

Dec. 6, 1932.

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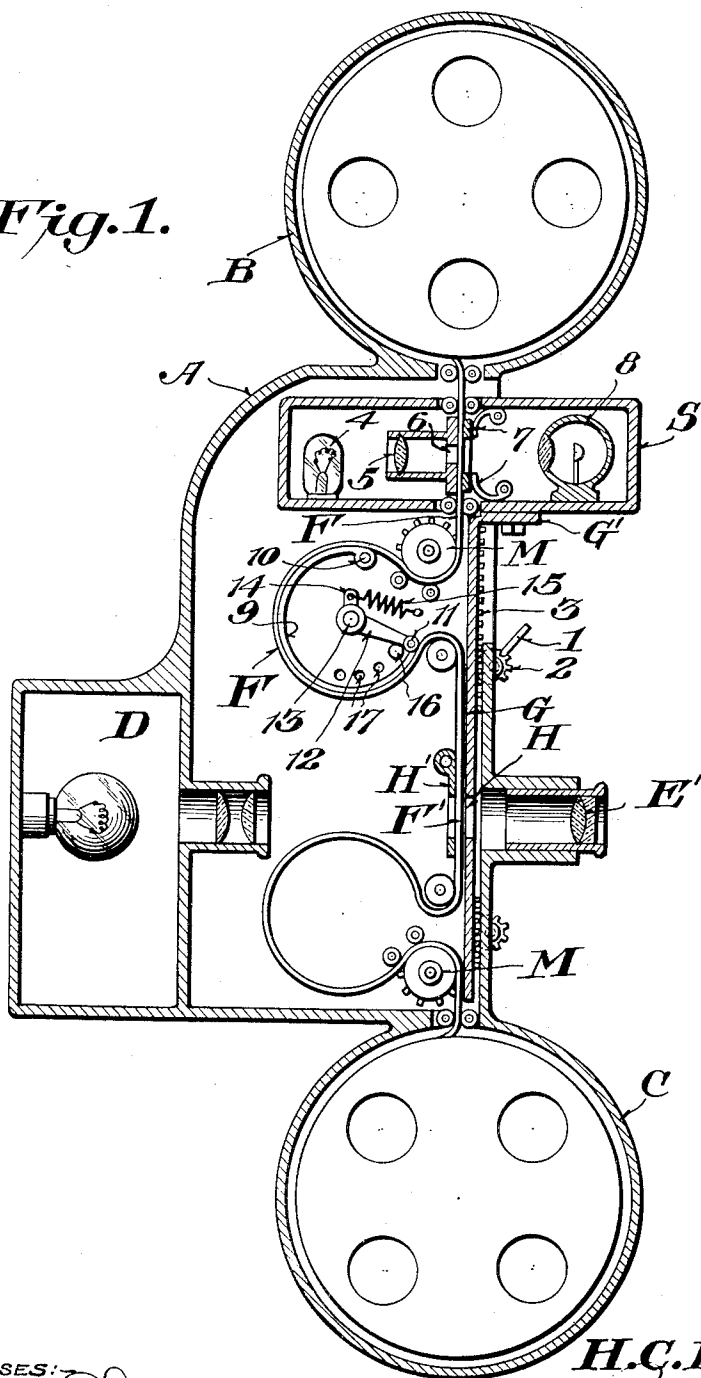
1,889,798

APPARATUS FOR REPRODUCING SOUND AND PICTURES

Filed May 29, 1929

2 Sheets-Sheet 1

*Fig. 1.*



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APPARATUS FOR REPRODUCING SOUND AND PICTURES

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2 Sheets-Sheet 2

*Fig. 2.*

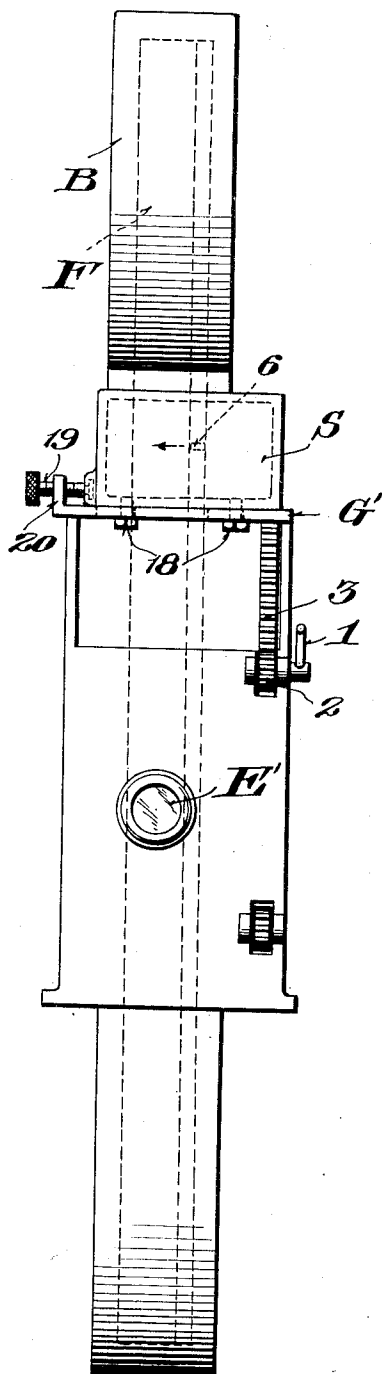


*Fig. 3.*

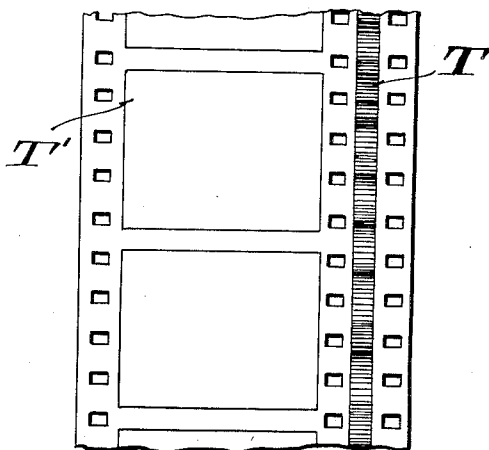


*Fig. 4.*

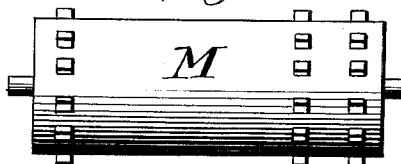
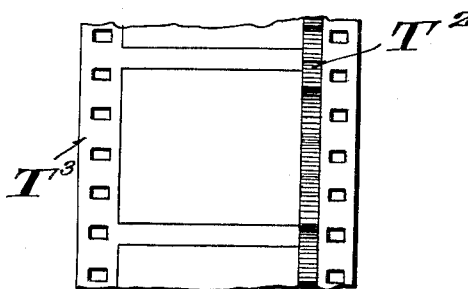


*Fig. 5.*



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## UNITED STATES PATENT OFFICE

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## APPARATUS FOR REPRODUCING SOUND AND PICTURES

Application filed May 29, 1929. Serial No. 367,012.

This invention relates to reproduction of sound and pictures in the form now generally known as talking pictures.

Proper synchronism of reproduction between the sound track and the picture record is of paramount importance in a reproducing machine. While various means of effecting synchronism are now in use, nevertheless, it has been difficult in the past to effect this synchronism in a simple, effective and practical manner, especially considering the lack of standardization of recording and reproducing machines.

Accordingly, the present invention has primarily in view an apparatus including means for initially setting and automatically maintaining the standard loop required in the film or record strip to maintain the proper distance between the picture aperture and the sound aperture for correct synchronization. In that connection, the invention contemplates means for automatically maintaining the required loop in the strip between the intermittent and continuously moving parts of the record and also to simultaneously frame the sound aperture with the picture aperture. Thus, by means of two simple operations, namely, that of threading the film in the machine, and framing the picture, which is always necessary before the projectionist starts his apparatus, perfect synchronization between the picture and sound is obtained and maintained.

With the above and other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts herein-after more fully described, illustrated and claimed.

A preferred and practical arrangement of the invention is shown in the accompanying drawings, in which:—

Figure 1 is a vertical sectional view of a reproducing machine illustrating the present improvements.

Figure 2 is a front elevation of a part of the machine shown in Fig. 1 illustrating both the vertical and lateral adjustments neces-

sary for adapting the machine to different types of record strips.

Figure 3 is an enlarged detail view of a combined picture and sound record made on a single film with the sound track on the outside of the picture sprocket openings.

Figure 4 is a detail elevation of the type of sprocket used in the reproducing apparatus.

Figure 5 is a detail view of a portion of a film wherein the sound record is within the marginal tractional edges of the film and occupies a part of the picture track.

Similar reference characters represent corresponding parts throughout the several figures of the drawings.

In the reproduction of picture and sound records to produce talking moving pictures it is essential to maintain an accurately uniform distance between the axis of the picture projecting aperture and the axis of the sound projecting aperture, and furthermore, it is essential to maintain a proper length of idle or slack film between the intermittently moving portion of the film and the continuously moving part so that the sound may be produced continuously while the pictures are intermittently moved at the proper rate per second before the picture projecting aperture.

In the production of motion pictures there is a constant tendency of the film to creep ahead of the picture aperture which will, if not corrected, result in the showing of a part of two pictures on the screen at once. Therefore, it is necessary for the operator or projectionist to keep the picture aperture "framed" and while this is a comparatively simple matter in projecting only pictures nevertheless it has presented considerable difficulty in the projection of sound with the pictures because it has been necessary for the operator to not only maintain the picture properly framed but to also maintain the sound aperture properly spaced with reference to the picture aperture so that the sound record will also always be accurately framed.

To overcome this difficulty the present invention aims to mount the means for framing

the picture with the sound reproducing unit so that the movement of the means for framing the picture will simultaneously move the means for framing the record on the sound track. In other words, the present invention contemplates the provision of a common means for framing both the picture and sound apertures.

The record strip or film occupies a relatively fixed position in the projecting machine, that is, it is fed from one reel to the other through a definite system of guides and sprockets M so that while it has a traveling movement, nevertheless, with reference to the axis of the projecting lens the means for framing the picture has an effective adjustable movement and it is the object of the present invention to combine the adjustment incident to the framing of the picture aperture with the adjustment for framing the sound aperture.

In my Patent No. 1,335,651 issued March 30, 1920, I have described the relatively differential movement between the picture and sound films as they pass their translating devices, utilizing enough slack in the film between the intermittent and continuously moving elements to provide for the proper movement of both in the reproducing apparatus.

The present invention represents a carrying forward of the idea expressed in the patent referred to, to the extent that I provide a novel and practical positive means for accurately maintaining the slack of the film in the form of a loop which is controlled by a novel device which may be set by the projectionist according to the type of sound and picture record that is to be shown or reproduced in the apparatus.

In the recording of picture and sound records on films, different types of recording apparatus are employed. In some apparatus the sound aperture may be a greater distance from the picture aperture than in others, and also the sound track may be within or without the picture track. In other words, the present state of the art does not afford a standardization of recording equipment sufficiently accurate to enable records made by different recording apparatus to be readily reproduced on present types of reproducers and even when such machines are re-equipped the projectionist must use considerable tact and experiment in placing the film in the apparatus.

The present invention however aims to overcome this difficulty by providing an adjustable device for maintaining the proper size of the loop at all times so that when the projectionist knows the type of recording machine on which the records were made, he can, by a simple adjustment, set the loop maintaining unit and merely thread the film through the machine and it will be ready for

projection. In other words, the projectionist can readily and accurately determine the proper size loop to be maintained and when his device is once set it needs no further attention.

Referring to the drawings which illustrate one way of carrying the invention into effect it will be observed that the projection apparatus is designated generally as A and includes the supply reel casing B and the take-up reel casing C together with the projection light housing D which cooperates with the condensing lens E to concentrate the light on the projecting lens E'. All of the parts referred to are fixed or relatively stationary one to the other since they are a part of the apparatus casing for the projection of pictures.

Within the casing A there is mounted a movable element G which has in one wall thereof the picture aperture H and film gate H' through which the film is threaded. The movable element G may be adjusted by any suitable and convenient means, such for example, as by the lever 1 which operates a pinion 2 meshing with a rack 3 on the movable element G. The purpose of this arrangement is to properly frame the picture before the projecting lens E'.

According to the present invention it is proposed to consolidate with the movable element G for framing the picture, the sound reproducing unit designated generally as S. This unit S will, therefore, move with the picture framing element G in the same direction and in the same proportion and thus the projectionist may simultaneously frame the sound track with the picture track.

The sound unit S may be of any well known type including the source of light 4, lens 5, sound aperture 6, film gate 7 and the photo-electric cell or other pick-up device 8 all of which is mounted in the casing of the unit S and movable with the picture framing element G.

As previously indicated it is essential to maintain a standard loop in the film F between the sound aperture and the picture aperture, and to that end it is proposed to provide a loop maintaining member 9 which is preferably made of spring metal or the like pivotally supported at 10 and having its other end pivotally secured, as at 11, to an arm 12 which in turn is pivoted in a fixed position as indicated at 13 in the casing of the apparatus. The arm 12 is provided with an offset portion 14 which is engaged by a spring 15 for placing the arm under tension and tending to maintain the same against a stop or abutment 16. This stop may be moved to any one of a plurality of positions as indicated by the sockets or openings 17 thereby to expand the metallic loop 9 according to whether a larger or smaller loop is desired. In the illustration shown the metallic loop 9

is of minimum diameter. By moving the pin 16 to any of the sockets 17 the tensioning spring 15 will rock the arm 12 so as to maintain it in contact with the pin or abutment. In that way the loop will be extended to a more or less greater degree according to which pin the arm 12 strikes against. When the operator of the apparatus knows the type of recording machine that the sound and picture records were made upon and knows the distance between the sound and picture recording apertures of the recording apparatus he can at once set his metallic spring loop 9 to the proper position and then thread the film about the loop. Then by framing the picture aperture through the manipulation of the lever 1 the picture and sound apertures will be automatically framed in the proper synchronized relationship.

If the apparatus for intermittently moving the film before the picture aperture tends to pull the film too fast and to cause it to creep, such creeping will be automatically resisted by the tensioning spring 15 and loop 9 which will at all times seek to maintain its normal position. Thus, after the picture has been initially framed by the manipulation of the element G having the picture aperture H the loop device 9 automatically maintains the picture framed during the operation of the machine.

In addition to the feature of vertically adjusting the picture aperture H and sound aperture 6 simultaneously, another feature of the invention resides in the provision of means for laterally adjusting the sound aperture 6. Figs. 3 and 5 of the drawings, show different types of sound tracks. Fig. 3 shows the sound track T on the outer side of the line of sprocket openings of the picture track T'. Fig. 5 of the drawings shows the sound track T<sup>2</sup> within the marginal limit of the picture strip T<sup>3</sup>. In this latter form of film the sound track T occupies a portion of the film which would otherwise be occupied by the picture. Therefore, as will be clearly apparent from a comparison of Figs. 3 and 5 it is essential to be able to laterally shift the sound aperture 6 to enable the reproducer to be useful in connection with different types of sound and picture records. If the reproducer is used in connection with the type of record shown in Fig. 3 the picture aperture 6 will occupy a position further to the right than it will when a record of the type of Fig. 5 is being reproduced.

Therefore, in order to permit of the lateral shifting of the entire sound reproducing unit S laterally on the shelf G' of the movable element G the casing of the sound reproducing unit S may be provided in its bottom wall with suitable guiding elements 18 and shifting means designated generally as 19. This shifting means may be of any desired form or construction, but in the illustration

shown is a knurled screw mounted in a bracket portion 20 of the shelf G' and has a ball or its equivalent bearing in a socket in the casing of the unit S. By manipulating the screw 19 the entire unit S may be shifted laterally with micrometer accuracy. If it is desired to lock the unit S in its set position the bolts 18 or their equivalent may be tightened up and used for that purpose.

Accordingly, it will be apparent that the sound reproducing unit S may be shifted laterally to adjust the sound aperture 6 to the particular type of sound film being used. This film may be a single film having the sound record either at one side or the other of one line of sprocket openings or where the two records are made on separate films, as for example in my former Patent No. 1,335,651.

From the foregoing it will be apparent that the present invention is primarily directed to coordinated adjustments for effecting the proper reproduction of the picture and sound records on the films. That is to say, the invention contemplates means for initially and subsequently maintaining the picture aperture properly framed with reference to the picture track on the film and to also simultaneously maintain the sound aperture properly framed with reference to the sound track. The picture track is framed through the aperture H and the sound track is framed through the aperture 6 according to the type of film to be reproduced, this being accomplished with reference to the distance apart on the length of the film of the sound and picture records by manipulating the lever 1 or its equivalent and being thereafter taken care of automatically through the loop device 9.

In the illustration shown, the sound reproducing unit S is located in advance of the picture projecting means. However, it will be understood that the spirit of the invention permits of locating the sound reproducing unit on the other side, that is, the leaving side of the picture projecting means. In other words, it is within the scope of the invention to mount the sound reproducing unit S at the bottom of the adjustable member G where the type and style of projector admits of that location. In that event the loop would also be located at the leaving side of the picture projecting means since it is essential that the sound record at all times move continuously while the picture record must be intermittently passed before the projecting lens.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from

the spirit of the invention and scope of the appended claims.

I claim:

1. In an apparatus for reproducing sound and pictures from the same film, the combination of means for initially and simultaneously framing the sound and picture records, and adjustable yielding means for automatically maintaining a standard looped portion of said records between the points of framing of the sound and picture records.
2. In an apparatus for reproducing sound and pictures from the same film, the combination of means for initially framing both the sound and picture records, and means for automatically maintaining the initially framed records during the movement thereof, said means comprising an adjustable loop member about which a portion of the record is led.
3. In an apparatus for reproducing sound and pictures from the same film, the combination of a picture framing element having a picture aperture and a sound framing element having an adjustable sound aperture, and means consisting of a spring tensioned loop member arranged between the sound and picture apertures and adapted to yieldingly maintain the said sound and picture records in proper relation to said apertures.
4. In an apparatus for reproducing sound and pictures from a film bearing both the combination of a picture framing element having a picture aperture and a sound framing element having a sound aperture, said picture aperture and sound aperture being spaced a fixed distance apart, means for shifting said picture and sound framing elements simultaneously with reference to the film bearing the sound and picture records, and means consisting of a yielding loop located between the sound and picture apertures and having the film bearing said records passing thereabout whereby differential movement between the portion of the film passing before the picture aperture and the sound aperture will be compensated for.
5. In a sound and picture reproducing apparatus, the combination of a picture framing element having a picture aperture and a sound framing element having a sound aperture, and means for maintaining a predetermined length of film between the sound and picture apertures, said means comprising a curved member pivotally supported at one end and adjustably mounted at its other end under spring tension.
6. In a sound and picture reproducing apparatus, the combination of a picture framing element having a picture aperture and a sound framing element having a sound aperture, and means for maintaining a predetermined length of film between the sound and picture apertures, said means comprising a curved member having a relatively fixed point of pivotal support at one end, an abutment adapted to be set at any one of a plurality of positions with reference to the other end of the curved member, and a spring tensioned and pivotally mounted arm connected with said last-named end of the curved member and adapted to be maintained against said abutment by spring pressure.
7. In a sound and picture reproducing apparatus, the combination with a vertically adjustable picture framing element having an aperture, of a sound framing element having an aperture, and means for maintaining said aperture at a fixed distance from the picture aperture but adjustable laterally with reference thereto.
8. In a sound and picture reproducing apparatus, a device having an apertured picture framing element, and an apertured sound framing element spaced a fixed distance apart, means for vertically adjusting the device having the picture and sound framing elements simultaneously, and means for adjusting the sound aperture at right angles with reference to the line of adjustment of the picture aperture.
9. In a sound and picture reproducing apparatus, the combination of picture projecting means, sound reproducing means, means for feeding a combined picture and sound record strip through the apparatus, means for simultaneously framing the sound and picture records, means for automatically maintaining a standard length loop of the record strip between the sound reproducing means and picture projecting means, and means for adjusting the sound reproducing means laterally with reference to the line of record strip feed.
10. In a sound and picture reproducing apparatus, the combination of picture projecting means, sound reproducing means, means for feeding a combined picture and sound record strip through the apparatus with both a continuous and intermittent feeding motion, means for projecting pictures from the intermittently moving portion of the record strip, means for reproducing sound from the continuously moving portion of the record strip, means for framing the picture and sound records in the direction of feed of said record strip, and means for adjusting the sound reproducing means laterally with reference to the line of strip feed to adapt the apparatus to record strips having the sound track located within or without the picture track.
11. In an apparatus for reproducing sound pictures from the same film, the combination with sources of reproducing light, of an adjustable member having a picture framing aperture and a sound framing aperture spaced a fixed distance apart and sound reproducing means mounted on said member at one side of said sound framing aperture.

12. In an apparatus for reproducing sound and pictures from the same film, the combination with the picture framing element of a sound reproducing unit integrally mounted with said picture framing elements, and means for simultaneously moving said picture framing element and sound reproducing unit.

13. In an apparatus for reproducing sound and pictures from the same film, the combination with sources of reproducing light, of a unit including a picture framing aperture and a sound framing aperture spaced apart, and sound reproducing means; and means for moving said unit in the direction of the length of the film thereby to effect synchronous reproduction between the sound and picture records.

14. In an apparatus for reproducing sound and pictures from the same film, the combination with an adjustable picture framing element, of a sound reproducing unit mounted on said adjustable picture framing element and including a sound aperture, said picture framing element having its picture framing aperture in fixed spaced relation to the sound framing aperture of the sound reproducing unit, and means for moving the adjustable picture framing element.

15. In an apparatus for reproducing sound and pictures from the same film, the combination of means for initially framing the sound and picture records, and means for automatically maintaining through film adjustment, the proper relationship of the picture and sound records during the operation of the apparatus.

16. In an apparatus for reproducing sound and pictures from the same film, the combination of means for initially framing the sound and picture records, and an adjustable and yielding member for automatically maintaining the proper film slack between the picture and sound framing parts of the apparatus.

In testimony whereof I hereunto affix my signature.

HENRY C. BULLIS.