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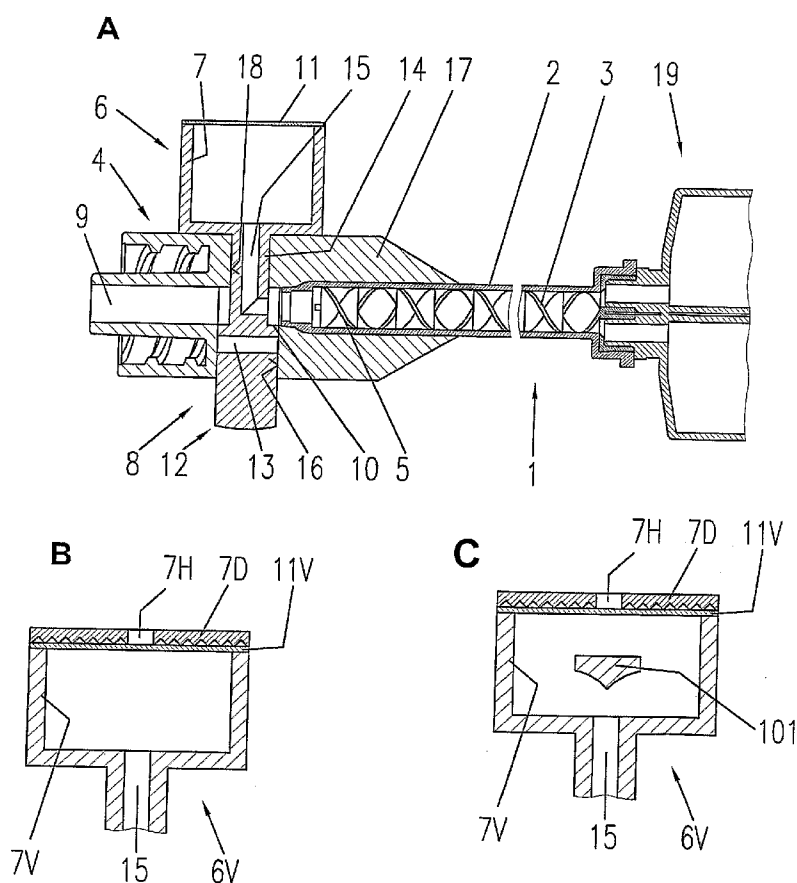
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[Continued on next page]

(54) Title: METHOD AND DEVICE FOR VENTING AND ELIMINATING UNWANTED MATERIAL OF A DISPENSING APPLIANCE



(57) Abstract: In the method for venting and eliminating liquid material of a dispensing appliance prior to dispensing, the air as well as unusable material are eliminated via a deviating channel and the conditioned material is dispensed via a dispensing channel. The device (6) for implementing the method for eliminating unusable liquid material and for venting a dispensing appliance is provided with a valve assembly (8) for selectively connecting the inlet area of the device with a deviating channel (15) or with an outlet (9). The deviating channel is connected to a collecting container having venting means (7). The method and the device according to the invention allow advantageously venting a multicomponent dispensing appliance and leveling the components as well as eliminating incompletely mixed components in the starting phase after the latter have left the mixer elements, thereby ensuring a flawless application. In an advantageous development, a device (102) is provided that avoids the occurrence of an overpressure during dispensing.

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## Method and Device for Venting and Eliminating Unwanted Material of a Dispensing Appliance

The present invention relates to a method for venting and  
5 eliminating liquid material of a dispensing appliance prior  
to the dispensing operation according to claim 1 as well as  
for venting, leveling, and eliminating incompletely mixed  
components after the mixing operation of at least two  
components, and to a device for implementing the method  
10 according to claim 1.

US-B-6 079 868 discloses a device for mixing and delivering  
a curable biomaterial, the device comprising, besides the  
usual delivery conduit, a mechanism for controllably  
15 shunting an initial portion of mixed biomaterial. This  
shunting mechanism allows to direct material either to the  
delivery conduit or to the outlet shunt before, during or  
after dispensing of the biomaterial.

20 When multicomponent cartridges are being filled, there are  
filling tolerances that lead to different volumes or to  
filling level differences between two or multiple  
containers. The result of these filling tolerances is that  
the components are not synchronously dispensed or are not or  
25 only incompletely mixed at the beginning of the dispensing  
operation. Therefore, the components have to be leveled  
prior to being dispensed and applied. Such a leveling device  
for syringe and cartridge containers is disclosed in WO  
2004/100854.

30

Another negative influence upon dispensing is the presence  
of air in the containers as well as in the mixer. Air  
bubbles in the containers are the result of inadequate  
venting during cartridge filling or may develop due to  
35 subsequent processes such as heating, freezing,

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sterilization, or irradiation. During dispensing, the air resp. gas is compressed, thereby affecting the mixing ratio and furthermore leading to an unwanted early or prolonged outflow of a component. Also, in certain medical  
5 applications, the air enclosed in the mixer must not enter into the body.

Another influence may result from different viscosities of the components. Specifically, the lower viscosity component  
10 may precede in the mixer, especially when the mixer is downwardly inclined, thereby preventing a correct mixture in the initial phase. Furthermore, at the beginning of the dispensing operation, the components are only incompletely mixed due to different other factors. This means that in  
15 demanding applications, the first portion of the mixed components must not be used.

Mainly in medical applications such as e.g. minimally invasive techniques, where application instruments are  
20 directly attached to the mixer, the venting and synchronization of the components and the elimination of incompletely mixed components after the mixing operation is indispensable.

25 With the current state of the art, an efficient venting and leveling is complicated, requires special attention, and is impossible in the case of fast-reacting adhesives. Since the reaction already starts in the mixer, there is not enough time to connect an application instrument to the mixer after  
30 venting and leveling and to place it in the correct location in/on the patient. If it is handled incorrectly or if venting, leveling, and elimination are omitted, the two-component adhesive may fail to function.

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On the background of this prior art, it is an object of the present invention to provide a method and device that allow the direct application of a vented material. This is accomplished by the method according to claim 1 and the  
5 device according to claim 5.

Another object of the present invention is to provide a method and a device that allow the direct application of a vented, leveled, and completely mixed material from a  
10 multicomponent dispensing appliance. This is accomplished by the method according to claim 2 and the device according to claim 5.

These methods and devices allow a substantial increase in  
15 safety in critical applications, particularly in medicine, since the venting and leveling operation is visualized and in preferred embodiments also automated.

The invention will be explained in more detail hereinafter  
20 with reference to drawings of exemplary embodiments.

Fig. 1 shows a longitudinal section of a first exemplary embodiment of the invention in the venting position,  
25

Fig. 1A shows a variant of the embodiment according to Fig. 1,

Fig. 1B shows another variant of the embodiment according to Fig. 1,  
30

Fig. 2 shows a second exemplary embodiment in the dispensing position,

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- Fig. 3A shows a third exemplary embodiment in the venting position,
- Fig. 3B shows the exemplary embodiment of Fig. 3A in the dispensing position,
- Fig. 4A shows an embodiment variant of the example of Figure 3A in the venting position,
- Fig. 4B shows the embodiment variant of Fig. 4A in the dispensing position,
- Fig. 5 shows a fourth exemplary embodiment in the venting position,
- Fig. 6 shows a fifth exemplary embodiment in the dispensing position,
- Fig. 7 shows a sixth exemplary embodiment in the venting position,
- Fig. 7A shows the exemplary embodiment of Fig. 7 with an additional relief valve,
- Fig. 8 shows a first variant of the embodiment of Figure 7 in the venting position,
- Fig. 9 shows a second variant of the embodiment of Figure 7 in the venting position,
- Fig. 10 shows a third variant of the embodiment of Figure 7 in the venting position, and
- Fig. 11 shows a variant of the embodiment of Figure 1 in the venting position.

- 5 -

Fig. 1 shows a first exemplary embodiment comprising a multicomponent dispensing assembly 1 with a mixer that is connected to a double syringe 19. The mixer comprises a mixer housing 2 with a mixing helix 3 as well as an interface, here a Luer-Lok connector 4. Venting and leveling device 6, hereinafter referred to as device, is located at the mixer outlet, between the last element 5 of the mixing helix and the Luer-Lok connector.

10

This device is essentially composed of a collecting container 7 and a valve assembly 8 in order to first conduct air and material to collecting container 7 after the last mixer element 5 and subsequently dispense the mixed material that has been vented and leveled directly through outlet 9. Collecting container 7 is provided with a closure in the form of a filter 11 that is permeable to air but prevents the outflow of material. A suitable filter material for this purpose is e.g. hydrophobic, porous or provided with fine channels.

20

In the variant of Fig. 1A, collecting container 7V is closed with a filter 11V and a cover 7D, the filter being placed between the container and the cover. The filter may e.g. be welded, glued, or connected to the cover and the container in another manner. If a cover having a structured inner surface is used, the air can still flow to opening 7H or to several openings in the cover for being evacuated when the filter is partly moistened. This design further offers the advantage that the filter is supported and protected from mechanical influence. The inner surface may have a structure of any kind, e.g. small V-shaped grooves as in Fig. 1A or rectangular grooves, in a parallel or a checkered, crossed array.

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Such a filter and cover combination is not only useful for the embodiments shown in the context of this application but for all kinds of filters in devices for leveling and venting cartridges or syringes.

5

In the embodiment variant according to Fig. 1B, a splash guard 101 is arranged in collecting container 6V so that the components may not squirt directly onto the filter and the cover. Such a splash guard is advantageous in all  
10 embodiments and may be designed in various ways, e.g. as a rounded wedge, as in Figure 1B, or as a disk or in any suitable form.

In the present exemplary embodiment, the collecting  
15 container and the valve assembly are designed as a unit that is adapted to be pushed over mixer housing 2 and secured thereto. At the end of the mixer, valve body 17 is provided with a bore 16 in which a movable valve member 12 is guided that connects to collecting container 7 via a connecting  
20 member 14. Movable valve member 12 comprises a dispensing channel 13 and an angled deviating channel 15 extending inside connecting member 14 and connecting the mixer outlet to the collecting container in the illustrated position.

25 Connecting member 14 is guided inside another smaller bore 18 of the valve body, as appears when comparing Fig. 1 to Fig. 2. The junction between the two bores 16 and 18 forms a shoulder 10, thereby preventing an unintentional withdrawal of the movable valve member.

30

In Fig. 2, the device is formed integrally with mixer housing 21 of mixer assembly 22, and the valve is shown in the dispensing position with dispensing channel 13 in the let-through position. Movable valve member 12 with the  
35 container is the same as in Fig. 1.



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A third exemplary embodiment is described with reference to Figs. 3A and 3B where device 23, analogously to the embodiment according to Figure 1, is designed as a unit that is attachable to the mixer. Here, valve body 24 is provided on its inlet side with inlet 25 and on its outlet side with Luer-Lok connector 4. Movable valve member 27 consists of a rotary plug 30 turning in a transversal bore 26 in the valve body and provided with a dispensing channel 31 and a deviating channel 32 that leads to collecting container 28 with filter 29. The collecting container is formed integrally with the rotary plug.

A comparison of the two Figures 3A and 3B shows that in the position of Fig. 3A, after having attached the device to a mixer outlet, the air that is present and some material may first enter into the collecting container as the dispensing appliance is operated, after which rotary plug 30 is brought to the position of Fig. 3B by rotating the collecting container and the air-free and leveled mixture can be dispensed.

In the embodiment variant of Figs. 4A and 4B, device 33 comprises the same valve body 24 as in Fig. 3 provided with inlet 25 and Luer-Lok connector 4 and a transversal bore 35 in which rotary plug 30 with dispensing channel 31 and deviating channel 32 is arranged.

In contrast to the embodiment according to Figs. 3A and 3B, collecting container 36 with filter 37 is arranged at an angle, e.g. 45°, with respect to the longitudinal axis of the mixer. This angle may also have a different value between 0 and 90°. The inclined arrangement of the container allows an improved venting when the dispensing appliance is directed vertically upwards for a better venting. To open

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dispensing channel 31, the collecting container is rotated 90°.

In Fig. 5, a fourth exemplary embodiment is illustrated that is based on the exemplary embodiment according to Fig. 2 whereas valve body 38 of device 39 and Luer-Lok connector 4 form a unit with mixer housing 21. A cylinder 40 is arranged as part of collecting container 41 on valve body 38 with Luer-Lok connector 4.

10

The movable valve member consists of a plug 43 that is displaceable in a transversal bore 44 in the valve body and is provided with a deviating channel 45, and at the end of which a cap 46 is arranged whose front side is provided with venting slots 47 above which filter 42 is arranged. In order to prevent that the movable valve member may be withdrawn, cap 46 comprises a circular collar 48 that cooperates with a collar 49 on cylindrical portion 40.

20 In the position illustrated in Figure 5, the device is in venting mode. After venting and leveling, the movable valve member is pulled up, thus forming a dispensing channel through which the mixture can be dispensed.

25 In Fig. 6, a fifth exemplary embodiment is illustrated where the valve assembly is spring-loaded in order to ensure an automatic return of the valve to the dispensing position. Similarly to that according to Figures 1, 3, or 4, device 50 is designed as a unit that is attachable to the mixer, and includes a valve body 51 with an inlet bore 25 and a Luer-Lok connector 4.

Valve body 51 is provided with a transversal bore 52 in which the movable valve member 53 is arranged. The movable valve member has a dispensing channel 54 followed by an

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intermediate portion provided with deviating channel 55 that leads to collecting container 56 with filter 57. A compression spring 58 is arranged between the end of the movable member and the bottom of the transversal bore. The  
5 section of the movable valve member provided with the dispensing channel has a larger diameter than the intermediate portion so that a circular collar 59 is formed at the junction between these two parts, thereby preventing that the movable valve member may be removed from the valve  
10 body.

In the position illustrated in Fig. 6, the device is in dispensing mode. If a venting and leveling operation is required, the collecting container is pressed down and the  
15 dispensing appliance is actuated until the air has escaped and the materials are leveled, whereupon the collecting container is released and dispensing may start immediately.

A spring-loaded valve member is also illustrated in the  
20 exemplary embodiment according to Fig. 7, device 60 being again designed as an attachable unit. Valve body 61 with inlet bore 25 is formed integrally with Luer-Lok connector 4. The movable valve member is designed as a nonreturn valve 62 that is arranged in a carrier member 63 arranged in a  
25 transversal bore 64 in the valve body.

Carrier member 63 comprises both deviating channel 65 and dispensing channel 66, a section of the deviating channel serving as the dispensing channel in the open position. In a  
30 manner known per se, nonreturn valve 62 is provided with a valve ball 67 that is loaded by a compression spring 68 and pushed against a valve seat 69 in carrier member 63. Carrier member 63 connects to collecting container 70 with filter  
71.

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This embodiment operates automatically, the air and the unwanted material first being transferred via deviating channel 65 to collecting container 70, and when the latter is filled, the valve being opened by the buildup of a higher  
5 pressure to allow the mixture to be dispensed.

In the exemplary embodiment according to Fig. 7A, an additional arrangement is illustrated that allows either avoiding or indicating an overpressure during dispensing.  
10 These functions allow a defined and complete filling of cavities. The components are leveled and vented as disclosed hereinbefore and subsequently transferred to the cavity e.g. by means of a catheter. When the cavity is filled up, the pressure increases and the pressure relief assembly either  
15 reduces the unwanted overpressure automatically by means of a pressure relief valve or via a signaling device, or the overpressure is displayed.

Such an arrangement is advantageous mainly in medicine, e.g.  
20 in the application of two-component substances as a nucleus replacement in intervertebral disks or for filling up osteoporotic bones with bone cement, to prevent overfilling.

In the exemplary embodiment of Fig. 7A, the pressure  
25 limiting or indicating device 102 is in the form of a pressure relief valve 103 consisting of a valve ball 104 loaded by a compression spring 105. Deviating channel 65 that leads to the collecting container is prolonged in the opposite direction to form a relief channel 106 and  
30 comprises an enlarged, outwardly open section 107 that is terminated by an outlet 108 of smaller diameter, the junction between the relief channel and the enlarged section being configured as a valve ball seat 109.

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With this device, the starting phase and the dispensing operation remain the same as previously. When the pressure in the system increases during dispensing and the cavity is full, pressure relief valve 103 opens at a previously  
5 specified pressure, which pressure is determined by the compression spring.

Instead of a pressure relief valve it is also possible to provide a signaling device that controls the dispensing  
10 appliance, or a display device that indicates the current pressure.

The pressure relief assembly is fully effective in combination with the venting and the leveling of the  
15 components for achieving best operating conditions, but a pressure relief assembly as described with reference to Figure 7A may also be used with the other described or with further leveling devices or alternatively without such devices, i.e. with a mixer or dispensing appliance alone.

20 Fig. 8 illustrates a variant of the embodiment of Fig. 7 where attachable device 75 comprises a circular collecting container 76 that is closed with a filter 77 and arranged around valve body 78. In a transversal bore 79 in the valve  
25 body, a carrier member 80 is arranged in which nonreturn valve 62 forms the movable valve member and which includes deviating channel 81 and dispensing channel 82.

In the variant of Figure 9, collecting container 83 of  
30 attachable device 85 is made of a porous material 84 that allows air but no material of the mixture to escape. The collecting container is arranged around mixer housing 21 that serves as the valve body 86 and whose wall 87 comprises a deviating channel 88. Nonreturn valve 62 is arranged in  
35 the dispensing channel 90 of a valve seat part 91. As

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further appears, the inlet on the cartridge side tapers toward the valve seat.

In the variant of Figure 10, the circular collecting  
5 container 92 of device 93 is directly arranged on the  
portion of mixer housing 21 that serves as the valve body,  
housing wall 94 comprising a deviating channel 95, and  
nonreturn valve 62 in dispensing channel 97 being disposed  
10 in a valve seat part 98. The collecting container is closed  
with a filter 99 and is rotatable or axially displaceable in  
order to open or close deviating channel 95, and rests on a  
shoulder 96 in mixer housing 21. In the rotatable version,  
one half 100D of end wall 100 on the outlet side of the  
collecting container is thicker than the other half.

15 Fig. 11 illustrates a variant of the embodiment of Fig. 1  
where no collecting container is provided. Device 72 has the  
same valve body 17 as in Fig. 1 with inlet bore 25 and Luer-  
Lok connector 4 but may alternatively also comprise the  
20 other valve assemblies. In contrast to the other examples,  
no collecting container is provided but deviating channel 74  
on actuating member 73 here leads to a coupling 89 for  
connecting a suction device or a hose or a collecting  
balloon.

25 According the above description, the venting and leveling  
device follows after the mixing operation. It may be used  
for static mixers, as shown, or also for dynamic mixers.  
Furthermore, the device may not only be arranged inside the  
30 mixer housing, after the last mixing element, or between the  
mixer and the following application instrument, but also  
integrated in the latter.

Instead of the illustrated straight embodiments, versions  
35 that are angled after the mixer are also conceivable. Also,

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the different valves and assemblies may be combined with each other as desired.

The invention described above eliminates the following  
5 system inherent weaknesses in multicomponent dispensing appliances :

- filling level differences in the cartridge,
- air bubbles in the cartridge cylinders,
- air in the mixer and in the transfer channel,
- 10 - the preceding component, and
- the incompletely mixed starting phase.

It is therefore possible to use such dispensing appliances also for critical applications in surgery as it is ensured  
15 that neither air nor incompletely mixed materials can be applied.

The method and the device have been described with reference to multicomponent dispensing appliances as they are most  
20 useful in this case, but an analogous method and an analogous device may as well be used for a single component dispensing appliance, in which case the venting and the elimination of the unwanted starting phase, which may e.g. also contain air bubbles, are of particular importance.

25 The differences in the devices according to the drawings are e.g. found in the use of an outlet nozzle instead of a mixer in Figures 1, 2, and 5, and furthermore in the use of a cartridge having a single storage container instead of  
30 double cartridge 19 in Figure 1. The remaining parts may be the same. However, the device of the invention may also be arranged in a different location of the dispensing appliance, e.g. on the application instrument.

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### Claims

1. Method for venting and eliminating liquid material of a dispensing appliance prior to dispensing, the air as well  
5 as unusable material being eliminated via a deviating channel and the conditioned material being dispensed via a dispensing channel.
2. Method according to claim 1 for venting, leveling, and  
10 eliminating incompletely mixed components after the mixing operation of at least two components, the air and the incompletely mixed materials being eliminated via a deviating channel and the vented, leveled, and mixed materials being dispensed via a dispensing channel.
- 15 3. Method according to claim 1 or 2, characterized in that after the venting and the elimination of the unusable or non-leveled material, the material is conducted into the dispensing channel by actuating a valve assembly.
- 20 4. Method according to any one of claims 1 to 3, characterized in that the pressure of the dispensed material is previously specified and is limited, signaled, or indicated.
- 25 5. Device for implementing the method according to claim 1, for venting a dispensing appliance and eliminating unusable liquid material therein, the device (6, 23, 33, 39, 50, 61, 72, 75, 85, 93) being provided with a valve assembly  
30 (8) for selectively connecting the inlet area of the device with a deviating channel (15, 32, 45, 55, 65, 74, 81, 88, 95) or with an outlet (9).
6. Device according to claim 5 for venting, leveling, and  
35 eliminating the liquid material after the mixing operation



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in a multicomponent dispensing appliance comprising a multicomponent syringe or cartridge and a mixer, characterized in that the device (6, 23, 33, 39, 50, 61, 72, 75, 85, 93) that is arranged after the mixer elements (3, 5) is provided with a valve assembly (8) for selectively connecting the area after the mixing elements with a deviating channel (15, 32, 45, 55, 65, 74, 81, 88, 95) or with the mixer outlet (9).

7. Device according to any one of claims 4 to 6, characterized in that it includes a pressure relief assembly (102) that is arranged after the mixer elements and is configured such that a previously specifiable pressure during dispensing is not exceeded, is signaled, or indicated.

8. Device according to claim 7, characterized in that the pressure relief assembly (102) comprises a relief channel (106) that is connected to the deviating channel (65) and is terminated by a pressure relief valve (103).

9. Device according to claim 7, characterized in that the pressure relief assembly (102) comprises a relief channel (106) that is connected to the deviating channel (65) and in or on which a signaling device or a display device is arranged.

10. Device according to any one of claims 5 to 9, characterized in that a collecting container (7, 28, 36, 41, 56, 70, 76, 83, 92) is connected to the deviating channel.

11. Device according to claim 10, characterized in that the collecting container is closed with a filter (11, 57, 71, 77, 84, 99) that is impermeable to the material and permeable to air.

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12. Device according to claim 11, characterized in that the collecting container (7V) is closed with a filter (11V) that is arranged between the container and a cover (7D) and  
5 is impermeable to the material and permeable to air, the cover having at least one opening (7H).

13. Device according to any one of claims 5 to 12, characterized in that it is designed as a unit can be pushed  
10 on a mixer (2).

14. Device according to any one of claims 5 to 13, characterized in that the valve body (20, 38) of the valve assembly is formed integrally with the mixer housing (21).  
15

15. Device according to any one of claims 5 to 12, characterized in that it is connectable on its outlet side to an application instrument.

20 16. Device according to any one of claims 5 to 15, characterized in that the valve assembly includes a movable valve member (12, 27, 34, 43, 53, 62) that is arranged inside the valve body (17, 20, 24, 38, 51, 61) and provided with a deviating channel (15, 32, 45, 55, 65, 74, 81, 88,  
25 95) and a dispensing channel (13, 31, 54, 66, 83, 90, 97), the movable valve member being capable of being selectively brought to respective positions in which the area after the mixer elements (3, 5) is connected to the deviating channel or to the dispensing channel.

30 17. Device according to claim 16, characterized in that the linearly movable valve member (12, 43, 53, 62, 73) is arranged in a transversal bore (16, 17; 44, 52, 64, 79) in the valve body (17, 20, 38, 51, 61, 78).

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18. Device according to claim 17, characterized in that the linearly movable valve member (53) is loaded by a compression spring (58).

5 19. Device according to claim 16, characterized in that the linearly movable valve member is a nonreturn valve (62).

20. Device according to claim 16, characterized in that the rotationally movable valve member (27, 34) is arranged in a transversal bore (26, 35) in the valve body (24).  
10

21. Device according to any one of claims 5 to 20, characterized in that the collecting container (7, 28, 36, 41, 56, 70) is integrally connected to the movable valve member.  
15

22. Device according to any one of claims 16 to 20, characterized in that the circular collecting container (76, 83) is connected to the valve body (78, 87).  
20

23. Device according to claim 22, characterized in that the circular collecting container (83) is made of a material (84) that is permeable to air but impermeable to the material.  
25

24. Device according to any one of claims 16 to 20, characterized in that the circular collecting container (96) is connected to the mixer housing (21).  
30

25. Device according to claim 24, characterized in that the collecting container (92) is arranged on the mixer housing (21) in a longitudinally displaceable or rotatable manner for opening or closing the deviating channel.

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26. Device according to any one of claims 5 to 25,  
characterized in that the deviating channel (74) of the  
collecting container is provided with a coupling means (89)  
for a suction device or a hose or a collecting balloon.

5

27. Device according to any one of claims 5 to 26,  
characterized in that the valve body is provided on its  
outlet side with interfaces (4) for following application  
instruments.

10

28. Device according to any one of claims 10 to 27,  
characterized in that the collecting container is arranged  
concentrically or eccentrically to the longitudinal center  
axis of the movable valve member or of the mixer housing and  
15 in the longitudinal axis or at an angle with respect to the  
longitudinal axis of the movable member.

29. Device according to any one of claims 10 to 28,  
characterized in that a splash guard (101) is arranged in  
20 the collecting container (6V).

30. Filter assembly for a device for venting and  
eliminating liquid material in a dispensing appliance prior  
to dispensing, comprising a collecting container (7V),  
25 characterized in that the filter (11V) is arranged between  
the collecting container and an associated cover (7D), the  
cover having at least one opening (7H) and the surface of  
the cover that is facing the filter having a surface  
structure that allows conducting the air that is flowing  
30 through the filter to the outlet opening resp. openings from  
any position, the filter (11V) being impermeable to the  
material and permeable to air.

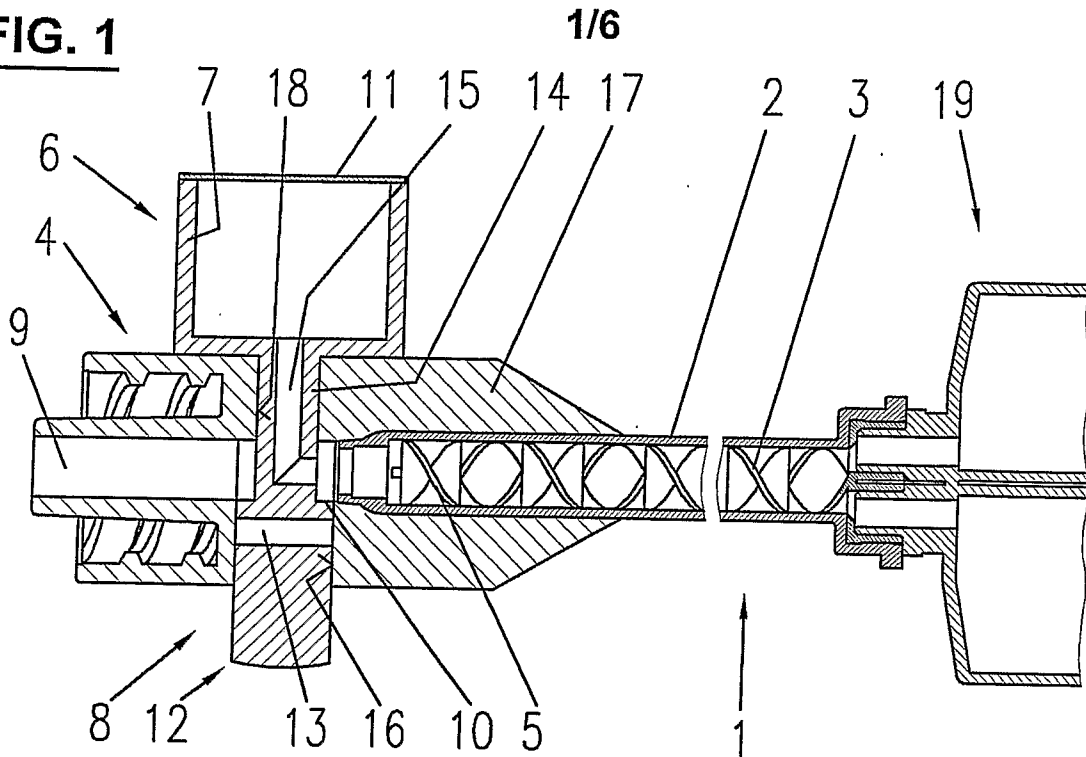
- 19 -

31. Filter assembly according to claim 30, characterized in that the filter is hydrophobic or porous or provided with fine channels.

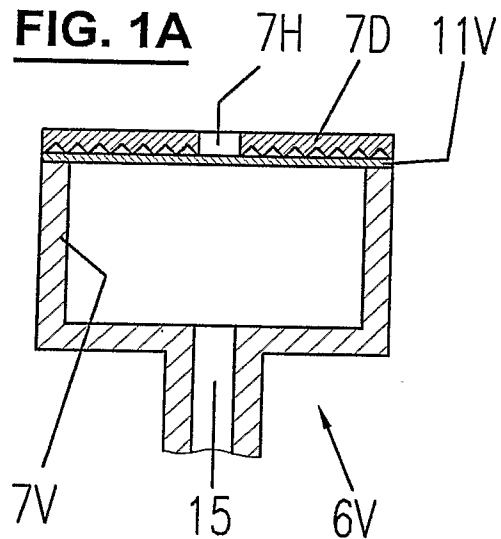
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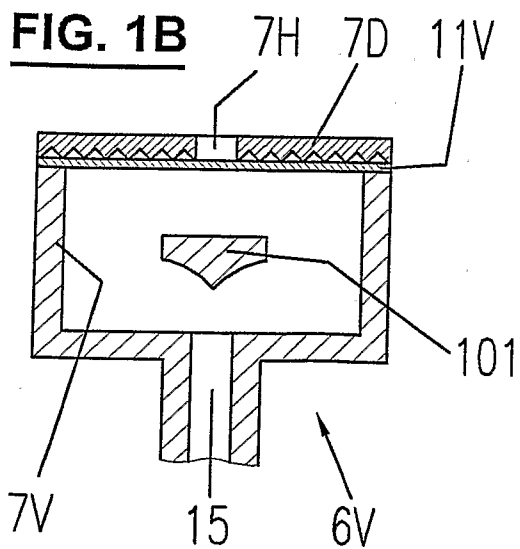
**FIG. 1**



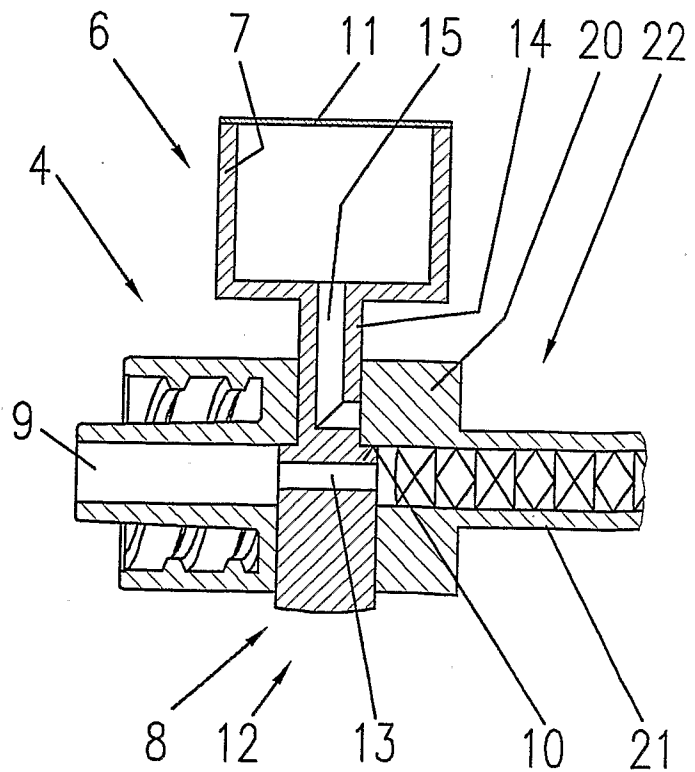
**FIG. 1A**



**FIG. 1B**

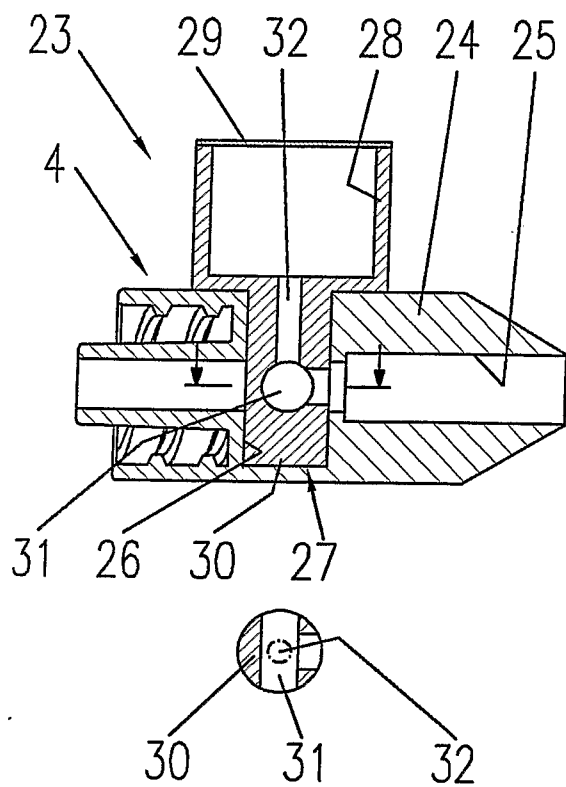


**FIG. 2**

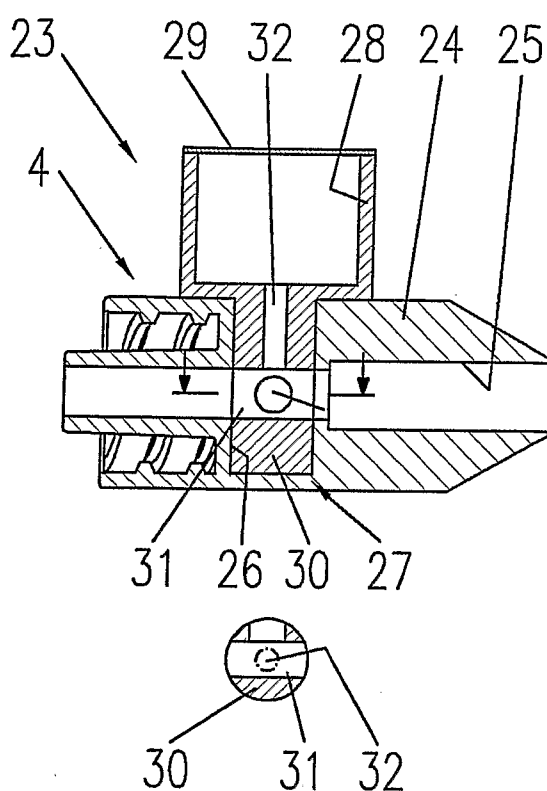


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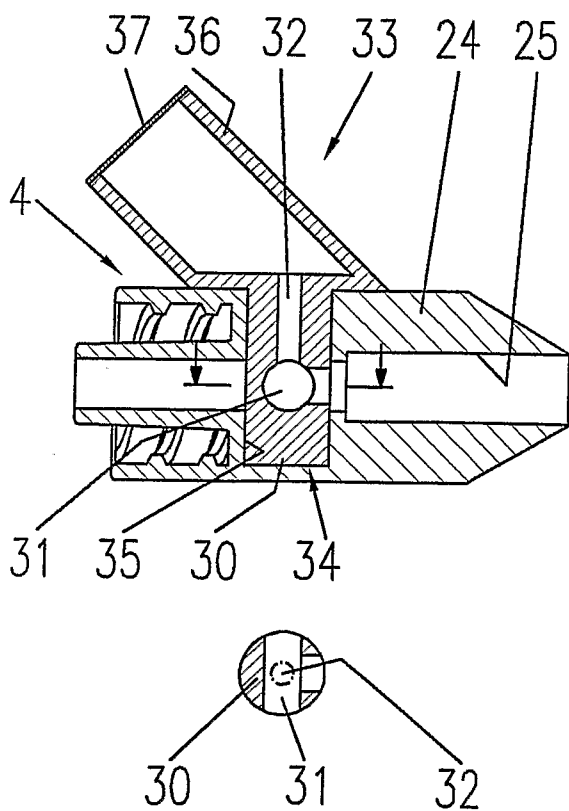
**FIG. 3A**



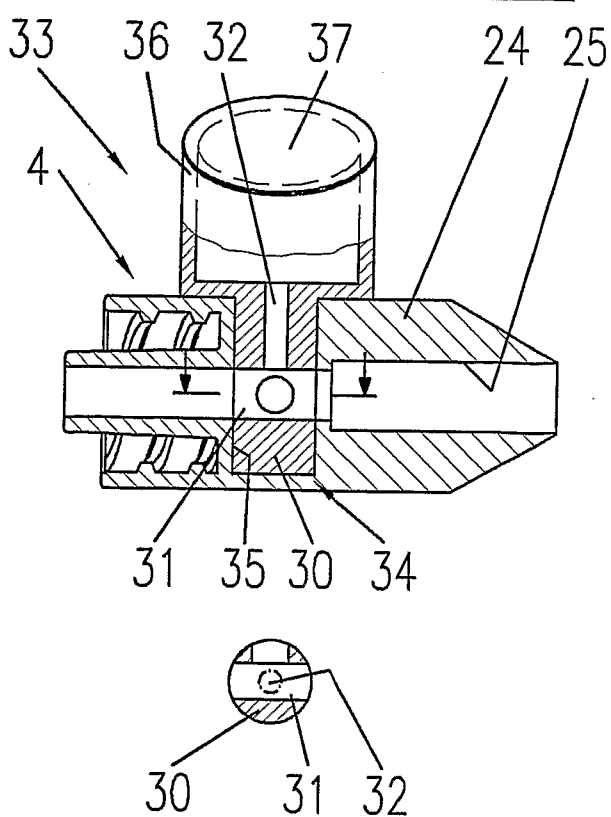
**FIG. 3B**



**FIG. 4A**

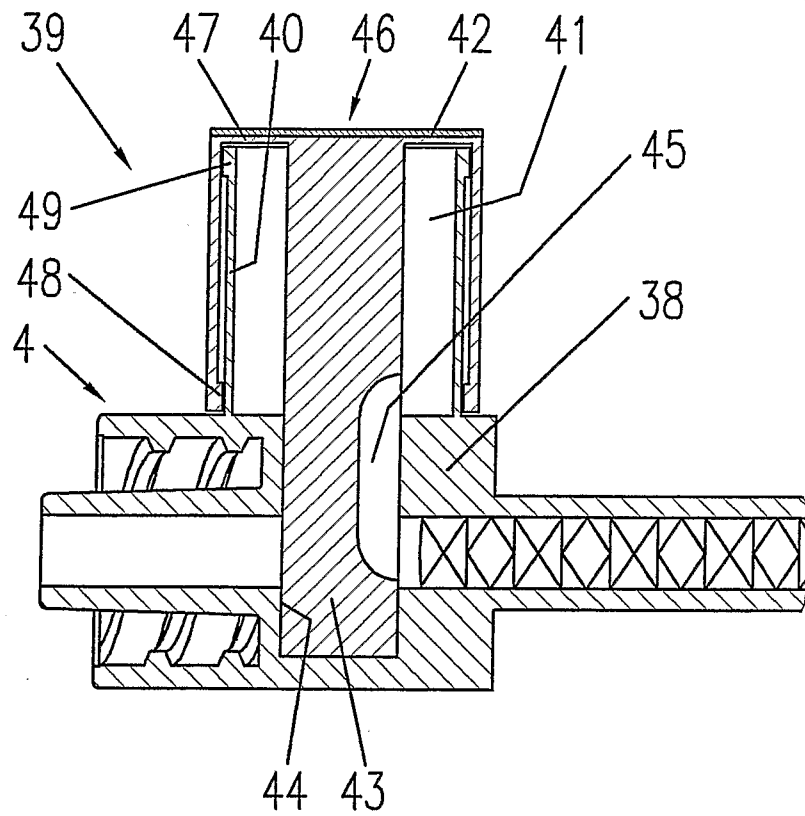


**FIG. 4B**

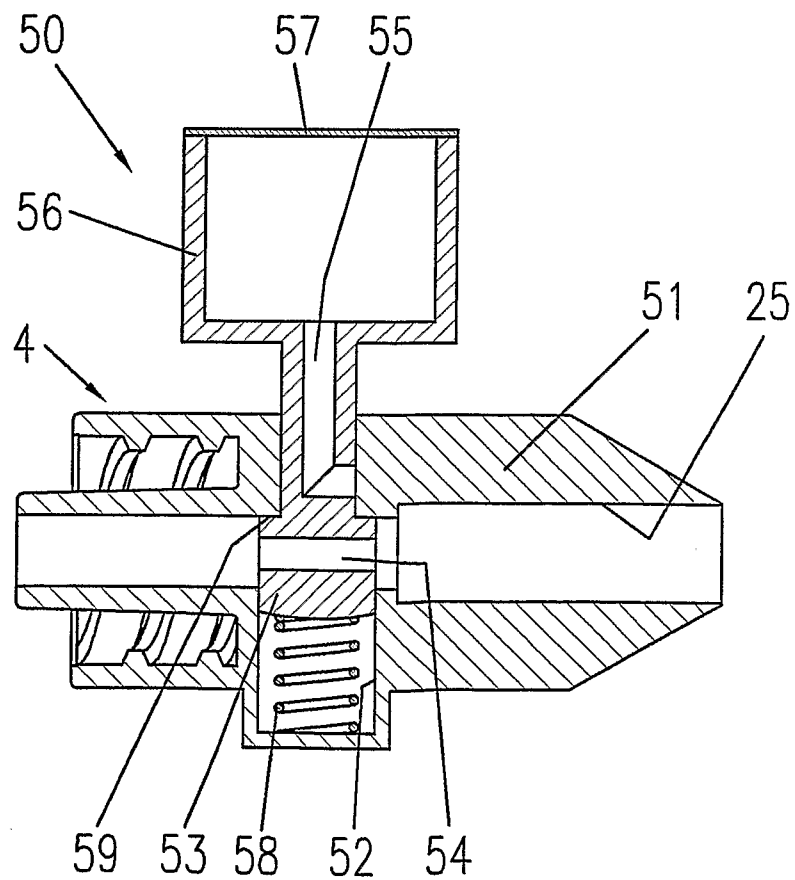


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**FIG. 5**

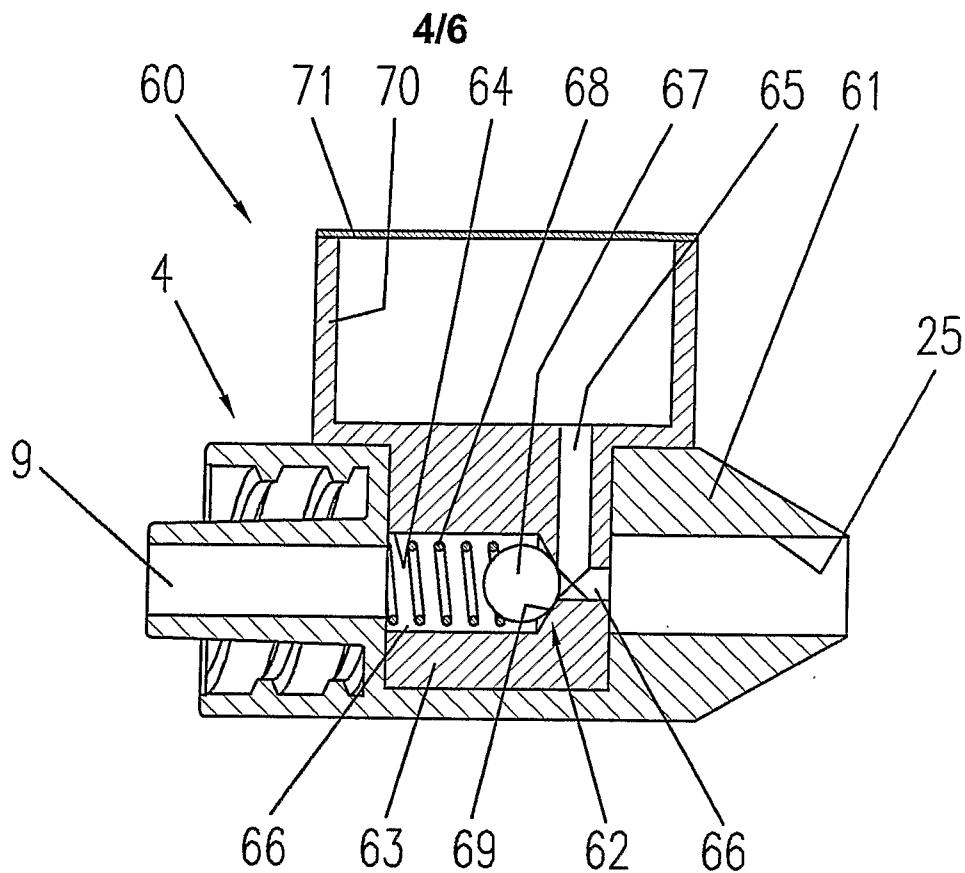


**FIG. 6**

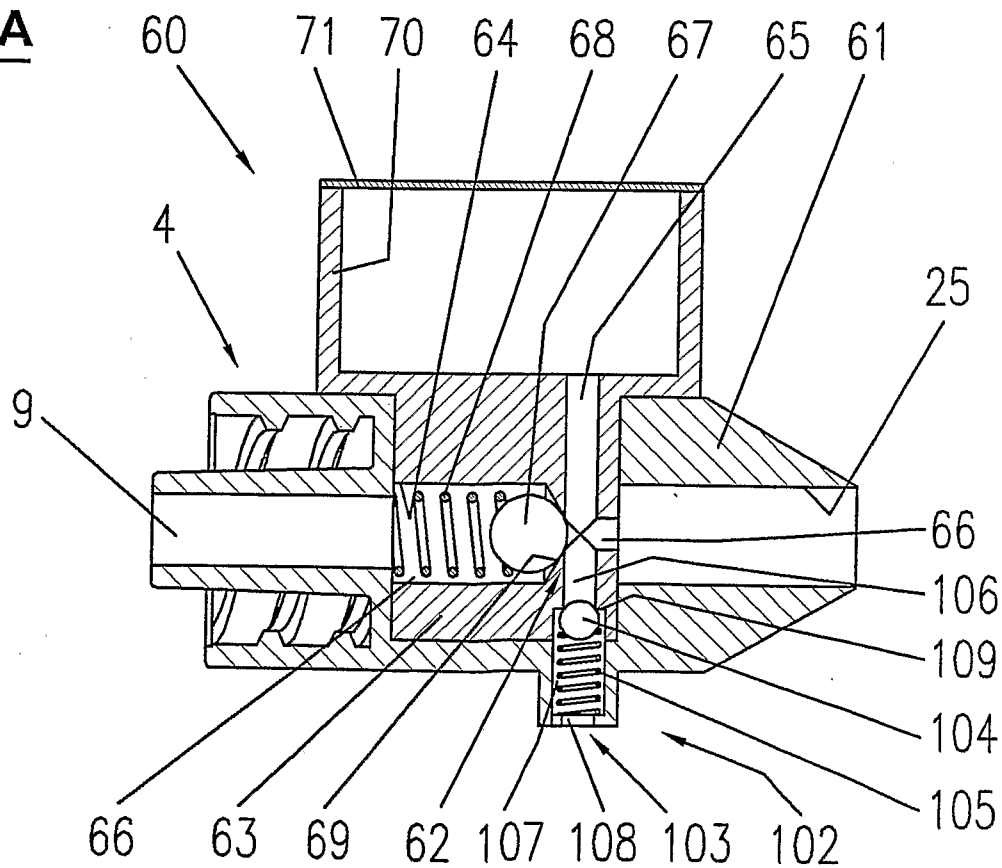




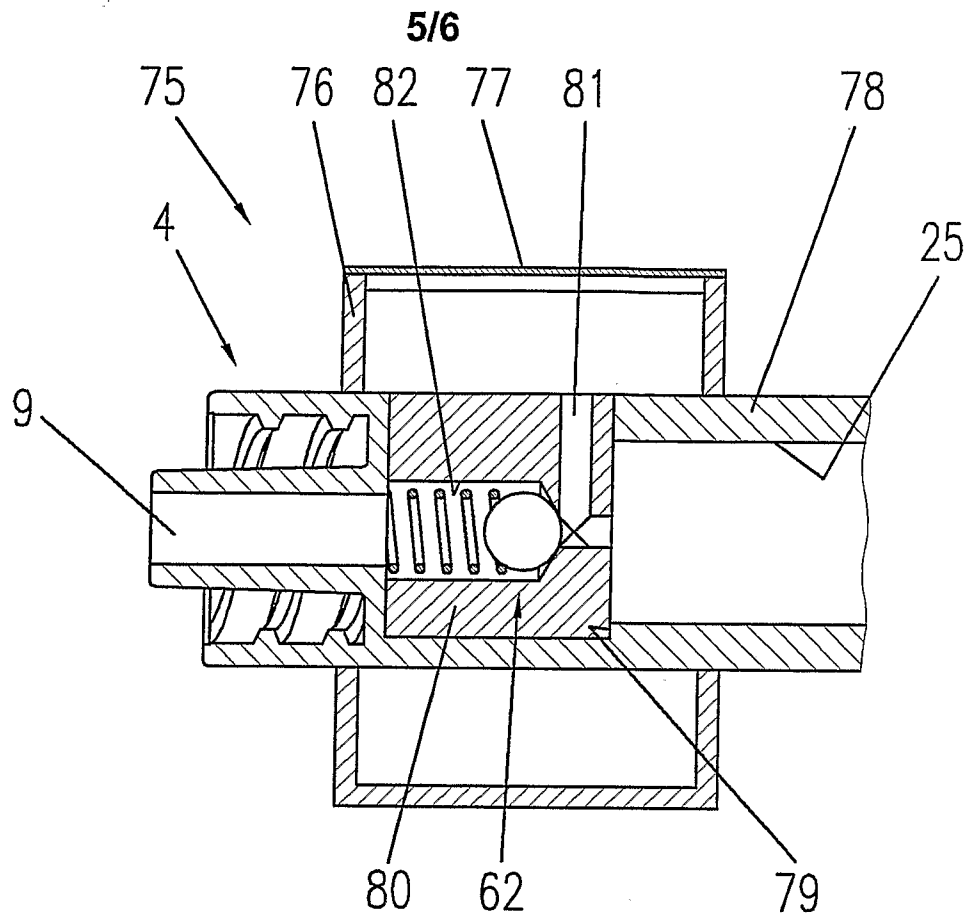
**FIG. 7**



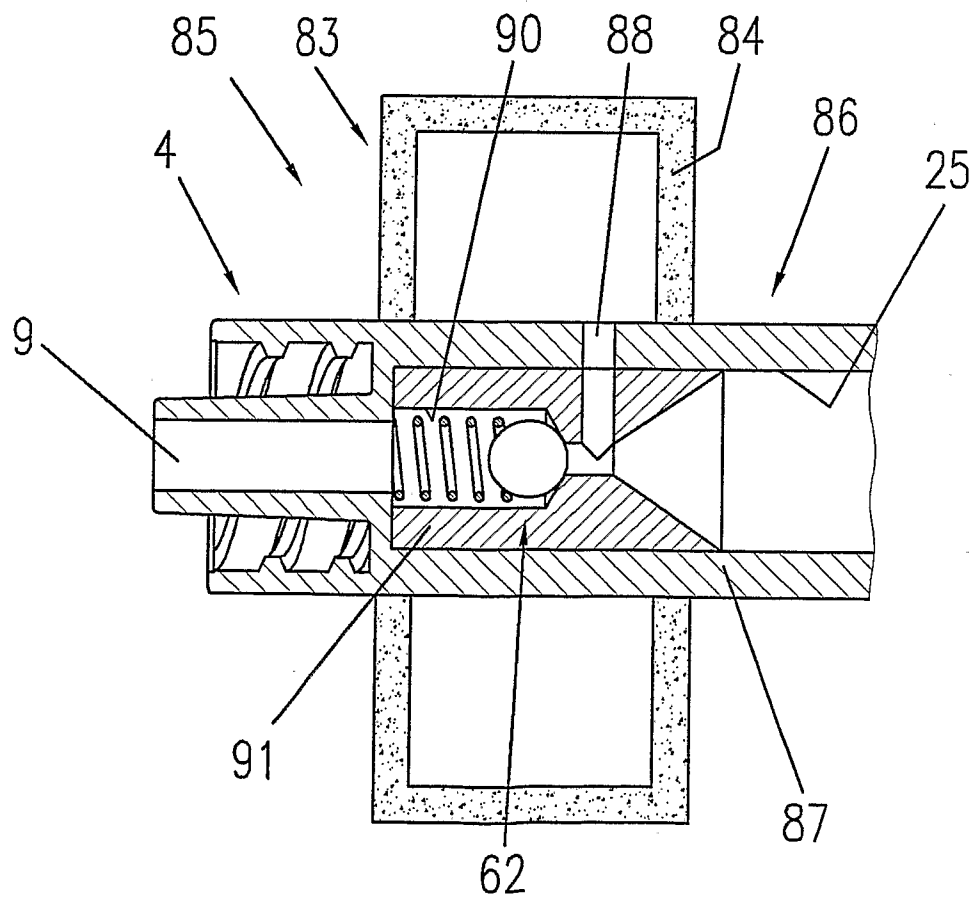
**FIG. 7A**



**FIG. 8**

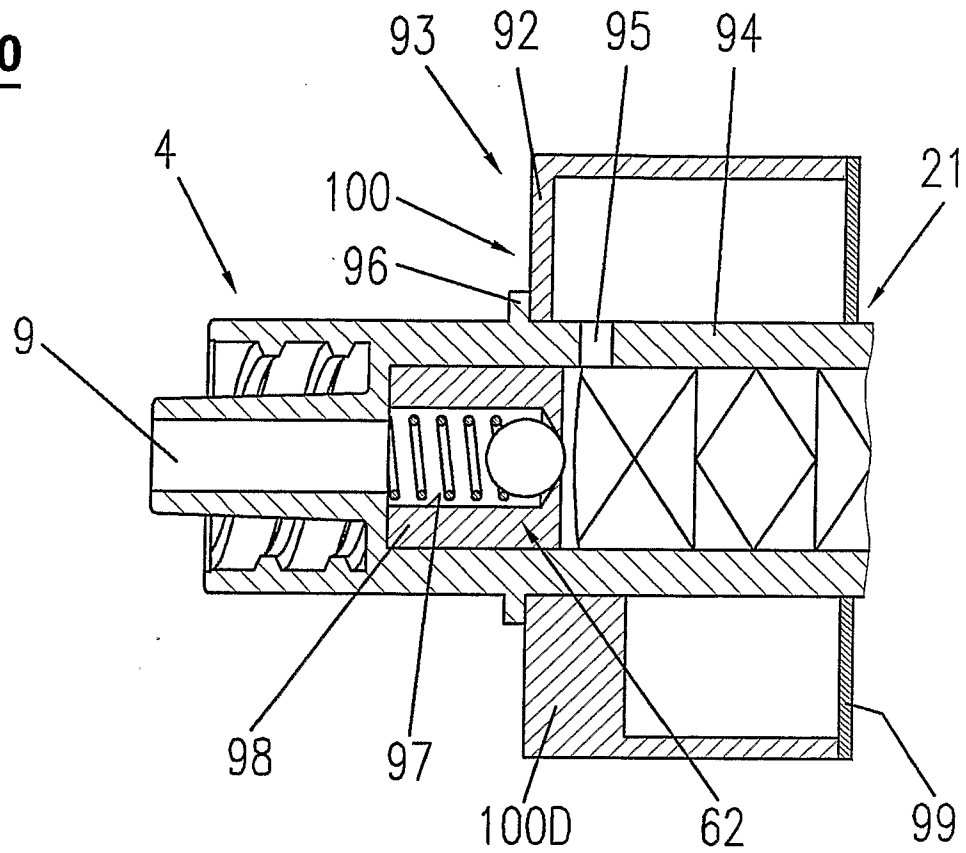


**FIG. 9**

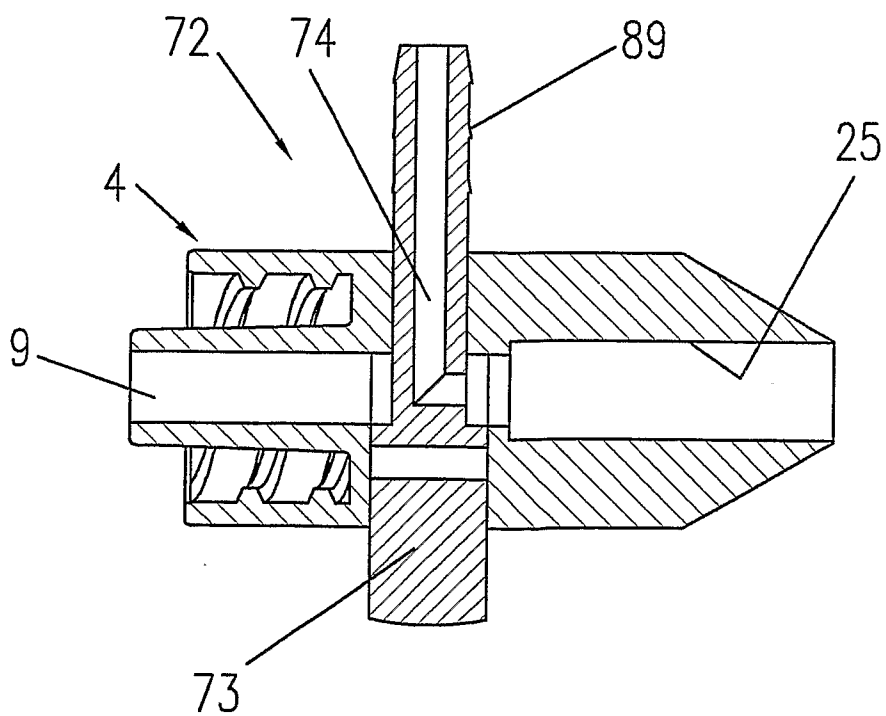


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**FIG. 10**



**FIG. 11**



# INTERNATIONAL SEARCH REPORT

International application No  
PCT/CH2006/000326

## A. CLASSIFICATION OF SUBJECT MATTER

INV. B05C17/005 B01F13/00 A61M5/36 B01D46/10 B01D46/42

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B01F A61B A61M A61J A61F B05C B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 079 868 A (RYDELL ET AL) 27 June 2000 (2000-06-27)	1-3, 5, 6, 10, 13-17, 21, 26-28
Y	column 1, line 19 - line 27	4, 7-9, 11, 20
A	column 11, line 43 - column 12, line 6 column 12, line 49 - column 13, line 30 figures 1, 3, 4, 8, 9a, 9b	4, 7-9, 12, 18, 19, 22-25, 29
	----- -/--	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

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Date of the actual completion of the international search

6 November 2006

Date of mailing of the international search report

13/11/2006

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## INTERNATIONAL SEARCH REPORT

International application No

PCT/CH2006/000326

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 94/15664 A (SHIU, MAN, FAI) 21 July 1994 (1994-07-21)	1-3, 5, 6, 14-16, 20, 26, 27
A	page 3, paragraph 3 page 4, paragraph 5 figure 1	4, 7-13, 17-19, 21-25, 28, 29
Y	US 2005/105385 A1 (MCGILL SCOTT ET AL) 19 May 2005 (2005-05-19) paragraph [0047] - paragraph [0049] figures 1, 2	4, 7-9
Y	US 6 159 232 A (NOWAKOWSKI ET AL) 12 December 2000 (2000-12-12) column 7, line 20 - line 35 column 8, line 14 - line 20 figures 2, 4	11, 20
A	GB 2 400 574 A (VISTEON GLOBAL TECH INC [US]) 20 October 2004 (2004-10-20) page 5, line 16 - line 27 figure 2	30, 31

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/CH2006/000326

## Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-29

Device and method for venting, levelling and eliminating unusable material in a multicomponent dispensing appliance including a pressure relief assembly after the mixer element.

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2. claims: 30,31

Filter assembly arranged between a collecting container and an associated cover.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/CH2006/000326

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6079868	A	27-06-2000	NONE	
WO 9415664	A	21-07-1994	NONE	
US 2005105385	A1	19-05-2005	US 2005105384 A1	19-05-2005
US 6159232	A	12-12-2000	NONE	
GB 2400574	A	20-10-2004	DE 102004016997 A1 US 2004206058 A1	11-11-2004 21-10-2004