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(54) A MOTION PICTURE FILM PROJECTOR

(71) I, ARUANNO ANGELA, trading as L.A.M.I.P. DI ARUANNO ANGELA, an Italian Citizen, of 20096, Seggiano di Pioltello (Milan), Via Galileo Galilei 38, Italy, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be described in and by the following statement:—

10 This invention relates to improvements in or relating to projectors for endless loop motion picture film carried on a spool in a cassette.

15 It is an object of the invention to provide a cinematographic projector which is of extremely simple construction, reliable in use and which also affords a reduction in overall size due to the arrangement of the components thereof.

20 It is a further object of the present invention to provide a projector, wherein the provision of cooling air to the projection lamp enables halogen lamps to be used which, as well known, are of reduced size, while supplying a high lighting power for an improved image.

25 According to the invention a projector, for endless loop motion picture film carried on a spool in a cassette, comprises a casing having a translucent wall forming a screen for the projected image, and in another wall an opening for the cassette, a housing in the casing for receiving the cassette, one open end of the housing co-operating with the opening in the casing, the other end of the housing defining a projection gate, an optical projection system associated with the projection gate, a light source mounted on the housing and arranged to illuminate the film via first reflecting means, a motor disposed on the opposite side of the housing to the light source, the axis of the motor shaft lying parallel to the axis of the housing which lies between said open end and said other end of the housing and the motor

45 driving a rotatable shutter formed with a cam track in the form of a groove with a variable depth, and a cam follower engaging against the base of the groove and being attached to a pivotable lever, the lever also carrying a transport claw for the film, the projector further comprising driving means for the cassette spool, and two fans, one fan for cooling the motor and the other fan for cooling the light source independently of said one fan.

The invention will now be described with reference to the accompanying drawings in which:—

Figure 1 is a sectional plan view showing a projector according to the invention;

Figure 2 is a vertical sectional view taken along line 2-2 of Figure 1, but on a somewhat enlarged scale;

Figure 3 is a vertical sectional view taken along line 3-3 of Figure 1, showing a further enlarged detail;

Figure 4 is a perspective view of a projector having a slidable mirror supporting frame device placed in position;

Figure 5 shows the device of Figure 4 from the internal side of the apparatus with the mirror in a first position;

Figure 6 is a view similar to Figure 5 with the mirror in a second position;

Figure 7 is a sectional view taken along line 7-7 of Figure 6, wherein the first position of the mirror is shown by chain lines;

Figure 8 is a sectional view taken along line 8-8 of Figure 5; and

Figure 9 is a sectional view taken along line 9-9 of Figure 5, wherein the second position of the mirror is shown by chain lines.

Referring to Figures 1-3, it will be seen that a projector according to the invention substantially comprises a cabinet or casing 10, one side of which includes a translucent screen 11, while an opening 12 is formed in another side for introducing and removing

a cassette (not shown) from a housing 13 carried by a frame 14 positioned internally of the casing 10.

The housing 13 has an open end facing the cassette insertion opening 12 and at its opposite end has a projection opening 14' for projecting the motion-picture frames of the inserted cassette, said opening 14' being aligned with the optical axis of the projection lens 15 (schematically shown) receiving illumination from a light source 16, which is carried on said housing 13 laterally of the magazine housing 13 and which may be, for example, a halogen lamp carried by a support 17, secured by fastening means, such as screws 18 and spacers 19, on a wall of said housing 13. This support 17 comprises a cavity 20 containing the lenses 21 for the optical condenser, so that the light provided by the lamp 16, on passing through an opening 22 in the lamp support in front of the optical condenser 21 and a corresponding opening 23 in the wall of housing 13, will be reflected by a reflecting mirror 24 (shown by dashed lines in Figure 1) contained in the cassette to the frames of the film being drawn in front of the projection opening 14' and to the projection lens 15. The images are then reflected again by a further mirror 25, schematically outlined in Figure 1, to the screen 11.

The projection lamp 16 is mounted within a conduit 26, in which cooling air for the lamp is circulated by a fan 27, the latter being supported on the shaft of an electrical motor 28 carried by said frame 14 on the side of the housing opposite to the projection lamp 16. This cooling air can be vented to the atmosphere, for example, through slits 43 provided on the wall of the casing 10.

The electrical motor 28 also drives projector film transport device, and a second fan 29 for cooling the motor. The axis of the motor shaft lies parallel to the longitudinal axis of the housing 13.

The shaft of motor 28 (Figure 1) carries a pulley 30 which, through a belt 31, is drivably connected to a second pulley 32 fixed to a shutter disc 33 rotatably carried adjacent the film projection opening 14'. As will be apparent, instead of the pulleys 30, 32 and driving belt 31, any other driving system could be used.

The shutter 33 is carried by a spindle 34 mounted on the frame 14 and extending parallel to the housing 13. The spindle rotates in bushings 35 (Figure 3) accommodated within a sleeve 36, and the end of the spindle remote from the shutter is connected to a worm screw 37 driving through a helical gear 38 a gear 39 having a pin 40 engageable with the spool of a film cassette (not shown) which carries an endless loop of film.

Furthermore, as best seen in Figure 1,

the pin 40 has its other end attached to a rotating disc 41 formed with a tooth 41' projecting inwardly of the housing 13 and arranged to engage a corresponding part of a spindle of the cassette spool. It will be apparent that instead of the mechanical system using a helical gear and worm screw drive described, any other drive system could be used, although the system shown is deemed a highly satisfactory approach.

Independently of the cassette spool drive, the transport of the motion-picture film passing in front of the projection opening 14' is effected by a claw 42 having projections engaging the corresponding perforations of the motion-picture film, said claw 42 being driven by a cam rotatably driven by said shutter 33.

More particularly, as shown in the sectional view of Figure 3, the shutter is made of moulded plastic material and on its face facing the claw has a curved cam surface 33' U-shaped in cross-section and in the form of a groove of variable depth which is engaged by a pin or cam follower 43 fixed to said claw 42. The claw 42 and follower 43 are mounted on a lever 101 pivoted at 42' (Figure 2) on the frame 14 for reciprocating in a vertical plane at a rate determined by the gear ratio between the electrical motor 28 and the shutter pulley 32, and in accordance with the profile of said cam 33'. The lever 101 is arranged so that the pin 43 is urged against the surface 33' and as the shutter rotates the pin 43 slides in the groove and imparts displacement in the horizontal and vertical planes to the claw 42. The provision of the U-shaped cam surface 33' in the shutter 33 allows for a more economical construction and generally supplies an accurate, continuously timed positive control to the transport claw 42 of the motion-picture film.

The projection system for projecting images on the screen 11 incorporated in the apparatus casing 10 has now been described and shown. However, it is apparent that the apparatus could be changed into a projector for projection on to a screen externally of and separated from the apparatus.

To this end, the mirror 25 can be moved, or even detached clear of an opening 44 which is provided on the wall of said casing 10 and aligned with the cassette opening 12 and the projection lens 15.

For example, the mirror 25 can be carried by a frame 45 pivoted at 46 on a pin projecting from the casing 10 and provided with a control knob 47. In this case, the mirror can be rotated through 180° about the pin 46 to clear the opening 44. Alternatively the mirror carrying frame 45 can be slidably carried by suitable guides pro-

vided internally of the wall of said casing 10. It should be apparent that the use of the above alternatives depends on the particular arrangement used for the frame 14 and members carried thereby.

The apparatus according to Figures 4-9 is generally similar to that of Figs. 1 to 3 with a modified movable mirror device and comprises within its casing 10 built-in screen 11 and a movable mirror supporting device, designated as a whole at 54, and placed within a suitable housing provided in said casing 10. In its portion inside of the casing, said device 54 comprises an inclined mirror 57. The light beam from the projection lens of an image projection system, (not shown in Figs. 4 to 7), can either be reflected from the inclined mirror, on to the screen 11, or can exit from the apparatus through an opening provided in the casing 10 to be projected on an external screen, that is with the inclined mirror 57 displaced from the path of the light beam.

The device 54 comprises a fixed frame 55 and a movable mirror supporting frame 56, carrying the mirror 57 and a control knob 58.

The fixed frame 55 comprises an external plate 61, preferably but not necessarily provided with grid openings 62 for the passage of cooling air, and fitted with a protective transparent sheet or window 63, which is carried by a lug portion 64 of the plate and attached, for example, by tangs 65 accommodated within suitable grooves 66 in the plate. Two strips 67 and 68 project from the plate 61 on that side which, when the device is assembled, faces inwardly of the apparatus, these strips 67 and 68 outwardly carrying engaging means, such as projections 67' and 68', for clamping within the housing provided in said casing 10 and internally having parallel guide grooves 69 and 70. The stationary frame 55 also has a slit 71 formed in the plate 61 and parallel to the grooves, the function of which slit will be explained.

The movable frame 56 (Figure 6) comprises a preferably opaque bottom plate 72, laterally extended by guide projections 73 and 74 suitable for sliding engagement in the grooves 69 and 70; and two side tabs 75 and 76 carrying the inclined mirror 57 therebetween, the mirror also being supported by supports 77. The mirror can be secured in place by gluing, or any other suitable means, or the tabs 75 and 76 can have stop members on the opposite side of the mirror relative to the supports 77 for clamping the mirror in place.

Reference numeral 79 designates a stiffening plate which can be provided, if required.

The control knob or handle 58 is made fixed to the movable frame 56, and an end

of the knob 58 extends through said slit 71; the ends of said slit 71 operate as ends of the stroke of the handle. The handle 58 can be fixed to a tab, such as tab 75, in any suitable manner. In the embodiment shown, a peg 80 is provided integral with the tab 75, on which the handle is attached through a hole in the handle.

The preferred material for the movable mirror device is a mouldable plastic material.

As will be readily understood from the drawings and the foregoing description, in assembling the projector, the previously assembled movable mirror device is fitted on the casing 10, engaging the fixed frame. By moving the handle 58, the movable frame can be caused to slide relative to the stationary frame. At the first position of the movable frame (Figures 4 and 9 and as shown by chain lines in Figure 7), the projection beam is reflected by the mirror and at the second position (Figures 5 and 7 and shown by chain lines in Figure 9) the projection beam passes outside the casing through the transparent window 63.

Changes and modifications can be made to the present invention to adapt the apparatus to any type of film and associated cassette, such as Super eight, Eight mm, and Single eight.

WHAT I CLAIM IS:—

1. A projector, for endless loop motion picture film carried on a spool in a cassette, comprising a casing having a translucent wall forming a screen for the projected image, and in another wall an opening for the cassette, a housing in the casing for receiving the cassette, one open end of the housing co-operating with the opening in the casing, the other end of the housing defining a projection gate, an optical projection system associated with the projection gate, a light source mounted on the housing and arranged to illuminate the film via first reflecting means, a motor disposed on the opposite side of the housing to the light source, the axis of the motor shaft lying parallel to the axis of the housing which lies between said open end and said other end of the housing and the motor driving a rotatable shutter formed with a cam track in the form of a groove with a variable depth, and a cam follower engaging against the base of the groove and being attached to a pivotable lever, the lever also carrying a transport claw for the film, the projector further comprising driving means for the cassette spool, and two fans, one fan for cooling the motor and the other fan for cooling the light source independently of the said one fan.

2. A projector as claimed in claim 1, wherein said other fan is carried on the shaft of the motor, and a conduit conveys

air from the fan along the conduit to said light source which is mounted in said conduit.

3. A projector according to claim 1 or 2 comprising an opening in the casing through which the image may be projected externally of the casing, and a second reflecting means which is pivotable or slidable relative to the casing so as to be selectively in a position over said opening to reflect the image onto said screen or in a position clear of said opening to allow said external projection of the image.

4. A projector according to claim 3 wherein the second reflecting means is supported in a first frame and is movable by an operating member projecting externally of the casing.

5. A projector according to claim 4 wherein the second reflecting means is mounted in a second frame supported by the first frame, the first frame being fixed

to the casing and formed with said opening for the external projection of the image, the second reflecting means being constituted by a mirror and the second frame being slidable relative to the first frame by said operating member.

6. A projector according to claim 5 wherein the operating member is a handle secured to the movable frame by the engagement of a peg on the second frame with a hole in the handle.

7. A projector for endless loop motion-picture film carried on a spool in a cassette substantially as described with reference to the drawings.

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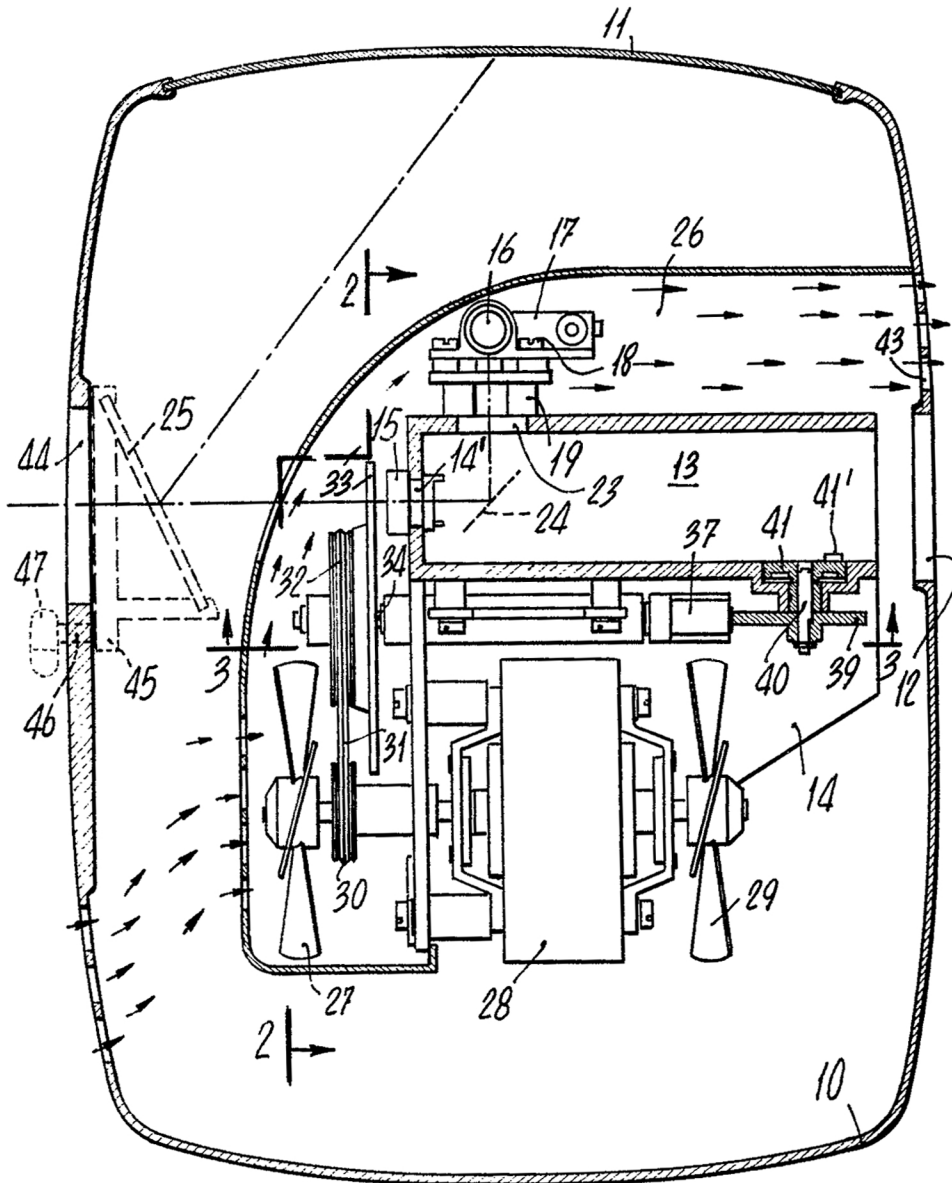


FIG. 1

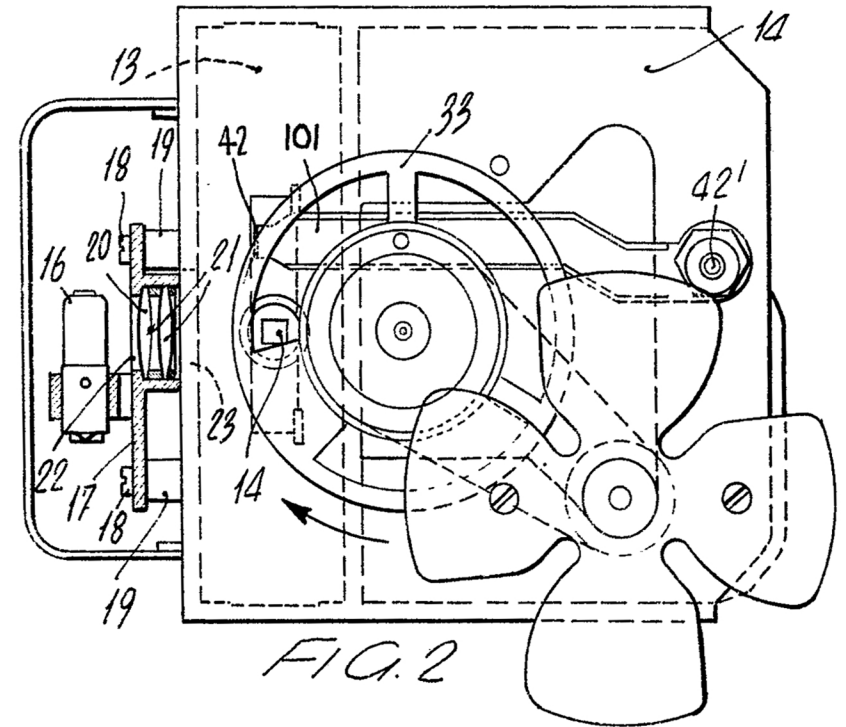


FIG. 2

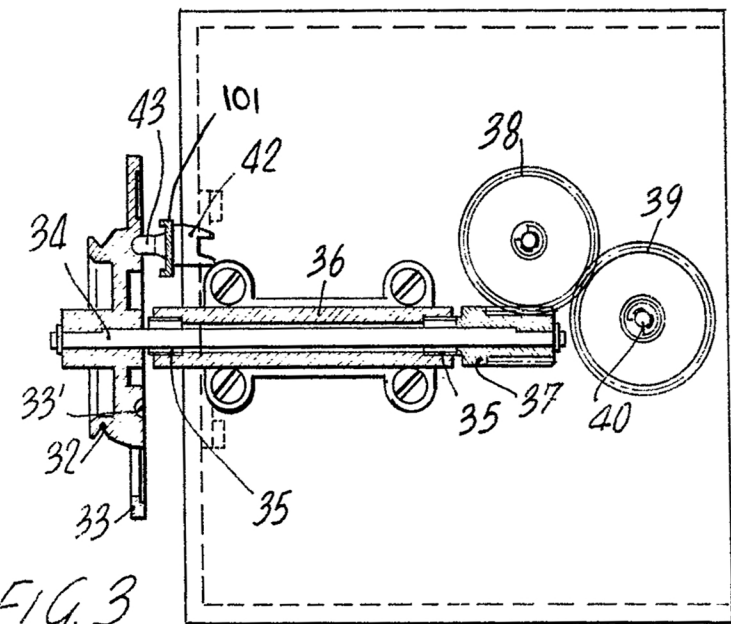


FIG. 3

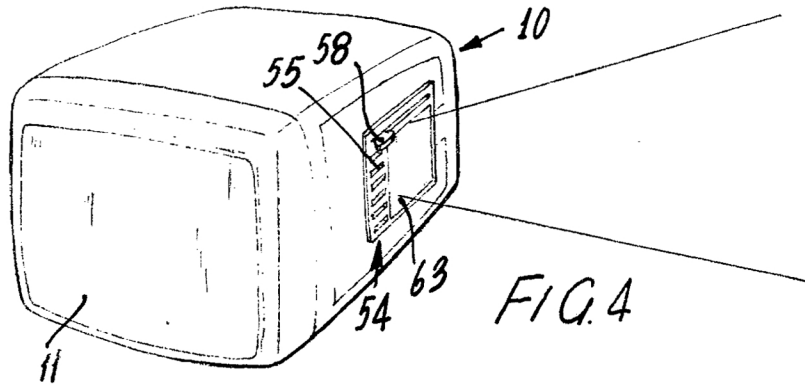


FIG. 4

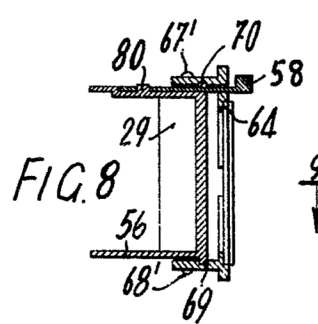


FIG. 8

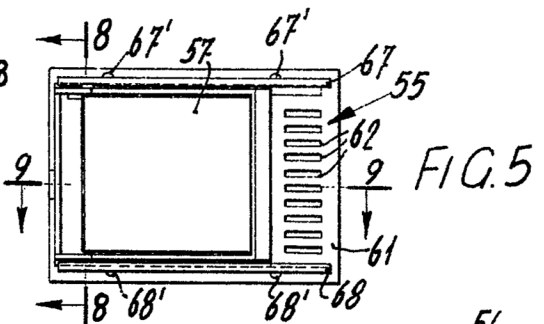


FIG. 5

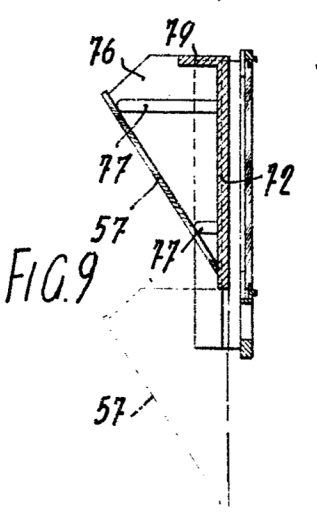


FIG. 9

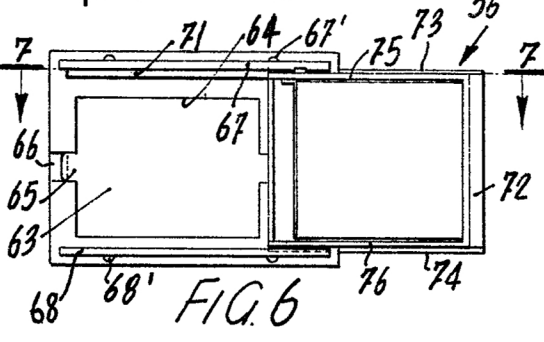


FIG. 6

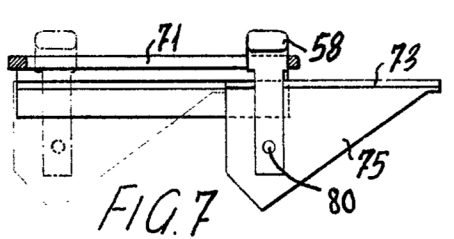


FIG. 7