

July 26, 1966

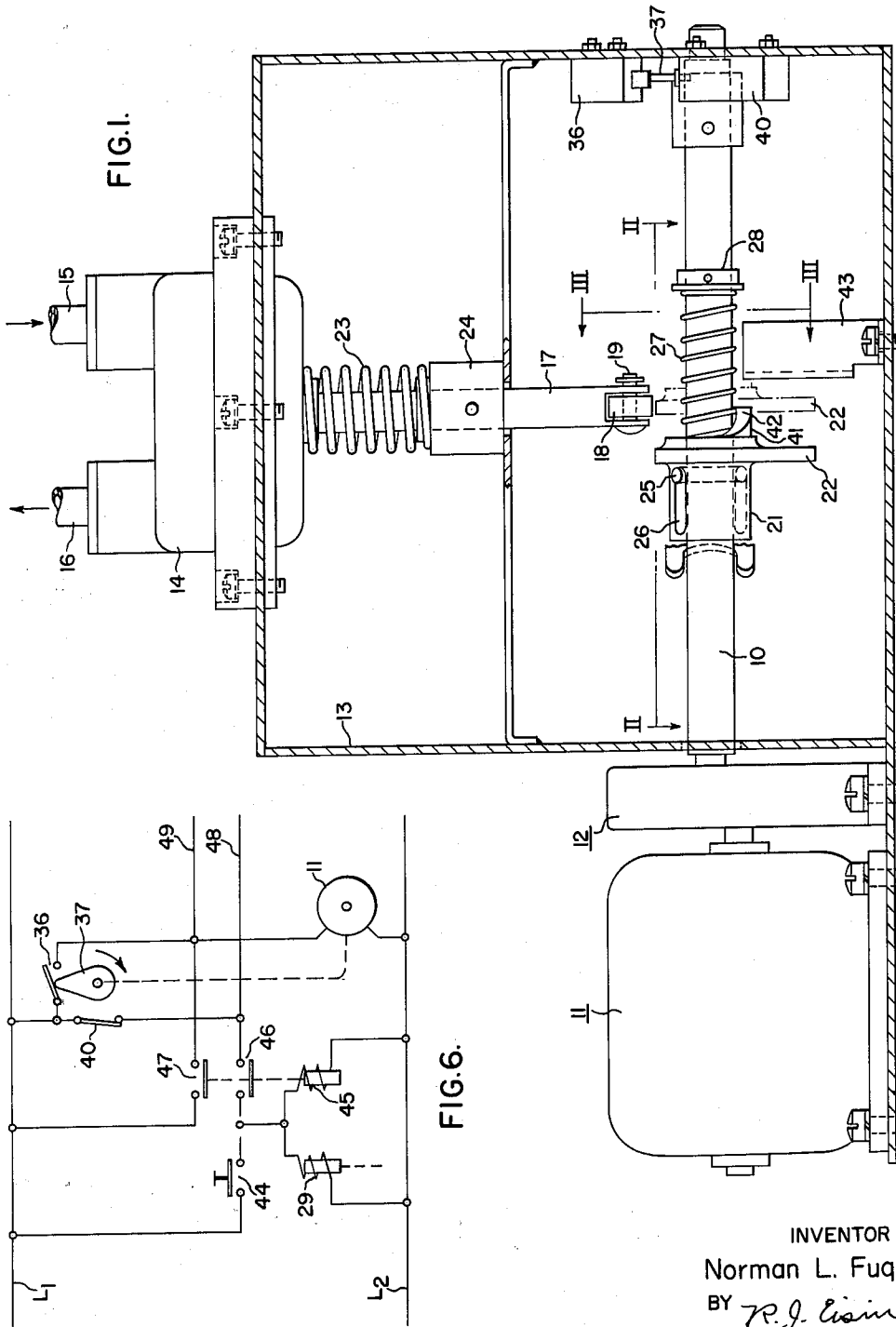
N. L. FUQUA

3,262,328

DISPENSING APPARATUS

Filed Dec. 24, 1964

3 Sheets-Sheet 1



July 26, 1966

N. L. FUQUA
DISPENSING APPARATUS

3,262,328

Filed Dec. 24, 1964

3 Sheets-Sheet 2

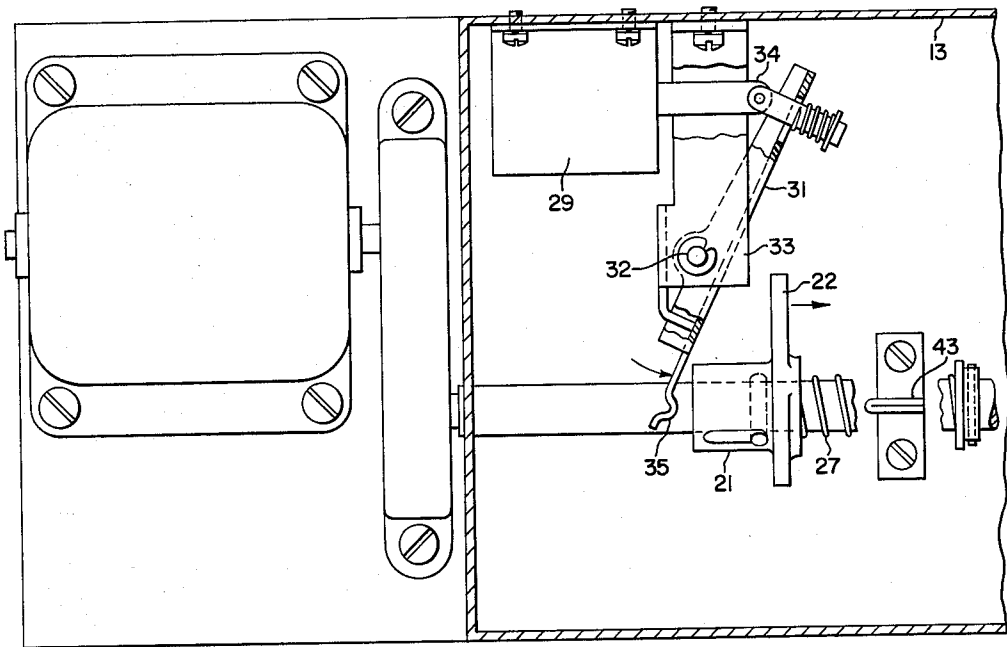


FIG. 2.

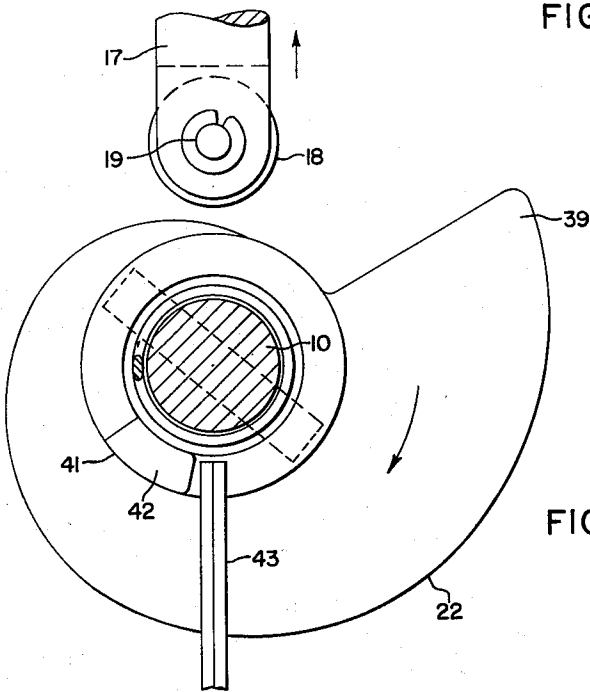


FIG. 3.

July 26, 1966

N. L. FUQUA

3,262,328

DISPENSING APPARATUS

Filed Dec. 24. 1964

3 Sheets-Sheet 3

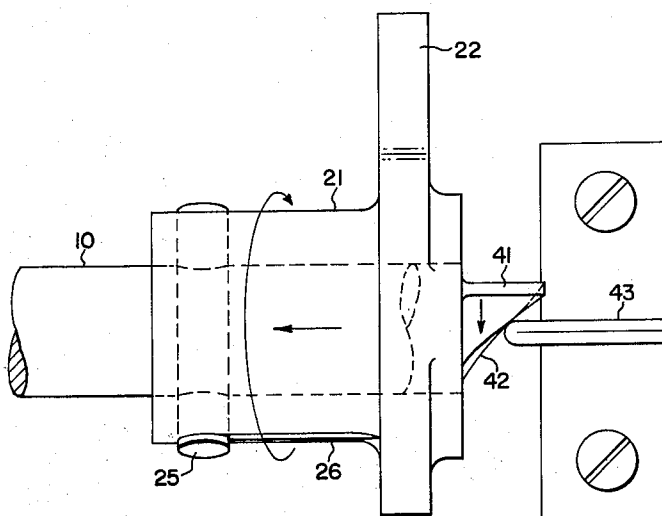
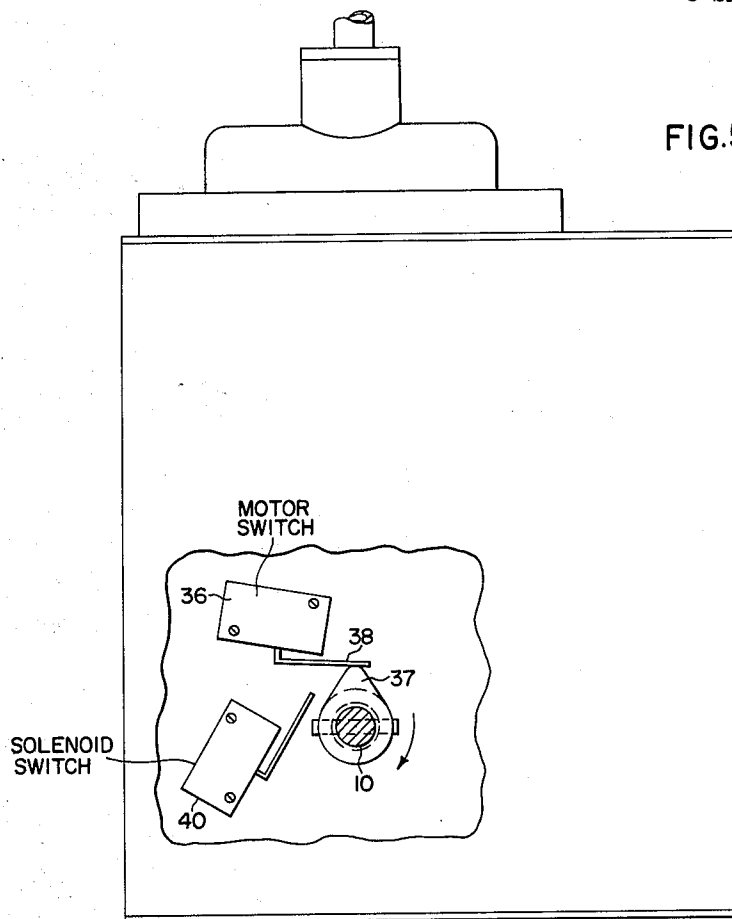


FIG.4.

1

3,262,328

DISPENSING APPARATUS

Norman L. Fuqua, Wilbraham, Mass., assignor to Westinghouse Electric Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

Filed Dec. 24, 1964, Ser. No. 420,898

3 Claims. (Cl. 74-55)

This invention relates to a drive mechanism adapted to be rendered operative or inoperative by a solenoid. It relates more particularly to a drive mechanism which includes a rotatable shaft, a drive member, such as a cam, keyed to the shaft to rotate therewith but slidable thereon, and a solenoid operable when energized to move said drive member axially on the shaft from a first to a second position thereon. The solenoid is de-energized at a predetermined point in the rotation of the shaft, whereupon the drive member is normally returned to its first position on the shaft by a yieldable force, such as a spring force, or gravity.

The object of the invention is to provide means effecting positive return of the drive member to its first or solenoid de-energized position in the event that it is not so returned by the yieldable force upon de-energization of the solenoid.

In accordance with the invention, a stationary abutment is provided having a part disposed in the path of continued rotary movement of a part of the drive member if the latter remains in its second position after de-energization of the solenoid. One of the cooperating parts is formed with an inclined or helical surface such that the drive member is forced axially on the shaft toward its first position upon continued rotary movement of the drive member.

In the illustrated embodiment, the drive member is a radial cam driving the rod of a pump on its discharge stroke. The cam drive member is moved axially by the solenoid from its first or inoperative position out of alignment with the rod to a second or operative position in which it is in alignment with the rod.

The foregoing and other objects are effected by the invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

FIGURE 1 is a vertical longitudinal section of a motor driven pump assembly in accordance with the present invention;

FIG. 2 is a horizontal section taken on line II—II of FIG. 1 and showing many of the parts in plan view;

FIG. 3 is a vertical cross section, taken on line III—III of FIG. 1;

FIG. 4 is a fragmentary plan view showing the cam member and the abutment in engagement for returning the cam member to its first or solenoid de-energized position;

FIG. 5 is an end elevation, with parts broken away, to show cam operated switches for the motor and the solenoid; and

FIG. 6 is a wiring diagram of a control for the motor and the solenoid.

Referring to the drawings in detail, there is shown a pump assembly comprising a rotatable shaft 10 driven by a motor 11 through a speed reduction gear unit 12. The shaft 10 is suitably mounted in a housing or frame structure 13, on which there is also mounted a pump 14 which may be of any suitable type, such as a diaphragm pump. It is provided with an inlet 15 and an outlet 16. There may be any desired number of pumps mounted on the frame 13 and any selected one may be driven by the shaft 10 in each operation thereof. For the

2

sake of simplicity, only one pump is shown, since the present invention is identical with respect to each pump. The pump assembly may be disposed in any desired position with the shaft 10 extending either horizontally or vertically. Such a pump assembly may be used, for example, in a cup drink dispensing machine to pump syrups of different flavors.

The pump 14 is provided with a rod 17 extending radially or perpendicularly of the shaft 10 and mounted for reciprocating movement away from and toward the shaft, the end adjacent the shaft 10 being provided with a roller or cam follower 18 rotatably mounted on a pin 19.

A cam or drive member 21 is mounted on the shaft 10 for actuating the pump 14. It includes a radial cam 22 which, when moved into alignment with the rod 17, as shown in dot-dash lines in FIG. 1, is adapted, upon rotation, to engage the follower 18 and thereby to move the rod 17 in the direction away from the shaft (upwardly as shown in FIG. 1) to effect the discharge stroke of the pump. The return or suction stroke of the pump is effected by a compression spring 23 encircling the rod 17 and bearing at one end against the pump housing and at its other end against a bushing 24 fastened to the rod 17.

The cam member 21 is keyed to the shaft 10 to cause it to rotate with the shaft, but permitting it to move axially between a first position, shown in full lines in FIG. 1, in which the cam 22 is out of alignment with the rod 17 and the cam follower 18 and is, therefore, inoperative to actuate the same, and its second position, mentioned above, in which the cam 22 is in alignment with the rod 17 and operative to actuate the pump upon rotation of the shaft 10. Such keying is effected by a pin 25 which is driven through the shaft 10 and which extends through axially extending slots 26 in the cam member.

The cam member 21 is normally in its first or inoperative position shown in full lines in FIGS. 1 and 2, being biased to such position by a yieldable force which in the present embodiment is provided by a helical compression spring 27 which may be disposed about the shaft 10 between the cam member and a collar 28 fixed on the shaft 10, as shown in FIGS. 1 and 2. The cam member is adapted to be actuated to its second or operative position in alignment with the rod 17, to the right as shown in FIGS. 1 and 2, by a solenoid 29 through a lever 31, which is pivoted intermediate its ends, as shown at 32, to a stationary bracket 33 fastened to the frame 13. One end of the lever 31 is pivoted to the armature 34 of the solenoid and the other end is bifurcated, the tines being formed with bosses 35 adapted to engage the end surface of the cam member 21, as shown in FIGS. 1 and 2.

In each operation of the pump assembly, the motor 11 is energized to effect one complete revolution of the shaft 10, starting from the standby or rest position shown in FIGS. 1, 2, 3 and 5 and in which the cam 22 is positioned as shown in FIG. 3 with the low part of the cam adjacent but slightly spaced from the cam follower 18. De-energization of the motor 11 at the end of one revolution of the shaft 10 is effected by a motor switch 36 (FIG. 5), which is actuated in switch opening direction by a cam 37 fixed on the shaft 10 and engaging an operating finger 38 of the switch. In each rotation of the shaft 10, it may be desired to operate the pump 14, or it may be desired to operate another pump not shown and therefore not to operate the pump 14, dependent upon the choice of the operator. If it is not desired to operate the pump 14, the solenoid 29 is not energized and the cam 22 remains in its inoperative position out of alignment with the pump rod 17, so that the shaft 10 may rotate without any effect on the pump 14. If it is desired to operate the pump 14, the solenoid 29 is energized at or near the moment of energization.

zation of the motor 11. The solenoid rotates the lever 31, counterclockwise as shown in FIG. 2, to move the cam member 21 to its second or operative position as mentioned, so that during the rotation of the shaft the cam 22 actuates the rod 17 to effect the discharge stroke of the pump, the cam 22 rotating clockwise as shown in FIG. 3. As the high point of the cam shown at 39 passes the follower 18, the follower 18 becomes clear of the cam and the spring 23 begins the return or suction stroke of the rod 17. At this time, the solenoid 29 is de-energized to permit the cam member to be returned to its first or inoperative position by the return spring 27. Such de-energization is effected by a solenoid switch 40, actuated by the cam 37 at this time, when the shaft 10 has completed approximately 280° of one rotation thereof.

Sometimes, however, a solenoid fails to return to its de-energized position, which failure may be due, for example, to residual magnetism or to friction or binding of the connected parts, including the lever 31 and the armature 34. In such case, if the condition were not corrected, the cam 22 would again operate the pump 14 upon the next rotation of the shaft, even though it may be desired that the pump 14 not operate during such rotation. To guard against this condition, the cam member 21 and the stationary structure are provided with cooperating parts to effect positive return of the cam member toward its inoperative position if it has not returned promptly after de-energization of the solenoid 29. In the present embodiment, such cooperating parts comprise first a lobe or projection 41, which may be an integral part of the cam member 22, which may be a molded plastic. The part 41 is formed with an inclined or helical surface 42, the low part being disposed forwardly and the high part rearwardly in the direction of rotation. The other cooperating part is provided by a stationary abutment 43 comprising a sheet metal member fastened to the frame 13 and extending radially of the shaft 10, the cooperating part thereof being disposed in the path of movement of the part 41 upon sufficient rotation in the second or operative position after de-energization of the solenoid. It is so disposed relative to the cam 22, as shown in FIG. 3, that, shortly after the high point of the cam shown at 39 disengages the cam follower 18, if the cam member has failed to return to its inoperative position but remains in its second or operative position, the inclined surface of the part 41 engages the abutment 43, as shown in FIG. 4. Upon continued rotary movement of the cam member, the cam member 21 is positively moved, due to the inclined surface 42 of the part 41, to the left as shown in FIGS. 1, 2 and 4, toward its first or inoperative position, and through the lever 31, it moves the solenoid armature 34 toward its de-energized position. The cam member 21 is not forced all the way to its inoperative position, but it is moved a sufficient distance to overcome the residual magnetism or friction, so that the spring 27 can be expected to complete the movement. Accordingly, if, in the next operation of the pump assembly, operation of the pump 14 is not desired, the cam member 22 will be out of alignment with the pump rod 17 so as to avoid operation of the pump 14.

The pump assembly may be controlled by suitable electrical control already well-known in the art. In FIG. 6 there is shown an electrical control that may be employed. It includes a manually actuated switch 44 adapted to complete a circuit extending from line conductor L1 through the switch 44 and then through the above-mentioned solenoid 29 and a relay coil 45 in parallel with the line conductor L2. The coil 45, when energized, closes contacts 46 that complete a holding circuit which extends from line conductor L1 through the above-mentioned solenoid switch 40 and the contacts 46 in parallel with the manually actuated switch 44. The coil 45, when energized, also closes the contacts 47, arranged in parallel with the above-mentioned motor switch 36, each of which is adapted to connect the motor 11 to the line conductor L1.

To initiate operation of the pump assembly operating the pump 14, the switch 44 is closed to complete the circuit to the relay coil 45. The latter closes its contacts 46 to complete the holding circuit to the solenoid 29 and the coil 45. The solenoid 29 operates through the lever 31 to move the cam member 21 to its second or operative position in which the cam 22 is in alignment with the pump rod 17. At the same time, the relay contacts 47 complete the circuit to the motor 11, which thereupon operates to effect rotation of the shaft 10, clockwise as shown in FIG. 3. The cam 22 rotates and engages the follower 18 to move the pump rod 17 through its discharge stroke. When the shaft 10 has rotated sufficiently that the high point 39 of the cam 22 has left the cam follower 18, the solenoid switch 40 is actuated by the cam 37 to open the holding circuit of, and thereby to de-energize, the solenoid 29 and the relay coil 45. The coil 45 opens the contacts 47 for the motor, but the circuit to the motor is maintained by the motor switch 36 for the remainder of the one revolution of the shaft 10, whereupon the switch 36 opens the circuit to terminate operation of the motor.

Upon de-energization of the solenoid 29, the cam member 21 is normally moved by the spring to its inoperative position. Should it fail so to move for any reason, the part 41 of the cam member will, upon continued rotary movement of the cam member in its second or operative position effected by the motor switch 36 after opening of the contacts 47 resulting from opening of the solenoid switch 40, move into engagement with the abutment 43, whereupon the cam member 21 is forced to the left toward its inoperative position, as described above.

The solenoid switch 40 is adapted, through a conductor 48, similarly to open the circuit of a solenoid associated with any other pump that may be driven by the shaft 10. Also, a circuit to initiate energization of the motor 11 for any other pump that may be driven by the shaft 10 may be completed through a conductor 49 in a similar manner, the motor circuit again being maintained by the motor or full cycle switch 36 until the shaft has completed one revolution.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof.

I claim as my invention:

1. A drive mechanism comprising

a rotatable drive shaft,

a driven device,

means for driving said device by said drive shaft upon rotation thereof including a drive member slidably mounted on said drive shaft,

means for keying said drive member on said shaft against rotation relative to the shaft but permitting the same to move axially on the shaft between an operative position in which said drive member is in driving relation to said driven device and an inoperative position in which it is not in such driving relation,

an electric solenoid, means connecting said solenoid to move said drive member axially on said shaft from its inoperative to its operative position thereon when said solenoid is energized,

yielding means operatively connected to said drive member to normally return said drive member to its inoperative position by a yielding force upon de-energization of said solenoid,

a stationary abutment member, and

means for assuring return of said drive member to its inoperative position comprising cooperating parts of said abutment member and said drive member, one of said parts having an inclined surface and said parts being so formed and relatively positioned

5

that during a portion of the rotation of said drive member in its operative position said parts engage each other and force the drive member toward its inoperative position.

2. A drive mechanism as set forth in claim 1 and further including 5

means for de-energizing said solenoid at a predetermined point in the rotation of said shaft prior to engagement of said cooperating parts, and a switch for continuing rotation of the shaft until said cooperating parts have passed each other. 10

3. A pump assembly comprising

a rotatable drive shaft,

a pump including an operating member,

a cam member mounted on said shaft and having a cam surface for actuating said operating member, 15

means for keying said cam member on said shaft against rotation relative to the shaft but permitting the same to move axially on the shaft between an operative position in which said cam surface is in alignment with said operating member and an inoperative position in which said cam surface is out of alignment with said operating member and is, therefore, inoperative to actuate the same, 20

an electric solenoid, means connecting said solenoid to 25

6

move said cam member axially on said shaft from its inoperative to its operative position thereon when said solenoid is energized,

yielding means operatively connected to normally return said drive member to its inoperative position by a yielding force upon de-energization of said solenoid,

a stationary abutment member, and

means for assuring return of said cam member to its inoperative position comprising cooperating parts of said abutment member and said cam member, one of said parts having an inclined surface and said parts being so formed and relatively positioned that during a portion of the rotation of said cam member in its operative position said parts engage each other and force the cam member toward its inoperative position.

References Cited by the Examiner

UNITED STATES PATENTS

2,957,420 10/1960 Reynolds et al. ----- 103—23

BROUGHTON C. DURHAM, *Primary Examiner.*

25 D. H. THIEL, *Assistant Examiner.*