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(54) **Vacuum cleaner**

(57) A vacuum cleaner comprises a rigid dust receptacle 13 formed as one-piece moulding of a porous sintered plastics material which is removably mounted within a cavity 12 in a body of the cleaner, an inlet 11 for dust laden air communicating with the interior of the receptacle 13, and an external housing 14. The dust receptacle 13 comprises an opening through which the dust collected therein can be emptied and a removable portion of the housing forms a closure 15 for the opening when the dust receptacle 13 is removed from the body

of the cleaner for emptying.

A single handle 24 is rotatable between a first position in which the closure 15 is locked to the body of the cleaner and a second position in which the closure 15 is unlocked from the body of the cleaner and locked to the receptacle. In the second position the handle forms a support for use in carrying the closure and receptacle assembly to waste receptacle for emptying: the closure prevents any dirt and dust escaping from the receptacle during carrying.

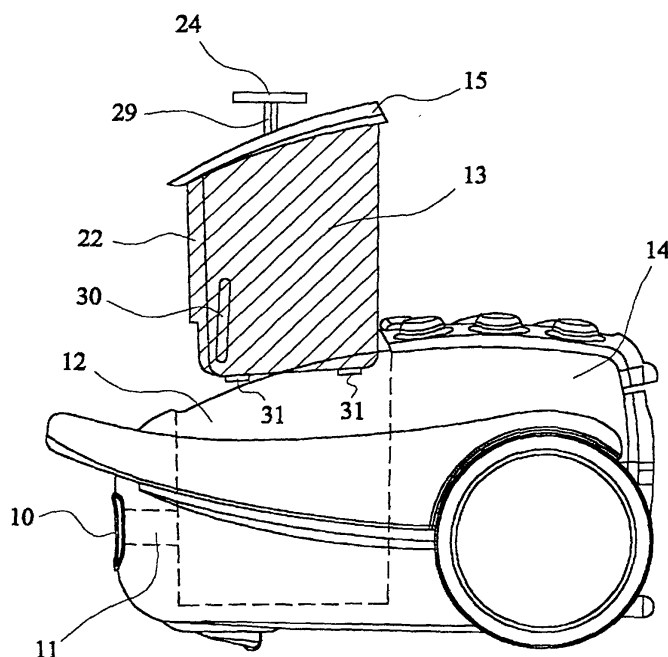


FIG. 2

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Description

[0001] This invention relates to a vacuum cleaner.

[0002] Vacuum cleaners commonly have a filter or porous paper filter bags for collecting the dirt and dust picked up by the vacuum cleaner. Hitherto these bags have been made from paper, and when the bag is full it has to be discarded and replaced by a new bag.

[0003] A disadvantage of disposable paper bags has been the cost of their purchase and thus, we have found that many users are reluctant to buy new bags and instead they repeatedly reuse the same bags. By doing this they reduce the efficiency and dust-retention capability of the cleaner. These factors have led to the recent popularity of so-called bagless or cyclonic cleaners, in which dirt is separated from the airstream by cyclonic devices and collected in solid plastic receptacles which can be removed from the cleaner for emptying.

[0004] A disadvantage of one known cyclonic cleaner lies in the fact that, to achieve the level of filtration demanded in modern vacuum cleaners, the cyclonic separator must be supplemented by filters disposed between the cyclone and the motor/fan unit, and between the motor/fan unit and the exhaust outlet of the cleaner. These filters can require frequent renewal, and can be expensive to purchase.

[0005] As stated above, it is known to provide vacuum cleaners having reusable dirt receptacles. GB 1049292 (Tokyo) discloses one such vacuum cleaner comprising a reusable and washable dirt receptacle. The receptacle is of multi-layer plastic foam construction and is of cylindrical form with an open end towards the dirty air inlet. The receptacle is formed of flexible material and may be squeezed dry following washing.

[0006] GB 2265096 (Hoover) discloses another such vacuum cleaner comprising a reusable dirt receptacle, the Hoover receptacle comprising a thin, flexible sintered plastics bag, having a removable lid, and supported within a rigid plastic cage.

[0007] We have now devised a vacuum cleaner having a reusable dirt receptacle which is less complicated than the above-mentioned cleaners and which is not subject to the aforementioned disadvantages of cyclonic cleaners, whilst offering filtration performance comparable with cleaners having conventional paper filter bags.

[0008] In accordance with this invention, there is provided a vacuum cleaner comprising a rigid one-piece dust receptacle formed of a moulded porous plastics material and removably mounted within a cavity in a body of the cleaner, and an inlet for dust laden air communicating with the interior of said receptacle.

[0009] Preferably, the moulded porous plastics material is a sintered material.

[0010] Preferably, the moulded porous plastics material is a high density polyethylene material, which is preferably ground and sintered.

[0011] Preferably the dust receptacle is substantially

rectangular or square in cross-section.

[0012] Preferably, spacers extend between the wall(s) of the dust receptacle and the wall(s) of the cavity in which the dust receptacle is mounted. In this manner an air gap can be provided around the external surface of the dust receptacle, which air gap is evacuated by the fan of the vacuum cleaner during use. Accordingly, air drawn through the dust receptacle is not concentrated in one area of its surface to provide a more even distribution of dust on the internal surface of the dust receptacle. The spacers whilst serving to locate the dust receptacle also help to prevent outward deformation of the wall(s) of the dust receptacle due to the pressure drop created across the wall(s) of the receptacle.

[0013] Preferably, the spacers are integral formations on the dust receptacle.

[0014] Preferably the dust receptacle is provided with an opening through which the collected dirt and dust can be emptied.

[0015] Until recent years, porous paper filter bags have been virtually universally used as the dirt receptacles in modern vacuum cleaners, with much attention being paid to means of retaining the dust and dirt within the bag during removal of the bag from the appliance and during its subsequent disposal in the dustbin. A sliding cardboard closure on the dirty air inlet to the bag, automatically closed by the action of removing the bag from the cleaner, has become the conventional method of retaining dirt in the bag during the disposal process.

[0016] A disadvantage of cyclonic vacuum cleaners is that the full dirt receptacle must be carried from the cleaner to the point of disposal in an open state, whereby its contents are not effectively contained and indeed, may be spilled and/or blown into the atmosphere during transport and emptying. Some currently available dual cyclonic cleaners suffer the further disadvantage that dismantling of the dirt receptacle is a complex and dirty operation, since the cyclonic separation components are partly contained within the receptacle.

[0017] Thus, in order to overcome this problem, the opening in the dust receptacle of the present invention is preferably provided with a closure which can be removed from the body of the cleaner together with the dust receptacle, in order to contain the dirt and dust whilst the receptacle is taken to be emptied.

[0018] Preferably, the body of the cleaner comprises an external housing, a removable portion of the housing forming said closure.

[0019] Preferably, a catch is provided for locking the removable portion of the housing to the remainder of the body of the cleaner when the cleaner is in use.

[0020] Preferably, a catch is provided for securing the removable portion of the housing across the opening in the receptacle, for at least the period during which the receptacle is being taken to be emptied.

[0021] Preferably, a single actuator is provided for operating both catches. The actuator is preferably arranged such that, in a first position, the removable por-

tion of the housing is locked to the remainder of the body of the cleaner and, in a second position, the removable portion of the housing is unlocked from the remainder of the body of the cleaner and secured across the opening in the receptacle.

[0022] Preferably, both catches are provided on a latching mechanism mounted to the removable portion of the housing, the mechanism comprising oppositely directed portions arranged to be urged apart when the actuator is moved to said first position, so as to engage the remainder of the body of the cleaner and arranged to be urged towards each other when the actuator is moved to said second position, so as to engage the receptacle.

[0023] Preferably, a handle is provided on the removable portion of the housing for carrying the receptacle to the point where it is to be emptied.

[0024] Preferably, the actuator forms said handle when in said second position.

[0025] Preferably, the actuator is recessed in the removable portion of the housing when in said first position.

[0026] The outer surface of the receptacle can become contaminated with fine dust during use. Accordingly, the receptacle is preferably provided moulded with at least one handgrip which enables the user to empty the receptacle without actually touching its outer surface.

[0027] Means are preferably provided within the cavity of the cleaner to obscure the gripping surface of the or each handgrip when the receptacle is fitted within the cavity and/or to wipe the or each handgrip of dust as the receptacle is removed from the cavity for emptying.

[0028] Also in accordance with this invention, there is provided a vacuum cleaner comprising a dust receptacle removably mounted within a cavity in a body of the cleaner and having an opening through which the dust collected therein can be emptied, an inlet for dust laden air communicating with the interior of the receptacle, and an external housing, a removable portion of the housing forming a closure for the opening when the dust receptacle is removed from the body of the cleaner for emptying.

[0029] An embodiment of this invention will now be described by way of example only and with reference to the accompanying drawings, in which:

Figure 1 is a plan view of a vacuum cleaner in accordance with this invention;

Figure 2 is a side view of the vacuum cleaner of Figure 1 showing the dust receptacle thereof partially removed;

Figure 3 is a side perspective view of the dust receptacle of the vacuum cleaner of Figure 1; and

Figures 4A - 4F are sectional views along the line IV-IV of Figure 1, illustrating how the dust receptacle is removed and locked in place.

[0030] Referring to Figures 1 & 2 of the drawings there is shown the body portion of a so-called canister-type vacuum cleaner. A dirty air inlet aperture 10 is provided in the front of the body portion of the cleaner for connecting to a cleaning tool via an elongate flexible suction hose.

[0031] The dirty air inlet aperture 10 communicates with a passage 11 leading to an internal cavity 12 within the body of the cleaner, in which a removable dust receptacle 13 is mounted.

[0032] The vacuum cleaner comprises an external moulded plastics housing 14 having top and bottom walls, and opposite end and side walls. As will be described, a portion of the top wall of the housing is removable (as shown in Figure 2) and forms a closure 15 for the dust receptacle 13.

[0033] Referring to Figure 3 of the drawings, the dust receptacle 13 comprises a one-piece moulding of a porous sintered plastics material, formed by sintering 400 micron ground particles of high density polyethylene. The one-piece moulding comprises a rigid bottom and opposite side and end walls (16-19), and an opening in its top. An externally projecting lip 21 extends around the upper end of the periphery of the receptacle, parallel to the upper edges of the side and end walls (17-19) thereof. An aperture 20 is provided in the front end wall 19 of the receptacle 13 which, in use, sealingly communicates with the dirty air inlet passage 11 by means of a grommet of resilient material fitted to the aperture 20.

[0034] A pipe (not shown) may be provided within the receptacle to communicate air from the aperture 20 to the upper region of the receptacle 13, thereby preventing accumulated detritus in the base of the receptacle from escaping back through the dirty air inlet passage 11.

[0035] Referring to Figure 4A of the drawings, in use, the receptacle 13 is mounted in the cavity 12 inside the body of the cleaner, where the opening in its top is sealed against the closure 15 by a seal 23.

[0036] Projections 30 on either side of the receptacle 13 locate within respective channels on either side of the cavity 12 to locate the receptacle 13 therein and to maintain an air gap around the sides of the receptacle.

[0037] The base of the receptacle 13 is also formed with feet 31 at each of its four corners, which rest upon the floor of the cavity to maintain an air gap below the receptacle.

[0038] A handle 24 is provided on the upper surface of the closure 15 for operating a lock mechanism 25 which either secures the closure 15 to the rest of the housing 14 or to the dust receptacle 13. The handle 24 is normally disposed in a recess 26 formed in the upper surface of the closure 15, so that the handle blends with the shape of the upper wall of the housing 14.

[0039] The lock mechanism 25 comprises a pair of oppositely-directed arms 27 slidably mounted to the underside of the closure 15. The inner ends of the arms 27 are connected to a cam 28 mounted on the shaft 29

of the handle 24, such that rotation of the handle through 90° causes the arms 27 to move from an extended position to a retracted position, as will be described in further detail.

[0040] When the dust receptacle 13 becomes full, it can be removed from the vacuum cleaner for emptying and washing. However, before this is done, the handle 24 must be operated to unlock the closure 15 from the body of the cleaner.

[0041] In order to operate the handle 24, it has to be pushed downwardly against a spring bias, in order to release the lock mechanism 25, which then allows the handle 24 to rise under the applied spring bias, as shown in Figure 4B.

[0042] In its raised position, the lower end of the shaft 29 of the handle engages the cam 28, such that rotation of the handle through 90°, retracts the arms 27, thereby disengaging them from the body of the cleaner. The outer ends of the arms 27 are cranked downwardly through 90° and are each provided with oppositely-directed projections 32,33 which respectively engage the cleaner body, when the arms 27 are extended, and the lip 21 on the receptacle 13, when the arms 27 are retracted.

[0043] Accordingly, when the handle 24 is raised and turned, the arms 27 disengage the body of the cleaner and engage the dust receptacle, as shown in Figure 4C. In this position, the handle 24 can be used to lift the closure 15 and receptacle 13 from the body of the cleaner, as shown in Figure D.

[0044] The assembly can then be carried to a point where the receptacle 13 can be emptied. It will be appreciated that the closure 15 serves to prevent any dust etc. from escaping from the receptacle 13 whilst it is being carried.

[0045] Referring to Figure 4E, in order to empty the receptacle, the handle 24 is turned back through 90° thereby extending the arms and releasing the receptacle 13. The receptacle 13 is provided with integral handgrips 22, as shown in Figure 3, which enable the receptacle 13 to be held and emptied without having to touch the external walls of the receptacle 13, which may be dusty. Means (not shown), such as foam pads, may be mounted within the cavity of the body of the cleaner for obscuring the gripping surfaces of the handgrips 22 when the receptacle 13 is fitted within the cavity 12 and for wiping the handgrips 22 clean as the receptacle 13 is removed from the body of the cleaner.

[0046] Once the receptacle 13 has been emptied, it is reunited with the closure 15 and locked thereto by turning the handle 24 through 90°. The assembly is then returned to the body of the cleaner and refitted, by turning the handle back through 90°, as shown in Figure 4F.

[0047] Finally, the handle 15 is pushed fully downwardly against the spring bias and then released, whereupon the handle is again held in the depressed position shown in Figure 1. In this position it is not possible to rotate the handle.

[0048] The receptacle of the vacuum cleaner in ac-

cordance with this invention is more efficient at filtering dirt and dust than conventional bagless cleaners but yet is inexpensive to operate, since the receptacle can be emptied and re-used almost indefinitely.

[0049] If necessary, the receptacle can be washed occasionally. Accordingly, the material of the receptacle is preferably treated with a hydrophilic substance to encourage the absorption of water by the material (sintered plastics materials being inherently hydrophobic).

[0050] For reasons of hygiene, the material of the receptacle may also be treated with an anti-bacterial substance.

15 Claims

1. A vacuum cleaner comprising a rigid one-piece dust receptacle formed of a moulded porous plastics material and removably mounted within a cavity in a body of the cleaner, and an inlet for dust laden air communicating with the interior of said receptacle.
2. A vacuum cleaner as claimed in claim 1, in which the moulded porous plastics material is a sintered material.
3. A vacuum cleaner as claimed in claim 2, in which the moulded porous plastics material is a high density polyethylene material, which is ground and sintered.
4. A vacuum cleaner as claimed in any preceding claim, in which spacers extend between the wall(s) of the dust receptacle and the wall(s) of the cavity in which the dust receptacle is mounted.
5. A vacuum cleaner as claimed in claim 4, in which the spacers are integral formations on the dust receptacle
6. A vacuum cleaner as claimed in any preceding claim, in which the dust receptacle is provided with an opening through which the collected dirt and dust can be emptied.
7. A vacuum cleaner as claimed in claim 6, in which the opening in the dust receptacle is preferably provided with a closure which can be removed from the body of the cleaner together with the dust receptacle.
8. A vacuum cleaner as claimed in claim 7, in which the body of the cleaner comprises an external housing, a removable portion of the housing forming said closure.
9. A vacuum cleaner as claimed in claim 8, in which a catch is provided for locking the removable portion

of the housing to the remainder of the body of the cleaner when the cleaner is in use.

10. A vacuum cleaner as claimed in claims 8 or 9, in which a catch is provided for securing the removable portion of the housing across the opening in the receptacle 5
11. A vacuum cleaner as claimed in claim 10 appended to claim 9, in which a single actuator is provided for operating both catches. 10
12. A vacuum cleaner as claimed in claim 11, in which actuator is arranged such that, in a first position, the removable portion of the housing is locked to the remainder of the body of the cleaner and, in a second position, the removable portion of the housing is unlocked from the remainder of the body of the cleaner and secured across the opening in the receptacle. 15 20
13. A vacuum cleaner as claimed in claim 12, in which both catches are provided on a latching mechanism mounted to the removable portion of the housing, the mechanism comprising oppositely directed portions arranged to be urged apart when the actuator is moved to said first position, so as to engage the remainder of the body of the cleaner and arranged to be urged towards each other when the actuator is moved to said second position, so as to engage the receptacle. 25 30
14. A vacuum cleaner as claimed in any of claims 8 to 13, in which a handle is provided on the removable portion of the housing for carrying the receptacle to the point where it is to be emptied. 35
15. A vacuum cleaner as claimed in claim 14 appended to any of claims 11 to claim 13, in which the actuator forms said handle when in said second position. 40
16. A vacuum cleaner as claimed in claim 15 appended to claim 12 or claim 13, in which the actuator is recessed in the removable portion of the housing when in said first position. 45
17. A vacuum cleaner as claimed in any preceding claim, in which the receptacle is preferably provided moulded with at least one handgrip. 50
18. A vacuum cleaner as claimed in claim 17, comprising means within the cavity of the cleaner to obscure the gripping surface of the or each handgrip when the receptacle is fitted within the cavity. 55
19. A vacuum cleaner as claimed in claims 17 or 18, comprising means within the cavity of the cleaner to wipe the or each handgrip of dust as the recep-

tacle is removed from the cavity for emptying.

20. A vacuum cleaner comprising a dust receptacle removably mounted within a cavity in a body of the cleaner and having an opening through which the dust collected therein can be emptied, an inlet for dust laden air communicating with the interior of the receptacle, and an external housing, a removable portion of the housing forming a closure for the opening when the dust receptacle is removed from the body of the cleaner for emptying.

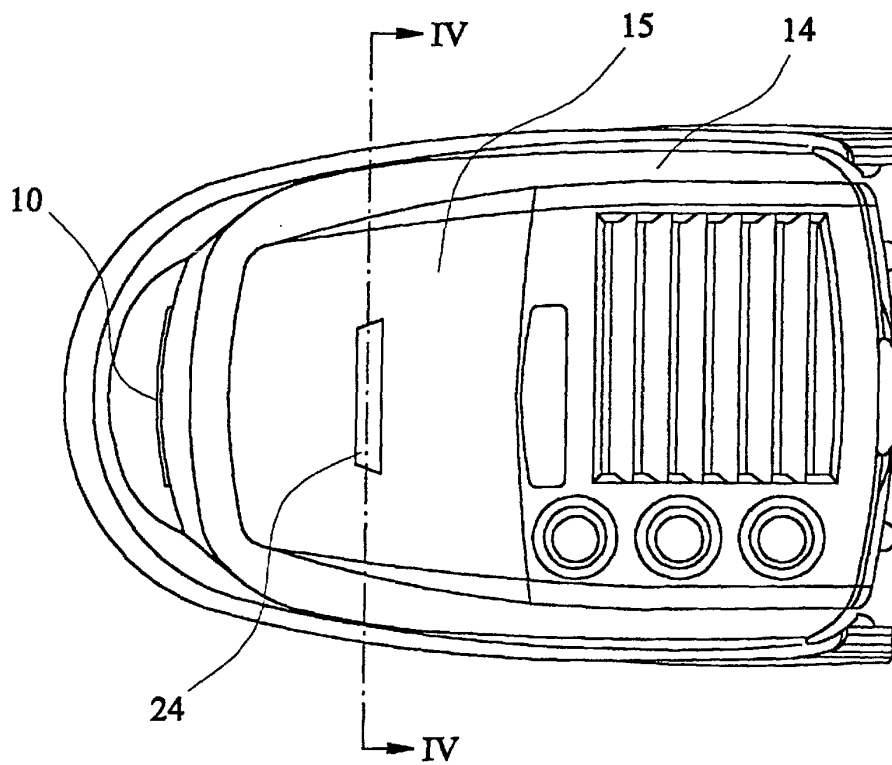


FIG. 1

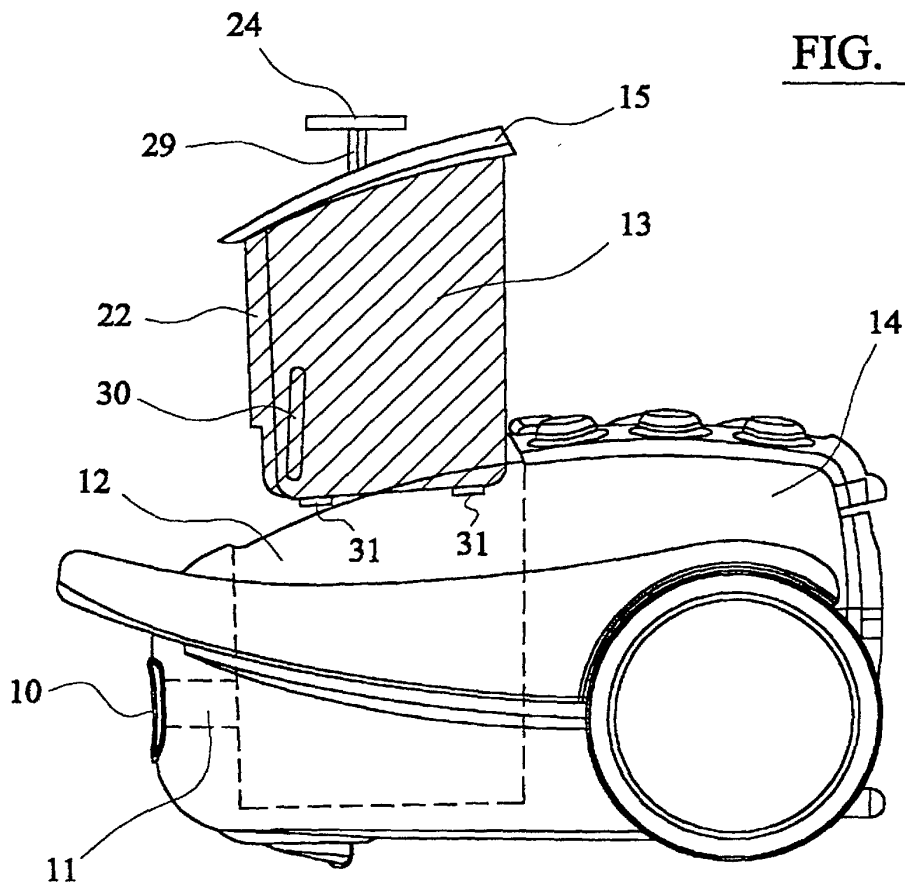


FIG. 2

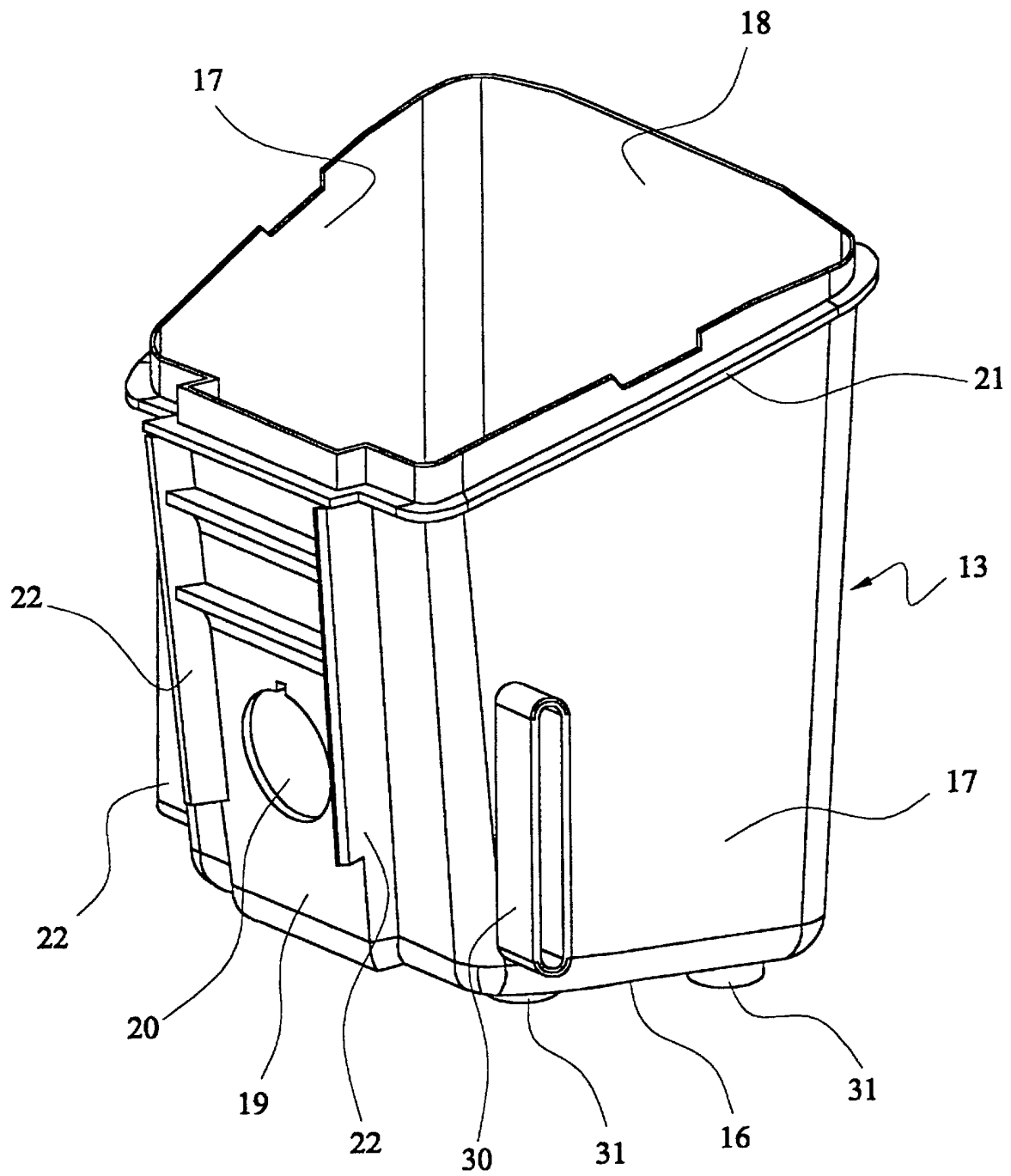


FIG. 3

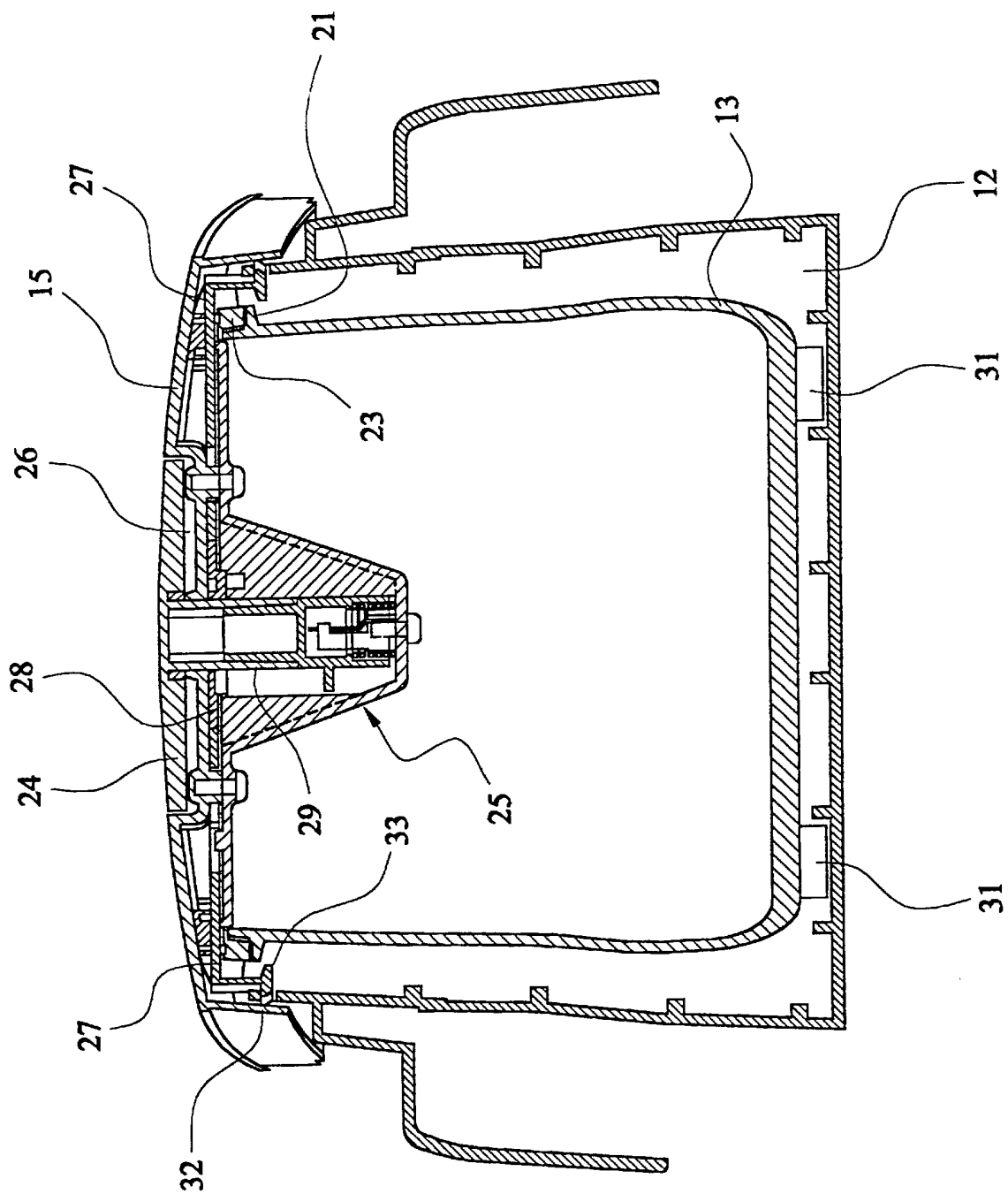


FIG. 4A

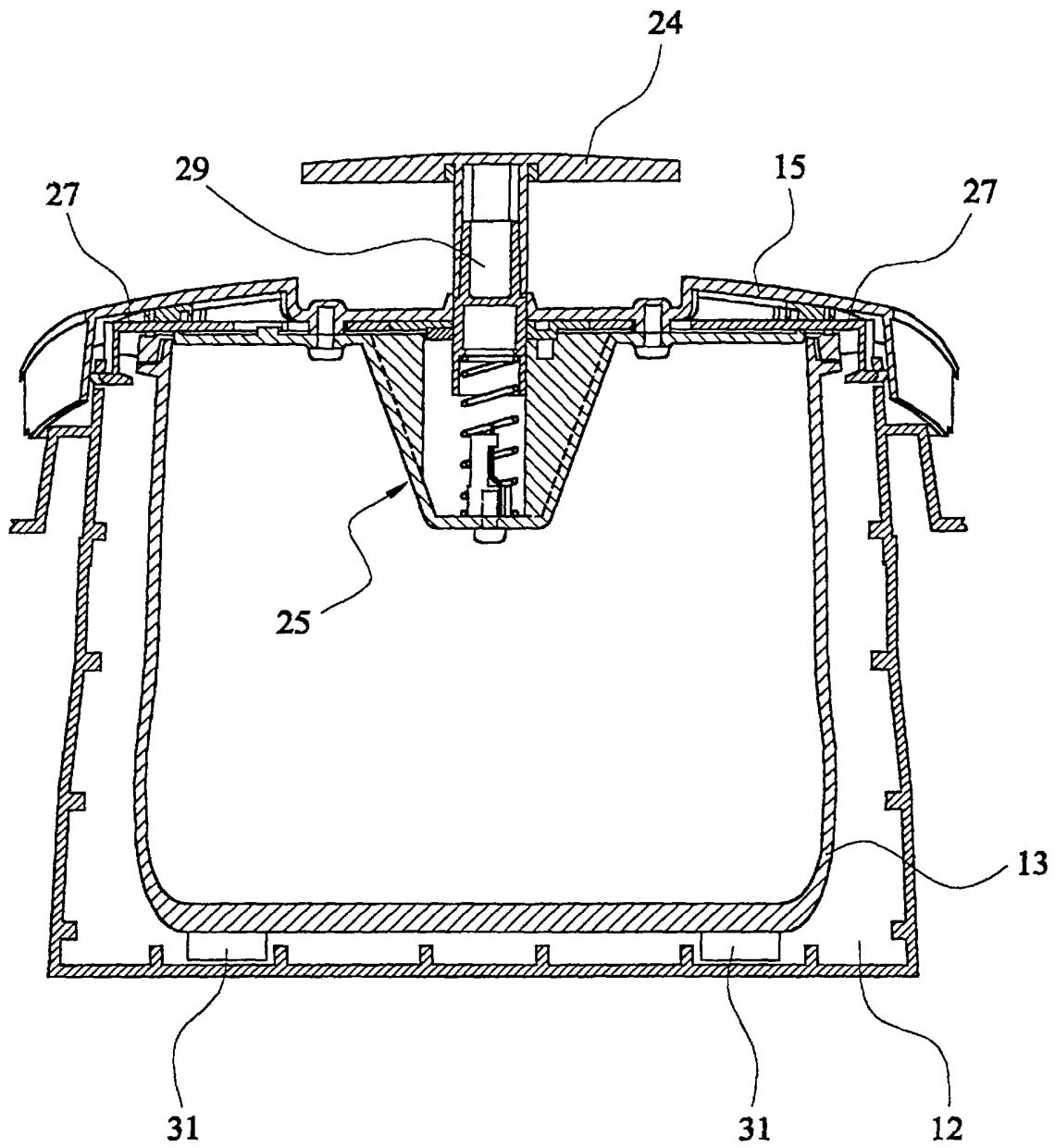


FIG. 4B

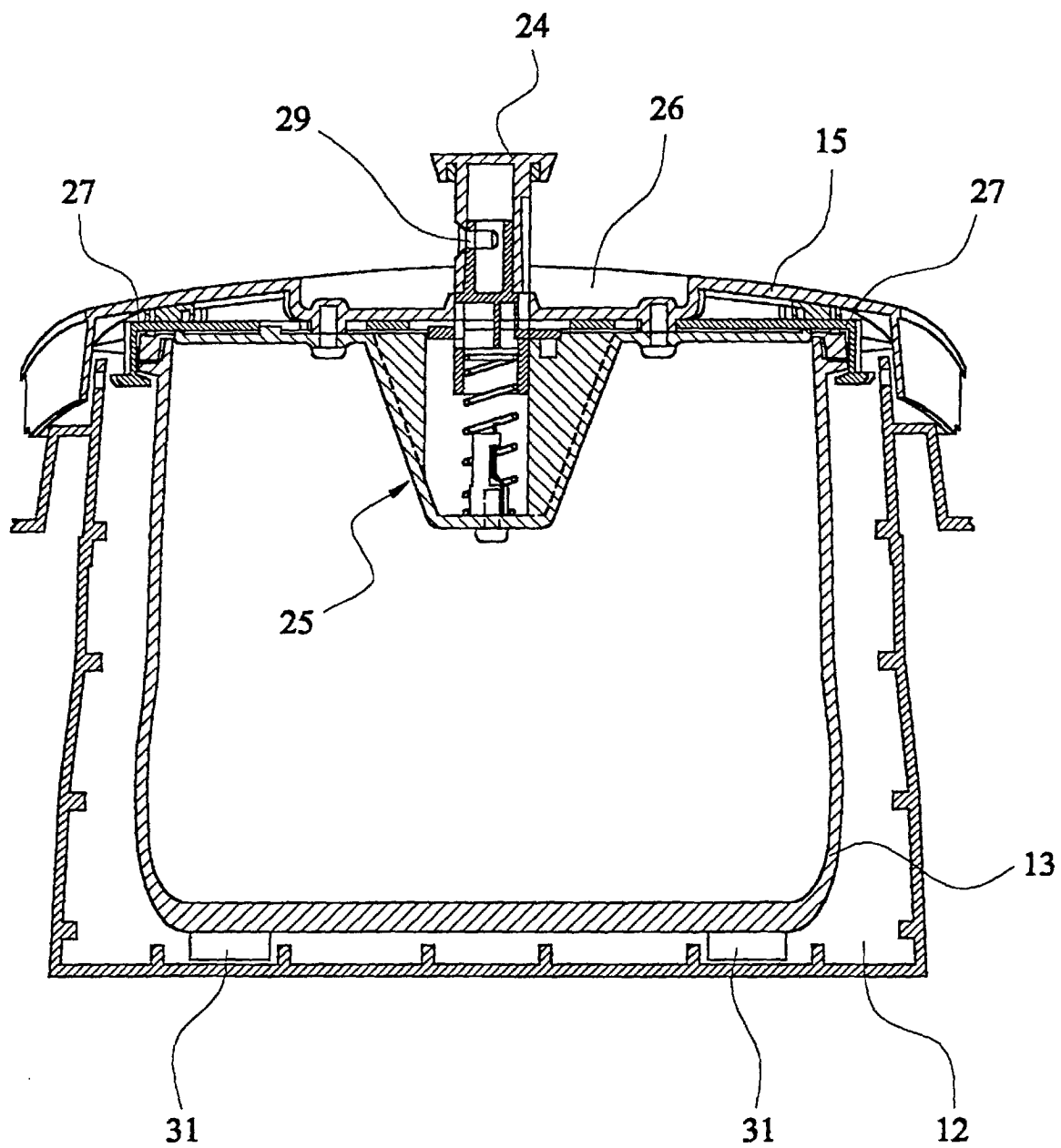


FIG. 4C

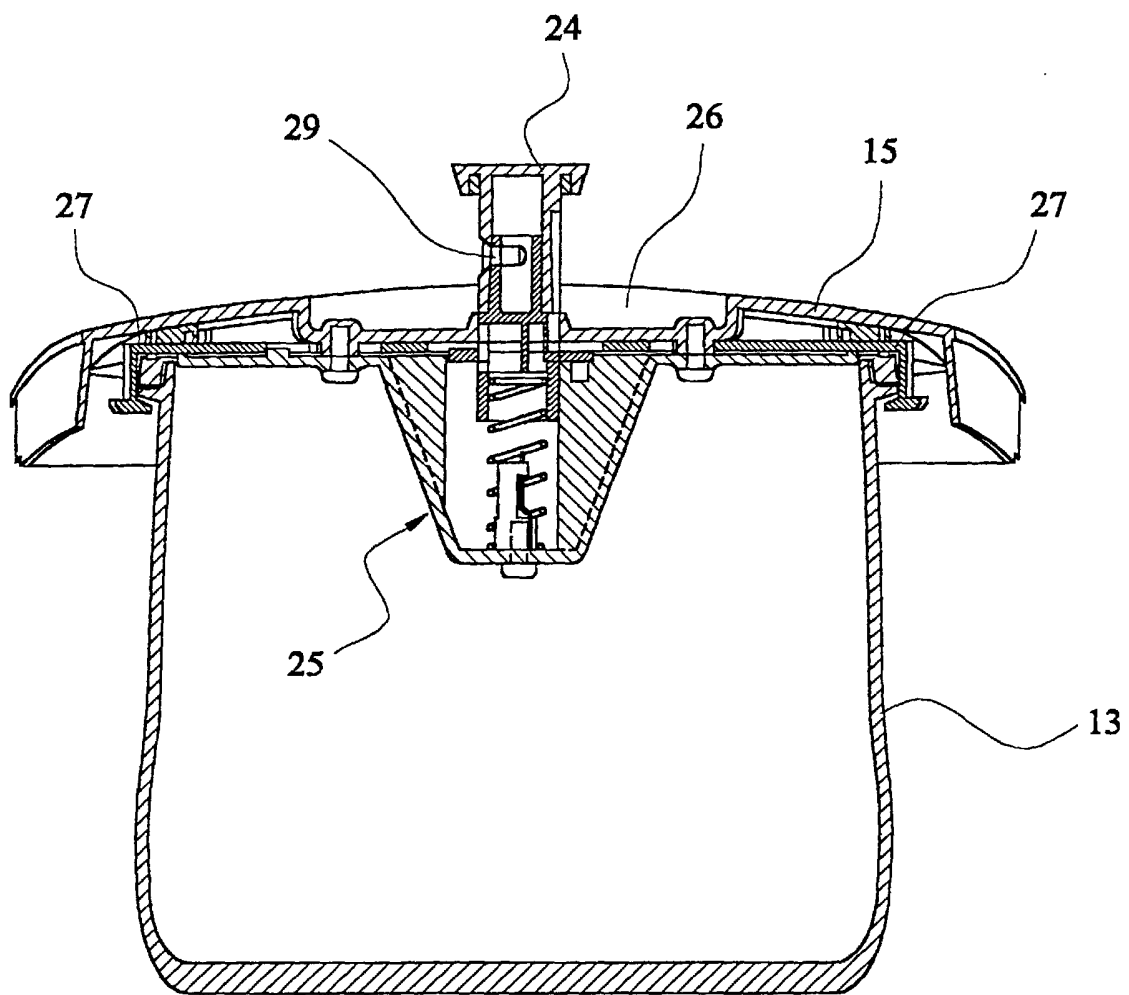


FIG. 4D

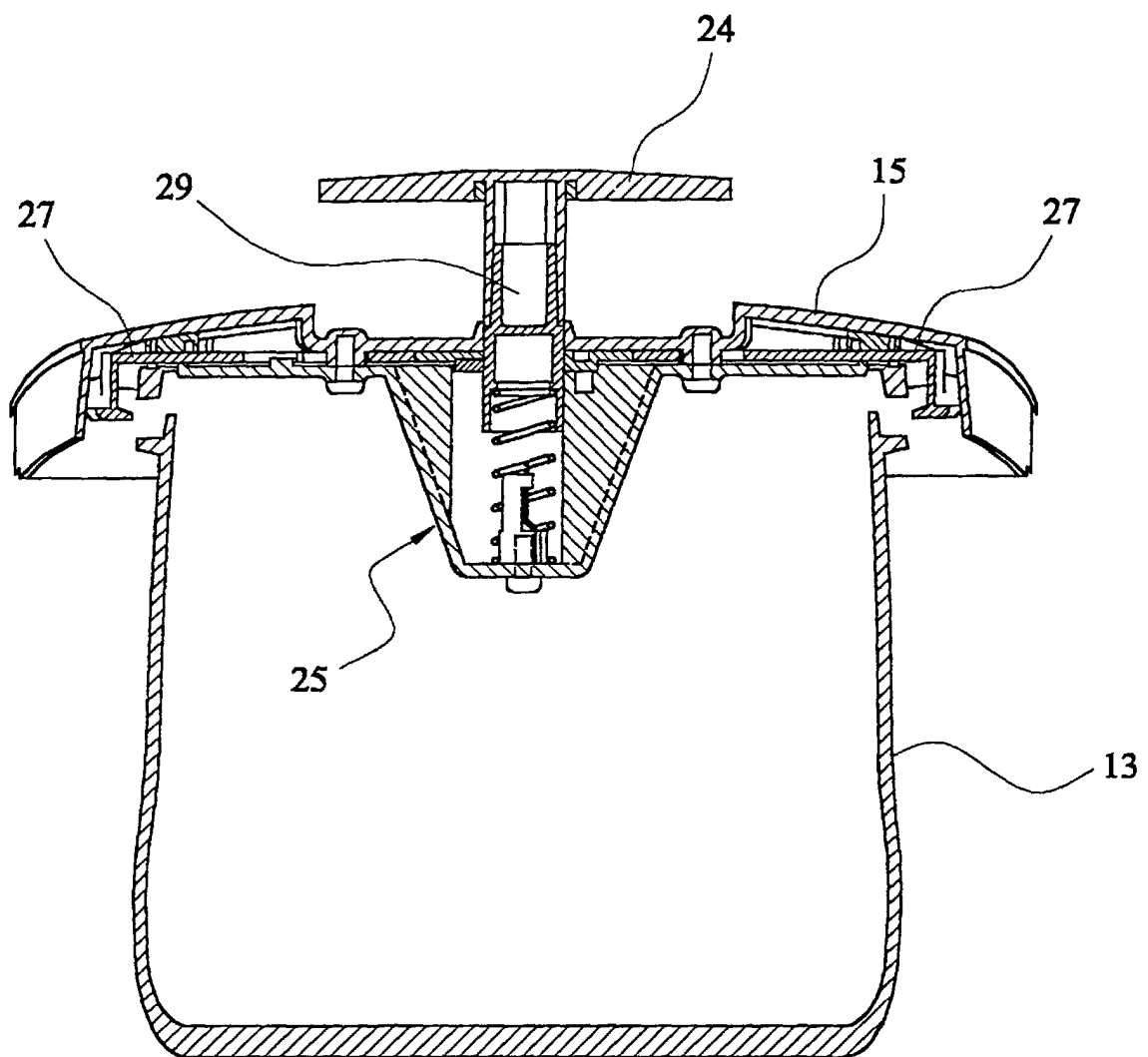


FIG. 4E

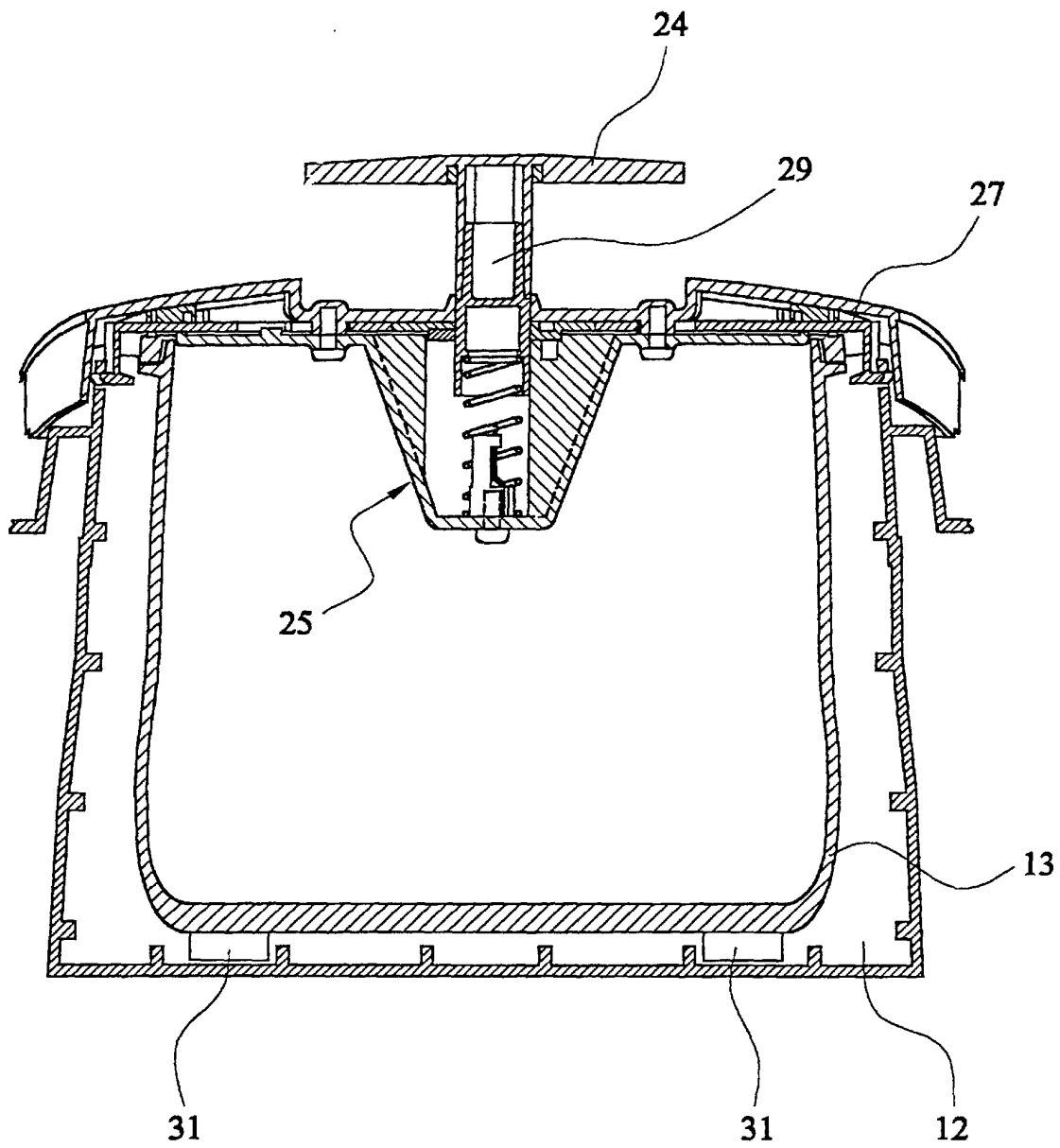


FIG. 4F