

April 5, 1949.

H. A. VAGTBORG
MAGNETIC RECORDING AND REPRODUCING DEVICE WITH
MEANS TO PREVENT ACCIDENTAL ERASE
OF RECORD MEDIUM

2,466,514

Filed Nov. 23, 1944

3 Sheets-Sheet 1

Fig. 1.

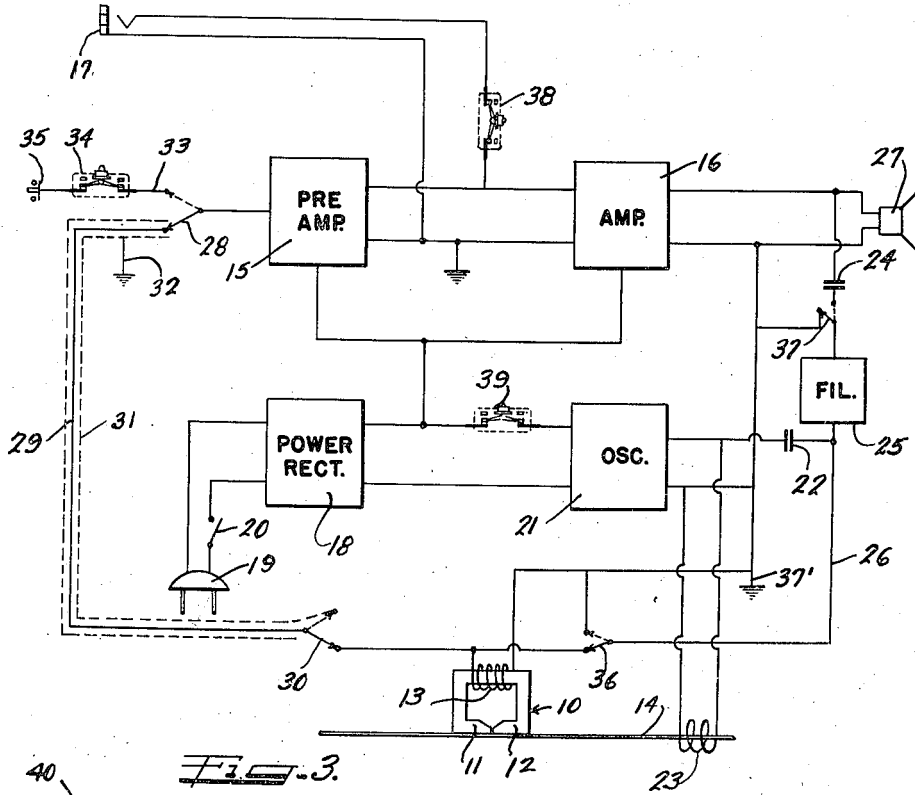


Fig. 3.

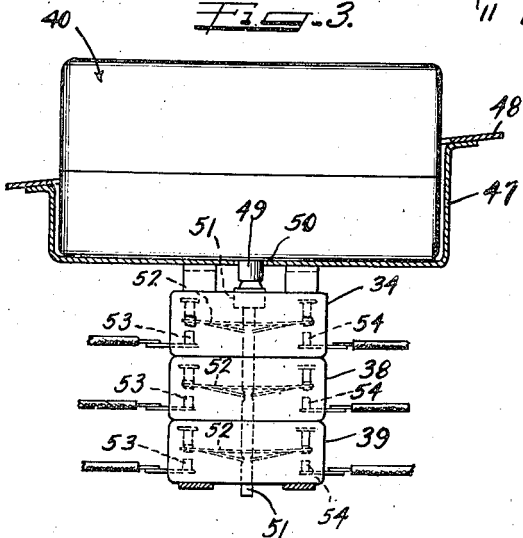
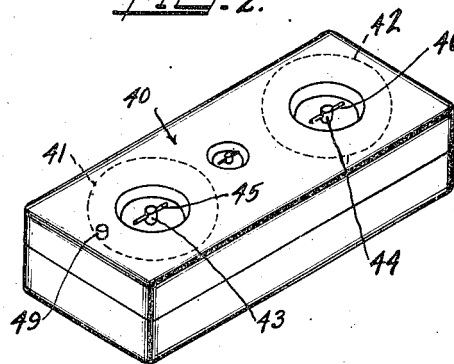


Fig. 2.



HAROLD A. VAGTBORG.

The Firm of Charles H. Hill
ATTORNEYS

April 5, 1949.

H. A. VAGTBORG
MAGNETIC RECORDING AND REPRODUCING DEVICE WITH
MEANS TO PREVENT ACCIDENTAL ERASE
OF RECORD MEDIUM

2,466,514

Filed Nov. 23, 1944

3 Sheets-Sheet 2

Fig. 4.

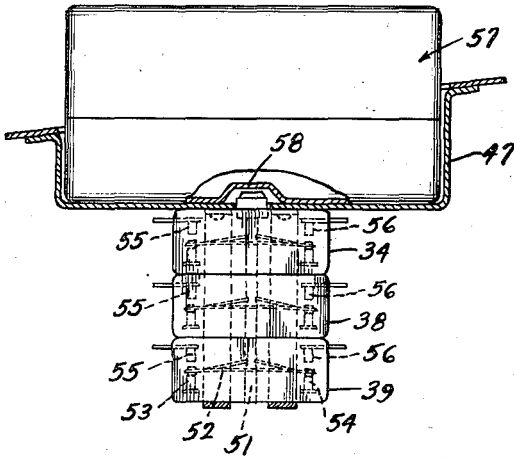


Fig. 7.

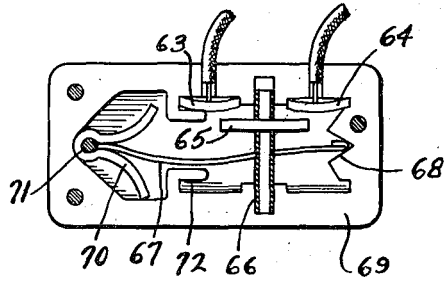


Fig. 5.

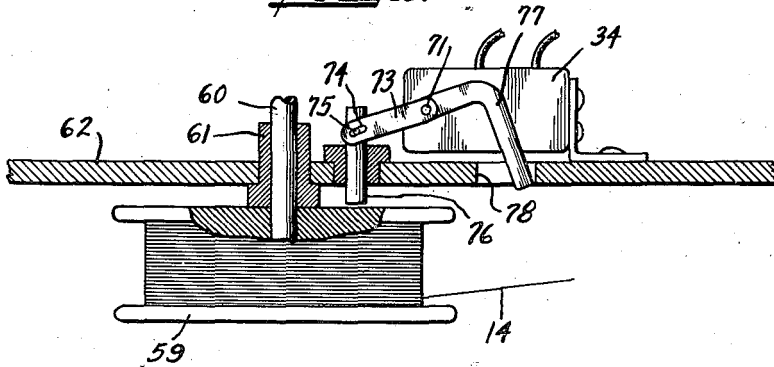
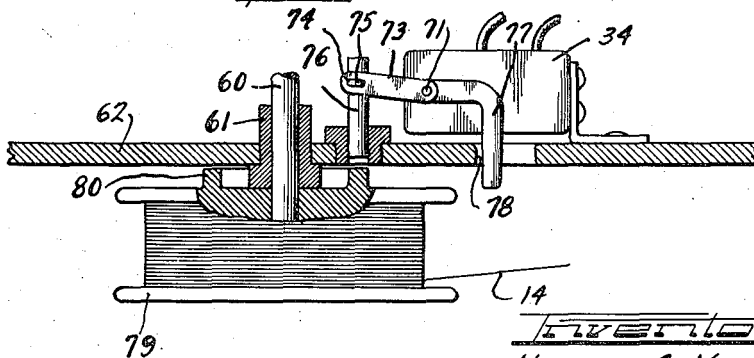


Fig. 6.



HAROLD A. VAGTBORG.

Attorney
Infirm of Charles Hill
Att.

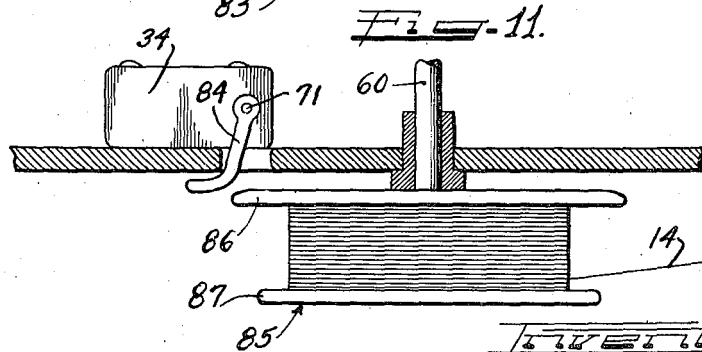
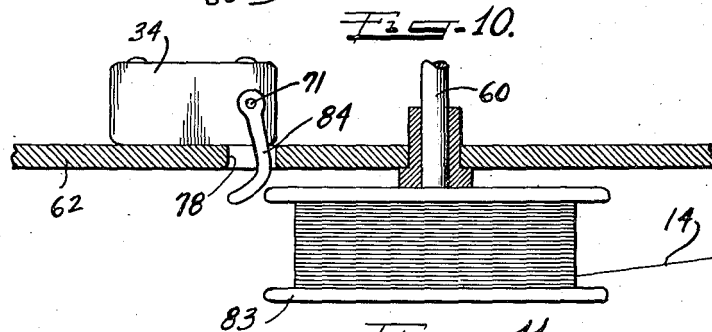
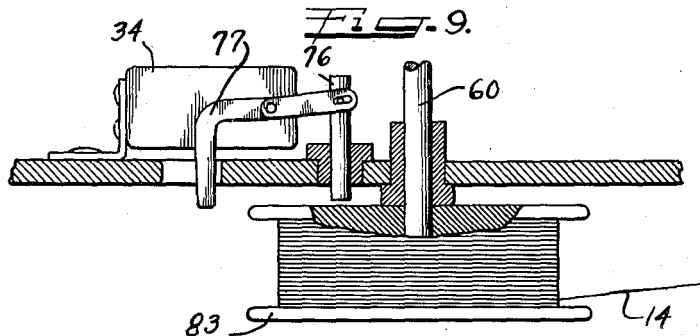
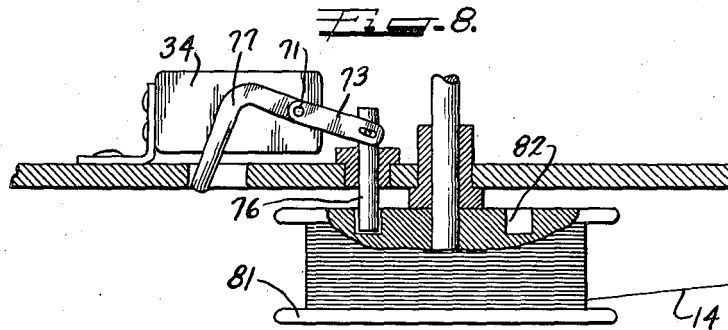
April 5, 1949.

H. A. VAGTBORG
MAGNETIC RECORDING AND REPRODUCING DEVICE WITH
MEANS TO PREVENT ACCIDENTAL ERASE
OF RECORD MEDIUM

2,466,514

Filed Nov. 23, 1944

3 Sheets-Sheet 3



HAROLD A. VAGTBORG
HAROLD A. VAGTBORG.

The Firm of Charles F. Hill
ATTORNEYS

UNITED STATES PATENT OFFICE

2,466,514

MAGNETIC RECORDING AND REPRODUCING DEVICE WITH MEANS TO PREVENT ACCI- DENTAL ERASE OF RECORD MEDIUM

Harold A. Vagtborg, Chicago, Ill., assignor to
Armour Research Foundation of Illinois Insti-
tute of Technology, a corporation of Illinois

Application November 23, 1944, Serial No. 564,824

3 Claims. (Cl. 179—100.2)

1

This invention relates to a magnetic recording and reproducing device and more particularly to a magnetic recorder of either the magazine loading type or the spool loading type, in which safety means is provided to prevent erasing or injury to professionally recorded records or other records of a permanent nature.

One of the principal features and objects of the present invention is to provide a novel magnetic recording and reproducing device of the magazine loading type in which means is provided to distinguish between magazines having a record therein of a permanent nature and magazines having a record therein or a blank wire upon which recordings may be made and then removed.

Another object of the present invention is to provide a novel magazine for holding a magnetizable medium.

A further object of the invention is to provide novel interlocking means between the recording circuit of a magnetic recorder and the magazine.

Another and still further object of the present invention is to provide novel means for selectively distinguishing between wire carrying spools wherein with spools of one type interlocking means is provided which will prevent the erasing head of the magnetic recorder from being energized and which will prevent any new recording being made on the wire of the magnetic recording device.

Still another and further object of the present invention is to provide a novel magnetizable medium carrying device and mounting therefor.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its manner of construction and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings, in which:

Figure 1 is a schematic wiring diagram of a magnetic recording and reproducing device;

Figure 2 is an isometric view of a wire magazine which may be used with a magnetic recording and reproducing device of the type schematically shown in Figure 1;

Figure 3 is an end view of a wire magazine in place on the deck or panel of a magnetic recording and reproducing device with the deck or panel shown in section;

Figure 4 is an end view similar to Figure 3 but showing a magazine similar to the magazine of

2

Figures 2 and 3 but in which a variation of the safety device is provided;

Figures 5 and 6 illustrate a modified form of the present invention wherein wire spools or reels are employed outside of a magazine, and wherein with certain spools (Figure 6) are provided safety means to prevent undesired demagnetization;

Figure 7 is a switch of the type employed in the mechanism shown in Figures 5 and 6 with its cover removed;

Figures 8 and 9 are variations of the second embodiment of the invention shown in Figures 5 and 6 but wherein the spools having a permanent recording thereon are provided with an annular groove on the rear face instead of an annular rib; and

Figures 10 and 11 are views illustrating a third embodiment of the present invention showing wire spools or reels mounted on the panel of a magnetic recording device.

Referring now to the first embodiment of the present invention illustrated in Figures 1 to 4 of the drawings, I have shown, in Figure 1, a schematic wiring diagram of a magnetic recording and reproducing device. More particularly, the magnetic recording and reproducing device includes a magnetic recorder head 10 which is in the general shape of a U having turned confronting polar portions 11 and 12. This core member of the magnetic head is provided with a magnetizing winding 13 which operates both as a magnetizing coil and as a pick-up coil, depending upon whether the device is being used to make a recording on or receive a transcription from the magnetizable medium 14. This magnetizable medium 14 is preferably in the form of a steel wire such for example as a medium carbon or a stainless steel wire of approximately .004 inches in diameter.

The electrical circuit with which the magnetizing head 10 is connected includes a stage 15 of preamplification which is used to give additional amplification of a microphone pickup when a microphone is being used, and is also used for additional amplification when the device is being used as a reproducer. It also includes a conventional audio-amplifier 16 which may be of any suitable design. This audio-amplifier 16 is connected to the pre-amplification stage 15 and also to a jack 17 through which the circuit may be connected to a radio receiver. Suitable biasing potentials and power for the pre-amplification stage and amplifier, as well as for other portions of the circuit presently to be described, are obtained from a power pack or power rectifier gen-

erally designated by the reference character 18. This power rectifier may be of any of the conventional transformer rectifier tube types, and is arranged to receive energy from an alternating current source through a plug 19. A switch 20 is also preferably provided in this circuit to provide convenient switching for the power pack.

When the magnetic head 10 is being used as a recording device, a relatively high-frequency alternating current is preferably supplied to the coil 13 in addition to the audio wave supplied from the amplifier 16. This provides an alternating current bias for the head which gives particularly good results. This high-frequency current is obtained from an oscillator 21 which is connected through a coupling condenser 22. The oscillator is also used to supply energy to the erasing head 23 which is in the form of a coil surrounding, or in close proximity to the wire 14.

The output of the audio-amplifier 16 is connected through a coupling condenser 24 to a filter equalizer circuit 25 and then into the input circuit of the magnetic head through the conductor 26. The audio amplifier 16 is also connected to a loud speaker 27. As will now be explained, the magnetic head is arranged to be connected to the input of the pre-amplifier stage 15 and thence through the amplifier 16 to the loud speaker 27 when it is desired to reproduce what is already recorded on the wire 14. When the magnetic head 10 is being used to make a magnetic recording on the wire 14 it is connected to the oscillator 21 through the coupling condenser 22 and also to the output of the amplifier 16 through the equalizer network or filter 25. In order to accomplish this, suitable switches are provided, as is illustrated in Figure 1. More particularly, the input of the pre-amplifier stage 15 is connected through a switch 28, a conductor 29 and a switch 30 to one side of the coil 13 of the magnetic head 10. The switches 28 and 30 are of the single pole double throw type. The conductor 29 is preferably shielded as at 31, the shield being grounded as at 32. When the switch 30 is moved from its full line position to its dotted line position, as shown in Figure 1, the conductor 29 is grounded. When the switch 28 is moved from its full line position to its dotted line position, the pre-amplifier is connected to a conductor 33 which extends through a switch unit 34 to a microphone terminal switch 35. A switch 36 is provided in the conductor 26 in such a manner as to reverse the end of the coil 13 to which the conductor 26 is connected. It will be noted that the right-hand end of the coil 13 is grounded as at 37'. A switch 37 is provided for shorting out the equalizer network or filter when the device is being used as a reproducer. Switches 38 and 39 are also provided in the circuit leading to the radio receiver jack 17 and in the power supply circuit to the oscillator, respectively.

While it has not been specifically shown, it will be understood that suitable means is provided to move the wire 14 and this preferably is energized from the same power source as the power pack 18.

The above description of a typical magnetic recording and reproducing device is believed sufficient for a full understanding of the novel teachings of the present invention. The physical structure of the above described recording and reproducing device will not be specifically illustrated except to indicate the manner in which the wire is handled. In the preferred embodiments of the

present invention the magnetic recording and reproducing device is equipped with a magazine such, for example, as the magazine 40 shown in Figure 2. This magazine 40 contains a pair of spools or reels 41 and 42 upon which the wire 14 is mounted. These spools or reels 41 and 42 are mounted on shafts 43 and 44 respectively. The ends of each of these shafts 43 and 44 are provided with pins 45 and 46 to provide a positive clutch engagement with suitable driving spindles (not shown) which are arranged in the machine to cause rotation of the spools.

The magnetic head 10 is contained within the magazine 40 and it is sufficient for an understanding of this invention to know that when the magazine is dropped into place in the machine and the recording unit is energized, the spools are rotated to cause relative movement of the wire 14 with respect to the head 10. Figure 3 illustrates the magazine 40 disposed in place in a cradle or pocket 47 mounted in the upper deck or panel 48 of a magnetic recording and reproducing device. Mounted below the pocket 47 are the three switch units 34, 38 and 39 which have been described in Figure 1.

The magnetic recording and reproducing device diagrammatically represented in Figure 1 is of such character that it may be used to make new magnetic records on the wire 14 or it may be used to reproduce the recording which is already on the wire 14. In actual use there will be occasions when the wire 14 contains a recording which it is undesirable to erase either intentionally or accidentally. Such recordings might be those of a symphony impressed upon the wire by a professional recording company, or might be a record of events which should be preserved. When records of this character are being used in the machine, it would be extremely unfortunate if the switches were accidentally thrown to a position where the erasing head 23 is energized or where the coil 13 is connected to the output of the amplifier 16. There are other occasions where a recording may have been made on the wire 14 from an incoming radio program through the jack 17 or through the microphone connection 35, which is of a temporary nature. In order to re-use the wire the equipment must be of such a character as to enable demagnetization of the wire and recording thereon.

One of the principal features of the present invention is to provide magazines for these different above uses which are similar in every character with the single exception of a special safety device which is associated with the records of a permanent nature and which will prevent the oscillator 21 from being energized. Such an arrangement is shown in Figures 2 and 3 of the drawings, wherein the magazine 40 is provided with a projecting pin 49 on the under surface thereof. When this magazine is dropped into place in the pocket 47, the pin 49 projects down through the opening 50 and engages the end of an actuating rod 51 to which the bridging contacts 52 of the switches 34, 38 and 39 are connected. This causes the bridging contacts to snap to their uppermost positions and thus causes disengagement of the stationary contacts 53 and 54 of each of the switches 34, 38 and 39. A switch of the type herein illustrated is of the over-center snap-action type. These switches are of such a character that downward movement of the stem 51 causes an upward snapping of the bridging members 52, while upward move-

5

ment of the stem 51 causes the bridging members 52 to snap to their lower positions in engagement with the stationary contacts 53 and 54. These switches 34, 38 and 39, with their bridging contacts 52 in the upper position are in an unstable position, and upon release of the pressure on the upper end of the stem 51 the bridging contacts 52 will snap back to their lower positions.

From the above description it will be apparent that when a magazine having a projecting pin 49 thereon is dropped into place the switches 34, 38 and 39 are open. This prevents operation of the device as a recorder and also prevents energization of the erasing head. The same general type of magazine, but not having a pin 49 thereon, dropped into place, will not cause opening of the switches 34, 38 and 39 and the device may then be used either as a recorder or reproducer, depending upon how the other switches in the circuit are thrown.

A variation of the foregoing device is illustrated in Figure 4 of the drawings. More particularly, the microswitches 34, 38 and 39 are so arranged that the upper contacts 55 and 56 are the ones which are connected into the electric circuit, and the lower contacts 53 and 54 are dummies. It will thus be understood that when the stem member 51 carrying the bridging contacts 52 is in its upper position, all of the switches 34, 38 and 39 are open, while when the stem member 51 is depressed downwardly the switches 34, 38 and 39 are closed. In this type of arrangement, a magazine 57 is provided having a recessed portion 58 therein when it is being used to house wire having a permanent recording thereon. When such a magazine is employed, the insertion of the magazine 57 into the pocket 47 will not effect actuation of the normally open switches 34, 38 and 39, and the device cannot, therefore, be used to record, nor will the erasing head 23 be energized. When a magazine is inserted, however, having a perfectly flat base wall, the base wall will engage the end of the stem member 51 and cause closing of the switches 34, 38 and 39.

A second embodiment of the present invention is illustrated in Figures 5, 6 and 7 of the drawings. More particularly, in this embodiment of the invention the wire 14 is mounted on a take-off spool 59 which is carried on the shaft 60. The shaft 60 extends through a bushing 61 in the front panel 62 of the magnetic recording and reproducing device (not shown). The switches 34, 38 and 39 are mounted as a gang switch, only the front switch 34 of the gang being shown. These switches are of a type similar to those described in connection with Figure 3 of the drawings. Each includes a stationary contact 63 and a stationary contact 64 which are bridged by a bridging contact 65 carried on a pin 66 which is mounted for limited longitudinal movement. A leaf spring 67 is connected at an intermediate point to the pin 66 and is engaged at one end by a notch 68 in the housing 69 of the switch. It is engaged at its other end by a V-shaped member 70 which is securely mounted on a shaft 71 which is arranged for limited rotational movement. The distance from the shaft 71 to the notch 68 is slightly less than the length of the spring 67 so that the spring 67 is arranged to stop between two positions. A stop member 72 is provided which limits the downward movement of the spring 67. This spring 67 differs from the arrange-

6

ment shown in Figure 3 in that it has two stable positions; one position being with the bridging contact 65 in engagement with the stationary contacts 63 and 64 and the other position being with the bridging contact 65 in an open position and the spring 67 in engagement with the stop 72. This is important for a reason which will presently be apparent.

A crank arm or link 73 is rigidly secured to the end of the shaft 71 which projects out of the switch housing 69. This arm 73 is slotted as at 74 to seize a pin 75 carried on a follower member 76. It will also be understood that the shaft 71 projects through all of the switch casings and thus actuates three switches which are the three switches diagrammatically represented as 34, 38 and 39 in Figure 1 of the drawings. The shaft 71 also carries an L-shaped finger 77 which projects through an opening 78 in the front panel 62 of the instrument. When the shaft 71 is in the position as shown in Figure 5 of the drawings, the switches 34, 38 and 39 are closed. When an ordinary spool or reel 59 is mounted on the shaft 61 the reel 59 does not contact the follower member 76 and the switches 34, 38 and 39 remain in their closed position. If, on the other hand, a reel 79 is provided which is similar in every character to the reel 59 with the exception that it is provided with a rearwardly projecting flange 80, the follower member 76 is engaged and snaps the spring 67 through its over-center position. In snapping through its over-center position, the spring 67 carries the follower member 76 rearwardly beyond the point where the flange 80 engages it. It will thus be observed that there is no friction between the reel 79 and the follower 76 during operating of the unit.

The L-shaped finger 77 is for the purpose of resetting the device after the reel 79 has been removed. It will be observed that this L-shaped finger 77 has moved outwardly through the opening 78 when the bridging contact 65 moves to its open position. In order to reset the device the outer end of the L-shaped finger 77 is depressed, which will again cause the spring 67 to pass through its over-center position to close the bridging contact 65 against the contacts 63 and 64.

A variation of this embodiment of the invention is shown in Figures 8 and 9 of the drawings. More particularly, the switch units 34, 38 and 39 (of which only unit 34 may be seen in the drawings) are the same type of unit as the switch unit shown in Figure 7, with the exception that this unit has been turned upside down. More particularly, the switch is mounted in such a position that when the L-shaped finger 77 is in the position as shown in Figure 8 of the drawings, the switches 34, 38 and 39 are open, while these same switches are closed when the L-shaped finger 77 is in the position as shown in Figure 9 of the drawings. In this variation of the second embodiment of the invention, a spool or reel 81 is provided with an annular recess 82 in the back face thereof when the wire 14 wound thereon carries a recording of a permanent nature, and against which accidental erasure is to be prevented. This recess 82 lies opposite the end of the follower 76 and when the reel 81 is mounted does not in any way disturb the position of the follower 76. It will thus be seen that the switches 34, 38 and 39 will remain in their open position under such circumstances. If, on the other hand, a reel such as the reel 83 shown

in Figure 9, is mounted on the shaft 60, it will strike the follower 76, force the spring 67 through its over-center position and cause a closure of the switches 34, 38 and 39.

A third embodiment of the present invention is illustrated in Figures 10 and 11 of the drawings. In this form of the invention the switch units 34, 38 and 39 are of the same type as that described in connection with Figures 8 and 9. Instead of the arm 73 on the shaft 71, however, an L-shaped arm 84 is provided. This arm 84 projects down through the opening 78 in the panel 62. When the arm is in its right-hand position as shown in Figure 10 of the drawings, the switches 34, 38 and 39 are in their closed position, while the converse is true when the arm 84 is in its left-hand position. More particularly, when the arm 84 is in its left-hand position the switches 34, 38 and 39 are open. When a reel 83 is mounted on the shaft 60, the outer peripheral flange of the reel will not strike the finger 84. The switches 34, 38 and 39 will thus remain in their closed position and the device may be used for either recording or reproducing. If, however, a reel 85 having a rear flange 86 of greater diameter than the front flange 87 is mounted on the shaft 60, the rear flange 86 will strike the finger 84 and rotate the shaft 71 to cause the switches 34, 38 and 39 to open. A spool or reel of this character may be used to contain wire having a permanent recording thereon.

While I have shown particular embodiments of my invention, it will, of course, be understood that I do not wish to be limited thereto, since many modifications may be made and I, therefore, contemplate by the appended claims, to cover all such modifications as may fall within the true spirit and scope of my invention.

I claim as my invention:

1. In a magnetic recording and reproducing device, a magnetic sound head, electrically energized means for magnetically recording sound on a wire, electrically energized means for reproducing sound previously magnetically recorded on a wire, said device being arranged to receive and operatively mount wire carrying spools in operative relation with respect to said head, switch means in the electrical energizing circuit of said recording means, said device hav-

ing means thereon responsive to spools having a predetermined rim shape and dimension to open said switch means when such spools are mounted on said device.

2. A magnetic recording and reproducing device of the type wherein intelligence is recorded by varying the magnetic condition of a lengthy magnetizable medium along its length, said device including electrically energized elements to impart varying degrees of magnetization to said medium as it passes thereover to record intelligence thereon, a shaft to receive a spool supporting said medium before it travels over said elements during operation of said device, and a switch operable to deenergize said elements, said switch having an operating element extending in direction parallel to the axis of said shaft to bear against an annular portion of the edge of said spool to control the energization of said elements in accord with the axial extent of said annular portion.

3. A magnetic recording and reproducing device of the type wherein intelligence is recorded by varying the magnetic condition of a lengthy magnetizable medium along its length, said device including electrically energized elements to impart varying degrees of magnetization to said medium as it passes thereover to record intelligence thereon, a shaft to receive a spool supporting said medium before it travels over said elements during operation of said device, and a switch operable to deenergize said elements, said switch having an operating lever extending in direction parallel to the axis of said shaft and mounted for rotation relative to said axis to bear against the outer periphery of the end flange of said spool to control the energization of said elements in accord with the diameter of said flange.

HAROLD A. VAGTBORG.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,560,721	O'Reilly -----	Nov. 10, 1925
2,213,768	Merriman -----	Sept. 3, 1940
2,321,812	Heller -----	June 15, 1943
2,364,556	Somers -----	Dec. 5, 1944