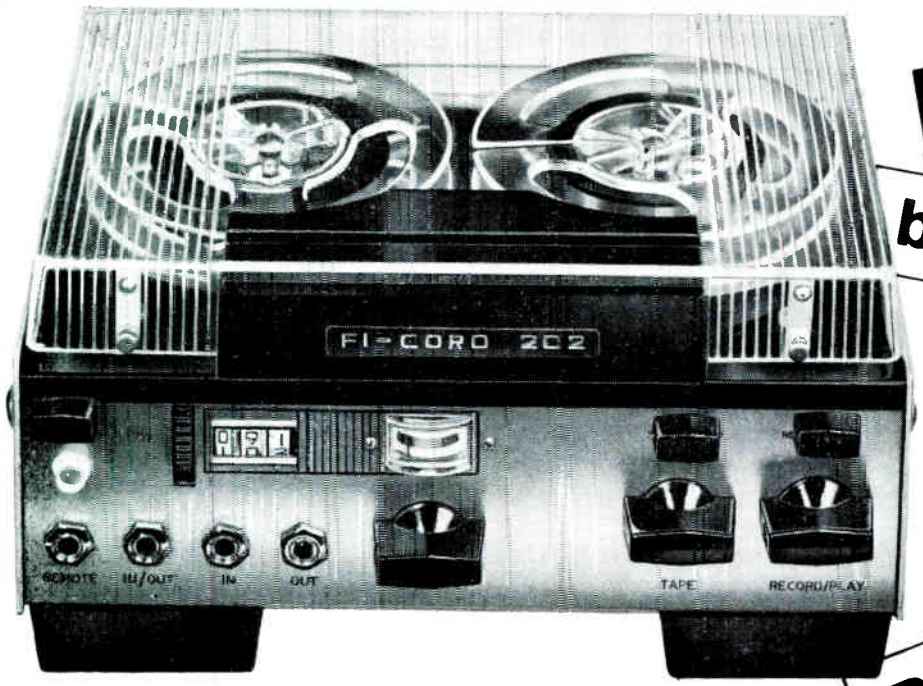
Send for free full colour brochure of tape prices and tape recording accessories

MSS RECORDING COMPANY LTD, COLNBROOK, BUCKS. Tel: Colnbrook 2431

British Mastertape Makes Sound Sense

SEE US AT THE
INTERNATIONAL AUDIO FESTIVAL & FAIR
BOOTH No. 5
COME AND HEAR
THIS IS YOUR TAPE IN DEMONSTRATION
ROOM 234

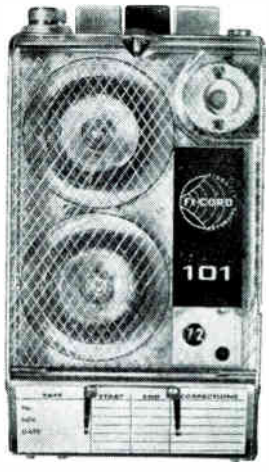
A MEMBER OF THE BICC GROUP OF COMPANIES



MALLORY

batteries give STAYING POWER to FI-CORD recorders

When FI-CORD fitted Mallory Mercury batteries to their recorders they proved that *lasting* high fidelity performance is possible even with miniaturization. Uniquely fade-free Mallory Mercury batteries deliver full power for many more hours. They do not leak, do not need rest periods to recuperate. And their stability eliminates the wow, flutter and distortion troubles that occur when ordinary batteries tire. Mallory batteries are made to give all portable recorders a longer, better performance per battery change. Ask for them by name when replacement time comes around and enjoy all the benefits of a really modern battery system.



MALLORY *for new ideas in batteries*

MALLORY BATTERIES LIMITED CRAWLEY SUSSEX *Crawley 26041*

NEW ANNOUNCING

TWO NEW TAPE RECORDERS FROM BRENELL

FOR STEREO

£120

THE STB1

This new stereo tape recorder from Brenell contains many new features which will appeal to the discriminating amateur and professional alike. It is beautifully designed both mechanically and electrically and incorporates twin recording and twin replay pre-amplifiers, designed for use with existing high fidelity amplifying equipment. Some idea of the versatility of this new machine will be gathered from this very brief specification:—

4 speeds, 1⅞, 3¾, 7½ and 15 i.p.s.—mixing—superimposing—sound-on-sound—immediate comparison of original and recorded signals—2 edgewise meters—replay facilities for ½, 2/2, ¼ and 2/4 track pre-recorded tapes.

FOR MONO

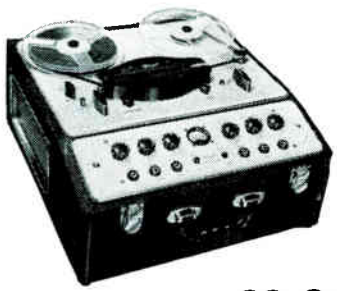
69 Gns.

THE MARK 5 Series 2

This new machine replaces the MARK 5 and offers a number of improvements both in appearance and electrically. The cabinet is finished in dark grey with chrome trim and the deck and amplifier have light grey masks giving the whole machine a very pleasing appearance. The amplifier has been redesigned to give an improved frequency response at all speeds on both record and playback. The output remains the same at 4 watts.

Specification

4 speeds, 1⅞, 3¾, 7½ and 15 i.p.s.—3 independent motors (synchronous drive to capstan motor)—instant stop without spillage—pause control—monitoring—superimposing—up to 8¼ in. reels—fast rewind (1,200 ft. in 45 seconds).



88 Gns.

and we continue

THE MARK 5 Type M

A high-class, semi-professional machine, the Type M has earned itself an enviable reputation for quality and reliability. Its superb finish and performance will match any high fidelity equipment which is available today—just consider this brief specification:—

4 speeds, 1⅞, 3¾, 7½ and 15 i.p.s.—separate record and replay heads and amplifiers—reels up to 8¼ in. dia.—fast rewind (1,200 ft. in 45 seconds)—mixing—superimposing—recording level meter—adjustable rotary tape guide.

Brenell

GD381

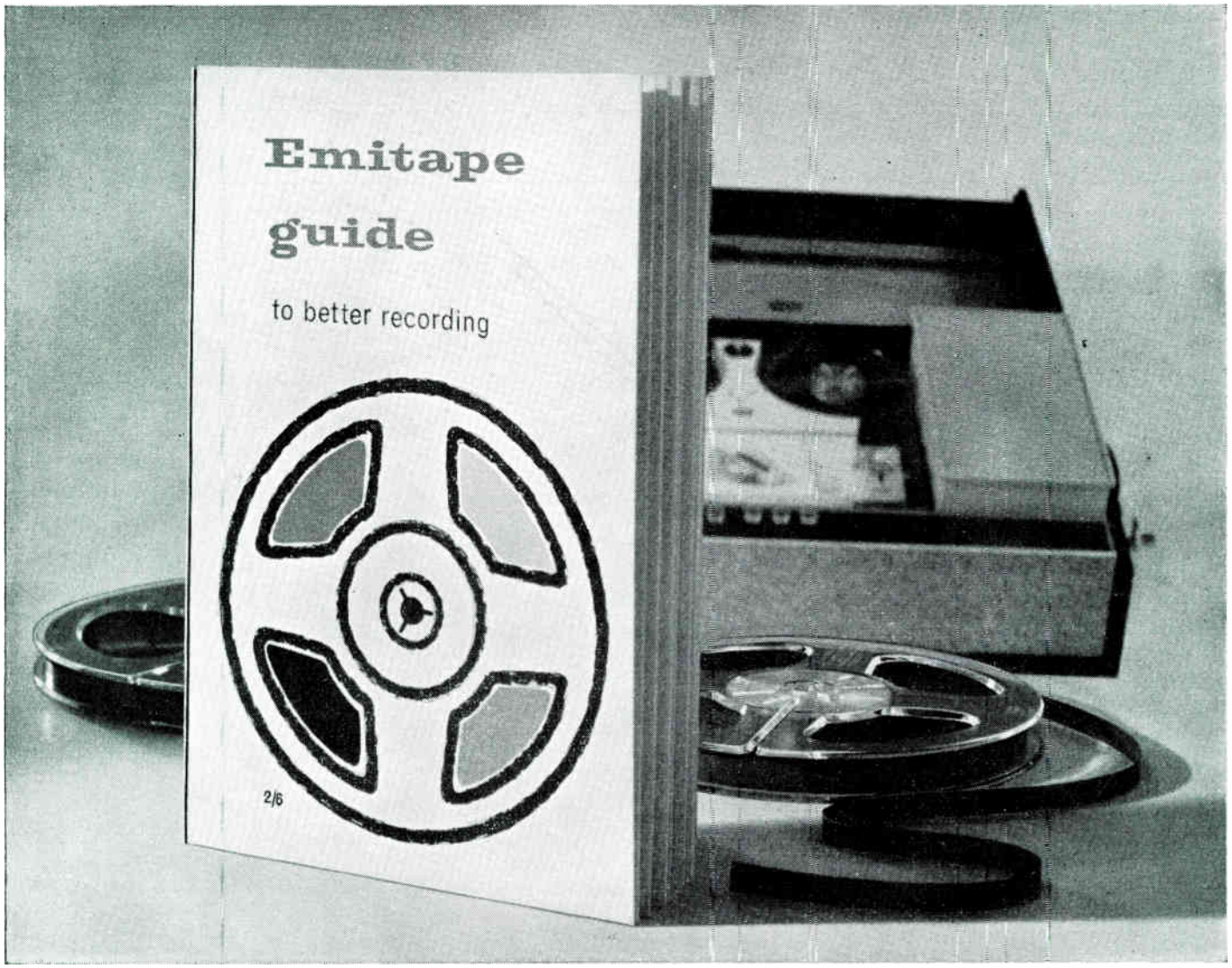
All this equipment can be seen and heard at the Audio Festival and Fair.

BOOTH No. 53 DEMONSTRATION ROOM 236.

BRENELL ENGINEERING COMPANY LIMITED.

1a Doughty Street, London, W.C.1. HOLborn 7356 (3 lines)

'The Emitape guide to better recording' by John Borwick



'No tape user can afford to be without this book'

PERCY WILSON, TECHNICAL EDITOR OF 'THE GRAMOPHONE'

Emitape shows everyone the way to better recording.

First, Emitape's six highly successful Emiguide tapes told you all about sound—through sound.

Now John Borwick caps the series with *The Emitape Guide to Better Recording*—56 pages, filled with ideas, examples and illustrations, giving you all the essentials of tape recording in straightforward language. At only 2/6, this is a *must* which every tape user can afford.

There's no mystery about tape technique when you get Emiguidance. Ask your local dealer for a copy of *The Emitape Guide to Better Recording*. Or write direct to E.M.I. TAPE LIMITED, Department EG, Hayes, Middlesex.

E.M.I. TAPE LIMITED · HAYES · MIDDLESEX

ET 86

Please send me a copy of *The Emitape Guide to Better Recording*. I enclose a postal order for 2/6.

NAME .....

ADDRESS .....

.....

Emitape

SEE US AT STAND 55—AUDIO FAIR, April 18-21

the TAPE RECORDER

APRIL - - - - - - - - - - - - - - - - 1963

VOL. 5 - - - - - - - - - - - - - - - - No. 3

Editor - - - - - - - - - - - - - - - - MILES HENSLOW

News Editor - Alan Lovell

Advertisement Editor - - - - - - - - - - - - Julian Berrisford

Editorial Offices - - - - 99 Mortimer Street, London, W.1

Telephone - - - - - - - - - - - - - - MUSeum 3967 to 3969

★

MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

EDITORIAL

THE tape world is an odd one. Sometimes we have been tempted to wonder, seriously, whether "tape"—as opposed to disc—might not have enjoyed a far more successful adoption if it had been purveyed at one speed on one track. At least everyone would have known precisely what to expect—and 90 per cent. of its users would most certainly have experienced much, much better results than they are getting today. If that last sentence seems harsh, recall that BBC quality in outside recorded broadcasts was largely based on results from the EMI battery portable, "L2". Speed, 7½ i/s, and full track. Yes, we can almost hear the remarks that are being made! But we insist, nonetheless, that that is the way things *should* have gone, assuming that quality is the prime factor. Forget tape for a moment, and consider disc development. For about 50 years discs were recorded at the *approximate* 78 rpm speed; they all fitted the same flat turntable, and a speed regulator catered for those who bothered to read what the label indicated. And because the world was offered a standard product, turntables invaded the homes of the millions. When the disc became a precision, quality product, and went "*lp microgroove*", the changeover was relatively easy. Today the two internationally used speeds are 45 and 33⅓ rpm: a single groove carries the programme, stereo or mono: in the constant battle to improve quality the manufacturers improve the quality of the recording/cutting technique, and the pickups for playing what is recorded.

Now back to tape. Before users had even properly tasted the novelty of the tape recorder they were given the muddling innovations of double tracks, two speeds (and not even standards on some machines), thinner tapes, then three speeds—even four speeds—thinner tapes still, then four tracks, then stereo. Cassettes were offered in lieu of reel to reel. Reel sizes varied from machine to machine. Now we see machines that will play two and four-track tapes, others that will record mono and replay stereo, and so on. Does it make sense? And recall that all this has taken place within a maximum of 15 years. Small wonder that there was a mad scramble on the part of some manufacturers to keep pace with what they guessed the demand would be—that inefficient machines were made—that the customer eventually carried the can.

Now, we started off by saying that the tape world is an odd one. We repeat ourselves. Most of the "innovations" have appeared because there seemed to be a need to foster tape economy. Quality was quite overlooked with this false doctrine in mind. Result?—the manufacturers are continually being caned for not reducing the price of tape, yet the users themselves do not co-operate by doing the one thing which would encourage that end—namely, using tape properly, and more of it.

The way to use and enjoy tape to its full is to edit it. In the long run, the only tapes that are really appreciated and used, and played again and again after years, and through the years, are those which provide a programme. It does not matter what that programme consists of, but it must be a complete entity. It is the reels which lie around, crammed with odd bits of this and that, that are the true waste. If even one tenth of the people who now use recorders would learn to edit and splice we should all be getting somewhere. We intend to return to this subject, hammering at it editorially, in the months ahead; but in the meantime we do earnestly urge our new readers to buy their recorders intelligently and with a plan in mind.

The Audio Show is again with us this month, and the selection of products promises to be bigger and more interesting than ever. Let those who want a recorder for everyday home entertainment, but who also plan to make sound on tape a part of their quality music, think specially hard. If possible, buy a good little machine for the fun and games, and study the more expensive, semi-professional models. The latter will do both jobs: the first will not. But think more expansively about the reels of tape. Don't bottle everything up on one miniature spool. And remember that a programme cannot be properly cut and edited if it is on two tracks of the same tape.

CONTENTS

COVER PICTURE

ON our cover this month is the author of the article on page 109, Douglas Fisher, who is a producer of Natural History Films. The recorder being used is a Fi-Cord 1A which has been modified and fitted in a larger case which allows the stowage of accessories in a section beneath the tape deck. The photographs were taken by Paul Bennett.

SUBSCRIPTION RATES

The subscription rate to *The Tape Recorder* is 27/6 per annum (U.S.A. $4.00) from The Tape Recorder, 99 Mortimer Street, London, W.1. Subscription + Index, 30/- (U.S.A. $4.25). The same rates apply to *Hi-Fi News*.

TAPE PREVIEW OF THE AUDIO

THE organisers of the 1963 Audio Festival and Fair to be held at the Hotel Russell, Russell Square, London, W.C.1, on April 18th to 21st inclusive, have advised us that over 72 manufacturers will be demonstrating their range of products. On the ground floor there will be the usual display stands giving visitors the opportunity of studying the equipment before passing up to the first floor for demonstrations. Most of the exhibitors will be holding demonstrations at regular intervals throughout the day and evening, but a few will leave the doors open allowing a continual flow of visitors.

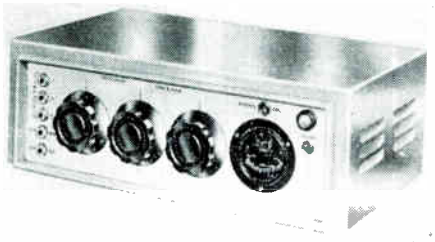
Tape recording enthusiasts will have an excellent opportunity of seeing new equipment and meeting the designers and directors.

FI-CORD 202 BATTERY/ PORTABLE

New firms attending their first Audio Festival include Revox (U.K. Concessionaires) Ltd., Sherwood Electronics Laboratories Ltd., C.B.S. Tapes, Siemans Norge a/s., Symphony Amplifiers Ltd., Twinsonic Ltd., Romagna Reproducers Ltd. and Winter Trading Ltd.

Personal Listening

Personal listening will be a feature of the A.K.G. Exhibit. A large photograph will show people watching television, children playing with bricks and a music lover listening to a record, all in the same room. It will show that with the use of A.K.G. K.50 Dynamic Headphones weighing only 3½ oz., whatever the distraction his listening pleasure will not be disturbed. Two new

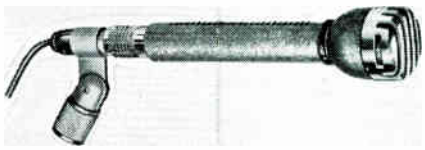


VORTEXION 3-CHANNEL MIXER

microphones will be introduced—the D77A and the C12A. The first is a dynamic stereo microphone costing £15 10s., and the C12A a condenser microphone with remote control allowing the engineer to choose the most suitable pickup pattern at the touch of a button. The price is £139.

Two new tape recorders will be on show at Recording Devices' stand, the Stuzzi 401 and the Master Recorder. The former is a two-speed machine (7½ and 3¾ i/s) with a four-track system. A special feature is the Intertrack transfer which makes it possible to listen to one track whilst recording on another, and also mix the two through the built-in mixer. The Master Recorder has been specially designed for language teaching.

In the B.A.S.F. demonstration room there will be three special booths giving visitors the opportunity of making a recording and sending it to friends and relatives. The tapes will be provided free. The M.S.S. Recording Company will be introducing a new quarter-track head, which has been developed over the past year. Also on show will be the full range of tape in new style boxes. A demonstration entitled, " This Is Your Tape "



A.K.G. D19 MICROPHONE

will be given in Room 234 which describes briefly the process of manufacturing magnetic recording tape. This has been produced for the enthusiast rather than the expert.

Two New Professional Recorders

Two new recorders will be on view for the first time on the Telefunken stand. These are the M24KL and M26KL, the only difference between the two is the operational speeds. These machines have been designed to bridge the gap between the amateur and professional. Each recorder is fitted with separate record and playback amplifiers allowing monitoring of the

TRUVOX R82 RECORDER

original and recorded signal. The price of the M24KL is £219 9s. and the M26KL £258 6s. A new automatic tape deck will be exhibited by Garrard Engineering and Manufacturing Co. Ltd., this has been designed for playing continuous music in factories and offices. Also on show will be the battery-operated tape deck introduced towards the end of last year.

A mains operated transistorised stereo recorder, the first to arrive in this country from Siemans Norge, of Norway, will be on show at the Denham and Morley stand. The recorder features plug-in amplifier panels, three speeds, two VU meters and the facility for playing both tracks through one speaker.

E.M.I. Sound Products Ltd. will be demonstrating the Emicorder Stereo Model ET 40, a mono recorder with full stereo replay facilities. The price of this quarter-track machine is £78 15s. Visitors to stand 55 will see E.M.I. TR 52/2, TR90 and RE 321 machines manufactured by E.M.I. Electronics for many broadcasting organisations throughout the world.

Other firms showing recorders and tape decks include Clarke and Smith, Fi-Cord, Tandberg, Sony, Truvox, Brenell, Ampex, Leevers Rich, Vortexion, Loewe-Opta, Ferrograph, Grundig and Planet.

Microphones will not be neglected. Lustraphone will be demonstrating the new Radiomic—a radio microphone allowing the user to move about without the hindrance of trailing leads. A full range of accessories will also be on view. Grampian

FESTIVAL

with their range of products, which includes the DP4, DP6 and parabolic reflectors, will demonstrate for the first time a battery-operated, transistorised reverberation unit for amateur and professional use. A new transistorised mixer with two medium and one high impedance inputs will also be featured. Standard Telephones and Cables will introduce the STC 4112 which has been designed for high quality speech in recording and broadcasting studios.

Tape will also be well represented. From America there will be Scotch, Irish, Ampex and C.B.S. From the European continent, Gevaert and B.A.S.F. and, last but by no means least, England with E.M.I., M.S.S. and Zonal.

E.M.I. RE 321 PORTABLE

As in previous years some firms will keep the new products secret until the opening of the Festival, but recording enthusiasts will know that this is an exhibition which must not be missed. Tickets, admitting two people, can be obtained from this office, but it is essential to enclose a stamped addressed envelope.

* * *

EXHIBITORS OF TAPE RECORDERS and ACCESSORIES

Acos—Cosmocord Ltd., Eleanor Cross Road, Waltham Cross, Herts. A selection of microphones and accessories.

A.K.G.—Akustische u Kinogerate GmbH, Nobilegasse 50, Vienna 15. U.K. agents: Politechna Ltd., 3 Percy Street, London, W.1. Selection of microphones and headphones. Special note—D77A and C12A microphones.

Ampex—Ampex Great Britain Ltd., Arkwright Road, Reading, Berkshire. Tape recorders (professional and semi-professional) mixers and speaker units.

B.A.S.F.—Badische Anilin and Soda Fabrik, A.G. Ludwigshafen am Rein, Germany. U.K. office: 5a Gillespie Road, London, N.5. Magnetic recording tape.

Brenell—Brenell Engineering Co. Ltd., 1a Doughty Street, London, W.1. Tape decks, recorders, mixers, amplifiers, tape units, pre-amplifiers. Special note—the Mark 5 Series 2 tape recorder and tape deck.

Butoba—Butoba K.G., Schonach, Schwarzwald, Germany. U.K. agents: Denham and Morley Ltd., Denmore House, 173/5 Cleveland Street, London, W.1. Three battery recorders—MT5, MT7 and MT7R.

C.B.S.—C.B.S. Tapes Inc. U.K. agents: Desmond Burgess Co., 12-16 Watling Street, London, E.C.4. Magnetic Recording Tape.

Clarke and Smith—Clarke and Smith Ltd., Melborne Works, Wallington, Surrey. Transistorised tape recorders.

(*Continued on page* 101)

AUDIO FESTIVAL EXHIBITORS

Name	Booth No.	Dem No.
A.K.G.	39	112
Armstrong Audio Ltd.	34	347
Acoustical Mfg. Co., Ltd.	49	447
Ampex G.B. Ltd.	63	417
B.A.S.F.	36	118
Braun A. G.	21	214
Brenell Engineering Co.	53	236
Butoba K.G.	8	421
C.B.S. Tapes Inc.	13	333
Chapman Ultrasonics Ltd.	69	315
Clairtone Sound Corp. of Canada	18	215
Clarke & Smith Mfg. Ltd.	46	221
Cosmocord Ltd.	57	204
The Decca Radio & T.V. Co. Ltd.	31	402
Design Furniture Ltd.	32	348
E.M.I. Electronics Ltd.	55	411
N.S.B. Field & Co., Ltd.	51	111
Fi-Cord Limited	9	212
The Ferrograph Co. Ltd.	48	442
Garrard Eng. & Mfg. Co. Ltd.	38	222
Gevaert Photo-Producten N.V.	40	311
G.K.D. Ltd.	52	414
Goldring Mfg. Co. Ltd.	44	202
Goodmans Industries Ltd.	24	448
Grampian Reproducers Ltd.	68	242
Grundig G.B. Ltd.	17	237
Harwood & Martin Ltd.	65	114
Instrumatic Ltd.	43	220
K.E.F. Electronics Ltd.	66	413
S. Kelly	28	118
H. J. Leak & Co., Ltd.	29	248
Lockwood & Co. Ltd.	11	412
Loewe-Opta AG.	7	121
Lowther Mfg. Co.	64	144
Lustraphone Ltd.	60	247
M.S.S. Recording Co.	5	234
Metro-Sound (Thoren and Ortophon)	4	113
Miles Henslow Publications Ltd.	41	—
Minnesota Mining & Mfg. Co.	45	334
Mordaunt Sound Reproducers	74	312
Mullard Ltd.	1	211
Planet Projects Ltd.	33	318
Philips Electrical Ltd.	10	336
Pye Ltd.	59	218
Radford Electronics Ltd.	30	320
Rogers Developments Ltd.	71	149
Rola Celestion Ltd.	47	302
S.M.E. Ltd.	37	—
H. H. Scott Inc.	2A	—
Sherwood Electronic Labs. Inc.	6	420
Shure Bros. Inc.	67	418
Siemens Norge A/S	19	422
Sony Corporation of Tokyo	73	321
Standard Telephones & Cables	14	—
Willi Studer (Revox) A/S.	62	217
Stuzzi Radiotechnischer Betrieb	25	313
A. R. Sugden Ltd.	15	337
Symphony Amplifiers Ltd.	23	213
Tannoy Products Ltd.	16	349
Tandbergs Radiofabrikk A/S	2	122
Telefunken G.m.b.H.	58	314
Teppaz S.A.	50	322
Trio Corporation	8A	120
Twinsonic Ltd.	20	317
Truvox Ltd.	61	304
Vitavox Ltd.	35	115
Vortexion Ltd.	27	342
Waverley Records Ltd.	3	—
Wharfedale Wireless Works Ltd.	70	147
Whiteley Electrical-Radio Co.	42	415
Zonal Film (Magnetic Coatings) Ltd.	56	—

Recording Studios use

Agfa TAPE

for finest quality sound

PE 31 Long Play
PE 41 Double Play
PE 65 Triple Play

Visit us at the AUDIO FAIR in Room 249

* EXTENDED DYNAMIC RANGE. Special Techniques make Agfa Tape more tolerant to overload without distortion.
* HIGHEST SIGNAL/NOISE RATIO.
* MAXIMUM FLEXIBILITY provides intimate contact with tape heads for widest frequency response.
* PRESTRESSED to give maximum tensile strength.
* UNAFFECTED by temperature or humidity changes.
* BONDED COATING provides resistance to abrasion and keeps recording heads clean.

AGFA LIMITED

27 REGENT STREET · LONDON S.W.1 · TELEPHONE: REGENT 8581

MORE DETAILS OF TAPE AT THE 1963 AUDIO FESTIVAL

E.M.I.—E.M.I. Electronics Ltd., Hayes, Middlesex. Professional mains and battery tape recorders, magnetic recording tape.

Fi-Cord—Fi-Cord International, 40a Dover Street, London, W.1. Battery tape recorder.

Ferrograph—The Ferrograph Company Ltd., 84 Blackfriars Road, London, S.E.1. Tape decks, tape recorders (stereo and monaural). Special note—the Series 5 recorder.

Garrard—Garrard Engineering and Manufacturing Co. Ltd., Newcastle Street, Swindon, Wilts. Battery operated tape deck. Special note—new automatic tape deck.

Gevaert—Gevaert Photo-Producten N.V. U.K. office: Gevaert Ltd., Great West Road, Brentford, Middlesex. Magnetic recording tape.

Grampian—Grampian Reproducers Ltd., Hanworth Trading Estate, Feltham, Middlesex. Microphones, parabolic reflectors, mixers. Special note—transistorised reverberation unit.

Grundig—Grundig (Great Britain) Ltd., 40 Newlands Park, Sydenham, London, S.E.26. Tape recorders, tape decks, microphones, accessories. Special note—new stereo mixer.

Loewe-Opta—Highgate Acoustics Ltd., 72 Great Portland Street, London, W.1. Mains and battery operated recorders.

Lustraphone—Lustraphone Ltd., St. George's Works, Regents Park Road, London, N.W.1. Microphones and accessories. Special note—new radio microphone.

M.S.S.—M.S.S. Recording Co. Ltd., Poyle Trading Estate, Bucks. Heads, magnetic recording tape. Special note—demonstration film.

Philips—Philips Electrical Ltd., Century House, Shaftesbury Avenue, London, W.C.2. Tape recorders, mixers, microphones, magnetic recording tape. Special note—new stereo recorder.

Planet—Planet Projects Ltd., Goodman Works, Belvue Road, Northolt, Middlesex. Tape decks. Special note—new U1-15 deck.

Revox—Revox (Concessionaires) Ltd., 296 Kensington High Street, London, W.8. Stereo and monaural tape recorders.

Scotch—Minnesota Mining and Manufacturing Co. Ltd., 3M House, Wigmore Street, London, W.1. Magnetic recording tape.

Siemans Norge—Siemans Norge A/S Norway. U.K. agents: Denham and Morley Ltd., Denmore House, 173/5 Cleveland Street, London, W.1.

Sony—Sony Corporation of Tokyo. U.K. agents: Tellux Ltd., Avenue Works, Gallows Corner, Romford, Essex. Tape recorders and microphones.

S.T.C.—Standard Telephones and Cables Ltd., Connaught House, 63 Aldwych, London, W.C.2. Microphones and accessories, and mixers.

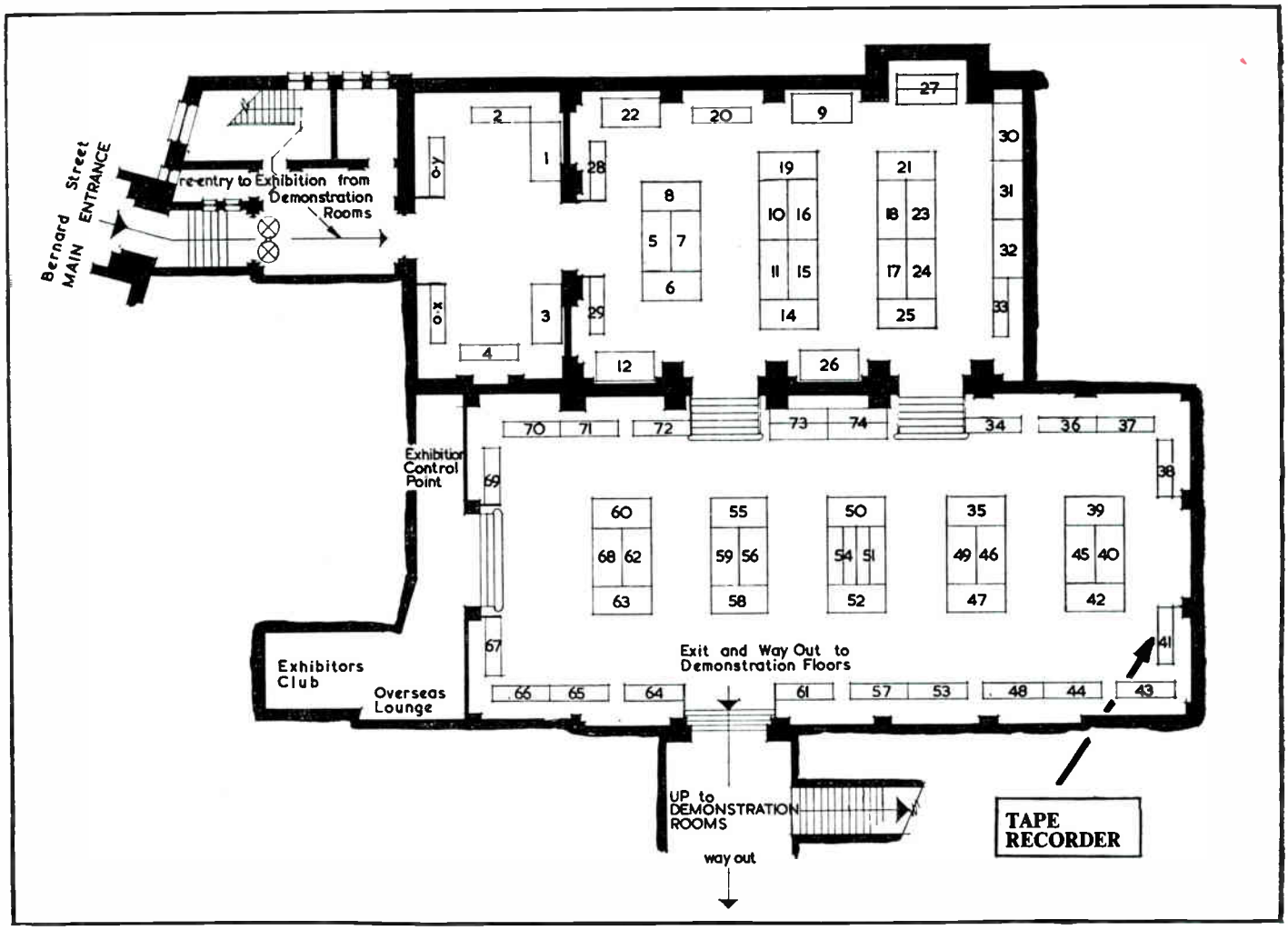
Stuzzi—Stuzzi Radiotechnischer Betrieb. U.K. agents: Recording Devices Ltd., 44 Southern Row, London, W.10. Tape Recorders, mixers and microphones. Special note—new 401 recorder.

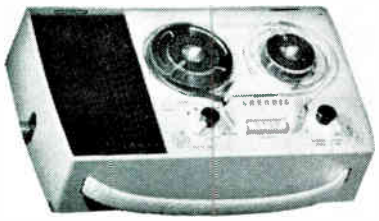
Symphony—Symphony Amplifiers Ltd., 16 King's College Road, London, N.W.3. Tape recorders and timer units.

Telefunken—Telefunken GmbH, Gottinger Chaussee 76, Hanover, Germany. U.K. agents: Welmec Corporation, 147 The Strand, London, W.C.2. Tape recorders, microphones and accessories. Special note—M24KL and M26KL recorders.

Truvox—Truvox Ltd., Neasden Lane, London, N.W.10. Tape recorders and tape units.

Zonal—Zonal Film (Magnetic Coatings) Ltd., The Tower, Hammersmith Broadway, London, W.6. Magnetic recording tape.





Grundig "Cub."

TAPE RECORDER

No. 16 GRUNDIG "CUB" and TK1

THE exigencies of publishing preclude a comprehensive treatment of a multiplicity of models. In other words, lack of space has made me leave out many details. Looking back over the past few articles of this series, I see that this statement, or something like it, has headed the page more than once.

It is in the nature of things—the way the toast always falls buttered-side downwards—that the details the author chooses to omit are the particular ones that give a number of readers their problems. Several queries have been received, and dealt with privately, on the Grundig battery machines, the "Cub" and the TK1. As these have been superseded by more up-to-date machines, a fair number are entering the secondhand market. Some readers may have the opportunity of picking up a sales bargain, but without information—for instruction manuals are always the first accessories to disappear—they may be reluctant to buy. The following notes are an attempt to fill the gap; to present, in the space available, the principal features and some of the servicing pitfalls of these older models.

Grundig "Cub"

The mechanical layout of this machine is shown in **fig. 1** with the underside details filled in by **fig. 2.** Most notable feature is the absence of a capstan. The tape is pulled across the head face by the take-up torque of spool *R*. As this spool is driven by a step on the flywheel spindle *F*, contacting its periphery, the speed of spool carrier revolution is constant, but the rate at which the tape is drawn past the head varies according to whether the spool is full or empty. A 3 in. spool is used, and the nominal speed is 3¾ i/s, varying between a maximum 4¼ i/s when the take-up spool is full and a minimum 3 i/s when the recording commences. This is a feature that will annoy the purist, and prevents a satisfactory reproduction of pre-recorded tapes, but as the machine is really intended for field work—capturing effects, taking interviews, notes, etc.—the speed variation is no great detriment. However, intending purchasers should note the point.

Further reference to **fig. 2** shows that the flywheel is driven by a belt coupled to motor *M*, with a tensioner pulley *P* whose main function is to convert the vertical plane of the motor pulley

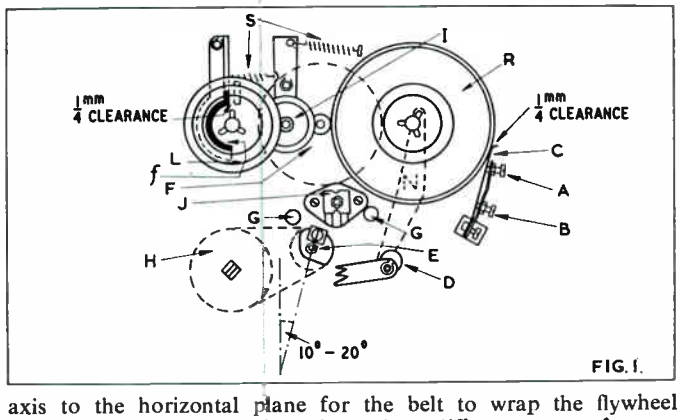


FIG. 1.

axis to the horizontal plane for the belt to wrap the flywheel groove. Note that there have been three different types of motor supplied, and the connections vary. The original motor was nickel-plated, had yellow and white switch leads and red and green motor leads. Its replacement, known as Type *A*, had yellow and black switch leads, and the motor leads were either red and green or red and blue, according to the production run. A later replacement had no leads at all. The motor is black, with red and green bands painted on the housing. Connections are easily remembered if one notes "red to red", the red motor lead going to the positive connection on the end with the red band. Likewise, the yellow lead connects to the positive tag on the green (switch) end of the motor.

Incidentally, this switch is a centrifugal type, working in conjunction with the special OC602 transistor. If the motor and switch are working correctly, current consumption should be as follows:

Record and Replay: Total current 250 mA; Rewind, 280 mA.
Amplifier current: Record, 10.6 mA; Replay 10.1 mA.

If consumption is high, check that the centrifugal switch is

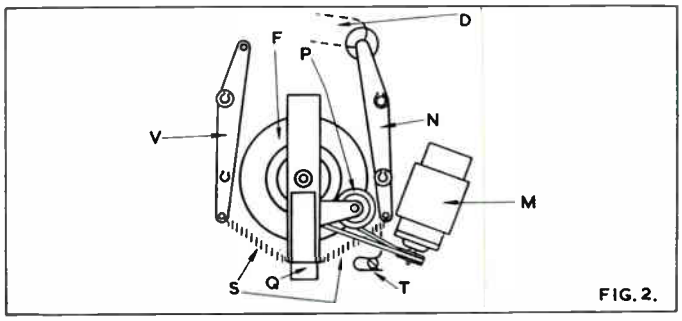


FIG. 2.

cutting in, and that the motor and flywheel bearings are not imposing excessive friction. If the latter is at fault, sluggish starting will be noted—between functions, the motor is switched out to save battery wear. Low current may indicate run-down batteries. The four 1.5 volt cells power the motor (U2 type), and a No. 8 battery, nominal 3 volts, is added to bring the total amplifier voltage up to 9 volts. A figure of 15 hours intermittent use is quoted by the makers, with new batteries, but this varies with the interpretation of "intermittent" and other variable factors. The author has used a "Cub" for periods averaging 30 minutes a day for more than a fortnight before finding it necessary to renew the batteries.

Rewind should take approximately 5½ minutes. Movement of the lever *V* (**fig. 2**) engages the left-hand spool carrier *L* (**fig. 1**) with the idler *I*, which is swivelled against the tension of its spring to connect with a step on the flywheel capstan. Check the return movement of this idler bracket when the Rewind function is neutralised, looking for excess tension at the flywheel spindle caused by a juddering of the idler when it should be disengaged. There is no provision for Fast Forward winding.

Braking

Braking is separate and requires careful setting. The left-hand brake is a spool-hub type, consisting of a felt pad *f* on a curved bracket. The cam and lever arrangement is such that this brake is engaged by the spool hub between functions. It is held in position against its stop flange by spring *S* and there should be a ¼ millimetre clearance between brake and stop during operation. A small amount of tape tensioning is thus provided, but excess must be avoided, and the flange can be bent slightly to obtain correct clearance.

The right-hand brake consists of a spring leaf *C*, mounted on a bracket to engage the edge of the spool *R*. When the machine is switched to Record or Replay, there must be a

SERVICE

By H. W. HELLYER

¼ mm. clearance. as indicated in **fig. 1**, and this may be adjusted by first slackening screw *B* until it is clear of the leaf spring, then adjusting screw *A* for the correct clearance and finally screwing *B* in until the end of the screw just touches the leaf—no more. Carefully retighten the locknuts.

The azimuth adjustment is conventional two-screw, with a central grub-screw and locknut securing the head in its bracket. First check that the tape is running true between guides *G* with the centre line 22.3 mm. from the deck, then set the head so that the top of the gap is 0.1 mm. above the upper edge of the tape, finally adjusting the screw without the spring loading for maximum replay of a test tone.

Erase Head Setting

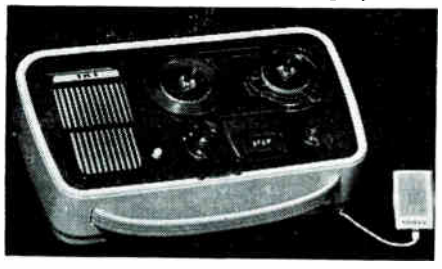
The erase head requires careful setting. This is a permanent magnet *E*, mounted on a wheel with chain coupling to the cam *H*. In the Record position, the line of the head should make an angle with the axis of the machine of between 10 and 20 degrees, as indicated. The switch assembly includes a plastic cam at the lower part of the spindle, which should be checked for wear. Note also that the chain wheel is mounted over a compression spring on a cup and ball, just above the positioning cam.

The four-transistor amplifier has an OC71 pre-amplifier, an OC71 driver and a matched pair of OC72 transistors in push-pull, and has a frequency response of 150-5,000 cycles. To check, insert 100 ohm resistor in the green return lead of the R/P head, and with controls turned to maximum, record a 1 Kc/s signal at 20 mV input from a network consisting of 50,000 and 500 ohms in series, signal to the microphone input (pins 1 and 2 of the socket) taken across the 500 ohm resistor. Note that the voltage across the head series resistor should be 5 mV (rising to twice this amount as the frequency of the input approaches the upper limit of 5 Kc/s). Record the test tone, replace the loudspeaker with a 3.5 ohm resistor and play back,

★

GRUNDIG TK1

★



to obtain a reading of at least 200 mV. At the lower test frequency of 333 Kc/s, a reading of 190 mV would be expected and 90 mV at 5 Kc/s, with the "Cub" switched to Replay and similar connections.

The noise level should not exceed 4 mV, and bias can be measured by inserting a mA-meter in the green lead and noting a reading of 0.425 mA ±10 per cent.

Grundig TK1

This model has now been withdrawn by the manufacturers, but a great number are still in existence, giving good results. It is a little more ambitious than the "Cub", but is not a development of that model, and must be regarded as a completely different machine. It has a wider frequency response, 80-8,000 c/s ±3 dB, a signal to noise ratio, also stated to be 40 dB, but in practice better than the smaller machine, A.C. bias at 40 Kc/s,

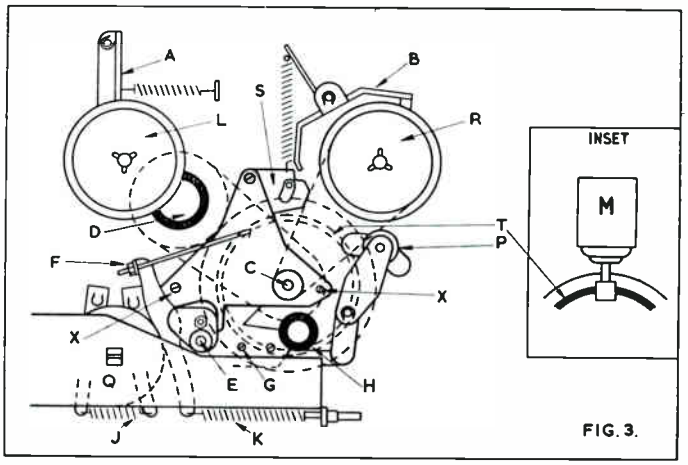


FIG. 3.

a faster Rewind time, 4 minutes for the 3 in. spool of standard tape, and a longer playing time, up to 20 hours at two hours per day.

It is a single speed, 3¾ i/s two-track machine, with magnetic erase, a DM71 magic eye, pause control, and the tape is capstan driven, giving a regular speed.

Mechanical Functions

The mechanical arrangement is shown in **fig. 3**. It should perhaps be mentioned that these drawings are not supplied by manufacturers, and in common with most others that have appeared in this series of articles, are not therefore to scale, having been prepared from my workshop notes. Their purpose is mainly to illustrate the text and save long descriptions of the location of various adjustments.

The motor, shown inset, is mounted horizontally, so that its pulley bears against the rubber tyre *T*, which is recessed in the lower face of the flywheel. The flywheel capstan is brought up through the deck, at *C*, and is contacted by the pinch wheel *H* when the Record or Play function is selected. A pulley on the capstan spindle is coupled by a flat belt to the clutch drum of spool *R*. This belt is silk weave on plastic base, and should be assembled with the textile surface inwards.

There is a friction adjusting ring fitted to the lower section of the clutch, with two retaining screws inserted from below. The spool carriers can be removed by first taking off the grip-rings at the spindle bases, and the clutch height raised by addition of washers (0.2 mm. and 0.5 mm. SRBP) between clutch assembly and chassis, with the Simrit washer re-inserted next to the clutch.

Belt Replacement

The other belt, from a larger step on the flywheel, is used to drive the coupling wheel for the Rewind pulley *D*. This is a round-section plastic belt of 2 mm. diameter. Belt replacement is not so difficult as it looks. First, remove the printed circuit panel. Then, take off the flywheel bearing bracket—take care not to lose the steel ball at the base of the spindle. Slide off the motor clamp and ease the motor away from the flywheel, when the Rewind belt can be removed. Switch the machine to Rewind and pull the flywheel clear, and the clutch belt can be removed.

The purpose of pulley *P* is to apply tension to the flat belt, by swivel action of the lever system when the main selector *Q* is turned. Note that, as in the Cub, the cam arrangement of this selector engages the various levers for pinch engagement, rewind and braking. Spring *J* holds the two pivoted brackets into contact with the cam, and spring *K* holds the lower end of the brake lever *F* in tension, with a coupling to the pinch wheel bracket. Note the locknut and thread adjustment at the end of this spring.

After adjusting for positive engagement and brake action—(see notes below)—check that the pressure roller is making a correct vertical contact with the capstan spindle. The screw *G*

(*Continued on page* 104)

TAPE RECORDER SERVICE—(continued)

on the bracket is spring loaded, and the pressure should be 14-16 oz. Head adjustment is as before (see Cub).

The left-hand brake is similar to the Cub, except that a sprung lever is used to hold it off, and a gentle pressure is applied to the hub of spool carrier *L* during Record and Playback, with bracket *A* sprung inwards. But the right-hand brake is a felt pad engaging the edge of the carrier clutch assembly by the swivel action of bracket *B*, with a torsion spring tending to hold it in engagement. When the rod *F* swivels the plate *S*, the lower end of the bracket *B* moves inward, and the locknuts should be adjusted on the threaded rod to give a 1/32 inch clearance of the brake from the clutch drum.

Transistorised Amplifier

The erase head is again a permanent magnet. with a chain drive from the selector. Details of the angle are not shown on **fig. 3** (more dotted lines would have been confusing), but in this case the base line from which the angle is judged is a line drawn through the two fixing screws of the head plate *X-X*, and the angle should be 10-14 degrees.

The amplifier uses 5 transistors, with a sixth as oscillator and a seventh as the motor regulator. Note that in the case of the TK1 there is a 33 ohm resistor in the collector-emitter circuit (the Cub uses a 22 ohm). The governor contacts control the base current, and the full motor current flows through this resistor—if the motor runs slow, the governor contacts close, current increases, and the motor speeds up. Note that machines up to serial number 9200 had the governor contacts connections red, armature connections green. After this model, the colour sequence was reversed.

Amplifier Adjustments

Amplifier adjustments include setting of the quiescent current of the output stage. With a D.C. mA-meter inserted in the secondary centre-tap of the output transformer, adjust the 2,000 ohm preset resistor for minimum current. with no tape loaded. This preset will be found between the output transformer and the oscillator coil, on the printed circuit panel. Head currents, etc., are measured across a 100 ohm resistor in the R/P head return lead. Bias current of 1.3 mA produces 130 mV, and a 100,000 ohm preset resistor allows final adjustment (near the oscillator coil).

With a 1 Kc/s input, during Record, and the DM71 removed to remove the bias, check that there is a recording current producing 15 mV across the 100 ohm resistor. Then modulation level can be adjusted by the 500,000 ohm preset, to give 1 volt negative reading at the grid, pin 1, of the DM71.

The noise level adjustments, mentioned above, producing a maximum 6 mA reading, can be checked by placing a resistor across the output connections of the jumper lead. 5.5 ohm, when the reading, with controls at maximum, should be no more than 2.1 mV.

our readers write . . . . .

. . . about a transistor tape amplifier

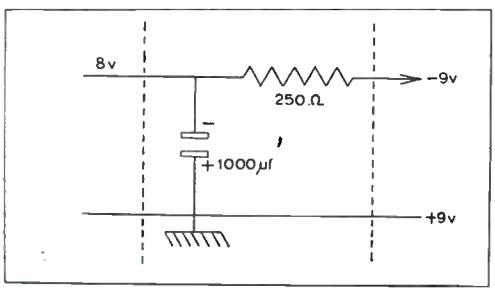
From:—R. Williamson, 78 Helena Road, Norwich.

Dear Sir:—Mr. Ridler's letter in the February issue of *The Tape Recorder* is the obvious answer to the reader experiencing noise with a transistor tape amplifier. I can write with bitter experience having successfully ruined a good CCIR test tape in the very same way. I think there is a more simple solution to the problem than that suggested by Mr. Ridler, particularly since it may not be practicable to arrange head switching as suggested.

I have been working on a quarter-track stereo tape player using twin transistor pre-amplifiers based, in fact, on an original design by Mr. Ridler. It proved disastrously easy to magnetise the replay head by connection and disconnection of the battery supply. I concluded that this was due to the high transient charging current in the input capacitor. To overcome this I introduced a delay circuit in the power lead itself in the form of a high value of capacitor and series resistance so eliminating power supply transients. Most transistor amplifiers handling low signals will tolerate a loss of a volt or so in the supply. In my case consumption of the two pre-amplifiers is 4 mA, so by Ohms law $\frac{1 \text{ volt}}{4 \text{ mA}} = 250$ ohms

so I used the following circuit:

Using a virgin tape, frequent disconnection and connection to the supply produced no progressive increase in noise level



whatsoever. If a higher voltage supply is available, the resistor can be increased in value to advantage. Or for that matter the capacity of the electrolytic can also be increased.

Incidentally, a battery supply is not entirely free from faults and even a new battery can have sufficient internal resistance to give measureable crosstalk on a stereo pair of pre-amplifiers. A battery near the end of its life can also be the source of noise where a decoupling circuit such as I have described is not used.

Yours faithfully.

* * *

. . . about the Federation

From:— P. P. Towell, Boston Soundhunters, 107 Spilsby Road, Boston, Lincolnshire.

Dear Sir:—There are over 120 Tape Recording Clubs in this country, but less than a quarter of them are members of the Federation of British Tape Recording Clubs. Have you ever wondered why the others do not join the Federation? Is the Federation, in fact, doing its job?

It is imperative that there should be an active organisation which can speak for the British clubs to their foreign counterparts, and not only be a clearing house for entries for the International Contest, important though that may be. But the Federation can hardly be called representative of this country when it actually consists of only 28 clubs. It cannot be the cost of the one guinea subscription (low enough, surely). But what benefits do we, as members of the F.B.T.R.C., enjoy?

When we started our local tape recording club, I immediately suggested that we should join the Federation, because having the honour to serve one National Federation of a similar kind, I know the help it can be to new clubs. We received our Introductory Cards, and the new multi-lingual ones promise to be even more useful. The "Approved Dealer Scheme" seemed an excellent idea, but since the dealers are listed on the recommendation of members of the local club, is the listing of any use to clubs in any other part of the country? I doubt it, because our members in Lincolnshire are hardly likely to want to use dealers out of our own neighbourhood.

Then there is the Bulletin, which comes out so erratically that some of the news is published in the national magazines beforehand. Owing to a two-month delay, the closing date of the new Quarterly Competition had to be put forward—even though entries had already been received from those who had one prepared after reading the preliminary announcement.

One wonders whether the Federation is on the right lines. There have been complaints about a tie-up with a manufacturer, but there is no reason why manufacturers should not help in distributing the Bulletin, though perhaps with a little less blatant advertising. More serious, to my mind, is the exclusive tie-up with one particular national recording magazine. This is hardly likely to bring maximum support for the Federation, which ought to have maximum coverage.

I am surprised that the Federation gives so little lead to clubs, some of whom appear to be having a job to keep going—mainly because of the lack of a lead or any help from the top. If there are no clubs, there will be no Federation. I would like to see it listing lecturers and firms willing to give demonstrations, arranging liaisons between local groups so that they can give increased support when a lecturer or demonstrator is in the area. It could suggest programmes and events for inclusion in the year's calendar of each club. The new Competition is only a beginning.

To get 1963 off to a better start in this new spirit, let us see the Federation making an enthusiastic approach to every club which is not yet a member, to join the Federation. Only then can his Committee be elected to be truly representative of all the clubs in Great Britain.

Yours faithfully.

Note: *We have had several letters about the potential usefulness of a live Federation, and we certainly feel that its membership should be greater than that stated in the letter above. We do not know whether the writer is correct when he suggests that there is a tie-up with one particular magazine. Our view is that the editor is probably doing a rather thankless task, which no one else has had the energy to tackle! A more lively Federation might well expand its Press contacts.* (*Editor.*)

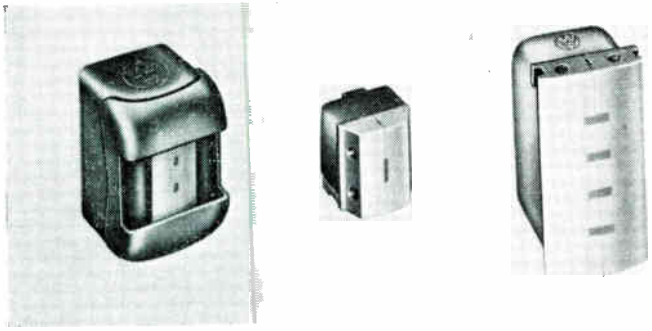
* * *

. . . about sound effects

From:—S. Farmer and Co. Ltd., Connaught House, 15-17 Upper George Street, Luton and at Dunstable.

Dear Sir:—Our attention has been drawn to an article in the February issue of *The Tape Recorder* about sound effects. The HMV 7FX records sell at 6s. 7d. and the 7EMF records, which are made by the French E.M.I. company, sell at 12s. 6d. and are obtainable throughout the country from all E.M.I. specialist import dealers. It is misleading that the catalogue numbers given for the 7EMF series in the article are not correct and should be three figure numbers. The E.M.I. Import Dept., at Hayes, Middx., can provide a complete list (in French!)

Yours faithfully.



TECHNICAL

A STUDY OF THE FACTS

"IN this laboratory", said my first technical chief, "we call them *adjustable* capacitors. *Everything* is variable, darn it!" Ever since then it has become more and more evident to me that as much loose and even inaccurate terminology is used in engineering as in everyday affairs. To be sure, people protest vigorously about it from time to time; but their protests are usually directed either at the alleged inability of engineers to write understandable prose or at the etymological horrors perpetrated by the coiners of new technical words such as "television" and "audio". The former is an unjustified generalisation and the latter, it seems to me, is irrelevant as long as the words coined are distinctive and unambiguous, and can be pronounced with reasonable grace. So often, too, those who swot the gnats ignore altogether the camels—the technical words used wrongly, or the common words given a misleadingly different technical meaning when they need not be.

Obvious Confusion

Habits die hard, of course. "Variable" capacitors and resistors are here to stay, with the result that we have to say "drifts" or "excursions" to what are simple variations. "Logarithmic" potentiometers also will always be with us, although they are in fact the exact opposite: exponential. "Potentiometer" itself is a classic example of misusage; originally applied to a device which measures a potential by comparison with another, it is now applied to the similar (but generally less precise) device which could be more understandably called a potential divider or a volume control. And again, how often does one see obvious confusion between the terms "potential", "voltage" and "e.m.f.", or read something about a "D.C. voltage"! All these and a host of other examples pass nowadays without as much as a raised eyebrow. I use them myself often enough.

Occasionally something must be done about it when there is an urgent reason. The B.S.I.'s insistence on "flammable" and "non-flammable" to replace the confusing "inflammable" and "uninflammable" is a case in point. More usually the misused words remain, preventing their use in their normal, obvious senses and forcing us to invent new ones, or to use synonyms or complicated circumlocutions to express those senses. The layman's contempt of jargon is not entirely unjustified.

All these thoughts raised themselves in my mind—not for the first time—when I was asked recently (and certainly not for the first time) to explain the difference between a "two-track" head and a "four-track" head. Being preoccupied at the time, I replied that the one had two sets of pole-pieces and the other four. Rude indeed, but it was probably the kind of reply which would have seemed obvious to the layman with a knowledge of standard English but none whatever of tape recording. Yet from previous experience my patient non-technical colleague seemed to *expect* these simple phrases to mean something quite remote from common experience. It turned out that what *he* meant was "half-track" and "quarter-track", which is a different thing altogether.

Heads

So, while tape terminology is still relatively fluid, let us try to define some features of tape recorder hardware in simple, logical and unambiguous terms which correspond as far as possible to their standard meanings. This could save a lot of misunderstanding and—who knows—we may win friends and influence people. First heads, since this is *the* current source of confusion.

Starting from the reasonable premise that all tape used in domestic audio recording has a nominal width of 0.25 inch, we can make these basic statements:

1a: A full-track head uses the full width of the tape.

1b: A half-track head can use one or both separate halves of the tape width, either simultaneously or in sequence according to its construction.

1c: A quarter-track head can use any or all quarters of the tape width, either simultaneously or in sequence according to its construction.

The tracks actually scanned on the tape by the poles need not be the entire full-, half- or quarter-width of the tape (and

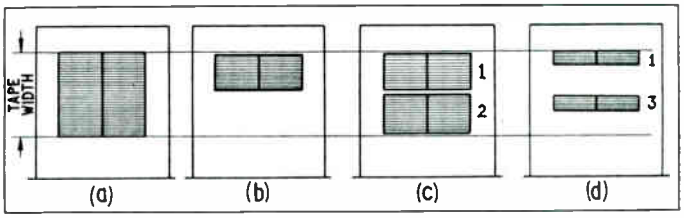


Fig. 1: *Head types: (a) full-track; (b) single half-track, or 1/2; (c) twin half-track, or 2/2; (d) twin quarter-track, or 2/4.*

in the last two never are), but this is a fair usage so long as the stated breadth is *effectively* occupied and so long as the actual track dimensions are agreed and specified. Apart from being fair and logical, the terms full-, half- and quarter-track are used throughout Europe (they are literal translations of, e.g., Vollspur, Halbspur, Viertelspur, respectively) so we may well soon have to understand them anyway.

We can also say:

2a: A single-track head has one set of poles;

2b: A two-track or twin-track head has two sets:

and so on.

A four-track head has thus four sets of poles and could use four tape tracks simultaneously. As far as I know, no commercially produced domestic recorder can use more than two tracks simultaneously, so for our purposes there is no such thing as a four-track head. In fact there are four kinds of heads commonly used in audio: the full-track head used by professionals, which is necessarily a single-track type: the single half-track; the twin half-track which can be used for stereo; and the twin quarter-track similarly. Europeans abbreviate the last three types 1/2, 2/2 and 2/4 respectively, which is also logical and concise.

Mechanic Gap Length

This nomenclature can be extended *ad lib*—on ¼ inch tape systems, that is—to cover any immediately foreseeable contingencies. The dimensions of the heads now used have already been given in a previous article (*The Tape Recorder*, June 1962), so they will not be repeated here. Sketches of the four main types are shown in **fig. 1**. Note that track numbering corresponds to that on the tape.

Before we leave heads, a note about gaps may be helpful (**fig. 2**). That much-quoted figure, the thickness of the gap spacer,

TERMINOLOGY

By GRAHAM BALMAIN

is called the mechanical gap length, not width. The *effective* gap length, which determines the head's actual playback performance at short recorded wavelengths, is usually a little greater due to a slight roughness at the interfaces and to work-hardening of the pole tips during lapping. It is called the *length* because everything here is referred to the plane and direction in which the tape travels. One can visualise this easily enough by mentally eating a bit of Alice's mushroom (the right-hand side, was it?) and standing inside the gap of a head which has been tipped on to its back; the tape is then a ceiling moving in the direction of the gap length. It's a pity the length has to be less than the breadth—the track width, that is—but there it is. The distance from the ceiling to the floor (the back edge of the pole tips) is called the gap depth.

Angles

Looking from the normal viewpoint again, we can see the leading and trailing pole faces and the overall pole length, which has some effect on long-wavelength response. The position of the head can be adjusted in several ways, the important ones being the height relative to the tape, the tilt to front or back, and the azimuth angle. The latter is the angle between the gap axis and the vertical (assuming this to be exactly at right angles to the direction of tape movement). Both tilt and azimuth angles should be zero, of course.

The mechanism also has its quota of misused terms (**fig. 3**). One should distinguish particularly between the drive idler and the pressure roller, and between spindles and thimbles, which fit over spindles to increase their diameter and their peripheral speed.

Tape

There is less to worry about as far as the tape is concerned. A *reel* of tape consists of a *spool* with a *pad* of tape wound on the *hub*. Spool *flanges* prevent the pad from falling off the hub

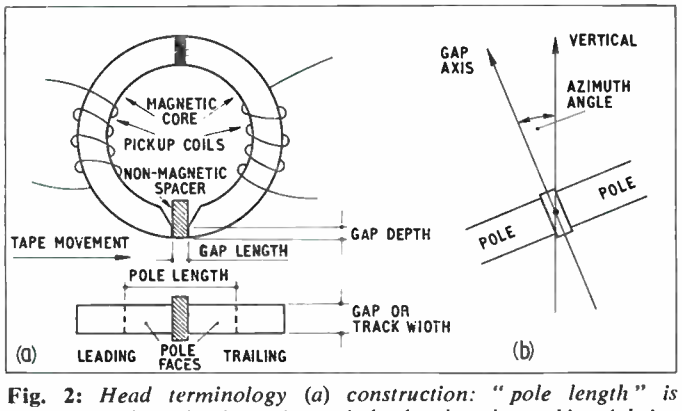


Fig. 2: *Head terminology (a) construction: "pole length" is that exposed at the front face of the head and capable of being in contact with the tape; (b) adjustment: azimuth angle.*

should it be that loosely wound. The tape itself consists of a plastic *base* carrying a *coating* which contains mainly iron oxide (or, rarely, some other magnetic material) and plastic binding materials. with admixtures of lubricant, anti-static agent, often a

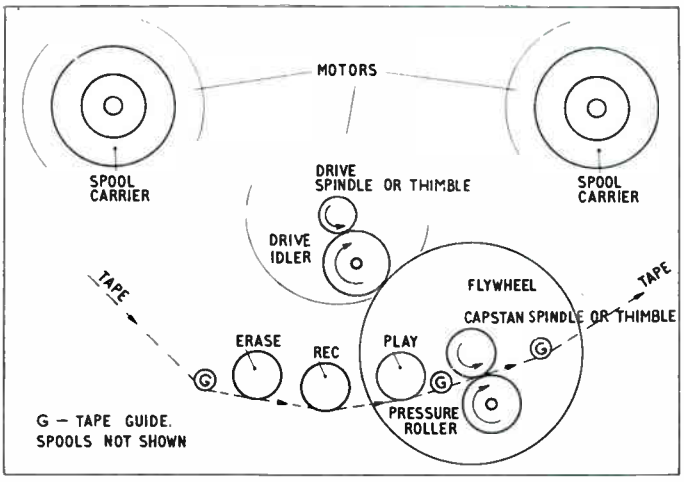


Fig. 3: *Main parts of a conventional three motor tape deck showing, erase, recording and playback heads, capstan, pressure roller, flywheel, drive idler, and drive spindle or thimble.*

dye and sometimes perfume. At each end of the pad there is usually a length of metal *foil* or *metallising* paint, and beyond these again the *leaders*, the coloured strips which indicate the type of tape (standard, L.P., D.P., T.P.), tell you which end it is, and may carry information about the recordings on it.

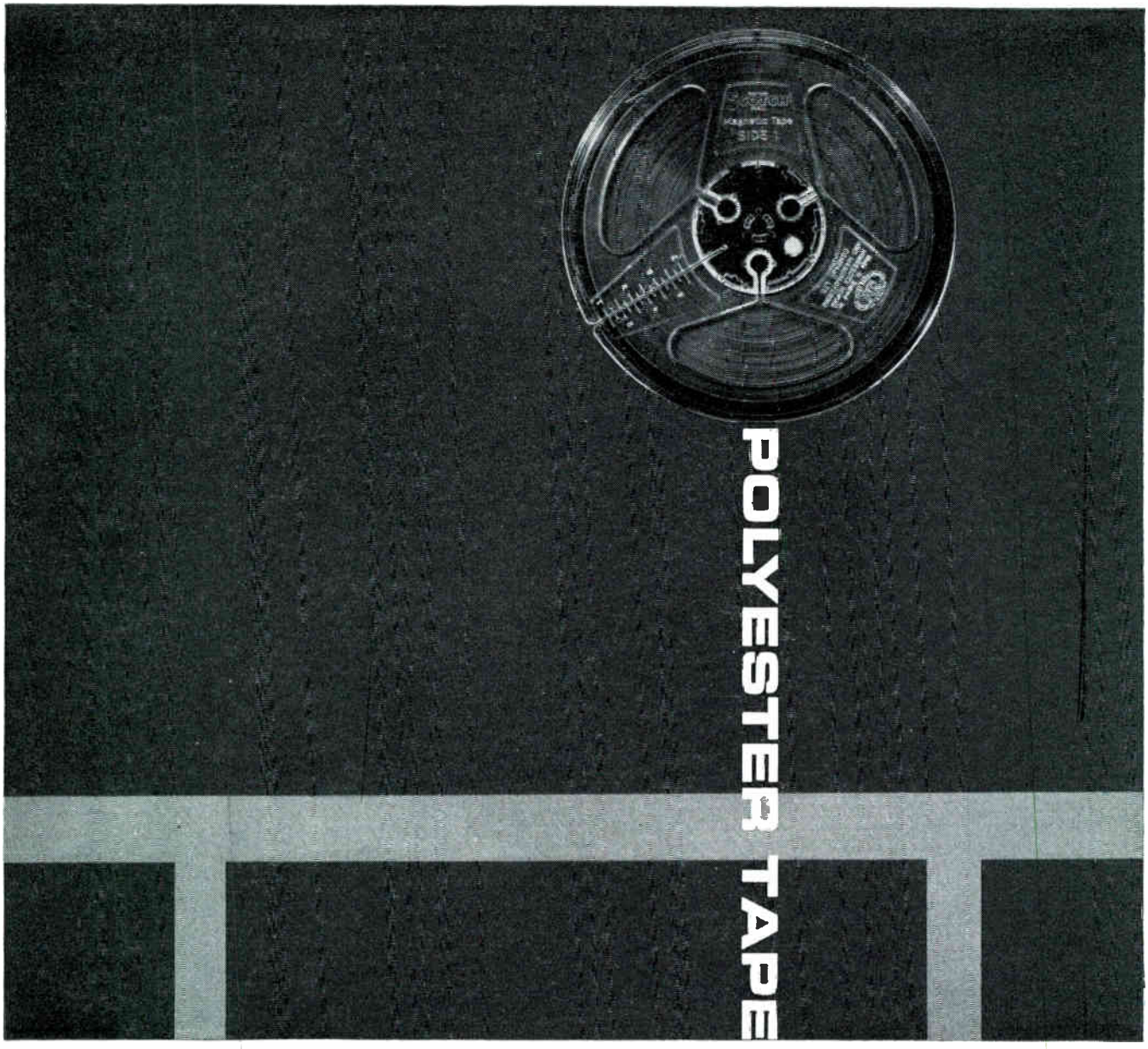
The electronics give rise to very little trouble if only because the subject does not arise in light conversation as often as the others. Two points come to mind particularly, the first concerning connectors. A "jack" is what the plug is pushed into, not the plug itself (why not call it a socket?); and the part of the mains connector which is fixed to the box or chassis, if your recorder is of that kind, is the *plug* (because of the two or three projecting pins) while the bit you push into it is the socket.

Bias

Secondly, the adjective describing bias. "High-frequency" is accurate, but can lead to confusion with high audio frequencies; "supersonic" will draw tiresome complaints from the etymologists; "ultrasonic" will satisfy the latter although, like supersonic, it is not always accurate—one can use a bias frequency of 10 Kc/s quite effectively for certain applications—besides which it is in common use in other fields (e.g. cleaning, dispersion) but not in tape recording. I prefer simply "A.C. bias", which is accurate, comprehensive and pointedly different from the D.C. bias sometimes used on battery portables and dictating machines.

Limits and Tolerances

Technical terminologoy is indeed tricky, but much of it could be simpler than it is. I am reminded, as the after-dinner speakers say, of the story about the machine designer who was asked why he always distinguished carefully between the words "limits" and "tolerances". "Limits", he said, "are what I ask for; tolerances are what I have to put up with".



A winner for the backing

You can't lose on Polyester backed "SCOTCH" Magnetic Tape. It's the great tensile strength of Polyester that makes the going good for extra stability and lasting high-quality reproduction.

Even experts agree to that. "SCOTCH" Magnetic Tapes —sound, video, instrumentation and computer—are their first choice every time. Leading disc makers use them for cutting masters, while more than 90% of the world's taped T.V. programmes are recorded on "SCOTCH" Video Tape No. 379 with polyester backing. But "SCOTCH" Magnetic Tapes are far from reserved for experts. To professional and enthusiastic amateur alike, "SCOTCH" Polyester-backed Magnetic Tapes give everything to play for.

Trade Mark Scotch Magnetic Tape

POLYESTER RANGE: NO. 102 STANDARD PLAY. 150 EXTRA PLAY. 200 DOUBLE PLAY

3M MINNESOTA MINING AND MANUFACTURING CO., LTD. 3M HOUSE, WIGMORE STREET, LONDON, W.1. TELEPHONE: HUNter 5522

A MODIFIED FI-CORD

By DOUGLAS FISHER

IT must be more than five years since I was first introduced to the Fi-Cord 1A, a truly amazing little instrument then and even today it can hold its own with the best. Over the years I have found it most useful for recording location sound effects for my natural history films.

Initially the Fi-Cord was less convenient to use than I felt it should be. The instrument was easy to thread, its controls were simple, it was small and light in weight but one had always to remember to fill one's pockets with all the bits and pieces necessary for a job of work—there was no stowage in the Fi-Cord case for its microphone, leads, spare tapes etc. It will be seen from the accompanying photographs how we solved this problem.

In the original instrument its four pin microphone plug and socket gave trouble, a flimsy and unreliable fitting. Electrical interference was also troublesome. This was first noticed when I recorded the cry of a baby seal in a cave on Ramsey Island. The sea was quite calm around the mouth of the cave and over the stethophones the cry could clearly be heard with the volume setting 5 (maximum), but on playback a faint electrical crackle was quite noticeable over the noise of the sea. This crackle disappeared when louder sounds were recorded at volume settings of two or three.

Two Sets of Batteries Fitted

A few weeks later I visited the manufacturer's laboratories with my complaints, they were most helpful and immediately produced cures for the troubles. The microphone socket was changed for a standard Bulgin miniature jack socket (Type J.30) and the microphone lead was fitted with the appropriate Bulgin jack plug (Type P.519). This modification meant losing the microphone switching facility, but this was no loss to me as I was using a Grampian DP4 microphone. The electrical crackle was traced to the Fi-Cord's own motor. The cure was to fit two separate sets of batteries, one for the amplifier the other for the motor. This we did and the fault disappeared completely. The second set of batteries was fitted into a new lid made slightly deeper than the original one.

The Fi-Cord was now performing excellently but my pockets were still bulging with its accessories, so the next step was to design and make a case to accommodate the Fi-Cord complete with enough bits and pieces for a day's work.

My assistant, John Anderson, made a cardboard mock-up of the case I had in mind. When we were satisfied that we had the right design, a copy of the model was made professionally in

The author of the article seen recording with his Fi-Cord in Sussex countryside.

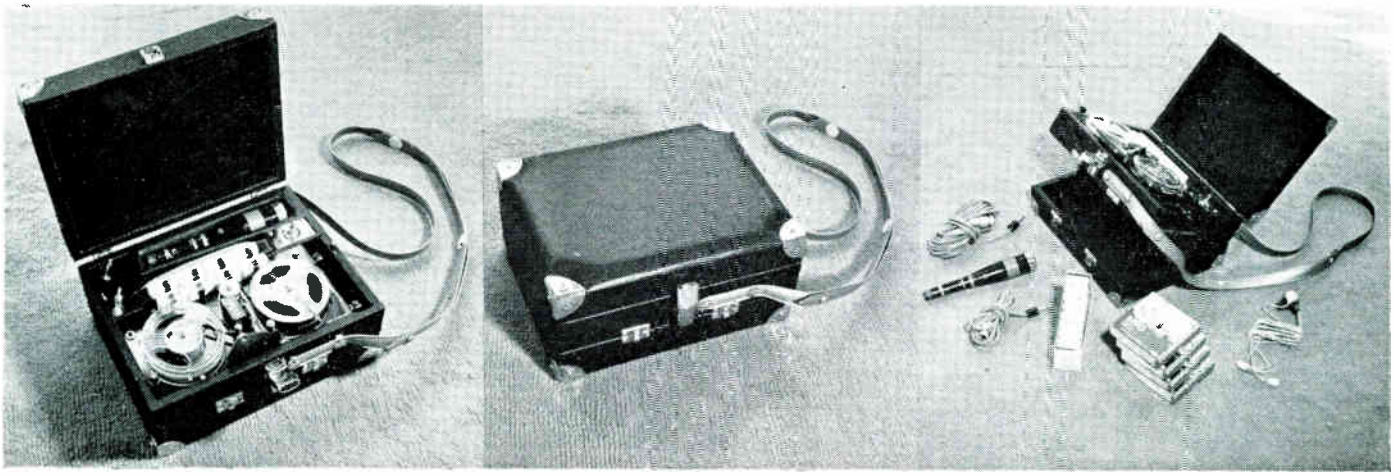
5-ply and 3-ply wood. Anderson then partitioned it with balsa wood, padded the microphone compartment and lid with foam plastic and covered the whole case inside and out with black rexine. The adhesive used was Evostik. Chrome plated corners, hinges and clips were bought from Romany's of Camden Town. The plastic strap and its fittings came from the original Fi-Cord case, but it really is not strong enough for the heavier case and is about to be changed for a stouter leather one.

From the handling point of view we have found that although the new case makes the Fi-Cord a heavier instrument it is still quite easy to carry. It is a tremendous asset to be able to grab up quickly just one case which contains all the bits and pieces. The case is so strong that a man weighing 15 stone plus can stand on it with confidence.

The large chrome plated switch enables the motor to be switched off while the amplifier is left on for monitoring. I know that this particular switch is not the right one for the job—I chose it (a) because it happened to be handy (b) because it fitted a spare space in the case. I wonder how often this happens in the design of equipment. A far smaller and neater switch would do the job equally well—probably better.

One further addition to this equipment is contemplated. I think that it may be possible to fit a small Japanese VU meter alongside the microphone compartment although I have been warned that there may not be enough power to drive it unless I fit a separate transistorised amplifier. However, experiments along these lines will be made shortly.

The photograph on the left shows the recorder with the two sets of batteries and amplifier switch. The compartment for the microphone can be clearly seen. The centre photograph shows the case closed and on the extreme right all the accessories.



NEW FI-CORD 202

PORTABLE BATTERY/MAINS RECORDER

so much in so little space

The FI-CORD 202 offers all these features:
2 speeds—7½ and 3¾ • Standard 4″ spools • Vu-meter • Fast forward wind • Fast rewind • Resettable counter • Manual and automatic volume control • Built-in loudspeaker • Extension speaker socket • Low and medium input sockets • Socket for remote control • Safety record switch • Easy-load battery cassettes • Battery warning lamp • Mains input.

FI-CORD 202 the new portable battery/mains high fidelity tape recorder, has been developed after years of exacting tests in the Fi-Cord laboratories. It is a worthy successor to the famed FI-CORD 1A, used internationally by broadcasting companies during recent years.

FI-CORD 202 is for the most exacting professional and equally for the enthusiastic amateur demanding the highest professional standards. It incorporates all the practical advantages of a full-size recorder in a small, light-weight machine.

FI-CORD 202 gives you high fidelity recording at your fingertips—whenever you wish, wherever you go.

AND the FI-CORD 202 weighs only 6½ lb, measures 9″ x 6½″ x 4½″.

Price: 66 guineas, including long life mercury batteries and tape.

ACCESSORIES INCLUDE:
Carrying case, choice of microphones, power packs for mains and car.

See us in ROOM 212 at the
AUDIO FESTIVAL and FAIR

FI-CORD INTERNATIONAL
40a Dover Street, London W1. HYDe Park 3448

NEWS FROM THE WORLD OF TAPE

Noise Abatement Experiments

SOCIETY is becoming increasingly noise-conscious, but most people cannot remember a particular noise for very long. So noise-abatement experiments are relying more and more on tape recordings made during comparative tests.

Development engineers at Morris Motors Ltd's Radiator Branch, at Oxford, use two tape recorders supplied by EMI Electronics Ltd., for measuring the acoustic performance of vehicles' exhaust systems under light engine load. One of the tape recorders is also used for recording transient noise conditions and for the cold testing of exhaust systems in the laboratory. When the vehicle exhaust noise is to be analysed, the car or van is parked on hard standing in an open place. The ambient noise level should not normally exceed 65 dbC. Two microphones are placed one at each side of the tail pipe in such a manner that they are not in direct contact with the exhaust gas. One microphone is connected to an RE 321 portable tape recorder and the other to a noise level meter. Tape recordings and decibel readings are taken for engine speeds of 2,000, 3,000, 4,000 and 5,000 rpm.

Back in the laboratory, the recordings obtained are individually transcribed on to a closed loop of tape fitted to a TR52 tape recorder. Analysing equipment is used to obtain ⅓ octave

spectrograms and the overall noise level is set to correspond with the particular engine speed being measured. The spectrograms so obtained enable a comparison to be made between different exhaust systems fitted to a particular vehicle. Tape recordings are also made of transient noise conditions and a closed loop made of each complete noise cycle. Signal loss due to the gap betweeen the erase and record head on the TR52 tape recorder is utilised to switch the filters in the ⅓ octave spectrometer. This is done by rectifying the signal from the extension loudspeaker output and using the resulting DC to operate a relay which, in turn, switches the ⅓ octave filter mechanism. The 600 ohm line output from the tape recorder is used to supply the signal to the filter input.

Attenuation of the silencer can be found by replacing the silencer with a section of exhaust pipe and repeating the experiment. The difference between the two spectrograms obtained is equal to the attenuation.

Winner of the G.P.O.'s Golden Voice Competition, Miss Pat Simmons, an assistant supervisor at London's Avenue exchange, records the new speaking clock (TIM) announcements for the telephone service. The microphone is an STC 4038 moving coil unit designed for high-quality studio work. (Photo courtesy H.M. Postmaster General).

* * *

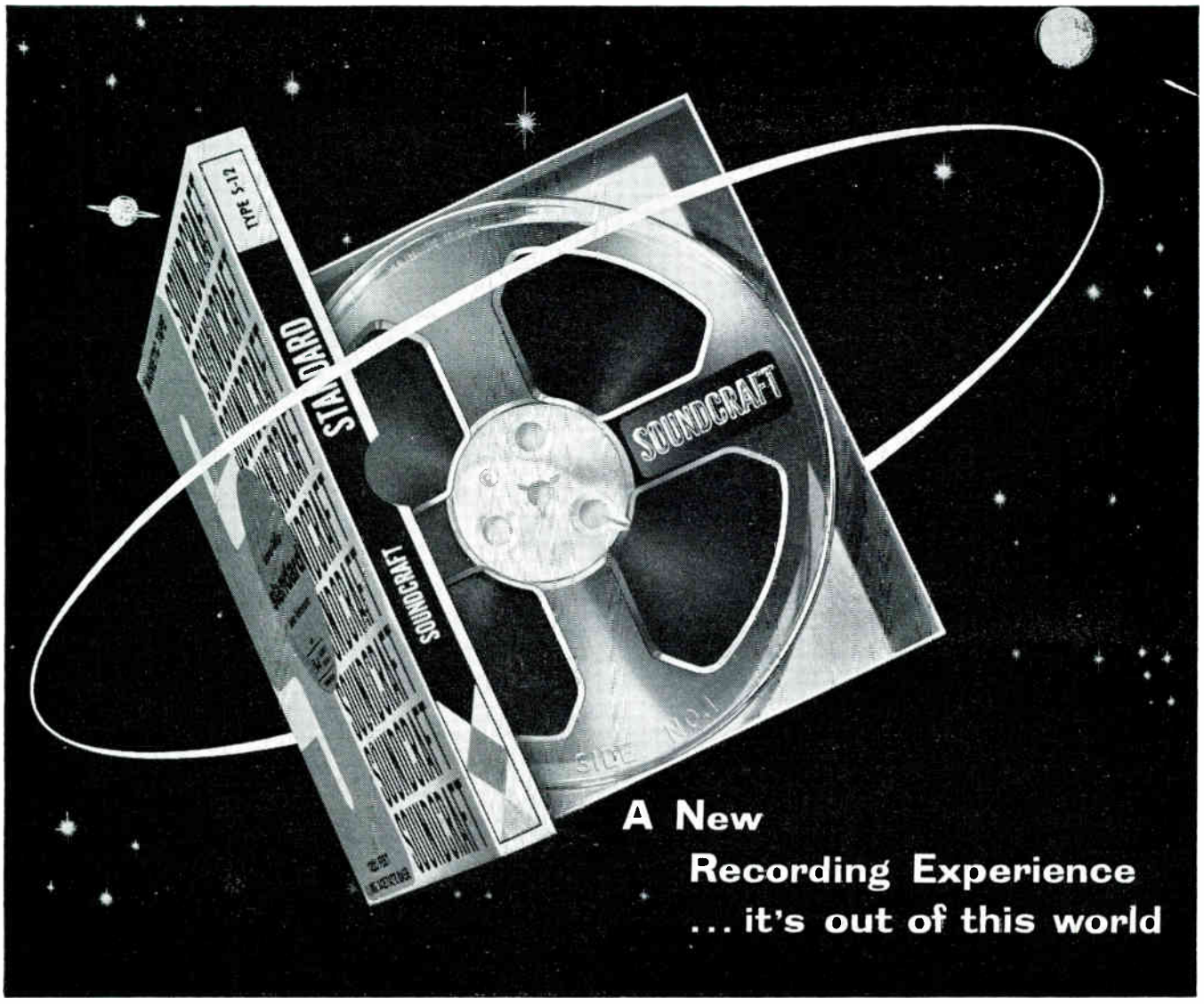
Fourteen-track Recorder

THE smallest 14-track, 300-kilocycle magnetic record/reproduce system yet to be marketed has been introduced by Ampex. Designated the FR-1300, the device offers unprecedented compactness for a high-performance recorder. It measures 24 × 18 × 12½ inches and weighs only 110 pounds. In addition to 300 Kc/s direct recording response, its full 14-track capability includes a 20 Kc/s FM system.

A notable innovation in the FR-1300 is a unique capstan-drive system which achieves tape speed accuracy of ± 0.05% without requiring an accessory motor-drive-amplifier. Six tape speeds are offered, 1⅞ to 60 i/s all electrically switchable from a single front-panel control.

Modular electronics are all solid-state and interchangeable with those of the larger Ampex Model FR-100C, a general purpose instrumentation recorder used in all phases of laboratory data acquisition storage and reduction. Input and output signal connectors are located on the top of the recorder for ease of accessibility from the front, back or side. For maximum head life, tape lifters raise the tape off the heads during fast forward and rewind.

A seven-track version of the FR-1300 will be offered in addition to the 14-track model. Deliveries of the FR-1300 will begin in the Spring of 1963.



Soundcraft Tapes are so good that they were chosen by the United States Government for use in their weather satellites, Tyros I and II. Still transmitting back to earth, Tyros II is an ever present reminder of the quality and proved ability of Soundcraft Tape. Soundcraft, also, were awarded Hollywood's coveted Oscar for their work in magnetic oxides. Now, this side of the Atlantic, this superlative tape has been sought after by discerning enthusiasts. Already well known British Tape Recorder manufacturers such as **ELIZABETHAN** and **MAGNAVOX** use and recommend Soundcraft for their machines. To do justice to your recording skill your recorder needs the finest tape. Try New Soundcraft tape this week and know the new recording experience that's *out of this world!*

SOUNDCRAFT . . . the tape that speaks from space

On 3″, 5″, 5¾″ and 7″ 4 spoke reels on DuPont Mylar and Soundcraft tri-acetate. Coloured Mylar Leaders and Trailers. All packs colour coded with timing charts and cellophane sealed for protection.

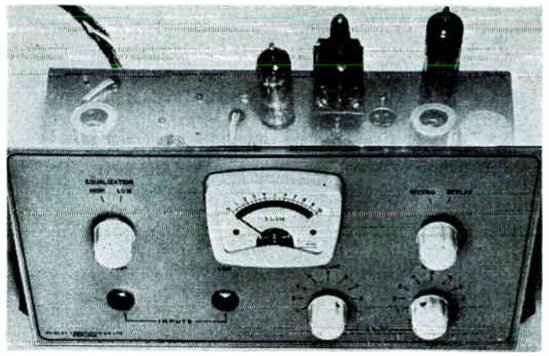
SOUNDCRAFT MAGNETICS LTD., Haddenham, Bucks. Tel. Haddenham, (Bucks.) 384 & 422-6 (6 lines.) *Manufactured by Reeves Soundcraft Corporation, Connecticut U.S.A.*

BUILDING THE TW/PA4 TAPE AMPLIFIER

PART THREE

SETTING-UP AND TESTING

By A. W. WAYNE*



HAVING attained the desired response in the lower register, the equalisation for the upper part of the spectrum must be adjusted. Surprisingly, this does not ordinarily offer great difficulties, as the combination of L2, C18 and R15 is very flexible; but again, a certain amount of juggling may be required, particularly in regard to C18, as the peak in response has to fit individual heads, and damping with a resistor of 15K–47K is sometimes necessary; but, for example, the values of **fig. 1** give a response ± 1.5 dB from 45 c/s–12,000 c/s from the average *Brenell* deck at 7½ i/s; while **fig. 2**, but with C18=1,200 pf, gives almost the same response ± 0.75 dB with most *Ferrograph* decks. In both cases it is possible to push the response up to about 13,500 c/s ± 1.5 dB, but only at the expense of a considerable increase in trouble and/or distortion: and so far as the author is concerned, there is no aural improvement whatsoever. Replay at 3¾ i/s, controlled by RC, C17 and S1/C, is best left for the moment.

Recording response setting-up at 7½ i/s is very straightforward. *Remove the test tape,* switch to *record* on both deck and amplifier, and check that V6 is oscillating. If results are negative, ascertain that R34 and R35 are the right way round, and that the connections go to the correct tags on L4. If all is correct, reduce R34 in value to 10K, 6.8K, 4.7K and 2.2K in that order. The valve will oscillate at one of these values, and the highest that gives maximum output with good waveform is the one to be chosen. With *Brenell* decks, junction C30L4 secondary should measure about 35-40 volts with the erase head in circuit, the bias at the anode of V6 reading up to 120 v. *r.m.s.*

Adjust L2 core for *minimum* reading at point Z, and then set bias, via VR4, to a value at the R/R head about 20% higher than that recommended by Brenell—the bias frequency is around 58,000 c/s—and as stated for all other decks except the *Miniflux*, where it can safely be about 10%—15% lower. Note that *Bradmatic* and similar decks erase at high impedance, and that the erase head should be connected, via a 0.01 mfd capacitor, to V6 anode. *Ferrograph* decks are fed as in **fig. 2**.

Setting the Modulation Level

To set the modulation level for all decks other than *Ferrograph*, remove V6, and with amplifier and deck still switched to *record* feed a 1,000 c/s signal into the "Low" input, and, at a reading of 10 v. *r.m.s.* as measured with the VTVM at junction C11R13, adjust VR3 until the modulation meter reads .8 full scale. For *Ferrograph* decks, which will accept a heavier drive, adjust for 12 volts. However, with a little care, the optimum drive consistent with acceptable quality can be found, for all makes of deck, by recording from a familiar source at increasing maxima until the best compromise has been reached. (It is, of course ,assumed that a distortion factor meter is not available.) Replace V6, put a clean tape on the deck, and record, at about half maximum modulation, a complete frequency sweep from 45 c/s to, say, 12,000 c/s.

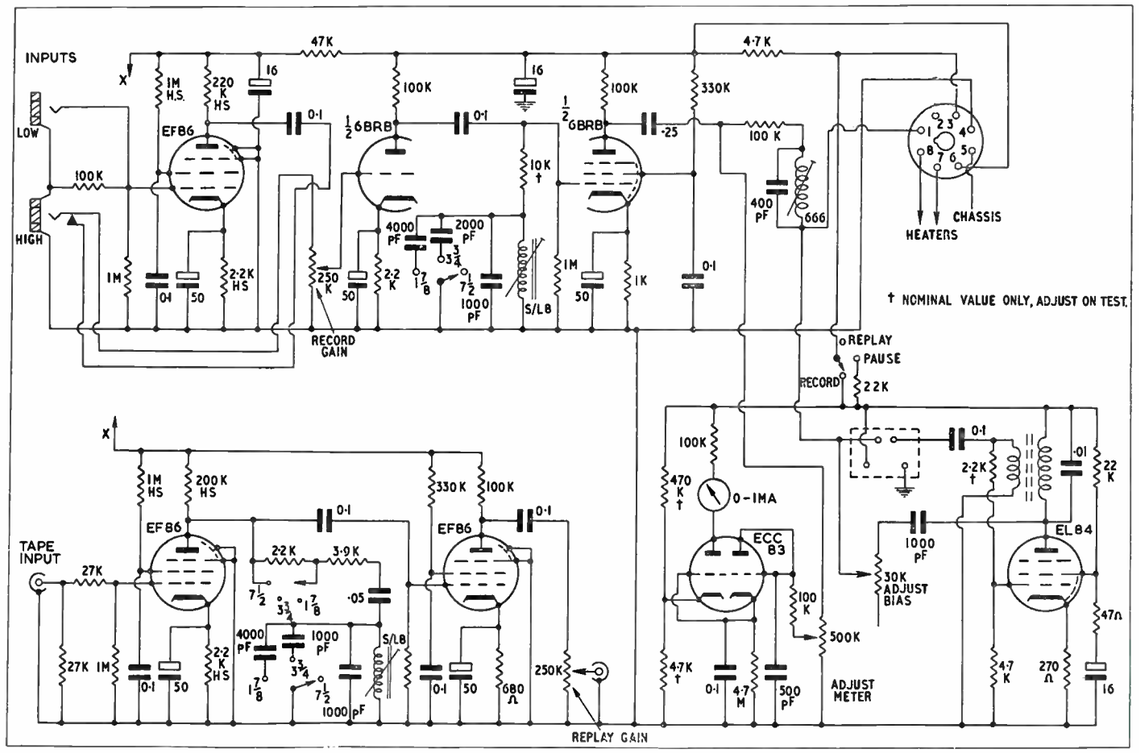


Fig. 1A: *Circuit diagram and component values for use with the Planet U1 tape deck. Since passing this for press the author has sent in the following alterations: 220 Kohm resistor should be placed between the anode of the first half of the 6BRB valve and 0.1μf capacitor. The 30K bias adjuster open side should be taken to chassis.*

Overall Response

Rewind and replay, and if the overall response is worse than ± 2 dB the cause should be investigated. It is unlikely that *Ferrograph* decks will be far out, the most likely possibility being a rise at around 10,000 c/s—11,000 c/s; and if this be all, rest and be thankful; but if it is too pronounced, reduce R11 to some value not less than 4.7K. Trial is the only way. Tape recorded on *modern Brenell* decks—see Tutchings again—may show a dip around 2,000-3,000 c/s, and a very pronounced rise between 5,000 c/s and 8,000 c/s, and it is for these and similar decks that RD must be incorporated in the amplifier. The best average value is 15KΩ, and care must be taken to place it across the *amplifier* side of L2 and earth, as it acts as a shunt to bias if placed across the head side.

For 3¾ i/s, S1A and S1B close, so reducing the reasonant frequency of the treble-peaking circuits, while S1C opens, thereby approximately doubling the time-constant of the replay bass equaliser. The values as given in **fig. 1** should result in a response ± 1.5 dB from 50 c/s to 6,500 c/s.

The comparatively modest figures claimed for the TW/PA4 may occasion a little surprise among the more voracious catalogue devourers, as they are considerably less than those quoted for quite a large variety of relatively low-priced commercial recorders; and it must be explained that the figures are (1) actual. i.e. true. and (2) for 2% peak distortion. It is not too difficult. given suitable heads, to achieve 60 c/s to 15,000 c/s at 7½ i/s, and 60 c/s to 9,000 c/s at 3¾ i/s ± 3 dB. Unfortunately, it is even less difficult to achieve equal or even more exaggerated distortion and noise figures at the same time.

Such claims are not for discerning listeners, and comparative tests of an orchestral item recorded on professional equipment and some of the wide-range home recorders will quickly expose the fallacy of unqualified extended frequency response. If a very wide frequency range is absolutely essential, the procedure is as follows. Reduce the bias voltage to about 0.75 of the standard value at 7½ i/s. and to about 0.6 at 3¾ i/s. Set the modulation meter for its maximum at 3.5 volts and 2.5 volts respectively at 1,000 c/s. and tune L1 and L3 with 470 pf for 7½ i/s, and 1,200 pf for 3¾ i/s. Increase the h.t. supply to 400 volts, and rearrange V4B as an amplifier. Feed V3 and V4 heaters with D.C. @ 5.8 v., earthing one side, increase C15 to 500 mfd. RD and R15 will have to be determined by experiment. It is unlikely that the most critical ear will detect any significant improvement; but what is certain is that the quality of a tape recorded and replayed at 3¾ i/s with the standard TW/PA4 circuit will be a revelation to many.

Selection of Tuning Capacitors

It will be appreciated that *B.S.R.* decks will not require the inclusion of S1, as these units work at 3¾ i/s only; but if care be taken in the selection of tuning capacitors for the equalisation circuits, a very satisfactory overall response at this speed is

**Shirley Laboratories Ltd.*

(*Continued on page* 117)

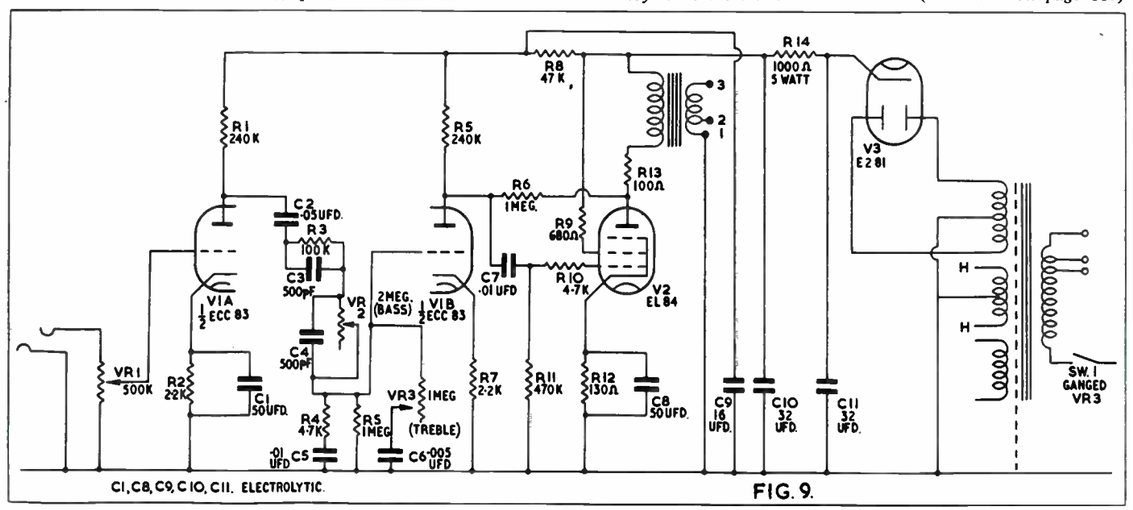


Fig. 9: *Circuit diagram of the W.BU. power amplifier suitable for use with the TW/PA4.*

By RALPH WEST

A MICROPHONE WINDSHIELD

MICROPHONES are delicate creatures, and their delicacy is almost in direct proportion to their goodness. Like other delicate creatures they do not like draughts either, especially the ribbon microphone. This is a pity as the best quality for a given price can be had from a ribbon type.

While the ribbon may not be particularly superior to the moving coil and condenser as regards frequency response and distortion, it does score, cost for cost, on the more subtle property, colouration involving transient response. The flimsy ribbon will usually ring less than the other structures, and therefore gives a more natural sound. This shows up quite strikingly with outdoor background sounds. It is difficult to capture such sounds without their sounding like escaping steam.

Unless specially protected a ribbon microphone will produce thunderous noises with an air velocity too low to produce any audible sound from foliage etc. That might be as low as 1 m.p.h. With a breeze of say 5-6 m.p.h. almost all good microphones would be unusable without special protection.

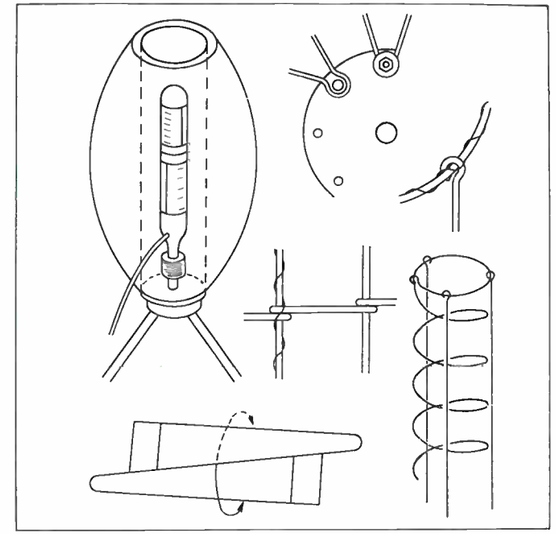
A wind shield has the apparently impossible job of stopping air movement without stopping air movement! Fortunately the sounds we are interested in involve only very small alternating air movements with frequencies above 20 or 30 c/s, whilst the movements that upset the diaphragm or ribbon are large, slow, and more or less unidirectional. If the microphone is encased in a box of fine metal gauze, or even better acoustically, a fine fabric box, there is good discrimination between sound and draught. The small holes have enough "resistance" to cause most of the airflow to pass round the outside of the box whilst the microscopically small amount of air displaced by the sound can easily penetrate. If the barrier is something like fine silk, then it is virtually acoustically transparent. Not only can sound penetrate the holes, but the fibres being so light, are easily deflected, and excite the air on the other side. In fact, a thin airtight membrane could be used, but would be difficult to engineer in a sufficiently flexible form.

The Ideal Material

Silk stockings furnish an ideal material. Slightly laddered and therefore U/S by my ladies' standards, is quite satisfactory, so there is no need to get into trouble trying to catch perfect specimens! The writer's design used three stockings, as a fairly large windshield was needed to house a Lustraphone Stereomic.

A 3 in. diameter circle of wood (it could have been metal) was drilled to take the microphone mounting and a circle of eight 4 BA holes. Eight 3 ft. lengths of 3/32 in. aluminium welding wire were folded in two and the folds shaped to form eyelets. Brass might be better for a more permanent job, but steel, while cheaper, would soon rust and rot the silk. The eight wires were bolted on and the sixteen spokes bent upwards like the start of a wicker basket. Three other lengths of wire were woven round at intervals, twisting round each main rib to lock it laterally. The vertical ribs were terminated by twisting their free ends on to the fourth and top ring. A Rugger ball shape was chosen as being a good compromise between the ideal spherical shape and the necessary size to house an elongated microphone. The windows in the framework were about 4 in. high and varied in width from almost nothing at the bottom to about 2 in. at the centre tapering again to about 1 in. at the top. Total height was about 16 in. and the top was left open at about 4½ in. diameter so that when necessary, two hands could be admitted. The four horizontal rings were further locked by winding lengths of 1/16 in. aluminimum wire on to several of the vertical ribs and round the top ring. Wire ends were dressed to point inwards and so leave a smooth external surface to prevent ladders.

Two stockings were slit open along the seam, laid side by



side, top to ankle, and sewn together to form a larger diameter cylinder. This was then stretched over the framework and its natural resilience made it fit neatly and snugly. The stocking foot at each end is useful for plugging holes top and bottom.

A second line of defence was prepared in the form of a simple cylindrical spiral of wire 3½ in. in diameter and the same height as the outer case. This was stabilised for shape with three longitudinal wires looped on to the end turns and lying outside the spiral. The third stocking pulled over this holds it together nicely. The bottom of this tubular frame was sewn to the stocking about 6 in. from the open top. This 6 in. "skirt" stops draughts coming in at the bottom where the microphone lead comes in. The design could be tidied up for use in broad daylight, but as this was only wanted for dawn-chorus recording, looks were not important. Several blackbirds did protest vigorously at the stranger in their midst, but probably not because it was improperly dressed.

In use, the microphone was fitted with a resilient mounting just above the base plate to minimise any vibration coming from the shield or stand due to the wind. For a stand, a camera tripod was used with its legs braced well apart and held down by a suspended brick.

Shapes and sizes are not critical, not too small or any wind noises caused by the shield will be recorded as they originate very close to the microphone, and not too large or it will blow over or flap about unnecessarily. Smooth contours generally, and freedom from sharp edges and corners lead to less noise and vibration.

Tests were made to see if this would in any way spoil results by recording outdoor and indoor noises (clock ticking) with and without the shield and it was impossible to tell which recording was which. An even more critical test was to knock up a very rough wind shield large enough to put round the head and again it just was not possible to detect any difference in any type of sound listened to.

On a perfectly calm day there is no need of course for a wind shield, but one can never rely on such luck, and quite good recordings can be made in a moderate wind say up to about 6 m.p.h. While the windshield would probably give adequate protection to higher wind speeds, too much noise of trees, etc., will spoil the recording. Even if the microphone is good enough, the loudspeaker is sure to make it sound more like steam than wind-in-the-trees.

Despite the hard winter, there should still be plenty to record this spring. Already the birds are beginning to warm up at dawn, so we can hope for another chance or two during April, May and June.

possible. It is suggested that C8 be 4,000 pf and C18 2,800 pf for the best and smoothest response, although a little experimentation here will pay handsome dividends.

Ancillary Gear

Fig. 5 is the circuit of the *Shirley Laboratories* WB/U amplifier, a quite useful piece of apparatus for both monitoring and replay. It is not at all critical in regard to its output transformer, as this is outside the feedback loop, which is via R6. R6 may be varied, within limits, to suit the conditions, increasing its value, increasing the gain and distortion and vice versa. The tone-controls are a rather sinister sort of compromise, but *non olet*, as they are very effective. The circuit is unworthy of further comment. **Fig. 10** is the circuit of a suitable power-pack for the TW/PA4, and it should be noted that the 10K 10 watt resistor is required with *Ferrograph* decks only, where it activates the hold-in solenoid.

Fig. 3, the detailed drawing of the amplifier chassis, is complete but for a few of the smaller fixing holes. In the *Shirley* works, these are drilled as required, as certain components sometimes vary slightly in physical dimensions. The standard commercial chassis is in 20 g. steel, cadmium plated; but aluminium of not less than 18 g. is equally suitable, and would certainly be easier to work. If the chassis be enamelled, care must be taken to clear the fixing holes down to the bare metal. Another point not to be overlooked is the provision of some means for earthing the jack-socket bodies. The best way is to nick the plastic covering of the body with a fine rat-tail file, exposing just enough of the brass insert to permit the soldering on of a few inches of 24 g. T.C. wire, which is then sleeved and soldered to the spigot of the nearest valve-holder.

Using the TW/PA4

A tape recorded at maximum modulation will provide up to 1½ volts *r.m.s.* at SK2; and there are few commercial amplifiers that will not deliver full output for an input of this magnitude. (It should be mentioned that there will also be a pretty full output of hum, too, if more than one earth connection be made between the TW and main amplifier; and the *only* earth return is via the screened connection to SK2; however, it must not be forgotten that this screen is also the earth return for the h.t. as well, so it is essential that the plug is in place before switching on.)

In general, recordings should be made at as high a level as possible, but excursions of the meter needle into the red region of the scale are best avoided, except perhaps for occasional peaks of very short duration. Under-recording may result in excessive background noise on replay, so short rehearsals of important programmes are advisable. The meter reads chiefly on peaks, giving comparatively little indication during the quieter passages, and this characteristic must be taken into consideration until experience in the operation of the amplifier is gained. But it is not unreasonable to mention that, properly handled, the TW/PA4 will provide reproduction impossible to distinguish from the original at 7½ i/s, and very little inferior at 3¾ i/s.

Appendix

Certain decks, the *Brenell* for instance, will require some minor modifications to the basic switching for the purposes of (1) ensuring freedom from hum during the rewind and recording functions, and/or (2) effecting the change-over of the head input from record to replay. The hum is due, of course, to the opening up of the replay input circuits except when replaying, and all that is necessary is to fit an extra switch wafer on the *record-replay* bank on *Brenell* decks, so arranged as to short out the amplifier replay input on record, wind, and rewind. For decks without integral change-over switches, the switching necessary is obvious, but the wafer for muting as for *Brenell* must not be omitted.

The significance of the octal socket on the rear of the chassis, as well as SK3, must now be explained. It will have already been observed that S2 does not appear on fig. 2, and that its presence on the amplifier, when *Ferrograph* decks are in use, is more in the nature of an ornament than necessity. The reason for this hyperbolic state of affairs lies in the *Ferrograph* "Record-Playback" switch and the underdeck tag-strips, which have all the functions of S2 built-in: so, with these units, two cables are made up, one of which plugs into the octal socket, the other going into SK3, and these carry the h.t. for the oscillator and meter, as well as the recording signal to the head.

The cable to the octal socket is connected to its plug as follows, looking at the free end of the pins: 3 to tag G on deck, 1 to tag GR, and 2 to tag A. From tag F solder a 10K 10 watt resistor to tag G, and join tag E to 1 on the other strip. Wire the SK3 plug to the tag-strip on the other side of the deck, again looking at the free end of the pins, with pin 2 to 1, 4 to 2, 3 to 3, and 1 to 4. The solenoid will then be energised through the 10K resistor, and the oscillator etc. through the deck switch in the appropriate mode. *Pause* will automatically function on rewind.

Some constructors owning *Brenell* or similar decks may prefer a belt-and-braces circuitry to obviate the risk of inadvertantly wiping a tape; and there will be no difficulty in re-arranging the h.t. wiring so as to make use of both S2 and the deck-switching, the method as outlined above being as simple as any.

Author's Note. Using the latest type of tape heads, the response of the TW/PA4 can be extended by 1½ to 2 Kc/s on each of the two higher tape speeds.

Where to get the parts

Most of the parts are obtainable from the majority of dealers, but following on the experiences in regard to the large number of enquiries regarding kits for the TWA/1515D amplifier, *Shirley Laboratories* have made arrangements with the following suppliers, who are prepared to stock either full kits or individual items. They are:

(1) **The Wayne Acoustic Laboratories**, 7 Longfellow Road, Worthing Sussex.
(2) **Home Radio Ltd.**, 187 London Road, Mitcham, Surrey.
(3) **The Photo Centre**, Keymer Parade, Burgess Hill, Sussex.

"Here they are Bert, the pride of my collection—a tape of every edition of the Archers since they first began. . . . !"

hi-fi books

HI-FI YEAR BOOK . . .

The 7th edition of this world renowned annual publication has been enlarged and now contains 272 pages and includes articles by leading authorities. The disc Stereo Picture and Microphones by Stanley Kelly; New developments in Transistor Amplifiers by George Tillett; Radio Tuners by Arthur Wayne; The Dynamic Decibel and Time on Tape by Graham Balmain. Loudspeakers for 1962-3 by Ralph West. Technical specifications are given of over 1000 items of Hi-Fi and Tape Equipment, and over 500 of these are photographically illustrated. **Only a few copies left.** **Price 11s 6d post paid.**

The 1963 edition is in the course of preparation and will be published on April 22nd. Place your order now for early delivery.

CINE YEAR BOOK . . .

For the first time ever, a comprehensive survey in one complete volume of the cine market for the cine user. The new reference book for the professional, the enthusiast, and the photo dealer. This valuable book follows the unique pattern set and maintained by the " Hi-Fi Year Book "—separate and detailed directories for every product group—Cameras, Lenses, Exposure Meters, Lighting, Film Stock, Screens, Projectors, etc. Some 200 photographic illustrations, Suppliers' addresses, product specifications, Library lists, Cine services are all included in this hard bound book. **Price 11s 6d post paid.**

The next edition is due for publication mid May. There are still a few copies of the 1962 edition in stock

HI-FI FOR BEGINNERS . . .

This work is thoroughly recommended to every enthusiast; it has been acclaimed from all sides as being the ideal book for everyone who has just started or is about to start their hobby. Those whose particular interest lies in tape will find that Chapter 7 alone will make this book worthwhile. **Price 8s 3d post paid.**

EXPERIMENTAL RECORDING . . .

This book presents in convenient form the series of articles by A. Tutchings on " Twenty Practical Experiments in Magnetic Recording " and full introductions for " Building a Fully Portable Recorder ", using a clockwork motor and transistor amplifier. **Price 5s 9d post paid.**

SOUND & CINE FOR BEGINNERS . . .

An up-to-date guide for the beginner by Richard Golding with an introduction to some advanced methods including the latest means of producing experimental soundtracks. Contents include making up separate tape tracks; sound stripe; optical sound-on-film; special recording apparatus; recording sessions; how to write commentaries etc.; with photographs and line illustrations. " The most comprehensive small book ever to be written on the subject of adding sound to film."

Price 8s 3d post paid.

HOW TO SPLICE TAPE . . .

If you use tape, sooner or later you will need to know how to splice tape, how to repair simple or complicated breaks, how to edit material, how to cut out words or syllables, etc. All this is described in this well-illustrated booklet.

Price 2s 6d post paid.

In Preparation . . . Stereo for Beginners by B. J. Webb

MILES HENSLOW PUBLICATIONS LTD. 99 MORTIMER ST., LONDON, W.1

by Richard Golding

SOUND AND CINE

PART FOUR—SOUND COUPLERS

LAST month we discussed the making up of a highly complicated and involved sound track of several levels by using equipment not expressly designed for the purpose. Now this sort of thing is typical of amateur cine and of 8mm sound recording in particular and, in fact, the only recording machine designed primarily for 8mm work—the Cinecorder—has had to cater for the normal tape recording market as well in order to be produced at an economical price. We have, therefore, a machine with features such as a sprocketed tape timing capstan with fitted strobe, a tape-lift for fades and a remote control for coupled camera and recorder start, all admirable in their own right, but with no corresponding speed for 16, 18 or 24 fps to enable sound editing by either, physical measurement or some form of track reading on a dual synchroniser.

Separate Tape Sync

Nevertheless, one can manage very well indeed with the Cinecorder and it is comparatively easy to place spot effects and lip sync dialogue exactly where they are required, as Desmond Roe (the Cinecorder designer) frequently demonstrates at R.P.S. meetings whenever separate tape sync is called for. Perforated separate tape together with sprocketed couplers are used widely nowadays but are still only a compromise, forced into being by the fact that so many thousands of us are stuck with variable speed silent projectors. Magnetic stripe did not really arrive too late but its price has remained too high to have the impact expected. This situation, of course, must change now that the Toie Talkie 8 is now available in mag/opt version for less than £150. 8mm optical sound could have a great effect alone in bringing down the price of mag/stripe machines in point of view of competition offered and might even take precedence as the desired medium for the final sound track although most home-moviemakers would prefer the immediacy and compactness of the stripe system. (It was considered at one time that 16mm mag/stripe would oust 16mm optical to a high degree but this just did not happen!)

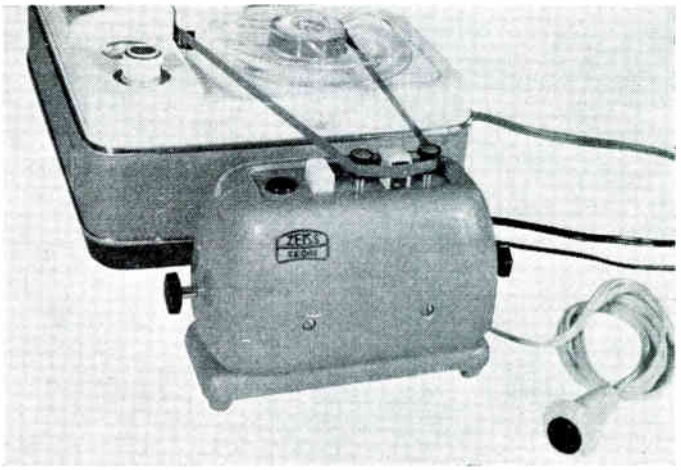
To recap, however, in terms of wide distribution a final optical track is desirable for 16mm, even though it may be slightly inferior to magnetic stripe as far as music reproduction is concerned. The optical track, whether variable density or variable area, can be handled by all 16mm sound projectors: the photographed image is permanent and cannot be affected by accidental erasure or adverse atmospheric conditions. *It is also cheaper to produce where a number of copies are required;* in other words, picture and sound may be duplicated together, whereas mag/stripe must have the sound magnetically transferred *after* the photographic process has been completed.

Optical Tracks

The first 8mm optical tracks that we will see here will be library copies produced from 16 or 35mm masters and in the form of reduction prints, but, as with 16mm, the time must come when the final print will be made from 8mm masters. With the projection-system equipment the synchronisation of sound and picture will no longer be exact enough to ensure a perfect transfer to optical and the Labs will most certainly decline handling any sort of slash-up equipment (this is how the professionals consider separate tape set-ups) to effect a transfer. The situation will then be wide open for perhaps a modified and more expensive version of the Cinecorder with, at least, a speed corresponding to sound film speed, or a cheap sprocketed film recorder. Either may well come from the demands of industry and Education, for this is where the money is, but these are early times and we must wait and see. Whatever happens, however, the 8mm home user must benefit in the end, but in the meantime we can review what there is available at the moment and there is quite a considerable choice.

Strobe and perforated tape

The strobe disc, itself, is not to be sneered at by any means and it is widely used in professional recording circles especially where synchro-pulse is concerned. Strobe tape, however, may prove a tighter and an easier method for most and is available from Tape Recorders (Electronics) Ltd. The price for their Super Synchro-Cine magnetic recording tape which has black lines printed on yellow backing is £2 10s. per 720 ft. on a 5 in. spool. The strobe mirror, if needed, is 5s. extra. Perforated tape is available from a number of sources—Zonal, Soundcraft Magnetics. Sychro Sound and K.G.M. Electronics—and the



price is around 1¼d. per foot. Cinetape A. (K.G.M.) for instance. with its 16 perfs per ¾ in. costs 18s. 6d. per 150 ft. and £3 7s. per 600 ft.

Sprockets for sound couplers can be had from K.G.M. Electronics and Sychro Sound (now Synchrodek Ltd.. 23/25 Victoria Street, London, S.W.1.). but in the case of a difficult conversion a call to Burgess Lane & Co., Chiswick, London. W.4. (Tel.: CHI 5752) may find a quick solution to the problem. Of course the whole question of loop coupling synchronisation depends on having a fixed speed tape recorder running with a variable speed projector and, as most people prefer to have the system as uncomplicated as possible, with as few units as possible to set up and to look after, we can first examine those projectors with built-in couplers.

8mm Projectors with Built-in Sound Couplers

I have details of three such models at the moment, all of them very good machines, but I do expect further developments from Photokina and our own Photo Fair in May. The *Eumig P8 Phonomatic* costs £45 10s. complete with a 15-25mm Zoom lens. It has reverse and still picture control, powered rewind, automatic threading and a 12v-100 watt lamp. The Phonomatic has probably the highest sale of the three in this country. The two Noris models with built-in couplers are supplied with either 15mm, 17mm or 20mm lens. They both

(*Continued on page* 121)

Two Years Guarantee

NOT MASS PRODUCED BUT VIRTUALLY HAND-MADE FOR RELIABILITY AND CONSISTENTLY HIGH STANDARD OF PERFORMANCE

R10 SPECIFICATION: 2 or 4 track version. 10 watts push/pull output.

Record Replay Responses—

7½ ips. 40–16,000 C.P.S. } ±3 dBs.
3¾ ips. 40–10,000 C.P.S. } At optimum
1⅞ ips. 50– 6,000 C.P.S. } bias setting.

Signal/Noise ratio—

half track 50 dBs at 2¾ ips.
quarter track 45 dBs at 3¾ ips.

Modified Collaro Studio Deck. Microphone and Radio/Gram inputs each with separate gain controls for mixing. Separate bass and treble controls. ± 12 dBs at 50 cycles and 12 k/cs. Adjustable monitor volume control independent of record level. Peak signal level meter 2¼ in. square. Bogen heads. Record safety device. 600 ohms Cathode follower output. Two per cent total harmonic distortion on peaks. 200/250 volts 50 cycles or 100/120 volts 60 cycles. Valve line up: 3 EF86, 2 ECC83, 1 ECC82, 2 ECL86. Metal rectifier, contact cooled.

Prices: 2 Track 7" spools ... ... **59 gns.**
4 Track 7" spools ... ... **69 gns.**

Fully illustrated literature available on request to—

REPS (TAPE RECORDERS) LTD.
118 Park Road North, South Acton, London, W3
Phone: Acorn 4141

BRITAIN'S LARGEST TAPE RECORDER AND HI-FI MAIL ORDER EXPERTS

PART EXCHANGE SPECIALISTS

If you have outgrown your present tape recorder or hi-fi equipment and would like to **own** a more advanced machine, as used by professional and serious tape recorder enthusiasts. **Contact us today ! ! !**

AND APPOINTED AGENTS FOR

Ferrograph 5AN	85 gns.
Wyndsor International	75 gns.
Ferrograph 422/4	110 gns.
Reflectograph 'A'	105 gns.
Tandberg 6 Stereo	110 gns.
Vortexion WVA	£93.13.0
Brenell Mk. 5 'M'	88 gns.
Simon SP.5	93 gns.
Brenell Mk. 5	64 gns.
Akai M6 Stereo	130 gns.
Philips Stereo	92 gns.
Sony 521 Stereo	124 gns.
Reps R10	59 gns.
Ampex Stereo 971	225 gns.
Revox Stereo	110 gns.

ALL ABOVE RECORDERS AVAILABLE FROM STOCK

WE HAVE THOUSANDS OF SATISFIED CUSTOMERS THROUGHOUT THE BRITISH ISLES

TRANSISTOR-BATTERY	
Grundig TK1	29 gns.
Optacord 412	45 gns.
Butoba MT5	69 gns.
Fi-Cord 202	69 gns.
Philips EL3585	24 gns.
Stuzzi Magnette	59 gns.
Uher 4000	93 gns.

Large stocks of new and used tape recorders at bargain prices. Ask for list. 30% to 60% reductions on original price.

Complete High-Fidelity systems supplied in parts or built to customers' requirements. The latest equipment and cabinets in stock. Agents for all leading makes.

Ferrograph Series 5

ALL GOODS AVAILABLE ON OUR FAMOUS

NO INTEREST TERMS

10% deposit, balance 12 months. 18 to 24 months terms available

FREE SERVICING — FREE DELIVERY — 300 MACHINES ON DISPLAY — OUR MAIL ORDER DEPARTMENT WILL DEAL WITH YOUR ENQUIRY BY RETURN. WRITE—PHONE—CALL FOR A QUOTATION ON YOUR MACHINE. A LARGE SELECTION OF USED TAPE RECORDERS. *HOME DEMONSTRATIONS IN THE LONDON AREA.*

Hi Fi CENTRE Tape recorders

REW

EARLSFIELD LTD., 266 UPPER TOOTING ROAD, LONDON, S.W.17
Telephone: BALHAM 7710

100 yards from Tooting Broadway underground station: opposite Tooting Market

use the 12v-100 watt lamp and the following features are common to both machines. Powered rewind, reverse and still picture control, push button switching and built-in notcher with cable release. The *Noris Synchroner* 100 contains the built-in *Synchromat* sound coupler and costs £51 19s. The *Noris Synchoner TS*, however, has the new coupling unit which allows stopping and starting, for examination of still, and reversing for editing and other purposes without losing synchronisation. It also has a built-in strobe. Its cost is £69 6s.

Couplers working as a separate unit

The following loop couplers are designed to work with a specific 8mm projector and will normally be attached to the tape recorder, forming part of that unit. The *Heurtier Synchroniser* is for use with the Heurtier PS8-100 projector and follows the normal swinging arm pattern. With this system the tape path is extended, from a point between the tape recorder capstan and the take-up spool, through the rollers of the coupler and then around the coupler capstan. This capstan is driven by the projector. One of the coupler rollers is mounted on a swinging arm, forming a tape loop which varies in size according to the projector speed. This moving arm is attached to a variable resistance in circuit with the projector motor, which controls its speed automatically. The Heurtier has an automatic projection start, is supplied with two capstans—3¾ and 7½ i/s and costs £13 10s. The *Cinegel Synchrovox* is for use with the Cinegel G58 projector and costs £11 15s. It follows the swinging arm principle, it has facility for sprocketed tape and is supplied with three capstans—1⅞, 3¾ and 7½ i/s. The *Movilux 8A* sound coupler, swinging arm, is supplied with a 3¾ i/s capstan and costs £11 15s.

Electrical System

The Bauer synchro-system of coupling, however, works on a purely electrical basis and the unit is connected to the projector solely by a multi-core cable. A merit of this system is its independence from mains-voltage conditions and fluctuations occurring through peak or light loads. Through this electrical control the Bauer system claims the high degree of accuracy of only half a frame over a 400 ft. film. This represents a loss or gain of only 1/30th second during a run of 33 minutes, but it does not take into account tape slip or stretch. The *Bauer Type N* coupler is designed for the T10/R projector, it has automatic projection start and is supplied with two capstans—3¾ and 7½ i/s. Its cost is £27 10s.

Probably the best of the swinging arm units, however, is the *Pathe Synchromeca*, a new machine in this country but which comes with an outstanding reputation. Its main use is for perforated tape and it costs £35 15s. Other Pathe units are: the *Tertason Synchroniser*, for use with *Cinerex 8mm* and *Gem, Son* and *Mk IX 9.5mm* projectors, price £7 17s. 6d., and the *Bell Synchro Box* which is for use with the Mitica 8LV 8mm projector and costs £17 15s.

The last two units in the swinging arm class are: the *Nizo Synchrovario* for use with Nizo projectors and selling for £19 15s. 9d., and the *Specto Synchroniser* 209 for use with Specto Greyline or Royal projectors. Price, with stand, £12 12s. The *Specto Speed Controller*, price £9 15s., does not really fall into the coupling class, but it deserves some mention. It is designed to govern projector speed on the Specto models and it does so quite efficiently without any mechanical or electrical link between projector and tape recorder.

The Universal Automatic Synchrodek

With the Synchrodek we expand our field entirely for this instrument is capable of being used with at least fourteen different projectors—some of which are 16mm—with very slight modification indeed (with the 16mm B & H 613, for instance, both mechanical and electrical connections should take no more than 15 minutes even by a beginner). This unit employs the differential gearbox system, the top half driven by a flexible shaft from the projector and the bottom half driven by the tape pulley mounted on the unit. Immediately one half changes speed in respect to the other a correcting voltage is applied to the projector motor by means of the already mentioned easily-fitted electrical connection. Used with sprocketed tape, the Synchrodek can hold sync within one frame over the length of a 30-minute film and, furthermore, can be stopped and started and reversed without losing sync (the unit can, of course, be supplied with an ordinary rubber pulley for use with normal tape). The projectors for which fitting instructions may be had are as follows: the B & H 613H, 606H, 625, 635 and the Lumina, the Bolex M8R and 18-5, the Kodak 8/500, the Eumig P26, the Specto 500 and Royal, the Movilux 8A and 8B and the Nizo Cinemator. It may be possible to use the Synchrodek with other projectors for which the manufacturers do not supply couplers, or indeed for which the production has been discontinued, and a call to Synchrodek Ltd. may prove very rewarding. The price of the Synchrodek is £19 19s.

Double Band Projectors

The complexities sometimes encountered in setting up three separate items, together with the need for carefully chosen cue marks, and the danger that a fault in any one item can ruin a complete recording session, have brought about what is perhaps the ultimate in separate tape sync—the "double band" system. This enjoys considerably more popularity on the Continent than in this country but there is one British projector which employs the same motor to drive both projector and tape recorder. This is the *Dominus 8mm*. The design is unconventional, and projector and recorder sit back to back in the same case. It is extremely portable, however, weighing only 33 lbs., and it can be used to advantage as a portable cinema, together with the *Bayflex* back projection unit. Price £120.

A projector of conventional design but with this double function is the *Malex Sonoclub*. The 8mm version is available in this country from Apparatus & Instrument Co., Ltd., but 9.5mm and 16mm versions exist in France and could be imported, I suppose, if the demand would warrant it. The Sonoclub carries the tape spools at the rear of the machine and the tape is driven by the projector motor. As with the Dominus, the tape recorder may be used separately, but with only the one speed of 7½ i/s. The sound mechanics, however, are quite advanced and include three magnetic heads, enabling top and bottom track recording for music and mixing with a commentary on the centre track. Erasing of a previous recording is possible from 0-100% permitting perfect superimposition and the facility is provided for perforated tape and 16mm fully coated sprocketed magnetic film. The price is £290. The same projector fitted with special Xenon arc discharge lamp runs out at £380.

"Do-it-yourself" Kit

At the other end of the scale, an outlay of £10 would bring you a do-it-yourself kit for making up a double band attachment for small rolls of film. This device, described in the *Tape Recorder* issues December 1961, January 1962, and February 1962, is marketed by Tutchings Electronics Ltd., and will give trouble-free sync and fairly good reproduction for speech.

. . . . tape recorder workbench

No. 45 SELECTED PROBLEMS

by A. Bartlett Still

LAST month I said that I would devote some space to queries that have been sent in by readers. While I am always prepared to offer advice when I am able, I would like to repeat a plea that the Editor has made on one or two occasions. Please do not send to me, or to *The Tape Recorder* office, queries relating to the servicing of a particular machine. These are properly the business of the manufacturer, who should be approached, in the first instance, through the dealer from whom the machine was purchased. After all, it is reasonable to assume that the maker will know rather more about a particular product than we possibly can. On the other hand, if it is a question of modifications to a particular model, the manufacturers will, almost invariably, advise against it as a matter of principle, or so it seems, while we are in a position to look at the problem a little more objectively. Of course, it must not be forgotten that any modification, however simple, will almost certainly invalidate any guarantee that may exist.

Condenser Microphones

Questions often seem to arise in connection with the condenser microphones often supplied with the Grundig range of machines. This is possibly because this type of microphone is less common, and therefore less well known. It may be described as a high impedance, capacitative, signal source, and therefore considerable care has to be taken if it is desired to extend the connecting cable. The cable used must be very well screened and of low capacity, since any capacity introduced in this way shunts the microphone and reduces the output. The plain fact is that cable of a suitable type cannot be obtained by the amateur. Grundig's sell made-up extension cables, using a specially chosen cable, and in so doing they accept the responsibility for satisfactory operation. The difficulty, of course, is to maintain output yet avoid hum pick-up.

The other question that seems to crop up quite frequently concerns the replacement of the condenser microphone by some other type. The use of a condenser microphone means that the input is high impedance with a polarising voltage of the order of

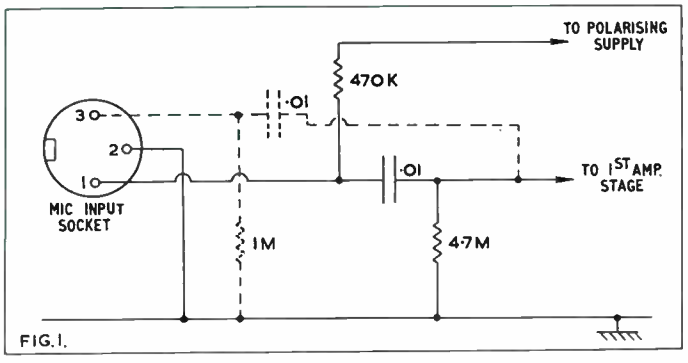
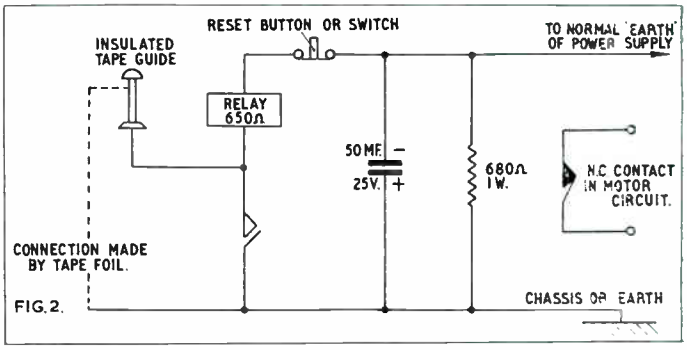


Fig. 1: *Adding non-polarised microphone input to Grundig tape recorder.*

100 V.D.C. To connect a moving coil or ribbon microphone, a suitable matching transformer is required. Sometimes these microphones are offered as high impedance versions, this merely means that they have the correct type of transformer built-in. The polarising voltage is derived from a very high impedance source. In consequence when a matching transformer, which has a low D.C. resistance, is connected the voltage collapses and can, in fact, be ignored.

With a crystal microphone, however, this is not the case. Due to its own high impedance it tends to maintain the voltage, which could, possibly, do damage to the crystal insert. The voltage must therefore be removed in some other way. On the older type of machine, which used a conventional jack socket, the voltage feed connection must be found and removed, thus rendering a condenser microphone inoperative. You have to make a once-for-all decision as to which type of microphone you wish to use.

The newer type of machine, using continental 3 pin sockets, allows another approach. As I show in my circuit, which is typical of the sort of input circuit used, the microphone connection is between pins 1 and 2. If we make use of pin 3 for an unpolarised input, other types of microphone may be connected as alternatives. The paralleling of inputs will mean that each



will have a frequency effect on the other, but this should be so small as to be unnoticeable. The additional resistor and capacitor required have been shown dotted and should present no difficulty in fitting. It should be remembered that the new microphone will be connected live to pin 3 and earth to pin 2. Having made such a modification, it would be a good idea to use this input even for transformer connected microphones.

Automatic Tape Stop

Some time ago I gave details of two methods of automatic tape stop, one mechanical and one electrical. The latter caused quite a bit of interest, and I have been asked to give the details once again.

The electrical system, the circuit of which is given in **fig. 2,** derives its power from the HT current of the tape recorder amplifier. Connection of the network should be made to the chassis on one side, and on the other to the earth connection of the power unit, which has first to be removed from the chassis. In the case of power units with valve rectifiers, this will come from the transformer. Where a metal rectifier is used, the lead in question will come from the rectifier.

Operation

The operation of the circuit is as follows: under normal conditions, the return HT current of the amplifier, probably about 40 mA, will develop a voltage across the resistor and maintain a charge in the condenser. As soon as the tape foil completes a circuit between the insulated tape guide and some metallic part of the tape deck, the charge is passed to the relay coil to provide a high initial energisation in order that it shall operate quickly. The relay coil is now in parallel with the resistor and shares the current which should be sufficient to maintain it, a normally open contact being used for this purpose to replace the tape foil.

This circuit has to be electrically reset as shown, though it may be possible to incorporate this with an existing switch or tape deck push button. Suitable relays would be Varley type VP or Magnetic Devices type 596, cost about 25s.

for Professional Performance..

...Tandberg

SERIES **6**

STEREO TAPE DECK

3 SPEEDS
3 HEADS
4 AMPLIFIERS
*4 TRACK and 2 TRACK

- High and low level mixer inputs and cathode follower outputs.
- "On and off the Tape" monitoring.
- Sound-on-Sound simultaneous record and playback.

110 gns

Booklet of Technical Reviews on request.

SERIES **7**

STEREO TAPE RECORDER

3 SPEEDS
2 HEADS
and 2 Power Amplifiers

- Two Indicators.
- Two Monitor Speakers.
- Two outputs for additional speakers or Hi-Fi.

*4 TRACK and 2 TRACK

Send for leaflet.

BUILD-IT-IN OR CARRY-IT-AROUND!

4 track model 74
2 track model 72

93 gns

(Luggage type carrying case. £7 1s 8d. extra).

Tandberg GB

ELSTONE ELECTRONICS LIMITED,
Edward St., Templar St., Leeds 2.
Telephone: Leeds 3-5111 (7 lines)

Can't see clearly ?

ARE YOU SO BLINDED BY THE VARIETY AND TECHNICAL SPECIFICATIONS THAT YOU CAN'T DECIDE WHAT TO BUY?

Don't worry! Tape Recorders are a specialised subject and you must get expert advice. You certainly won't get it from most shops. You get that advice for nothing. Who are we? The biggest specialists in the British Isles, who sell more machines than any other dealer, that's who!

Wherever you live (our mail-order service covers the whole of the country), we offer you the best terms and service available. Interested enough to know more? Full details of all our offers and free brochures on all the best makes are yours for the asking.

218 HIGH ST., BROMLEY, KENT

RAVensbourne 4000 & 4477

HOWARD TAPE RECORDERS

Readers' Problems

★ Readers who encounter snags, or who run into trouble with their tape recording equipment, are invited to write to this editorial office for advice, marking the envelopes "Readers' Problems—Tape". Replies will either be sent direct by post, or published in this column if the subject is of general interest. However, we must emphasise that this advisory service cannot include requests for information about manufacturers' products when such information is obviously obtainable from the makers themselves. It is also essential to keep the queries reasonably short and to the point, and to limit them to one specific subject if at all possible. And, please, in no circumstances confuse such letters with references to other matters which have to be dealt with by other departments in our office.

Voltage Reductions

Dear Sir:—In view of the recent difficulties in the electrical supply industry, leading to reductions in voltage, would you please tell me what effect, say 10%, reduction from a nominal 240 volts has on (a) tape speed (b) volume.

Would a recording made under such conditions sound appreciably different if played back under normal conditions, and if so, in what way?—*Yours faithfully,* **M.H., Dudley.**

A well-designed tape recorder should be able to absorb a mains voltage reduction of 10%, though this would probably be about the maximum. The sort of effects that one might expect once this voltage reduction becomes noticeable would be a reduction of tape speed during recording, with a corresponding apparent increase during replay on normal mains, and a reduction in bias. The reduction in recording bias would mean an increase in the volume of the recording signal, particularly in the treble register, and an increase in the distortion on the tape. These two latter effects would be noticeable to a greater or lesser degree, depending upon how close the normal bias level is to the optimum level for the tape you use.

Perhaps I should add that if a recording made under these low mains voltage conditions is affected, there is, unfortunately, nothing that can be done about it.

* * *

Using Different Tapes

Dear Sir:—I recently replaced a mono recorder, for which brand X tape was recommended, by a stereo tape recorder of the same make. On enquiry I was told that the manufacturers now recommended brand Y tape and the new recorders were biased accordingly. In spite of some inward doubts as to whether the new recommendation might be due more to bulk discounts than improvements in quality, I shall change over to the new tape.

Meanwhile all tape manufacturers recommend their tape for all recorders but never mention the optimum bias required. Very few recorders have variable bias and the manufacturers do not quote the figure at which it is set. Just how important is this subject and how can one know which tapes are suitable for which recorder? I will admit that I can notice little, if any, audible difference with the better-known tapes but there are people with a more sensitive ear than mine.—*Yours faithfully,* **K.F., Cirencester.**

I have a strong personal feeling that the first paragraph of your letter represents a pretty shrewd guess on your part. However, there are differences in quality between various brands of tape, though relatively small, and there are certainly variations in the bias requirements of one tape as against another. Whether the differences are as audible as they are visible on the meter is, perhaps, open to question.

* * *

A Recorder Running Fast

Dear Sir:—I have just acquired a second-hand Körting MK112 model. It works well except for the 3¾ i/s speed. It seems to be faster. I have proved this to myself by using my tapes on other recorders and it reproduces slower at the true 3¾ i/s speed. Any suggestions which may help me rectify this trouble.—*Yours faithfully,* **R.A.M., Germany.**

If the 7½ i/s speed is correct, then we can safely eradicate the motor. But check if this is so—there have been both 50 c/s and 60 c/s motors issued. The frequency of the motor should be marked on a small plate on the underside: check this against your local mains frequency. If these match, but overall speed is incorrect, check the 4 microfarad condenser and the flat belt drive to the flywheel.

If the speed, although too fast, is regular, and correct at the 7½ setting, the only other discrepancy is the separate 3¾ i/s spindle. This is an unusual method of construction, with a separate spindle driven by intermediate belts and a rubber drive wheel mounted on a slide-plate bracket. But variation of the intermediate parts of the drive cannot affect the speed, except to make it irregular. The basic speed of the capstan depends on the relative diameters of the motor drive spindle and the capstan spindle and the rpm of the motor. You probably are well aware of this, and I apologise for reminding you. You may possibly have a worn capstan spindle, though this would be visible as the formation of a slight "waist".

In view of this, I would urge you to check the points mentioned, also to test the frequency reproduction of a test tape, or make a simpler test, such as: record a tone, from a musical instrument or similar source, on a known good machine.

Play back the tape on your machine, and match the tone with the original. Check for pitch and wow. Then make the opposite test, record on your machine, play back on the other. This will certainly show up any discrepancy.

* * *

Partial Erasure

Dear Sir:—I wondered if you could advise on a little trouble I am having with a new Elizabethan four-track recorder, model LZ29.

The trouble being only very partial erase, the previous recording always being in the background of the fresh recording. I have cleaned the erase head, but without improvement.—*Yours faithfully,* **A.H.S., Stockport.**

The problem of partial erase on the Elizabethan LZ29 may be, quite simply, an erase head slightly high or low—which can only be proved exactly if careful tests are carried out. Taking the numbers of the tracks, as 1, 2, 3, 4, from top to bottom, try the following: Record on track 1 a steady input at a set level (if you have no tone source available, try the test tone which both television channels put out at intervals during the morning transmissions. Make this recording with the input at a certain definite level, and the recording level set at a definite value. Without altering this, rewind to the start of that recording, change to track 3 and record what is in effect a parallel track. Now play these back, and you should have identical outputs from both these tracks if you started with a clean tape.

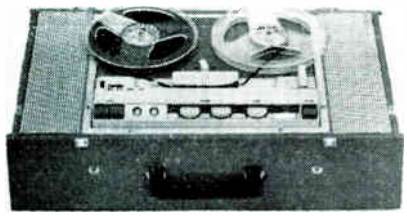
Now invert the tapes and record on track 2 with the microphone removed. In other words, record silence. Make this recording over the same length of tape as the previous tracks so that you have now, in effect, a "sandwich" made by the two recorded tracks with a track of silence between them.

Re-invert the tape and play back the two tracks, noting if one is reduced in output from what it was before. If the output from track 1 is reduced, the erase head is set too low, if 3 is reduced, the erase head is too high. If both are the same, yet the erasing of either is incomplete when re-recording, check that the tape makes good contact with the erase head during record.

TAPE, RECORDERS & ACCESSORIES

FIRST DETAILS OF NEW PRODUCTS

● *We remind our readers that notices of equipment listed and illustrated in this monthly feature are in no sense reviews. When figures, specifications and diagrams are published, these data are extractions from manufacturers' lists. When samples of this equipment are submitted for test, they are passed to our technical contributors, whose reports are published in a separate section.*



★

SONY 464 CS STEREO RECORDER

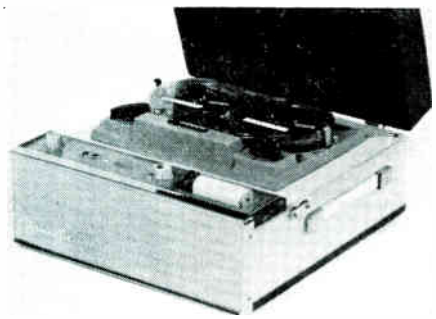
★

THE new Sony 464 CS is a completely self-contained stereo system with two microphones, two extended range stereo speakers and such additional features as sound-on-sound recording. push button channel selection, duel recording indicators, automatic tape lifters, digital counter, pause control and FM stereo recording inputs.

Four-track recording and play back is available at speeds of 7½ and 3¾ i/s, giving a frequency response of 40-15,000 c/s at 7½ i/s. Harmonic distortion is less than 2% at 3 dB below the rated output of 3 watts. The power consumption is 153 watts.

The recorder measures 23 × 15 × 8 in. and weighs 37½ lb. The price is £98 14s. **Distributors: Tellux Ltd., Avenue Works, Gallows Corner, Colchester Road, Romford, Essex.**

* * *



★

DANSETTE CADET TWO-SPEED BATTERY RECORDER

★

THE Dansette Cadet is a two-speed machine featuring the new Garrard battery tape deck which provides sixty minutes of playing time at 1⅞ i/s and thirty minutes at 3¾ i/s. The machine is fitted with an elliptical speaker measuring 7 × 3⅜ in. and amplifier is fully transistorised operating on six U2 batteries.

A magic eye level indicator, and inputs for microphone, radio or gram are provided. The microphone is of a variable reluctance type. The machine is supplied with one cassette, containing 600 feet of tape. The price of the recorder, which measures 11⅛ × 5⅝ × 12 in. is £27 6s. The weight is approximately 10 lb. **Manufacturers: Dansette Products Ltd., 112/116 Old Street, Clerkenwell, London, E.C.1.**

* * *

Philips EL3541 De-Luxe

A DE LUXE version of Philips most popular tape recorder, the model EL3541, will be making its first appearance in this country at the Audio Fair. This new version. model EL3541/H, has a newly designed wooden cabinet covered with PVC cloth with an attractive charcoal grey colour scheme. This new model, which is to be called the Family de Luxe. is to sell at £44 2s. **Manufacturers: Philips Electrical Ltd., Century House, Shaftesbury Avenue, London, W.C.2.**

Lustraphone Sub-miniature Ribbon Microphone

AN entirely new Lustraphone microphone will be shown for the first time at the 1963 Audio Festival. It is the "Microdyne", a sub-miniature Ribbon Velocity Microphone. model VR/70L. The frequency response quoted is between 50 and 14,000 c/s and the unit weighs only 2¾ oz. The size of the microphone is 1 $\frac{13}{16}$ × 1 $\frac{7}{16}$ × $\frac{13}{16}$ in. The price will be announced later. **Manufacturers: Lustraphone Ltd., St. George's Works, Regents Park Road, London, N.W.1.**

* * *

★

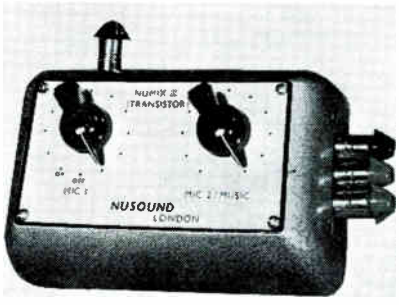
UHER ROYAL STEREO TRANSISTORISED RECORDER

★

THE latest tape recorder to be announced in the Uher range is the Uher Royal Stereo. It is completely transistorised and uses a ¼-track system. Four tape speeds are provided 7½, 3¾, 1⅞, $\frac{15}{16}$ i/s. The wow and flutter figure quoted is 0.15% at 7½ i/s. Frequency response for each speed from 7½ i/s is 50 to 20,000; 50 to 16,000; 50 to 8,000; 50 to 4,000 c/s. Two recording meters are fitted. Other facilities include monitoring, mixing. and echo effect. The maximum size spool that may be fitted to the machine is seven inch.

The dimensions of the Royal Stereo is 15 × 13¾ × 3 in. Weight 23 lb. **U.K. Distributors: Bosch Ltd., 205 Great Portland Street, London, W.1.**

* * *



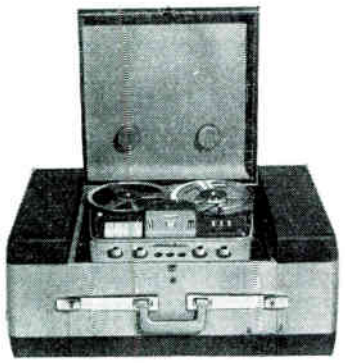
★

NUMIX MARK III MIXER

★

THE Numix Mark III, a transistorised mixer constructed to take two low impedance microphones and one pickup, is powered by one 8 V Mallory cell. The inputs and output are terminated with phono sockets. The specification supplied states: Inputs 30-600 ohms and 680 Kohms. Output; 25 Kohms. Voltage gain; 1 mV in-400 mV out. Signal to noise ratio; −51 dB. The price of the unit. complete with battery, is £9 6s. 6d. A set of phono to jack adaptor leads suitable for the unit is £1 10s. **Manufacturers: Nusound Recording Co., 35 Craven Street, London, W.C.2.**

GRUNDIG TK 60 STEREO



SPECIAL OFFER!!

We have a number of the fabulous TK60 STEREO TAPE RECORDERS available at the fantastic price of 89gns. This recorder is listed at £134 and at the price offered shows a saving of over £40!! Absolutely complete in the last detail with two superb detachable acoustically designed speakers, 9 watts output, frequency response 50–16,000 c/s, bass and treble controls, automatic tape stops, etc. Superb value and an absolutely unrepeatable offer, BRAND NEW in sealed cartons with full maker's guarantee. Hire Purchase terms available. We specialize in mail order. Write to our HEAD OFFICE at Stratford – address below.

★ **HIGHEST PART EXCHANGE ALLOWANCES**
★ **OVER 250 NEW & S/H RECORDERS ON DISPLAY**
★ **H.P. TERMS OVER 9-24 MONTHS**
★ **FREE HOME DEMONSTRATIONS**
★ **TAPE RECORDER REPAIR SPECIALISTS**
★ **FREE DELIVERY. FREE TECHNICAL ADVICE**

NOTE.—OUR CITY SHOP OPEN MON.-FRI. 9-6. CLOSED SAT. OPEN SUN. 9-2 p.m.

CITY & ESSEX TAPE RECORDER CENTRES

228 Bishopsgate, E.C.2. Opp. Liverpool St. Station. Bis 2609
2 Maryland Station, Stratford, E.15. (Adj. Station) Mar 5879
205 High St. Nth. (Opp. East Ham Station), E.6. Gra 6543

ELECTRONIC WORLD

is by far the cheapest HIGH QUALITY TAPE on the market

* ***Acclaimed by experts***
Reprints of reviews available

* ***Backed by our Guarantee***
If you are not completely satisfied with any purchase, we undertake to refund the full price plus your return postage

POST COUPON NOW!

DE VILLIERS (Electronic World) LTD.
16d Strutton Ground, London, S.W.1

STANDARD PLAY (Acetate base)
3 in. spool 175 ft. 4 spools for 18/-
or 48/- dozen
4 in. spool 300 ft. 4 spools for 26/-
5 in. spool 600 ft. 2 spools for 26/-
5¾ in. spool 850 ft. 16/- per spool
7 in. spool 1,200 ft. 19/- per spool

ARCHIVE GRADE (S.P. Polyester)
7 in. spool 1,200 ft. 22/6 per spool

LONG PLAY (Acetate Base)
7 in. spool 1,800 ft. 28/-

LONG PLAY (Polyester Base)
3 in. spool 225 ft. 4 spools for 22/-
or 60/- dozen
4 in. spool 450 ft. 2 spools for 21/-
5 in. spool 900 ft. 2 spools for 35/-
5¾ in. spool 1,200 ft. 24/- per spool
7 in. spool 1,800 ft. 31/- per spool

DOUBLE PLAY (Special Polyester base)
3 in. spool 375 ft. 4 for 40/-
or 108/- per dozen
4 in. spool 600 ft. 2 for 30/-
5 in. spool 1,150 ft. 27/- per spool
5¾ in. spool 1,750 ft. 35/- per spool
7 in. spool 2,400 ft. 45/- per spool

I enclose remittance for £ s. d. *Post Free*

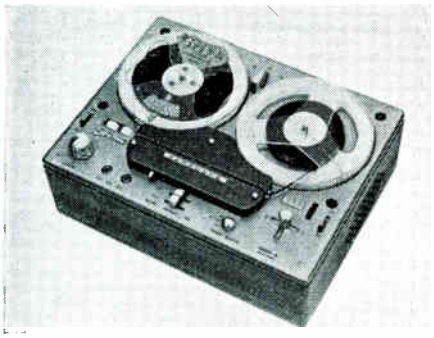
Name .....

Address .....

.....

BLOCK LETTERS PLEASE **Cash with order**

EQUIPMENT REVIEWED



★

TANDBERG SERIES 7 STEREO TWO-TRACK AND FOUR-TRACK RECORDERS

★

Manufacturer's Specification—Models 74 and 72: Power requirements: 110, 125, 145, 200, 220 and 245 volts, 50 cycles, 85 watts (motor pulley for 60 c/s 24s. extra). **Tape speeds:** 7½ i/s, 3¾ i/s and 1⅞ i/s. 7 in. reels. Speed can be changed while recorder is running. **Speed accuracy:** ±1 per cent. for all speeds at correct line frequency and voltage. **Fast forward and rewind:** approx. 2 min. for 1,200 ft. of tape without wear on heads. **Inputs, Sensitivity and Impedance:** 2 microphones 1.5 millivolts *r.m.s.*, 3.3 megohms. Two line inputs—adjustable external presets 7 millivolts to 7 volts *r.m.s.* **Outputs:** 4 ohms. At maximum recording level with indicator beams touching each other, 5 per cent. distortion at 3 watts output. **Recording level indicators:** Electronic for each channel (2 EAM86) with damped backward movement. Electronic eye takes range of 25 dB plus overload. Indicator beams just touch at 5 per cent. distortion (from tape). **Wow and flutter:** 0.15 per cent *r.m.s.* at 7½ i/s, 0.2 per cent. at 3¾ i/s and 0.3 per cent. at 1⅞ i/s. **Frequency response:** 7½ i/s 30 to 20,000 c/s, 3¾ i/s 30 to 14,000 c/s and 1⅞ i/s 50 to 7,000 c/s. **Bias and erase frequency:** 85.5 Kc/s distortion 0.5 per cent. Erase head with ferrite core. Minimum erasure 70 dB. **Record-Playback head:** gap width 0.00012 in. **Motor:** Asyncronmotor. **Valve complement:** 1 ECC82, 2 ECC83, 2 ECL86, 2 EAM86, 2 Philips AC107 transistors, selenium rectifier 125 mA, 250 V. **Dimensions:** 15⅛ x 11 13/16 x 6⅞ in. (teak cabinet). **Weight:** Instrument alone weighs 27½ lb. With carrying case 32½ lb.

All the preceding details are common to models 72 and 74. The following differences between 2- and 4-track Series 7 should be noted. **Noise level:** (72) 2-track 56 dB below maximum recording level. (74) 4-track 53 dB below maximum recording level. **Cross talk rejection:** 2-track better than 60 dB at 1,000 c/s. 4-track better than 65 dB at 1,000 c/s. **Price of both models:** including empty reel and connecting leads, £97 13s. Luggage-type carrying case £7 1s. 8d. extra.

Sole U.K. distributors: Elstone Electronics Ltd., Edward Street, Templar Street, Leeds, 2.

WHEN John Farnell, of Elstone Electronics Ltd., offered me the chance of doing side by side tests on these two machines, which are identical except for the width of the heads, I jumped at the opportunity of making a modest contribution to a controversy which has raged in the columns of this magazine for many months now (and which was terminated by the Editor on page 59 of last month's issue). These recorders are ideal for 2- and 4-track comparisons because the internal hum and hiss has been reduced to a very low level by the use of low noise transistors in the first stages so that tape effects can be clearly measured or estimated subjectively by careful listening tests. I will leave my own conclusions to the end of this joint review and describe first the objective measurements which can be pinned down to relatively exact figures, and which, incidentally, will demonstrate the very close matching of the technical performance of the 2-track Model 72 and the 4-track 74.

Wow and Flutter

Fig. 1a shows the fluttergrams or pen recordings of the short-term speed variations of the 72, and **fig. 1b** those of the four-track 74. The traces and integrated total *r.m.s.* readings are virtually identical at the two higher speeds. The 74 machine shows slightly more capstan wow at the lowest speed of 1⅞ i/s but this is not a function of the track width but rather a demonstration of the inevitable small differences which show up on production samples of similar machines. All readings are well within the specifications limits.

Play Only Responses

Test tapes having surface induction characteristics of 100, 200 and 400 microsecond were played on both machines to give the responses shown in **figs. 2a** and **2b**. The 1⅞ and 3¾ i/s playback

(*Continued on page* 131)

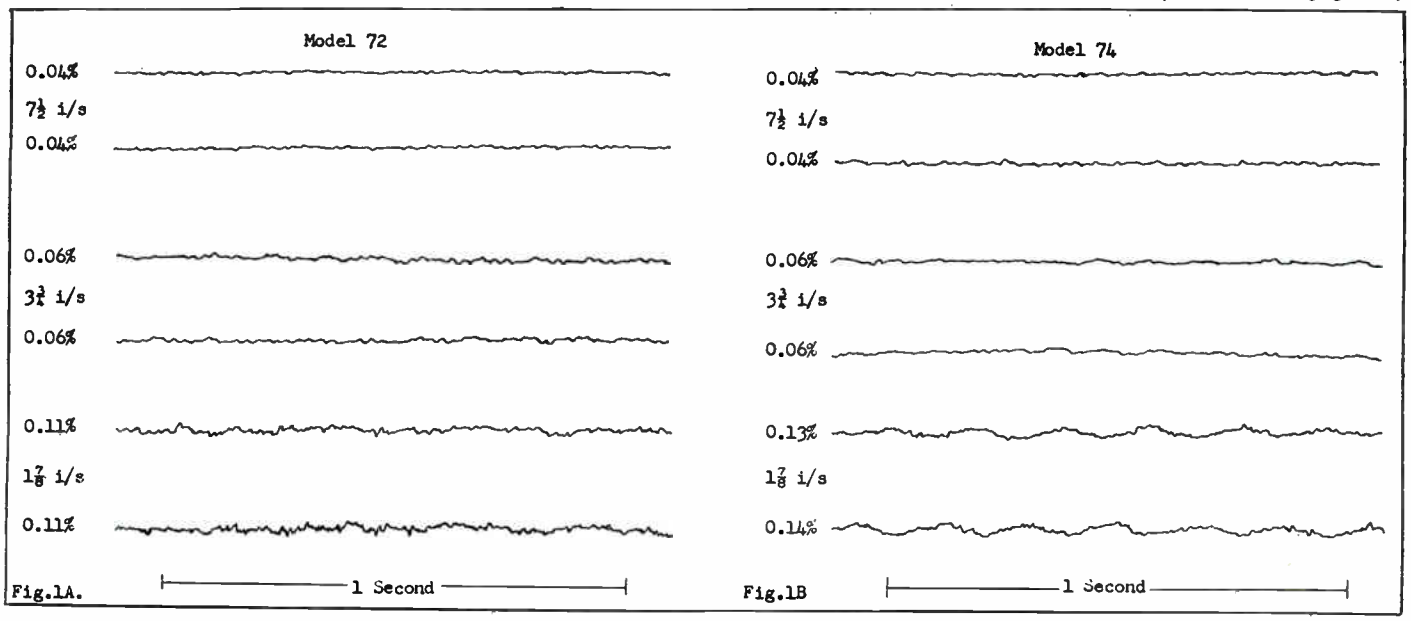


Fig.1A. Fig.1B

LOEWE OPTA

Hi-Fi Tape Recorders

FOR PERFECTION IN SOUND

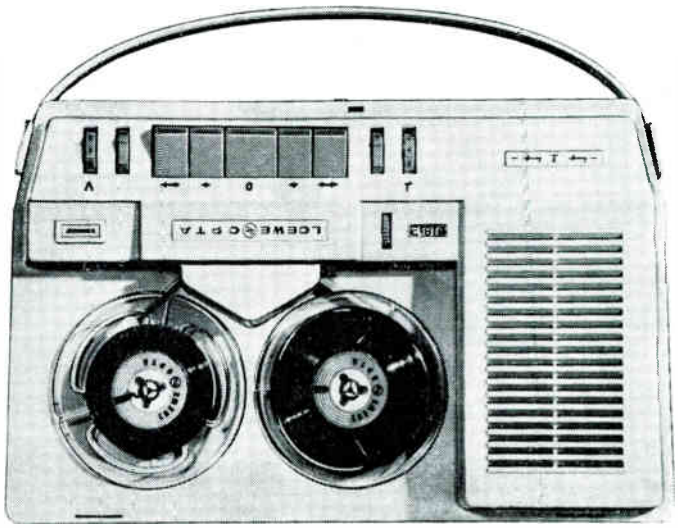
THE LATEST ADDITION TO THE OPTACORD RANGE

OPTACORD 414

With the first ever high frequency motor ensuring long life and constant speeds.
Unsurpassed for a portable tape recorder.
For use on mains, batteries and car batteries.

47 Gns.

Ask our Representative to call, or see the complete range at our Showrooms.



HIGHGATE ACOUSTICS

71/73, GT. PORTLAND STREET, LONDON, W.1 *Telephone: MUSeum 2901/6*

THE RECORDER CO.

for best machines on advantageous terms

	Deposit £ s. d.	12 Monthly Payments £ s. d.	Cash Price Gns.
4-TRACK STEREO/MONAURAL			
Akai M6	13 13 0	10 4 9	130
Sony 521	13 2 0	9 15 2	124
Grundig TK46 ...	10 12 0	7 15 7	99
Telefunken 97 ...	10 0 0	7 9 7	95
Sony 464 C5	10 0 0	7 7 10	94
Philips EL3534 ...	9 16 0	7 4 8	92
2-TRACK STEREO/MONAURAL			
Telefunken 98 ...	10 0 0	7 9 7	95
MAINS TWIN-TRACK			
Simon SP5	9 16 0	7 6 5	93
Brenell 5 Type "M" ...	9 5 0	6 18 7	88
Telefunken 85 ...	8 15 0	6 10 8	83
Akai Model 69 ...	8 6 0	6 4 5	79
Grundig TK41 ...	8 0 0	5 17 11	75
Brenell 5/2 (Meter) ...	7 15 6	5 16 7	74
Brenell 5/2	7 5 0	5 8 8	69
Reps R10	6 4 0	4 12 11	59
Telefunken 95 ...	6 4 0	4 12 11	59
Truvox R82	5 15 6	4 6 8	55
Grundig TK18 ...	4 2 0	3 1 5	39
Truvox R62	4 2 0	3 1 5	39
Grundig TK14 ...	3 13 6	2 15 2	35
Wyndsor Trident ...	3 10 0	2 11 11	33
Elizabethan LZ30 ...	3 7 3	2 10 5	32
Ferguson 3200 ...	2 16 6	2 0 10	26

	Deposit £ s. d.	12 Monthly Payments £ s. d.	Cash Price Gns.
4-TRACK MONAURAL			
Akai Model 69 ...	8 6 0	6 4 5	79
Grundig TK40 ...	8 0 0	5 17 11	75
Reps R10	7 5 0	5 8 8	69
International	7 5 0	5 8 8	69
Philips EL3549 ...	6 12 0	4 17 6	62
Truvox R84	6 4 0	4 12 11	59
Grundig TK23 ...	4 15 0	3 10 10	45
Truvox R64	4 2 0	3 1 5	39
Elizabethan LZ29 ...	3 15 8	2 16 9	36
Philips EL3541 ...	3 15 8	2 16 9	36
Ferguson 3202 ...	3 10 0	2 11 11	33
Philips "5tar Maker"	2 16 9	2 2 7	27
BATTERY			
Uher 4000	9 16 0	7 6 5	93
Ficord 202	7 0 0	5 3 10	66
Butoba MT5	7 0 0	5 3 10	66
Stuzzi Magnette ...	6 4 0	4 12 11	59
Optacord 412 Bat./Mains	4 19 0	3 14 0	47
Stella ST470	2 15 0	1 19 2	25
Philips EL3585 ...	2 10 5	1 17 10	24

TRUVOX HI-FI TAPE UNITS	£ s. d.	£ s. d	£
TWIN-TRACK			
PD.82 Standard ...	4 4 0	3 3 0	42
PD.87 Stereo ...	6 6 0	4 14 6	63
FOUR-TRACK			
PD.84 Standard ...	4 12 0	3 9 0	46
PD 86 Stereo ...	6 6 0	4 14 6	63

H.P. also over 18 and 24 months

Open Saturday until 6.0 p.m. — Friday 6.30 p.m.
If unable to call, write for free brochure or send deposit now for quick delivery.

Agents for **FERROGRAPH, VORTEXION, REFLECTOGRAPH, SONY, GOODMANS, ETC.**

INTEREST FREE TERMS · FREE DELIVERY · PART EXCHANGE

The Month's Bright Spot

GRUNDIG TK46

Price 99 gns.

Fully Stereo/Mono: Separate recording and playback amplifiers · 3 heads · Superimposition facilities · Direct tape monitoring · Reverberation control · 2 output stages · 2 Loudspeakers.
We will be pleased to demonstrate this remarkable model. Send for full details.

THE RECORDER CO.

(Dept. R) 188, WEST END LANE, WEST HAMPSTEAD, LONDON, N.W.6.
Telephone: **SWI 4977**
Nearest Station: **West Hampstead, Bakerloo Line**

responses conform almost exactly to the C.C.I.R. 200 and 400 microsecond recommendations, but the 7½ i/s response is to the 70 microsecond characteristic forecast in my article on test tapes exactly a year ago (April 1962, page 123). See also last month's Editorial. This characteristic is midway between the C.C.I.R. (100 m/s) and the N.A.R.T.B. (50 m/s) responses and has been chosen as a compromise which will play either characteristic with no more than 3 dB error. The very close matching of the playback responses of the two recorders should be noted.

Record Replay Responses

The record replay responses were taken on the two recorders by feeding oscillator tones to the line inputs and measuring the replay levels at the low impedance output sockets. These tests were duplicated on upper and lower tracks. The test recordings were done at test tape level 12 dB below peak recording level.

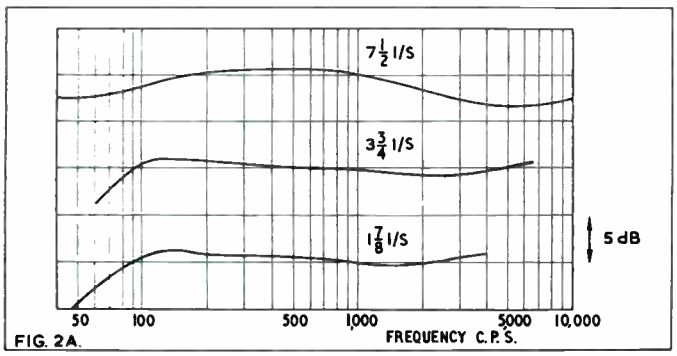


FIG. 2A.

Fig. 3a shows the responses for the two-track machine and **fig. 3b** those of the four-track recorder. In both cases the bottom tracks show evidence of being slightly over-biased, giving less extreme top response and a very slight rise at very low frequencies. Note that the 7½ i/s *recording* characteristic is to true N.A.R.T.B. response giving a 3 dB *rise* at 10 Kc/s with the compromise playback response mentioned earlier. The magic eye beams closed at a level exactly 12 dB above test tape level and the recorded signal could be raised a further 3 dB before the onset of visible waveform distortion.

Signal to Noise Ratio

Now we come to the moment of truth when there should be a measureable and significant difference between the two machines according to all the "experts". Let us first see what the theoretical difference should be. Doubling the width of the track should double the voltage output of a recorded sine wave or combination of sine waves (any speech or music), but tape noise is random in character, and doubling the width of the track will double the noise *power*, putting the *r.m.s.* measured noise up by only 3 dB. As the signal has gone up 6 dB (two to one in voltage), and the noise only 3 dB (two to one in power),

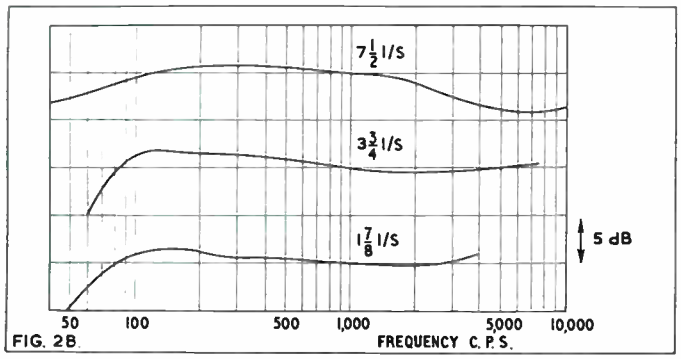


FIG. 2B.

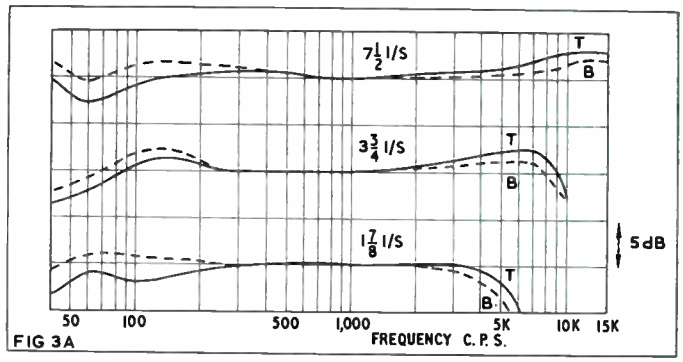


FIG 3A

the signal noise improvement is 3 dB. This assumes that all other noise and hum is negligible compared to the tape noise which is very far from the case in most domestic tape recorders but is much more nearly so in the machines under discussion.

Because of very low level mains hum in the electronics, transistor hiss (also at very low level), and electromagnetic hum fields picked up on the heads, the wide range signal (and hum) ratio is likely to be rather different to the theoretical 3 dB.

System noise and hum, with the tape not moving but with the motor running, was 50 dB below test tape level or, adding the 12 dB to peak recording level, 62 dB on the two-track machine, and (46 plus 12) 58 dB on the four-track unit. Tape erased and biased on each recorder gave wide range noise and hum −57 dB and −51 dB below peak recording level for the 72 and 74 machines respectively. Filtering out the hum made practically no difference on the two-track, which remained at −57 dB, but improved the four-track performance to −54 dB.

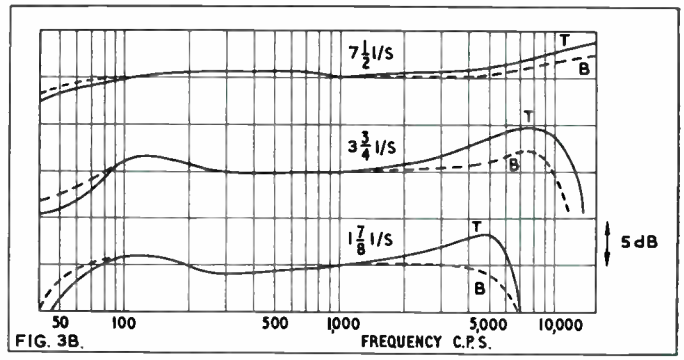


FIG. 3B.

So that, neglecting hum, which can not be heard at this level anyway, the theoretical 3 dB noise difference is confirmed.

Acoustic Response

I should have mentioned earlier that each recorder is fitted with small loudspeakers on the sides of the case and stereo reproduction is quite effective if one listens fairly close to the recorder so that the angle subtended by the two speakers is about 45 degrees. Placing the machine in a corner of a room widens the sound field by reflection from the walls and allows listening at a greater distance.

A switched bass lift is provided in the twin power amplifiers and **fig. 4** shows the measured acoustic response on the axis of one speaker with and without the bass lift. For really effective stereo listening a pair of wide range extension speakers should be plugged into the 4 ohm output sockets and the speakers placed for optimum stereo effect. Due to the very heavy negative feedback around the output stages, speakers of higher or lower impedance may be used with no alteration of frequency response and with only a small drop in maximum power output.

Comment

Due to the identical appearance of these two machines, it was possible to use either without reference to the type numbers

The Grampian Ribbon Microphone

Exceptionally wide frequency response — virtually level from 40 c/s to 15 Kc/s—combined with excellent transient response, makes this the ideal instrument for the studio and wherever a high standard of fidelity is essential. Two models are available, each in three impedance sensitivities.

Model GR. 1, having a semi-cardioid response, gives approximately 10 db suppression to high frequencies at the rear face. It is ideal for overcoming problems of feed-back between microphone and speakers.

Model GR. 2, having a bi-directional "figure of eight" sensitivity pattern, discriminates against unwanted side noise both in the vertical and horizontal planes.

Supplied in attractive, padded instrument case, complete with 18 ft. screened lead, swivel holder and connector. **£11.10.0.**

Grampian

30 years' experience in the manufacture of high-quality microphones

A full range of accessories is available. Please send for illustrated leaflet. Enquire too for details of the famous Grampian DP4 range of Moving Coil Microphones

GRAMPIAN REPRODUCERS LTD

Hanworth Trading Estate. Feltham, Middlesex. FELtham 2657

CBS TAPES

BACKED BY WORLD-FAMOUS NAME IN SOUND

Specially prepared fine magnetic iron oxide dispersion precision and uniformity in processing with quality control at all stages—these are features that result in CBS Tapes giving you extended frequency range, better wearing; better transients and the chance to make magnificent recordings from all sources even on quarter track at 3¾ i.p.s.! Start using CBS now and note the difference!

IN ALL SIZES—STANDARD LONG PLAY AND DOUBLE PLAY

Particularly recommended for ¼ track and stereophonic use.

BETTER QUALITY FOR LESS COST

		5″	5¾″	7″
Standard	1½ Mil	600′ 17/6	900′ 23/-	1,200′ 27/6
Long Play	1 Mil	900′ 21/-	1,200′ 25/-	1,800′ 35/-
Double Play	½ Mil	1,200′ 34/-	1,800′ 45/-	2,400′ 56/-
Standard Mylar		600′ 21/-	900′ 28/-	1,200′ 35/-
Long Play		900′ 25/-	1,200′ 32/-	1,800′ 47/-
Double Play 10 (Tensilised)		1,200′ 42/-	1,800′ 55/-	2,400′ 68/-

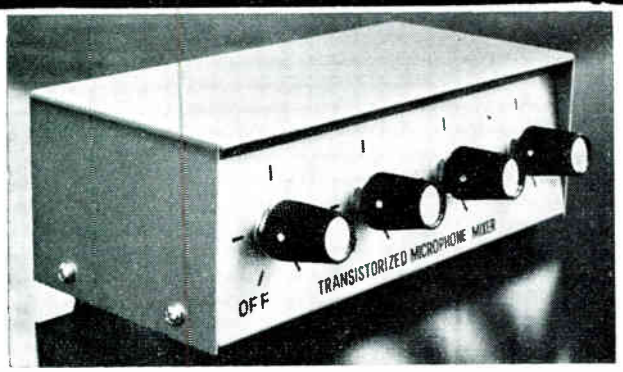
★ *WITH LEADERS AND STOP FOILS*
★ *SUPERB QUALITY AT 3¾ I.P.S.*
★ *LONG WEARING*
★ *RECOMMENDED SPECIALLY FOR FOUR-TRACK INSTRUMENTS*
★ *CONSISTENTLY HIGH QUALITY IN ALL GRADES*

CBS TAPES

DESMOND BURGESS & CO.
12—16 WATLING STREET,
LONDON, E.C.4 *CITY 2238*

Lee Electronics

TAPE RECORDER & HI-FI AUDIO SPECIALISTS



AT LAST A 4-CHANNEL TRANSISTORISED MICROPHONE MIXER AT A REASONABLE PRICE

Four high impedance inputs, e.g. four mics or two mics, one gram and one radio. Output gain approximately 6dB. Inputs, standard jack sockets. Battery PP3.

Price complete with PP3 circuit diagram, instructions etc

£3 - 19 - 6

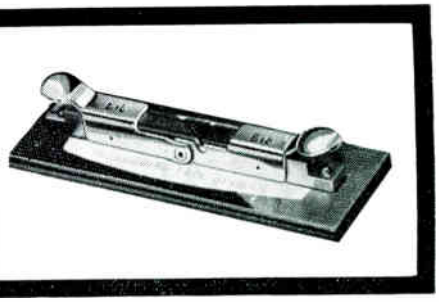
TRADE SUPPLIED

Details of this, and other offers, available on request.

400 Edgware Road, Paddington **PAD 5521**

BUY A Bib

THE PROFESSIONAL TAPE SPLICER



—The most reliable and easy to use.

All metal—beautifully plated—compact in size—mounted on flock covered base. Easily and permanently attached to your tape recorder. Ferrograph, Vortexion, Reflectograph and Wearite decks already have fixing holes for the Bib splicer.

Clamps hold the magnetic or leader tapes in the precision cut channel—no danger of damaging the edges—most important with 4 track recordings. Right angle and oblique cutting slots are provided to facilitate editing to a syllable.

The Bib tape splicer saves tape and makes editing a fascinating hobby.

More Bib splicers have been sold in recent years than any other make. It is incorporated in the "Scotch" Tape Accessory Kit and is used by recording studios and broadcasting organisations.

Complete with razor cutter only 18/6

MULTICORE SOLDERS LTD.

MULTICORE WORKS, HEMEL HEMPSTEAD, HERTFORDSHIRE

CHMS 13

EQUIPMENT REVIEWED — *continued*

without really knowing which was which. I recorded identical test material on the two machines simultaneously from a good quality F.M. tuner and covered the type numbers on the top plate of each unit. With brand new tape I honestly could not guess 100 per cent. which was which! With older well worn tape I could just hear slight amplitude fluctuations on the top track of the four-track 74 recorder on certain kinds of programme material, but at no time was I conscious of any difference in background noise.

I next connected a changeover switch to the loudspeaker so that an instantaneous comparison could be made. I could now

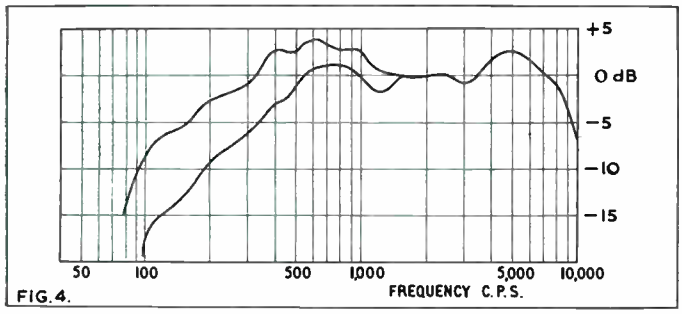


FIG. 4.

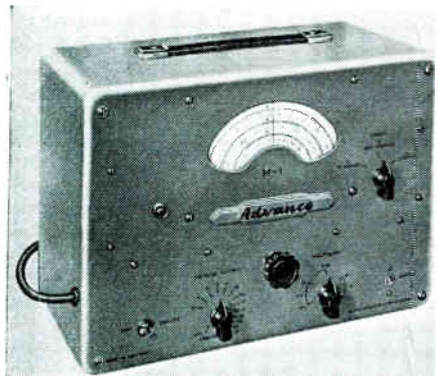
pick out the four-track machine every time—but not because of any of the effects mentioned above, but because of the slighter "brighter" high note response shown in **fig. 3b!**

When I reviewed the Tandberg Series 6 recorder a year ago (April 1962 issue, page 133) the only criticism I could make about the operation of the deck was the reverse coupling of the reel platforms which made threading of the tape a bit tricky. On the Series 7 recorders even this moan is denied me! A fourth position is provided on the joystick control which decouples the reels so that the tape may be wound around the hub of the take up reel without having it pulled off by the contra-rotating supply reel. **A. Tutchings.**

The review was sent to the distributors who returned it marked "No Comment".

* * *

Test Gear (1)



An Audio Signal Generator may be a beat frequency oscillator or a resistance / capacitance phase shift oscillator. The B.F.O. offers the considerable advantage of covering the whole audio range in one sweep, but the phase shift type is generally more accurate for a limited outlay. The illustration shows the Advance Components Audio Signal Generator Type H.1.

— YOUR TAPE DEALER —

—— *Country and Provincial* ——

TAPE CLUB NEWS

Cotswold

The winter has had its inevitable effect upon the activities of the Society; but only one meeting was actually cancelled. On one occasion the chairman, Ernest Morris, and joint secretary, Peter Turner, were both due to make contributions. Both live in the country; and both were snowed in. However, both had recorded their contributions beforehand as a precaution; and this proved wise in the event.

Rugby

Members were entertained by Mrs. M. Taylor who, as guest speaker, gave a talk about Spain, illustrated with colour slides. She and her husband are much travelled in Europe in connection with their coach-tour business. Their own holidays are usually out of season, and often consist partly of the surveying of fresh areas for their suitability for new coach tours.

Medway

In addition to the January and February editions of the Children's Home programme, a second Home is now being visited with a similar programme of requests, songs, short stories and a competition. The children from each home also record requests and messages to each other.

North London

Have created a great interest with their fortnightly newstape for blind people in Enfield. The 45-minute programme is at present heard by 30 elderly blind and housebound people in their own homes, but it is hoped to treble this number by the end of the year.

Northampton

The First National Tape, Audio and Cine Rally will be held at the Central Methodist Halls, Regent Square, Northampton, on Saturday, 30th March, 1963. The Trade Exhibition will open from 10.30 a.m. to 9 p.m. and the Rally from 2 p.m. to 9 p.m.

The Trade exhibition is open to the general public. Admission to the Rally is by ticket only, obtainable free of charge from all leading Tape and Cine Equipment dealers in Northampton or from the club secretary.

New Secretaries

Carlisle Tape Recording Club: J. E. Francis, 29 Dalton Avenue, Carlisle.

Huddersfield Tape Recording Society: J. D. Ireland, 9 Ingfield Avenue, Dalton, Huddersfield.

Cambridge Tape Recording Society: D. J. L. Cowan, Oak Tree Farm, Hilton, Huntingdonshire.

Leicester Tape Recording Club: P. J. Starie, 43 Western Park Road, Leicester.

Etessa Tape Recording Club: L. A. Bridgland, G.P.O. Cable and Wireless, Electra House, Room 716, Victoria Embankment, London, W.C.2.

Blackpool and Fylde Recording Club: G. C. Backhouse, 103 Keswick Road, Blackpool.

New Clubs

Manchester: J. J. Crisp, Faculty of Technology Union, University of Manchester, Sackville Street, Manchester, 1.

Colchester: J. R. Gomer, 150 Layer Street, Colchester, Essex.

Southend: R. T. Hall, 18 Weybourne Close, Southend, Essex.

— YOUR TAPE DEALER —

PETERBOROUGH, NORTHANTS Tel: 5643/5644

CAMPKINS RECORD SHOP

RECORD TAPE AND HI-FI EQUIPMENT SPECIALISTS

NEW ADDRESS **15 LONG CAUSEWAY** LARGE STOCKS

(IN CITY CENTRE)

HAMILTON ELECTRONICS

HIGH FIDELITY TAPE RECORDERS 35 LONDON ROAD

TEL. 28622 **SOUTHAMPTON**

---

18 QUEEN STREET **SALISBURY**

J. F. SUTTON

RECORDS — RECORDERS — HI-FI

421 SHIRLEY ROAD
111 EAST STREET **SOUTHAMPTON**

Audio Electronics (Midlands) Ltd.

Specialists in Dictation Mcs., Tape Recorders, Inter-Com., Tapes and Accessories

Full After Sales Service on all Equipment

PHILIPS, GRUNDIG, TRUVOX, UHER, ETC.

203 STAFFORD STREET WALSALL Tel.: 21086

WORTHING, SUSSEX

We stock Hi-Fi Equipment by Leak, Quad, Goodsell, RCA, Acos, Garrard, Collaro, Tannoy, Wharfedale and Goodman and give fully comparative Demonstrations

BOWER & WILKINS LTD.

1 Becket Bldgs., Littlehampton Road Worthington 5142

— TAPE TO DISC SERVICES —

The following are members of the Association of Professional Recording Studios who can be relied on to give satisfaction

MJB RECORDING & TRANSCRIPTION SERVICE

specialise in the production of microgroove records from Professional and Amateur recordings (Acetate copies; Processing Masters and Pressings at 16⅔; 33⅓ & 45 r.p.m.) Extended playing times achieved by controlled cutting. Mobile, Studio, Editing, Label printing and "Off the Air" Services.

7 HIGH STREET, MAIDENHEAD Tel: 25630

TAPE RECORDERS · AUDIO EQUIPMENT · DISC CUTTING STD & LP FROM TAPE · STUDIO FACILITIES · HIRE SERVICE · SALES · EXCHANGES

MAGNEGRAPH

1 Hanway Place, London, W.1 *Tel.: LAN 2156*

CLASSIFIED ADVERTISEMENTS

Advertisements for this section must be pre-paid and accompanied by a postal order, money order, or cheque. The rate is 6d. per word with a minimum charge of 7/6d. Box numbers may be used for an extra charge of 1/6d. The trade rate is 9d. per word, plus 2s. for a box number, conditions on application. **Send replies to box numbers, c/o "The Tape Recorder", 99 Mortimer Street, London, W.1.**

No responsibility will be accepted by the editor, the publishers, or the printers of The Tape Recorder for the quality of any goods offered, bought or exchanged through the medium of these columns, or for any failure in payment, etc., though the greatest care will be taken to ensure that only bono fide advertisements are accepted.

All advertisements for the May issue must arrive not later than April 5th.

SITUATIONS VACANT

Technical Salesman (19-30 years) required for Tape Recorder Sales in specialised business. Applicant must have good general all-round knowledge of various makes and certain service knowledge. Interesting and progressive post in congenial atmosphere. Various staff benefits. Write for appointment, stating age and details of previous experience to John King (Films) Ltd., Film House, East Street, Brighton, Sussex.

Test Engineers required by Truvox to check and adjust to professional standards complex and comprehensive Stereo Tape Units for Home and Overseas markets. Excellent working conditions and pay for first-rate men. Tape experience preferred, good audio knowledge essential. Staff positions after short proving period. Telephone or write for interview—Mrs. Smith, Truvox Ltd., Neasden Lane, London. N.W.10. DOLlis Hill 8011.

FOR SALE

Pre-recorded tapes. Unique complete catalogue listing all makes, mono, stereo. 7½ and 3¾ i/s including World Record Club tapes. Call for free copy or send 1s. mailing fee. Dept. T.R.3 Teletape Ltd., 33 Edgware Road, W.2. PAD 1942.

Find that review you want—get a copy of the index for "Tape Recorder", volumes 1, 2 and 3. Price 2s. each volume, post free.

Use up those odd lengths of tape, splice them together professionally after reading **"How to Splice Tape"**, price 2s. 6d. posted, from The Tape Recorder, 99 Mortimer Street, London, W.1.

All makes of tape recorders repaired or modified. Miniflux heads supplied. "Audiomaster" equipment serviced. Audio installations built to your specification by John C. Latham, Deimos Ltd., 8 Corwell Lane, Hillingdon, Middlesex.

Tape Recorders. Save from 30 per cent. to 60 per cent. on the original price. Large stock of secondhand, new, shop soiled machines. All guaranteed. Obtainable on our No Interest Terms. Best part exchange allowances on your existing equipment. Call, write, 'phone today for free list. Quotation and details. Our mail order covers the whole country. R. E. W. Earlsfield Ltd., 266 Upper Tooting Road, London, S.W.17. Balham 7710.

Full building instructions for the remarkable "Tricolumn" loudspeaker are available in reprint form from Hi-Fi News, 99 Mortimer Street, London, W.1. Price 2s. 6d. post free.

Tape Bargains in all sizes. Example: Top Brand 5½ in. 1,200 ft. 19s. 6d., P. & P. 1s. 3d. S.A.E. for list. Large choice of new and used recorders.—E. C. Kingsley & Co., 132 Tottenham Court Road, London, W.1. EUS 6500.

Ferrograph 5A/N, 422 and 424, Revox E36, etc., always in stock.—City and Essex Tape Recorder Centres. (see page 128).

Tape and gram equipment repairs/mods.—Harding Electronics, 120A Mora Road, Cricklewood, N.W.2.

£10,000 worth of Hi-Fi equipment and Tape Recorder accessories. Due to purchase of wholesaler's entire stock we can offer hundreds of bargains in pickups, cartridges, styli, motors, etc., at greatly reduced prices. Send 3d. stamp for comprehensive lists. Lee Electronics Ltd., 400 Edgware Road, London, W.2.

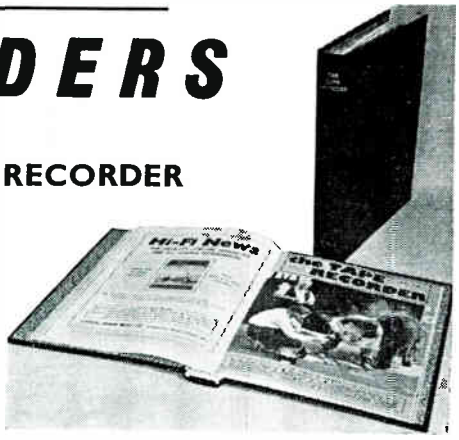
(Continued on page 138)

Index to Volume 4 of THE TAPE RECORDER
Available shortly - - - - Price 2s. 6d.

BINDERS

for

THE TAPE RECORDER



★

Semi-permanent Binders for Volume 4 now available.

From the first number keep your copies clean and ready for easy reference. Semi-permanent binders are available for volume 4. Each case will take twelve copies plus index and will open flat at any page. They are covered in black buckram and gold blocked on spine with name and volume number. Also available, volume 3.

Price 15s. post free.

MILES HENSLOW PUBLICATIONS LTD

99 MORTIMER STREET, LONDON W.1

NUSOUND RECORDING Co.

35 CRAVEN STREET, W.C.2. TELEPHONE TRA 2080

Ferrograph

(Appointed Dealer)

New Series 5

now on demonstration

also Models 422-424.

Accessories; Mixers, Tuners, Microphones, Stands, by leading manufacturers.

It pays to deal with a specialist

Accessories for your Ferrograph

NUSOUND NUMIX Mk. 2

The **'NUMIX 2'** is a two-channel unit (Mic and other source) low- or high-impedance feeds. The **'NUMIX 2'** can be used with **ANY TAPE RECORDER WHICH WILL ACCEPT A HIGH-Z MICROPHONE.** Near professional results are guaranteed.

Price: £6.10.0 complete.

Write for leaflet on NUMIX 1, NUMIX 2, and NUMIX 3 Transistor

FRANCIS OF STREATHAM

LEADING STOCKISTS OF EQUIPMENT FOR

TAPE and HI-FI

. . . and NO EXTRA FOR CREDIT TERMS

★ **Minimum Deposit**
★ **No Interest or Service Charges on H.P. up to 18 months**
★ **Free Service during Guarantee Period**

Akai M6 ¼ & ½ Tr. St.	130 gns.
Akai de luxe 69	79 gns.
Brenell Mk. V Model M	88 gns.
*Brenell Mk. V	64 gns.
Brenell 3 star	58 gns.
Cossor 4 Tr. 1602	38 gns.
Cossor 4 Tr. 1601	59 gns.
Cossor 1603 4 Tr.	28 gns.
Elizabethan 200	22 gns.
Elizabethan 2230	32 gns.
Ferguson 3200	26 gns.
Ferguson 3202 2 sp. 4 Tr.	33 gns.
*Ferrograph 5AN	85 gns.
*Ferrograph 422 or 424	110 gns.
*Ferrograph 4A N	81 gns.
*Ferrograph 4AN/S	88 gns.
Fidelity Minor	22 gns.
Grundig TK14	35 gns.
Grundig TK23 4 Tr.	45 gns.
Grundig TK40 4 Tr.	75 gns.
Grundig TK41 2 Tr.	75 gns.
Loewe Opta 404 2 sp. 4 Tr.	53 gns.
Loewe Opta 403	45 gns.
Philips 4 Tr. 3541	36 gns.
Philips 4 Tr. 3542	59 gns.
Philips 3514 4 Tr.	27 gns.
*Reflectograph 'A' ¼ Tr.	105 gns.
Robuk	36 gns.
*Simon SP5	93 gns.
Sony Stereo 462 4 Tr.	75 gns.
Sony 521 Stereo	124 gns.
Stella 4 Tr. 454	38 gns.
Stella 4 Tr. 459	62 gns.
Stella 456	28 gns.
Stuzzi 4 Tr. Junior	26 gns.
*Tandberg Series VI Stereo ¼ or ½ Track	110 gns.
*Tandberg Mono, 3B	76 gns.
*Telefunken 85 De Luxe	83 gns.
*Telefunken 95	59 gns.
*Telefunken 96 4 Tr.	69 gns.
*Telefunken 98 ½/¼ Tr.St.	95 gns.
Truvox 60 2 or 4 Tr.	39 gns.
Truvox Series 80/2 Tr.	55 gns.
Truvox Series 80/4 Tr.	59 gns.
Truvox R7	82 gns.
Uher Universal	83 gns.
*Vortexion WVA	£93.13.0
*Vortexion WVB	£110.3.0
*Vortexion C Stereo	£148.10.0
*Vortexion CBL Stereo	£160
Wyndsor International	69 gns.

BATTERY PORTABLES

Cossor 1620	25 gns.
Grundig Memorette	55 gns.
Philips Portable	24 gns.
Loewe Opta 412 (Mains/Battery/Car)	47 gns.
Butoba	66 gns.
Clarion Phonotrix	39 gns.
Fi-Cord 202	66 gns.
Stella	25 gns.
Stuzzi Memo-Cord	25 gns.

**Microphone extra*

Mains Power Pack for

Philips or Stella	£5.0.0
Grundig Mains Power Pack	8 gns.

TRUVOX DECKS WITH PRE-AMPS

PD 82—Standard Twin Tr.	£42.0.0
PD 85—Professional 4 Tr.	£52.10.0
PD 86—Professional 4 Tr. Stereo	£63.0.0

Tape Decks by Brenell, Wright & Weaire.
Tape to disc and copy service

● MICROPHONES, MIXERS ETC.

Grampian Reflector	£5.15.0
Lustraphone VR/70	£10.10.0
Lustraphone VR/64 Ribbon	£7.17.6
Lustraphone LFV/59 Dynamic	£8.18.6
Grampian GR/2 as advertised	
Grampian DP/4 Dynamic	£8.0.0
Simon 'Cadenza' Ribbon	£10.10.0
Reslo Ribbon or Dynamic	£9.12.6
Reslo Cardioid	£19.19.0
TSL 3 Channel Mixer	£2. 7.6
Grundig Mixer	£16.16.0
AKG K 50 Headphones	£7.10.0

Also in stock microphones by ACOS, FILM INDUSTRIES, TELEFUNKEN, A.K.G.

- **ALL WALGAIN PRODUCTS**
- **Stands of all types and accessories**
- **TAPES by all leading makers in all grades and sizes as advertised.**
- **Pre-recorded by Columbia, H.M.V. Saga, Music-on-Tape.**

Prices subject to alteration as announced by manufacturers.

HI-FI

●STEREO AND MONO AMPLIFIERS
Quad Chapman Rogers
Leak Dulci Armstrong
Tripletone

●TUNERS
Quad Rogers Pye
Leak Dulci Armstrong
Chapman

●LOUDSPEAKERS by
Quad Kelly
W.B. Wharfedale
Goodmans Tannoy
Mordaunt Leak

●MOTORS, PICKUPS
Garrard Tannoy EMI
Goldring Lenco Shure
Connoisseur Decca Stereo
Decca Deram Mk. II
Philips Ronette
All-Balance B & O
Ortofon SME Mk. II
Acos

All types of Diamond and Sapphire styli, stereo and mono. Microlifts. Garrard SPG3. Acos Dust Bug.

CABINETS
Record Housing
Leak 'Southdown'

169-173 STREATHAM HIGH ROAD, LONDON, S.W.16

Between St. Leonard's Church and Streatham Station

STReatham 0466/0192

PLEASE NOTE THIS IS OUR ONLY ADDRESS. OPEN ALL DAY SATURDAY

CLASSIFIED ADVERTISEMENTS — *continued*

FOR SALE—continued

Diemos Ltd., announce an outstanding new type of amplifier. This is the most versatile unit ever offered to the tape enthusiast, mono or stereo, magic eye or meter up to 7 mono channels etc. Specifically suitable for the Planet Decks. Send for full details to 8 Corwell Lane, Hillingdon, Middx.

Recorder need Repairing? Then let City and Essex Tape Recorder Centre do it for you expertly and economically (see page 128).

Collaro Studio tape decks fitted with Bradmatic ¼-track heads, £10. With extra monitoring head, £11. As above but fitted with Mitchigan ¼-track heads, £13; or with extra monitor head, £15. Record/Playback amplifiers for above available at £12 12s. Immaculate secondhand Philips EL3536 stereo tape recorder, £70. Film Industries M8A ribbon mic., £5 10s. Official service and spares for Collaro Studio decks and Hi-Fi repairs. Hampstead Hi-Fi, 91b Heath Street, London, N.W.3. Tel.: HAM 6377.

Revox latest F36, Telefunken series 75, 85 and 95 and Truvox series 80 (latest 3 speed versions) always on demonstration and for immediate delivery at the hi-fi tape specialists. 48 hours' service for professional tape copying. N.R.S. 16 Kings College Road, London, N.W.3. PRI 3314.

Easysplice Tape Splicer makes accurate splicing easy—guaranteed 5s. 6d. Scotch Boy splicing tape 3s., P. & P. 6d. Easysplice, 30 Lawrence, Ealing.

Ferrograph 4A/N with Reslo ribbon microphone, and Wearite Defluxer. Six months' occasional use. Virtually a new machine, £70. Also—H.M.V. AM/FM Tuner, hardly used. £20. R. Blocksidge, 11 Everest Road, Handsworth Wood, Birmingham 20.

Ampex 960 Stereo Recorder (no power stages). Cost £190; offers over £100. Box (Home Counties) 308.

L. Bishop Limited, Tape Recorder Services, 1708 Bristol Road South, Rednal, Birmingham. Tel.: Rubery 2709. Grundig specialists.

All American Pre-recorded Stereophonic Tapes supplied. Send 4s. 6d. for current catalogue. Imported records, Kesto 36, 2 Burgh Quay, Dublin 2, Ireland.

Philips Stereo 3536 Tape Recorder, as new, £75 o.n.o. Moore, 183 Algernon Road, S.E.13.

Used Bradmatic Deck overhauled at works in wooden case. 77 Wolverhampton Road South, Birmingham 32.

TAPE EXCHANGE

Exchange exciting music, interesting chatter . . . Join "Worldwide Tapetalk". 35 The Gardens, Harrow. S.A.E. for particulars.

WANTED

Can You Help? Need May, August, November 1959 issues to complete file. Glad to pay your price and postage. John Berridge, 19 Wigan Crescent, Downsview, Ontario, Canada.

Good Cash prices for tape recorders.—Tel.: Maryland 5879, see page 128).

Ferrograph case wanted reasonable condition. Weston, East Africa House, Gt. Cumberland Place, W.1. Evenings, PAD 7631.

EDUCATIONAL

Languages by tape: French, German, Spanish, Italian. Individual tuition. No tapes to buy. Linguatape, Cheriton Fitzpaine, Crediton, Devon.

Sleep Learning. Of fascination to all T.R. enthusiasts. Send 6s. 6d. for book (refund guarantee). York House, Huddersfield.

TAPE TO DISC

Tape to Disc Recordings. Finest professional quality, 10 in. L.P. 35s. (32 min.); 12 in. L.P. 40s. (45 min.); 7 in. E.P. 17s. 6d. 48-hour Postal Service. S.a.e. for leaflet to: Deroy Sound Service, 52 Hest Bank Lane, Hest Bank, Lancaster.

Tape to Disc service, editing, and dubbing, all speeds. Studio available for musical groups. Outside recordings our speciality. Ilford Sound Recording Service, 63 Aintree Crescent, Barkingside, Ilford, Essex. Telephone: CRE 8947 and GRA 5107.

Rapid Recording Service, 78s and L.Ps from your own tapes. (48-hour service) Master Discs and pressings. Recording studio. Mobile recording van. Manufacturers of the Sleep-o-matic Unit. Foreign language courses available for sleep-learning. Brochures and price lists on request from Dept. T.R. 21 Bishops Close, London, E.17.

ADVERTISERS' INDEX

Published by Miles Henslow Publications, 99 Mortimer Street, London, W.1.
Printed by STAPLES PRINTERS LIMITED (*Incorporating F. Howard Doulton Ltd.*) Warton Road, Stratford, London, E.15

SEE ALL MAKES

Hear all makes. At the Tape Recorder Centre showroom you can see, hear and compare them *all*, on the spot. The country's leading specialists in tape recording are there to give you unbiased help in choosing from the country's largest stocks of equipment. At The Tape Recorder Centre there is the model best suited to your needs (and your pocket). And everything else for tape recording, office dictation and hi-fi, plus excellent HP terms. See all makes, hear all makes, at

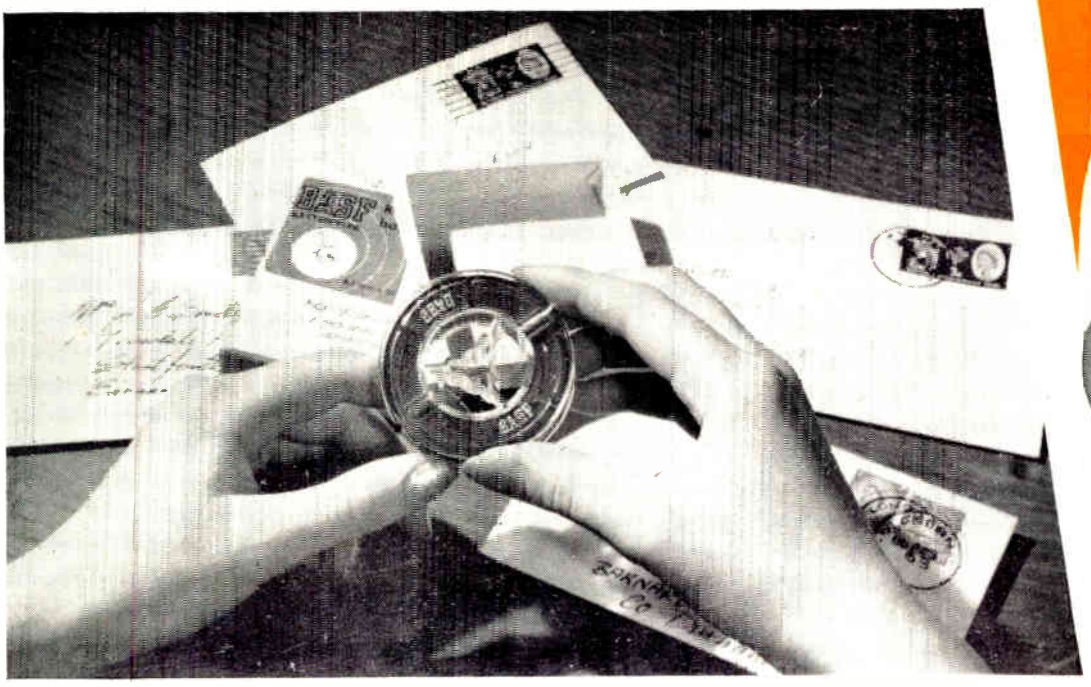
THE TAPE RECORDER CENTRE

Philips
Elizabethan
Grundig
Ferrograph
Stella
Vortexion
Brenell
Ampex
Tandberg
etc

82 High Holborn, London, W.C.I. **Tel: CHAncery 7401**

BOX 47

NOW THEY CAN REALLY "HEAR" FROM YOU WITH BASF LETTER-TAPE



What could be more pleasant than receiving mail actually recorded on a BASF LETTER-TAPE. There is nothing quite so intimate as the sound of a voice; nothing conveys the nuances of meaning like the spoken word. BASF LETTER-TAPES make sending and receiving mail extra personal. A LETTER-TAPE has 150 ft. of long play tape, but weighs under 1½ ozs. including the mailing carton.

FREE: A letter-tape and the facilities to record on it are yours at the Audio Fair from April 18th to 21st at Room 118, Russell Hotel, London. We are also showing one of the latest educational aids—magnetic recording tape for language classes.

BASF —SYMBOL OF AUTHENTIC SOUND

BASF CHEMICALS LIMITED, 5a GILLESPIE ROAD. LONDON, N.5. TEL: CANONBURY 2011