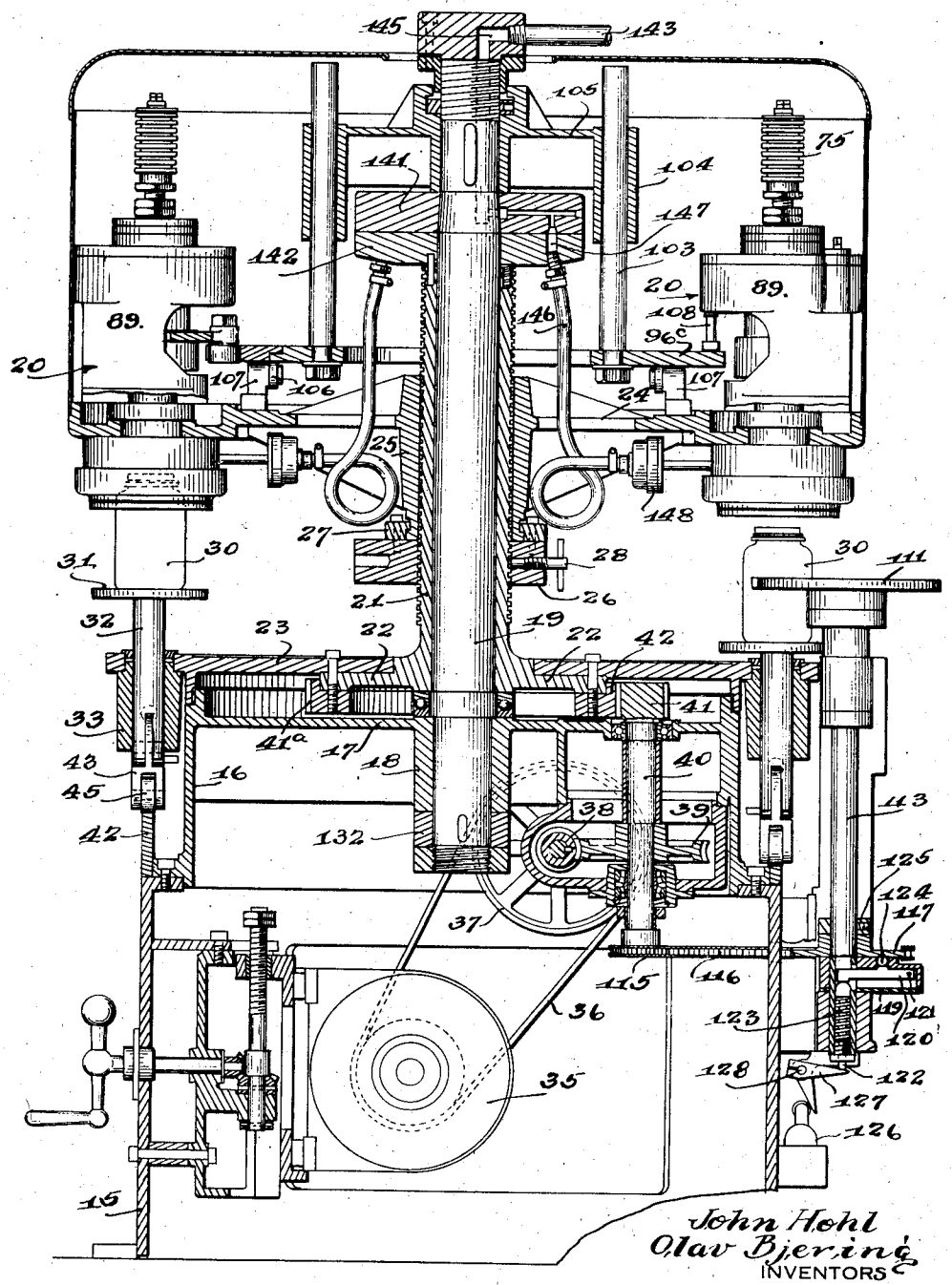
Jan. 11, 1944. J. HOHL ET AL 2,338,852

VACUUM SEALING MACHINE

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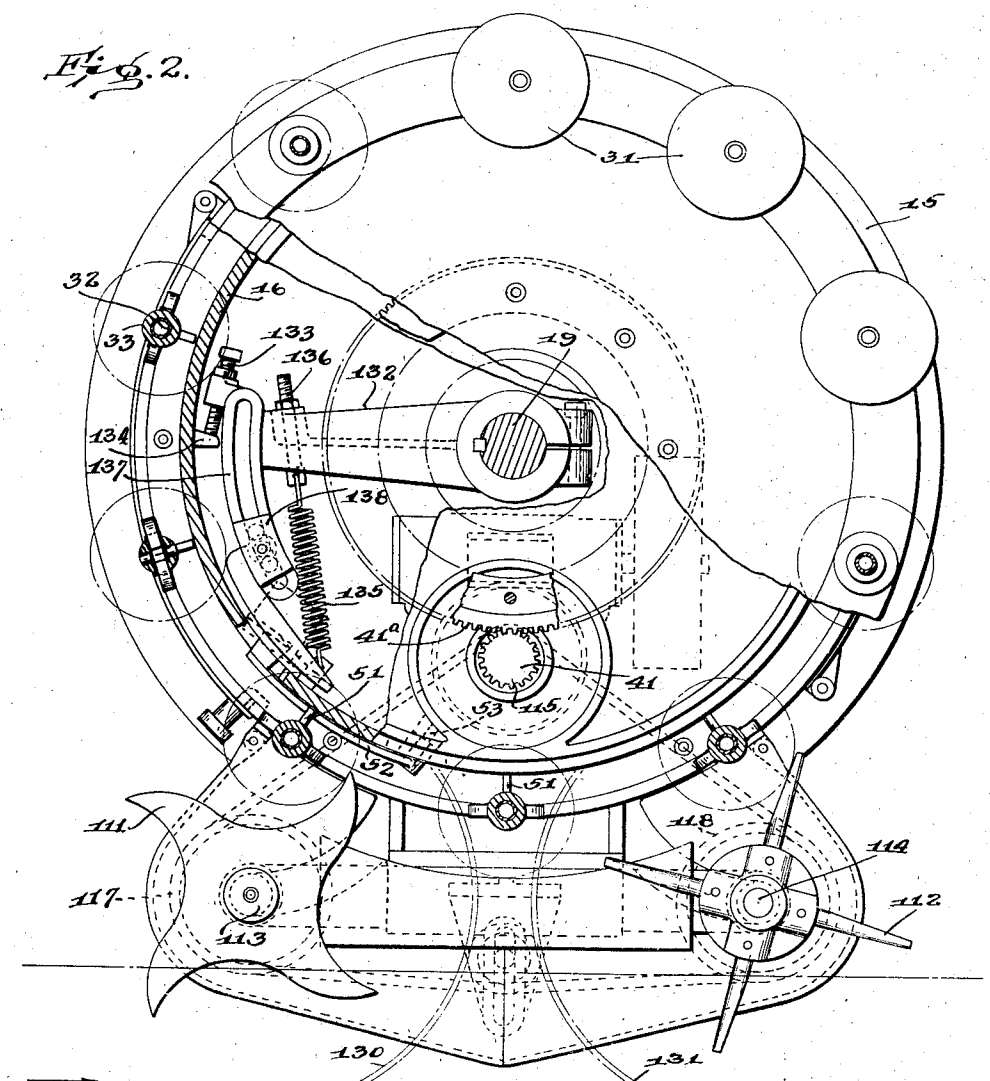
Fig. 1.

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VACUUM SEALING MACHINE

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Fig. 2.



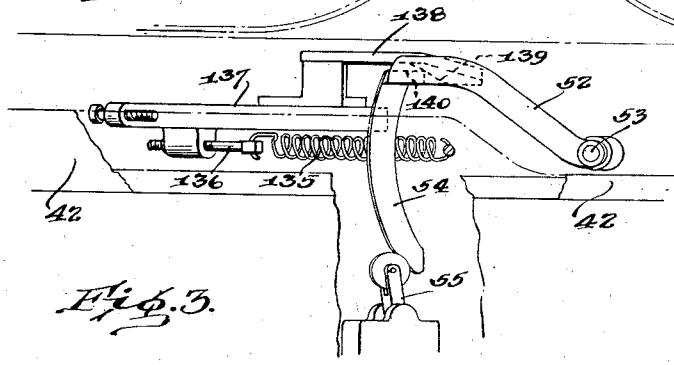


Fig. 3.

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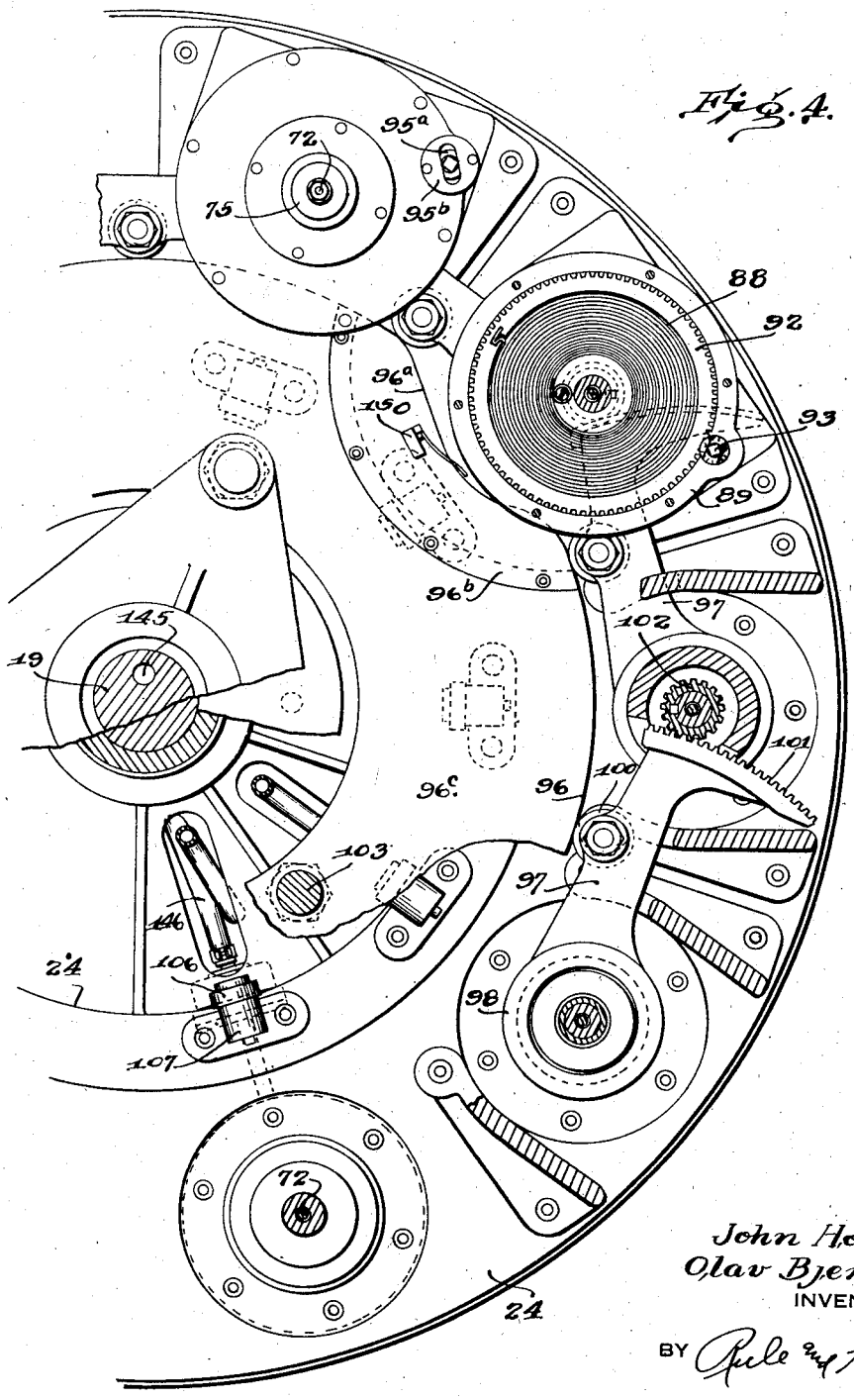
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VACUUM SEALING MACHINE

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Fig. 4.



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VACUUM SEALING MACHINE

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Fig. 5.

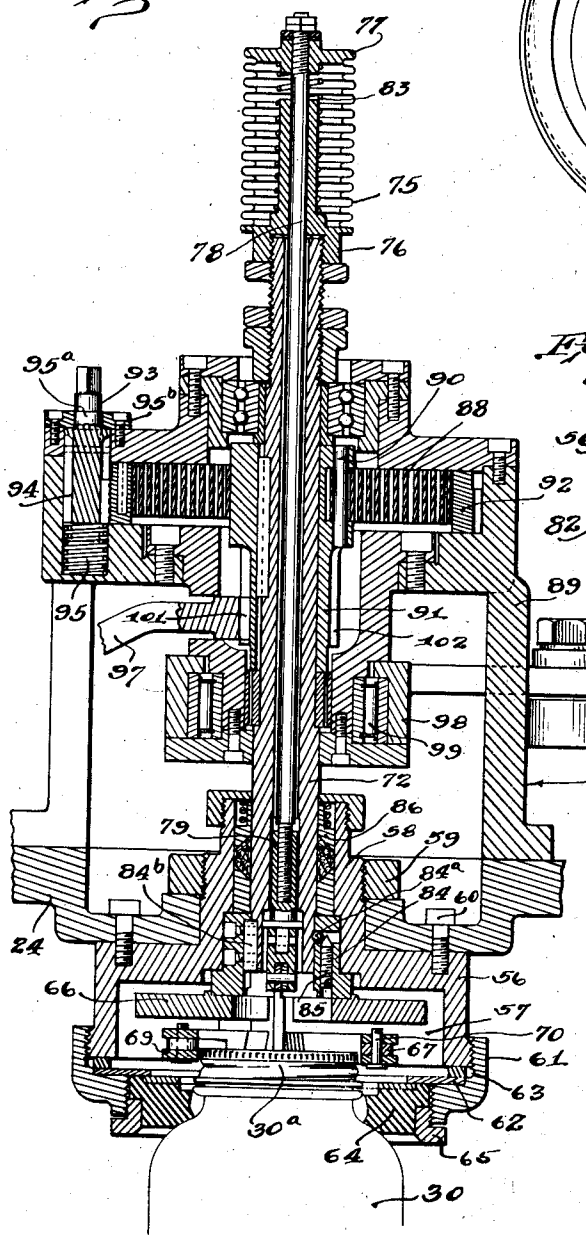


Fig. 6.

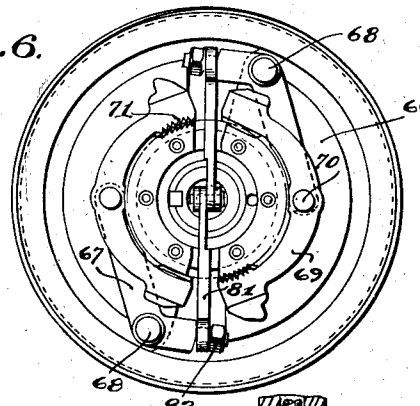


Fig. 7.

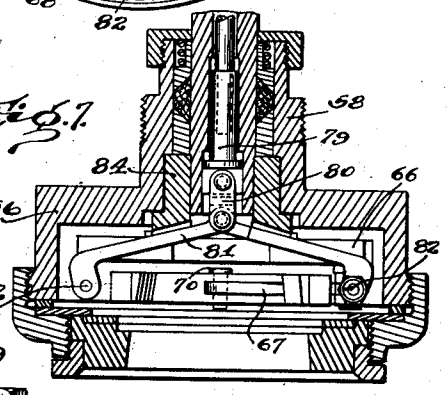
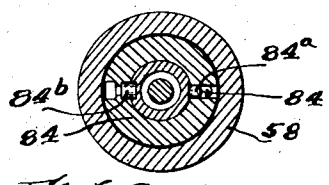


Fig. 8.



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Fig. 9.

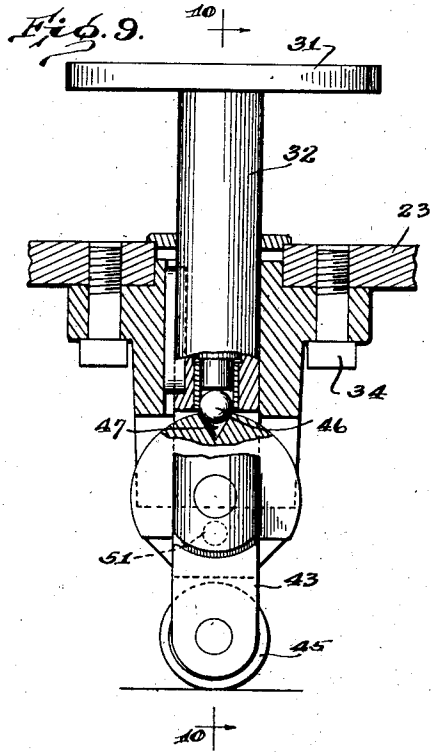
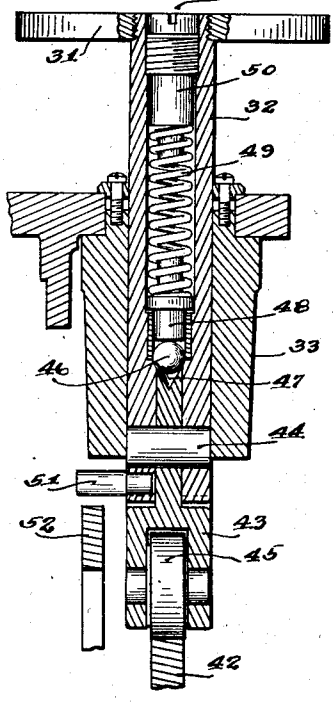


Fig. 10.



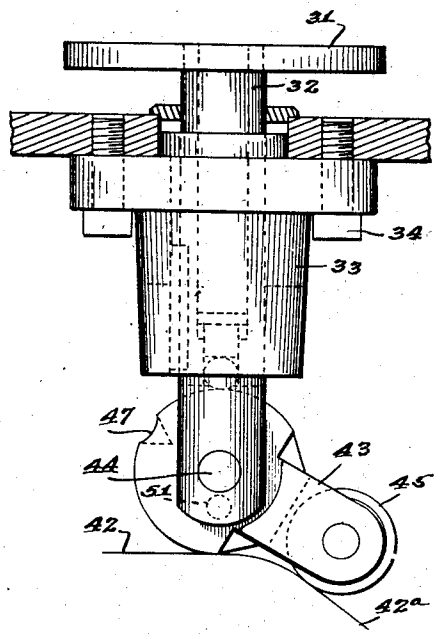


Fig. 11.

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Patented Jan. 11, 1944 2,338,852

UNITED STATES PATENT OFFICE

2,338,852

VACUUM SEALING MACHINE

John Hohl and Olav Bjering, Toledo, Ohio, assignors to Owens-Illinois Glass Company, a corporation of Ohio

Application January 23, 1942, Serial No. 427,872

14 Claims. (Cl. 226—82)

Our invention relates to machines for applying a partial vacuum within jars, bottles or other containers to which caps or closure devices have been loosely applied after the containers have been filled with food products or other commodities, and then tightening the closure devices.

The invention in its preferred form is embodied in a machine of the type in which the sealing units, each including vacuumizing and cap tightening means, are mounted on a carriage rotatable about a vertical axis, and in which the containers with the caps loose thereon, are placed on vertically movable supports or pedestals for lifting them into operative relation to the sealing units.

An object of our invention is to provide improved mechanism for rotating and tightening the closures and thereby sealing the vacuumized containers.

A further object of the invention is to provide safety means for preventing a crushing pressure being applied to a container, and also for stopping the machine, when any undue resistance is encountered to the upward movement of the container to a sealing position. This safety means would operate, for example, if the container were not properly centered on its support when moved upward to the sealing unit.

A further object of our invention is to provide a safety mechanism operable automatically to open a control circuit of the driving motor and stop the machine under conditions such that the free rotation of the carriage about the center column is interfered with and an excessive turning torque thereby applied to said column.

A further object of the invention is to provide safety means for stopping the machine when the movements of the mechanism for feeding the containers to the carriage is placed under strain due to a misplaced container or other cause.

Other objects of the invention will appear hereinafter.

Referring to the accompanying drawings:

Fig. 1 is a sectional elevation of a machine embodying the present invention.

Fig. 2 is a part sectional plan view of the machine, portions being broken away.

Fig. 3 is a fragmentary view in elevation, showing a safety mechanism.

Fig. 4 is a fragmentary part sectional plan view of the machine, showing particularly the mechanism for rotating the closure devices and thereby tightening them on the containers.

Fig. 5 is a sectional elevation of a vacuumizing and sealing unit.

Fig. 6 is a bottom plan view of the same.

Fig. 7 is a sectional elevation, looking in a direction at right angles to that of Fig. 5, of a portion of the mechanism shown in Fig. 5, and showing particularly the means for gripping and rotating the closure device.

Fig. 8 is a sectional plan of means shown in Fig. 5 for holding in place the supporting means for the gripping jaws.

Fig. 9 is a part sectional elevation of a pedestal for supporting a container, and safety means associated therewith.

Fig. 10 is a sectional elevation at the line 10—10 on Fig. 9.

Fig. 11 is a view illustrating the operation of the safety means to prevent upward movement of the pedestal when an abnormal resistance to such movement is encountered.

The machine as herein illustrated embodies various structural features disclosed in the patent to Barnby #2,126,942 August 16, 1938, and the patent to Barnby et al., #2,254,642 September 2, 1941.

Referring particularly to Figs. 1 and 2, the machine framework comprises a base in the form of a cylindrical housing including a lower section 15 and an upper section 16 of somewhat smaller diameter, bolted thereto. The section 16 includes a cover portion 17 for the housing, provided with a central hub 18 in which a center column or post 19 is supported, said post being journalled for limited rotative movement within the hub 18 as hereinafter described.

The sealing units 20 are arranged in an annular series and supported on a carriage which is mounted for rotation about the center column 19. The carriage includes a tubular shaft 21 surrounding the column 19 and formed at its lower end with a flange 22 to which is bolted a platform 23. The carriage also includes an upper platform 24 formed with a hub 25 mounted for up and down adjustment on the tubular shaft 21. Means for supporting the platform 24 and for adjusting it up and down, includes a bearing in the form of a ring 26 having a screw-threaded mounting on the shaft 21 and connected to the hub 25 by a flanged collar 27. The latter prevents up or down movement of the platform 24 independently of the ring 26. A locking screw 28 secures the parts in adjusted position. The sealing units 20 are directly supported on the upper platform 24 and adjustable up and down therewith as required to accommodate the machine to containers of different heights.

The containers 30 herein referred to as jars,

are supported on pedestals, each comprising a supporting disk 31 attached to a vertical, tubular stem 32 mounted for up and down movement in a sleeve 33 secured to the under side of the platform 23 by bolts 34 (Fig. 9). The pedestals are arranged directly beneath and in vertical alignment with the sealing units 20.

The carriage is rotated continuously by an electric motor 35 (Fig. 1) having a driving connection through a belt 36 and pulley 37, with the worm shaft 38, the latter having keyed thereto a worm which drives a worm wheel 39 keyed to a vertical shaft 40. A pinion 41 on the shaft 40 drives a ring gear 41a bolted to the flange 22 and thereby rotates the carriage.

The pedestals 31 are supported on a stationary cam track 42 mounted on the machine base and surrounding the upper section 16 thereof. The cam track is shaped to lift the work-pieces 30 into engagement with the sealing units 20 for the vacuumizing and sealing operations and then lowering them to permit their removal.

Referring to Figs. 9, 10, and 11, each pedestal is provided with safety mechanism, permitting it to retain its lowered position when an abnormal resistance to the upward movement is encountered as, for example, when a jar or container carried thereby is out of alignment with the sealing unit to such a degree as to cause it to be jammed against the rim of the vacuum bell. The safety means includes a short rock arm 43 connected to the lower end of the stem 32 by a horizontal pivot 44, the lower portion of the stem being bifurcated to receive said arm and the latter also being forked to receive a cam follower roll 45 journalled therein and running on the cam track 42. The arm 43 is normally held in vertical alignment with the shaft 42 by means including a ball 46 which seats in a notch 47 formed in the arm 43, a plunger 48 and a coil spring 48 mounted within the stem 32. The spring is held under compression between the plunger 48 and an adjustable plug 50 threaded in the stem.

During normal operation, the arm 43 retains its upright position in line with the stem 32. The pedestal is lifted by an inclined section 42a (Fig. 11) of the cam track. If while the cam roll is running up the incline, the jar 30 should become jammed, the resistance to such upward movement will apply sufficient pressure of the cam roll against the inclined track section to swing the arm about its pivot 44, carrying the notch 47 out of engagement with the ball 46. The pedestal is then free to drop and retain its lowered position while the arm swings idlly about its pivot 44.

The arm 43 has attached thereto a pin 51 which projects over a safety switch operating arm 52 (Figs. 2 and 3) which is connected by a pivot 53 to the housing 16. The arm 52 carries a finger 54 which extends downwardly into position to engage a switch 55 in the control circuit of the electric motor 35. During the normal operation of the machine the pin 51 travels over but out of contact with the arm 52. If, however, the arm 43 has been operated as above described so that the pedestal is not lifted to normal position, the pin 51 strikes the arm 52 and moves it downward, thereby operating the switch 55 and stopping the motor. The machine is thus stopped and remains at rest until the operator resets the switch.

The sealing units 20 are all of the same construction. Referring to Figs. 5 to 8 inclusive, each unit comprises a vacuum bell 56 attached to the under surface of the platform 24, said bell formed with a vacuum chamber 57. The part 56 is formed with a tubular hub extension 58 which projects upward through an opening in the platform and is secured in place by a ring 59 threaded on said extension. Bolts 60 provide additional attaching means and prevent rotation of the vacuum bell. A clamping ring 61 threaded on the lower end of the vacuum bell serves to clamp a bearing ring 62 against a sealing gasket 63 which bears on the lower face of the bell. A ring gasket 64 is clamped in position against the plate 62 by a clamping ring 65. When a jar 30 is moved upward into engagement with the gasket 64, it makes sealing contact therewith.

The closure gripping device includes a pair of supporting plates 66 within the vacuum chamber. A pair of bell crank levers 67 (Figure 6) are mounted on the lower surface of the plates 66 by pivot pins 68 at diametrically opposite points. Gripping jaws 69 are connected by pivots 70 to the bell crank levers, each jaw being formed with teeth or serrations 71 for gripping engagement with the upper margin of the closure or cap 30a (Fig. 5).

A vertical tubular shaft 72 is secured at its lower end within the hub 58 and has mounted on its upper end a metal bellows 75. The lower end 76 of the bellows is threaded on the shaft 72. The upper end plate 77 of the bellows has a screw-threaded connection with the upper end of a push rod 78 which extends downwardly through the tubular shaft 72 and has operating connections with the gripping jaws. Said connections include a section 79 screw-threaded on the lower end of the push rod. A link 80 connects the section 79 with a pair of arms 81 extending radially outward and connected by pivots 82 to the bell cranks 67.

The bellows 75 when subjected to a predetermined degree of vacuum, is collapsible against the opposing force of a coil spring 83 held under compression between the ends of the bellows. This operates to push the rod 78 downward. Clearance is provided between the push rod 78 and the shaft 72 to permit the suction to be applied to the bellows when air is exhausted from the vacuum chamber 57. The supporting plates 66 for the gripping jaws are removably secured in place within the vacuum chamber by means of a tubular connector 84 (Figs. 5 and 8) secured to said plates and extending upward into the hub 58. The connector 84 is held in position and at the right height by a ball 84a and a locking screw 85 which holds the ball in position to engage a groove or notch in the shaft 72. Rotation of the connector 84 relative to the shaft 72 is prevented by a key 84b. A spring loaded packing 86 provides a seal between the shaft 72 and its bearing.

The closure tightening mechanism operates to rotate the shaft 72 after suction has been applied for vacuumizing the container and operating the gripping device. Such mechanism includes a coiled spring 88 housed within a casing 89 mounted on the platform 24. The inner end of the spring is secured by a pin 90 to a sleeve 91 keyed to the shaft 72. The outer end of the spring is attached to a ring gear 92 (Figs. 4 and 5) mounted within the casing 89 and rotatable for adjusting the tension of the spring.

The means for rotating the ring gear to adjust the tension of the spring includes a shaft 93 mounted in the wall of the casing 89 and movable

up and down therein. The shaft is provided with gear teeth 94 which mesh with the teeth on the ring gear 92. A compression spring 95 normally holds the shaft in its lifted position in which a shoulder 95a thereon (Figs. 4 and 5) engages an elongated opening in a cap 95b, which limits the upward movement and prevents rotation of the shaft. The shaft may be lowered to disengage it from the collar 95a and then rotated for adjusting the spring, by means of a wrench applied to the squared end of the shaft.

Rotation of the shaft 72 and with it the gripping jaws, for tightening the caps on the jars, is under the control of a stationary cam track 96 formed on the periphery of an annular cam plate 96c (Figs. 1 and 4). Rock arms 97 individual to the sealing units, are mounted for oscillating movement about the axis of the shaft 72, each arm being formed with a hub 98 provided with roller bearings 99. A cam follower roll 100 is mounted on the rock arm intermediate its ends and runs on the cam track. The outer end of the rock arm is formed with a segmental rack 101 which runs in mesh with gear teeth 102 formed on the sleeve 91. It will be noted that each rock arm 97 is journalled in one sealing unit and operates the tightening device for the next sealing unit. The cam track 96 is concentric with the carriage for the greater portion of its circumference and includes a comparatively short section 96a which is shaped to permit the rock arm 97 to swing inwardly under the tension of the coil spring 88 for operating the tightening device. The operating section of the cam is preferably formed on a cam patch 96b removably mounted on the cam plate 96c and which may be replaced by other cam patches or sections of different cam contours to meet the requirements of different sizes or styles of closure devices.

Means for holding the cam plate 96c stationary while the machine is operating, and permitting it to be adjusted up and down with the sealing units, includes posts 103 (Figs. 1 and 4) secured to the cam plate and extending upward through bearing sleeves 104 formed on a stationary frame 105 keyed to the center post 19. The cam plate is supported on rolls 106 mounted on brackets 107 on the platform 24. Means for holding the cam plate seated on the rolls 106 includes pins or bolts 108 interposed between the cam plate and the casings 89.

The containers may be carried to and from the machine by a horizontal traveling conveyor 110 (Fig. 2). The containers are transferred from the conveyor to the supports 31, and back to the conveyor by transfer mechanism including the star wheels 111 and 112 carried on vertical shafts 113 and 114 respectively. The star wheels are rotated continuously in synchronism with the rotation of the carriage. The driving means includes a sprocket wheel 115 (Fig. 1) keyed to the lower end of the shaft 40 and driving a sprocket chain 116 trained over the wheel 115, a wheel 117 on the shaft 113, and a wheel 118 on the shaft 114.

A safety device which will now be described, is provided for arresting the movement of the star wheels when any abnormal resistance to their movement is encountered, as might occur, for example, if a container became jammed or misplaced during the transfer.

Referring to Fig. 1, the sprocket wheel 117 is mounted to turn freely on the shaft 113. Directly beneath the sprocket wheel is a hollow arm 119 which is keyed to the shaft for rotation therewith. A switch operating lever 120 housed within the arm and connected thereto by a pivot 121, has its free end projecting within the tubular shaft 113. A vertical rod 122 mounted within the lower end of the shaft and movable lengthwise therein is held in contact with the lever 120 by a coil spring 123. A ball 124 seated on the lever 120 engages a recess or notch formed in the wheel 117, being yieldingly held therein by the spring 123. A collar 125 prevents upward movement of the gear 117. A micro-switch 126 is arranged to be actuated by the rod 122 operating through arms 127 attached to a pivot pin 128. The ball 124 provides a driving connection between the arm 119 and the sprocket wheel 117 during normal operation. Any excessive or abnormal resistance to the rotation of the transfer wheels 111, 112, and with them the arm 119, results in the sprocket wheel 117 being advanced relative to the arm 119 and forcing the ball 124 downwardly out of its holding notch. The lever 120 and rod 122 are thereby moved downward and actuate the switch 126, thereby opening the motor control circuit and stopping the motor 35. The switch remains open until it has been manually reset.

The star wheel 117 moves the containers along a guide rail 130 onto the supporting disks 31. The carriage rotates in a clockwise direction (Fig. 2) so that the containers are carried therewith through the greater portion of a complete rotation of the carriage, during which they are vacuumized and the caps tightened to seal the containers. The wheel 112 serves to transfer the sealed containers back onto the conveyor 110, the containers being guided during this transfer by a rail 131.

An automatic safety mechanism is provided for stopping the machine whenever any undue resistance is offered to the normally free rotation of the carriage about the stationary center column 19. This mechanism will now be described. Referring to Fig. 2, an arm 132 is keyed to the center column 19 which, as before noted, is mounted for limited rotative movement. A stop screw 133, adjustable in the outer end of the arm 132, engages a stop lug 134 formed on the stationary housing 16. A coil spring 135 is anchored at its opposite ends to the arm 132 and the housing 16 and is held under tension adjustable by means of an adjusting screw and nut 136. The arm 132 is provided at its outer end with an arc-shaped extension 137 concentric with the carriage. A shoe 138 is secured to the extension 137 and is adjustable lengthwise thereof. Said shoe is provided on its under surface with a cam 139 or inclined surface (Fig. 3) directly over a shoulder 140 formed on the switch operating lever 52.

During normal operation of the machine the arm 132 remains stationary while the carriage rotates freely on the center column. If, however, the center column or parts connected thereto should offer any undue resistance to such rotation of the carriage, the latter will apply a turning torque to the center column and start it to rotate with the carriage. This causes the cam 139 to actuate the lever 52 immediately, thereby throwing the control switch 55 and stopping the motor. Such operation of the safety mechanism would be caused, for example, by a resistance to the rotation of a shaft 72 for rewinding a cap tightening spring 88. The resistance would react through the arm 97 to place

a drag on the cam 96 in a direction to rotate the center column 19.

The application of suction to the vacuum chambers 57 is controlled by a distributing head (Fig. 1) comprising a member 141 in the form of a disk which is normally stationary having a fixed mounting on the column 19, and a rotatable member 142 directly therebeneath. The latter is keyed to the tubular shaft 21 for rotation with the carriage. A vacuum pipe 143 connected to any suitable means for exhausting the air, opens into a passageway 145 extending through the column 19 to the distributing head. Vacuum pipes 146 individual to the heads 20 are periodically opened to the vacuum line through ports 147 in the member 142. The pipes 146 extend to air filters 148 and thence to the vacuum chambers 57.

When a container 30 has been lifted into sealing engagement with the gasket 64 (Fig. 5), the suction chamber is opened through the pipe 146 and distributing head to the suction line, thereby producing a partial vacuum so that the container is vacuumized. At the same time the bellows 75 is subjected to a suctional action and when a predetermined degree of vacuum is produced therein, is collapsed, compressing the coil spring 83 which is held under compression between the ends of the bellows. The push rod 78 is thereby lowered and operates the gripping device to grip the cap 30a with a predetermined pressure. Immediately following the gripping of the cap, the cap tightening mechanism is brought into operation by the cam roll on the lever 97 being brought to the operating section 96a of the cam track. This allows the arm 97 to be rotated in a counter-clockwise direction under the tension of the coil spring 88, thereby rotating the shaft 72 and tightening the cap. When the cap is tightened to the required degree, the inward swinging movement of the lever 97 will be arrested by the frictional resistance of the cap to further rotative movement. The cam roll 100 will at this point leave the cam track section 96a and as the carriage advances will again be picked up by the cam track and the arm 97 swung outward, thereby rewinding the coil spring 88 and setting the arm for the next succeeding operation. The cam patch 96b provides, in effect, two separate cams, the one comprising the section 96a for controlling the cap tightening movement and the other for rewinding the spring. If, for any reason, the cam roll 100 should move inward to the lowermost portion of the cam track, the arm 97 will operate a micro-switch 150 (Fig. 4) in the motor control circuit and stop the machine. Such operation of the switch 150 would indicate that the force of the coil spring was not being fully or effectively applied for tightening the cap.

Modifications may be resorted to within the spirit and scope of our invention.

We claim:

1. A machine for tightening caps on containers, comprising a support for a container, means for gripping a cap which has been placed on the container, means for rotating the gripping means and cap relative to the container through a limited angle of rotation and thereby tightening the cap, and automatic control means operable to stop the machine upon failure of the cap to offer a predetermined resistance to said tightening movement.

2. A machine for tightening a cap which has been loosely placed on a container, comprising a support for the container, a gripping device for gripping the cap, an electric motor, means driven by the motor for rotating the gripping device and cap relative to the container and thereby tightening the cap, and means operable automatically to stop the motor when the resistance of the cap to rotative movement during said operation is less than that normally required to tighten the cap.

3. A sealing machine comprising in combination a carriage, means for rotating it, a support for a container, said support being mounted for rotation with the carriage, a gripping device for gripping a closure for the container, a spring, means providing an operating connection between said spring and the gripping device, means for holding the spring under tension and causing it to operate through said connection to rotate the gripping device and thereby rotate the closure and seal the container, and means for retarding and controlling the said rotation of the gripping device and closure comprising a stationary cam, an arm mounted for movement on the carriage, a cam follower roll carried by said arm and running on the cam, and motion transmitting means between the said arm and gripping device.

4. A sealing machine comprising a carriage, means for rotating the carriage, a support on the carriage for a container, and means for rotating and thereby tightening a closure device on said container, said tightening means including a spring, means for holding the spring under tension, means cooperating with the spring for causing the tension of the spring to rotate said closure device, a stationary cam, and means on the carriage controlled by said cam for determining and controlling the time and speed of rotation of the closure device by said spring.

5. A sealing machine comprising a carriage, means for rotating the carriage, a support on the carriage for a container, an arm mounted on the carriage for swinging movement, means for gripping a closure device, a coil spring held under tension, means interconnecting the spring with said arm and gripping device for causing the spring to swing said arm and for applying a torque to the closure device and thereby rotating it and tightening it on said container, a stationary cam, and a cam follower roll carried by said arm and running on the cam and thereby retarding and controlling the movement of said arm and said rotation of the closure device.

6. A machine for tightening caps on containers, comprising a carriage rotatable about a vertical axis, a support on the carriage for a container, means for gripping a cap, a rock arm on the carriage, means providing operating connections between said arm and said gripping means by which rocking movement of said arm rotates the gripping means and cap, a coil spring held under tension and connected to rock said arm, a stationary cam, and a cam follower roll on said arm and running on said cam, the cam being arranged to retard and control the movement of the rock arm during said rotation of the gripping means and cap.

7. A cap tightening machine comprising a carriage, means for rotating the carriage about a vertical axis, an annular series of supports for containers, shafts individual to said supports, gripping devices for gripping the caps connected to said shafts and rotatable therewith, rock arms mounted to rock about the axes of said shafts, a stationary cam track, cam rolls carried on said rock arms and running on the track, means for

applying torque to shafts for rotating them and thereby tightening the caps on the containers, and means providing motion transmitting connections between each said rock arm and the next succeeding shaft to the one about whose axis the rock arm rocks whereby rotation of a shaft for tightening a cap imparts rocking movement to the connected rock arm, said rocking movement being controlled by the stationary cam track.

8. A cap tightening machine comprising a carriage, means for rotating the carriage about a vertical axis, an annular series of supports for containers, shafts individual to said supports, gripping devices for gripping the caps connected to said shafts and rotatable therewith, rock arms mounted to rock about the axes of said shafts, a stationary cam track, cam rolls carried on said rock arms and running on the track, coil springs individual to and surrounding said shafts, each said spring being connected to its said shaft and held under tension for applying torque to the connected shaft for rotating it and thereby rotating the connected gripping device and cap, and means providing driving connections between the said shafts and rock arms.

9. A vacuum sealing machine comprising a carriage, means for rotating it about a vertical axis, an annular series of container supports mounted on the carriage, sealing units individual to said supports, said units being mounted on the carriage above the supports, each said sealing unit comprising a vertically disposed rotatable shaft, gripping means actuated by said shaft for gripping a container cap, spring means individual to said shafts for applying torque to the shafts and thereby rotating them and tightening the caps on the containers, rock arms individual to said shafts, pinions on said shafts, racks carried on said rock arms and engaging said pinions, a stationary cam track, and cam follower rolls carried on said arms and running on said track.

10. A vacuum sealing machine comprising a carriage, means for rotating it about a vertical axis, an annular series of container supports mounted on the carriage, sealing units individual to said supports, said units mounted on the carriage above the supports, each said sealing unit comprising a vertically disposed rotatable shaft, gripping means actuated by said shaft for gripping a container cap, rock arms individual to said shafts, pinions on said shafts, racks carried on said rock arms and engaging said pinions, a stationary cam track, cam follower rolls carried on said arms and running on the cam track, and coil springs mounted on said shafts, each spring being connected at one end to a said shaft and held under tension applying torque to the shaft for rotating it and thereby tightening the caps on the containers.

11. A vacuum sealing machine comprising a carriage, means for rotating it about a vertical axis, an annular series of container supports mounted on the carriage, sealing units individual to said supports, said units mounted on the carriage above the supports, each said sealing unit comprising a vertically disposed rotatable shaft, gripping means actuated by said shaft for gripping a container cap, rock arms individual to said shafts, pinions on said shafts, racks carried on said rock arms and engaging said pinions, a stationary cam track, cam follower rolls carried on said arms and running on the cam track, and coil springs mounted on said shafts, each spring being connected at one end to a said shaft and held under tension applying torque to the shaft for rotating it and thereby tightening the caps on the containers, said cam track comprising a portion concentric with the axis of the carriage and a recessed portion, permitting the said rock arms to swing inwardly under the tension of said springs, said operating portion of the cam shaped to permit each cam roll to run off the track when a predetermined torque has been applied to the cap determined by the tension of said spring.

12. A machine for tightening caps on containers, comprising a carriage rotatable about a vertical axis, an electric motor operatively connected to rotate the carriage, means for supporting a container on the carriage for rotation therewith, a cap gripping device for gripping a cap which has been placed loosely on a container, a rotary element connected to the gripping device, a spring operatively connected to said rotary element for rotating it and thereby rotating the gripping device and the cap relative to the container and tightening the cap, an arm mounted for movement on the carriage, means providing operating connections between said arm and said rotary element by which the arm is caused to move in synchronism with the rotation of said rotary element, a stationary cam track, a cam follower roll carried by said arm and running on the cam track, said track comprising an operating cam section controlling the movement of said arm while the said rotating element is being rotated for tightening the cap, said cam section being arranged to retard and control the rotation of said rotatable element during the tightening of the cap and causing the roll to run free of the cam when the cap has been tightened to a degree determined by the tension of the spring.

13. The combination of a carriage, means for rotating it about an axis, a support for a container, said support being mounted to rotate with the carriage, a closure gripping device mounted to rotate with the carriage, a coil spring held under tension and operatively connected to the gripping device for rotating the latter and thereby rotating a cap on the container, a stationary cam, and means operated thereby for rewinding the spring.

14. The combination of a carriage, means for rotating it about an axis, a support for a container, said support being mounted to rotate with the carriage, a closure gripping device mounted to rotate with the carriage, a coil spring held under tension and operatively connected to the gripping device for rotating the latter and thereby rotating a cap on the container, a stationary cam track, and means actuated thereby for controlling the said rotation of the cap and for rewinding said spring.

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