May 31, 1949. J. G. SHEPLER 2,471,786

SAFETY DEVICE FOR MOTION-PICTURE PROJECTORS

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FIG. 1

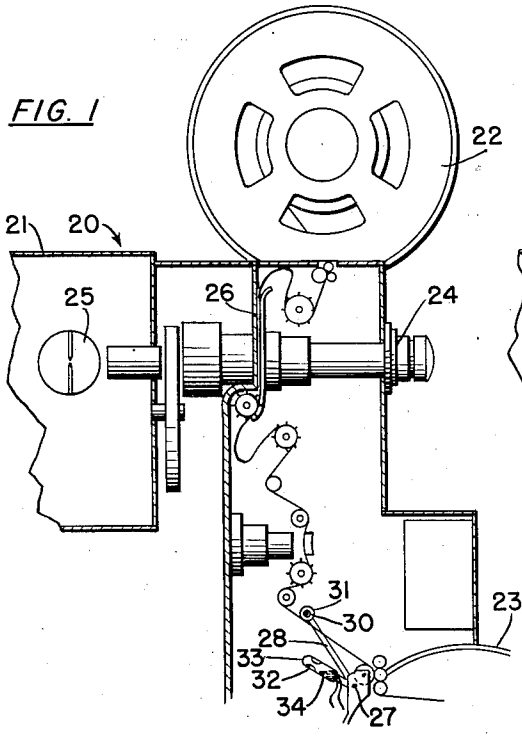


FIG. 2

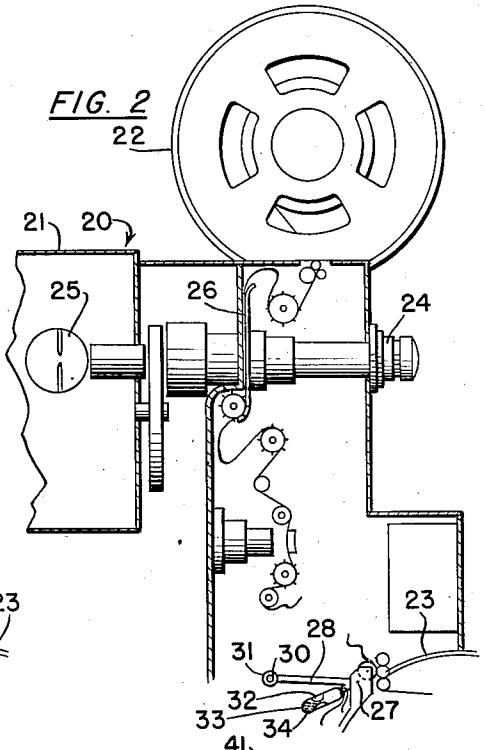
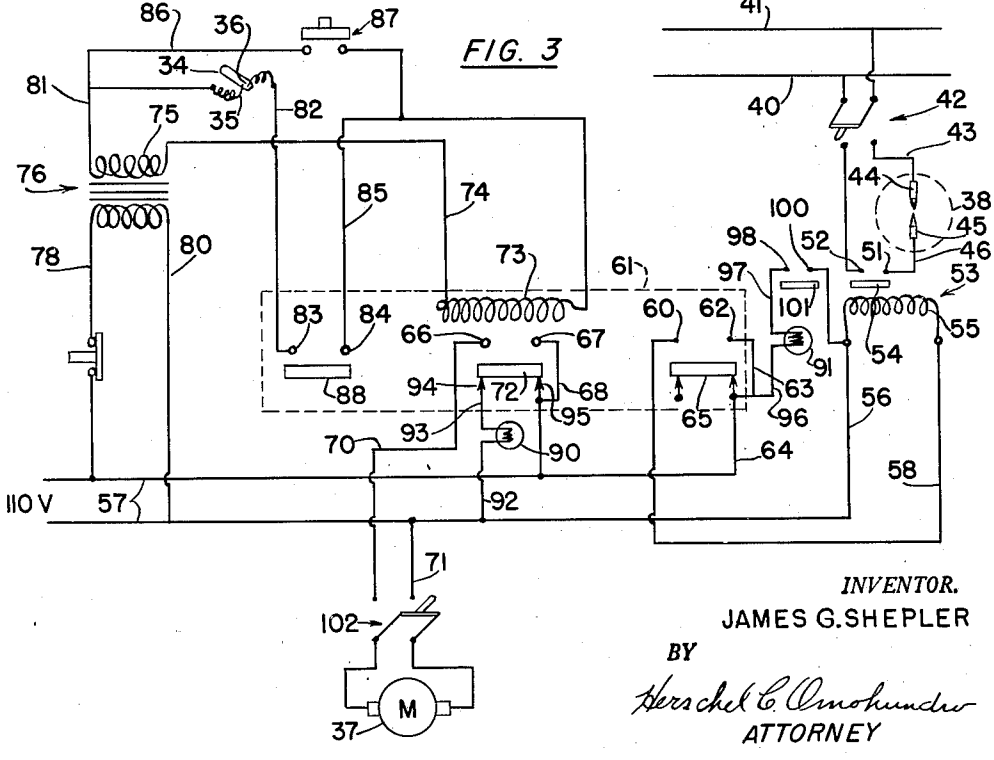


FIG. 3



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SAFETY DEVICE FOR MOTION-PICTURE PROJECTORS

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4 Claims. (Cl. 88—17)

1

This invention relates generally to motion picture projection apparatus and more particularly to a safety device for use in such apparatus to lessen or eliminate the hazard of fire now common in such apparatus. In motion picture projecting machines use is made of a carbon arc lamp which produces a light of great intensity and one which generates intense heat. When the picture machine is in operation, the film is moved past the film gate where light from the arc lamp passes through the film. As long as this film is not exposed an undue length of time in the path of the light from the arc lamp, there is little danger of fire. If, however, the film breaks and jams up in the projecting machine, it may be exposed to the light and heat therefrom for an undue length of time which may cause the film to explode and burn, generating toxic gases and creating a great hazard for the machine operator as well as the patrons of the theater.

One of the objects of this invention is to provide a safety mechanism which will lessen or eliminate the fire hazard by extinguishing the arc lamp the instant the film breaks, so that the source of heat will be eliminated.

It is also an object of the invention to provide a safety mechanism including a film controlled switch which will operate to break the circuit for the arc lamp in the event a break in the film occurs, the switch being of such type that it will not create a fire hazard in itself by arcing or otherwise creating a source of heat.

Another object of the invention is to provide a safety mechanism for motion picture projecting machines which mechanism includes a heavy duty relay switch and a low voltage pilot relay circuit including a second relay switch, the first relay switch controlling a circuit of relatively high amperage for operating the arc lamp of the projecting machine, the pilot circuit carrying relatively low voltage so that the potential source of arcing and heat will be very slight.

It is also an object of the invention to include the circuit for the motor which operates the projecting machine in the safety mechanism so that in the event of film breakage the motor will cease to operate, thus decreasing the amount of film which can jam in the machine after the breakage occurs.

It is also an object of the invention to provide a safety mechanism for motion picture projecting machines, which safety mechanism includes a circuit having a film controlled switch, a plurality of relays and current conductors so connected that when the circuits are broken due to

2

breakage or slack in the film, a push button arranged in the circuit will have to be actuated by the operator before the machine can again be put into operation even though the film operated switch may previously be closed.

Another object of the invention is to provide visual indicators in the form of lamps in the circuit to advise the operator of the condition of the circuit.

With these and other objects in view which will appear as the description proceeds the invention consists in the novel features of construction and arrangement of parts more particularly pointed out in the following description of one form of the invention illustrated in detail in the accompanying drawing.

In the drawing:

Fig. 1 is a side elevational view of a motion picture projection machine illustrating somewhat diagrammatically the safety mechanism forming the subject matter of the present invention.

Fig. 2 is a similar view showing the safety mechanism in a different stage of operation.

Fig. 3 is a diagrammatic view illustrating the electric circuits employed in the safety mechanism.

Referring more particularly to the drawing, the numeral **20** designates generally a motion picture projector. This projector includes a frame **21** having film magazine **22** at the top for film to be displayed and a take-up magazine **23** at the bottom for receiving film which has already been displayed. Between these magazines the frame is provided with the projecting mechanism per se, which mechanism includes a projection lens **24**, a lamp **25** and mechanism **26** between the lamp and the lens for moving the film therebetween intermittently. This mechanism is well known in the art of motion picture projecting and forms no part of the present invention.

When the motion picture projecting machine **20** is set up for operation, the film from the upper magazine is trained around various sprockets forming a part of the projecting mechanism, per se, and through the mechanism for intermittently moving the film, then it is trained around other sprockets and finally introduced into the take-up magazine **23** where it is wound upon a take-up reel.

At a point adjacent the inlet to the take-up magazine, the frame **21** is provided with a shaft **27** on which is mounted for rocking movement a bell crank member **28**. One arm of this member **28** is provided with a pivot **30** on which a small roller **31** is journalled. In the operation

of the device the film is passed under the roller 31 so that the roller rides thereon. The other arm of the bell crank 28 is provided with a bracket 32 to hold the glass bulb 33 of a mercury switch 34. Under normal conditions when there is no film in the machine the weight of the mercury switch will cause the bell crank 28 to rock around the shaft 27 to a position wherein the mercury in the bulb 33 does not engage both of the contacts 35 and 36 of the switch. The circuit controlled by the switch will then be broken. When the roller 31 is disposed in engagement with film which is properly threaded through the machine, the mercury switch will be held in a position wherein the mercury engages both contacts 35 and 36 to complete the circuit.

It should be obvious that if the film should break or slack otherwise develop therein, that the bell crank 28 will rock to a position in which the mercury switch will break the circuit.

As disclosed in Fig. 3, the mercury switch 34 is connected in a pilot control circuit for a second circuit containing the motor 37 employed to operate the projecting machine, and a third circuit containing the coil of a heavy duty relay switch for the arc light 38 forming a part of the lamp 25. The arc light 38 is powered by a separate source of current of high amperage type. This source is indicated in Fig. 3 by the lines 40 and 41. These lines are connected with a conventional manually actuated double pole switch 42 which is open when the machine is not in operation. One side of the switch 42 is connected by a wire 43 to one of the carbon elements 44 of the arc light 38, the other carbon 45 being connected by a wire 46 with one of a pair of contacts 51 and 52 of a heavy duty relay switch 53. The relay switch 53 includes a contactor 54 which, when the device is inoperative, is spaced from the contacts 51 and 52. At this time the arc light will be deenergized. Relay switch 53 also includes a field coil 55 for actuating the contactor 54, one end of which coil is connected with a line 56 leading to a commercial source of current, generally of 110 volt type, indicated in the drawing by the numeral 57, the other end of the coil 55 being connected by a line 58 with a contact 60 of a second relay switch 61.

This relay switch 61 has a complementary contact 62 which is directly connected by lines 63 and 64 with the source of commercial current 57. Relay switch 61 includes a contactor 65 which is normally spaced, when the device is inactive, from the contacts 60 and 62. Relay 61 also includes a second set of contacts 66 and 67, the latter of which is connected by a line 68 with the source of current 57. Contact 66 is connected by a line 70 with one terminal of the electric motor 37, the other terminal thereof being connected by a line 71 with the current source 57. Contacts 66 and 67 are connected when the device is active, by a contactor 72 which also is disposed out of engagement with the contacts 66 and 67 when the device is inactive. Relay 61 includes a field coil 73 having one end connected by line 74 with the secondary 75 of a low voltage transformer 76, the primary coil 77 of this transformer being connected by leads 78 and 80 with the commercial source of current 57. The secondary coil 75 of the transformer 76 has a line 81 extending therefrom, this line leading to contact 35 of the mercury switch 34. The other contact 36 of this switch is connected by a line 82 with one of a third set of contacts 83 and 84 of the relay 61. The other of this pair of contacts is connected by a line 85 with the second side of field coil 73. This side of coil 73 is also connected with a line 86 which is shunted around the mercury switch 34. Line 86 contains a normally open starting switch 87 by which the operation of the circuit is initiated. A contactor 88 is moved, when coil 73 is energized by the closing of switch 87, into engagement with contacts 83 and 84 to complete and hold the circuit closed for coil 73. The switch 87 may then be released without danger of the circuit breaking.

To advise the operator that the device is inoperative, a signal light 90 is provided; this light may be suitably located depending upon the desires of the operator. A second light 91 is provided to notify the operator when the device is in operating condition. Lamps 90 and 91 may be of contrasting colors to render their indications more positive. Lamp 90 is arranged in a circuit including a lead line 92 extending to the current source 57 and a second lead line 93 extending to one of a pair of contacts 94 and 95 forming a part of the relay switch 61. Contact 95 is connected by line 68 with the current source 57. When the field coil 73 of relay switch 61 is deenergized, contactor 72 of the relay switch will be in engagement with contacts 94 and 95. When this bar is so positioned, lamp 90 will be energized and the operator will be advised that relay switch 61 is inoperative.

Lamp 91 is connected by a lead line 96 with wire 64 which extends to the current source 57. It is also connected by a lead line 97 with one of a pair of contacts 98 and 100 forming part of relay switch 53. Contact 100 is connected with the current source 57 by lead line 56. When field coil 73 of relay 61 is deenergized, contactor 65 will be spaced from contacts 60 and 62 and field coil 55 of relay switch 53 will also be deenergized. At this time a second contactor 101 of relay switch 53 will be spaced from contacts 98 and 100 so that lamp 91 will be deenergized.

When it is desired to operate the projection machine, it will be necessary in threading the film in the machine, to position the roller 31 on the film as indicated in Fig. 1. When this roller is so positioned, the mercury switch will be disposed to connect wires 81 and 82. The relay switches 53 and 61 will not be operated at this time however, since contactor 88 is spaced from contacts 83 and 84. To cause the operation of the relay switches 53 and 61 is is necessary to operate push button switch 87 which will complete the pilot circuit for field coil 73 of relay switch 61. When this coil is energized it will attract contactor bar 88 moving the same into engagement with contacts 83 and 84. As soon as this engagement has been made, the push button may be released since the circuit for the field coil is then completed through contacts 83 and 84 and contactor 88. Also when field coil 73 is energized, contactor 72 will be moved into engagement with contacts 66 and 67 and current may then flow from the source 57 to the projection machine operating motor 37 any time the operator closes the conventional switch 102 which is located in this instance, in the lead lines 70 and 71 for the motor 37. The energization of coil 73 also attracts contactor 65 and moves the same into engagement with contacts 60 and 62 completing the circuit for field coil 55 of relay switch 53.

When field coil 55 is energized it will attract contactors 54 and 101 moving the former contactor into engagement with contacts 51 and 52 and the latter contactor into engagement with

contacts 98 and 100. At this time lamp 91 will be energized and the circuit for the arc lamp will be in condition for operation at any time the operator desires. It is then necessary for the person operating the machine to merely close the conventional manual switch 42 in the arc lamp circuit to energize this lamp. The act of closing the push button switch is the only act required of the operator in addition to the usual acts required by the conventional machine.

As long as the projection machine operates normally the safety device will be inactive. As soon, however, as a break in the film occurs or slack develops therein from any cause, sufficient to permit the mercury switch 34 to move to the position shown in Fig. 2, the circuit for the field coil 73 will be broken. When this field coil is deenergized, contactors 65 and 72 will move out of engagement with contacts 60 and 62 and 66 and 67, respectively. The current supplied to the machine operating motor 37 will be interrupted and the film feed discontinued. Current supply to the field coil 55 of relay 53 will also be interrupted permitting contactors 54 and 101 to move out of engagement with contacts 51 and 52 and 98 and 100, respectively. The circuit for the arc lamp 38 will thus be broken and this lamp extinguished thus discontinuing the source of heat which might ignite the film.

When contacts 98 and 100 are disconnected, lamp 91 will be extinguished. As previously mentioned, the deenergization of coil 53 permits contactor 72 to engage contacts 94 and 95 to complete the circuit for the lamp 90 which lamp advises the operator that the device is in the projection machine stopping condition.

From the foregoing it will be apparent that a safety device has been provided in which a pilot circuit is employed to control the operation of the conventional circuits for the driving motor and the arc lamp which in some instances have separate current sources. Since the pilot circuit is powered by the same current source as the driving motor any interruption to the source for such motor will cause the discontinuation of current flow to the lamp thus preventing the concentration of heat on the film which would otherwise occur from the stoppage of the driving motor. It should also be apparent from the foregoing description that the pilot circuit carries only a low voltage and no danger of fire will be present from this circuit.

While the invention has been shown in one form only it is obvious that many minor changes may be made in the construction and relation of parts without departing from the spirit and scope of the invention as set forth in the following claims.

I claim:

1. Safety mechanism for motion picture projectors of the type having a driving motor and an arc lamp comprising a source of current; a relay switch between said current source and said arc lamp; a field coil in said relay switch; a control circuit for said field coil; a second source of current connected in said control circuit, a second relay switch in said control circuit between said second current source and said field coil; a circuit containing said driving motor in parallel with said control circuit; a second field coil in said second relay switch; a pilot circuit containing said second field coil, said pilot circuit being connected with said second current source; a pair of switches connected in series in said pilot circuit one of said switches being controlled by the film and the other being controlled by the field coil in said second relay switch; and a third normally open switch arranged in said pilot circuit in parallel with one of said pair of switches.

2. Safety mechanism for motion picture projectors of the type having a driving motor and an arc lamp comprising a source of current for said arc lamp; a relay switch between said current source and said arc lamp; a field coil in said relay switch; a second current source; a second relay switch between said second current source and said field coil; a second field coil in said second relay switch; a pilot circuit connected with said second field coil; a first switch in said pilot circuit responsive to the energization of said second field coil; a film controlled switch in said pilot circuit in series with said last-mentioned switch; and a normally open, manually actuated, push button switch shunted around the other two switches in said pilot circuit, the momentary closing of said push button switch when said film controlled switch is closed serving to complete the pilot circuit and to close said first switch to maintain said pilot circuit completed.

3. Safety mechanism for motion picture projectors of the type having a driving motor and an arc lamp comprising a source of current for said arc lamp; a relay switch between said current source and said arc lamp; a field coil in said relay switch; a second current source; a second relay switch having a field coil and three contactors controlled thereby, one of said contactors governing current flow from said second current source to the first-mentioned field coil; a circuit for said driving motor, said circuit being controlled by the second contactor of said second relay switch; a manually actuated switch in said driving motor circuit; a transformer having a primary coil connected with said second current source and a secondary coil connected at one end with one end of the field coil of said second relay switch, the third contactor of said second relay switch being connected with the other end of the field coil of said second relay; a film-controlled switch connected with the secondary coil of said transformer and said third contactor; and a normally open manually operated switch shunted around said film-controlled switch and said third contactor.

4. In a motion picture projector, a film take-up magazine having a film inlet opening; film guide rolls adjacent said opening; a film guide spaced from said first-mentioned guide rolls; a bell crank member mounted for pivotal movement adjacent said film inlet opening; a roller journalled on one arm of said bell crank member, said roller normally engaging film extending between said spaced guide rolls and guide; a mercury tube switch carried by the other arm of said bell crank, said switch having spaced contacts electrically connected when said roller is engaged with said film; a relay switch having a field coil and three contactors controlled thereby; a pilot circuit for said field coil, said pilot circuit having one of said contactors and said mercury tube switch in series; a normally open, manually actuated switch shunted around said mercury switch and the contactor arranged in said pilot circuit; a driving motor; a circuit for said driving motor, said circuit being controlled by another of the contactors of said relay switch; an arc lamp; a second relay switch for controlling the operation of said arc lamp, said second relay switch having a field coil and a contactor; and a circuit for the field coil of said second relay, the latter circuit

being controlled by another of the contactors of the first-mentioned relay switch.

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