Feb. 16, 1943. J. J. HARDENBERG 2,311,383

FILM UNWINDING MECHANISM

Filed June 30, 1939

Fig. 1

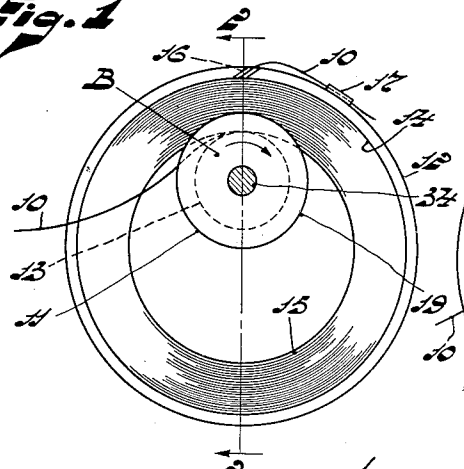



Fig. 3

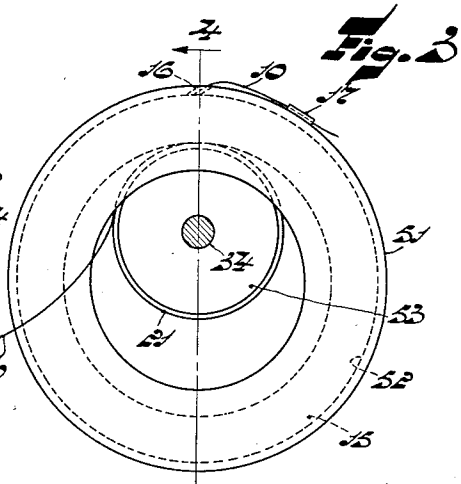



Fig. 2

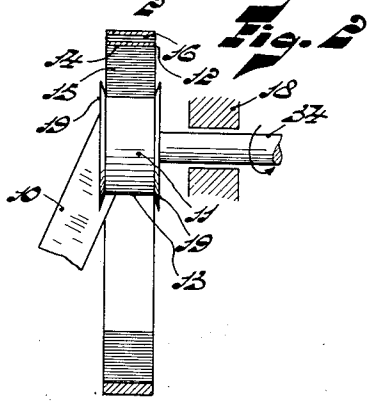



Fig. 4

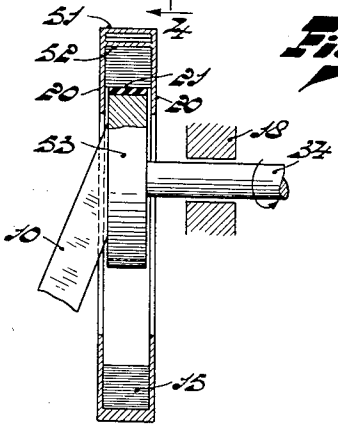



Fig. 5

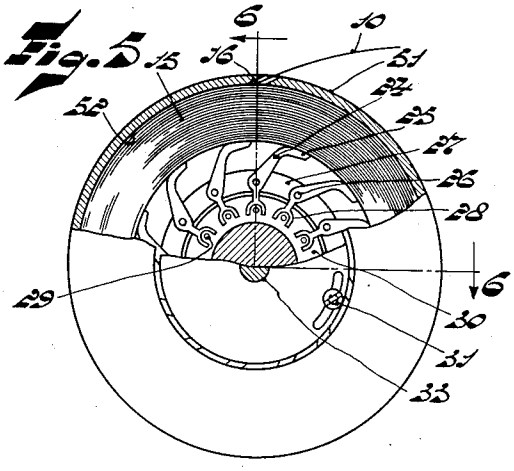
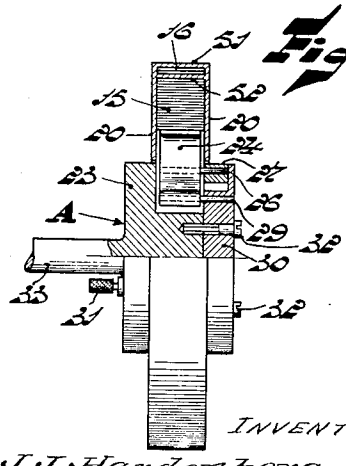



Fig. 6

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2,311,383

# UNITED STATES PATENT OFFICE

2,311,383

## FILM UNWINDING MECHANISM

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Application June 30, 1939, Serial No. 282,293
In Germany July 25, 1938

3 Claims. (Cl. 242—72)

My invention relates to a mechanism for winding and particularly for unwinding hand-shaped carriers, such as sound and/or picture films.

The main object of my invention is to provide a simple mechanism for unwinding band-shaped carriers.

A further object is to provide a winding and unwinding device in which the use of flexible driving shafts is eliminated.

A still further object is to provide a winding and unwinding mechanism the reel of which can also be used as a storage reel or a feed reel.

Further objects and advantages of my invention will appear as the description progresses.

In accordance with the invention and for the winding of the film I use a rotary member having an external driving surface and support this member from a driving shaft, I loosely suspend a cylindrical take-up body from this driving member, either directly or through the film which is wound into a roll against the internal surface of the body.

The take-up body with the film wound against its internal surface into an annular roll may be used as a supply reel in an electro-optical reproducing system or a projecting system, in which case, separate re-winding of the film is unnecessary. For this purpose I provide means to prevent undesired unwinding of the film at the center of the roll and also provide in the outer wall of the take-up body an aperture through which the film is withdrawn.

In order that the invention may be clearly understood and readily carried into effect I shall describe the same in more detail with reference to the accompanying drawing in which:

Figure 1 is a side view of a winding mechanism suitable for use in conjunction with the unwinding mechanism of the invention,

Fig. 2 is a sectional view along line 2—2 of Figure 1,

Fig. 3 is a side view of another form of the winding device of Fig. 1,

Fig. 4 is a section along line 4—4 of Figure 3,

Fig. 5 is a partly sectionized side view of an unwinding device according to an embodiment of the invention,

Fig. 6 is a sectional view along line 6—6 of Figure 5.

The winding device illustrated in Figures 1 and 2 comprises a driving roller 11 provided with two flanges 19 and an external driving surface 13. Roller 11 is fixedly secured to the end of a shaft 34 which is rotatably mounted on a suitable fixed bearing 18 and is rotated in the direction of the arrow B by suitable driving means (not shown) so that the driving surface 13 has the speed of the film.

An annular winding reel or take-up body 12 surrounds roller 11 and has an internal surface 14 whose width is slightly less than that of the surface 13 between flanges 19. Thus, body 12 is adapted to be loosely suspended from surface 13 and to be driven thereby.

A film 10, which may be a sound film, a picture film, or a sound-picture film, has its end secured to body 12. For this purpose an end portion of the film extends through a slot 16 in body 12 and passes beneath a clip 17 secured to the body.

At the beginning of the winding the end of film 10 is secured to body 12 and at this time the surface 14 is in direct contact with surface 13. Upon rotation of roller 11 in the direction of the arrow, the body 12 is rotated thereby with the result that the film 10 is drawn in beween surfaces 13 and 14. Upon continued rotation of roller 11, the body 12 is rotated in the same direction so that the film is wound into an annular roll or coil 15.

Thus, the turns of coil 15 are supplied to the take-up body 12 internally thereof and engage the internal surface of the preceding turns without the occurrence of any mutual displacement. When the coil 15 is to be unwound, the beginning of the film is on the outside of the coil so that the latter can be unwound immediately and without any re-winding.

In the above-described device the required frictional pressure between film 10 and the driving surface 13 is obtained by the weight of the take-up body 12 which, with or without the film already wound up, is loosely suspended from roller 11 so that the film is pressed against the driving surface 13 by gravity. The two flanges 19 ensure correct guiding of the film.

The device shown in Figs. 3 and 4 is similar to that of Figs. 1 and 2 and similar parts are designated by the same reference numerals. However, in Figs. 3 and 4 the body 12 is replaced by a body 51 having an internal take-up surface 52 and two flanges 20 so that the film coil 15 is wound up in a confined space. This construction is particularly useful for films having a small width, for instance, 5 mms. and even less, which films without any supporting means could not be wound into a self-supporting roll which could be readily handled. The driving roller 11 is replaced by a flange-less roller 53 which extends into the space between flanges 20. To

increase the friction between film 10 and roller 53, the latter is provided with surface layer 21 of friction material, such as rubber.

Figs. 5 and 6 illustrate a take-up device which is similar to that of Figs. 3 and 4 but can be used both as a storage reel and as a feed reel. In Figs. 5 and 6, hollow body 51 with the film roll 15 therein is closed on the inside by an insert core A to prevent undesired unwinding of the film at the center of the roll.

If this storage reel is to be used as a supply reel in an electro-optical reproducing system or in a projector the film coil 15 should be centered at its inside on a core so that it can be unwound from without. Furthermore, the coil 15 should be capable of rotating loosely in the hollow body 12 so that the film 10 can pass freely through the slot 16. In addition it is preferable that the core may be used with film rolls of different length films and consequently of different inside diameters.

As shown in Figures 5 and 6 the core A comprises a mandrel having a cylindrical portion 23 and a shaft portion 33. A plurality of curved lever arms 24 are rotatably mounted on pins 26 fixed to a ring 27 and have their end surfaces 25 engaging the inside of the film coil 15. Each of the levers 26 has a forked inner end 28 which engages a pin 29 mounted on a central disc 30 which is secured to the end of the mandrel portion 23 by screws 32. If ring 27 is rotated relatively to disc 30, the pins 26 will be displaced tangentially relatively to the pins 29 with the result that the ends 25 of levers 24 will be moved either inwardly or outwardly. The ring 27, when in the desired position, can be forced tightly against the mandrel 23 by means of a set-screw 31 so that the lever arms will be retained in that position which centers the coil 15.

When unwinding the film, the body 51 is placed in a horizontal plane after the coil 15 is mounted on the core, the core 23 being supported in a suitable support by means of shaft 33. The film end 10, which has already been passed out through slot 16 at the beginning of the winding operation, is placed in engagement with the conveyer members of the film apparatus (not shown) and is unwound by them from the coil 15 which is supported on the mandrel A and is free to move within the body 12 which remains stationary. The unwinding operation is effected in the usual manner from the outside inwards, each turn of the coil conserving the same diameter at which it was wound originally so that there is no sliding between adjacent turns and the film is not damaged by scratches.

The take-up device and feed spool according to the invention are particularly advantageous for use of replacing the usual gramophone records in systems for reproducing speech and music. The size of the storage reel may be about equal to two gramophone records in the case of a film having a width of about 3½ mm. and its duration of play is from 10 to 15 minutes, according to the thickness of the film, so that it surpasses the usual gramophone records not only in quality but also in recording duration.

Although I have described my invention in connection with specific examples and details of construction, I do not wish to be limited thereto because obvious modifications will readily present themselves to one skilled in the art.

What I claim is:

1. A film unwinding device comprising an annular body having an internal take-up surface and adapted to receive an annular roll of film, the periphery of said body being provided with a slot through which the film passes during the unwinding, a core within the annular body adapted to support the film during unwinding, said core comprising a central member, an annular adjusting member surrounding the central member and a plurality of levers pivoted on said adjusting member, the outer portions of said levers forming an annular supporting surface for the film roll and the inner portions thereof being secured to said central member, and means to secure said adjustment member to said central member.

2. A film unwinding device comprising an annular body having an internal take-up surface and inwardly extending flanges forming a confined space adapted to receive an annular roll of film, the periphery of said body being provided with a slot through which the film passes during the unwinding, a core within the annular body adapted to support the film during unwinding, said core comprising a central member, an annular adjusting member surrounding the central member and a plurality of levers pivoted on said adjusting member, the outer portions of said levers forming an annular supporting surface for the film roll and the inner portions thereof being secured to said central member, and means to secure said adjustment member to said central member.

3. A film unwinding device comprising an annular body having an internal take-up surface and adapted to receive an annular roll of film, the periphery of said body being provided with a slot through which the film passes during the unwinding, a core within the annular body adapted to support the film during unwinding, said core comprising a central cylindrical member having a plurality of pin members extending from an end surface thereof and symmetrically arranged about the axis thereof, an annular adjusting member surrounding the central member and a plurality of curved lever arms pivoted on said adjusting member, the outer portions of said levers forming an annular supporting surface for the film roll and the inner portions thereof being fork shaped and engaging said pin members, and means to secure said adjustment member to said central member.

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