June 6, 1944. M. R. HUTCHISON, JR 2,350,761

SAFETY SHUTTER FOR PROJECTORS

Filed July 16, 1942

FIG. 1.

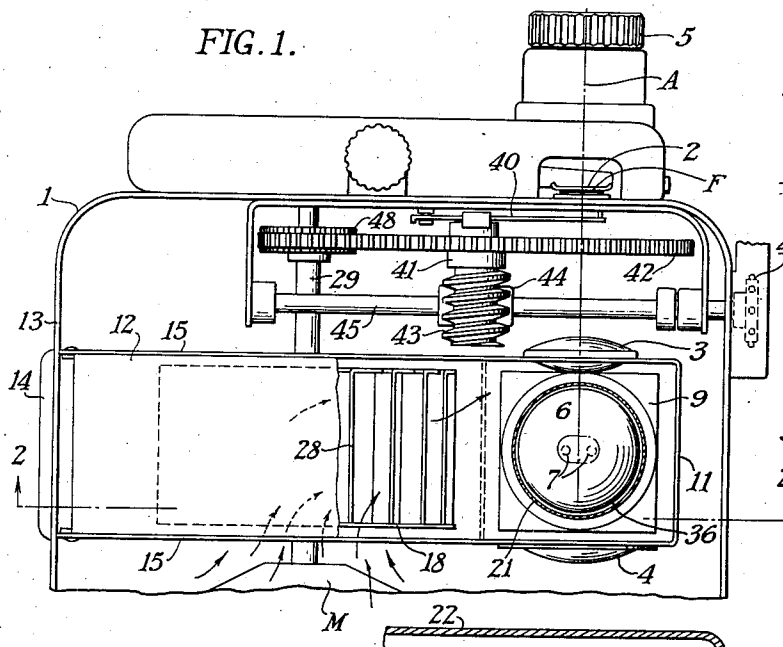


FIG. 4.

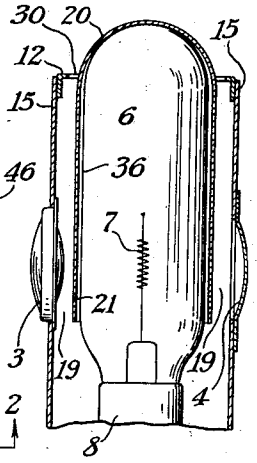


FIG. 3.

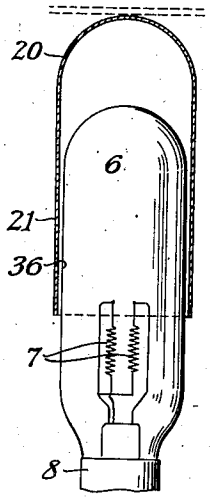
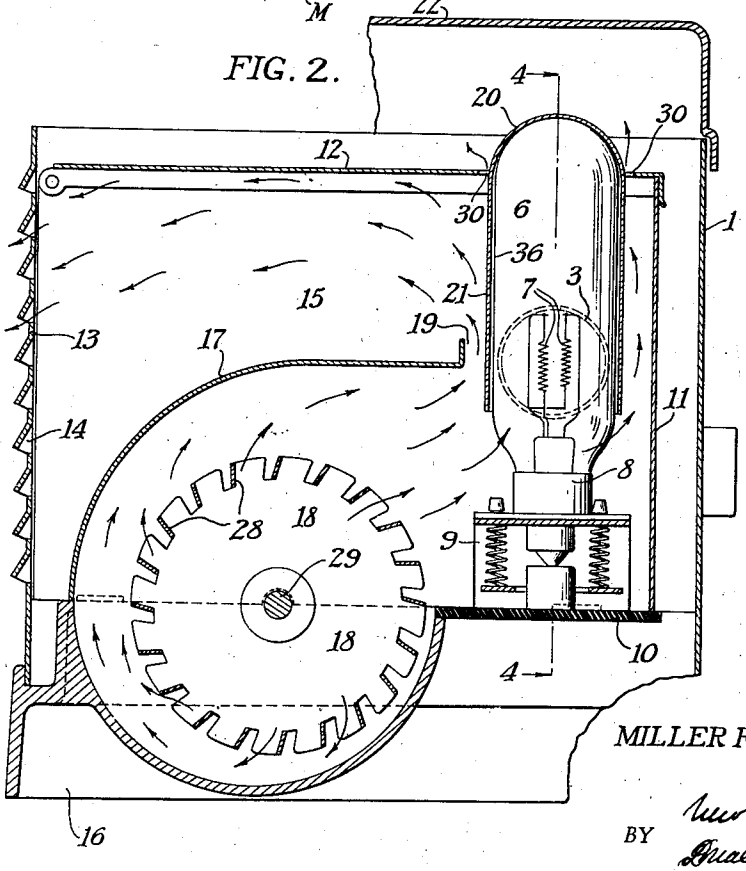


FIG. 2.



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SAFETY SHUTTER FOR PROJECTORS

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7 Claims. (Cl. 88—24)

This invention relates to safety devices for still or motion picture projectors. One object of my invention is to provide a projector with a device which prevents film to be projected from becoming overheated. Another object of my invention is to provide a simple and inexpensive device which will permit light rays to pass to the film, or slide, in position for projection only when a cooling system is in operation. Still another object of my invention is to provide a device of the type described in which there is no mechanical linkage for operating the safety device. Other objects will appear from the following specification, the novel features being particularly pointed out in the claims at the end thereof.

Projection apparatus, particularly where high powered lamps are employed, have usually been provided with some mechanical means for preventing a light beam from passing through the film or slide being projected except at such times as when a cooling system is in operation. Usually these devices are comparatively complicated and require mechanical operating connections of some sort sometimes depending upon speed governors or like devices. While many of these so-called safety shutters have worked satisfactorily, they are usually quite expensive and not particularly suitable for inexpensive apparatus.

My present device has largely eliminated expensive parts and reduced the cost of a safety shutter to a minimum. Moreover, it is simple in construction and requires no complicated assembling operations so that it may readily be assembled by unskilled help.

Coming now to the drawing wherein like reference characters denote like parts throughout:

Fig. 1 is a fragmentary plan view of an inexpensive type of motion picture projector constructed in accordance with and embodying a preferred form of my invention;

Fig. 2 is a longitudinal section taken on line 2—2 through the machine shown in Fig. 1;

Fig. 3 is a view showing the safety cap in position to pass light rays through an optical system; and

Fig. 4 is a transverse section taken on line 4—4 of Fig. 1 through the safety cap and lamphouse showing the safety shutter in an operative or light blocking position.

My invention comprises placing a metallic cap over a lamp so that the cap has a sliding fit therewith and directing air from a blower about the lamp in such a manner that the difference in pressure caused by the blower between the top and the bottom of the lamp may cause the cap to rise to a position in which the bottom of the cap moves away from the lamp filament so that light rays may pass through an optical system and through a film or slide in position for projection.

It is obvious that my invention is suitable for any piece of projection apparatus employing a lamp and a cooling system, whether this apparatus is designed to utilize film, such as motion picture film, slides or the like, or glass slides, and is suitable for use in any case with such a projector where it is desired to reduce the heat passing through the film or slide to a minimum. Thus, my improved heat shutter will open when the cooling air reaches a predetermined quantity and will close when the blower output is reduced or when the blower is turned off.

More specifically, my invention may comprise a projector or casing 1 of any desired shape including a film gate 2 in which a film F may lie in an optical system which, in this instance, may comprise a condenser lens 3, a reflector 4, and an objective carried by a focusing lens mount 5. In the present instance this optical system is arranged along an axis A which lies in a straight line, although of course, if desired, mirrors may be introduced into the system for changing the axis.

I also provide on the axis A a lamp 6 having the usual type of filament 7, this lamp having a base 8 which may be supported in a known type of socket 9. This lamp 6 and its socket 9 may be supported on one wall 10 of a lamphouse which may include an end wall 11, a top wall 12, and an outside wall 13 having openings 14 through which air may pass. There are a pair of parallel side walls 15 included in the lamphouse and the lamphouse may be supported by the casing 1 of the projector and the base 16 thereof. Between the parallel side walls 15 there is a curved wall 17 passing from wall 10 about a blower 18 and extending toward the lamp 6, there being a relatively small opening 19 about the lamp 6 and the cap member 20 which is adapted to telescopically receive the lamp 6.

As shown in Fig. 3, the safety shutter or cap 20 is provided with a skirt 21 of such a length that when the cap 6 strikes the top wall 22 of the projector casing 1, the skirt will be in the position shown in Fig. 3 in which the lamp filaments 7 are exposed so that light rays may pass through the optical system and through a film or slide located in the film gate 2. However, when the cap 20 fully telescopes the lamp 6 the skirt 21 will extend into the position shown in Fig. 4 in

which it effectively prevents light rays from passing from the filament 7 along the axis A to the film gate 2. Thus, it is only when the cap is in its raised position that light is effective at the film gate 2.

The blower member 18 consists of a fan having blades 28 carried by a shaft 29, which shaft may be operated by a motor M. The speed of this motor is such that the fan 28 will create an air pressure about the throat 19 of the lamp which is considerably higher than the air pressure around the top of the lamp, since most of the air may escape through the openings 14 in the end wall 13 of the projector. However, some of the air may pass out through the opening 30 in the top wall 12 which is preferably only of a size to permit the cap 20 to slide freely therethrough.

When the motor M starts to drive the fan blades 28, the motor only slowly gets up to speed so that at first there is comparatively little difference in pressure at the two ends of the cap 20. However, as the speed increases and the blower 18 operates at its maximum speed the pressure differential is sufficient to cause the cap to move from its Fig. 4 position to its Fig. 3 position since, of course, the pressure inside of the cap is substantially the pressure at the throat 19 of the lamphouse and since it naturally moves toward a low pressure area near the top of the lamp. Thus, the velocity of the air from the blower 18 is sufficient to move the cap and, when the motor is reduced in speed or turned off, this pressure differential is altered so that cap 20 is permitted to slide back again into its (Fig. 4) telescoping position, in which it blocks off light, being moved by gravity.

The sliding fit between the cap 20 and lamp 6 is not critical but it is desirable to have the skirt 21 fit rather closely the cylindrical wall 36 of the lamp 6 because I have found that if there is much clearance between these parts the cap is inclined to flutter or rattle against the lamp 6 and thus produce an undesirable noise. However, where there is a free moving fit between the skirt 21 and the wall 36 of the lamp, the cap may move silently to and from its operative light blocking position, and in addition it will be held up against the top wall 22 of the projector casing during all of that time in which the blower 18 is operating at its proper speed.

In the present embodiment of my invention I have shown the projector to be a motion picture projector and the film F may be intermittently moved through the film gate 2 by means of a pull down mechanism diagrammatically shown at 40 which may be operated from the shaft 41 turned by a gear 42 which may also constitute a shutter. This gear 42 turns a worm wheel 43 and worm 44 which in turn operates a shaft 45 carrying a sprocket 46 which moves a film to and from the film gate 2 in a known manner.

It is obvious that with a machine of this type it is not desirable to pass light rays to the film F in the gate 2 until the machine gets up to speed for two reasons. First, because the film may become overheated when it moves too slowly in the gate 2, and, secondly, because the blower 2 has not reached a sufficient speed to move air with the desired velocity around the lamp 6 to cool the lamp and, thirdly, because flicker will appear on the screen. It will be noted that the shaft 29 which turns the fan 28 also turns a gear 48 meshing with the gear 42. Consequently, with this embodiment of my invention the speed of the film varies when the speed of the fan varies and, consequently, the film is moving at the standard speed before the fan can move air with sufficient velocity to raise the safety shutter or cap 20 to a position in which light passes from the filament 7 to the reflector 4 and through the condenser lens 3 and the film gate 2.

If the projector is for projecting slides such as slides made on a cellulosic base alone or film slides mounted on one glass plate or between two glass plates, it is not necessary to consider movement of the slide because it remains stationary during exposure. However, in such cases it is desirable to have the air for cooling the lamp 6 reach a cooling velocity to carry off undue heat before the slides are exposed, so that in such an instance it is still desirable to have a cap which will serve as a safety shutter and which may be moved by differential air pressure upon the operation of the blower.

It should be noted that either a motion picture or still projector does not have the movement of the air stream materially interfered with by the addition of my safety shutter lamp cap. The beneficial safety results are obtained without a sacrifice of the usual cooling air stream which is nevertheless used to operate the safety shutter.

While I have described a preferred embodiment of my invention it is obvious that various embodiments can readily be devised in accordance with my invention and I consider as within the scope thereof all such embodiments as may come within the scope of the appended claims.

I claim:

1. A safety shutter for motion picture projectors of the type including an objective, a film gate and a lamp for illuminating the film gate, the combination with said lamp, of a housing for directing air about the lamp including a restricted area about the bottom of the lamp, a blower for supplying air to the housing through the restricted area, and a cap carried by the lamp and having a sliding fit therewith of a length to prevent illumination from reaching the gate when contacting with the top of the lamp and adapted to be raised to illuminate the film gate when air from the blower passes about the lamp and cap, a stop carried by the projector for limiting upward movement of the cap.

2. A safety shutter for motion picture projectors of the type including an objective, a film gate and a lamp for illuminating the film gate, the combination with said lamp, of a housing for directing air about the lamp including a restricted area about the bottom of the lamp, a blower for supplying air to the housing through the restricted area, and a cap carried by the lamp and having a sliding fit therewith of a length to prevent illumination from reaching the gate when contacting with the top of the lamp and adapted to be raised to illuminate the film gate when air from the blower passes about the lamp and cap, and means included in the casing for limiting the upward movement of the cap to a position in which parts of the cap remain in contact with said lamp.

3. A safety shutter for motion picture projectors of the type including an objective, a film gate and a lamp for illuminating the film gate, the combination with said lamp, of a housing for directing air about the lamp including a restricted area about the bottom of the lamp, a blower for supplying air to the housing at varying velocities through the restricted area, a cap of a shape

closely approximating the shape of the top of the lamp and having a freely sliding fit thereon, said cap including a skirt of such a length as to prevent illumination of the film gate, said cap being slidable on the lamp to a position in which the skirt may move to a position in which the film gate may be illuminated, the sole means for moving the cap comprising air moved by the blower through the housing and around the lamp.

4. A safety shutter for motion picture projectors of the type including a lamp house, an objective, a film gate and a lamp of substantially cylindrical shape and having a rounded end and a filament inside the lamp for illuminating a film gate, the combination with said lamp, of a safety shutter comprising a cap slidably fitting said lamp and including a rounded top and skirt encircling the cylindrical part of said lamp a distance sufficient to cover said filament and block off light to said film gate, a blower, means directing air about said lamp from the blower, and including a restricted area around the lower part of the lamp, said blower by delivering air about the lamp through the restricted area being adapted to lift the cap until said skirt is moved from its light blocking position whereby light may pass from the filament to the film gate, said cap descending to a light blocking position when the air from the blower is insufficient to hold said cap in a raised position.

5. A safety shutter for motion picture projectors of the type including a lamp house, an objective, a film gate and a lamp of substantially cylindrical shape and having a rounded end and a filament inside the lamp for illuminating a film gate, the combination with said lamp, of a safety shutter comprising a cap slidably fitting said lamp and including a rounded top and skirt encircling the cylindrical part of said lamp a distance sufficient to cover said filament and block off light to said film gate, a blower, means directing air upwardly about said lamp from the blower, and including a restricted area around the lower part of the lamp, said blower by delivering air about the lamp and through the restricted area being adapted to lift the cap until said skirt is moved from its light blocking position whereby light may pass from the filament to the film gate, a stop for limiting the movement of the cap on the lamp under the impulse of the air blast whereby at least a portion of said cap may always remain about the lamp.

6. A safety shutter for projectors of the type including a lamp house, a film gate, an optical system passing through the film gate, and a projection lamp mounted in the lamp house, the combination with said lamp, of a cap telescopically fitting said lamp and slidably mounted thereon, a stop limiting upward movement of the cap for keeping at least a portion of the cap encircling the lamp, a blower, means for directing air from the blower to the lamp so shaped as to produce a difference in air pressure between the top and bottom of the lamp when the blower is operating, said cap moving to and from an operative light blocking position in accordance with pressure changes about the lamp.

7. A safety shutter for projectors of the type including a lamp house, a film gate, an optical system passing through the film gate, and a projection lamp, the combination with said lamp, of a cap telescopically fitting said lamp and slidably mounted thereon, an open passageway in the top wall of said housing about the top of said lamp, a blower, means for directing air from the blower to the lamp so shaped as to produce a difference in air pressure between the top and bottom of the lamp when the blower is operating, said means including an air passageway from the blower to the lamp, a restricted throat in the passageway about the lower part of the lamp forming a high pressure area, said open passageway about the top of the lamp forming a low pressure area whereby said cap may move from the high to the low pressure area when the blower is operating.

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