

AUGUST 1967

TAPE

RECORDING MAGAZINE

2¹/₂

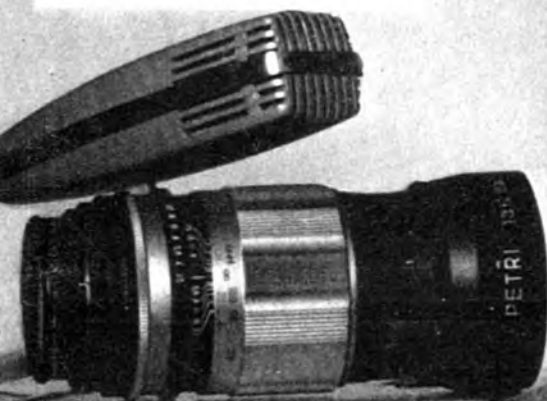
INSIDE

SOUND and VISION

"Talkies"—The Truth
Sound Tracks
for
Colour Slides

TEST BENCH
MUSIC REVIEWS
NEW PRODUCTS
ETC., ETC.

*Second class postage paid at
New York Post Office, N.Y.*



THE MANY MOODS OF



THE GREATEST RECORDING ORGANISATION IN THE WORLD

MUSIC CASSETTES

Manfred Mann

Instrumentally Great

H.M.V. TC-CSD3594

Russ Conway

Concerto For Dreamers

Columbia TC-SCX3435

Zoot Money

Zoot

Columbia TC-SCX6075

Matt Monro

Love Is The Same
Anywhere

Parlophone TC-PCS3020

E.M.I. RECORDS (THE GRAMOPHONE CO. LTD.) E.M.I. HOUSE, 20 MANCHESTER SQUARE, LONDON W.1

How does a 10½" reel playing at 3¾ ips giving 18,000 cps and 20 watts per channel, yet costing only 185 gns., sound to you?



Mighty like Akai X 300 with our unique Crossfield Head

The Akai X 300 is a 4-track stereo/mono studio-type tape recorder. It has 4 heads—erase, record, playback/monitor, and Crossfield; and 3 motors—one hysteresis synchronous direct drive capstan, two torque for fast forward and rewind. It has two speeds—3¾ ips which will give you 30 to 18,000 cps \pm 3db; and 7½ ips which will give you 30 to 24,000 cps \pm 3db. The X 300 also has Akai's unique Crossfield Head. On conventional recording heads the bias current tends to erase the higher frequencies. On the Akai Crossfield, however, the bias current is fed into a separate head opposite the recording head in such a way that it can't interfere with the higher frequencies. This makes possible true high fidelity recording at much slower tape speeds than normal. Add to these features—piano key controls, tape

cleaner, sound over sound, 10½" reel space, automatic stop and shut off, 4 digit index counter with reset button, vertical or horizontal operation. And all Akai stereo tape recorders are already biased to receive FM Multiplex Stereo broadcasts. So we hope you'll agree that the Akai X 300 gives you quite a lot of equipment for 185 gns.

To: Pullin Photographic Ltd.
(Dept. TRM.11)
11, Aintree Road, Perivale, Middlesex.
Please send me details of the Akai X 300.

Name _____
Address _____

AKAI
PULLIN
PHOTOGRAPHIC

(A Company within The Rank Organisation)

whatever the make....



AKAI 1710 4-Track Stereo. 3 speeds $1\frac{1}{2}$, $3\frac{1}{2}$ and $7\frac{1}{2}$ (15 i.p.s. optional extra). F.M. Multiplex ready. Two built-in speakers. Automatic shut-off. Horizontal or vertical use. Demonstration tape included. **79 Gns.** Deposit £27 13s. 0d. and 12 monthly payments of £4 14s. 2d.

AKAI M8 4-Track Stereo, 4 speeds $1\frac{1}{2}$, $3\frac{1}{2}$, $7\frac{1}{2}$ and 15 i.p.s. Three heads including Cross-field. Two speed Hysteresis Synchronous motor. Sound on Sound. Biased for F.M. Multiplex. Two speakers. Tape Cleaner. Four digital counter with reset. Vertical or horizontal use **125 Gns.** Deposit £44 5s. 0d. 12 monthly payments of £7 5s. 0d.



★ **INTEREST-FREE H.P. TERMS**

Open Saturday 6 p.m. Friday 6.30 p.m. If unable to call write for brochures.

★	Deposit		12 Monthly Payments		Cash Price
	£	s. d.	£	s. d.	Gns.
MAINS 4-TRACK					
Telefunken 201	11	18 0	1	19 8	34
Ferguson 3222	12	5 0	2	0 10	35
Grundig TK140	13	6 0	2	4 4	38
Philips EL3558	14	14 0	2	9 0	42
Ferguson 3224	15	8 0	2	11 4	44
Wyndor Vanguard	20	13 0	3	8 10	59
Philips EL3556	21	14 0	3	12 4	62

★	Deposit		12 Monthly Payments		Cash Price
	£	s. d.	£	s. d.	Gns.
MAINS 2-TRACK					
Ferguson 3220	8	15 0	1	9 2	25
Grundig TK120	10	6 6	1	14 5	29½
Tandberg 823	18	18 0	3	3 0	54
Brenell Mk. 5/3	25	18 0	4	6 4	74
Brenell Mk. 5/3 'M'	32	11 0	5	8 6	93
Ferrograph 631	33	5 0	5	10 10	95
Ferrograph 633 Connoisseur	42	0 0	7	0 0	120

★	Deposit		12 Monthly Payments		Cash Price
	£	s. d.	£	s. d.	Gns.
STEREO MONO					
Philips EL3312	16	16 0	2	16 0	48
Sony TC250A	19	19 0	3	6 6	57
Philips EL3555	26	5 0	4	7 6	75
Akai 1710	27	13 0	4	12 2	79
Sony TC260	33	19 0	5	13 2	97
Tandberg Series 12	36	15 0	6	2 6	105
Truvox PD104	36	15 0	6	2 6	105
Beocord 1500	36	15 0	6	2 6	105
Beocord 2000K De Luxe	43	15 0	7	5 10	125
Revox 736	44	9 0	7	8 2	127
Beocord 2000T De Luxe	45	3 0	7	10 6	129
Akai X-300	65	5 0	10	15 0	185
Akai X-355	83	6 4	13	17 9	239

★	Deposit		12 Monthly Payments		Cash Price
	£	s. d.	£	s. d.	Gns.
BATTERY					
Philips EL3302	9	9 0	1	11 6	27
Telefunken 301 4-Y	18	18 0	3	3 0	54
Akai X-4 Stereo	34	13 0	5	15 6	99
Uher 4000L	36	1 0	6	0 2	103

PART EXCHANGES

THE RECORDER CO
 (DEPT. T) 186-188 WEST END LANE, WEST HAMPSTEAD, LONDON, NW6
 Telephone: SW1 4977



FOR PERFECTION IN SOUND

LOEWE OPTA

INTRODUCE THE NEW OPTACORD 450 BATTERY/MAINS

CASSETTE LOADING TAPE RECORDER for 39 GNS.

OPTACORD 450 THE UNIVERSAL TAPE RECORDER FOR BATTERY/MAINS OPERATION (Power-pack incorporated)

- New compact-magazine-system bans tape threading (Philips type).
- Unlimited reproduction possibilities with self-made recordings or commercially available pre-recorded tapes.
- Ready for recordings per microphone supplied with the set, as well as from the radio-receiver, record player or any other tape recorder.

Other features include:

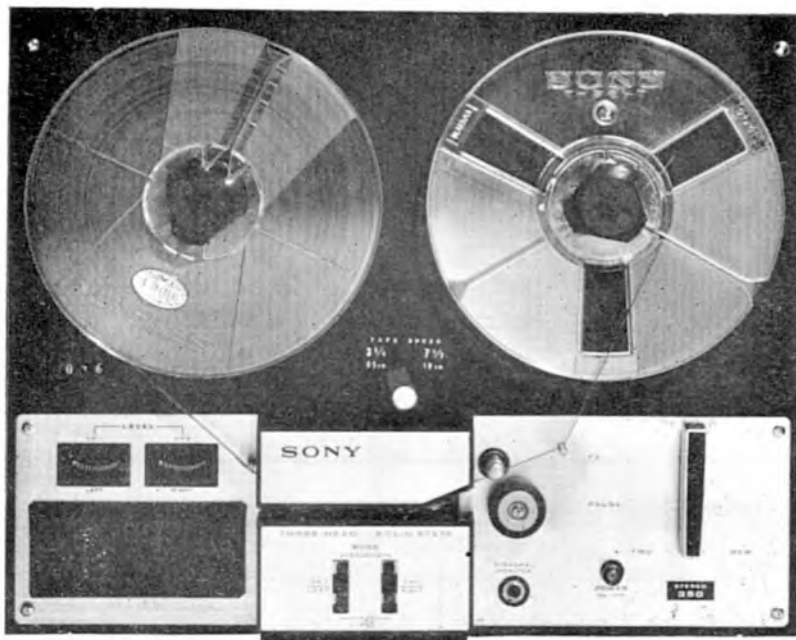
Further to operation on batteries (5 monocells 1.5v each) or on mains (110/220 v a.c.) connection to car battery (6 or 12 V) also possible. Playing time with compact-magazine C 60 = 2 x 30 mins. with compact magazine C 90 = 2 x 45 mins. Monitoring via built-in loudspeaker, external speaker or headphone: Frequency response 50-8000 c/s; Contrast = 40dB.

Write for illustrated leaflet and further details to:



HIGHGATE ACOUSTICS

71/3 Gt. Portland Street, London, W.1.
MUSEum 2901/5



SONY research makes the difference

MODEL TC350 - FEATURES

4 track stereophonic and monophonic recording and playback Precision solid state circuitry comprising independent recording amplifiers and playback preamplifiers Professional 3 head system Sound on sound recording Language/music training facilities Vertical and horizontal operation All idler beltless tape driving mechanism Two tape speeds (7½ and 3¾ ips) 7" reel capacity automatic shut-off switch head-set monitor jack pause control digital tape index counter two VU meters integrated record/playback connector

SPECIFICATIONS:

Power requirements: 50W, 100, 110, 117, 125, 220, 240V, 50/60 c/s AC.

Reel: 7" or smaller.

Tape speed: 7½ and 3¾ ips. with automatic equalization change.

Recording system: 4-track stereophonic or monophonic.

Frequency response: 30-20,000 c/s at 7½ ips. ± 3 db 50-15,000 c/s at 7½ ips. 30-14,000 c/s at 3¾ ips.

Signal-to-noise ratio: Better than 50 db.
Wow and flutter: Less than 0.17% RMS at 7½ ips. Less than 0.25% RMS at 3¾ ips.

Harmonic distortion: Less than 3% at 0 db line output.

Level indication: Two VU meters.

Record: NAB standard.

Playback: calibrated to 0 db line output.

Recording time:

4-track stereo 4-track monophonic
1,200' tape 7½ ips. 1 hr. 2 hrs.
3¾ ips. 2 hrs. 4 hrs.
1,800' tape 7½ ips. 1½ hrs. 3 hrs.
3¾ ips. 3 hrs. 6 hrs.

Fast forward and rewind time:

Within 4 min. (1,200' tape).

Input: Microphone

Sensitivity: - 72 db (0.19mV)

Impedance: low (will accommodate any microphone from 250-1K ohm impedance).

Auxiliary

Sensitivity: - 22 db (0.06 V).

Impedance: approx. 100K ohms.

Integrated record/playback connector.

Sensitivity: - 42 db (6.15 mV).

Impedance: approx. 100K ohms.

Output:

Line

Output level: 0 db (0.775V).

Impedance: optimum load impedance 100K ohms.

Binaural monitor

Output level: - 1 db (0.692V).

Impedance: accommodates 10K ohm head-set.

Integrated record/playback connector
Output level: 0 db (0.775V).

Impedance: optimum load impedance 500K ohms.

Head: Recording RP 30-2902.

Playback PP 30-4202N.

Erase EF 18-2902H.

Transistor: 2SC402 x 18, 2SB381 x 2, 2SC291 x 1.

Diode: 1T22A x 2, 5G-D x 2.

Dimensions: 15¾ (W) x 6⅞ (H) x 13" (D).

Weight: Approx. 17 lbs. 3 ozs.

Accessories: Empty 7" reel. Connection cord. Capstan. Pinch roller. Reel cap.

Recommended retail price **75 Gns.**

Sony offer the finest range of tape recorders from the battery portable TC 900 to the studio quality 777.

For further details see your Sony dealer or write to:

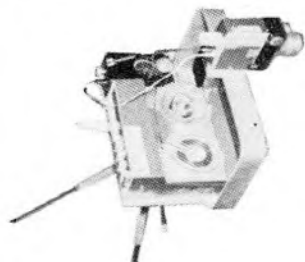
Sony U.K. Sales Division,
Eastbrook Road, Gloucester.
Tel: Gloucester 21591.

London Showrooms:
70-71 Welbeck Street, London, W.1.
Tel: HUNter 2143

SONY®
RESEARCH MAKES THE DIFFERENCE

For Factory, School, or Home, SYNCHRODEK, MINI-DEK and SYNCHROSLIDE are the three words for your SYNCHRONISATION problems.

The MINI-DEK will allow you to film in lip-sync. with most battery operated cameras.

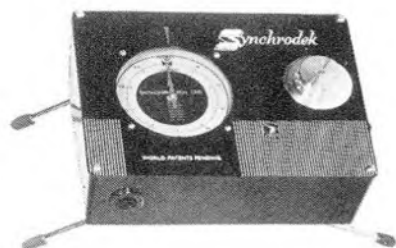


15 gns.

Camera Tripod CRADLE available at £35.0d. to house MINI-DEK, portable TAPE-RECORDER & CAMERA.

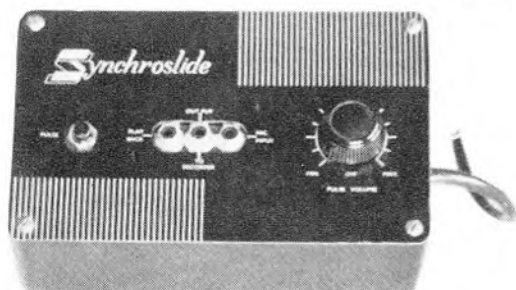
The Synchrodek will enable the film to be played back in synchronisation with any silent Projector and is indispensable for transfer of tape to a Sound Magnetic stripe Projector

19 gns.



The Synchroslide will enable a sound commentary to be synchronised to any slide show or automatic stripe projector. Indispensable for lecturing, demonstrations, etc.

14 gns.



Write to

SYNCHRODEK (1964) LTD.

ROCHDALE ROAD, BRACKNELL, BERKS.

for full details of the above products

UP TO
50%
OFF!

FANTASTIC SAVINGS

We have a fantastic selection of tape recorders, new, shopsoiled and secondhand showing savings on the manufacturers' list price of up to 50%. Our quoted prices are absolutely unbeatable, so why not call at any of our showrooms and see the fantastic savings that we, as Britain's largest tape recorder specialists company, are able to offer you by virtue of our ability to purchase large quantities and pass the savings thus obtained on to you! (Personal Callers only.)

- UNBEATABLE NO-INTEREST TERMS
- OVER 100 MODELS ON DISPLAY
- EXPERT STAFF EXPERT ADVICE
- GENEROUS PART EXCHANGES
- SAVINGS OF UP TO 50%

THIS MONTH'S BARGAINS

PHILIPS EL4306—Latest 1967 4 track 2 speed model. List £44 2 0. Brand new, boxed.....	OUR PRICE	36gns.
SABA TK230—Superb 4 track 3 speed stereo model. Absolutely as new. List £100.....	OUR PRICE	45gns.
AKAI M8—Stereo. One only S.S. Latest 1967 Model. List £146.....	OUR PRICE	99gns.
WYNDSOR INTERNATIONAL—Superb 4 track 3 speed model. 10 watts output. Absolutely perfect condition. List £78.....	OUR PRICE	32gns.
AKAI I710—Latest 4 track stereo. One only S.S. List £83.....	OUR PRICE	64gns.
B. & O. 2000—2 track suitcase. Stereo. Absolutely as new. List £129.....	OUR PRICE	79gns.
AKAI X4—4 track stereo battery mains portable. List £143. Two only. Brand new (Brown model).....	OUR PRICE	79gns.
PHILIPS TYPE—Cassette battery mains portable. Brand new. List 27 gns. Few only.....	OUR PRICE	21gns.
PHILIPS EL4305—Latest 1967 model. List £37 16 0. Brand new, boxed. Few only.....	OUR PRICE	29gns.
GRUNDIG TK45—4 track stereo. Perfect condition. 1 only. List £112.....	OUR PRICE	59gns.
PHILIPS EL3536—4 track mono stereo. Perfect condition. Original list £97.....	OUR PRICE	42gns.
UHER 4000S.—Superb 4 track. Battery mains portable. List £104. 1 only.....	OUR PRICE	59gns.
TELEFUNKEN 85KL—De luxe. Superb 2 track model. Brand new. List £95.....	OUR PRICE	59gns.
TANDBERG 64—4 track 3 speed tape deck. As new. List £115. One only.....	OUR PRICE	69gns.

PERSONAL CALLERS ONLY

HURRY WHILE STILL AVAILABLE !

NoSound
TAPE RECORDER CENTRES

82 High HOLBORN, W.C.1 (200 yards Kingsway)	CHAncery 7401
228 BISHOPSGATE, E.C.2 (opposite Liverpool St. Station)	BIShopsgate 2609
36 LEWISHAM HIGH STREET, LEWISHAM, S.E.13	LEE Green 2399
242 4 PENTONVILLE ROAD, N.1 (200 yards Kings Cross)	TERminus 8200
2 MARYLAND STATION, STRATFORD, E.15	MARyland 5879

QUALITY

the simple, single aim

behind the manufacture of these and every UHER Tape Recorder. The production of tape recorders for every amateur and professional need is the sole pre-occupation of the UHER Company, whose specialisation has led to many outstanding developments, including the first application of printed-circuit techniques in tape recorder manufacture.



4000 Report-L

UHER



An extremely versatile battery portable that gives virtually every facility of a mains-operated recorder—with many exceptional new features. Four tape speeds provide an infinite variety of recordings. Collectorless motor. Weighs only 6 lbs. Price, including microphone and tape, 103 gns.

1000 Report Pilot

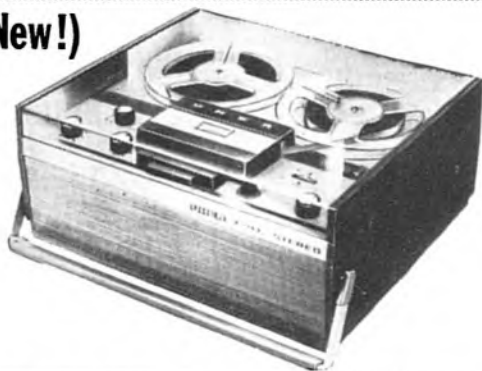
UHER



A tape recorder of the highest standard, specially manufactured for professional use. Ideal size, weight, performance and exceptional quality reception. Can be used to synchronise sound with film as well as reporting under professional conditions, on a wide range of voltages. Remote control stop/start. Full track. Collectorless motor. Automatic volume control. Price on application

724L Stereo (New!)

UHER



The latest, full stereo four track, all mains recorder, specially designed to meet the strong demand for an instrument particularly easy to understand and operate. Monophonic and stereophonic recording and playback. Suitable for use with 'hi-fi' equipment. Fully transistorised. High impedance output. Takes 7" spools. Now built in to a smart teak cabinet with a smoke-tinted perspex lid. Priced at only 75 gns.

**SEE US AT THE AUDIO FAIR—BOOTH
No. 47 IN DEMONSTRATION ROOM 122.**

BOSCH

BOSCH LIMITED. 205 Great Portland Street,
London, W1. Telephone: LANGHAM 2672-5

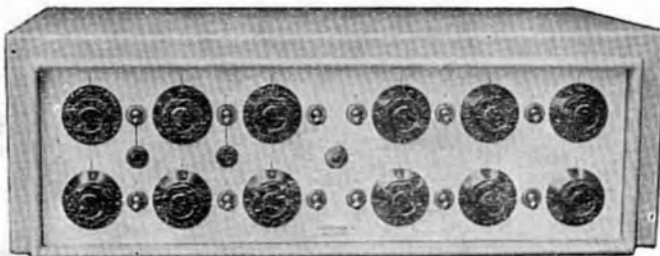
UHER

—Vortexion

12-WAY ELECTRONIC MIXER

quality equipment

The 12-way electronic mixer has facilities for mixing 12 balanced line microphones. Each of the 12 lines has its own potted metal shielded microphone transformer and input valve, each control is hermetically sealed. Muting switches are normally fitted on each channel and the unit is fed from its own metal shielded mains transformer and metal rectifier.



FOUR-WAY ELECTRONIC MIXER

This unit provides for 4 independent channels electronically mixed without "spurious break through," microphone hum and background noise have been reduced to a minimum by careful selection of components. The standard 15-50 ohm shielded transformers on each input are arranged for balanced line, and have screened primaries to prevent H.F. transfer when used on long lines.

The standard 5 valve unit only consumes 18.5 watts. H.T. is provided by a selenium rectifier fed by a low loss, low-field transformer in a screening box. The ventilated case gives negligible temperature rise with this low consumption assuring continuance of low noise figures.

20,000 ohms is the standard output impedance, but the noise pick-up on the output lines is equivalent to approximately 2,000 ohms due to the large amount of negative feedback used.

For any output impedance between 20,000 ohms and infinity half a volt output is available. Special models can be supplied for 600 ohms at equivalent voltage by an additional transformer or 1 milliwatt 600 ohms by additional transformer and valve.

The white engraved front panel permits of temporary pencil notes being made, and these may be easily erased when required. The standard input is balanced line by means of 2 point jack sockets at the front, but alternative 3 point connectors may be obtained to order at the rear.

Mixer for 200-250 V AC Mains	...	...	...	£40 8 6
Extra for 600 ohm output model	...	...	...	£1 18 6
Extra for 600 ohm 1 milliwatt output	...	...	...	£3 0 6
Size 18½ in. wide × 11½ in. front to back (excluding plugs) × 6½ in. high. Weight 22 lb.				

THREE-WAY MIXER and peak programme meter for recording and large sound installations etc.

This is similar in dimension to the 4-Way Mixer but has an output meter indicating transient peaks by means of a valve voltmeter with a 1 second time constant in its grid circuit.

The meter is calibrated in dB's, zero dB being 1 milliwatt-600 ohm (.775 V) and markings are provided for +10 dB and -26 dB. A switch is provided for checking the calibration. A valve is used for stabilising the gain of this unit. The output is 1 milliwatt on 600 ohms for zero level up to +12 dB maximum. An internal switch connects the output for balance, unbalance, or float. This output is given for input for 40 microvolts on 15 ohm.

An additional input marked "Ext. Mxr." will accept the output of the 4-Way Mixer converting the unit into a 7-Way controlled unit. This input will also accept the output of a crystal pick-up but no control of volume is available.

The standard input is balanced line by means of 3 point jack sockets at rear but alternative 2 point connectors may be obtained to order at the front or rear as desired.

The 8 valves and selenium rectifier draw a total of 25 watts.

P.P.M. for 200-250 V AC Mains	...	...	Price on application
Size 18½ in. wide × 11½ in. front to back (excluding plugs) × 6½ in. high. Weight 23 lb.			
10/15 watt Amplifier with built-in mixers.			
30/50 watt Amplifier with built-in mixers.			
2 × 5-way stereo mixers with outputs for echo chambers, etc.			

Full details and prices on request.

VORTEXION LIMITED, 257-263 The Broadway, Wimbledon, S.W.19

Telephone: LIBerty 2814 and 6242-3-4

Telegrams: "Vortexion London, S.W.19"



You wouldn't teach Music with an out-of-tune piano

(So why use anything but Ilford Zonatape on your tape recorder?)

The tape recorder is fast becoming commonplace in many schools as a teaching aid. But a lot of schools, though they are very careful about what tape recorder they buy, don't seem to bother about the *tape*. They buy just any old stuff.

One tape—Ilford Zonatape—is, however, specially made for schools and anyone else who wants an utterly reliable tape. Not only specially made, but specially *tested*.

Next time you buy tape for your recorder, buy Ilford Zonatape.

ILFORD 

Ilford Limited, Motion Pictures & Magnetic Products Division
201-203 Wardour Street, London W.1. REGent 8731

TAPE

RECORDING
MAGAZINE

Vol. 11

No. 8

August 1967

IN THIS ISSUE

Tape trends and tape talk	294
Douglas Brown	
"Techniques"—MIXERS AND MIXING	295
Denys Killick	
SOUND AND VISION	298
Laurence Graham	
TAPE AND TRANSPARENCY	299
TRM Feature	
"On the Fringe"—Abstractions	300
Denis Gilbert	
MAKING SOUND MOVIES	302
John Aldred	
Cross Talk	305
By Audios	
Glossary of tape terms	306
Harry Mack	
Test Bench—Uher Stereo-Mix 5	307
Ferrograph Defluxer	308
Rendar Safebloc	308
CASSETTE NEWS	310
MUSIC ON TAPE—	
Musicassette Reviews	310
Tape Record Reviews	312
New Products	314
Advertisement Inquiries Service	317

COVER PHOTOGRAPH: Our collection of equipment for quality Sound and Vision productions includes a Uher Stereo Royal Tape Recorder. This machine features a built-in synchroniser which will automatically trigger suitable slide projectors. As an example of a really good projector we have included the Leitz Pradovit Colour which has remote focusing facilities as well as a pulse slide change socket. The lens is a Petri 135 mm long focal length and the microphone is a Sennheiser MD 411 which may be used at low, medium or high impedance.

"TAPE Recording Magazine" is published on the third Wednesday in the month, by Print and Press Services Ltd., from Prestige House, 14/18 Holborn, London, E.C.1.

"TAPE Recording Magazine" is available by a postal subscription of 25s. per annum (U.S.A. \$3.75) including postage, or it can be obtained at newsagents, bookstalls and radio and music dealers. In the event of difficulty, write to the Publishers at Prestige House, 14/18 Holborn, London, E.C.1.

Back numbers, if still in print, are available at 2s. 6d. per copy.

Address all communications

PRESTIGE HOUSE,
14/18 HOLBORN, LONDON, E.C.1

EDITORIAL

01-242 4742

Publisher,
R. DOUGLAS BROWN

ADVERTISING

01-242 4851

Editor,
DENYS G. KILICK
Advertisement Manager, VIVIENNE GOODING

Tape trends and tape talk

By Douglas Brown

IF YOU HAVE ADOPTED an attitude in the spools v. cassettes argument and you think you know the shape of the future, I advise you to hold hard and give yourself time to think again. Perhaps some other, altogether different, system will win out in the end.

In America an engineer called Chester Newell who has many years' experience with firms like Ampex and General Electric, has devised an entirely new tape transport system which uses neither spools nor cassettes. With understandable enthusiasm, the inventor calls it "the first fundamental breakthrough since tape recording was invented."

That there is something in it is indicated by his success in making licensing arrangements with IBM, Borg-Warner and the Electronic Engineering Company for exploitation of the system in industrial and consumer equipment.

Newell's system comprises three basic rotating parts: a large centre capstan (rather like that on a VTR), with feed and take-up hubs for the tape positioned on either side of it. The tape held on these hubs is held in contact with the capstan and travels between one hub and the other in constant contact with the capstan.

Because it at no point "rides free," it is claimed that wow and flutter and tape spillage have been eliminated. The system can be operated at any speed up to 1,000 ips. The result, of course, is that it is particularly suitable for video recording. And the recorders using the system are self-threading.

Perhaps the most remarkable claim made by Newell, however, is that his "reelettes" of tape can be made as cheaply as a disc—this is for a two-inch size, providing 44 minutes of stereo recording on an eight-track $\frac{1}{4}$ -inch tape playing at $3\frac{3}{4}$ ips.

Immediate plans for exploiting the new system in America include a simple tape player to sell at about £7, an automatic tape changer handling up to 20 reelettes and giving 16 hours of continuous playback, and a colour video recorder within a year at less than £500.

Well, if Chester Newell manages half of that, he is going to give the whole industry a pretty severe jolt. But for the amateur it is an exciting prospect. There's never a dull moment!

COLOUR TV is, of course, the current electronic wonder. I am very impressed with the results to date; but the big question-mark remains: how many people are prepared to pay the price? It may be two or three years before colour really breaks through.

I risk a prophecy, I don't think amateur video recording will really get going until colour is available. This is one area in which the home enthusiast can cheerfully "miss a stage" of technical development.

* * *

FOR A LONG TIME now there have been three tape recording magazines in this country—a remarkable circumstance, in view of the difficulties encountered in most European countries in getting one such publication established.

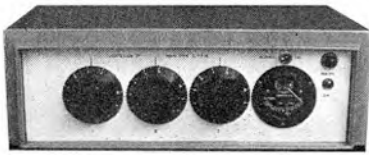
I believe that, before long, there will be only two British magazines devoted exclusively to tape recording. And *TAPE Recording Magazine* will certainly be one of them.

These are difficult days for publishers. Magazines are folding almost every month. There has never been enough revenue to make three magazines in this field commercially prosperous. We have always concentrated on maintaining the standards set since our first issue over ten years ago, when we pioneered this field. We believe that we shall now be able to improve on even that standard now that the field will be less crowded.

There has been a certain pressure on us to resume monthly publication of news from the tape recording clubs, but our researches have convinced us that this material is of interest to only a small proportion of our readers. I proposed to the Federation of British Tape Recordists and Clubs, therefore, that club news should be given in its *Bulletin* and the summer issue, now out, adopts this suggestion. Clubs wanting to know what is happening among amateurs elsewhere should get a copy.

The Federation has also just circulated a list of additions to its Sound Archives Catalogue, which now makes available the best of amateur recording to those who want to study the work of others.

TAPE RECORDING TECHNIQUES BY DENYS KILLICK



This Vortexion Mixer accepts the outputs from three microphones, each of which is controlled by a large, rotating knob on the front panel. The meter is a built-in peak programme meter which enables the user to accurately modulate the recording without reference to the level indicator on the tape recorder. An excellent tool for all live recording applications

MIXERS AND MIXING

WHEN discussing live recording in this series I have confined my remarks to the use of a single microphone. The single microphone has great advantages over more complex multiple arrangements. Problems of internal balance between the various components within the recording can usually be solved quite simply by merely adjusting relative positions of performers to produce the desired blend of sound.

In single microphone recordings we can preserve the "sound perspective" that was present in the original performance. If we wish to convey that an event is taking place in a large building, perhaps a church or a cathedral, the single microphone can be used to convey the relative spacial positions of soloists, choir and congregation. Only stereophonic reproduction will add directional information across the sound stage, but in monophonic work the sense of distance can be realistically preserved along the single axis of the mono loudspeaker.

If, in our example of church recording, we were to scatter microphones around the building, bringing soloists, choir and congregation into equally close perspective, the spaciousness of the single microphone recording would be lost. The listener would have no spacial appreciation at all and the recording would take on a false "studio" quality devoid of any feeling of "church." There may well be times when this effect is desirable; by the use of appropriate microphones and recording techniques the most reverberant cathedral in the country can be made to sound as intimate as a private drawing room. This is the degree of control that may be exercised by the recording engineer, and the final sound

quality will depend entirely upon his decisions. The recordist should know what he wants, know how to get it and then go all out for it.

Having mentioned the example of recording soloists, choir and congregation all by means of a single microphone, I must point out that the decision to use a multiple microphone set-up does not relate to the number of performers who might be taking part in an event. The decision to use two or more microphones depends entirely upon the disposition of the sound sources. If, in our example, we add just one additional sound source, say a reader standing at the lectern reading a lesson, the introduction of this one person will make it impossible for us to continue working with a single microphone. We could have doubled the choir, doubled the congregation, included the organ and possibly even doubled the soloists and still retained our single microphone; but the spoken word from the lectern, usually to one side of the church, would present an important sound source well off microphone. The only way to satisfactorily undertake this recording would be to use a second microphone to cover the reader, and to arrange for this to be connected in some way to the recorder, preferably via a mixer.

So one use of a sound mixer is to combine the signals from two or more microphones into a single output which can be fed into the recording equipment. The number of microphones that may be used on any one recording is limited solely by the number of microphones actually available and the number of inputs in the mixer.

The simplest, and cheapest, kind of

mixing equipment is the passive, or resistive mixer. It has a number of advantages which must be weighed against some serious drawbacks. The resistive mixer is usually very small in size, light in weight and costs only a pound or two. It comprises only a metal box containing the microphone input sockets, each of which is wired to some form of variable resistance. These are connected in series to the single output socket, and knobs are provided on the front panel to fade the individual microphone channels up or down. In operation the various microphone signals are balanced up by rotation of the individual resistance controls. The mixed output is connected, via a short lead, directly to the microphone input on the tape recorder.

Remembering the rules for the matching of microphone impedances to the impedance at the microphone input socket on the machine, it will be realised that the same condition also applies to the connection of microphones to mixers. As the effect of the resistive mixer is to insert a variable resistance in each individual microphone line, it must be appreciated that the control it exerts is purely subtractive. At no time is the microphone signal amplified before it reaches the recorder; fading down from maximum merely reduces individual signal strengths.

Whenever a piece of electronic equipment is inserted in the recording chain between the microphone and the recorder there is always a danger of it producing unwanted sound components in the form of background noise or hiss. There will also be some level of distortion, however small, to add to the distortion inherent in the recorder. Since resistive mixers

contain no valves, transistors or other active electronic components, they will not produce harmful effects in this way. Unfortunately there is a serious limitation in the use of simple equipments of this kind. One of the most important attributes of a mixer lies in its ability to control each and every input channel independently of any other channel. In this respect the resistive mixer is very inefficient. Adjustment to the level on one channel is liable to upset the balance on all the others. The best way to use a resistive mixer is to confine it to applications where individual channel balances can be predetermined and set before recording starts; any further adjustment during the course of the programme should then be avoided. Used in this way the resistive mixer can produce satisfactory results. Because of its low cost it is a very popular accessory for amateur use.

The alternative to the resistive mixer is the electronic model. A well designed electronic mixer will enable the user to control the respective levels at the various inputs quite independently of each other, without affecting overall balance. Its disadvantages lie in the greater size, additional weight and very much greater cost. Here I must repeat the warning of the danger of any electronic accessory introduced into a recording system producing spurious noise which might otherwise not have been present. So the first thing I would look for in any electronic mixer would be its inherent noise level. Noise is bound to be present to some degree; the important thing is to keep it to as low a level as possible. A poorly designed circuit can not only produce unacceptable levels of hum or hiss, but it can also degrade the signal by narrowing the frequency response, usually in the form of losses at the upper end.

The correct way in which to regard mixing equipment is to appreciate that it must be of at least as good quality as the recorder with which it is going to be associated, or preferably of even better quality. Attempts to economise in the purchase of mixers could be dangerous—the dearest often proves the cheapest in the long run. Nevertheless, once purchased a mixer is a piece of equipment that should give service almost indefinitely. Do remember that, unlike the recorder itself, it will probably only have a limited number of hours operational time in any one year, and therefore deterioration in electronic components should be so slow as to be negligible. My own mixing equipment has been operating satisfactorily for a good many years, and I confidently anticipate it will continue to do so for a very long time to come.

Even when the differences between the two kinds of mixers, resistive and electronic, are fully appreciated, it is not an easy matter to select an appropriate model to suit the user's requirements. The choice of a mixer is a very personal affair. So much depends upon the precise nature of the sound sources that one proposes to mix. For live recording work a microphone mixer is obviously indicated. The variety of models available range from two to twelve or more input versions. The recordist has to have a very good idea of the total number of separate microphones he is likely to wish to mix so he can investigate equipments offering at least that number of inputs *at the correct impedance*.

If we were interested in mixing together the outputs from radio, gramophone and tape recorder, the microphone mixer would be useless. We should then have to investigate models offering control at the sensitivities corresponding to the outputs of the various associated appliances it is proposed to use. Some mixers cope with both kinds of work by offering, say, two microphone inputs together with two low sensitivity inputs.

A mixer to this specification can be a most useful tool. It will cope adequately with simple microphone mixing and will also prove invaluable in creative programme building where different kinds of sound sources have to be mixed together.

So much for the equipment. The practical use of mixing equipment is a very deep and involved subject. In the practice of the art of mixing we step right out of the realm of technology into the sphere of aesthetics. In technical work the unalterable laws of physics are meticulously observed to give predictable and measurable results. In aesthetics, or artistic appreciation, the existing rules are far from unalterable, and certainly they are of dubious authority. It very often happens that works of the highest artistic merit are produced when the rules are deliberately broken.

The role of the sound mixer is the role of the artist; his available sound sources have been compared to the colours on an artist's palette. In his blending and mixing of sounds he is producing an aural picture which could be likened to the graphic artist's drawing or painting. Just as the success or failure of a painting depends upon the skill and perception of the artist, so the success or failure of any mixing operation depends upon the operator.

As soon as we begin to mix sounds we are taking discrete entities to produce a hybrid which previously had no existence in its own right at all. In the live microphone recording of, say, an orchestral work, the sound produced by a mul-

multiple microphone technique will not be the sound that could possibly be heard by either the audience, the instrumentalists or the conductor. It will be a completely new sound existing in its own right as a direct result of the combined skills of performers and engineers.

In my opinion one of the greatest tragedies of the musical world lies in the inescapable fact that the great classical masters of composition were never able to hear the modern recorded versions of their works. If they had been, I wonder what their reaction would have been? By using the modern close microphone techniques the recording engineer is able to capture the tonal brilliance of every instrument and produce a sound such as the composer could never have imagined possible. When Beethoven imagined the sounds of his symphonies he could only think of them in terms of an orchestral blend of tonal values as heard by an audience. He could not possibly have thought of them as an amalgam of intimately individual instrumental sounds such as is produced today by the latest techniques. I like to think that he and his contemporaries would wholeheartedly approve of what we are now doing to their works; although in fact he might well have vehemently condemned it.

In the recording of music the mixing engineer can produce blends and qualities of sound over the widest imaginable range. It is within his power to make or mar the recording. Upon his taste and judgment will depend the success or failure of the entire operation.

In my personal library of tapes I have retained an amusing recording of my own as an example of all that is worst in mixing techniques. The work recorded is the performance of a major choral and orchestral event. The choir numbered about 200, with more than 50 instrumentalists in the orchestra. Even in the double forte passages with colossal sound output, the entire performance is dominated by the *umpha umpha* of a single bassoon. I will not digress into the story of why it happened, but only point it out as a crashing example of the result of bad mixing.

We shall be dealing later on with more specific mixing applications. It is not possible to generalise on this subject, any more than an artist can adopt a single formula for drawing a tree which will be equally applicable to all trees. Within the techniques of mixing will be found scope for the expression of all the creative instincts of the recording enthusiast. The man who mixes is using the medium of recorded sound as a creative expression of his own thoughts, rather than as a mere method of duplication to produce facsimiles of other people's thoughts.

cassettes go HI-FI



-with ^{Trade Mark} Scotch
magnetic tape

It's the very latest 'Scotch' magnetic tape development and it means that hi-fi enthusiasts will want to take another look at cassette recorders. Now, for the first time ever, you can get cassettes containing the brilliant 'Scotch' magnetic tape with 'Superlife' coating. This tape has a flawless mirror-smooth coating that gives improved frequency response and less wear on the delicate recording heads—so it keeps its high quality far longer. With 'Scotch' magnetic tape the cassette recorder becomes a serious possibility as a second, portable machine—and with these new cassettes, the recordings you make will merit playing on your full-scale home set-up.

Scotch **Compact
Cassette**



MINNESOTA MINING & MANUFACTURING CO. LTD.
3M House, Wigmore Street, London W1. Telephone: HUNter 5522

'3M' and 'SCOTCH' are trademarks of Minnesota Mining & Manufacturing Company

ONE of the most exciting ways in which recorded sound can be used is as an accompaniment to a visual image. This may take the form of a sound track with a home movie, or more simply as part of a sound and colour slide show. Although the basic techniques from the recording point of view are identical to those employed in what we might call pure sound recording, the end product in a sound and vision combination is something very different.

The first thing that has to be understood by the recording enthusiast is that in sound and vision applications *the visual image nearly always takes precedence over the sound*. In fact, so rarely is the contrary the case, one could say sound is *always* secondary to vision.

Now this may well be a bitter pill for the recording fraternity to swallow. But swallow it they must—otherwise the resulting programme will be a dismal failure. Just consider what happens when we go to the cinema to see a film. What do we do? Why, we go to see a film. Note very carefully in both cases we talk about *seeing* a film. In fact we would have both seen the film and heard its sound track; but the sound track is always understood and not mentioned. No-one would dream of saying they were going to the cinema to “hear” a film.

Try a little experiment. When a play or feature programme is being broadcast on television try watching the action with the sound faded right out. The images will flicker on the screen but nothing will be heard. Although only the sound content will be missing we shall have the feeling of having lost more than half the programme. Now turn the sound up and the vision down. With a blank screen we shall hear unrelated sounds that tell us very little. Now the other half of the programme is missing, and again we shall have the feeling that far more than half the programme has gone.

Here, then, lies the secret of sound and vision. In a properly produced programme the one is always dependent on the other, the whole is always greater than the sum of the two individual parts. In building such a programme the finely balanced relationship between sound and visual image always leads the audience to watch in the first place and to listen in the second. Only in such a way can both the visual and aural senses be wholly satisfied, giving the impression of total involvement to the audience.

When working in pure sound the objective should always be to render events and emotions in intelligible, aural form in such a way that the listener forms his own mental images of the action. As soon as we link a picture to the sound the listener is deprived of the right (obligation?) of making his own imagined

AN EXPLORATION OF THE CREATIVE POSSIBILITIES OF TAPE AND FILM IN WHICH THE AUTHOR, LAURENCE GRAHAM, MAKES A PLEA FOR CO-OPERATION BETWEEN RECORDING ENTHUSIASTS AND PHOTOGRAPHERS

SOUND AND VISION

images; instead he has actual pictures projected in front of his eyes. In pure sound a great deal of latitude exists for the listener to exercise his imagination in translating the sounds heard; the addition of a visual image, moving or still, imposes an immediate necessity for the sound to precisely “fit” the picture. If it doesn't we shall simply say that the sound is wrong, whereas if it does fit then the picture will appear to be far more realistic than it actually is.

Photography, whether it be still or cine, is undoubtedly a highly skilled art. So, for that matter, is sound recording. There is no reason why the photographer should imagine himself to be capable of producing good sound recordings without knowledge and experience, any more than the recording enthusiast should mistakenly believe that photography is a simple occupation which doesn't warrant time or trouble. If ever there was a need for photographers and recordists to get together and to work in harmonious co-operation it is in the preparation of sound and vision programmes. Each can bring to the project his own skill and expertise. It is only in this way that good results will be achieved.

The average man-in-the-street tends to forget that he has at his disposal, through the cinema and television, a vast store of material, all of it the work of highly skilled and highly paid professionals, to the very best standards. By contrast some bungling amateur efforts appear pathetic. When work of this kind has

been undertaken professionally the resulting programme seems to the audience a smooth, effortless presentation. Everything falls neatly into place and nothing obtrudes. One can easily be lulled into a sense of false security by imagining that this must surely be the easiest thing in the world to try to do. Many people fail to realise how fallacious this is until they have suffered a great deal of frustration, and perhaps expense as well. The more expert and professional a production actually is, the less obvious will be the work and the effort, not to mention the skill, which went into putting it together. When techniques are obtrusive then they are either wrong or poorly executed.

It is difficult to make a good feature tape in pure sound. It is difficult to make a good silent cine film and it is difficult to make an interesting colour slide show. It is very much more difficult to make either a sound film or a sound slide show. Unfortunately it is only too easy to throw a few noises together and hope for the best. A great many amateurs get to this point and then give up, defeated by the prospect of the difficulty of improvement. It is at precisely this point that the enthusiast will really ask himself what is wrong, and then make honest and sincere endeavours to put it right. By doing so he will begin to learn about one of the most fascinating of all occupations, and will at the same time develop skills that will be the envy of friends and acquaintances.

TAPE AND TRANSPARENCY

PHOTOGRAPHY is said to be one of our most popular hobbies, second only to gardening in its universal appeal. At one time photography meant taking family snapshots with a box Brownie and receiving an envelope of black and white prints from the local chemist. Today, more and more people are turning to colour photography, many of them using highly sophisticated 35 mm. cameras. And of all the colour photographs taken the vast majority are transparencies for projection.

When thinking in terms of sound and vision the colour transparency slide show is an excellent starting point. Indeed, when fully developed the technique of the sound slide show can be not only a starting point but also a final goal. But many tend to think in terms of sound tracks accompanying moving films without, perhaps, realising that the sound track is equally appropriate as an accompaniment to a slide show. Apart from which, experiment with colour transparencies and sound can form an ideal apprenticeship to the more complex (and certainly more expensive) craft of producing cine sound tracks.

Amongst the readers of *TAPE Recording Magazine* there must be thousands and thousands who are not only about to go on holiday, but who will also be taking with them their camera and a spool or two of colour film. When returning from their holiday the transparencies will be processed, mounted in some convenient way and projected during the winter evenings for the entertainment of friends and relations.

Let us be honest—just how entertaining are these slide shows? The audience is captive; probably too polite to make disparaging remarks, they sigh their way through yet another view of the break-water almost entirely obscured by the bulging, semi-nude bodies of the great anonymous crowd of perpetual sun-bathers. As the proud photographer talks on and on the slide is mournfully regarded by glum faces whose boredom is mercifully concealed by the gloom.

This is not such an exaggeration, although it is naturally not being suggested that you, dear reader, could ever be personally identified with such a slide show! But the undoubted tendency is for slide shows to be dull, to be boring and to lack imagination. I am going to suggest that what they need is a properly produced sound track. In my opinion this would go a very long way towards completely changing the entire character of the show. The mere addition

of sounds will not miraculously transmute bad slides to good; but what it will do is to focus attention on the real structure of the show and help enormously to put the relative values of its different parts into a proper perspective.

Before we consider equipment, which, as in most other activities, can be very simple and primitive or very complex and expensive, let us just consider the slide show itself. Colour transparencies are projected on to a screen for the enjoyment of an audience. This may seem to be so obvious as to be completely superfluous. However it should never be forgotten that this is the sole basis of the activity.

Putting ourselves in the place of the photographer, let us forget our own selfish interests for the moment and concentrate upon the audience. If we take a collection of colour slides we could very well ask ourselves the highly pertinent question, "For how long would any member of an audience really wish to look at any one of these slides as they are being projected?" This is a question too few photographers ever ask, either of themselves or their audiences, and yet it is one to which an answer must be found if a satisfactory sound track is to be put together.



Typical of slide synchronising attachments, the Grundig Sono-Dia

As with so many recording projects the hardest work is done right at the beginning, with paper and pencil rather than with tape and microphone. The available slides have to be arranged in their correct sequence, preferably numbered for reference, and then listed in order with a note against each slide to indicate roughly how long that particular image should remain on the screen. Remember that repetition is monotonous; different visual images should be allowed to remain on the screen for different lengths of time. Whilst on the subject of time it could be mentioned that it takes a really outstanding colour transparency to hold an audience's attention for very much longer than thirty seconds. This you can try for yourself—you may be surprised to realise what a long time thirty seconds really is.

The simplest sound track could be merely a spoken commentary, describing each slide in turn. This commentary should be carefully written out in the form of a script, properly related to the time that each individual slide is to remain on the screen, and then be recorded as a straightforward voice recording. Now this commentary can only be properly thought out by direct reference to the slides it is to accompany. Even when being recorded it is an advantage for the reader to have the slides projected in front of him so that he can point out the features to which he is referring, and then allow a pause to give time for audience reaction before making his next statement.

At all costs avoid opening each section of the commentary with the words: "The next slide will be . . ." or "And now we have . . ." A carefully selected sequence of slides can follow each other in fairly rapid succession, with the commentary devoted to generalised remarks about which each slide illustrates one small component factor. Success will largely depend upon the skill with which the commentary is written and recorded.

Having completed the recording we now have to consider the various methods that may be adopted for actually giving the show. The simplest and least expensive is to arrange the slides in their correct order and for the operator to sit with a copy of the written script in his hand. The projector and the tape recorder are started together, and then the operator carefully follows the cues on the script which will tell him exactly when to change each slide. This method is strongly recommended, at least as an initial exercise, because it is only by organising a few trial runs like this that judgments can be made as to the correctness of the balance between sound and vision. At this stage all kinds of alterations may be made without difficulty. Even the slide sequence can be changed if a better idea presents itself—as of course it very often will. This is one of the great advantages of the sound slide show; it is so flexible it can be altered and improved as many times as one wishes.

But there are disadvantages in adopting this method for regular showing. To obtain maximum brilliance of colour in the projected images the room should be as dark as possible. When the room is in total darkness it is impossible for the operator to read his script. If he has difficulty in following the written word he will soon find himself in difficulty in deciding precisely where to change his slides. The simple alternative is to provide a "sound cue" on the tape so that every time the operator hears this he knows he has to change to the next slide in the sequence.

A very simple sound cue could be in the form of the sound of a small bell being struck. When the commentary is being recorded the bell is sounded at each one of the predetermined time intervals. When the show is given it is very obvious to the operator at which points the slides are to be changed. This is so simple it can be tried as a preliminary experiment. Do choose a high pitched, melodious sounding bell, or even a suitable wine glass. Whatever instrument is chosen tap it lightly so that the sound will not be too obtrusive.

Whatever sound is chosen to provide the cue it must be remembered that its purpose is to attract the attention of the operator without distracting the audience. A more subtle sound cue can sometimes be used very successfully. Most projectors make a certain amount of noise when the slide is being changed. If, when the commentary is being recorded, we also record the projector as it changes slides, this noise could provide the information the operator requires. Because it is a perfectly natural sound associated with such shows it will not be noticed by the audience. During the presentation of such a show the slide is changed whenever the noise of changing is heard on the tape. Most audiences will be quite unaware of the fact that they have heard this sound twice for every slide change instead of once.

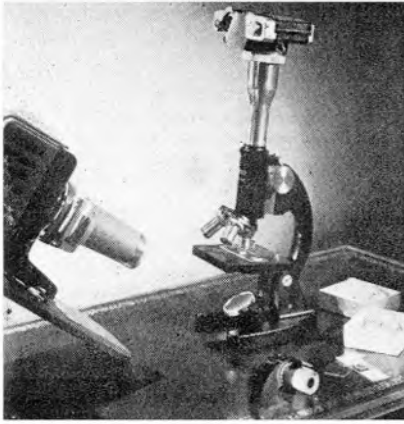
As with most other modern equipments, slide projectors are available nowadays with various degrees of automation. If a remote

(Please turn to page 304)

SOUND AND VISION—A NEW APPROACH
VERY MUCH "ON THE FRINGE"

ABSTRACT SOUND ABSTRACT VISION

DENIS GILBERT Reports



A completely new outfit for producing colour transparencies of microscope slides. Suitable for use with any S.L.R. camera, the standard kit costs £29 17s. 6d. A Leitz projector is shown here providing the light source

DISCUSSIONS on photographic techniques lie far outside the scope of *TAPE Recording Magazine*. But a new piece of equipment that has just been made available may well give a new impetus to those recording enthusiasts who would like to produce tape slide shows but who feel that their colour slides just do not warrant the addition of a sound track. Photography often involves travelling around photographing new places and new things. But there is a whole range of fascinating "things" that can now be photographed without ever moving away from one's own home. I am referring to the fascinating world of the microscopically minute.

There is nothing new in taking photographs through the microscope. It is a technique that is very commonly used by specialists throughout the world. But now the firm of Greenhill & Ellis (Optical) Limited of Ling House, Dominion Street, London, E.C.2, have produced a special microscope with universal adaptor which, when coupled with any single lens reflex camera body, makes it possible to create the most striking abstract and surrealist studies. The basic instrument incorporates good quality lenses identical to those used in many research instruments. The camera is merely fitted to the head of the microscope tube and objects placed on the glass slide on the stage are photographed.

When working in full colour one can obtain the most beautiful images. Even simple substances, such as copper sulphate, can be used to show brilliant geometric form in their crystalline structure. A jam jar containing an inch or so of stagnant water can be made to reveal a completely new world of minute organisms under this microscope. There are few geometric designs so perfect, or so graceful, as those of the diatoms, skele-

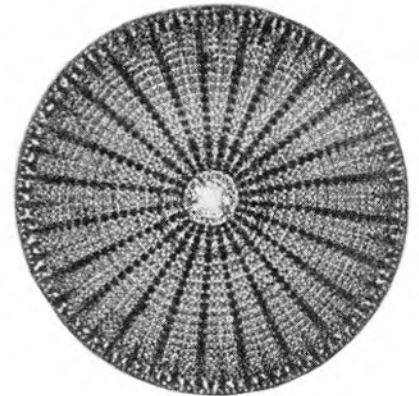
tons of tiny crustacea who lived in bygone ages.

The ability to produce at will colour slides of abstract patterns immediately poses the question, "What kind of sound track should accompany such a show?" Why not abstract sound (music concrete) with abstract visual images?



A simple natural object which is typical of the kind of work that can be done with this equipment. The slide is of a gnat's antenna—when projected it forms a truly dramatic image

Music concrete is, of course, a method of producing sound which is devoid of form. We have previously discussed this in relation to the work of the BBC Radiophonic Workshop. Natural sounds are recorded and then changed by simple recording techniques to produce new, often brilliant and startling, sound structures. Recorded sounds are speeded up or slowed down, played backwards, repeated, superimposed, filtered and generally subjected to every conceivable electronic treatment. Music concrete has



A diatom photographed by means of the equipment illustrated. Diatoms provide the most beautiful geometric patterns and display brilliant colours under polarised light. Very suitable for coupling to an abstract sound track

tended to be reserved for the very few dedicated enthusiasts. Audiences in general tend to dislike it. They get bored with it very quickly. But if linked with appropriate abstract colour slides of great beauty and impact the sound track could form an integral part of the show and so produce a very moving experience.

In work of this kind there will be no need to worry about copyright, no need to travel all over the country with camera and battery tape recorder. All the recording, both sound and visual, could be done in the comfort of one's own home. All that is needed is patience and determination. We have no doubt that there is a great future for slide shows of this kind.

If you should be keen on working in abstract sound with music concrete but do not care to bother with photography, please do contact your local photographic club and talk to the secretary about this new idea. You are sure to find a photographer who will be delighted to cooperate with you, and together you could begin to explore this completely new field.



I should like a copy of the **Electroniques Hobbies Manual**. Enclosed is a cheque/P.O. for 10/6.

NAME

ADDRESS

TRM1

Available now! The enthusiasts' greatest-ever components guide!

Over 600 pages packed full of tips, kits and details of over 11,350 different parts from 85 leading manufacturers!

Whatever your particular interest in electronics, you'll find the **Electroniques Hobbies Manual** a first-class investment.

It saves you time. No searching around for the parts you need. Every type of equipment — from stock components to sophisticated professional items—is here. Supplied by over 85 leading manufacturers, this equipment is *all* available by mail order on fast despatch.

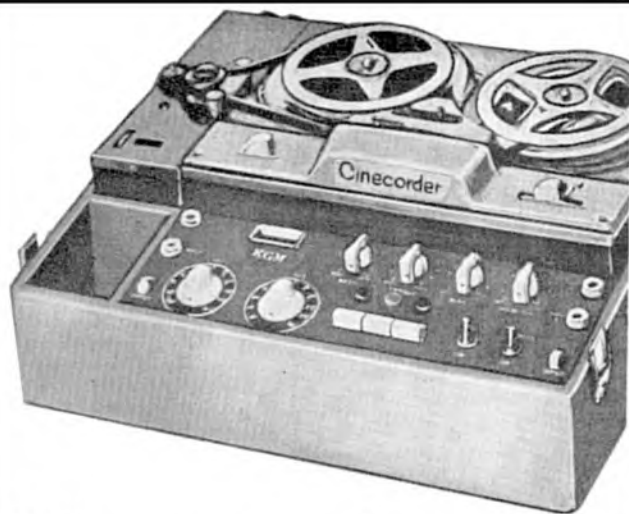
It aids your projects. Complete designs, and details of kits available for beginners and experts, are all contained in the Manual. Inside, too, there's a wealth of technical data, practical tips and formulae to help you build with confidence. **It costs just 10/6 post free.** And it puts the whole electronics industry at your service, including the specialised knowledge of Electroniques. Behind this brilliant new venture are the vast resources of STC and ITT, so you're assured of a first-class service!

Be sure of your **Electroniques Hobbies Manual**. Clip the coupon, and send today — while stocks last!

Electroniques (Prop. STC Ltd.) Edinburgh Way, Harlow, Essex. Telephone: Harlow 26777.



High-grade components for amateur communications



Cinecorder

THE TAPE RECORDER WITH FEATURES FOR EVERYBODY

- TAPE DRIVEN CAPSTAN AND STROBE
- TAPE TIME INDICATOR
- INPUT SELECTORS
- TWO CHANNEL MIXING
- PUSH BUTTON FUNCTION SELECTOR
- COMBINED TAPE/PROJECTOR START SWITCH
- VOLUME CONTROL FOR "MONITOR" PHONES OR SPEAKER
- BIAS CONTROL FOR SUPERIMPOSING
- TAPELIFT LEVER FOR CUEING
- SHIFTRACK LEVER FOR DUAL RECORDINGS
- REMOTE CONTROL CONNECTION
- DETACHABLE-LID LOUDSPEAKER

The Cinecorder is a high quality tape recorder with many unique and special features, making it ideal for all ordinary tape recording purposes as well as for adding sound to home movies or the projection of slides.

As a straight tape recorder, the Cinecorder is a finely made instrument with an unusually well balanced tone. For the purpose of "Cine," it has been specially designed for the amateur to record easily, on his own elaborate sound tracks for films. Linked with almost any kind of projector reasonably accurate commentary or background music/effects are ensured. 100 per cent lip synchronisation is easily obtained using perforated Cinetape.

Recommended at its previous price of £75 for its excellent facilities and superb performance, it represents outstanding value for money, at 59 gns. Available on INTEREST FREE TERMS £20 13s. deposit and 12 monthly payments of £3 8s. 10d. Order NOW or call, see and hear this superb machine at our New Demonstration Room.

Parking Space Available

AVAILABLE FROM MAIN DEALERS:—

R.E.W. (Earlsfield) LTD.
266-8 Upper Tooting Rd., London, S.W.17
Telephone (01) 672 8267 or BAL 9175



or if in difficulty write direct to manufacturers:—

M. Murray Electronics Ltd., 5 Selkirk Road, London, S.W.17

POST THE COUPON NOW!

I enclose cash* / deposit for the Cinecorder * Please send me full details.
* Delete inapplicable

NAME

ADDRESS.....

R.E.W. (Earlsfield) Ltd.

Dept. T.R.M. 266/8 Upper Tooting Road, London, S.W.17.

THE marriage between tape recording and home cine makes sense. One could be forgiven for thinking there is virtually nothing to it. After all, a film sound track is very much like a feature tape, except that you play it back with the film. Unfortunately, there is rather more to it than that. Not only does the sound track require rather careful fitting, or synchronising, but also the function of the sound is very different to that in pure sound applications. But let us think about the vexatious question of synchronisation.

The easiest way to provide sound with a cine film would seem to be to take a complete and edited film, and then to make up a sound track on tape, timing it very carefully so that its programme duration is precisely that of the duration of the film. To give a show, all we would have to do would be to line up the film in the projector and the tape in the playback recorder, and then start both pieces of equipment precisely together. Then we sit back and enjoy sound and vision.

But, oh dear, oh dear, what trouble we are now in! It will soon be painfully obvious that something has gone very seriously wrong. As the show proceeds the sound and vision will drift further and further out of synchronisation. After a few minutes, images on the screen will bear no relation to the sounds heard from the recorder; at the end of a thirty-minute programme there may well be a difference of thirty seconds or more between the end of the film and the end of the tape. The two programmes will be hopelessly out of step.

There are a number of reasons why this should happen. With tape recorders we are vitally concerned with the constancy of their recording and playback speed, or short-term speed stability; but long-term speed stability is quite another matter, which does not worry us so much. And variations in long-term speed stability can mean big differences in overall timing. If anyone doubts the inability of recording and projection equipment to keep in step of their own accord I can only recommend that they try it for themselves. There is no finer argument in favour of the need for synchronisation than the frustration of hearing the sound track slipping inexorably away from the projected film. But if you would care to save yourself a great deal of trouble please do take it from me that it will happen without fail every time, although induction projector motors are more stable than the brush type.

Once we accept the need for synchronisation then we have to add, regretfully, that there is no simple, trouble-free means of achieving it. The home movie enthusiast who, after all, cannot be expected to be a recording technician, has often been convinced by glib advertising that such-and-such a piece of equipment will enable him to produce home talkies with the greatest of ease. So he dives right in, gets himself involved with lip-sync dialogue films, and eventually discards the equipment he has acquired, leaving himself a wiser, but very much poorer, man. So let us understand right from the very beginning that synchronisation to the degree of accuracy



required for lip-sync is a difficult, specialised task, which should never, under any circumstances, be attempted by the beginner who should confine himself to more simple exercises.

There are two basic methods of obtaining a sound track with a film. Either we can use a silent projector and synchronise it, by means of a special attachment, to a tape recorder or, alternatively, we may record directly on to a magnetic stripe on the film and use a special sound projector. At first glance the use of magnetic stripe appears to have overwhelming advantages. As the stripe runs along the film, parallel to the visual frames to be projected, there can be no errors in synchronisation. But there are a number of less obvious facts which should be borne in mind.

In deciding whether to use tape or stripe so many enthusiasts choose unwisely, either because of compelling advertising, high-pressure salesmanship or just lack of experience. So let's understand, right at the beginning, that whichever method is selected it will involve plenty of hard work and not a little head scratching; there is no easy way of obtaining good-quality synchronised sound.

One or two basic facts might help to get the tape or stripe argument into perspective. Tape, even running at $3\frac{1}{2}$ ips, will always give better overall sound quality than stripe. 8 mm film running at 16 or 18 frames per second is roughly equal to a linear speed of 2.4 ips, or 3.6 ips at 24 frames per second.

Tape will give a better signal-to-noise ratio than stripe due to its greater track width. Even a 4-track recorder lays a track 0.04 inches wide, but on 8 mm stripe the track width is between 0.025 and 0.03 inches.

Sound drop-outs are also more frequent on stripe, mainly due to film joins passing through the projector, and not to the stripe itself. Even so, the film base is very much thicker than tape (film 0.006 inches, long-play tape 0.0015 inches) so it is far more difficult to design and mass-produce a good stripe sound head at a reasonable price than it is to produce the same quality tape head.

The wow and flutter content in some 8 mm magnetic stripe projectors would be considered by the recording enthusiast to be appalling. There is an excellent reason why this should be so. When film is being projected it does not run with a continuous, steady motion through the gate. Each frame is momentarily arrested to permit what is really a still picture to be thrown briefly on to the screen; the film then moves forward to the next frame, pauses, projects and so on through the spool. The illusion of movement is due to the inability of the brain to separate the succession of still images. The visual memory carries one shot over into the next to give the impression of movement. Can you imagine what would happen to recording tape if it were to run through the sound channel of a tape

MAKING SOUND MOVIES

By JOHN ALDRED



As an example of a magnetic stripe projector, the French Heurtier P6.24 S shown with combined carrying case/loudspeaker

recorder in this pattern of stops and starts? The wow content would be truly monumental.

In an attempt to overcome this problem the usual method with stripe projectors is for the film to run through the gate and then pass out around a system of pulleys, to form a loose loop which absorbs the unsteady motion of the film and converts it to a smoother motion before it passes the sound head. But the question is, how smooth? In the case of certain equipment at the lower end of the price bracket the answer is not very smooth at all. In fact the instruction booklet relating to one 8 mm stripe projector warns the user not to attempt to reproduce any long, sustained notes. Believe me that warning was not misplaced!

If one is using 16 mm cine equipment which, of course, is far more expensive from the point of view of running costs, results from stripe are likely to be more successful. The linear film speed is 7.2 ips at 24 frames per second and the available track width is 0.1 inches—equivalent to an ordinary half-track recorder. Even so a modern tape recorder running at $3\frac{1}{2}$ ips will still give better sound quality. One last important consideration when thinking about magnetic stripe. Really this system can only be considered as a convenient method of projection. When actually compiling your sound track material you will still have to resort to conventional tape and conventional tape recorders.

Almost any two-track or four-track mono or stereo recorder can be pressed into service for cine use, but it will be found that the work is very much easier if the following facilities are available:

1. A tape speed of $3\frac{1}{2}$ ips if the recorder is to be used with a synchronised

MAKING SOUND MOVIES

By JOHN ALDRED

projector, otherwise 7½ ips, but never 1½ ips.

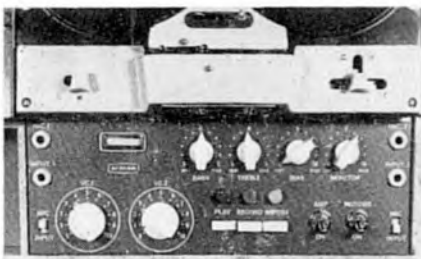
2. A good monitoring outlet for headphones or loudspeaker, but preferably for both.

3. Mixing, multiplay, parallel replay or superimposition facilities or, better still, all four.

4. Room to extend the tape path between the capstan and the take-up spool to accommodate the synchronising device.

All these facilities are really needed when putting together a cine sound track. If your machine doesn't have them it would pay you to shop around for another model, otherwise a great deal of hard work and much time is going to be wasted.

Actually there is a machine expressly de-



Imposing in appearance, the control panel of the Cinecorder contains inputs for four sound sources, selector switches for two volume controls, separate tone controls, variable bias for superimposition, monitor volume, function selector buttons with indicator lamps and separate switches for amplifier and motors. The "Shiftrack" control and Tape Lift lever can also be seen

signed for cine use called the "Cinecorder," and although it has not been actually manufactured for the past couple of years it is still being advertised. The Cinecorder has many desirable features not found on other recorders, such as an accurate tape timer calibrated in seconds, a "Shiftrack" control which is the equivalent of parallel track replay, a tape lift lever for the accurate cueing in and out of sound on picture cuts, a variable superimposition device, tone controls which operate on record as well as replay, and provision for mixing any two out of four inputs—all of which may be left permanently connected. The loudspeaker is fitted into a completely detachable lid, and may be sited near the screen and used for monitoring whilst recording. The Cinecorder is built around the BSR tape deck with selected tape heads, and gives a very smooth response from 50 to 9,500 Hz. Another recorder eminently suitable for cine is the Wyndsor Vanguard.

Magnetic stripe projectors cost between £90 and £200 in the 8 mm gauge, and upwards of £350 in the 16 mm gauge. They have been specially designed for recording, and their amplifiers feature mixing, monitoring—usually on headphones, and some form of volume indicator. One of the most popular 8 mm models is the Eumig Mark S, since its amplifier is designed for automatic mixing as well as automatic volume control. There is no provision for manual operation, and the automatic circuitry cannot be disconnected.

An alternative to purchasing a stripe projector is to use a silent projector with tape synchronising facilities. Favourites are the Eumig Phonomatic for standard 8 mm, the Noris Synchroner for standard 8 mm and super 8 mm, and the Bauer T.I.S for super 8 mm only. All incorporate what is termed a tape loop synchroniser, which automatically regulates the projector speed by means of a tape-operated variable resistor in the motor circuit. The Noris is designed to run backwards in sync as well as forward; very useful when editing with sound.



The Synchronode is an excellent and well-tried appliance. A mechanical connection must be made to the projector, either to the sprocket shaft or the inching knob on the main drive shaft

Then there is a device called the Synchronode, designed to synchronise any recorder with almost any projector—silent or sound. The principle used is one of differential gearing, like the rear axle of a car. A mechanical link to the projector drives one half-shaft, and the tape passes around a pulley to drive the other half-shaft. The position of the differential is used to switch a resistor in and out, the value of the resistor being carefully matched to the power requirements of the particular projector motor. Attached to the differential is a large pointer which moves round a scale calibrated in frames of film. It is therefore easy to see when you are actually in sync, or if not by how many frames in advance or retard.



In the Contronics system a perspex rod in the projector light beam conducts information to a small photo-diode at the bottom of the tube

So far I have outlined ways and means of synchronising your tape recorder to a projector, assuming you will be using plain ¼-inch tape in the standard or long play varieties. Actually standard play is preferable since there is less chance of the tape slipping on the synchroniser. It is obvious that any slip at all, or tape stretch, is likely to upset synchronisation. The error could amount to four seconds or more in a 20-minute film. So to eliminate all doubt on films where accuracy is important one uses Perforated Cinetape, a special standard play tape with a tough Mylar base, which contains 16 perforations every 3¼ inches.

Cinetape runs quite normally through your tape recorder, either twin-track or four-track, and the perforations are only used to provide a positive "lock" on the synchroniser—using a special tape sprocket instead of a plain roller. These sprockets are only available for the Synchronode unit and the Eumig Phonomatic projector, but they are 100 per cent successful in maintaining accurate sync. Due to the perforating process Cinetape is more expensive than plain tape, and costs approximately 1½d. per foot.

A rather more sophisticated system has been developed by Contronics Ltd., which makes use of the fact that the light of the projector beam is chopped by a 3-bladed shutter. At a film speed of 16 frames per second the light is interrupted 48 times. This information is collected by a photo diode on the end of a perspex tube, and converted into electrical pulses. These are amplified, rectified, and recorded on tape as a series of "electronic sprocket holes," for want of a better phrase.

On playing back, the pulse track is fed into a "flip-flop" circuit, a form of multi-vibrator, which is used to lock the projector motor to the information on the tape. This system is actually an electronic version of the mechanical Synchronode, and only slight modification is required to the projector. Of course you need a stacked four-track head on your recorder, but the Contronics unit may be connected straight to the head itself. It is called the Carol Cinesound.

All the apparatus I have mentioned so far is designed to assist in synchronising your sound to an already edited picture, except perhaps the Synchronode which may be used with certain cameras after they have been specially modified. But if you really want to try your hand recording direct sound at the moment of shooting, "lip-sync" as it is called, then I can recommend the very latest gadget called the Filmin Synchronette—a small transistorised unit for use with your camera and projector. The Synchronette has all the virtues of the other units without any of the limitations, and combines the advantages of perforated Cinetape with the photo-electric principle of the Contronics system.

(Continued overleaf)

From page 303

The Synchronette operates from its own internal batteries, measures only 5½ x 2½ x 2¼ inches, and is therefore completely portable. It can be used to synchronise any projector or electrically-driven camera, and since it has no moving parts it requires only an electrical connection—up to 200 ft. in length if necessary. This is how it works. The perforated Cinetape is threaded past a light beam in front of a photo-diode, and the pulses are fed into a multivibrator to control the camera or projector speed. The multivibrator can be likened to an electronic form of escapement, as used in computers, allowing one frame of film to pass for every frame of tape passing the light beam.

The only modification required to your camera is the fitting of a miniature socket. This merely provides access to the motor circuit and in no way upsets the normal running of the camera. A similar modification must be made to your projector before the Synchronette can be used to show sound films. You can easily incorporate an automatic start by splicing a length of plain tape ahead of the Cinetape. Then the projector will not start until the first Cinetape perforation passes the optical scanning point. You can also transfer sound from tape to stripe when using a projector like the Eumig Mark S, so that most of your synchronisation problems are solved by a single, inexpensive unit.

The Fimin people (Films in Miniature Ltd) also make a mains-operated synchroniser for use with Cinetape and any camera with an electric motor, as well as an interesting sound transfer unit for re-recording tape on to stripe. This transfer unit can also be used for editing when connected to an animated film viewer. It has a built-in pre-amplifier with bass and treble

controls for getting the best quality out of your original recordings, and you can even use it to show sound films with a silent projector instead of using your tape recorder and a synchroniser, providing you employ an external power amplifier and loudspeaker.

Since sound films rely on smooth-flowing visuals as well as a good, balanced sound track, editing picture as well as sound can present problems. Beginners are therefore advised to shoot long scenes before cutting the camera, so that editing is simplified in the initial stages. Even though you use a scene number board and clap-sticks when shooting sync sound, synchronism may be lost each time you stop the camera. This means editing the sound and picture records to restore synchronisation before projection, which in practice means merely matching-up the clap-sticks on film and tape. In theory, if you can count, you can edit: for one frame of picture will always equal one frame of sound. The troubles arise afterwards when you really get down to editing a film sequence, for once you have removed the clap-sticks you have no positive sync reference. You have to rely on carefully-applied sync marks at all cutting points, marks made with chinagraph or marking ink which can be removed after editing has been completed.

So you can appreciate that there is far more to the making of amateur sound films than the initial recording. That is only the beginning. Editing sound films is such a vast subject that even *TAPE Recording Magazine* could not do justice to it in a single article. But I hope that I have managed to whet your appetite sufficiently with synchronised sound, and that you will be encouraged to have a go. You will learn far more by actual practical experience than by reading articles and books.

From page 299

controlled projector is used the operator can sit back at his ease and merely press a button at each change point; the only other job he has to do is to ensure that the slides are in their right order in the magazines and that the individual magazines are arranged in their correct sequence. With a manual projector each slide has to be inserted and removed in turn.

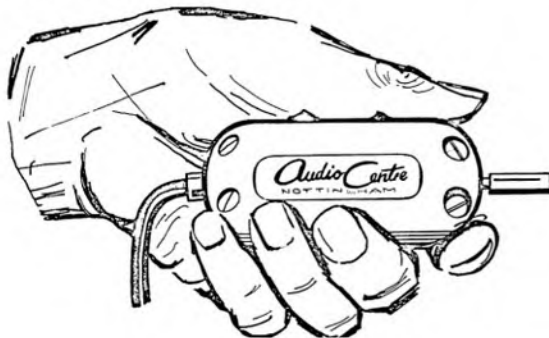
We can progress still further along the road to automation by actually synchronising the projector to the tape recorder so that the tape itself will trigger the projector at the correct points. This is the most sophisticated way of doing the job, and is ideal for the more complex programmes. Such an arrangement is only possible where a fully automatic projector is being used.

The method of operation is basically very simple. A pulse, or signal, is recorded on the tape at those points where the slide changes are to occur. On playback of the tape the synchronising pulse is reproduced (inaudibly) together with the sound commentary, is fed into the synchroniser where it actuates an electrical contact which passes a current via a linking lead to the projector and so performs the same function as depressing the button on the end of a remote control lead. The synchroniser itself is usually a compact piece of apparatus which is used at the side of the tape recorder. In some versions the tape is passed through the sound channel on the recorder, then through the synchroniser and back on to the take-up spool. In other models the tape path is not changed and the pulse is recorded electrically, together with the microphone commentary, on to the tape. A good example is the Synchroslide.

(Please turn to page 309)

YOU WANT YOUR HEADS SEEN TO!

YOUR TAPE RECORDER CANNOT GIVE YOU FIRST CLASS RECORDINGS OR PLAYBACK UNLESS YOUR HEADS ARE IN TOP CONDITION. USE A TAPE HEAD DEFLUXER REGULARLY FOR BEST RESULTS.



THE AUDIO CENTRE DEFLUXER

specially supplied to us by the Ferrograph Company

THE AUDIO CENTRE DEFLUXER

complete with instructions

60/-

- POST FREE
- BY RETURN

THE *Audio Centre*

A DIVISION OF THE PHOTO CENTRE, 28-30 PELHAM STREET

54833 · NOTTINGHAM · 51247

CROSS

TALK

By Audios

EVERY day we open our morning newspapers we read of more and more depressing events. War is rife; yet it seems that peace may be even more ominous. It is not my function to join in the fashionable game of attributing blame to either one side or the other in the Middle East—as in most squabbles the true cause of the trouble can usually be said to be six-of-one and half-a-dozen-of-the-other.

But as in so many aspects of modern living tape recording features prominently. The Israelis claim to have recorded a telephone conversation between President Nasser of Egypt and King Hussein of Jordan in which the two leaders intrigue together to involve both America and Great Britain. Only a few hours earlier the *Week-end Telegraph* carried a major feature describing how the recorded human voice has as many individual peculiarities as the fingerprint, and in fact can be used as positive and accurate means of identification. Lawrence G. Kersta calls his system Voiceprinter. It has already been used as means of identification in criminal trials in America.

The Voiceprinter equipment contains electronic devices making it possible to render human speech into visual form; within the top of the cabinet is a tape recorder. And the visual representations of voices are never identical for two different individuals.

So the next obvious move was to submit the recording of the Nasser-Hussein conversation to analysis. Reports so far indicate that the authenticity of Nasser's voice has been proven. But hold hard for just a moment—a gentleman from Leeds University claims that Voiceprinting is neither new nor reliable as a means of positive identification. So the gentle art of sound recording is drawn relentlessly into the service of armed combat.

Whether the Voiceprinter is right or wrong is immaterial. It would be gratifying to conclude that recording techniques are being used solely in the cause of right over wrong. Unfortunately the frontiers between right and wrong become increasingly blurred. There are no more blacks or whites, only intermediate

shades of grey. We can only note the extension of tape recording into the realm of power politics with apprehension and regret that the situation that required its use should ever have arisen.

* * *

THERE are news items other than those relating to armed combat. We have recently given some editorial coverage to Video tape recorders and the problems associated with them. But the word "tape" is critical. Have you ever thought of Video reproduction through the medium of disc, rather than tape? If not you are well behind the times. This is not a dream of the future. It has not only been accomplished but it has been accomplished in colour. Admittedly we have a long way to go before Video discs are familiar items of domestic equipment. Nevertheless, the disc system may well prove to be a serious competitor in the future to tape. So much depends upon cost. At the present stage of development it is not possible to obtain the extended programme time on disc that can be obtained on tape, but given two or three years this may well come about. The prospect of purchasing gramophone records with both sound and visual images registered on the single disc becomes a possibility for the future. Is this one of the many shapes of things to come?

* * *

TO turn from conjecture to reality we now find ourselves in the middle of the most popular holiday season. Few people would dream of going on their holidays without a camera. How many would say with equal urgency, "I must take a tape recorder"? Just as the scenes captured on film will have gone beyond recall once the holiday is over, so the sounds will have passed, perhaps never to be renewed. At one time it didn't matter. To record those sounds would have required a pantechinon full of equipment and qualified staff. Today a small, portable battery tape recorder, costing only a few pounds, is all that is needed. Looking back a few years I remember how bitterly I envied the owners of the old E.M.I. L2 portable recorders. For them the world of outdoor sound was wide open. To me it was closed because I just couldn't afford the equipment. To-day any amateur can achieve a quality standard at least as good as was obtained with the early portable recorders, but at a fraction of their cost and certainly at a fraction of their inconvenience. One would have thought that the portable recorder would have been as familiar an object as the camera, with the sound snapshot creating as much interest as its visual counterpart. This happy situation has not quite come about. Perhaps it is because appreciation of sound requires more mental effort than visual appreciation. We have to think and concentrate about sound, whereas we can take in a picture at a glance. Or so one would think. In fact, perceptive visual appreciation requires at least as much thought as aural appreciation.

Most of the cameras carried around the resorts will be used for the type of unimaginative photograph that has been taken since the earliest days of photography. What we all need is a deeper understanding of the medium in which we work, whether it be sound or vision. A poor photograph can be looked at and shovled on one side within seconds; a poor sound recording must (for the sake of politeness) be listened to from beginning to end, and that process cannot be speeded up.

So let us resolve to be selective in both our recordings and our photography. Let us take recordings that are meaningful, that can be listened to by persons outside our own family and yet still appreciated. Any fool can click a camera shutter, just as any fool can wave a microphone around. But the true artist in either medium will produce meaningful work that exists in its own right, and the difference always lies in the person—not the equipment.

* * *

THE giant Canadian exhibition Expo '67 has just opened to provide those fortunate enough to visit Montreal with an unforgettable experience. I was interested to learn that speaker units for installation in the Swiss Government Pavilion were ordered at the British Audio Fair from Jordan-Watts Ltd.

The 20 modules will be used to supply continuous piped music throughout the duration of the exhibition. They were selected for a very unusual reason. During the Fair recordings of the famous Swiss Alpenhorn will be played; the notes from this instrument have long been recognised as extremely difficult to reproduce. The Jordan-Watts modular unit is said to be one of the very few systems able to do this perfectly. It is gratifying to know that British audio equipment is so highly thought of abroad.

* * *

NEWS has just been received of a new organisation called "Tapes for the Blind." The aim of this organisation, which by the way is a registered charity, is to send a monthly sound magazine to blind or handicapped tape recording enthusiasts who have enrolled for free membership. The proposed magazine is ambitious; to run at 3½ ips, the duration will be of approximately two hours and it is to contain many interesting items including interviews, documentaries, music, poetry, sound effects and other material members care to ask for.

Non-handicapped persons are eligible for "helper membership" in return for a subscription fee of 10s. per year. Helper members are expected to send in from time to time any material they think might be of interest to the listeners.

The club secretary, Mr. Eddie Jones, 63, Ashton Road, Luton, Bedfordshire, would be only too pleased to forward details to those interested who are asked to contact him.

My personal feeling is that all who devote time and energy to work of this kind are to be highly commended. I wish this venture all good fortune and have no doubt that those readers seeking a useful outlet for their recording talents will be generous with their assistance.

* * *

I RECENTLY had the pleasure of a long chat with Lord Montagu of Beaulieu. Aware of his great interest in motorcars I asked him what he thought of the new cassette type reproducers designed for listening whilst driving. Not only did he wholeheartedly approve but he confided in me his secret wish that Philips might produce the whole of the Wagner Ring Cycle in Music-cassette form. As he explained, by wading through the set on his regular journeys between Beaulieu and London he would ultimately get through the entire collection. And he reckoned he could do it in just about six months. . . !

A glossary of tape terms—part 16

TONE CONTROLS. Basically, the tone control is used to enable the listener to "tailor" the replayed sound to suit his tastes. In practice, it is too often used to compensate for deficiencies in the recording or reproducing system.

Some examples of tone controls are shown in Fig. 1. The simplest type is the "top-cut" treble attenuator produced from a series capacitor and resistor across the output of an amplifier. As the signal frequency rises, the reactance of the capacitor decreases and the resistor has greater effect, until at the highest frequencies the greatest attenuation occurs. Hence the term, "top-cut."

Other tone controls attenuate different bands of frequency, or give precedence to certain bands of frequencies, earning the doubtful title of "boost controls." Passive tone controls have the effect of "rotating" the response about a hinge frequency, usually in the region of 1 kHz. A Baxandall tone control has the effect of a broader "hinge," with the boost and cut confined to the ends of the scale initially. It is especially advantageous for bass control where the mid-frequencies are not to be attenuated so much.

At the treble end of the spectrum special problems often demand filters and "slope" controls, altering the degree of attenuation over the controlled band. For a switched filter, a slope of 6 dB per octave, with the -3 dB point at about 6 kHz is normal. The continuously variable type is more likely to add the advantage of increased attenuation at the lower end.

* * *

TOP-CUT. Method of tone control that attenuates the treble end of the audio spectrum. (See above.)

* * *

TRACKS. The actual bands of recorded signals on the tape. Two or four-track recording is standard on modern machines, and where 1/2-inch tape is used, the track dimensions, separation and sequence shown in Fig. 3 will be employed. Some makers number the tracks differently, but the system is fundamentally the same. Perhaps it is too much to expect complete standardisation! With at least two cassette systems employing different widths of tape and speeds of transport, and lately at least three videotape systems with wide differences, we must be grateful for what compatibility we can obtain from the given two and four-track systems.

As a guide to track identification, makers of pre-recorded tapes generally put white or green leader at the beginning of track 1 and red leader tape at the beginning of track 2, (end of track 1).

For stereo recordings, a track width of 2 mm (0.08 in.) is usual, giving adequate track separation. The left channel occupies the top track and the right channel the lower track. Four track machines thus use track 1 left channel and track 3 right channel (numbering vertically from the top).

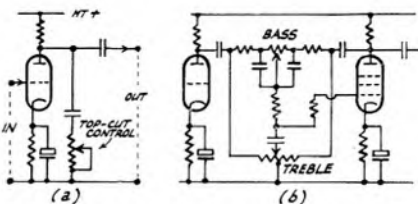


Fig. 1. (a) Simple top-cut tone control. (b) Baxandall system, using negative feedback principle. At high frequencies the treble control take-off capacitor is small and the treble control gives boost or cut. At low frequencies the reactance of the two capacitors to the outer ends of the bass control increases and varying the control gives boost or cut

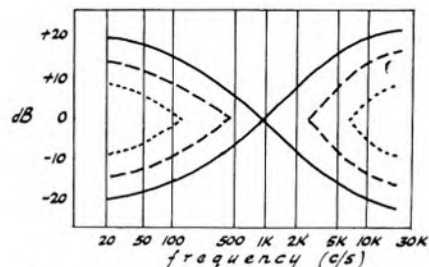


Fig. 2. Frequency response curves of tone control

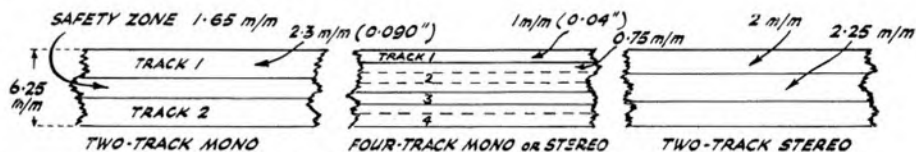


Fig. 3. Track arrangements and dimensions

TRANSDUCER. Any device capable of receiving energy in one form and passing it on in another. Thus, a microphone, receiving sound energy and converting it to electrical impulses, is a transducer; similarly, a loudspeaker converts electrical energy into sound waves, and is also a transducer.

* * *

TRANSFER CHARACTERISTIC. Relating to an amplifier, this is the graph that shows the output waveform of an amplifier against the input waveform, i.e., gives an indication of the distortion. Fig. 4 shows the transfer characteristics of three specimen amplifiers, with the varying outputs that can be expected from a pure sine-wave input. Note that the straight-line transfer characteristic A gives true reproduction. Variations from this produce distorted output. This can be reduced to various proportions of harmonic distortion and measured by special instruments. Because the input signal is more usually a combination of waveforms, the output is seldom a simple variation as shown. More often, intermodulation effects produce a modified output, and this also can be measured and assessed.

Practically, the amount of harmonic distortion that can be tolerated depends on the actual harmonic content and distribution. Quite a bit of "low-order" harmonic distortion (i.e., up to the 6th harmonic) can be tolerated without discomfort, but the 7th, 9th, 11th, 13th, 14th, 17th, 18th and 19th harmonics are dissonant, and quite small components of these harmonics are disagreeable to the ear.

As a guide, distortion of 0.8 per cent in a 15 kHz bandwidth is just perceptible, and 2.5 per cent becomes objectionable. Reduc-

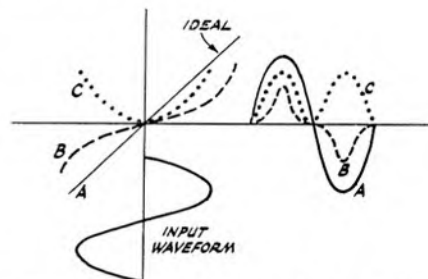


Fig. 4. Specimen transfer characteristic curves for different amplifiers showing the distorted form of the output when the transfer characteristic is non-linear

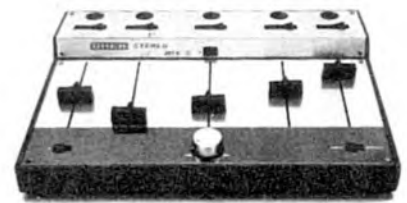
tion of the bandwidth increases these figures, and the volume level modifies their effect.

Referring to the tape recording process, the term transfer characteristic relates to the remanence curve, plotted on a B-H axis, showing the variation of remanent induction (of tape) with the magnetising force needed to produce it. Because the intensity of magnetising force is not directly proportional to the residual magnetism, an applied signal will give a distorted recording. The remedy is to employ high frequency bias. This technique has been discussed earlier.

* * *

TRANSFER DISTORTION. The effect that occurs when the recording bias is incorrect, either in waveform or amplitude.

Transfer distortion takes place when a tape is replayed, and the replayed signal has to be "tailored" to regain a level reproduction characteristic. (See Equalisation, and Standards.)



UHER STEREO-MIX 5

INVESTIGATED BY R. HIRST AND D. KILLICK

MANUFACTURER'S SPECIFICATION

Uher Stereo-Mix 5

Frequency Range: 2 to 20,000 Hertz, linear.

Dynamic Range: > 60 dB.

Power supply: 9 Volt Battery.

Transistors: 11 x AC151.

Output Impedance: 20 kOhms.

Mutual Level Influence: < 1 dB.

Stereo Channel Separation: > 55 dB.

Total Linear Distortion: < 0.5 per cent.

Inputs 1 and 6: Impedance 3 kOhms, Input Voltage 0.1-27 mV. Suitable for Stereo or Mono microphones. Mono microphones connected here record on the left (No. 1) channel in Stereo operation.

Inputs 2 and 7: Impedance 2 x 47 kOhms and/or 2 x 1 megohm. Input voltages 3.5-500 mV and/or 70 mV-10 V. Suitable for Stereo or Mono microphones and other sound sources requiring a high input impedance, e.g., output from radio, tape recorder, crystal pick-up, etc. Mono sound sources connected here record on left (No. 1) channel in Stereo operation.

Inputs 3 and 8: Impedance 3 kOhms, Input Voltage 0.1-27 mV. All as for inputs 1 and 6 above, except that Mono sources record on the right (No. 2) channel in Stereo operation.

Input 4: Impedance 3 kOhms. Input Voltage 0.1-27 mV. Suitable for Mono microphones or any sources requiring a 3 kOhms input impedance. In Stereo operation the Direction Control mixes the signal to either left or right channels at will, and can cross fade from one to the other.

Input 5: Impedance 47 kOhms and/or 1 megohm. Input Voltage 3.5-500 mV and/or 70 mV-10 V. Suitable for high impedance Mono microphones or other sound sources requiring a high impedance input. Direction control available as for Input No. 4 above.

Price: £47 6s. 9d.

Distributors: Bosch Ltd., 205, Great Portland Street, London, W.1.

UHER STEREO-MIX 5 TEST CHART

Input No.	Connections	Input Voltage	Output Voltage	Signal-to-Noise Ratio	Input for 5% Distortion	
					All Controls Maximum	Input Maximum Pre-set Minimum
3 and 8	Pin 3	2 mV	1 V	78 dB	10 mV	200 mV
2 and 7	Pins 1 and 4	15 mV	100 mV	58 dB	20 mV	2 V
2 and 7	Pins 3 and 5	300 mV	100 mV	56 dB	500 mV	11.6 V
1 and 6	Pins 3 and 5	2 mV	1 V	76 dB	10 mV	200 mV
4	Pin 3	2 mV	1 V	72 dB	10 mV	200 mV
5	Pin 3	300 mV	100 mV	57 dB	500 mV	11.4 V
5	Pin 1	15 mV	100 mV	58 dB	500 mV	2 V

NOTES.—Inputs 4 and 5 have the additional facility of a separate internal mixing configuration. Crosstalk was too low to obtain any accurate or repetitive measurement. Frequency Response was sensibly flat within the claimed range of up to 20,000 Hertz, but it should be noted that some losses will occur if the output from an ordinary crystal or ceramic cartridge is fed into the 1 megohm inputs (2 megohms is the correct matching impedance). Better results will be obtained with the newer high capacity types. Test equipment used includes: Marconi Signal Generator, Bruel and Kjaer Frequency Analyser Type 207 and Marconi Distortion Factor Analyser.

In our "Techniques" feature this month we have discussed mixers in detail. For our review we have selected an electronic mixer manufactured by Uher. This unit can be operated in stereo or mono conditions, and is powered independently of mains by a 9-volt battery.

There are a number of problems which inevitably arise in tabulating laboratory findings on mixers. The more versatile the mixer, the more difficult it is to adequately summarise results. The equipment now under consideration is one of the most versatile and flexible mixers we have come across. We have, however, formulated a table of results, but we feel that some explanation of our reasons for presenting it in this way is called for.

There are certain basic requirements that must be considered in the design of any mixer. In the first place the unit must be capable of handling a wide variety of inputs, both in voltage and impedance; at the same time distortion must be low and signal-to-noise ratio must be maintained at a reasonable level. To cope

with these problems careful consideration must be given at the design stage to voltage swings within the unit. Flexibility can be increased by the inclusion of additional pre-set potentiometers in each of the controlled stages, although this will inevitably tend to make operation rather more complicated.

To simplify the table of readings a set condition of output has been determined for each channel, and then the input, signal-to-noise ratio and distortion characteristics have been related to that output. If the pre-set control is adjusted to its minimum condition a relatively greater signal will have to be fed into the equipment to maintain the same output. This could be regarded as "worsening" conditions from the input point of view, and will therefore enable us to establish appropriate overload characteristics.

If it is assumed that the noise voltage in the device remains constant at given settings of the gain controls, then the useful dynamic range could be established. For example, if the average signal of a

microphone was 2mV and fed into pin 3 of socket 8, the output would be 1 volt and the signal-to-noise ratio would be 78 dB below the output of 1 volt. If the maximum output from the microphone were to be, say, 20 mV, then the output would have theoretically increased by ten times, assuming the mixer could handle it. With the noise content remaining constant the signal-to-noise ratio would have improved by ten times also. If the minimum output of the microphone were to be in the order of 0.02 mV the output would have dropped by one hundred times, but the constant noise voltage would bring about a corresponding deterioration in the signal-to-noise ratio.

We could say that the signal being recorded would have a dynamic range of from 0.02 mV to 20 mV—in other words 60 dB. At the lower input signal condition the signal-to-noise ratio would be in the order of 38 dB, since the minimum input voltage of 0.02 mV is 40 dB below the 2 mV average signal strength quoted. Thus the signal-to-noise ratio would have deteriorated by this amount at the lower input level. From this information it is possible to judge whether or not the settings provided will suit the particular applications for which the mixer is to be used.

In the case of the Uher Stereo-Mix 5 it is fair to say that the unit endeavours to comply with the greatest possible number of working conditions. Deterioration of recorded quality should only come about through misuse of the appliance. This brings us to our most serious criticism of an otherwise splendid piece of equipment. The instruction manual provided is so badly written and so badly translated as to make a proper understanding of the facilities offered almost impossible. Your reviewers are well accustomed to handling a wide variety of equipments, but none have given so many headaches in establishing precisely what does what as the Uher Stereo-Mix 5. This is entirely unnecessary, since the functions of the various inputs and controls could have been very easily described, and once the user is familiar with them operation is delightfully simple. We fail to understand why any manufacturer of any product should apparently go out of his way to make its use by the new purchaser as difficult and as complicated as possible.

In appearance the Uher Stereo-Mix 5 is exceptionally neat, measuring only 11 in. x 8 in. approximately, 2½ in. high at the rear, sloping to 1 in. at the front. There are five controllable channels, each of which is operated by a glide-type potentiometer which travels along a numeric scale marked from one to ten. In addition, each of the five channels has an individual, rocker-type, on/off switch and an adjustable, pre-set, gain. These pre-set gain controls are conveniently placed on the main panel and are slotted so they may be turned by the insertion of a coin. This method is ideal since it prevents any chance of accidental changes in levels.

Also on the front panel is the on/off switch together with a rotating knob which is described as a "Direction Control." The inclusion of this direction control is a surprisingly sophisticated addition that one would not expect to find in equipment at

this price level. Its functioning is extremely interesting.

The five controllable channels are arranged as two stereo pairs, one on the right and the other on the left, with a single, unrelated channel in the centre. This centre channel may be fed to either the right hand or left hand stereo pairs at will by operating the direction control. In stereo recording it is often desirable to fix relative positions of individual sound components within the sound stage, and this is simply accomplished by mixing part of one stereo channel into the other. This is normally done on a professional stereo mixer by the use of an additional control, known as a "pan-pot fader." Direction control on the Stereo-Mix 5 is the nearest approach to this principle that we have found on amateur equipment. By skilled use it is possible to apparently move a particular sound right across the full width of the stereo sound stage without any actual physical movement having taken place in the studio.

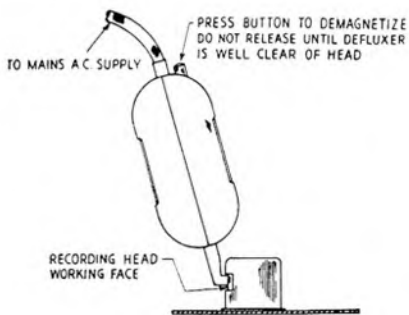
Yet another facility is offered on this equipment. It incorporates a built-in signal generator which serves a double purpose as a check on battery power and a means of accurately lining up the mixer with its associated recorder. The method of use is to throw a switch on the mixer control panel into its generator position, and then to modulate the recorder to full recording level. If a stereo machine is being used both channels must be calibrated in this way. If no signal is present when the generator is switched into circuit the mixer battery is exhausted and requires replacement. If this sequence of operations is properly carried out as part of the routine setting-up proce-

sure it should be impossible to accidentally work with a flat battery.

The versatility of this appliance is truly astounding. In mono application up to five microphones may be mixed, or alternatively, three pre-amplified inputs plus two microphones or two pre-amplified inputs and three microphones. In the stereo condition two stereo microphones can be connected together with a single mono microphone for directional control. Alternatively, a number of choices of microphone and pre-amplified sources can be mixed in a bewildering sequence of combinations.

Summarising the features of the Uher Stereo-Mix 5 the manufacturers claim universal usage because it can suit every tape recorder, endless mixing facilities to suit every wish of the connoisseur amateur enthusiast, good amplification with very low signal to noise ratio and freedom from distortion, built-in tone generator for accurate balancing and internal battery check, switchable channels and independent level controls. Our investigation indeed confirms that these facilities are not only present but they operate cleanly and well. If we may repeat our criticism of the inadequacy of the instruction manual we would warn intending purchasers that they should allow themselves considerable time to really understand and familiarise themselves with the wealth of facilities available.

In the opinion of your reviewers this mixer offers outstanding versatility and value for money. It could be the most useful single accessory for any enthusiast who wishes to seriously devote himself to any form of sound recording other than the most elementary.



ACCESSORY REVIEWS

Ferrograph Defluxer manufactured by Wright & Weaire Limited, 84, Blackfriars Road, Southwark, London, S.E.1. Price 60s.

Rendar Safebloc Mains Coupler. Rendar Instruments Limited, Victoria Road, Burgess Hill, Sussex. Price 42s. 6d.

The Rendar Safebloc and the Ferrograph Defluxer are two most useful accessories for recording enthusiasts. The defluxer is an instrument which enables the user to reduce to the lowest possible level the effects of extraneous magnetic noise in tape recording. Its use will also protect valuable recorded tapes against the gradual partial erasure of their high frequency content. Intended for use on practically any type of magnetic recorder, its purpose is to remove residual magnetic fluxes from the heads or other metal parts against which the tape normally comes into contact during its progress through the sound channel.

In the form of a robust plastic moulding, the instrument has a specially shaped metal



prong at one end and lead for mains connection at the other. The only control is a red on-off button, conveniently placed adjacent to the cable exit.

After fitting an appropriate plug to the mains lead, the red button is depressed and the specially shaped metal tip is presented to the working face of the head for one or two seconds only. With the button still de-

pressed the tip is slowly withdrawn so that the magnetic circuit of the head is subjected to a slowly decreasing AC field. A warning in the instructions advises the user never to release the on-off button until the defluxer is well clear of the heads. The same technique is applied to any other steel parts that might lie within the tape path.

Signs indicating the need for defluxing are an increase of background noise and hiss, or the appearance of irregular "pops" at intervals during what should be silent periods of playback. The gradual degradation of quality due to the partial erasure of short wave-lengths from pre-recorded tapes will be extremely difficult to detect, since the cumulative losses are suffered gradually over a period of time. Regular defluxing will prevent this state of affairs ever arising.

In user tests it was found that the defluxer operated very satisfactorily. Our only criticism is of the shape of the on-off button. Since this has to be kept depressed (normally with the thumb of the right hand) during the whole of the defluxing operation, the continued pressure on the ball of the thumb is liable to leave an impressed indentation in the flesh. Your reviewer has been using this type of defluxer for some five or six years and the earlier models could inflict pain from this continually applied pressure. The recent model, in the familiar Ferrograph green/grey colour, was much easier in operation, requiring far less pressure on the button.

In all other respects the appliance does precisely what it is intended to do. The defluxing operation need take no more than half a minute or so if the heads on the recorder are easily accessible. It will take longer if head covers or deck plates have to be removed first. It was particularly noted

that the plastic body of the instrument had been manufactured in two halves; by undoing four screws and nuts the case could be split in two, thus permitting complete renewal of mains lead if required.

Summarising our comments on the defluxer we would confirm that it is a most useful tool, which, at low cost, will perform invaluable service in both protecting existing recordings and preventing unnecessary increases in the noise level of new recordings.

Most people using recording equipment find they often have to plug one or two different appliances, a recorder, a mixer, a radio, a gramophone, etc., into the same mains socket. The usual procedure is to use a number of adapters and fit each individual lead with its own mains plug. Gradually one builds up a very untidy, and perhaps even dangerous, Christmas-tree contraption. Some multi-adaptors are notorious for making poor electrical connections which will cause audible crackles on recordings. Apart from which the day will inevitably dawn when one just does not have the right sort of mains plug required to fit.

This problem can be completely overcome by using the Rendar Safebloc Mains Coupler. This accessory offers a safe, quick and secure means of connecting two or three core, bare ended, flexible leads to AC mains. No plug is needed, and the apparatus is constructed in such a way that no current can pass when its internal metal fittings are exposed so there is no danger of suffering an electric shock.

The case of the Safebloc is moulded in a tough, thermosetting plastic. When the lid is opened three nickel-plated, corrosion resisting clips are revealed. These are colour coded for instant identification and are provided with a strong, non-slip grip. Mains

supply is fed into the Safebloc by means of a three-core cable to concealed terminals beneath the screw-on baseplate. The action of opening the lid of the Safebloc not only reveals the clip connectors, it also effectively cuts off the power supply to them. In use one keeps the Safebloc permanently connected to a live mains socket, and to power a piece of equipment the bare ends of the mains lead from that appliance are merely inserted in the jaws of the spring clip connectors. As soon as the lid is closed contact is made and current flows through to the connected appliance.

As a safety measure the live line is fused with a 5 amp. fuse, but any value up to 13 amps. can be inserted if required. "Double" versions are available for use with three or four terminal supplies. These double Safeblocs are made up of six terminals of which two, three or four may be fused.

The Rendar Safebloc will be found to be the kind of accessory that makes one wonder how one managed without it. Sooner or later every recording enthusiast is tempted to ram a few bare wires into an ordinary mains power socket. Happily we usually manage to get away with heinous crimes of this kind. But if a Safebloc is used such risks need never be taken. Complete safety is assured, together with ultimate flexibility of connections without having to bother about using a single mains plug.

This appliance is not nearly so well known as it deserves to be, and it might be found that local retailers do not stock it. Most wholesalers should have supplies, however, or alternatively it may be purchased by post from Electroniques (Proprietors S.T.C. Limited), Edinburgh Way, Harlow, Essex. **D.G.K.**

TAPE AND TRANSPARENCY—

Continued from page 304

In use the microphone is plugged into the Synchroslide, not the tape recorder, and the output from the Synchroslide goes to the microphone input on the machine. After setting levels a pulse button on the Synchroslide is actuated whenever a slide change is required. The effect of pressing this pulse button is to add a subsonic signal to the voice commentary. On playback the output from the recorder is fed, via the Synchroslide, to the projector independently of the power output to loudspeakers. Whenever the pulse is played back it will actuate the slide change mechanism. The manufacturers state that the appliance is suitable for use with most tape recorders and most projectors. This underlines the point that before acquiring any synchronising attachment one must carefully check to ensure that it really is compatible with both the projector and tape recorder which it is proposed to use.

For our own experiments in tape/slide synchronisation we have been using two pieces of very excellent equipment which give outstandingly good results. The Uher Stereo Royal tape recorder offers a vast range of very complex facilities, amongst which is a built-in pulse generator intended for use with automatic projectors. So the Uher Stereo Royal is one of the few tape recorders which may be used for tape/slide applications without needing any auxiliary synchronising attachment.

It is delightfully easy to use. The recording is prepared in the normal manner and then the tape is wound back to the beginning again for the application of the pulses. The function control switch is then turned

to one of two positions marked Dia. 1 or Dia. 2, depending on whether the commentary is mono or stereo. All one has to do is to run the tape through, listening to the playback, and then depress a special pulse control button at the appropriate moments. If mistakes are made the tape may be re-wound, the original pulses removed and new ones inserted without in any way affecting the commentary recording.

The projector we used in conjunction with the Uher Stereo Royal was the Leitz Pradovit Colour. This beautifully made instrument, which offers remote control of focusing as well as remote control slide changing, is one of the aristocrats of the projector world. Manufactured by the makers of the world famous Leica camera, it functions with utter reliability to ensure the smoothest possible presentation of the show.

With these two pieces of equipment—or their equivalents—one is in an excellent position to produce some really fine work. The uninitiated might imagine that the sound slide show is nothing more than a feeble substitute for a properly prepared moving film with sound track. Commercial interests have taken advantage of this situation by persuading enthusiasts to buy cine cameras and projectors in preference to still cameras, often before the full potential of the slide show has been seriously explored. Although working with still images in the manner suggested could form an excellent training for more difficult cine work, it should be remembered that a good slide show is always better than a poor film; and in fact the very best slide show could be said to be as interesting and as satisfying as the very best film. Although both media do have a great deal in common they are, when properly developed, quite different, and therefore not

open to direct comparison in this way. There are in this country a few really great exponents of the tape and transparency technique. Their productions are of absorbing interest of great artistic merit. Their basic tools are the tools described in this article.

Any slide show is all the better for properly prepared introductory slides. The preparation of these is a purely photographic job which it is not my function to discuss here. But just as we have the visual introduction, so too we can have an aural introduction, usually musical in nature. At the other end of the show, its conclusion, there should also be a closing slide or sequence of slides which again can be given a musical background. During the show itself appropriate music can be faded in and out, either as background to the voice or as musical interpretation of the image on the screen.

This work calls for the greatest exercise of both taste and restraint. Firstly, we have to understand that we may not, under any circumstances, use copyright music. We may not, for instance, dub our music from commercial gramophone records. So the choice of music is likely to be severely limited, and yet it must also be wholly appropriate to the slides it is to accompany.

In future editions of *TAPE Recording Magazine* we shall be dealing with various aspects of sound mixing techniques. They all apply directly to the preparation of sound tracks. It is not possible to give specific guidance, since every sound track is created on its own merits for a particular purpose. The arbiter must always be the enthusiast's personal judgment. One thing is quite certain: it is only by attempting work of this kind that one can ever come to understand the creative possibilities that are at one's disposal.

EVENTS ARE MOVING RAPIDLY IN THE CASSETTE WORLD

CASSETTE NEWS

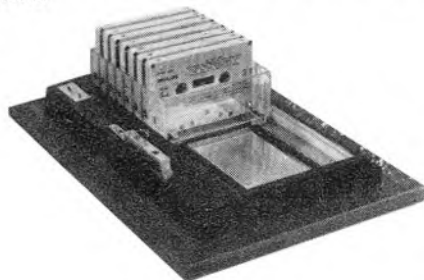
DEVELOPMENTS in the cassette world are now following each other with such rapidity that we are having difficulty in keeping abreast of current progress. Last month, in our Special Cassette Number, we reported the probability of cassette autochangers becoming available within twelve months. Before our July issue was off the printing press Garrard Engineering Limited were showing a prototype of their eight-cassette autochanger. A transparent plastic rack accepts up to eight cassettes at a loading. When the mechanism is put into operation all eight cassettes will be played from beginning to end, in sequence, on side one only. If the cassettes are then removed, turned round and re-inserted, the programme will follow with the eight second sides.

The operation of the equipment is ingenious. The first cassette in a programme sequence slides down from the plastic rack to the mechanism beneath. When playback of side one is complete the cassette is raised back to rack level, the entire rack and contents move to the right and the second cassette falls into place. This sequence of operations is continued until the last of the eight cassettes has been played. Described by the manufacturer as "goof-proof," wrongly inserted cassettes (upside down) are merely rejected and the rack travels to the next in line.

Since we had forecast the imminent arrival of this class of equipment last month it was gratifying to actually see the physical reality so soon. Garrard tell us they hope to be in a position to market this product by early next year at the latest.

The basis of the autochanger is the Garrard "Slide-in" mechanism. Insertion of a Compact Cassette into the slot provided automatically throws the tape transport system into operation, without the use of start or run levers. A sophisticated stop system senses the revolutions of the cassette reel, automatically stops the tape and ejects when the end of the tape has been reached. This electronic stop system ensures that the cassette is ejected when the motor is stopped, and the tape is therefore never pinched between the capstan and pinchwheel. At the end of the cassette the whole system will switch off automatically.

As this mechanism can operate either horizontally or vertically, depending on the tensions of two springs, it has a wide range of possible uses. Its ease of operation and extreme compactness could make it ideal for development as a car player or auto-radio.



A prototype of the Garrard automatic cassette changer

With emphasis on motor-car applications a number of firms are developing Compact Cassette equipments. Eurovox Automotive Products Limited have a car stereo player known as the 411 retailing at 30 guineas. A choice of three different speaker kits are available at recommended prices of five guineas per kit. Personality Electrics Limited are marketing the Easi-tune Stereo-tone cassette player at a recommended retail price of 32 guineas, which includes two 7 in. x 4 in. speakers. Elizabethan will shortly have available an Elpico car cassette player utilising existing radio speakers. Price has not yet been fixed for this unit. Radiomobile are also planning to market a car/portable tape recorder, but the date of introduction and price have not yet been finalised. The unit will be supplied with car attachments. In its portable condition it will operate from internal batteries and loudspeaker, while in the car it may be connected to the car battery supply and external loudspeaker. By simple switching it will be possible to record directly from the radio. Removal from the car will be by an easy slide-out action, and a carrying case will be supplied.

To meet the special requirements of motor-car drivers a new release of Musicassettes, under the title of "Moods Orchestral Series," has been designed to soothe away the frustrations of traffic jams without inducing excessive relaxation. A number of different orchestras have been recorded performing a carefully selected repertoire to give a wide variety of sounds and rhythms.

During the month of July only, Philips are making a special, low-price, "Golden Sounds" offer of two sets of four Musicassettes, each set at £2 less than the normal retail price. It should be noted that this offer definitely closes on the last day of July.

Looking into the future it is understood that "Double L.P." Musicassettes will be available before the end of this year. Pro-

gramme time will be approximately 40 minutes per side, 80 minutes in all. In October a new series of spoken word Musicassettes will be released. These will not only include drama, poetry reading, etc., but will also feature "Do-it-Yourself" instructional material for the home hobbyist or handyman. Within this series will also be included very highly specialised, technical, recordings for the use of professional people. For instance, doctors now find it difficult to keep pace with all the latest reading material describing recent medical advances. In the future they won't need to find the time to read anything; they will just slip a Musicassette into their car playback machine and listen whilst they drive on their rounds.

Of more general interest is the participation of the Readers Digest Organisation in the Musicassette market. Their first release of a specially recorded set of four compatible mono/stereo cassettes carries the title "Mood Music for Listening and Relaxation." Offering a 23 per cent saving on normal prices, in conjunction with low-deposit easy terms, they can be obtained only through the Readers Digest Association Limited of 7/10 Old Bailey, London, EC4. Arrangements are being made for an early review of this library in our regular Musicassette Review section.

It would be pleasant to be able to close these notes on latest developments with a hint of Video pictures in the future from Compact Cassettes running at 1/4ths ips! Unfortunately this is far beyond the bounds of practical feasibility. There are excellent technical reasons for emphatically denying even the remotest possibility of such an event. But what is impossible in 1967 may be possible in 1977 and commonplace by 1987. At least such thoughts open very wide fields of interesting speculation.

MUSIC ON TAPE

REVIEWS

MUSICASSETTE

SHAKESPEARE AND ALL THAT JAZZ. Cleo Laine. Fontana CFF6000, 40s.

This brilliantly sophisticated collection is a pure amalgam of all that is best from Johnny Dankworth and Cleo Laine. There is a fascination about the idea of setting Shakespearian words to music. And when that music has been conceived by Arthur Young, Duke Ellington and Johnny Dankworth one can be quite sure that the result will be as original and as exciting as it will be appropriate to the Shakespearian lines.

Added to this we have the inimitable voice of Cleo Laine. Rich in texture, she effortlessly follows the highly intricate scores to produce one of the most satisfying albums I have heard for a long time. The satisfaction is not merely musical—there is an intellectual satisfaction which will readily appeal to all kinds and conditions of people. My teenage son promptly appropriated this Musicassette and has been playing it ceaselessly ever since. So parents should be warned—if the youngsters get their hands on it you will never see it again.



MUSICCASSETTES 'GOLDEN SOUNDS' OFFER

An offer that introduces you to the wonderful world of musicassettes—yet saves you ££££'s

SET A		SET B	
<p>"Golden Hits" Dusty Springfield CPP 1021 "Portrait" The Walker Brothers CPP 1019 "Dave Dee, Dozy, Beaky, Mick & Tich" Dave Dee, Dozy, etc. CFP 4007 "Changes" Julie Felix CFF 5001</p>		<p>"Your Favourite Classical Themes styled '66" Tilsley Orchestral CFP 4010 "Music for Relaxation" x Michel Legrand CPP 1013 "Mood Latino" Bill McGuffie CPP 1017 "Show Souvenirs" Harry Secombe CPP 1001</p>	

During July only Philips bring you the wonderful 'Golden Sounds'—Offer a unique chance for you to enjoy the many pleasures of musicassettes at a **dramatic reduction on the normal retail price.**

It brings you the choice between two sets of specially chosen musicassettes. Set A offers some of the very best material available in the top pops category.

Set B brings you music in a more relaxed mood.

The normal price you would pay for a set of four musicassettes is £8. But the 'Golden Sounds' Offer brings the price down to **just £6 per set—a saving of £2!**

Or you save a remarkable £4 if you buy both sets! See your local record dealer now and ask for further details. Remember—this offer ends on July 30th, so hurry.

write for a leaflet giving full details of the wonderful range of musicassettes to Philips Records Ltd Stanhope House Stanhope Place London W 2

YOUR LOCAL DEALER

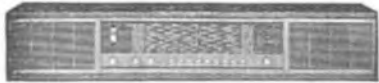
LONDON

Lee Electronics

THE TAPE RECORDER & HI-FI AUDIO SPECIALISTS
400, EDGWARE RD., LONDON, W.2 (PAD 5521)

London's leading Stockists of High-Fidelity
and Audio Equipment. Many bargains in
new and reconditioned equipment.

SEND FOR FREE LISTS OF RECORDING
TAPES, RECORDERS, AMPLIFIERS, ETC.



APPOINTED B. & O. AGENTS

- ★ TAPE RECORDER HIRE
- ★ TAPE TO DISC 78 & LP
- ★ RECORDING STUDIO
- ★ TAPE RECORDER REPAIRS
- ★ SALES—EXCHANGES

MAGNEGRAPH

1, Hanway Place, London, W.1.
Tel.: LANGham 2156

Masseys Centre of Sound

West London's Hi-Fi Tape Recorder Specialist
—Demonstration Room with Comparator

APPOINTED FERROGRAPH DEALER

AT

CHISWICK, W.4

Accessories, All Kinds—Servicing—Pre-Recorded
Tapes Mono/Stereo
121-123 High Road—10 a.m.—7 p.m.

◀ TEL: CHI 2082 ▶

(not closed for lunch)

TAPE RECORDER HI-FI CENTRE (SHEEN) LTD.

— The Centre for —

FRIENDLY HELP—SALES—SERVICE
DEMONSTRATIONS ANY TIME—ALL PRE-
RECORDED TAPES—STEREO—MONO
LANGUAGES—DANCE—JAZZ—SHOWS
CLASSICS, etc.—2 and 4 TRACK—STOCKISTS
OF ALL MAKES AND MODELS OF RECORDERS
AND HI-FI—Add sound to your movies with
Synchrodek—WE ARE STOCKISTS OF
SYNCHRODEK
TERMS—EXCHANGES, ETC.

3/4 STATION PARADE, SHEEN LANE,
SHEEN, LONDON, S.W.14
(Opposite Mortlake Station, S.R.)
Showroom: PROspect 0985

9 a.m.—6 p.m.; Fridays 9 a.m.—8 p.m.

The items in the album are: *Take All My Loves, Blow, Blow Thou Winter Wind, Shall I Compare Thee, Witches Fair and Foul, Fear No More, Sigh No More Ladies, Dunsinane Blues, If Music be the Food of Love, Oh Mistress Mine, Duet of Sonnets, Winter, My Love is as a Fever, It was a Lover and His Lass and The Compleat Works*. Many of these are old favourites. All adhere strictly to the original text, with two exceptions. The final item, *The Compleat Works*, uses the titles of all the Shakespearean plays, sonnets and poems as lyrics, and in *Dunsinane Blues* numerous quotations from Macbeth, Malcolm McDuff and several apparitions are used as the basis of the lyric with additional linking material by Johnny Dankworth.

I find it difficult to imagine anyone who could not listen to this recording without responding to these truly beautiful settings of some of the finest words that have ever been written in the English language.

JOAN BAEZ. Fontana CFF5000, 40s.

Joan Baez accompanies herself on the guitar in this very moving collection. The vocalist's artistry is superb. The choice of items is highly imaginative, and the recorded quality is excellent. Having already reviewed the Cleo Laine collection and announced it excellent the reviewer is in a dilemma to adequately describe the Joan Baez. For in its own way it is at least equally as good. Let me just say that these two collections are, in my opinion, two of the very best Musicassettes that one can buy.

The Joan Baez repertoire includes: *There but for Fortune, Stewball, So we'll go no more a'roving, The Death of Queen Jane, Bachianas Brasileiras No. 5, Go 'way from my Window, I still miss Someone, When you hear them cuckoos hollerin', Birmingham Sunday, It Ain't me Babe, O'cangaceiro and The Unquiet Grave*.

Let me mention just three of these numbers. The Baez rendering of *It Ain't me Babe*, is sheer, unalloyed, delight. The song expresses perfectly the relationship between the demanding female and the reluctant male; it is presented with such humour and verve as to convince me that it should be treated as a classic. In telling the story of *The Death of Queen Jane*, Joan Baez strikes an utterly different, contrasting note. With haunting pathos, the sadly beautiful tale unfolds. If tears should start in the eyes then it is not without good reason. Lastly, the original *Bachianas Brasileiras No. 5*. Based upon the classical fugal form the melody is pure Brazilian, and the addition of Joan Baez renders the whole thing monumental.

The sleeve notes by Langston Hughes are uninformative and way out on a very slender romantic limb. To quote just one sentence: *Human feet with toes—like yours and mine, Joan Baez*. I am quite prepared to accept that the vocalist is happily endowed with the usual human fittings at the extremities of her limbs. She is also endowed with precisely the right kind of personality about which Hughes says nothing understandable, and she performs some of the most interesting works one could wish to hear and about which one would like to read something coherent and sensible. Instead, we get half a page about mountain peaks and fluffy clouds. Never mind—what we buy is the music not the blurb, and in buying music one is acquiring something very fine that will be treasured for a long, long time.

MUSIC ON TAPE

ORCHESTRAL

A selection of some of the best
Stereo Tapes

ELGAR. *Enigma Variations; Overture Cockaigne; Introduction and Allegro; Serenade in E Minor.*

VAUGHAN WILLIAMS. *Fantasia on Green Sleeves and Fantasia on a Theme by Thomas Tallis.*

The Sinfonia of London with the Allegri String Quartet and the Philharmonia Orchestra, both conducted by Sir John Barbirolli. Angel Y2S3668 four-track stereo, 3½ ips. 120s.

This single 7-inch spool running at 3½ ips. has the performance of the *Enigma Variations and Cockaigne* by the Philharmonia Orchestra on side two (programme length 45 minutes, 54 seconds) and all the rest of the items by the Sinfonia of London with the Allegri String Quartet are on side one (duration 47 minutes, 48 seconds). We are constantly referring to quality losses that inevitably occur in these 3½ ips four-track stereo tapes. Whilst this is purely a personal view, I do strongly feel that the 3½ ips tape record is going to be superseded by the Musicassette or its equivalent. Spool-to-spool equipment must, if it is going to retain its place, at least exhibit the advantage of very definite superiority in terms of quality. This it can easily do at 7½ ips but at 3½ it could be quite another matter.

In the present case I was certainly conscious of this lack of quality during playback. Which leads one logically to ask what are we listening to, the music or the hi-fi? If it's the music, then here we have a very good and very acceptable tape; if it's the hi-fi then one can only say that quality could certainly be better. The tragedy is, of course, that in this day and age there is not the slightest reason why the manufacturer should not provide us with both the music and the quality. Since we, the customers, are aware of his ability to do just that we should be rightly incensed when we are offered something less.

This is not an album about which one can carp for very long. A great many people will say that the *Enigma Variations* is their favourite Elgar work. It certainly is for me. Said to have been composed as a series of musical portraits of Elgar's friends and acquaintances, the enigma of identification has never been satisfactorily resolved. Nowadays very few members of the countless audiences who will revel in the sound of the *Enigma Variations* give a thought to the people who originally inspired them. It no longer seems to matter.

Elgar truly is England—an England of imperial majesty and far flung empire. All that has now changed. The picturesque village of Broadheath, in Worcestershire, which Elgar knew so well, now has its own miniature council housing estate. All is different—except the music which one sometimes comes to regard as the only permanence in a changing world.

This album could not by any stretch of the imagination be described as cheap. I suspect that the majority of purchasers will be those who consider deeply before thrusting their hands into their pockets. With the one proviso mentioned, that quality would have been better at faster speed. I don't think they will be disappointed.

BEETHOVEN. Violin Concerto in D Major, Opus 61. David Oistrakh with the French National Radio Orchestra conducted by André Cluytens. Angel ZS 35780 four-track stereo, 7½ ips. 75s.

In this recording we really do have something to get our teeth into. What can one say about soloist David Oistrakh? Would anyone seriously question his right to be called the greatest living exponent of the violin? I think probably not. Most will agree that he is the unchallenged successor to Fritz Kreisler.

Beethoven wrote his Violin Concerto in 1806, but it was not popularly accepted until later in the century when Joseph Joachim brought a brilliance of performance and interpretation that dazzled his audiences. The successor to Joachim was Kreisler. Now Oistrakh is next in line.

Elsewhere in these reviews I may have made some rather slighting remarks about quality standard at 3½ ips. This recording, at 7½ ips, is of such high standards of both performance and sound quality that other string works at slow speeds really do pale into insignificance by comparison. The delicious tone that David Oistrakh draws so effortlessly from his instrument is one of the rare joys of this life that are beyond price. He has chosen to play the set of cadenzas left us by Kreisler, and in the performance of these the sheer brilliance of technique and artistry leave one in no doubt that this album is a vehicle in which great masters truly meet.

Did you gather that this review is awarding the highest order of merit to the Oistrakh Beethoven Violin Concerto, as offered on this Angle tape? For me at least, Beethoven has always been a composer offering more intellectual meat in his compositions than any other. When such heights of genius are transmuted into sound by such a virtuoso as we have here, then the recording is bound to be memorable. If ever the BBC decides to change Desert Island Discs to Desert Island Tapes I would insist upon making this recording my own personal first choice.

MENDELSSOHN. Incidental Music to A Midsummer Night's Dream. Choir and Symphony Orchestra of the Bavarian Radio, conducted by Rafael Kubelik with Edith Mathis soprano and Ursula Boese contralto. Ampex DGC 8959 four-track stereo 7½ ips. 75s.

Of all the Shakespearian plays none has quite the delicate tenderness, the humour, or indeed the simple understanding of simple lives that is revealed in *A Midsummer Night's Dream*. The composer's task was to produce for the Schlegel translation musical scores approaching the stature of the literary genius they were to accompany.

The music of Mendelssohn evokes precisely an honest bucolic simplicity, with its everlasting faith in the natural life of the woods and the fields, together with the super-natural life of the fairy kingdom. What must be one of the most famous pieces of music of all time, the Mendelssohn Wedding March, originated as part of the *Midsummer Night's Dream* music. Serving as the great universal epithalamium, this march has surely pealed from every church organ in the land, from the greatest cathedral to the lowliest chapel. It has sounded for royalty and commoner, rich and poor, indiscriminately.

I particularly singled out the Wedding March for mention because, due to its overwhelming popularity, it is a work which

could so easily suffer contempt through familiarity. Too many hackneyed versions too frequently heard tend to rob the listener of any sense of musical appreciation. After all, this is surely the Wedding March—not a piece of music? Which goes to show just how badly we need to carefully listen to a thoroughly good recording of an excellent performance, such as is offered in this album. I think perhaps the rendering of the Wedding March really thrilled me more than the whole of the rest of the tape but, almost certainly it was for precisely the reasons I have explained. This version of the work really makes one appreciate its magnificence: it ceases to be just the Wedding March and becomes a superb piece of music, existing (and exulting) within its own right.

The rest of the recording is up to an equal standard. Quite apart from the Wedding March, which everyone will know, most of the rest of the contents of the album will be familiar to even the least musical of listeners. Since recorded quality is so good I can strongly recommend this tape as an excellent example of the very lightest classics that will appeal to the widest possible audience. It will also appeal to those whose interest is perhaps more serious but who happen to lack this work in their music library.

MOZART. Eine Kleine Nachtmusik in G, K 525, and Divertimento in D, K 251. Hamburg Bach Orchestra conducted by Robert Stehli. Phonoband B 3069 four-track stereo, 7½ ips. 66s.

This, the second album from the Phonoband catalogues to be reviewed, is presented in a beautifully illustrated box which unfortunately lacks a single word of musical or biographical explanation. As with the first tape reviewed, the spool bears only a label carrying the Phonoband reference number. Neglect of details like this is a pity. One of the great services to music lovers lies in the provision by record publishers of adequate sleeve or box notes, many of which are really excellent in compilation and presentation. The record companies in particular have performed sterling service in this way, and many of the tape publishers are running them a close second. It must therefore be regretted that Phonoband are not following this lead, at least in the present instance.

However, this particular album contains what must surely be two of the most popular of the Mozart compositions. *Eine Kleine Nachtmusik* is almost standard diet at any light orchestral recital. Most recordings are coupled with a Divertimento on the other side to give a well balanced programme. Neither of the recorded works were intended by their composer to be serious masterpieces. One could almost describe them as "classical mood music." As such they offer the pleasantest and easiest of listening, devoid of intellectual strain or fatigue. Their function is simply to entertain, to bring a light musical diversion to a pleasant hour of relaxation.

As with the previous Phonoband recording reviewed, I find the standards of performance and recording to be acceptable without being outstanding. So the whole is a pleasant listening experience. It will plumb no great depths, it will arouse no violent passions. What it will do is exactly and precisely what its composer intended—it will fill the idle hour with delicate sound and perfect harmony, to leave one feeling that all is well with life and the world.

YOUR LOCAL DEALER

LONDON

WIMBLEDON'S TAPE RECORDER CENTRE
ALL LEADING MAKES IN STOCK

Ferrogaph - Telefunken - Loewe Opta - Saba - Wyndson
Philips - Grundig - Ferguson - Brenell - Truvox - etc.
P.e-Recorded Tapes: Mono & Stereo - Microphones - Accessories.

● BARGAIN OF THE MONTH
FI-CORD 202A
ONLY 39 GNS.

TEL-LEE-RADIO

220 THE BROADWAY,

Wimbledon, S.W.19. LIBerty 4946

THE SOUTH

SOUTHAMPTON

Tape Recorder Specialists

APPROVED AGENTS FOR:—
PHILIPS - GRUNDIG - FERROGRAPH
VORTEXION, ETC.

- ALL MAKES OF TAPE RECORDERS SUPPLIED
- ACCESSORIES AND HI-FI EQUIPMENT
- PART EXCHANGES AND SECOND-HAND MACHINES
- PROMPT AND SKILLED SERVICING

RECORDING MACHINES LTD.

79 Queensway, Southampton

Telephone: 27092

THE SOUTH WEST

TOM MOLLAND LTD.

Invite you to visit their well-equipped Demonstration Theatre and compare all the leading makes of Hi-Fi and Tape Equipment at

102 CORNWALL ST., PLYMOUTH

Telephone 69282/3

Immediate delivery to ALL Areas

WORTHING

Tape Recorder Centre

- Tape and Hi-Fi Experts
- Agents for all types of machines and equipment
- SERVICING & REPAIRS

THE MUSIC SHOP

22 NEW BROADWAY,

Tarring Road, Worthing, Sussex.

Telephone: Worthing 3630

YOUR LOCAL DEALER

THE NORTH

CHESHIRE

CHARLESWORTH'S
OF CREWE LTD.

**Tape Recorder
and Hi-Fi Specialists**

Head Office: 14 Hightown, Crewe. Tel. 3327
Hi-Fi CENTRE: 28 HIGHTOWN, CREWE.
Technical Division: 19 Ludford St., Crewe.

**TAPE RECORDER
CENTRE (Halifax)**

stock all the best tape recorders and hi-fi equipment. Agents for Revox, Tandberg, Ferrograph, etc. Demonstrations by expert staff. Two years' free service on recorders over £35.

30 King Cross St., Halifax. Phone 66832

**THEATRE ORGAN
DISCS and TAPES**

ORGAN OF THE MONTH CLUB brings out regular releases of famous Theatre Pipe Organs and organists, our aim is to present a record of every known make of Theatre Organ.

Full details from:
CONCERT RECORDING
P.O. BOX 2
ROTHWELL, KETTERING, NORTHANTS

**CUSSINS &
LIGHT LTD.**

YORK'S LEADING RADIO
TV & ELECTRICAL STORE

Visit our First Floor
**TAPE RECORDER
CENTRE**

**LARGEST RANGE
OF RECORDERS
& ACCESSORIES
IN THE NORTH**

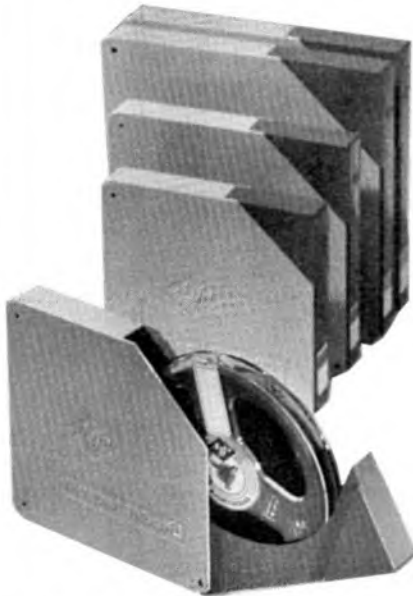
**KING'S SQ.
YORK**



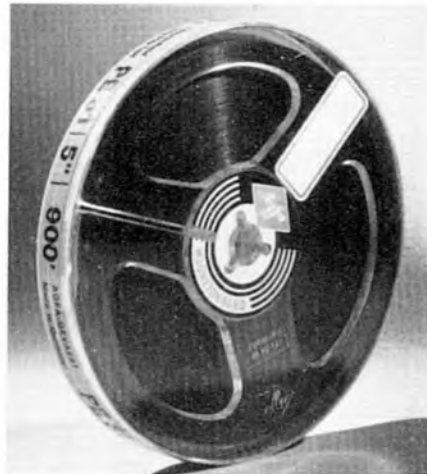
NEW PRODUCTS

**AGFA
INNOVATIONS**

STORAGE of tapes is always important. Agfa-Gevaert have previously marketed their shatterproof "Novodur" plastic library boxes inclusive of tape only.



Now the two-tone grey Agfa library boxes, as above, are available separately for 4½-inch, 5-inch, 5½-inch and 7-inch reel sizes at a cost of 6s. each for the two smaller reels, 7s. 6d. for 5½-inch and 8s. 8d. for 7-inch.



Although the cardboard swivel-type box will remain the standard packing for all Magnetron tape, a new clear plastic pack is now available as an alternative. The new packs, as shown above, in 5-inch, 5½-inch and 7-inch sizes cost 2s. 6d. less than the equivalent size of tape in the standard swivel-type cardboard box.

Another Agfa-Gevaert innovation is the marketing of all 3-inch Agfa Magnetron tapes in "Universal-Kassettes." These are designed for sending through the post, and



conform to all international postage regulations. They come complete with two "Phonopost" weatherproof, self-adhesive labels. Prices are 8s. for the 210-foot PE31 long-play tape, 13s. for the 300-foot PE41 double-play tape and 20s. for the PE65 450-foot triple-play tape.

Agfa-Gevaert Limited, Magnetic Tape Division, Great West Road, Brentford, Middlesex.

**BAKER
REPRODUCERS**

LAATEST addition to the Baker range of reproducers is the twelve-inch Major, incorporating built-in, concentric, tweeter cone and new, powerful, magnet system.

Power-handling capacity is quoted as 20 watts, bass resonance 40/50 Hertz and flux density 14,000 Gauss. Frequency response is stated to be from 40 to 14,500 Hertz, overall diameter 12½ inches and net weight 6 lb. The price of the Major is £8.



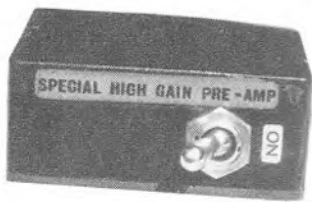
Full details of this and other units in the range can be obtained from the manufacturers, together with specifications and drawings for suitable enclosures.

Baker Reproducers Limited, Bensham Manor Road Passage, Thornton Heath, Surrey.

**TUNER
ACCESSORIES**

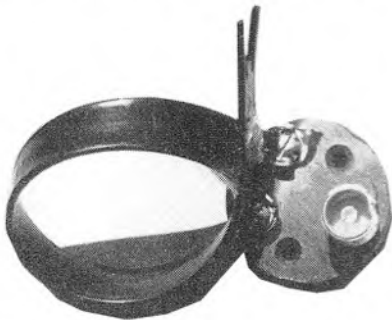
THE proper functioning of an FM tuning unit is largely dependent upon the efficiency of its aerial. This is even more true in the reception of multiplex stereo transmissions, where there is an inherent reduction in signal-to-noise ratio of some 20 dB. Two new items introduced by Holdings Audio Centre are designed to improve FM reception.

The Stereo Booster is a high gain, low noise, pre-amplifier connected by plugging the aerial lead into the input socket and the booster's output lead to the aerial socket on the tuner. Power is provided either by the internal battery or a separate, mains operated, power supply unit.



The manufacturer claims that the Stereo Booster will increase the strength of all British FM stations, but is peaked for maximum gain on the Third Programme. Due to its high gain it will appreciably improve results on mono or stereo where previously the limiting factor has been lack of gain in the FM tuner.

With scrupulous fairness the manufacturer adds a paragraph on what the Stereo Booster will *not* do. It will not greatly improve results if an exceptionally efficient tuner (such as, for example, a Fisher) is already in use. Nor is it claimed that the Stereo Booster will work miracles if the tuner is badly aligned or of poor quality. Holdings offer an advisory service and will quote for the proper alignment of most makes of FM tuners to better than manufacturers' standards. They will also advise on the choice of high gain aerials for optimum results. They particularly ask readers to write in the first place, on no account forwarding the tuner until requested.



In addition to the Stereo Booster a 300 ohm to 70 ohm matching transformer is available. This matches the 300 ohm aerial input of American and Continental tuners to British coaxial cable.

The price of the Stereo Booster with battery is £3 18s., separate mains operated power supply unit 39s. 6d. The aerial transformer is 17s. 6d. All prices included postage.

Holdings Audio Centre, Mincing Lane, Darwen Street, Blackburn, Lancashire.

SONOTONE COMPATIBLE

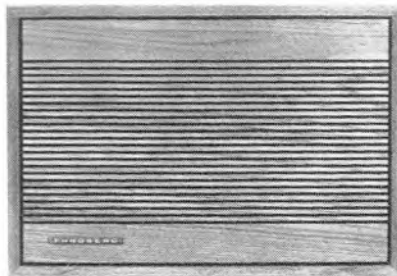
WITH record companies ceasing to manufacture stereo LPs from July 1, many owners of disc reproducing equipment will need to replace their mono-only cartridges for mono compatible models. Our editorial on "Compatibility" in June dealt fully with this subject.

Now Sonotone are introducing two mono compatible crystal cartridges, models TMX 10 and TMX20. Both have quoted frequency response from 20 to 10,000 Hertz, but the former is for the lighter tracking weights of 4 to 6 grams, the latter 7 to 10 grams. As might be expected, the output at the lighter

tracking weight is, at 200 mV nominal, less than the heavier tracking model which gives 600 mV nominal. Retail prices for both the TMX10 and TMX20 are 21s. plus 3s. 9d. purchase tax.

Metrosound Manufacturing Co. Ltd., Bridge Works, Wallace Road, London N.1.

SMALLER SPEAKER FROM TANDBERG



Development in the loudspeaker world is continuous. One of the latest firms to introduce modifications is Tandberg. Their new model 11 speaker is a version of the very successful Tan 10. The unit used in the Tan 11 is identical to the Tan 10, but the cabinet size has been changed to make it fit on a shelf, or similar position, more conveniently. The price, which remains unaltered, is £14 including tax.

Elstone Electronics Ltd., Hereford House, North Court, off Vicar Lane, Leeds 2.

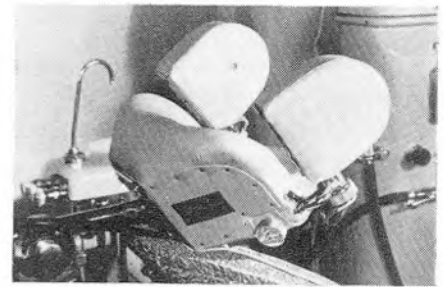
AUDIO ANALGESIA

THE use of recorded sound in dental surgery has been receiving a great deal of interest in both Australia and the United States of America. Now Plessey have come into this market with a product developed by Auditorama Sales, South Australia, in conjunction with the Rola Division of Plessey Components (Australia) Ltd. The device utilises a technique known as "audio analgesia," the principle of which is the use of music superimposed on, or mixed with, "white noise."

White noise is, of course, a random combination of audio frequencies producing sounds similar to that of rushing water or escaping steam. Experiments have indicated that white noise, when combined with music, can produce anaesthetic qualities in certain dental patients.

Recorded on tape, the blend of music and white noise is amplified and transmitted to the patient by means of a newly developed headrest. This incorporates two of the Rola Division's latest model C3D ferrite magnet loudspeakers which are said to provide maximum efficiency with minimum depth. Each speaker is incorporated in one wing of the headrest and provides effective sound transmission without restricting the patient's movements. Sterilisation problems are eliminated.

Results indicate that the system minimises pain and allows the patient to relax. This in turn enables the dentist to work more



efficiently with consequent reductions in treatment time.

Inquiries from those professionally interested will be welcome and should be addressed to:

The Liaison Office, Plessey Australia, The Plessey Company Ltd., Ilford, Essex.

Gramplan
for good
SOUND EQUIPMENT
GRAMPLAN REPRODUCERS LTD
Hanworth Trading Estate, Feltham, Middlesex

RAPID RECORDING SERVICE
78s and LPs FROM YOUR OWN TAPES
48 HOUR SERVICE
MASTER DISCS AND PRESSINGS
RECORDING STUDIO
DEMONSTRATION DISCS
MOBILE RECORDINGS—ANY DISTANCE
Brochure on request from
Rapid Recording Service
21, BISHOPS CLOSE, LONDON, E.17

SUBSCRIBE TO TRM
and receive your monthly copy by post for 1 whole year (12 issues). Send 25s. (USA \$3.75) by postal order or cheque today.
25/-
U.S.A. \$3.75
To: TAPE RECORDING MAGAZINE, Prestige House, 14-18 Holborn, London, E.C.1
Name
Address
.....
.....

CLASSIFIED ADVERTISEMENTS

Rate.—One shilling per word; box numbers, 2s. 6d. extra. Payment with copy, which should be sent to Advertising Department, "TAPE Recording Magazine," Prestige House, 14-18, Holborn, London, E.C.1.

NEW EQUIPMENT

TAPE RECORDERS. SAVE FROM 30 per cent to 60 per cent on the original price. Large stocks of second-hand, new, shop-soiled machines. All guaranteed. Obtainable on our **NO INTEREST TERMS.** Best part exchange allowances on your existing equipment. **CALL, WRITE, PHONE** today for free list. Quotation and details. Our Mail Order covers the whole Country.—R. E. W. Earlsfield Ltd., 266, Upper Tooting Road, London, S.W.17. BALham 9174-5.

W.H.M. WOW AND FLUTTER METER (RMS) £48 net U.K. Leaflets, Specification and Test Report on request. 35, Villiers Road, WATFORD.

FOR SALE

BLACKBURN has Lancashire's leading Hi-Fidelity / Tape Recorder stockists and Electronic Engineers at **HOLDINGS AUDIO CENTRE, MINCING LANE/DARWIN STREET, BLACKBURN** (Tel. 59595).

GEVAERT new boxed Recording Tapes: 600 ft. (5½ in. spool) at 9s. each or 6 for 50s. **GRUNDIG** 2-transistor Pre-amplifiers suitable for boosting microphones and tape head monitoring—listed at 4½ gns.—**OFFERED NEW** and boxed at 5½s. 6d. each. **LEE ELECTRONICS**, 400, Edgware Road, W.2, PADDINGTON 5521.

VORTEXION WV8 4, ½ track, 7½ and 15 ips. A SUPERB INSTRUMENT capable of highest quality recording work. Seen S.W. London. £60 cash. No offers. Box No. 478.

30 PER CENT OFF BASF TAPE L.P. 7-in. reel, 1,800 ft., 33s. 3d.; D.P. 7-in. reel, 2,400 ft., 52s. 6d.; P. & P. 2s. per reel (4 post free). **W.S.L.**, 104, NORWOOD HIGH ST., S.E.27.

PHILIPS AUTOMATIC TAPE RECORDER, new, unused, £17 10s. Weybridge 44775.

BARGAIN SALE OF HI-FI EQUIPMENT

Leak Stereo 30, 43 gns. Rogers Cadet 3, £27. Switched F.M. to match, £17. Goodmans Maxamp, 42 gns. Beomaster 1000 Tuner/Amplifier with built-in decoder, 72 gns. Goldring Lenco GL68, 15 gns. GL70, 25 gns. De-luxe teak plinths with perspex cover, 6 gns. and 8 gns. Garrard LAB 80, £24. AT60 Mk II, £12. SP25, £10. Beogram 1000 with S.P. 6, 27 gns. Beocord 1500 de-luxe, 110 gns. Telefunken M200, 34 gns. M105, 50 gns. Bookshelf twin speaker system in teak, 22 x 12 x 12, only 12 gns. Credit terms available—Part exchanges welcome. **N.R.S./T.R.M.**, 153, Fellows Road, London, N.W.3. 01-722 3314.

1961 FERROGRAPH—Speed 3½, 7½ ips. Good condition. Needs servicing. Price: £50. Phone 01-546-5420.

TAPE EXCHANGES

FRIENDLY FOLK ASSOCIATION, Torquay (Est. 1943). Social introductions, Pen-friends, Book-lovers, Stamps, Photography, Tapesponding. Members 100 countries.

Join **TAPEMATES INTERNATIONAL** and exchange tapes with friends throughout the World. Club and recording booths 6 p.m.-10.30 p.m. Tuesdays, Thursdays and Saturdays. 6, Holland Park Avenue, London, W.11.

Make interesting new friends UK and overseas, all ages. Join **VICTORY CLUB**, 34, Honeywell Road, London, S.W.11. Details free. Established 20 years.

LANGUAGES NO OBSTACLE TO ESPERANTO TAPE FRIENDS. Send Tape and Stamp to: **THE ESPERANTO CENTRE**, 1a, Craigs Avenue, Edinburgh 12.

REPAIRS

OUR MODERN SERVICE DEPARTMENT equipped with the latest test equipment including a wow and flutter meter and multiplex Stereo Signal Generator is able to repair Hi Fi and Tape Recording Equipment to manufacturer's standard. **TELESONIC LTD.**, 92 Tottenham Court Road, London, W.1. 01-636 8177.

TAPE DUBBING

E.R.S. RECORDS: TAPE/DISC Vari-groove High Level Recordings with **WIDE FREQUENCY RANGE.** Top quality pressings. 162, SHIRLAND ROAD, LONDON, W.9.

J. & B. RECORDINGS. Tape/disc. Mobile unit. Quality recording. 14, Willows Avenue, Morden, Surrey. Mitcham 9952.

JOHN HASSELL RECORDINGS. Tape-to-Disc Service using latest high level disc-cutting system. Quality pressings made. Studio with Bechstein Grand, Mobile unit. 21, Nassau Road, London, S.W.13. RIVERSIDE 7150.

TAPE-TO-DISC RECORDING Finest professional quality. 10-inch LP—42s. (32 mins.), 12-inch LP—48s. (45 mins.), 7-inch EP—21s.

40ft. RECORDING STUDIO S.A.E. for leaflet to **DEROY Sound Service**, High Bank, Hawk Street, CARNFORTH, Lancs.

MISCELLANEOUS

HIGHEST CASH PRICES offered for good quality Tape Recorders and Hi-fi. See our advert., page 220 this issue. **R.E.W.**, 266-8, Upper Tooting Road, London, S.W.17.

HI-FI and STEREO by modern CONTINENTAL manufacturers, and also latest Tape Recorders. Write to us for introductory leaflets and lists. Part-exchanges arranged. From **WALLACE HEATON (CITY SALE) LTD.**, 93, Fleet Street, London, E.C.4.

YOU WILL BE GLAD to have contacted **AUDIO SUPPLY ASSOCIATION** before your next purchase of quality equipment. 65-page illustrated catalogue 5s. Unbiased advisory service, preferential terms. High quality records manufactured from suitable tapes. Bulk prices on pressings (choirs). 18, Blenheim Road, W.4. Tel.: 995 1661.

TAPE RECORDS

Every pre-recorded tape available in Britain is listed in the complete **TELETAPE** catalogue at 1s. 6d. post free.

Vast selection of Mono and Stereo tapes. Send now for your copy by return to: Mail Order Dept., **TELETAPE Ltd.**, 11, Redvers Road, London, N.22, or call at our Marble Arch or Shaftesbury Avenue Showrooms.

Four-track Stereo Tapes are expensive! Join the **W.S.L. Stereo Tape Library** and enjoy every tape for only a few pence per day. **Worldwide Service.** Send 9d. postage for full details to: 104, Norwood High Street, London, S.E.27.

AMERICAN 4-TRACK STEREO TAPES ARE CHEAPER from **DUBLIN**—e.g. 9 Beethoven Symphonies complete J. Krips and L.S.O. £7 10s. Complete and up-to-date catalogue of all releases, prices, etc., 3s. **MUSIC U.S.A.**, 201, Pearse Street, Dublin 2, IRELAND.

PUBLICATIONS

NOW IN ITS SECOND REPRINT. Alan Beeby's informative handbook **SOUND EFFECTS ON TAPE.** Invaluable to all dramatists and recording enthusiasts. Tells in practical terms not only what to do but also how and why. 3s. 6d. post free. Remittance with order to **Print & Press Services**, Prestige House, 14-18, Holborn, London, E.C.1.

YOU OUGHT to send for a copy of "Psychology and Whisper Teaching" to **York House**, New North Road, Huddersfield (5s. 9d. post free).

THE LAW and Your Tape Recorder by Andrew Phelan, Barrister-at-Law. Excellent **NEW** booklet which interprets many aspects of UK Law for tape recorder owners. 3s. 6d. post free. Remittance with order to: **PRINT & PRESS SERVICES LTD.**, Prestige House, 14-18, Holborn, London, E.C.1.

A CURIOSITY? A COLLECTOR'S PIECE? Now available limited reprint edition of very first issue of **TAPE Recording Magazine** (Feb., 1957). 2s. 6d. (USA \$0.65) **POST FREE.** Cheque or postal order to **TAPE**, Prestige House, 14-18, Holborn, London, E.C.1.

EDUCATIONAL

LEARN WHILE YOU SLEEP: GCE and Professional subjects. Languages, etc. Free booklet from **THE SLEEP LEARNING ASSOCIATION**, 14 Belsize Crescent, London, N.W.3. Tel.: SW1 6160.

MAGNETIC TAPE

ILFORD ZONATAPE—guaranteed shop quality sealed—Polyester Long Play—5in. 900 ft (list 28s.), one 18s., two 34s., three 50s. 5½in. 1200 ft. (list 35s.), one 24s., two 46s., three 66s. **ALL POST FREE.** **HAYWOOD & SONS**, 2, Edinburgh Avenue, Leeds 12.

TAPE TALK CAMERA CIRCLES

run by the

Editor and Staff of "Camera Owner"

The Modern Photo Monthly

Full details available in each month's issue, available from all newsagents at 2/6d., or write for a specimen copy with two back numbers for 3/-.

Ask for details of the *Tape Talk Camera Circles*, two hobbies for the price of one!

"CAMERA OWNER,"

Coo Press Ltd., 19, Doughty Street, London, W.C.1

● TRM BINDER

Tape Recording Magazine Binder in two-tone green, gold stamped on sturdy spine. Insert your copies of TRM as they are received to form a smart, complete and tidy volume.

PRINT & PRESS SERVICES LTD.
Prestige House,
14-18 Holborn : London, E.C.1

14/6
POST FREE
16/3
OUTSIDE U.K.

The Berean (NON-DENOMINATIONAL) Forward Movement

Loan of over 1,000 reliable expositions of the Bible available on tape (3½ ips) for cost of postage only. For Bible Study groups or private meditation. Supporting literature also available. Details from: Miss R. Hammond, (TRM), Burwood, Blofield, NORWICH, Norfolk. NOR 84Z.

GLOBAL PRODUCTS

Global Mk. 2 Speed Erase. £5 16s. 0d. including postage.
PRE-RECORDED THEATRE ORGAN TAPES
An interesting selection of Organs and organists, for the music lover and organ enthusiasts.
"Intermission" Global Tape 6531
"Tango Bolero," "Blaze Away" etc., on the Compton Organ. £1 1s. 0d. including postage.
"Traditional Jazz." "Steve Lane's" Southern Stompers
"King Porter Stomp," "Snake Hips," etc. Global Tape 6591. £1 1s. 0d.
"Vic Hammett" Wurlitzer Organ
"Brazil," "If I Had You," "Birth of the Blues," etc. 12in. Mono L.P. Saga-Society 1037.
10s. plus 2s. 6d. P. and P.
S.A.E. for Leaflets and Catalogue
P.O. BOX No. 1, ROTHWELL, KETTERING, NORTHANTS

THE INSTITUTE OF SLEEP-LEARNING

is pleased to announce

A MAJOR BREAKTHROUGH IN SLEEP-LEARNING ECONOMICS

At last we are able to offer a recorder which is not only ideal for Sleep-Learning and Therapy and gives excellent results on music but is at the same time at a sensationally low price—only 25 gns.

Send now for our latest free catalogue of Complete Sleep-Learning Kits and accessories including our special Induction Tapes, Pillow Speakers, Time Switches, etc., etc., together with latest Press Reports on this Vital New Subject.

THE INSTITUTE OF SLEEP-LEARNING
Dept. TRM, 153, FELLOWS ROAD, S A ISS COTTAGE, LONDON, N.W.3. 01-722 3314

LEDA RECORDING TAPE

THE ULTIMATE IN TAPE VALUE! Made to full specification. Leaders and trailers on all types 5" and above. Strong, attractive hinge-lid boxes.

GUARANTEE. If you do not agree that the quality of this tape is as high as any you have ever bought (irrespective of price!) we will immediately refund your money and return postage costs.

Standard Play (P.V.C.)	Long Play (P.V.C.)	Double Play (Polyester)	Triple Play (Polyester)
3" 150' 2/3	3" 225' 3/-	3" 300' 4/3	3" 600' 8/9
4" 300' 3/9	4" 450' 5/-	4" 600' 8/3	4" 900' 12/6
5" 600' 8/3	5" 900' 9/9	5" 1200' 15/3	5" 1800' 22/6
5½" 900' 10/-	5½" 1200' 12/3	5½" 1800' 19/3	5½" 2400' 28/6
7" 1200' 12/3	7" 1800' 17/3	7" 2400' 21/9	7" 3600' 38/6

P. & P. 2/6 per order. We also stock a wide range of accessories, all at lowest-ever prices. S.A.E. list.

LEDA TAPES (T), 30 BAKER STREET, LONDON, W.1

ADVERTISMENT INQUIRIES

SERVICE

I should like further information about
Messrs 's advertisement

on page..... of TAPE Recording Magazine
about..... (product)

NAME

ADDRESS

August 1967

This is a special service for readers of "TAPE Recording Magazine." It enables you without cost to get fuller information about those products in which you are particularly interested. Fill in one coupon below for each inquiry, with your name and address in block capitals in each case. Then cut out the whole of this section, following the dotted line, fold as indicated overleaf and post to us.

I should like further information about
Messrs 's advertisement

on page..... of TAPE Recording Magazine
about..... (product)

NAME

ADDRESS

August 1967

I should like further information about
Messrs 's advertisement

on page..... of TAPE Recording Magazine
about..... (product)

NAME

ADDRESS

August 1967

I should like further information about
Messrs 's advertisement

on page..... of TAPE Recording Magazine
about..... (product)

NAME

ADDRESS

August 1967

I should like further information about
Messrs 's advertisement


on page..... of TAPE Recording Magazine
about..... (product)

NAME

ADDRESS

August 1967

ONLY ENGLISH ANNUAL TO DEAL EXCLUSIVELY WITH TAPE RECORDING SEND NOW FOR USEFUL 1966 EDITION

Fill-in & Post this Coupon with Remittance Today! 

To: **TAPE Recording Magazine, 7 TUDOR STREET, LONDON, E.C.4**
 Please send me.....copy(ies) of TAPE Recording YEAR BOOK 1966, at 7s. 6d.
 (U.S.A. \$1.25) per copy POST FREE. I enclose remittance.

NAME

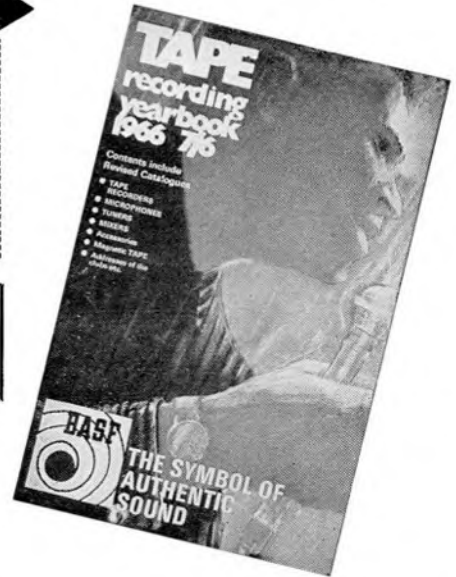
ADDRESS.....

TAPE YEAR BOOK the Recordist's Reference

PRICE
7/6

- ★ The only available up-to-date comprehensive catalogue of TAPE RECORDERS on the market with full specifications, price, etc., plus photographs.
- ★ Review of tape developments during the past year.
- ★ Manufacturers, dealers and Club Secretaries' addresses.
- ★ GLOSSARY of technical terms, "at-a-glance" tabulated catalogues of microphones, tuners, mixers, and associated accessories; Magnetic Tape Charts, etc.

On sale at bookstalls or direct from publishers using coupon above



..... CUT ALONG DOTTED LINE

THIRD FOLD HERE

**TAPE RECORDING MAGAZINE,
7, TUDOR STREET,
LONDON, E.C.4**

BUSINESS REPLY FOLDER
Licence No. ND 922

SECOND FOLD HERE

POSTAGE
WILL BE
PAID BY
PRINT AND
PRESS
SERVICES
LIMITED

**NO POSTAGE
STAMP
NECESSARY
IF POSTED
IN GREAT
BRITAIN OR
NORTHERN
IRELAND**

FIRST FOLD ALONG THIS LINE

FLAP A

Fold along lines as indicated and then tuck Flap A into Flap B

FLAP B

FRANCIS OF STREATHAM

MAINS TAPE RECORDERS

*Ampex 800 Series	£127.10.0
*Ampex 1100 Series	£149.10.0
*Akai 1710	79 gns.
*Akai X-300	190 gns.
*Akai 910	62 gns.
*Akai M8 Stereo	136 gns.
Akai 355 Stereo	239 gns.
*Beocord 2000	119 gns.
*Beocord 2000 de luxe	135 gns.
*Beocord 1500	89 gns.
*Beocord 1500 de luxe	105 gns.
*Beocord 1000	69 gns.
*Brenell STB2	£150.0.0
*Brenell Mk. 5 M Series 3	93 gns.
*Brenell Mk. V Series 3	74 gns.
Elizabethan LZ32	32 gns.
Elizabethan LZ34	34 gns.
Ferguson 3218	34 gns.
Ferguson 3222	35 gns.
Ferguson 3216	49 gns.
*Ferrograph 633	120 gns.
*Ferrograph 631	95 gns.
*Ferrograph 632 Stereo	126 gns.
Fidelity Playmatic	28 gns.
Grundig TK400 2sp. 4 Tr.	47 gns.
Grundig TK14L	37 gns.
Grundig TK17L	43 gns.
Grundig TK18L	39 gns.
Grundig 23L Auto	49 gns.
Grundig TK140	38 gns.
Grundig TK120	29 1/2 gns.
Philips 3556	62 gns.
Philips 3558	42 gns.
Philips 3553	36 gns.
Philips 3552	24 gns.
*Revox 736	124 gns.
Sony TC260	97 gns.
Sony 250A Deck/Pre-amp	57 gns.
Sony 200	72 gns.
Sony 600	127 gns.

Stella 463	39 gns.
*Tandberg Series 6	110 gns.
*Tandberg Series 8, 2 Tr.	54 gns.
Tandberg Series 12	105 gns.
Telefunken 203	69 gns.
Telefunken 201	44 gns.
Telefunken 200	39 gns.
*Telefunken 85 de luxe	83 gns.
*Telefunken 204 Stereo	106 gns.
*Truvox PDI02	93 gns.
*Truvox PDI04 Stereo	89 gns.
Truvox R102	76 gns.
Truvox R104	79 gns.
Truvox R40	44 gns.
Uher Hi-Fi Special	129 gns.
*Uher 724L	75 gns.
*Vortexion WVA, 3 speed	£96.7.0
*Vortexion WVB, 3 speed	£115.10.0
*Vortexion CBL Stereo	£172.0.0
*Van der Molen VR4	59 gns.
*Van der Molen VR7	39 gns.
*Uher 784 Royal	129 gns.
*Uher Hi-Fi Special	129 gns.

BATTERY PORTABLES

Akai X-IV, 4 Tr. Stereo	131 gns.
Coscor 1621	26 gns.
Grundig EN3 Notebook	23 gns.
Grundig TK6L	73 gns.
Grundig C100	39 gns.
Loewe Opta 408	39 gns.
Loewe Opta 416	51 gns.
Loewe Opta Cassette	39 1/2 gns.
Philips EL3301	26 gns.
Philips 3586	27 gns.
Sanyo Auto	22 gns.
Sanyo Batt./Mains	36 gns.
Stella 472	27 gns.
Telefunken 300	49 gns.
Telefunken 301 4 Tr.	54 gns.
Uher 4000L	103 gns.

*Microphone extra

LEADING STOCKISTS OF EQUIPMENT FOR TAPE and HI-FI ... and NO EXTRA FOR CREDIT TERMS

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

Prices subject to alteration as announced by manufacturers

MAINS POWER PACKS

Philips, Stella or Coscor	£5.12.0
Uher 4000, with cell	18 gns.
Telefunken 300, with cell	£15.17.0

TAPE DECKS by Brenell, Wearite.
TAPE-TO-DISC and Copy Service.

MICROPHONES, MIXERS, etc.

Hammond Condenser M100	29 gns.
AKG D14S	£10.0.0
AKG D119	£20.10.0
AKG D19C	£17.10.0
AKG K50 Headphones	£7.10.0
Eagle Mixer	£3.3.0
Grampian Reflector	£6.15.0
Grampian DP 4 Dynamic	£8.5.0
Grampian Ribbon	£11.10.0
Grundig Mixer (Stereo)	18 gns.
Philips Preamp	£6.10.0
Reslo Ribbon	£12.2.0

Also in stock: microphones by ACOS, BEYER FILM INDUSTRIES, TELEFUNKEN, etc.

● DEFLUXERS by Wearite, Walsgain

PRE-RECORDED TAPES

by Columbia, H.M.V. and all E.M.I. labels, Crown, Phonoband, Eagle, etc.

TAPE SPLICERS by Bib, Bond, E.M.I.

Matching transformers, plugs, sockets, etc.

STANDS of all types. TAPES

Hi-Fi Dept.

- AMPLIFIERS (mono & stereo)
 - Quad Scott Tripletone
 - Leak Rogers Cadet Mk. III
 - Armstrong B. & O. Pye
 - Truvox
- TUNERS
 - Quad Rogers B. & O. Leak
 - Armstrong Pye Tripletone
- LOUDSPEAKERS
 - Quad Pye W.B. Wharfedale
 - Goodmans Tannoy Leak
 - Lowther Kef Rogers Elac
 - S.H.B. Tandberg B. & O.
 - Truvox Ditton
- MOTORS, PICKUPS
 - Garrard incl. Thorens
 - AT6, 401, etc. Tannoy
 - Goldingr Shure
 - Connoisseur Ronette
 - Decca Sonotone
 - Transcriptor B. & O. BSR
 - Philips SME Mk. II
 - Ortofon Pickering

All types of Diamond and Sapphire styli, stereo and mono. Microlifts, Garrard, Goldring, Acos Pressure Gages Disc Preener, Acos Dust Bug

● CABINETS—Record Housing and GKD

Please note our only address as below

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

Between St. Leonard's Church and Streatham Station
OPEN ALL DAY SATURDAY—1 p.m. Weds.

STreatham 0466/0192

● FREE CAR PARK, Prentis Road

HEATHKIT

The first choice in
Hi-Fi EQUIPMENT

OUR WIDE RANGE INCLUDES:—

AUDIO

Cabinets, Turntable Units, Mono and Stereo Amplifiers, Pickups, Speaker Systems, Mono and Stereo Control Units, Tape Preamplifiers, Tape Decks, etc.

RADIO

AM/FM and FM Tuners, Car Radio, FM Decoder, Transistor Radios, SW and Communication Receivers.

MISCELLANEOUS

Children's Hobby Kits, Tool Kits, Intercom, Electric Organs, and a wide range of Amateur Radio Gear.

TEST

A range of Audio Test, Home Workshop, Service, and Laboratory Instruments.



MALVERN CABINET KIT
£18.1.0 incl. P.T.



BERKELEY SPEAKER KIT
£19.10.0



TRUVOX

TAPE DECKS
from £13.10.0 to £36.15.0



MAGNAVOX



TRANSISTOR MIXER, TM-1 Kit. £11.16.6



Transistor Stereo Amplifier Kit AA-22U from £39.10.0 less cabinet



Transistor FM Tuner Kit from £20.19.0 incl. P.T.



FREE! CATALOGUE
Don't Delay! We are waiting to send your copy.

For enjoyment and pride in assembly, for long years of pleasure and performance, for new adventures in creative electronics, post the coupon below and get your personal copy of the Heathkit catalogue of quality build-it-yourself and assembled equipment. Read about models from radio to Hi-Fi equipment — from VVMs to oscilloscopes — analogue computers to tool kits. Every model covered by a money back guarantee. See for yourself, why Heathkit Models are the choice of the discriminating Builder. Britain's largest selection of quality electronic kits.

HURRY! MAIL THIS COUPON TODAY.

To DAYSTROM LTD., Gloucester. Tel.: 20217. Please send me
FREE BRITISH HEATHKIT CATALOGUE

Full details of Model(s)
Name
Address
(Block capitals ple-se)

T.5

TOP TAPES



4 TWIN TRACK
TAPES AT 3³/₄ I.P.S.

THE SHADOWS

Jig-Saw

Columbia TA-SX6148

MANUEL

Sunrise, Sunset

Columbia TA-SX6139

**THE G.U.S. (FOOTWEAR)
BAND**

Kings of Brass

Columbia TA-SX6146

FRANK I FIELD

You came along

Columbia TA-SX6147