Tape recorders adapted for use by the blind

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Report (National Research Council of Canada. Radio and Electrical Engineering Division : ERB), 1962-06

ERB-614

UNCLASSIFIED

NATIONAL RESEARCH COUNCIL OF CANADA

RADIO AND ELECTRICAL ENGINEERING DIVISION

TAPE RECORDERS ADAPTED FOR USE BY THE BLIND

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OTTAWA

JUNE 1962

ABSTRACT

A number of modifications to tape recorders are described, including various approaches to tape position indicators and recording-level meters, that should enable the blind operator to make full use of these instruments. This was felt to be desirable because tape recorders play such an important role in the education, vocation, and entertainment of a blind person.

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INTRODUCTION

The tape recorder is one of the most useful tools available to the blind person. Not only can it serve as a medium of entertainment but it is almost invaluable as an educational device. In recent years many volunteer groups have been organized for the purpose of reading textbooks and magazine articles onto tape for use by the blind. The tape recorder and the attendant library of tapes have made it possible for many blind people to take employment which formerly was closed to them. To the blind person the tape recorder may be his personal notebook, the method of copying classroom notes and lectures, his means of dictating letters or of copying broadcast programs and, in many cases, through the exchange of tapes, his actual means of correspondence. In using the tape recorder the blind person has very little difficulty in mastering the controls once he has had a short briefing. However, two quite serious equipment problems remain to be overcome: first, a tape position indicator; second, a recording-level meter.

The author can state from personal experience that few things can be more annoying than looking for a particular piece of information in the middle of a long tape. Without some type of tape position indicator no appropriate form of indexing is possible. Also, it is sometimes important to know when one is approaching the end of a tape. It may be disastrous to run out of tape without warning while making an important recording.

The recording-level meter may also be of great importance in some circumstances. It is true that if the recording to be made is such that a trial run is possible to check levels, the blind operator can do very well without such a device. However, if the material is such that he cannot get a second opportunity of recording it, for example, a classroom lecture or a broadcast program, then a level meter can be of vital importance. Levels may vary so drastically under lecture or classroom conditions that there is no point in simply trying to learn appropriate settings of the gain control, although this technique may be reasonably useful in copying radio programs, as broadcasters hold levels fairly constant.

POSITION INDICATORS

Two approaches to the position indicator have been developed by the author. Unfortunately, most of the commonly used counter or cyclometer-type indicators do not lend themselves to conversion for use by the blind. This is because the drums used on most of these devices are too small to carry the Braille markings and also, as the numbers change quite rapidly, it is very difficult to feel them under fast forward or rewind operation.

However, the clock dial counter manufactured by Wright and Weaire, Ltd. of Great Britain, bearing their catalogue designation "type CTA" and used on the Ferrograph tape recorders, may be readily converted for use by the blind. This counter is about $1\frac{1}{2}$ inches in diameter, about the size of a man's Braille watch, and is fitted with two hands, similar to those of a clock. If the glass is removed and the metal rim (used to hold the glass in place) turned down, then a set of Braille dots may be placed around the face, which can be felt by the operator. A certain amount of care must be exercised by the user in trying to feel the hands while running the machine on fast forward or rewind to avoid damaging the hands. However, with a little practice no difficulty should be experienced. Although normally supplied only on the Ferrograph recorder, this type of counter could be installed on many other makes, either by punching an appropriate hole in the tape deck or through the use of a small bracket mounted on the side of the recorder. In the Ferrograph the device is driven from the take-up spindle by means of a mitre gear and flexible drive. This may not be practical in other makes, in which case a small pulley may be installed on the shaft which protrudes from the side of the counter and may be driven by a belt from the take-up spindle. Accuracy with this device is quite remarkable; the author has been able to go back and find his place within about 20 to 30 seconds near the middle of an 1800-foot tape.

Another approach that has been tried is one in which a light metal arm is held in contact with the tape on one of the reels by spring tension. This arm rotates on a rod mounted to the recorder deck. The end of the arm is cut into the shape of a cam. A second arm is also free to rotate about another rod mounted on the tape deck. One of the ends of this arm rides against the cam, while the other end carries a pointer which moves along a Braille scale. The cam is so shaped that there is a linear relation between the number of feet of tape on the reel and the reading on the Braille scale.

The advantages of this device are that it is much cheaper to manufacture than the first, and is more easily installed on any recorder. However, it is not nearly so accurate as the first device, which may be readily understood, since the total display of the amount of tape on the reel is over a length of approximately four inches on the Braille scale, whereas the first device displays this on a 0 to 1000 revolution counter.

LEVEL METERS

A number of these devices have been described in the Braille Technical Press. Most of them fall into the general category of biassed diodes which permit an impulse of electrical energy to pass into the earphones when the signal voltage exceeds the bias. Four alternative approaches will be described.

1. Use of meter relays

Several companies, including the Assembly Products Company, market a meter which, besides the normal pointer, has a second one which is controlled by a knob on the meter face. This second pointer may be set to any desired scale reading and when the current through the meter causes it to read this value, contact is made between the two pointers, closing a pair of contacts. These may be used to control any desired external circuit. If the recorder to be modified has a meter as its level indicator, one of this type having the required sensitivity may be substituted. Then any convenient auditory or tactile device may be operated from the contacts.

2. Use of the voltage-sensitive oscillator

In this circuit (Fig.1) use is made of a special form of transistorized blocking audio-frequency oscillator which is so arranged that it will not oscillate until the

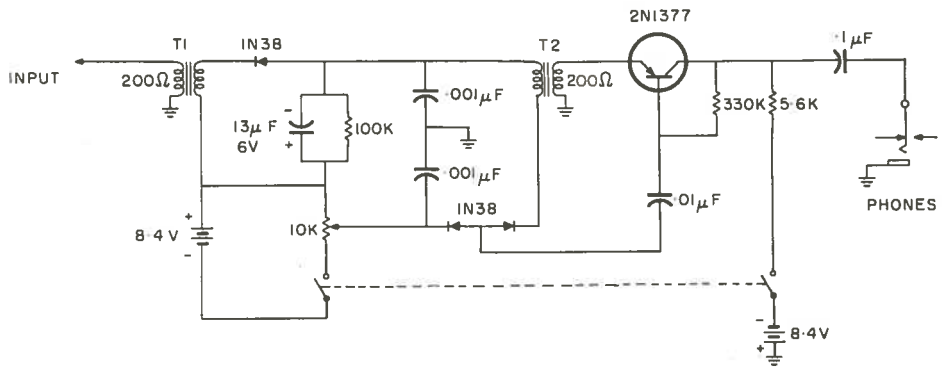

Fig. 1 Circuit diagram of auditory level indicator using voltage-sensitive oscillator

voltage difference between its two input terminals reaches some accurately known value. This circuit is sufficiently sensitive that it will trigger reliably within 20 millivolts of this value. Therefore, if rectified audio-frequency voltage derived from the monitor output of the tape recorder is applied to one of the input terminals, and a calibrated d-c bias voltage applied to the other input terminal, the device may be set to trigger-on, or start oscillating at any pre-determined recording level. The advantages of this device over the previously mentioned biassed diodes are first, that the level of the output signal from the oscillator does not change with the amount of input signal, provided that the signal is above the threshold level, and secondly, because of the time constants involved in the rectifier circuit, it will continue to oscillate for a short time after the peak has been passed. This device gives a very precise indication of the peak recording level, and in

experimental use it has been found that the gain control can be set to within 2 or 3 percent of any pre-determined setting.

3. Tactile level indicator

In many circumstances an audio output is not desirable, as this in itself may interfere with the recording being made, or the wearing of earphones may be impractical. Under these conditions, a device with a tactile output is desirable. The output device chosen is simply a small plunger, driven by a solenoid. The solenoid is connected as the load in a simple transistorized d-c amplifier which is, in turn,

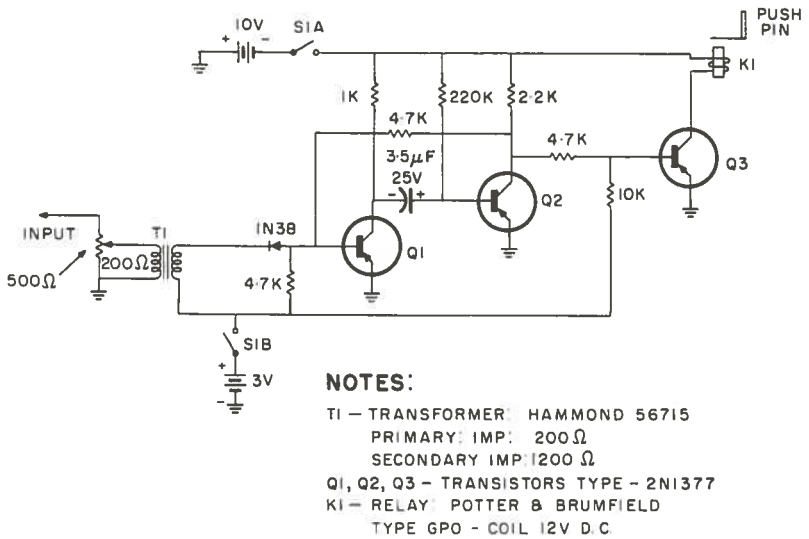

Fig. 2 Circuit diagram of tactile level indicator

controlled by a transistorized univibrator. This circuit (Fig.2) is appropriately biassed so that it will operate only when signals applied to it from the tape recorder monitor jack exceed some pre-determined level. This is probably the most satisfactory of all the devices cited, as it is simple, relatively inexpensive, and leaves the user's hearing completely free. The time constants of the univibrator are chosen so that when a pulse from the recorder has triggered the device on, the plunger will remain up for about 0.5 second.

4. Cadmium selenide photocell

Another possibility not to be overlooked is the use of a simple audio-frequency blocking oscillator whose frequency is controlled by the change in resistance of a cadmium selenide photocell. This simple device is useful with those recorders

having an eye tube as the level indicator. The photocell is simply placed close to the eye and the pitch of the oscillation is heard to change in the earphones as the recording level changes. Although this approach can be quite successful, it is not exact and requires a certain degree of skill in its use.

In conclusion, it may be seen that, with suitable attachments, a blind operator of a tape recorder need be at no disadvantage compared with his sighted counterpart.