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Riedel et al.

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[54] **CONTROL ARRANGEMENT FOR A VESSEL FILLING MACHINE**

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[52] **U.S. Cl.** **141/140**

[51] **Int. Cl.** **B65b 57/02**

[58] **Field of Search** 141/140–143, 156–162

[56] **References Cited**

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3,093,165 1/1963 Risser 141/140

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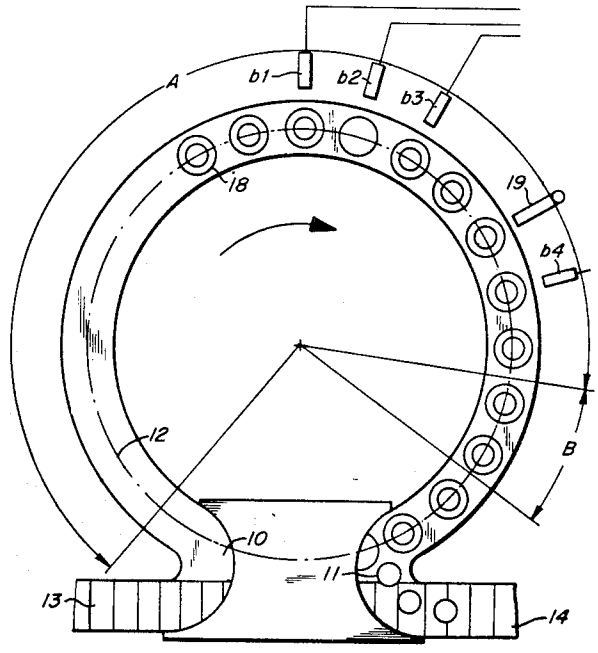
[57] **ABSTRACT**

A vessel filling machine having a conveyor for conveying vessels to be filled in spaced relation through a filling region in which filling devices engage the vessels from above. In the absence of a vessel in a respective position of the conveyor, the respective filling device will move beyond the normal vessel engaging position thereof to a second position.

Feeler elements are located along the filling region for detecting the positions of the filling devices. In the event a complete vessel is absent from a position on the conveyor, the feeler elements cooperate to actuate an instrumentality designed to clear debris from the position from which the complete vessel is absent and in the event the debris is not cleared from the position, the machine stops.

10 Claims, 3 Drawing Figures



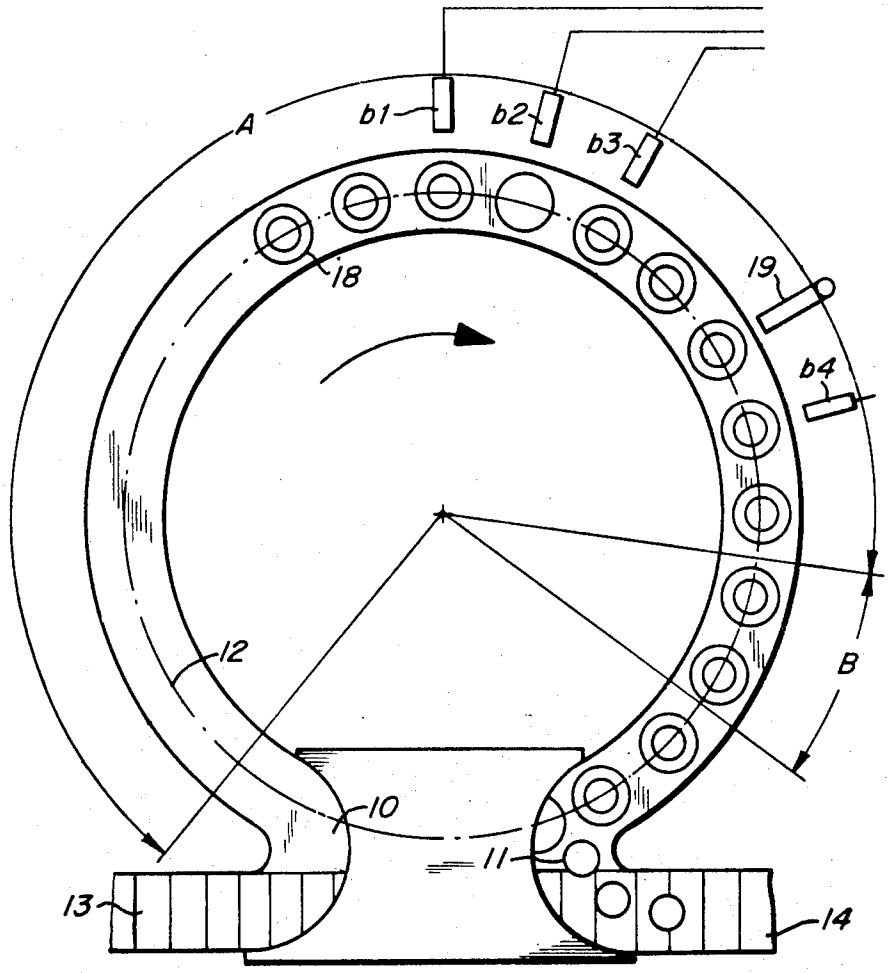


FIG-1

FIG-2

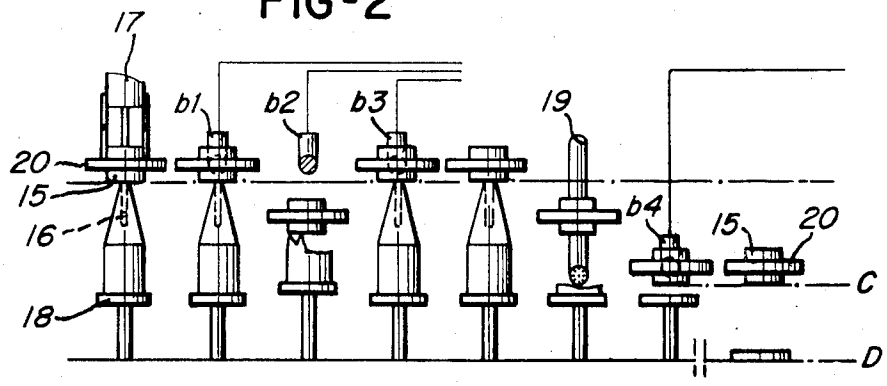
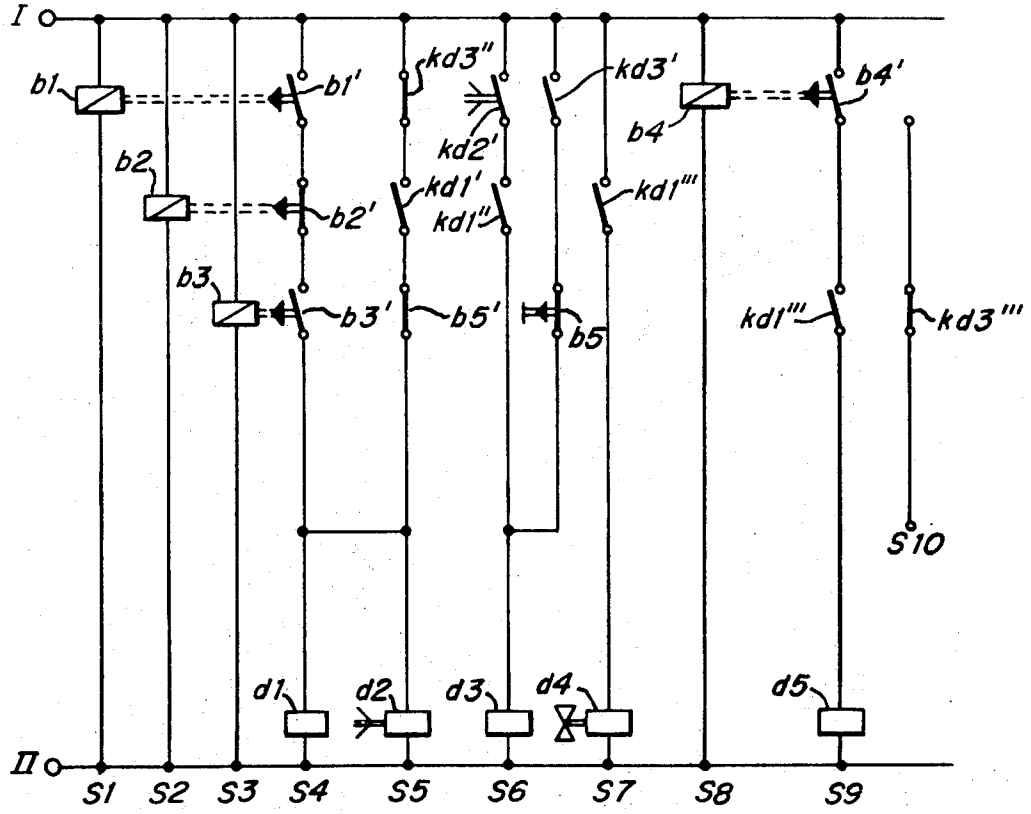

17
b1
b2
b3
19
20
15
16
18
b4
15
20
C
D

FIG-3


I
II
b1
b1'
b2
b2'
b3
b3'
kd3"
kd2'
kd1'
kd1"
b5'
b5
kd3'
kd1'''
b4
b4'
kd1'''
kd3'''
S10
d1
d2
d3
d4
d5
S1
S2
S3
S4
S5
S6
S7
S8
S9

CONTROL ARRANGEMENT FOR A VESSEL FILLING MACHINE

The present invention relates to a control device for use in connection with rotating vessel treating machines, especially vessel filling machines, for the starting and turning off of devices which are associated with the machine and are arranged laterally of the circulatory path of the vessels. Devices of this type are spraying and splashing-off devices as well as devices for stopping the machine when a vessel gap is present in the circulatory path. Such devices usually comprise a plurality of feeler elements arranged laterally of the circulatory path of the vessels, which feeler elements will during the pressing of the vessels against the filling elements or during the withdrawal of the vessels from the filling elements check the moved machine elements in their respective end positions and release pulses acting upon associated control means.

Devices with feeler elements for checking and controlling the treatment of the vessels and adapted in response to the occurrence of vessel gaps in the circulatory path of the vessels to stop the treating machine or to actuate devices associated therewith have become known in various designs and with various ways of operation. Thus, according to a device described in German Patent No. 1,020,573, two feeler members are provided which feel the vessels at the inlet and outlet of the machine. A pulse released by the feeler member at the inlet side and received by a storing device is erased by the feeler member at the outlet side when the vessel leaves the machine in undamaged condition, whereas when the vessel is damaged the pulse is called off for stopping the machine or for actuating a pertinent device, for instance, an alarm.

According to U.S. Pat. No. 2,315,866, the machine is likewise stopped by means of a control device according to which a feeler lever controls the vessels during their treatment and in response to the occurrence of a vessel gap acts upon a switch. A turning off of the machine is also effected by the device according to German patent disclosure No. 1,256,094 which by means of pivotable feeler levers directed into the circulatory path of the vessels or by means of light sensitive electric devices feels vessels or centering tulips which had remained in their pressed-on condition or adhered to the filling plugs of the filling elements.

In practice it is in most instances not desirable to equip rotating vessel treating machines of high output, especially high output filling machines, with control devices of the heretofore known type. In conformity with the purpose of such devices to stop the machine element when one or a plurality of vessels are lacking, although not every gap occurring in the flow of the vessels would interfere with the practical operation, these known control devices counteract the efforts, as far as possible, not to interrupt the operation of the high output machines. Already with regard to the high hourly output as well as the considerable energy peaks occurring when continuously starting and stopping rotating masses, it is for instance with a vessel breakage occurring during the handling of the vessels and in view of the thus occurring gap not necessary under all circumstances to stop the machine in order to remove the broken pieces of the vessel. It will suffice, while the machine is in operation, by means of spraying and splashing devices of any suitable known type to spray or

splash the machine elements which contacted the broken vessel, which machine elements may, for instance, by the lifting elements, the handling elements, etc., before a new vessel is fed into the machine. If, however, the disturbance or disorder which affects or interferes with the insertion of the newly fed vessel, for instance broken off pieces of the vessel adhering to the handling elements which pieces had not been removed by the preceding spraying or splashing treatment, has not been eliminated, it will be necessary to stop the machine.

It is, therefore, an object of the present invention to provide a control device which will meet the above described requirement, especially in connection with high output machines, and will stop the machine only if a device provided for the elimination of disorders of the above mentioned type and duly actuated by the respective disorder is unable to eliminate the disorder.

It is a further object of this invention to provide a device as set forth in the preceding paragraph which, if the disorder is eliminated by the respective device before the vessel leaves the machine, will see to it that the machine remains in operation and the newly fed vessels are inserted for their subsequent treatment or handling.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. 1 is a diagrammatic view of the vessel path of the machine while showing the arrangement of the feeler elements and of the spraying and splashing device for use in connection with the present invention.

FIG. 2 is a cutout of the vessel path within the region of the feeler elements.

FIG. 3 represents a control circuit for use in connection with the device according to the invention.

The control device according to the present invention is characterized primarily in that it comprises four feeler elements which are serially arranged and distributed over a portion of the circumference of the vessel path. Three of these feeler elements precede the spraying and splashing device within that range of the circulatory path over which the vessels are pressed onto the filling elements and prior to the vessel withdrawal from the filling elements in the upper end position of the machine elements which can be lifted during the pressing on of the vessels against the filling elements. The fourth feeler element is in the lower end portion of the machine elements arranged within that section of the circulatory path of the vessels which follows the spraying and splashing device and ends prior to that section of the path where the vessels are withdrawn from the filling elements. The first and the third feeler elements are spaced from each other by a distance equalling at least twice the machine division (twice the distance between two normally successive vessels along their circulatory path). The second feeler element in its turn is arranged between the first and third feeler elements at a distance from the first and third feeler element which equals one machine division, while two working contacts respectively controllable by the first and third feeler elements and a rest contact controllable by the second feeler element are connected to a current path of the control voltage conductor and are adapted, when commonly occupying their effective position to turn on the spraying and splashing device and to prepare the stopping of the machine through a time element. This time element

is by means of the fourth feeler element cleared or reset when the machine elements occupy their lowered end position but remains unaffected when the machine elements are not lowered.

According to the present invention, the feeler elements comprise contactfree magnetic switches known per se, expediently proximity switches with built-in magnetic cores, while the machine elements adapted to be lifted and lowered for effecting magnetic flux changes in the magnet for purposes of releasing a control pulse are formed by the vessel tulips arranged on the treating elements of the machine. The invention can advantageously be further developed by causing the influencing of the magnetic switches by means of metal strips which are arranged on the vessel tulips and which are arranged opposite the switches and in the same plane with a slight spacing from each other and follow each other in such a way in the respective end positions of the vessel tulips that they form a nearly closed annular strip.

According to another embodiment of the invention, especially for use in connection with filling elements without vessel tulips, the vessel supports which receive the vessels form the machine elements adapted to be lifted and lowered and influence the magnetic switches. They may also be provided with metal strips which in the respective end positions of the vessel supports form an annular strip.

Referring now to the drawings in detail, only that part of the vessel filling machine is shown which comprises the circulatory path **12** of the vessels which path extends from the vessel inlet **10** to the vessel outlet **11.** The path **12** is preceded and followed by a conveyor **13** and **14** respectively. Along the vessel path **12** vessel supports **18** adapted to be lifted and lowered are located opposite filling elements **17** which are equipped primarily with one centering tulip **15** each adapted to be lifted and lowered and with a filling and/or gas pipe **16,** the filling elements **17** being arranged with regard to each other at a predetermined machine division. At the inlet **10** the empty vessels fed into the path **12** by conveyor **13** respectively move onto the supports **18** which latter during an upward stroke thereof press the vessels against the filling elements **17** through the intervention of the tulips **15,** the tulips **15** carrying out an upward movement on the filling pipes **16** of the filling elements **17** or on another mounting and occupy their upper end positions C as shown in FIG. **2.** In the pressing-on range which extends over the region A of the vessel path **12** (FIG. **1**), the vessels are primarily pretensioned, filled and relieved, and in the succeeding range B, during the downward stroke of the supporting elements, withdrawn from the filling elements **17.** At the end of the withdrawing range B, the supports **18** again occupy their starting position, and the filled vessels leave the outlet **11** and enter the withdrawing conveyor **14** of the machine. After the vessel withdrawal has been completed, also the tulips **15** due to their own weight or due to an outer force again occupy their lower end position D.

In the pressing-on range A, in the upper end position of the tulips **15,** there are provided three feeler elements in the manner of contactfree magnetic switches *b***1,** *b***2** and *b***3,** expediently proximity switches with built-in magnetic core, in adaptation to the circumferential division of the machine and laterally of the vessel path **12.** Between the first and the third switches *b***1** and *b***3** which have a minimum distance from each other of two machine divisions there is arranged the second switch *b***2.** The present invention furthermore comprises a spraying and splashing device **19** of any desired known design. This device **19** follows the switch *b***3** and precedes the switch *b***4** when considering the direction of movement of the vessels in the machine. The spraying and splashing device **19** is directed toward the filling or gas pipes **16** of the filling elements **17** and toward the vessel supports **18.** A fourth feeler element *b***4,** likewise a proximity switch, is adjacent the device **19** provided in the lower end position of the centering tulips **15** in the pressing-on range A.

For increasing the switch safety of the proximity switches *b***1** – *b***4,** the control pulses of which are generated by a change in the magnetic flux, the tulips **15** advantageously and respectively have a metal strip **20.** The metal strips **20** are arranged on the tulips **15** in slightly spaced relationship to the switches while being located opposite thereto, and in the end positions C, D of the tulips **15** form a nearly closed annular strip.

In conformity with the respective operational conditions, the switches *b***1,** *b***2,** *b***3,** which in the specific example shown are arranged in the filling range, may also be located instead in the pretensioning range. Switch *b***4** is likewise adjustable. This switch is adapted within the range adjacent the device **19** and ahead of the completion of the vessel withdrawal to occupy any position while maintaining its lower end position D. For a selective adjustment over this section, the switch *b***4** is expediently detachably mounted.

According to the circuit illustrated in FIG. **3,** the proximity switches *b***1,** *b***2** and *b***3** are respectively connected to circuits S1, S2 and S3 which in their turn are connected to the control voltage conductors I/II. The contacts *b***1′,** *b***2′** and *b***3′** of the proximity switches *b***1,** *b***2** and *b***3** are together by means of a relay *d***1** electrically connected to the circuit line S4 which latter through a holding circuit is connected to a circuit S5. Provided within the circuit S5 is a time relay *d***2** and a contact *kd***1′** of the relay *d***1.**

In a further line S6 there is interposed a relay *d***3** and a second contact *kd***1″** of relay *d***1** and a contact *kd***2′** of relay *d***2.** In a holding circuit branching off from line S6 there is interposed a contact *kd***3′** of relay *d***3** and a pushbutton switch *b***5.** A further contact *kd***3″** of relay *d***3** is arranged in line S5 while a contact *kd***3‴** is connected to the driving circuit S10 of the machine. A third contact *kd***1‴** of relay *d***1** is with a magnetic valve *d***4** of the spraying device **19** arranged in the line S7.

For purposes of connecting the proximity switch *b***4** and a relay *d***5** to the conductor I/II, there are provided circuits S8 and S9. The circuit S9 comprises a relays *d***5** and a contact *b***4′** of a switch *b***4** and also has connected thereto a contact *kd***1⁗** of the relay *d***1.** A contact *kd***5′** of the relay *d***5** is arranged in the line S5 for preparing the time relay *d***2.**

When the machine, after having switched on the drive, is in operation while the control voltage conductor I/II is connected to a network, the control device according to the invention operates as follows:

a. When the vessel path **12** is not occupied, the tulips **15** of the filling elements **17** maintain their lower end position D and the switches *b***1,** *b***2** and *b***3** are not influenced by the operation of the machine so that the contact *b***2′,** in conformity with the circuit diagram of FIG. **3,** is closed while the contacts *b***1′** and *b***3′** are

open. A pulse released by the tulips **15** by means of the metal strip **20** at the switch *b*4 shifts the contact *b*4' to its closing position. At the relay *d*5 no switching function is exerted, the circuit S9 of relay *d*5 being interrupted by contact *kd*1'''.

b. When the path is occupied without any gap, the tulips **15** of the vessels fed onto the conveyor **13** and received at the inlet **10** by the supports **18** and pressed against the filling elements **17** occupy their upper end positions C which they maintain over the pressing-on range A. Of the metal strips **20** which in this connection are adjusted into the plane of the switches *b*1, *b*2 and *b*3 and form a nearly closed ring, the respective strip lifted with the first vessel will when passing by the switches *b*1, *b*2 and *b*3 each release a control pulse as a result of which the contacts *b*1' and *b*3' close and the contact *b*2' opens. During the movement of the next following metal strips **20** in front of the switches *b*1, *b*2 and *b*3, these contact positions are maintained and relay *d*1 will still be ineffective. Also switch *b*4 remains unaffected. Its contact *b*4' maintains its opening position. Past the vessel withdrawing range B and the return of the tulips **15** into their lower end position D, the filled vessels move through the outlet **11** onto the conveyor **14.**

c. When the vessel path is occupied without any gaps, it is assumed that in the pressing-on range A in front of the switches *b*1, *b*2 and *b*3 approximately in the most critical pretensioning range a gap occurred due to the breakage of a vessel. The tulip **15** which engages the broken vessel will, of course, no longer occupy its upper end position C but will drop into intermediate positions or will drop to its lower end position D. The metal strip **20** which is fastened to this specific tulip **15** will interrupt the annular ring which it previously formed with the remaining metal strips **20** so that, when the gap passes by the switch *b*1, a change in the magnetic flux will result, and the released pulse influences the contact *b*1'. Furthermore, influenced by the metal strip **20** of the tulips **15** occupying the upper end position C on the last and last but one vessel in front of the gap, contact *b*2' maintains its opening position and contact *b*3' maintains its closing position. When in the now succeeding phase the gap comes into the range of switch *b*2, contact *b*2' will close as does contact *b*1' the switch *b*1 of which is influenced by the metal strip **20** following the gap. Inasmuch as switch *b*3 is furthermore influenced by the strip **20** preceding the gap and since its contact *b*3' already occupies its closing position, the circuit S4 is closed and relay *d*1 is energized. Relay *d*1 will then by means of its contact *kd*1' be connected to the holding circuit S5 and consequently remains effective independently of the circuit S4 which latter in the subsequent phase, when passing past the gap at the switch *b*3, will be interrupted by the contact *b*3' and moved to its open position. Simultaneously with the contact *kd*1', also the time relay *d*2 is energized. By means of contact *kd*1''' the circuit S7 is closed, and through the intervention of the energized magnetic valve *d*4 the spraying and splashing device **19** is made effective. The energization of the relays *d*3 and *d*5 is prepared by the contacts *kd*1'' and *kd*1'''' which are simultaneously moved into closing position. When tulip **15,** after the breakage of a vessel, returns to its lower end position D automatically or in view of the influence of the spraying and splashing device **19,** which becomes effective during the further operation of the machine, the tulip **15** influences the switch *b*4 so that its contact *b*4' closes. The effective relay *d*5 then by means of contact *kd*5' de-energizes the time relay *d*2 and disconnects relay *d*1 from its holding line S5. The operation of the machine will not be affected thereby and will continue. The spraying and splashing device **19** is now turned off.

If, however, the tulip **15** of the treated or sprayed filling element **17** does not occupy its lower end position D, for instance in view of a not flushed off broken piece of material which adheres to the filling pipe **16** of the filling element **17** or remains on the vessel support **18,** the switch *b*4 is not affected by the metal strip **20** of tulip **15,** and contact *b*4' remains open. The time relay *d*2 remains energized through *kd*5', *kd*1', *kd*3'', and after a predetermined time together with contact *kd*2' closes circuit S6. As a result thereof, relay *d*3 will be energized. Relay *d*3 will then by means of contact *kd*3' be connected to the holding circuit S6 and by means of the opened contact *kd*3''' interrupts the circuit S10 of the machine operation so that the machine will be stopped.

The simultaneously opened contact *kd*2' disengages the time relay *d*2 from the holding circuit S5. When actuating the pushbutton switch *b*5, a non-illustrated control contactor briefly turns off the drive motor, and the operator can move the stopped machine stepwise into positions which permit the removal of the broken pieces without difficulties. With this switch actuation, also the holding circuit for relay *d*3 is interrupted so that the contacts *kd*3', *kd*3'' and *kd*3''' of relay *d*3 return to their starting position.

In conformity with the described embodiment of the invention, the arrangement of the switches *b*1 and *b*3 with a spacing therebetween which equals two machine divisions and with the switch *b*2 arranged between switches *b*1 and *b*3, each time two gaps are felt or sensed which are caused by the breakage of a vessel and which amount to a machine division. By widening this minimum spacing between the switches *b*1 and *b*3 and by the provision of the switch *b*2 at a distance of one machine division either with regard to the first switch *b*1 or with regard to the third switch *b*3, the arrangement according to the invention can also any time be used for sensing larger gaps, and it is possible in the described manner to actuate the device associated with the machine and to stop the machine. Important with regard to the gaps which are to be checked in conformity with the invention is the division spacing between the switches *b*1 and *b*3 which minus one machine division furnishes the size of a gap.

It is, of course, to be understood that the present invention is, by no means, limited to the specific showing in the drawings but also comprises any modifications within the scope of the appended claims. Thus, the feeler elements may, instead of being influenced by the centering tulips, also be influenced by other machine elements adapted to be lifted and lowered when the vessels are in pressed-on position. Such machine elements are, for instance, the vessel supports. In such an instance it is merely necessary to arrange the feeler elements at the end positions of such machine elements.

What is claimed is:

1. In a control system for a vessel filling machine having a vessel conveyor with predetermined spaced positions which are occupied by vessels during movement of the vessels through the machine, said machine hav-

ing a region along which vessels in said respective positions are moved by said conveyor and within which region respective moveable machine members engage said vessels and are held by the vessels in a first location and move to a second location in the absence of a vessel in the respective position; said control system comprising four feeler elements distributed along said region, the first three of said feeler elements in the direction of movement of said conveyor developing signals in response to an adjacent said machine member occupying the said first location thereof, the fourth said feeler element developing a signal in response to the adjacent machine member occupying its said second location, the first and third of said feeler elements being spaced a distance about equal to two of the spacings between said vessels and the second feeler element being located about midway therebetween, a clearing station between said third and fourth feeler elements operable when actuated to treat the adjacent vessel position to clear residue such as a broken vessel therefrom, and a control circuit under the control of signals from said feeler elements and controlling the actuation of said clearing station and the operation of said machine, said control circuit being operable in response to signals from said first and third feeler elements in the absence of a signal from said second feeler element to cause actuation of said clearing station and to prepare a machine disabling circuit, said control circuit being operable in response to a signal from said fourth feeler element to interrupt said disabling circuit.

2. A control system according to claim **1** in which said clearing station comprises means to divert a fluid spray toward the said vessel position on the conveyor which is adjacent thereto.

3. A control system according to claim **1** in which said control circuit includes means to delay the actuation of said clearing station until the vessel position on the conveyor aligned with said second feeler element at the time the second feeler means moved to its second location and developed a signal is near said spraying station.

4. A control system according to claim **1** in which said control circuit includes means to delay the operation of said machine disabling circuit until the vessel position on the conveyor aligned with said second feeler element at the time the second feeler means moved to its said second location has passed said fourth feeler element.

5. A control system according to claim **1** in which said feeler elements comprise contact free magnetic switches and said machine members comprise magnetic means operable to actuate said switches when in proximity thereto.

6. A control system according to claim **5** in which said magnetic means on said machine members are in the form of metal strips which present a substantially continuous strip when said machine members are in corresponding locations.

7. A control system according to claim **6** in which said machine members comprise vessel supports on said conveyor.

8. A control system according to claim **6** in which said machine members comprise filling devices moveable into engagement with the tops of vessels resting on said conveyor.

9. A control system according to claim **8** in which said filling devices move with said vessels.

10. A control system according to claim **1** in which said feeler elements are adjustable in the direction of movement of said conveyor.

* * * * *