

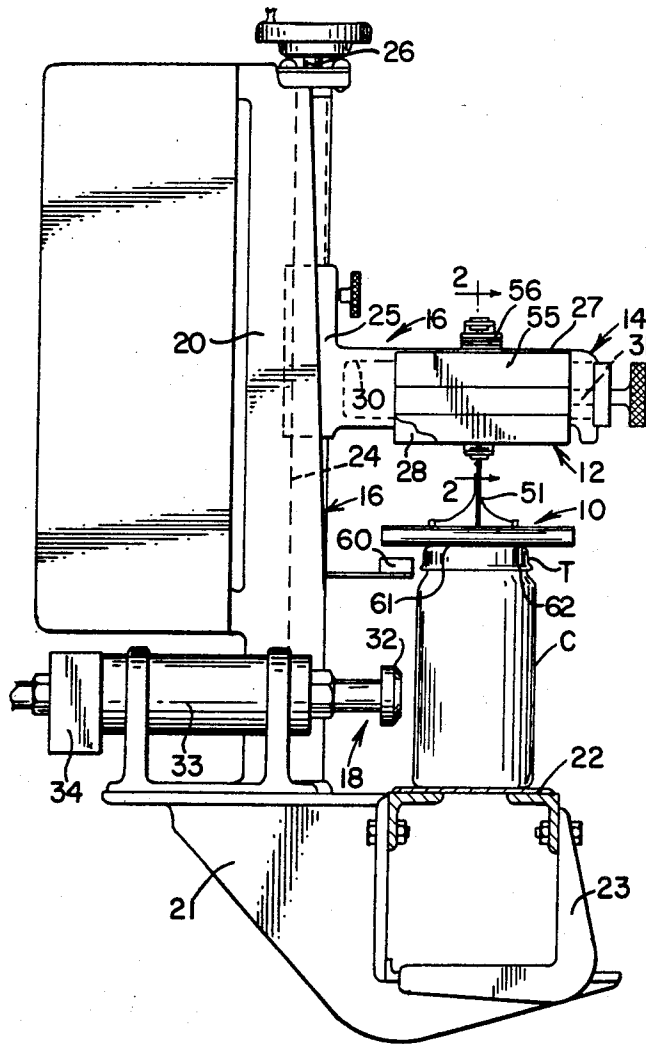
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3,206,025 9/1965 Ochs 209/88
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[54] **DUD DETECTOR**
8 Claims, 4 Drawing Figs.
[52] **U.S. Cl.**..... **209/80,**
53/53, 73/52, 209/88
[51] **Int. Cl.**..... **B07c 3/10**
[50] **Field of Search**..... 209/80, 88;
73/52, 45.2, 49.3; 53/53

[56] **References Cited**
UNITED STATES PATENTS
2,960,223 11/1960 Fauth 209/88
3,071,247 1/1963 Paruolo 209/88

ABSTRACT: An apparatus for determining the condition of a top panel of a container or of a closure lid on a vacuum-packed container which indicates the vacuum or pressure condition within the container. The apparatus comprises a sensing head mounted at a detecting station for vertical reciprocation when a container is in proper position at the station which comprises a tubular housing resiliently supported in a horizontal position and enclosing a switch having an actuator intermediate the ends of the housing. The switch actuator is adapted to be operated when the housing is lowered into contact with oppositely disposed rim portions of the top panel or closure lid if the center of the panel is convex or raised, as a result of a loss of vacuum within the container. The switch controls an ejector device for removing from the detecting station a container having its top panel convex due to loss of vacuum.



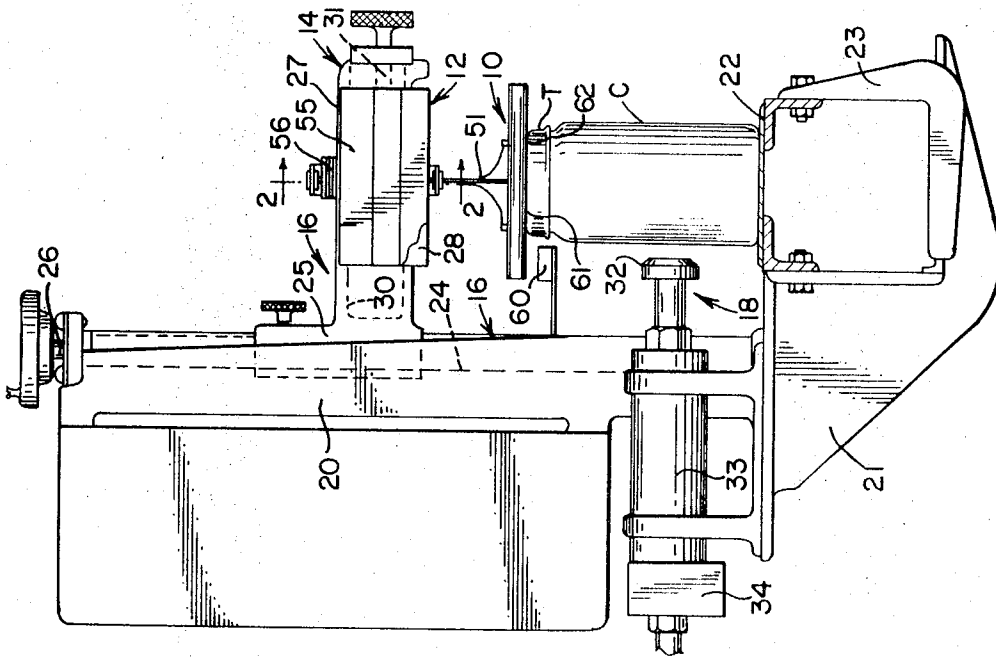


FIG. 1

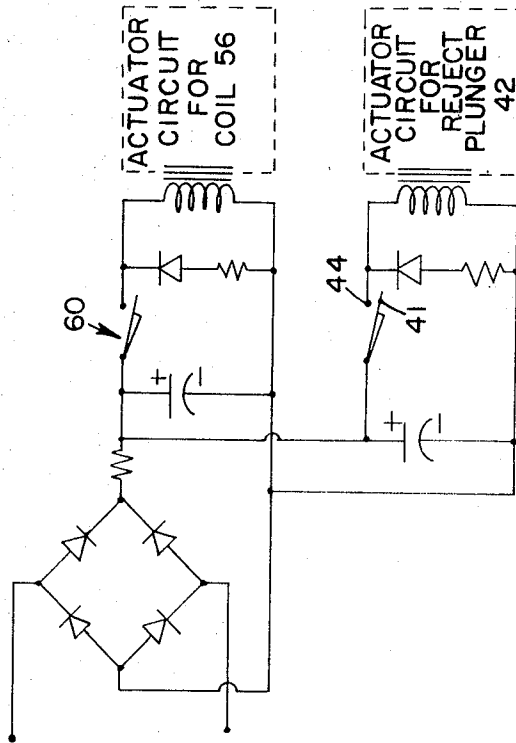
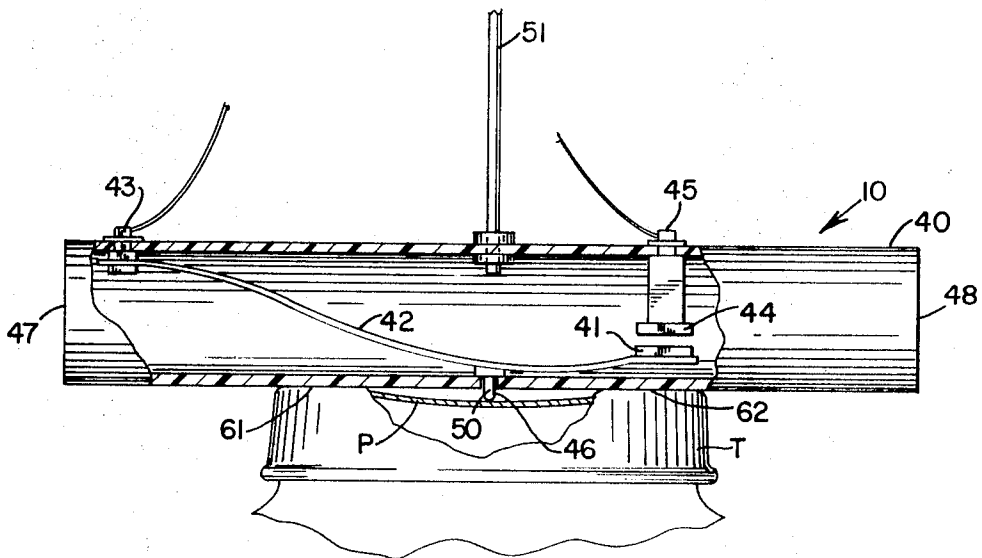
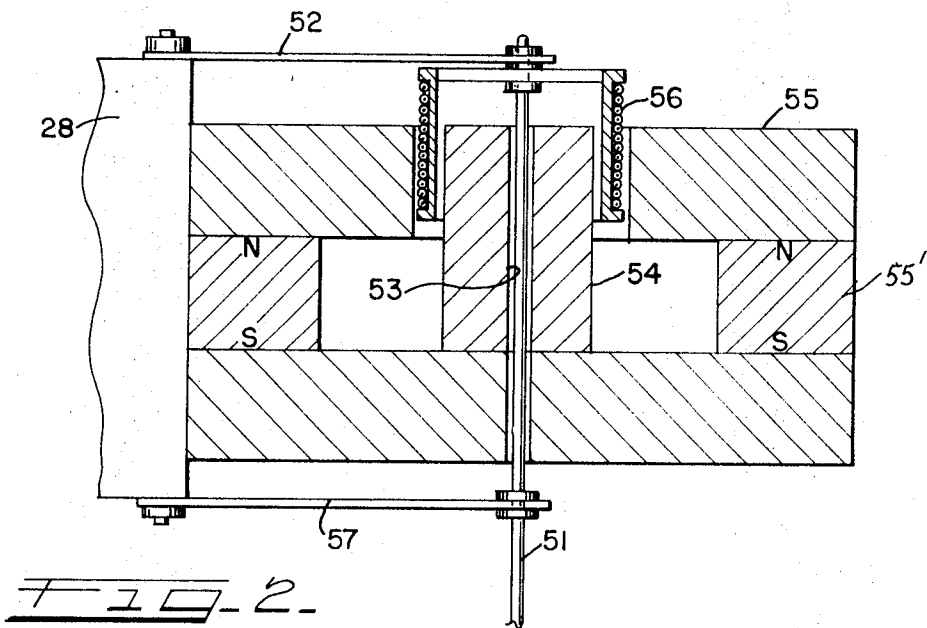


FIG. 4

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DUD DETECTOR

This invention relates generally to the sorting of vacuum-packed or vacuum-sealed containers and is particularly concerned with a mechanism for detecting containers in which there has been a loss of vacuum sufficient to make it desirable to separate the container from the remaining containers in the packing line or the like.

It is the practice in the packaging of certain materials, for example, baby foods and similar products, to pack the product in glass jars or containers which are sealed with metal caps of the type having a central panel portion which is flexed downwardly by atmospheric pressure to a lower than normal elevation or height with respect to the peripheral portion of the cap as long as the desired vacuum is maintained in the container. When there is a loss of vacuum in the container due to improper sealing or other conditions the normally flexed portion of the cap rises as it returns to an unflexed position. When this condition exists, due to failure of the cap applying and sealing mechanism to function properly, or due to the presence of a defective or damaged container or cap, it is desirable to separate the so-called "dud" from the containers which have been properly sealed and in which the proper vacuum condition exists. Since the processing of containers of this character may be accomplished at very high speeds, ranging up to 2,000 per minute, it is essential to provide a detecting mechanism which is capable of efficient operation on containers traveling at a relatively high speed. Also, allowance must be made for the presence of normally expected variations in the dimensions of the jars and caps since considerable tolerance is allowed in the manufacture of the same.

Various apparatus and arrangements have been developed for incorporation in a vacuum-packaging line so as to detect containers in which the required vacuum conditions are lacking. A typical arrangement is disclosed in R.C. Bailey U.S. Pat. No. 3,206,027, dated Sept. 14, 1965. The apparatus disclosed in this patent is operative to detect the presence of a sealed container in which the vacuum has been reduced below a predetermined minimum by measuring changes in the height of the deflectable portions of the metal caps on the containers and detecting when such changes exceed a predetermined amount. This apparatus and other apparatus of this type, however, includes a sensing arm which rides on or contacts the top surface of the container and which is rendered virtually inoperative at high speeds due to the bouncing or fluttering action which results from rapid contact of the sensing head with successive containers. In an effort to develop apparatus which does not require contact with the container to measure the deflection of the top panel, proximity sensors have been employed, which measure the difference in height between the center panel and the margins of the top or cap and compare the same with a standard so as to detect variations. One such system or apparatus is disclosed in my U.S. Pat. No. 3,392,829, granted July 16, 1968. While this system or apparatus has been successfully employed it requires the use of relatively complex circuitry and it is expensive to install and maintain.

It is a general object of the present invention to provide an apparatus for inspecting containers of the type in which the quality of seal and the retention of vacuum is indicated by the position of a panel forming part of or constituting a wall of the container wherein the device will operate efficiently at high speed and may be installed and maintained at relatively low cost.

It is a more specific object of the invention to provide a device for inspecting packed jars or similar containers of a type in which a flexible panel is incorporated in a wall or closure member which indicates by its position the vacuum or pressure condition within the container, which device comprises a sensing head disposed at a detecting station which is operative to engage with the panel carrying wall of the container as it reaches the inspecting station and to sense the condition of the flexible panel and also an ejector device which is actuated according to the condition of the flexible panel so as to separate from the remaining containers those containers

which are improperly sealed or damaged or otherwise have suffered a loss of vacuum.

Another object of the invention is to provide a detector device for capped jars or similar containers having a flexible panel, the position of which indicates the presence or absence of proper vacuum conditions within the container, wherein an inspection head is mounted for reciprocation at an inspection station so that it may be moved into contact with the wall of the container in which the flexible panel is incorporated and having a switch forming element which is actuated in accordance with the condition of the flexible panel so as to activate a mechanism for ejecting a container having predetermined vacuum conditions within the same from the inspection station and separating or segregating such containers so that they may be removed from a canning line or the like.

A still more specific object of the invention is to provide a detector device for sensing the condition of a flexible panel in a container wall, the position of which indicates the pressure or vacuum condition within the container, which device comprises a tubular housing suspended from a reciprocally mounted support which is adapted to operate to engage the opposite ends of tubular housing with oppositely disposed marginal portions of the container wall and having a switch operating member intermediate the ends of the housing which is activated upon contact with a container wall in which the indicating panel is at predetermined elevation so as to indicate a loss of vacuum within the container, which switch member is incorporated in a circuit for operating a device whereby the defective container may be segregated from the other containers.

These and other objects and advantages of the invention will be apparent from a consideration of the apparatus which is shown by way of illustration in the accompanying drawings wherein:

FIG. 1 is an elevational view of an apparatus at a detecting station in a jar-packing line for detecting and ejecting vacuum-packed jars having a raised center panel indicating loss of vacuum, the view being taken on a vertical plane extending transversely of the path of the conveyor on which the jars are carried;

FIG. 2 is a cross section, to an enlarged scale, taken on the line 2-2 of FIG. 1;

FIG. 3 is an elevational view, with portions broken away and to an enlarged scale, showing the sensing head of FIG. 1; and

FIG. 4 is a diagrammatic layout of the electrical control circuit for the apparatus.

For the purpose of illustration of the invention there is shown in FIG. 1 a typical detecting station and a jar-packing line with a sensing head 10 depending from a supporting device 12 in which there is incorporated a means for vertically reciprocating the sensing head 10, the supporting device 12 being in turn carried on an L-shaped bracket arm 14 adjustably mounted on an upright supporting structure 16 at the base of which there is an ejector device 18.

The supporting structure 16 comprises an upstanding post 20 mounted on a base-forming bracket 21 which extends beneath a top conveyor run 22 on which the jars or other containers C are advanced beneath the detecting head 10. The bracket 21 may be attached to and form a part of the frame structure 23 on which the conveyor run 22 is supported as it moves beneath the detecting head 10. The post 20 has a track formation 24 for receiving one leg 25 of the bracket 14 with an adjusting screw 26 for adjusting the height of the horizontal leg 27 of the bracket 14 above the conveyor run 22 on which the jars C are carried. A suitable carriage 28 is slidable in a track 30 in the bracket arm 27 and adjustable transversely of the conveyor run 22 by means of a suitable adjusting screw 31.

The ejector device 18, which may be supported on a suitable bracket at the bottom of the post 20, is in the form of a piston 32 extending from cylinder 33 which is supplied with operating fluid from a suitable line through an electrically controlled valve indicated at 34. The ejector 32 is operative to move a jar C which is located at the detecting station beneath

the detecting head 10 in a path laterally of the conveyor run 22 so as to separate the same from the jars which are permitted to remain on the conveyor 22.

The detecting head 10 (FIG. 3) comprises a housing 40 which is formed of a suitable plastic material, such as, for example, "Synthane" tubing, which is understood to be a laminate of plastic and glass fiber or the like, produced by Synthane Corp. of Oaks, Penna., and which has nonconducting electrical characteristics. The housing 40 is in the form of a length of the cylindrical tubing and has an axial dimension greater than the diameter of the maximum size container end which is to be tested by the equipment. The tubular housing 40 is of sufficient cross-sectional diameter to enclose a leaf-spring-mounted switch contact 41 with the leaf spring 42 secured at one end to a contact member 43 and extending in the axial direction in the housing 40, with the other end normally spaced from a fixed contact member 44 which depends from a contact or connector 45. The bottom wall of the tubular housing 40 has an aperture 46 located intermediate the tube ends 47 and 48 in which there is disposed a switch actuator in the form of a headed pin 50 with the stem portion thereof slidably mounted in the aperture 45. The pin 50 is adapted to engage the switch contacts 41 and 44 when it is depressed by contact with the top of a raised center panel P in a jar top or closure cap T. When the center panel P is concave, as indicated in FIG. 3, the pin 50 is inoperative and the switch contacts 41 and 44 remain open. The housing 40 is, of course, formed of nonconducting material or the switch contacts are suitably insulated.

The tubular housing 40 is suspended by means of a length of spring wire 51, for example, a length of relatively stiff resilient piano wire. The wire 51 depends from the end of a leaf spring 52 which extends from the carriage support member 28 and through a vertically disposed central opening 53 in a cylindrical soft iron center portion 54 of a magnet assembly 55 which includes permanent magnet ring 55' and which is supported on the carriage 28. A moving coil 56 is carried on the leaf spring 52 which forms with the magnet assembly 55 a loud-speaker-type motor device adapted to impart to the depending wire 51 and the tubular housing 40 a vibrating motion in a vertical path. A leaf spring member 57 also extending from the carriage support 28 steadies the wire 51 and cooperates with the member 52 in supporting the tubular housing 40. The coil 56 is actuated or drawn down by an electrical impulse from the capacitor discharge power supply as indicated schematically in FIG. 5, with the springs 52 and 57 returning the coil 56 to the up position after it is depressed by an impulse from the power supply.

The activation of the coil 56 is controlled by a jar detector switch, indicated at 60 in FIG. 1, which is mounted at the detecting station and which may be a proximity-type switch actuated by the presence of a capped jar C at the station which is in proper position for contact by the tubular housing 40 when the latter is lowered by an impulse operating the coil 56.

Referring to FIG. 4, the presence of a container C at the detecting station generates a pulse for operating the coil 56. The switch mechanism carried in the cylindrical housing 40, which includes the normally open contacts 41 and 44, is incorporated in a conventional circuit for actuating or operating the ejector mechanism for reject plunger 32.

In the operation of the device, when a container C reaches the detector station and is in predetermined position thereon the switch 60 closes the circuit for supplying an impulse current to the coil 56, resulting in the lowering of the tubular housing 40 so that it contacts the top of the closure on the container at the points indicated at 61 and 62 on FIG. 3. The contact with the container closure or cap T is momentary and the tubular housing 40 is raised to its normal position by the leaf springs 52 and 57. The downward motion and engagement of the housing 40 with the container top T will engage the switch-operating button 50 with the raised portion of the center panel P when there has been a loss of vacuum sufficient to bring the same above a predetermined level relative to the

top surface of the container, that is, when the panel P is convex on its top surface. When button 50 is raised the switch contacts 41 and 44 are closed and the plunger 32 is actuated to eject the defective container at the detecting station. The coil 56 which produces a constant downward force will take care of variations in the overall height of the container and closure member so as to allow for variations in cap orientation and manufacturing tolerances in the jar height. The contact of the tubular housing 40 with a top of a container is of very small duration so that there is no interference with the movement of the container on the conveyor 22. Also, the weight of the housing 40 and the associated parts is very small and with low inertia mass a very fast response rate can be obtained by utilizing reciprocating motion such as provided by the pulse motor arrangement.

I claim:

1. Means for sensing contour variation of closure members on sealed containers as they are advanced along a path, one by one, past a detecting station and for ejecting certain of said containers from said path, which means comprises a sensing head, a resilient support at said detecting station for mounting said sensing head for reciprocation in a vertical path, said sensing head having a housing in the form of a relatively short section of tubing disposed with the longitudinal axis thereof extending crosswise above the path of said containers so that lowering said head will engage end portions of said housing with oppositely disposed top marginal portions of a container top wall when the container is at said detecting station and the top wall is in acceptable condition with the center portion thereof concave, means responsive to positioning of a container at said detecting station for lowering said housing so as to momentarily engage said housing with said container top wall, and a switch-actuating member extending from the bottom of the housing intermediate the end portions thereof which is operated upon engaging with the center portion of the top wall of a container positioned at said station when said center portion is raised a predetermined amount so that it is not in acceptable condition, means at said detecting station for ejecting containers which are not in acceptable condition and electrical control means for said ejecting means which is operative in response to operation of said switch-actuating member.

2. A device for sensing contour variation of closure members on sealed containers as they are advanced along a path, one by one, past a detecting station which comprises a sensing head, a support on which said head is mounted for reciprocation in a vertical path at said detecting station, said sensing head including a housing in the form of a relatively short section of tubing disposed with the axis thereof extending crosswise above the path of said containers so that lowering said head will engage axially spaced end portions of said housing with oppositely disposed top marginal portions of a container top wall when a container is at said detecting station with the top wall having a center portion thereof concave, electrical impulse means operative to lower said head into momentary engagement with the top of a container at said detecting station, container-sensing means at said detecting station for actuating said electrical impulse means when a container is positioned at said station, switch elements enclosed in said tubular housing and a switch-actuating member extending from the bottom of said tubular housing intermediate the container-engaging end portions thereof which is inoperative when the housing is engaged with a container having a top wall with a center portion thereof concave and which is operated upon engaging with the center portion of the top wall of a container in which said center portion is raised to a convex position.

3. An apparatus as set forth in claim 2 and said head being mounted in depending relation on a resilient member which permits said head to be lowered into contact with variable height containers.

4. In an apparatus for detecting defective vacuum-packed containers of the flip-panel-type in which loss of vacuum within the container is indicated by a raised panel portion in

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the top wall of the container, a detecting head comprising a length of tubing having a switch mounted therein with an actuator mounted in the bottom wall intermediate the ends of the tubing, a support means for mounting said tubing with the long axis thereof extending crosswise above the path of advance of a line of containers which support means includes resilient means normally holding said head above the path of the containers, and means cooperating with said support means for reciprocating said tubing in a vertical path so as to bring opposite end portions of said tubing down into momentary engagement with oppositely disposed portions of the top of successive containers thereby positioning said switch actuator for operation by an indicator panel portion where the latter is in raised position due to improper sealing and resultant loss of vacuum in the container.

5. In an apparatus as set forth in claim 4 and said length of tubing being formed of a substantially rigid plastic having non-conducting electrical characteristics.

6. In an apparatus as set forth in claim 4 and means at said station for detecting the presence of a container, and electrical impulse means for reciprocating said tubing which is responsive to operation of said means for detecting the presence of a container at said detecting station.

7. In an apparatus as set forth in claim 4 wherein said support means comprises vertically spaced leaf spring members

extending laterally of the path of vertical reciprocation of said head and said means for reciprocating said tubing comprises electrical impulse means actuated in response to positioning a container at said detection station.

8. In an apparatus for detecting defective vacuum-packed containers of the flip-panel-type in which loss of vacuum within the container is indicated by a raised panel portion in the top wall of the container, a detecting head comprising a length of tubing having a switch mounted therein with an actuator mounted in the bottom wall intermediate the ends of the tubing, a support for mounting said tubing with the long axis thereof extending crosswise above the path of advance of a line of containers, means for reciprocating said tubing in a vertical path so as to bring opposite end portions down into engagement with oppositely disposed portions of the top of successive containers thereby positioning said switch actuator for operation by an indicator panel portion where the latter is in raised position due to improper sealing and resultant loss of vacuum in the container, said support for mounting said length of tubing including a relatively stiff resilient wirelike member which depends from said means for reciprocating said tubing and said means for reciprocating said tubing being operable to accommodate within predetermined limits variations in the height of the containers.

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