June 8, 1937. M. LESJAK ET AL 2,082,962

DEVELOPING TANK FOR ROLL FILMS

Filed Nov. 21, 1935. 2 Sheets-Sheet 1

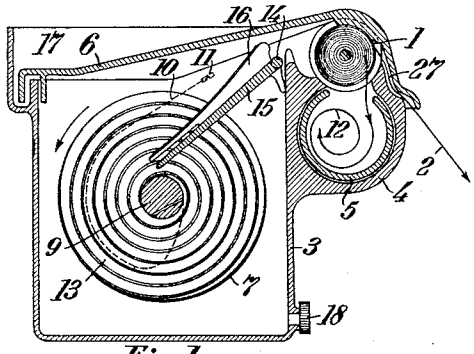


Fig. 1

Fig. 2

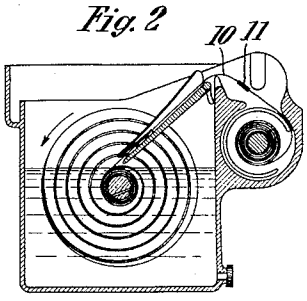


Fig. 3

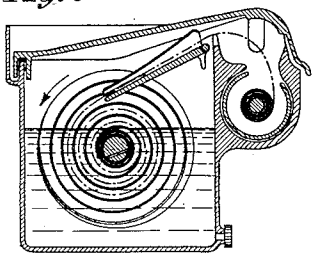


Fig. 4

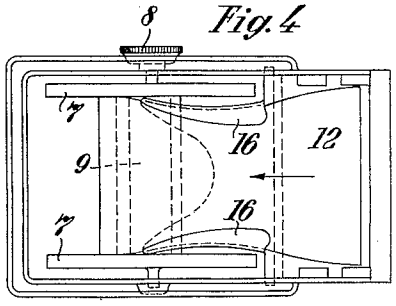


Fig. 5

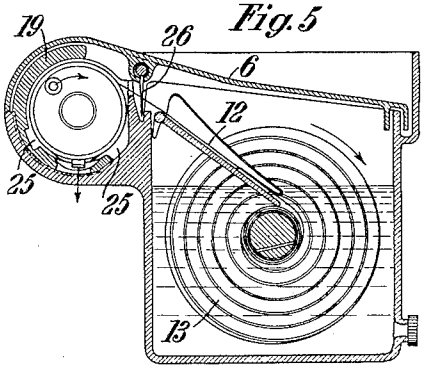


Fig. 6

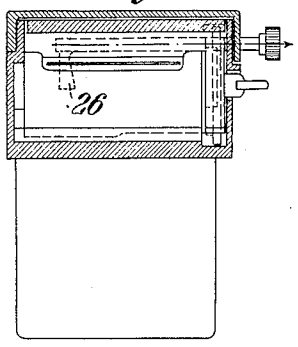
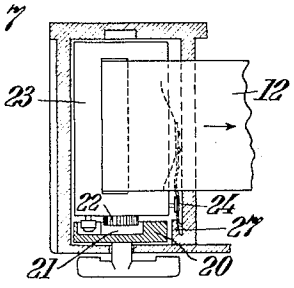


Fig. 7



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June 8, 1937. M. LESJAK ET AL 2,082,962

DEVELOPING TANK FOR ROLL FILMS

Filed Nov. 21, 1935 2 Sheets-Sheet 2

Fig. 8

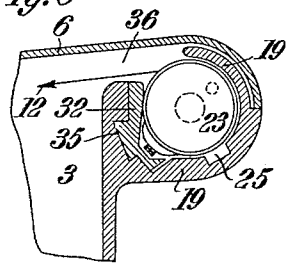


Fig. 12

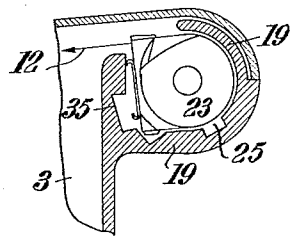


Fig. 9

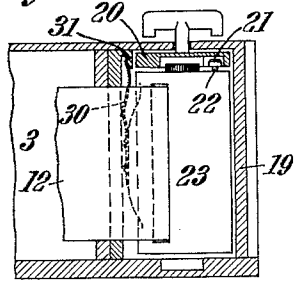


Fig. 13

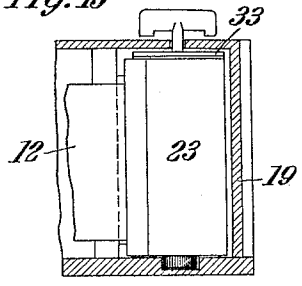


Fig. 10

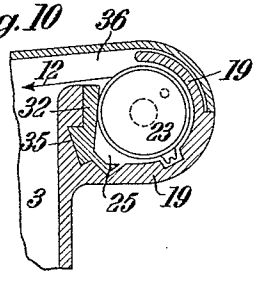


Fig. 14

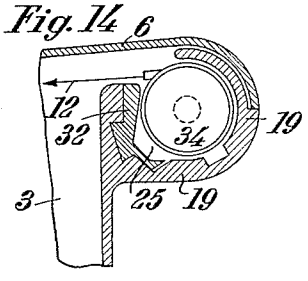


Fig. 11

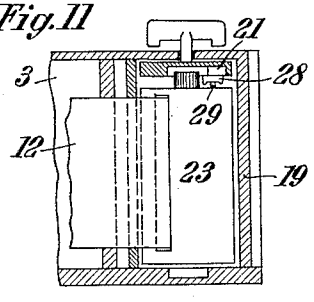
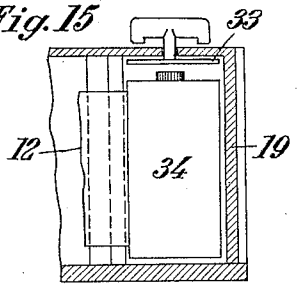


Fig. 15



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Patented June 8, 1937 2,082,962

UNITED STATES PATENT OFFICE

2,082,962

DEVELOPING TANK FOR ROLL FILMS

Michael Lesjak and Wilhelm Kehr, Augsburg, Germany

Application November 21, 1935, Serial No. 50,913
In Germany November 23, 1934

7 Claims. (Cl. 95—90.5)

Our present invention relates to a developing tank for roll-films and more particularly to a daylight developing tank for roll-films.

One of its objects is a developing tank for roll-films in which the film may be introduced in daylight or bright artificial light.

Another object is a daylight developing tank which is particularly suited for paper-protected roll-films.

Another object is a daylight developing tank which is particularly suited for roll-films in cartridges containing perforated cinematographic film.

Another object is a daylight developing tank in which a paper protected roll-film is unwound by withdrawing the protective paper strip into a container from which it is wound into the developing vessel.

Another object is a daylight developing tank in which the cinematographic film is unwound from the cartridge or cassette into a room from which it is wound into the developing vessel.

Further objects will be seen from the detailed specification following hereafter. Reference is made to the accompanying drawings in which:

Figs. 1 to 3 are side elevations of sections of the tank,

Fig. 4 is a plan view of the tank,

Figs. 5 to 7 show a tank adapted for the treatment of a roll-film in a cartridge or a cassette,

Figs. 8, 10, 12 and 14 show sections through a mechanism for unwinding a roll-film in a cartridge or cassette, and

Figs. 9, 11, 13 and 15 show plan views of the mechanism shown in Figs. 8, 10, 12 and 14.

This invention relates to a daylight developing tank for films, especially paper protected roll-films or roll-films in cartridges, for example, perforated cinematographic films. The construction is such that the film can be introduced into the tank in daylight or bright artificial light, unrolled by withdrawing the protecting paper, developed, fixed and washed.

Apparatus into which the exposed film can be introduced in daylight, or in which the exposed film is first introduced into the tank in a darkroom and subsequently developed in daylight, are known. The mounting of films in spiral grooves in a horizontal or vertical plane in such a way that the film cannot be moved is also known. It is not, however, possible to insert the film in the spiral grooves if the tank is still wet as a result of washing, or of the previous development. Also, since the film cannot be moved, it is very difficult to eliminate any air bubbles which may be attached to it.

In this invention, the film if protected on its rear face by a paper strip is first led into a preliminary chamber by lateral withdrawal of the protecting paper from the tank after it has been closed. This chamber can itself be made light-tight by means of a rotating shutter, and is so arranged that the developer cannot enter it. A band to which the end of the film is attached before closing the tank is fixed on the common axle of two oppositely placed spirally grooved discs. By rotating these discs by means of a handle operated from outside, the film is led over a guide into the spiral grooves and so enters the developing tank, which is charged to the appropriate level with developer. In contradistinction to the known methods, the film is led into the grooves from the inner end of the spiral outwards. This method of unrolling the film has a number of advantages. The film can be led into a tank already charged with developer, thereby ensuring uniform contact with the fluid, and absence of air bubbles and specks. After unrolling, while the film is being developed, it can be continually rotated, so that a uniform development free from flecks is produced. The coated side of the film is not brought into contact with edges or angles which might scratch it, during the unrolling or developing. The unrolling itself proceeds steadily and without encountering any obstacle. Relatively little developer is required, since owing to the vertical arrangement of the spirally-grooved discs the tank need only be about half full. The tank is relatively small and compact, and is adapted for travelling. The tank is preferably made of pressed material, for example the artificial resin known as "Bakelite", or the like.

The accompanying drawings illustrate the invention:—

Figs. 1–3 are side elevations of sections of the tank.

Fig. 4 is a plan of the tank.

The developing tank consists of an appropriate container **3** on one side of which is the preliminary chamber **4**, the front of which can be closed by means of the rotating shutter **5**. At the bottom is the outlet **18**. The two spirally grooved discs **7** joined to one another by an axle **9** are mounted inside the container, and can be rotated from outside by means of the knob **8**. The band **10** carrying a clip **11** is fixed to the axle. The guide **15** is pivoted to the container at **14**. The film spool is placed in a compartment above the chamber **4**. The container, the chamber **4** and

the compartment for the film spool are closed by a light-tight cover **6**. A narrow slit **27** is provided between the chamber **4** and the cover **6** for withdrawing the protecting paper strip.

For developing, the film **12** rolled on the spool **1** is first unrolled into the chamber **4** by withdrawing the protecting paper **2**, the tank being closed. The chamber **4** is then made light-tight by means of the shutter **5** operated from outside. The tank is then opened, and the end of the film is attached to the clip **11** on the band **10** (Fig. 2). After again closing the tank the film is automatically introduced through the guide **15** into the spiral grooves, by turning the grooved discs **7** (Fig. 3). The guide is provided at each side with a lap **16**; these laps lightly press towards each other the edges of the film before it enters the grooves, so that its breadth is less than the distance between the grooved flanges of the discs. The film is unrolled into the spiral grooves from the inner end of the spiral outwards. The guide **15** it automatically lifted during the unrolling until the film is completely set in the grooves. The unrolled film can then be continually rotated in the developer. After developing and removing the developer through the outlet **18**, the fixing solution and water are successively introduced through the light-tight opening **17**.

The use of the tank for developing roll-films in cassettes or cartridges, for instance kino-films as used in small cameras (Leica, Kodak, Contax, Peggy), is illustrated in Figs. 5–15. In this case instead of the preliminary chamber **4** which can be shut off from the tank, a chamber **19**, open to the tank, is provided, and is furnished at the front with a light-tight driving mechanism comprising a disk **20** which can be rotated from outside. The chamber **19** is mounted somewhat above level with the upper border of the developing tank **20** that the liquid cannot penetrate into it. The disk has on its inner side recesses **21** and detent pins which engage the corresponding pivots **22** of the cartridge or cassette. By turning the disk **20** in a closkwise direction through 180° the cartridge **23** in the chamber is opened. Fig. 7 shows a section of the disk and its arrangement with a Leica cassette **23** opened. Preferably a correspondingly formed disk is used for each of the known makes of film cartridge and cassette (Figs. 8–15). The disk can be changed at will.

The film cassettes of different make have different forms; for example, partly projecting locking springs **24** and other projections. The inner wall of the chamber **19** has recesses **25** corresponding with these projections, which are so placed that all film cassettes at present commercially in use can be fitted into one and the same tank.

The internal cross-section of the chamber can, in using somewhat larger cassettes, for example, be altered so as to allow of the insertion of a filling-piece into, or its removal from, a dove-tail groove **35**.

For developing, the film cartridge or cassette is inserted in the chamber **19** (Fig. 7). The end of the perforated film is attached to the band as described above, the tank being open. The tank is then closed by the light-tight cover **6**, the chamber is then opened in the manner described, and the film **12** withdrawn from the cartridge and unrolled.

Since the end of the film in the Leica, Contax and Kodak cartridges is fixed, a knife **26**, which can be operated from outside, is inserted so as to be light-tight, immediately behind the chamber **19**, and by means of this the film can be cut through after it has been unrolled. This cutting is necessary, as otherwise the film would not be capable of rotation and other movement while it is being developed.

The duration of the development is determined in a known manner by means of a developing time gauge.

The various shapes of the filling pieces which are to be inserted in the chamber as employed for different film cartridges or cassettes are illustrated in Figs. 8–15. The film cassettes **23** consist either of two metal shells rotatable one inside the other, in which are cut slits for withdrawal of the film (Leica, Contax), or of a metal shell, which can be opened longitudinally having a light-tight slit for withdrawal of the film (Peggy, Figs. 12 and 13). The film cartridges **34** are shells closed on every side and having a light-tight slit for withdrawal of the film (Kodak, Figs. 14 and 15).

At the front of the preliminary chamber is inserted the interchangeable disk **20** which can be rotated and fits light-tight into the front wall of the chamber. This disk has, for example on its inner side, a recess **21** which engages the corresponding pin **22** of the (Leica) cassette. By turning the disk clockwise through 180° the cassette is opened (Figs. 8 and 9). In Figs. 10 and 11 is shown a disk having a somewhat more projecting catch **28**, which, on the insertion of a different film cassette (Contax), presses down the catch pin **29**, and thereby liberates the fastening, ensuring that the Contax cassette can be opened by a clockwise turn of the disk **20**.

As shown in Figs. 8 and 9, a tongue **30** is riveted to the film cassette, which prevents the latter from opening. This tongue is pressed outwards on inserting the cassette, by means of a conical lug **31** fixed to the inside of the chamber and the cassette is thereby unlocked. For another cassette (Peggy, Figs. 12 and 13) the filling piece **32** (see Fig. 10) must be removed before inserting the cassette so as to make room for the larger cassette. Since this cassette is longer than those mentioned above, the recessed disk **20** must be exchanged for a smooth, thin walled disk **33**, which merely serves to make the chamber light-tight.

The cylindrical film cartridge (Kodak, Figs. 14 and 15), from which the film is withdrawn through a lateral slot, is inserted in the same manner as the film cassettes.

What we claim is:

1. A daylight developing tank for roll films which comprises in combination a container, an axle mounted in said container and protruding over one side of said container so as to be capable of movement from outside the container, two spirally grooved discs mounted on said axle inside said container and at a distance from each other corresponding with the breadth of the roll film to be treated in said developing tank, a guide hinged to said container for guiding the film to be treated and having a breadth less than the distance of said spirally grooved discs, the free end of said guide being bent outwardly so as to engage said grooves of said spirally grooved discs, a chamber mounted on said container for receiving a roll film, and a lid for light tight closure of said container and said chamber.

2. A daylight developing tank for roll films which comprises in combination a container, an axle mounted in said container and protruding over one side of said container so as to be capable

of movement from outside the container, a film clip fixed to said axle, two spirally grooved discs mounted on said axle inside said container and at a distance from each other corresponding with the breadth of the roll film to be treated in said developing tank, a guide hinged to said container for guiding the film to be treated and having a breadth less than the distance of said spirally grooved discs, the free end of said guide being bent outwardly so as to engage said grooves of said spirally grooved discs, a chamber mounted on said container for receiving a roll film, and a lid for light tight closure of said container and said chamber.

3. A daylight developing tank for roll films which comprises in combination a container, an axle mounted in said container and protruding over one side of said container so as to be capable of movement from outside the container, a film clip fixed to said axle, two spirally grooved discs mounted on said axle inside said container and at a distance from each other corresponding with the breadth of the roll film to be treated in said developing tank, a guide hinged to said container for guiding the film to be treated and having a breadth less than the distance of said spirally grooved discs, the free end of said guide being bent outwardly so as to engage said grooves of said spirally grooved discs, said guide carrying on each side a guide lap, the distance of said laps being smaller than corresponds with the breadth of the film, a chamber mounted on said container for receiving a roll film, and a lid for light tight closure of said container and said chamber.

4. A daylight developing tank for roll films which comprises in combination a container, an axle mounted in said container and protruding over one side of said container so as to be capable of movement from outside the container, two spirally grooved discs mounted on said axle inside said container and at a distance from each other corresponding with the breadth of the roll film to be treated in said developing tank, a guide hinged to said container for guiding the film to be treated and having a breadth less than the distance of said spirally grooved discs, the free end of said guide being bent outwardly so as to engage said grooves of said spirally grooved discs, a chamber mounted on said container for receiving a roll film, a shutter for opening said chamber to and closing it from said container, and a lid for light tight closure of said container and said chamber.

5. A daylight developing tank for roll films which comprises in combination a container, an axle mounted in said container and protruding over one side of said container so as to be capable of movement from outside the container, two spirally grooved discs mounted on said axle inside said container and at a distance from each other corresponding with the breadth of the roll film to be treated in said developing tank, a guide hinged to said container for guiding the film to be treated and having a breadth less than the distance of said spirally grooved discs, a chamber mounted on said container for receiving a roll film, a shutter for opening said chamber to and closing it from said container, a lid for light tight closure of said container and said chamber, and a second chamber formed by said container and said lid above said first chamber for receiving a roll film.

6. A daylight developing tank for roll films which comprises in combination a container, an axle mounted in said container and protruding over one side of said container so as to be capable of movement from outside the container, two spirally grooved discs mounted on said axle inside said container and at a distance from each other corresponding with the breadth of the roll film to be treated in said developing tank, a guide hinged to said container for guiding the film to be treated and having a breadth less than the distance of said spirally grooved discs, the free end of said guide being bent outwardly so as to engage said grooves of said spirally grooved discs, a chamber mounted on said container for receiving a roll film, a shutter for opening said chamber to and closing it from said container, and a lid for light tight closure of said container and said chamber, said lid and said container forming a slot bent to form a light trap.

7. A daylight developing tank for roll films which comprises in combination a container, an axle mounted in said container and protruding over one side of said container so as to be capable of movement from outside the container, two spirally grooved discs mounted on said axle inside said container and at a distance from each other corresponding with the breadth of the roll film to be treated in said developing tank, a guide hinged to said container for guiding the film to be treated and having a breadth less than the distance of said spirally grooved discs, the free end of said guide being bent outwardly so as to engage said grooves of said spirally grooved discs, a chamber mounted on said container for receiving a roll means connected with said chamber for unwinding a roll film in a cassette introduced into said chamber.

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