May 5, 1936. M. J. A. BOMBRUN 2,039,949

ROLLING DEVICE FOR FILMS

Filed June 5, 1933 4 Sheets-Sheet 1

Fig. 1.

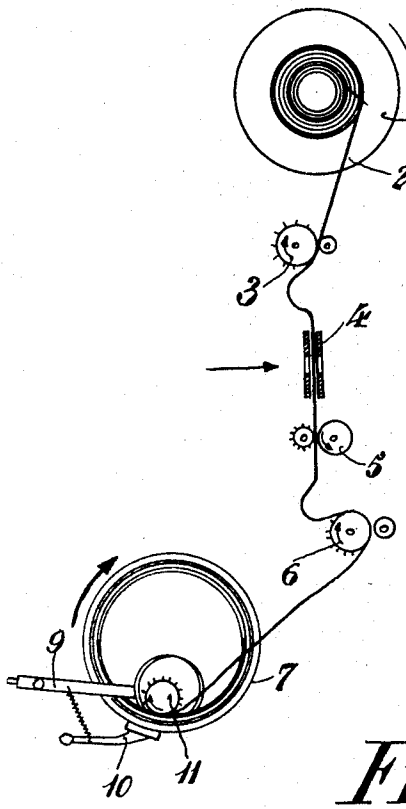


Fig. 2.

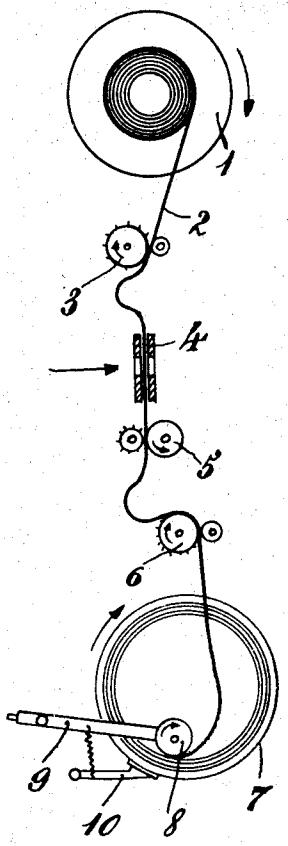
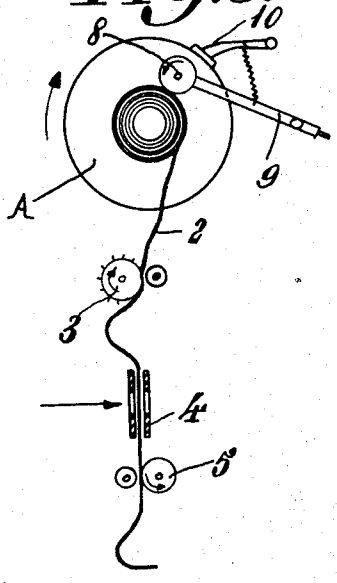


Fig. 3.



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May 5, 1936. M. J. A. BOMBRUN 2,039,949

ROLLING DEVICE FOR FILMS

Filed June 5, 1933 4 Sheets-Sheet 2

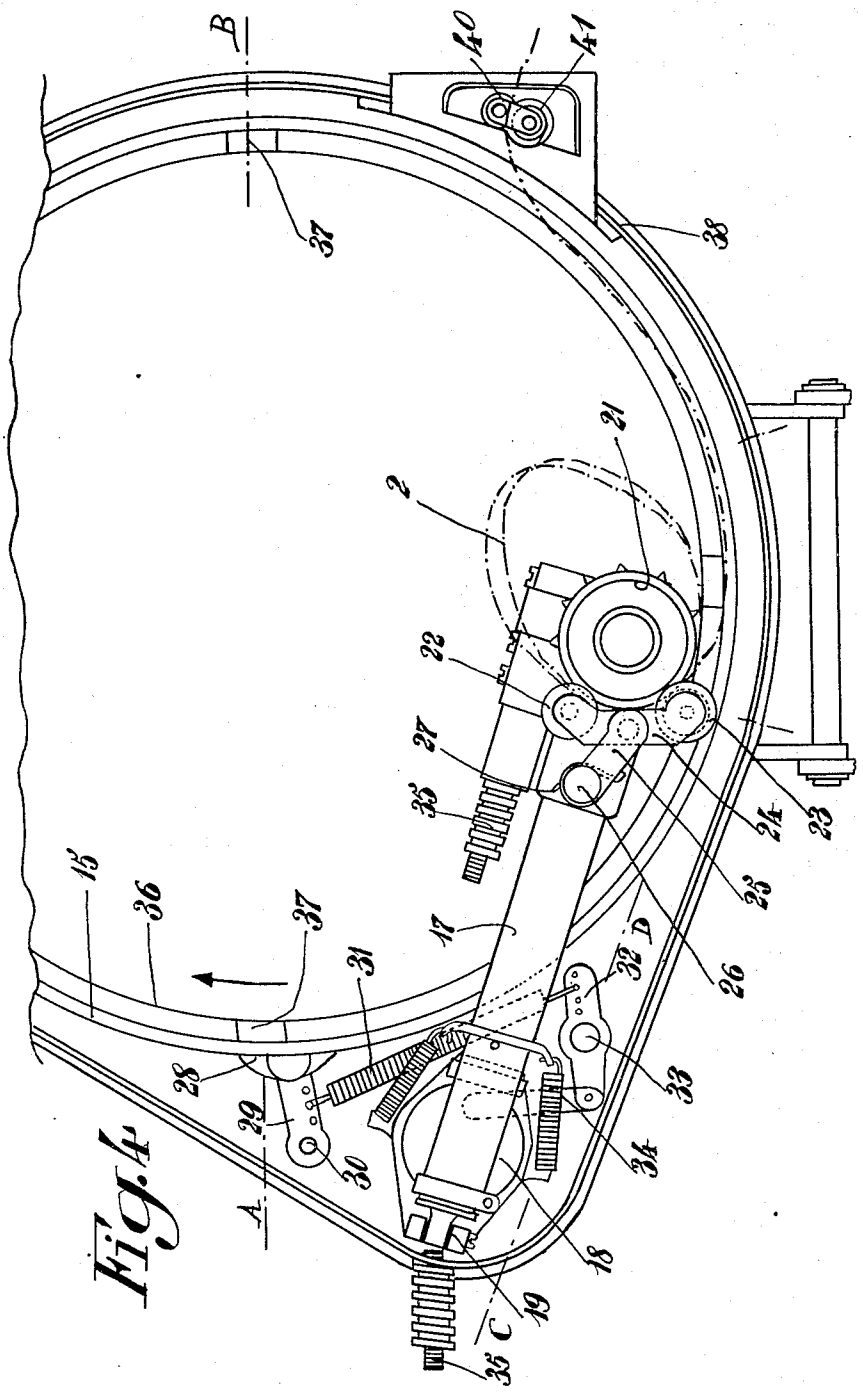


Fig. 4

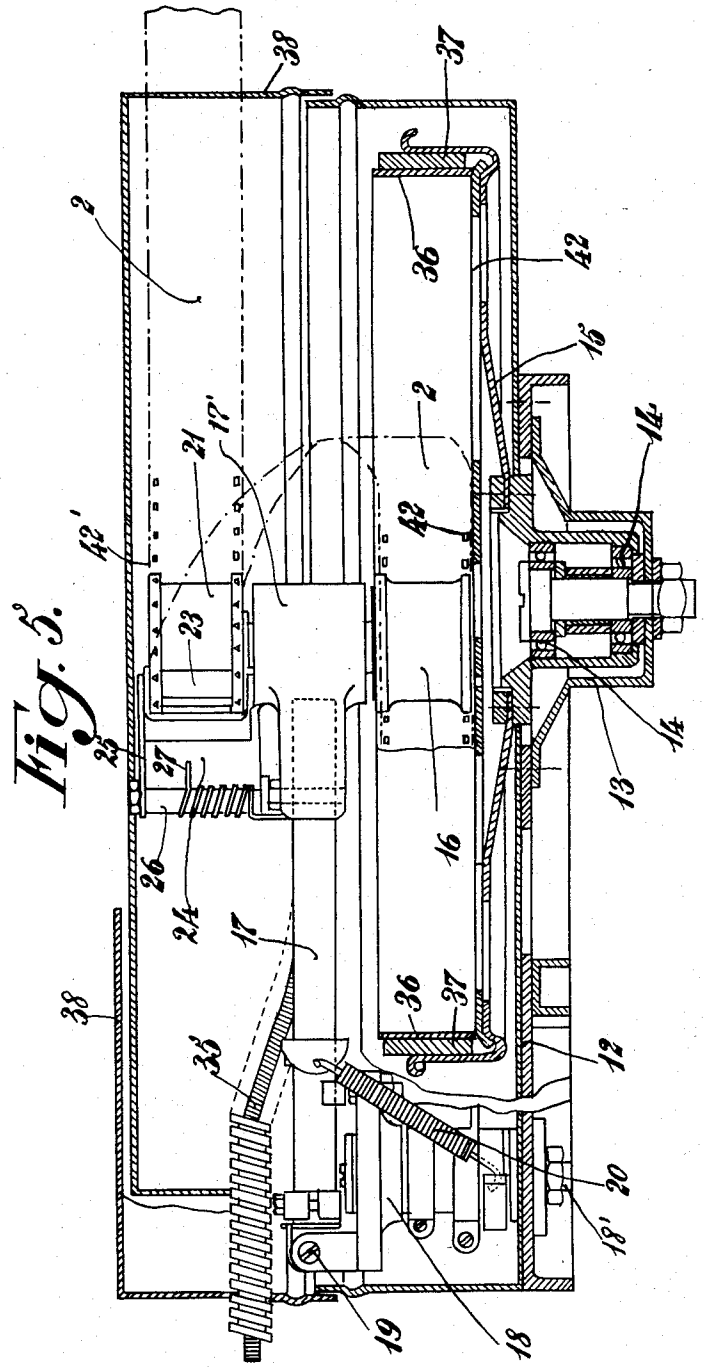
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ROLLING DEVICE FOR FILMS

Filed June 5, 1933 4 Sheets-Sheet 3

Fig. 5.



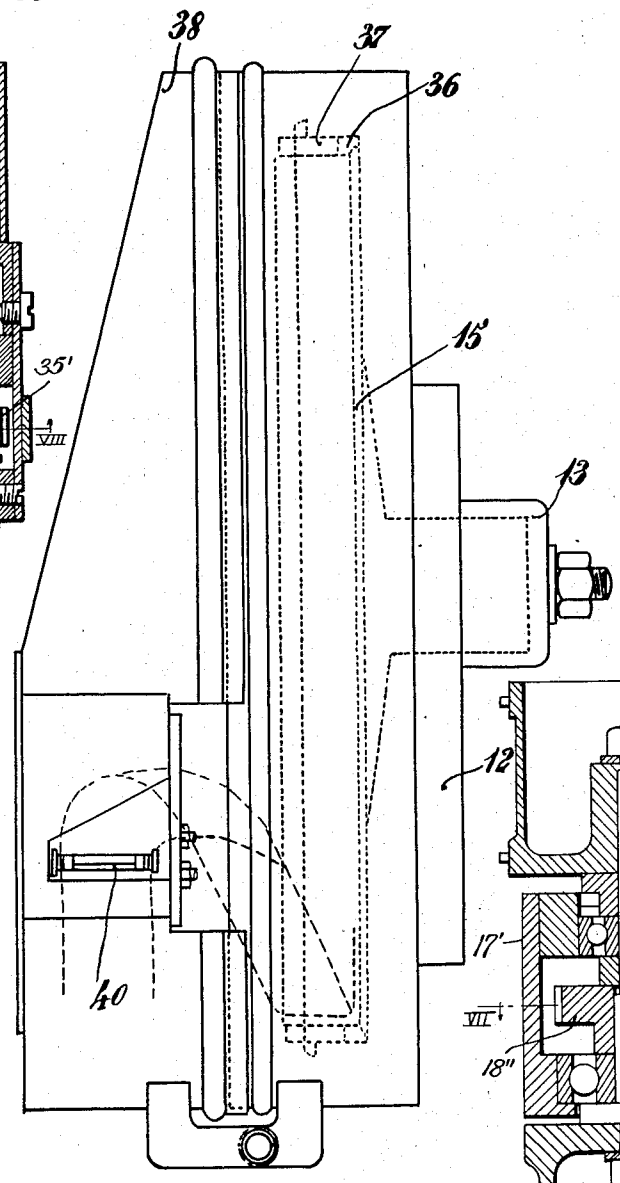
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ROLLING DEVICE FOR FILMS

Filed June 5, 1933 4 Sheets-Sheet 4

Fig. 6.



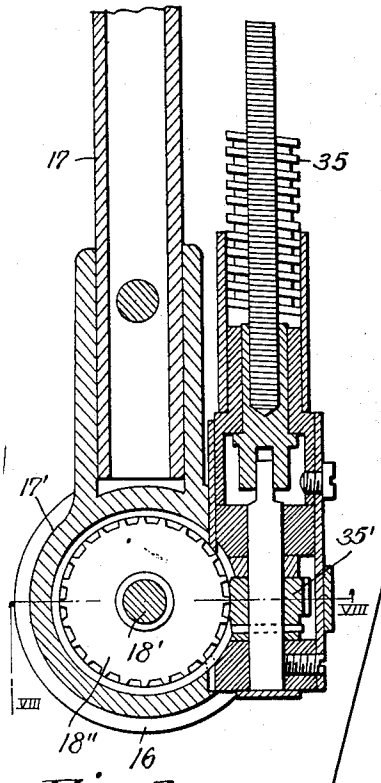
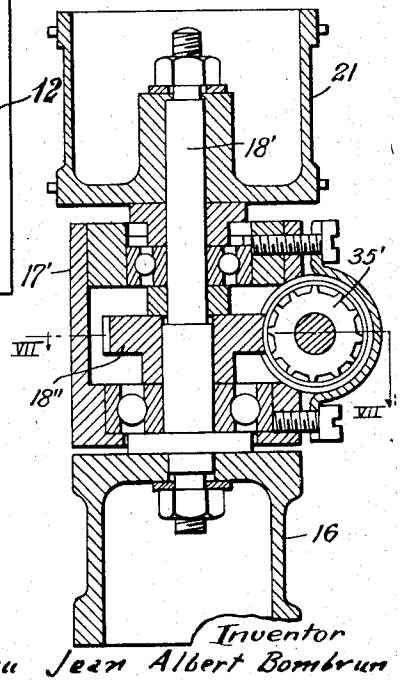


Fig. 7.

Fig. 8.



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UNITED STATES PATENT OFFICE

2,039,949

ROLLING DEVICE FOR FILMS

Mathieu Jean Albert Bombrun, Paris, France

Application June 5, 1933, Serial No. 674,324
In France April 3, 1933

8 Claims. (Cl. 88—18.7)

This invention relates to a device for the rolling of films and more particularly to a device for the rolling without tension of a cinematograph film, from the periphery towards the center, on the receiving spool of a film-projection apparatus.

Several devices have already been proposed for the rolling of cinema films, from the periphery towards the center, so as to have the film always ready at hand for another projection, without having to re-wind said film.

The several devices known are open to numerous objections.

Some do not permit of obtaining winding rolling speed rigorously synchronous with the projection-speed, this injuring the film and being particularly harmful in the case of sound films.

Others have an intermediary winding mechanism, such, as for instance an endless belt, which causes different sections of the film to rub against one another, giving rise to relative sliding movements, which cause scratching of the film.

Some others have a speed change mechanism, which is very delicate to manipulate and which does not give satisfaction.

The invention is particularly intended to do away with the difficulties enumerated above and has for its object to provide a device which permits the winding without tension, from the periphery to the center of a cinema film, on a receiving spool, without the film being damaged in any manner.

The device according to the invention is essentially characterized by the fact that it comprises in combination a loosely mounted receiving drum, inside which the film is wound and a winding friction roller abutting against the inner surface of said drum, the said friction roller being rotated in such a way that its circumferential speed remains always equal to the linear speed of the film projection.

According to another feature of the invention a braking device is associated with the receiving drum, said braking device operating in such a way that the circumferential speed of the drum is always equal to the circumferential speed of the winding up friction roller.

According to an embodiment of the invention, the loose drum is mounted on a holder connected to the frame of the projecting machine, the friction roller being carried by a lever and driven by means of any suitable transmission from one of the film driving mechanisms within the film-projecting apparatus.

In order that the invention may more readily be understood and carried into practice, embodiments thereof will now be described solely by way of example, with reference to the accompanying drawings in which:

Fig. 1 is a diagrammatic view of the device according to the invention when it is placed in a laterally displaced position with regard to the film-projecting apparatus.

Fig. 2 is a similar view to Fig. 1, showing the same device when it is placed under the film-projecting apparatus.

Fig. 3 is a diagram showing the application of the device to the unwinding of a film.

Fig. 4 is a plane view of the structure formed by the receiving drum and winding friction roller.

Fig. 5 is a sectional view corresponding to Fig. 4, said section being taken on the lines A—B and C—D of Fig. 4.

Fig. 6 is a side view corresponding to Fig. 4.

Fig. 7 is a detail longitudinal section, illustrating the manner of operating the winding roller; and

Fig. 8 is a cross sectional view through line 8—8 of Fig. 7.

On the drawings, Figures 1 and 2, 1 designates a stock-spool upon which is wound the film 2 to be projected, said spool being carried by the film-projecting apparatus, not shown, by any suitable means.

The film 2 is actuated in the usual way, for example by means of a cogged-cylinder 3. The film 2 passes through the gate 4 in front of the lens of the film-projecting apparatus, at the delivery end of which it is engaged by a driving device 5, then by a cogged-cylinder 6.

The cogged-cylinder 3, the driving device 5, and the cogged cylinder 6 are the same as in other film-projecting apparatus and do not present any special characteristics.

However, it should be observed that, as customary, it is necessary to provide for the same circumferential speed of cylinders 3 and 6, as well as of the driving device 5.

The winding or rolling device for the film according to the invention essentially consists of a receiving drum 7 and a friction roller 8. The drum 7 is mounted on a holder connected by any suitable means to the frame of the film-projecting apparatus. The winding friction roller 8 abuts against the inner surface of receiving drum 7 and is mounted at the outer end of an arm or lever 9 pivoted on the holder of drum 7.

The lever 9 is combined with a braking device 10 acting upon the receiving drum 7 in such a way that the drum can turn only when the friction

roller 8 is revolving. Besides, the braking device 10 acts in such a way that when the drum 7 and the friction roller are operating, their circumferential speeds are equal at all times.

The winding friction roller 8 is driven by means of any suitable transmission from one of the cogged cylinders 3 or 6 or from the driving device 5.

The transmission must be such that the circumferential speed of the winding friction roller 8 will be equal to the circumferential speeds of the elements indicated above, constituting part of the film projecting apparatus.

Owing to the transmission indicated the elements revolving in the film-projecting apparatus, as well as the revolving elements of the winding device proper, are rotating at the same circumferential speed, which is equal to the linear speed of the film-projection in the projecting-film apparatus.

The film 2 after passing through the film projecting apparatus is wound up without tension, this insuring a condition whereby the winding operation will not cause the film to be damaged to any extent whatsoever.

In the embodiment of Fig. 1, in which it was supposed that the winding device was placed at random with respect to the position of the film projecting apparatus, use is made of the tendency of film 2 to form a loop when coming out of the film projecting apparatus, to bring it to the winding plane, that is to say, in the plane of the receiving drum 7. To this end the friction roller 8 is combined with a cogged cylinder 11 of the same diameter, driven at the same revolving speed as that of the winding friction roller, and fixed in front of the latter.

In the embodiment of Fig. 2, in which it has been supposed that the rolling device is underneath the film-projecting apparatus, the film which has a certain rigidity owing to its speed penetrates directly in the receiving drum 7, making a loop, so as to get into the rolling plane. This result is obtained in giving to the receiving drum 7 a sloping position with respect to a horizontal plane or slanting with respect to a vertical plane. The same result could be obtained by means of a guiding device of film 2 at its point of entry into the rolling device.

In Figs. 4 to 6, a complete winding device is shown. In these figures, 12 designates a support or holder provided with a hub 13, in which a drum 15 is mounted by means of ball-bearings 14. By virtue of this arrangement the drum 15 may turn loosely.

The friction roller 16 is carried by a shaft 18', rotatably mounted in the end 17' of a lever or arm 17 provided with a hub 18 and swingable on a pivot 18' carried by the holder 12 and at right angles to the latter. Arm 17 is, furthermore hinged on a pivot 19 parallel to holder 12. This second articulation has for its object to enable the revolving of arm 17 and several elements that it supports to swing in such a way as to withdraw the friction roller 16 from the receiving drum 15 as we shall see later.

Besides, arm 17 is connected to hub 18 by means of two tension springs 20, which have for their object to prevent friction roller 16 coming out of the receiving drum 15 during the winding operation.

As shown, shaft 18' also carries a cogged cylinder 21 having a diameter equal to the diameter of the winding friction roller 16.

Two friction rollers 22 and 23 rotate together with cogged-cylinder 21, said rollers being mounted in such a way that they can rotate in a socket 24. The latter can swing on a lever 25, which is articulated or hinged on an axle 26 carried by arm 17. Rollers 22 and 23 are maintained in contact with the cogged cylinder 21 by the action of a spring 27 wound round the pivot 26.

The winding device is completed by a brake-shoe 28 mounted at the end of a rod 29 hinged on a pivot 30 carried by the holder of the winding device.

The brake-shoe 28 is maintained in contact with the outer face of the winding cylinder 15 by a tension spring 31 having one end attached to rod 29 and the other end to an arm 32 rocking about a fixed pivot 33. The other end of arm 32 is connected by means of an articulated lever 34 to the hub 18 of arm 17 carrying the friction roller 16.

A flexible transmission shaft 35, by means of a pinion 35' and a gear 18'', transmits to shaft 18', and, therefore, to friction roller 16 and cogged-cylinder 21 a movement of rotation from one of the driving elements of the film-projection apparatus. This transmission must be established in such a way that, as said before the various elements revolving in the winding device rotate at the same circumferential speed, said speed corresponding to the linear projection speed of the film.

To make it easier, after the winding, to remove the film from the receiving drum 15, the latter is provided inside with a movable crown 36 which has external cleats 37. This crown must preferably be made of a strip of spring steel so as to adhere sufficiently against the receiving drum and to revolve with the latter.

It is inside the crown that the said winding of the film 2 is effected.

The crown 36 is provided with hooks to permit its removal when the film is wound.

The whole of the winding device is contained inside a box, the lid 38 of this box is provided with an opening 39 for the film, which passes as one may see in Fig. 4, between two friction rollers 40 and 41.

The manner in which the described device is used is as follows:

The box being opened and the crown 36 being taken out, one places inside the receiving drum 15 and at the bottom of the latter, one of the spindles 42 of the bobbin or spool on which film 2 must be wound as it issues from the film projecting apparatus. This done one places inside the receiving drum 15, the crown 36 and the free end of the film 2 coming out of the film projection apparatus is inserted in the box.

To obtain a good feeding of the film the free end of said film 2 may be introduced in an opening provided in crown 36 so as to get it between the drum 15 and one of the cleats 37 of crown 36. The film 2 is also arranged in such a way that its perforations 42' are in mesh with the teeth of the cogged-cylinder 21 the film coming into contact with the inner face of crown 36, position in which it is maintained by the winding friction roller 16.

The film projecting machine being put in operation after passing over the exit cogged cylinder of the film, the film is driven by the cogged cylinder 21 as well as by the winding friction roller 16 which drives in its turn the receiving drum 15.

This results in film 2 being wound inside crown 36 from the periphery towards the center.

As film 2 is being wound arm 17 revolves round its pivot 18' and swings from the periphery of the crown 36 towards the center thereof.

It follows that the arm 32 rocks about its pivot 33 pulling more and more on tension spring 31.

It can be seen then that the braking action exerted by the brake-shoe 28 on drum 15 becomes more and more as the length of the rolled film increases, that is to say, as the receiving drum 15 becomes heavier, and possessed in consequence of a greater inertia.

When the film 2 is completely wound, it is only necessary to open the lid, in order to take out the friction roller 16 from the inside of the crown 36 in causing holder arm 17 to swing about pivot 19. This done, the other spindle of the spool is put in its place so as to re-establish the stock-spool, which is only to be taken out from the receiving drum 15.

This taking out operation is made possible owing to the free space existing on the periphery between crown 36 and the receiving drum 15.

After the winding the film is ready to be filmed again, the first view to be shown before the lens being on the periphery of the rolled film.

The receiving spool may be of any known type, provided that the two spindles are movable, preferably one of these to have an extensible hub.

The example described refers to the case of Fig. 1. It is obvious that for the case of Fig. 2 the cogged-cylinder 21 would be dispensed with, the other mechanisms being similar.

The device just described in its application to the rolling of films could be used also for the unrolling of films before being projected. This operation has been represented in the diagram of Fig. 3. In this application one can find all the elements previously described, and designated by the same reference characters.

The unrolling friction roller 8 being driven at the same revolving speed is the receiving cogged cylinder 3 of the film and the driving mechanism 5, the use of the device according to the invention makes it possible to wind the tension of the film between the stock-spool A and the receiving cogged cylinder 3 of the film. Besides, this device suppresses the ordinary friction on the axle bearing the stock-spool A. Moreover, it is possible to wind a greater length of the film on only one stock-spool, without fearing that the weight could affect the normal unrolling of the film.

From what has been described it will be seen that the invention offers a device making it possible to wind a film on a spool from the periphery towards the center at a speed equal to the linear speed of projection of the film, without the latter being subjected to the slightest tension.

This device makes it possible to extend the life of the film, as it avoids numerous re-windings, a necessary operation after each projection of the films.

What is particularly interesting in the case of sound films, is that the films are not subjected to any tension whatsoever and consequently the ribbon is not affected or injured.

It will be obvious that the invention is in no wise limited to those particular uses nor to those particular forms of construction of its various parts which have been more especially described herein by way of example; on the contrary it embraces every modification lying within the scope of the claims hereunto appended, and it is to be understood that any system of spools and transmission devices of any approved type may be utilized.

I claim:

1. A rolling device for cinema films consisting of a frame, a drum loosely mounted on said frame, a pivot carried by said frame and perpendicular to the plane of said drum, a hub revolving on said pivot, an arm carrying at one end a winding friction roller tangent to the inner surface of said drum, a second pivot perpendicular to said first mentioned pivot connecting the other end of said arm to said hub, springs connecting said arm and said hub, urging said arm towards said drum transversely to the plane of rotation thereof so as to hold the friction roller in operative position within said drum, and a driving mechanism rotating said friction roller at a circumferential speed always equal to the linear speed of the film in the projection film apparatus.

2. In a rolling device for cinema films a frame, a drum loosely mounted on said frame, an arm pivoted on said frame, a winding friction roller carried by said arm, rotatable within said drum, a brake-block pivoted on said frame, and acting on said drum and means connecting said brake-block to said arm in such a way that the braking action increases as the quantity of the rolled film increases.

3. A rolling device for cinema films consisting of a frame, a drum loosely mounted on said frame, a pivot carried by said frame at right angles to the plane of said drum, a hub revolving on said pivot, an arm carrying at one end a winding friction roller tangent to the inner surface of said drum, and a second pivot at right angles to said first mentioned pivot connecting the other end of said arm to said hub, springs connecting said arm and said hub, a driving mechanism rotating said friction roller at a circumferential speed always equal to the linear speed of the film in the film projecting apparatus, a braking device acting on said drum, and means controlling said braking device so as to increase the braking action as the quantity of the rolled film increases.

4. In a rewinding device for films comprising a frame, a drum rotatably mounted on said frame, a winding friction roller tangent to the inner surface of said drum, a carrier for said roller and means for rotating said roller at a circumferential speed equivalent to the linear speed of the film in the film projecting apparatus, a braking device, a spring urging said braking device against the surface of said drum, and means operatively connecting said carrier to said spring, to automatically increase the braking action exerted by said braking device as the length of film rewound therein increases, causing inward displacement of said carrier with respect to said drum.

5. In a rewinding device for films comprising a frame, a drum rotatably mounted on said frame, a winding friction roller tangent to the inner surface of said drum, an arm pivotally mounted to swing in a plane parallel to said drum, carrying said roller, and means for rotating said roller at a circumferential speed equivalent to the linear speed of the film in the film projecting apparatus, a braking device acting on said drum, and means controlled by said arm to automatically increase the braking action exerted by said braking device as the length of film rewound therein increases.

6. In a rewinding device for films comprising a frame, a drum rotatably mounted on said frame, a winding friction roller tangent to the inner surface of said drum, and means for rotating said roller at a circumferential speed equivalent to the linear speed of the film in the film projecting apparatus, an arm carrying said roller, said arm being mounted to swing in a plane parallel to the plane of said drum and in a plane at right angles thereto, a spring acting on said arm, to urge said roller into frictional engagement with the inner peripheral surface of said drum, and spring means urging said arm towards said drum transversely to the plane of rotation thereof so as to hold the friction roller in operative position within said drum.

7. In a rewinding device for films comprising a frame, a drum rotatably mounted on said frame, a winding friction roller tangent to the inner surface of said drum, and means for rotating said roller at a circumferential speed equivalent to the linear speed of the film in the film projecting apparatus, an arm carrying said roller, said arm being mounted to swing in a plane parallel to the plane of said drum and in a plane at right angles thereto, and springs acting on said arm, tending to retain it in its normal position where said roller projects within said drum, and a braking device controlled by said arm, acting on said drum.

8. In a rewinding device for films comprising a frame, a drum rotatably mounted on said frame, a winding friction roller tangent to the inner surface of said drum, and means for rotating said roller at a circumferential speed equivalent to the linear speed of the film in the film projecting apparatus, an arm carrying said roller, said arm being mounted to swing in a plane parallel to the plane of said drum and in a plane at right angles thereto, and springs acting on said arm, tending to retain it in its normal position where said roller projects within said drum, a braking device acting on said drum, and means controlled by said arm, to automatically increase the braking action exerted by said braking device as the length of film rewound therein increases.

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