UNITED STATES PATENT OFFICE

2,050,494

MOTION PICTURE PROJECTOR FOR SOUND MOTION PICTURES

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Application August 8, 1933, Serial No. 684,207

1 Claim. (Cl. 179—100.3)

This invention relates to apparatus for reproducing sound and motion pictures from film records and, more particularly, the invention is directed to a small portable type of apparatus especially designed for use by amateurs in home projection and in other analogous uses and wherein the smaller sizes of motion picture film are employed.

An object of the invention is to provide an apparatus of this kind of small and compact form and of such structural simplicity that it may be readily set up for operation by relatively unskilled operators without involving undue preparation or complicated equipment and adjustment.

A further object resides in the provision of projecting apparatus wherein improved sound reproducing means are utilized by which the sound records on the projected film are faithfully and pleasingly reproduced in audible form.

With these and other objects in view, which will appear as the description proceeds, the invention consists in the novel features of construction, combination of elements and arrangements of parts hereinafter fully described and pointed out in the appended claim.

In the accompanying drawings:

Fig. 1 is a view in side elevation of the combined sound and motion picture reproducing apparatus comprising the present invention;

Fig. 2 is a horizontal sectional view taken through the sound reproducing means of the apparatus on the plane indicated by the line II—II of Fig. 1;

Fig. 3 is a vertical transverse sectional view taken on the plane indicated by the line III—III of Fig. 1;

Fig. 4 is a vertical sectional view taken through the sound reproducing mechanism on the plane indicated by the line IV—IV of Fig. 2.

Referring more particularly to the drawings, and to the specific embodiment of my invention herein selected for illustration and detailed description, the numeral 1 designates the pedestal base of the machine. The lower surface of this base may be provided with a felt or rubber cushion 2 which permits the machine to be placed on a table or other suitable form of support without marring the table and at the same time minimizing vibration in the machine during its operation. Pivotally carried by the upper end of the base 2, as at 3, is a foldable head 4, which is provided with a cylindrical casing 5 in which may be mounted any of the usual types of strong incandescent lamps used in motion picture projection. The casing 5 may be provided, as usual, with a fan for the purpose of dissipating heat incident to the operation of the lamp, not shown, disposed in the casing. Associated with the casing 5 and carried by the head of the machine 5 are the usual adjustable projection lenses 6 and shutter mechanism 7, and a motion picture film 8, containing a sound record, is brought into registration with the parts 5 and 7 in the usual manner for the projection of light images on the film. The mechanism so far described is of standard construction and does not form per se a part of the present invention, hence a further detailed description thereof has been omitted.

Carried by the head 4 is a film holder or reel 9 upon which the film 8 is spirally wrapped. In training this film through the sprockets and roller guides of the machine, it is first passed around the under side of a roller 10 carried by a fixed arm 11 connected with the head 4. The film is then trained over a roller 12 arranged to rotate about a stud axis 13 and thence into contact with the circular surface of a horizontally disposed cylindrical casing 14 in which is contained a standard photoelectric cell 15. Exteriorly the casing 14 is provided with annular guides, as shown in Fig. 2, to maintain the sound portion of the film in registration with a small light aperture 16 formed in the side wall of the casing 14 in alignment with the light-sensitive portion of the cell 15.

To govern the operation of the cell in accordance with the so-called "variable-area" sound record imposed on the film, the head 4 carries a housing 17 in which is positioned an incandescent lamp 18 of appropriate candle power. The filament of the lamp 18 is disposed in alignment with an opening 19 formed in one of the side walls of the housing 17. Secured to the head 4 and horizontally aligned with the aperture 16 and the opening 19 is a lens housing 20. Mounted in the end of the housing 20, immediately adjacent to the lamp 18, are reversely disposed plano-convex lenses 21, which direct a light beam through an aperture 22 provided in an opaque 45 baffle wall 23. The housing 20 is reduced in cross sectional area beyond the wall 23 as at 24 and terminates, adjacent to the film 8, in an enlargement 25 in which is provided a pair of condensing lenses 26. By means of this lens arrangement, a fixed, uniform light beam is focused on the sound area of the film so that the images of such light record will be transmitted to the photoelectric cell 15 in the intermittent, vibratory form incident to the recording of sound en-
ergy on motion picture film. The photoelectric cell responds, as usual, to these light fluctuations to establish similar fluctuations in an associated electrical circuit which leads to associated amplifying and sound reproducing means (not shown) through the conductors 27, as disclosed in my prior application Serial No. 625,803 filed June 29, 1922.

Below the casing 14, there is mounted on the head 4 a pair of rollers 28 and 29 around the peripheries of which the film is trained through approximately 180 degrees for each roller. To stabilize the motion of the film as it is being drawn past the light aperture 16 in order to prevent unevenness in its fixed rate of travel, the roller 29, as shown in Fig. 3, has fixed there-into a shaft 30, which is mounted in roller or other suitable type of antifriction bearings 31 carried in connection with the head 4. The outer end 32 of the shaft 30 is equipped with a heavy inertia or fly wheel 33 which functions to stabilize the speed of rotation of the roller 29 and to provide for the steady movement of the film through the sound reproducing zone. Below the roller 29, there is arranged a circular guide 32 with which the film engages during its passage into contact with the upper feed sprocket 34 of the picture projecting mechanism. The film is maintained in contact with a large portion of the circumference of the sprocket 34 by a spring pressed friction shoe 35. The film is looped as at 36 following passage around the roller 34 and is adapted to be retained for straight linear travel in the shutter guide 37 of the picture projecting apparatus. Upon release from the guide 37, following registration with the lens mechanism 6, the film is again looped as at 38 and passed around a lower guide sprocket 35 also provided with a friction shoe 36. The film is then secured to a “take-up” reel 41 detachably mounted on an arbor 42 which is supported in connection with the frame or head 4 of the machine.

When not in use, the head or frame 4 of the machine may be moved bodily about the pivot 3 to a lowered position and the reels may be disconnected from their respective arbors, thus enabling the machine to be placed in a case of relatively small dimensions for storage or transpor- tation purposes. When the machine is set up for operation, the frame or head of the machine is revolved to the position disclosed in Fig. 1, and a set screw 43 may be employed to limit and adjust the upward swinging movement of the frame or head, the screw 43 being carried by a threaded lug 44 formed with the base 1.

From the foregoing, it will be seen that a combined sound reproducing and picture projecting apparatus has been provided characterized by its exceptionally simple, compact and readily accessible form. The arrangement of the several rollers and guides provides utmost convenience in the matter of threading the film through the machine and insuring its proper registration with both the sound reproducing and picture projecting mechanisms. It has been my purpose in the development of this invention to render the apparatus so simple and readily understood that it may be successfully employed for use in ordinary homes by relatively unskilled operators and at the same time to admit of the employment of 16 mm. film which is so generally used in amateur motion picture work. While I have attained simplicity in this regard, I have nevertheless embodied in the apparatus sound reproduction of very high quality and in every way favorably comparable with commercial large size projectors. I attribute this quality primarily to the uniform travel of the film past the light aperture 16. It will be noted that the fly wheel roller 29, as shown more particularly in Fig. 4, is disposed in advance of the movement imparting sprocket 34 of the film. While the sprocket 34 is driven by a substantially constant speed electric motor 45, yet due to the engagement and disengage- ment of the teeth of the sprocket with the feed openings 46 on both sides of the film, minute vibrations may be imparted to the film which would produce an uneven motion of the latter in traveling over the aperture 16. To avoid this un- evenness, I utilize the feed rollers 28, 29 and 33 and dispose the latter relatively to each other so that a small amount of slack, as indicated at A, will be provided in the film during the travel of the latter from the aperture 16 to the drive sprocket 34. I have found in such this small degree of looseness, as it were, in the film absorbs unsteadiness attributable to the sprocket operation so that smooth linear travel of the film at a uniform rate of movement past the sound reproducing mechanism is obtained.

While the apparatus has been shown and described in its preferred embodiment, nevertheless it will be understood that various changes may be made from time to time in the arrangement of the working parts without departing from the spirit and scope of the invention as set forth in the appended claim.

What is claimed is:

In combined motion picture and sound reproducing apparatus, a supporting frame, electro-responsive sound reproducing means including a stationary casing supported by said frame and provided internally with a chamber for the reception of a photoelectric cell, said casing being provided externally with an arcuate film guiding surface, there being an aperture in the wall of said casing in registration with the light-sensitive area of said cell and said guide surface, a pair of film guiding rolls rotatably supported by said frame above and below said casing for the guidance of motion picture film having a sound record imposed thereon, said rolls being of such diameter and disposed relatively to said casing as to cause the film during its passage over the stationary guide surface of the casing to assume substantially the configuration of said guide surface in the region of said opening, means disposed between said rolls and in registration with the opening provided in said casing for maintaining a constant beam of light on the sound record portion of said film during travel thereof past the opening, means including a lens containing barrel, an inertia guide roll for said film disposed in horizontal alignment with the lower of said first-named guide rolls in immediately contiguous relationship with said lens barrel, an inertia wheel rotatable with said inertia roll about the same horizontal axis, a driving sprocket disposed below said inertia roll in vertical registration therewith, and a rotatable idler arranged to engage with the film passing substantially vertically downward from said inertia roll to said sprocket, to provide a region of slackness in said film between the inertia roll and the sprocket.

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