Jan. 23, 1940. F. MOORE 2,187,948

DEVELOPING TANK

Filed July 27, 1939

Fig. 1.

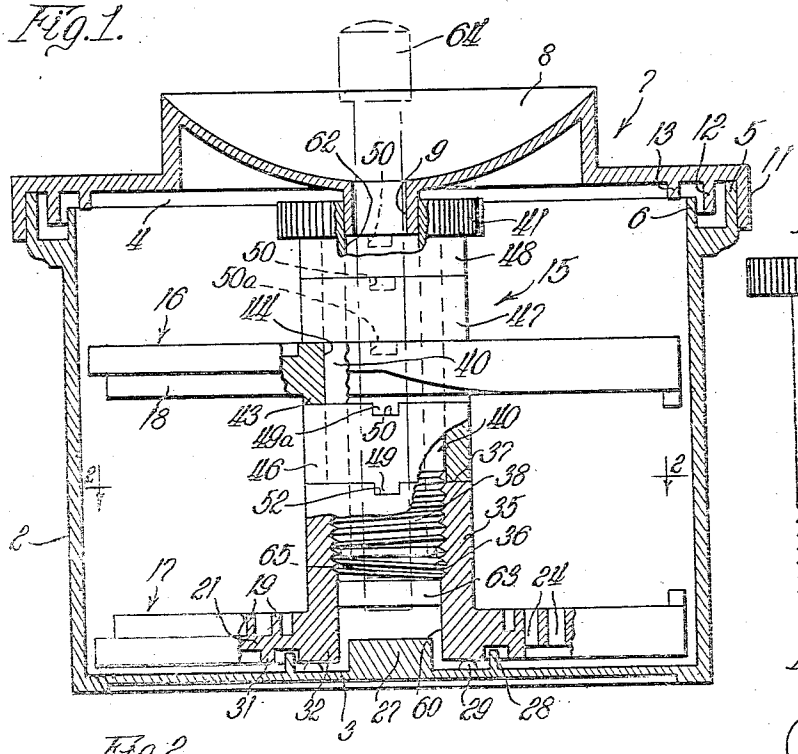


Fig. 2.

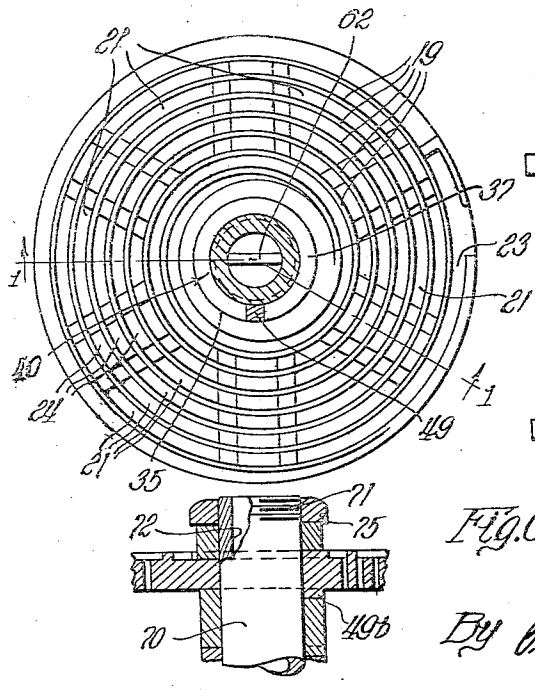


Fig. 3.

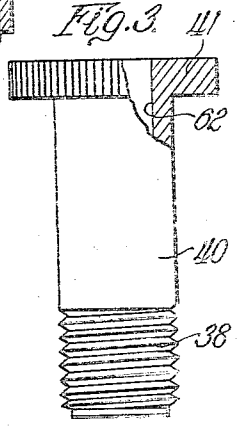


Fig. 4.

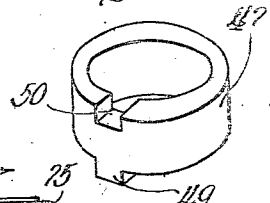


Fig. 5

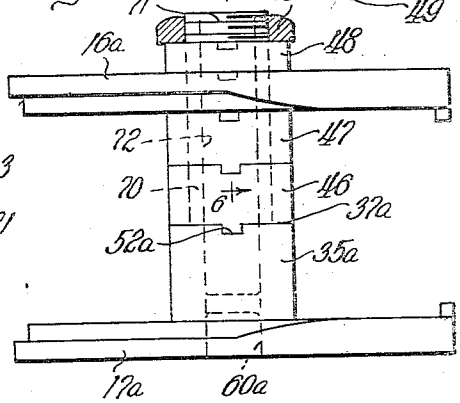


Fig. 6.

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DEVELOPING TANK

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11 Claims. (Cl. 95—90.5)

The present invention relates generally to photographic apparatus and is more particularly concerned with developing tanks utilized for developing, washing, and fixing photographic films.

The object and general nature of this invention is the provision of a developing tank which is adjustable to accommodate photographic film of different widths and which is so constructed that when adjusted for any particular width of film the reel of the tank is held firmly and securely in adjustment without any danger of the reel heads loosening or permitting the film to disengage from the heads, yet the reel and film is movable freely within the tank and its light cover to permit a complete and effective agitation so that the film is developed quickly and uniformly. Adjustable developing tanks heretofore provided have embodied inconvenient or unreliable means for holding the reel heads in adjusted position. For example, some of the prior developing tanks have embodied spring detent means for holding the movable head in adjusted position, reliance being placed upon the spring member for maintaining the reel in adjustment. Other prior constructions have embodied shiftable parts dependent upon attachment to the tank cover itself or dependent upon engagement with the film to maintain the desired adjustment.

It is a feature of this invention to improve upon such constructions by providing a new form of adjustable developing tank in which the reel includes a shiftable head held in adjusted position by a plurality of interchangeable spacing members which can be firmly clamped in position so that there is no possibility of the reel heads loosening and getting out of adjustment, yet at the same time the means on the tank and tank cover receiving the reel supports the latter for agitating movement within the tank and holds the reel in the same position, independently of the particular position in which the shiftable reel head has been adjustably fixed.

These and other objects and advantages of the present invention will be apparent to those skilled in the art after a consideration of the following detailed description of the preferred forms of my invention, illustrated in the accompanying drawing.

In the drawing:

Figure 1 is a sectional view of a developing tank embodying the principles of the present invention, being a view taken generally along the line 1—1 of Figure 2;

Figure 2 is a view taken along the line 2—2 of Figure 1;

Figure 3 is a view of the screw threaded tubular rod upon which the spacing collars and the adjustable reel head are mounted;

Figure 4 is a perspective view of one of the spacing collars;

Figure 5 is a view showing a modified form of reel which may be used in place of the reel shown in Figure 1; and

Figure 6 is a fragmentary section taken along the line 6—6 of Figure 5.

Referring more particularly to the form of the invention shown in Figures 1 to 4, the developing tank as shown comprises a cylindrical container 2 having a closed bottom 3 and an open top 4, the container 2 being formed at its open end with spaced light intercepting flanges 5 and 6. The container 2 is adapted to receive a removable cover 7, the central portion of which is formed with a funnel section 8 and a short tubular element or spout 9 in the central portion of the cover, the periphery of which carries three light intercepting flanges 11, 12, and 13, as shown, these flanges cooperating with the flanges 5 and 6 on the container 2 to establish the light trap whereby, even though the outer flanges 5 and 11 on the container and cover, respectively, are intended to fit snugly, any light filtering through the outer flanges will be stopped by the inner flanges, thereby protecting the film being developed from being fogged. The spout 9 of the funnel 8 extends inwardly a substantial distance below the general plane of the cover 7 for a reason which will appear below. Within the receptacle 2 is disposed a reel structure indicated in its entirety by the reference numeral 15 and which comprises upper and lower discs or reel heads 16 and 17. The reel heads 16 and 17 on adjacent surfaces are each provided with groove defining ribs 18 and 19. As best shown in Figure 2, these ribs are arranged spirally, thereby defining spiral passages for holding roll film for development, but it will be understood that, if desired, the grooves or ribs may be arranged to radiate from the center, thereby accommodating cut film. Each reel head is formed with a number of reinforcing arms or spokes 21 radiating from the center of the disc and serving to support the ribs. It will be understood that the developing tank may be formed of any suitable material, but Bakelite or other plastic is preferred since with such material it is convenient to form each of the reel heads 16 and 17 as one integral part. As will be understood, the film to be developed is threaded endwise into the grooves or passages defined by the ribs 18 and 19, the entrance opening into

the grooves being indicated at 23 in Figure 2. As also best shown in this figure, each reel head is provided with openings 24 between the ribs 19 to provide for the free flow of developing or fixing solution or rinsing water.

The bottom 3 of the container 2 is provided with a central stud 27 and an annular flange or rib 28 concentric with the stud 27, there being relatively short rounded projections or studs 29 between the central stud 27 and the flange 28. The lower reel head 17 carries a depending flange 31 and a central depending section 32, the latter being adapted to rest on the projections 29 inside of the flange 28 on the bottom of the container, while the outer depending reel head flange 31 is disposed outside of the container flange 28, thereby providing a light trap or seal at this point, while, at the same time, the reel 15 is supported slightly above the bottom of the container to provide for a free flow of liquid throughout all parts of the reel.

The lower reel head 17 is provided with an upwardly extending central hub 35, preferably formed integral with the reel head, the hub being in the form of a tubular extension provided with screw threads 36 on the interior. The hub 35 extends upwardly and terminates in a shoulder 37. The hub 35 receives the lower screw threaded end 38 of a tubular connecting member 40 constructed in the form of a rod having an annular knurled flange or head 41 extending radially outwardly and having a diameter greater than the diameter of the central hub 35. The upper reel head or disc 16 carries a short hub 43 having a central opening 44 to receive the tubular connecting member 40, as best shown in Figure 1.

A plurality of spacing collars of different axial dimensions is indicated at 46, 47, and 48. Each spacing collar is provided with a lug or projection 49 and a corresponding recess 50 in the opposite end, as illustrated in Figure 4 which shows in detail the spacing collar 47. The shoulder 37 of the lower disc hub 35 is formed with a recess or notch 52 to receive the projection or lug 49 of the associated collar, and the upper reel head 16 is formed with a projection 49*a* and a recess 50*a* corresponding to the construction of the spacing collars. The recess 50*a* appears in dotted lines in Figure 1 since it is on the opposite side of the reel head 16 from the projection or lug 49*a*, shown in Figure 1. It could, of course, be formed on the same side as the projection or lug 49*a*, if desired. As best shown in Figure 1, the tubular connecting member 40 has an internal diameter substantially the same as the external diameter of the funnel spout 9, whereby the latter is received within the upper end of the tubular connecting member 40.

It will be observed that the axial dimensions of the several spacing collars 46, 47, and 48 vary, the collar 46 having the greatest axial length while the collar 48 has the least axial length, and it will also be observed that the diameter of the collars 46, 47, and 48 is substantially the same as the external diameter of the hub or tubular extension 35, which is appreciably less than the diameter of the innermost ribs 19. The axial length of the hub or tubular extension 35 and the various spacing collars 46, 47, and 48 are particularly chosen so as to provide a reel construction which can be adjusted readily to accommodate the various widths of film customarily available. As will be clear from Figure 1, any one or more of the spacing collars 46, 47, and 48 may be disposed on either one side or the other of the adjustable reel head 16. For the narrowest film, which may, for example, be the 35 mm. film used in the miniature or candid type camera, the upper reel head 16 is disposed directly against the shoulder 37, with the lug 49*a* seating in the notch 52, all of the spacing collars 46, 47, and 48 being disposed between the outer face of the reel head 16 and the knurled flanged head 41 of the tubular connecting member 40. The purpose in having the lug 49*a* engage the notch 52 is to make sure that the ribs 18 and 19 are arranged in opposed registry, that is, the ribs 18 and 19 are arranged so that the opening 23 of the upper disc or reel 16 is directly opposite the opening 23 in the lower reel head 17. This is necessary in order to thread the film easily and conveniently into the grooves or passages defined by the ribs 18 and 19. In assembling the spacing collars 46, 47, and 48 on the outside of the upper head 16, it is immaterial in which order the spacing collars are assembled. The lug 49 on the lowermost collar will be engaged in the notch or recess 50*a* of the upper head 16, and then the projection 49 on the next outer collar will engage the notch 50 of the lower collar. The outer collar is assembled in a similar manner, and since the outer edge or end of the outer collar is the portion which is provided with the notch, it will be seen that this outer end or edge of the outer collar fits snugly against the shoulder provided by the flanged head 41 of the tubular member. Screwing the threaded end 38 of the latter into the threaded bore of the tubular extension 35 then securely fixes the various parts of the reel in position, and at the same time the clamping engagement of the parts effected by the tubular connecting member 40 securely holds the upper and lower reel heads against relative rotation.

If it should be desired to adjust the reel for film of a width greater than the axial dimension of the tubular extension 35, one of the spacing collars is disposed between the tubular extension 35 and the upper reel head 16. For example, the collar 46 may be disposed between the upper head 16 and the lower head 17, as shown in Figure 1, in which case the lug 49 of the collar 46 rests in the notch 52 and the lug 49*a* of the upper head 16 is disposed in the notch 50 of the collar 46. The various notches and lugs are formed so that, by this means, the head 16 is held in the proper position relative to the lower head 17 so that the openings 23 are directly opposite one another and the film receiving grooves are in position to receive a film threaded into the reel. The other two spacing collars 47 and 48 are then disposed outside the upper end 16, between the latter and the head 41 of the tubular connecting member 40.

In this way, using various spacers, either on the inside or outside, or both, of the upper head 16, any of the widely used films of commercial widths available at the present time may be accommodated, yet in each instance the upper head 16 is held in the proper position relative to the lower head 17 to dispose the ribs and film receiving openings 23 directly opposite each other. Therefore, no matter how the spacing collars are arranged, when the tubular member 43 is screwed up tight the collars and reel heads are secured together firmly and rigidly and with practically no danger of the parts accidentally becoming disengaged as might possibly occur in tanks where the shiftable head is held merely by spring detent means. It will be seen that if

during the operation of developing a film, the film should become disengaged from the grooves in the reel head, the development would be seriously affected by portions of the film coming into contact with each other which would result in uneven development.

It will also be observed that however the spacing collars are arranged whether one or all is inside or outside of the upper reel head 16, the distance between the outer or upper end of the tubular member 40 and the lower portion of the head 17 always remains the same. The purpose of this arrangement is that the reel 15, no matter for what film the reel heads may be adjusted, is always held in the proper position in the container 2. Referring now to Figure 1, it will be seen that the tubular extension 35 is recessed, as at 60, to receive the central stud 27 formed on the bottom 3 of the container. This serves to center the reel in the lower portion of the container 2. At the other end of the reel, the spout 9 fits down inside the tubular connecting member 40, thereby centering the upper end of the reel. In this way, the reel is held in the proper position in the container and arranged for rotation therein, entirely independently of the particular adjustment of the reel heads. The bore or central opening extending through the tubular connecting member 40 as indicated in Figures 1 and 3 by the reference numeral 62. It will also be observed that in the lower portion of the tubular extension 35 a bridge or transverse bar 63 is formed, the bore 62 communicating with the interior 63 of the tubular extension 35. This permits a rod or agitator, indicated at 64 and having a lower slotted end 65, to be inserted into the bore 62 so that the slotted end engages the bar 63, whereby turning the upper knurled end of the rod 64 serves to rotate the reel within the container 2. The spout 9 extends downwardly within the bore 62 a sufficient distance so that no light can pass into the interior of the tank, and at the lower end the stud 27 and cooperating flanges 28, 31, and 32 prevent any light leakage at this point, as pointed out above. A portion 8 of the cover 7, in conjunction with the spout 9, is formed to provide a funnel for pouring into the tank the desired developing, washing, or fixing solution, and it is therefore important that, no matter what the adjustment of the reel may be, the latter be supported at its upper and lower ends to provide for the flow of the liquid into the tank.

Figures 5 and 6 disclose a modified form of reel structure in which the lower disc 17a is provided with an integral tubular extension 70 which extends upwardly through the spacing collars and the upper head 16a. The outer end of the tubular extension 70 is threaded, as at 71, and is provided with an internal bore 72 extending the full length of the extension 70, the hub 35a of which corresponds to the tubular extension 35 described above and which receives the spacing collars in substantially the same manner. A nut 75 screws on to the threaded portion 71 of the extension 70 and serves to clamp the upper head 16a on the spacing collars in position, as described above in connection with Figure 1, the shoulder 37a on the tubular hub 35a having a notch 52a corresponding to the notch 52 shown in Figure 1. The hub 35a of the disc 17a is provided with a recess 60a to receive a center stud 27 in the bottom of the tank (see Figure 1) and the interior bore at the upper end of the tubular extension 70 is arranged to receive the spout 9 of the cover 7, whereby, entirely independently of the adjustment of the reel head 16a, the reel is arranged for rotation within the developing tank and is disposed in a position to permit developing, washing, and fixing solutions to be poured into the tank when the reel is in position therein, as described above. In Figure 6, the hub or central portion of the upper reel head 16a does not extend below the ribs 18 as in Figure 1, but is finished off substantially flush except, of course, for the associated anchoring lug or projection 49a.

While I have shown and described above the preferred form in which the principles of the present invention have been imparted, it is to be understood that my invention is not to be limited to the specific details shown and described above, but that, in fact, widely different means may be employed in the practice of the broader aspects of my invention.

What I claim, therefore, and desire to secure by Letters Patent is:

1. An adjustable developing tank comprising a container, a cover therefor, the latter and the bottom of the container having reel-receiving means spaced apart a fixed distance, and a reel comprising upper and lower reel heads having inwardly projecting ribs forming film-receiving grooves, one of said heads having an axial extension, the inner portion of which is threaded, and the other head having a central opening, a plurality of spacing collars of various axial dimensions and the outside diameter of each being less than the diameter of the radially innermost ribs of the heads whereby the collars clear said ribs and may be disposed interchangeably between said heads and on the outside of said other head so that the latter may be placed closer to said one head than when all of said collars are placed between said heads, a threaded member adapted to be engaged with said axial extension and cooperating therewith to clamp said heads and all of said collars together independently of whether any or all of the latter are placed inside or outside of said other head, and means on the reel spaced apart a fixed distance axially independently of the disposition of said collars inside or outside said other head and corresponding to the fixed spacing between the reel-receiving means on said container bottom and said cover for mounting said reel for rotation in the container relative to the bottom thereof and the cover when the latter is in position on the container.

2. An adjustable developing tank comprising a container, a cover therefor having a funnel section with a depending nozzle, the bottom of the container having reel-centering means, the latter and said nozzle being spaced apart a fixed distance when the cover is in place on the container, and a reel comprising upper and lower reel heads having film-receiving ribs, the lower head having an axial extension and centrally disposed means at its outer face cooperating with said reel-centering means, the inner portion of said axial extension being threaded, a plurality of spacing collars of various axial dimensions and the outside diameter of each being less than the diameter of the radially innermost ribs of the heads whereby the collars may be disposed interchangeably between said heads and on the outside of the upper head so that the latter may be placed closer to the lower head than when all of said collars are placed between said heads, a threaded member adapted to be engaged with

said axial extension and cooperating therewith to clamp said heads and collars together irrespective of whether any or all of the latter are placed inside or outside of said other head, and means at the upper end of the reel to telescopically receive said nozzle and spaced apart a fixed distance axially from said centrally disposed means independently of whether said collars are disposed inside or outside said upper head and corresponding generally to the fixed spacing between the reel-centering means on said container bottom and said nozzle for mounting said reel for rotation in the container relative to the bottom thereof and the cover when the latter is in position on the container.

3. An adjustable developing tank comprising a container, a cover therefor, the latter and the bottom of the container having reel-receiving means spaced apart a fixed distance, and a reel comprising upper and lower reel heads having film-receiving grooves, one of said heads having a central opening, a tubular rod having a flanged head at one end and adapted to be inserted through said opening and connected at its other end to the other reel head, a plurality of interchangeable spacing collars arranged to be disposed optionally between said reel heads and between said one reel head and the head of said tubular rod, whereby the distance between said reel heads may be varied to accommodate a plurality of film sizes but without varying the distance between said other reel head and the head of said tubular rod, and means on said other reel head and said head of the tubular rod and spaced apart a distance corresponding to the fixed spacing between the reel-receiving means on said container bottom and said cover for mounting said reel for rotation in the container relative to the bottom thereof and the cover when the latter is in position on the cover.

4. An adjustable developing tank as defined in claim 3, further characterized by an axial extension formed on said other head and threaded interiorly to receive the threaded end of said tubular rod.

5. An adjustable developing tank as defined in claim 3, further characterized by an axial extension formed on said other head and threaded interiorly to receive the threaded end of said tubular rod and all of said interchangeable collars slidably fitting over said tubular rod optionally between the flanged head thereof and said one reel head or between the latter and said axial extension.

6. An adjustable developing tank as defined in claim 3, further characterized by said spacing collars being of different axial dimensions whereby the reel heads may be adjusted for various widths of film by different combinations of one or more collars on said tubular rod on one or the other sides of said one head.

7. An adjustable developing tank as defined in claim 3, further characterized by an axial extension formed on said other head and threaded interiorly to receive the threaded end of said tubular rod, said axial extension and the outer face of said one head each having a notch adjacent the portion receiving said threaded rod, the opposite face of said one head having a projecting lug, and each of said collars having a similar notch at one end and a projecting lug at the other end, whereby the interengagement of the notches and lugs serves to lock said one head against rotation relative to the other head while accommodating rotation of said tubular rod to clamp the collars and heads together in axially fixed position.

8. An adjustable developing tank comprising a container, a cover therefor, the latter and the bottom of the container having reel-receiving means spaced apart a fixed distance, and a reel comprising upper and lower reel heads having film-receiving grooves, the lower head having an axial tubular extension and the upper head having an opening for slidably receiving said extension, the latter having a portion of larger diameter adjacent the lower head and terminating in a shoulder, a plurality of spacing collars of substantially the same diameter as said enlarged portion of the tubular extension and each slidable on the latter, cooperating axially extending notches and lugs formed on the ends of said collars, on said shoulder and on the inner face of said upper head, whereby the latter is held in position relative to the lower head through the connection of said upper head with the shouldered portion of said tubular extension, a nut threaded onto the outer end of said tubular extension for holding said upper head and any associated collars in position on the tubular extension with said notch and lug means in engagement, and means on the lower head and at the end of said tubular extension receiving said nut and cooperating with said reel-receiving means for mounting said reel for rotation relative to the container and cover.

9. A reel for a developing tank comprising a pair of reel heads, one having an axial extension with its outer portion threaded and each having film receiving generally arcuate grooves, a plurality of spacing collars of various axial lengths, and a threaded member adapted to be engaged with said axial extension and cooperating therewith to clamp said heads and collars together, the outside diameter of each collar being less than the diameter of the radially innermost groove, whereby the collars may be interchangeably disposed either on the inside of the other head between the latter and said one head or on the outside between said other head and said threaded member, so as to position said heads optionally to accommodate films of various different widths, both of said heads and said collars carrying axially engageable interlocking means whereby for the most narrow film the heads are interlocked directly together to prevent relative rotation of one with respect to the other and for the wider film, when one or more collars are placed between said heads, said other head is locked to said one head through the interposed and interlocked collars.

10. A reel as defined in claim 9 characterized further by said threaded member comprising a tubular rod having a head at its outer end and its inner end extending through said other head and all of the spacing collars in any position of said other head and into threaded engagement with said tubular extension.

11. A reel as defined in claim 9 characterized further by said tubular extension having a shoulder and a portion outwardly thereof of reduced diameter and adapted to slidably receive all of said collars and said other head, the outer end of said tubular extension being threaded to receive said threaded member.

FRANCIS MOORE.