

May 13, 1969

M. A. BATTLE

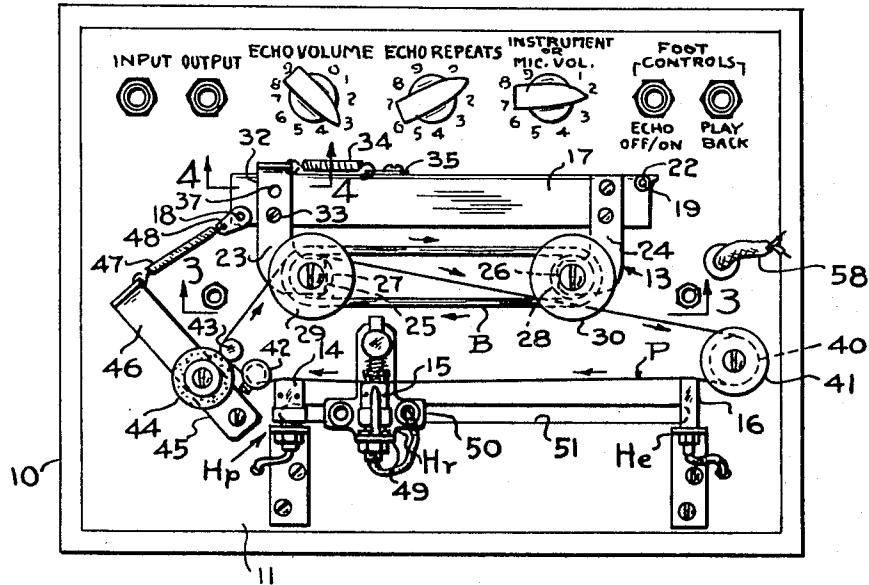
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ECHO PRODUCING ENDLESS LOOP MAGAZINE RECORDER

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FIG.1



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FIG.3

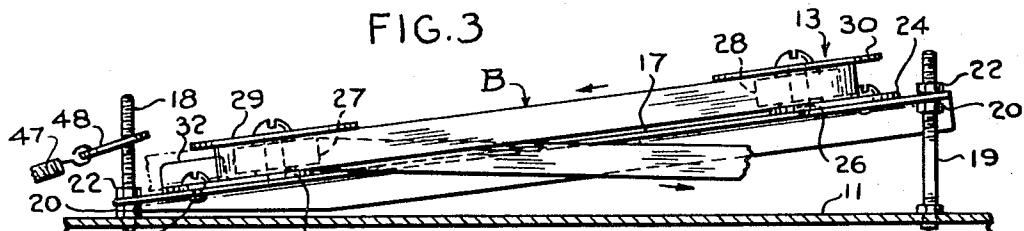


FIG.4

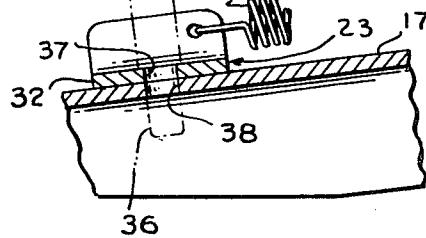
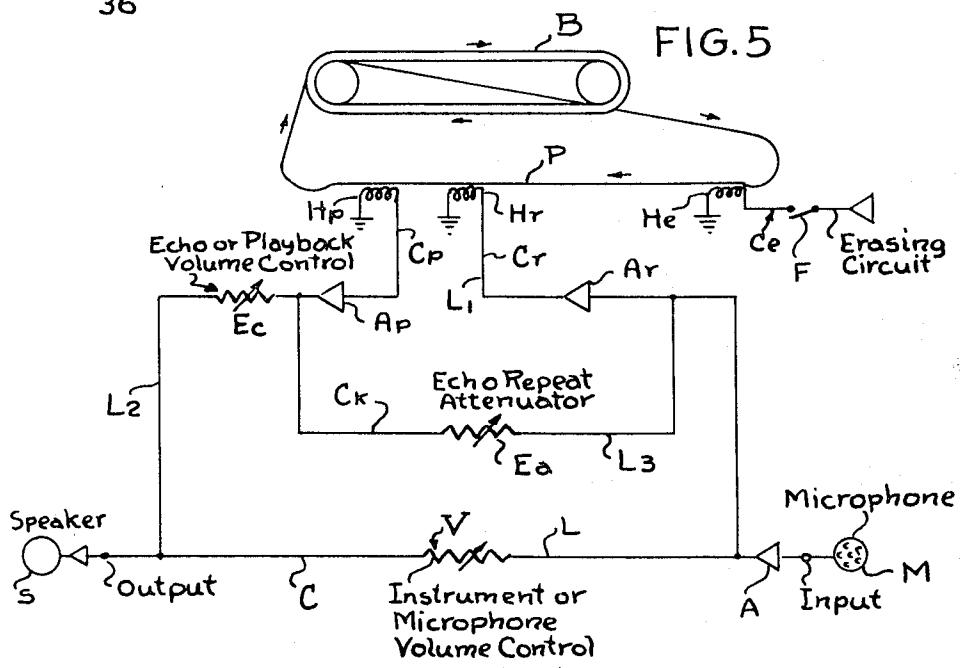


FIG.5



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**ECHO PRODUCING ENDLESS LOOP  
MAGAZINE RECORDER**

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Filed Jan. 13, 1964, Ser. No. 337,243  
Int. Cl. G11b 5/00

U.S. CL. 179—100.2

4 Claims

## ABSTRACT OF THE DISCLOSURE

An echo producing recorder having an endless loop tape wound in a plurality of superposed convolutions on two equal sized freely rotatable spools, one of the spools being mounted on a pivoted arm and biased away from the other spool in order to maintain the tape in taut condition.

Heretofore, sound recording machines have been provided with an endless loop magazine wherein a loop portion of a spiral wound loop body was driven past a sound-recording transducer head. Such recording machines have had certain disadvantages in that they were difficult to load, or to reload. The spiral wound loop body, moreover, was required to be of predetermined extent and to have an exact number of loop turns to operate reasonably smoothly. Accordingly, only a relatively small number of loop turns could be used, and if the tape was shortened or lengthened, as in making a repair splice therein, the tape could not adjust to the loop change and damaging binding action resulted.

One object of the present invention is to provide a tape recorder of the character described, wherein a spiral wound loop body is automatically self-adjusting to take up slack therein, regardless of variations in the total length or extent of the tape or the number of turns in the loop body.

Another object of the invention is to provide a recorder of the character described having improved means for presetting the size of the loop body for normal smooth, self-adjusting operation.

Another object of the invention is to provide a device of the character described having a removable and interchangeable magazine on which the loop body may be pre-loaded, apart from the machine.

Still another object of the invention is to provide a recorder of the character described, having improved, simple to operate, echo producing means.

These and other objects of the invention will be manifest from the following brief description and the accompanying drawings.

Of the accompanying drawings:

FIGURE 1 is a top plan view of an echo producing recorder embodying the features of the invention with a guard plate indicated in chain-dotted lines.

FIGURE 2 is a front elevation of the same, with the guard shown in full lines.

FIGURE 3 is an enlarged vertical cross-section taken substantially on the line 3—3 of FIGURE 1.

FIGURE 4 is a further enlarged, fragmentary cross-section taken substantially on the line 4—4 of FIGURE 1.

FIGURE 5 is a schematic wiring diagram illustrating the electrical system of the recorder.

Referring particularly to FIGURES 1 and 2 of the drawings, there is illustrated an echo producing magnetic tape recorder, including a casing or cabinet 10 for containing electrical circuitry, to be described later. A

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mounting plate 11, removably secured over a top opening of the casing, supports a removable magazine 12 in association with transducer means, including a fixed sound recording head Hr, a slidably adjustable echo producing head Hp, and a fixed sound erasing head He 5 arranged to have tape engaging portions 14, 15 and 16 disposed substantially in lateral alignment.

The tape magazine 12 may include an elongated plate or member 17, which is releasably secured to mounting plate 11, as by means of two upright posts 18 and 19 and received through apertures in opposite ends of plate 17. As best shown in FIGURES 1 and 3, the plate 17 is downwardly supported on nuts 20 adjustably threaded on the posts 18 and 19, to be at an acute angle of the plane of plate 17 to the upper face of cover plate 11, and may be held in that position by locking nuts 22 threaded on the posts to firm engagement with the upper sides of plate 17. Affixed to the lowermost and uppermost ends of the inclined plate may be forwardly presented, fixed and pivoted arms 23 and 24, respectively, having oppositely inturned ends 25 and 26 on which are mounted frictionless bearings or spools 27 and 28 generally in an inclined plane parallel to the plane of plate 17. Central portions of these bearings (of known structure not shown) are held affixed between the arm portions 25 and 26 and upwardly spaced discs 29 and 30, so that the rotatable outer portions of the bearings will run freely with respect thereto (see FIGURE 3). For yieldingly urging arm 23 on its pivot 33 toward the fixed arm 24, arm 23 has an extension 32 from which a tension spring 34 extends to a clip 35 affixed on the plate 17.

An endless loop body B is of magnetic tape spirally wound in a plurality of superposed convolutions between the spools or bearings 25 and 26, in given spaced relation of the same initially predetermined by temporary insertion of a suitable pin 36 in aligned apertures 37 and 38 in arm extension 32 and plate 17, respectively. With a predetermined number of windings of tape in the loop body, and locking pin 36 removed in normal use of the machine, the tension of spring 34 is calculated to apply a resilient braking action between the loop body and the bearings 25 and 26 which retains the loop body taut without restricting free movement of the same with rotation of the bearings. In actual practice it has been found that the device operates satisfactorily with locking pin 36 left in locking position.

As provided for by the inclined relationship of plate 17, the loop body B may have a take-off loop portion P from inner and outer turns or convolutions of the same, 50 closely adjacent the spool 27 as shown in FIGURE 1. An inner extent of loop portion P is guided at an inclination forwardly under the loop body, and laterally away from the bearing or spool 27, and passes around a guide spool 39, including a frictionless bearing 40 between fixed guide discs 41, 41. From the spool 39 the loop portion is reversely extended laterally across the machine and around a groove in a guide post 42 on plate 11, around a closely adjacent, cylindrical power shaft 43, driven by an electric motor (not shown) within the cabinet 10, and then 55 to connect an outer extent of the loop portion P with the outer turn of the loop body. A spring-pressed rubber roller 44 yieldingly presses the magnetic tape against the driven shaft 43, to drive the tape continuously in clockwise direction as indicated by arrows in FIGURE 1. For this purpose the roller 44 may be rotatably mounted on a pivoted arm 45, from an extension 46 of which a tension spring 47 extends to vertically adjustable engagement of an apertured clip 48, on the corresponding end 60 of the spring, with the threaded post 18. Thus the driving

pressure of the roller 44 may be adjusted by vertical adjustment of the clip 48 on post 18.

The arrangement is such that as the drive shaft 43 is continuously rotated the tape body B is steadily rotated clockwise on the spools 27 and 28, continuously to move an elongated straight extent of loop P against the three transducer heads Hr, Hp and He, to transcribe sound onto the magnetic tape, to play back the recorded sound, and to erase the transcribed sound from the tape, respectively. Each of the transducer heads may be utilized independently of the others, or in various combinations with each other as desired. As an example, the transducer head Hr may be operated to transcribe sound to all or part of the tape, to be selectively played as often as desired, through the playback head Hp and a speaker S (see FIGURE 5). The transcribed sound may be removed from the tape at any time by switching on the erasing head He. Echo repeats of transcribed sound may be accomplished by switching on both the recording head Hr and the playback head Hp while connected through an echo repeat circuit, to be described later, in which event the played-back sounds are re-recorded on the tape and again heard through the playback circuit. The spacing of the echo repeats is variable by adjusting the recording head Hr laterally with respect to the playback head Hp. For the latter purpose the head Hp may be mounted on a bracket 49 having suitable guide means 50 slidably engaging opposite edges of a straight slot 51 in supporting plate 11, as shown in FIGURES 1 and 2. In any event, the erasing head He is only actuated when it is desired to erase transcribed sound from the tape as it moves clockwise toward the recording head Hr.

If at any time the loop portion P and/or the windings of the loop body B become slackened, whether the tape is being driven or not, with subsequent continued operation of the motor driven shaft 43 the tension of spring 34 on arm 23, tending yieldingly to urge the spools 27 and 28 apart, the device is automatically self-operating to take up the slack in the continuous tape, instantly to return the tape to normal taut but free moving condition, as shown in FIGURES 1, 2 and 3, in which the apertures 37 and 38 in arm 23 and plate 17, respectively, will be in substantial alignment. Substantial portions of tape may be added or removed by splicing, in which event the tape body will automatically adjust itself as described.

The tape magazine 12 may be replaced by a like tape magazine on which a tape body B has been pre-wound in the manner previously described. For this purpose, magazine 12 is removable from the two posts 18 and 19 by removal of nuts 22 therefrom. In securing the replacement magazine on the posts 18 and 19 as best shown in FIGURES 1 and 3, the loop portion P may be in oversupply to facilitate positioning the same in the guide means therefor. As before, operation of the machine will automatically take up this slack in the tape.

As best shown in FIGURES 1 to 3, and with locking pin 36 positioned as shown in chain-dotted lines in FIGURE 4, the driving connection to the tape loop portion P through capstan 43 and roller 44 being at the leading end of the elongated extent of the loop portion and being closely adjacent the spool 27, a major trailing extent of the loop portion P, from the capstan 43 to the innermost convolution of the loop body, tends to be continuously maintained in substantially taut condition (see FIGURE 1).

A protective cover plate 53 for the tape magazine may be removably secured to the upper ends of uprights 54, 54 affixed on plate 11, as by means of screws 55, 55. Plate 53 is shown provided with a device 56 for winding the electric cord 58 for the machine when it is not in use. A downturned edge 59 of cover 53 may have a suitable scale 60 by which a pointer 61 may indicate the spacing of the recording head Hr from the playback head Hp (see FIGURE 2).

Operation and use of the improved tape recorder will

be amplified by a brief description of the electrical circuitry thereof, to follow.

The schematic wiring diagram shown in FIGURE 5 illustrates the endless loop body in association with the transducer heads Hp, Hr and He. Sound in the form of music and/or voice, for example, may be fed into a microphone M, and is transmitted through an amplifier A in a line L of a speaker circuit C, which includes a volume control to be heard through an amplified speaker S in line L.

Connected to the output side of microphone amplifier A is a line L1, of a recording circuit Cr, constituting a second path for feeding the input sound through a recording amplifier Ar to the slidably adjustable recording head Hr, which magnetically transposes the sound onto the moving tape loop P.

As the magnetized tape moves continuously past playback head Hp in line L2 in the playback circuit Cp, connecting between playback head Hp and line L, playback sound is fed through an amplifier Ap and an echo volume control Ec, to the amplified speaker S, so that the original sound and an echo of the same are heard through the speaker. The spacing of the original sounds and the echos thereof may be varied through a very wide range by by sliding the recording head Hr toward or from the playback head.

For obtaining a variable number of echo repeats, a line L3 in an echo repeat circuit Ck connects line L1, of circuit Cr at the input side of amplifier Ar and line L2 of circuit Cp at the output side of amplifier Ap thereof. The number of echo repeats is varied by adjustment of an attenuator Ea.

The erasing head He erases previously recorded sounds in the tape loop body B before the loop P passes the recording head Hr. By means of a playback switch F, however, the erasing head He may be de-energized so that the recorded sounds may be played back as often as desired. The direct speaker circuit C and echo repeat circuit Ck may be controlled and/or disconnected by means of controls V and Ea, respectively.

Modification of the invention may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. In a magnetic sound or like recording device having magnetic tape transducer means and means for driving and guiding the tape past said transducer means, freely-acting means for effecting automatic adjustment of the tape incident to shortening or lengthening of the same so as to restore and maintain uniform tension and of the tape for normal operation thereof, said tape-adjusting means including two duplicate freely rotatable spools mounted in the same plane in substantially parallel relation to each other and multiple superposed convolutions of an endless tape around and rotatable with said spools and extending in elongated loops with substantially spaced parallel sides between and in a plane including said spools and having a single loop take-off portion for direction through said driving and guiding means past said transducer means, said tape-adjusting means being directly effective within and upon said convolutions by operation of said spools.

2. The same structure as in claim 1 hereof, wherein said tape-adjusting means includes a pivoted arm upon which one of said spools is freely rotatable and spring means yieldingly tending to urge said spools apart in a freely acting manner.

3. The same structure as in claim 1 hereof, wherein said transducer means includes a magnetic sound recording head in a sound recording circuit including a speaker, and a sound playback head in an echo circuit electrically connected to said recording circuit and speaker, said playback head being mounted to be relatively shiftable to vary the distance thereof from said recording head along the elongated extent of said take-off loop portion and correspondingly to vary the spacing of the playback sound

with reference to the recorded sound received through  
the speaker.

4. The same structure as in claim 1 hereof, wherein  
there is provided a magazine upon which said tape and ad-  
justing means therefor are mounted, and means for re-  
movably mounting said member upon said device.

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U.S. CL. X.R.