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MAGNETIC - TAPE TECHNIQUE
[OF RECORDING ELECTRONIC MUSIC]

BY

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MAGNETIC-TAPE TECHNIQUE

[OF RECORDING ELECTRONIC MUSIC]

Summary

Examples are given of the application of the magnetic-tape recording process and of editing the tape for the requirements of electronic music.

One of the most important characteristic features of electronic music is the method of sound storage on magnetic tape. The modifications applied to this recording process, as well as tape cutting, occupy a special position among the means provided for shaping electronic sounds and noises. We are therefore offering a brief survey of some of the methods which have proved successful in the studio.

A. Sound Recording

In addition to the sound-recording apparatuses described in the previous paper an additional set of machines consisting of two Magnetofons is used for carrying out the work connected with tape cutting and recording (Fig. 1). One of the mechanisms can be switched from 38.1 to 76.2 cm./sec., so that most of the operations on the magnetic tape are carried out here. For pitch constancy, of course, very high demands are made on the uniform speed of these machines. By careful maintenance of the machines frequency modulation and band slippage can be kept below .01%. A current supply at constant frequency is assured by means of a constant-frequency transformer.

The convenient tape loops are an indispensable and very versatile aid. They are used either to operate control processes or for the repetition of excerpts of a composition any desired number of times.

On this apparatus tapes up to length of approximately 10 metres can be played back with the aid of a guide pulley mounted with springs on a stand (Fig. 2). For longer tape loops a magazine is used which can accommodate tapes up to 150 metres long (Fig. 3).

For the production of musical intervals a number of pulleys with suitable staged diameters are provided. With the aid of these a whole gamut of tape speeds can be covered with great accuracy.

A favourite means of electronic composition technique consists of successive recordings. Here electronic sounds are recorded in succession on an endless tape in such a way that a multiple superposition of passages is obtained. These recordings are made with the erasing head ineffective (i.e., the tape raised away from the head). Nevertheless, partial erasing of the recorded modulation takes place at each revolution of the loop owing to the high frequency of the recording head. The dependence of the degree of erasing on the number of revolutions is indicated in Fig. 4. It is seen there that the degree of attenuation depends very largely on the kind of tape and that it tends towards a constant value after 10 to 15 revolutions. It is obvious that for this process only magnetically hard tapes can be used whose erasing properties are accurately known, so that the resulting signal loss can be taken into account.

Frequency band compression and expansion by changing the tape speed has already been discussed elsewhere along with its subjective effects.

Similarly, the application of the feed-back Magneto-fon for obtaining resonance and echo effects need merely be mentioned again for the sake of completeness.

B. Band Cutting

Far reaching changes can be made in the acoustic phenomena present on the magnetic tape with the aid of scissors and adhesive material. Balancing processes and rhythmic and dynamic structures can easily be changed in this manner.

The success of the cutting technique depends greatly on the accuracy of the cutting. This accuracy, in turn, depends very largely on the length of tape taken up by the sound process, a factor which becomes increasingly difficult to determine as the sound phenomena become very short or when slow band speeds are employed. Re-recording at a higher tape speed (greater tape length), to be reduced again to the original value after cutting, is a great help in this situation.

For accurate location of the points on the tape at which cuts are to be made, the following technique has proved successful. The place to be cut is brought close to the play-back head and then an audible play-back voltage is produced by suddenly pulling the tape by hand. After some practice this can be recognized as corresponding to the acoustic picture of the process. The point so located can then be marked with a pencil through the play-back head slot and can easily be cut.

Of course the places at which the tape is pasted together must remain inaudible during play-back. Under exacting conditions this is possible only when two prerequisites are satisfied: in the first place, an adhesive strip must be placed behind the tape, i.e., there must be no pasting of one strip over another; secondly, in order to achieve a magnetically soft transition a long slanting cut must be made. Care

must be taken to ensure that the running surface in contact with the play-back head are in the same plane (Fig. 5a).

It is obvious that scissors, cutting apparatuses and adhesive patterns must not be magnetic. The use of self-adhering Scotch tape in conjunction with a tape dispenser has proved particularly useful. A very practical device for measuring tape lengths is a millimetre scale on the guide pulleys of the winding mechanisms. In view of the required accuracy of tape cutting, the use of a cutting device mounted on the head bracket is only possible if the knife does its cutting at the level of the play-back head slot.

By pasting strips of unrecorded tape between the modulated strips of tape rhythmic figures of an arbitrary kind can be produced. The use of a solvent to remove the magnetite layer from layered tapes at the proper places serves the same purpose. The method employed depends on the kind of tape used and the proportion of modulated to unmodulated tape.

By incision and paring along the edges of the tape the dynamics of the recording can be influenced and altered (Fig. 5b), and a different shape of envelope contour can be attained. For proper mechanical guidance during reproduction, of course, recordings treated in this way have to be backed by white tape.

In the same way, the otherwise so difficultly accessible transient processes can be influenced according to prescribed conditions.



Fig. 1
Magnetic recording apparatus for sound recording
and tape cutting.

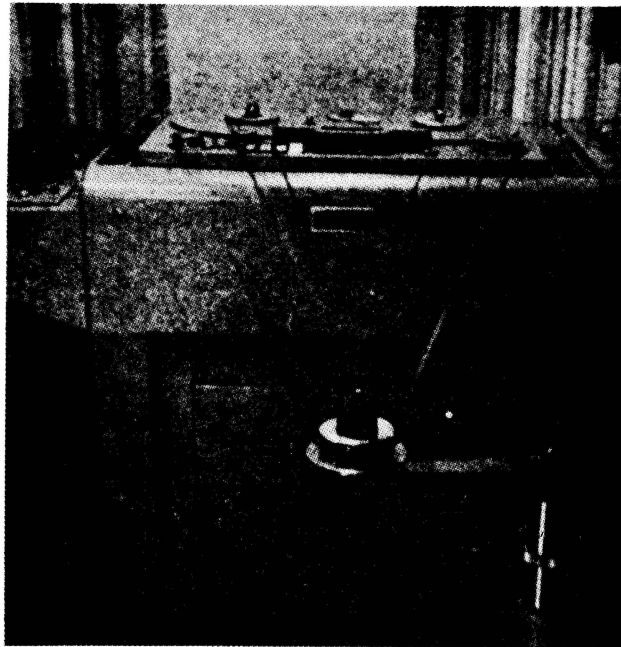


Fig. 2
Guide pulley for playing a 10 metres tape loop.

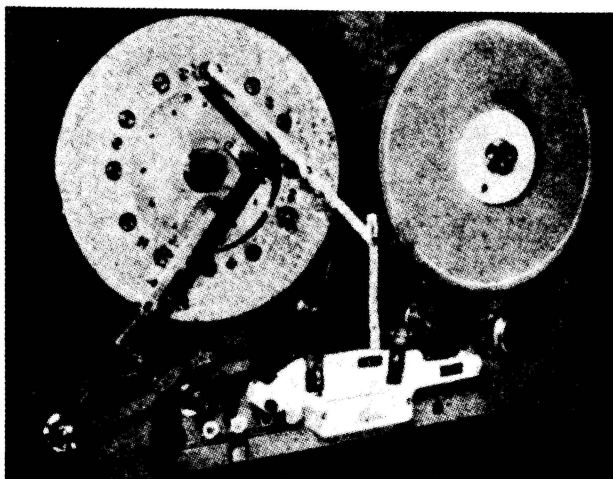


Fig. 3

Magazine capable of accommodating endless tape up to 150 metres long.

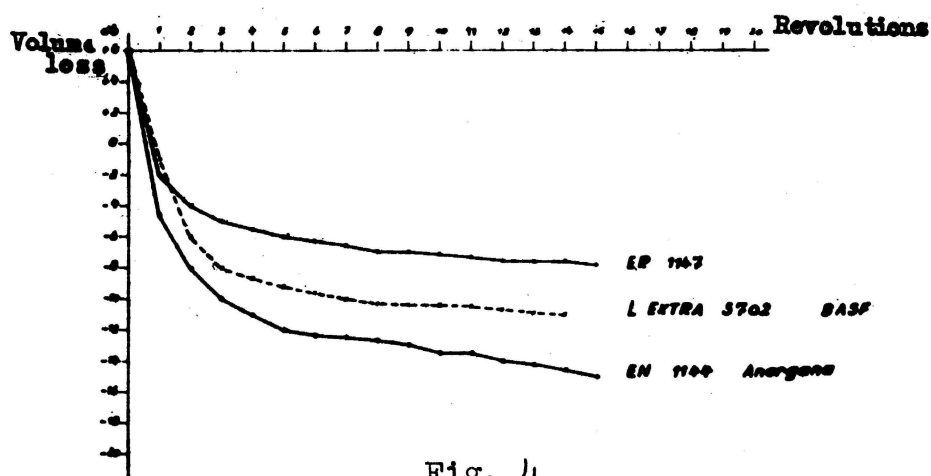


Fig. 4

Volume loss from loops of different kinds of tape depending on the number of revolutions past the recording head.

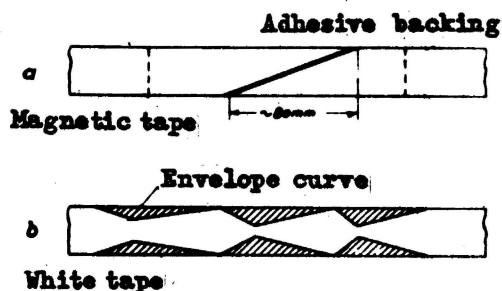


Fig. 5

Tape cuttings.

(a) for magnetically soft transitions.

(b) for the production of prescribed envelope curves.