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# AUTOMATICALLY OPERATED FILM WINDING MECHANISM

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*Fig. 1.*

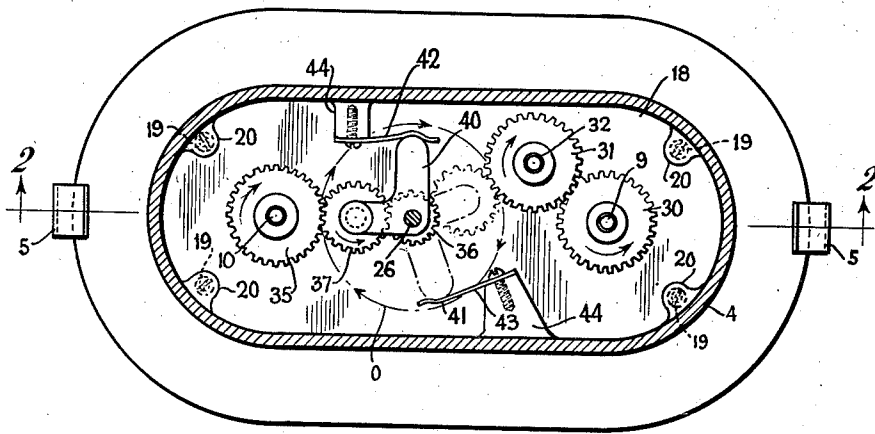


Fig. 2.

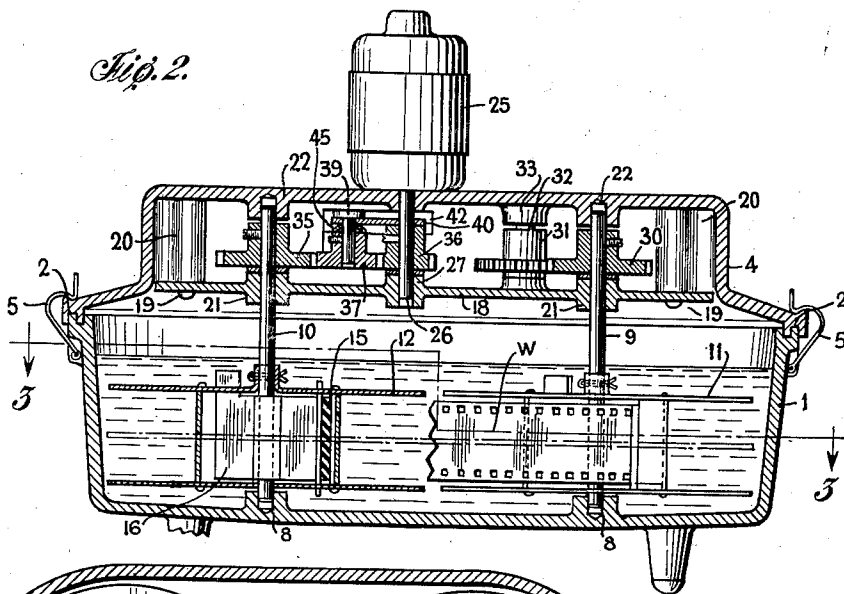
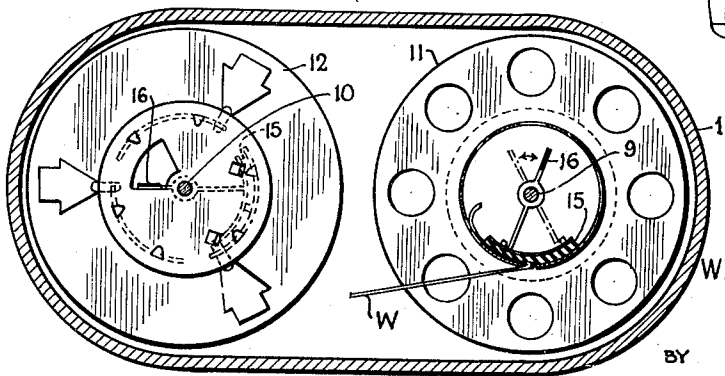


*Fig. 3.*



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AUTOMATICALLY OPERATED FILM  
WINDING MECHANISMWilliam E. Miller, Hudson, Ohio, assignor to The  
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The present invention is directed primarily to a mechanism for automatically winding and re-winding photographic films while they are immersed in developing or treating baths, although it may have much wider application.

The mechanism shown and described herein is intended to improve upon those forms of devices for this purpose in which the film will run for any desired period, the driving mechanism being so designed that it will reverse automatically whenever the film has completely unwound from one of the film spools, and this operation will continue indefinitely as long as the power is applied to the driving mechanism, the film being reeled to and fro between the spools.

While devices of this nature have been designed heretofore, it is the object of the present invention to create a much simpler and more effective organization than any which have preceded it. The mechanism is inexpensive and much less complicated than prior devices and is positive in its operation.

The best known and perfected form of the invention is shown in the attached drawings and will be described in detail, but it will be appreciated that the invention is not confined to the form shown, but may be altered or modified within the scope of the invention. It will also be understood that by unimportant modifications, the principles of the invention may be adapted to the winding and rewinding of all types of webs, strands, or the like.

In the drawings:

Fig. 1 is a plan view of the device with the cover removed, showing the spool driving mechanism;

Fig. 2 is a vertical section on the line 2—2 of Fig. 1; and

Fig. 3 is a horizontal section on the line 3—3 of Fig. 2.

In the drawings, the numeral 1 is the base or tank which is to be filled with the proper treating solution or bath, the upper edge of the tank being formed with standard light-sealing grooves, as shown at 2, which cooperate with like light seals on the top or lid 4. The cover 4 is removable and designed to be held in close fitting relation to the edge of the tank by devices such as shown by the clips 5. The bottom of the tank is formed with two open bearings 8 which receive and steady the lower ends of the two spool shafts 9 and 10.

Over the shafts 9 and 10 are removably fitted the two spools 11 and 12, respectively, simple cotter pins being shown to fix the spools on their respective shafts.

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The spools and their fittings may be of any well known design and it is not necessary to enter into a detailed description thereof other than to call attention to the fact that each end of the film or web is securely clamped to its spool so that when the web is unwound from one spool it will be so securely clamped to that spool that it will not release and the tension exerted upon the web will cause the winding mechanism to reverse itself. Merely by way of example, the spools are shown with a radially supported clamping shoe 15 on the inside of each spool and circumferentially movable by a rotatable key 16 into close clamping relation to the interior of the spool barrel so that the end of the web W, which is passed through a slot in the barrel, will be clamped by the shoe.

The lid or cover 4 is formed with a housing in which the driving mechanism is located, the lower side of the housing being closed by a plate 18 secured by screws 19 to posts 20 at the ends of the housing. The shafts 9 and 10 extend through bearings 21 formed in the plate 18 and project into open bearings 22 depending from the top of the cover.

On the top of the cover is the motor 25, the shaft 26 of which extends through the cover and into a bearing 27 in the plate 18.

On the shaft 9 between the cover and the plate 18 is fixed a driving gear 30 which meshes with an idler gear 31 rotatably mounted on a shaft 32 located in the plate 18 and steadied by a bearing 33 in the cover. On the shaft 10 is the driving gear 35, it being noted that the two shafts 9 and 10 are thus driven in the opposite directions by the motor 25 to wind the web upon the spools successively.

On the lower end of the motor shaft 26 is the driving pinion 36 which is in constant mesh with an intermediate or planetary pinion 37 which is fixed to a shaft 39. This shaft 39 is headed as shown in Fig. 2 and is carried on one of the arms of a right-angled lever or plate 40 which is rotatably mounted at its center on the shaft 26 so that the plate 40, carrying the pinion 37, may pivot around the shaft 26.

The end of the plate 40 which does not carry the pinion 37 is rounded as shown and is adapted to frictionally engage the rounded seats 41 in either flat metal spring plate 42 or 43 fixed to shoulders 44 formed on the inside of the cover.

When the driving mechanism is in the position shown in full lines in Figs. 1 and 2, the pinion 37 engages directly with the gear 35 and with the gear 36 driven in clockwise direction the spool 12 will be driven to wind up the film on

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that spool so long as the arm or plate 40 is held by the spring detent 42. The tension on the spring 42 is sufficient to hold the gears in engagement as shown.

When, however, the film is completely unwound from the spool 11 onto the spool 12, the gear 35 can no longer rotate and the torque exerted by the motor causes the arm 40 to free itself from the spring 42 and the arm rotates in clockwise direction until it is engaged by the spring detent 43 and at the same time the pinion 37, which moves in the orbit O, engages the idler gear 31, as shown in the dotted line position, and the spool 11 is now rotated in counter-clockwise direction to wind the film upon it. This operation continues until the spool 12 is completely uncovered, whereupon the gear 30 stops and the arm 40 moves on around the circle until the parts are restored to their full line position again. It will be noted that the springs 42 and 43 are located so as to catch and hold the plate with the gear 37 in mesh with either the gear 35 or the idler gear 31.

This motion of reversing the drive of the two spools will go on indefinitely and the operator, having once placed the spools on the shafts 9 and 10, closed the cover and turned on the motor, the film winds and rewinds until the motor is stopped.

It will be seen that an extremely simple device has been provided, of few parts, light in weight or little bulk, and inexpensive to make and operate. There are no parts to get out of order and none which requires attention except for an occasional lubrication with a light oil. There are many advantages over earlier forms of mechanisms for this general purpose. If, for some purposes, it may be desired to run the two spools in the same direction, the gear drives may be changed.

It will be noted that the force which causes the arm 40 to move initially until the gear 37 is released from either driven gear is the torque exerted by the gear 37. Thereafter the friction of the rotating parts is sufficient to cause the arm 40 to continue its movement until the gear 37 is re-engaged. For light work, as in a film winding apparatus such as shown herein, the friction of the rotating parts is generally sufficient to cause the arm 40 to complete its full movement from station to station. If, however, additional friction may be required, and indeed as a safety factor, the resistance to free rotation of the gear 37 may be increased, as, for example, by the insertion of a light spring washer 45, which is shown in Fig. 2, between the hub of the gear 37 and the arm 40.

What is claimed is:

1. A reversible winding apparatus comprising a driving sun gear, a cage and an intermediate, planetary driving gear, a pair of driven gears with their pitch circles substantially tangent to an extreme orbit of the pitch line of the planetary gear about the sun gear axis, slip detents defining the positions of toothed engagement of the planet gear with the respective driven gears, whereby the planetary gear resumes orbital motion of constant direction in response to a braking of an engaged driven gear sufficient to overcome the detent, an auxiliary gear in constant mesh with one of said pair of gears, a spool rotatable with said auxiliary gear, a spool rotatable with the other of said pair of gears, and means on said spools for attaching the ends of a web.

2. A continuous web winding and rewinding apparatus comprising a pair of spool shafts, with fixed axes in respect to the apparatus, driven

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gears on said shafts, a reversing gear in constant mesh with one of said driven gears, a motor having a shaft located between the spool shafts, a driving pinion on the motor shaft, a freely rotatable arm concentric with the motor shaft, an intermediate pinion carried by the arm and in mesh with the driving pinion, and movable with the arm into driving relation with said reversing gear or with the other of said gears in succession, upon uni-directional rotation of said arm, and detent means constructed and arranged to automatically engage and hold said arm when the intermediate pinion is in mesh with said reversing gear, and when it is in mesh with the said other of said gears, said detent means having a holding power adapted to yield to a predetermined back torque applied to said intermediate pinion.

3. A continuous web winding and rewinding apparatus comprising a pair of spool shafts, with fixed axes in respect to the apparatus, driven gears on said shafts, a reversing gear in constant mesh with one of said driven gears, a motor having a shaft located between the spool shafts, a driving pinion on the motor shaft, a freely rotatable arm concentric with the motor shaft, an intermediate pinion carried by the arm and in mesh with the driving pinion, and movable with the arm into driving relation with said reversing gear or with the other of said gears in succession, upon uni-directional rotation of said arm, and spring detent means constructed and arranged to automatically engage and hold said arm when the intermediate pinion is in mesh with said reversing gear, and when it is in mesh with the said other of said gears, said spring detent means having a holding power adapted to yield to a predetermined back torque applied to said intermediate pinion.

4. A continuous web winding and rewinding apparatus comprising a pair of spool shafts, with fixed axes in respect to the apparatus, and mounting spools to which the ends of the web are attached, driven gears on said shafts, a reversing gear in constant mesh with one of said driven gears, a motor having a shaft located between the spool shafts, a driving pinion on the motor shaft, a freely rotatable arm concentric with the motor shaft, an intermediate pinion carried by the arm and in mesh with the driving pinion, and movable with the arm into driving relation with said reversing gear or with the other of said gears in succession, upon uni-directional rotation of said arm, and detent means constructed and arranged to automatically engage and hold said arm when the intermediate pinion is in mesh with said reversing gear, and when it is in mesh with the said other of said gears, said detent means having a holding power adapted to yield to a predetermined back torque applied to said intermediate pinion, due to the drag of the attached end of said web.

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