May 30, 1933. C. ANDERSON ET AL 1,911,338

OSCILLOGRAPH FILM HOLDER

Filed Dec. 12, 1930

Fig. 1.

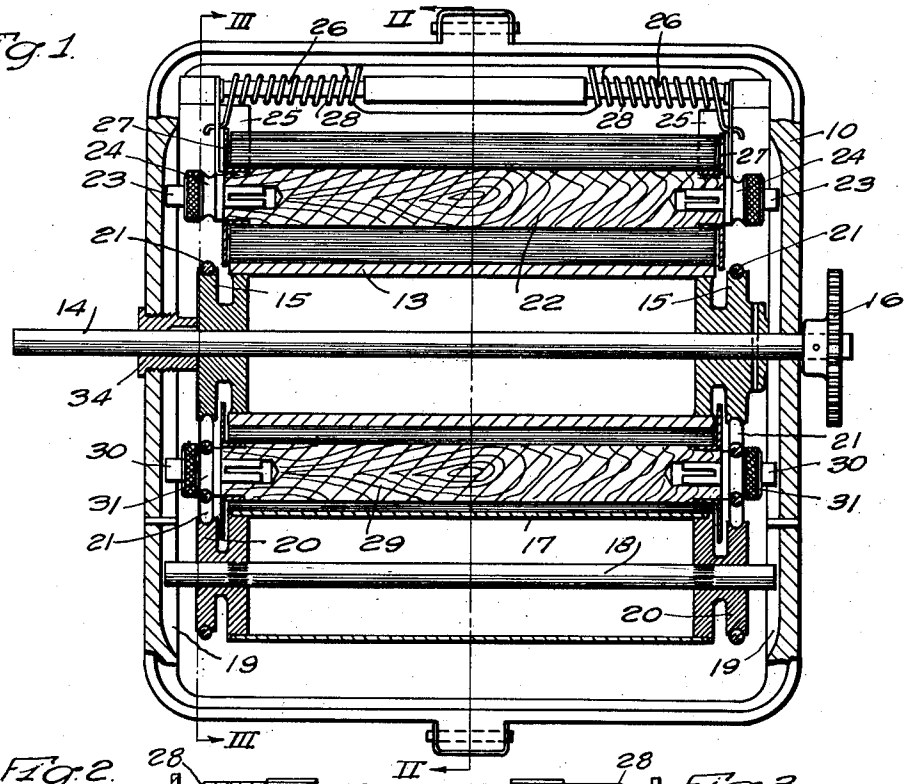

Fig. 2.

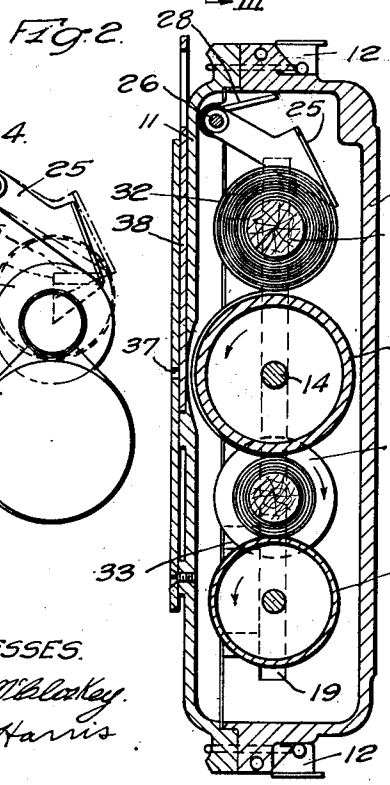

Fig. 3.

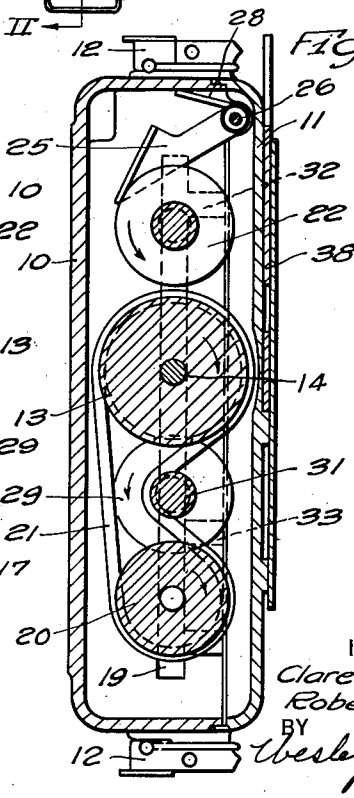

Fig. 4.

WITNESSES.
E. A. McCluskey.
F. M. Harris.

INVENTORS
Clare Anderson and
Robert H. Lewis.
BY
Wesley G. Carr
ATTORNEY

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UNITED STATES PATENT OFFICE

CLARE ANDERSON, OF BELLEVILLE, AND ROBERT H. LEWIS, OF NORTH ARLINGTON, NEW JERSEY, ASSIGNORS TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

OSCILLOGRAPH FILM HOLDER

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Our invention relates to photographic film holders and particularly to film holders to be employed with oscillographs for moving a long strip of film at a relatively high speed.

It has been found that film holders, which were known before our invention, often failed to operate properly at high speeds. These failures were caused because the film was not rewound smoothly and tightly after exposure.

An object of our invention, therefore, is to provide a more reliable film holder of the above-mentioned type.

A further object of our invention is to provide a film holder of the above-mentioned type that can be easily loaded and unloaded.

In practicing our invention, a main drum is mounted in a fixed position in the film-holder casing, an auxiliary drum being mounted in the casing in movable relation to the main drum, and the two drums being connected together by means of flexible belts or the like. The film is threaded over the surface of the main drum and is rewound on a take-up spool which is mounted between and in contact with the two drums. The flexible belts pass over pulleys on shaft portions, inserted in the ends of the take-up spool, for the purpose of providing a rewinding torque on the take-up spool.

Other features and advantages of our invention will appear from the following description, taken in connection with the accompanying drawing in which;

Figure 1 is a sectional view, in longitudinal section, of a film holder constructed in accordance with our invention,

Fig. 2 is a sectional view, taken on the line II—II of Fig. 1, looking in the direction of the arrows,

Fig. 3 is a sectional view, taken on the line III—III of Fig. 1, looking in the direction of the arrows, and

Fig. 4 is a diagram to illustrate the operation of the apparatus.

Referring to the drawing, the film holder comprises a casing which consists of a main section 10 and a cover section 11 which may be clamped together in light-tight relation by means of clamps 12. A main drum 13, having a shaft 14, is rotatably mounted in the main section 10, each end of the drum being provided with a pulley 15. A gear wheel 16 is mounted on one end of the shaft 14, exterior of the casing, for driving the film holder.

An auxiliary drum 17 is rotatably mounted in the main section 10 of the casing; the ends of the auxiliary drum shaft 18 resting in grooves 19, in the sides of the main section 10, which extend longitudinally of the casing. Each end of the auxiliary drum 17 is provided with a pulley 20, and these pulleys are connected to the pulleys 15 of the main drum 13 by means of flexible belts 21. It will be noted that, since the shaft 18 of the auxiliary drum 17 is free to move toward the main drum 13, the flexible belts 21 will tend to pull the drums toward each other.

A film-supply spool 22 is mounted in the main section 10, with the ends of its shaft portions 23 resting in the grooves 19. The shaft portions 23 are inserted in the ends of the film-supply spool 22 before loading the film holder. The shaft portions 23 are provided with pulleys 24 but the pulleys are utilized only after the supply spool has been emptied and is being employed as a take-up spool.

A brake action on the supply spool 22 is provided by means of brake shoes 25 which are pivotally mounted on a rod 26 supported in the casing 10. The brake shoes 25 are held against the flanges 27 of the supply spool by means of springs 28.

A take-up spool 29 is positioned between the main drum 13 and the auxiliary drum 17 with the ends of its shaft portions 30 resting in the grooves 19. Each end of the take-up spool 29 is provided with a pulley 31, a portion of the peripheries of which engage the portions of the belts 21 which are nearer the cover section 11 of the casing, as shown in Fig. 3. With this arrangement, the main drum 13 drives the auxiliary drum 17 and the take-up spool 29, by means of the belts 21, in opposite directions; the auxiliary drum 17 being rotated in the same direction as the main drum 13.

The film holder is loaded by slipping the supply spool 22 through slots 32 into posi-

tion in the grooves 19. After the end of the film is reeled from the spool 22, from the under side thereof, and secured to the take-up or receiving spool 29, the receiving spool is slipped through the slots 33 into position in the grooves 19. When the receiving spool is in position, the film is in contact with the front half of the main drum surface 13, and the receiving-spool pulleys 31 are in engagement with the belts 21.

When a belt must be replaced, the removable plug bearing 34 on the main shaft 14 may be unscrewed from the casing 10, and a new belt inserted into the casing through the plug opening.

The diameters of the drums 13 and 17 and the receiving spool 29, and the diameters of their pulleys, are so chosen that, when the receiving spool 29 is empty, it will be rotated beween the two drums without any slippage between the surface of the spool and the drum surfaces and without any slippage of the belts 21. However, as the effective diameter of the receiving spool 29 is increased by film wound thereon, there will be slippage of the belts 21 on the receiving-spool pulleys 31, and this slippage maintains the film tightly wound on the receiving spool.

In designing the film holder to make it operate as described above, the diameters of the auxiliary drum 17 and main drum 13 are chosen arbitrarily. The pitch diameters of the drum pulleys are then so selected that the ratio of the pitch diameter of the main drum pulley 15 to the pitch diameter of the auxiliary drum pulley 20 is equal to the ratio of the diameter of the main drum 13 to the diameter of the auxiliary drum 17. The receiving spool 29 is then so dimensioned that the ratio of the diameter of the main drum 13 to the diameter of the empty receiving spool 29 equals the ratio of the pitch diameter of the main drum pulley 15 to the pitch diameter of the receiving-spool pulley 31.

When the film holder is first threaded, there is usually a certain amount of slack in the film. In order that this slack may be taken out and the film wound tightly up on the receiving spool 29, it is necessary that a braking action be applied to the supply spool 22. As the film unwinds from the supply spool, the film being unwound from a cylinder of a smaller diameter, the speed of rotation of the spool increases, and, consequently, more torque is required to unwind the film. For this reason, the traction on the supply spool should be increased. This is accomplished by employing the brake shoe 25 set at the angle illustrated in Figs. 2, 3 and 4.

The action of the brake shoe 25 may best be understood by referring to Fig. 4, where the brake shoe is shown in dotted lines to indicate its position when the supply spool 22 is full. A line drawn from the point where the brake shoe contacts with the flange 27 of the supply spool to the axis of the supply spool, indicates the direction of the force exerted by the brake shoe. The horizontal and vertical components of this force are indicated at 35 and 36, respectively. The horizontal component exerts purely a braking action, and the vertical component so forces the supply spool into frictional engagement with the main drum that the main drum tends to rotate the spool.

As the film unwinds, the brake shoe drops to the position shown in full lines. It will be noted that, assuming that the total force remains approximately the same as before, the braking component has decreased, and the drum-friction component has increased.

Attention is called to the fact that the end of the brake shoe 25 is the portion of the brake shoe which makes contact with the supply spool. Consequently, when the supply spool is partially unwound the brake shoe 25 makes contact with the spool at a point nearer the top of the spool than when the spool is full. This fact is shown in Fig. 4. The adjustment of the brake shoe 25 is such that a full spool never moves the brake shoe to a position which even approximates the horizontal position.

In operation, the action of the brake shoe is as follows:

When the main drum 13 first begins to rotate, the vertical component of the force exerted by the brake shoe is too small to afford sufficient traction to drive the supply spool because of the comparatively large horizontal braking component. Therefore, any slack in the film is taken up by the receiving spool which is being driven by the main drum 13 through the flexible belts.

As soon as the slack is taken out, the additional traction supplied by the contact between the film and the front surface of the main drum causes the supply spool to unwind. As the film unwinds and the speed of rotation of the supply spool increases, the traction between the supply spool and main drum increases, and the braking action on the supply spool decreases. Slippage of the film on the main drum is thereby prevented.

The cover section 11 of the casing is provided with a long slot 37 that extends, parallel to the main drum shaft 14, the width of the film to permit the exposure of the film to the deflected light beam from a galvanometer element, for example. A shutter 38 is provided for closing the slot 37 when desired.

Various modifications may be made in our invention without departing from the spirit and scope thereof, and we desire, therefore, that only such limitations shall be placed

thereon as are imposed by the prior art and set forth in the appended claims.

We claim as our invention:

1. A film holder comprising a main roller and an auxiliary roller, a film-supply spool positioned above said main roller, a film-receiving spool positioned below said main roller and between said main roller and said auxiliary roller, means connecting said main drum and said receiving spool for rotating said receiving spool in a direction opposite to the direction of rotation of said main drum, said means also connecting said main drum and said auxiliary drum for rotating said auxiliary drum in the same direction as said main drum.

2. A film holder comprising a casing, a main drum rotatably mounted in bearings which are fixed with respect to said casing, an auxiliary drum rotatably mounted in a groove extending longitudinally of the casing, a flexible belt connecting said drums to rotate them in the same direction, a receiving spool, and means for inserting said receiving spool into said groove and into contact with said belt, whereby said spool is rotated in a direction opposite to the direction of rotation of said drums.

3. A film holder comprising a casing consisting of a main section and a cover section, a main drum mounted with its shaft in fixed relation to said casing, a groove in one side of said main section and extending longitudinally thereof at right angles to said drum, a similar groove on the opposite side of said main section, an auxiliary drum rotatably mounted in said grooves, a belt so connecting said drums that they rotate in the same direction, a receiving spool rotatably mounted in said groove between said drums, said spool having its side which is opposite to said cover section in contact with the surface of the belt nearest to the cover section, and grooves so extending from said longitudinal grooves to the edges of said main section that said spool may be lifted from said belt and removed from said grooves.

4. A film holder comprising a driving drum, an auxiliary drum, a receiving spool positioned between said drums, the axes of said drums and said spool lying in the same plane, and said spool and auxiliary drum being movable in said plane, and a flexible uncrossed belt connecting said drums, said receiving spool having a pulley in contact with that surface of the belt which is opposite to the surface that engages said drums.

5. A film holder comprising a casing, a driving drum rotatably mounted in fixed relation to said casing, a supply spool, a receiving spool, and an auxiliary drum, the axis of said drums and spools being in the same plane, said spools and said auxiliary drum being so mounted in said casing that they are movable in said plane, said receiving spool being positioned between, and in contact with, said drums, and a flexible belt so connecting said driving drum and said receiving spool that they are caused to rotate in opposite directions.

6. A film holder comprising a driving roller, a supply spool positioned above said roller, a receiving spool positioned below said roller, the axes of said roller and said spools being parallel and said spools being movable toward and away from each other, means for providing traction between said supply spool and said driving roller which gradually increases as the film is unwound from said supply spool.

7. A film holder comprising a driving roller, a supply spool positioned above said roller, a receiving spool positioned below said roller, the axes of said roller and said spools being parallel and said spools being movable toward and away from each other, means for applying a braking action to said supply spool and for providing traction between said supply spool and said driving roller so characterized that said braking action is reduced and said traction is increased as the film is unwound from said supply spool.

In testimony whereof, we have hereunto subscribed our names this 5th day of Dec. 1930.

CLARE ANDERSON.
ROBT. H. LEWIS.