

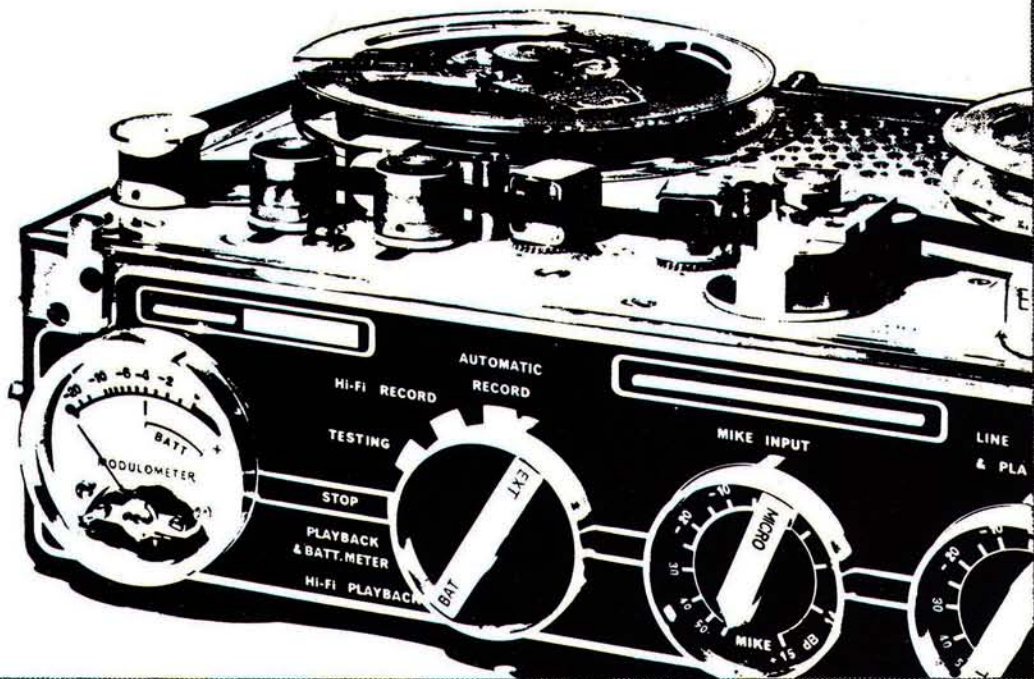
MAY 1965 TWO SHILLINGS

tape recorder



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 YEAH YEAH YEAH ! YEAH YEAH YEAH WAOOOOH ! UM UM UM WE SAID YEA
 YEAH YEAH WAOWE SAID UM UM UM ! AN'A YEAH YEAH YEAH I SAID UME
 YEAH YEAH YEAH ! YEAH YEAH YEAH WAOOOOH ! UM UM UM WE SAID YEA
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 I SAID YEAH YEAH YEAH ! YEAH YEAH YEAH QA0000H ! UM UM HE SAID
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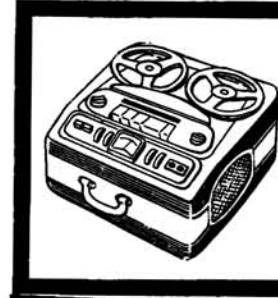
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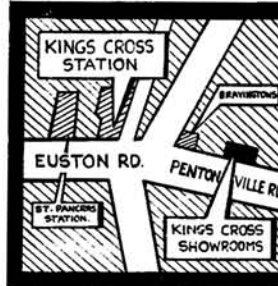
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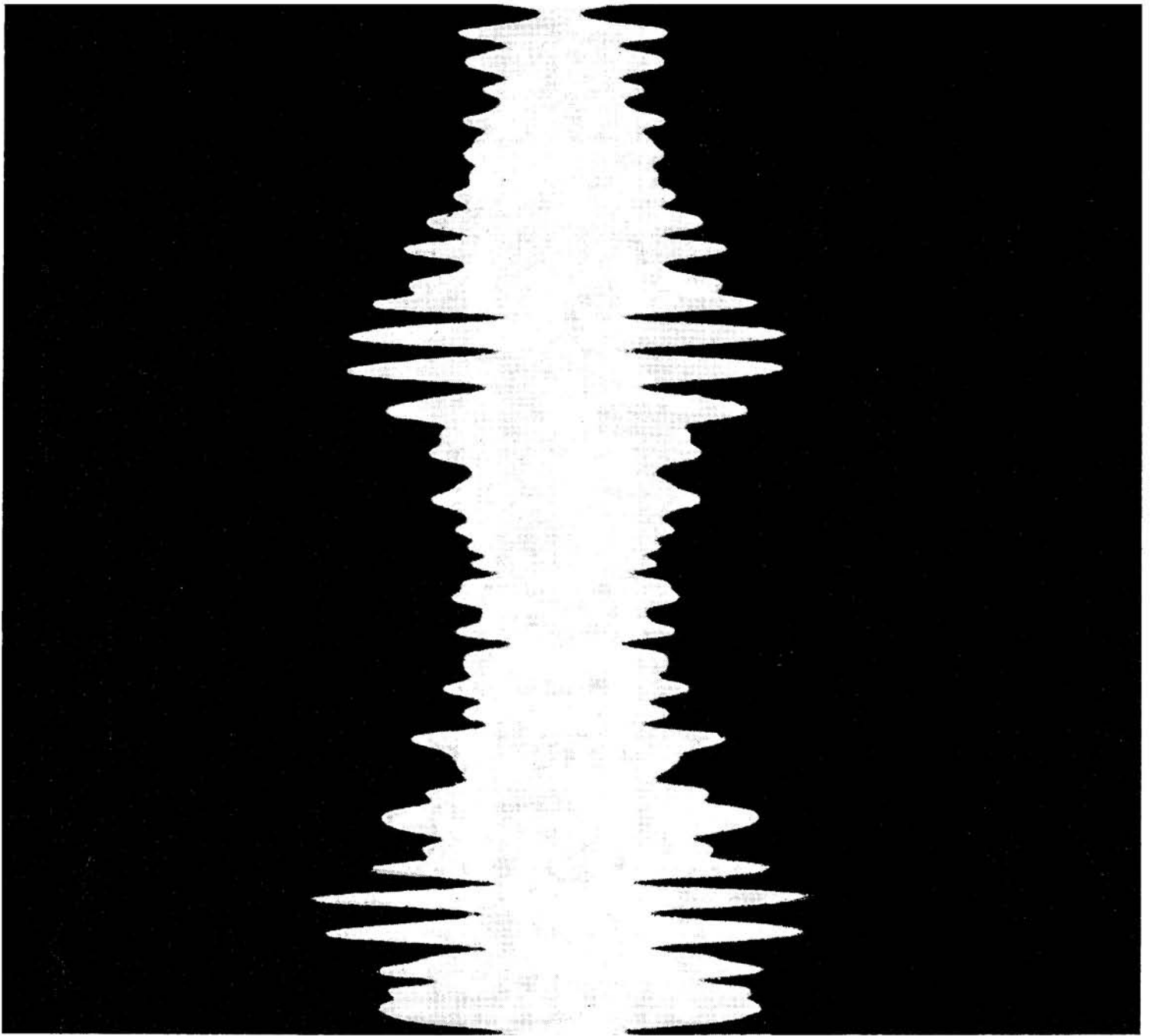
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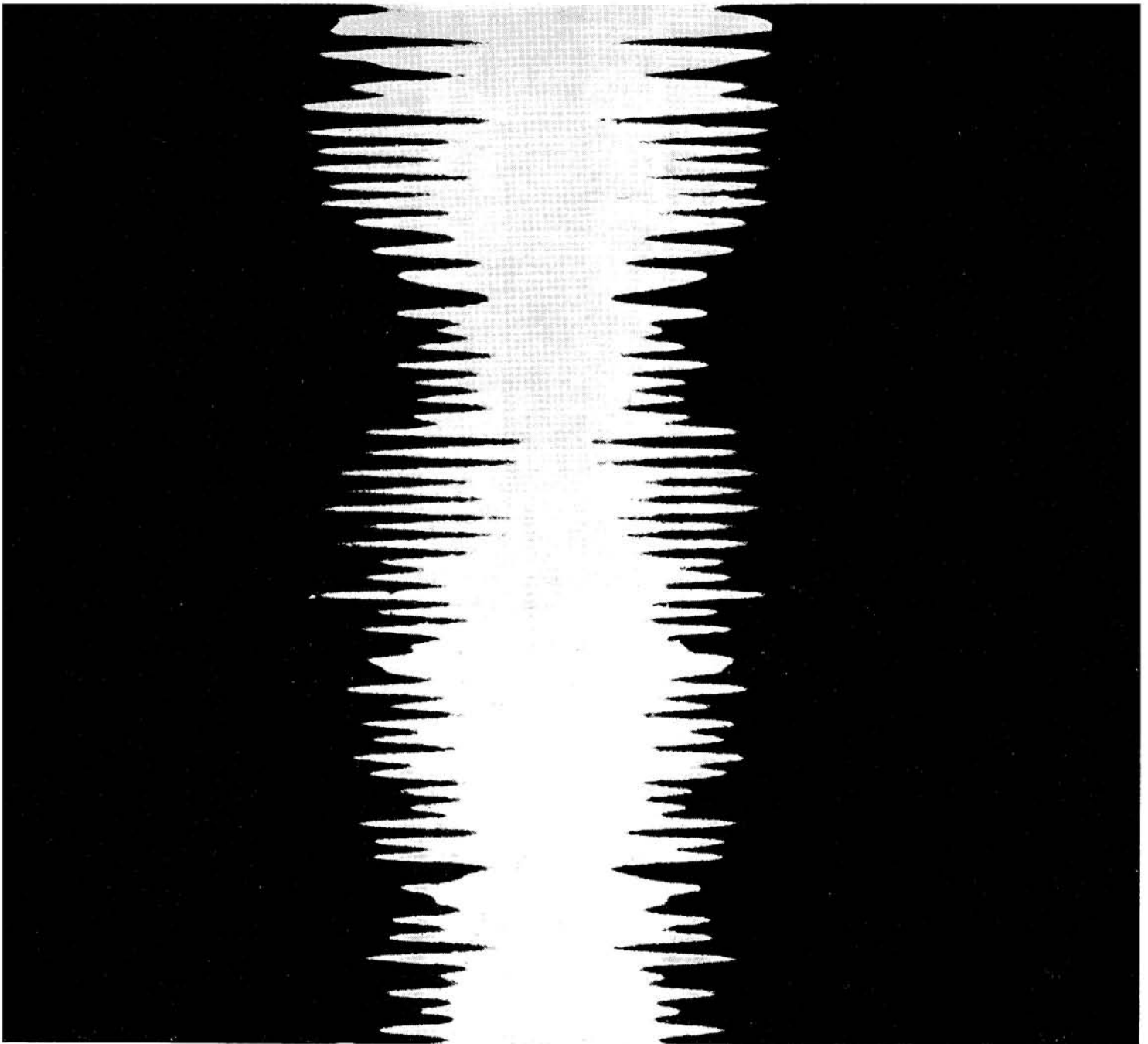
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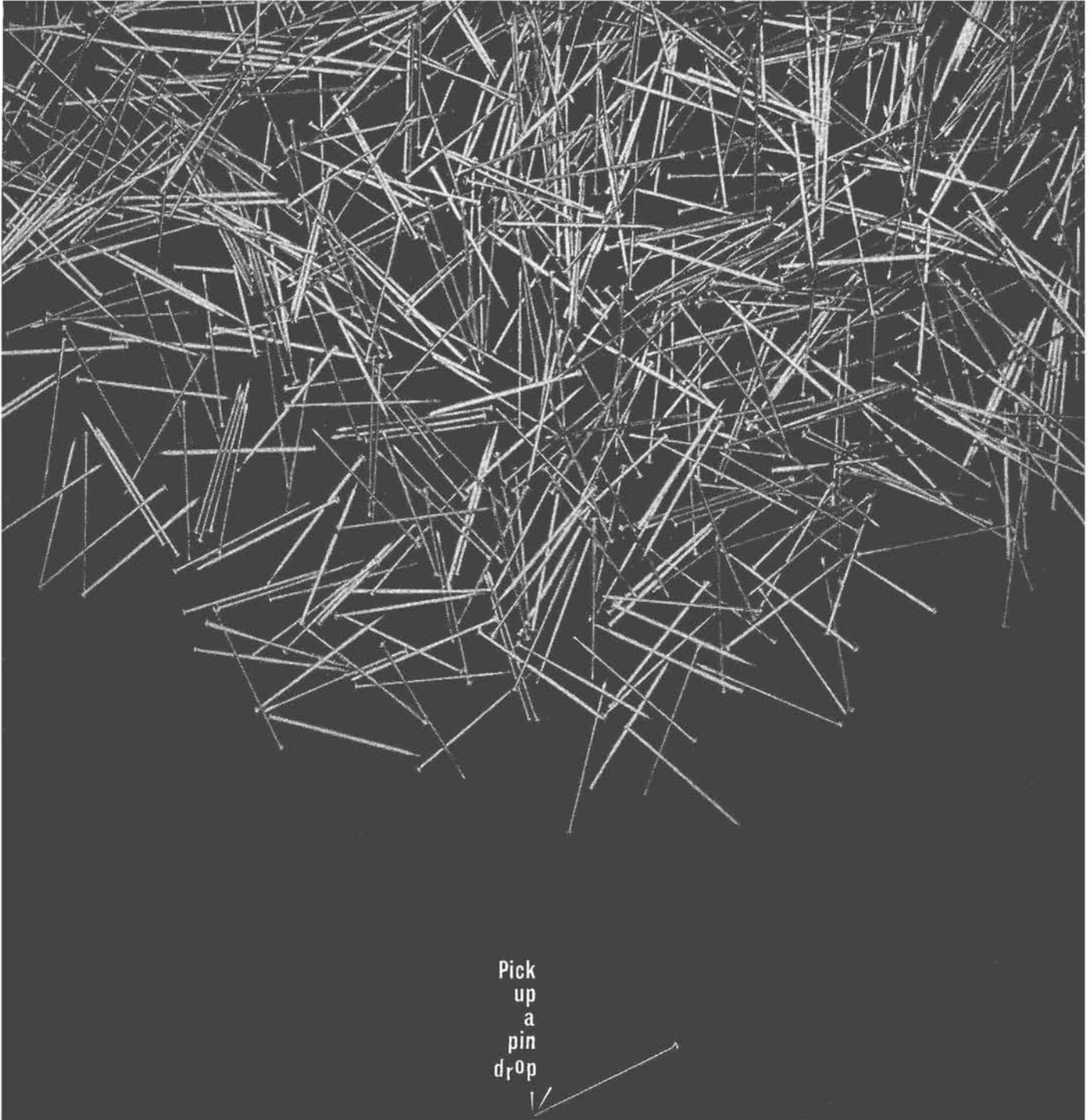


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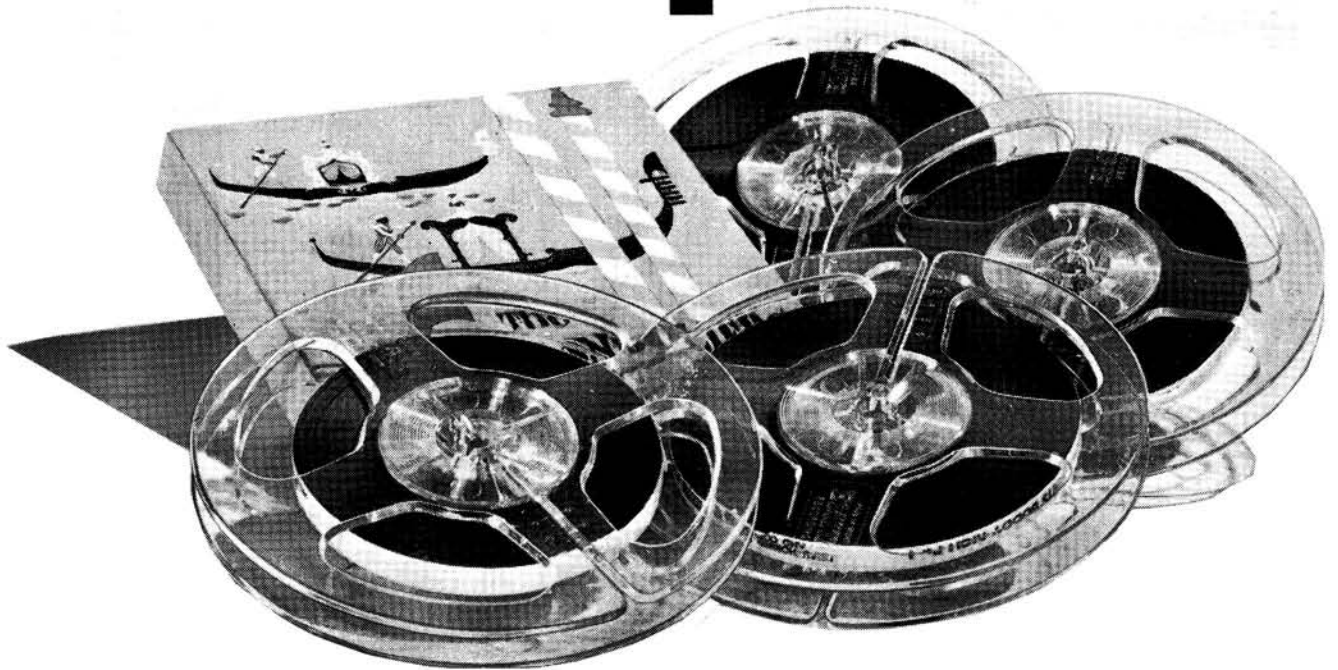
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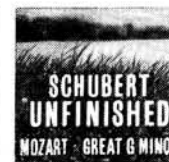
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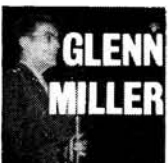
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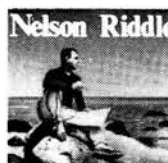
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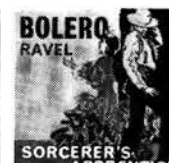
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editorial

OUR REMARKS in the March Editorial seem, if not to have started the ball rolling, at least to have helped it on its way.

Through the good offices of the Deputy Speaker of the House of Commons, Dr. Horace King, who happens to be an amateur tape recording enthusiast of long standing, we managed to obtain the comments of the Postmaster General, Mr. Anthony Wedgwood Benn. Readers may judge the present situation regarding the future of airmail rates for sound recordings from the PMG's reply:

"We do recognise the growing interest that there is in the international exchange of tape recordings of all kinds and you may be interested to know that we are having a look at the question of introducing a *Phonopost* service. This is a service provided for in international postal regulations which caters specially for tape recordings, etc. I will write to you again when we have reached firm conclusions."

A similar reply received from the GPO Public Relations Officer states that such a service would be unlikely to begin before 1st January 1966, when revised regulations, which were agreed at the Universal Postal Union Congress in Vienna last year, come into force.

Rather more certain than a "Phonopost" is the 1965 International Audio Festival and Fair, which will come into force at the Hotel Russell on 22nd April and last until Sunday 25th. Full details of exhibitors and exhibits are given on page 156. There has been a tendency in the past to look upon 'The Fair' as an exhibition primarily of interest to the hi-fi enthusiast. For a specialised corner of the audio market, however, the number of participating tape and recorder manufacturers is surprisingly high—some 50% of the total number of exhibitors.

Readers fortunate enough to be in the market for recording equipment would do well to take advantage of the leisurely, friendly, albeit crowded, atmosphere of the Hotel Russell by handling and hearing the products within their own particular price category. It is surprising the degree by which different recorders of similar price vary in quality and reliability. This is particularly so of the battery portable, and readers might care to put our past comments to the test by comparing cheap with expensive.

There can be no doubt, of course, that more than a few tape enthusiasts will be pulled across the barrier to 'hi-fi'. But the two hobbies can run side by side if the amplifier and speaker within the recorder-cabinet are replaced by better quality external models. Similarly, many music lovers are likely to add one of the several excellent stereo tape units to their equipment, only to waste expensive peak programme meters, low-impedance microphone stages, magnificent recording amplifiers and complex mixing facilities merely on replay of commercial tape records.

Beware of catching the plague of simply-sit-back-and-listen; but a word of encouragement for those who freely confess to suffer from that affliction. Assuming the tape recorder is not permanently sealed in a mahogany cabinet, there is no reason why the music lover should not

increase the pleasure obtainable from his machine by venturing out to local amateur musical groups—ideal subjects for recording. The recording stages of the tape equipment will be taxed to the full, so too will the music-lover's knowledge of acoustics, microphone positioning and balance. Not only does live recording provide the music lover with the opportunity of competing with commercial disc quality, but at the very least it creates admiration for the professional musicians' and technicians' skill, for one soon discovers that there is a lot to learn about the recording of live music.

The Audio Fair is, of course, the ideal place to take acquaintances newly interested in tape recording, since only one good demonstration of high quality sound reproduction is needed to allay the common belief that the domestic recorder working through internal speakers is of "pretty good quality". One must keep in mind the early opinion that acoustic gramophones were close on the heels of perfection. If the best reproduction you have heard came from a low-price tape recorder, or from a high-price radiogram—then give your ears the benefit of at least one tour of the Hotel Russell.

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COVER PICTURE

This month's cover picture was supplied by Ampex. It illustrates their new MR-70 professional recorder which offers a frequency response from 40 c/s to 20 Kc/s \pm 1dB at 30 i/s. Several versions are available, using $\frac{1}{4}$ in., $\frac{1}{2}$ in. and 1in. tape with up to eight channels. The ultimate in luxury—illuminated push-button solenoid control, has yet to reach the domestic market.

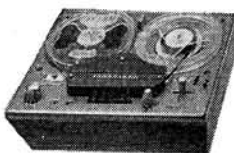
SUBSCRIPTION RATES

Annual subscription rates to *Tape Recorder* and its associated magazine *Hi-Fi News* are each 30s. in the U.K. and 32s. 6d. overseas (U.S.A. \$4.50) from Link House Publications Ltd., Dingwall Avenue, Croydon, Surrey. *Tape Recorder* is published on the 14th of the preceding month unless that date falls on a Sunday, when it appears on the Saturday.

"WHENEVER THE DEMAND IS FOR PRECISION RELIABILITY AND NATURAL SOUND REPRODUCTION —THE CHOICE MUST BE TANDBERG"

SERIES

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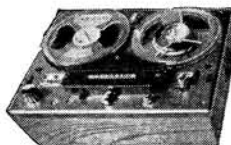


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speeds— Three heads
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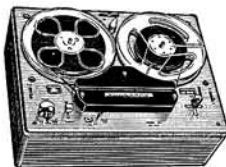


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SERIES

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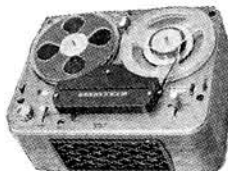


Model 823 2 track
(teak case) 54 gns.
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High class monaural tape recorders suitable for
home, business, education, photo sound, etc.
($3\frac{1}{2}$ and $1\frac{1}{2}$ I.P.S. speeds — 7" reels).

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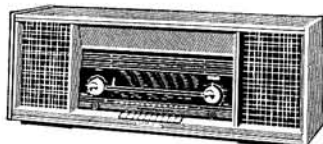
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Model 92 2 track only
(teak case) 69 gns.

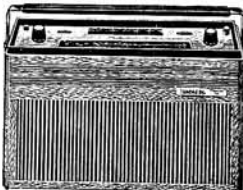
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Model 7-41 without speakers 80 gns.
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F.M. and L.W. M.W. S.W.1. S.W.2. A.M.
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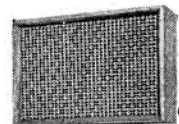
TRANSISTOR RADIO



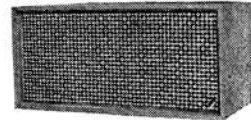
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49 gns.

Covers L.W. M.W. S.W. and F.M. bands
Special facilities for car radio use (special
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Model Speaker 813 gns. justly claim to be



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Dimensions:
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deep.
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deep.

Tandberg

For further information and specifications please write to:

Elstone Electronics Limited, Edward Street, Templar Street,
Leeds 2. Telephone: Leeds 3-5111 (7 lines)

world of tape

PHOTO CINE FAIR

BETWEEN 13th and 19th May, the International Photo Cine Fair will be held at the National Hall, Olympia. Though of marginal interest to the majority of tape enthusiasts, the fair has included, in past years, demonstrations of video tape recorders from Ampex and Precision and tape-cine synchronising equipment.

MASTERTAPE FREE OFFER AND NEW NAME

SIX hundred feet of triple play tape is being offered with every 5½in. S 1,200ft. reel of Mastertape during Spring. The manufacturers also announce a change of name from MSS (*Marguerite Sound System*) Recording Company to Mastertape Magnetic Ltd.



"With this model you get a spoken guarantee"

FILM AND TAPE AT THE B.K.S.T.S.

ON 3rd March members and friends heard Norman Leever, past President of both BKS and BSRA, give a lecture on *Integrating the use of film and tape in sound recording*. This covered the many techniques which have been used for synchronising magnetic sound tracks with the film frames and dealt particularly with the *Leever-Rich* Synchronpulse system. Amongst its advantages, this allows a wide range of speed coverage, it being not unknown for some film to be shot with an error of 20%. In addition, Mr. Leever showed techniques for identifying cameras using pulse coding, the sequence being repeated every 100 frames to facilitate editing.

On show were the studio recording equipment and also a lightweight transportable recording and playback unit with mixing arrangements. The electronics were fully transistorised and the mechanical drive, whilst of high standard, was specially designed to minimise the overall weight. Details of lecture programme and membership of the British Kinematograph and Television Society are obtainable from: The Secretary: BKSTS, 164 Shaftesbury Avenue, London, W.C.2.

NEXT MONTH

FRIDAY 14TH MAY is publication date for the June issue, which will contain a reasonably detailed account of the DIN system of socketry. The addition of variable speed rewind to tape decks in general—the Wearite in particular—will be described by G. T. Rogers, while Martin York discusses aspects of indexing recordings. A. Tutchings will review the B & O Stereomaster.



AMPEX DOMESTIC VIDEO RECORDER

PART of the "home entertainment centre of the future" now being manufactured by the American *Ampex Corporation* is a video tape recorder operating at 100 i/s on ½in. tape. Designated *Signature VI*, the recorder was based on the Ampex VR303 which is currently used in a mobile closed-circuit system costing approximately £2,000. A maximum recording time of fifty minutes is possible using 12½in. spools. The entertainment centre includes colour television and FM radio reception with stereo disc reproduction and sells for £1,430.

SCOTCH BABY SPEAKS OUT

THE recent competition launched to boost sales of *Scotch* recording tape has been won by Mr. I. C. Naylor of Bedford. Several thousand entries were submitted, each suggesting the comments of a baby discovering its father not using Scotch tape. Mr. Naylor has a choice of £200 worth of audio or photographic equipment for his line: "What! No Scotch? I'll give him something to record—at about three o'clock tomorrow morning."



FILMAGIC CLEANING ACCESSORIES

FILMAGIC cleaning kits, comprising the *Pylon* tape cleaner and FM 200 idler and guide lubricant, are now being imported from the USA. Price 36s. 6d. (including 1s. 6d. postage), the *Pylon* kit comprises a bottle of tape conditioning fluid, one of three "pylons"—with screw or rubber suction pad for location on the deck, or as a third alternative with a fork base for connection to an existing guide.

Two 2oz. bottles of red 'cleaner' and blue 'lubricant' make up the FM 200. The cleaner may be used on magnetic heads and drive assemblies while the lubricant provides protection for guides and other friction points. Both these products and similar accessories for maintaining cine and slide equipment are available from: *Concordia*, 42 Museum Street, London, W.C.1.



**When you can't tell if it's 'recorded'
or 'live', ten to one it's on Agfa**

There's a lot to tell about Agfa High Definition tape but the interesting thing is that most recording studios throughout the world insist on using it. No self-respecting studio engineer would want it unless he was sure of getting the widest frequency response, tolerance to overload without distortion, exceptional physical properties and so on. So look for the bright orange and blue pack and remember the one with the diamond is your tape recorder's best friend.

Agfa High Definition Polyester recording tapes are available in an extensive range of spool sizes and tape thicknesses to suit all types of recorders. A splicing tape dispenser at 6/6, and an accessory kit at 34/6 are also available. Your local shop will tell you about them.



the world's most versatile tape

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A product of Agfa-Gevaert A.G.

CHURCH organs are very difficult to tape. One cannot just start the recorder, begin playing the organ, and hope to obtain a perfect result—without a great deal of luck.

It is possible to work the recorder and play as well but this is not a good idea. By playing the loudest chord likely to be sounded in a piece of music and setting the input level accordingly, one can then carry on playing, leaving the machine to look after itself.

A passable recording may result, but generally the overall effect is much more realistic if the microphone is somewhere in the body of the church. With the tape recorder close to the organist the microphone is not likely to be far away, especially with a crystal. I use a *Grampian* moving-coil with 18ft. of lead, but even this is rarely enough unless soft music is played or a very small organ used.

The only exception I have come across is in my own parish church. The organist plays in the chancel but the pipes are on the west end wall, about a hundred feet away. With the recorder lying on the choir stall behind me and the microphone wedged under the lectern bible a very good impression is obtained.

CURIOSLY SELECTIVE

The human ear can listen to organ tone in most parts of a building and receive a pleasing impression, but a microphone is curiously selective. One position may lead to certain pedal pipes sounding boomy and obtrusive; in another, one particular stop or pipe may sound quite out of balance and tune. If this happens to be a key note in the music the recording is useless from a hi-fi point of view.

If a tape recording of an organ recital is to be made and there is no knowledge of the optimum microphone position, a place reasonably high up in the body of the church should be selected. The organist is aiming to please the audience, not you!

But if a realistic recording is required it is essential to have the organist playing while various microphone positions are tried until the playback is good. This settled, it is always a good idea to have the selected pieces played over—or at any rate have the organist improvise on the stops he proposes using in their various combinations. Some may have to be avoided. On some organs, to obtain clearness, the Gamba must not be used. It has a curiously pervasive quality and causes a 'muzzy' type of tone in combination with other stops.

Except in slow chords them annual sixteen foot stops are best avoided. I love this tone but was horrified, when I first tried it, to hear what a muddy thick sound came from the speaker! Still, the 'Full Swell' effect including a 16ft. reed, generally comes off much better than the 16ft. flue stop.

If it is intended to record a choir, then further complications of balance crop up; a second microphone would be a great asset. Still, I have heard some good choir recordings made locally by people using only one microphone. Some juggling will be needed to bring a voice part up to strength.

I find that the deep pedal tones play back far too loudly and a degree of bass cut is necessary, especially if a hi-fi system is used for reproduction. My equipment includes a 12in. speaker mounted in a heavy cabinet, and while it is very pleasant to have the entire house shaking under the stress of a powerful 32ft. reed, there is certainly some distortion without a degree of bass cut. However, this will depend on the individual set-up, room acoustics, etc.

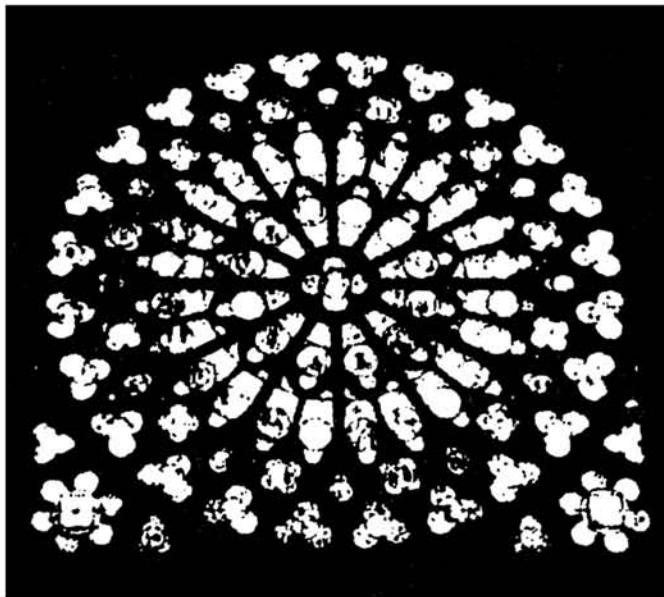
My live organ recordings are made at a speed of $7\frac{1}{2}$ i/s to keep down wow and flutter, which will rear their heads in organ music if nowhere else.

Sometimes I seem to detect wow and flutter but suspect the fault does not lie with the machine, but with the building acoustics. If a chord is held on the organ and the VU-meter watched it will be noticed that the needle fluctuates about, rather in the fashion of a faulty car speedometer needle. The original tones entering the microphone are increased and diminished by echoes from the walls.

The Roman Catholic church in Lyme Regis has the organ up in a west end gallery and the player sits among the pipes. Under these conditions the recording is poor—the pipes seem to shriek from all directions; there is also a plopping of pneumatic mechanism. A friend working the recorder down in the chancel would have made all the difference.

Through the kindness of the organist I was able to play twice on the Canterbury cathedral organ last year, each time with a friend to work the recorder.

The organ is tonally designed to be heard from the floor of the choir. The pipes are disposed along the south triforium and the organist is



with coke obbligato

Some notes on organ recording by Michael Jack

30ft. or so up on the chancel screen.

Consequently in the organ loft a false impression is obtained. The cathedral atmosphere, with its lengthy reverberations, comes over very well but it is not a balanced recording—the microphone was laid on the edge of the screen. The softer choir organ sounds nearly equal in power to the great, while the powerful tuba, being further away, sounds quite tame. The terrific 32ft. reed simply swamps everything if full bass is used.

It would obviously have been more satisfactory if my assistant had been down in the choir, but this would have meant an awful lot of signalling and organ stool shuffling!

On the second visit there was the usual crowd of visitors. In the loft it was just a murmur of sound but it was enough to ruin that part of the recording. Complete silence is necessary; unwanted noises have a disconcerting habit of sounding out of all proportion on play-back.

SUDDEN SNEEZE

The most painful recording I ever made was on an organ where the pipes were on the south side of the chancel and the player sat opposite on the north side. My trial run, with the microphone pointed towards the organ, gave the expected unsatisfactory result. A sudden sneeze didn't help.

I finally fixed the recorder in the vestry which occupied the north transept, out of sight of the organist. Starting the mechanism, I trotted down to the organ and played for ten minutes.

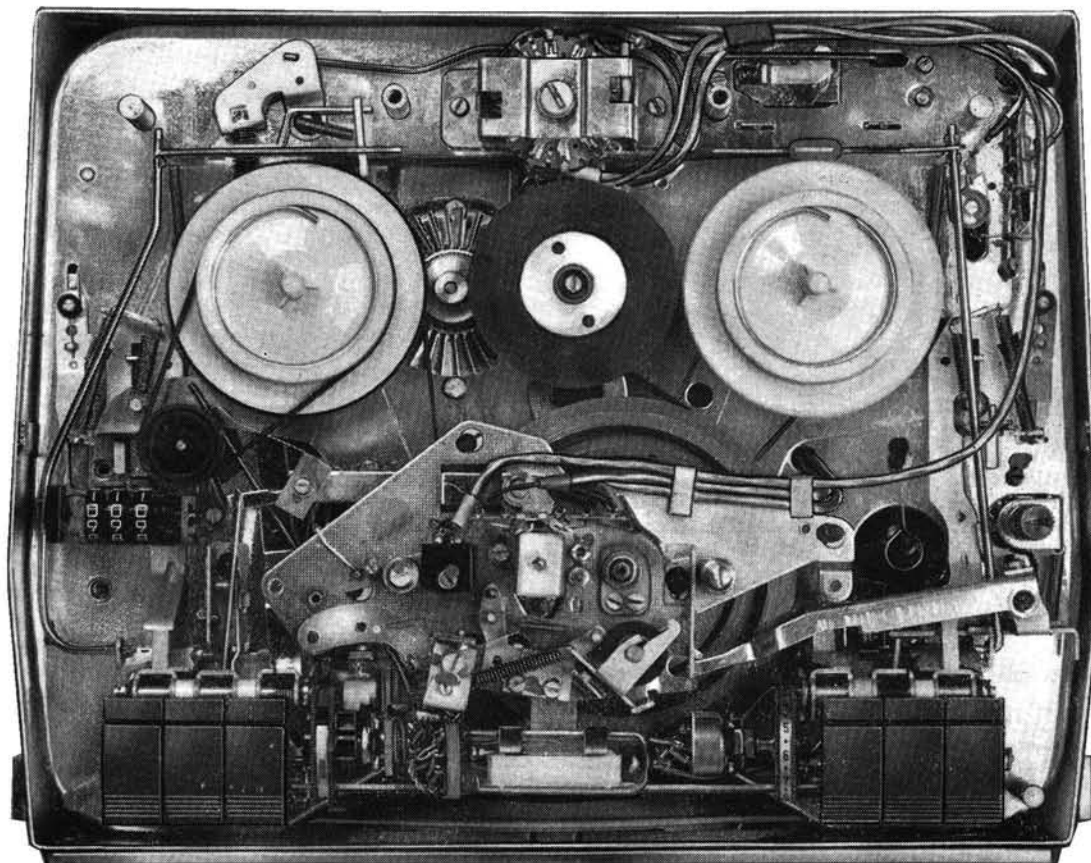
Returning to the vestry I was astounded to find two coal heavers delivering half a ton of coke down a small hole in the vestry! The recording was ruined, of course.

First the organ was heard, coming over very much better with the microphone half-way down the church. Next there was a click as the main door was opened. Heavy footsteps then sounded, advancing towards the microphone. Laboured breathing was also picked up as the coal heavers passed into the vestry.

A loud clang as the man-hole cover was flung up was immediately followed by a titanic rumbling rattling roar as the first sack of coke shot down the hole. Then the second sackful, followed by footsteps retreating back up the nave. Through all this uproar the organ continued to wail away perfectly happily!

With someone working the recorder all this nonsense would have been avoided; also the input level would not have been a matter of guesswork. I scrubbed it all off the tape but regretted it afterwards. An organ recital with coke obbligato is not a common occurrence in this country.

Grundig lift the lid on four new Tape Recorders



And set new styling standards inside and out!

350 Design and Development engineers went to work to produce Grundig's new *de luxe* range of tape recorders. They made the internal layout so brilliant that the outside just had to be a world-beater too!

Here's what you get: a complete choice of two track, two track automatic, four track and four track automatic machines, at sensible prices, from 37 gns.

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TM4

LIVING within thirty miles of each other in the North Riding of Yorkshire are three writers to whom a tape recorder is an indispensable item of equipment. In style and content the output of these three northern writers varies considerably.

Mr. John S. Wilson is a writer of radio and newspaper short stories. He has published or broadcast about 100 of these in recent years and lives in Osgodby, near Scarborough.

Ampleforth, near York, is the home of Mr. W. D. Spence, a school stores manager who has published eleven novels, including several Westerns, since 1959.

Thirty miles away, on Scarborough's North Cliff, lives forty-eight years old Mr. R. K. Forster, a freelance journalist who writes non-fiction books.

All three use tape recorders and believe that by doing so they increase the speed and quality of their output. Here is a brief outline of their methods of work and the results they have achieved.

Mr. Spence was the first of the three to use tape. His *Elpico-Geloso* G.256 (1½ i/s) was bought in 1959 for £20 and has been in constant use

Then I alter the typescript in ink, putting it roughly into shape. By now the script is almost illegible. I type it again and this second draft is read on to tape and played back for comparison with the typescript. For me, repetition of words and phrases, instances of clumsy construction, and irrelevancies, are far more readily detected in the playback than they would be by sight-reading, or reading aloud."

When he is finally satisfied that the story is what he intended to commit to paper Mr. Wilson then types a fair copy and, to ensure that the story's texture is as neat and tight as he can make it, he takes the precaution of checking it on tape once more.

Without a tape recorder Mr. Wilson believes he could not tackle the job of writing radio material. Here, he finds, the need to be accurate in grammar and syntax is subordinated to the necessity to be conversational in style and clear in meaning. Unlike the reader of the printed page, the listener cannot turn back to a previous sentence or paragraph.

By using a tape playback Mr. Wilson finds that he can put himself in the place of the listener and determine where the emphasis must be laid. Precision of timing is also, he finds, of paramount importance when preparing radio material. Different stories—each containing 2,000 words—can vary as much as two minutes in reading time according to the varying proportions of dialogue and narrative which they contain.

The third member of this literary trio, Mr. R. K. Forster, has two tape recorders in regular use: a standard *Bush T.P.50* and a battery-powered *Philips EL3585*. Their use he finds complementary. For what he calls "long term and leisurely" research work, as in the preparation of non-fiction books, he uses the Bush; for outdoor interviews and rehearsing short broadcast talks he uses the Philips. In these capacities both serve him well.

He says: "Some months ago I began research on a book about the bombardment, in 1914, by units of the German Fleet, of Scarborough and Whitby. I asked people who recalled this event if they were willing to be interviewed. The response was terrific: I had tapped a splendid source of potential material".

It was at this point that Mr. Forster's two tape recorders earned their keep. The smaller more mobile Philips portable was in use for brief interviews at the homes of bombardment veterans. The Bush T.P.50 was used for longer interviews in Mr. Forster's own home.

"Between them," he says, "they captured in reminiscence every shade and inflexion of the fear, fright and indignation of that memorable morning over fifty years ago. In this way they helped immeasurably to inject realism, credibility and accuracy into passages of the book which might otherwise have been most difficult to write."

In dozens of different ways connected with his work Mr. Forster has found his tape recorders to be invaluable. The Philips portable has earned him hundreds of guineas by recording, in the exact manner they were spoken, snatches of dialogue and dialect tape-recorded in Yorkshire's three Ridings. Lectures have been prepared and rehearsed on the Bush T.P.50. The initial 'stage-fright' of his early broadcast talks has been overcome by leisurely rehearsals in the privacy of his own writing-room.

Recently he interviewed, using the Philips EL3585, a retired Scarborough sea-captain whose talk was interwoven with nautical technicalities which could have been alarming to an interviewer who knew no shorthand. The tape recorder smoothed this difficulty with effortless ease.

For one of the best instances of his practical on-the-spot use of the Philips equipment Mr. Forster quotes the occasion when he obtained the permission of a North Riding shopkeeper to record a few specimens of over-the-counter conversations.

A youthful customer sauntered in, pointed to a row of sweet jars on a shelf behind the counter, and the following dialogue took place:

"I'd like some of them."
 "Some of these?"
 "No. Them."
 "These 'ere?"
 "No. Them there."
 "Is these them?"
 "No! Them's them. Where I'm pointing."
 "Ah! You mean these?"
 "Aye, that's right. Them's they. I'll 'ave a quarter."

There, Mr. Forster believes, is a gem of real-life dialogue that no possible act of memory could so faithfully have recorded as did the hearing ear of his dutiful Philips.



By ROBERT KENDAL

ever since. He finds this compact 10 x 5½ x 4in. machine ideal for his use.

"My method of work," he said, "is, first, to turn over in my mind the theme of a novel. I then make a rough draft on three or four pages of an exercise book. I enlarge this basic idea—still in an exercise book—by outlining each chapter in a synopsis of about 500 words. This enables me to see the novel in its entirety. At this stage my tape recorder comes into use. With the chapter outlines before me, I dictate the novel on to tape."

This is the point at which, ideally, Mr. Spence would like to hand over the work to a trained typist. He is experimenting in this direction and has already made progress. But at present he still finds it necessary himself to transcribe back from the tape into longhand. This enables him to make any corrections and alterations. "But," he adds, "once the novel is on tape the work of creating it is virtually finished. At that stage I could leave it for a week, or a month, and still carry on with the final acts of polishing and revising."

Mr. Wilson's tape recorder is a ½-track *Walter 404*, with speeds of 3¾ and 7½ i/s. He finds, especially for a writer, that a counter is a necessity. The only modification he has introduced is a change from the original 3-pin microphone plug and socket to miniature jack plugs whose contact, he finds, are more positive.

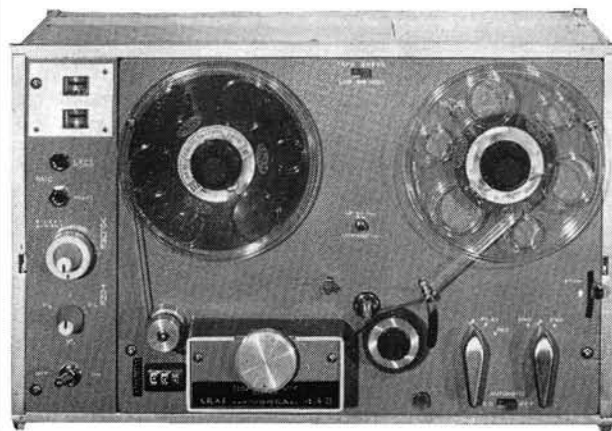
He finds that 7in. spools, which just fit the machine, are best suited to his needs. At 3¾ i/s they conveniently offer sixty minutes playing time on each side. To Mr. Wilson, specialising in radio short stories, this works out in terms of eight periods of fifteen minutes each.

To illustrate his dependence on tape Mr. Wilson outlined the way he tackles a short story once the basic idea has crystallised.

"I type," he said, "a rough draft of the material 'as it comes'.

TAPE AT THE HOTEL RUSSELL

Below: Ampex 2070.
Lower right: Brown Dual
Function Microphone.
Bottom right: Akai X4.



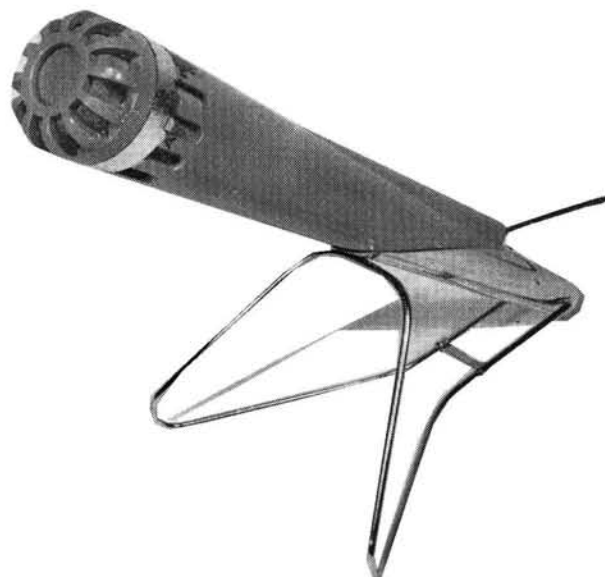
THE last few days of February and early March, probably see more editorial anguish than all the other months put together. With biting winds and frequent snow falls, it is not surprising that manufacturers eye with horror or apathy our request for information of products to be introduced in long-distant April.

This being so, we cannot be sure that every significant new development in the tape recording field to be found at the Hotel Russell is mentioned in the following pages; but we have done our best, and anything missed will be covered in the report on the 1965 *International Audio Festival and Fair* in the July issue. The Fair takes place at the Hotel Russell, Russell Square, London, W.C.1 and runs from Thursday 22nd April till Sunday 25th. It is open to the public from 4 p.m. to 9 p.m. on the Thursday, from 11 a.m. till 9 p.m. on the Friday and Saturday, and from 11 a.m. till 8 p.m. on the Sunday. Before 4 p.m. on the Thursday is for trade and press only. Readers still without tickets for the Fair may obtain them from this office by sending a stamped addressed envelope and a simple request stating the number wishing to attend—but time is running out!

ALPHABETICAL ORDER

Now to the show itself, with exhibitors in alphabetical order. As in past years, an entertaining and informative demonstration begging not to be missed will be given by *Agfa*. On this occasion it is hoped to demonstrate the durability of a recording made on *Agfa* tape by passing a loop from a recorder through "varying temperatures and conditions" and back to a replay unit.

Three additions to the *Akai* range of stereo recorders will be shown for the first time in this country. Model *M8* follows the vertical styling of the *M7*, which it replaces, and incorporates at least one feature which makes it well before its time. Exceptionally high bias frequency prevents interference which might arise from beating between bias and pilot tone on the multiplex stereo transmissions we do not yet have. The *M8* sells for £158 11s. Most of the *Akai* range incorporate cross-field biasing to improve high frequency response at low speeds, and the new *X4* ½-track stereo mains/battery portable is no exception. This unique machine costs £141 15s., operates at ½, 1½, 3½ and 7½ i/s and gives a claimed response of 40 c/s to 20 Kc/s ±3dB at 7½ i/s, 0.16% RMS wow and flutter, and 30 c/s to 5.5 Kc/s



Below right: Sony TC600.
Centre: Fi-Cord 202A.
Left: Akai ST-1.



a preview
of the
1965
audio
fair



$\pm 3\text{dB}$ at $\frac{1}{2}$ i/s, 0.35% RMS wow and flutter. A 5in. elliptical speaker is included in the $10 \times 9\frac{1}{2} \times 4\text{in.}$ case, and rechargeable batteries allow up to $6\frac{1}{2}$ hours running time. Output power is 2W per channel.

Two speeds, $7\frac{1}{2}$ and $3\frac{3}{4}$ i/s, are offered by the Akai ST-1, price £115 10s. This too is a $\frac{1}{4}$ -track stereo machine, complete with 3W per channel output stages and miniature VU-meters.

While 3M may be demonstrating their self-threading spool, the new Ampex 2070 shows how easy life can be without any take-up spool. Just what happens when one wishes to remove the self-threading 'black box' remains to be seen. Another interesting aspect of the 2070 is the claimed wow and flutter performance—just 0.0007% RMS at $7\frac{1}{2}$ i/s. Automatic reverse, controlled by a subsonic signal which may be added to any point on a tape, enables opposite tracks to be replayed without interruption, the tape being driven, and held to the heads, by two capstans, one at each side of the head block. A version of this machine, designated Model 1070, is also available for use with normal spools. The Ampex MR-70, shown on this month's front cover, may also be demonstrated at the Hotel Russell. Intended for the professional market, this machine is solenoid-controlled and incorporates variable speed wind, 30 and 15 i/s tape speeds, and has a frequency response from 40 c/s to 20 Kc/s $\pm 1\text{dB}$ at the higher speed.*

A new microphone and several headsets will be exhibited for the first time by S. G. Brown. The Dual Function microphone is intended for tape recording use and incorporates a switchable noise-cancelling device.

BASF Chemicals follow last year's pattern by offering free copies of four lecture tapes: "Politicians, Tokyo Olympic Games, Technical", and "Classical Music".

HESITANT APPEARANCE

The Butoba MT22 mains/battery portable recorder made its first rather hesitant appearance at the 1964 Fair, spending the rest of that year 'under the counter'. Now, however, it appears that importing arrangements have been satisfactorily negotiated and the British Market will at last see a reasonably-priced Continental battery machine offering $7\frac{1}{2}$ i/s. Three motors and solenoid switching seem likely to

*Stop Press. Ampex announce they are withdrawing from the Fair, though these products are now available.

impose more than a little strain on the batteries (though these can be recharged) but nevertheless offer full remote control facilities.

Spool capacity is 6in. with lid open or closed, giving one hour recording time on each of two tracks with triple-play tape. Frequency range is from 40 c/s to 18 Kc/s at $7\frac{1}{2}$, to 15 Kc/s at $3\frac{3}{4}$ and to 9 Kc/s at $1\frac{1}{2}$ i/s, with 1% distortion at normal modulation level. The $12\frac{1}{2} \times 10 \times 5\text{in.}$ machine weighs 12lb. and is finished in moulded die-cast metal.

Another promising battery portable is that to be introduced by EMI, replacing the very successful RE321. The L4 offers several improvements on its predecessor, at the same price of £124. Remote control, mixing of two microphones, and two speeds— $7\frac{1}{2}$ and $3\frac{3}{4}$ i/s—combine with 14V rechargeable power supply and provision for film synchronisation through a fourth magnetic head, to make the machine one of the most versatile portables ever produced.

Elcom (Northampton) will display their wide range of professional mixers, faders, printed circuit connectors, and similar very well made components. A variety of pre-amplifier modules are also to be exhibited.

COLOUR SLIDES

The exceptional performance obtainable from their new quadruple-play and triple-play tape will be demonstrated by Kodak, with colour slide illustrations.

The introduction of a new series of Ferrograph recorders is a rare occurrence which should attract much attention from the genuine enthusiast. Further improvements to the Wearite deck give the added versatility of a third tape speed and, with a new design of synchronous capstan motor using sealed ball race bearings, lower wow and flutter and longer life are achieved. Models 631, 632 and 634 operate at $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{1}{2}$ i/s, costing £98 8s., £120 15s. and £126 respectively. The $1\frac{1}{2}$ i/s tape speed is replaced by 15 i/s on Models 631/H and 632/H which sell for £96 12s. and £126 respectively. The new range also incorporates restyled cabinets.

Beyer and Fi-Cord microphones, the Synchrodek cine attachment and a restyled 202 battery portable will be shown by Fi-Cord International. The 202A is similar to the original, but modifications

(continued on page 159)



Why Kodak P.300 tape gives you better high frequency response at low speeds

When you record at speeds below $7\frac{1}{2}$ ips, noticeable high frequency losses will occur, whatever your equipment. But now, with Kodak P.300 Triple Play Tape, you can bring these losses to a lower level than ever before. That's because Kodak P.300 Tape has been specifically designed for low-speed operation and incorporates 'gain' at high frequencies. This enhanced high frequency response at low speeds has not been achieved at the expense of the tape's other features. Its combination of exceptional wavelength response, signal-to-noise ratio and low distortion cannot be equalled by any other triple play tape in the world. What's more, print-through is up by only 1dB on standard play tape. Yet these are not your only benefits. The oxide coating on Kodak P.300 tape is accurate to within *millionths* of an inch, providing incomparable uniformity of output. And this uniformity, together with the flexibility of the specially

treated base material, gives you complete freedom from drop-out — an important advantage in both low speed and quarter-track recording.

But you be the judge. Try Kodak P.300 Triple Play Tape for your next recording and hear for yourself.

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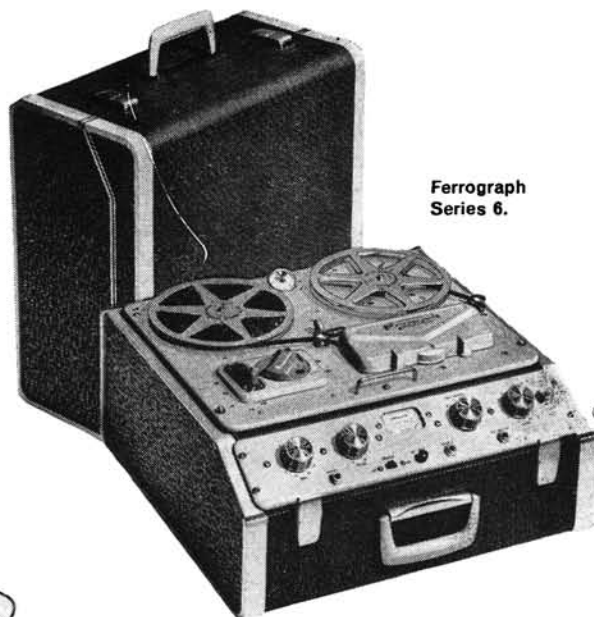
Kodak Ltd., Dept., 70, Kodak House, Kingsway, London W C.2

6

Kodak sound recording tapes — the best tapes in the world



Left: Brown Diplomat Headphones.
Bottom: EMI L4.



Ferrograph Series 6.



Beyer M110 Lavalier Microphone

to the battery voltmeter have been made, with added output facilities for external amplifier and speaker. Price had not been confirmed at the time of writing.

No additions to the *Grampian* range of microphones are expected, though a 50W heavy duty transistor amplifier and 12in. speaker will be introduced. Of special interest are the Grampian Parabolic Reflector and Reverberation Unit.

Another tape manufacturer exhibiting wares with colour slides is *Ilford-Zonatape*. A ten-minute slide programme and hi-fi demonstrations are planned.

The *Radiomic* remote microphone system will again be shown by *Lustraphone*, together with their wide selection of microphones, stands and accessories.

The recently-introduced *Optacord* 408, will be demonstrated alongside another battery portable, Model 416. The latter machine follows the styling of the 414 but has two speeds, $3\frac{1}{2}$ and $1\frac{1}{2}$ i/s; the 414 operates at the single speed of $3\frac{1}{2}$ i/s. No price details have been given.

At least two of the many new circuits being shown by *Mullard* should be of interest to the recordist. These are a five-transistor mixer and eight-transistor tape recorder. Leaflets giving information of Mullard designs will be available free to visitors.

The *Revox* 736 stereo recorder and *Hammond* Capacitor Microphone will be demonstrated by Colin Hammond Ltd. Selling at £29 8s., the microphone is a redesigned version of the *Microkit* and incorporates low impedance balanced output, totally encapsulated pre-amplifier, replaceable capsules and regulated transistor power supply. The microphone is supplied fully assembled.

Users of battery equipment may find something of interest at the *Mallory* stand, where an improved version of their Manganese Alkaline dry cell, available in five standard sizes, will be displayed.

Sony tape equipment, already on permanent display in London's

Welbeck Street, will be shown at the Audio Fair as usual. A particular attraction is likely to be the *SRA-3* stereo tape preamplifier which may be connected to almost any deck, making a complete tape unit possible for under £50. The preamplifier incorporates twin VU-meters and sells, fully assembled, for £33 12s. A $\frac{1}{4}$ -track tape deck, Model *TD 263D*, is available for the *SRA-3*, price £39 18s.

Sony are, of course, best known for their complete stereo recorders, which this year comprise the *TC200*, price £75 12s., *TC500*, price £110 5s. (reviewed in this issue), *TC600*, price £131 7s. and *TC777A*, price £162 15s.

Technical staff will be present at one of the two demonstration rooms taken this year by *Truvox*. For the first time, visitors to the Fair will have the opportunity of discussing their experiences of *Truvox* recorders, tape units and amplifiers with the engineers responsible for their development. The new *Series 100* range will be demonstrated in the acoustic isolation of an adjacent room.

As usual, we shall ourselves be found somewhere amongst the bustling booths on the ground floor, with our sister magazine *Hi-Fi News*. We hope there to follow the Agfa pattern, in determining just how long we can stand up to varying temperatures, humidity and conditions.

By far the easiest route to the Hotel Russell is via Piccadilly Line to Russell Square Underground Station. The entrance to the Audio Fair is a few yards to the left of the station exit.

Here are some of the easy-to-build Heathkit models from our wide range

HI-FI EQUIPMENT CABINETS

A range of over a dozen equipment cabinets is now available to meet the differing needs of enthusiasts. Designed for maximum operating convenience or for where room space is an over-riding consideration, this range includes kits, accurately machined for ease of assembly and "left in the white" for finish to personal taste, ready assembled cabinets or RECORD HOUSING assembled and fully finished cabinets, and has at least one model to meet your requirements. Why not send for full details? Prices from £7 7s. 0d.—£37 16s. 0d.

ALL BRITISH MODELS AVAILABLE ASSEMBLED. PRICES ON REQUEST

Deferred terms on orders over £10.



"Malvern"



MFS

COTSWOLD HI-FI SPEAKER SYSTEM

This is an acoustically designed enclosure 26" x 23" x 14 1/2" housing a 12" bass speaker with 2" speech coil, elliptical middle speaker, together with a pressure unit to cover the full frequency range of 30-20,000 c/s. Delivered complete with speakers, cross-over unit, level control, grille cloth, etc. Ralph West ("Hi-Fi News") says: "The reviewer was very impressed and places this design among the top few and unhesitatingly recommends it to the most critical music lover."

"COTSWOLD" MFS SYSTEM

Similar performance to standard "Cotswold" but designed for the smaller room. Size 36" high x 16 1/2" wide x 14 1/2" deep. Either model £23 4s. 0d. kit.



FM TUNER

A Tape recorder requires a quality tuner

HI-FI FM TUNER, Model FM-4U

Available in two units which for your convenience are sold separately: Tuning unit (FMT-4U—£2 15s. 0d., incl. P.T.), despatched wired and tested, and I.F. amplifier (FMA-4U—£13 3s.). Printed circuit for I.F. amplifier and ratio detector. Built-in power supply: 7 valves. Tuning range 88-108 Mc/s. Total price Kit £15 18s. 0d.

Tape Recording and Replay Hi-Fi Amplifiers Models TA-IM (Mono) and TA-IS (Stereo) For use with most tape decks. Thermometer type recording indicators, press-button speed compensation and input selection. 3-position bias level and printed circuit construction.

TA-IM Kit	£19 18s. 0d.
TA-IM and Collaro "STUDIO"	£31 5s. 6d.
TA-IM and TRUVOX D92/2	£52 18s. 0d.
TA-IM and TRUVOX D93/4	£52 18s. 0d.
TA-IS (illustration Centre) Kit	£25 10s. 0d.
TA-IS and TRUVOX D93/2 . .	£58 10s. 0d.
TA-IS and TRUVOX D93/4 . .	£58 10s. 0d.

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Get best possible recordings with a tuner



A.M./F.M. TUNER

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

Also available in two units as above: Tuning heart (AFM-TI—£413s. 6d. incl. P.T.) and I.F. amplifier (AFM-AI—£21 16s. 6d.). Printed circuit board: 8 valves; consecutive FM limiting and ratio detector. Tuning range FM: 88-108 Mc/s; AM: 16-50, 200-550, 900-2,000m. Switched wide and narrow AM bandwidth. Built-in power supply. Total price Kit £26 10s.



Save Money and enjoy yourself building these Heathkit models

They are so easy to build even for an absolute beginner. The manual of instruction is fool-proof—just follow the step-by-step.



S-33

MONO CONTROL UNIT Model UMC-1. Designed to operate with the MA-12 or any amplifier requiring 0.25v or less for full output. Suitable for cabinet mounting or free standing. Size 10" x 7" x 4". Kit £8 12s. 6d. Assembled £13 12s. 6d.

DELUXE 6 WATT STEREO AMPLIFIER Model S-33H. A stereo/mono amplifier with the high sensitivity necessary for lightweight ceramic pickups (e.g. Decca Deram). Deluxe version of the S-33. Kit £15 17s. 6d. Assembled £21 7s. 6d.

HI-FI STEREO 6 WATT AMPLIFIER Model S-33. Attractively styled, completely self-contained. Printed circuit makes it easy to build. Only 0.3% distortion at 2 1/2 W/chal. U/I output, ganged controls. Kit £13 7s. 6d. Assembled £18 18s. 0d.

HI-FI MONAURAL AMPLIFIER Model MA-5. An ideal general-purpose reasonably priced mono amplifier, 5 watts output at only 0.5% distortion, has inputs for Gram, Radio. Printed circuit board. Kit £10 19s. 6d. Assembled £15 10s. 0d.

HI-FI SPEAKER SYSTEM Model SSU-1. This kit is easily assembled. It contains speakers and balance control in its direct ducted port reflex cabinet. It is equally suitable for stereo or mono in average room. (Legs 14/6 optional extra.) Kit £10 17s. 6d. Available for vertical or horizontal use.

AUDIO SIGNAL GENERATOR Model AG-9U. Delivers up to 10 volts pure sine-wave (less than 0.1% distortion. 20 c/s to 20 Kc/s). Decade switch-selected frequencies from 10 to 100,000 c/s. Kit £22 10s. 0d. Assembled £30 10s. 0d.

POWER-AMPLIFIER 12-WATT Model MA-12. Single channel, ideal for stereo conversion. Kit £11 18s. 0d. Assembled £15 18s. 0d.

COLLARO "STUDIO" TAPE DECK. Two tracks. "Wow" and "flutter" not greater than 0.15% at 7 1/2" p.s. Long Term Speed Stability better than 0.5%. £17 10s. 0d.

SUGDEN MOTOR UNIT "CONNOISSEUR CRAFTSMAN". Heavy duty motor, operating at 33 1/3 and 45 r.p.m. Very heavy 12" turntable. £17 2s. 11d.



USC-1



TA-IS



TRUVOX D93



STUDIO

HI-FI STEREO 18-WATT AMPLIFIER Model S.99. Within its power rating, this is the finest stereo amplifier available, regardless of price. U/L push-pull output. Printed circuit. Kit £27 19s. 6d. Assembled £37 19s. 6d.

TRANSISTOR INTERCOM. Models XI-1U and XIR-1U. Ideal for office or home. Each Master operates up to five Remotes.

Master Kit £10 19s. 6d. Assembled £16 19s. 6d. Remote Kit £4 7s. 6d. Assembled £5 16s. 0d.

STEREO CONTROL UNIT Model USC-1. A deluxe stereo control unit with variable filter, switched rumble filter, printed circuit boards and many other refinements. Operates direct from tape heads. Kit £19 10s. 0d. Assembled £26 10s.

"OXFORD" PORTABLE RADIO Model UXR-2. Superbly styled hide case, with Golden trim and slide-rule tuning scale; this completely self-contained transistor dual-wave set performs brilliantly everywhere, even in a car. Reproduction is exceptionally good. Printed circuit. Kit £14 18s. 0d.

SHORTWAVE TRANSISTOR PORTABLE Model RSW-1. Four wave-band seven transistor portable with telescopic and ferrite aerials, slow-motion tuning. Covers Medium, Trawler and 6-26 Mc/s in four switched bands. Uses printed circuit board and latest circuit technique. Superbly styled leather case. Kit £19 17s. 6d.

TRUVOX D93/2 AND D93/4 TAPE DECKS. High quality mono-stereo Tape Decks. D93/2 1/2-track for highest fidelity. £36 15s. 0d. D93/4 1/4-track for most economical use of tape. £36 15s. 0d.

GARRARD AUTO/RECORD PLAYER Model AT-6. A 4-speed stereo-mono unit with manual or fully automatic record selection; adjustable counter-balanced arm. Fitted with Decca Deram ceramic cartridge £14 6s. 1d. or Ronette 105 mono/stereo cartridge £13 12s. 1d.

GOLDRING Lenco TRANSCRIPTION RECORD PLAYER Model GL-58. Fitted with the G.60 pick-up arm and Ronette 105 mono-stereo cartridge, it has infinitely variable speed adjustment between 33 1/3 and 80 r.p.m. and four fixed speeds. 3 1/2 lb. turntable to reduce rumble, "wow" and "flutter" £20 1s. 3d.



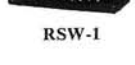
S-99



USC-1



TA-IS



TRUVOX D93



STUDIO



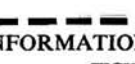
S-33



MA-5



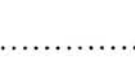
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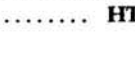
AG-9U



MA-12



USC-1



TA-IS



TRUVOX D93



STUDIO

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field trials of battery portables

BY DAVID KIRK

No 8 PHILIPS EL3586



TWO months ago it was my pleasure to field test a battery recorder costing nearly £80; but whereas I concluded that it was worth every penny, how many of us could actually afford such a machine? Choosing from the range of low-priced portables can be a hazardous task and certainly requires more time and care than is allowed by the retailer's demonstration.

There was one little machine that enjoyed a long and happy lifetime, very favourable reviews and field trials, and had a reputation for reliability, robust construction and low battery consumption. Nothing could improve on the Philips EL3585—at £25 it surpassed the quality of recorders nearly double the price and double the tape speed. Nevertheless in October 1963 it was replaced—by the EL3586. Modifications to styling, facilities and performance were small. A treble tone control had been added but more useful than this and the "remote control" feature was the provision for checking modulation level without starting the tape, achieved by re-wiring the record-interlock button. The microphone also showed signs of re-design and was no longer fitted with a rear-facing circular grill.

NO DIFFERENT

Actual performance seemed to be no different to the EL3585, the two being closely compared, and one thing I cannot, and shall not complain of, is recording quality. The machine is a superb example of what can be done by an efficient manufacturer on a limited budget.

Battery consumption is low, six leakproof cells giving a working life of between twenty and forty hours, depending on frequency of use. For greater economy, however, the mains power unit makes a worthwhile accessory at about £5. Connection of this device is made through a DIN socket positioned below the microphone socket, battery power being cut off automatically by insertion of the plug. This is an improved state of affairs to the EL3585 mains connection which involved removal of batteries and replacement of a long metal 'dummy'. 'Remote control' is also effected through this plug, but its use is not to be recommended and I look forward to the day when this particular sales gimmick is dropped.

In common with its predecessor, the EL3586 does not lend itself to easy dismantling, unless of course, one has the "special tool, whose

name I cannot print here" mentioned by H. W. Hellyer in his sixth *Tape Recorder Service*. Although fumbling fingers are liable to upset delicate drive mechanisms, most owners of tape recorders like to see just what they have bought by peering at least once 'below deck'. The EL3586 can easily be damaged by the mere act of dismantling, however, and great care should be taken not to snap the carrying handle hinges, around which lie the secret to inaccessibility, namely—circlips. After careful removal of these and two of the four screws on the deck, the mechanism is revealed. The compactness and ruggedness gives food for thought as the two halves of the cabinet are re-united; how do they do it at the price? It is debatable whether inaccessibility is an asset on a domestic recorder but my own view is that familiarity with the 'works' results, in the long run, in more careful handling and greater respect for delicate mechanism.

PRIOR OCCASIONS

On many occasions prior to this field trial I have had the opportunity to use an EL3586, which has played its part in recording sound effects, tape correspondence from remote geographical points, and in general employment for dubbing recordings to and from a mains machine.

The recorder is comparatively large and heavy, but vertical design and sturdy carrying case give real meaning to the term 'portable'.

After a little practice, the controls became easy to operate single-handed with the machine suspended from the shoulder strap but required two hands to record when the metal handle was fitted. This handle, incidentally, replaces the original flexible plastic handle and, though stronger and more attractive than the latter, tends to become rather slippery in damp weather.

Setting recording level is a simple matter, thanks to the upward-angled and very well-behaved VU-meter and to the conveniently located gain control. Extracting and replacing the microphone in its housing within the cabinet proved difficult, however, and this accessory was always carried in a coat pocket. The side-pocket of the carrying-case is not large enough for a bulky microphone but is ideal for maps, notes, tapes, *Audio Fair* leaflets and similar items unlikely to graze one's thighs.

Recordings made on the EL3586 did more than justice to the quality which might be expected of $1\frac{1}{2}$ i/s, though it was noticed that the recorder was very fussy about which brands of tape were used on it. Philips, Agfa and Kodak brands proved least inclined to drop-out effects, though frequent head cleaning was found of great importance in keeping background noise at a low level.

PERFECTLY ADEQUATE

Dubbings taken from the preamplifier output of the battery recorder were perfectly adequate for use on $7\frac{1}{2}$ i/s slide accompaniments and did not betray their original speed. Background hiss was negligible and speed fluctuation difficult to distinguish. Motor noise was non-existent. Distortion, too, proved of a very low level, a deceptively high level being given by sympathetic vibration of the plastic cabinet whilst monitoring through the internal speaker.

In the quest for perfection—of facilities, not, of course, of quality—I would like to see the addition of headphone monitoring facilities during recording, relinquishing of remote battery switch, increase in size of the microphone storage compartment, and provision for connecting an external loudspeaker—as well as the present preamp output. Nevertheless, there need be no hurry in designing a successor to the EL3586, which, I am sure, would still find a market if it were doubled in price. What modification, I wonder, would be needed to convert it to $7\frac{1}{2}$ i/s!

MANUFACTURER'S SPECIFICATION

Tape Speed: $1\frac{1}{2}$ i/s. **Spool Capacity:** 4in. without and 3in. with lid. **Battery Complement:** Six 1.5V leakproof cells. **Battery life:** 40 hours. **Frequency response:** 80 c/s to 8 Kc/s ± 3 dB. **Wow and flutter:** 1% peak-to-peak. **Hum and Noise:** -40dB. **Dimensions:** $11\frac{1}{2} \times 7\frac{1}{2} \times 3\frac{1}{2}$ in. **Weight:** 8lb. with batteries. **Miscellaneous:** Fast forward and rewind; Tone control. **Accessories:** Mains adapter, remote on/off switch. **Price:** £27 6s. **Manufacturer:** Philips Electrical Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

RECORDING BIRD SONG



part two

Identifying the species

By A. G. FIELD

MANY people who would like to record song birds or wild life feel that it is beyond them merely because they cannot distinguish one species from another. But if those who cannot tell a hedge sparrow from a house sparrow, or the sound of a fox from that of a badger, would only stop to consider they would see that this is the very least of their problems. After all, one can always record the sound first and identify the species at a later date.

There are many gramophone records of bird song available, which, although they do not always give the quality of sound obtainable from a tape fresh from the wilds, are almost always of sufficient quality to identify the species. Some sounds take kindly to discs and these can usually be reproduced with excellent quality.

This article will be concerned mainly with introducing the tyro to specific birds, as it is in this field that the writer has had most opportunity and experience. The techniques for mammals are very similar except that they are usually more shy and difficult to approach. Many of them are nocturnal.

Here, then, is a list of a few commonly found birds and mammals with a description, as far as this is possible, of their calls.

Blackbird. General habitat: town parks and gardens, country lanes, fields, woodland and coppice. Quite common between mid-February and July. Song varies with locality from rich and mellow to harsh. The song is in phrases sometimes with a short period between each, while at other times the bird gives the impression that it has all the time in the world for singing. The phrases generally have unmusical endings. Other sounds made by the bird are an apparently aimless "clack, clack, plink, plink, plink", usually at dusk, and, at any time without warning, a hysterical clattering yell. Best time to record the song is mid-May at dawn. Afternoon or evening can also be good if quiet enough. Technique: parabolic reflector with heavy filter over the mouth of the microphone. In very favourable conditions a 'bare' microphone may be used. Modulation level: one-third to one-half of normal. Try to record a little reflected sound from nearby trees.

Song Thrush. Habitat: as for blackbird but less common and growing steadily rarer. Winter song can be heard from November until severe frosts. Main song: February until mid-July. Best song periods: March to early July. The song is loud and carries well. It sometimes resembles (with a bit of imagination) human words, these being almost invariably repeated such as "be quick, be quick, do it, do it, cherry tree, cherry tree, pretty dick pretty dick."

If you are lucky you may locate a really beautiful specimen singing in a minor key, but alas these 'star' singers are heard only about twice in a lifetime. The ordinary songsters are still fairly plentiful. Recording technique: parabola with heavy filter at a fair distance or a bare microphone fairly close. Aim a reflector alternately at the bird and also at some reflecting surface such as a building or large tree trunks without altering the recording gain control. This will give an interesting effect of close up and distance on playback. Recording level: one-third to one-half of normal on loudest passages.

Mistle (Missel Thrush). Habitat: as for song thrush. This bird is coming into towns more than it used to. It is also becoming more common and is now (in my locality at any rate) as common as the Song Thrush. Song commences in January and ceases during May.

Best song period is February. The voice is similar to the Song Thrush but less varied. It does not repeat short phrases exactly as does the latter. Sometimes there are beautiful low notes. The bird is easily alarmed or annoyed about the nest, when it may become aggressive, emitting a harsh rattling sound punctuated by "gar, gar." Recording technique: as for song thrush.

Skylark. Habitat: open country, wide open spaces, fields, downs and mountain sides. Quite common. Song periods: March to July and October. Best song period: April, May and June. Best recording

time: When the sun comes out after rain. The best song occurs before daylight in May but it is then difficult to track the bird in the parabola sights, and scanning with the aid of headphones produces an unnatural effect. The song is a continuous 'torrent' of notes given out on the wing and giving an impression of great happiness. Star singers are occasionally found. These have fascinating rhythms in their song which they change as they elevate higher in the sky. These star singers are rather rare but the common type is well worth recording. Recording technique: use a moderate microphone level. If the bird rises close at hand, quickly set the recording level to about half and follow the bird with the parabola keeping it in the sights. Do not raise the modulation level as the bird rises, but let the level fade naturally with height.

Willow Warbler. This delightful songster is a summer visitor arriving in April when it commences to sing. Habitat: woods and copses. Quite common, long periods from April to July and sometimes part of August. The call of the bird is a plaintive "tooeet". The song is a delightful cadence of beautiful timbre starting with faint high notes and running down the scale getting louder as it goes. The song is never really loud but it carries well. Best months to record are April to July. Best time—any time during the day after the dawn chorus. Microphone technique: reflector and heavy filter. Take care not to get too much top response or the beauty of the song will be spoilt. Modulation: about one-third of maximum.

Black Cap. Habitat: as for the Willow Warbler. Not as common as the latter but by no means rare. Can be found between April and first week of July. Best months to record—April and May. The song starts as a weak stuttering warble, sometimes with two or three false starts, and breaks out into loud clear silvery notes ending in a minor key with a plaintive air. The final plaintive air suggests to the writer: "fee, fee, feeta, peet". Try to capture some reflected sound with this powerful singer, and to avoid over-emphasising the stuttering beginning a parabolic microphone should have a heavy filter. Modulation level: up to half of maximum.

Jenny Wren. Habitat: hedges, woods, copses and overgrown streams. This bird suffered badly in the big freeze but is rapidly recovering in numbers. Song period: between March and August and sporadically in other months. Song is remarkably loud for so small a bird. It is full of jubilant trills and will raise the echoes within a small area. Best time to record: Any of the singing months. Recording technique: this poses problems as the song should sound loud yet it is distortion prone. A parabola should have a heavy filter to avoid over-recording the top notes. A bare microphone with a preamplifier gives better results but requires more luck. Recording level: one-third of maximum.

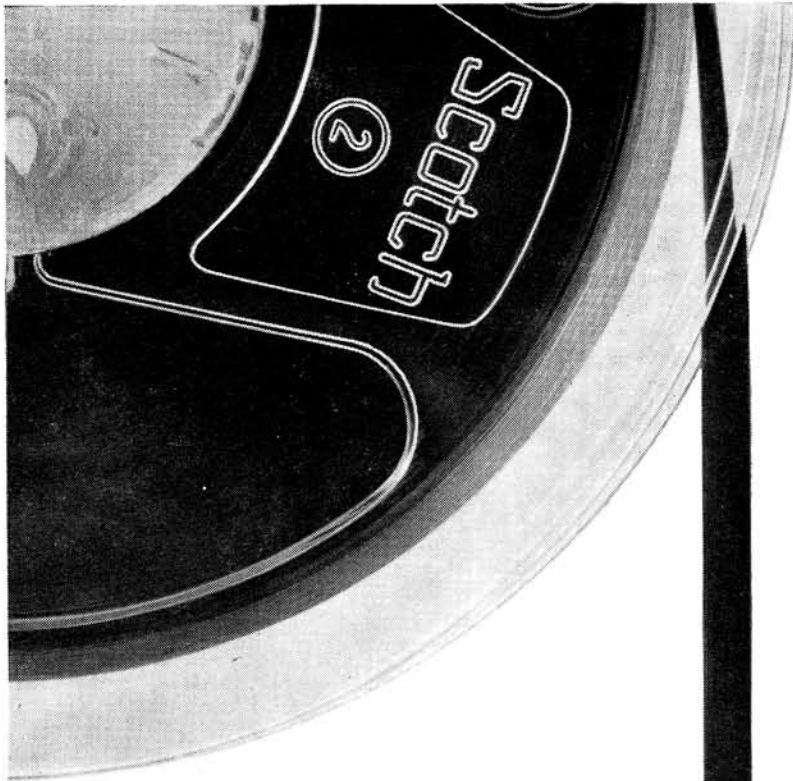
Cuckoo. Habitat: generally a woodland bird. Fairly common. Song period: April, May and June. The song of the male is too well-known to need description, but have you heard the high-pitched liquid bubbling call of the female? It is well worth taping. Best time for recording is May, at the crack of dawn. Recording technique for female: parabola with filter over microphone. Recording level: not more than half normal. Recording technique for male bird: parabola with heavy filter or bare microphone. The male Cuckoo song is not distortion prone and may be recorded at full level, background noise permitting.

Great Spotted Woodpecker. Habitat: woodland, none too common. Drumming period: March, April, May, and June. The drumming 'song' is quite extraordinary. The bird rains blows on a chosen dead branch at a rate calculated to promote resonance. This is usually around fifteen blows per second. The resultant sound carries quite a distance. The call note of the bird is a very sharp "quick, quick . . ." April and May are the best months for recording. Recording technique: for the drumming, a parabola with only a thin filter adds 'bite'. The call note should have a medium filter. Both sounds should be recorded at one-third of full modulation level for clean results.

Green Woodpecker. Habitat: woodland and tree clad country, especially where ant-hills abound. The song is a loud echoing laugh in a clear voice. Song Period: March to June and occasionally in other months. Recording technique: the bird is difficult to record due to its shyness and the sporadic nature of its song. A parabolic microphone must have a heavy filter or the timbre of the sound will be spoilt. It is difficult to get sufficient echo this way, however, and best recordings are obtained with a bare microphone usually when trying to record something else. Recording level—up to half of maximum.

Tawny Owl. Habitat: woodland and country. Also city suburbs. Nocturnal, the call note is a sharp "keewick". The song is a low hoot

(continued on page 184)



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HAVING glanced at some basic aspects of tape recording and introduced some of the terms used when describing equipment, we turn our attention this month to the tape mechanism and the principles of magnetic recording.

A complete recorder comprises *tape deck, recording amplifier, oscillator, playback amplifier and loudspeaker*. Reference to **fig. 1** shows the layout of a typical deck, this version incorporating separate record and replay heads—to be dealt with later.

Essential function of the tape deck is to pull tape past the erase, record and playback heads (in that order) at a constant speed. International standards have defined tape speeds, spool diameters, hub sizes, and many other characteristics, enabling a recording made on one machine to be played on another. The standard deck has a 'feed spool' on which the tape is wound; tape is 'fed' from this spool past at least one guide and then past the magnetic heads, between *capstan* and *pinch-wheel*, past another guide, and on to the 'take-up' spool.

Although the spool turntables either have motors of their own or are driven by the capstan motor, it is the capstan which drives the actual tape. During the record or playback process, the tape is forced against the capstan by the rubber pinch-wheel and pulled on to the take-up spool which itself is driven in an anti-clockwise direction. The feed spool, however, is turned by the tape, which pulls the turntable against a tension applied to prevent slack tape tangling when the deck eventually stopped. This back tension is applied either by a simple light brake or by a motor trying to oppose the spool motion.

Another frequently found feature is that of *fast wind*. Unlike a gramophone record, where one can select a particular passage simply by lifting and replacing the pickup, magnetic tape must be wound from spool to spool until the appropriate section appears before the heads. In a properly designed machine the tape will be lifted clear of the heads and capstan during fast wind to prevent excessive friction wearing them prematurely.

During recording and replay, however, the tape is held close to the heads by pressure pads or, less commonly, pressure pins. Pressure pads take the form of small felt-lined arms held against the heads by light springs. Pins are narrow guides which slide into position at either side of the head, which is consequently hugged by the tape. The two systems are shown in **fig. 1**. A few decks, incidentally, use both pads and pins, taking advantage of the former's low cost for the erase head (which does not generally need such precise tape contact) and the latter's greater efficiency for the record and replay heads.

Before leaving the tape deck, it is worth remembering that a few machines do not conform to this outline. Many cheap battery recorders and dictaphones, for example, do not incorporate a capstan. Instead, the tape is driven direct from the take-up spool. The great disadvantage of this transport system is that tapes recorded on one machine cannot be replayed with any fidelity on another. It is not difficult to visualise the increase in linear tape speed which occurs as the diameter of the reel on the take-up spool increases. This is known as a *non-linear* drive, a capstan system being *linear*. The other main departure from **fig. 1**, use of a combined record playback head, will be dealt with later.

At this point, a little basic electron and magnetic theory should assist the understanding of these devices and of the recording principle.

To begin with, what is electricity? Normal theory defines it as the flow of electrons in a conductor. All materials, from the gases in the atmosphere to the wiring of a tape recorder, are composed of atoms,

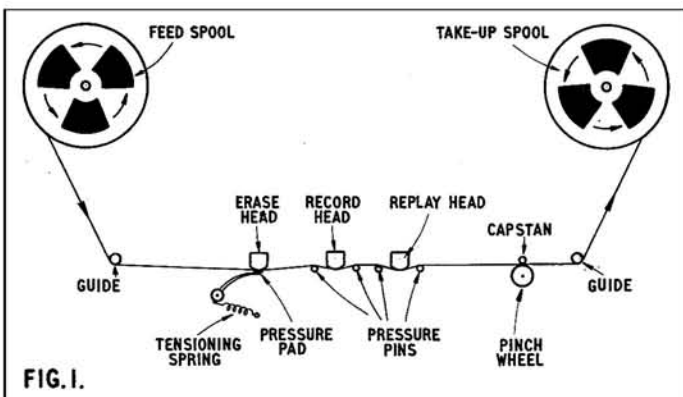




FIG. 1.

THE ABC OF TAPE RECORDING





absolute
beginners'
corner

PART TWO · BASIC PRINCIPLES

BY DAVID KIRK

rather in the manner that cube sugar is composed of tiny sugar grains. A single atom is essentially a number of tiny electric charges or particles arranged around a nucleus. Different substances have atoms of differing formation, the number and arrangement of electrons or negative particles—varying considerably (in addition to positive and neutral particles which need not concern us). The ease with which the 'outer' electrons may be dislodged from atoms determines the *conductivity* of a material, copper being a better conductor than plastic because it has more of these 'free electrons'.

When a current of electricity flows through a wire, many of the electrons which go to make up the wire are snatched from their atoms and carried along with the flow, to be replaced by others in a continuous process of give and take. When the current is stopped by disconnection of the power supply, free electrons quickly attach themselves to those atoms with vacant electron positions.

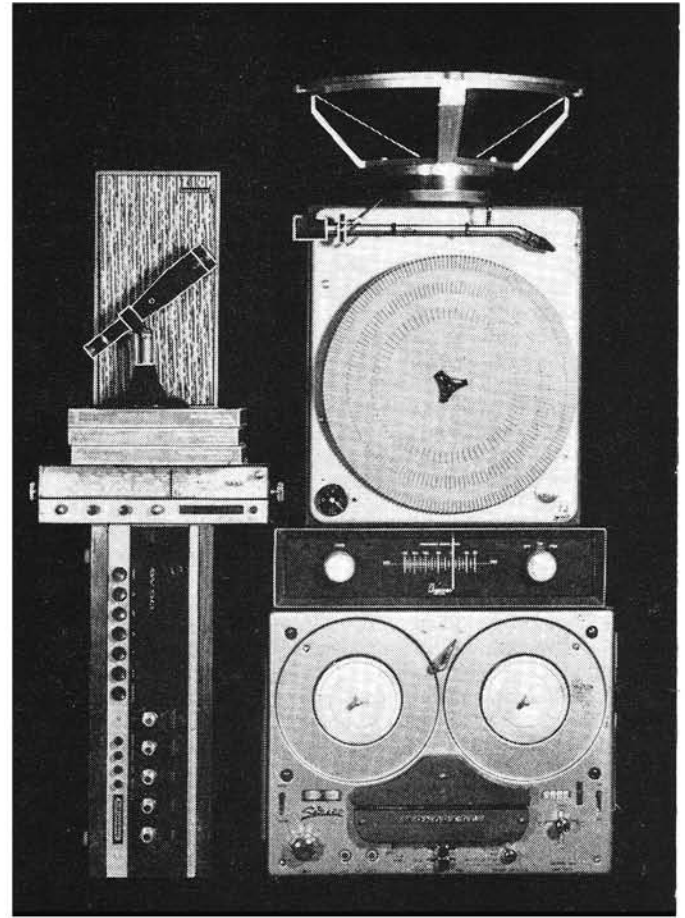
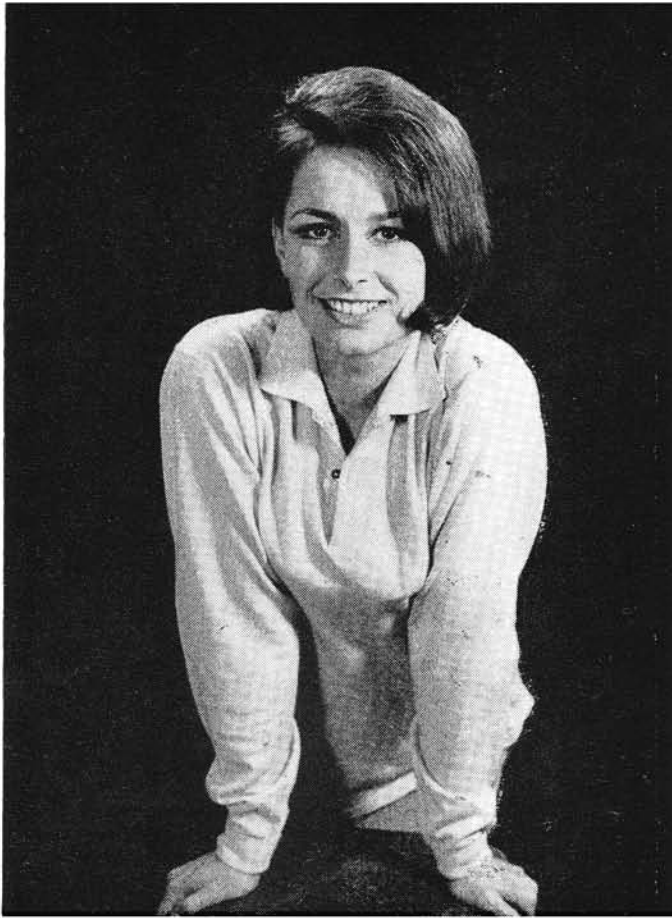
The circuit shown in **fig. 2** illustrates a length of wire in which electrons are flowing. They flow because a power supply, in the form of a battery, is pumping them, sucking electrons in at the 'positive' terminal and pushing them out at the 'negative'. A battery is not an electron supply, it is nothing more than a pump.

Whenever electrons flow through a conductor (which may take the form of a wire, the human body if one is unfortunate enough to receive a 'shock' from the mains electricity supply, or the air itself in the case of a lightning flash) a magnetic field is generated round that conductor. By coiling the conductor in the form shown in **fig. 2**, this magnetic field can be strengthened by adding the separate smaller fields together.

A suitable *core* material inserted in the coil will increase the efficiency and hence the field strength. Iron and steel make excellent cores along which the magnetic flux can be channelled. The two metals have much in common, for, when the battery is connected and electrons flow, both take on the characteristics of a bar magnet, with two opposing magnetic poles termed North and South (i.e., north and south-seeking). In the case of a steel core, however, these poles tend to remain magnetised when the electron flow is halted or the core has been withdrawn from the coil. The bar has become a permanent magnet. An iron core does not hold magnetism in this way and returns to its normal non-magnetised state when no electrons flow within the coil.

The strength of the magnetic field depends, as we have seen, on the core material within the coil. An even more important factor is the

(continued on page 167)



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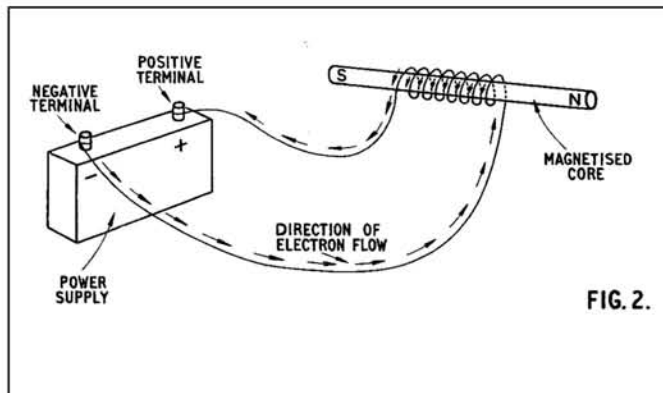
magnitude of the electric current being supplied to the coil. In order to make serious use of the properties of electricity, we must have some means of measuring the amount present in any given conductor. Just as we think of liquids in terms of gallons, length in terms of feet, and weight in terms of pounds, so electrical quantities are measured in Volts and Amps. These terms are often confused, but they apply to two different aspects of electrical flow.

Electrical flow in a wire is readily analogous to water flowing in a pipe. It is possible to force water at high pressure through a narrow pipe or at low pressure through a large-diameter pipe and obtain the same amount of water from each. The terms voltage and current can be loosely applied to the hose with which one sprays the garden. Feeding water through a normal hose-pipe and out through the open end, the pressure of the water might be such that, although plenty of water leaves the hose, it falls lifelessly to the ground, forming a large puddle. In this case we have a good current of water but insufficient force (i.e., 'voltage') to provide a jet suitable for spraying. We must therefore increase the 'voltage'. Blocking part of the hose end with a finger increases the water pressure just before the outlet to such a degree that the heavy lifeless flow becomes a fast and powerful jet. The quantity of water being forced through the hose may fall in these circumstances, but the force at the outlet has been greatly increased. Where, then, does the extra force come from? Examination of the spurting water jet shows that what was gained in pressure was lost in the diameter of the jet, compared with that of the unimpeded flow. An increase in 'voltage' has taken place, accompanied by a decrease in 'current', although in this case the pressure at the outlet could never be higher than that in the water main; restricting the flow by means of a high 'resistance' has simply made a higher proportion of the mains pressure available near the hose end.

Replacing the tap, hose and open nozzle with a battery, some long connecting wires and a low-resistance car headlamp bulb, the similarity between water and electron flow becomes clear. The low resistance bulb allows so little force (voltage) to build up across itself, that the electrons gush uselessly back to the positive terminal, most of the battery voltage being 'used up' along the wires. Inserting a high resistance torch bulb, however, restricts the current flow and enables sufficient voltage to build up to provide a usable illumination, almost the full battery voltage now appearing across the bulb.

What, then, is the purpose of the low-resistance bulb? Such a bulb is useless for comparatively low-power circuits, but will work efficiently when the full current for which it is designed is able to flow, a condition obtained when using a high capacity car battery and short, low resistance connecting wires.

Up to this point the electron flow we have been dealing with has been in one direction only (DC or direct current). Suppose, now, that the two wires connected to the battery terminals are reversed—electron flow will be in the opposite direction. This automatically

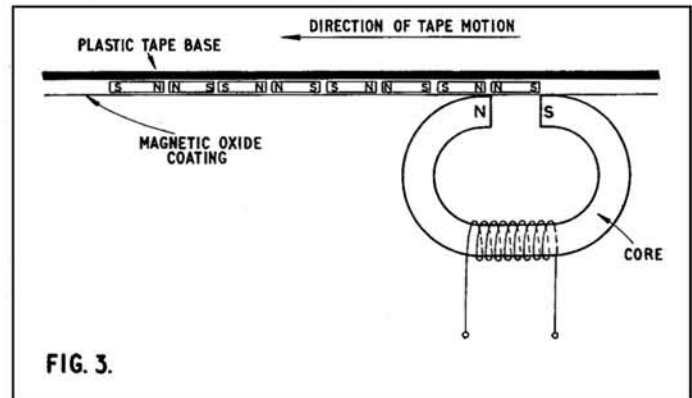


reverses the polarity of the magnetic field, an iron core now having a North pole where the South pole was situated, and vice versa. Were the battery in fig. 2 to be replaced with a power supply continuously alternating from positive to negative and back to positive (AC), the polarity at each end of the core would change in sympathy.

It is, of course, possible to magnetise more than one metal shape. The bar used as a core in fig. 2 might easily be replaced with the 'horseshoe' core in fig. 3. This figure, in fact, shows the basic magnetic tape head. Instead of feeding the coil with DC, let us insert an alternating signal of 100 c/s (cycles per second). Each 'cycle' comprises a complete rotation of flow, negative to positive and back again. The magnetic field in the coil will therefore change twice per cycle. Correspondingly, the magnetic field at the tips of the horseshoe core changes direction 200 times per second.

Unlike the iron core, however, the tiny oxide particles coated on the recording tape will retain a magnetic charge indefinitely. Supposing, therefore, the tape were to be pulled past the 'recording head' at 100 i/s (inches per second), while a 100 c/s signal was passing through the head coil. The alternating polarity at the core tips would record tiny 'bar magnets' on the tape. The length of each magnet pair, corresponding to one 'wavelength' or complete cycle of change, would, therefore, be one inch.

In this way, then, a 100 c/s tone has been recorded on tape. If, in fig. 3, the gap between the pole-pieces is about $\frac{1}{2}$ in. (i.e., half a wavelength) and we wish to record higher frequencies, say 200 c/s, either the tape speed must be doubled or the gap between the horseshoe core poles halved. In practice, the head gap is in the order of one thousandth of an inch and is limited only by the sensitivity of the tape and the difficulty of manufacturing horseshoe magnets of this size, while tape speed is correspondingly reduced.



Just as straightforward is the playback process. Whereas the head would have been connected to the output of a recording amplifier during RECORD, this same head can be used to replay the signals placed on a tape. It is part of electrical phenomena that a magnet moving in the region of a wire will generate a voltage within the wire. In fact, just as electron flow can be converted to magnetic energy, so magnetic force can be used to produce electricity, as in the case of a dynamo. The moving magnetic field which generates a voltage across the coil of a tape head comes from the many tiny bar magnets embedded in the tape during the recording process. Provided tape speed remains the same, the signal induced within the head is basically identical to that which generated the original recorded pattern. For financial reasons, many manufacturers of domestic equipment employ a single head for both recording and playback.

The one head we have yet to deal with is that used to erase the magnetic pattern on a used tape, to render it suitable for recording new material. Early domestic recorders, and a few cheap modern ones, used a simple permanent magnet to erase a pre-recorded tape, though these suffered from the consequent disadvantage of 'recording' their own rather noisy background hiss. The most effective erase head, however, is similar to a normal record/playback head.

When required to operate during recording, the erase head is connected to an oscillator which supplies a current of about 50 Kc/s (50,000 cycles per second) to the erase head. The head gap is much too large to accommodate this frequency and is able to do no more in the way of recording than to destroy whatever signal happens to be present on the tape. This oscillator is also employed to supply the recording head with bias, and will be dealt with in more detail next month.

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DOMESTIC



RECORDERS IN THE USSR



a factual survey of Russian design

BY LEONID SAMBEK

Above:
Kometa.
Right:
Vostok.
Far Right:
Yauza 10.



THE first Soviet magnetic tape recorders for use in the home were made available about fifteen years ago. These were the *Dnieper-1* and *Dnieper-3* recorders and the *MP-1* and *Volna* radiogram attachments. The *Dnieper-3* was a single-motor single-track desk-type recorder housed in a case similar to that of a radio set. Each reel was good for forty-three minutes of continuous operation and the output power was 3W. The first recording attachments were merely tape transports with spools holding 150ft. of standard tape and relying on a radiogram for motor drive and amplification. Such a tape transport had to be placed above a gramophone turntable so that the latter could drive the tape. The first recorders could record and play at $7\frac{1}{2}$ i/s, thus giving a recording bandwidth from 100 c/s to 5 Kc/s. The track arrangement was not standard. Owing to inconvenience of use and a relatively low fidelity, these recorders are out of production now.

New, more advanced tape recorders soon completely ousted the first recording machines. The range (see Table) included the *Dnieper-5*, *Dnieper-9* and *Dnieper-10*, improved varieties of the *Dnieper-3*. The *Dnieper-8*, *Yauza*, *Elfa-6*, *Elfa-10*, *Astra* and *Melodia* were made portable. *Dnieper-8* used a spring-driven tape transport, and the variable-speed *Elfa-6* incorporated a radiogram in the same cabinet. There were also semi-professional desk-type recorders (*MAG-5*, *MAG-8* and *MAG-8m*) with a three-motor tape transport, tape on bobbins and separate record and playback amplifiers.

All the above recorders were intended for monophonic recording, and usually had one tape speed and one or two loud-speakers. The exceptions were the *Astra* and *Melodia* in which the tape speed was switchable from $3\frac{3}{4}$ to $1\frac{7}{8}$ i/s and from $7\frac{1}{2}$ to $3\frac{3}{4}$ i/s respectively. Also, the *Melodia* recorder incorporated a reversible motor and two sets of

heads to drive the tape in both directions and thus switch from track to track without removing the tape spools. Unlike other recorders, the *Melodia* had three loudspeakers fitted to the front and sides to simulate stereophonic effect.

Most of these recorders are now obsolete and have been replaced by more advanced types which will be dealt with later, but they have extended the numbers of tape recording enthusiasts.

The latest types of Soviet-built tape recorders are the *MAG-8MP*, *Dnieper-11*, *Yauza-5*, *Astra-2*, *Kometa* and *Yauza-10*. All these types are housed in portable wooden cases, except the *MAG-8MP* and *Dnieper-11* which are desk-type units.

The *MAG-8MP* is a semi-professional recorder fitted with a three-motor tape transport and independent record and playback amplifiers. It has much in common with its predecessor *MAG-8M* and is suitable for single-track recording at a tape speed of $7\frac{1}{2}$ i/s. The 7in. tape spools can hold about 1,500ft. of standard tape.

The *Dnieper-11* recorder is suitable for $\frac{1}{2}$ -track operation and has two tape speeds of $7\frac{1}{2}$ and $3\frac{3}{4}$ i/s. It can use standard 7in. tape spools. The motor-driven tape transport is controlled by piano-type keys. The recorder is housed in a polished wooden case with a hinged top cover, and fitted with individual tone controls, tape speed switch, and the erase head switch which may be used for preconditioning the tape for recording purposes. Four loudspeakers are incorporated, the main two being mounted on the front panel and the other two high-tone speakers on the sides.

The *Yauza-5* and *Astra-2* recorders are enclosed in a portable wooden case with a detachable top cover. Both the recorders have two tape speeds and are suitable for $\frac{1}{2}$ -track recording from a micro-

(continued overleaf)

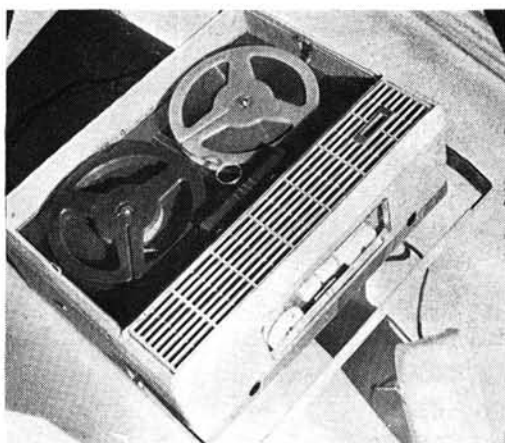
PRINCIPAL SPECIFICATIONS OF SOVIET TAPE RECORDERS

Model	Spool size	Number of tracks	Tape speed (l/s)	Frequency range	Harmonic distortion	Tonal distortion	Relative noise level	Microphone	Number of loudspeakers	Output power	Number of motors	Supply	Power consumption	Design pattern	Weight	Dimensions
MP-1	4in.	1	7½	100 c/s—5 Kc/s	—	—	—	crystal	—	—	—	mains	—	attachment	—	—
MP-2	4in.	1	7½	70 c/s—7 Kc/s	—	—	—	dynamic	—	—	—	mains	—	attachment	—	—
Dnieper-3	9in.	1	7½	100 c/s—5 Kc/s	—	0.6%	—	dynamic	1	3W	1	mains	160W	desk-type	15lb.	—
Dnieper-5	9in.	1	7½	100 c/s—5 Kc/s	5%	0.6%	—	dynamic	1	3W	1	mains	100W	desk-type	14lb.	21 x 12½ x 12in.
Dnieper-3	4in.	1	3½	200 c/s—5 Kc/s	—	0.8%	—	crystal	headphones	1V/6000Ω	spring-driven	battery	—	portable	—	—
Dnieper-10	7in.	2	7½	50 c/s—10 Kc/s	5%	0.6%	—35dB	dynamic	2	2.5W	1	mains	100W	desk-type	14lb.	20 x 14 x 13in.
Dnieper-11	7in.	2	7½ 3½	40 c/s—12 Kc/s 100 c/s—6 Kc/s	5%	0.5% 0.9%	—35dB	dynamic	2	3W	1	mains	160W	desk-type	12lb.	22 x 13 x 13in.
Elfa-6	9in.	2	variable	100 c/s—5 Kc/s	5%	0.9%	—	dynamic	1	1.5W	1	mains	90W	portable	—	—
Elfa-10	7in.	2	7½	50 c/s—10 Kc/s	5%	0.6%	—35dB	dynamic	1	1W	1	mains	75W	portable	7lb.	16 x 14 x 8in.
Elfa-17	7in.	2	7½	60 c/s—10 Kc/s	5%	0.6%	—35dB	dynamic	—	0.3W	1	mains	50W	panel-mounted	—	—
Yauza	5in.	2	7½	70 c/s—7 Kc/s	5%	0.8%	—	dynamic	2	1W	1	mains	75W	portable	7½lb.	19 x 14½ x 9in.
Yauza-5	5in.	2	7½ 3½	50 c/s—12 Kc/s 60 c/s—3 Kc/s	5%	0.5%	—35dB	dynamic	2	1.5W	1	mains	75W	portable	6½lb.	15 x 14½ x 9in.
Yauza-10	6in.	4	7½ 3½	40 c/s—15 Kc/s 60 c/s—10 Kc/s	5%	0.4% 0.6%	—	directional dynamic	4	2 x 2W	1	mains	110W	portable	8lb.	15½ x 14½ x 9in.
MAG-5	—	1	30 15	70 c/s—10 Kc/s	—	0.2%	—	dynamic	1	5W	3	mains	400W	desk-type	—	14 x 8½ x 12in.
MAG-8MP	9in.	1	7½	50 c/s—10 Kc/s	5%	0.6%	—35dB	dynamic	1	2.5W	3	mains	250W	desk-type	26lb.	12 x 21 x 17in.
Astra	5in.	2	3½ 1½	100 c/s—6 Kc/s 100 c/s—4 Kc/s	5%	0.7% 1.5%	—35dB	dynamic	2	2W	1	mains	90W	portable	9lb.	17½ x 13 x 10in.
Astra-2	5in.	2	3½ 1½	50 c/s—10 Kc/s 50 c/s—5 Kc/s	5%	0.7% 1.5%	—35dB	dynamic	2	2W	1	mains	70W	portable	—	—
Melodia	7in.	2	7½ 3½	50 c/s—10 Kc/s 100 c/s—6 Kc/s	5%	0.5% 0.9%	—35dB	dynamic	3	2W	1	mains	100W	portable	12lb.	16½ x 16½ x 9in.
Kometa	6in.	2	7½ 3½ 1½	40 c/s—12 Kc/s 40 c/s—6 Kc/s 100 c/s—4 Kc/s	5%	0.4% 0.6% 1.5%	—35dB	dynamic	3	1.5W	2	mains	90W	portable	7lb.	15½ x 14 x 9in.

Right:
Yauza 20.
Far Right:
Vesna.



Right:
Evrika.
Far Right:
MEZ-60.



phone, radio receiver and gramophone. One motor is used for track switching. Double-purpose amplifiers and dual-purpose heads are used for recording and playback. The recorders can be powered from an AC mains supply and have two loudspeakers.

The *Kometa* recorder has three tape speeds and three loudspeakers mounted on the front and sides of the case. It is fitted with a 'trick' button for superimposing the recording media, a button for stopping the tape for short intervals of time and a device for stopping the tape transport automatically as the tape runs out. A specific feature of the *Kometa* is the use of two motors for driving the tape transport: one motor for driving the tape for recording and playing back and the other for fast winding in both directions. Tape transport is controlled by two knobs and three piano-type keys. The tape is held to the drive capstan by means of a pressure roller which is actuated by a solenoid releasing simultaneously the reel shafts.

The *Yauza-10* is designed for stereophonic and monophonic recording and playing at tape speeds of $7\frac{1}{2}$ and $3\frac{3}{4}$ i/s. It has four tracks and a tape counter for finding a required section more easily. The recorder is normally furnished with directional wide-band dynamic microphones suitable for stereophonic recording.

Extension loudspeakers are employed in the *Yauza* for obtaining stereo playback effect. In addition to these, the recorder is fitted with built-in loudspeakers which are switched off when the extension loudspeakers are brought into play. The recorder is housed in a portable wooden case and the extension loudspeakers are packed in a separate detachable box. Two identical channels for recording and playing back and double-purpose amplifiers are featured. Differential tone controls, a stereophonic balance control and an input gain control are provided. The single-motor tape transport is controlled by a five-position knob which can be interlocked to prevent inadvertent erasing.

The recorder can be powered from a 127 or 220V AC supply. The principal specifications of this model is listed in the table.

A range of new tape recorders based on new materials, transistors, etc., are now manufactured by the Soviet Union's industry. This range includes:

The *Nota* recording attachment which can record on two tracks at a speed of $3\frac{3}{4}$ i/s. In this unit 4in. tape spools are employed. The attachment is designed for use in conjunction with an amplifier, radio or television set.

The *Sibir* recorder-receiver combination set designed for $\frac{1}{2}$ -track recording and playing back at a tape speed of $3\frac{3}{4}$ i/s.

The *Dnieper-12* recorder, designed for $\frac{1}{2}$ -track recording at $3\frac{3}{4}$ and $1\frac{3}{4}$ i/s and fitted with 7in. spools.

The *Tembr* recorder has a three-motor tape transport and individual recording and playback amplifiers, thus allowing the user to monitor the tape during recording.

A new range of miniature transistorized recorders suitable for a battery or mains supply are just becoming available. The range includes the *Yauza-20* (see page 477, January), *Orbita* and pocket-sized *Bloknot* (see page 53, March).

The *Yauza-20* uses sixteen transistors and five semi-conductor diodes and can be powered from ten *Saturn* or *Mars* type cells. One set of battery cells is sufficient to run the recorder for ten hours. The recorder can also be powered from an external 12V DC source or AC mains via a rectifier, which is normally attached to the recorder. The recorder can record two tracks at $3\frac{3}{4}$ and $1\frac{3}{4}$ i/s and has bandwidths of 63 c/s to 10 Kc/s and 80 c/s to 5 Kc/s respectively. A 1W loudspeaker is incorporated. The dimensions: 12 x 9 x 4 $\frac{1}{2}$ in. Weight (including batteries and tape): 2 $\frac{1}{2}$ lb.

The *Orbita* transistorised recorder is similar in design to the *Yauza-20*, but is smaller (9 x 11 x 4in.) and has an output of 0.5W.

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THE RECORDER CO.

EVEN in the best-regulated editorial offices lines of communication occasionally get crossed. Last month we began a 'recap' of some of the earlier articles on *Philips*, *Stella* and *Cossor* tape recorders, picking out some of the points that had either been the subject of manufacturer's rethinking or had led to readers' questions. The sequence of these notes was planned out, and the following article commenced before David Kirk's very forthright Field Trial of the Philips EL 3586 was seen.

First then, while applauding a column that does not fear to offer unstinting praise, I must apologise to readers who may have gained the opinion that we are all in love with the same machine in the same issue. I promise next month to get my teeth into something bigger.

Bigger, but not necessarily better—if by that overworked word we mean suited to its aims. Of the machines that are a little more than handy midgets, and can be adapted to good quality work, the Philips 'upright' models earn themselves high marks. There are one or two small detractions: that case opening fiddle that bothered Mr. Kirk, the care needed in re-assembly to avoid damaging the VU-meter, and the need to get the pressure bracket assembly exactly aligned.

tape recorder service

BY H.W. HELLYER

socket, which enables one to disconnect the batteries and convert to mains without the juggling with cells that inevitably roll off the table and add to the hazards of our hobby!

Less obvious, but welcome, is the use of the new narrow-gap (less than 2 micron) head, which has bettered the efficiency and brought the frequency response figure to 80 c/s—8 Kc/s \pm 3dB. At 1 $\frac{1}{4}$ i/s, this is a very fair result.

Remote control facilities have now been made available—I suspect more because it was convenient to add them when other alterations were made than because there was any great demand. However, it makes a further selling point. The equivalents, again, with styling differences only, are the Stella 471 and Cossor 1621. Except where specifically noted, the following details refer to the 3585 and 3586.

Details of the pressure bracket assembly, the correct azimuth adjustment and the brake adjustment were given in the June 1962 article. Several points have since been queried, particularly the brake operation and the clutch device, and the accompanying illustration, **fig. 1**, gives the principal mechanical layout. This shows the flywheel and the right-hand spool carrier, and the pulleys, drive wheels and levers



NUMBER 41 · PHILIPS EL3585 AND 3586

In the latter half of my article which appeared in June 1962, because of restrictions on space, it was only possible to deal very perfunctorily with the most important servicing aspects of the Philips EL3585. No electrical details were given, and the similarity between models from the same stable, which has confused many readers, was lightly skated over.

Mr. Kirk's article on page 161 takes care of many of the points I would have mentioned, leaving more space for the 'meat' of the matter—the electrical and mechanical make-up of these machines and the principal adjustments and repairs.

But first, let's get it clear what we are discussing. The 3585 is the battery-powered development of the 3514, using six transistors on a printed-circuit panel that has been standardised for other machines, powered by six cells, and having a 4in. loudspeaker instead of the 6 $\frac{1}{2}$ in. type that the mains model employed. It is a $\frac{1}{4}$ -track machine, whereas the mains machine is $\frac{1}{2}$ -track. The equivalents in the companion makes are the Stella 470 and the Cossor 1620. These had different cabinet styling but are fundamentally the same.

The 3586 is the improved version. Smartened up with a charcoal grey loudspeaker grille and a matt aluminium control panel and with the addition of an edge-operated tone control (see **fig. 2, VR2**), it had other features that greatly widened its application. Chief among these is the **STANDBY** button. This enables the operator to preset recording level without starting the tape in motion. Hardly less important is the improvement in socket placing, and the fitting of a mains-unit plug-in

that are relevant to our discussion.

The motor pulley M drives the flywheel, from which all other functions, except rewind, derive. The last is achieved by the inward movement of the pulley FR, and a belt drive to the left-hand turntable. During this action, to prevent spillage, the right-hand spool is gently braked by the pad P against the hub, the screw AS providing correct adjustment for the required 3-4gm. torsional pull. During **PLAY** or **FAST FORWARD**, the angled end of the lever is pushed clear.

This action should be checked if the main brake adjustment has had to be altered. The right-hand brake B is a rubber 'tongue' which presses against the inner underside of the turntable when the press-buttons are neutralised. Its adjustment, as outlined previously, is allowed by first slackening the screw LS then sliding the bracket until there is a 26mm. distance between outer side of turntable spindle and edge of brake block.

After this adjustment has been made, the friction pad adjustment must always be rechecked. There should be a clearance of 0.3mm. between the two brackets, as shown. But if further adjustment is needed, make sure that the pad pressure is adequate on **FAST REWIND**, and within the scope of the adjustment screw AS before bending the lip of the brake bracket. Do not attempt to adjust by bending the pad spring or the whole sequence will go haywire and you will have tape spillage with a vengeance.

The **STANDBY** switch action has made a difference to the bracket and
(continued on page 175)

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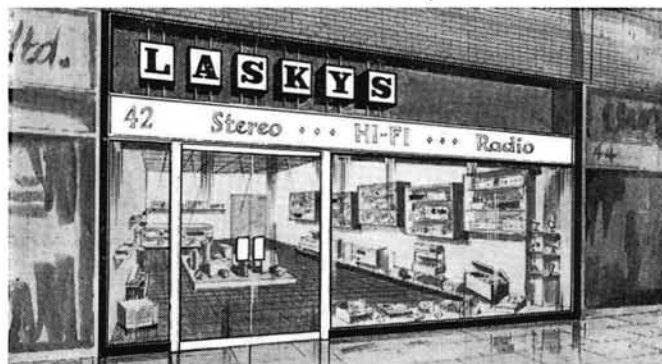
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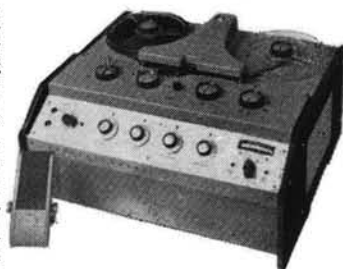
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motor arrangements, where the flywheel is contacted by **M**. In the 3586, a larger, static bracket is fitted, with a sprung idler pulley, held off during **STANDBY**. As a consequence, the motor switching has had to be modified so that the amplifier is powered before the motor, and so that remote control facilities switch out the internal arrangements. These are minor differences, but it now means that the switch actuated by the main slide bar, in turn operated by the buttons, is superseded by the cut-out switch in the remote control socket. This last operates when the plug is inserted. For intermittent switch operation, make sure first that this switch closes properly.

In fig. 1, it will be noted that the idler **I** is drawn as if the bottom portion were hidden or covered. This method of presentation, which may offend a draughtsman, is your scribe's device for indicating that the actual pulley is in two parts. The upper part contacts the turntable **R** and a torsion spring between it and the lower part allows a slipping-clutch action. The lower part is a rubber wheel driven by the flywheel when the bracket on which it is mounted is taken into place by the lever action initiated by the push-buttons. When in this play position, the hub of this assembly, at the bottom, should have a clearance of 0.5mm. from the adjacent stop bracket. This is quite important, and the bracket may have to be bent slightly to ensure adequate clearance if the drive is erratic.

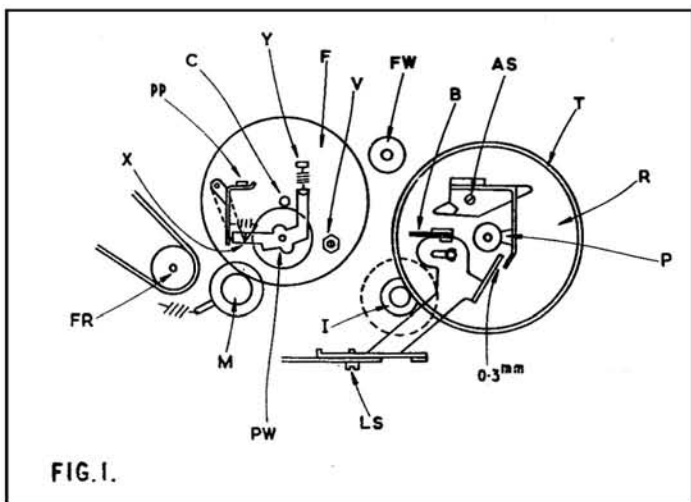


FIG. 1.

The other parts shown in fig. 1 have been included to underline the description of the slide bracket operation in the previous article. **PW** is the pressure roller or pinch wheel, **C** the capstan spindle, and the two springs of the pressure bracket assembly can be seen, with one of the pressure pads **PP**. In the **PLAY** position, there should be from a half to 1½mm clearance between the end of the pressure bracket and the stop lugs on the pressure arm, marked **X** on the diagram. It is this lug that should be bent slightly to achieve correct inward pressure, not the pivoted bracket. Similarly, if the roller **PW** does not engage with correct inward pressure (which should be 275-325gm, measured by pulling the roller off engagement when **PLAY** is selected) bend the lug **Y** and not the upright lug on the roller bracket. This assumes that the slide bracket adjustment has been carried out as previously detailed.

SINGING NOISES

One final point: the locknutted screw **V** is the vertical play adjustment limiter for the flywheel. It should be screwed down until just touching the flywheel and then backed off a turn and locked. An annoying 'singing' noise may indicate that this is too liberally adjusted.

There was no space previously for details of the electrical adjustments, but correspondence has shown that there is a need to mention a few points. First, the output transistor current of the 3585. It is very necessary when this push-pull circuit, using a pair of OC72 transistors, has been altered in any way, or if there is a hint of cross-

over distortion giving roughness to the output, for the collector current of the output pair to be properly adjusted. To do this, first locate the output transformer, then look for a wired link on the printed circuit panel. Disconnect, and insert a milliammeter. This point is the centre-tap negative feed to the primary of the output transformer. Switch to **PLAY**, turn the gain control to minimum, and adjust the slide-type variable resistor just below the driver transformer to get a reading of 3MA, which is the correct collector current.

The 3586 employs a different circuit, using AC128 transistors, and a changed layout, but the slider control is easily identified near the transistors and the procedure is the same.

METER ADJUSTMENT

The meter is used to indicate battery state during all functions except **RECORD**, and to indicate modulation depth when recording. There are two variable resistors for meter adjustment, and it is very necessary that the modulation depth adjustment be made before the battery state adjustment, to prevent misleading indications. The two resistors are easily identified, as the recording adjustment is near the meter connections to the printed panel, whereas the battery indicator resistor is at the bottom corner of the panel, near the output transformer (just below the 1,000µF electrolytic capacitor).

To set these, insert a 10-ohm resistor in the earthy lead of the record/play head, turn gain control to minimum, apply a 1 Kc/s signal via a 470-ohm resistor to pin 1 of the input socket and connect a 1K

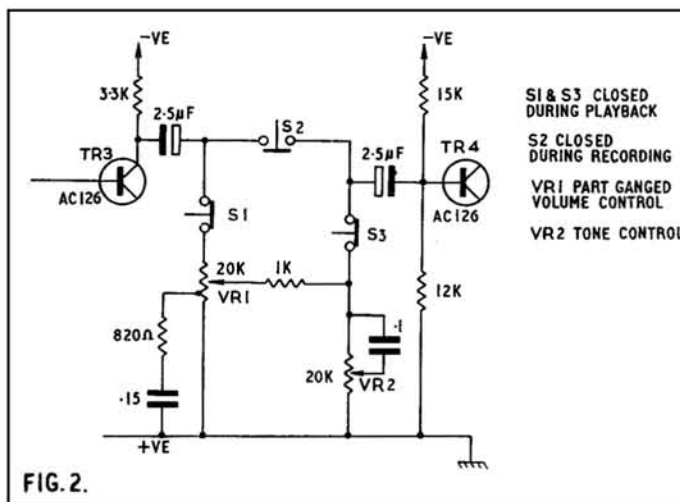


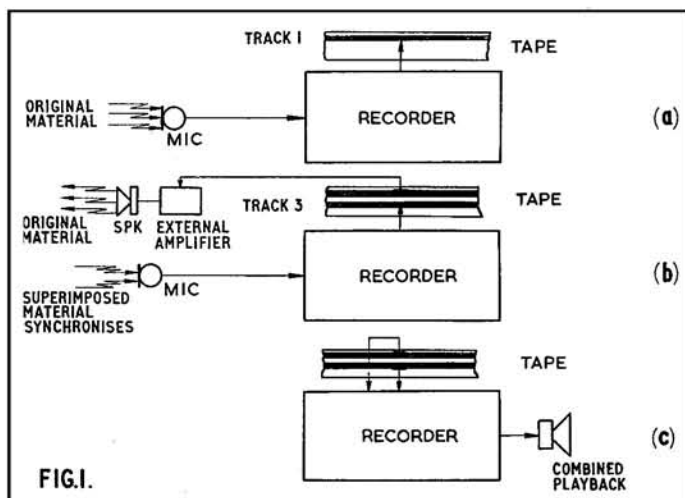
FIG. 2.

resistor from pin 1 to pin 2. Switch to **RECORD**, increase the gain control until a valve-voltmeter across the 10-ohm resistor gives a 1.5mV reading. At this stage, the pointer of the meter should just lie above the line which separates red and black regions. If not, adjust the first resistor mentioned above.

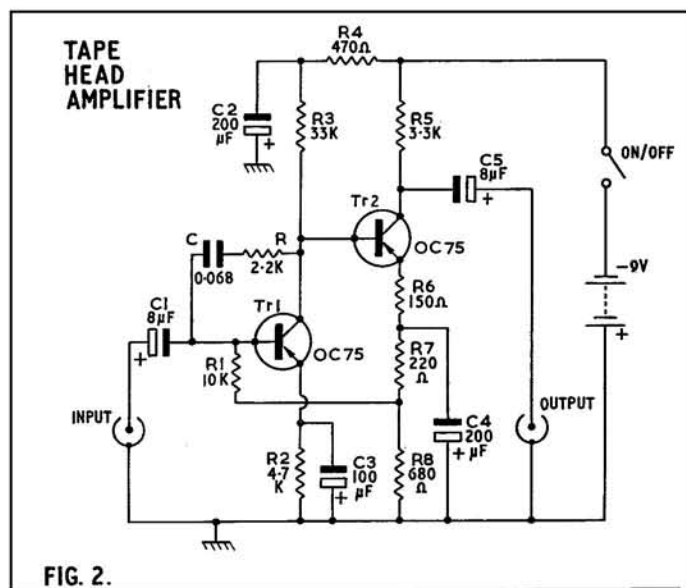
After this you can set the battery state indicator by connecting to a 6.7V source, switching to **PLAY**, and adjusting the second resistor until the pointer lies above the line separating the green and red portions of the meter. In other words, less than 6.7V means the batteries need changing.

The tone control used in the EL3586 is a gain-compensated type between the third stage and the driver transistor as shown in fig. 2. This means that the gain control, which adjusts the signal level to the second stage as on the previous model, has another section ganged to it. Both sections are 20K, but the second section, VR1 in our drawing, taps off a portion of the signal from the AC126 TR3, via the 2.5µF coupling capacitor as before, but with the difference that a network consisting of 820-ohm plus 0.15µF is across the lower portion of the resistor giving frequency compensation as the gain setting is reduced. From the slider, the signal is taken, via a 1K resistor and 2.5µF coupling, to the base of the AC126 driver, and the tone control network consists of another 20K variable resistor partly by-passed with a 0.1µF capacitor, loading this circuit. A by-pass switch connects the two 2.5µF couplers in series during record and open-circuits the tone control network.

towards better taping



BY GORDON J. KING



LAST month's article finished with a discussion on how one section of a $\frac{1}{4}$ -track head can be arranged to monitor a recording previously made on one track while the other section of the head is actually producing a recording on another track. We saw that this technique makes it possible to synchronise the material on two tracks so that on replay the simultaneous outputs from the two head sections can be mixed (i.e., connected in parallel) at the input of the playback amplifier.

Many domestic $\frac{1}{4}$ -track machines feature a head switching arrangement which on playback allows either one or both head sections to be connected to the input of the amplifier. Head switching is, of course, also available on RECORD, but on this channel the head section which is not actually recording at the time has its winding terminated across a socket which can be used for the purpose mentioned above.

Say, for instance, a vocalist wishes to over-record in synchronism with a previous recording of the same material. This, as is well known, is often done to give extra depth to the vocal or to give the impression of more than one singer. The exercise is basic. The singer listens to the original recording made on one track through a pair of headphones or amplifier/speaker system and accompanies this while the machine is set to record on the other track. The composite of the two tracks is then heard on playback, as already described.

This composite recording can then, if required, be dubbed on to a single track, and the process repeated. This is the way that multiple vocal and instrumental recordings are made. A master tape is eventually produced and this is transferred to disc.

Fig. 1 illustrates the synchronised recording procedure as described. In practice, the signal output from one section of the head is insufficiently strong to work a pair of headphones or loudspeaker direct, so some form of external amplification must be adopted here.

Moreover, if it is proposed to feed this signal into a hi-fi system, it should be reasonably well equalised, though this may not matter quite so much if the signal is to be used only for energising a pair of head-

phones or earpiece. In effect, what is wanted is the front end of a transistor tape recorder, the output of which will match the load to which it is applied. Valve preamplification could be used, of course, but this is considerably more difficult to handle so far as the enthusiast is concerned, what with HT and LT power supplies and so on and with keeping the hum down to a low level.

These problems have been solved in essence by the transistor, and in fig. 2 the circuit of a transistorised head amplifier is given which can be built by most enthusiasts without a great deal of difficulty.

EQUALISING FOR ANY SPEED

The amplifier employs two Mullard OC75 transistors in a DC-coupled circuit with frequency-selective feedback between the collector and base of Tr1. The RC time-constant can be arranged to suit the equalisation requirements for any speed. Tr1 is arranged to operate at a very low collector current, thereby improving the signal-to-noise ratio of the amplifier.

The signal developed across the 33K resistor in Tr1 collector is coupled to the base of Tr2. The signal is thus further amplified and appears across the 3.3K resistor in Tr2 collector circuit, from whence it is coupled out via the 8µF electrolytic capacitor.

Decoupling between the two stages is provided by the 470 ohm resistor and the 200µF electrolytic in the supply negative circuit. To ensure that the impedance at the base of Tr2 is high, the 150 ohm unbypassed resistor is included in the emitter circuit of this transistor. This gives local feedback which causes an increase in Tr2 input impedance and thus allows the use of the high impedance type of frequency-selective network. The effect is that the feedback increases with rising frequency owing to the corresponding decrease in the capacitive reactance of the C element. In this way, then, the gain of Tr1 stage falls as the frequency increases. This gives a tape replay characteristic similar to that shown in fig. 3 (a) to equalise the signa

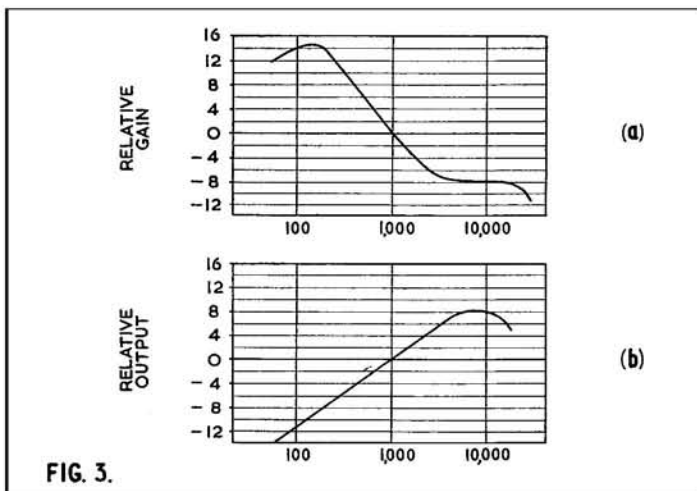


FIG. 3.

PART 14 FUN AND GAMES WITH $\frac{1}{4}$ -TRACK

output direct from the head which approximates the curve shown in fig. 3 (b). It will be recalled from basic tape recording theory that the output from the head rises at the rate of 6dB per octave up to a point where the gap width and losses have their influence by causing the output to fall.

The head amplifier, therefore, must have a gain which falls with increase in frequency and which stabilises at the frequency where the losses and gap width show up. Some replay amplifiers help to counter the treble fall-off by possessing also a top-lift characteristic. Usually, however, the record amplifier has a treble-boost characteristic to make good the treble attenuation on replay.

Now to get back to the circuit in fig. 3. The overall circuit is stabilised for DC by the 10K resistor on the base of Tr1 being returned to the emitter circuit of Tr2. The actual values for C and R in the feedback network should be chosen to give the best results for the application to which the amplifier is put. For instance, if the amplifier is simply to feed a pair of headphones accurate equalisation will not be too important. Indeed, it may be best to keep the relative gain down more than normal at the low-frequency end of the spectrum. This can be achieved simply by reducing the value of C.

If C is omitted (note here that a high value electrolytic capacitor would then need to be used to take the place of C, for without a capacitor in this network there would exist a DC connection between the collector and base of Tr1 which would disturb its working conditions), the amplifier will possess a gain which is substantially flat over the audio spectrum, and the amount of gain will then depend upon the value of R. The smaller the value, the greater the negative feedback and the smaller the gain.

When R is connected in series with C it becomes responsible for the flattening of the response at the treble end of the spectrum. Without R, of course, C would cause the gain to continue to drop even beyond the turnover frequency of the head. This is undesirable as it would result in treble attenuation. The type and impedance of the head

section connected to the amplifier will also to some degree modify the equalising requirements. The values shown for C and R can serve as a starting point for experimentation.

The head amplifier can easily be built upon a small piece of *Veroboard* and then this can be fitted inside a 2oz. tobacco tin. The whole thing is then screened and the Veroboard assembly can be supported in the tin by the input and output sockets. These can be co-axial sockets fixed to either side of the tin. The tin will also accommodate the 9V PP3 (or equivalent) battery and on/off switch.

Owing to the somewhat poorer signal/noise ratio (due in some measure to the smaller head voltage on replay) of quarter-track recording compared with half-track extra special care should be taken over details such as keeping the heads thoroughly clean and free from oxide dust, ensuring that the deck items are thoroughly demagnetised and ensuring that the tape itself is in good order. Tape faults manifest much more readily, of course, when only a quarter of the width is used than when half is used.

Keen $\frac{1}{4}$ -track users may do well to purchase a reliable bulk eraser. This will make certain that the tape, at least, is as noise-free as possible at the commencement of a recording session.

QUESTION OF ECONOMY

Apart from the extra fun and games afforded by a $\frac{1}{4}$ -track machine, the question of tape economy may be considered important. Running at $3\frac{1}{2}$ i/s, up to eight hours mono playing is possible on a 7in. spool (up to four hours in the case of stereo). Heads have undergone incredible development of recent years, so that even at this speed a useful output up to 12 Kc/s or more is possible from machines in the popular price range. The output at the low end may stop at around 60 c/s, but this does not matter if one is interested only in the recorder's own speaker. An earlier article in this series enthused over the far better quality which is possible from even one of the inexpensive specimens by the employment of a hi-fi speaker system; or, at least, something better than the speaker which the basic instrument is able to accommodate.

One problem sometimes revealed in $\frac{1}{4}$ -track exercises is associated with the so-called 'safety lanes' between the four tracks. The tape width is, of course, divided by virtue of the length of the gaps in the head sections into tracks whose width is something less than a quarter of the width of the $\frac{1}{4}$ in. tape. This is necessary to ensure that the tracks do not overlap each other. Should they do this the programme on one track will break into the programme on the adjacent track being replayed. This gives a sort of cross-talk effect which can be most disconcerting, particularly when the replayed programme is of necessity recorded at low level.

The standard now seems to be to make the safety lanes between tracks 2 and 3 approximately the same width as the lanes between the two tracks of a half-track recording. The reason for doing this is to ensure the optimum compatibility so far as playing a half-track recording on a $\frac{1}{4}$ -track machine is concerned. We have already seen how the disposition of the two head sections of a $\frac{1}{4}$ -track machine makes this possible. Each head, it will be remembered, covers only about a half of each track of a $\frac{1}{4}$ -track recording. Clearly, then, if the safety lane between tracks 2 and 3 of a $\frac{1}{4}$ -track recording was much narrower than that between the two tracks of a $\frac{1}{2}$ -track recording, there would be virtually zero tolerance, and extreme trouble would be experienced when endeavouring to play a $\frac{1}{2}$ -track recording on a $\frac{1}{4}$ -track machine, having in mind the need for a greater playback gain under this condition. Thus, even the slightest trace of overlap would almost certainly give a degree of cross-talk trouble.

Incidentally, if cross-talk cannot be removed when a $\frac{1}{2}$ -track recording is played on a $\frac{1}{4}$ -track machine, attention should be directed to the setting of the head, for if the head is set too high the safety lane of the $\frac{1}{2}$ -track recording will be embraced by the bottom gap of the $\frac{1}{4}$ -track head.

Take care, however, to avoid lowering the head too much (assuming that its overall height can be adjusted), for such action would kill the safety lane at the bottom of the tape, and probably make the playing of this unpredictable when a $\frac{1}{4}$ -track tape is again used on the machine—especially if the recording here was made *before* the head readjustment!

Owing to the relatively narrow safety lanes at the top and bottom edges of a $\frac{1}{4}$ -track tape (sometimes the lanes here are deleted), the tape drive mechanics must be carefully adjusted to avoid top and bottom curling or pulling of the tape as it passes the heads.

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equipment reviews

THIS is a self-contained stereo recording and reproducing system with satellite loudspeakers forming the lid of the recorder for transport; their leads are stored with F-87 cardioid microphones, in elegant little zip bags which form part of the speaker enclosures. The weight, at 55lb., is relatively high, but it is well distributed about the carrying handle and can be moved short distances without much difficulty.

The machine can be used either horizontally or vertically, and the controls and switches are well placed for operation in either position. Separate controls are provided for each channel with the microphone and auxiliary controls mounted coaxially. The microphone input jacks are at the front, between the two sets of control knobs, and the auxiliary inputs and line output sockets, together with the mains input and speaker sockets, are placed in a hinged compartment at the rear.

A three digit counter is provided for tape position indication and resetting to zero is by a single press button.

A single heavy duty motor is used for all functions and can be adapted for either 50 or 60 c/s operation by a frequency selector switch which alters the motor phasing capacitor. At the same time the capstan sleeve must be changed to suit the supply frequency.

A capstan sleeve is always a doubtful proposition, as the slightest eccentricity can give rise to wow at capstan rotation frequency, but on this machine no trace of capstan wow could be detected at either speed. The fluttergrams of fig. 1 show very slight traces of 25 c/s flutter at motor rotation frequency (750 rpm) at $7\frac{1}{2}$ c/s, with total RMS combined wow and flutter not exceeding 0.1%, which is well within the specification figure of 0.15%. At the lower speed of $3\frac{3}{4}$ i/s, flywheel smoothing is not quite so efficient, and rather more 25 c/s flutter can be detected. Nevertheless the worst combined reading was just under the specified 0.2%.

Tape speeds were exactly $7\frac{1}{2}$ i/s and $3\frac{3}{4}$ i/s within the limits of my test equipment, and the speeds were maintained over a 10% change of mains voltage in either direction.

The playback equalisation was tested by playing standard test-tapes and measuring the response at the line output socket. Fig. 2 shows a 3dB fall at high frequencies when a 70µs test-tape was played. This

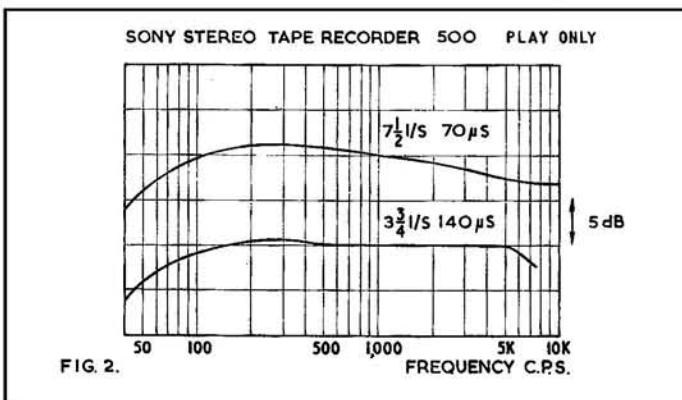


FIG. 2.

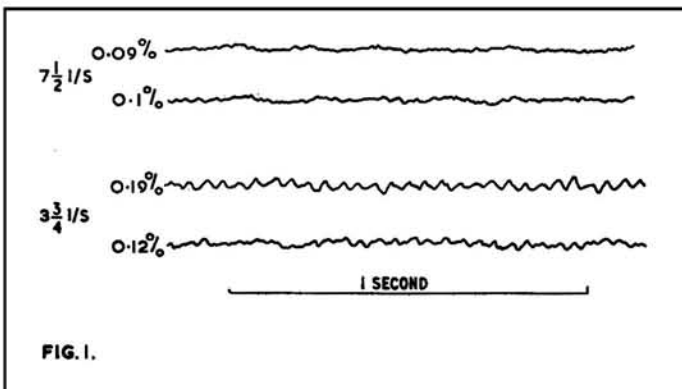
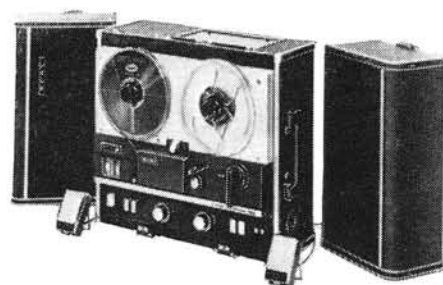


FIG. 1.

SONY
TC500
STEREO



MANUFACTURER'S SPECIFICATION: Quarter track stereo tape recorder. **Speeds:** $7\frac{1}{2}$ and $3\frac{3}{4}$ i/s. **Wow and flutter:** 0.15% at $7\frac{1}{2}$, 0.2% at $3\frac{3}{4}$ i/s. **Frequency response:** 50 c/s to 14 Kc/s ± 2 dB at $7\frac{1}{2}$ i/s, 30 c/s to 13 Kc/s at $3\frac{3}{4}$ i/s. **Harmonic distortion:** 2% at 3dB below rated output. Combined record/playback head. **Bias frequency:** 80 Kc/s. **Level Indicators:** two VU-meters calibrated to 0dB at 12dB below saturation. **Tone control:** two position switch giving flat response or 8dB bass boost. **Input Impedances:** high. **Output:** 3W-per-channel. **Weight:** 55lb. **Dimensions:** $18\frac{1}{2} \times 16\frac{1}{2} \times 12\frac{1}{2}$ in. **Price:** £103 19s. **Distributor:** Debenhams Electrical & Radio Distribution Ltd., Eastbrook Road, Eastern Avenue, Gloucester.

indicates that the equalisation is to the NARTB 50µs characteristic. At $3\frac{3}{4}$ i/s the playback response was level on a 140µs test-tape. Both responses showed a fall in bass response below 100 c/s.

System noise, with no tape passing the heads, was 33dB below test-tape level or 45dB below theoretical peak recording level. Noise and frequency responses were identical on the two tracks.

Record/play responses were measured by injecting constant level test tones into the auxiliary input sockets and measuring the output at the 600-ohm line output sockets. Responses on the two channels were virtually identical and have therefore not been plotted separately. Fig. 3 shows the kind of response we expect from a properly biased semi-professional machine: a level response to 10 Kc/s at $7\frac{1}{2}$ i/s, and to 5 Kc/s at $3\frac{3}{4}$ i/s. The optimistic claims of the specification could easily be met by lowering the bias slightly, but, in my opinion, the extra cleanness and lack of harmonic and intermodulation distortion is much to be preferred to any extension of high frequency response.

During these tests, it was obvious from the VU meter readings that a small amount of bass lift was used on recording. It will be seen from fig. 3 that the resultant response compensates the bass loss found on the play-only tests.

Peak recording level, at 12dB above test-tape level, was obtained with the VU meters reading +3dB in the red sector of the meter scales. Waveform distortion at this level was negligible and, as usual with properly biased tape, it could be increased by a further 2-3dB before waveform distortion became obvious.

A peak level recording was erased on the machine and the signal/noise ratio confirmed at 45dB.

The overall acoustic response was obtained by recording twenty-five
(continued on page 181)

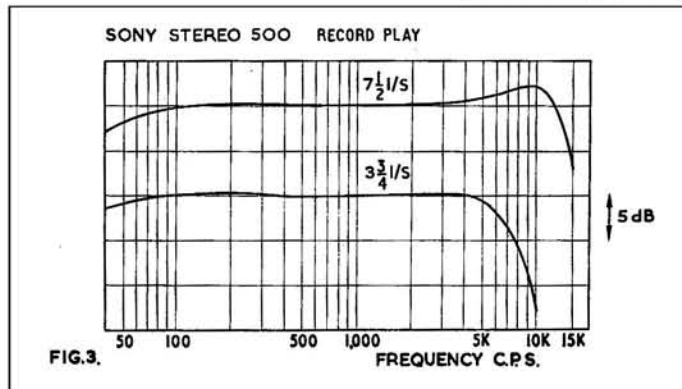
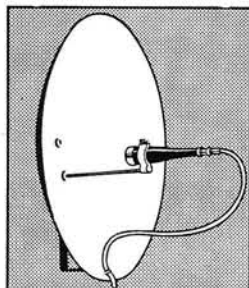
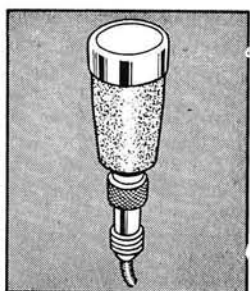
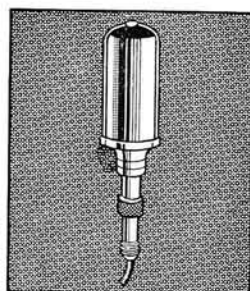
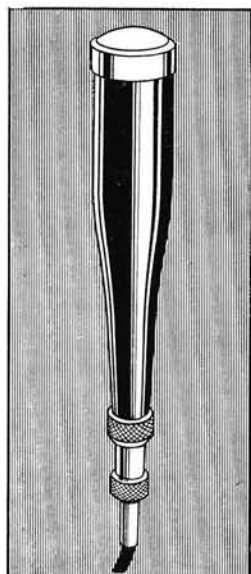


FIG. 3.

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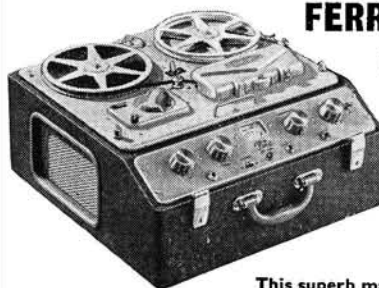
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one-third octave bands of filtered white noise and measuring the sound output on replay at a distance of 1ft. on the speaker axis. The responses were measured with the 'Contour' switch on 'flat' and 'bass'. The flat electrical response to the speaker shows a smooth bass fall off from 800 c/s to -15dB at 100 c/s. The bass compensation provided by the contour switch maintains a level response to 200 c/s and is only 6dB down at 100 c/s (fig. 4).

The high note rise above 4 Kc/s occurs only on the speaker axis. At 45° off axis, the response is level to about 8 Kc/s.

These little satellite loudspeakers are therefore extremely good on their own, but a single low frequency 'woofer' in a large enclosure, placed between the well spaced satellite speakers, could be added for permanent installations to give the 'body' needed for realistic reproduction. In practice it can be fed from either channel, as stereo effect is imperceptible at very low frequencies, but the purist would no doubt feed it from a separate amplifier fed from the combined line outputs of the two channels.

The free air response of one of the microphones supplied with this recorder was measured in a white noise sound field to give the responses shown in fig. 5. The low note response is well maintained, but there is a broad bump at 2 Kc/s followed by a level high note response at a slightly lower level. The front-to-back discrimination is better than 10dB down to 300 c/s, falling to 6dB at 100 c/s and is only 2dB at 40 c/s.

The response and directional characteristics are therefore perfectly satisfactory for normal use with the recorder in the home; better microphones would only be required for full scale musical recordings which are to be played on wide-range stereo speaker installations in a large room.

This is a well designed stereo recorder which can also be used to play either two track or four track pre-recorded stereo tapes. The twin satellite speakers are more than monitors and when used with the contour switch on BASS the acoustic response is as smooth as any equipment I have yet measured. The speakers are heavy for their size, indicating a high-flux magnet and solid cabinet, and distortion at high levels is remarkably low.

A lot of thought has obviously been put into the layout of the controls and the stowage of microphones and speaker cables, etc., and I place it high on my list of self-contained stereo recorders.

—A. Tutchings.

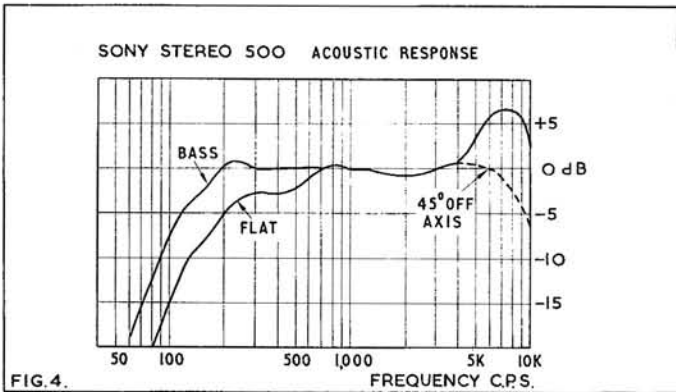


FIG. 4.

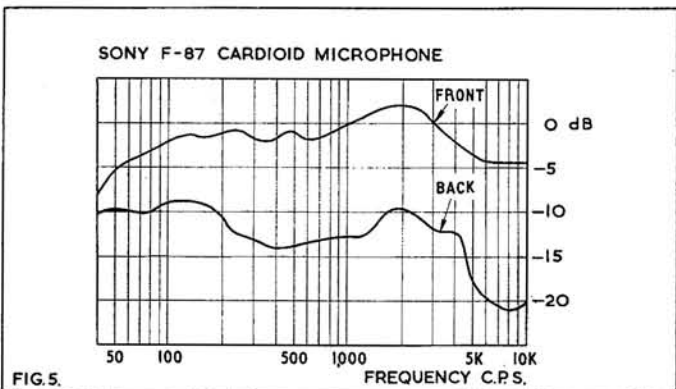


FIG. 5.

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tape reviews

CLASSICS
JAZZ & FOLK
SPOKEN WORD

GEORGE GOODALL
TONY FARSKY
MAURICE POBBREY



LA TRAVIATA (Verdi). Sadler's Wells Opera, Chorus and Orchestra, conducted by John Matheson. Ava June, John Wakefield, Neil Easton, Joan Davies, Shirley Chapman, Tom Swift and Lawrence Folley. **HMV TA-CLP 1778.** 3½ 1/s twin-track mono, 35s.

MANY opera lovers object to Italian opera being translated into English, and on listening to this tape one or two of the reasons become apparent. *La Traviata* is a tender love story based on Alexandre Dumas's story *The lady with the camellias* and is the account of a frustrated love affair between a notable courtesan and a young French nobleman during the reign of Louis XIV. The original libretto was Italian, and reading the anglicised first lines of the selected arias on the back of the box smacks somewhat of melodrama. *Farewell for ever* and *Ah, was it he?* are phrases which seem to lack any Latin lilt, and in the words of the arias themselves such as "cherish" rhyme with "perish", which is enough to make it difficult for some to take the situation seriously. Even the skilled technique of Ava June and John Wakefield cannot avoid a rather ugly sound on long flowing melismas. Under these circumstances words like "dearest" cannot help but become "de-he-hearest", and "for ever" extend to "for e-he-he-ver".

However, there are others who prefer to accept such shortcomings for the sake of being able to follow the action without a text. With this tape there are no problems, for the diction is very clear. Sadler's Wells have a reputation for presenting Italian opera with translated libretto in an artistically satisfying way. What is artistically satisfying is a matter of personal taste, but by any standards they certainly present their productions with a conviction powerful enough to sweep away most prejudices.

In the chorus selections, the voices were rather overpowered by the orchestra on the review copy of this record, but this apart, the recording quality was very good. The recorded balance between soloists and orchestra was splendid. To all but the purists, then, this selection from one of the best known operas should prove popular. G.G.

THE SEEKERS Thirteen folk songs. **World Record Club TT 422** 3½ is twin-track mono. 29s. **HIDE AND SEEKERS** Twelve folk songs by The Seekers with Bobby Richards and his Orchestra. **World Record Club TTP 443.** 3½ 1/s twin-track mono. 29/-.

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Their hit (not included on these tapes) *I'll Never Find Another You*, is pop-folk with a similar sound to one of last year's top groups, but nevertheless the Seeker's success gives grounds for hope that we may
(continued overleaf)

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TAPE REVIEWS CONTINUED

yet see the day when undoctored folk will find its place in the top pops.

The group is made up of Judith Durham, 21 year old blues and gospel singer with a considerable reputation in Australia as a jazz singer, Athol Guy plays bass, and Bruce Woodley and Keith Potger both play banjo and guitar. The style and treatment of some items is a little reminiscent of that great American group, the Weavers. The banjo provides a good deal of extra lift and drive.



TT 422 is the better of the two tapes. In addition to *Waltzing Matilda*, two less well-known Australian songs, *South Australia* and *With My Swag All On My Shoulder* are included in a varied programme. The best among the rest of the twelve songs are the *Wreck of the Old 97*, *Cottonfields* and *Lemon Tree*.

TT 443 suffers from the addition of Bobby Richards' orchestra; fortunately this intrusion only occurs on a few of the items. Most enjoyable of the dozen songs are the spirituals and gospel songs, especially *This Little Light of Mine*, *The Water is Wide*, *Well Well Well*, and *We're Moving On*.—T.F.

RECORDING BIRD SONG CONTINUED

"whooooooo . . . hoo . . . hoo . . . hoo . . . hoo". There is a pause of several seconds between the first low note and the following wavering one. Best song period: February and March. Recording technique: parabola with heavy filter. Use a tripod for the reflector (or a ground spike) and do not forget a torch (preferably with dim battery) to read the VU-meter. Recording level—up to half for the sharp call note. Up to full setting for hoot, other considerations permitting.

Little Owl. Habitat: farmland and tree-clad countryside. Nocturnal but hunts by day. Call notes—various sharp yells. Song: a plaintive and monotonous note repeated every few seconds with variation. This single note is rather higher than that of the tawny owl—around 800 c/s. Recording technique: this is not difficult as the Little Owl is a creature of habit. The area should be prospected on any fine evening in late March or April. As dusk falls it will be noticed that the Owl calls from a certain branch of a certain tree. On the first suitable evening afterwards take your recorder, parabola and tripod to the chosen spot. Aim your microphone at the chosen branch. Run out sufficient cable to get well out of sight. Do all this *before* dusk and wait for your owl.

He will probably start while the Blackbirds are still 'plinking'. Record your owl while you have the chance but wait to see if you can get him by himself.

Recording Mammals. These are usually very timid and would probably be scared off at the sight of a parabola unless concealed by bushes. It is, of course, necessary to keep down-wind of the animal or it may pick up your scent. A bare microphone and preamplifier are probably best.

Some forests contain deer and the 'rutting' of a stag is an impressive sound to record. The scream of a vixen is a spine chilling sound. Badgers grunt and also scream on rare occasions. Squirrels make scolding noises at times. Rabbits thump the ground with their feet to warn others of danger before dashing off. The sniffing of hedgehogs at mating time is a sound that is easily recorded. But wild animals in general are more difficult than birds and should be regarded as 'second year stuff'. Success is most likely to reward those prepared to spend a night out in the wilds, but luck plays a very big part in wild life recording.

It is a good idea to visit the library (in the off season, of course) and read all you can about the animals and birds you wish to record. Many excellent books have been written on this subject.

Gramophone records of bird song are obtainable from: *The Royal Society for the Protection of Birds*, The Lodge, Sandy, Beds.

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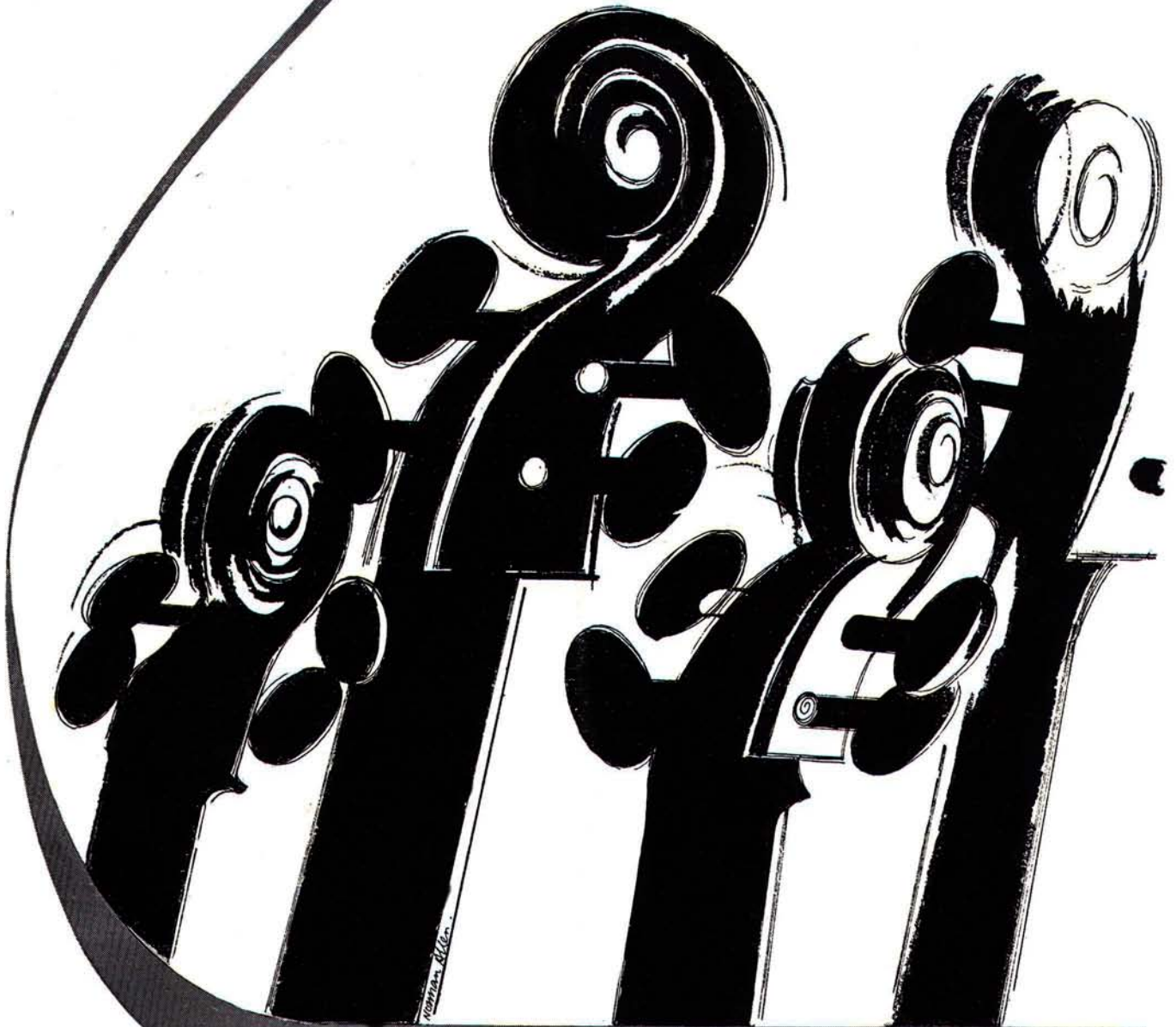
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