

[54] **MODULAR TYPE LIQUID FILLING MACHINE**

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[51] Int. Cl.² **B65B 3/04**

[58] Field of Search 141/13, 84, 99, 138, 155, 141/156, 180, 178, 183, 184, 186, 191, 234, 235, 237, 392; 184/81

[56] **References Cited**

UNITED STATES PATENTS

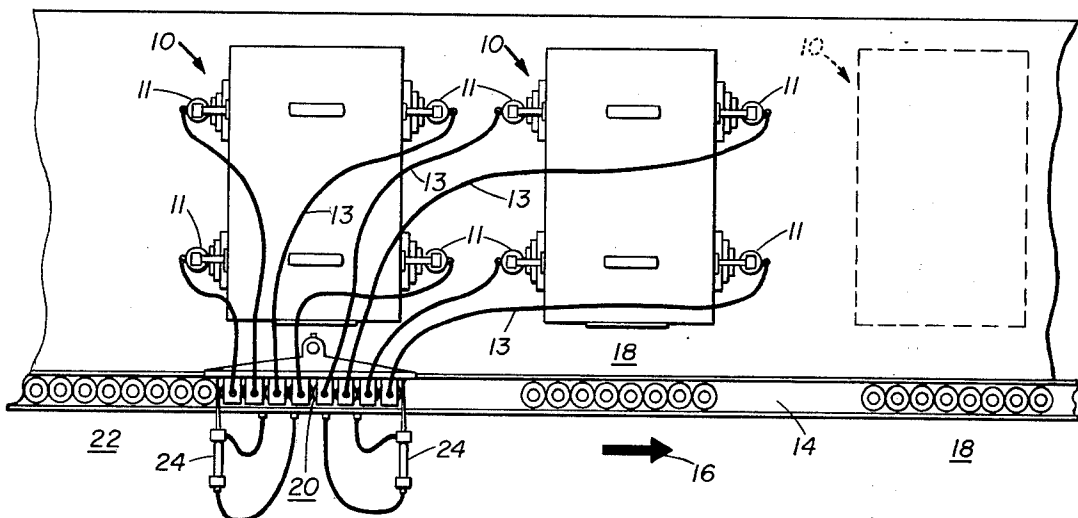
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[57] **ABSTRACT**

A modular type of automatic liquid filling system is provided for filling a plurality of liquid containers individually and simultaneously. It consists of an automated system of two, three, or more container filling machines or modules connected to a terminal strip. An external shunt wound motor is used to control a cam. This cam, in turn, closes a normally open micro-switch. The microswitch operates a power relay for each filling machine or module. Each filling machine then cycles one complete revolution and then stops, with the respective nozzles thereof filling a plurality of liquid containers with fluid. Modules or filling machines can be added to the system to increase production of filled containers as desired.

7 Claims, 4 Drawing Figures



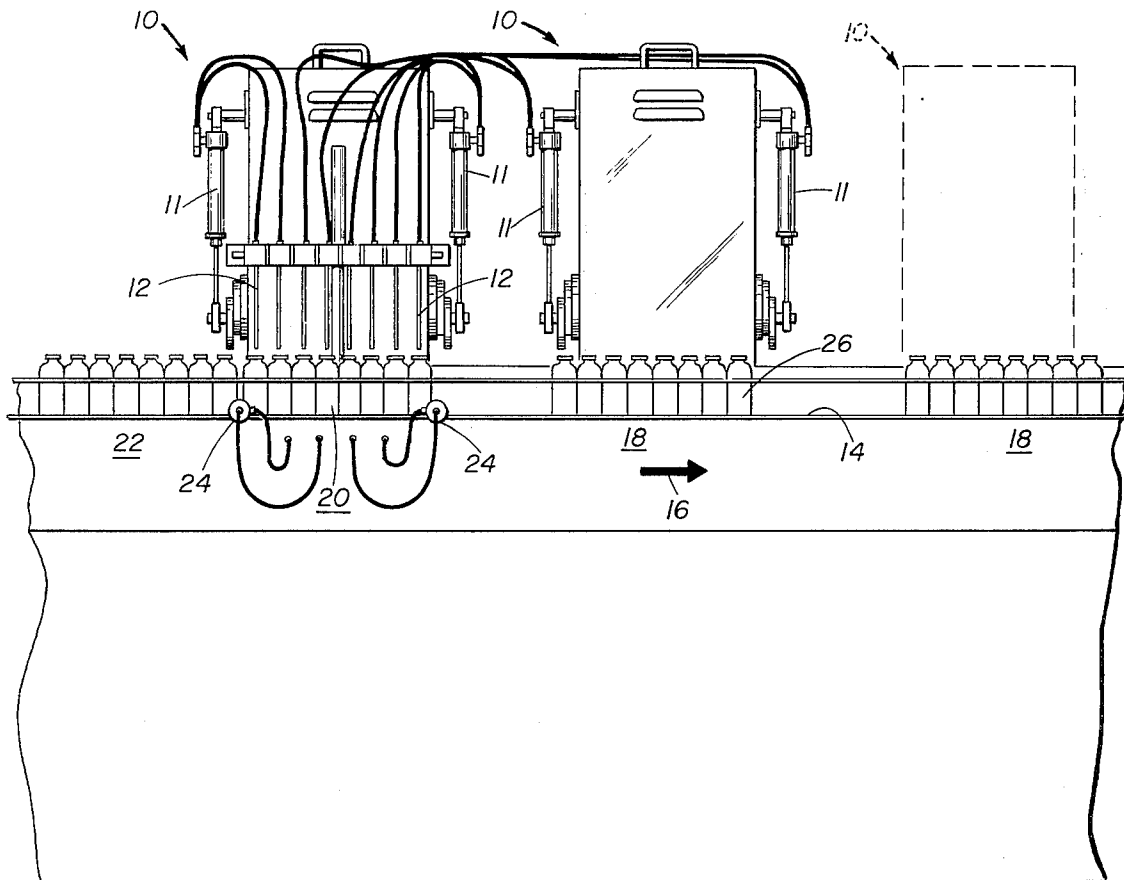
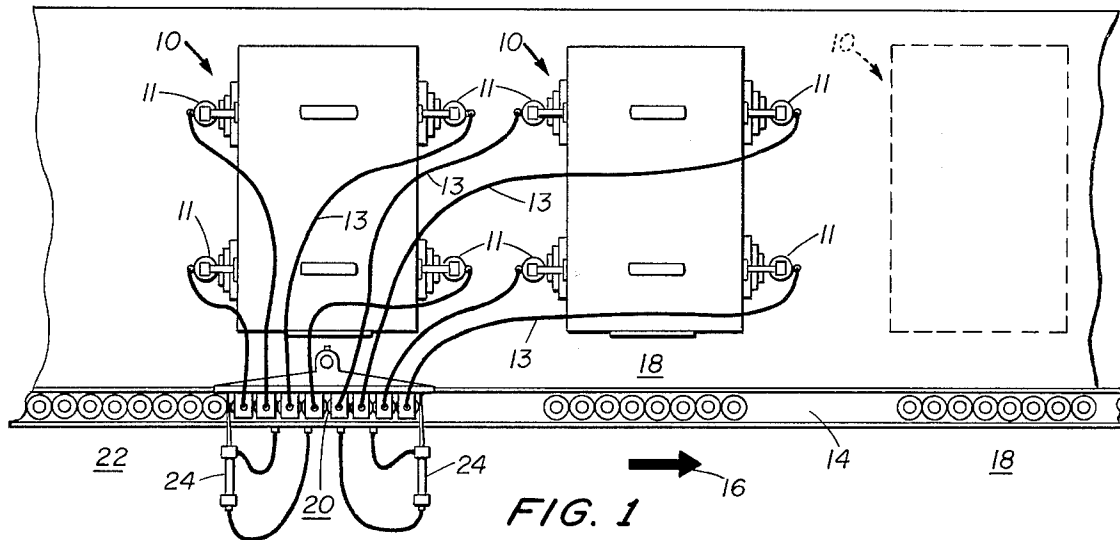
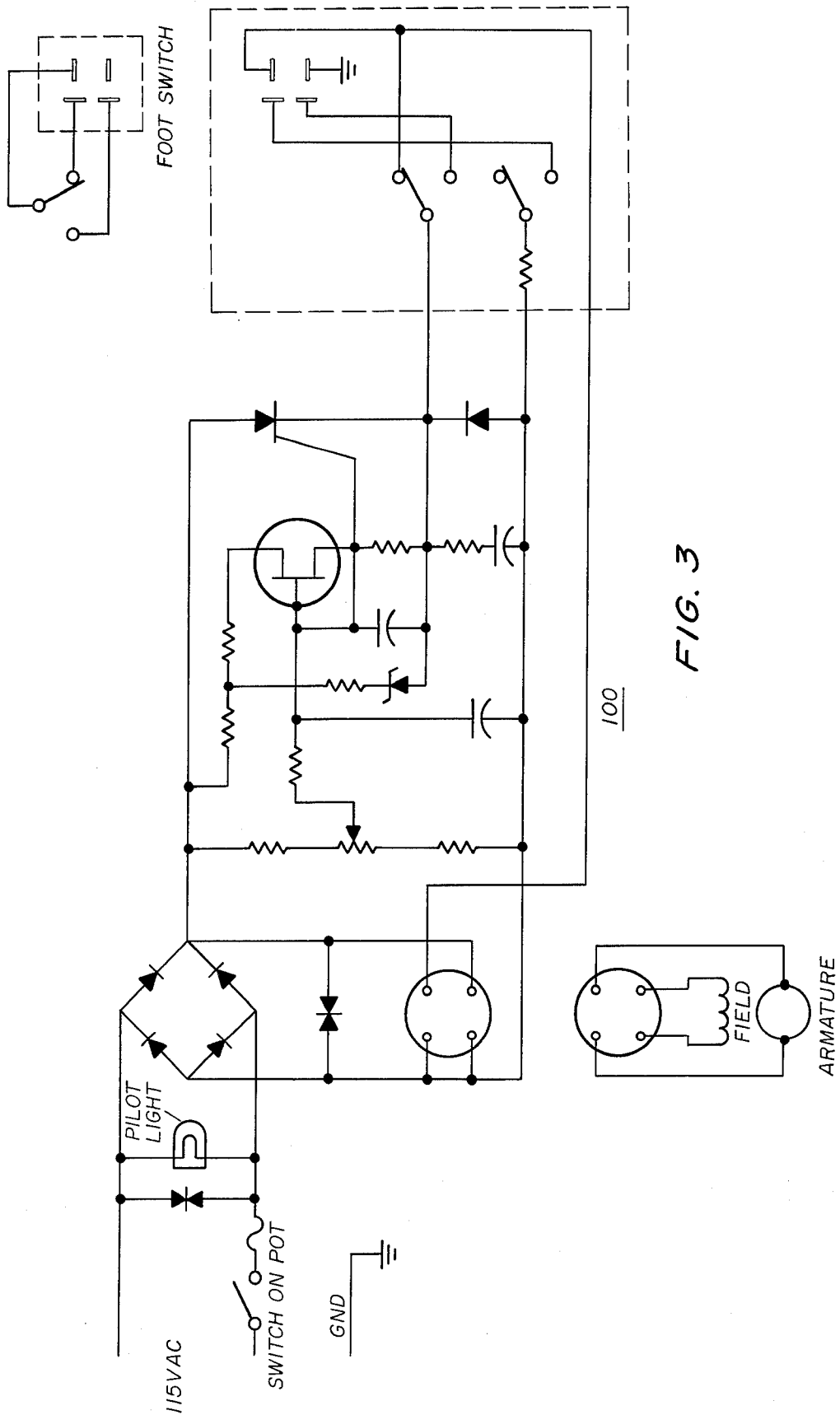
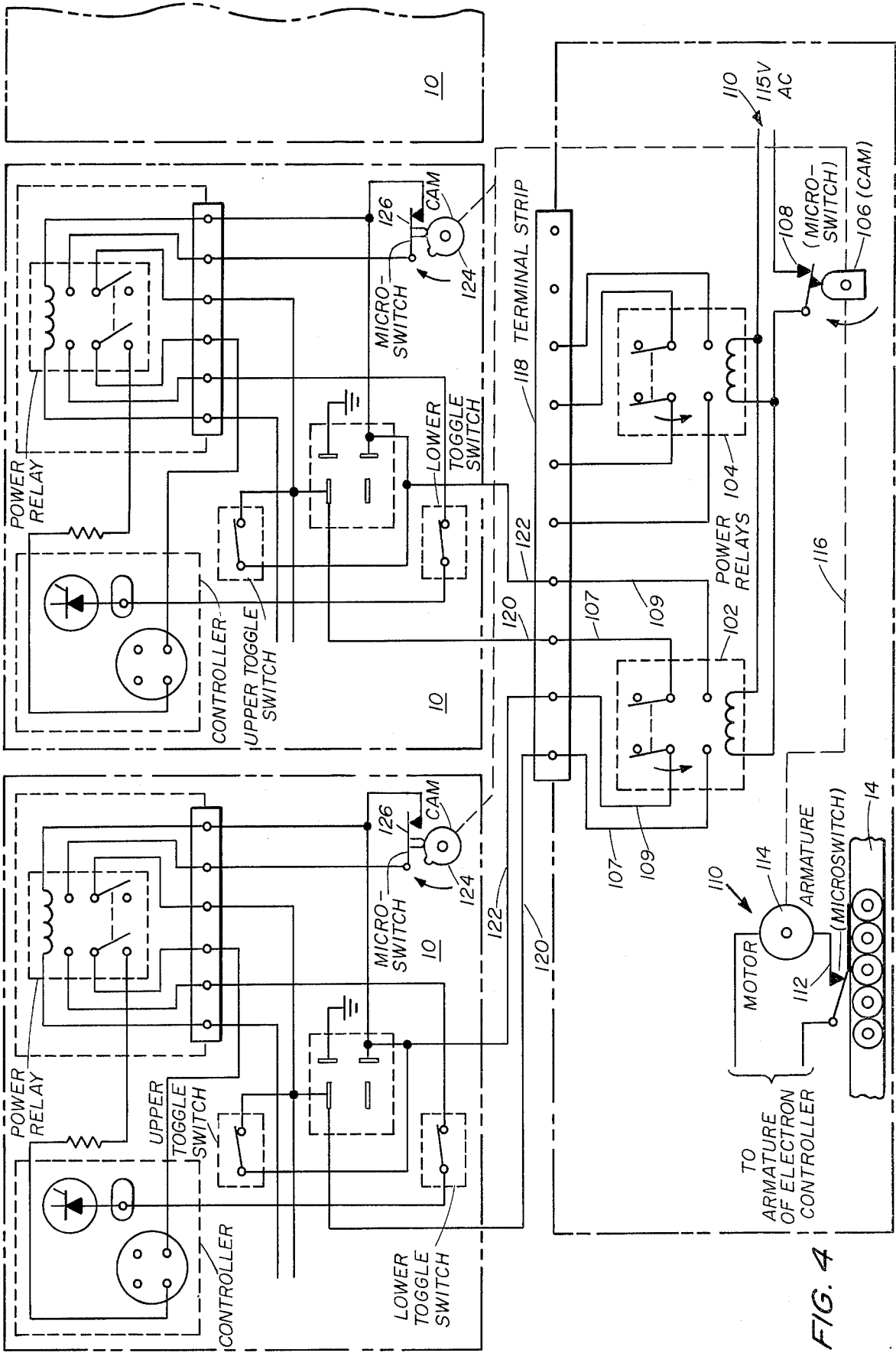


FIG. 2





MODULAR TYPE LIQUID FILLING MACHINE

This invention relates generally to a liquid handling system, and more particularly it pertains to a modular type of automatic liquid filling system for filling a plurality of liquid containers individually and substantially simultaneously.

Reference is made to my U.S. Pat. No. 3,237,661 for "Container Filling System" which was issued on Mar. 1, 1966, which shows a machine for filling containers on a continuously moving conveyor, and which is utilized in the modular system of this invention.

It is an object of this invention to provide a plurality of these machines in a modular type liquid filling system for filling of a plurality of liquid containers with fluids and the like to increase production of filled liquid containers.

Another object of this invention is to provide a synchronizer attachment with an impulse type motor for controlling a plurality of modular type liquid filling machines which can be added to or taken away from a modular type of automatic liquid filling system to increase or decrease the number of containers being filled at one time.

It is a further object of this invention to provide a modular type of automatic liquid filling system for filling a plurality of liquid containers individually and substantially simultaneously.

Still another object of this invention is to provide an automated system of two, three or more liquid container filling machines synchronized to operate together, filling a plurality of containers substantially simultaneously.

And even another object of this invention is to provide modular type liquid container filling machines which can be introduced into an automated system for substantially simultaneously and efficiently filling a plurality of liquid containers.

A further object of this invention is to provide a modular type automatic liquid container filling system utilizing one or more module type filling machines capable of being quickly and efficiently introduced into or removed from the system as desired.

And another object of this invention is to provide a modular type automatic liquid container filling system which is economical to assemble, and which is efficient and reliable in operational use.

To provide a modular type automatic liquid container filling system which can have modular units added thereto without difficulty, is still another object of this invention.

And to provide a modular type automatic liquid container filling system which is easy to install and maintain is still another object of this invention.

Other objects and attendant advantages of this invention will become more readily apparent and understood from the following detailed specification and accompanying drawings in which:

FIG. 1 is a top plan view of a modular type automatic liquid filling system incorporating features of this invention;

FIG. 2 is a front elevation view of the modular type automatic liquid filling system of FIG. 1;

FIG. 3 is a schematic of an electron controller for a liquid filling machine of the modular type automatic liquid filling system; and

FIG. 4 is a schematic electrical diagram showing the electrical circuit for operating two or more liquid filling

machines or modules, with a synchronizer attachment and impulse motor therefor.

Referring now to FIGS. 1 and 2 of the drawings, there is shown at least two identical liquid filling machines 10. Any number of liquid filling machines 10 can be utilized in the modular type liquid filling system of this invention. Each liquid filling machine 10 is substantially similar to the machine shown in my U.S. Pat. No. 3,237,661 issued Mar. 1, 1966 for "Container Filling System".

As shown in FIGS. 1 and 2, each liquid filling machine 10 is provided with a plurality of predetermined liquid capacity reciprocating pumps 11, either two or four, operated by a motor. The outputs of these pumps 11 are connected to flexible tubing 13. Each flexible tubing 13 is provided with a nozzle 12 on the end thereof.

There can be provided two optional types of filling nozzles, namely the stationary nozzle 12 as shown in the drawings, or a diving type which enters the containers 26 on the conveyor line 14. The diving type nozzles fill the containers 26 and then they are retracted.

The containers 26 move on a continuously operated conveyor belt 14 which moves in the direction of the arrow 16. Depending upon the requirements of the manufacturer, the containers 26 are moved on the conveyor belt 14 in groups. For example, if only one container filling machine 10 with four nozzles 12 is to be used, then four containers 26 are grouped together on the container belt 14. If, however, eight containers 26 are to be filled with liquid simultaneously, then two container filling machines 10, each having four nozzles 12, are connected into the system as will be described subsequently, and all eight containers 26 are filled substantially simultaneously with liquid as required.

In FIGS. 1 and 2, there are shown two groups 18 of eight containers 26 which have been filled with liquid, and a further group 20 of eight containers 26 which are being filled with liquid through the flexible tubing lines 13 and nozzles 12 from two automatic type filling machines 10.

A suitable mechanism 24, as shown in FIGS. 1 and 2, is utilized for positioning the group of eight containers 26 under the nozzles 12 as desired. New containers 26 to be filled with liquid are designated by reference numeral 22, and these unfilled containers 26 are moved into a filling position or area as indicated by the group of containers 20 as required and their position is controlled by the mechanism 24 which positions the containers 26 under the nozzles 12.

Referring now to FIG. 4 of the drawings, there is shown an arrangement for connecting a number of automatic liquid filling machines 10 into a system so that the number of liquid containers 26 to be filled can be increased in order to increase production.

When a manufacturer has a four nozzle automatic filling machine 10, he may later decide that it is necessary to increase production from a four nozzle automatic filling machine to a six nozzle, eight, or twelve nozzle or high nozzle filling system. To do so, would require the purchase of additional or a larger nozzle filling machine.

To eliminate this additional cost, this invention makes it possible for the manufacturer to obtain only one additional machine 10 with four nozzles 12, for example, to increase his nozzle filling system to eight nozzles. Thus, the manufacturer is able to double his pro-

duction with minimal outlay of capital as will now be discussed.

Each automatic liquid filling machine 10 is equipped with an electronically controlled, shunt wound (or permanent magnet) motor 110 and a single revolution mechanism. The single cycle or single revolution operation is accomplished by opening the motor armature circuit, then magnetically braking the motor 110 to a stop by shorting out the motor armature. This operation is performed simultaneously with all of the machines 10 or all of the modules in the system.

As noted, each module filling machine 10 is equipped with a single cycle mechanism. The synchronizing device consists of the D.C. shunt wound (or permanent magnet) motor 110, an electronic controller system 100, a cam mechanism 106, relays and a single cycle mechanism.

Generally, when containers 26 on the conveyor line depress the microswitch 112, the circuit to the motor armature in the synchronizing mechanism is closed and the motor 110 begins to operate. In so doing, it causes cam 106 to close microswitch 108. This actuates power relays 102 and 104, closing the normally open contacts. This, in turn, actuates the motors to each individual module (filling machine) in the system causing them to make a single revolution. The speed control for synchronizer motor 110 can be set so that microswitch 108 closes a fraction of a second after each module has completed its single revolution. Thus, the operation of the system is virtually continuous.

As shown in FIG. 4, a normally open microswitch 112 is attached to the conveyor belt system so that the containers 26 on the conveyor belt 14 depress the microswitch 112 and close it. If there are no containers 26 on the conveyor line or belt 14, the pressure of the microswitch 112 is released and the switch opens.

Now, let it be assumed that containers 26 are on the conveyor line or belt 14, so that the microswitch 112 is depressed. The microswitch 112 closes the armature circuit of an external DC shunt wound motor 110. The motor armature 114 is electrically coupled to a conventional electron controller system 100 shown in FIG. 3 which is utilized to control and synchronize two or more filling machines or modules 10. The motor 110 in FIG. 4 is coupled to a cam 106 which engages a microswitch 108 by point contact. The cam 106 is attached to the output shaft 116 of the motor armature 114.

As long as there are containers 26 on the conveyor belt 14, the microswitch 112 to the armature circuit is closed and the external motor 110 continues to rotate. Everytime that the cam 106 rotates one revolution, it closes the normally open microswitch 108 which actuates power relays 102 and 104. Each power relay 102 and 104 is connected by leads 107 and 109 to a terminal strip 118.

If six filling machines 10 are being utilized, then additional power relays, similar to relays 102 and 104 would be utilized. The electrical system of each filling machine 10 is also connected by leads 120 and 122 to the terminal strip 118 so that each power relay 102 or 104 controls power to the motor to the individual machine or module 10.

Thus, if three filling machines 10 are being utilized, there would be an additional power relay for the third machine. Thus, everytime the motor 110 makes one revolution, the cam 106 depresses the microswitch 108 momentarily and when it does, this closes and locks the

power relays 102 and 104 and actuates the electronic controllers of FIG. 3 in the system. The motor in each machine 10 is provided with a cam 124. Each cam 124 will make one revolution, and when it does, it opens up a microswitch 126 to the armature circuit of its respective motor in the filling machine 10.

The motor of each filling machine 10 makes one revolution and then comes to a stop so that if one motor of one filling machine 10 is running a little faster than the motor of a second filling machine 10, it will make no difference because all of the machines 10 will come to a stop and one filling machine 10 will wait for the other filling machine 10 to complete its operation.

Thus, in FIG. 4, the motor of the left filling machine 10 will make one revolution and come to a stop. The motor of the second filling machine 10 will make one revolution and come to a stop and so on. The motors of the filling machines or modules 10 do not have to be synchronized because if one is a little faster than the other they will all come to a stop and will all start at one time.

In actual operation, a plurality of filling machines or modules 10 are connected by plugging the respective leads 120 and 122 into the terminal strip 118. The containers 26 on the conveyor line 14 close the microswitch 112 to operate the motor 110, which, in turn, rotates the cam 106. Cam 106 closes the normally open microswitch 108, to close the power relays 102 and 104 as previously described. Thus each filling machine 10 in the system will then recycle one time and stop; and the respective nozzles 12 thereof fill their respective containers 26 with liquid as shown in FIGS. 1 and 2.

If the speed of any one of the filling machines or modules 10 in the modular system is slightly more or less than the other machines 10, it will not affect the operation of the modular system as each filling machine will come to a stop after the cycle of operation for that particular machine 10 has been completed. Thus, the single load cam 106 attached to the electronically controlled variable speed motor 110 depresses the normally opened microswitch 108. This normally opened microswitch actuates the series of relays 102 and 104. These relays 102 and 104, in turn, operate the single cycle mechanism of each filling machine 10 in the system to fill its respective containers 26 with fluid through the nozzles 12.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A modular type system for filling a plurality of containers with fluid, comprising, at least two liquid filling machines, each machine having a single cycle operating mechanism, each machine having a plurality of fluid filling nozzles located in a filling area, operating means sequentially passing said containers into and out of said filling area in groups to be filled with fluid by said nozzles of said filling machines, electronic control means for synchronizing the operation of said filling machines, means connected to said synchronizing means for sensing containers in said filling area, power relays having contacts connectable with said single cycle operating mechanisms, means for closing and locking said connectable contacts of said power relays in an operative position to operate the single cycle op-

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erating mechanisms of the respective filling machines to fill said containers with fluid through the use of the respective nozzles of said filling machines, said synchronizing means being rendered operable in response to the sensing of the containers in said filling area by said sensing means, and means connected to the output of said synchronizing means and operable upon operation of said synchronizing means for actuating said closing and locking means to operate in synchronism said single cycle operating mechanisms of the respective filling machines.

2. A modular type system for filling a plurality of containers with fluid as recited in claim 1, and additionally pump means for delivering a predetermined amount of said fluid to each said container.

3. A modular type system for filling a plurality of containers with fluid as recited in claim 1, wherein said op-

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erating means for passing said containers into and out of said filling area to be filled with fluid consists of a conveyor for said containers.

4. A modular type system for filling a plurality of containers with fluid as recited in claim 1, wherein said means for sensing containers in said filling area consists of a microswitch.

5. A modular type system for filling a plurality of containers with fluid as recited in claim 1, wherein the actuating means includes a normally open microswitch.

6. A modular type system for filling a plurality of containers with fluid as recited in claim 1, wherein said motor is of a DC shunt wound type.

7. A modular type system for filling a plurality of containers with fluid as recited in claim 1, and means for controlling the number of containers in said filling area.

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