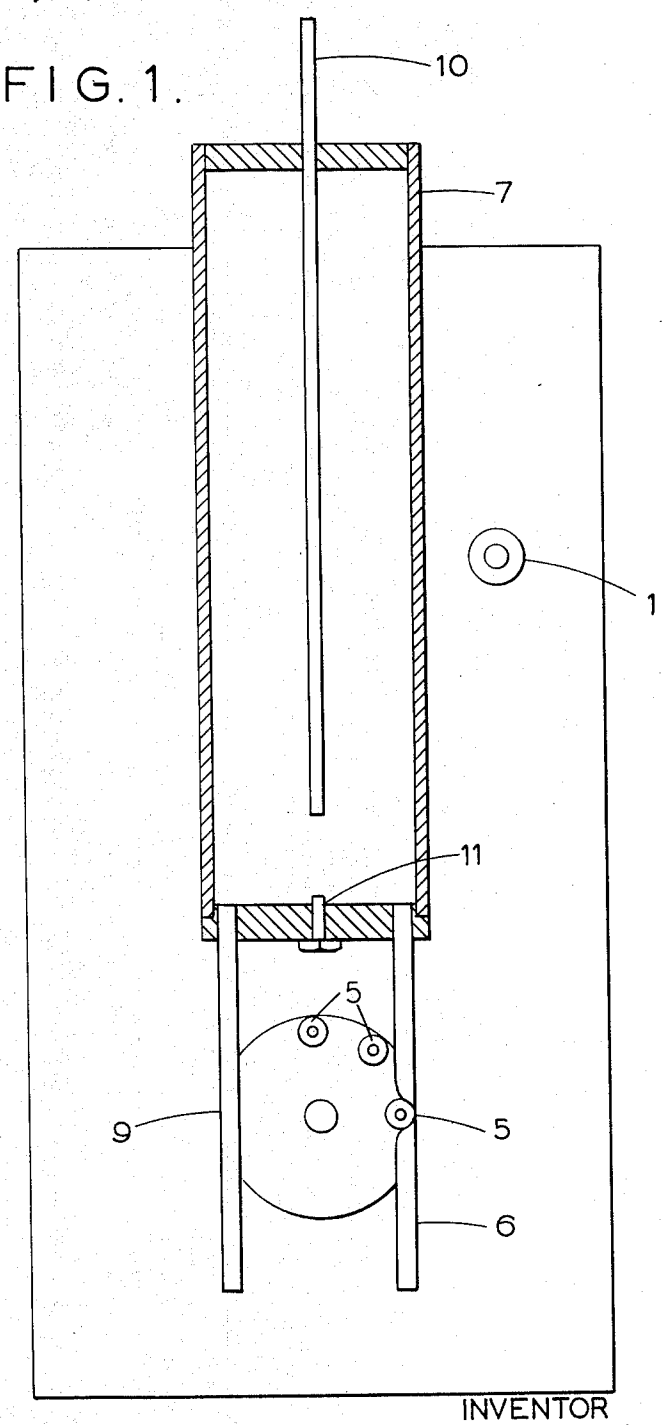
Jan. 4, 1966 E. WAIN 3,227,315

APPARATUS FOR METERING PREDETERMINED VOLUMES OF LIQUID

Filed Sept. 30, 1964 3 Sheets-Sheet 1

FIG. 1.

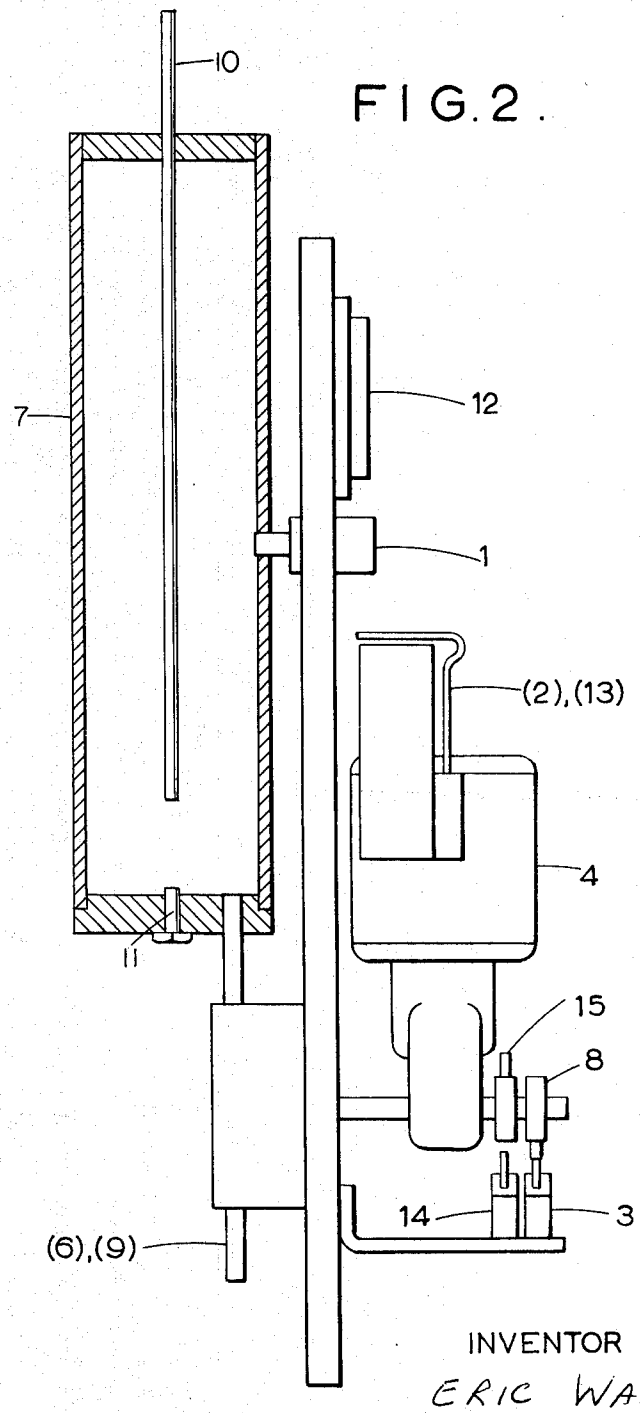


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APPARATUS FOR METERING PREDETERMINED VOLUMES OF LIQUID

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FIG. 2.



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FIG. 3.

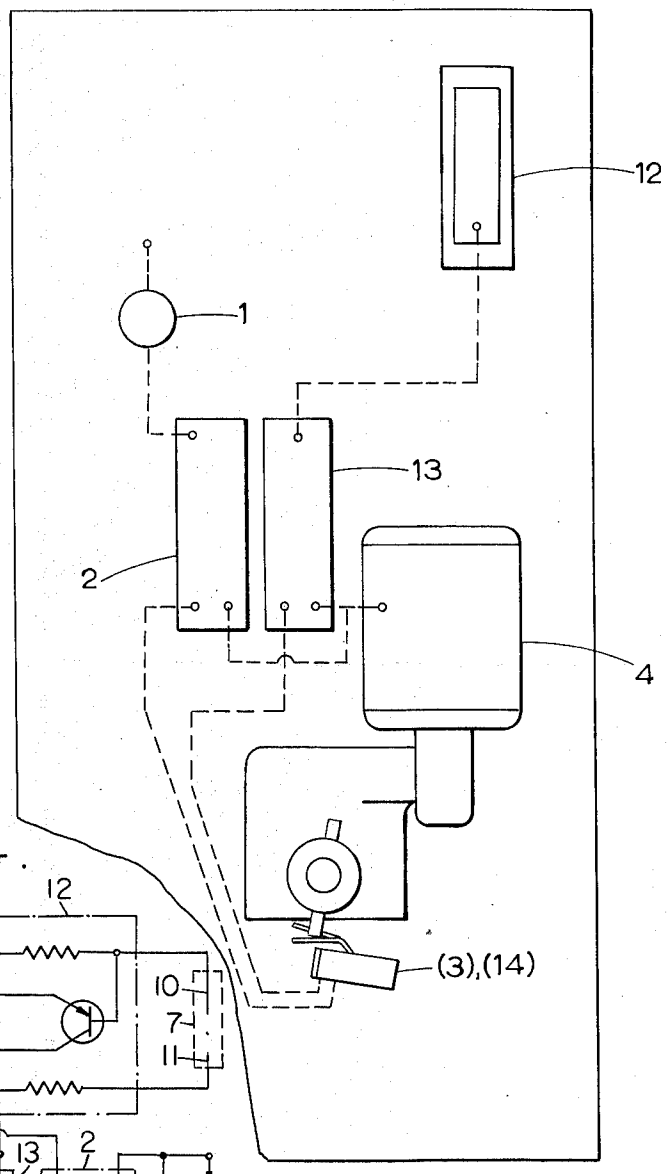
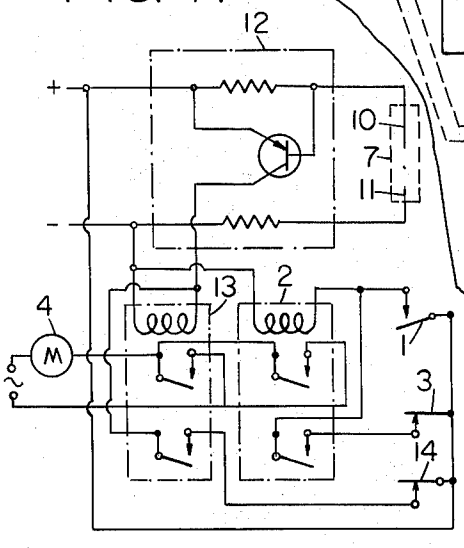


FIG. 4.



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3,227,315

APPARATUS FOR METERING PREDETERMINED VOLUMES OF LIQUID

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Filed Sept. 30, 1964, Ser. No. 400,458
4 Claims. (Cl. 222—64)

The present invention relates to a replenisher unit for supplying measured amounts of liquid from a reservoir to a treatment bath at predetermined time intervals, more especially the invention is concerned with a replenisher unit for use in connection with automatic photographic development plant.

In many processes utilizing liquid treatment baths, particularly photographic development processes, it is necessary to replenish the fluids in the bath at regular intervals and obviously for this purpose, particularly where an automatic process is concerned, an automatic replenisher unit is desirable.

It is an object of the present invention to provide a replenisher unit for supplying liquid from a reservoir to a treatment bath in measured amounts and at predetermined time intervals which treatment device can be pre-set to deliver any required amount of liquid and at any time interval and is completely automatic.

Accordingly the present invention provides a liquid feed device for supplying measured amounts of liquid from a storage vessel to a bath, which comprises a first flexible tube connecting the storage vessel to a measuring vessel, a second flexible tube connecting the measuring vessel to the bath, a first electrode positioned within the measuring vessel, a second electrode within the vessel and spaced from the first electrode, a first relay connected to the second electrode, an electric motor electrically connected to the first relay by way of a switch, means for activating the switch in response to revolution of the motor, a second relay electrically connected to the motor by way of a second, motor-responsive, switch actuating means and switch, clamping means driven by the motor and adapted to clamp alternatively the first and then the second flexible tubes, the clamping means and the switch actuating means being so synchronised that, when one tube is clamped one switch actuator operates to break the circuit to the motor by way of one relay and when the other is clamped the other switch actuator operates to break the circuit to the motor by way of the other relay.

In a preferred embodiment of the invention the clamping means comprises a disc rotatable by the motor and positioned between the flexible inlet and outlet tubes from the measuring vessel and provided in the region of its periphery with at least one roller axially mounted at right angles to the plane of the disc, the roller being so positioned that when it is adjacent to one or other of the tubes it exerts a clamping action on the tube and prevents liquid running through it. In a most advantageous embodiment of the invention the disc is in fact provided with three axially mounted rollers in series, the object of this being that where a tube is clamped by the first of the three rollers and where the disc rotates and this first roller moves off the tube then the second and third rollers move on to the tube in succession thus keeping it in the clamped position and is is only when the first roller clamps the other flexible tube that the first flexible tube is opened and liquid is allowed to pass. The advantage of this is that at no time are both tubes open, one is always closed. The clamping means can of course take other equivalent mechanical forms; for example the clamping means can be a shaft of "clover leaf" cross section driven directly or indirectly by the motor or indeed the clamping means can comprise an eccentric driven by the motor and mounted between two piston clamps each of which impinges against one or other of the flexible tubes, in response to pressure from the eccentric.

The preferred method of switch actuation is the provision of two cams driven directly or indirectly by the motor, one cam position above each of the switch mechanisms and so arranged that as the motor rotates, first one cam and then the other cam strikes the corresponding switch and actuates it. The positioning and frequency of rotation of the cams are so synchronised with the rotation of the clamping disc that the necessary relationship between the actuation of the switch and the clamping of the tubes is established.

The invention is now particularly described with reference to the accompanying drawings, without in any way being limited to the details disclosed in the drawings.

In the drawings FIGURE 1 is a front elevation of the apparatus according to the invention.

FIGURE 2 is a side elevation of the apparatus according to the invention; FIGURE 3 is a rear elevation of the apparatus according to the invention and FIGURE 4 is a schematic view of the circuit network thereof.

Referring now to the drawings, on actuation of a press button **1** a low voltage current is caused to flow and energize the coil of a relay **2** which relay is "held in" by a microswitch **3** and the relay passes single phase main voltage current to a motor **4**. The motor **4** rotates causing the pressure exerted by roller **5** on tube **6** to be released. Tube **6** is in direct connection with a reservoir for the liquid to be conveyed and the release of pressure on tube **6** results in liquid flowing into the container **7**.

After motor **4** has revolved 180° striker cam **8** actuates a microswitch **3** thereby de-energizing the coil of relay **2** causing roller **5** to exert pressure on the other tube **9** and thus preventing liquid running from the container **7**.

When liquid in the container reaches the level of electrode **10** a current of very low order transmitted through the liquid from electrode **10** to electrode **11** is then amplified by means of a transistor unit **12** thereby energizing the coil of relay **13** which relay is held in by means of microswitch **14**. Relay **13** passes normal voltage current to motor **4** which again rotates causing pressure exerted by the roller **5** on tube **9** to be released allowing liquid to run out of the container **7**. After the motor has once again revolved 180° the striker cam **15** actuates microswitch **14** thereby de-energizing the coil of relay **13** causing the roller **5** to exert pressure once more on tube **6** and thereby preventing further liquid entering container **7**. Following upon this position the cycle is automatically repeated. The actual power supply to the circuit has not been shown but can obviously be positioned at any convenient point between electrodes **10** and **11**. A circuit diagram for effecting the above operational sequence in the manner set forth is illustrated in FIGURE 4 and is self explanatory and of conventional design.

What I claim is:

1. A liquid feed device for supplying measured amounts of liquid from a storage vessel to a bath, which comprises a first flexible tube connecting the storage vessel to a measuring vessel, a second flexible tube connecting the measuring vessel to the bath, a first electrode positioned within the measuring vessel, a second electrode within the vessel and spaced from the first electrode, a first relay connected to the second electrode, an electric motor electrically connected to the first relay by way of a switch, means for actuating the switch in response to revolution of the motor, a second relay electrically connected to the motor by way of a second motor responsive switch actuating means and switch, clamping means driven by the motor and adapted to clamp alternatively the first and the second flexible tubes, the clamping means

and the switch actuating means being so synchronised that, when one tube is clamped one switch actuator operates to break the circuit to the motor by way of one relay and when the other is clamped the other switch actuator operates to break the circuit to the motor by way of the other relay.

2. A liquid feed device according to claim 1 in which the clamping means comprises a disc, rotatable by the motor and positioned between the flexible inlet and outlet pipes from the measuring vessel and provided in the region of its periphery with at least one roller axially at right angles to the plane of the disc, which roller is so positioned that when, resulting from rotation of the disc, it is immediately adjacent either of the flexible tubes it exerts a clamping effect on the tube.

3. A liquid feed device according to claim 1 in which the switch actuating means comprises two cams coaxially mounted on a shaft driven by the motor and arranged one above each switch.

4. A liquid feed device according to claim 1 comprising a transistorized amplifying unit in circuit between the second electrode and the first relay.

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