



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
20.04.2016 Bulletin 2016/16

(51) Int Cl.:
B65B 31/04 (2006.01)

(21) Application number: **15002927.0**

(22) Date of filing: **14.10.2015**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

(72) Inventors:
• **Picozza, Augusto A.**
Boca Raton, Florida 33498 (US)
• **Plazarte, Enrique**
Fort Lauderdale, Florida 33306 (US)
• **Harris, Jason**
Boca Raton, Florida 33498 (US)
• **Morales, Gustavo**
Brunswick, Ohio 44212 (US)

(30) Priority: **14.10.2014 US 201462063796 P**

(71) Applicant: **Sunbeam Products, Inc.**
Boca Raton, FL 33431 (US)

(74) Representative: **Vossius, Tilman**
Barkhoff Reimann Vossius
Prinzregentenstrasse 74
81675 München (DE)

(54) **VACUUM SEALER WITH ADJUSTABLE HEAD**

(57) A vacuum sealer (10) including a base (12) defining a support surface (16) and a body (20) extending from the base (12). A suction head (40) is supported by the body (20) and is moveable along the body (20) toward and away from the support surface (16). The suction head (40) supports a suction assembly (60) including a suction inlet (66) with a sealing member (64) thereabout. A suction pump (40) is configured to selectively provide a suction force to the suction inlet (66).

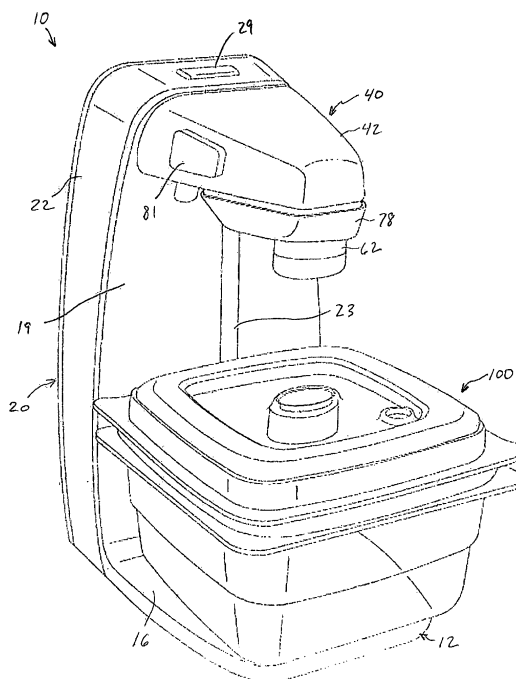


Fig. 1

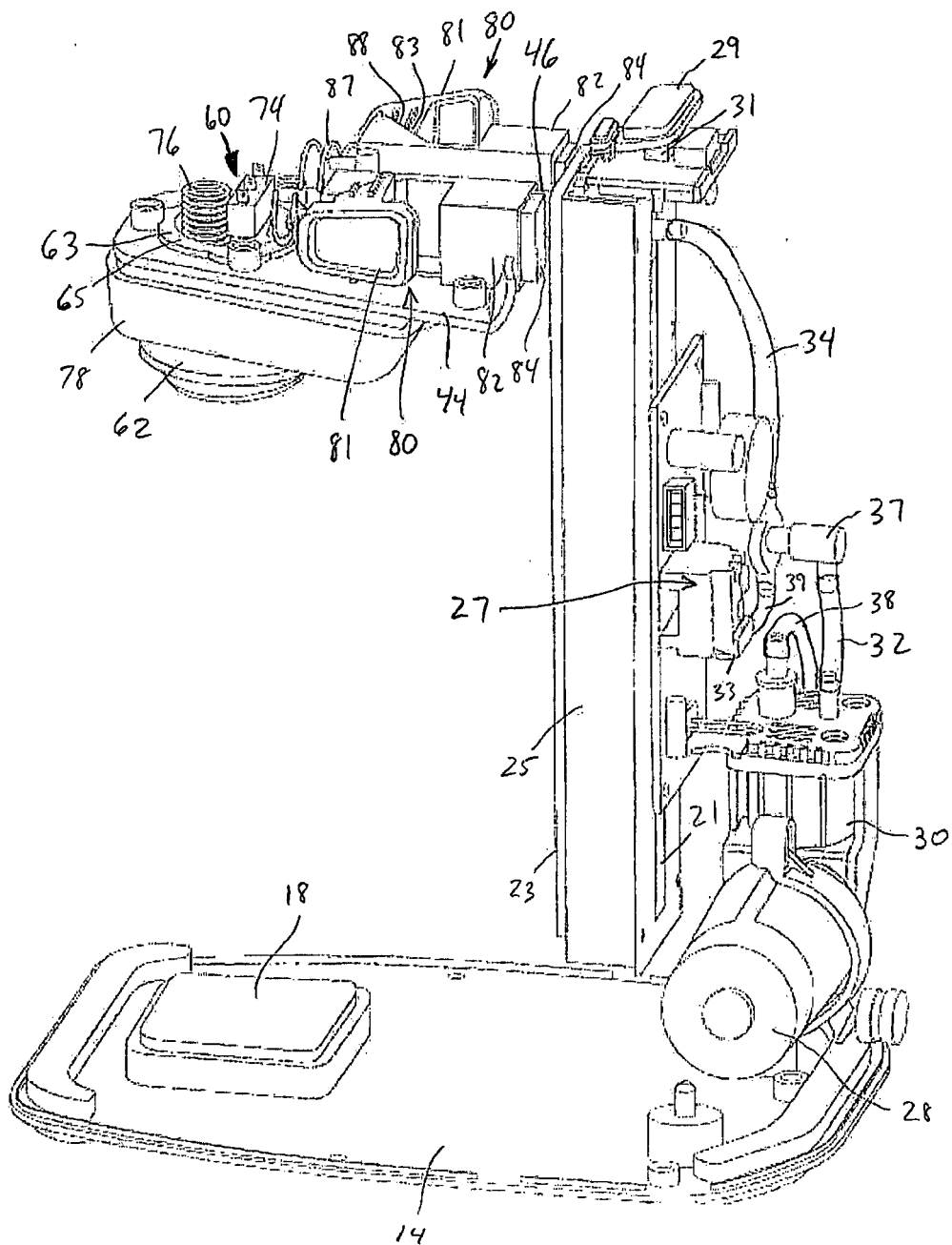


Fig. 3

Description

RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 62/063,796, filed October 14, 2014; and U.S. Provisional Application No. 62/101,428, filed on January 9, 2015; and U.S. Provisional Application No. 62/232,718, filed on September 25, 2015, the contents of each of which are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] This invention relates to vacuum sealers. More particularly, the invention relates to vacuum sealers with an adjustable head configured to engage and seal containers and bags.

BACKGROUND OF THE INVENTION

[0003] It is common practice to pack perishable goods in an evacuated bag of synthetic plastics material. There are two widely used procedures for evacuating and then sealing a bag. In the first procedure the packed but open bag is placed in a chamber with its open mouth lying on an anvil. The lid of the chamber is closed and this brings a heatable sealer bar into close proximity with the upper face of the bag. The chamber is evacuated and hence the bag flattens. Once the pressure in the chamber has fallen to a pre-set pressure, the sealer bar moves down towards the anvil. The bag is gripped between the anvil and the sealer bar and then current is supplied to a wire running along the sealer bar to weld the two walls of the bag together along a line adjacent the bag's mouth. The sealer bar moves away from the bag and anvil, the pressure in the chamber is allowed to rise to atmospheric and the lid is opened so that the evacuated and sealed bag can be removed from the chamber.

[0004] This procedure is initiated by pressing a start button once the lid is closed and the procedure which follows is fully automatic.

[0005] A disadvantage of this type of vacuum sealer is that the entire volume of the chamber must be evacuated regardless of the volume of the bag.

[0006] The second common method employs a vacuum sealer which has an anvil of resilient material and a sealer bar which can be lowered to grip the mouth region of the bag between itself and the anvil. A vacuum pipe passes between the anvil and sealer bar and enters the bag. Pneumatic cylinders press the sealer bar against the anvil and the sealer bar itself presses the part of the pipe which is between the anvil and sealer bar into the resilient material of the anvil. The air in the bag is sucked out through the pipe. Thereafter the pipe is withdrawn from the bag and from between the anvil and the sealer bar. The space left by the pipe as it withdraws is immediately closed-up by the material of the anvil which ex-

pands resiliently to fill the space and maintain the mouth of the bag sealed.

[0007] Power is then applied to the resistance wire of the sealer bar to weld the two faces of the bag together and form the seal which closes the bag.

[0008] Unless care is taken to place the inlet end of the pipe close to the product being packed, the bag can be sucked onto the pipe inlet end. Once the pipe inlet end is obstructed the time taken to evacuate the bag increases and a poor vacuum is obtained, there usually being residual air left in the bag.

SUMMARY OF THE INVENTION

[0009] In at least one embodiment, the present invention provides a vacuum sealer including a base defining a support surface and a body extending from the base. A suction head is supported by the body and is moveable along the body toward and away from the support surface. The suction head supports a suction assembly including a suction inlet with a sealing member thereabout. A suction pump is configured to selectively provide a suction force to the suction inlet.

[0010] In at least one embodiment, the vacuum sealer base defines a reference platform aligned with the suction assembly such that a valve assembly of a container or bag is easily alignable with the suction assembly.

[0011] In at least one embodiment, the vacuum sealer includes a microcontroller and a motor configured to actuate the suction pump and the microcontroller is associated with one or both of a manual switch or an automatic switch configured to signal the microcontroller to activate the motor. The automatic switch is configured to signal the microcontroller when the suction assembly is forced into the suction head by a given distance. In at least one embodiment, the vacuum sealer includes a sensor configured to sense the vacuum pressure of a container or bag engaged by the suction assembly and the microcontroller is configured to deactivate the motor when a given vacuum pressure is reached.

[0012] In at least one embodiment, the suction assembly is moveable relative to the suction head and the suction assembly is biased to a position wherein the sealing member is furthest from the suction head.

[0013] In at least one embodiment, a guide extends within the body to define a linear track for the suction head and the suction head includes a guide arm extending from a support platform of the suction head to a guide block positioned within the body and configured for movement along the linear track. The support platform supports at least one brake member which is biased such that a brake pad thereof engages a face of a body housing and locks the position of the suction head relative to the support surface. A release button may be associated with each brake member. The release button includes a sloped surface which engages a sloped surface of the brake member such that depression of the release button causes the brake member to move away from the face

thereby disengaging the brake pad and allowing movement of the suction head relative to the body.

[0014] In at least one embodiment, the suction assembly includes a vacuum chamber into which the suction inlet opens and a suction outlet which is in fluid communication with the suction pump. A water flow mechanism may be positioned in the suction outlet and configured to signal a microcontroller to deactivate the suction pump upon detection of liquid in the vacuum chamber. The suction assembly may also include a liquid receiving chamber about the vacuum chamber which is configured to receive any liquid extracted via the suction inlet.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The accompanying drawings, which are incorporated herein and constitute part of this specification, illustrate the presently preferred embodiments of the invention, and, together with the general description given above and the detailed description given below, serve to explain the features of the invention. In the drawings:

Fig. 1 is a perspective view of a vacuum sealer in accordance with an exemplary embodiment of the invention with a container positioned for sealing.

Fig. 2 is a cross-sectional view along the line 2-2 in Fig. 1.

Fig. 3 is a perspective view of the vacuum sealer of Fig. 1 with the housing removed.

Fig. 4 is a perspective view of the head of the vacuum sealer of Fig. 1 with a portion of the housing removed.

Fig. 5 is a side elevation view in partial cross-sectional showing a vacuum sealer in accordance with another exemplary embodiment of the invention.

Fig. 6 is a perspective view of the vacuum sealer of Fig. 5 with a bag positioned for sealing.

Fig. 7 is a perspective view of a vacuum sealer in accordance with another exemplary embodiment of the invention.

Figs. 8-10 are perspective views of a vacuum sealer in accordance with another exemplary embodiment of the invention illustrating various operating positions.

Figs. 11-13 are perspective views of a vacuum sealer in accordance with another exemplary embodiment of the invention illustrating various operating positions.

Figs. 14-16 are perspective views of a vacuum sealer in accordance with another exemplary embodiment of the invention illustrating various operating positions.

Fig. 17 is a perspective view of a vacuum sealer in accordance with another exemplary embodiment of the invention in a bag sealing configuration.

Fig. 18 is a perspective view of the vacuum sealer of Fig. 17 in a container sealing configuration.

DETAILED DESCRIPTION OF THE INVENTION

[0016] In the drawings, like numerals indicate like elements throughout. Certain terminology is used herein for convenience only and is not to be taken as a limitation on the present invention. The following describes preferred embodiments of the present invention. However, it should be understood, based on this disclosure, that the invention is not limited by the preferred embodiments described herein.

[0017] Referring to Figs. 1-4, a vacuum sealer 10 in accordance with an exemplary embodiment of the invention will be described. The vacuum sealer 10 generally comprises a base 12 configured to support a container 100 or bag 150 (see Fig. 5) to be sealed, a body 20 extending generally perpendicular to the base 12 and a suction head 40 moveable relative to the body 20 for engagement with the container 100 or bag 150.

[0018] With reference to Figs. 2 and 3, the base 12 includes a bottom plate 14 and an upper portion 24 which defines the support surface 16. In the illustrated embodiment, the upper portion 24 extends from and is integral with the body 20 although other configurations are possible. A reference platform 18 extends from the bottom plate 14 and through the upper portion 24 such that the reference platform 18 extends above the support surface 16. The reference platform 18 is aligned with the suction assembly 60 of the suction head 40 such that a valve assembly 130 of either a container 100 or bag 150 may be easily aligned with the suction assembly 60. In the case of a bag 150, the user positions the bag with the valve assembly 130 positioned on the reference platform 18. A target marking or the like (not shown) may be provided on the reference platform 18.

[0019] With respect to a container, Fig. 2 shows an exemplary container 100 configured for use with the reference platform 18. The container 100 has a hollow body 102 defined by sidewalls 104 extending from a bottom surface 108 and terminating in a rim 106 about an open end 107. The bottom surface 108 has a concave central portion 110 from which an alignment projection 109 extends. In the current embodiment, the alignment projection 109 has a rectangular perimeter which complements the configuration of the reference platform 18. The reference platform 18 and alignment projection 109 may have other complimentary configurations, for example, circular, oval, pentagon etc.

[0020] The lid 120 of the container 100 has a skirt 124 depending from a top surface 122. The skirt 122 extends to a lower rim 126 with a channel 128 thereabout. An elastomeric sealing member 127 is positioned in the channel 128 and is configured to engage the rim 106 of the hollow body 102 to form a sealed connection between the lid 120 and the hollow body 102. A valve assembly 130 extends through the top surface 122 and is positioned such that it is aligned with the alignment projection 109 when the lid 120 is positioned on the hollow body 102 such that the valve assembly 130 is aligned with the

reference platform 18. The valve assembly 130 includes a tubular member 132 which extends through the top surface 122 to define the passage therethrough. The tubular member 132 extends above the top surface 122 although such may not be required. An inward shoulder 134 of the tubular member 132 defines a seat about the through passage 135. A valve member 138 is positioned within the tubular member 132 and includes a radially extending shoulder 136 configured to engage the seat and seal the through passage 135. The valve member 138 is biased toward sealing engagement, however, upon application of a sufficient suction force, the valve member 138 moves away from the seat and a suction force may remove air from the hollow body 102 and create a vacuum therein. Once the suction force is removed, the valve member 138 is configured to automatically return to the seated position. Other valve assemblies may be utilized in place of the described valve assembly 130.

[0021] To supply the suction force, a suction pump 30 and associated motor 28 are positioned within an internal chamber 26 of the body housing 22. Tubing 32 extends between the suction pump 30 and a tee connector 37 while further tubing 34, 36 and 67 extends between the tee connector 37 and the suction assembly 60. An exhaust tube 38 also extends from the suction pump 30 and is directed to a housing exhaust port (not shown). A tube 39 also extends from the tee connector 37 to a pressure sensor 33. While tubing is described herein, it is understood that other mechanisms, for example, integral piping or the like, may be utilized. The motor 28, suction pump 30 and the pressure sensor 33 are associated with a microcontroller 27 which is further associated with a manual activation switch 31 in the body 20 and an automatic switch 74 in the suction head 40. Actuation of the manual activation switch 31 by pressing button 29 or actuation of the automatic switch 74 by positioning the suction assembly 60 against a container or bag, as will be described hereinafter, causes the microcontroller 27 to actuate the motor 28 which in turn causes the suction pump 30 to generate a suction force in tube 32. The suction force is carried through tubes 32, 34, 36 and 67 to the suction assembly 60. The pressure sensor 33 monitors the generated suction through tube 39 and once a desired level of vacuum has been achieved in the container or bag, the microcontroller 27 is configured to automatically deactivate the motor 28 and thereby the suction pump 30. In a preferred embodiment, the microcontroller 27 is further configured to automatically deactivate the motor 28 after a certain time period as a fail-safe mechanism.

[0022] To facilitate movement of the suction head 40 up and down, and thereby bring the suction assembly 60 into engagement with a valve assembly 130, the body 20 includes a vertical track 25 configured to guide a slide block 48 within a vertical slot 21 (see Fig. 3). A wiper 23 or the like may extend across the vertical slot along the body housing 22 such that the vertical slot 21 is not externally visible. A guide arm 46 extends between the

guide block 48 and a head support platform 44. The support platform 44 supports the suction assembly 60, the brake assemblies 80 and a liquid cup 78. A housing member 42 is positioned on the support platform 44 to generally enclose the suction assembly 60 and the brake assemblies 80.

[0023] Referring to Figs. 3 and 4, the brake assemblies 80 control movement of the support platform 44, and thereby the suction head 40, relative to the body 20. Each brake assembly 80 includes a brake body 82 with a brake pad 84 positioned adjacent to a face 19 of the body housing 22. A spring assembly including two springs 87 and a synchronizing plate 89 biases the brake pads 84 into engagement with the face 19 which locks the vertical position of the suction head 40 relative to the body 20. Each brake assembly 80 includes a disengagement button 81 configured to be depressed to disengage the respective brake pad 84. Each disengagement button 81 is aligned with a notch 86 in the respective brake body 82. An inclined surface 83 on each disengagement button 81 is configured to engage a respective inclined surface 88 within the notch 86 such that as the button 81 is pushed into the notch 86, the inclined surface 83 engages the brake inclined surface 88 and pushes the respective brake pad 84 against the biasing force of the spring assembly and away from engagement with the face 19. With both buttons 81 depressed, the suction head 40 may be moved vertically relative to the body 20. Upon release of the buttons 81, the brake pads 84 automatically engage under the bias of the spring assembly and the vertical position of the suction head 40 is again locked.

[0024] Vertical movement of the suction head 40 allows the suction assembly 60 to be brought into engagement with a valve assembly 130 of a container 100 or bag 150 aligned with the reference platform 18. The suction assembly 60 includes a vacuum chamber 62 supported by a moveable cup 63 which extends through the support platform 44 and is supported thereon by a radially outward rim 65. The cup 63 is axially moveable toward the head housing 42, but is biased toward the seated position on the support platform 44 by a spring 76. The vacuum chamber 62 includes a central inlet 66 which is surrounded by a downwardly extending sealing member 64. The sealing member 64 has an inner diameter greater than the outer diameter of the valve tubular member 132 such that the sealing member 64 may receive the valve tubular member 132 and seal thereabout. With the sealing member 64 sealed about the valve tubular member 132, the valve assembly 130 is in sealed communication with the vacuum chamber 62.

[0025] As the suction head 40 is moved downward toward the container 100 or bag 150, the sealing member 64 engages a surface thereof and the vacuum chamber 62 and cup 63 are pushed into the suction head 40. As the cup 63 moves inward, it engages the automatic engagement switch 74, for example, a limit switch, and the microcontroller 27 activates the motor 28. In addition to biasing the cup 63 away from the switch 74, the spring

76 also biases the sealing member 64 toward the valve assembly 130, thereby maintaining a good seal between the suction assembly 60 and the container 100 or bag 150. The vertical movement of the suction head 40 avoids the need for a user to hold the suction assembly 60 against the container or bag while vacuuming.

[0026] When the motor 28 is actuated, the suction force of the suction pump 30 is directed to a vacuum chamber outlet 68 such that the suction force passes through the chamber 62 and the central inlet 66 to the valve assembly 130. A water flow mechanism 72 is positioned in the opposite end 70 of the vacuum chamber outlet 68. The water flow mechanism 72 is configured to signal the micro-controller 27 to shut off the motor 28, and thereby the pump 30, if liquid enters the vacuum chamber 62. To reduce the likelihood of liquid entering the vacuum chamber 62, a liquid receiving chamber 78 is provided about the vacuum chamber 62. Any extracted liquid fills in the liquid receiving chamber 78, which can be removed and emptied after use.

[0027] Referring to Figs. 5 and 6, a vacuum sealer 10' in accordance with another exemplary embodiment of the invention will be described. The vacuum sealer 10' is similar to the previous embodiment any only the different features will be described herein. In the present embodiment, the faces 19' of the body housing 20' define a corner configuration 17 adjacent the support surface 16' such that positioning of a bag 150 or container 100 into the corner configuration will align the valve assembly 130 with the suction assembly 60. Additionally, instead of guide track with slot, the body 20' includes a toothed track 225 engaged by a damper gear 226 and a torsion spring gear 227 to control the vertical movement. A lever 224 pivotally connected to the suction head 40' includes a projection configured to engage the toothed track 225 to lock the vertical position of the suction head 40' relative to the body 20'. In other respects, the vacuum sealer 10' operates in a similar manner to that described above.

[0028] Referring to Fig. 7, a vacuum sealer 10" in accordance with another exemplary embodiment of the invention will be described. The vacuum sealer 10" is similar to the first embodiment with a suction head 40" vertically adjustable relative to the body 20". In the present embodiment, the motor, pump and microcontroller (not shown) are positioned within the suction head 40' and move therewith. Such a configuration eliminates the need for tubing and the like passing from the body 20" and the movable suction head 40". Similar to the previous embodiment, the base 12" includes a support surface 16" with a corner configuration to assist with alignment of the bag or container with the suction assembly. In other respects, the vacuum sealer 10" operates in a similar manner to that described above.

[0029] Referring to Figs. 8-10, a vacuum sealer 10''' in accordance with another exemplary embodiment of the invention will be described. The vacuum sealer 10''' is similar to the previous embodiments. In the present embodiment, the base 12''' includes a first support surface

16''' with a corner configuration 17 and a second, raised support surface 15. Additionally, the suction head 40''' is supported relative to the body 20''' for both vertical motion and rotational motion. A container 150 may be positioned on the first support surface and engaged by the suction assembly 60 in the orientation illustrated in Fig. 8. To reduce the vertical travel of the suction head 40''' when using with a bag, the suction head 40''' is rotated relative to the body 20''' until the suction assembly 60 is aligned with the second, raised support surface 15 as illustrated in Fig. 9. The suction head 40''' is then moved a shorter vertical distance as illustrated in Fig. 10. In other respects, the vacuum sealer 10''' operates in a similar manner to that described above.

[0030] Referring to Figs. 11-13, a vacuum sealer 10^{iv} in accordance with another exemplary embodiment of the invention will be described. The vacuum sealer 10^{iv} is similar to the previous embodiments. In the present embodiment, the suction head 40^{iv} includes a first portion 41 which is moveable relative to the body 20^{iv} and a second portion 43 which supports the suction assembly 60 and which is moveable relative to the first portion 41. A container may be positioned on the support surface 16" of the base 12" and engaged by the suction assembly 60 by moving the first portion 41 relative to the body 20^{iv} as illustrated in Fig. 12. When using with a bag, the first portion 41 is moved relative to the body 20^{iv} and then the second portion 43 is moved relative to the first portion 41 as illustrated in Fig. 13. In other respects, the vacuum sealer 10^{iv} operates in a similar manner to that described above.

[0031] Referring to Figs. 14-16, a vacuum sealer 10^v in accordance with another exemplary embodiment of the invention will be described. The vacuum sealer 10^v is similar to the previous embodiments. In the present embodiment, the suction assembly 60^v of the suction head 40^v includes an extension tube 47 which may be extended via a slider 45. A container may be positioned on the support surface 16" of the base 12" and engaged by the suction assembly 60^v by moving the extension tube 47 out from the suction head 40^v via the slider 45 as illustrated in Fig. 15. When using with a bag, the extension tube 47 is moved out from the suction head 40^v via the slider 45 and then the suction head 40^v is moved relative to the body 20^v as illustrated in Fig. 16. In other respects, the vacuum sealer 10^v operates in a similar manner to that described above.

[0032] Referring to Figs. 17-18, a vacuum sealer 10^{vi} in accordance with another exemplary embodiment of the invention will be described. The vacuum sealer 10^{vi} includes a clamshell body 20^{vi} including opposed body housing portions 22a and 22b connected to one another via a body hinge 13. A support surface 16^{vi} is defined between the body housing portions 22a, 22b. A suction assembly 60^{vi} extends through body housing portion 22a and is movable relative thereto to engage the valve 130 of a bag 150 positioned on the support surface 16^{vi}. To utilize the sealer 10^{vi} with a container 100', the body

housing portion 22b is pivoted about the body hinge 13 to an orientation similar to that shown in Fig. 18 wherein the body housing portion 22a may be aligned with the container and the suction assembly 60^{vi} moved into contact with the valve assembly 130 by moving relative to the housing portion. In other respects, the vacuum sealer 10^{vi} operates in a similar manner to that described above.

[0033] These and other advantages of the present invention will be apparent to those skilled in the art from the foregoing specification. Accordingly, it will be recognized by those skilled in the art that changes or modifications may be made to the above-described embodiments without departing from the broad inventive concepts of the invention. It should therefore be understood that this invention is not limited to the particular embodiments described herein, but is intended to include all changes and modifications that are within the scope and spirit of the invention as defined in the claims.

Claims

1. A vacuum sealer comprising:

a base defining a support surface;
a body extending from the base;
a suction head supported by the body and moveable along the body toward and away from the support surface, the suction head supporting a suction assembly including a suction inlet with a sealing member thereabout; and
a suction pump configured to selectively provide a suction force to the suction inlet.

2. The vacuum sealer of claim 1 wherein the base defines a reference platform aligned with the suction assembly.

3. The vacuum sealer of claim 1 further comprising a microcontroller and a motor configured to actuate the suction pump, wherein the microcontroller is associated with at least one switch configured to signal the microcontroller to activate the motor.

4. The vacuum sealer of claim 3 wherein the at least one switch is a manual switch.

5. The vacuum sealer of claim 3 wherein the at least one switch is an automatic switch configured to signal the microcontroller when the suction assembly is forced into the suction head by a given distance.

6. The vacuum sealer of claim 3 further comprising a sensor configured to sense the vacuum pressure of a container or bag engaged by the suction assembly and the microcontroller is configured to deactivate the motor when a given vacuum pressure is reached.

7. The vacuum sealer of claim 1 wherein the suction assembly is moveable relative to the suction head and the suction assembly is biased to a position wherein the sealing member is furthest from the suction head.

8. The vacuum sealer of claim 1 wherein a guide extends within the body to define a linear track for the suction head.

9. The vacuum sealer of claim 8 wherein the suction head includes a guide arm extending from a support platform of the suction head to a guide block positioned within the body and configured for movement along the linear track.

10. The vacuum sealer of claim 9 wherein the support platform supports at least one brake member which is biased such that a brake pad thereof engages a face of a body housing and locks the position of the suction head relative to the support surface.

11. The vacuum sealer of claim 10 wherein a release button is associated with each brake member, the button including a sloped surface which engages a sloped surface of the brake member such that depression of the button causes the brake member to move away from the face thereby disengaging the brake pad and allowing movement of the suction head relative to the body.

12. The vacuum sealer of claim 1 wherein the suction assembly includes a vacuum chamber into which the suction inlet opens and a suction outlet which is in fluid communication with the suction pump.

13. The vacuum sealer of claim 12 wherein a water flow mechanism is positioned in the suction outlet and is configured to signal a microcontroller to deactivate the suction pump upon detection of liquid in the vacuum chamber.

14. The vacuum sealer of claim 13 wherein the suction assembly includes a liquid receiving chamber about the vacuum chamber which is configured to receive any liquid extracted via the suction inlet.

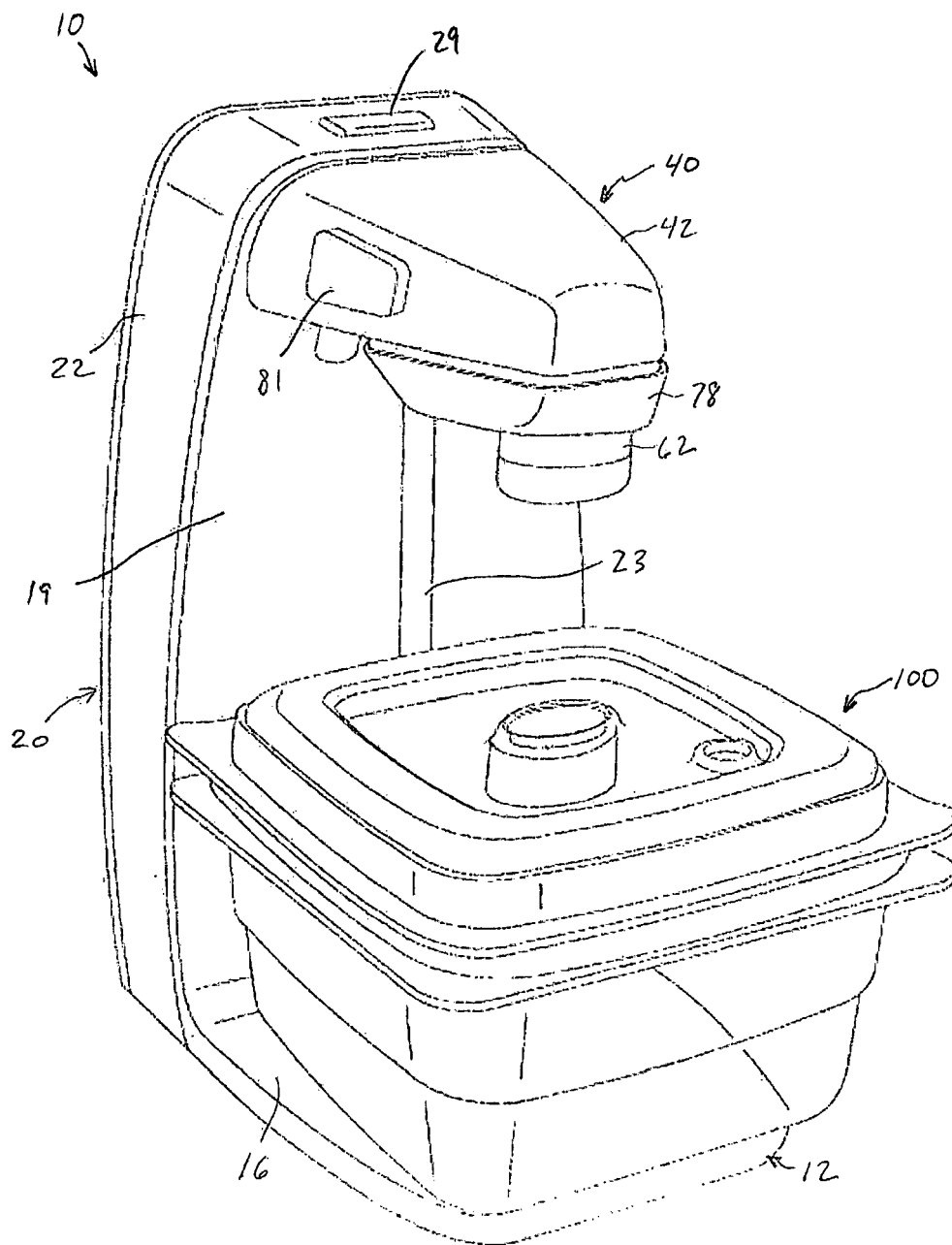


Fig. 1

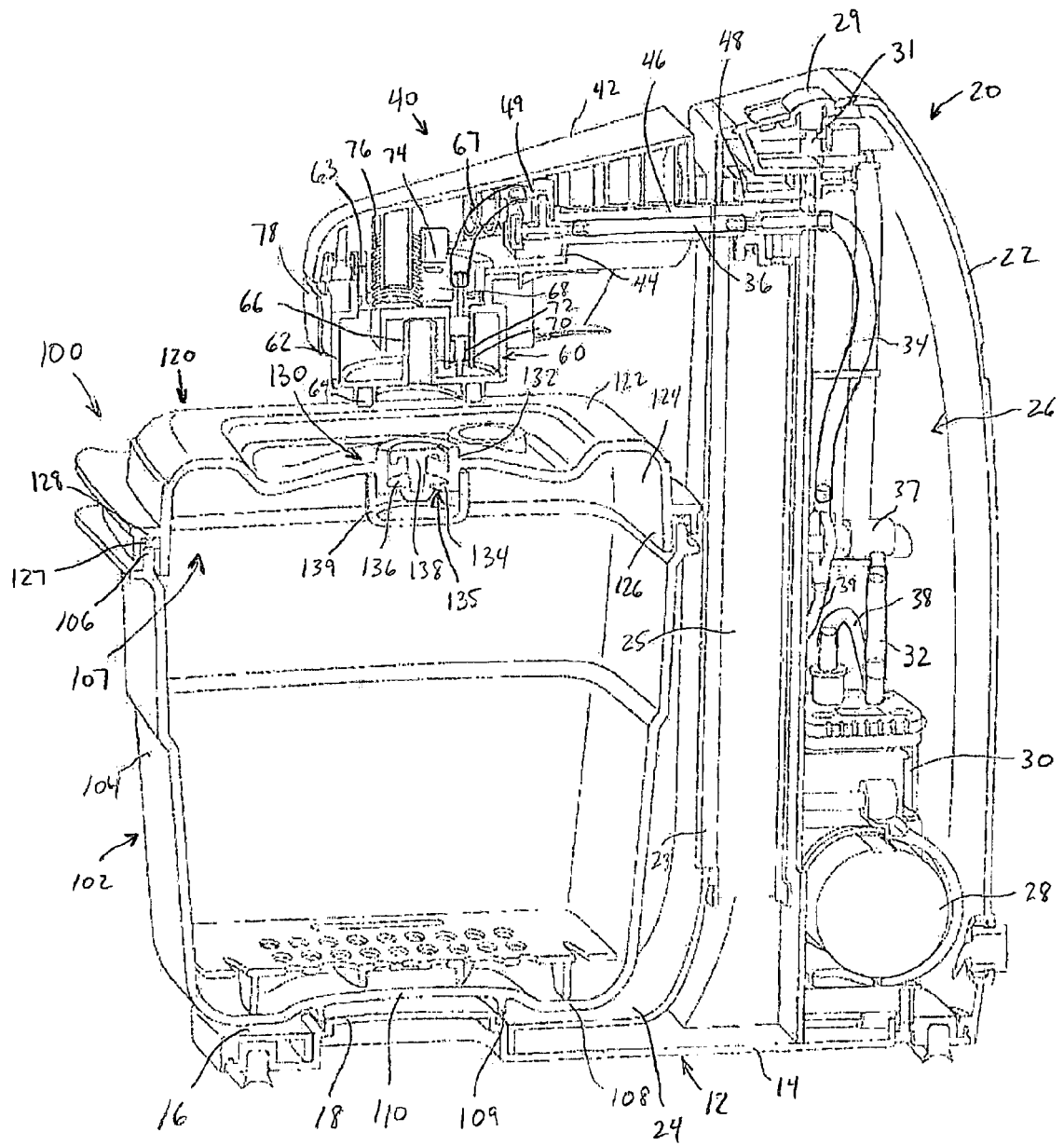


Fig. 2

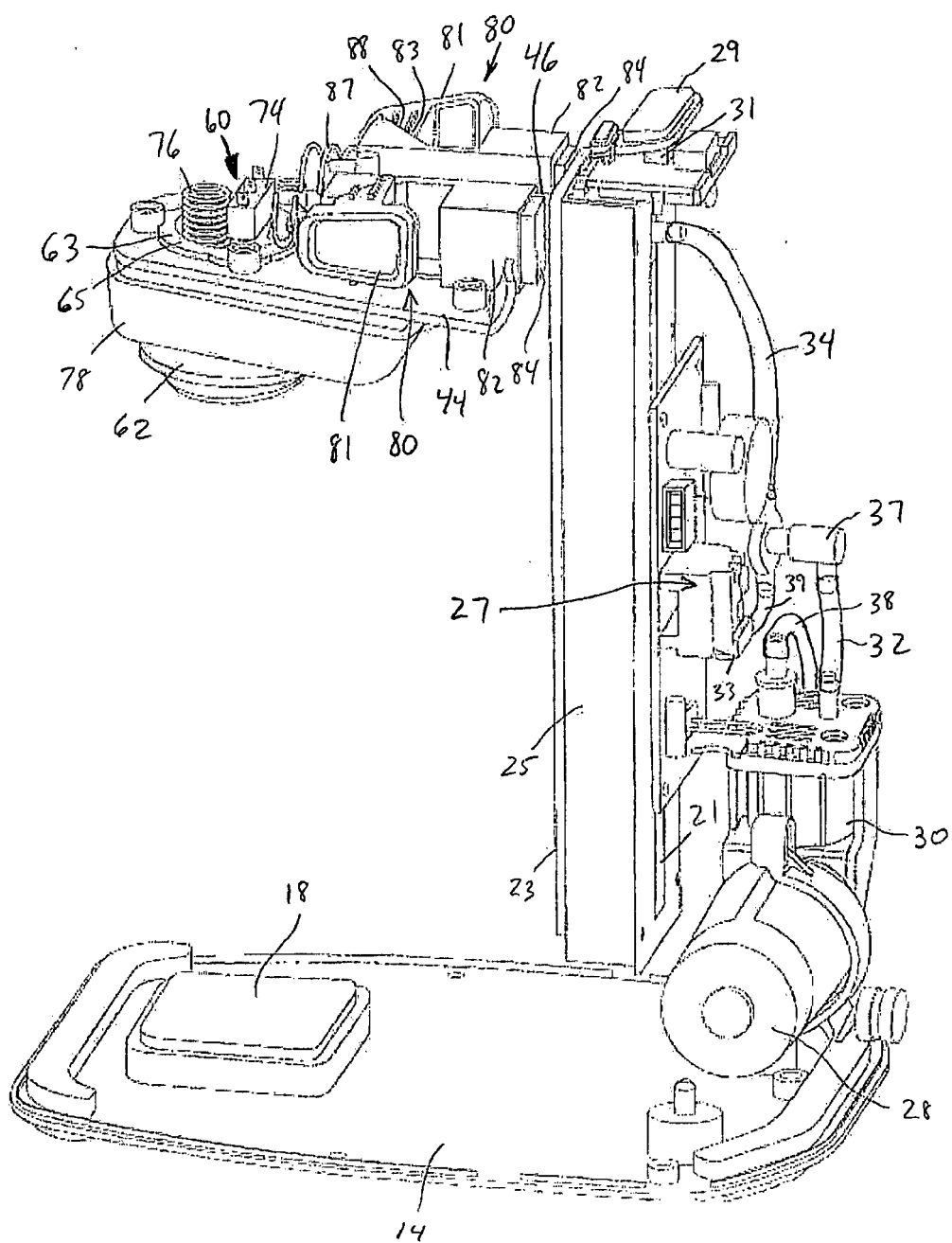


Fig. 3

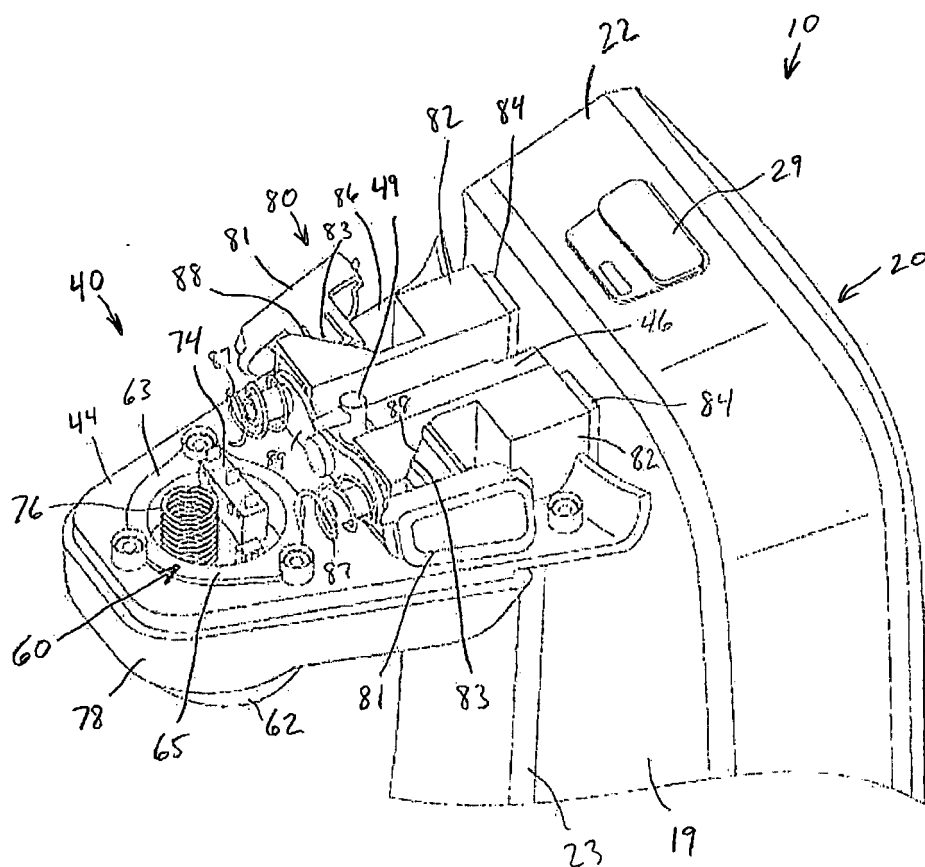


Fig. 4

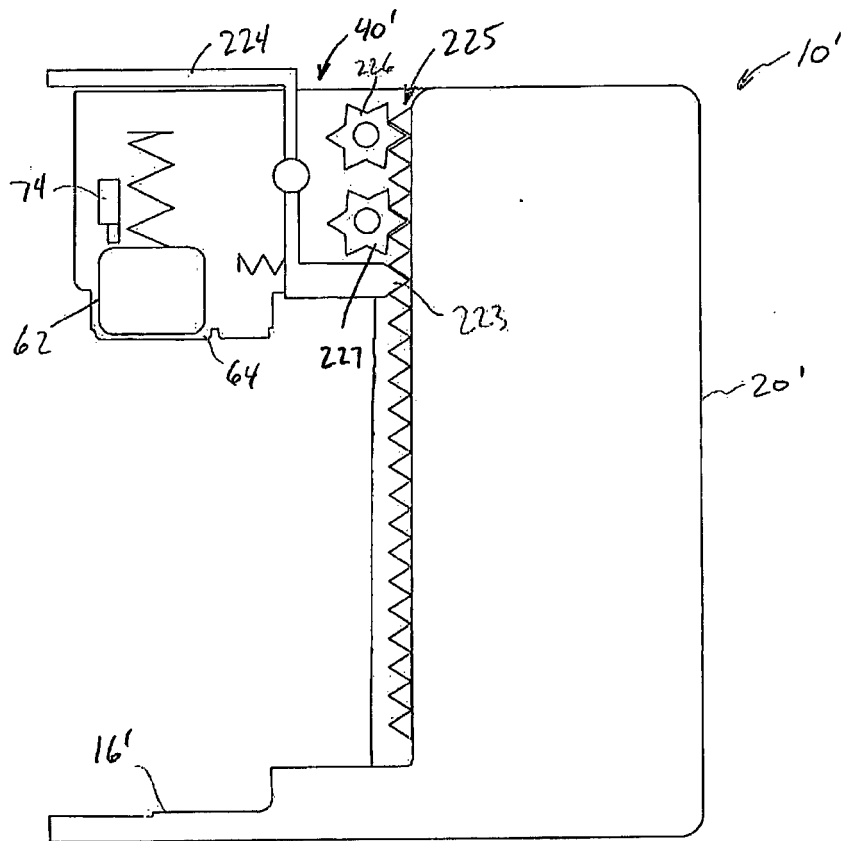


Fig. 5

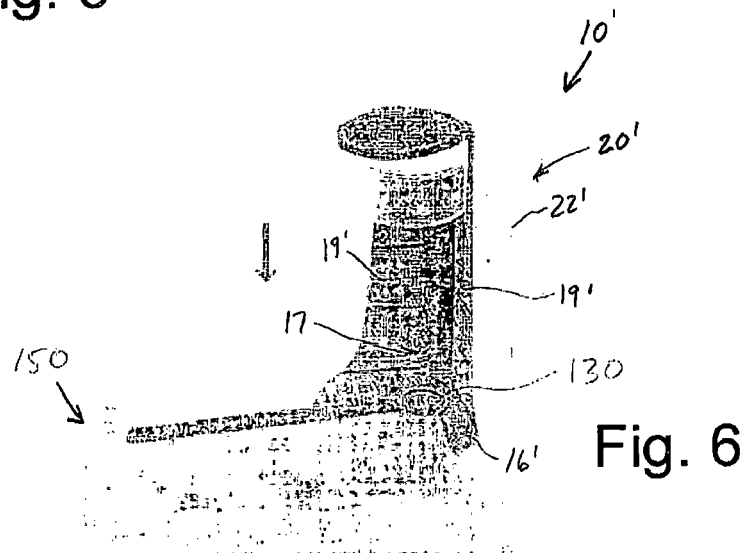
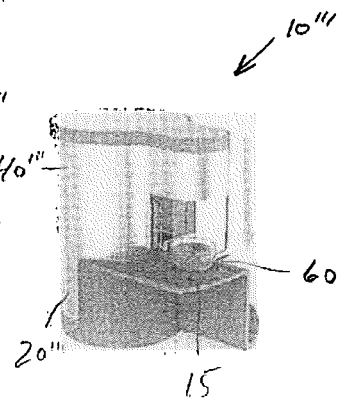
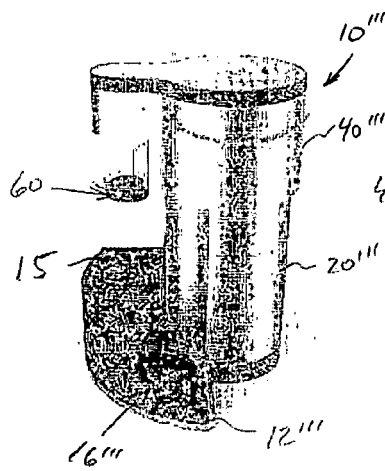
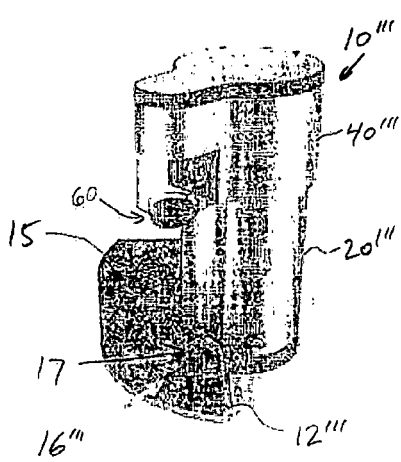
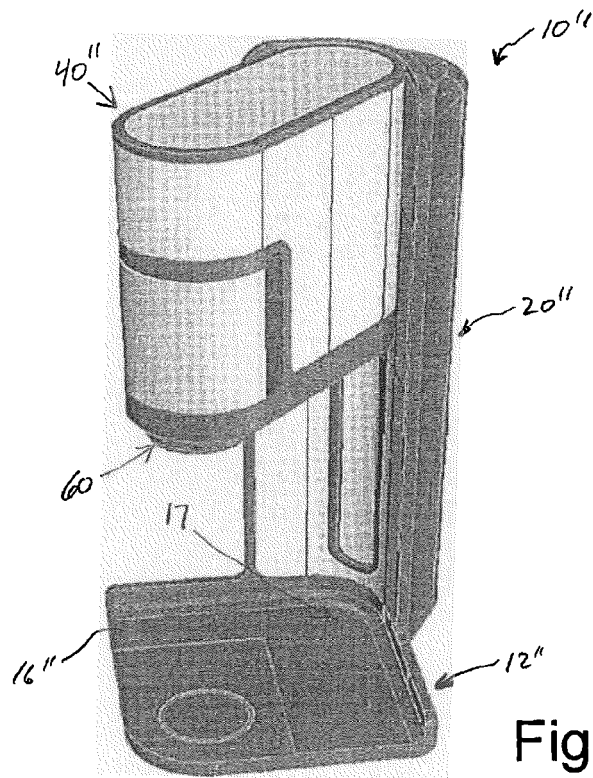


Fig. 6



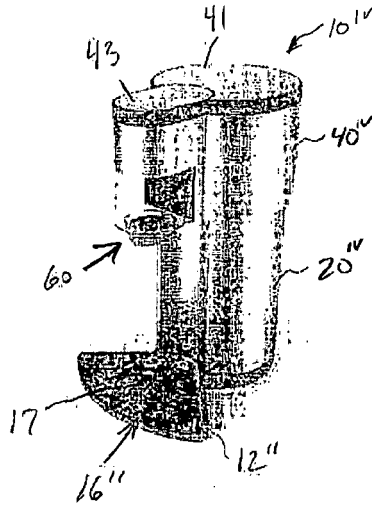


Fig. 11

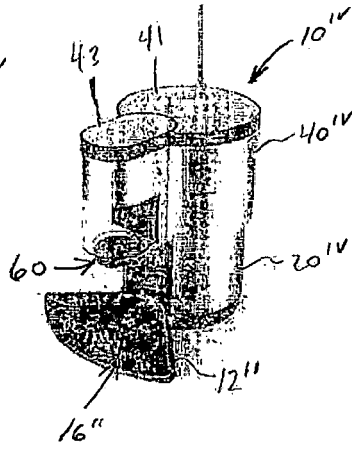


Fig. 12

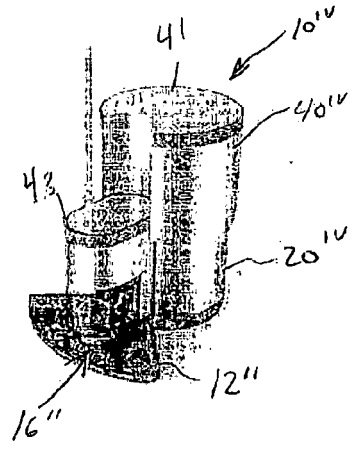


Fig. 13

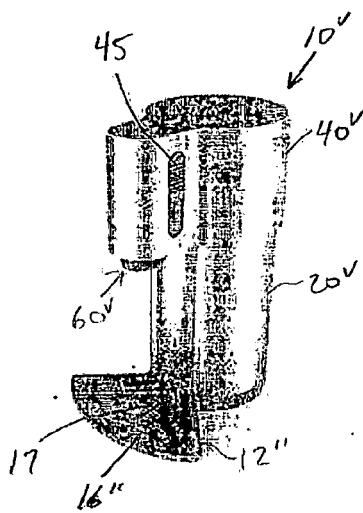


Fig. 14

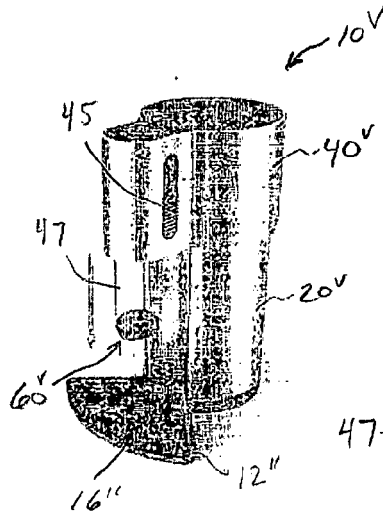


Fig. 15

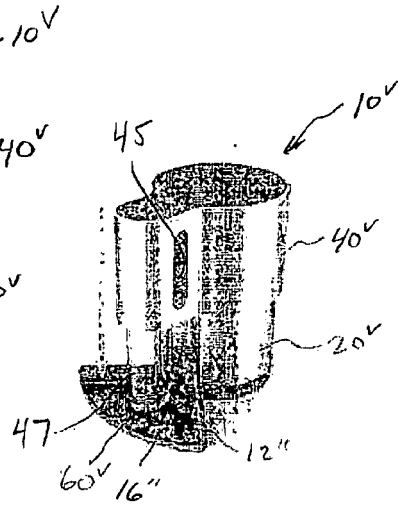


Fig. 16

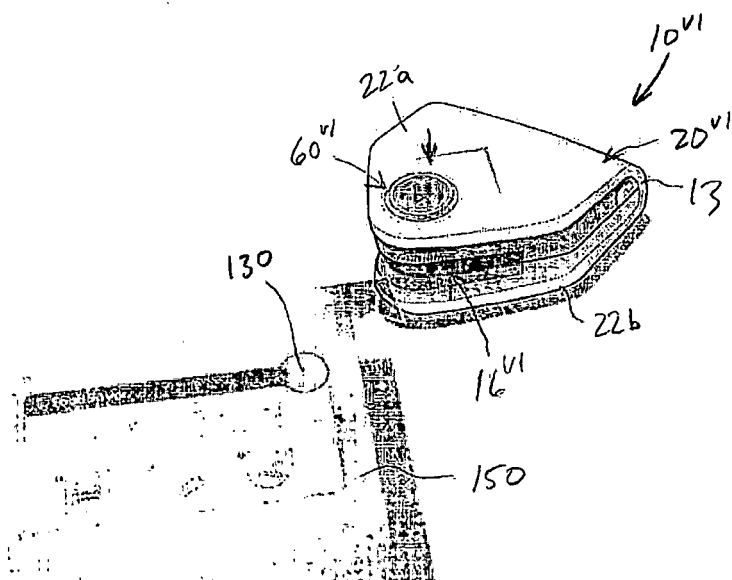


Fig. 17

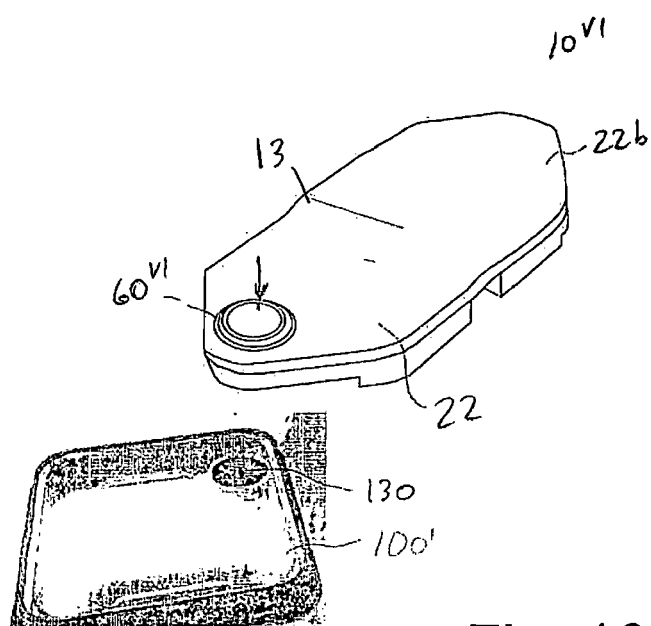


Fig. 18

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 62063796 A [0001]
- US 62101428 A [0001]
- US 62232718 A [0001]