

May 1, 1962

A. F. UHLIG
GAUGING APPARATUS

3,032,192

Filed Dec. 23, 1959

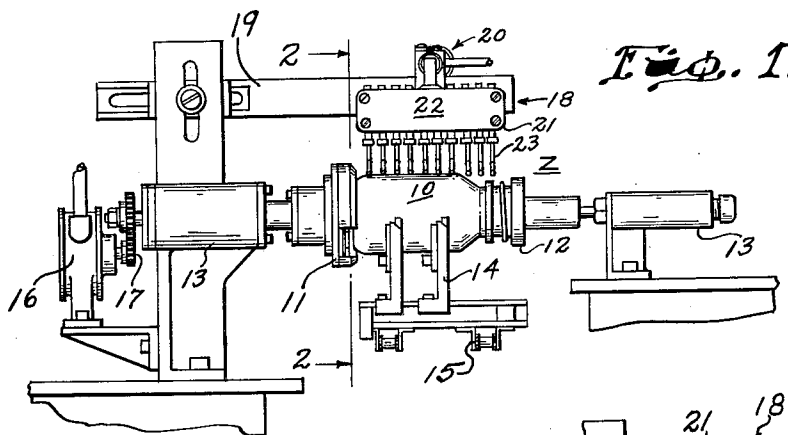


Fig. 1.

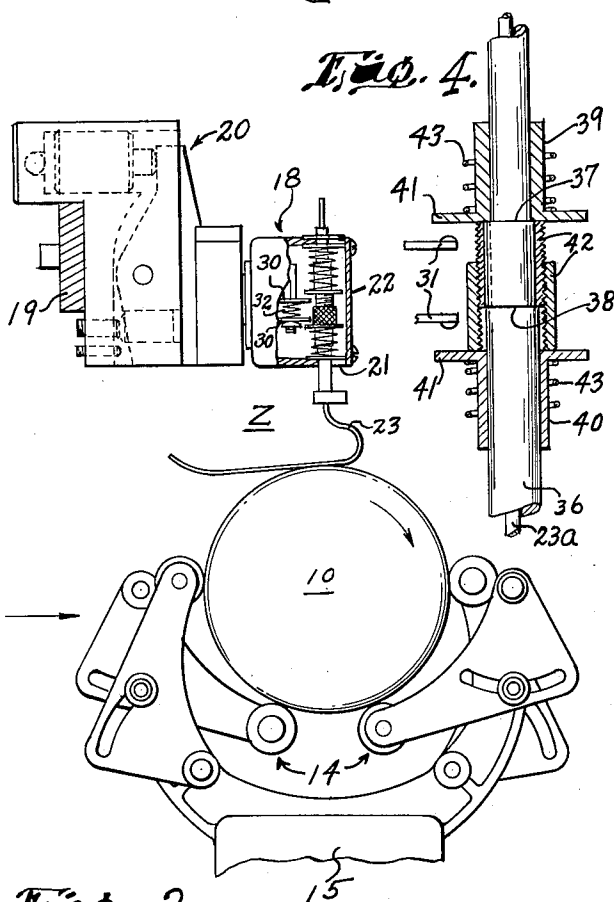


Fig. 2.

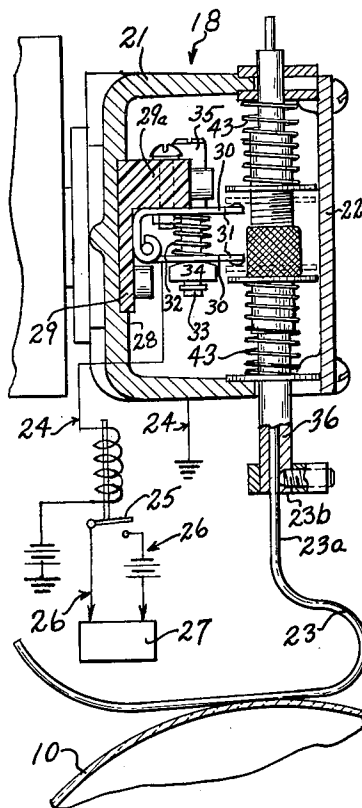


Fig. 3.

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3,032,192

GAUGING APPARATUS

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Filed Dec. 23, 1959, Ser. No. 861,666
2 Claims. (Cl. 209—88)

My invention relates to gauging or inspecting apparatus and more particularly is an improved apparatus for detecting bulges, depressions and similar deformations in the exterior surface of articles such for example as cylindrical bottles and jars and causing removal from a production line of those articles in which the defect exceeds predetermined arbitrary though regulable limits.

Another object of my invention is the provision of inspecting apparatus of the above character in which a multiplicity of resilient gauging fingers ride upon the surface to be gauged or inspected and operate in response to contact of one or more of these fingers with a defect of serious proportions in such surface to close an electrical circuit and cause rejection of the article concerned.

A further object of my invention is the provision of novel, simple and readily adjustable electrical circuit closing means operable by feelers or fingers which ride upon a moving surface during the inspecting operation.

Other objects will be in part apparent and in part pointed out hereinafter.

In the drawings:

FIG. 1 is a sectional elevational view showing a glass container being inspected by apparatus embodying my invention.

FIG. 2 is an end elevational view with parts in section taken substantially along the line 2—2 of FIG. 1.

FIG. 3 is an enlarged sectional elevational view showing one of the gauging feelers or fingers and the electrical mechanism which it actuates.

FIG. 4 is a detail sectional view of a part of the electrical switch mechanism.

In the illustrated embodiment of my invention, it is being utilized in the object of a cylinder surface such as the exterior surface of a round bottle or jar 10. Obviously, a flat surface of an object being moved through an inspecting zone could with equal facility be checked for contour imperfections.

As perhaps is best shown in FIG. 1, the jar 10 whose exterior surface is to be gauged or inspected, is rotatably supported in a holder comprising base and neck chucks 11 and 12, respectively, these chucks being movable axially into and out of contact with the ends of the jar by means of air motors 13. Incident to operation of these motors to bring the chucks into gripping and supporting engagement with the jar, the latter is lifted bodily away from a cradle 14 which is an element of an endless conveyor 15. This conveyor brings the jars in succession to various inspecting stations in the manner disclosed in U.S. Patent No. 2,849,114, issued August 26, 1958 to B. A. Noble et al. and assigned to the assignee of the present application. The base chuck 11 is intended to be positively rotated by a motor 16 which operates through a gear train 17 for this purpose. The inspecting or gauging apparatus 18 is mounted for vertical adjustment upon a bracket 19 in the inspecting zone Z.

The specific connection between the apparatus 18 and bracket 19 (FIG. 2) includes a rockable carrier 20, the function and details of which are disclosed in U.S. Patent No. 2,890,786, issued June 16, 1959 to W. W. Wolford and assigned to assignee of this application. The carrier in the herein disclosed form functions in timed relation with the arrival of an article in the inspecting zone Z to position the apparatus in contact with the surface to be gauged, should such physical contact be essential. As

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in the patent just referred to, the carrier may be air or fluid operated. To the forward side of this carrier, the inspecting apparatus 18 itself is affixed.

This apparatus comprises a horizontally elongated housing 21 for a major part of the mechanism involved. A removable front cover plate 22 is secured to the housing. Enclosed in this housing are electrical switches, one or more of which may be closed in response to the arrival of a defective surface area of the article at a point in the inspecting zone where it is engaged by electrical contact control fingers 23 which ride over said surface. When the defect is sufficiently serious as determined by adjustment of the apparatus and the fingers, or any one of them, cause closing of an electrical circuit 24, a solenoid relay actuated switch 25 is closed and in turn closes a second electrical circuit 26. Thus an article ejecting device 27, which may be of any of many which are available in the open market is activated to remove the defective article from the production line.

Along the interior of the back wall 28 of the housing is an insulating strip 29 of generally inverted L-shape cross-section. Two electrical switch contact bars 30 are mounted upon this strip 29. The upper of these bars 30 is L-shape in cross-section and is bolted to the horizontal flange 29a of said insulating strip. A free margin 31 projects well beyond the flange 29a (FIG. 3) while the other margin is hinged to an adjacent back edge of a second or lower contact bar 30. Here again the free margin 31 of the lower bar 30 projects beyond the flange 29a and is directly beneath the corresponding part of the upper bar. These bars are relatively movable and are urged apart by a coil spring 32 which encircles a pin 33, the latter extending vertically through both bars. A head 34 is secured to the lower end of the pin beneath the lower contact bar. An adjusting sleeve 35 is threaded onto the pin just above the upper contact bar 30. By rotating this sleeve the space between the free margins 31 of the bars may be varied as circumstances require. The coil spring maintains the bars in any desired maximum spaced-apart relationship as determined by setting of the sleeve 35.

Each of the aforementioned feelers or fingers 23 includes a vertical rod 23a anchored in a holder 23b which is provided at the lower end of a tube 36. This tube 36 (FIGS. 3 and 4) extends upwardly into the housing 18 being reduced in diameter at intervals to provide a pair of vertically spaced-apart upper and lower annular shoulders 37 and 38, respectively. Upper and lower electrical contact sleeves 39 and 40, respectively, are mounted upon the tube 36. The flanges 41 on these sleeves straddle the free margins of the contact bars 30. Axially adjustable bushings 42 positioned between the sleeves 39 and 40 provide means for changing the spacing between the contact flanges 41 and therefore the relationship between these contact sleeves and the bars 30. These settings, as is apparent, determine the degree of imperfection required to close the electrical circuits and actuate the ejecting device 27. Coil springs 43 encircling the contact sleeves 39 and 40 yieldingly urge these sleeves to their innermost positions. The lower bushing 42 is threaded over the upper bushing and is knurled externally to facilitate rotation thereof and consequent axial adjustment of their overall length. Thus adjustment of the electrical contact is effected.

It will be apparent from the foregoing that upon arrival of an article in the gauging zone Z and chucking of the article, the feelers or fingers may be brought into contact with the surface to be gauged. As the surface moves past the fingers the latter ride over it and closely follow the contour. In the event the article surface is seriously defective as to contour, such defect will, through one or more of the fingers 23, cause axial movement of the con-

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tact sleeves 39 and 40. Thus one of these sleeves is brought into engagement with one of the contact bars 30 and closes the electrical circuit 24. Thereupon the second circuit 26 is closed by means of the switch 25, and the ejecting device actuated. In the event a depression of excessive depth is encountered, at least one of the fingers lowers and the upper contact sleeve 39 thereupon engages the upper contact bar. On the other hand, if the defect is in the form of a bulge and therefore causes upward travel of one of the fingers, the lower contacts are closed, as is evident.

Modifications may be resorted to within the spirit and scope of the appended claims.

I claim:

1. In apparatus for inspecting the exterior surface of an object to detect contour imperfections therein, means for supporting an object and so moving it as to cause travel of its exterior surface through an inspecting zone, electrical means operable in response to the arrival of an imperfect surface area in and movement through said zone comprising a multiplicity of fingers in said zone for sliding engagement with the surface being inspected, the fingers being movable in response to variations in the contour of said surface, electrical circuit closing means operable by a predetermined degree of movement of any one of said fingers, and defective object-ejecting means in an electrical circuit closable in response to actuation of said circuit closing means the electrical circuit closing means comprising a pair of parallel contact bars connected to one side of an electric circuit and a pair of electric contact elements connected to another side of the electric circuit, said elements spaced apart and carried by one of the fingers and movable with the latter to bring one or the other of the contact elements into engagement with one of said contact bars at times, said contact bars being hinged together and having spaced-apart free margins, the contact elements straddling said free margins,

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expansion spring means normally urging the contact bars apart about the hinge and a device for compressing the spring and thereby reducing the spacing between said free margins.

2. In apparatus for inspecting the exterior surface of an object to detect contour imperfections therein, means for supporting an object and so moving it as to cause travel of its exterior surface through an inspecting zone, electrical means operable in response to the arrival of an imperfect surface area in and movement through said zone comprising a multiplicity of fingers in said zone for sliding engagement with the surface being inspected, the fingers being movable in response to variations in the contour of said surface, electrical circuit closing means operable by a predetermined degree of movement of any one of said fingers, defective object-ejecting means in an electrical circuit closable in response to actuation of said circuit closing means, a common carrier for all of said fingers, and means for rocking the carrier to move the fingers to and away from a position for engagement with the surface of the object being inspected, the electrical circuit closing means comprising a pair of parallel contact bars connected to one side of an electric circuit and a pair of electric contact elements connected to another side of the electric circuit, said elements spaced apart and carried by one of the fingers and movable with the latter to bring one or the other of the contact elements into engagement with one of said contact bars at times.

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