Jan. 13, 1970 L. C. RIKER 3,489,186

NO-CAN NO-FILL MECHANISM FOR FILLING MACHINES

Filed June 9, 1967 2 Sheets-Sheet 1

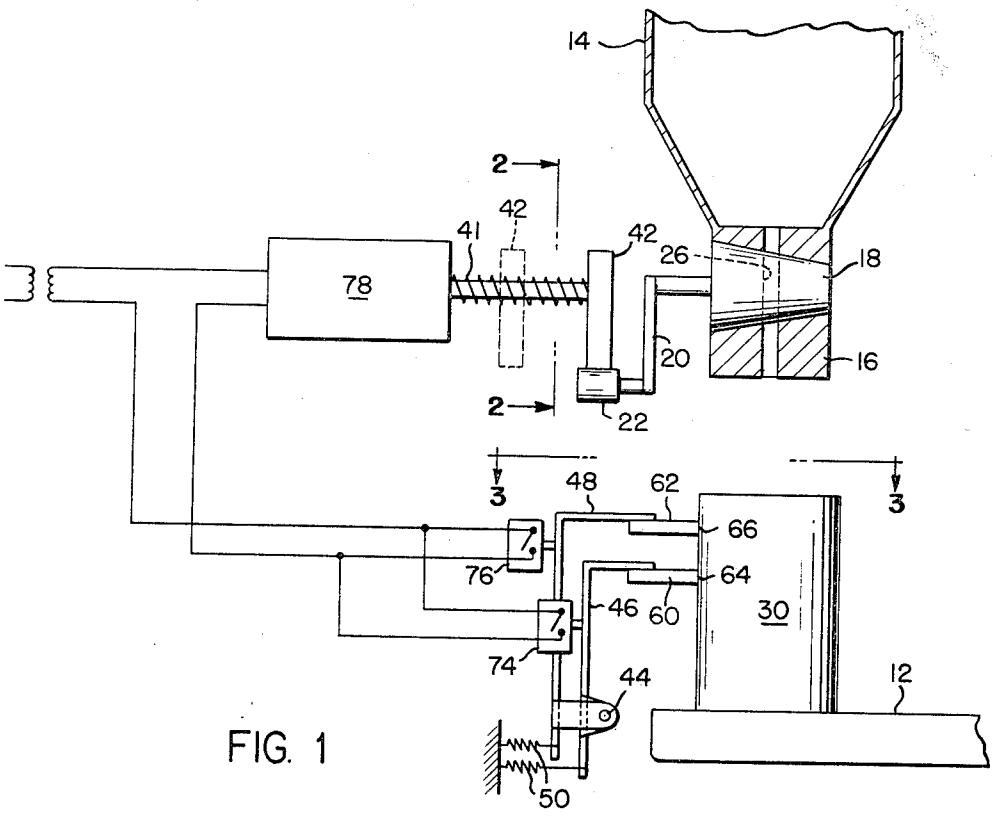


FIG. 1

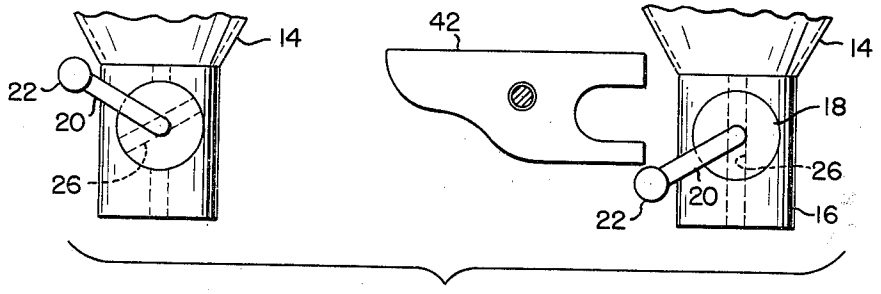


FIG. 2

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Jan. 13, 1970 L. C. RIKER 3,489,186

NO-CAN NO-FILL MECHANISM FOR FILLING MACHINES

Filed June 9, 1967 2 Sheets-Sheet 2

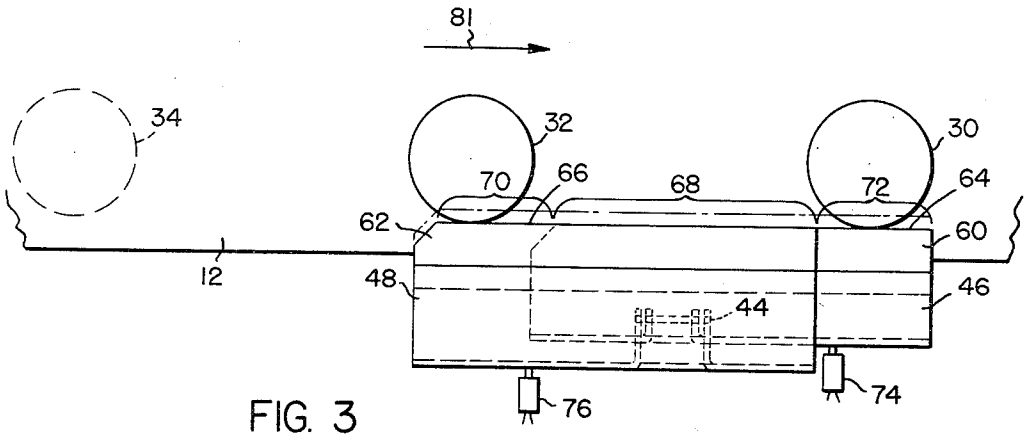


FIG. 3

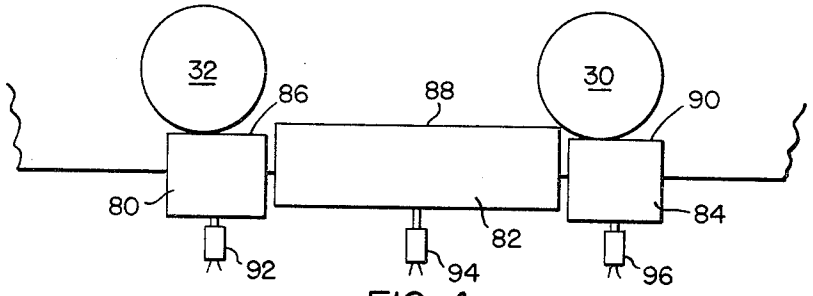


FIG. 4

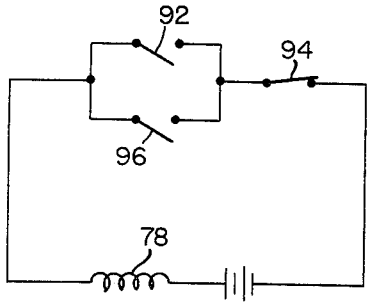


FIG. 5

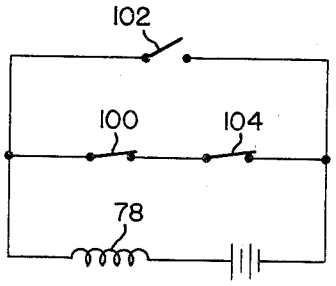


FIG. 6

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NO-CAN NO-FILL MECHANISM FOR FILLING MACHINES

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Int. Cl. B65b 57/06; B26d 5/28
U.S. Cl. 141—141 6 Claims

ABSTRACT OF THE DISCLOSURE

In a no-can no-fill mechanism for rotary filling machines having a plurality of filling stations, a pair of limit switches wired in parallel and two trip shoes for activating the mechanism whenever a filling station is not occupied by a container to be filled. The mechanism remains inactive only when both trip shoes are depressed by engagement with containers occupying the filling stations and releasing either trip shoe, activates the no-can no-fill mechanism to prevent filling at an unoccupied station. The trip shoes are overlapped and slightly offset from one another, so that the last of a series of containers will pass off and release the first shoe while still holding the second depressed.

The present invention relates to a filling machine for filling cans, glass jars or other containers with various free flowing liquids or semi-flowing products, and more particularly to a mechanism for use in connection with such machines for maintaining the filling mechanism inoperative when no container is in a position to be filled.

Reference is made to the patent of Joseph T. Stigler, No. 2,759,649 and the patents referred to therein which show a typical prior art no-can no-fill mechanism and a typical filling machine to which the present invention can be applied. For purposes of providing background for the present invention, the operation of a typical filling machine on which the present invention can be used and a typical prior art no-can no-fill mechanism is only generally described since the details thereof are described in the patents referred to above. It should be understood that the no-can no-fill mechanism of the present invention may be incorporated in any machine of the general type described in the above cited patents or similar rotary container handling machines.

Such a filling machine includes a plurality of filling stations equally spaced about the periphery of a rotating turret. Associated with each filling station is a valve which opens and closes to permit the filling of containers which occupy the filling stations. Opening and closing of the filling valves is controlled by a cam follower carried by each of the filling valves, the follower being deflected in one direction to open the valve and in the opposite direction to close the valve. The cam follower is deflected to open the valve by a cam which is movable into and out of the path of travel of the cam followers. If the cam is in the path of travel, the follower will be deflected to open the valve. On the other hand, if the cam is moved from the path of travel, the follower will not be deflected and the valve will remain closed. As long as each filling station is occupied by a container to be filled, the cam will remain in the path of the cam follower. However, if for some reason one or more filling stations are not occupied by containers, the cam is moved from the path of the cam followers to prevent the opening of the filling valves associated with the unoccupied stations.

The cam is moved by any suitable drive means such as a solenoid, an air cylinder or the like, which is energized by closing a switch. In the prior art this switch is

opened and closed by a single trip shoe resiliently mounted in a position which lies normally in the path of travel of the containers. Upon contact with the containers occupying the filling stations, the trip shoe is moved to a depressed position which opens the switch. Therefore, as long as the shoe is depressed by a container, the solenoid is de-energized so that the cam remains in the path of travel of the cam followers. However, if a filling station is unoccupied, the trip shoe will move to its normal position in the path of travel of the containers closing the switch. Closing the switch in turn energizes the solenoid and removes the cam from the path of the cam followers.

To prevent unnecessary movement of the trip shoe, the length of the shoe is made substantially equal to the center-to-center distance of the filling stations to allow a steady stream of containers to hold the trip shoe in the depressed position without fluttering. Thus, the trip shoe in the prior art only moves in two situations, when an unoccupied filling station is followed by an occupied filling station, or when an occupied filling station is followed by an unoccupied filling station. The first situation is termed a no-can to can condition and the second situation is termed a can to no-can condition.

Furthermore, since the single trip shoe of the prior art is equal in length to the center-to-center distance between filling stations, the container following an unoccupied station in the no-can to can condition contacts and depresses the trip shoe before the center line of the unoccupied station has completely traversed the trip shoe. Thus, in the no-can to can condition, the cam is advanced into the path of the cam followers when the container moves the trip shoe to the depressed position, which occurs before the unoccupied station has completely traversed the trip shoe. However, in the can to no-can condition, the cam is retracted from the path of the cam followers when the trip shoe has moved to its normal position. This occurs after the container preceding an unoccupied filling station has completely traversed the trip shoe or when the center line of the unoccupied station is located at some point on the trip shoe. Accordingly, with a single trip shoe the cam follower representing an unoccupied filling station is closer to the cam when the cam is retracted than the cam follower representing an occupied filling station is to the cam when the cam is advanced.

While this distance differential does not influence the low speed operation of the filling machine, it becomes an important factor when the filling machine is operated at high speeds, and, in fact, limits the top speed of the filling machine.

For example, experiments conducted on a 35 station rotary filling machine operating at a speed of 1,000 containers per minute show that the cam followers passed a fixed point every .0600 second. Of this time, .0327 second was required for the cam follower to traverse the length of the cam surface and an additional .0065 second was required for the follower to clear the cam. The remaining .0208 second of the total cycle represented the time available for moving the cam. In the no-can to can condition, it was found that the cam was advanced into the path of a cam follower when the follower was still the full .0208 second away from the cam. However, in the can to no-can condition, the cam was retracted from the path of a cam follower when the follower was only .0035 second away from the cam. Because of the relatively short time available for retracting the cam from the path of the cam followers, it was found empirically that the actual safe reliable operational speed of the filling machine was in the neighborhood of 800 cans per minute rather than a top speed of 1,000 cans per minute, the speed of the machine being reduced to provide sufficient time for retracting the cam from the path of the cam followers.

SUMMARY OF INVENTION

In the preferred embodiment of the present invention, the single trip shoe of the prior art is replaced by two trip shoes, one shoe to control the advance of the cam into the path of the cam followers and another trip shoe to control the retraction of the cam. Each trip shoe is operatively connected to a switch, the two switches being connected in parallel to a solenoid. With this arrangement, the solenoid is energized and the cam retracted when either trip shoe is in its normal position. In like respect, the solenoid is de-energized and the cam advanced only when both trip shoes are in a depressed position.

In experiments conducted on the same 35 station filling machine using two trip shoes, it was found that the reaction time of the no-can no-fill mechanism was increased so that the cam could be retracted from the path of a cam follower associated with an unoccupied filling station while the cam follower was still the full .0208 second away from the cam. Thus, with the two strip shoe arrangement, it was found the safe reliable speed for continuous operation of the 35 station filling machine was increased to 1,000 containers per minute, an increase representing at 25% improvement in the production rate of this machine.

OBJECTS OF THE INVENTION

One object of my invention is to provide an improved triggering device for activating no-can no-fill mechanisms.

Another object of my invention is to provide a sensing and triggering device for activating a no-can no-fill mechanism which utilizes at least two trip shoes to indicate the presence or absence of containers at filling stations.

A further object of my invention is to provide a sensing and triggering device for no-can no-fill mechanisms which increase the safe, reliable operating speed of filling machines.

A still further object of my invention is to provide a no-can no-fill mechanism which utilizes the maximum amount of time available to both advance and retract the valve opening cam from the path of the filling valve.

These and other objects, advantages and characterizing features of my invention will become more apparent upon consideration of the following detailed description thereof when taken in conjunction with the accompanying drawings depicting the same.

DESCRIPTION OF DRAWINGS

FIGURE 1 is a schematic representation of the no-can no-fill mechanism of my invention showing a double trip shoe arrangement for indicating the presence or absence of containers at filling stations.

FIGURE 2 is a view taken along line **2—2** of FIGURE 1.

FIGURE 3 is a view taken along line **3—3** of FIGURE 1.

FIGURE 4 is a view similar to FIGURE 3, only showing another embodiment of my invention which utilizes three trip shoes.

FIGURE 5 is an electrical schematic of the switches associated with the trip shoes shown in FIGURE 4.

FIGURE 6 is a view similar to FIGURE 5, showing a schematic of still another embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, the no-can no-fill mechanism of my invention is preferably used on a filling machine which is circular in plan. The general construction of a machine on which the no-can no-fill mechanism of my invention is incorporated will not be described in detail, since the details thereof are described in the Stigler Patent No. 2,759,649, referred to above and the references cited therein. For purposes of clarifying the present invention, I have shown schematically in FIGURE 1 a portion of the rotating turret indicated at **12** of the filling machine and

one of the multiplicity of cylinders indicated at **14**. Mounted below each of the cylinders **14** is a valve body **16** in which a conical valve **18** is seated. The valve **18** has an arm **20** rigid therewith upon the end of which a roller **22** is mounted. It will be understood that the valve has a filling port **26** which is movable into either of two positions. One position provides a filling opening between the cylinder and the containers to be filled and the other position closes off communication from the cylinder.

All of the above mechanisms are completely described in the above mentioned patents. With respect to the valve construction, it is sufficient to state that special connecting ports are provided but that for the purpose of this application all that is required is that the valve be opened in one position and closed in the other position.

Also shown in FIGURE 1 is a container **30** representing the multiplicity of containers that are carried on the rotating turret **12**, at filling stations located beneath cylinders **14** so that when valve **18** is opened, product within the cylinder can be fed into the container located therebeneath.

Mounted in the path of travel of rollers **22** is a valve opening cam **42**, which, as long as containers are supplied to the machine, does not move from the position shown in solid line in FIGURE 1. Thus, cam **42** is normally always in a position to engage rollers **22** to rotate valve **18** in a counterclockwise direction (FIGURE 2) to enable the containers to fill with material being discharged from cylinders **14**.

The containers are filled as they rotate with turret **12**. When the containers are filled, rollers **22** engage a stationary valve closing cam (not shown) which rotates the rollers in a clockwise direction to close valves **18**.

Referring now to FIGURES 1 and 3, carried by any suitable fixed part of the machine is a pivot **44** upon which arms **46** and **48** are pivotally mounted. Springs **50**, having one end mounted on a fixed part of the machine and another end attached to arms **46** and **48**, normally urge the arms in a clockwise direction about pivot **44** as viewed in FIGURE 1. Each arm **46**, **48** carries remote from springs **50** a trip shoe **60**, **62** respectively. Each trip shoe **60** and **62** has a container engaging portion **64**, **66** substantially equal in length to the center-to-center distance between filling stations. Container engaging portions **64**, **66** normally lie in a position in the path of travel of the containers as shown in phantom in FIGURE 3, but are moved to the position shown in solid line upon engagement with the containers. FIGURES 1 and 3 also show that trip shoes **60** and **62** are disposed one above the other (FIGURE 1) and are offset one from the other in the direction of container travel (FIGURE 2) to form offset end sections **70** and **72** and an overlapped intermediate section **68**. It will be appreciated that intermediate section **68** has a container engaging portion of a length less than the distance between containers, but that the intermediate section **68** together with either end sections **70** or **72** define a container engaging portion which is substantially equal to the center-to-center distance of the containers. Moreover, both trip shoes together define a container engaging portion (**68**+**70**+**72**) which is greater than the center-to-center distance of the containers.

Associated with each arm **46** and **48** is a limit or snap action switch **74** and **76** respectively. Switches of this character are well known and need not be described in detail. It should be sufficient for purposes of understanding the present invention to say that when either container engaging portion **64** or **66** is in the position shown in phantom in FIGURE 3 the switch associated with the arm carrying that portion is closed. As shown in FIGURE 1, switches **74**, **76** are connected in parallel to a solenoid **78**, which in turn is operatively connected to valve opening cam **42**. Thus, closing either switch **74** or **76** will energize solenoid **78** to move cam **42** out of the path of travel of cam followers to the position shown in dotted line in FIGURE 1.

To describe the method of operation of the no-can no-fill mechanism of my invention and by way of illustration only, I shall describe the operation as beginning with all filling stations on rotating turret **12** unoccupied. In this situation container engaging portions **64**, **66** are in the position represented in phantom in FIGURE 3. With trip shoes **60**, **62** and their respective container engaging portions in this position, switches **74**, **76** are both closed, solenoid **78** is energized, cam **42** is in the position shown in dotted line in FIGURE 1 and filling valves **18** remain closed as turret **12** rotates. Assume now that the first container **30** enters a filling station on rotating turret **12** and moves in the direction indicated by arrow **81** in FIGURE 3. Container **30** first engages trip shoe **62**, moving this trip shoe to the position indicated in solid line in FIGURE 3, but trip shoe **60**, however, remains in the position indicated in phantom in FIGURE 3. As viewed in FIGURE 1, the engagement between container **30** and trip shoe **62** moves the trip shoe counterclockwise opening switch **76**. However, since the container has not yet engaged trip shoe **60**, switch **74** is still closed so that the solenoid remains energized to keep cam **42** out of the path of travel of cam follower **22**. As container **30** continues in its path of travel it will next engage trip shoe **60** moving this trip shoe to the position indicated in solid line in FIGURE 3. As viewed in FIGURE 1, this engagement moves trip shoe **60** and arm **46** counterclockwise so that switch **74** is opened. Now, with both switches opened, solenoid **78** is de-energized, allowing cam **42** to move into the path of travel of cam follower **22** under the influence of any suitable means such as spring **41**. With the cam in this position, the follower **22** associated with the filling station occupied by container **30** is moved counterclockwise to open valve **18**.

Since the container engaging portion **64** and **66** of each trip shoe is equal to the center-to-center distance between filling stations, it will be appreciated that the next container **32** (FIGURE 3) occupying the next successive filling station, will be in a position to depress trip shoe **62** just as the center line of container **30** passes off of the shoe. Also, by the time container **30** has completely passed off trip shoe **60**, the next following container **32** will be located in the intermediate section **68**, holding both trip shoes in a depressed condition. Therefore, as long as a continuous stream of containers is supplied to the machine, both trip shoes will remain in a depressed condition holding both switches **74**, **76** open. With both switches open, solenoid **78** is de-energized, allowing cam **42** to remain in the path of travel of the filling valves and cam followers **22**.

Assume now that the next filling station in sequence is unoccupied, an absent container **34** being represented in dotted line in FIGURE 3. Since container **34** is not present on the machine, trip shoe **62** will move to the position indicated in phantom in FIGURE 3 when container **32** has traversed both end section **70** and intermediate section **68** and is located in section **72**. Since there is no container present to hold trip shoe **62** depressed, it will move to its normal position in the path of travel of the containers as indicated in phantom. As viewed in FIGURE 1, this movement rotates trip shoe **62** and arm **48** clockwise causing switch **76** to close. Since switches **74** and **76** are wired in parallel, closing either switch will activate solenoid **78** and withdraw cam **42** from the path of the filling valves and cam follower **22**. The cam remains in the position indicated in dotted line in FIGURE 1 until both trip shoes are again moved to a depressed position.

Therefore, with the double trip shoe arrangement, the cam is not moved into the path of travel of the cam followers until both the trip shoes are depressed, which situation occurs when a container has moved onto the intermediate portion **68**. However, the solenoid is activated to remove the cam from the path of the filling valves whenever either trip shoe is returned to its normal position in the path of travel of the filling stations. This may occur, for example, while the last container of a series of containers is still present at end section **72** holding trip shoe **60** in a depressed position.

Thus, it should be appreciated that in the no-can to can condition, the solenoid is not de-energized until the first of a series of containers has engaged and moved trip shoe **60** to a depressed position and in a can to no-can condition, the solenoid is energized when the last of a series of containers has passed off of trip shoe **62**, but is still holding trip shoe **60** in a depressed position. Thus, in relation to the operation of the single trip shoe of the prior art, it will be appreciated that the present invention, in the no-can to can condition, would de-energize the solenoid at substantially the same time as a single trip shoe. However, during the critical can to no-can condition, the double trip shoe of the present invention would energize the solenoid before the single trip shoe of the prior art could operate.

While the double trip shoe arrangement represents the preferred embodiment of the invention, there are other embodiments which would operate equally as well; for example, in the embodiment shown in FIGURE 4, three trip shoes **80**, **82** and **84** are used. Each trip shoe **80**, **82** and **84** carries a container engaging portion **86**, **88** and **90** respectively, which lie in a normal position in the path of travel of the containers. The length of each container engaging portion is such that the length of the intermediate portion **88** together with either portion **86** or **90** defines a length substantially equal to the center-to-center distance of the filling station. Upon engagement with a container, the trip shoes are moved to a depressed position actuating switches **92**, **94** and **96**. As seen in the schematic of FIGURE 5, the switches **92** and **96** associated with end trip shoes **80** and **84** respectively are connected in parallel and switch **94** associated with intermediate trip shoe **82** is connected in series with the parallel connected switches **92** and **96**. With this arrangement, solenoids **78** is energized only when switch **94** and either switch **92** or **96** is closed. This situation occurs only when immediate trip shoe **82** and at least one of the end trip shoes is in a normal position.

In FIGURE 6 is represented a schematic of still another embodiment of the invention. Here the solenoid is normally energized to maintain the cam in the path of travel of the cam followers, and is de-energized to remove the cam from the path of travel of the cam followers. In such a situation, the switches **100** and **104** associated with the end trip shoes would be connected in series and the switch **102** associated with the intermediate trip shoe would be connected in parallel with the series connected switches. With this arrangement, the solenoid would be de-energized for moving the cam from the path of travel of the filling stations only when the intermediate trip shoe and at least one of the end trip shoes are in a normal position. However, since this embodiment requires that the solenoid be energized for a long period of time to maintain the cam in the path of travel of the cam followers, it is not a preferred embodiment. It is preferred for longer life of the solenoid to energize the solenoid only in instances when a container is not supplied to the filling machine.

Thus, it will be appreciated that the present invention accomplishes its intended objects providing a no-can no-fill mechanism which responds quickly to the absence of containers from filling stations to prevent the opening of filling valves associated with these unoccupied stations.

While I have described the preferred embodiments of my invention as representing an improvement in no-can no-fill mechanisms it should be readily apparent to one skilled in the art that the mechanism of my invention can be readily adapted to other applications. For example, the mechanism of the present invention is equally applicable to arts associated with filling such as washing, painting or coating containers prior to filling or the capping and labeling of containers subsequent to filling. Moreover,

he present invention is equally applicable not only to filling machines and the like but also to any situations wherein a continuous stream of substantially equally spaced workpieces are moved linearly or arcuately through a work station where operations such as painting, sandblasting, cleaning, boring, drilling, tapping, threading, etc., are performed on the workpiece. The present invention can be utilized to suspend such operation at the work station whenever one or more workpieces are absent from the continous stream. In this respect while I have described the figures as being schematic representations of a no-can no-fill mechanism it should be readily apparent that the reference numerals **30**, **32** and **34** can represent any article or workpiece other than containers and that the reference numeral **14** can represent any work station other than a filling cylinder.

Having described my invention in detail what I claim is new is:

1. In an apparatus for continuously moving a steady stream of substantially equally spaced workpieces through a path of travel, at least one device located adjacent said path of travel for performing an operation on the workpieces moving through said path of travel, means for suspending the operations performed by said device when a workpiece is absent from said steady stream comprising:

(a) trip-shoe means having aligned intermediate and end portions, said trip shoes means being of a length greater than the distance between successive workpieces and said intermediate portion being of a length less than the distance between successive workpieces;

(b) means for resiliently maintaining said intermediate and end portions in a normal position in the path of travel of said workpieces, said portions movable to a depressed position upon being engaged by workpieces moving through said path of travel;

(c) drive means operatively connected to said device and activated by said trip shoe means for rendering said device inoperative and suspending the operations performed by said device when said intermediate and at least one of said end portions are in said normal position; and

(d) a switch associated with and actuated by each of said aligned intermediate and end portions for energizing said drive means when said portions are engaged by said work pieces and moved to said depressed position,

(i) said switches associated with and actuated by said end portions being connected in parallel with said drive means, and

(ii) said switch associated with and actuated by said intermediate portion being connected in series with said parallel connected switches,

whereby said drive means is activated for rendering said device inoperable when said intermediate portion and at least one of said end portions are in said normal position.

2. A no-can no-fill mechanism for container filling machines which include a plurality of filling valves, said filling valves being movable into either a closed position or an open position, means for supplying containers to be filled beneath each of said filling valves, means for moving said filling valves and containers through a path of travel and valve opening means for moving said filling valves to said open position, said no-can no-fill mechanism comprising:

(a) at least two aligned trip shoes which together provide a container engaging portion of the length greater than the distance between successive containers, each of said trip shoes being of a length substantially equal to the distance between successive containers, each of said trip shoes being resiliently maintained in normal position in the path of travel of said containers and movable to a depressed position upon being engaged by containers moving through said path of travel; and

(b) means actuated by said trip shoes for rendering said valve opening means inoperative when at least one of said trip shoes are in said normal position.

3. A no-can no-fill mechanism as set forth in claim **2** in which said trip shoes comprise:

(a) a first trip shoe; and

(b) a second trip shoe overlapping said first trip shoe and offset therefrom in the direction of container travel to define an overlapped section and offset end sections, wherein a container engaging one of said offset end sections will depress one of said trip shoes and a container engaging said overlapped section will depress both of said trip shoes.

4. A no-can no-fill mechanism as set forth in claim **3** in which said means actuated by said trip shoes comprises:

(a) drive means operatively connected to said valve opening means for moving said valve opening means to an inoperable position;

(b) a first switch actuated by said first trip shoe for energizing said drive means;

(c) a second switch actuated by said second trip shoe for energizing said drive means connected in parallel with said first switch; and

(d) said first and second switches being closed when said trip shoes are in said normal position and opened when said trip shoes are in said depressed position, whereby said drive means is energized for moving said valve opening means to an inoperable position when either of said trip shoes is in said normal position.

5. A no-can no-fill mechanism for container filling machines which include a plurality of filling valves, said filling valves being movable into either a closed position or an open position, means for supplying containers to be filled beneath each of said filling valves, means for moving said filling valves, and containers through a path of travel and valve opening means for moving said filling valves to said open position, said no-can no-fill mechanism comprising:

(a) trip shoe means including a pair of aligned trip shoes overlapped and offset one from the other in the direction of the container travel, each of said trip shoes having a container engaging portion substantially equal to the center-to-center distance of successive ones of said containers;

(b) means for resiliently maintaining said trip shoes in a normal position in the path of travel of said containers, said trip shoes movable to a depressed position upon being engaged by containers moving through said path of travel;

(c) drive means operatively connected to said valve opening means for rendering said valve opening means inoperative; and

(d) means for actuating said drive means including at least two parallel connected switches, one of said parallel connected switches being associated with and operated by each of said trip shoes, whereby movement of either trip shoes to said normal position will actuate said drive means.

6. In an apparatus for continuously moving a steady stream of substantially equally spaced workpieces through a path of travel and at least one device located adjacent said path of travel for performing an operation on the workpieces moving through said path of travel, means for suspending the operations performed by said device when a workpiece is absent from said steady stream comprising:

(a) trip-shoe means having aligned intermediate and end portions, said trip-shoe means being of a length greater than a distance between successive workpieces and said intermediate portion being of a length less than the distance between successive workpieces;

(b) means for resiliently maintaining said intermediate and end portions in a normal position in

the path of travel of said workpieces, said portions movable to a depressed position upon being engaged by workpieces moving through said path of travel;

(c) drive means operatively connected to said device and activated by said trip-shoe means for rendering said device inoperative and suspending the operations performed by said device when said intermediate and at least one of said end portions are in said normal position; and

(d) a switch associated with and actuated by each of said aligned intermediate and end portions for energizing said drive means when said portions are engaged by said workpieces and moved to said depressed position,

(i) said switches associated with and actuated by said end portions being connected in series with said drive means, and

(ii) said switch associated with and actuated by said intermediate portion being connected in parallel with said series connected switches, whereby said drive means is energized to render said valve opening means operative when said intermediate portion and at least one of said end portions are in said normal position.

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53—59; 83—211, 370