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JUNE 22, 1943.
BY A. P. C.

E. BOLCSKEY
MOTION PICTURE PROJECTORS
Filed Nov. 28, 1941

Serial No.
420,886
2 Sheets-Sheet 1

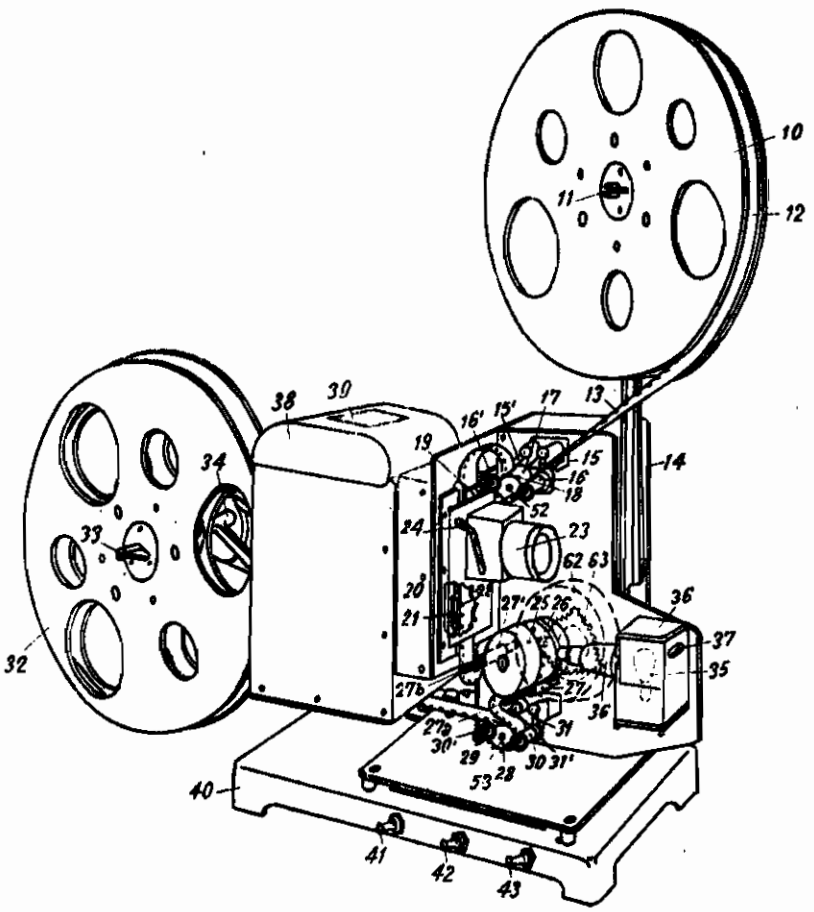

Fig. 1.

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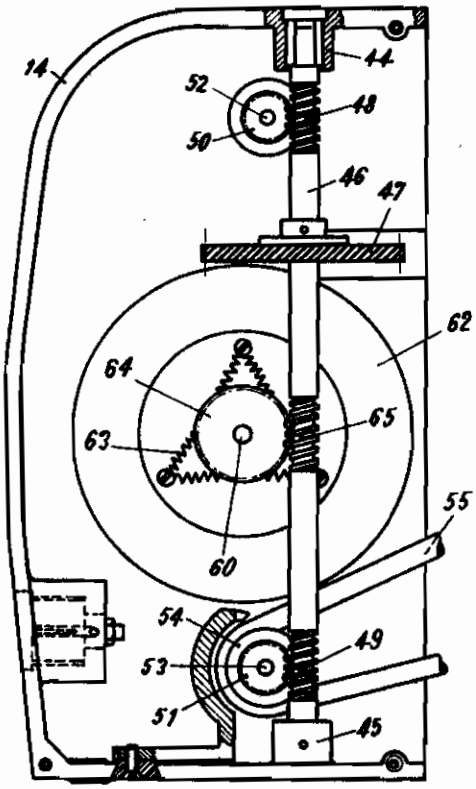


Fig. 2.

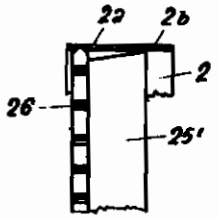


Fig. 5.

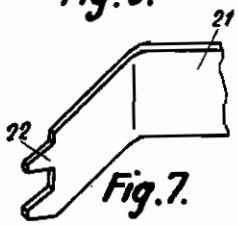


Fig. 7.

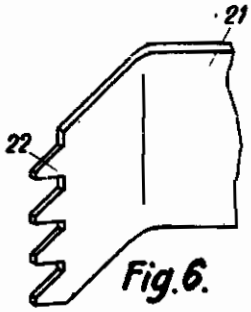


Fig. 6.

Fig. 3.

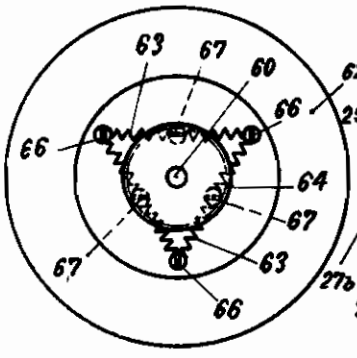
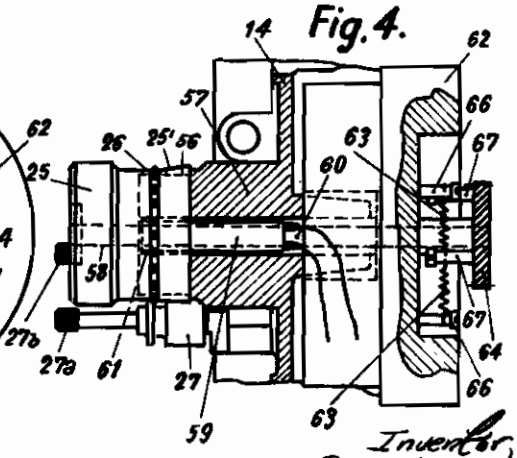


Fig. 4.



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ALIEN PROPERTY CUSTODIAN

MOTION PICTURE PROJECTORS

Erno Bolcskey, Budapest, Hungary; vested in the Alien Property Custodian

Application filed November 28, 1941

My invention relates to improvements in or relating to motion picture projectors, particularly narrow picture projectors and sound projectors.

The invention aims particularly improvements in the guidance and feeding of the film strip.

In the case of the known projectors the device for the reproduction of the sound was perfectly independent from the projectors. The films was first moved through the picture projector and then through the device for the reproduction of the sound. The latter was equipped not only with a separate drawing drum but beside this with at least two, in many cases with several tension, damping and leading drums. Such means had to be used in order to transform the step-by-step movement of the film caused by the fork or any other film conveying means, into a continuous movement. Such contrivances, however, have on the one hand the drawback that they comprise a multiplicity of parts and on the other hand, the film strip could not be moved continuously on the sound track drum even in the case that the movements of the drawing drum were perfectly continuous. This was due to the fact that the movement of the film through the projector was not effected by the sound track drum comprising the photoelectric cell but by a drawing drum arranged behind the sound track drum.

By the invention these drawbacks are completely eliminated in such a manner that the sound will be reproduced with the smallest possible number of elements and the utmost continuity. To realise this, the sound track drum itself is driven. This drive is effectuated completely continuously by moving the sound track drum by means of a flywheel and an elastic coupling. In new projectors, the sound track drum constructed in compliance with the invention may replace from the beginning the drawing drum of the picture projector and may be arranged following the aperture and the means for effecting the intermittent movement of the film. In the case of a combination with a silent motion picture projector, the sound track drum may be disposed behind the picture projector without any particular change in the construction. The apparatus, however, can be applied also by itself for sound reproduction. A further advantage of the apparatus according to the invention consists in that it may be used for films with rightsided perforation as well as for leftsided ones, since the rotating direction of the sound track drum may be inverted by way of a simple transmission gear. By inserting the sound strip in the opposite direction it can be effected that also films being perforated on the opposite side can be turned towards the lense system with their emulsion side. Narrow films as usually applied, are perforated on their right as well as on their left side. In the known sound reproduction apparatusses this reversion could not be effected at all or only by using elaborate changes, as the film did not move symmetrically to the photoelectric cell.

The known apparatusses for sound reproduction have the further drawback of impairing the uniformity of the sound substantially by the circumstance that the film strip bearing on one of its edges the sound track did not lay up uniformly on the sound track drum and that consequently that part of the film bearing the sound track but not supported by the sound track drum got twisted in wavy lines or was, at least, positioned in a non-uniform distance from the photoelectric cell. In the known projectors it has been tried to avoid this drawback by disposing a pressing roller which had the purpose of pressing the film to the sound track drum and by this to compensate the lack in uniformity. Such means proved, however, not satisfactory as, on the one hand, the pressing roller could not be placed near enough to the photoelectric cell owing to constructional reasons, whereas on the other hand, as the emulsion side of the film lays on the drum, the pressing roller can work only on a very small surface between the picture and the sound track. If a roller having a broader surface had been employed, the emulsion on the picture film would have been destroyed.

The above cited drawbacks are eliminated by the invention in such a manner that the sound track drum is formed slightly conically, e. g. with a conicity of 1:100, growing in width from the perforated part towards the sound track. In this way the film lays upon the sound track drum mainly in the vicinity of the sound track, so that the sound track will pass by the photoelectric cell in a shape corresponding exactly to the sound track drum and in a constantly equal distance.

The invention relates finally to an improvement in the conveying fork operating the intermittent movement of the film, which engages the perforations disposed on the edge of the same to the purpose of advancing the film strip.

The known conveying forks are usually carried out with two teeth. According to the invention the conveying fork comprises on the same plane more than two, advantageously four teeth. By

this execution of the fork the following advantages are obtained:

1. The perforations of the film will be worn out more uniformly in consequence of the distributed strain.

2. The movement of the film will be more uniform than hitherto.

3. Even film strips being used for a long time, the perforations of which are damaged, can be moved along well.

In Fig. 1 of the drawing, 10 represents a film-drum rotating around the shaft 11 from which the film 12 runs. This film is equipped on one of its edges with perforations 13, in which the conveying fork as hereinafter described engages. A swinging arm 15 is mounted on the housing 14, on the free end of which a roller 16 is mounted rotatably. In a certain distance from this arm 15 there is a second swinging arm 15' mounted on the housing 14, which carries on its free end a roller 16' similar to the roller 16. Between the rollers 16 and 16' a third roller 17 is mounted which is equipped on its edge with sprockets 18, which engage the perforations 13 of the film 12. The film advances between the rollers 16 and 17 respectively 17' and 16' as indicated in the figure and then runs downward through a vertical guide channel 19. This channel is mounted on the housing 20 and comprises a slot in which the conveying fork 21 operated in the known manner moves upwards and downwards, during which movements engaging the perforations 13 of the film 12 by its teeth 22, by this causing the film to move up- and downwards from the projector lense 23. Arm 24 serves in a well known manner for focussing the lense system of the mechanism. The film is now carried around a drum 25 serving as sound track, which is equipped with sprockets 26 for engaging the perforations 13. This drum is to be described more particularly hereinafter. Two pressure rollers 27 and 27' pressing the film to the drum may be both swung by way of the handles 27*a* and 27*b*, Figures 1 and 4. The film 12 moves first between the drum 25 and the roller 27' then runs around the drum 25 and finally advances between drum 25 and roller 27. Now it reaches the roller 29 which is similar to the roller 17 and provided with sprockets 28 at its edge. Beside the roller 26 there are the roller 30 and 30', which are mounted similarly to the roller 16 and 15' on the rotatable arms 31 and 31'. From the roller 30 the film runs to the film drum 32, the shaft 33 of which is carried by arm 34 mounted on the casing of the apparatus.

While the film is carried around the drum 25, it arrives into the scope of the lense system 36 alighted by the source of light 35 for the sound reproduction. The lense system is carried out in a manner known per se. The housing 36 of the lense system comprises a ventilation opening 37.

The lamp for the picture projection is mounted in a manner known per se in the housing 39, carrying the housing 26 mentioned above and is equipped at its upper part with a ventilation opening 39.

The whole device is mounted on a socket 40 which comprises the switches 41, 42 and 43 for the projector lamp, the driving motor and the lamp 35.

Figure 2 shows the housing 14 seen from behind and shows the drive of the apparatus.

A vertical shaft 46 is rotatably mounted in the projections 44 and 45 of the housing 14. On this a worm wheel 47 is keyd which is driven by a driving motor not shown in the drawing in a manner known per se, by means of a transmission gear. The principal shaft 46 is equipped with worms 48 and 49, which engage worm wheels 50 and 51. The shaft 52 of the wheel 50 supports the conveying roll 17 and the shaft 53 of the wheel 51 supports the conveying roll 26. Thus, when the motor rotates shaft 46 by means of the worm wheel 47, the rollers 17 and 36 rotate too and the film begins to advance.

There is also a pulley 54 mounted on the shaft 53, which rotates the winding drum 32 by way of a string 55 in a manner known per se.

Figures 3 and 4 show the construction and drive of the sound drum.

The drum is formed out as a solid body comprising a sleeve-shaped projection 25', Figure 4. The sleeve 25' is mounted loosely on a suitable projection 56 on a solid part 57 of the housing 14, so that the sleeve 25' with the drum 25 can rotate freely with regard to the parts 56, 57 of the housing. The drum 25, 25' is mounted on a suitably bedded shaft 58. The photoelectric cell 59 is established in a recess of the housing 57 and projects into a suitable recess 61 of the drum 25, 25'.

According to the invention the surface of the sleeve 25' is formed slightly conically, Figures 4 and 5, so that the film 12 is pressed sufficiently by the rollers 27 and 27' on to the sleeve 25' forming the guide of the sound track, particularly with its parts 2^b supporting the sound track. The picture track of the film is indicated at Figure 5 by 2^a.

According to the invention the drive of the sound track drum is operated in the following way:

A flywheel 62 is keyed on the shaft 60 of the drum, Figure 2–4, which is coupled with a wheel e. g. with a worm wheel 64 arranged loosely on the shaft 60, by means of springs 63. The wheel 64 is rotated by a worm 65 of the principal shaft 46, Figure 2. The springs 63 are mounted on the one hand on bolts 66 fixed in the flywheel 62 and on the other hand on bolts 67 fixed in the wheel 64. In the drawing three bolts 66 and 67 and a corresponding number of springs 63 are shown.

The wheel 64 may also be driven by a separate motor.

The fork 21 advances the film 12 in a known manner intermittently along the picture projector 23. This intermittent movement must be transformed at the sound track 25, 25' into a continuous movement which succeeds by the above described drive of the drum 25, 25' in a simple manner.

Figure 6 shows an advantageous way of execution of the conveying fork 21.

According to the invention the fork comprises, unlike the known construction in Figure 7, not two but more, preferably four conveying teeth 22, which engage the perforations 13 of the film in a manner known per se. The teeth 22 are arranged at equal distances which correspond exactly to the distances of the perforations 13 of the film. As in new films the perforations are provided at perfectly equal distances, the edges of the perforations are worn uniformly by the teeth 22 during the advancing of the film. After a certain time of wear, however, the edges of the film become damaged. If the film is moved by a known fork 21, comprising only two teeth, the film will advance non-uniformly. Besides, the undamaged holes will also be soon torn in at their edges. Now, if two adjacent holes were

damaged, the known conveying fork was unable to push forward the film at all. It had to be waited, until the drawing drum drew the film on. In consequence thereof, the film often tore or the picture was moved intermittently.

When the conveying fork comprises, according to the present invention, more than two, e. g. four teeth 22, the film will always be moved on uniformly and continuously, even if a part of the holes are damaged at their edges. An interruption of the conveying of the film and the tearing of the film is thus avoided.

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