Nov. 18, 1969 L. H. BISHOP 3,478,666

APPARATUS FOR ROCKING A PHOTOGRAPHIC TRAY

Filed Aug. 2, 1967

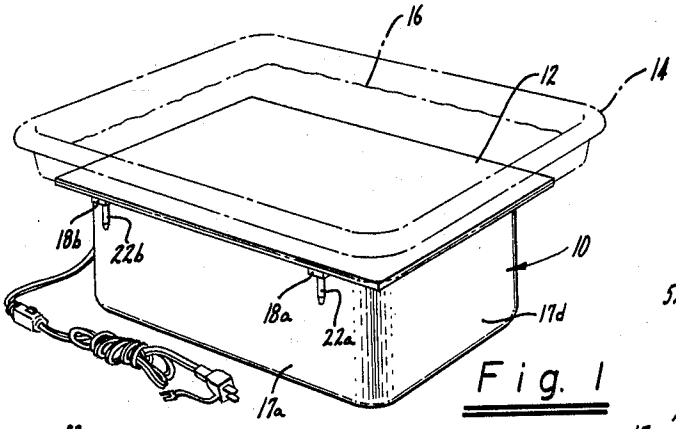


Fig. 1

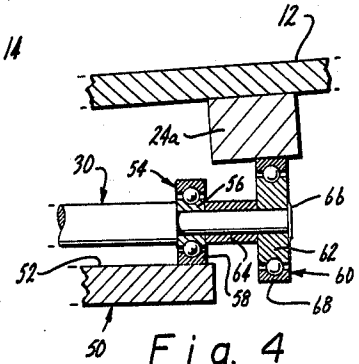


Fig. 4

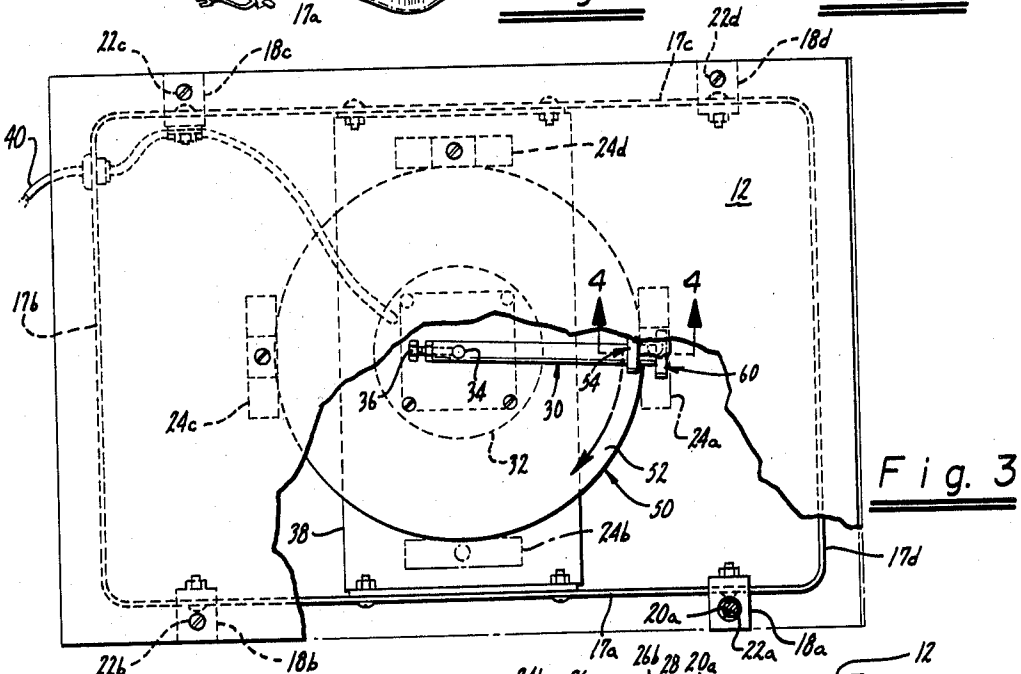


Fig. 3

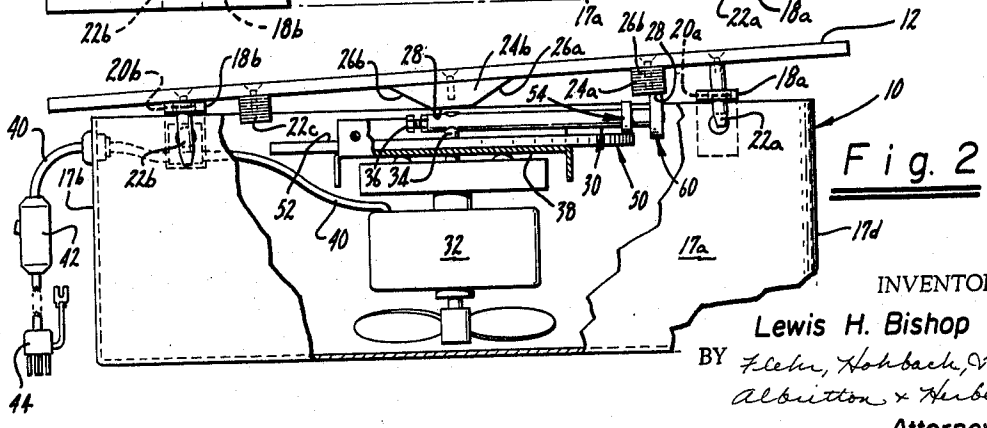


Fig. 2

INVENTOR.
Lewis H. Bishop
BY Klein, Hohbach, West, Albritton & Herbert
Attorneys

United States Patent Office 3,478,666
Patented Nov. 18, 1969

3,478,666

APPARATUS FOR ROCKING A PHOTOGRAPHIC TRAY

Lewis H. Bishop, San Carlos, Calif., assignor to Pierce Specialized Equipment Company, San Carlos, Calif., a corporation of California

Filed Aug. 2, 1967, Ser. No. 657,967
Int. Cl. G03d 3/04
U.S. Cl. 95—99 6 Claims

ABSTRACT OF THE DISCLOSURE

A tray rocker including a housing having outwardly extending tabs for supporting a platform for four way rocking motion about intersecting axes lying in common plane. Holes in the tabs receive guide pins associated with the platform to define the axes. A plurality of cams are attached to the lower surface of the platform and are engaged sequentially by a rotating rotor arm having a cam drive bearing at its outer end.

Background of the invention

This invention relates to apparatus for rocking a photographic tray and in particular to such apparatus by which a photographic tray is sequentially rocked to provide agitation of liquid contained in the tray.

In the development and processing of photographic films, it is common practice to agitate the developer in different directions by smoothly raising and lowering the sides of the tray so that the developer flows to the opposite side of the tray and returns, washing fresh solution over the film. It is recommended practice to carry out the agitation in a sequence wherein adjacent sides or corners of the tray are successively raised and lowered to form an agitation cycle. If performed by hand, this agitation cycle becomes quite tedious. Previously available apparatus for performing this operation has been unduly cumbersome, complex, and expensive, and has required special power sources.

In general, it is an object of the present invention to provide apparatus for rocking a photographic tray which will overcome the above mentioned limitations and disadvantages, and which derives the recommended sequential rocking motion from a simple rotary motion.

Another object of the invention is to provide an apparatus of the above character which is particularly simple and reliable, requiring a minimum of maintenance, and which is adapted to be operated from commonly available electrical power.

In general, the above objects are achieved by providing a platform for carrying a photographic tray containing the solution to be agitated. Means are provided for supporting the platform in a substantially horizontal plane or position while permitting it to be pivoted about intersecting axes lying in the horizontal plane. The platform is provided with means defining a cam track having varying levels with respect to the platform. Rotatable means is positioned for travel under the platform and adapted to sequentially engage portions of the cam track during the agitation cycle or interval so that the platform and tray are sequentially raised as the rotatable means travels about said track. These and other features and objects of the invention will become apparent from the following description and the accompanying drawings.

Description of the drawings

FIGURE 1 is a perspective view of a preferred form of apparatus for rocking a photographic tray constructed according to the invention.

FIGURE 2 is a side elevational view of the apparatus of FIGURE 1 with portions broken away to reveal internal mechanical features.

FIGURE 3 is a top plan view, partially broken away, of the apparatus of FIGURE 1.

FIGURE 4 is a sectional view taken along the lines 4—4 of FIGURE 3.

Detailed description

As shown in the figures, the apparatus of the invention includes a housing **10** which supports a platform **12** for carrying a tray **14** containing a photographic solution **16**. Housing **10** consists of a box-like structure having interconnected side walls **17***a, b, c, d* with sufficient depth to accommodate the mechanical elements of the apparatus, and to provide a watertight compartment for the same. Angles are fastened to the side walls **17** and provide outwardly extending tabs **18***a, b, c, d* which are located at the corners of a rectangle lying in a substantially horizontal plane above the housing **10**. Each of the tabs are provided with holes **20***a, b, c, d* for receiving pins **22***a, b, c, d* associated with platform **12**.

Platform **12** consists of a flat plate of rigid material having downwardly extending guide pins **22***a, b, c, d* secured thereto at positions corresponding to the holes **20** provided in tabs **18**. As shown, particularly in FIGURE 3, the guide pins **22** are somewhat smaller than the holes **20** so that the platform **12** can be lifted slightly at each side, that is to say, tilted at an angle about one side of the rectangle and defined by the tabs **18** without causing any binding of guide pins **22** in holes **20**.

The platform **12** is provided with means on its lower surface for forming a cam track having varying levels. The cam track includes four cams **24***a, b, c, d*, each of which is provided with a lower surface including ramps **26***a, b* separated by a flat **28**, the length of which defines the duration of maximum tilt of the platform. As shown, each of the cams **24** has the same shape and is screwed to the underneath of the platform **12** to define a cam track in the form of a closed circular loop. The track preferably lies at the midposition between the guide pins **22***a, b, c, d*, and the platform with each cam opposed to a set of guide pins at the opposite side of the platform. In this way, raising of cam **24***a*, for example, causes the platform to pivot upwardly about a line joining tabs **18***b*, **18***c* and the associated pins **22***b*, **22***c* as though the platform were hinged on that line. Similarly, the platform is pivoted about a line joining the adjacent tabs and pins by raising the opposite cam.

Means are provided for sequentially engaging and raising cams **24***a, b, c, d* and consist of a rotor arm **30** driven by suitable gear motor **32** having rotating output shaft **34** to which the arm **30** is secured by a set screw **36**. The gear motor **32** is supported by a shelf **38** which is secured to the side walls of the housing **10** in a plane parallel to and below platform **12**. A suitable electric cord **40**, switch **42** and plug **44** are provided for supplying electric power to the gear motor.

Shelf **38** also supports a rigid circular disc **50** having a planar upper surface **52** which extends to the inner perimeter of the cam track. Rotor arm **30** carries an outer antifriction ball bearing **54** having an inner ring **56** secured to the rotor arm and an outer ring **58** resting on the periphery of surface **52** of the disc **50**. As the rotor arm is driven about its axis of support, bearing **54** rolls about the periphery of disc **50** and is supported thereon. A cam drive bearing **60** is carried by the outer end of rotor arm **30** at a position spaced outwardly from the support bearing **54** and is preferably of a ball bearing, antifriction type having an inner ring **62** engaged between a spacer **64** and a suitable means **66** for securing the bearings **54** and **60** together onto the end of the rotor arm **30**.

The outer ring **68** of the drive bearing lies at the level of surface **52** and cams **24***a*, *b*, *c*, *d* and travels along the path of the cam track.

The operation of the above described apparatus is particularly simple and effective. As the output shaft **34** of gear motor **32** rotates, it drives the rotor arm **30** in a sweeping arc so that the outer end of the rotor arm travels in a circular path. Bearing **54** rolls on the periphery of the disc **50** on surface **52** to support the outer end of the rotor arm in a substantially horizontal plane. As the cam drive bearing **60** is driven about the cam track by motor **32** and arm **30**, it sequentially engages and lifts each of the cams in turn, the lift force being supplied from the disc **50**, through bearing **54**. The amount of lift is determined by the height of the cam **24** and the duration of lift is determined principally by the length of the flat **28**. After engaging a cam and lifting the cam and platform, the cam bearing rolls off the return ramp **26***b* to smoothly return the platform to its rest position on the tabs **18**. The motion of the platform is characterized by a four way rocking motion due to the platform being successively pivoted a predetermined small angle about axes lying in a common plane defined by the lines joining tabs **18***a*, *b*, *c*, *d*. The axes transversely intersect each other so that each agitation step is successively directed in opposition to the prior step. One suitable agitation cycle results from using a rotor arm speed of about 6 revolutions per minute.

Thus, there has been provided a particularly effective tray rocking apparatus which is positively driven and which produces a four way rocking motion from simple rotary motion. By using a central axis drive, the amount of lift provided increases or decreases as the tray size is increased or decreased. The photographic tray **14** may be positioned as shown in FIGURE 1 so that it is rocked from its sides but it is obvious that the tray can be turned 45 degrees so that the rocking motion takes place from its corners. To those skilled in the art to which the invention relates, many modifications and adaptations of the invention will suggest themselves. For example, the pivot lines between tabs **18** can be arranged in a rectangular pattern, as shown, or can be arranged in other configurations as on a square or other plan. Accordingly, it is to be understood that the descriptions and disclosures herein are not to be taken in a limiting sense but are given as an illustration of the invention, the scope of which is to be determined by the following claims.

I claim:

1. In apparatus for rocking a tray to agitate a photographic solution contained therein, a platform for carrying the tray, means for supporting the platform in a substantially horizontal position while permitting the platform to be pivoted about intersecting axes lying in a common plane, means forming cams carried by the lower surface of said platform, said cams having varying levels, and means mounted beneath the platform for periodically engaging the cams to sequentially lift the platform about successive ones of said intersecting axes.

2. Apparatus as in claim **1** wherein said means for periodically engaging the cams includes a rotor arm, means mounting said rotor arm for rotation in a plane lying below and parallel to the platform, said rotor arm carrying a cam driver thereon for sequentially engaging each of said cams.

3. Apparatus as in claim **2** wherein said means mounting said rotor arm includes a bearing mounted intermediate the length of said rotor arm and a disc supported in a plane lying below and parallel to said platform.

4. Apparatus as in claim **3** wherein said cam driver is an antifriction bearing having a cylindrical surface adapted to engage and roll over said cam.

5. Apparatus as in claim **2** wherein said means for periodically engaging the cams includes an electric motor including means for providing a rotating output shaft, said shaft being transversely connected to said rotor arm.

6. Apparatus as in claim **1** wherein said means for supporting the platform includes horizontally extending tabs positioned at the corners of a rectangle, each of said tabs having a hole therein, and further including guide means carried by the lower surface of said platform and positioned to align with said holes, said guide means and holes freely engaging each other so that the platform is free to be pivoted about axes defined by the sides of said rectangle.

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NORTON ANSHER, Primary Examiner

FRED L. BRAUN, Assistant Examiner

U.S. Cl. X.R.

134—118; 259—72