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MAGNETIC SWITCH
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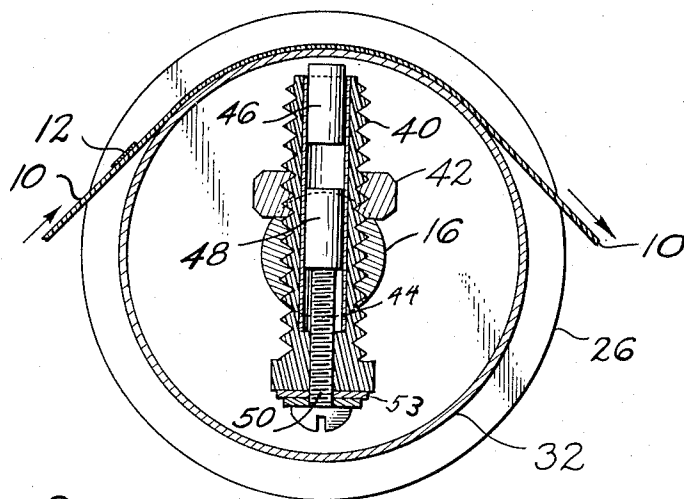
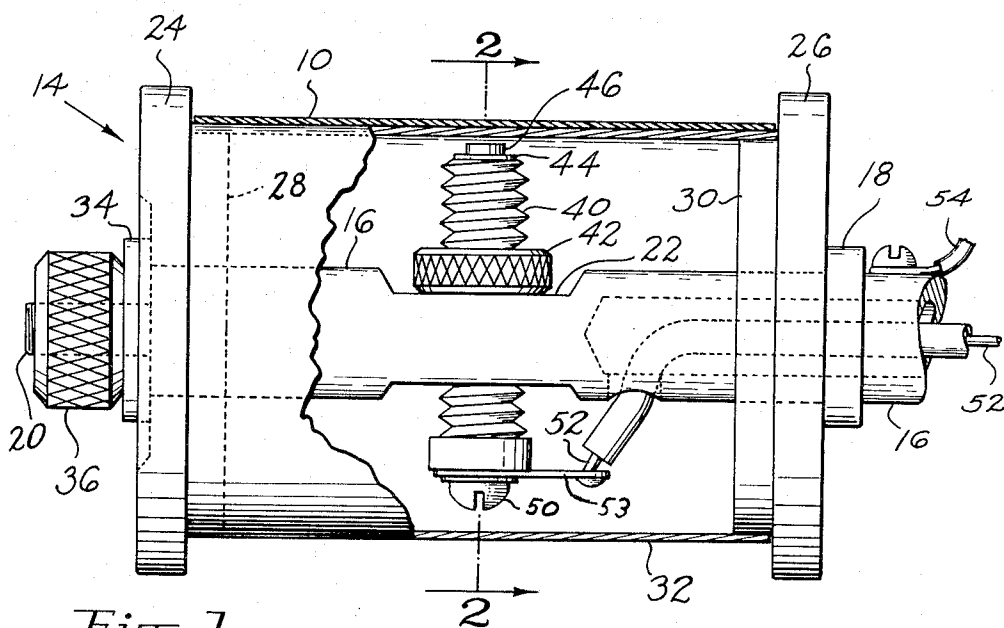


Fig. 2.

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MAGNETIC SWITCH

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9 Claims. (Cl. 200—87)

This invention relates to electrical switches and particularly pertains to a magnetic switch for use with strip material having a magnetic element thereon. The switch thus is applicable for use in connection with automatic motion picture film changeover apparatus, although it also is applicable to apparatus for cutting in commercial announcements on television film, and in general, for switching over from one electrically operated machine to another in a variety of applications.

In the operation of motion picture projectors means conventionally are employed for switching in a second projector automatically as the end of the film is reached on the first projector. Although various means of accomplishing this purpose have been proposed heretofore, the use of these has been attended by one or more disadvantages. Arcing may occur, which results in fire or damage to the film. Imperfect electrical contact may be obtained, making the device unreliable. The film contacting mechanism may damage the film by abrasion. Also, the apparatus employed is bulky and difficult of adaptation to installations where space is limited.

It therefore is the general object of the present invention to provide a magnetic switch which will overcome the foregoing disadvantages and which occupies but a minimum of space. Accordingly it may be installed, for example, inside an idler pulley on a motion picture projector.

It is another object of this invention to provide a magnetic switch which is particularly sensitive, easily actuated, and hence rapid in operation.

Still another object of this invention is the provision of an electric switch which is positive and reliable in operation. Still a further object of this invention is the provision of an electric switch which is simple in construction, inexpensive, and readily adaptable to a variety of applications in which it is desired to switch a circuit on or off in response to the movement of a strip of material past a predetermined point.

The manner in which the foregoing and other objects of this invention are accomplished will be apparent from the accompanying specification and claims considered together with the drawings, wherein:

Figure 1 is a view in side elevation, partly in section, illustrating the presently described magnetic switch; and

Figure 2 is a sectional view taken along the lines 2—2 of Figure 1.

In the illustrated embodiment, the presently described magnetic switch is shown used in conjunction with a strip of motion picture film 10, having embedded therein or affixed thereto a magnetic element 12. The latter may comprise a spot of iron filings glued to the film; a piece of steel or other material having magnetic properties; or a small magnet. It may be located at any desired station on the film, although in the usual case it will be stationed near its end in order to turn on a second projector, operate a theater curtain, turn on lights, or energize an electric circuit to accomplish some other desired purpose.

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The film passes through the projector in the usual manner and in so doing traverses guide means such as an idler pulley 14 rotatably mounted on a shaft 16 affixed to the frame of the machine. The shaft is hollow and is made of electrically conducting material. It is provided with a thrust shoulder 18 and a threaded reduced end portion 20. Its central portion 22 is reduced and perforated for a purpose which will appear hereinafter.

The idler pulley likewise is made of electrically conducting material. It comprises a pair of spaced apart end pieces 24, 26 having shoulders 28, 30. A spool 32 is mounted on the shoulders. The entire assembly is rotatably mounted on shaft 16, being held in place by washer 34 upon which bears nut 36. The idler pulley thus serves as guide means for guiding the passage of a strip of material, such as a motion picture film, over the elements of the switch assembly.

The latter is mounted within the pulley and comprises a support or core member 40 threaded into the perforation in the central portion 22 of shaft 16. The core member is made of electrically insulating material. It cooperates with adjusting means such as the nut 42 by means of which its position relative to the shaft may be varied as desired.

One end of core member 40 is open for the reception of an electrically conducting sleeve 44. The latter in turn receives an electrically conducting magnetic element used to interconnect the sleeve 44 and the cylinder 32, thereby completing an electric circuit.

Although a single magnetic element within the sleeve may be used to accomplish this function, it is preferred to use a pair of such elements 46, 48 arranged with like poles opposite so that a repelling force maintains the magnets spaced apart from each other. This increases the sensitivity of the switch.

The magnetic elements preferably comprise small magnets made for example of Alnico. They are dimensioned to be slidably received within sleeve 44 and the outermost magnet 46 is dimensioned to bridge the space between the outer end of the sleeve and the inner surface of cylinder 32.

Electric contact means are provided to connect the magnets and the sleeve which houses them into the electric circuit. In the illustrated form, the contact means is adjustable and comprises a screw 50 threaded into an end of core member 40 and supporting magnet 48. Adjustment of this screw effects the longitudinal displacement of magnet 48 which, in turn, will adjust the position of magnet 46 until it is spaced apart from the inner surface of cylinder 32 by precisely the desired amount.

Screw 50 is of conducting material and is connected to the electric lead 52 by such means as connector plate 53 which is provided with a threaded opening in which the screw 50 is received. The lead 52 passes through the opening in hollow shaft 16 and thence to the source of electric energy. The circuit is completed through lead 54 which may be attached to shaft 16 in any desired position.

Operation

The operation of the presently described switch is as follows:

First core 40 is adjusted by means of nut 42 until it is in approximately the correct position, a gross adjustment thus being effectuated. Next the position of magnet 46 is adjusted by turning screw 50, this effectuating a precision adjustment whereby the spacing of the magnet from the interior wall of cylinder 32 is determined exactly. This dual adjustment is of considerable significance since it greatly increases the sensitivity of the switch.

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When the switch is in the position illustrated in the drawings, the circuit is open since magnet 46 is out of contact with cylinder 32. However, as film 10 passes over the idler pulley housing the switch, magnetic patch 12 ultimately will pass directly over magnet 46. Even though this requires but a brief instant, the sensitivity of the switch is such that magnet 46, being attracted by the magnetic patch on the film, will be elevated until it is in firm contact with cylinder 32.

This completes the electric circuit, energy flowing for example through lead 52, screw 50, magnet 48, sleeve 44, magnet 46, cylinder 32, end pieces 24, 26, shaft 16 and thence out lead 54. The closed circuit then may be utilized for the operation of any desired apparatus, for example, a second motion picture projector.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of my invention, or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. A magnetic switch for an electric circuit, comprising electrically conducting hollow cylindrical guide means forming first electric contact means, a hollow core member of electrically insulating material mounted within the guide means and open at one of its ends, second electric contact means mounted on the core member, an electrically conducting magnetic element movably mounted within the core member in contact with the second contact means and normally spaced apart from the guide means, the magnetic element being movable substantially normal to the cylindrical guide means for contact therewith to interconnect the second contact means and guide means upon advancement from the core member by application of a magnetic force, the guide means and the second contact means being adapted to be connected in an electric circuit and to complete the latter upon interconnection of the guide means and second contact means by the magnetic element.

2. A magnetic switch for an electric circuit, comprising electrically conducting hollow cylindrical guide means, a hollow core member of electrically insulating material mounted within the guide means and open at one of its ends, an electrically conducting sleeve within the core member, an electrically conducting magnetic element movably mounted within the sleeve in contact therewith and normally spaced apart from the guide means, the magnetic element being movable substantially normal to the cylindrical guide means for contact therewith to interconnect the sleeve and the guide means electrically upon being advanced from the sleeve by a magnetic force, the guide means and the sleeve being adapted to be connected in an electric circuit and to complete the latter upon interconnection of the guide means and sleeve by the magnetic element.

3. A magnetic switch for an electric circuit, comprising electrically conducting hollow cylindrical guide means, a hollow core member of electrically insulating material mounted within the guide means and open at one of its ends, an electrically conducting sleeve within the core member, an electrically conducting magnetic element slidably mounted within the core member in contact therewith and normally spaced apart from the guide means, the magnetic member being movable substantially normal to the cylindrical guide means for contact therewith to interconnect the sleeve and the guide means electrically upon being advanced from the sleeve by a magnetic force, adjusting means for adjusting the spacing between the magnetic element and the guide means, the guide means and the sleeve being adapted to be connected in an electric circuit and to complete the latter upon interconnection of the guide means and sleeve by the magnet.

4. A magnetic switch for an electric circuit comprising electrically conducting hollow cylindrical guide means,

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a hollow core member of electrical insulating material mounted within the guide means and open at one of its ends, an electrically conducting sleeve within the core member, a pair of electrically conducting magnetic elements slidably mounted within the sleeve and in contact therewith, the magnets being stationed with like poles adjacent and normally spaced apart from each other by the repulsive forces therebetween, the outer magnet normally being spaced apart from the guide means but movable substantially normal to the cylindrical guide means for contact therewith to interconnect the guide means and sleeve electrically upon being withdrawn from the sleeve by application of an external magnetic force, the guide means and the sleeve being adapted to be connected in an electric circuit and to complete the latter upon interconnection of the guide means and sleeve by application of said external magnetic force.

5. A magnetic switch for an electric circuit, comprising electrically conducting hollow cylindrical guide means, a hollow core member of electrically insulating material mounted within the guide means and open at one of its ends, an electrically conducting sleeve within the core member, inner and outer magnets slidably mounted within the core member with like poles opposite, the magnets being maintained spaced apart from each other by the repulsive force exerted by the like poles, electrically conducting screw means threaded into the core member longitudinally of the sleeve, the screw means contacting and supporting the innermost of the magnets for adjusting the position of the same, the outermost of the magnets being normally spaced apart from the guide means but movable substantially normal to the cylindrical guide means for contact therewith to interconnect the guide means and the sleeve upon displacement by an external magnetic force, the guide means, the sleeve and the screw means being adapted to be connected in an electric circuit and to complete the latter upon interconnection of the guide means and the sleeve through the outermost of the magnet pairs.

6. A magnetic switch for an electric circuit comprising an electrically conducting shaft, an electrically conducting spool rotatably mounted on the shaft, a hollow core member of electrically insulating material mounted upon the shaft within the spool and substantially normal thereto, an electrically conducting sleeve within the core member, an electrically conducting magnetic element slidably mounted within the sleeve in contact therewith and normally spaced apart from the inner surface of the spool, the magnetic element being movable substantially normal to the spool for contact therewith to interconnect the spool and the sleeve upon displacement by a magnetic force, the spool and the sleeve being adapted to be connected in an electric circuit and to complete the latter upon interconnection of the spool and sleeve by the magnetic element.

7. A magnetic switch for an electric circuit comprising electrically conducting hollow cylindrical guide means forming first electric contact means, a hollow core member of electrically insulating material mounted within the guide means and open at one of its ends, second electric contact means mounted on the core member, an electrically conducting magnetic element movably mounted within the core member in contact with the second contact means, the magnetic element being movable substantially normal to the cylindrical guide means upon application of a magnetic force between a first position wherein it is in contact with the guide means and a second position wherein it is out of contact therewith, and an electric circuit including the guide means and the second contact means and adapted to be altered by movement of the magnetic element.

8. A magnetic switch for an electric circuit, comprising electrically conducting hollow cylindrical guide means forming first electric contact means, hollow second electric contact means mounted within and electrically in-

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5 insulated from the guide means, an electrically conducting magnetic element movably mounted within and in contact with the hollow second electric contact means, the magnetic element being movable substantially normal to the cylindrical guide means for contact therewith to interconnect the latter and the second contact means upon advancement from the latter by application of an external magnetic force, the guide means and the second contact means being adapted to be connected in an electric circuit and to complete the later upon interconnection of the guide means and second contact means by the magnetic element.

9. A magnetic switch for an electric circuit, comprising electrically conducting hollow cylindrical guide roll means mounted for rotation and forming first electric contact means, hollow second electric contact means mounted within and electrically insulated from the guide roll means, an electrically conducting magnetic element movably mounted within and in contact with the hollow second electric contact means, the magnetic element being mov-

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able substantially normal to the cylindrical guide roll means for contact therewith to interconnect the latter and the second contact means upon advancement from the latter by application of an external magnetic force, the guide means and the second contact means being adapted to be connected in an electric circuit and to complete the latter upon interconnection of the guide means and second contact means by the magnetic element.

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