June 27, 1961 K. HANSEN ET AL 2,990,128

DEVELOPING DEVICE FOR FILMS

Filed Jan. 25, 1957 2 Sheets-Sheet 1

FIG 1

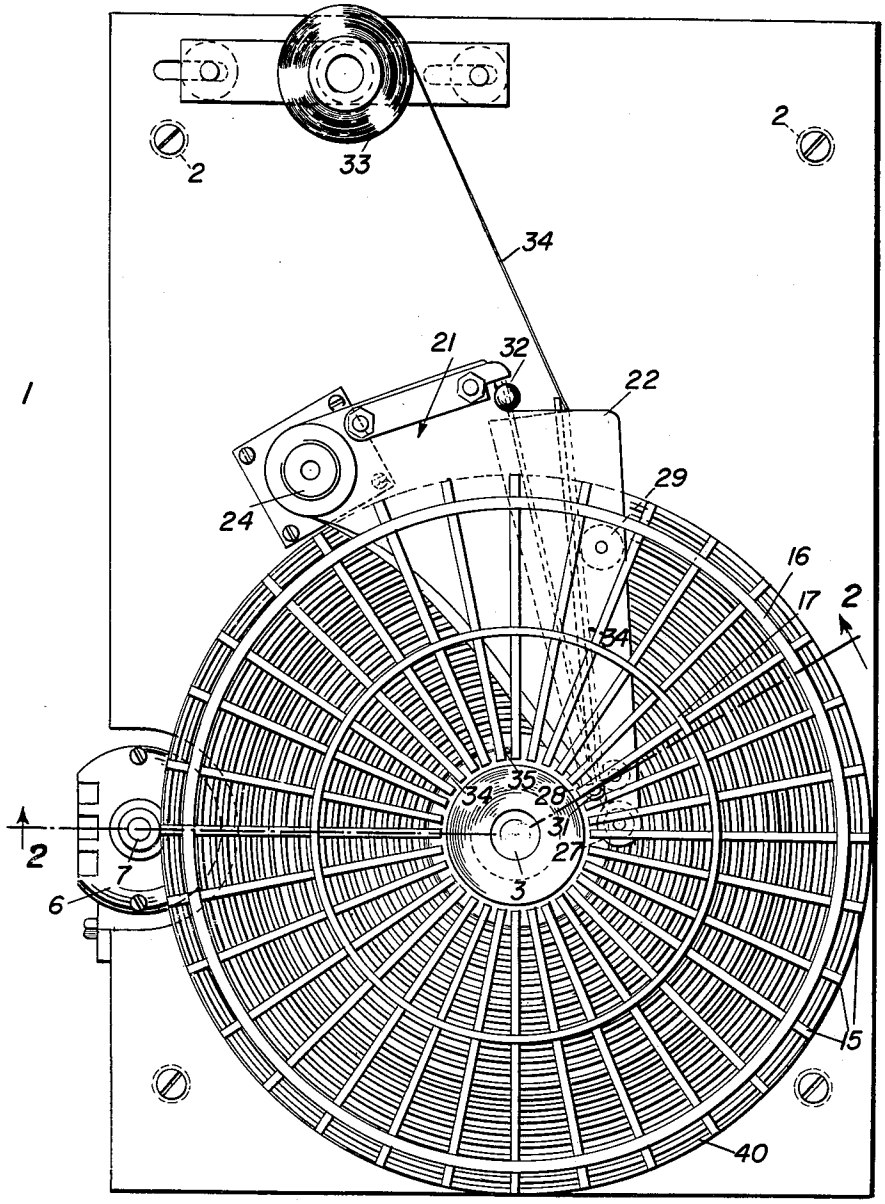
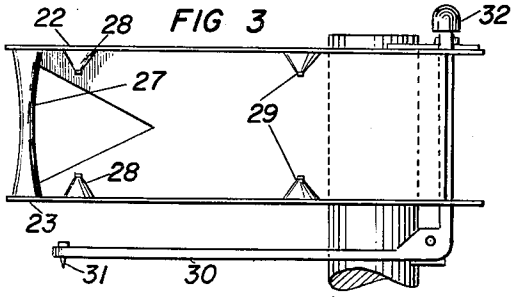


FIG 3



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2 Sheets-Sheet 2

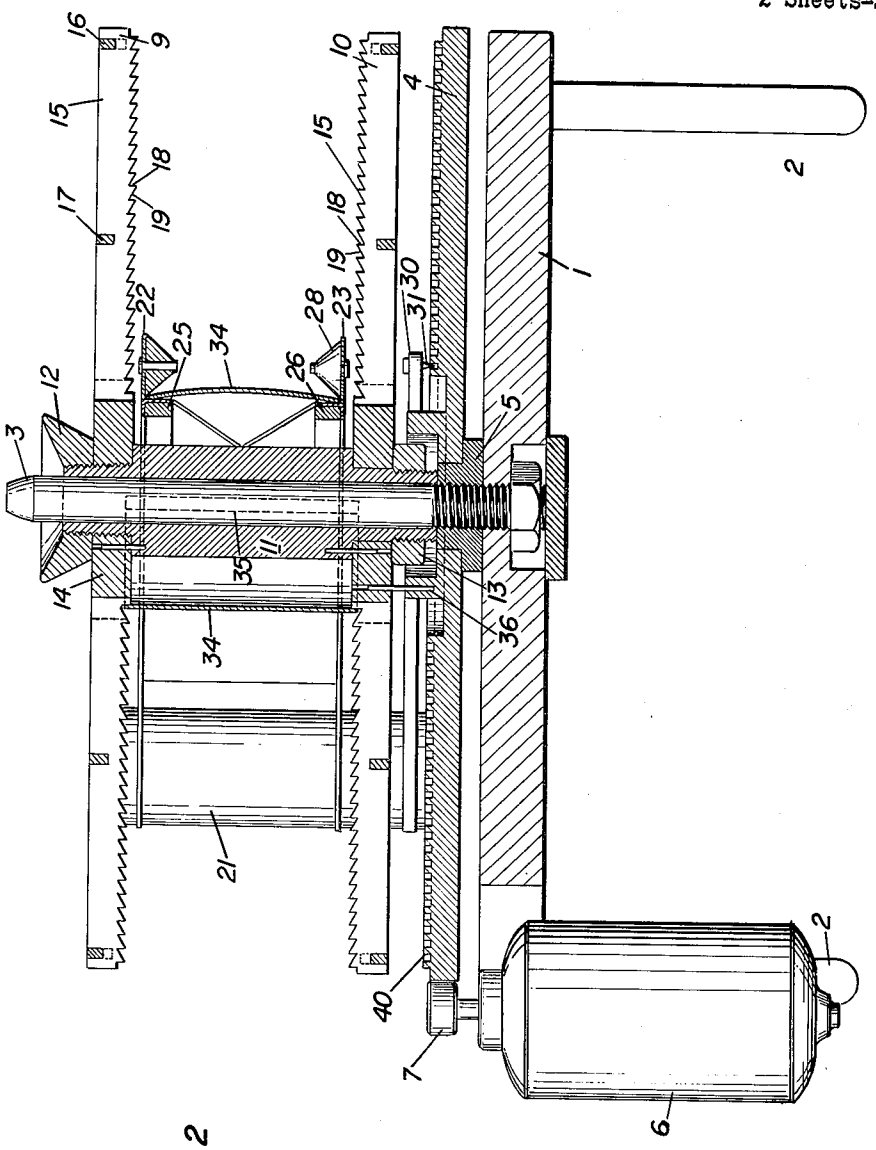


FIG 2

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DEVELOPING DEVICE FOR FILMS

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The present invention relates to a device for carrying film bands during developing and the like.

Spools for securing a film band during developing, fixing and the like are previously known, comprising two disks coaxially disposed and between which the film band is retained in spiral shaped grooves. These known devices have suffered from the inconvenience that the circulation of liquid around the film band has been poor even though it might have been somewhat improved by apertures arranged in the bottom of the grooves for the film band. Besides, a portion of the liquid has always remained in the grooves. Therefore it has been impossible to dry the film band while the same remains in the spool, as the emulsion layer of the film, in drying, sticks to the wall of the groove along practically the whole length of the film band.

By means of the device according to the invention these inconveniences are eliminated. The device according to the invention permits a proper liquid circulation around each part of the film band wound on the spool, and in removing the developing spool from the developing bath or the like practically all the liquid pours off when the spool is lightly shaken. Furthermore, the film band makes contact with the developing spool along very small surfaces only which in connection with the excellent liquid drainage makes it possible to allow the film band to dry while remaining in the spool.

The device according to the invention comprises a spool with two disks coaxially disposed and joined together by means of a central pin, said disks having members for retaining the film band between the disks in the shape of a spiral with spaced coils and is characterized in that each disk has several ribs radially disposed and fixedly connected to a hub and provided with teeth on the edge opposing the other disk in such a manner that the teeth interspaces are positioned on a spiral, the teeth forming carrying members for the film band.

Suitably the spaces between the ribs are substantially completely open so that developing liquid and air may freely pass between the ribs.

For winding the film onto the spool in an efficient manner according to the invention a special film guide member is provided.

Known film winding devices have a guide member, holding the film band curved transversely so that it is introduced between the walls of the spool without coming into contact with said grooves until the moment it is released from the guide member, at which it recovers a plane form transversely due to its inherent resilience, and the edges run into the respective spiral grooves. In employing such guide members the film spool is generally disposed vertically, that is with a horizontal axis of rotation, and the guide member is adapted so as to be resting, actuated by its own weight, upon the next preceding coil of the film. The spool may, in another arrangement, also be disposed horizontally, the position of the guide member being controlled by that part of the film band which has already been threaded into the spiral grooves. Thus, in such arrangements the only function of the guide member is to curve the film transversely, the following up of the spiral grooves by the guide member being secured by the film band itself.

Under normal circumstances such a guide member

operates very well but when irregularities of the film band appear, such as the edge being uneven or defective, it might occur that the edges of the film band are fed into the wrong spiral groove. This may in turn cause two coils of the film to be accommodated in the same spiral groove which in the following developing and drying procedure will cause these coils to stick together and the film may be destroyed.

The risk of the film band to be fed into the wrong groove is especially great with a developing spool according to the invention where the spiral grooves do not have continuously interconnecting walls, as in this case the interrupted wall sections may easily catch the edges of the film too early and pull the edges into the wrong groove.

In the film winding device according to the invention the risk of feeding one or both edges of the film band into the wrong groove is avoided in a simple manner. The device according to the invention is characterized in that it comprises a movable guide member for introducing the film band into the developing spool and a guide plate which is adapted to rotate with the developing spool and which is provided with a spiral groove corresponding to the spiral groove of the developing spool, the guide member being arranged to cooperate with said spiral groove in the guide plate, whereby the guide member during rotation of the spool will always follow the spiral groove of the spool.

The invention will be described in greater detail hereinafter with reference to the attached drawing showing an embodiment of the spool together with the film winding device according to the invention. FIGURE 1 shows a top plan view of the arrangement and FIGURE 2 shows a cross section along the line 2—2 of FIGURE 1. FIG. 3 is an elevational view of a detail.

The device illustrated presents a frame or base plate **1** disposed on legs **2**. A pin or shaft **3** is fixedly disposed on this plate. Immediately above the plate **1** a guide plate **4** is rotatably arranged about the shaft **3** by means of a bearing **5**. This guide plate is provided on the top side with a spiral groove, the function of which will be described in greater detail later on. An electric motor **6** is also arranged on the plate **1**, the motor shaft being provided with a roller **7**, made of rubber, for instance. This roller bears against the edge of the guide plate **4** and drives this plate by friction.

A developing spool **8** is detachably arranged on the shaft **3**. This spool consists of two circular disks **9** and **10** and a hub portion **11**. The disks and the hub are held together by means of a pair of nuts **12** and **13**. Hence, the same disks may be arranged on hubs of varying widths, corresponding to different film widths.

Each of disks **9** and **10** consists of a central portion **14** and a number of ribs **15** having rectangular cross sections and extending radially, spaced from one another, from the central portion. These ribs are held together by two circular ribs **16** and **17**. Each rib **15** is provided with teeth **18**, **19** on the edge facing the other disk. The teeth are formed in such a manner that the interspaces between the teeth are positioned on a spiral path, the teeth preferably being made by turning, in a lathe, a spiral groove **40** in the disk after the same has been assembled. The teeth **18**, **19** are so shaped that they have a triangular cross section with the edge **18**, facing the periphery of the disk, running perpendicularly to the disk. The grooves of disks **9** and **10** have the same pitch as the groove **40** of the guide plate **4**.

A pin **36** is arranged on the guide plate **4** adjacent to its centre. A recess, corresponding to the pin **36**, is arranged in the central portion of lower disk **10**. When the developing spool is placed upon the shaft **3** the spool is turned until the pin **36** engages said recess whereupon

the spool 8 and the plate 4 can not be turned relative to each other.

The film band is introduced to the developing spool by means of a guide member generally designated 21. This member consists of two sheet plates 22 and 23 which are firmly joined together and turnably arranged on a pin 24 vertically disposed on the base plate 1.

The edges 25, 26 of sheet plates 22, 23 are bent towards each other so as to form two guide channels for the film band. The sheet plates 22, 23 are arranged at such a distance from each other that they may be swung in between the disks 9 and 10 of the developing spool. For this reason a film band 34 positioned between the sheet plates 22, 23 will be bent transversely as may be seen from FIGURE 2. So as to retain the film band between the guide channels, two rollers 28, 29 are arranged on each of sheet plates 22, 23, said rollers being rotatable around a central pin and shaped with a tapered cross section. Moreover, a roller 27 is disposed between the two guide channels, said roller engaging the outer side of the film band, that is the convex side. In the case illustrated this roller is shaped with a concave cross section which substantially corresponds to the curved configuration of the film band disposed between the guide channels.

When the developing spool rotates the guide member 21 is positively guided by means of the guide plate 4. An arm 30 is attached to the guide member 21, said arm extending between the lower disk 10 of the developing spool and the guide plate 4. At its end the arm 30 is provided with a finger 31 adapted to engage the groove in the top side of the guide plate 4. The finger 31 is preferably disposed vertically underneath the edges 25, 26 of the guide member. The finger carrying arm 30 should suitably be adjustably attached to the guide member so that it may be adjusted laterally causing the edge of the film band 34, in leaving guide channels 25, 26, to be located right opposite a groove in the disks 9 and 10.

The other end of the arm 30 is provided with a handle 32 by means of which the arm can be actuated vertically so that the finger 31 may be raised and thereby be disengaged from the spiral groove in the guide plate 4. Hereby the guide member 21 may be swung in and out between the disks 9 and 10 of the developing spool independent of the guide plate 4.

In order to prevent the finger 31 or the inlet section of the groove in the guide plate 4, that is that section of the groove which is located immediate to the shaft 3, from being damaged when starting the winding action, the plate 4 may be provided immediate to the shaft 3 with a recess portion the bottom of which being flush with the bottom of the spiral groove in the same plate. A leaf spring may be adapted in this recess portion so as to automatically feed the finger 31 into the inner end of the spiral groove when the plate 4 is rotated in the right direction, while when the plate 4 rotates in the wrong direction the finger 31 will be allowed to pass freely by said leaf spring.

When a film is to be wound upon the developing spool the roll of film is arranged around a pin 33 disposed on the base plate 1. The free end of the film band is introduced between the guide channels, the guide member 21 then suitably being moved into its innermost position. However, this is not necessary, as the winding may start at any coil of the spiral groove. The film band which is curved transversely when being between the guide channels will straighten again when it leaves the guide member due to its inherent resilience and snaps in between those teeth of the ribs 15 which form the corresponding coils of the spiral grooves in the disks 9 and 10. When the end of the film band has been introduced by hand so far that it, for instance, will describe a semicircle on the developing spool, generally the friction between the spool and the band is so great that the motor 6 can be started whereupon the winding proceeds automatically. In order to obtain a safer securing of the end of the film band in the spool this end may be folded so that the folded flap 35 engages one tooth on each of the reels 9 and 10, ensuring a safe securing. As the winding proceeds the guide member 21 moves outwardly under the action of the guide plate 4 so that the film band, leaving the guide channels, is fed into the right coil of the grooves.

When the whole film band has been wound onto the spool the guide member is swung out so that it clears the spool 8 and the latter is detached from the shaft 3 whereupon the spool with the film band may be subjected to the desired treatment, for instance submerging into a developing bath. After the treatment of the film is finished most of the adhering liquid is removed by shaking whereupon the film may be allowed to dry while still remaining in the spool.

In order to minimize the adherence between the film and the ribs 15, the ribs of course should be as narrow as possible in view of the strength of material. For instance, it has been found that for spools having a diameter of 200–300 mm. a width of up to 2–3 mm. is suitable for the ribs. If desired, the edge engaging the film band may be made narrower than the rest of the rib.

We claim:

1. A film holding reel of the type used in film developing tanks, comprising a hub, a plurality of radially extending spoke members on both ends of said hub and fixedly attached thereto, each of said spoke members being provided on its inner face with a row of teeth, corresponding teeth of adjacent spoke members being radially displaced relative to each other whereby the interspaces of said teeth on said spoke members define interrupted spiral film tracks for both edges of the film, a guide plate disposed underneath said spoke members having a spiral groove facing said spoke members, and a guide member for the film having an arm extending between the lower spoke members and said guide plate provided with a finger to cooperate with the spiral groove of said guide plate.

2. A device according to claim 1 wherein said arm is provided with means for raising and lowering the same so that said finger may be disengaged from the spiral groove of said guide plate.

3. A device according to claim 2 wherein said guide member is rotatably carried on an axis parallel to the axis of said hub.

4. A device according to claim 2 wherein said guide plate is arranged coaxially to said hub.

5. A film holding reel of the type used in film developing tanks, comprising a hub, a plurality of radially extending spoke members on both ends of said hub and fixedly attached thereto, each of said spoke members being provided on its inner face with a row of teeth, corresponding teeth of adjacent spoke members being radially displaced relative to each other whereby the interspaces of said teeth on said spoke members define interrupted spiral film tracks for both edges of the film, a movable guide member for introducing a film between said spoke members and a guide plate having a spiral groove corresponding to said spiral film track, said guide member cooperating with said spiral groove in said guide plate whereby said guide member upon rotation of said reel will always follow said spiral track.

6. In a device for winding photographic roll film to be processed in a spiral having spaced convolutions, a film holding reel comprising a hub, a plurality of radial spoke members on both ends of said hub and fixedly attached thereto, each of said spoke members being provided on its inner face with a row of teeth, corresponding teeth of adjacent spoke members being radially displaced relative to each other whereby the interspaces of said teeth on said spoke members define interrupted spiral tracks for the edges of said film, and means to feed the edges of said film into said interrupted spiral tracks, compris-

ing a guide plate disposed underneath said spoke members on one end of said hub and having a spiral groove facing said spoke members, and a guide member for the film having an arm extending between said spoke members on one end of said hub and said guide plate and provided with a finger to cooperate with the spiral groove of said guide plate.

7. A device according to claim 6 wherein said arm has means for raising the same so as to thereby disengage said finger from said spiral groove of said guide plate.

8. In a device for winding photographic roll film to be processed in a spiral having spaced convolutions, a film holding reel comprising a hub, a plurality of radially extending spoke members on both ends of said hub and fixedly attached thereto, each of said spoke members being provided on its inner face with a row of teeth, corresponding teeth of adjacent spoke members being radially displaced relative to each other whereby the interspaces of said teeth on said spoke members define interrupted spiral tracks for both edges of the film, means to feed the edges of the film into said interrupted spiral tracks comprising a movable guide member for introducing a roll film between said spoke members on both ends of said hub and a guide plate connected for simultaneous rotation with said film holding reel and having

a spiral groove corresponding to said interrupted spiral tracks, said guide member cooperating with said spiral groove in said guide plate whereby said guide member upon rotation of said film holding reel will follow said interrupted spiral tracks.

9. A device according to claim 8 wherein said guide plate is arranged coaxially to said film holding reel.

References Cited in the file of this patent

UNITED STATES PATENTS

957,991	McLeod	May 17, 1910
1,188,217	Stehle	June 20, 1916
2,280,113	Andrews	Apr. 21, 1942
2,297,525	Anheuser	Sept. 29, 1942
2,315,532	Lucia et al.	Apr. 6, 1943
2,371,073	Smith	Mar. 6, 1945
2,461,039	Debrie	Feb. 8, 1949
2,608,357	Brearton	Aug. 26, 1957

FOREIGN PATENTS

555,485	Great Britain	Aug. 25, 1943
652,611	Great Britain	Apr. 25, 1951
878,501	France	Oct. 12, 1942