Sept. 1, 1953 F. S. SINCLAIRE 2,650,962

ROLLER TYPE SWITCH

Original Filed April 15, 1948 2 Sheets-Sheet 1

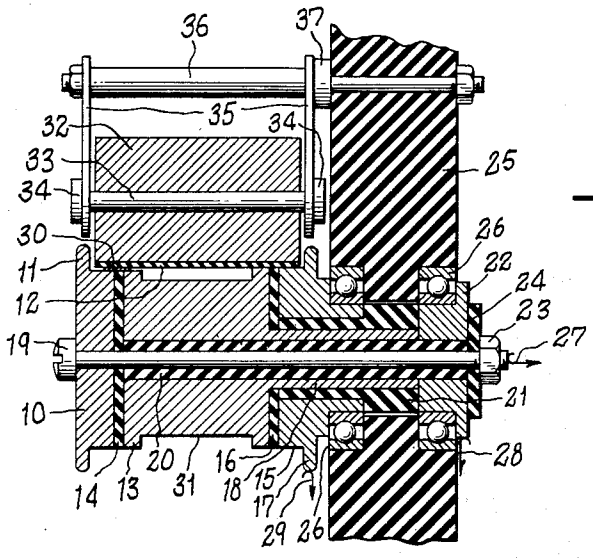


Fig. 1.

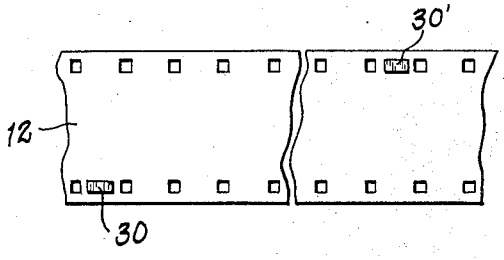


Fig. 2.

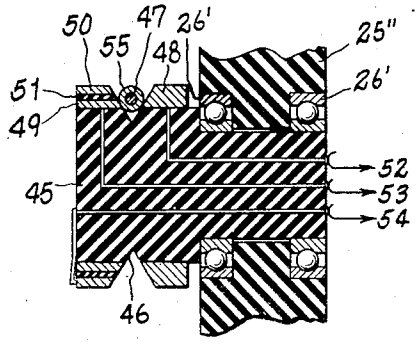


Fig. 3.

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ROLLER TYPE SWITCH

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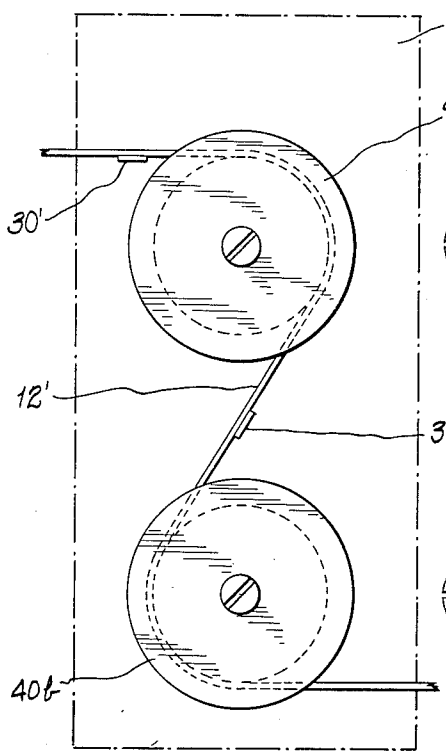


Fig. 3.

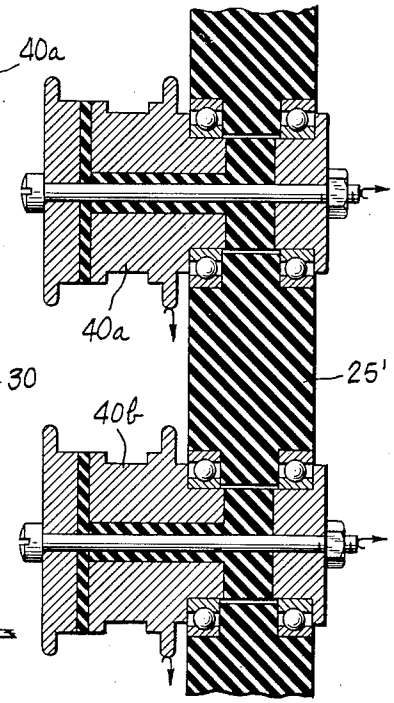


Fig. 4.

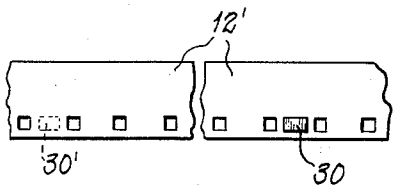


Fig. 5.

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Patented Sept. 1, 1953

2,650,962

UNITED STATES PATENT OFFICE

2,650,962

ROLLER TYPE SWITCH

Francis S. Sinclaire, Brooklyn, N. Y.

Original application April 15, 1948, Serial No. 21,191. Divided and this application September 21, 1950, Serial No. 185,940

6 Claims. (Cl. 200—46)

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My invention relates to improvements in roller type switches, and more specifically to such switches particularly adapted for actuation by indicia placed on movie films or strip sound records. This application is a division of my copending application, Serial No. 21,191, filed April 15, 1948, for Sound Synchronizing Apparatus.

One object of my invention is to provide a new and novel laminated rolling contact switch whose contacts are adapted to be bridged by indicia placed on movie films or strip sound records with a rolling action and avoiding any sliding action which might tear, dislodge or otherwise mutilate the indicia.

Another object of my invention is to provide such a laminated film or strip switch in which the contacts are coaxially led out of the same side of the unitary switch structure, thus leaving the switch surface open and clear for easy threading of the film or strip sound record.

Still another object of my invention is to provide such a laminated film or strip switch of simple construction which may be fabricated easily and at relatively low cost.

Other and further objects will be apparent from the following description when taken with the accompanying drawings, in which:

Fig. 1 shows in cross-section one embodiment of a film or strip switch in accordance with my invention;

Fig. 2 is a plan view of portions of a film or strip bearing indicia for use with the switch of Fig. 1;

Fig. 3 is an end view of two film or strip

Fig. 3 is an end view of two film or strip switches, each generally similar to the switch shown in Fig. 1, and with an 8 mm. film threaded therearound;

Fig. 4 is a cross-sectional view of the two film or strip switches of Fig. 3;

Fig. 5 is a plan view of portions of an 8 mm. film bearing indicia for use with the film or strip switches of Figs. 3 and 4; and,

Fig. 6 is a cross-sectional view of a strip switch in accordance with my invention suitable for use with indicia placed on wire records.

In Fig. 1 is shown a cross-sectional view of one form of laminated switch in accordance with my invention. It includes a cylindrical end contact member 10 of conducting material having a raised lip 11, as shown, for preventing substantial lateral movement of the motion picture film 12. Adjacent contact member 10 and coaxial therewith is positioned a second cylindrical contact

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member 13. A washer 14 of insulating material is provided between contact members 10 and 13. A third cylindrical contact member 15 is positioned on the other side of contact member 13 and coaxial therewith, but insulated therefrom by means of a second insulating washer 16. A lip 17 is formed on the periphery of contact member 15 similar to lip 11 of contact member 10 and for the same reason. A central aperture is provided in contact member 15 through which extends a sleeve 18 of contact member 13 as shown. A central supporting member, which may be in the form of a threaded machine screw 19, extends through the unit thus far described and is insulated from contact member 13 by means of insulating sleeve 20. Another insulating sleeve 21 is placed around extended sleeve 18 of contact member 13 to insulate it from contact member 15. A flange 22 of conducting material is positioned at the free end of sleeve 18 and makes an electrical connection therewith. A nut 23 is secured to the free end of machine screw 19 to hold the assembly together and is insulated from flange 22 by means of insulating washer 24. Portions of contact member 15, insulating sleeve 21, and flange 22 are formed as shown to provide a journal so that the entire unit may be rotatably mounted in a support 25 of insulating or dielectric material. If desired, ball bearings 26 or other suitable anti-friction devices may be provided at the journal surface in order that the switch unit may rotate more freely in support 25. Suitable contacts 27-29 (shown schematically) are provided adjacent the threaded end of machine screw 19, the periphery of flange 22, and the periphery of contact member 15, respectively, as shown, for the purpose of making electrical contact with contact members 10, 13, and 15, respectively, while leaving the operative surface of the switch unit free and clear for easy threading, removal, and replacing of the film 12. A strip of foil 30 is shown adjacent one edge of film 12 and bridging contact members 10 and 13. It is obvious that an electrical circuit is thus established between contacts 27 and 28, which contacts will be connected to control any desired circuit. When it is desired that an electrical circuit be established between contacts 28 and 29, a similar piece of foil similarly positioned on the same surface but adjacent the opposite edge of film 12 (see Fig. 2) will accomplish the desired result. Cylindrical contact member 13 may be undercut as shown at 31, if desired, so that the picture area of the film is not touched and thus any possible scratching of the picture area is prevented.

While not essential, a pressure roller 32 is preferably provided as shown for maintaining film 12 and the indicia such as foil 30 in contact with the laminated switch. Roller 32 is mounted upon shaft 33, the ends of which are journaled in bearings 34 of supporting arms 35 adjacent one end of each. The other end of each arm 35 is provided with an aperture through which threaded supporting rod 36 extends as shown. An extension of rod 36 is fitted through an aperture in support 25, and spacer 37 is provided between the latter and the pressure roller assembly. Suitable biasing means (not shown), such as a spring, are utilized to maintain roller 32 in the position shown in Fig. 1.

It is to be noted that the construction of this film switch of Fig. 1 has been somewhat simplified and not drawn to scale for the sake of clarity of the drawing. For instance, film 12 may be of the ordinary 16 mm. size and foil 30 only $\frac{1}{16}$ inch wide and 0.001 inch thick, while insulating washers 14 and 16 are 0.005 inch thick. I have found that by the use of such a foil with the switch exemplified, momentary currents as high as three amperes can be passed without overheating the foil or the film carrying it. This large current is more than ample for any ordinary relay operation. Also, the use of a rotatable switch avoids any possibility of tearing, dislodging, or otherwise mutilating the foil as it passes over the switch due to the lack of relative motion between the foil and the surface of the switch contacted thereby as the switch revolves. Furthermore, it is to be noted that by making the diameter of the contact members large relative to the length of the foil, the latter bridges the contacts of the strip or film switch for a considerable length of time despite its small length. This results, of course, from the continuous contact of the foil with the periphery of the laminated switch for a large portion of the circumference as the switch revolves with the film motion. This is to be compared with the momentary contact obtained in prior art systems utilizing spring or finger contacts.

Fig. 2 is a plan view of portions of a film or strip for use with my switch, such as film 12 of Fig. 1. As shown, this is of the ordinary 16 mm. type movie film and has foil 30 positioned adjacent one edge between and in line with two of the film perforations. A second similar foil 30' is similarly positioned on the same surface but adjacent the opposite edge of film 12, again between and in line with two adjacent film perforations and for the purpose above-described. The positioning of these foils 30 and 30' is of course determined by the relative timing desired for the operation of the circuits being controlled.

While reference has been made to 16 mm. film above in connection with Figs. 1 and 2, my switch is, of course, not limited to this size film. For example, 35 mm. film can be used merely by providing the proper spacing between lips 11 and 17.

My novel switch is also capable of use with 8 mm. movie film and any similar film or tape having perforations adjacent only one edge thereof. The necessary modifications for such operation are illustrated in Figs. 3, 4, and 5, and for purposes of exemplification only the following explanation will be given in terms of an 8 mm. movie film.

In Fig. 3 is shown an end view of two film or strip switches 40*a* and 40*b*, each similar to the switch shown in Fig. 1 and with a cooperating movie film 12' threaded therearound. Since

the picture area on an 8 mm. film extends nearly to the edge opposite that provided with the perforations, foil 30' is positioned on the reverse side of the film (see also Fig. 5). Inasmuch as the film 12' is a dielectric or insulator, foil 30 completes a circuit only through switch 40*b* and foil 30' completes a circuit only through switch 40*a*.

In Fig. 4 is shown a cross-sectional view of film or strip switches 40*a* and 40*b* mounted in insulating support 25'. In view of the obvious similarity between the construction of each of switches 40*a* and 40*b* and the switch of Fig. 1, which is described above at length, no detailed description of these switches is believed necessary.

My switch is also capable of use with strip records in the form of wires. Indicia may be easily provided on wire by increasing the cross section of the wire at each desired point. This may be accomplished by forming a knot in the wire at each such point or by affixing a conducting sleeve of larger diameter thereat.

In Fig. 6 is shown in cross section a strip switch 40'' suitable for use with wire records having such indicia placed thereon. Switch 40'' comprises a cylindrical body 45 of insulating material having a T-shaped cross section. The narrower portion of body 45 is rotatably supported in support 25'' by means of suitable anti-friction devices such as ball bearings 26'. Body 45 may be prevented from sliding out of support 25'' and ball bearings 26' by any suitable means (not shown). A channel or notch 46 is provided around the periphery of the larger portion of body 45, this notch being preferably V-shaped, although channels of other shapes, such as square or half-round, may be substituted therefor. A ring or circular contact 48 of conducting material is affixed to the right-hand periphery of the larger portion of body 45 as shown, and a similar ring 49 of conducting material but of lesser thickness is affixed to the left-hand periphery. Another similar ring 50 of conducting material is positioned around and concentric with ring 49 but separated therefrom by means of a ring 51 of insulating material. As shown, conducting rings or contacts 48–50 and insulating ring 51 are beveled so as to form an extension of notch 46. The notch 46 in body 45 is made large enough to allow the wire 47 to lie therein without touching any of the contacts or rings 48–50 in the absence of an indicium placed on the wire. In the preferred form, to insure this, the open ends of the notch 46 are spaced apart a distance greater than the diameter of the wire 47, and the depth of the notch 46 is made at least equal to one-half the diameter of wire 47. Suitable coaxial contacts 52–54 (shown schematically) are provided for conducting rings 48–50 respectively and electrically connected thereto by any suitable means, a schematic representation only being intended to be shown in the drawing. When a wire record 47 is threaded around the periphery of the switch, it will normally lie in the notch 46 cut in body 45 and thus not complete a circuit between any of contacts 52–54. However, when a portion of wire 47 having a larger cross section, produced for instance as by means of a conducting sleeve 55, passes over the switch, a circuit will be completed between contacts 52 and 53 or 52 and 54, depending upon the outside diameter of the sleeve 55. Thus, by the use of sleeves 55 of two different diameters, both "start" and "stop" signals may be placed on a strip sound record of the wire

type, if desired, and it is, of course, obvious that any desired number of selective circuits can be provided by a suitable combination of contacts or rings positioned around the periphery of the switch when used with suitable conducting indicia of corresponding different cross sections on the wire. The operation of the switch in any event is the same as that above-described in connection with Fig. 1.

Numerous additional applications of the above-disclosed principles will occur to those skilled in the art and no attempt has here been made to exhaust such possibilities. The scope of my invention is defined in the following claims.

What I claim is:

1. A strip-actuated electric switch comprising a strip of wire of a first diameter having a conducting portion of a greater diameter, a rotatable cylindrical member having a peripheral channel formed therein, the width of said channel being at least equal to said first diameter and less than said second diameter and its depth at least equal to one-half said first diameter, and a pair of circular contacts positioned on the periphery of said cylindrical member but insulated therefrom and on opposite sides of said peripheral channel so as to form an extension of said channel, whereby when said strip is threaded around said cylindrical member, the portion of said first diameter bottoms in said channel without completing a circuit between said circular contacts, whereas said portion of greater diameter cannot enter said channel but lies in the extension thereof and completes a circuit between said circular contacts.

2. Apparatus according to claim 1 wherein the length of the portion of said wire of greater diameter is small relative to the diameter of said contacts, whereby longitudinal movement of said strip rotates said member and produces an electrical connection between said contacts when the portion of greater diameter passes thereover, which electrical connection continues for a substantial period of time due to the continued contact between said portion and said pair of contacts as said length moves along the peripheries of said contacts.

3. A strip-actuated electric switch for operation by a wire of a first diameter having a conducting portion of a greater diameter comprising a rotatable cylindrical member having a peripheral notch with converging walls formed therein, the distance between the open ends of said notch being greater than said first diameter, and a pair of circular contacts positioned

on opposite sides of said notch and insulated from said cylindrical member, the opposed edges of said circular contacts being shaped to form an extension of said notch, whereby longitudinal movement of said strip rotates said member and produces an electrical connection between said contacts when the portion of said strip of greater diameter passes thereover.

4. A strip-actuated electric switch for operation with a strip of wire of a first diameter having a conducting portion of a greater diameter comprising a rotatable cylindrical member and a pair of circular contacts positioned on the periphery of said member but insulated therefrom and spaced apart to form a channel therebetween, the width of said channel being greater than said first diameter but less than said greater diameter, whereby when said strip is threaded around said cylindrical member in said channel, the portion of said first diameter lies in said channel without completing a circuit between said circular contacts whereas said portion of greater diameter abuts the opposed faces of said circular contacts and completes a circuit therebetween.

5. A switch apparatus including a strip member, a length of conducting material positioned on a portion of the strip member, a pair of rotatable annular concentric contact members spaced and insulated from each other, the strip member and contacts being so arranged that the contacts may roll with the passage of the strip member thereover, and the conducting material electrically interconnects the contacts during a portion of their rotation.

6. A switch apparatus including a length of motion picture film having a strip of conducting material on a face thereof between and in line with two adjacent film perforations, a pair of rotatable annular concentric contact members axially spaced and insulated from each other, the film and contacts being so arranged that the contacts may roll with the passage of the film thereover and the conducting strip electrically interconnects the contacts during a part of their rotation.

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