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2,793,010

AGITATION APPARATUS

Original Filed Sept. 17, 1953

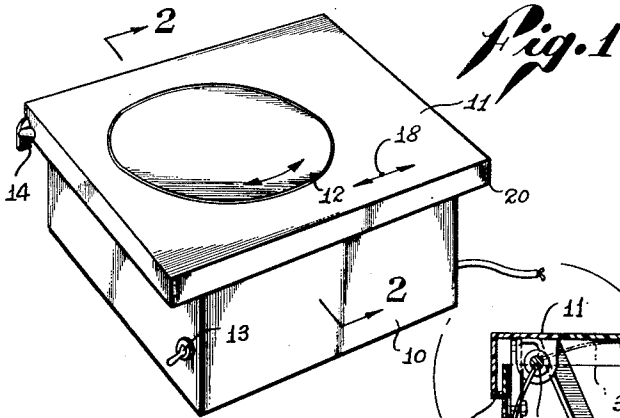


Fig. 1

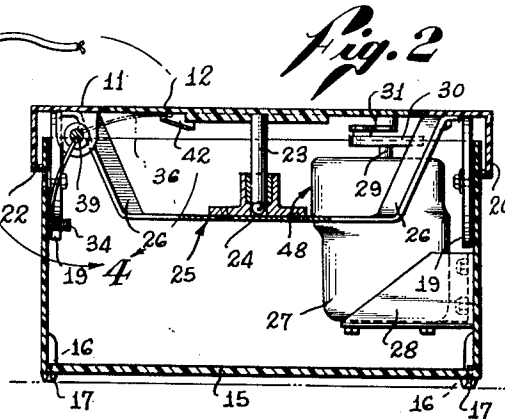


Fig. 2

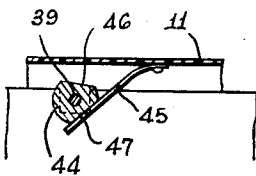


Fig. 5

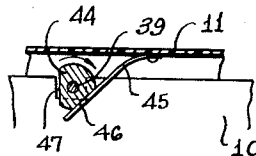


Fig. 6

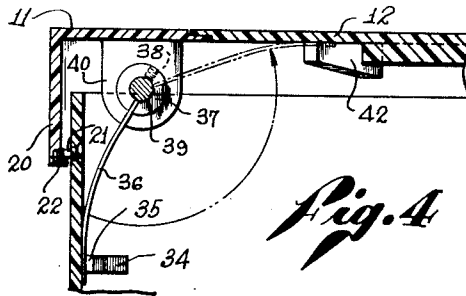


Fig. 4

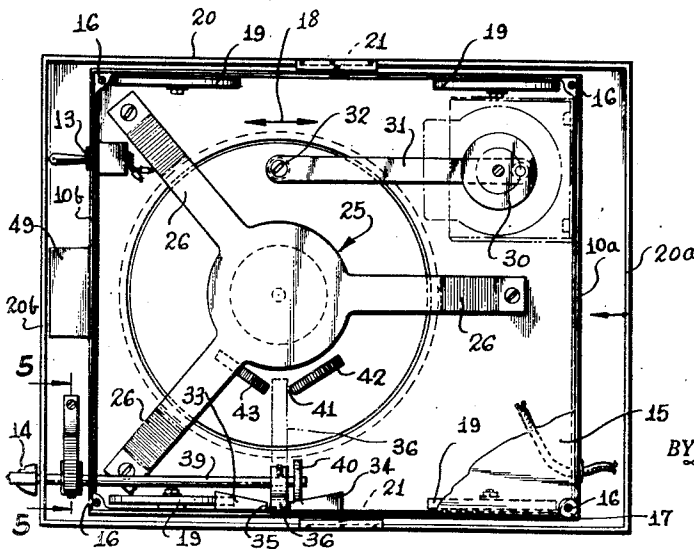


Fig. 3

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AGITATION APPARATUS

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Substituted for abandoned application Serial No. 380,711, September 17, 1953. This application May 18, 1956, Serial No. 585,678

11 Claims. (Cl. 259—72)

This invention relates to an agitation apparatus and has particular reference to a photographic agitator which finds particular utility when employed in photographic developing processes to agitate the developing solution.

This application is a substitute for my earlier abandoned application, Serial No. 380,711 filed September 17, 1953 and entitled, "Agitation Apparatus."

It is well known that continuous agitation of the developing solution during development of photographic images is essential to the proper functioning of the developing process. While commercial and large scale operations oftentimes use machines for producing such agitation, the amateur photographer and those engaged in similar small scale operations have almost universally resorted to manual agitation because of the size, cost, and general lack of suitability characterizing the known agitating machines.

In amateur photography it is a common practice to develop photographic negatives in a closed and light-tight container or tank, the tank being shaken from time to time, or continuously, to effect an agitation of the developing solution. Roll film is usually supported in the tank by a reel upon which the film is wound in a spiral, whereas cut film and plates are usually held by suitable frames in spaced side by side relation. Accordingly, in order to effect an adequate agitation of the developing solution in a roll film tank, it is necessary that the tank be given a circular or arcuate oscillatory motion, whereas a cut film tank should be oscillated linearly. Since most amateurs and those engaged in small scale operations use both roll film and cut film, their requirements cannot be fulfilled by any single agitation machine known prior to this invention, because such prior machines provide only a single type of motion and do not provide both a linear oscillation and an arcuate oscillation.

It is, therefore, an object of this invention to provide an agitation apparatus which overcomes the above-mentioned disadvantages by providing at the will of the operator oscillatory motions of either of two dissimilar types.

It is also an object of this invention to provide an apparatus of the character set forth in the preceding paragraph wherein said two types of oscillatory motion produced comprise linear and arcuate.

It is an additional object of this invention to provide an apparatus of the character set forth in the preceding paragraphs which includes a manually operable selector device permitting the selection of either of two types of oscillatory motion.

It is also an object of this invention to provide an apparatus of the character set forth hereinabove which includes a table mounted for linear oscillatory movement, a turntable carried by said table and adapted to produce an arcuate oscillatory motion, a power means for so moving said table and turntable, and a selector means for selecting the type of motion produced.

It is a still further object of this invention to provide an apparatus of the character set forth in the preceding paragraphs wherein said table is carried by a base and said

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power means is coupled to said turntable, and wherein said selector includes means for selectively locking said table to said base or to said turntable, as desired.

It is another object of this invention to provide an apparatus of the character described which is small in size, of inexpensive construction, and capable of operation over long periods of time with a minimum of maintenance.

Other objects and advantages of this invention will be apparent from a consideration of the following specification, read in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of a preferred form of apparatus embodying the invention;

Figure 2 is a vertical cross-sectional view of the apparatus shown in Figure 1;

Figure 3 is an underside view of the apparatus shown in Figure 1, the bottom cover being broken away to reveal the interior construction;

Figure 4 is a fragmentary cross-sectional view showing on an enlarged scale the portion of the device indicated by the circular line "4" in Figure 2;

Figure 5 is a fragmentary cross-sectional view taken substantially along the line 5—5 of Figure 3 showing a detent device; and

Figure 6 is a view similar to Figure 5, but showing an alternate position of the detent device.

Referring to the drawings, there is shown in Figure 1 a preferred embodiment of the invention comprising a base or housing 10 surmounted by a structure including table 11 which supports a turntable 12 preferably set into the upper surface of the table 11 so as to dispose in the same plane the upper surfaces of both the table 11 and the turntable 12, these upper surfaces being intended and adapted to support a developing tank or like article to be agitated. As will be explained, the housing 10 encloses a suitable source of mechanical power, such as an electric motor, which may be controlled by a switch 13, electric energy being supplied by the usual attachment cord.

According to one mode of operation, the table 11 is stationary while the turntable 12 oscillates about its center. Alternatively, the table 11 may be reciprocated to provide a linear oscillatory motion, in which event the turntable 12 remains fixed relative to the table 11. A manual selector 14 is provided to permit selection of these two types of operation.

As is best shown in Figures 2 and 3, the housing 10 is open at both the top and bottom, the top opening being covered by the table 11, and the bottom opening being fitted with a removable cover 15 held in place as by screws 16, the latter, if desired, being fitted with rubber feet 17. The table 11 is supported for reciprocation in the direction of rollers or wheels 19 rotatably secured to the sides of the base 10, as shown, the upper edges of the wheels extending above the upper edges of the sides of the base 10, and the table 11 resting upon the upper edges of the wheels.

The table 11 is preferably rectangular in form and the four edges carry depending skirts 20 serving to cover the space between the table 11 and the upper edges of the base 10 and so hiding the exposed portions of the wheels 19. The table 11 is held against upward movement by means of pins 21 which overlie inwardly extending flanges 22 carried by the lower edges of the two skirts 20 which are disposed parallel to the direction of reciprocation. To facilitate assembly, the flanges 22 may be made removable, as shown.

The turntable 12 is mounted upon the upper end of a shaft 23 which is journaled for rotation by a combination journal and thrust bearing 24. The bearing 24 is suitably secured to a spider 25, the legs 26 of which are suitably secured to the underside of the table 11.

Power for operating the device is preferably supplied

by an electric motor 27 secured, as by a mounting bracket 28, to one end wall of the housing 10. The vertically disposed shaft 29 of the motor 27 carries on its upper end a crank 30 to which is pivotally secured one end of a drag link 31. The other end of the drag link 31 is pivotally attached to the underside of the turntable 12, as shown at 32, the point 32 being disposed at a greater distance from the center of the shaft 23 than the throw of the crank 30 so as to translate rotation of the crank 30 into an arcuate oscillation of the turntable 12.

When the device is operated to produce an arcuate oscillation of the turntable 12, it is necessary, or at least desirable, to hold the table 11 against reciprocation. To this end there is provided a latch comprising a pair of opposed and tapered latch plates 33 and 34 secured to one side wall of the base 10 and defining therebetween a latch notch 35 adapted to be engaged by a resilient latch finger 36. The latch finger 36 is secured, as by means of a collar 37 and set screw 38, to a shaft 39 supported from the underside of the table 11 by bearings comprising a bracket 40 and a suitable bore through the skirt 20, such bearings serving to journal the shaft 39 for angular movement as hereinafter described. By the construction just described, the latch 36, engaging the notch 35, serves to hold the table 11 against reciprocation so that energization of the motor 27 will cause an arcuate oscillation of the turntable 12.

To provide for a selection of a linear oscillatory motion, the shaft 39 is fitted with the previously mentioned selector knob 14 by means of which the shaft 39 may be turned to dispose the resilient latch finger 36 in an alternate position as shown in dotted lines in Figures 2, 3, and 4. In such alternate position, the latch finger 36 enters a latch notch 41 defined by a pair of opposed and tapered latch plates 42 and 43 which are secured to the underside of the turntable 12, and which may be identical with the plates 33 and 34 previously described. In this alternate position of the latch finger 36, the turntable 12 is held against movement relative to the table 11, whereas the table 11 is free to move relative to the base 10. Accordingly, operation of the motor 27 and the resulting reciprocation of the end 32 of the drag link 31 will cause a linear oscillation of the table 11.

It will be seen that the finger 36 will not necessarily be aligned with the latch notch at the time the shaft 39 is turned. For this reason, the latch plates 33, 34, and 42, 43 are given a length sufficient to be engaged by the finger 36 in all normal positions of the table 11 and turntable 12. The resilience of the finger 36 allows the shaft 39 to be turned completely to the selected position regardless of the engagement of the finger with any of the latch plates. The tapered surfaces of the latch plates ensure that the finger will slide along the surface of the plate engaged and snap into the latch notch as soon as the motor 27 is energized. Thus, a selection of the desired motion may be made at any time with complete assurance that the finger will immediately be moved to the desired latch engaging position as soon as the device is placed in operation.

To securely but releasably hold the selector 14 in either of its two positions, the shaft 39 is provided with a suitable detent mechanism. Such a detent mechanism may be constructed as shown in Figures 5 and 6, and may include a cam member 44 secured to the shaft 39 and cooperating with a leaf spring 45 secured to the table 11, the spring 45 being adapted to engage either of two flat surfaces 46 or 47 provided by the cam member 44 to resiliently hold the shaft 39 against rotation from either of such positions. The flat surfaces 46 and 47 are, of course, so positioned as to dispose of the finger 36 in the latch notches 35 and 41, respectively.

In operation, if roll film is to be processed, the tank is placed on the turntable 12 and preferably in approximate concentricity therewith. The selector 14 is turned to the position engaging the finger 36 with the latch notch

35 to lock the table 11 against movement relative to the base 10, and the motor is started by means of the switch 13. As a result, the tank is subjected to a gentle and continuous arcuate oscillation. If cut films or plates are to be processed, the tank may be placed in any desired location on the table 11 or on the turntable 12. The selector is turned to the alternate position to engage the finger 36 with the notch 41 and lock the turntable 12 against movement relative to the table 11, and the motor is started by means of the switch 13. As a consequence, the tank is subjected to a continuous and gentle reciprocation or linear oscillation.

Since it would be possible, although unlikely, for both the table 11 and the turntable 12 to be moved beyond their normal limits of travel, particularly during the time the finger 36 is being moved from one latch notch to the other and engages neither, provision is made for limiting the movement of the table 11. Such provision may comprise an end one of the skirts 20, as for example, the skirt 20a shown in Figure 3, disposed to engage an end wall 10a of the base 10 if the table 11 be moved beyond its normal range. Alternatively, a stop member 49 may be secured to an end wall of the base (as shown at 10b in Figure 3) in a position to be engaged by one of the end skirts 20, as for example, by the skirt 20b shown in Figure 3.

Preferably, the device is constructed to provide a frequency of the order of one hundred complete cycles of oscillation per minute. Since most electric motors operate at much higher speeds, it is preferred to use as the motor 27 a device of well-known type including a self-contained speed reducer or gear reduction unit as indicated generally at 48 in Figure 2, and driving the shaft 29 at a speed of the order of one hundred R. P. M.

The amplitude of the linear oscillation is determined by the throw of the crank 30. As an amplitude of about one inch is usually adequate, the crank 30 should provide a throw of approximately one-half inch. For a given crank throw, the amplitude of the arcuate oscillation is determined by the distance of the point 32 from the center of the shaft 23. For an amplitude of about thirty degrees and a crank throw of about one-half inch, the point 32 should be placed about two inches from the center of the shaft 23. While amplitudes greater than those mentioned may be used if desired, it is believed that eminently satisfactory results may be obtained at the indicated amplitudes and speeds, and also at lesser amplitudes and speeds.

From the foregoing, it will be seen that this invention provides an agitation apparatus which is particularly adapted for use in the agitation of developing tanks such as are often-times used in amateur photography. Attention is directed particularly to the fact that the device provides a plurality of types of oscillatory agitating motions, and includes a selector allowing the operator to select at will the type of agitation desired.

It will be noted that the device described is of extremely simple construction and susceptible of low cost manufacture. The device is also of rugged and fool-proof construction and is not likely to get out of order. In this connection, attention is directed to the resilient selector latch 36 and the cooperating tapered latch plates which provide for automatic engagement of the latch in a selected position without regard to the then relative positions of the table, turntable, and base.

While the preferred embodiment of the invention has been shown and described in the foregoing, the invention is not to be limited to the details of construction illustrated and described, except as defined in the appended claims.

I claim:

1. In an agitation apparatus, the combination of: a base; a structure carried by said base and defining an upper surface for supporting an article to be agitated; means mounting said structure for movement of said

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upper surface in the plane thereof; drive means carried by said base; coupling means drivably connecting said drive means to said structure for imparting to said surface either of two dissimilar types of oscillatory motion, said two types comprising a linear oscillation and an arcuate oscillation; and selector means operable to select either of said types of oscillations.

2. In an agitation apparatus, the combination of: a base; a structure carried by said base and defining an upper surface for supporting a container containing a solution to be agitated; drive means on said base connected to said structure for imparting to said surface either of two dissimilar types of oscillatory motion, said two types comprising a linear oscillation and an arcuate oscillation; and manual selector means operable at will to select either of said types of oscillatory motion to be imparted to said surface.

3. In an agitation apparatus, the combination of: a base; a table carried by said base and defining an upper surface; means mounting said table on said base for linear oscillation in the plane of said surface; a turntable also defining an upper surface, said upper surfaces providing a support for a developing tank or like article to be agitated; bearing means carried by said table and supporting said turntable for arcuate oscillation in the plane of said surface; drive means carried by said base; and coupling means drivably connecting said drive means to said turntable.

4. The apparatus of claim 3 wherein said turntable is recessed into said table to dispose the upper surfaces of said table and turntable in the same plane.

5. The apparatus of claim 3 wherein said coupling means comprises a rotating crank connected to be rotated by said drive means, a drag link pivotally connected at one end to said crank, and means pivotally connecting the other end of said drag link to said turntable at a point spaced from the center of rotation thereof a distance greater than the throw of said crank.

6. An apparatus according to claim 3 which also includes a selector means co-acting with said coupling means and operable to a first position for effecting said linear oscillation of said table, and operable to a second position for effecting said arcuate oscillation of said turntable.

7. The apparatus of claim 6 wherein said bearing means and said coupling means co-act to drivably connect said drive means also to said table, and wherein said selector means includes a latch mechanism operable in said first position to hold said turntable against movement relative to said table and operable in said second

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position to hold said table against movement relative to said base.

8. The apparatus of claim 6 wherein said bearing means and said coupling means co-act to drivably connect said drive means also to said table, and wherein said selector means comprises a latch finger carried by said table, latch plate means on said turntable defining a first latch notch, other latch plate means on said base defining a second latch notch, means mounting said latch finger for movement to first and second positions engaging said finger with said first and second notches respectively, and manual means connected to said latch finger permitting said finger to be moved at will from one of said position to the other, the engagement of said finger with said first notch serving to hold said turntable against movement relative to said table while permitting said linear oscillation of said table, and the engagement of said finger with said second notch serving to hold said table against movement relative to said base while permitting said arcuate oscillation of said turntable.

9. The apparatus of claim 8 wherein said latch finger is supported at one end with the other end disposed to engage said notches as aforesaid, said latch finger being flexible to allow said other end to be displaced relative to said one end, and wherein each of said latch plate means comprises a pair of tapered and opposed latch plates disposed in alignment and spaced from each other to define said latch notch, the taper of said plates defining inclined surfaces sloping toward said notch and serving to guide said finger into said notch upon movement of said finger along said plates.

10. The apparatus of claim 9 wherein the combined length of said aligned latch plates exceeds the amplitude of said oscillation.

11. An apparatus according to claim 8 wherein said means mounting said latch finger for movement comprises a shaft carried by said table and journaled for rotation relative thereto, wherein said manual means comprises a knob on said shaft, and which includes also detent means co-acting with said shaft to yieldably hold said shaft in each of said two positions of said finger.

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