Dec. 23, 1930. C. L. HEISLER 1,786,301

SOUND RECORDING AND REPRODUCING APPARATUS

Filed Nov. 19, 1928

Fig. 1.

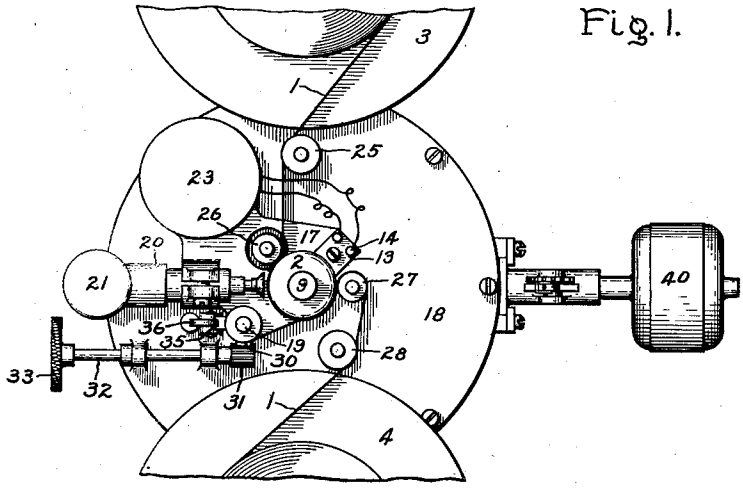


Fig. 2.

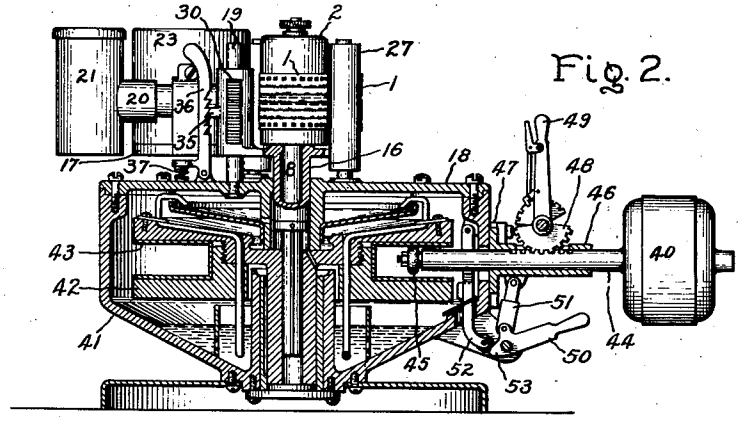
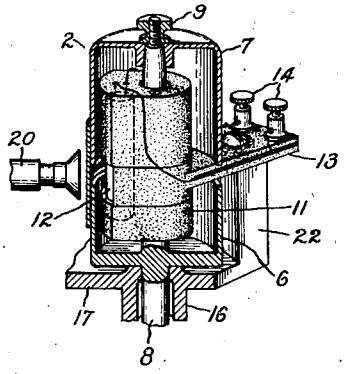


Fig. 3.



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UNITED STATES PATENT OFFICE

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SOUND RECORDING AND REPRODUCING APPARATUS

Application filed November 19, 1928. Serial No. 320,261.

My invention relates to apparatus for recording sound on a film and for reproducing sound from a film record. One of the objects of my invention is to provide an improved apparatus of this character by means of which sound may be recorded successively in a plurality of tracks on the film or may be reproduced successively from a plurality of sound tracks thereon.

My invention will be better understood from the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims. This application is a continuation-in-part of my copending application, Serial No. 203,344, filed July 5, 1927.

Referring to the drawing, Fig. 1 is a plan view of apparatus forming one embodiment of my invention; Fig. 2 is an elevation partly in section of the apparatus shown in Fig. 1; and Fig. 3 is a detail of the film supporting drum and photo-electric cell holder.

In the embodiment of my invention illustrated by the drawing, I have shown a sound reproducing apparatus in which the film 1 bearing a sound record in a plurality of tracks or bands passes over the motor-driven drum 2 by which it is withdrawn from the unwinding reel 3 and fed to the winding reel 4. The drum 2, as shown more distinctly in Fig. 3, is divided circumferentially into two portions 6 and 7 of which the lower portion is fixed to the shaft 8, while the upper portion 7 is readily detachable from the free end of the shaft. To facilitate the quick attachment and detachment of the portion 7 and an accurate fit thereof on the end of shaft 8 these parts are provided with co-operating conical faces and are clamped together by means of the thumb screw 9. The two drum portions are spaced apart a distance slightly greater than the width of a sound track on the film. Within the drum is the holder 11 containing the photo-electric cell 12 and having the supporting arm 13 which extends out through the space between the drum portions. The holder is provided with a suitable window through which the cell may receive light entering through a film on the drum. The leads from the cell are shown embedded in the sides of the arm 13 and terminating in binding posts 14. Shaft 8 is rotatably mounted in the sleeve 16 integral with the supporting plate 17. Sleeve 16 has a bearing in the center of the cover 18 and slides vertically on the guide pin 19 fixed to the cover. Plate 17 supports the optical system 20 including the lamp housing 21 by means of which a light beam of the desired narrowness is focused on the film 1. Plate 17 has the post 22 (see Fig. 3) to which the arm 13 is secured and it also supports the transformer 23 to which extend the leads from the binding posts 14. The film after leaving the reel 3 passes over the roller 25, thence around drum 2, being pressed against its surface by the rollers 26 and 27 and finally over roller 28 to winding drum 4. All four of the above rollers are mounted on the cover 18, rollers 25 and 28 being provided with flanges to guide the film and prevent transverse movement thereof when the drum is raised and lowered. In order to shift from one sound track to another the plate 17 is provided with the rack 30 with which meshes the pinion 31 on shaft 32. This shaft is mounted in bearing lugs on cover 18 and has on its outer end the hand wheel 33. For holding the plate 17 and parts carried thereby in any one of the several definite positions corresponding to the several sound tracks on the film, I have provided the pawl 35 which engages the ratchet 36 pivoted to the plate 17 and held against the pawl by the spring 37.

The shaft 8 is rotated at a substantially uniform speed by the electric motor 40, which for example may be a synchronous motor, the drive connection between the motor and the shaft being such that the shaft may be driven at will in either direction and at various speeds. The apparatus comprising this driving connection is contained in the casing 41 of which the top is the aforementioned cover 18. The shaft 8 is splined to the hub portion of the friction disk member 42 whereby it may move longitudinally while being driven thereby. Member 42 has an annular channel, the opposite sides of which form two friction surfaces and loosely fitting in the channel is

the spool-like lining member 43, the purpose of which is to provide a yielding connection or point of slippage in the drive in the event that the apparatus is unduly overloaded. In the construction illustrated the motor is supported by the tube 44 which is secured to the motor casing and which encloses the motor shaft, the latter having the small friction wheel 45 thereon which is arranged to engage either the upper or the lower surface of member 43. Tube 44 is splined in the bracket 46 which in turn is attached to the casing 41 by the guides 47 permitting a limited vertical movement of the motor and its shaft. Gear segment 48 meshing with a rack on the tube 44 may be rocked by means of the hand lever 49 to vary the position of the friction drive wheel 45 and hence the speed of the drum. To cause the drive wheel 45 to engage the upper or the lower drive surfaces of member 43 as desired I provide the hand lever 50 connected with the bracket 46 by the yielding link 51, suitable stops, not shown, being provided to limit the movement of the lever to insure the proper driving pressure on wheel 45. I also provide the brake lever 52 which is operated by the nose 53 on lever 52 to engage the periphery of driven member 42 whenever lever 50 is shifted to reverse direction of rotation of the drum. In certain cases it may be found more desirable to provide a separate fixed mounting for the motor and connect its shaft with the shaft of friction wheel 45 by means of a flexible connection.

The above described apparatus is particularly adapted for use with films having a sound record thereon which extends in alternate directions along the length of the film in tracks spaced in accordance with the teeth on the ratchet 36 and beginning with the bottom track as viewed in Fig. 2. The film being threaded over the drum the apparatus is started to rotate the drum in the proper direction with the plate 17 in the lowermost position. When the end of the sound record in the lower track is reached lever 50 is shifted, thereby arresting the movement of the drum and then rotating it in the opposite direction. At the same time the hand wheel 33 will be rotated to shift the plate 17 and apparatus carried thereby raising it one notch of the ratchet 36. Similarly successive reversals and shifting of the plate will be made until the entire record has been reproduced.

While I have illustrated my invention as comprising a sound reproducing apparatus it has certain features which are applicable also to apparatus for recording sound on a film in a plurality of tracks. In that case a photocell is not used and the narrow light beam by which the film is exposed is caused to vary in accordance with the sound waves being recorded.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. Apparatus of the character described comprising a convex film supporting member, means for moving the film longitudinally and in opposite directions at a substantially uniform speed, means for projecting a narrow beam of light on the film, means for shifting the light projecting means and the film supporting member transversely of the film, and means for retaining the film against transverse movement.

2. Apparatus of the character described comprising a film supporting drum, means for rotating the drum in opposite directions, means constructed and arranged to project a narrow beam of light on a film supported by said drum and means for simultaneously shifting said light projecting means and said drum axially of the drum.

3. Sound reproducing apparatus comprising a rotatable drum adapted to support a film, rollers arranged to press the film against the drum, a photo-electric cell mounted within the drum, an optical system for directing a narrow light beam on the film and means for moving the optical system in a direction parallel to the axis of the drum.

4. Sound reproducing apparatus comprising a rotatable film supporting drum having a circumferential opening therein, means for directing a narrow light beam toward said drum at the opening therein, a photo-electric cell mounted in the drum, means for preventing transverse movement of the film and means for shifting the light beam and the drum transversely and independently of the film.

5. Sound reproducing apparatus comprising a shaft mounted for rotation and longitudinal movement, a drum carried thereby and adapted to support a film, a photoelectric cell within the drum, an optical system for directing a beam of light toward the drum, means for moving the optical system and the shaft with the drum axially of the shaft, a motor, and a drive connection between the motor and the shaft comprising means for varying the speed and the direction of rotation of the shaft.

In witness whereof, I have hereunto set my hand this 17th day of November, 1928.

CHARLES L. HEISLER.