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February 1963
Vol. 5 No. 1

INCORPORATING "SOUND AND CINE"

IN THIS NUMBER

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HIRE PURCHASE TERMS
PART EXCHANGES
RANGE OF CABINETS

SPEAKERS	£	s.	d.	$
Goodmans ARU172 or 180...	3	5	6	9.15
Goodmans Axiette 8	5	10	0	11.40
Goodmans Axiom 300 12"	11	5	9	31.80
Goodmans Axiom 10	6	2	6	12.65
Goodmans AL/120	29	10	0	82.90
Goodmans Trebax SK/20XL	7	0	0	19.70
Goodmans Triaxiom 12/20	25	0	0	70.25
Kelly Ribbon HF Mk. II	10	10	0	29.50
Leak "Sandwich" Speaker	39	18	0	112.15
Lowther Acousta	38	17	0	111.00
Lowther Acousta/Twin	72	16	0	208.00
Lowther Acousta/Super	95	0	0	272.00
Lowther Audiovector	98	0	0	280.00
Lowther TPI	98	0	0	280.00
Lowther PM6	18	18	0	53.10
Mordaunt "Arundel" Speaker	42	0	0	120.00
Quad Electrostatic Speaker	52	0	0	146.10
Tannoy 12" Monitor	30	15	0	88.00
Tannoy 15" Monitor	37	10	0	108.00
T.S.L. Tweeter LPH6S	1	18	7	4.00
W.B. Stentorian "Clumber" 912C	15	1	6	41.25
W.B. Stentorian 8" HF812	4	5	6	8.78
W.B. Stentorian 8" HF816	7	0	9	14.42
W.B. Stentorian HF912	4	10	6	9.27
W.B. Stentorian 10" HF1012	5	2	6	10.50
W.B. Stentorian 10" HF1016	8	4	0	16.85
W.B. Tweeter T10	4	8	3	12.40
W.B. Tweeter T3S9	1	15	9	3.70
Wharfedale 8/14S	7	3	5	14.75
Wharfedale Bronze 10FSB	5	3	3	11.40
Wharfedale Coaxial 12	25	0	0	70.25
Wharfedale Golden 10FSB	8	15	5	19.30
Wharfedale RS12DD	12	10	0	33.00
Wharfedale SFB/3 3-speaker	39	10	0	111.00
Wharfedale Slimline 2	22	10	0	63.20
Wharfedale Super 12 RS/DD	17	10	0	49.20
Wharfedale Super 8FS/AL	7	3	5	14.75
Wharfedale Super 3	6	9	11	14.30
Wharfedale W2 Speaker System	29	10	0	82.90
Wharfedale W3 Speaker System	39	10	0	111.00
Most Makes of Cross-Over Units in Stock				
CABINETS (Speaker and Equipment)				
A.D. Equipment Cabinets from	17	10	0	50.00
A.D. Speaker Enclosures from	10	10	0	30.00
Record Grieg Equipment Cabinet	25	4	0	72.00
Record Liszt Equipment Cabinet	11	19	6	34.00
Record Nordyk Equipment Cabinet	6	19	6	20.00
Record Viking Corner Enclosure	10	10	0	30.00
TUNERS				
Armstrong ST3 Mark II AM/FM	27	16	0	58.20
Armstrong T4B Tuner	21	18	0	47.80
Chapman FM91 Unpowered	22	15	10	50.00
Chapman FM9S (AM/FM)	26	8	3	58.00
Chapman FM91 Powered	26	13	4	57.00
Chapman FM9S Powered	30	6	2	66.00
Leak Mark II Troughline	33	15	0	70.25
Quad FM	28	1	9	59.00
Quad AM Tuner L/M/S	32	2	0	67.44
Rogers Variable FM (S/P) in case	30	17	6	62.75
Rogers Variable FM (S/P) chassis	26	9	6	57.20
Rogers Switched FM Unit	15	11	1	34.00
AM/FM RADIOGRAM CHASSIS				
Armstrong AF208	22	18	0	49.20
Armstrong Jubilee Mk. II Tun/Amp.	30	12	0	65.95
Armstrong Stereo 12 Mk. II Tun/Amp.	43	10	0	93.00
Armstrong Stereo SS Tun/Amp.	32	15	0	70.15
AMPLIFIERS				
Leak TL12 Plus and 'Point One' Pre-Amplifier	31	10	0	88.50
Leak TL12 Plus and 'Varislope' Mk. III Pre-Amplifier	34	13	0	97.35
Quad II Control Unit and Quad II Amplifier	42	0	0	118.00
Quad II Amp. and 22 Pre-Amp.	47	10	0	133.45
Rogers Cadet MK2	12	0	0	35.00
Rogers RG Cadet MK2 Control Unit	11	0	0	32.00
All Non-Integrated and Pre-Amplifiers Available Separately				
STEREO AMPLIFIERS				
Archon	49	19	6	143.00
Armstrong PCU27 Control Unit	28	10	0	82.00
Armstrong A20 Amp. and PCU2S Pre-Amplifier	44	12	6	127.50
Chapman 305 Stereo	39	18	0	114.00
HMV Integrated Stereo	72	9	0	207.00
Leak Stereo 50 Amp. with Varislope Stereo Pre-Amplifier	67	0	0	188.30
Leak Stereo 20 Amp. with Varislope Stereo Pre-Amplifier	55	9	0	155.80
Leak Stereo 20 Amp. with Point One Stereo Pre-Amplifier	51	9	0	144.60
Lowther Stereo	87	0	0	249.00
Quad 22 Control Unit with two Mk. II Amplifiers	70	0	0	196.70
Rogers Cadet MK2 Complete	26	10	0	73.00
Rogers HG88 Mk. II Integrated Stereo Amplifier (in case £43 10 0)	40	0	0	113.50
Rogers Junior III Stereo Control	22	10	0	63.20
Rogers Master Stereo Control	35	0	0	98.35
Rogers 'Junior' Stereo Amp.	27	5	0	78.00
Walgain Stereo Pre-Amplifier	7	10	0	21.20
TAPE RECORDERS AND DECKS				
Ampex—Prices on Application				
Armstrong PAB03 Tape Osc. Pre-Amp. (Power Unit £2 19 6)	16	16	0	47.20
Brenell Mark V	67	4	0	188.80
Brenell Mark V, Type M	92	8	0	259.60
Brenell 3 Star (2 or 4 track)	60	18	0	171.20
Brenell Mark V, deck	29	8	0	82.65
Brenell Play/Record Amp.	24	0	0	67.45
Butoba MTS (Battery)	66 gns.			198.00
Cossor 1601 ¼T	59 gns.			177.00
Cossor 1602 ¼T	37 gns.			117.00
Cossor 1603 ¼T	28 gns.			84.00
Elizabethan FT3 ¼T	45 gns.			135.00
Elizabethan TT3 ½T	39 gns.			111.00
Elizabethan FTI ¼T	34 gns.			102.00
Ferrograph Series 420	115	10	0	324.00
Ferrograph 4 A/N	85	1	0	239.00
Ficord 202 (Battery)	66 gns.			198.00
Grundig TK40 ¼T	75 gns.			225.00
Loewe Optacord 403 ¼T	43 gns.			129.00
Loewe Optacord 404 ¼T	53 gns.			159.00
Loewe Optacord 412 ¼T (Battery)	45 gns.			135.00
Philips EL 3585 (Battery)	24 gns.			72.00
Philips EL 3514	27 gns.			81.00
Philips EL3541	36 gns.			108.00
Philips EL3542	59 gns.			177.00
Reflectograph Mod. A ¼T	105 gns.			315.00
Reflectograph Mod. B ¼T	115 gns.			345.00
Simon SP5 ¼T	93 gns.			279.00
Sony 521 (Stereo)	124 gns.			372.00
Sony 777 (Professional Mono)	190 gns.			570.00
Stella ST455 ¼T	59 gns.			177.00
Stella ST454 ¼T	37 gns.			111.00
Stella ST470 (Battery)	25 gns.			75.00
Stella ST4S6 ¼T	28 gns.			84.00
Stuzzi Magnette (Battery)	59 gns.			177.00
Tandberg Model 3B	76 gns.			228.00
Tandberg Series 6	110 gns.			330.00
Telefunken 75-15 ¼T	47 gns.			141.00
Telefunken 8SKL ¼T	79 gns.			237.00
Telefunken 9S ¼T	59 gns.			177.00
Telefunken 96 ¼T	69 gns.			207.00
Telefunken 97 ¼ST	95 gns.			285.00
Truvox R7 ¼T	82 gns.			246.00
Truvox PD86 ¼T	63	0	0	180.00
Truvox PD87 ¼T	63	0	0	180.00
Veritone 16 ¼T	91 gns.			273.00
Vortexion WVA	93	13	0	263.15
Vortexion WVB	110	3	0	309.25
Wearite 4A deck (other available)	42	0	0	117.00
MOTORS				
Connoisseur 'Craftsman' 2-speed	18	5	0	39.35
Connoisseur 3-speed	24	8	8	53.00
Garrard Autoslim	8	14	6	20.00
Autoslim Deluxe Complete	12	14	8	28.00
Garrard LAB/A/Auto unit/GC8	21	18	11	62.00
Garrard Lab/A/Auto unit/EV26A	22	17	0	64.00
Garrard 301	23	5	0	50.00
Garrard 301 with Strobo	24	10	3	54.00
Garrard 4HF/GC8 on base	22	0	2	49.00
Garrard 4HF/EV26A Stereo-Mono	22	18	4	44.00
Lenco GLS8 (Cartridge extra)	17	15	5	44.25
Lenco GL70 (Cartridge extra)	29	1	8	63.20
Philips AG1016 Motor and P.U.	14	3	6	30.40
PICK-UPS AND CARTRIDGES				
Auriol Pick-up Control	3	9	9	7.70
Acos Hi-Light Stereo pick-up	18	5	8	39.00
Bank & Olufsen ST/L Stereo pick-up	17	11	6	38.00
Decca ffss Stereo pick-up	21	0	4	44.85
Decca Deram cartridge	4	4	0	8.70
Decca L.P. head	10	10	0	23.25
EMI EPU/100 Stereo pick-up	22	12	3	47.80
Garrard EV26A Stereo/Mono cartridge	2	5	11	5.00
Garrard GC8 Mono t/o cartridge	1	7	10	3.00
Garrard SPG3 Stylus press gauge		19	9	2.20
Garrard TPA12 pick-up arm shell	4	11	10	9.00
Goldring G60 pick-up arm only	3	17	7	8.45
Goldring L70 pick-up arm	8	2	10	18.00
Goldring MX1/D mono cartridge	2	8	6	5.30
Goldring SX10/D stereo cartridge	2	18	2	6.36
Goldring S80 t/o cartridge	5	8	7	12.00
Goldring 600 t/o cartridge	10	17	2	24.00
Goldring 700 Mk. II Stereo cartridge	9	10	0	21.00
Leak L.P. Pick-up complete	12	18	7	29.00
Ortofon CG Mono Head	18	0	11	40.00
Ortofon Pick-up arm SKG212 (inc. trans.)	6	2	6	12.50
Ortofon Pick-up arm SMG212	12	17	9	28.75
Ortofon Pick-up arm RKG309	21	18	2	48.50
Ortofon Pick-up arm RMG309	27	1	4	60.00
Ortofon Replacement Diamond Stylus	6	8	11	14.00
Ortofon Replacement Sapphire Stylus	2	1	11	6.00
Ortoton Stereo Head SPU/G	23	4	0	51.50
Ortoton Stereo Head SPU/GT (inc. trans.)	25	15	6	57.00
Ortofon Transformers	2	7	6	7.25
Philips AG3016 mono pick-up head	1	0	0	2.25
Philips AG3063 Stereo pick-up head	1	10	0	3.25
Q-Max "Stylovue (Batteries 9d.)	1	6	6	3.00
S.M.E. Arm Model 3009	24	14	6	52.70
S.M.E. Arm Model 3012	27	4	0	58.20
Tannoy Vari-Twin Mark II Stereo	13	3	8	27.96
Watts "Dust Bug"	1	2	9	2.45
Also "A.D.C.", "Pickering" and "Shure" models				

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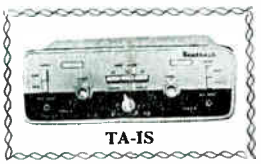

TA-IS

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**

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Tape Decks. High quality mono/stereo tape decks. D83, 2-track for highest fidelity **£31.10.0**
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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.

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S-33

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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**

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

Available in two units: Tuning heart (AFM-TI—**£5.5.6**, 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 **£25.18.6**

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For your convenience, this model is available in two units sold separately: Tuning Unit (FMT-4U—**£3.2.0** 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.

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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**

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HI-FI SPEAKER SYSTEM Model SSU-1. This kit is easily assembled. It contains twin 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. **£11.5.0**

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CONTENTS

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EDITORIAL

IN the Editorial column of our sister journal (*Hi-Fi News*) this month we discuss the comparative virtues of high fidelity products from English factories and from overseas. The reason for this essay is the possibility of Common Market membership, and the effect it might have upon British products. In this field it seems that the English made hi-fi product should do well and go far, taking the best as the guide. Several countries in the Continent of Europe are not yet awake to high fidelity sound reproduction, and even those with the greatest consumer demand for hi-fi equipment do not produce the variety or, often, quality that we have to offer. America is a challenger and, with prices lowered to realistic levels, could be a stiff competitor. Quite a number of our manufacturers might find themselves out on a limb unless they paid considerably more attention to minor detail—which, as we say, could make them or break them in overseas markets, because it is this detail which spells reliability.

How, then, do English made tape recorders stand up to comparison in this way? And what would be the effect to the trade if we were to become a member country of the European Common Market? With the gradual abolition of import duties all round, recorders from all countries involved could be sold, price for price, and would have to stand or fall by the degree of value they offered for money. Had we written this same column two years ago, nearly every word would have hurt as it was written. It is good to know that the position has changed very much for the better in a comparatively short time, and that today there are several English manufacturers whose products would undoubtedly be eagerly sought and bought on the Continent. This does not mean that all is beer and skittles. Far from it. Very few of our cheaper models would stand a chance beside the cheaper Continental recorders. They would lose on grounds of performance, reliability and styling. This latter factor is something which either baffles us, or which, in ignorance, is considered unnecessary—and its absence is by no means confined to tape recorders. For example, the Germans stole the march on the whole world in the miniature camera field because they created a wide demand by making something which looked really good. It is a complete myth, that the German lens was a superior product to its English counterpart: we just did not (and still do not) know how to style the surrounding mechanism and casework. However, coming back to cheap tape recorders, it may be said but it is true that styling will sway the sales more easily than performance.

Our tape decks include some six makes which would take a lot of beating anywhere; and as the do-it-yourself cult grows on the Continent it will be these decks which are sought by discriminating enthusiasts. And, incidentally, this is exactly what has happened and what is still happening in Britain. The Continental buyer does not yet regard a tape recorder in the same way as the more enlightened British buyer. He wants a good-looking box with some well-behaved mechanics and electronics—and he gets it. If the time comes when he is offered the not-so-good-looking English box, with better electronics and mechanics, he will buy it if he is after quality.

It is very interesting to study the two different approaches towards quality equipment. The English manufacturer's attitude appears to be: "*You won't get anything to work better*", whereas the dominating attitude almost everywhere else is: "*See how beautiful we have made it look*". The former attitude is still all right for the intelligent English buyer, but the rest of the world, under pressure of competition, tends to go for the good looks, taking it for granted that the quality is there, too. It is doubtful whether our quality manufacturers would sell a handful more tape machines in the home market if they made them look more handsome; but if it comes to selling in good quantity abroad, a little more spit and polish will be needed.

So much for our decks and our better quality machines. They should do well, simply because they are very good. As for the big potential market for cheaper machines, we should be wasting our time trying to compete, as things are at the moment: more significant, we should find the reciprocal invasion overwhelming. *But*, given some proper, conscientious thought about reliable electronics—less sloppy workmanship and intelligent factory inspection—and given even half as much thought about attractive styling, the whole position might be completely reversed.

COVER NOTE

TO save a lot of correspondence, we *do* know that we have made a technical mistake in the preparation of the cover picture this month. In honesty, we did not notice it until it was ready for printing; and when we spotted it we first thought of posing it as a "deliberate mistake". But second thoughts told us that most of our readers would be far too smart, and that we might well go broke if we started to give away prizes. So, instead, the answer will be found at the end of this note.

Pelham puppets make excellent table-top models for photographers, and a little sticky tape, out of sight, overcomes their resistance to holding hands, etc. Here, they are dancing to a tape recorded at 3¾ i/s from the monitor speaker of an EMI RE321 which runs at 7½ i/s.

CHAMP!

CHAMP!

CHAMP!

CHAMP!

New Philips hi-fi tape recorder has 4 tape speeds, long playing time, parallel track facility and no warm-up time! Warm-up time is a thing of the past with the new Philips hi-fi tape recorder: just press the button and the all-transistor amplifier ensures you can record or play back *immediately*. The fourth tape speed of 15/16 ips gives you extra long playing time – up to 34 hours on one 7" reel D.P. tape. Amongst the many other interesting features of this fine instrument are parallel-track facilities that let you play back two tracks simultaneously; monitoring and mixing facilities; and brilliant four-track mono recording and playback. If you want to own a good tape recorder, a real champion, you really must hear this one. It's at your dealer's, now.

PHILIPS NEW DE LUXE HI-FI TAPE RECORDER Model EL3549

Made in Holland

62 GNS

complete with moving-coil microphone, 7" reel of LP tape, empty take-up spool and connecting leads.

ANOTHER FINE PRODUCT FROM PHILIPS—THE FRIEND OF THE FAMILY

PHILIPS ELECTRICAL LTD., ELECTRO-ACOUSTICS DIVISION, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2

(PTR 4154)

NEWS FROM THE WORLD OF TAPE

"Grand Prix" for Sound Recording at Cannes

AT the 1962 Cannes film festival, an important distinction was awarded to the Greek film "Electra", for the exceptional quality of the sound recording and sound montage. The awards went to the Athens Company "Finos Film", which utilised Gevasonor fully coated film, type 2.01 for the magnetic sound recording. This was then transferred to an optical sound track on Gevaert ST6 sound negative type 2.56. The evaluation of the high technical content of this sound recording was made by the "Commission Superieure Technique du Centre National de la Cinematographic". At the end of June, a reception was given by Gevaert at the head office of "Finos Film" in Athens. In the presence of a large number of actors, script-writers, authors, composers and producers, the gold medal of the Gevaert World Organisation was awarded to Mr. Finos. Mr. Arvanitides, of the Ministry of Industry, made a speech on behalf of the Greek Government. The film "Electra" is now being considered for the Oscar award and for the "American Critics Prize".

* * *

R. G. JONES of Morden Ltd., Surrey, have placed an order for EMI eight-channel sound control and mixing equipment.

Both the tape recorder and the mixing equipment are transportable and will be used in the studio as well as in the Company's mobile recording unit.

Outputs from up to eight microphones can be mixed by the sound control equipment, in which the most up-to-date EMI transistor-operated amplifiers and ancillary units are incorporated. Background noises can be eliminated, and echo and other special effects can be introduced to achieve any desired result. Portable connections will be provided for use with the mobile unit when on location.

According to Mr. R. G. Jones, approximately half his Company's recording work is carried out by the mobile unit. Recording sessions have already been conducted throughout the British Isles in concert halls, theatres and cathedrals. Other work has included sound effect recording for several leading television companies, and recording sessions for film companies and sound broadcasting organisations.

* * *

Ampex Announce a New Demonstration Facility

A MOBILE Display Unit has recently been commissioned by Ampex International to provide for demonstration at exhibitions and on customers' premises of the comprehensive range of Ampex magnetic tape recorders and core memory systems. The articulated vehicle has been built in the United Kingdom by Coventry Steel Caravans and the installation of the instrumentation and computer recorders and the core memories has been carried out at Ampex Electronics Ltd., Reading.

Provision is made for heating and cooling the vehicle to allow for operation in a wide range of climates. It has been equipped to be, as far as possible, a self-contained unit. Electricity is generated from the Bedford prime-mover unit by means of a

power-take-off from the main engine. Sufficient power is available to demonstrate all equipments. Various instructional aids are provided, including 16 mm sound projector, slide projector, sound amplification and a professional audio recorder. Signal generating equipment provides a variety of test waveforms. These are made available to all machines via two video distribution amplifiers.

The vehicle will be employed for demonstration purposes both in Europe and in the United Kingdom. As well as attending major exhibitions and conferences, a comprehensive tour of industrial establishments is planned.

* * *

Bell Laboratories Develop New Microphone

A SMALL solid dielectric condenser earphone which is easy to make, does not use a high bias voltage and has a wide frequency response with low distortion, has been invented at the Bell Telephone Laboratories.

The earphone was developed as a research tool, but is expected to have far wider uses both as an earphone and a microphone. The unit has a capacitance ten times greater than that of conventional microphones, thus effectively lowering its impedance, and a permanently polarised piece of dielectric material is used to obtain the necessary bias.

The response is flat within 3 dB from 20 to 15,000 c/s as an earphone, and from 50 to 15,000 c/s when used as a microphone.

* * *

Tape and Psychology

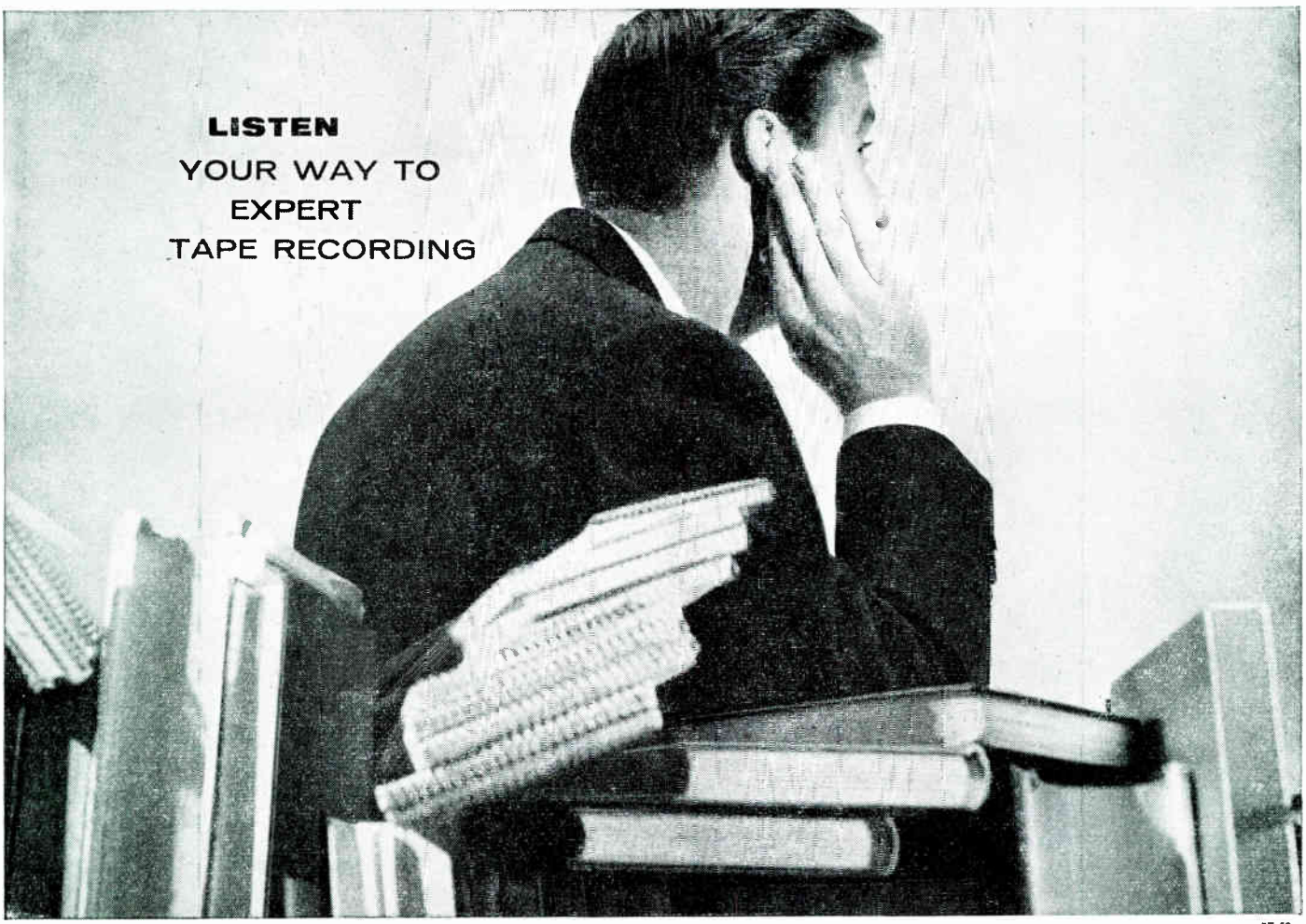
FEW inventions have so wide a field of application as that of the tape recorder. Apart from entertainment, industry, space research, and a multiplicity of other uses too numerous to mention here, its latest use is in the treatment of mental illness.

Overcrowded Mental Hospitals with long waiting-lists are finding it increasingly more difficult to deal with the many thousands of mentally sick people needing help.

The tape recorder can play an extensive part in the alleviation of this national problem. Psychologists have known for a long time that suggestion therapy given during sleep is effective in cases of neurosis. Space does not permit a description of the psychological mechanics involved, but over many years of research in this field, Dr. P. Ager* has found that direct approach to the subconscious mind (as in sleep-learning) has succeeded in

* *Educational Recordings.*

(*continued on page* 11)



ET 58

Emiguides guide where books can't take you

The newest (and easiest) way to learn about sound is *through* sound. Learn while you listen—with Emiguides.

These six instructional tapes were written and recorded by John Borwick. (At the instigation of the makers of Emitape.) All six of them make a unique introduction to expert recording. But each one is available separately, being completely self-contained. They are recorded full track at $3\frac{3}{4}$" per second, can be used again for your own recording. You can get them at any radio or photographic shop, price 51/- the set of six (in a plastic tray), or separately at 8/6 each.

If you'd like to know more before you buy any—write to us for the Emiguide leaflet. Then put the books away!

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Please send me further details of Emiguides

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T.R. 2

Emitape

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cases where drug therapy and shock treatment have failed to bring about successful results.

An under-pillow speaker connected to a tape recorder which is actuated by a time switch is all the apparatus required. The introduction of this method does not herald an era of "do it yourself" psychotherapy. The formulation of the appropriate suggestions must be done by a psychologist experienced in this particular field.

Although automated psychotherapy is being used successfully in private practice, a wider scope for its use could be provided in Mental Hospitals once the tendency to tardiness (common to most of our institutions) in adopting new ideas is overcome.

Some manufacturers are already marketing tape recorders with a built-in time switch, intended for sleep-learning. This indicates that sleep-suggestion is a recognised procedure. It is now possible for persons suffering from many forms of neurosis to have unlimited daily treatment at home, thanks to the tape recorder.

* * *

EMI Equipment for Thailand Recording Studio

A STEREOPHONIC recording studio in Thailand is to be completely equipped by EMI Electronics Ltd., for the Kamol Sukosol Company in Bangkok.

This company—one of the major recording organisations in Thailand—will be able to carry out recording sessions with the most up-to-date equipment available. This includes a fully-transistorised mono/stereophonic mixing console, a TR90 stereophonic tape recorder, studio loudspeakers and test equipment.

The mixing console will be used for making both monophonic and stereophonic master tapes at the same time. Recording will be by means of the EMI stereophonic sum and difference technique or by the spaced microphone method, and the console will be able to control the mixing of inputs from up to eight microphones. The latest EMI transistor-operated amplifiers and ancillary units will be incorporated.

* * *

White Noise and Efficiency

WE were amused to see a report from the Medical Research Council recently, which stated that their Applied Psychology Research Unit had been experimenting with "white noise" tapes in an effort to prove the stimulus of noise to the tired brain.

A group of sailors was lent by the Admiralty as guinea-pigs for this experiment. There is no information as to whether they volunteered. They kept awake all night, then given tasks of a simple nature, such as switch operation, number selection, and so on. When they were deafened by the blast of white noise their efficiency increased—to the surprise of lay observers.

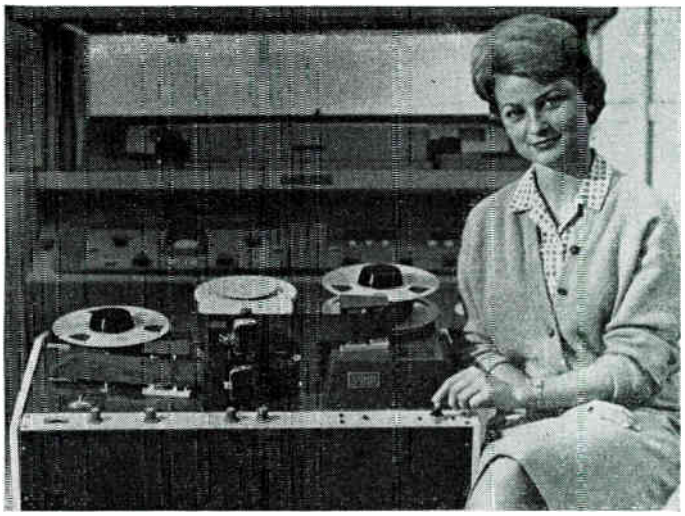
We could have told the Medical Research Council what to expect. It is the little, distracting noises, dropping like pebbles into the pool of silence, that impair efficiency. Given a background that need not be listened to, like junior's everlasting "pops", and the mind will work happily, isolated from the outside world.

The dentists have already found the value of white noise as an anaesthetic: now the doctors prove it a stimulus. Soon we shall be having some of Mr. Tutchings' test tape prescribed on the National Health.

* * *

Service for Clariou and Phono Trix Recorders

SERVICING for Clarion and Phono Trix tape recorders and all radio receivers distributed by G.B.C. Electronic Industries Ltd., is being taken over by Transistor Tape Recorder Service Co., Terminus Buildings, Claremont Road, Seaford, Sussex. In addition all accessories for the Clarion range of recorders and radios will be supplied by Transistor Tape Recorder Service Co.



Ampex Produce a Smaller Video Recorder

AMPEX, originators of the Videotape* Television Recorder, have introduced a portable television tape recorder that weighs 130 pounds and costs less than one-quarter that of existing broadcast machines. It is one-twentieth the size of previous models of the Videotape recorder, which revolutionised television broadcasting following its introduction in 1956. The unit, to be known as VR-1500, was announced at a special demonstration in New York City on December 3rd.

The VR-1500 is specifically designed for closed circuit television recording in education, industrial and military training, medical science, sports and many other fields. It will bring the advantages of television recording and immediate replay within the reach of many new users.

The VR-1500 operates at a tape speed of 5 i/s (one-third the speed of most previous television tape recorders) and uses standard two-inch-wide television tape. As a result, the tape costs are reduced by as much as two-thirds.

**TM Ampex Corporation.*

* * *

The Invisible Salesman

AUTO TAPE is a portable transcription unit, using a tape deck mechanism which is activated by a remote control micro-switch that can be attached or built into almost any product. The switch is triggered by either handling the product or even the approach of a customer towards it. Once activated it is fully automatic. Sales message or technical details will be relayed through a hidden loudspeaker attached to or concealed within the product being displayed.

Once triggered the instrument delivers only one completed message and will not operate again until re-triggered.

The unit is only 12 in. square by 5 in. deep, and weighs 20 lb. It may be operated on any mains voltage or car battery.

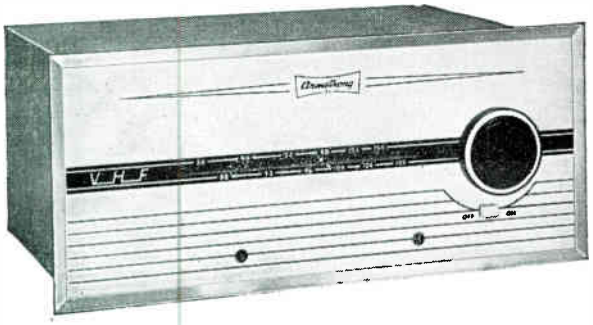
* * *

Advertisement Prices

Will readers please note that due to the reduction in purchase tax, prices given in a few of the advertisements may be incorrect. Tape recorder prices are unaffected.

* * *

Armstrong Quality Tuners



Designed to match any amplifier or tape recorder

T4B FM TUNER *(illustrated)* £21.18.0
T4C FM TUNER *(without case)* £19.19.0
ST3 Mk 2 AM/FM TUNER £27.16.0

We also make a wide range of high fidelity amplifiers and tuner-amplifiers, both mono and stereo, all of which offer top quality performance at reasonable prices.

Write for free descriptive literature to

The T4B model (and uncased version—T4C) is a self-powered high fidelity FM Tuner. Automatic frequency control ensures complete stability and the cathode follower stage, together with the variable output control, enables it to be used with any amplifier or tape recorder. All these features are to be found also in the ST3 Mk. 2 AM/FM Tuner together with coverage of the medium and long wavebands. The AM section includes a ferrite aerial and two IF stages ensuring good Continental reception, and there is a miniature bright-line indicator for easy tuning.

For first class recordings from radio with absolute stability, there is nothing better than an Armstrong tuner and we confidently assert that there is no better value on the market.

AVAILABLE FROM LEADING HIGH FIDELITY AND TAPE RECORDER DEALERS THROUGHOUT THE COUNTRY

ARMSTRONG (DEPT. TFT), WARLTERS ROAD, HOLLOWAY, LONDON, N.7. NORTH 3213

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Post this coupon today for full details

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TI

our readers write . . . . .

. . . about the five pound recorders

From: W. H. Wheatley, 139 The Ridings, Ockbrook, Nr. Derby.

Dear Sir:—It was with great interest that I read your editorial in the December issue regarding the less than £5 tape recorders, as at the recent Earls Court Motor Cycle show I saw these being demonstrated and sold by a well-known London firm.

I was not very impressed by the performance even at £4 19s. 6d. especially as the lid was £1 extra. While at this demonstration I came into conversation with two other keen tape recordists one of whom remarked that the 3 in. spools of tape being sold were only half filled. On enquiring the amount of tape on the spools I was informed that it was 100 feet, price 12s. 6d. or two for £1. This must be just about the dearest tape on sale. *Yours faithfully.*

* * *

From: Mr. E. C. Steele, 67 Burns Avenue, Feltham, Middx.

Dear Sir:—I was interested to read in your editorial column, the remarks made in regard to the new-type invasion of tape recorders costing below £5.

I have recently seen one of these recorders, in the hands of a member of the general public, although I have not had the opportunity of examining one at close quarters.

There were until just recently a number of machines in radio dealers, priced at between 10-12 Gns. They have apparently disappeared from these shops, in the face of fierce competition from a well-known mail-order firm advertising in the national daily press at a bargain price of £4 19s. 6d.

I happened by chance to overhear a remark passed "At that price how can you get caught". It left me wondering, that perhaps £5 spent might give me, at least, a machine for dictation. *Yours faithfully.*

* * *

. . . about high fidelity listening

From: E. J. Nicholson, 31 Northwood Lane, Clayton, Newcastle, Staffs.

Dear Sir:—In his letter printed in your December issue, Mr. Childs concludes with the view that the individual ear must always be the criterion for high-fidelity listening and I hasten to take issue with him on this point.

Rather I think that for the most part the ear adapts itself to a particular sound which may seem pleasant enough at the time and then accepts this as high fidelity although in many cases this is indeed far from the truth of the matter.

High fidelity in its quite literal interpretation, of course, is commercially uneconomical and rarely encountered but we do accept as "hi-fi" the ability to reproduce electronically a perfect signal throughout the range of, say, 40 c/s to 15,000 c/s and it is perhaps rather unfortunate that we tend to place more emphasis on the ability to faithfully reproduce the upper end of the frequency scale than we do in the case of the lower end of the spectrum. This, I suspect, is because a *moderate* bass response usually still sounds pretty good (the main power of the sound in this region is around 200 c/s or so, anyway, and this can be very comfortably handled by pretty well any amplifier these days) and certainly the ear can be very easily tempted to accept this as the ultimate.

It all depends, as Prof. Joad used to say, on what you listen for and I rather suspect that Mr. Childs is not actually enjoying the full bass response he imagines but in fact is listening to a sound of multiple harmonics of the true bass and has come to accept this.

True, there is not a *lot* of information in the register between, say, 40 c/s and 100 c/s which has a great impact on our listening ears but in this enlightened age of LPs, FM and things there is enough to make a noticeable difference. Admittedly, if the individual ear cannot accept such reproduction then we must temper it at will (after all, that is what we have tone controls for isn't it?) but at least let us start off with a so-called flat response before we decry it as unnecessary—that surely is retrograde thinking.

Incidentally, I am the bloke who sent Mr. Childs the test tape to which he referred and little did I think that it would invoke the minor furore which it has. In spite of this we are still the best of friends, I am pleased to say, albeit completely unshaken in our respective beliefs. *Yours faithfully.*

* * *

. . . about a reader's problem

From: P. F. Ridler, Head of Department of Electrical Engineering, Salisbury Polytechnic, P.O. Box 8074, Causeway, Salisbury, Southern Rhodesia.

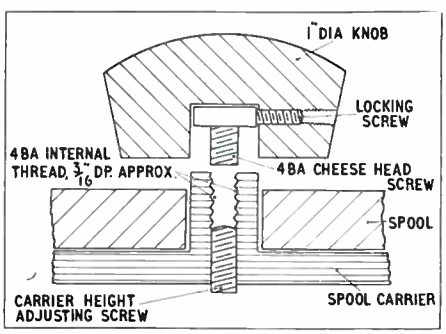
Dear Sir:—I notice in your "*Readers' Problems*" column on page 407 October 1962, a question from "D.C." of Upton Park about noise in a transistorised preamplifier. This noise is certainly not due to a dry cell supply, as this is probably the quietest supply available. The "thumping" and "swishing" noises experienced are typical of a magnetised replay head and transients in a transistorised amplifier can easily cause this.

Remembering that the base of the first transistor has a D.C. bias voltage on it, and that this is coupled to the head through a fairly large capacitor, then it follows that the initial switching on, or final switching off, of the supply can cause a current to flow through the head. I have measured transient currents of 100μA.

The cure is fairly easy. Arrange the switching so that the input of the preamplifier is connected to earth through a few thousand ohms when the supplies are switched on or off, and only connected to the head when the play button is pressed. This will eliminate the transients and probably the horrid noises.

I hope that "D.C." has not ruined any precious recorded tapes. *Yours faithfully.*

* * *



. . . about vibrating spools on the Collaro Studio Deck

From: J. Henshaw (no address supplied).

Dear Sir:—It appears that some of the readers of your magazine are having trouble with vibrating spools when re-winding on the Collaro Studio deck. I have made two hub caps very simply as described below.

Fit the head of a 4BA cheese-head screw into the centre of a 1 in. knob and grip it with the locking screw. Cut the 4BA screw slightly proud of the base of the knob. Place the tape spool on the tape carrier and screw above hub-lock into the internal 4BA thread on the carrier so locking the spool. *Yours faithfully.*

. . . about the English Curlew

From: F. Turnidge, 33 Day Road, Cheltenham, N.S.W., Australia.

Dear Sir:—I would be pleased to hear from any readers with recordings (7½ or 3¾ i/s) of the calls of the English curlew. In exchange I can supply recordings of Australian birds. *Yours faithfully.*

Truvox D82

TAPE RECORDER

No. 14 TRUVOX RECORDERS

TO cover the whole range of Truvox tape recorders as adequately as some of my correspondents would wish is quite impossible. It is necessary therefore, to concentrate on the models with the widest range, and on which the majority of queries have been received. This takes us back to July 1953 when the Models TR2, 3, and 4, using the Mark III deck, were first issued. The fact that information is currently being requested on these decks speaks well for their robust construction. Many of them have given regular and trustworthy operation for years. One wonders, comparing their original price of 22 gns. with present-day values, whether the current models will do so well.

These models had three shaded-pole motors. Early runs used BTH motors for take-up and capstan, but a Hoover motor for Rewind. This can be quickly identified as slightly longer than the others, grey in colour. The last was supported by two round pillars and 4BA screws. A later modification (after No. 1627), supported the Hoover motor by a large, circular former. Then, from serial number 5,000 onwards, the Hoover was replaced by a BTH motor, similar to the other two.

Interesting Features

There are some interesting features about this motor circuit, which are worth mentioning here. **Fig. 1** shows the basic details, with the switch connections drawn as seen from the inner side of the push-button switch bank, and the relevant colours of the connections marked for the benefit of those who wish to incorporate the deck in suitable equipment. It will be noted that there is a green lead, carrying HT from the main power unit. This feed is employed as follows:

When the Brake button is depressed, whichever of the two spooling motors is idling (i.e., Rewind motor during Take-up, and vice versa), is connected to this DC point, via the 1,000 ohms, 6-watt resistor directly from the unsmoothed HT. the cathode of the GZ32 rectifier in the Truvox amplifier. A current of up to 150 milli-amps is drawn from this source, producing a magnetic field in the motor to bring the armature quickly and smoothly to rest.

The important point about this is that the interlocking on earlier machines (up to 3,000) allowed the Off button to be pressed at any time. There was a temptation to hold the brake button down, and the heavy DC drawn by the circuit described above should not be flowing any longer than is necessary to bring the tape to rest. In later machines the mechanical interlock prevents the Off button being pressed until the brake button is in operation—thus a more direct action is obtained, and spillage due to misuse is obviated. The operation of the Off button neutralises the other buttons.

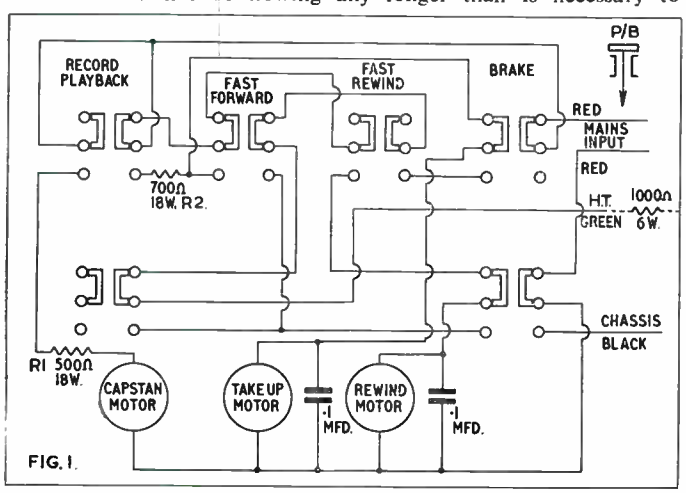


FIG. 1.

Note the two large resistors, R1 and R2 in **fig. 1**. R1 serves to regulate the speed of the capstan motor, thus enabling interchangeable motors to be used, and R2 is in series with the take-up motor to reduce the torque during Record and Playback. The latter is switched out during Fast Forward winding, putting full power on the motor. These are 18 watt, wire-wound components, and should be capable of protracted use. Nevertheless, in any direct-drive machine, these resistors are weak links. Poor connection, aggravated by the unavoidable heat that they generate, can lead to erratic transport action. When replacing, always ensure adequate power rating, if necessary, using two or more components to make up the correct resistance. Always mount voltage dropping resistors clear of other components, and leave a convenient length of mounting wire untrimmed to assist as a heat shunt.

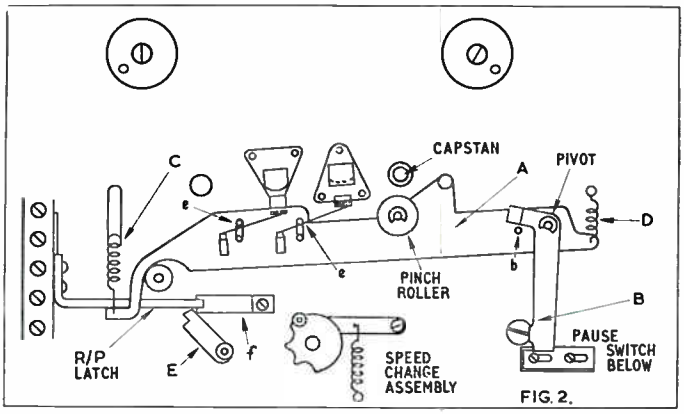


FIG. 2.

Electrical Switching

On this deck, the switching is mainly electrical, a simple, spring-loaded plate, operated by the *R/P* lever and knob being the only mechanical function that may need attention. This plate bears both the pinch roller and a similar roller acting as a tape guide. The main lever also actuates the tape pressure pads, by pins on the upper side engaging pivoted arms, coupled to the actual wiper arms by locknuts. Check that these are secure. that the pads have not hardened and are set cleanly in the guide slots.

The hub locks used on the earlier machines differed from more recent models in that they had to have the central screw tightened for locking, the right-hand hub lock had a larger bore and no retaining clips were used. On later models there were two variations, clip on the take-up (left-hand) lock which still has to be unscrewed, while the right-hand lock could be pulled off, and later again, after serial number 6,000, clips which need only be slackened for the complete lock assembly on each side to be removed.

Three different types of capstan have been used. First, there were metallic, rubber-faced capstans with metal pinch rollers, then composition capstans with metal rollers and finally metal capstans and rubber pinch rollers. The last is the best arrange-

SERVICE

By H. W. HELLYER

ment, but requires a stronger spring action on the engagement plate. This point should be checked if capstans have been changed for modified types during overhaul (as often happens when a machine enters the second-hand market). The new spring TR242 is usually ordered when the capstans are replaced, but owners may find that an auxiliary tension spring at the outer end of the main lever will provide sufficient assistance to maintain pinch pressure.

A final note concerns the push-buttons, which may tend to stick. The whole assembly can be adjusted by slackening two fixing screws, but if a single button sticks, check that it is not fouling the nameplate. If it is, a touch with a file should provide sufficient clearance.

Series 80

Representative of the more modern versions of the Truvox tape recorder is the type 80 deck. This has been widely acclaimed, and is fitted in the R and D 82 and 84 series, mono and stereo machines. The principal departure from previous marks was the provision of mechanical braking throughout. The Mark III and IV had electric brakes, as previously described. The Mark VI was in some ways similar to the 80 in that the speed change was by idler pulley, a digital revolution counter was fitted, driven by belt from the left-hand hub, and tracking was to British and American standards. Tape withdrawal during fast wind was no longer manual, and braking was electric, plus pause and "auto-parking" mechanical braking. The operation of the Off button applied pads to the spooling motors, which provided handy locking also when the machine was not in use. BTH motors were used throughout.

The model 80 has been described as "technically luxurious", and even in these days of quality construction by a number of makers it is well up to professional standards. Two speeds are used, $7\frac{1}{2}$ and $3\frac{3}{4}$ i/s, with drive pulley selection, disengaged completely when the machine is Off.

Pressure Lever Adjustment

The main factors to be noted during servicing are the pressure lever adjustments, the pause and main braking, and a few electrical points. There is not sufficient space for a detailed description of the deck, but figs. 2 and 3 give a general outline of the mechanical parts we need to discuss.

Fig. 2 shows the top view with the covers removed. It will be seen that both the main operating lever *A* and the pause lever *B* are pivoted at the same point. The engagement spring *C* draws the main lever inwards when the latch below the *R/P* press

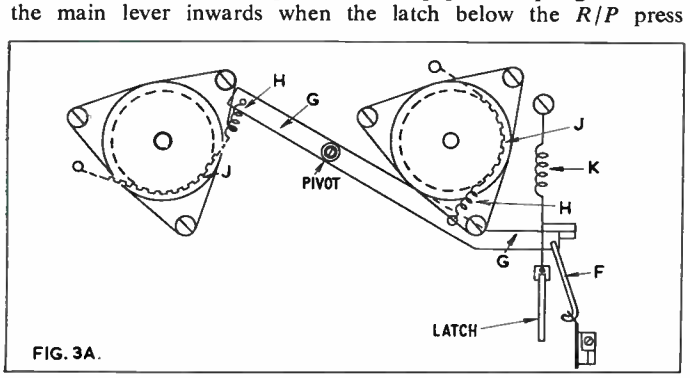


FIG. 3A.

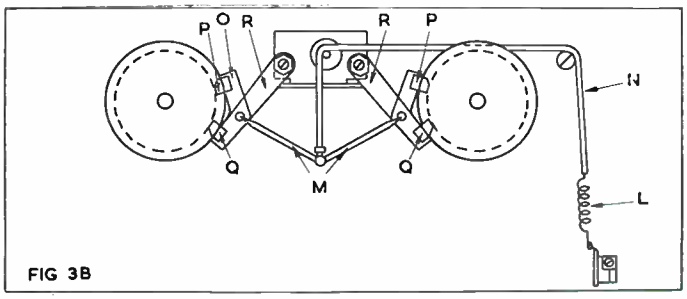


FIG 3B

button allows free movement, and the return spring *D* assists clean disengagement. The main lever must be free on its pivot and slide cleanly on the flat pad that will be found just in front of the erase head.

The pressure pads have a contact pressure of 12 grams, give or take 3 grams, and are mounted on pivots, with stop pins *e-e* preventing fouling action. Adjust these for a 0.02 in. clearance between pin and leaf in the Play position. Check that the pads line up with the *R/P* gaps and, if needed, roughen them slightly, or coat with graphite grease. (Note: always ensure that this grease dries out before using the machine—many a small fault has been caused by the inadvertent transmission of graphite grease from the original point of application.)

An important item is the Pause control. This withdraws the pressure mechanism from capstan and heads by the tongue on lever *B* engaging pin *b*, at the same time operating a micro-switch beneath the deck. There is a nylon screw which provides the push pressure to the switch itself, and this should allow the switch to just close as the pinch roller moves from the capstan. But note that the top cover limits the travel of *B* in the Off position, and if these adjustments are made with the covers removed and not subsequently re-checked, wow may be reported. Make any necessary compensation by bending the tongue of *B*.

Linking Bars

The press button unit itself often gives rise to trouble—mainly, it must be stated, due to heavy-handed operation. These buttons require a definite push action, but the interlock is such that force can be applied to overcome incorrect engagement of the Stop button. The result is bending of the latch bar along the base of the switch unit. The end then becomes trapped above the "pip" on the Stop bar, preventing complete depression of the latter. The bar can be prised away from the Stop bar sufficiently to straighten it without the need for major dismantling.

Note that the bending of any of the vertical bars of the push button will prevent that particular button from staying engaged. Do not be tempted to compensate by bending the latch bar, but check that the vertical bars and the compression springs are in order. Note that some models have a cup and spring on all but the Stop button, while later versions use springs on all buttons with the extra spring of the stop button outside the main spring, to keep this button clear of the *R/P* cancelling lever. On these models, a different brake linkage system is employed, as will be described, but on the 1961 version, the brake linkage tension affects the pushrod return.

Braking

The two types of braking are shown in **fig. 3a** and **b. Fig 3a** is the earlier version, with the Stop button operating linkage *F* which pivots lever *G*, drawing the servo type brakes *J* tight on the drums, with the compensating action of springs *H*. Spring *K* provides return pressure for disengagement, when operation of any of the other buttons moves the main latch.

A more sophisticated version was used in the 1962 machines, as shown in **fig. 3b.** Known as the Compensated Brake System, this arrangement relies on the pull of nylon cord *N* to increase the cantilever angle of links *M*. This applies braking pressure via the angle bracket *O* and brake pads *P* and *Q*. Note that these pads are dissimilar; easy identification being that *P* is pink and *Q*, brown.

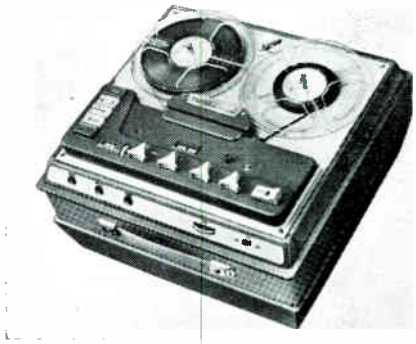
(continued on page 16)

TAPE RECORDER SERVICE—(continued)

Apart from the tension of spring *L* and possible breakage of the nylon cord, the only likely cause of erratic braking is the pivoting of the main arms *R*. Check for loose securing screws, and see that the cord is not frayed by any sharp edges of brackets or plates.

Switch Contacts

Electrically, the Truvox deck presents few problems. One possible fault is caused by erratic contacting of the Record/Play switch. The mechanical arrangement is shown in **fig. 2.** The Record selector *E* is held by the *R/P* latch, and released by the pressure of leaf spring *f* when the press buttons are neutralised. If the leaf spring is secure, and the above-deck mechanism is operating properly, check the coupling to the spindle, beneath the deck-plate. This is secured by an Allen screw, and the easy way of ensuring correct switch action is by taking a meter reading for continuity between the "live" *R/P* head connection and the grid (pin 2) of the EF86 valve when the switch is inoperative, i.e., Playback. With the switch held at Record, the continuity should be between the live lead to the head and one side of the oscillator trimmer condenser, adjacent



The Truvox R82, two-track recorder which features the latest deck.

to the oscillator coil. Take these readings with the machine disconnected from the supply and take care not to let the ohmeter connect the head to chassis. Even the small DC thus applied can have a detrimental effect by magnetising the *R/P* head slightly. Similar strictures apply if a test lamp made temporarily from a torch battery and bulb is used for these continuity tests.

If poor recordings accompanied by a lack of erase are reported, check that the bias trimmer has not been damaged. Correct bias, measured with a valve-voltmeter, should be 75 volts (quarter-track) and 120 volts (half-track) machines, measured across the *R/P* head. Erase volts, also measured with a VVM, should be 10-12 volts and 45 volts. These are all RMS values.

A possible cause of HT short-circuiting is the output transformer, which can break down between windings, particularly if the machine has been operated with the internal loudspeaker disconnected.

The autostop, which may not be fitted on some earlier models, where both this and the Trick facility were optional extras, is of the conventional type. An insulated guide is short-circuited by magnetic foil leader tape, energising a relay which is fed from a separate winding on the mains transformer, the AC converted to DC by silicon rectifier. The relay contacts interrupt the motor circuit, and an additional pair holds the relay "on" until depressing the Stop button neutralises the circuit, when the relay resets.

By RALPH WEST

EXTENDING MICROPHONE LEADS

THOSE who use moving coil and ribbon microphones usually have no difficulty with long leads. Even a hundred feet presents no problems—or should not!

They use a circuit as shown in **fig. 1.** The microphone *M* will have a low impedance, usually around 30 ohm. It will be connected by a long lead *L*, of twin screened cable to the centre-tapped primary of the microphone transformer *T*. This will be in or near the tape recorder or amplifier, and it is invariably in a Mumetal case to screen it from magnetic interference from motors and mains transformers. A short coaxial screened lead L_2 carries the signal to the first valve in the amplifier.

For shorter runs the lead L_1 may be unscreened providing it

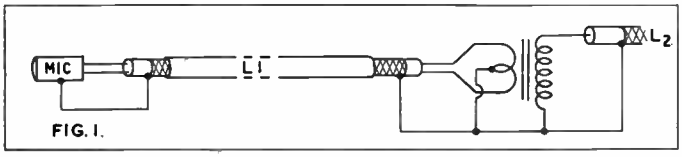


FIG. 1.

is twisted and the microphone case is left disconnected, but it must not go near to electrical fittings, earthed pipes, or wet grass etc., or the balance may be upset and hum result.

If lead L_1 is a coaxial or single core type—and no centre-tapped primary—again the lead must not be very long. How long? Well, it depends on the signal and the microphone sensitivity. With a big signal and a sensitive microphone, one may get away with even 30 ft. or 40 ft., but the circuit of **fig. 1** has all the advantages.

The capacitance of the long lead L_1 does not upset the frequency response measurably, as, being a low impedance circuit, only very low voltages exist between the two leads and the outer screen. So the amount of high frequency current bypassed by the cable is negligible.

Frequency Attenuation

With crystal and condenser microphones, the capacitance of the screened lead attenuates all frequencies equally and so results in a general loss of signal. Unfortunately, the loss is considerable as they are very high impedance devices, so a head amplifier is really needed. A compact one or two valve amplifier is built into the actual microphone case and some step down device, often a transformer, provides a low impedance output just like that of the magnetic types. Similar long lines will then be used, but extra conductors will be needed to carry HT and LT (it will

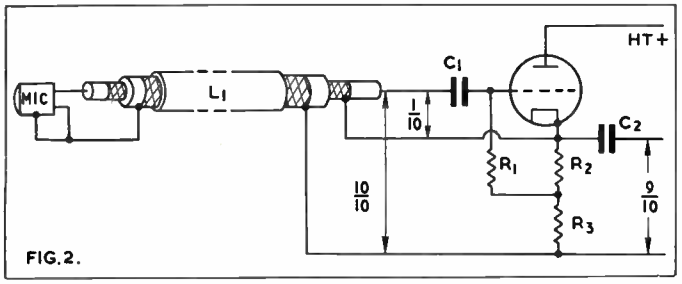


FIG. 2.

have to be DC too) to the valve. This is the usual arrangement with the expensive professional condenser microphones.

There is another trick which is much easier for the amateur and it uses that ubiquitous cathode follower—in a less common arrangement. Double screened coaxial cable is used and connected as shown in **fig. 2.**

The "live" microphone terminal goes to the inner wire and the case and "earthy" terminal to the outer braiding. Nothing must touch the inner braiding at this end. The signal is taken from C_2 as usual and is about 9/10ths of the input value. This can be fed to the next stage and a longish screened lead won't hurt here as this output is a low impedance one. This same output voltage is also fed to the inner braiding, so the voltage between this and the inner is only about 1/10th of the total microphone output. The screened cable thus acts as though it had only 1/10th of its actual capacitance and so this lead can literally be 10 times as long as usual—for the same signal loss. Likewise the capacitance between inner and outer braids is no embarrassment as it is connected to a low impedance point, namely the cathode.

The Most Suitable Valve

Almost any valve can be pressed into service as a cathode follower, but as this one will generally be handling a small signal—and hence followed by considerable amplification, a low noise, low microphony type would be wisest. An EF86 with screen, suppressor and anode connected together should be suitable.

The load on the microphone is not the grid leak R_1 but, approximately ten times R_1. Thus, if R_1 is 2 M ohms the micro-

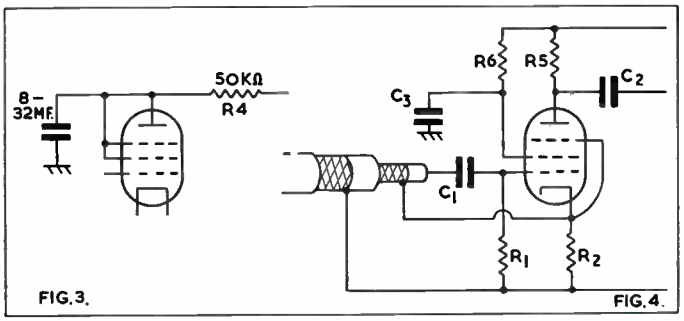


FIG. 3. FIG. 4.

phone "sees" a 20 M ohms load and it should have a good bass response. C_1 need not be larger than 0.01 mfd. R_2 is the normal bias resistor for the valve and 2.2 K ohms is suitable for an EF86. R_3 is the cathode load and its value is not critical, 20 K —50 K ohms will be in order. The value of C_2 depends on what it feeds. If it is a grid leak or volume control of ½ M ohm or more, 0.1 mfd is ample. If the load is only, say, 100 K ohms, then 0.25 mfd will be needed if a full bass response is desired. The anode is shown going straight to HT+, but it could be decoupled with advantage, as suggested in **fig. 3.**

A Compromise Circuit

Fig. 4 shows a compromise circuit. The valve is used as a normal amplifier but its cathode resistor is not bypassed. The inner braiding is driven again by the cathode. The effective capacitance reduction is, however, much less, probably only one half, and R_1 itself is the effective load on the microphone. The unbypassed cathode also reduces the stage gain to something less than half, but it might suit some particular set of conditions where a shorter lead was being used.

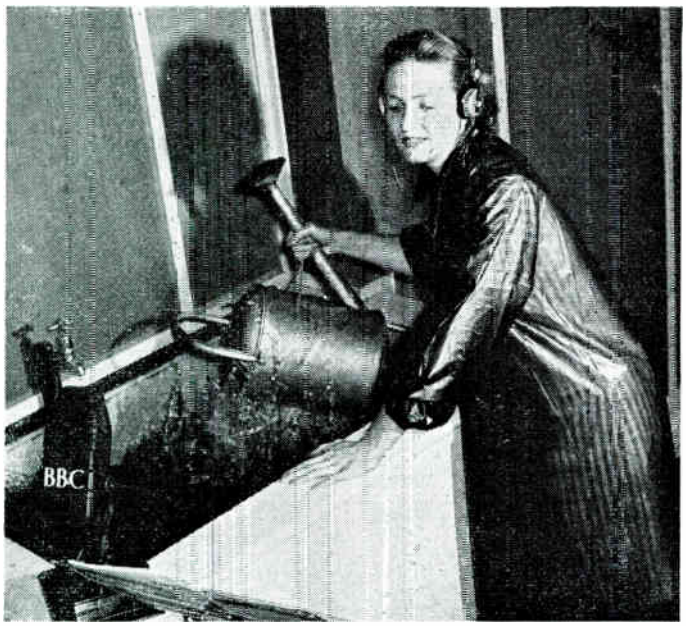
Double screened coaxial is not very common but can be obtained from most of the cable manufacturing firms.

It might also be found by diligent search around the various surplus stores. Anyway it is a worthwhile circuit for those who must use long leads with crystal and condenser microphones. A 100 ft. sounds a lot, but it will not go far down the garden or round the back of a stage!

This subject is dealt with by Stanley Kelly in the 1962 Hi-Fi Year Book.

SOUND

SOUND EFFECTS



The majority of sound effects used by the BBC are recorded on disc, indexed and filed under the appropriate title. Occasionally a sound effect is produced during the actual broadcast, as seen on this photograph. The engineer follows the script, and also receives instructions through the headphones from the producer.

THE creation of your own sound effects (as discussed in some detail in last month's *Sound and Cine*) can be a most absorbing operation in its own right, and sometimes highly entertaining, but it does require time and, in some advanced cases, extra equipment. The time taken in experimenting and re-recording until the thing is just right sometimes outweighs the cost of purchasing the exact effect needed. With this in mind I have compiled a guide to some of the more useful commercially recorded effects currently available.

It seems that the best individual buy on the market is the **Pye Golden Guinea GGL 0143** which contains no less than 43 effects. At sixpence per effect this does seem good value and some of the effects are very well recorded indeed. The disc is of American origin, however, and seven of the effects are unmistakably from the U.S.A. and could not be used in a film with an English locale. Nevertheless, this leaves 36 effects for one guinea, which is still good value. Of course, if in your film you have an insert of a telephone ringing in New York (a call from London for instance), you will have even better value. The effects are as follows: car skid: car skid and crash: car sequence—door closes, starter turns over twice, car starts, revs up and then pulls away; car stops, engine idles and then shuts off: car door closes: car horn: sports car horn: throaty car horn: traffic overall perspective (this is a fairly constant sound which could be used as a background loop and the spot effects laid just where they were needed): bus: motorcycle: truck: tractor: vacuum cleaner (could be used for a lift): water pours into glass: pop bottle sequence (with fizz): washing machine: bath being drawn: shower: tea kettle sequence: hand lawnmower: children playing in school yard: baby crying: four telephone sequences (all American): fairground: shooting gallery: roller coaster (quite well done but the voices at the end are unmistakably American): parade with marching band: bowling sequence: bowling alleys (U.S.): sports car race: horse race (American voice commentary): door buzzer: door chimes: door knocks: key in lock: door opens and closes quickly: door opens and closes: screen door opens and closes: squeaky door opens and closes (this one is marvellous on its own account and I have used it to great effect in the sound background for a ghost story sequence at a party over Christmas).

A Greater Choice

The Golden Guinea disc is cheap and provides an immediate source for library sound effects but has, of course, limitations where the more imaginative track is concerned. A greater choice is offered, however, by the two H.M.V. series of 7 in. 45 r.p.m. discs; the English series produced by *E.M.I.* under the 7FX label and retailing for 7s. 0½d.; and the French series (some of which have a distinct French flavour) distributed by *Rare Records Ltd., 5-7 Barton Square, St. Anne's Square, Manchester* 2, under the 7EMF label and retailing for 13s. 11d. per disc. An alphabetical guide to these series is as follows:

Aeroplanes: air liner passing overhead, engine noise or roar (interior), nose dive, crash and fire. *Jets:* warming up and taking off, landing and taxiing, flying full boost. 7FX13. Engine starting up, in flight (inside and outside craft). Twin-engined plane. Plane taking off in distance, approaching and then fading away. Algiers Airport. 7EMF10.

Air Raid: Air raid on London, warning, planes approach, A.A. gunfire, falling bombs, fire engines, shell bursts, all clear, air raid effects. 7FX1.

Applause: excited applause (outdoor), excited applause (indoor), concert applause. 7FX12. Theatre interval, applause, laughter. Calls of " Viva "—" Hip-Hip-Hooray ". 7EMF8

Baby and children: baby sobbing, children at play (with screeches), laughter. 7FX16. Children, baby crying, playtime. 7EMF8.

Dawn Chorus

Birds: Dawn chorus in Spring in the country with cocks in the distance and five o'clock striking, birds in the forest, parrots in flight, gulls at sea with wind and sea noises, parrot saying " Bonjour ", nightingale, goldfinch, blackbird, reed warbler. 7EMF7. Dawn chorus, nightingale, owls (barn and screech). 7FX11.

Cars: revving and departure, approach and pass (with horn), approach and stop, door slam, door slam and depart, approach and pass, reverse (with horn), horns, sirens, door, starter, ticking over, approach and skid, crash. 7FX2. Starting up and departure of small car from garage, engine stopping, starting up and departure of larger vehicle, an old lorry, passing cars, skidding tyres, hooter receding, car approaching and braking, road accident. 7EMF3.

Cheering crowds. with rattles and shouts. 7FX3. Swimming bath with diving and swimming noises. 7EMF8.

Church Bells: call to service (single bell), call changes (8 bells—Thatcham, Berks). 7FX3. Chime of four bells, Vespers at an Abbey, chime of three bells, High Mass, bell announcing High Mass, Angelus, Death Knell. 7EMF9.

Clocks: striking clocks, Big Ben, striking clocks (house type), winding a clock, clock striking the quarter hours. 7EMF16.

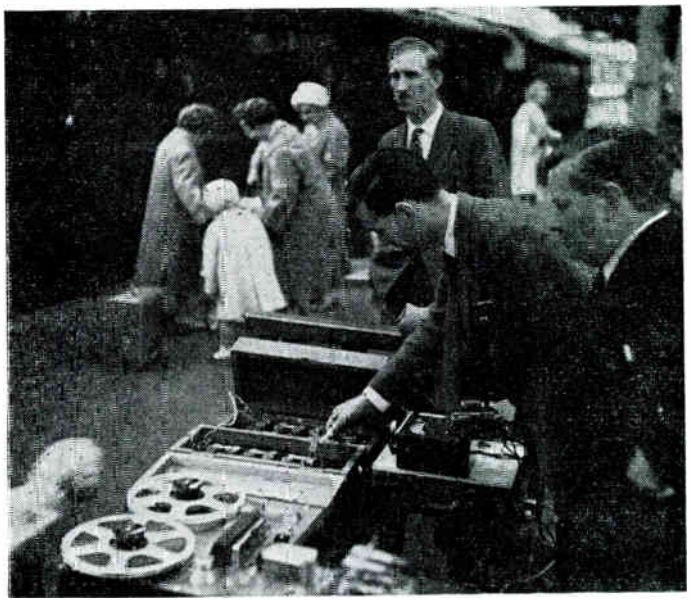
Demolition: falling debris, demolition, explosion with fire and water, glass crashes and hammering. 7FX14.

Dogs: house dogs barking, Alsatian barking and howling, small dogs barking, small dogs yelping, barking at a distance, terriers barking at intruder. 7FX4.

Domestic animals: cat mewing, cat purring, cat wailing, big cat wailing out of doors, angry cat outdoors, donkey, goat, cow, sheep (with bell), herd of cows. 7EMF4.

AND CINE

—— BY RICHARD GOLDING



Decca engineers Dave Frost (centre) and Arthur Lilley (right) check the equipment which included an Ampex 351 stereo recorder and A.K.G. condenser microphones. The recording featured the Aberdeen Flyer which was the last non-stop steam train to make the journey from King's Cross to Edinburgh.

Domestic sounds: vacuum cleaner, refrigerator, sewing machine, coffee grinder, shower bath, filling a wash basin, creaking door. 7EMF1.

Farmyard: cows, calves and heifers, cock-crow, hens, guinea fowl and bantams. 7FX17. Hens, chickens and cocks heard distinctly at Dawn, ducks, pigs, turkeys and geese. 7EMF6.

Fire: heavy roar with slight crackling. 7FX18.

Footsteps and marching: running in the street, walking (light and heavy), in street with traffic noises, troops marching. 7FX17.

Ghosts: various effects. 7FX15.

Gun and pistol shots: 15 various effects (single and dual), gun battle, gun salute of six shots. 7FX18.

Horses: group galloping on turf, group trotting on gravel, single horse walking on gravel, horse and carriage arriving—departing. 7FX5. Horse trotting, galloping, several horses walking, trotting, neighing, horse and cart. 7EMF6.

Jungle noises: 7FX20.

Public events: baseball match, Punch and Judy show, children chattering, shouting, laughing, man's voice shouting. Circus—children laughing, clowns calling out. Before a concert—instruments tuning, chatter, audience movements. 7EMF23. Crowds: firework display, theatre, cocktail party, exhibition—crowd in large building, restaurant—quiet speech, cutlery, serving. At the market. In a railway station—loudspeaker, luggage wagon, crowd, door banging. In the street—children playing, car hooting, whistles, distant cries. Church congregation, repetition of prayers. 7EMF24.

Machines in factories: compressors, drills, hand saw, electric saw, presses, type machine. 7EMF13. Various machines, sawmill including mechanical plane, grinding mill, gear wheel pulleys, pressing machine, iron foundry, smelting, large moulding machine, steam hammer. 7EMF21.

Storms at Sea

Rain: heavy. 7FX7. Rain on a tin roof, rain and thunder, wind with objects being blown over, thunder, violent storm. 7EMF11.

Sea: wash on shingle, seagulls. 7FX6. Sea and boats—ebb and flow heard distinctly, ebb and flow nearby, sea in a little bay with seagulls, surge of sea, high and low tide, storm at sea, boats being driven on to rocks, fishing boats, engine room of cargo boats, cargo boats letting off steam, loading of cargo, anchor, shouted orders. 7EMF18.

Signalling: Tom-tom, jungle drums, morse, teletype, sirens, intercom phone. 7EMF15.

Sports: indoor cycle race with crowds, racing cars, outboard motor boats, crowd at bullfight, skating rink, swimming pool, Judo exhibition. 7EMF20.

Traffic: Old bus, Paris Metro—doors closing and train leaving, interior of underground train. Paris traffic with horns, tramways, modern bus departing. 7EMF12.

Trains: express passing with whistle, express crash, local passenger—arriving, door slams, guard's whistle—departing, express journey complete—start, continuous with whistle—stop, etc. 7FX9. Express departing—crossing an iron bridge, train travelling, goods train with whistle blasts, train in tunnel, train pulling up and shunting. 7EMF2.

Travel: ship's siren, diesel engine, luggage wagon, express train passing, car starting up—driving away—heard in distance, motorcycle, scooter, helicopter, approaching and receding plane, tourist flight aircraft. 7EMF19.

Tree felling: 7FX20.

War: revolvers, fusilade, musketry, marching men (guns in background), aerial bombardment, tank movements. 7EMF17.

Water: river and sea noises, rowing, barges, lapping of water between boats, ebb and flow of the sea, little motor boat, boat's diesel engine, ship in a stormy sea, ship's siren, foghorn, warning siren, two ships signalling with siren. 7EMF5.

Wild animals: seals in water, baboon, gibbon, one camel with bell, herd of camels, elephant, pumas, hyena laughing, chimpanzee, lion, tiger, panther. 7EMF14. Wild life overseas—bullfrogs, birds in background, tropical birds, virgin forest in Indo-China. Tom-tom drums, cicada. 7EMF22.

Tapesounds

For those requiring a single effect on tape, **Sound Recordings, 14 Hathaway Hamlet, Shottery, Stratford-upon-Avon,** issue a catalogue containing over 300 separate effects. Each effect is available at 3¾ or 7½ i/s and is priced at 9s. 6d. net, having an average playing time of between 30-60 secs., depending on the subject of the effect. Where it is desired to repeat or extend the duration of a basic "*Tapesound*," i.e. a continuous background of bird song, sounds of the sea etc., an additional fee will be charged, depending on the dubbing and editing time involved. Some of the sections in the catalogue are fairly comprehensive, for instance, the bird song section contains no less than 24 different bird voices, but Sound Recordings will undertake to obtain other sounds according to individual requirements at a small extra charge, according to the duration and distance taken in recording the effect.

Stagesound

One of the best professional sources for sound effects for screen and theatre is **Stagesound (London) Ltd., 12 King Street, London, W.C.2.,** the specialist recording studio. Prices, however, are not beyond the small-film producer's pocket and run out as follows: single sided 10 in. record—£1 4s.—duration 3 mins., single sided 12 in. record—£1 8s.—duration 4 mins., double sided 10 in. record—£1 10s.—duration 6 mins., double sided 12 in. record—£1 18s.—duration 8 mins All records supplied are cut

(*continued on page* 20)

SOUND AND CINE — *continued*

especially to each customer's own requirements and up to six cuts can be obtained per side of each record. Effects on tape are also available.

Specialised Railway Sound

Train recordings available under the *Argo* label and some of which are also issued in stereo are as follows:

The West Highland Line DA6. *Shap* DA7. *The Somerset and Dorset* DA8. *West of Exeter* DA9. *Gresley Pacifics* EAF33. *N.7 on the Jazz* EAF34. *South Eastern Steam* EAF 35. *Narrow Gauge on the Costa Brava* EAF36. *Dukedogs and the City* EAF37. *Steam Traction Engines* EAF38. *Trains in the Night* DA12 mono, ZDA12 stereo. *Newfoundland heads the Waverley* DA13 mono, ZDA13 stereo. *South Western Steam* EAF43. *The Great Eastern* DA14.

Besides their well-known spoken word and drama records Argo have much to offer the collector of the unusual sound and one record which, I suppose, could qualify for this latter category could be: *Jeanie Deans and Oxford* EAF39. This contains recordings of the paddle steamer Jeanie Deans on the Clyde and the steamer Oxford between Abingdon and Oxford.

Travelogue Background Music

Music on the Desert Road: a sound travelogue by Deben Bhattacharaya featuring Turkish, Bedouin and Hindi music.	Angel 35515
African Music:	
Drums of East Africa	Decca LF1120
Kenya	Decca LF1121
Congo and Tutal drums	Decca LF1169
Guitars of Africa	Decca LF1170
Congo songs and dances	Decca LF1172
Tanganyika	Decca LF1084
Uganda Protectorate	Decca LF1173
Algerian Music:	HMV HLP2
Arabian Music:	HMV HLP2
Armenian Folk Music:	Vogue VE170133-4
Australian Aboriginal Music:	HMV HLP1
Balinese Music:	HMV HLP1 & Argo RG1-2
Cambodian Music:	HMV HLP1
Chinese Music:	HMV HLP1
Greek Classical Music:	HMV HLP1
Hungarian Folk Music:	Vox VX990
Indian Ragas and Talas:	HMV ALP1665
Iraqi Music:	HMV HLP2
Islamic Music:	HMV HLP2
Japanese Music:	HMV HLP2
Jewish Sacred Music:	HMV HLP2
Laos Music:	HMV HLP2
Madagascan Music:	HMV HLP2
Moroccan Music:	HMV HLP2
Pakistani Music:	HMV CLP1308
Philippine Music:	HMV 7eg8565
Pre-Gregorian Chant:	HMV HLP3
Roumanian Folk Dances:	Supraphon LPM419
Tahitian Music:	HMV HLP1
Tibetan Music:	HMV HLP1
Tunisian Music:	HMV HLP2
Turkish Music:	HMV HLP2
Viet-Nam Folk Songs:	Supraphon suep592

Copyright

Wherever the word " recording " is heard the word " copyright " is apt to rear its ugly head but with sound effects we are, more or less, on fairly sure ground. Most records in the sound effects category may be re-recorded for amateur use without further permission or fee but wherever this is not stated, either on the label or in the catalogue, it would be as well to make completely certain. The other discs listed above are subject to the usual conditions and will require clearance.

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. office.

Dubbing Tapes

Dear Sir:—Having just completed a series of interviews of a skin divers' club in Cornwall on a Fi-Cord 1a battery recorder at 7½ i/s, I now have to re-record the whole series into one complete programme at a speed of 1⅞ i/s.

My mains recorder has the speed of 7½ i/s but not that of 1⅞ i/s, so I intend re-recording on to the Fi-Cord at the 1⅞ i/s speed the length of the recordings being just enough to cover both sides of a 3¾ in. spool. The input of the Fi-Cord is 400-1,000 ohms and as I have no wish to re-record via the microphone because of a loss in quality I would like to transfer direct from the mains recorder into the Fi-Cord. But the only output on my mains recorder is via the speaker. I have no indication of the impedance of the speaker, the recorder being an early model Wyndsor having a Lane Mk. VI deck.

Could you tell me, is it possible to do the transfer without a loss in the quality, and how to go about it? I am not a technical man, but given the ways and means in a straightforward layman's language I am able to do most things.—*Yours faithfully,* **D.M., London, N.1.**

The external loudspeaker impedance of your Wyndsor tape recorder will almost certainly be of the order of 3 ohms and should therefore be quite suitable, in terms of impedance, for connection to the input of your Fi-Cord. The signal level, however, will be rather high and so some simple attenuation will be needed. If connection to the external loudspeaker socket disconnects the internal speaker then a dummy load must be provided, taking the form of a 5 ohm 1 watt resistor connected directly across the plug. To attenuate the signal I would suggest a series resistor in the live side of 1 K ohm with a shunt resistor (between the two lines, and on the Fi-Cord side) of 10 ohms. If the internal speaker does not become disconnected, the 5 ohm resistor will not be necessary.

* * *

Overheating Motors

Dear Sir:—I was very interested in the article on servicing the Collaro Studio tape deck (*Tape Recorder* February 1962), as I have recently built a tape playback system around this deck. Indeed, I found the article invaluable as the brake system was completely out of adjustment on the deck I purchased.

However, I have a major problem left in that a very annoying flutter sets in when the supply spool becomes more than half empty. This can be removed instantly by helping the supply spool round so that the tape is just slack. Thinking that the motor was overenergised, I tried cutting out the motor supply completely at first and the fitting of high wattage resistors in series to reduce power—but I only changed the flutter by small amounts, in an apparently random way.

Another point is that the motors quickly get too hot to handle and this causes the take-up spool in particular to get hot—can this be reduced at all?—*Yours faithfully,* **N.C.B., Harrow.**

The problem of take-up on the Collaro Studio deck is something that has exercised several of our readers, and the small defects pointed out, both in my original article last February and in F. K. Rawson's supplementary notes on Pages 429/431 *of the November issue should cover most of the points you raise.*

However, if your motors get too hot (a certain amount of heating is inevitable, due to losses in the rotors fundamental to induction motor design), and there is an apparent increase in back torque when the supply spool is half empty, there may be a simple cause. If a bearing is binding when heated, the torque will increase. Check lubrication. After about 1,000 *hours use it is necessary to give the bottom bearings a few drops of light machine oil, and a drop run in from the top would not be amiss. But take care that no surplus oil is "spun off" to contaminate the rubber idlers.*

As there are no clutches, the amount of tape on the spool should have no effect on this flutter. Check that this is not simply a question of time, i.e., does the flutter develop after a half spool is run off, or would it be present on starting up with a half spool loaded? If the latter, make sure that the spool carrier is secure on its spindle. There is a lateral clamp screw, accessible through a hole in the side of the drum. Check also that you do not have a brake too finely adjusted, expanding sufficiently to cause drag when hot.

Adding resistors in series with the motor is not the answer, as the motors are in series—but increasing the value of the resistor in parallel with the supply motor would increase take-up and decrease reverse torque.

This is not advised, for any alteration to the basic circuit indicates that the motors are faulty. Reference to Mr. Rawson's article shows the relevant circuit. Note that early models of the Studio suffered from this defect and the resistor in question was changed from 2,000 *ohms to* 2,500 *ohms*—10 *watt, of course. Make sure you have the latter value.*

* * *

Using a Condenser Microphone

Dear Sir:—I wonder if you could suggest a circuit that would enable me to use my Grundig GCM3 microphone with another recorder that normally requires a Pieza-Electric microphone.

There are two inputs a high gain of .25 meg impedance and a low gain of 2 meg impedance. There is a socket on the recorder for use with a radio tuner, giving a supply of 200 V.-20 mA H.T. and 6.3 V. A.C. heater, should this be of use for a polarising voltage, which I understand is required for a condenser microphone. *Yours faithfully,* **J.H., Hollywood.**

The Grundig condenser microphone to which you refer could certainly be used with another recorder provided certain additions are made to the input circuit. The screen of the microphone cable will be connected to the earthy side of the input in the normal manner. The live conductor of the microphone cable will be connected to the live input connection through a capacitor, which should be 0.05 *mfd with a voltage rating of* 500 *volts D.C. The high voltage rating is required to ensure that D.C. leakage through the condenser will be as low as possible.*

The polarising voltage required could be obtained from the 200 *volts supply, but it would be advisable to put some extra smoothing to avoid introducing hum at the microphone input. From the* 200 *volts supply you should take a* 1 *M ohm resistor the other end being connected to earth through a* 0.1 *mfd capacitor again of* 500 *volts D.C. rating. From the junction of these two components a second resistor of* 2.2 *M ohm should connect to the live microphone line. In order to keep hiss to a minimum it might be worthwhile spending a few extra coppers and obtaining high stability resistors, such as the Erie type* 108.

*If you were to sketch this circuit out, you would find a similarity between it and part of the microphone input circuit of the TK*20.

BUILDING THE TW/PA4 TAP

PART ONE — ANALYSIS AND CHASSIS LAYOUT

● Many readers have constructed the TWA 1515D Stereo Tape Amplifier designed by A. W. Wayne, and described by him in *Hi-Fi News* (July 1960 to January 1961). Now, the same designer has produced the TW/PA4, a monaural recording amplifier and playback pre-amplifier with cathode follower output, suitable for use with Brenell, B.S.R., Ferrograph and Planet tape decks. The first article in a series of three appears below and this month the circuit published is for the Brenell and B.S.R. decks. Circuits for the Ferrograph and Planet decks will appear during the next two months. Those readers wishing to construct this amplifier are advised to prepare the chassis as illustrated in **Fig. 3**, and obtain the necessary components. **Figs. 2, 4, 5, 6, 7** and **9** will appear later. **Note.** All instructions given for Miniflux heads will apply to the Planet deck, although the makers should be contacted for information as to the solenoid operation.

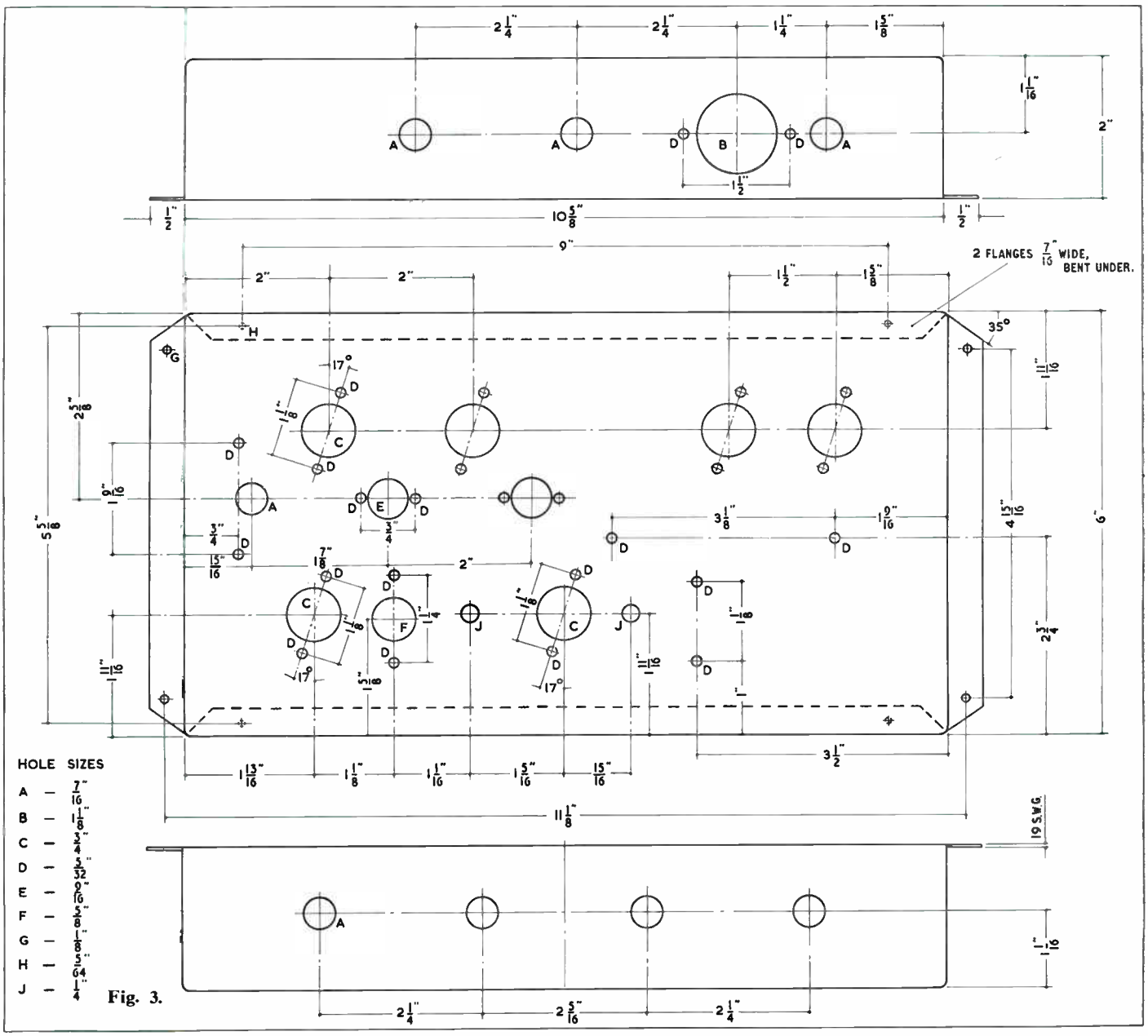


Fig. 3.

'E AMPLIFIER

By A. W. WAYNE*

THE TW/PA series of amplifiers were originally designed for purely professional purposes, but because of their comparative simplicity of construction and adjustment were later included in the *Shirley Laboratories* catalogues as a standard production for the commercial market. The TW/PA4 is as suitable for a laboratory standard as for a hi-fi tape installation, and it offers few constructional difficulties to even an inexperienced amateur.

Fig. 1 is the circuit for use with *Brenell, B.S.R.*, and other decks with medium to high impedance heads, including the *Miniflux*, while **fig. 2** is the circuit as modified for *Ferrograph* decks.

This second illustration also shows one or two small variations on the original circuit, any of which may be transferred to **fig. 1** and vice versa if so desired. **Fig. 3** is a drawing of the standard chassis, which should be adhered to in the main, while **fig. 10** and **fig. 9** are circuits of a suitable power-pack and power amplifier respectively. A short analysis follows.

Recording Amplifier

V1 and V2, together with the associated circuitry, comprise the recording amplifier. V1, the *Mullard* EF86 low-noise pentode, is a voltage amplifier with loads so chosen as to offer reasonable gain with a fair bandwidth, this being ±0.5 dB from 30 c/s to 18,000 c/s. Signal input—"High" = high-gain—to this valve is via J1, a standard insulated jack-socket, and the impedance of 1 megΩ is the maximum permissible under the specified operating conditions.

This value must not be exceeded, as otherwise there may be a shift, due to contact potential, in the bias centre away from the straight portion of the valve characteristic. However, there can be no objection to a reduction of R1 to any value convenient for the requirements of the signal source, 220K usually being a satisfactory compromise for most transformer-coupled ribbon or dynamic microphones. Input sensitivity is 2 m.v., and high output moving coil or reluctance pickups may make use of this input, the necessary equalisations being inserted at the point marked "X". A suggested losser equalising circuit is given in **fig. 11**.

The amplified signal goes, via C4 and J2, to VR1, the recording gain control. Insertion of a plug into the jack-socket disconnects V1 output from VR1, so removing the possibilities of valve hiss etc., emanating from V1, and feeds the signal directly across the control, the low value of which is selected with the minimisation of high frequency losses in mind.

The input sensitivity at J2 is approximately 200 m.v., which is ample for *Ronette Studio* and similar crystal pickups, while the load is quite satisfactory for such units; but the less suave types, which may require a load of up to 2 megΩ, will demand that VR1 be changed to this value, or that a suitable series resistor be included in the live signal lead. Whichever method be chosen, there will be an inevitable loss of top at certain settings of the control slider. With the series resistor, this loss will occur at all positions above the lowest third of the track; but with a 2 megohm potentiometer the danger area stretches from about 0.25 to about 0.9 of the track, reckoning from the earthy end. Fortunately, the loss tends to supress the objectionable peaks so often apparent in reproduction from these pickups, but when recording from a good quality radio tuner, the deterioration can be quite marked. If at all possible, it is better to keep to the designed value of VR1.

V2, the *Brimar* 6BR8, is an audio voltage-amplifying triode-pentode, and is not to be confused with the ECL86 type, where the pentode section is a power device. The circuit of V2a is so

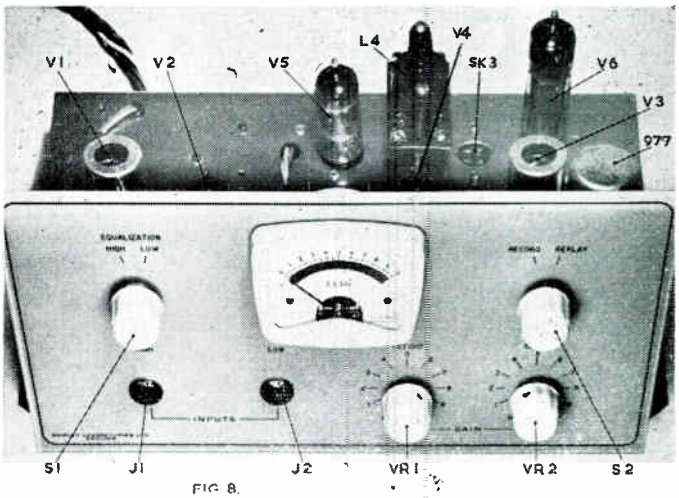


FIG 8.

Fig. 8. *Layout of TW/PA4 components values can be found on page 25.*

designed as to permit the valve to work, even when fully driven, over the straight portion of its characteristic, and it feeds V2B in the normal way. V2B circuit, however, is worthy of more detailed description.

V2B is the recording valve proper, i.e. it provides the actual recording current. Now, for reasons bound up with the physics of magnetic recording, it is necessary to provide increasing recording current with increasing frequency up to the required recording limit—in practice, it should go a little beyond this point—which, at 7½ i/s, may be considered to lie in the region of around 10,000 c/s to 12,000 c/s. It is possible to exceed this figure, but only at the cost of either greater complexity in the amplifiers or of exaggerated distortion. The rise of current with frequency must be fairly steep, considerably more than the theoretical 6dB per octave possible with RC circuits, and it is also essential that, once the chosen limit frequency has been reached, the response beyond drops as rapidly as possible, to avoid loading the tape with mere noise. There are two common methods of ensuring the required curve, by the use of either feedback or of tuned RLC losser circuits. The TW/PA4 makes use of a combination of the two, R11 providing the feedback, and R11LIC8 the losser network.

It will be observed that V2B cathode is stood off by R11, the degeneration along this resistor reducing the gain of V2B by a fraction modified by the presence of network L1C8 in shunt with it, R8. the grid-leak, being returned to the junction R10R11 so as to ensure correct bias. At resonance, the impedance of L1C8 approaches zero, so short-circuiting R11 and the feedback, and permitting V2B to realise its full gain at this frequency. At other frequencies, the impedance of the circuit varies in accordance with (*a*) the displacement of f+x and f−x from fo = resonance, and (*b*) the Q of combination. Q, on the other hand, determines both magnitude and slope of the response curve, either of which may be greater than is acceptable. The Q of L1C8 is quite high, and R11, which is adjusted on test, modifies the two parameters by reducing the Q of L1C8 as well as by controlling the distance over which the network can operate.

The head is an inductive device, so its reactance increases with increasing frequency; and unless fed from a source capable of maintaining constant current at all frequencies, less power for magnetisation will be available as they mount. (It must be appreciated that this situation is not to be confused with that discussed above.) There are many ways of ensuring this constant current—a pentode valve is a device for such a purpose—but one of the simplest is to include a resistor, R13 in this particular case, in the feed line of such a value that it represents the major fraction of the total impedance in the circuit; and while it may be argued that, as V2A is a pentode, R13 is not strictly necessary, here it also fulfils the function of opposing shunting of V2A load resistor R9 to A.C. by the head reactance at the lower and middle frequencies.

(*Continued on page 24*)

*Shirley Laboratories Ltd.

L2C12 is a resonant trap to keep recording bias from V2B, as well as to place a high impedance block between oscillator and recording valve, with the object of preventing possible modulation of bias by the signal appearing at C11; and C10 deals with stray bias that could otherwise appear across R6 by way of inter-wiring coupling etc.

S2, on *record*, switches h.t. to V.5 and V.6, the meter and recording valves, while C27 retains its charge for a period long enough to obviate sudden cessation of bias on a peak of oscillation. This is an important matter, as the velocity of the vector of a wave is zero at the peaks, while its magnitude is greatest; so, from the viewpoint of the head, these points represent a comparatively large D.C. current, quite capable of causing permanent magnetisation in the core. The oscillator coil, L4, is of high efficiency, and the circuit provides ample power for the most difficult situations. Up to 180 volts bias at about 58 Kc/s

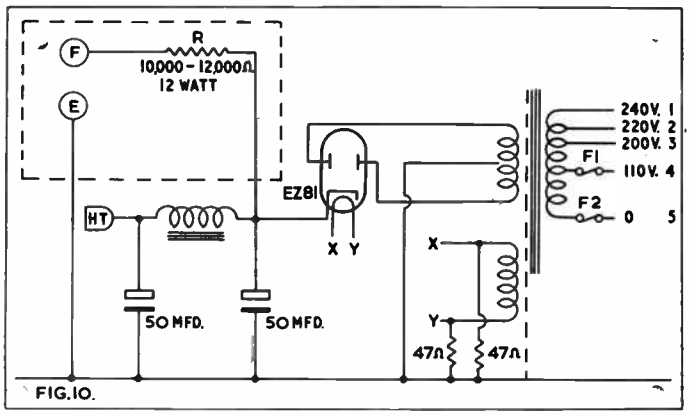


Fig. 10. *Circuit of a suitable power pack.*

is available via C29 and VR4, while erase at low impedance from about 35 volts to 65 volts, depending on the impedance of the erase head in use, may be drawn through C30. Grid drive for V6 is by way of R34, R35, and feedback along R36, the undecoupled cathode resistor, helps keep the wave-form free of second harmonic. R38 reduces sparking at the switch contacts when switching from *record* to *playback*, and is omitted from **fig. 2.** as Ferrograph decks are already equipped to deal with this situation.

Meter Circuit

V5 and its associated network and meter comprise a sustained-peak-reading valve-voltmeter, C25 with R32 determining the delay on peaks. To increase delay, increase the time-constant of the combination, but *only* by altering C25. If R32 be altered, R30 R31, the backing-off potentiometer, must be adjusted to suit. Audio signal for driving the meter is applied via C11 and VR3, diode signal-clipping is prevented by R33, and C26 diverts bias from the circuit, so avoiding false readings on the meter due to rectified bias. This completes the description of the recording amplifier of the TW/PA4.

Replay Pre-Amplifier

The *replay* pre-amplifier, V3V4AV4B, is entirely separate from the recording section, with the object of avoiding the often awkward switching necessary when valves are common to both the recording and replay functions, as well as permitting continuous monitoring of the recorded signal with 3-head decks.

V3 is the head pre-amplifier, and R15 is selected to suit the characteristics of the head in use, 220K being a satisfactory compromise for many decks. However, if an unwanted peak at round 6,000 c/s to 8,000 c/s appears across VR2 when playing from a standard test-tape, R15 must be reduced to the valve necessary to eradicate it. Generally, such a peak is the result of the self-capacitance of the head windings together with the local strays resonating with the inductance of the head; and while this phenomena is often taken advantage of in simpler apparatus with the object of achieving a satisfactory high-frequency response, in the circuits of all Shirley Laboratories' amplifiers no parameter not absolutely under the control of the designer is permitted to obtrude.

Cathode Follower Output

The amplified signal is fed, by way of R21 and the shunt equalising network R22-C19-C18-L3 to the grid of V4A, the final amplifier. V4B is merely a cathode-follower which, because of its low output impedance, permits the use of long connecting lines between SK2 and the associated power-amplifier; but it should be noted that it must *not* feed into a low impedance—10,000Ω being the minimum—or distortion will surely ensue. This is a point often neglected by operators; and if a low impedance input termination is essential, then SK2 should couple via a line transformer.

Equalising Circuit

S1A-S1B-S1C is the equalising switch for two tape speeds, and here is arranged for 7½ i/s and 3¾ i/s. (15 i/s is a waste of material for the domestic user, while 1⅞ i/s hardly comes within the purview of hi-fi, and neither will be considered here). Switching to "low" shunts additional capacity across C8 and C18, thereby reducing the resonant frequency of the equalising circuits to an appropriate figure, as well as increasing the time constant in the replay network by a factor of X2. With *Ferrograph* decks, S2 is arranged merely to short-circuit C11 output to earth

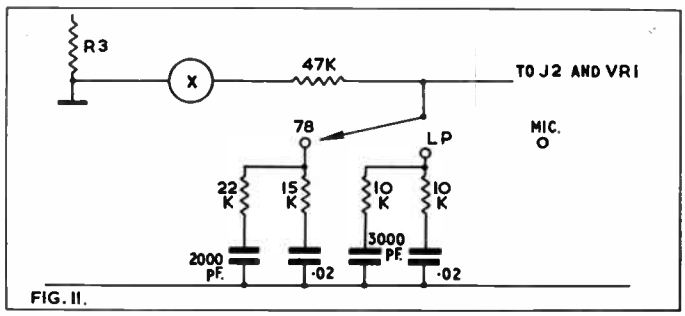


Fig. 11. *A suggested losser equalising circuit.*

in the *replay* position, and is not shown in **fig. 2**, where the figures and letter in circles refer to the identified connections on the tag-strips fitted to the underside of these units. These strips are clearly seen in **figs. 4** and **5.** For *B.S.R.* decks, S2 is omitted entirely, and the equalising circuits are re-arranged as follows: C8=4,000 pf, C18=2,700 pf, R22=8,200Ω. R15 may be as much as 100K. Results with these decks at 3¾ i/s can be quite startling.

High and Low Inputs

Considering **fig. 2,** it will be observed that both "High" and "Low" inputs are fed directly across R1. This configuration provides for considerably enhanced sensitivity at the "Low" input as compared to **fig. 1,** but in most cases some high-frequency compensation will be required in the way of a resistor and a small capacitor CX across RX, typical values being 560KΩ and 82 pf; but a certain amount of cut-and-try may be necessary.

The head input transformer is the *Wright and Weaire* type 977, and R15, the secondary load, averages 150KΩ, although some transformers may require as little as 100K. V4 is an EF86 triode-connected for working into short connecting lines of low capacity, and, although capable of slightly less gain than V4A of **fig. 1** is usually rather quieter. C29 is 2,000 pf, VR4 is 3,000Ω, and both erase and bias are derived from the secondary of L4.

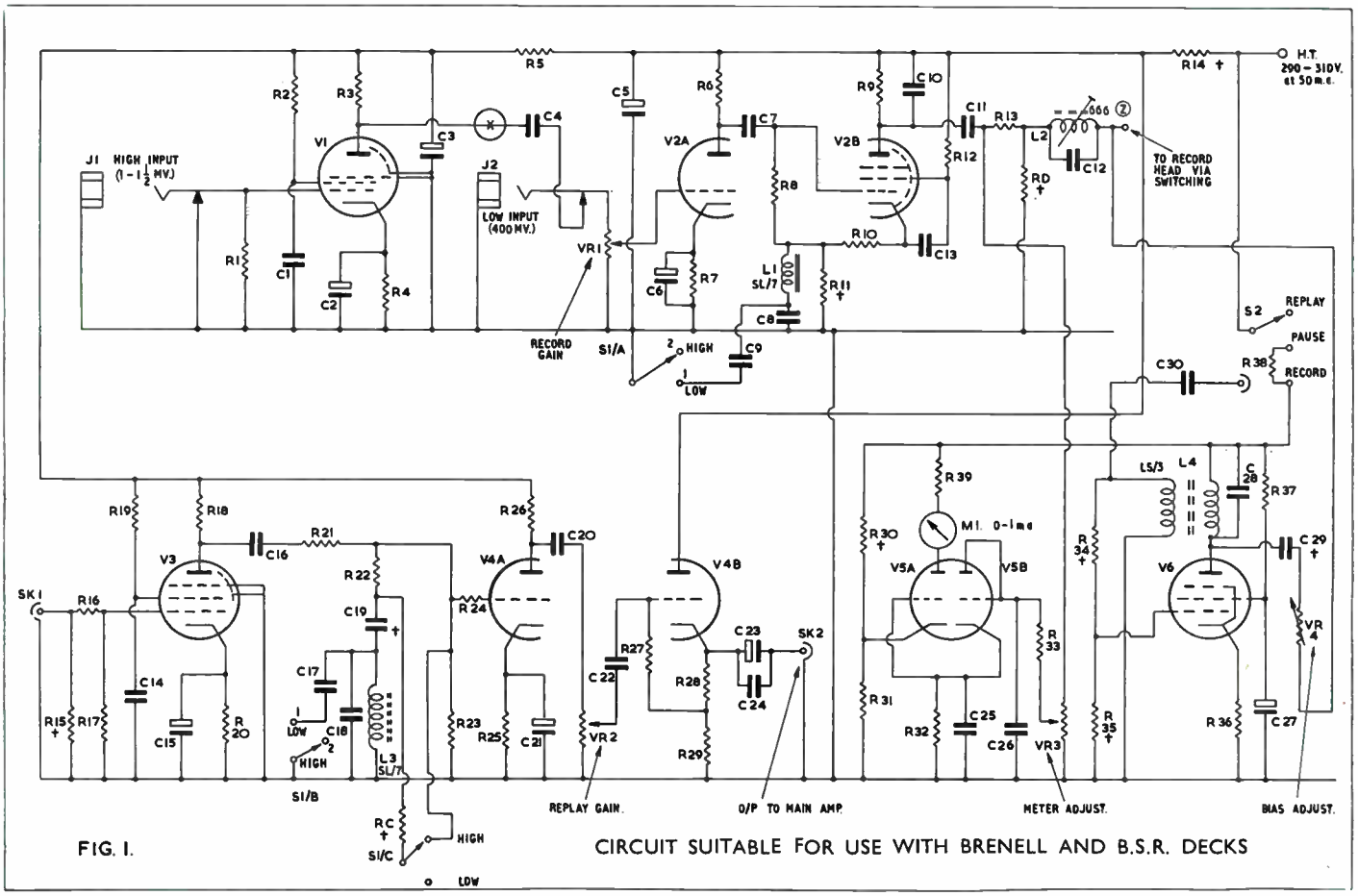


FIG. I. CIRCUIT SUITABLE FOR USE WITH BRENELL AND B.S.R. DECKS

Resistors		*Capacitors*	
R1	1 meg	C1	.1 mfd
2	1 meg*	2	50 mfd 25 v.w.
3	220k*	3	16 mfd 350 v.w.*
4	2.2k	4	.1 mfd
5	27k	5	16 mfd 350 v.w.*
6	100k	6	50 mfd 25 v.w.
7	2.2k	7	.01 mfd
8	1 meg	8	1000 pf
9	100k	9	3000 pf
10	1k	10	50 pf
11	10k +	11	.25 mfd
12	330k	12	400-500 pf
13	100k	13	.1 mfd
14	4.7k + 2 watt	14	.1 mfd
15	10k +	15	50 mfd 25 v.w.
16	10k	16	.1 mfd
17	1 meg	17	3000 pf
18	220k*	18	1000 pf
19	1 meg*	19	.04 mfd +
20	2.2k*	20	.1 mfd
21	100k	21	50 mfd 25 v.w.
22	10k	22	.1 mfd
23	2 meg	23	4 mfd
24	10k	24	.01 mfd
25	2.2k	25	.1 mfd
26	220k	26	750 pf
27	1 meg	27	16 mfd 350 v.w.
28	1k 1 watt	28	10,000 pf
29	47k 1 watt	29	1,000 pf
30	470k +	30	.01 mfd
31	10k	* = composite unit	
32	4.7 meg	+ = adjust on test	
33	100k	All paper conds 400 v.w.	
34	13.5k = 2 × 27k +	All pfs. 10% or better	

Resistors	
35	4.7k +
36	270Ω 2 watt
37	47Ω
38	22k
* = hi-stab	
+ = adjust on test	
All ½ watt except where stated	

Valves	
1	EF86 Mullard
2	6BR8 Brimar
3	EF86 Mullard
4	ECC83 Mullard (see text)
5	ECC83 Mullard
6	EL84 Mullard

Sundries

SK1, SK2	Belling-Lee co-axial
SK3	Carr-Fastner or similar
S1 3 p 2 way	A.B. Metals
L1 and L3	Shirley Labs. type SL/7
L2	W. & W. type 666
L4	W. & W. type 726
M1	Shirley type 9, Sifam type M1
J1, J2	Igranic P72
Chassis and Front Panel	Shirley Laboratories Ltd.
Valve-holders	McMurdo
VR1 250k log A.B. Metals	
VR2 250k log A.B. Metals	
VR3 500k lin. A.B. Metals	
VR4 30k w.w. pre-set A.B. Metals	(But see text and Fig. 2).

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.

WHARFEDALE SUPER 8/RS/DD

"Strikes the right note"

SAYS DONALD ALDOUS

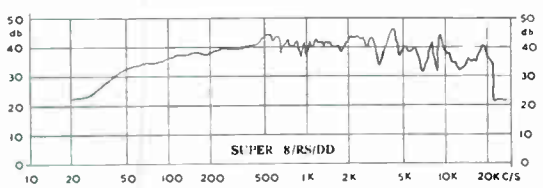
In a recent review of the Wharfedale Super 8/RS/DD in "Audio & Record Review", Donald Aldous reported as follows:—

The latest Wharfedale Super 8/RS/DD speaker strikes the right note the moment it is removed from its box. It is beautifully made and finished and looks right.

The unit was tested in a corner enclosure of approximately 1½ cu. ft. with the interior heavily lined with carpet felt and a vent of 1½in. wide across the front at the bottom. The bass radiated with this enclosure was smooth and at an ideal level to give balance with the extended top response.

The music signals and tone bursts confirmed that the speaker is free from any obvious discolouration.

Summary.—We agree entirely with the view of Gilbert Briggs expressed to us as "his humble opinion", that the Super 8/RS/DD unit is easily the best 8in. model Wharfedale has ever produced. A stereo pair in small enclosures gives sound quality that will come as a revelation to any listeners wedded to massive enclosures, this can easily be matched to 2–5 ohms with the W.MT1.



Impedance 10/15 ohms.

CERAMIC MAGNET. Flux density 14,500 Oersteds.

Total flux: 60,000 maxwells.

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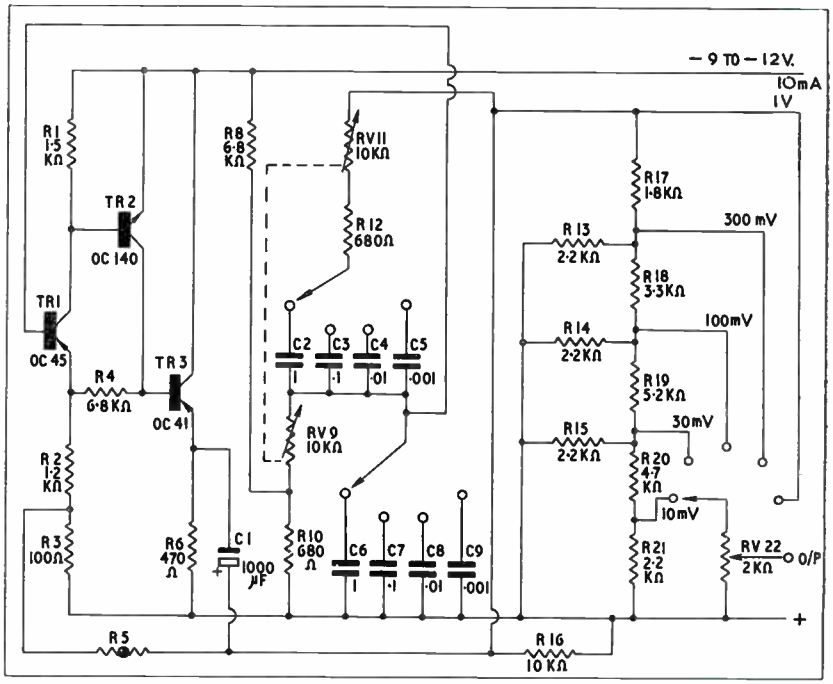
CITY & ESSEX TAPE RECORDER CENTRES

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

TAPE RECORDER WORKBENCH

No. 43 AUDIO OSCILLATOR

By A. Bartlett Still



IN the November 1962 issue of *The Tape Recorder* I described an A.C. millivoltmeter that I have been using for several years. In order to use such an instrument to its fullest effect as a piece of test gear, particularly in respect of tape recorders, a second unit is needed. This second unit is an audio oscillator, again the one I have been using for a considerable time was home made.

Recently, however, I have been using a transistorised unit that I built up on a piece of Veroboard, and I have found it to be entirely up to the standards required for the amateur. As I have tried to explain before, while it is desirable to have test equipment of a very high standard, the home enthusiast can be happy with less, provided it is reliable.

Three Transistors

The circuit I give is basically a Mullard design and they have kindly given me permission to publish my version of it. The original can be found in the "Mullard Reference Manual of Transistor Circuits". The minor variations that I have introduced are designed to make the unit more adaptable to tape recorder testing and servicing, I am confident they do not detract from the performance.

The basic oscillator is a three-transistor Wien-network unit. It incorporates a thermistor to control the amplitude of the output signal in spite of changes in supply voltage. A battery voltage of between 9 and 12V is suitable, in fact, the change of output amplitude or frequency over this range is only about 1 per cent. The drain on the batteries is around 10 mA.

15 c/s to 24 Kc/s

The three transistors are all different types, though all from the Mullard range, and they should be readily obtainable. It must be noted that TR2, an OC140, is an n-p-n transistor and is therefore connected with its emitter to the negative supply line. If attention is paid to the circuit diagram, realising that the connections to TR2 are opposite to the other two, no difficulty should be encountered. In order to achieve a frequency response high enough to check the bias frequency on tape recorders, I have used an OC41 for TR3. If the oscillator is only required for work at audio frequencies, the fourth position may be left off the switch and TR3 changed to an OC72 or OC84.

With the bridge components shown, my unit covers four octaves on each of the first three bands, i.e.:

15 c/s to 240 c/s; 150 c/s to 2,400 c/s; 1.5 Kc/s to 24 Kc/s

On the top band, which it will be seen is not required for normal signal checks, the calibration remains good up to about half scale, 120 Kc/s. Thereafter it seems that some capacity shunting takes place, because the top frequency reached is only about 180 Kc/s, and not the designed 240 Kc/s.

A Reasonable Compromise

A double-gang potentiometer is used, and if this is obtained with a "semi-log" law, the scale become practically linear by octaves, which is a reasonable compromise. A compromise also is the output attenuator, which is designed as a simple means of reducing the signal. It is not intended to be an accurate device since, for one thing, the output voltage will be affected by the connection of any load resistance of less than about 5 Kohms.

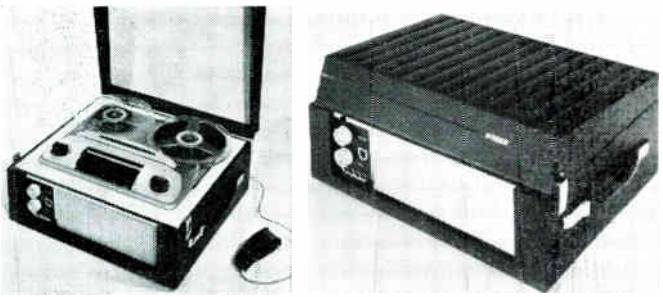
Next Month

Next month I shall try to give some hints on building a similar oscillator, with some details of components that are the most suitable. I believe that, particularly for those who do not have any form of audio oscillator at the moment, this transistorised unit would be well worth the time and trouble that might be involved in collecting the necessary bits and pieces and making them up. Incidentally, let me make it quite plain that, although the original circuit is Mullard's, the responsibility for the changes I have made is entirely mine.

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.*



WYNDSOR RECORDING CO. LTD., announce a new tape recorder in the medium-price range. It will be known as the "Trident". Three speeds are utilised 7½, 3¾ and 1⅞ i/s. Two track heads are fitted, and the deck will take 7 in. spools.

The frequency response claimed is 50-15,000 c/s (7½), 50-9,000 c/s (3¾), and 50-7,000 c/s (1⅞). The output is 4 watts. Facilities available include superimposing, tone control, pause control, monitoring and digital counter. Inputs for microphone and radio are provided together with outputs for extension loudspeaker and headphones. The dimensions of the machine are 14½ x 15½ x 7¾ in. Weight 27 lb. The machine is supplied complete with microphone and tape for £36 15s. **Manufacturers: Wyndsor Recording Co. Ltd., 2 Bellevue Road, Friern Barnet, London, N.11.**

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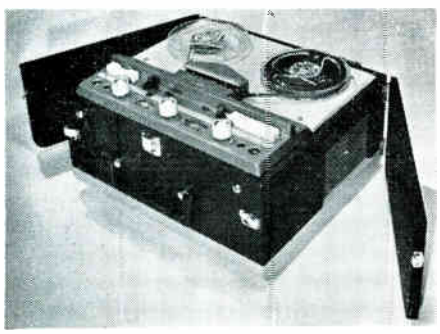

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NICODER MODEL 551 FOUR-TRACK STEREO RECORDER

★

IMPORTED by **Finex (Overseas) Ltd., 7 West End Lane, Kilburn Bridge, London, N.W.6,** and retailing in this country for £92 8s., the Nicoder portable stereo recorder originates in Japan. The price includes microphones (2), tape and recording leads. A four-track tape system is used and the tape speeds are 7½ and 3¾ i/s, giving a claimed frequency response of 50-14,000 c/s at 7½ i/s. The figures for 3¾ i/s are not supplied. The wow and flutter figure is 0.3 per cent. at the highest speed with the signal to noise ratio of 45 dB per channel. Cross talk separation is better than 50 dB. Output is 5 watts per channel.

Other features include separate bass and treble controls, tape counter, two 6 x 4 in. speakers, automatic tape lifters, two V.U. meters and all push-button controls. The weight of the Nicoder is 28 lb. and the size 14¾ x 12¼ x 7¾ in.

* * *

Planet Projects Announce a New Deck

PLANET PROJECTS LTD. have now produced the U1/15 tape deck which is identical to the U1 but operates at speeds of 15, 7½ and 3¾ i/s. Further information is available from the manufacturers **Planet Projects Ltd., Goodman Works, Belvue Road, Northolt, Middlesex.**

A Four-Channel Transistorised Mixer

A TRANSISTORISED microphone mixer that will accept four high impedance inputs is being distributed by Lee Electronics.

Standard jack sockets are provided for the inputs and the output is fed into a phono socket. The specification states Input Signal 1.5 volts, Output Signal 2.5 volts. The unit is powered by a 9 volt battery which has a life of 400 hours.

The mixer is supplied in a gold-finished case, complete with instructions and circuit diagram. The size is 6 x 3½ x 2 in. Price £3 19s. 6d. **Sole Distributors: Lee Electronics, 400 Edgware Road, Paddington, London.**

* * *

★

ULTRA MODEL 6200 FOUR-TRACK RECORDER

★

ULTRA RADIO AND TELEVISION LTD. have entered the tape recording field with the Ultra model 6200, a four-track recorder with speeds of 3¾ and 1⅞ i/s. Five easy-action piano type keys control the operation.

The frequency range at 3¾ i/s is quoted as 60-10,000 c/s with a signal to noise ratio of 40 dB. This machine will accommodate spools of up to 5¾ in. in diameter and the rewind time for 850 ft. of tape is 2½ min. Other features include pause control, super-imposition, automatic stop-foils and digital tape position indicator.

The Ultra 6200 is supplied complete with crystal microphone, one reel of standard play tape, empty spool and radio connecting lead. The price is £34 13s. **Manufacturers: Ultra Radio and Television Ltd., Television House, Eastcote, Middlesex.**

* * *

★

NEW ACOS STICK MICROPHONES

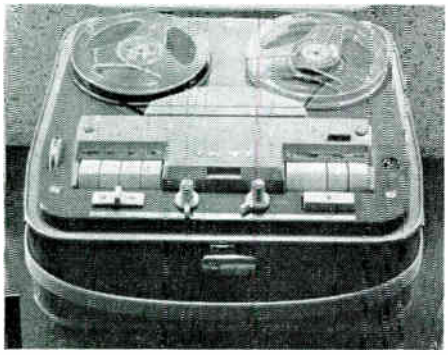
★

COSMOCORD LIMITED have recently introduced two new Acos crystal microphones. The MIC 52 which is only available to manufacturers, is a small bowl shaped microphone which may be used in the hand or stood on a desk. The MIC 52 has an output of approximately 50 dB ref IV/dyne/cm².

The MIC 60 is a new stick microphone. A new principle of construction makes possible a smooth flat frequency response extending to 10 Kc/s together with an output of approximately −55 dB ref IV/dyne/cm² which is high for a microphone of this quality. At present supplies are only sufficient to meet manufacturers' requirements.

Ceramic versions of both these microphones will be available at a later date. **Manufacturers Cosmocord Limited, Eleanor Cross Road, Waltham Cross, Herts.**

EQUIPMENT REVIEWED



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GRUNDIG
TK41
TWO-TRACK
RECORDER

★

Manufacturer's Specification: Mains voltage: 50 cycles A.C. only, 110, 200, 220, 240 volts. **Power consumption:** 70 watts (approx.). **Fuses:** 160 mA H.T., 800 mA Mains 110 V., 400 mA Mains 200-240 V. **Valves:** EF86, ECC81, ECC83, ELL80, EL95, EM84. **Maximum spool size:** 7 in. lid removed, 5¾ in. under lid. **Tape speeds:** 7½ i/s, 3¾ i/s and 1⅞ i/s. **Running time:** Grundig 1,700 ft. double-play tape TDP8 or equivalent, 1½ hr. at 7½ i/s, 3 hr. at 3¾ i/s and 6 hr. at 1⅞ i/s. **Rewind time:** 1,700 ft. D.P. tape, fast forward 3 min. 40 sec. (approx.). **Fast rewind:** 2 min. 40 sec. (approx.). **Wow and flutter:** maximum ±0.1 per cent. at 7½ i/s, ±0.12 per cent. at 3¾ i/s, ±0.2 per cent. at 1⅞ i/s. **Input sensitivities:** microphone, 2 mV/1.5 megs, diode input, 2 mV/33 K. Pickup input, 100 mV/1 meg. Telephone adaptor, depending on telephone impedance. **Output power:** 7 watts push pull. **High impedance output:** 700 mV/15 K. at 7½ and 3¾ i/s, 470 mV/15 K. at 1⅞ i/s. **Loudspeaker:** 6 in. x 4 in. elliptical with ceramic magnet. **Hum and noise level:** From high impedance output, 3 mV. From low impedance output, 100 mV. **Weight:** 28½ lb. (approx.). **Dimensions:** 16½ x 15 x 15⅝ in. **Price:** including microphone: £78 15s. **Manufacturers: Grundig (Great Britain) Ltd., Newlands Park, Sydenham, London, S.E.26.**

I HAVE had occasion recently to complain about the low quality output stages fitted to most West German recorders. Indeed, I see that I closed my review of the Grundig TK40 in the July 1962 issue of this magazine by saying "my only criticism of this recorder concerns the very inadequate output stage provided". This criticism has been handsomely met in the TK41 by the provision of a well designed 7 watt push pull output stage with a comprehensive bass and treble tone controls.

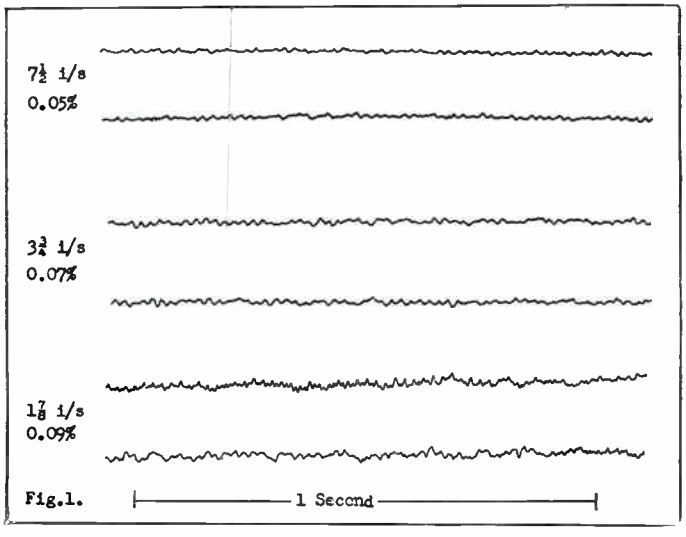

Fig.1.

Most of the other features of the TK40 have been retained with the exception of the external head outlets the microphone input socket now replaces these on the right-hand side of the control keys.

The push button reset of the tape position counter and the fold-away tape cleaner are still fitted, but the mixing facility has been removed to make room for the bass and treble tone controls. There are, however, so many points of similarity between the two recorders that I suggest you read this review in conjunction with the one mentioned above for the TK40. The very close matching of the wow and flutter pen recordings, and the almost identical response curves show that production control is of a very high order and that the test figures obtained in these reviews are likely to be duplicated on each and every machine sold.

Speed Wow and Flutter

The tape speeds were carefully checked and were again found to be within plus or minus 0.5 per cent. of the nominal speeds. The *r.m.s.* combined wow and flutter figures were all below 0.1 per cent., even at the lowest speed of 1⅞ i/s. **Fig. 1** shows the actual pen recordings. There is a very slight trace of 4 c/s

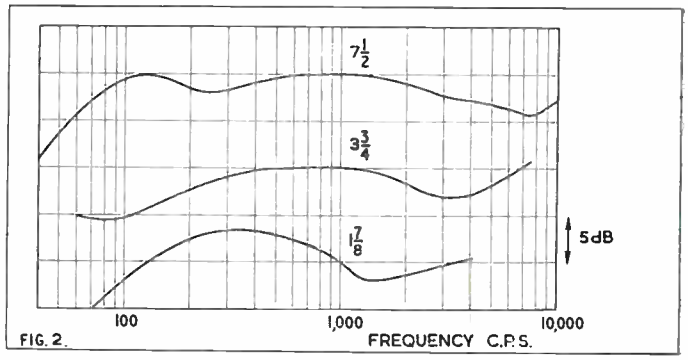

FIG. 2.

capstan wow at the lowest speed, but this was the worst performance which could be coaxed from the machine by careful phasing of the recorded and replay cyclical speed variations. One of the most impressive features of this recorder was the rock-steady flutter bridge meter reading which was repeated time after time as the machine was stopped and started. This shows that tape slip is negligible and that all cyclical speed variations are kept to a very low level so that cumulative build up of any single component is completely negligible.

High frequency flutter due to tape friction effects is remarkably low due to the high surface finish of the heads and tape and the use of the "pressure sling" in place of the usual pressure pads.

Play Only Responses

One hundred, 200 and 400 microsecond test tapes were played and the responses measured at the high impedance line output of the recorder. **Fig. 2** shows the identical head contour effects noted in the previous review, and the trend towards a 5 dB step in the high frequency responses confirms that the recording characteristics are very close to the N.A.R.T.B. standards of 50, 100 and 200 microseconds for the three speeds of 7½, 3¾ and 1⅞ i/s.

The range of bass and treble tone control provided in the power amplifier allows good reproduction of tapes recorded to the British and Continental C.C.I.R. recording characteristic, but the line output is not affected by the tone controls and bass and treble lift must be provided in the external power amplifier for adequate reproduction of such tapes.

Fig. 3 shows the overall responses obtained by feeding oscillator tones to the Pickup input on record and measuring the high-imped-

ance line output on replay. The extra N.A.R.T.B. recording pre-emphasis lifts the high note response and a little bass lift is used in recording to compensate the bass loss shown in **fig. 2** due to the short pole face length of the R/P head used in this recorder.

Peak recording level, as indicated by clashing of the magic eye beams, was only 6-7 dB above test tape level and waveform distortion was evident if the signal was turned up beyond this level. This could indicate either lower than optimum bias to ensure a very wide recorded frequency response, or overload of the recording amplifier. There was some evidence that amplifier overload was the main offender but this could have been aggravated by lack of sensitivity due to low bias.

Signal Noise Ratio

Combined mains hum tape and system noise was 45 dB below test tape level; with overload 6 dB above test tape level this gives a total dynamic range of 51 dB. This was confirmed by recording 500 c/s with the magic eye beams just meeting and then erasing with the gain control at zero. The ratio was 330 to 1 which is better than 50 dB. Tape erased on the machine was within 1 dB of bulk erased tape which shows that the bias waveform is good and free of second harmonic distortion.

Overall Acoustic Response

Twenty-five one-third octave bands of filtered white noise were recorded and the sound output of the loudspeaker measured on axis by means of a calibrated microphone. It was found that the most level acoustic response was obtained with maximum

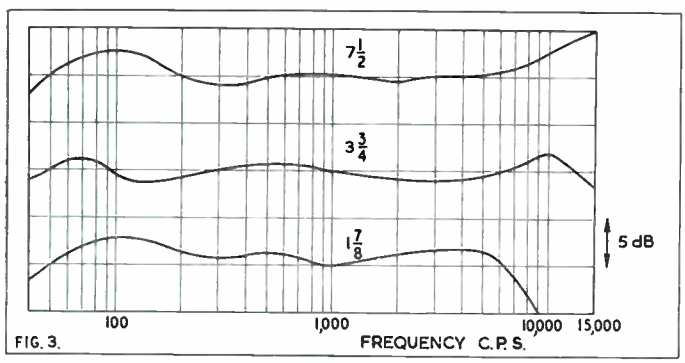

FIG. 3.

bass and treble lift. This response is shown by the solid curve of **fig. 4.** The dotted curve was obtained with maximum bass and treble cut.

External Speaker

Before listening critically to a wide range external speaker, the output socket was loaded with a heavy duty 6 ohm resistor and the tone controls set for the most level response from the earlier pure tone recordings. The optimum settings were found to be about 6 on the bass control knob with the high note control lever set to the half-way position. The range of control from these settings was found to be approximately plus and minus 12 dB at 10 Kc/s and 60 c/s. In other words, the bass lift is compressed into the last two divisions of the bass control but the treble lift and cut are roughly symmetrical about the centre setting of the control.

A wide variety of pre-recorded tapes together with home recordings from a number of other two-track recorders were played into a Tannoy 15 in. coaxial speaker in a 9 cubic ft. enclosure, and in every case a satisfactory tonal balance could be obtained by judicious setting of the tone controls.

Comment

This machine answers all my criticisms about inadequate power output stage. The 6-7 watts is more than sufficient for normal domestic requirements, and the heavy negative feedback makes it insensitive to changes of speaker impedance or load. The tone controls are a great improvement on the normal top cut control and provide maximum lift or cut near the extremes (top and

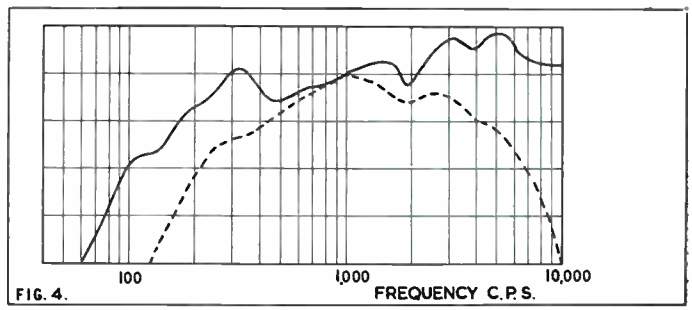

FIG. 4.

bottom octaves) of the frequency range. Tape control and motion is nearly perfect and the tape is handled gently at all times.

I did notice that the best pre-recorded tapes, and tapes recorded on semi-professional machines, sounded just that little bit cleaner than the machine's own recordings. This confirms that the designers have chosen a very wide frequency response (with whiskers) rather than the clean shaven but slightly less extended response which can be obtained from an adequately biased recorder. I notice that the bias pre-set has been placed under the head dress cover in an easily accessible position so that the bias can be altered if desired. Can it be that this is the first signs of a revolt of the technicians against the advertising copy writers?

I would hate to encourage indiscriminate twiddling of pre-set controls, but I think this is a case where the customer should be allowed to suit himself, or rather his own ear. A quarter turn of the screw in a clockwise direction is the very maximum that should be attempted without adequate test gear, but I think purchasers will find it worth trying.

In the same way, the single screw azimuth setting for the R/P head is a great convenience when playing old tapes which may have been recorded off azimuth. But please note the original setting and do not turn it more than a quarter turn in either direction!

A. Tutchings

* * *

★

ILFOTAPE LONG-PLAY MAGNETIC TAPE

★

THE sample submitted for test was a 900 ft. 5 in. spool. It was fitted with a green leader and pale blue trailer and stop foils at beginning and end of the tape. The polystyrene spool carries numbers to identify the tracks and a recessed semicircular indentation to take a pressure adhesive sticker for notes on the recording. The usual radial slot is fitted to make the threading of the tape easy. One spoke of the reel on each side carries a graduated scale numbered from 1 to 10 for programme location.

Drop Out Test

A section of the tape, about half way through the reel, was recorded at 7½ i/s with a 10 Kc/s tone on each track for a period of about one minute. This signal was then replayed into a sensitive pen recorder

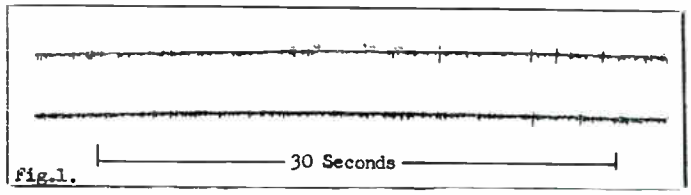

Fig.1.

(*Continued on page* 33)

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EQUIPMENT REVIEWED — *continued*

so that sensitivity changes along the length of the tape could be measured, and rapid changes of signal level known as " drop outs " recorded. **Fig 1** shows the pen trace.

To put new readers into the picture it should be pointed out that tapes so far tested give traces which vary from a straight line with just discernible " ticks ", due to occasional and very small drop outs, to a continuous " grass " with spikes extending downwards about ¼ in.

The " grass " amplitude on this sample is low and the number of drop outs small, but the presence of any " grass " at all indicates that there is a very slight roughness which may not necessarily be surface roughness at all; it may be an oxide particle size effect, or a roughness of the PVC base, or a surface dust, or scratching due to the polishing process.

Sensitivity and Frequency Response Test

A frequency run from 100 c/s to 10,000 c/s was recorded at a " standard " signal current and bias voltage. These " standard " test conditions have been carefully selected after tests on a very large number of tape samples. In the case of any violent deviation from a

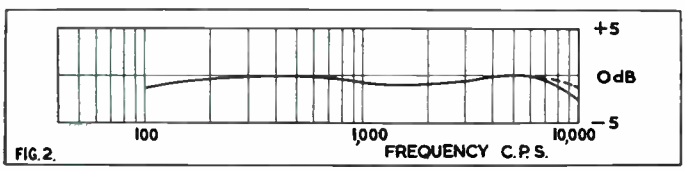


FIG.2.

level frequency response or standard playback level, the bias is varied to see if matters can be improved and the bias change noted and mentioned in the review. In this sample the bias proved to be optimum, and the playback level was only 1 dB below standard **Fig. 1.**

There is some evidence of " directional effect " where the extreme high note response is dependent on the direction of tape travel. The solid curve is for track one and the dotted curve for track two. The frequency response is within plus or minus 1 dB of the mean, which shows that the magnetic characteristics and thickness of the oxide are normal.

Comment

As I have said before in previous tape reviews a good tape should be compatible with other good quality tapes. If one sounds noticeably different from the others it must be an " odd man out " which needs different bias or equalisation to bring it back in line. All modern tapes are so nearly alike in sensitivity, frequency response and bias requirements that they may be intercut one with the other with no more variation in sound quality than will be found in different batches of the same make of tape. Ilfotape conforms to the mean, and it is no disgrace to say that " it is a good average recording tape ".

* * *

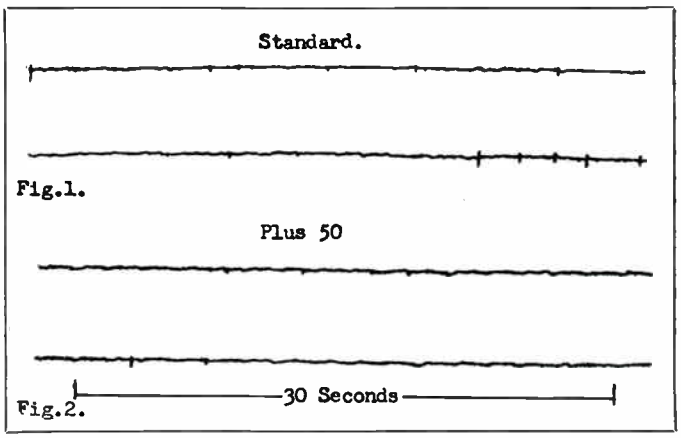
SOUNDCRAFT STANDARD AND PLUS 50 TAPE

TWO samples of American Soundcraft tape were submitted for review. The Standard play is on a 1·5 mil acetate base, and the Plus 50 has a 1 mil. mylar base. The oxide thickness in each case is nominally ½ mil.

Figs. 1 and 2 show the drop out charts for these two tapes on a 10 Kc/s 7½ i/s half track recording. It will be seen that the pen recordings are remarkably smooth, indicating a high surface finish and very fine grain size. Drop outs are slightly more frequent on the thicker acetate base due to the difficulty of maintaining perfect contact with the head poles.

Close Contact With the Head

The thinner mylar base allows the oxide to " hug " the head surface so that if a dust or other particle comes along it only lifts its own little local area from the head surface and does not jump the whole tape away as with the stiffer base. For this reason drop outs show up less frequently on E.P. and D.P. tapes. There is a very slight cyclical change of level about once every two seconds. This could be a slight unevenness in the base, or a change in oxide thickness due to an uneven or dirty roller in the coating plant, but unless we are looking at the signal by meter or C.R.C. we need not worry; such a very small



change in level would not be audible under the most critical listening conditions.

The frequency responses shown in **Fig. 3** are well within normal limits under standard bias and signal test conditions. Both tapes show the usual short wavelength directional effect; solid curves are for track 1 and the dotted curves for track 2. The slight fall in high note response on the standard play tape is quite usual, and is another symptom of spacing loss caused by the thicker stiffer acetate base.

The Americans do not seem to favour the slotted reel cheek; both these samples have only the usual hub anchorage point. A matt surface label rectangle is provided on each side of the reel for title, reel number, date, etc.

As usual, these tapes were used on a variety of recorders and track configurations and I was most impressed by the very steady signal

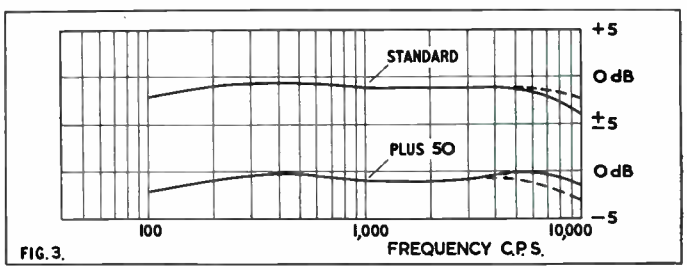


FIG.3.

obtained, even from the edge tracks of slow speed four track recordings. I ran one short section of each tape backwards and forwards twenty or thirty times to simulate normal wear and tear and then listened critically to a fresh recording; an occasional drop out could be heard but at no time was the flow of the programme disturbed to an extent which would be noticed on casual listening. **A. Tutchings.**

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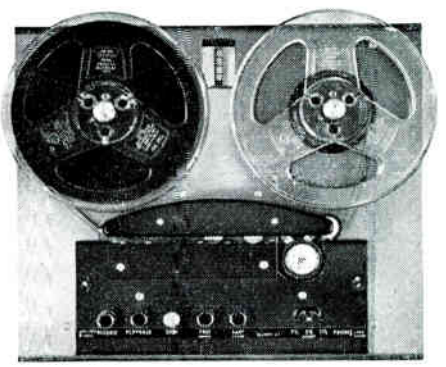

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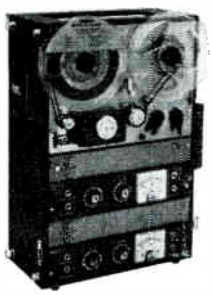

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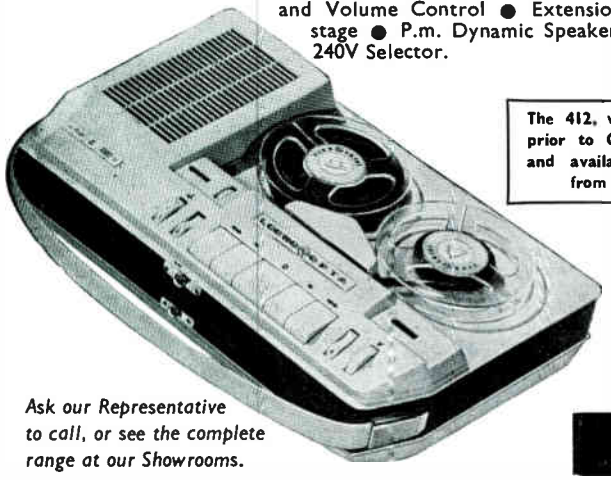

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(*Continued on page* 42)

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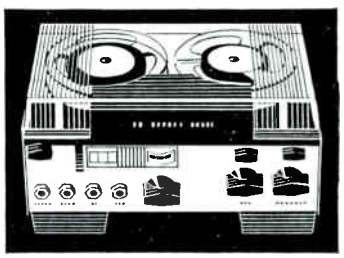

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