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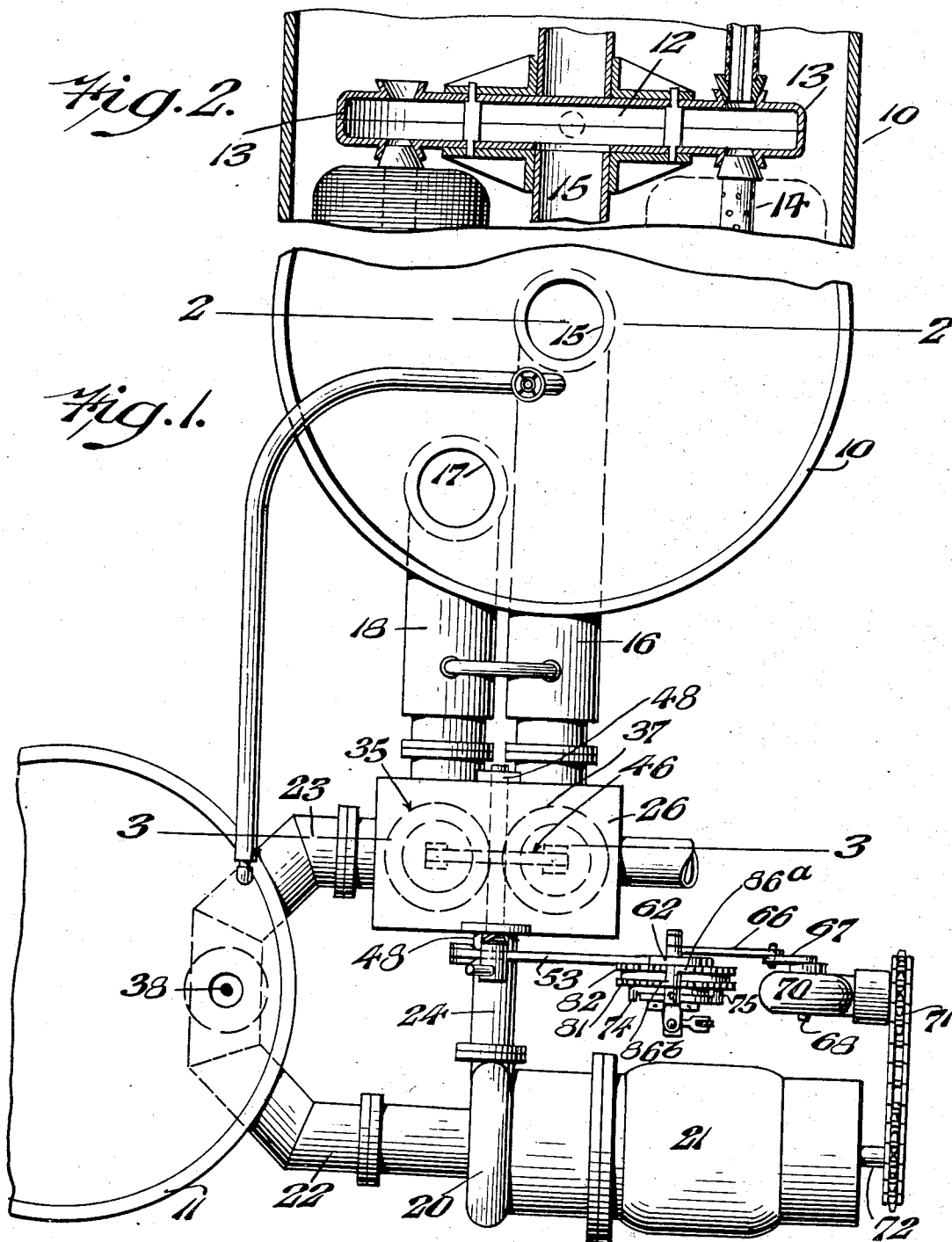
A. HOPKINS ET AL

2,263,924

MECHANISM FOR CONTROLLING THE CIRCULATION IN DYEING APPARATUS

Filed April 18, 1939

3 Sheets-Sheet 1



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Fig. 3.

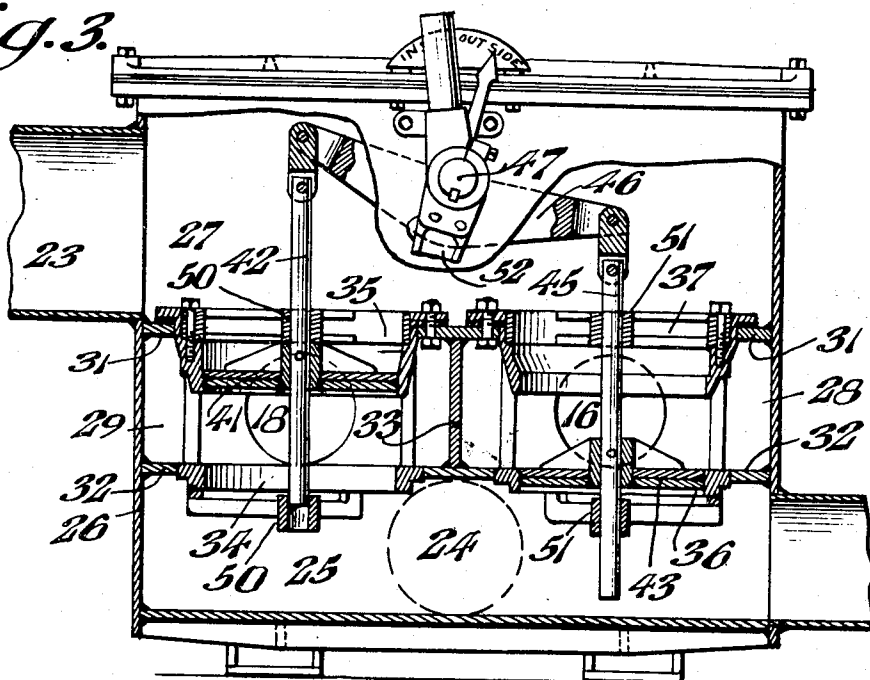
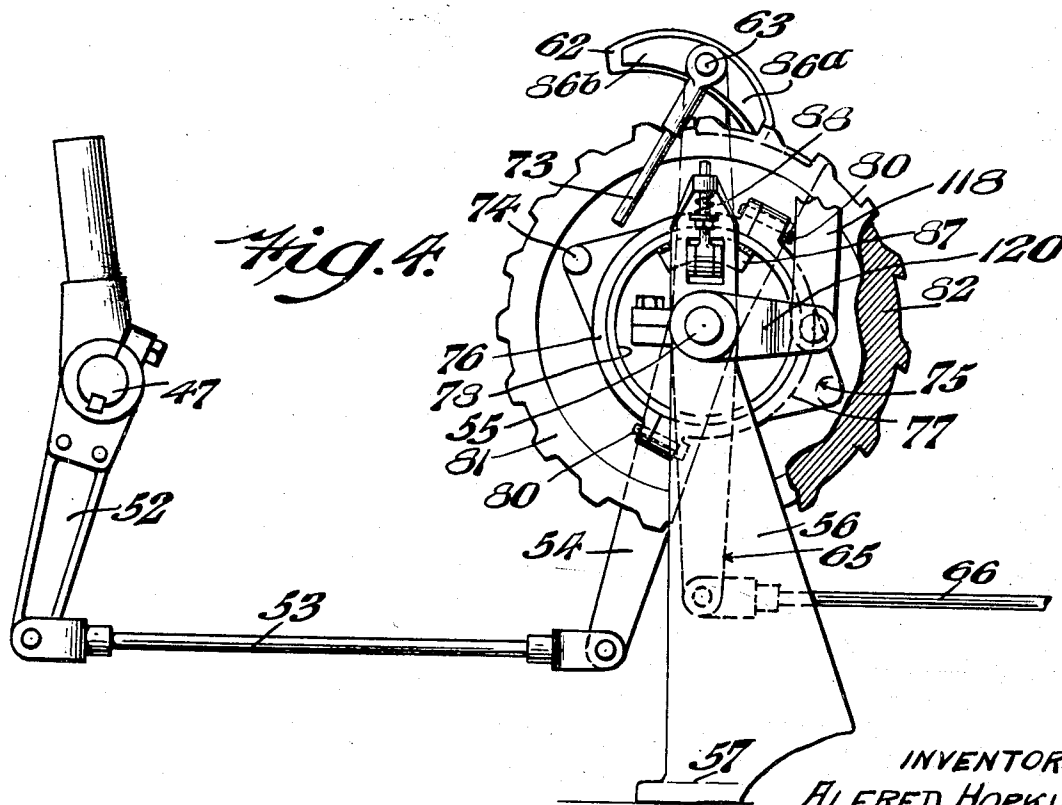


Fig. 4.



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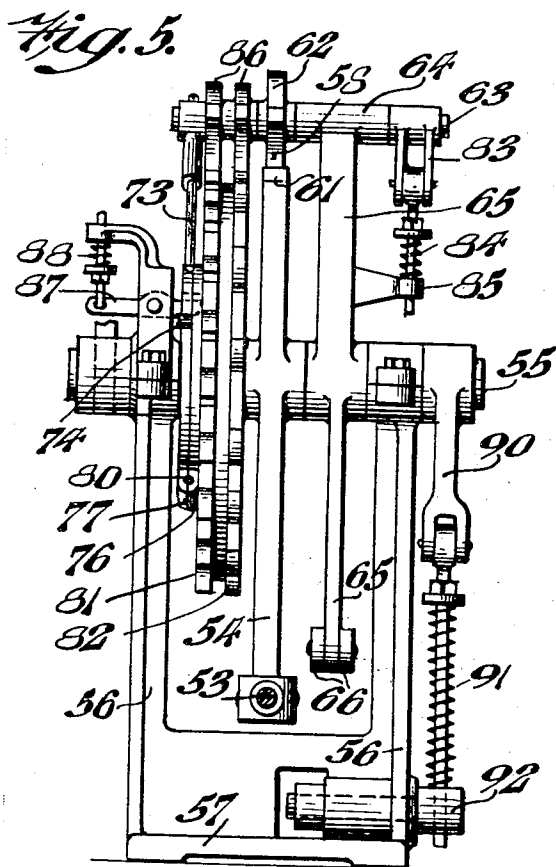
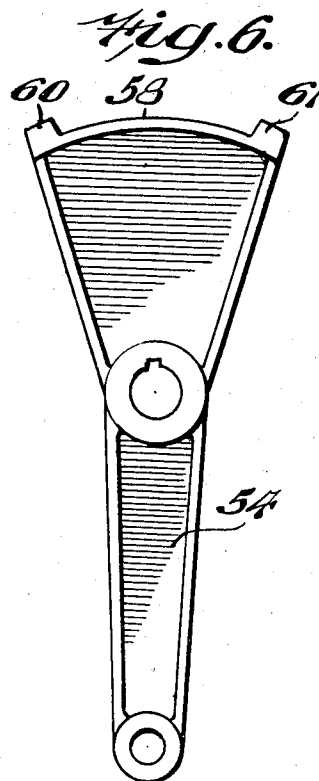
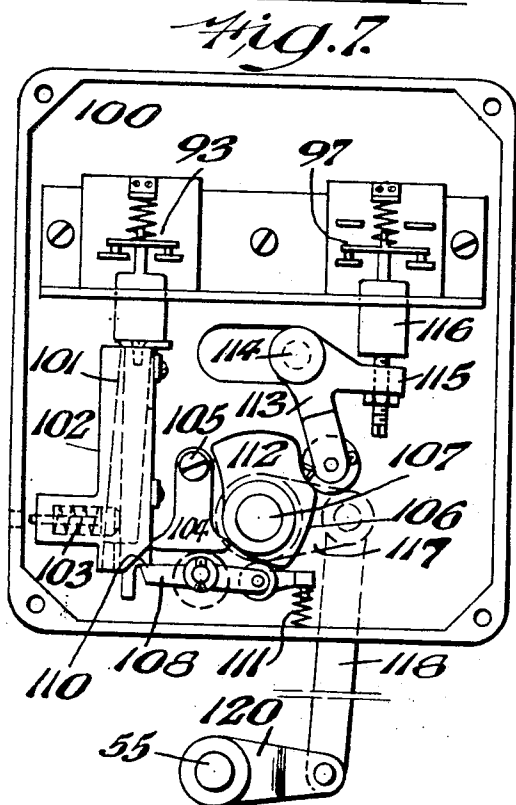
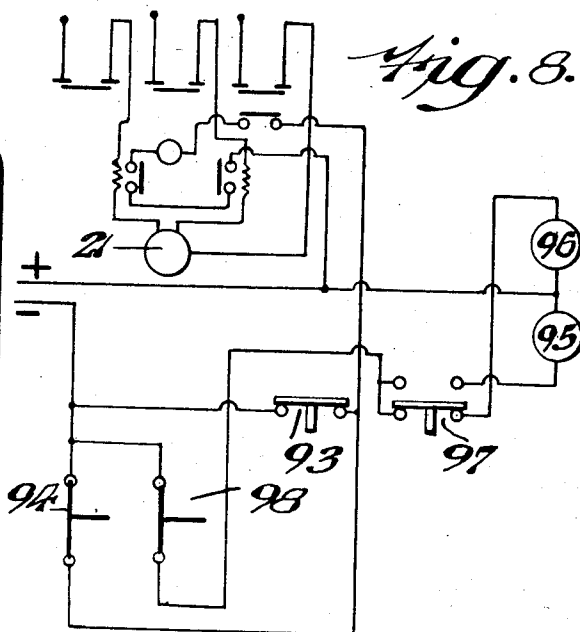
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MECHANISM FOR CONTROLLING THE CIRCULATION IN DYEING APPARATUS

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6 Claims. (Cl. 74-1)

The present invention relates to yarn dyeing apparatus and more particularly to a novel control for the circulation of dyeing or other liquid.

Some of the objects of the present invention are to provide an improved dyeing apparatus; to provide means for automatically reversing the direction of the circulation of a yarn dyeing or treating liquid; to provide a liquid circulation control wherein liquid alternately traverses a yarn package from the outside to the inside thereof; to provide a positive mechanically controlled means for changing the direction of the circulation of a dyeing or treating liquid through a body of yarn; to provide a device wherein the time of liquid circulation in a given direction can be varied at will; to provide a control for a liquid circulating means wherein provision is made for preventing the apparatus from coming to rest in any position but that required to cause circulation to be resumed in a predetermined direction at the end of the rest period; and to provide other improvements as will hereinafter appear.

In the accompanying drawings, Fig. 1 represents a plan partly broken away of a package dyeing apparatus embodying one form of the present invention; Fig. 2 is a fragmentary section on line 2-2 of Fig. 1, showing the general arrangement of the package carrier; Fig. 3 represents a section on an enlarged scale taken on line 3-3 of Fig. 1, showing certain parts in side elevation; Fig. 4 represents a detail in side elevation of the control unit by which the valves shown in Fig. 1 are automatically operated at predetermined intervals; Fig. 5 represents an end elevation of the control unit; Fig. 6 represents a detail in side elevation of the power lever; Fig. 7 represents a front elevation of a switch box with the cover removed to the control switches and operating mechanism therefor; and Fig. 8 is a wiring diagram for the parts controlled by switches shown in Fig. 7.

Referring to the drawings one form of the present invention is shown in association with a dye vat 10 and connected expansion tank 11, the former being arranged to receive a carrier 12 for yarn, and the latter for supplying the dye mixture to the system as well as compensating for pressure conditions in the vat 10. In the present system the carrier 12 is of tubular construction having a header 13 for mounting package spindles 14 in such a manner that liquid in the vat 10 can pass through the yarn into the header 13 and then by a pipe 15 which communicates with an external pipe 16 as a part of the circulating system. A port 17 through the vat

10 communicates with a second external pipe 18 and as a result of the foregoing carrier and pipe connections liquid may be caused to flow through the pipe 18, and port 17 into the vat 10, thence from the outside of the yarn to the inside thereof to enter the carrier 12 and leave by pipe 15 leading to the pipe 16. The direction of the circulation is in accordance with whether the pipe 16 acts as an inlet and the pipe 18 as an outlet, or the pipe 18 acts as an inlet and the pipe 16 as an outlet. Under this latter condition the flow of liquid is from the inside of the yarn package to the outside thereof, but it may here be stated that the initial or starting circulation is always from the outside to the inside of the yarn package and that the present invention comprehends means for preventing flow in the wrong direction initially.

For circulating the liquid a pump 20 is provided and driven by a suitable power unit, such as an electric motor 21. The suction side of the pump 20 is connected by a pipe 22 with the system return pipe 23, while the discharge side of the pump 20 is connected by a pipe 24 with a chamber 25 in a valve casing 26. The return pipe 23 is in communication with a second chamber 27 in the casing 26. The pipes 16 and 18 respectively communicate with two compartments 28 and 29, in the casing 26, formed by spaced parallel partitions 31 and 32 and a dividing partition 33. The partitions 31 and 32 are arranged to locate the aforesaid compartments intermediate the chambers 25 and 27 so that controlled ports 34, 35, 36 and 37 can determine how the pipes 16 and 18 are connected in the system. For example and assuming the ports 34 and 37 open and the ports 35 and 36 closed then liquid entering the chamber 25 from the pump discharge pipe 24 will travel through the port 34 into compartment 29, the pipe 18 into the vat 10, then from the outside to the inside of the yarn to the carrier 12, then by pipes 15 and 16 to the compartment 28, through port 37 to chamber 27 and return pipe 23 to the suction pipe 22. Preferably a valve controlled outlet 38 may, as desired, form a communication between the expansion tank 11 and the suction pipe 22, and this outlet 38 is normally open until the vat 10 and circulating system have the proper quantity of liquid therein.

For the purpose of efficiently controlling the several ports in the casing 26 each pair is arranged in coaxial relation, that is ports 34 and 35 are in spaced apart registered relation, and ports 36 and 37 are likewise arranged. As shown a valve disc 41 is arranged to seat alternately

within the ports 34 and 35, being mounted on a valve rod 42 and so spaced thereon that when disc 41 closes the port 34 the opposite port 35 is open and vice versa. As shown a valve disc 43 is arranged to seat alternately within the ports 36 and 37, being mounted on a valve rod 45 and so spaced thereon that when disc 43 closes the port 36 the port 37 is open and vice versa. Since for proper operation the port 36 must be closed when the port 34 is open, a walking beam lever 46 is provided having its ends pivoted respectively to the valve rods 42 and 45 while its center is keyed to a rock-shaft 47 journaled in suitable bracket bearings 48 on the casing 26. Guide spiders 50 and 51 assure proper straight line movement of the respective valve rods 42 and 45.

In order to actuate the rock-shaft 47 according to requirements, namely, to shift the control valves to reverse the direction of the circulation, an operating arm 52 is fixed to the projecting end of the rock-shaft 47 and has its opposite end pivotally connected to a reciprocable rod 53, which joins the operating end of a power lever 54. This lever 54 is keyed or otherwise made fast intermediate its ends to rock-spindle 55 which is journaled in a bifurcated bracket 56 rising from a fixed base 57. The free end of the power lever 54 is in the form of an arcuate surface 58 struck on a radius having the spindle 55 as a center and terminating at opposite ends respectively in radially projecting lugs 60 and 61. Intermittent movement of the power lever 54 is brought about by the action of a double ended pawl 62 which is fast to an oscillative pin 63 pivotally carried by a tubular head 64 from which it protrudes at both ends. This head 64 forms one end of an oscillative lever 65 mounted for relative movement on the rock-spindle 55 and having its opposite end joined to a connecting rod 66 extending from a crank 67. This crank 67 is keyed to the shaft 68 of a speed reducing unit 70 which is here shown as continuously driven by a sprocket and chain mechanism 71 from the shaft extension 72 of the motor 21.

As a means for shifting the double ended pawl 62 to operate the power lever 54, a trip finger 73 is fast on the pin 63 and so located as to intercept the path of travel of two trips 74 and 75, the former projecting laterally from a rim offset on an annular split ring 76, and the latter from a similar offset on a like annular split ring 77. These rings 76 and 77 are arranged for mounting on a drum 78 so that the two trips 74 and 75 lie in the same plane but angularly separated to receive the finger 73 between them. Clamping bolts 80 are employed to lock the rings 76 and 77 in selected positions respectively and thus make it possible to adjust the relation of the trips to the finger 73 at will to vary the time of one direction of circulation with respect to the other. The drum 78 forms a part of two ratchet wheels 81 and 82 arranged back to back with teeth in reverse order and both supported by and freely oscillative on the spindle 55. The spacing of the teeth of the ratchet 81 preferably differs from the spacing of the teeth of the ratchet 82, the arrangement being such that more strokes of the power lever 54 are necessary to move the trip ring 76 through a definite angle than are required to reverse this motion by moving the trip ring 77. When a trip engages the finger 73 the continued movement of the associated ring swings the finger 73 to turn the pin 63 and thus reverse the po-

sition of the operating pawl 62. An arm 83 is keyed to the pin 63 and is loaded by a coil spring 84 compressed against a fixed abutment 85, this construction acts positively in holding the pawl 62 in its selected position.

For actuating the two unit ratchet, a double ratchet pawl 86 is keyed or otherwise made fast to the pin 63 with one pawl 86a arranged to engage the ratchet wheel 81 and the other pawl 86b arranged to engage the ratchet wheel 82 according to the position of the finger 73.

To prevent the ratchet wheels and control rings from over-running or out of proper adjusted positions the inner face of the drum 78 is used as a braking surface which is in frictional engagement with a brake lever 87 held in operative position by a loaded spring 88.

For retaining the rock-spindle 55 in a selected position, an arm 90 is keyed thereto and connected to a coil spring 91 which is compressed against a fixed abutment 92 attached to the bracket 56. The load of the spring 91 is effective in both limit positions of the power lever 54 and prevents improper movement thereof.

From the foregoing it will be evident that the direction of the circulation through the packages in the dye vat 10 is under automatic control and can be timed at will for length of flow in both directions. Preferably the circulation from the outside to the inside of the packages is longer than in the reverse direction, this being brought about by the difference in the number of teeth on the respective ratchets 81 and 82. Also it is considered advisable to have the direction of the circulation initially from the outside to the inside of the packages and therefore a novel control has been devised which so functions that the apparatus can only come to rest in such a relation that a resumption of operations must circulate the treating liquid from the outside to the inside of the packages. Such control, in the present instance, is incorporated in the electric circuit of the motor 21, which actuates the pump 20, and includes a single pole snap switch 93 arranged in parallel with a push button switch 94 for control of the motor 21. As will be seen the closing of either switch 93 or switch 94 will result in the closing of the motor circuit. Supplemental to this control circuit and functioning with it for indicating purposes are two circuits including respectively signal lamps 95 and 96 arranged to be selectively energized by a double pole snap switch 97 in series with a main push button switch 98. With the switches 93 and 97 in the closed positions shown the direction of the circulation is from the inside to the outside of the packages, and with the push button 98 closed, the signal lamp 96 is lighted to show the circulation direction. Should the push button 94 be pushed to open its circuit and stop the machine, the fact that the switch 93 is closed will prevent such stopping until the completion of the inside to outside cycle but then the switch 93 will be automatically opened and the motor 21 stopped. With the opening of the switch 93 there is a simultaneous shifting of switch 97 so that the signal lamp 95 will light to indicate the flow of liquid is to take place from the outside to the inside when treating is resumed.

For actuating the switch 93 it is located in a housing 100 and has an operating strip plunger 101 slidable in a slotted guide 102 which provides a clearance to allow the plunger 101 to be laterally deflected so that its lower end can seat

on the floor of the guide 102 to hold the switch 93 open when required. In this laterally disposed position the plunger 101 compresses a spring pressed pin 103 which thus acts to restore the plunger 101 when its holding means is released. As shown this means consists of a detent 104 pivoted at 105 and having a T-shaped head to contact at one side the plunger 101 and to be contacted at the other side by a cam 106 in order to be shifted in the required direction to deflect the plunger 101 to its supported position. The cam 106 is keyed to a rock shaft 107 which in its initial turning movement actuates a pivoted lever 108 to lift the plunger 101 not only far enough to open the switch 93 but to bring the end of the plunger above the floor of the guide 102. A shoulder 110 is provided as a lift face for the lever 108 which is held against the cam 106 and restored by the coiled spring 111. The cam 106 is also provided with a dwell 112 to engage a rocker arm 113 pivoted at 114 to shift an extension 115 and thereby impart straight line movement to the operating plunger 116 of the switch 97.

Movement is transmitted at the end of each treating cycle to the rock shaft 107 by an arm 117 keyed to the shaft 107 and connected by a link 118 to a crank arm 120 which is keyed to the rock spindle 55.

Thus while the two step by step mechanisms control the timing of the circulation according to requirements each at its change over interval causes the power lever 54 to rock not only to reverse the valve mechanism but to also rock the spindle 55 so that the arm 120, link 118 and arm 117 rock the shaft 107. This movement swings the cam 106 clockwise, as seen in Fig. 7, to engage lever 108 and thereby lift the plunger 101 to open the switch 93. This is the circuit condition while the circulation is from the outside to the inside of the packages, and though switch 93 is open the switch 94 is closed so that the pump is operating. The movement of the cam 106 brings the dwell 112 to a position to shift the switch 97 and close the circuit which includes the signal lamp 95 to indicate the direction of the circulation. When the next change of direction of the circulation takes place the cam 106 turns in the reverse direction and the spring pressed pin 103 shifts the plunger 101 into register with the opening in the bottom of the casing 102 and then the spring of switch 93 restores the latter to contact position. With switch 93 closed the pump motor 21 cannot stop even though the main control switch 94 is open and consequently the treating cycle from inside to outside of the packages continues until completed whereupon the switch 93 is again opened automatically and, if switch 94 is also open, the machine stops. Hence means are provided to begin every cycle of operation with the treating liquid circulating from the outside to the inside of the packages.

Having thus described our invention, we claim:

1. A motion transmitting mechanism comprising a part to be reciprocated, means including a power lever for reciprocating said part, a rock spindle fastened to and mounting said power

lever, an arm mounted on said rock spindle for free oscillation thereon, means for continuously oscillating said arm, and time controlled means for transmitting the motion of said arm to said power lever during one half of an oscillation of said arm whereby said part is actuated.

2. A motion transmitting mechanism, comprising a part to be reciprocated, means including a power lever for reciprocating said part, a rock spindle fastened to and mounting said power lever, an arm mounted on said rock spindle for free oscillation on said rock spindle, means for continuously oscillating said arm, time controlled means for transmitting the motion of said arm to said power lever during one half of an oscillation of said arm, and time controlled means for transmitting the motion of said arm to said power lever during the opposite half of an oscillation of said arm, whereby said part is reciprocated periodically.

3. A motion transmitting mechanism, comprising a part to be reciprocated, means including a power lever for reciprocating said part, a rock spindle fastened to and mounting said power lever, an arm mounted for free oscillation on said rock spindle, means for continuously oscillating said arm, time controlled means for periodically interconnecting said arm and said power lever to reciprocate said part, and spring controlled means for holding said rock spindle in a limit position determined by movement of said power lever.

4. A motion transmitting mechanism, comprising a part to be reciprocated, means including a power lever for reciprocating said part, a rock spindle fastened to and mounting said power lever, an arm mounted for free oscillation on said rock spindle, means for continuously oscillating said arm, and a timing means including a pawl and ratchet mechanism for interconnecting said arm and power lever during one half of an oscillation of said arm, whereby said part is moved in one direction or the other according to the direction of said half oscillation.

5. A motion transmitting mechanism, comprising a part to be reciprocated, means including a power lever for reciprocating said part, an arm pivoted for free oscillation, means for oscillating said arm, a laterally disposed pin carried by said arm, means on said pin for engaging said power lever to cause said part to move, and means to time the engagement of said means with said power lever.

6. A motion transmitting mechanism, comprising a part to be reciprocated, means including a pivoted power lever for reciprocating said parts, lugs projecting respectively from opposite sides of the free end of said lever, a pawl arranged to rock between said lugs, a pin forming a pivot for said pawl, an arm pivotally mounted and carrying said pin for oscillatory motion, means to continuously oscillate said arm, and means to periodically shift said pawl to engage one or the other of said lugs to cause said power lever means to reciprocate said part.

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