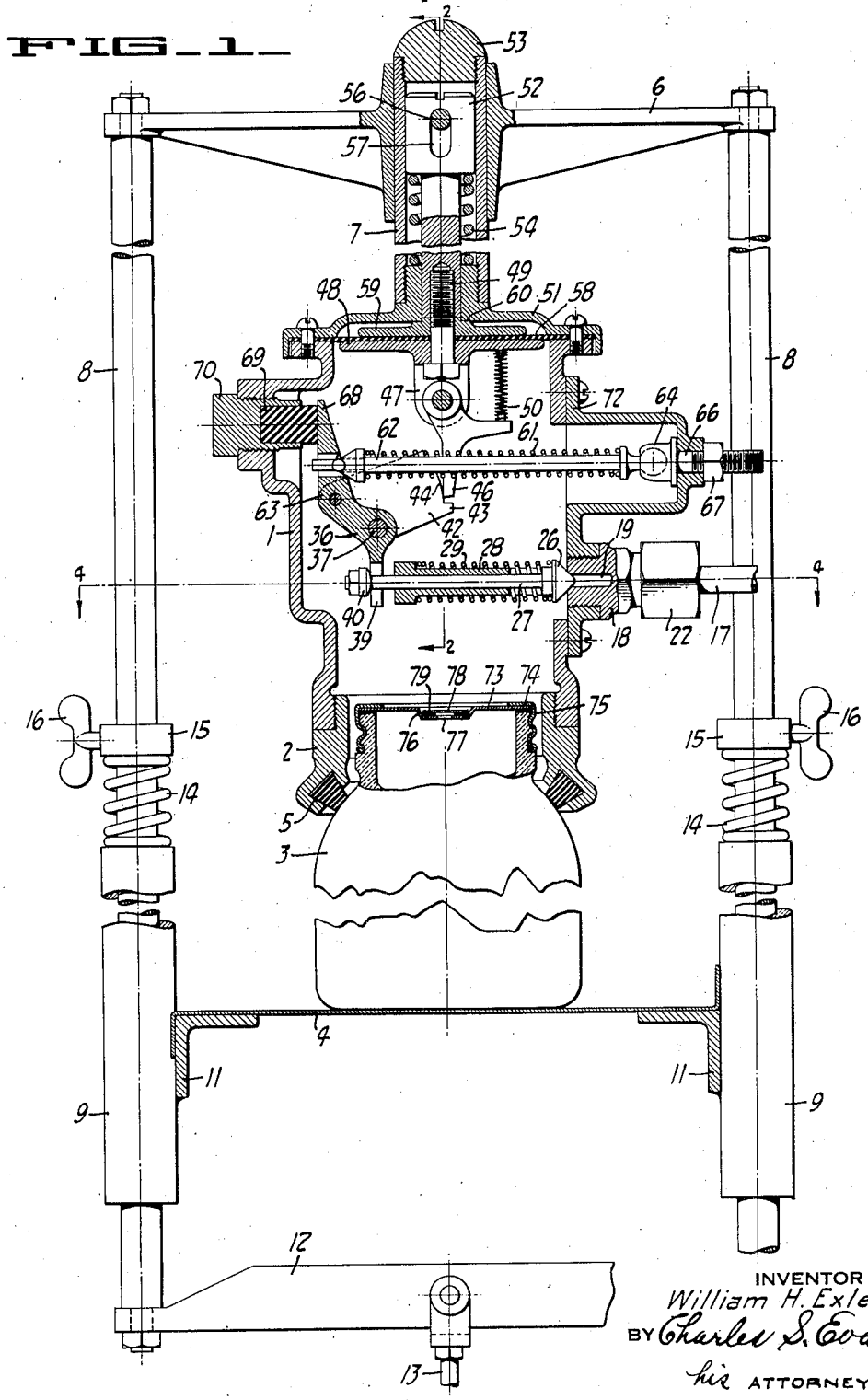
Nov. 30, 1943. W. H. EXLEY 2,335,502

VACUUM SEALING DEVICE

Filed April 11, 1941 2 Sheets-Sheet 1

FIG. 1



INVENTOR
William H. Exley
BY Charles L. Evans
his ATTORNEY

Nov. 30, 1943. W. H. EXLEY 2,335,502

VACUUM SEALING DEVICE

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FIG_4_

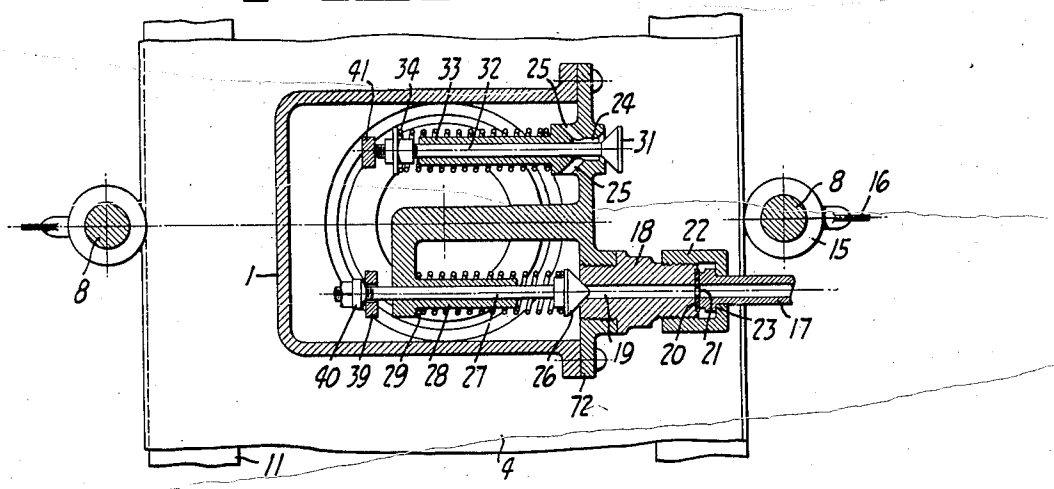


FIG_2

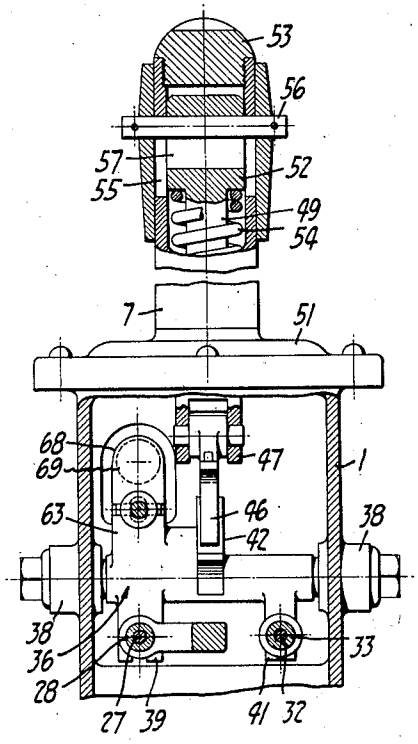
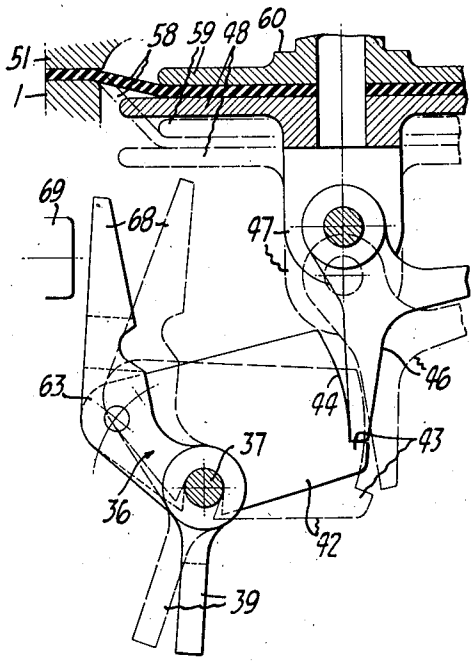


FIG_3_



INVENTOR
William H. Exley
BY Charles L. Evans
his ATTORNEY

Patented Nov. 30, 1943 2,335,502

UNITED STATES PATENT OFFICE

2,335,502

VACUUM SEALING DEVICE

William H. Exley, San Jose, Calif.

Application April 11, 1941, Serial No. 388,114

9 Claims. (Cl. 226—82)

My invention relates to a device for sealing containers in vacuum; and particularly to a vacuum head for packing products in vacuum, whereby containers are arranged to be sealed under controlled conditions of vacuum.

It is among the objects of my invention to provide a vacuum head for sealing containers in vacuum, provided with means responsive to movement of the head and container into sealing engagement for creating vacuum within the head.

Another object is to provide a vacuum head provided with means responsive to vacuum created within the head for breaking the vacuum within the head.

Another object is the provision of means for regulating the degree of vacuum effective for breaking the vacuum within a vacuum sealing head.

A further object is to provide means for restricting the rate at which vacuum is created within a vacuum head, and for varying the degree of such restriction to meet varying requirements.

A further object is the provision of valve operating mechanism embodying improved features of structure and arrangement.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of my invention. It is to be understood that I do not limit myself to this disclosure of species of my invention, as I may adopt variant embodiments thereof within the scope of the claims.

In the drawings:

Figure 1 is a front elevation of the vacuum sealing device of my invention, partly in vertical section.

Figure 2 is a fragmental sectional view of the upper end of the head, extension and stem for actuating the valve mechanism, the section being taken upon the line 2—2 of Figure 1 in the direction indicated.

Figure 3 is a front elevation, showing a portion of the valve actuating mechanism.

Figure 4 is a section taken upon the line 4—4 of Figure 1 in the direction indicated.

In terms of broad inclusion the sealing device of my invention comprises a head arranged to effect sealing engagement with a container to be sealed in vacuum. The head is arranged to be connected to a source of sub-atmospheric pressure for creating a vacuum therein; and is provided with a vent for breaking the vacuum. Valves associated with the vacuum connection and the vent are normally positioned to close the vacuum connection and open the vent; and a valve actuating member is provided for displacing the valves from their normal positions so as to simultaneously open the vacuum connection and close the vent.

Mechanism responsive to movement of the head and container into sealing engagement is arranged to impart an initial movement of the valve actuating member to valve displacing position. Means responsive to vacuum created in the head while the valves are so displaced imparts further movement to the valve actuating mechanism such as to cause the valves to be released to their normal positions. thereby closing the vacuum connection and opening the vent. Means resisting the valve releasing movement are arranged to be adjusted from outside the head for regulating the degree of vacuum effective for releasing the valves to vacuum breaking position.

My invention also contemplates the provision of interchangeable means for restricting the rate at which vacuum is created within the head, and to permit the rate of evacuation to be varied in accordance with requirements.

In terms of greater detail, the sealing device of my invention comprises a vacuum head, designated in general by the numeral 1, provided with an adaptor 2, arranged to effect sealing engagement with a container 3, resting upon a suitable support 4.

For purpose of illustration, I have shown an arrangement wherein the head 1 is supported by a yoke 6, engaging the upper end of a hollow extension 7, upon the top of the head. The ends of the yoke 6 are secured to a pair of supporting rods 8, slidably engaging guides 9, secured to the frame 11 of the support 4. The lower ends of the rods 8 are secured to a yoke bar 12. A pull rod 13, connected to the bar 12, is arranged to be operated by a foot pedal or other suitable actuating mechanism, not illustrated, for imparting downward movement to the rods 8 and head 1. Springs 14, mounted upon the rods 8, between the upper ends of the guides 9 and collars 15, secured to the rods, as by thumbscrews 16, normally hold the head 1 and rods 8 in normal raised position.

The head 1 is arranged to be connected to a source of sub-atmospheric pressure by means of a conduit 17, connected to the head by a suitable fitting 18, provided with a vacuum port 19. Preferably a disc 20, having a restricted orifice 21, is interposed between the fitting 18 and the adjacent end of the conduit 17 for restricting the

rate at which air may be withdrawn from the head 1. A collar 22 is threaded onto the fitting 18 and engages a shoulder 23 on the conduit 17 for securing the conduit to the fitting 18 in seating engagement with the disc 20.

The head 1 is also provided with a vent port 24 for opening the head to the atmosphere or other source of vacuum breaking pressure. Lateral passages 25 connect the port 24 with the interior of the head 1.

A valve 26, having a stem 27, mounted in a suitable guide 28, is arranged to seat upon the inner end of the fitting 18 for closing the vacuum port 19 thereof. A spring 29 normally holds the valve 26 in port closing position. A second valve 31, provided with a stem 32, extending through a guide 33, is mounted in association with the vent port 24. A spring 34 normally tends to move the valve 31 from an unseated position to a position closing the vent port 24.

The valves 26 and 31 are preferably positioned in spaced parallel relation; and are arranged to be operated simultaneously by a valve actuating yoke 36, pivoted within the head by means of a shaft 37. The ends of the shaft 37 are journaled in bearing members 38, secured to opposite walls of the head 1.

The yoke 36 is provided with a forked arm 39, straddling the stem 27, and engaging a shoulder 40, provided on the stem for displacing the valve 26 from its normal port closing position, against the resistance of the spring 29. A second arm 41 is arranged to engage the stem 32 for moving the valve 31 against the resistance of the spring 34 to unseat the valve 31 and open the vent port 24.

The yoke 36 is operated by means of a lever arm 42, secured to the yoke and provided with a tooth 43 and a cam area 44. The tooth 43 is arranged to be engaged by a pawl 46, pivoted upon a boss 47 upon the lower side of a diaphragm plate 48, bolted or otherwise secured to the lower end of a stem 49, slidably movable within the extension 7 of the head 1. The pawl 46 is normally held against the cam area 44 and in alignment with the tooth 43 by a spring 50.

The stem 49 extends through a cover plate 51, upon the top of the head 1, which provides a guide for the lower end of the rod. The upper end of the stem is provided with an enlarged head 52, arranged to effect a sliding fit with the inside surface of the extension 7. A cap 53 closes the upper end of the extension. A suitable spring 54 is mounted over the stem 49, between the plate 51 and head 52, for holding the stem in a normally raised position, and for resisting downward movement of the stem within the extension 7.

A pin 56, carried by the yoke bar 6, extends through slots 55 in the upper end of the extension 7; and also through a slot 57 in the head 52. The pin 56 normally supports the weight of the head 1. The slots 55 and 57 permit a limited movement of the pin 56 relative to the extension 7. The slots 55 are longer than the slot 57 to permit a limited movement of the stem 49 independently of the extension 7.

A yieldable diaphragm 58, of rubber or other suitable elastic material, is clamped between the diaphragm plate 48 and an upper diaphragm plate 59, secured to the lower end of the stem 49. The edge portion of the diaphragm is clamped between the body of the head 1 and the cover plate 51. The lower diaphragm plate 48 fits fairly closely inside the upper portion of the body of the head 1 and is movable therein in response to suction created within the head. The upper diaphragm plate 59 is of smaller diameter, such as to effectively clamp the diaphragm 58 against the plate 48; and at the same time permit the diaphragm to yield to inward movement of the plate 48. A shoulder 60, on the plate 59, normally seats against the under side of the cover plate 51.

A vacuum regulating spring 61 is mounted within the head 1 upon a rod 62. One end of the rod is engaged by an arm 63, carried by the valve actuating yoke 36. The other end of the rod 62 is connected, as by a ball and socket joint 64, to an adjusting screw 66, threaded through the wall of the head 1. The spring 61 is arranged to be compressed by the arm 63 as the yoke 36 is moved to displace the valves 26 and 31 from their normal positions, and to exert a predetermined resistance to such valve displacing movement. The degree of such resistance may be regulated by suitable adjustment of the screw 66. A lock nut 67, upon the outwardly extending portion of the screw 66, serves to secure the screw in adjusted position.

The spring 61 normally holds the arm 63 in a position with an extension 68 thereof seating against a bumper 69, preferably of rubber or similar material. The bumper may conveniently be mounted upon the inner end of a plug 70, threaded into the wall of the head 1.

The head 1 is preferably cast as a unit to which the cover plate 51 is secured. The head is arranged to receive a plate 72, covering an opening in a side of the head for giving access to the valve mechanism, and to facilitate the assembly thereof. The valve guides 28 and 33 are preferably cast integrally with the plate 72.

The adaptor 2 is threaded or otherwise replaceably secured to the lower end of the body 1. Adaptors of various sizes and shapes may be provided for use with containers 3 of various types and sizes, the adaptors being interchangeable as desired. Preferably, the adaptors are provided with gaskets 5, of rubber or other suitable material for effecting sealing engagement with the container to be sealed.

In operation, a container 3 is positioned on the support 4 in alignment with the adaptor 2; and the pull rod 13 is operated to move the rods 8 and yoke 6 downwardly against the resistance of the springs 14 for moving the head 1 into engagement with the container. During the initial downward movement of the yoke 6, the head 1 is lowered bodily onto the top of the container. As the weight of the head 1 is rested on the container 3, further movement of the yoke 6 causes the pin 56 to move downwardly along the slots 55 and 57 until it engages the bottom of the slot 57. Continued downward movement then causes the stem 49 to be moved downwardly within the extension 7 until the pin 56 reaches the bottom of the slots 55, whereupon the pin 56 exerts a downward pressure by which the head is caused to press the adaptor 2 into sealing engagement with the top of the container.

The downward movement of the stem 49 within the extension 7 causes the pawl 46 to engage the tooth 43 and turn the lever arm 42 and valve actuating yoke 36 in a clockwise direction. The arms 39 and 41 of the yoke 36 are thereby moved to unseat the vacuum valve 26 from its normal seated position, and at the same time move the vent valve 31 to close the vent port 24, as shown in full lines in Figure 3 of the drawings.

The opening of the vacuum port 19 by the valve 26 causes air to be withdrawn from the head 1 and container 3. The rate at which air is withdrawn and vacuum is created within the head is restricted by the orifice 21 so as to prevent displacement of material from the container 3. If air is withdrawn from the head too rapidly, the suction tends to lift the material from the container. Light products, such as ground coffee, are more readily disturbed by suction then heavy ones, and hence require that the vacuum be created more slowly. By placing a disc 20 having a restricted orifice 21 of suitable size in the connection which communicates with the source of sub-atmospheric pressure, the rate at which vacuum is formed may be restricted to a degree suitable for the particular material which is being packed. Discs 20 having orifices 21 of various sizes are interchangeable for accommodating the head to the requirements of various products.

As vacuum is created within the head 1, the suction causes the diaphragm plate 48 and the stem 49 to be drawn downwardly into the head, the elastic diaphragm 58 being distorted to permit such movement. As the plate 48 is so moved, the pawl 46 imparts a further turning movement to the lever arm 42 such as to cause the cam area 44 to engage the pawl and force it out of engagement with the tooth 43, as indicated in dotted lines in Figure 3.

The turning movement of the lever arm 42 is resisted by the spring 61 acting against the arm 63. The resistance offered by the spring is adjusted by means of the screw 66, to control the degree of vacuum within the head effective for moving the diaphragm plate 48, to cause disengagement of the pawl 46 and tooth 43.

As the pawl 46 disengages the tooth 43, the spring 61, acting with the valve springs 29 and 34, causes the valve actuating yoke to turn back to its normal position and to release the valves 26 and 31 to their normal positions, thereby simultaneously closing the vacuum port 19 and opening the vent port 24. The breaking of the vacuum permits the diaphragm 58 to return to its normal position. The spring 54 raises the stem 49, and the pawl rides past the tooth and is swung back into alignment therewith by the spring 59.

The container 3 may be provided with any suitable type of closure arranged to permit air to be withdrawn from the container through the head 1, and to seal the container when the vacuum is broken. By way of illustration, I have shown a closure comprising a cap 73, provided with a gasket 74, arranged to effect sealing engagement with the top of the container, and held thereon by a collar 75. The center portion of the cap is recessed at 76; and is provided with an opening 77 through which air may be exhausted from the container. A closure disc 78, provided with a gasket 79, is arranged to seat in the recess 76 for sealing the opening. Vacuum created within the head 1 causes the disc 78 to be raised sufficiently to permit air to be exhausted from the container. As soon as the vacuum within the head is broken, atmospheric pressure immediately seats the disc, and seals the opening 77.

While I have illustrated and described an arrangement wherein the head 1 is arranged to be moved downwardly onto a container 3, the operation may of course be reversed to provide for movement of the container upwardly into engagement with the head. In such an arrangement, the operation would be the same as that above described except that, as the container 3 engages the head 1, the head will be raised to cause the pin 56 to engage and cause initial relative movement of the stem 49 for actuating the valve mechanism to vacuum creating position. Further movement of the head would be limited by the slots 55, and when the bottoms of the slots 55 engage the pin 56, the head will be held stationary while the container is pressed into sealing engagement with the adaptor 2. Further movement of the stem 49, and diaphragm plate 48, in response to vacuum created within the head, would cause the breaking of the vacuum within the head in the manner above described.

I claim:

1. A sealing device comprising a head having a port communicating with a source of sub-atmospheric pressure, means for effecting sealing engagement of the head with a container, a valve normally closing said port, a valve operating member within the head, actuating means engaging said member and responsive to relative movement of the head and container into sealing engagement for moving said member to valve opening position, means responsive to vacuum created within said head for releasing the valve to its normal port closing position, and means for automatically breaking the vacuum within the head coincidently with the closing of said valve.

2. A sealing device comprising a head having a port communicating with a source of sub-atmospheric pressure, means for effecting sealing engagement of the head with a container, a valve normally closing said port, a valve operating member within the head, actuating means engaging said member and responsive to relative movement of the head and container into sealing engagement for moving said member to valve opening position, means responsive to vacuum created within said head for releasing the valve to its normal port closing position, means for automatically breaking the vacuum within the head coincidently with the closing of said valve, and means for regulating the degree of vacuum effective for releasing the valve.

3. A sealing device comprising a head having a vacuum forming connection and a vacuum breaking vent, means for relatively moving the head and a container into engagement, means upon the head for effecting a seal between the head and the container, a valve normally seated for closing the vacuum connection, a valve actuating member engaging the valve and movable for unseating said valve, a lever arm connected to the valve actuating member, a stem extending into the head, interengageable means upon the stem and lever for transmitting movement from the stem to the lever arm during an initial inward movement of the stem for displacing said valve, means responsive to further inward movement of the stem for disengaging said interengageable means for releasing said valve to normal position, means responsive to relative movement of the head and container into engaging relation for imparting such initial movement to the stem, means responsive to vacuum created within the head for imparting such further movement to said stem, and a second valve mounted in association with the vacuum breaking vent and controlled by the valve actuating member for closing said vent when the vacuum connection is open and for opening said vent when said connection is closed.

4. A sealing device comprising a head having

a vacuum forming connection and a vacuum breaking vent, means for moving the head into engagement with a container, means upon the head for effecting a seal between the head and the container, a valve normally seated for closing the vacuum connection, a valve actuating member engaging the valve and movable for unseating said valve, a lever arm connected to the valve actuating member, a stem extending into the head, interengageable means upon the stem and lever for transmitting movement from the stem to the lever arm during an initial inward movement of the stem for displacing said valve, means responsive to further inward movement of the stem for disengaging said interengageable means for releasing said valve to normal position, means responsive to relative movement of the head and container into engaging relation for imparting such initial movement to the stem, means responsive to vacuum created within the head for imparting such further movement to said stem, and means for regulating the degree of vacuum effective for imparting said further movement to said stem, and a second valve mounted in association with the vacuum breaking vent and controlled by the valve actuating member for closing said vent when the vacuum connection is open and for opening said vent when said connection is closed.

5. In a vacuum sealing device, the combination with a head having means to effect sealing engagement with a container and provided with a vacuum port and an atmospheric port, of a pair of valves associated with the ports for creating and breaking a vacuum within the head, a valve controlling member engaging the valves for initiating movement of said valves from vacuum breaking positions to vacuum creating positions, a lever arm connected to the valve actuating memebr, a stem mounted upon the head and provided with a pawl, a tooth upon the lever arm arranged to be enaged by the pawl, a cam area upon the lever arm for displacing the pawl from the tooth, means responsive to movement of the head and container into sealing engagement for moving the stem and pawl to impart initial movement to the lever arm, and means responsive to vacuum created in the head for further moving the stem and pawl to impart further movement to the lever arm for initiating recovery movement of the valve controlling member and valves to vacuum breaking position.

6. A sealing device comprising a head having a vacuum forming connection and a vacuum breaking vent, means for effecting sealing engagement of the head with a container, a valve normally closing said vacuum connection, a valve actuating member engaging the valve, means responsive to relative movement of the head and container into engagement for moving said member into valve opening position and responsive to vacuum created within the head for releasing the valve to its normal position, a second valve associated with the vacuum breaking vent and controlled by the valve actuating member for closing said vent concurrently with the opening of the vacuum forming connection and for opening said vent concurrently with the closing of said vacuum forming connection.

7. A sealing device comprising a head having a vacuum forming connection and a vacuum breaking vent, means upon the head for effecting sealing engagement of the head with a container, valves movable to open and close the connection and the vent, valve controlling means engaging the valves and movable for concurrently initiating movement of said valves from positions in which the vent is open and the connection closed to evacuating positions in which the vent is closed and the connection opened, means responsive to vacuum created within the head and container for further moving said valve controlling means to initiate recovery movement of said valves, and means for exerting a controlled resistance to said further movement of the valve controlling means.

8. A sealing device comprising a head having a vacuum forming connection and a vacuum breaking vent, means upon the head for effecting sealing engagement of the head with a container, valves movable to open and close the connection and the vent, valve controlling means engaging the valves and movable for concurrently initiating movement of said valves from positions in which the vent is open and the connection closed to evacuating positions in which the vent is closed and the connection opened, means responsive to vacuum created within the head and container for further moving said valve controlling means to initiate recovery movement of said valves, means for exerting a controlled resistance to said further movement of the valve controlling means, and means operable from outside the head for regulating the degree of said resistance.

9. A sealing device comprising a head having a vacuum forming connection and a vacuum breaking vent, means upon the head for effecting sealing engagement of the head with a container, valves movable to open and close the connection and the vent, valve controlling means engaging the valves and movable for concurrently initiating movement of said valves from positions in which the vent is open and the connection closed to evacuating positions in which the vent is closed and the connection opened, means responsive to vacuum created within the head and container for further moving said valve controlling means to initiate recovery movement of said valves, means for exerting a controlled resistance to said further movement of the valve controlling means, and means for restricting the rate at which vacuum is created within the head.

WILLIAM H. EXLEY.