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(54) **FOAMING AND FOAM DISPENSING DEVICE AND DISPENSER APPARATUS**

(57) The present invention concerns a foaming and foam dispensing device (10) for a liquid dispenser apparatus (40), designed to pump and foam a pourable liquid from a container (50), comprising a housing plate (20) having at least one positioning element (21, 22), adapted to cooperate with at least one guiding element (41, 42) of the dispenser apparatus (40), wherein the housing plate (20) defines a plane P. The foaming and foam dispensing device (10) further comprises a first pumping arrangement (11) for pumping the pourable liquid, and a second pumping arrangement (12) for pumping a foaming media, wherein the second pump-

ing arrangement (12) features a cylindrical media chamber (14), in which a displacement member (15) is displaceably guided along a central axis (C), and an actuation element (16) for actuating the first and the second pumping arrangement (11, 12), that has an actuation area (17) for cooperating with an operating element (43) of the dispenser apparatus (40), wherein one side of the plane P faces the actuation area (17), wherein the media chamber (14) of the second pumping arrangement (12) is located on the side of the plane P that faces the actuation area (17) of the actuation element (16).

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Description

[0001] The present invention relates to a suitable for a liquid dispenser apparatus. The foaming and foam dispensing device is designed to pump and foam a pourable liquid from a container and comprises a housing plate having at least one positioning element adapted to cooperate with, preferably adapted to be received and retained in, at least one guiding element of the dispenser apparatus wherein the housing plate defines a plane, a first pumping arrangement for pumping the pourable liquid, and a second pumping arrangement for pumping a foaming media, wherein the second pumping arrangement features a cylindrical media chamber, in which a displacement member is displaceably guided along the central axis, and an actuation element for actuating the first and the second pumping arrangement that has an actuation area for cooperating with an operating element of the dispenser apparatus, wherein one side of the plane faces the actuation area.

[0002] Further, the invention relates to a liquid dispenser apparatus suitable for dispensing of liquids associated with hand-hygiene. Such foaming and dispensing devices as well as such liquid dispenser apparatuses are e.g. placed in health care settings, public conveniences or highly frequented public areas.

[0003] The present invention especially relates to a foaming and dispensing device with individual features of claim 1 and further to a liquid dispenser apparatus with individual features of claim 14.

[0004] The use of liquid dispenser apparatuses for dispensing liquids for hand hygiene has become very important over the past few years, as the importance of hand hygiene has become more and more acknowledged in the public in order to reduce the risk of infections and to avoid spreading of anti-microbial resistencies. An apparatus for making and dispensing foam is e.g. known from US 2001/004276 A1. The apparatus for making and dispensing foam disclosed in this document has a housing forming a generally closed foaming chamber, a liquid pump for drawing liquid from a supply and spraying the liquid into the foaming chamber, and an air pump for forcing air into the foaming chamber. The conduit forms a continuously opened passage having an inner end opening into the foaming chamber and an outer end open to outside. A foam generator and the foaming chamber mixes the spray and air therein to generate foam and to expand the foam to flow through the conduit out the outer end thereof.

[0005] The liquid pump includes a small diameter liquid chamber with a small diameter liquid piston displaceable therein while the air pump includes a large-diameter air chamber and a large-diameter air piston displaceable therein and coupled directly to the liquid piston. The large-diameter air chamber as well as the liquid chamber project from a housing plate on a side of the housing plate that is opposite to the side where a nozzle is arranged. In operation both, air chamber and liquid cham-

ber, are located within a supply container that holds a foamable liquid soap or detergent.

[0006] A disadvantage of this apparatus is, that due to the large-diameter air chamber non-standard containers have to be used in cooperation with this apparatus. Such containers are rather expensive and laborious to use in industry as bottling plants at soap or disinfectant producers must be adapted to these non-standard containers. Further, in some legislations it may even be necessary to registered and approve such containers by medical registration authorities.

[0007] It is hence an object of the present invention to provide a foaming and dispensing device which is suitable for use with standard liquid soap containers having a narrow neck and alternatively to improve such devices. It is a further object of the present invention to provide a liquid dispenser apparatus along the use of standard narrow neck containers, and alternatively to improve such apparatuses.

[0008] These and other objects of the present invention are accomplished by providing a foaming and foam dispensing device for a liquid dispenser apparatus wherein the media chamber of the second pumping arrangement, which is suitable for pumping a foaming media like air, is located on the side of the plane, defined by the housing plate, that faces the actuation area of the actuation element. Preferably, the second pumping arrangement is entirely located on that side of the plane. Due to this arrangement, only the first pumping arrangement may be arranged on the side of the plane and respectively on the side of the housing plate which faces the container when the foaming and foam dispensing device is in operation. This first pumping arrangement which is suitable for pumping the liquid like e.g. liquid foamable soap, may due to its smaller diameter easily be arranged or inserted into a standard container via its neck.

[0009] In an advantageous embodiment of the present invention, a ratio of an inner radius of the media chamber of the second pumping arrangement air pumping arrangement and a height of the media chamber of the second pumping arrangement in a direction along the central axis has a value in the range of 2.8/1 to 1.5/1, preferably of 2.5/1 to 1.8/1.

[0010] In a further favorable embodiment of the invention the at least one positioning element is arranged at an outer edge of the housing plate, hence providing an exact positioning close to the first and second pumping arrangements.

[0011] In an advantageous geometry according to the invention, a first and a second outer edge are disposed on opposite sides of the housing plate, having first and second positioning elements, allowing for an exact positioning of the foaming and foam dispensing device in a liquid dispenser apparatus.

[0012] In a further advantageous embodiment, each of the first and second positioning elements have a chamber arranged on a wall-member that projects, preferably vertically, from the housing plate. By means of the cham-

fers arranged on the wall-members, positioning of the foaming and foam dispensing device in the liquid dispenser apparatus may be improved further. Also, when the first and second positioning elements with the chambers cooperate with corresponding guiding elements of the dispenser apparatus, a reversible fixation or retention of the foaming and foam dispensing device in the liquid dispenser apparatus may be achieved.

[0013] In another preferred embodiment of the invention, the second pumping arrangement has a cylindrical housing that can be formed in one piece with a housing plate and that projects away from the housing plate in a direction towards the actuation area of the actuation element. Cylindrical in this respect is meant to be circular cylindrical. By forming the cylindrical housing of the second pumping arrangement in one piece with the housing plate manufacturing costs may be reduced.

[0014] In a further advantageous embodiment of the invention the housing plate has an extension that projects away from the cylindrical housing in a direction parallel to the direction of the first and second positioning elements, and that on the side of the extension facing the actuation area of the actuation element there is disposed at least one mounting appliance for mounting a dispenser nozzle. With the extension of the housing plate on which a mounting appliance is arranged, a modular design of the outlet channel is supported, with different lengths of dispenser nozzles are rendered possible.

[0015] In a further preferred embodiment of the invention, a first and a second mounting appliance are arranged on the extension in a distance from each other along a radial line with respect to the cylindrical housing. With these at least two mounting appliances arranged in a distance to each other and to a distance from the cylindrical housing dispenser nozzles of different length may be used with the foaming and foam dispensing device, and may be arranged in different distances to the cylindrical housing. Due to this flexibility the foaming and foam dispensing device may be used with different sizes of liquid dispenser apparatuses.

[0016] In a further favorable embodiment of the invention, each mounting appliance comprises two opposite posts, each having a slot for cooperation with a respective key of the dispenser nozzle. First it should be mentioned that the key needn't be an integral part of the dispenser nozzle. Rather the key could also be formed on an individual part which is connected to the dispenser nozzle. Due to this construction with two opposite posts each having a slot for cooperation with a key a mechanically simple solution for placing a dispenser nozzle on the extension of the housing plate can be provided.

[0017] In another embodiment of the invention the keys are disposed on an intermediate member which is connected to the dispenser nozzle. Forming the keys on an intermediate member which is connected to a dispenser nozzle facilitates manufacturing the dispenser nozzle and the intermediate member with the keys as injection molding parts. Also, a high flexibility when choosing dif-

ferent sizes of dispenser nozzles is obtained.

[0018] In a further preferable embodiment of the invention, the actuation element hosts a fluid dispensing channel that terminates at one end in a pipe socket, the pipe socket being in fluid communication with the dispenser nozzle via an elastic tube. This structure with the elastic tube being in between the pipe socket and the dispenser nozzle facilitates that the dispenser nozzle may be fixed to the extension of the housing plate while the actuation element is a movable piece which may be moved back and forth respectively up and down, while the dispenser nozzle remains static.

[0019] In a preferred embodiment, the intermediate member is at one end connected to and in fluid communication with the elastic tube and at its opposite end the intermediate member is connected to and in fluid communication with a dispenser nozzle. This means that the pipe socket will be connected to the dispenser nozzle not only via the elastic tube but also via the intermediate member, whereby the intermediate member also is used to fix the dispenser nozzle to the extension of the housing plate via the cooperation of the mounting appliances with the slotted opposite posts and the respective keys at the intermediate member.

[0020] In a further advantageous embodiment, in fluid direction before and/or behind the intermediate member there is arranged at least one foam generator within the fluid dispensing channel. There may hence be one or more foam generators placed within the fluid dispensing channel including the fluid dispensing channel within the dispenser nozzle. As a result a fine pored and solid foam may be generated.

[0021] The object of the present invention is further solved by providing a liquid dispenser apparatus that comprises a casing with a first shell and a second shell, the first shell and the second shell being pivotably connected with each other and being pivotable between an open and a closed position, at least one guide element for positioning of a foaming and dispensing device, a foaming and dispensing device according to the invention as described above, being received and positioned by the at least one guiding element, and an operating element for actuating the foaming and dispensing device, in order to facilitate dispensing of a foamed liquid from a container. The liquid dispenser apparatus therefore has all the advantages as described above in respect to the inventive foaming and foam dispensing device.

[0022] Further features of the invention, its nature and various advantages will become more apparent from the accompanying drawings and the following detailed description of the preferred embodiments, in which:

Figure 1 a is a perspective view of a foaming and foam dispensing device in a first embodiment,

Figure 2 shows a cross-section of the embodiment of figure 1 along the line II of figure 1,

Figure 3 shows a side view of the embodiment of figure 1 with the dispenser nozzle being tied in another mounting appliance,

Figure 4 shows a top view of another foaming and foam dispensing device according to the invention,

Figure 5 shows a side view of the embodiment of figure 4,

Figure 6 shows a perspective view of a dispensing apparatus with a foaming and foam dispensing device and a container holding a liquid in a perspective view,

Figure 7 shows the embodiment of figure 6 in a side view with the liquid dispenser apparatus partially cut along its longitudinal axis.

Detailed description of the invention

[0023] In figures 1 - 3 a first embodiment of a foaming and foam dispensing device 10 is shown. The foaming and foam dispensing device 10 comprises a lower intake formed by an immersion tube 37 which is connected to and in fluid communication with an end of a cylindrical housing 13.1 of a first pumping arrangement 11. In a media chamber 14.1 of the first pumping arrangement 11 a displacement member 15.1 is axially movably guided and is biased by a spring member 16.1 into the position shown in figure 2. Spring member 16.1 is partially hosted in a spring housing 13.3 which is located between the cylindrical housing 13.1 of the first pumping arrangement 11 and a housing plate 20 which runs perpendicularly to an axial extension of the spring housing 13.3 and the cylindrical housing 13.1. On a side of the housing plate 20 which is opposite to the side where the spring housing 13.3 and the cylindrical housing 13.1 project from another cylindrical housing 13.2 of a second pumping arrangement 12 is arranged. Within the other cylindrical housing 13.2 a media chamber 14.2 is disposed in which a displacement member 15.2 is movably arranged.

[0024] At a free of the cylindrical housing 13.2, opposite to the housing plate 20 a cover member 39 is located which holds displacement member 15.2 in place against the force of spring member 16.1.

[0025] The housing plate 20 defines a plane P which runs perpendicular to a central axis C which is defined by an axial extension of displacement member 15.1 and an actuation element 16 which is located on the other end of the displacement member 15.2 close to the other displacement member 15.1. The other displacement member 15.2 is also connected to and movably with the actuation element 16. The actuation element 16 has on its side, which is facing away from the plane P an actuation area 17 which in operation of the device may co-operate with an operating element 43 of a dispenser apparatus 40 as can be seen in figures 6 and 7.

[0026] At the lower end of the cylindrical housing 13.1 between the media chamber 14.1 and the immersion tube 37 a valve member is located which has a closure body 38 which is formed e.g. as a valve ball. In the present embodiment this valve member is formed as a check valve. The valve member may but also be formed as a different type of valve.

[0027] As has been mentioned before, actuation element 16, displacement member 15.1 of the first pumping arrangement 11 and displacement member 15.2 of the second pumping arrangement 12 are designed for joint movement in an axial direction along the central axis C. The actuation element 16 and coupled displacement members 15.1, 15.2 are biased into a neutral position by spring member 18. The functional unit of actuation element 16 and coupled displacement members 15.1, 15.2 may be pushed into a second position by applying a force on the actuation area 17 to move displacement member 15.2 towards the housing plate 20 and towards the plane P respectively, while displacement member 15.1 is moved away from the housing plate 20 and away from plane P. In operation the first pumping arrangement 11 with displacement member 15.1 will pump a liquid into a fluid dispensing channel 18 (see figure 2) which is arranged within the actuation elements 16 and which opens towards the media chamber 14.1 of the first pumping arrangement 11.

[0028] Simultaneously, second pumping arrangement 12 will pump air into this fluid dispensing channel 18 by movement of the displacement member 15.2 towards the housing plate 20. Within the fluid dispensing channel 18 in fluid direction before and/or behind the intermediate member 35 there is arranged at least one foam generator 9.1, 9.2 which may e.g. be formed as a sieve and which causes the liquid pumped with the first pumping arrangement 11 to mix with the air pumped by the second pumping arrangement 12 to form a foam. A foam generator 9.1 may be located within the actuation element 16 and/or additionally a foam generator 9.2 may be arranged within a dispenser nozzle 30.1 which is arranged at the end of the fluid dispensing channel 18. The actuation element 16 has a pipe socket 19 disposed on a side of the actuation element 16 close to the actuation area 17 with the fluid dispensing channel 18 running through this pipe socket 19. Pipe socket 19 is connected to an elastic tube 29, which connects the fluid dispensing channel 18 via an intermediate member 35 with the dispenser nozzle 30.1.

[0029] Housing plate 20 has an extension 27 which lies within plane P and which extends in a radial direction with respect to the central axis C of the cylindrical housing 13.2. On the side 28 of the extension 27 facing the actuation area 17 a first mounting appliance 31 and a second mounting appliance 32 are located. These first and second mounting appliances 31, 32 are each made up by a set of two posts 33, each post 33 having on one side an axial slot 34 which opens to one side of the post 33 wherein the posts 33 are arranged in a way that the slots of

each pair of opposed posts 33 face each other. The posts 33, the extension 27, the housing plate 20, the cylindrical housings 13.1, 13.2 as well as the spring housing 13.3 are formed in a single piece, e.g. from a plastic material which has been formed by e.g. injection molding.

[0030] In figures 1 and 2, the intermediate member 35 carrying the dispenser nozzle 30.1 is inserted with its keys 36 (arranged on both sides of the intermediate member 35) into the slots 34 of the posts 33 of the second mounting appliance 32. In figure 3 on the other hand the intermediate member 35 with its keys 36 is inserted into the slots 34 on the posts 33 of the first mounting appliance 30.1. As both, first mounting appliance 31 and second mounting appliance 32 are arranged in a distance x to each other with respect to a radial direction originating from the central axis C or respectively from the cylindrical housing 13.2. The distance of the free end of the dispenser nozzle 30.1 (figure 3) or 30.2 (figure 4) from the central axis C may be varied depending on the needs as defined by the dispenser apparatus 40 where the foaming and foam dispensing device 10 is integrated in.

[0031] For the positioning and releasable fixation of the foaming and foam dispensing device 10 in a liquid dispenser apparatus 40 there are two positioning elements 21, 22 arranged at opposite outer edges 23, 24 of the housing plate 20. The positioning elements 21, 22 are formed as wall-members 26 which each form chamfers 25 and which may cooperate with first and second guiding elements 41, 42 of a dispenser apparatus 40 as can be seen in figures 6 - 7.

[0032] In figures 4 and 5 another embodiment of the invention is shown. For reference signs and functions not described in the following text reference is made to the description of figures 1 - 3 which is herewith incorporated by reference. The embodiment of figures 4 and 5 differ from the ones described in respect to figures 1 - 3 in that a different dispenser nozzle 30.2 is arranged at the intermediate member 35 and which has a shorter length as the dispenser nozzle 30.1 described in respect to figures 1 - 3.

[0033] In figures 6 - 7 a liquid dispenser apparatus 40 is shown which is equipped with a foaming and foam dispensing device 10 according to the invention as well as with a liquid container 50 which may include a liquid such as a foamable liquid soap. The dispenser apparatus 40 comprises a casing 45 which comprises a first shell 46 and a second shell 47. Both shells 46, 47 are pivotably connected to each other by means of pivot bearings 49 arranged at an end of the casing 45 opposite to the other end of the casing 45 where an operating handle 44 and an operating element 43 are arranged at. With respect to the foaming and foam dispensing device 10 and its function it is referred to the respective description of figures 1 - 5.

[0034] In the part of the first shell 46 which is near the operating handle 44 a first guiding element 41 and a second guiding element 42 are arranged at opposite walls of the first shell 46 of the casing 45. Both first and second

guiding elements 41, 42 are formed as elongated slots which cooperate with the positioning elements 21, 22 of the foaming and foam dispensing device 10 in that the wall-members 26 with chamfers 25 are located within the slots in the first and second guiding elements 41, 42. The foaming and foam dispensing device 10 is located with its immersion tube 37, the cylindrical housing 13.1 of the first pumping arrangement 11 and the spring housing 13.3 (at least partially) within the container whereby spring housing 13.3 has a diameter small enough to be able to be inserted into the neck 51 of container 50.

[0035] As can especially be seen from figure 7, the operating handle 44 and the operating element 43 may be formed as a single, double lever like, member and are pivotably mounted on the casing 45 by means of a pivot bearing 61. The dispenser nozzle 30.2 (which may as well be a longer dispenser nozzle 30.1) is located mainly within the casing 45 but its free end is located in an opening 60 in the second shelf 47 of casing 45. In the position shown in figure 7, the casing 45 is closed by means of a closure element 48.1 formed at the second shell 47 and a respective counter element 48.2 formed at the first shell 46.

[0036] In operation handle 44 may be pushed in direction of arrow 62 and thus moving operating element 43 accordingly in direction 63. Such movement will cause actuation element 16 of the foaming and foam dispensing device 10 to move accordingly and hence pumping liquid and air through the fluid dispensing channel 18 up to the dispenser nozzle 30.2 which will eject a foamed liquid upon each actuation of handle 44, as has been described above with respect to figures 1 - 5.

REFERENCE SIGNS

[0037]

9.1	foam generator
9.2	foam generator
10	foaming and foam dispensing device
11	first pumping arrangement
12	second pumping arrangement
13.1	cylindrical housing of a first pumping arrangement)
13.2	cylindrical housing of a second pumping arrangement)
13.3	spring housing
14.1	media chamber of first pumping arrangement)
14.2	media chamber of second pumping arrangement)
15.1	displacement member of first pumping arrangement)
15.2	displacement member of second pumping arrangement)
16	actuation element
16.1	spring member
17	actuation area
18	fluid dispensing channel

19	pipe socket
20	housing plate
21	positioning element
22	further positioning element
23	first outer edge
24	second outer edge
25	chamfer
26	wall-member
27	extension of housing plate)
28	side of the extension)
29	elastic tube
30.1	dispenser nozzle long)
30.2	dispenser nozzle short)
31	first mounting appliance
32	second mounting appliance
33	posts
34	slots
35	intermediate member
36	keys (at intermediate member)
37	immersion tube
38	valve body
39	cover member
40	dispenser apparatus
41	first guiding element
42	second guiding element
43	operating element
44	operating handle
45	casing
46	first shell
47	second shell
48.1	closure element
48.2	counter element
49	pivot bearings
50	container
51	neck
60	opening
61	pivot bearing of 43, 44)

C	central axis
P	plane

x	distance between first and second mounting appliance)
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Claims

1. Foaming and foam dispensing device (10) for a liquid dispenser apparatus (40), designed to pump and foam a pourable liquid from a container (50), comprising a housing plate (20) having at least one positioning element (21, 22), adapted to cooperate with at least one guiding element (41, 42) of the dispenser apparatus (40), wherein the housing plate (20) defines a plane P, a first pumping arrangement (11) for pumping the pourable liquid, and

a second pumping arrangement (12) for pumping a foaming media, wherein the second pumping arrangement (12) features a cylindrical media chamber (14), in which a displacement member (15) is displaceably guided along a central axis (C), and an actuation element (16) for actuating the first and the second pumping arrangement (11, 12), that has an actuation area (17) for cooperating with an operating element (43) of the dispenser apparatus (40), wherein one side of the plane P faces the actuation area (17),
characterized in that,
the media chamber (14) of the second pumping arrangement (12) is located on the side of the plane P that faces the actuation area (17) of the actuation element (16).

2. Foaming and foam dispensing device (10) according to claim 1, **characterized in that** a ratio r/h of an inner radius (r) of the media chamber (14) and an axial height h of the media chamber (14) in a direction along the central axis C has a value in a range of 2.8/1 to 1.5/1, preferably in the range of 2.5/1 to 1.8/1.

3. Foaming and foam dispensing device (10) according to claim 1 or 2, **characterized in that** the at least one positioning element (21, 22) is arranged at an outer edge (23, 24) of the housing plate (20).

4. Foaming and foam dispensing device (10) according to any one of claims 1 to 3, **characterized in that** a first and a second outer edge (23, 24) are disposed on opposite sides of the housing plate (20), having first and second positioning elements (21, 22).

5. Foaming and foam dispensing device (10) according to any one of claims 1 to 4, **characterized in that** each of the first and second positioning elements (21, 22) has a chamfer, arranged on a wall-member (26) that projects from the housing plate (20).

6. Foaming and foam dispensing device (10) according to any one of claims 1 to 5, **characterized in that** the second pumping arrangement (12) has a cylindrical housing (13) that is formed in one piece with the housing plate (20) and that projects away from the housing plate (20) in a direction towards the actuation area (17) of the actuation element (16).

7. Foaming and foam dispensing device (10) according to any one of claims 1 to 6, **characterized in that** the housing plate (20) has an extension (27) that projects away from the cylindrical housing (13) in a direction parallel to a direction of the first and second positioning elements (21, 22), and that on the side of the extension (27) facing the actuation area (17) of the actuation element (16) there is disposed at least one mounting appliance (31, 32) for mounting

a dispenser nozzle (30).

foaming and dispensing device (10).

8. Foaming and foam dispensing device (10) according to any one of claims 6 to 7, **characterized in that** there are a first and a second mounting appliance (31, 32) arranged on the extension (27) in a distance (x) from each other along a radial line with respect to the cylindrical housing (13). 5
9. Foaming and foam dispensing device (10) according to any of claims 6 to 8, **characterized in that** each mounting appliance (31, 32) comprises two opposite posts (33), each having a slot (34) for cooperation with a respective key (36) of the dispenser nozzle (30). 10
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10. Foaming and foam dispensing device (10) according to claim 9, **characterized in that** the keys (36) are disposed on an intermediate member (35) which is connected to the dispenser nozzle (30). 20
11. Foaming and foam dispensing device (10) according to any one of claims 1 to 10, **characterized in that** the actuation element (16) hosts a fluid dispensing channel 18 that terminates at one end in a pipe socket (19), the pipe socket (19) being in fluid communication with the dispenser nozzle (30) via an elastic tube (29). 25
12. Foaming and foam dispensing device (10) according to any one of claims 1 to 11, **characterized in that** the intermediate member (35) is at one end connected to and in fluid communication with the elastic tube (29) and at its opposite end the intermediate member (35) is connected to and in fluid communication with the dispenser nozzle (30). 30
35
13. Foaming and foam dispensing device (10) according to any one of claims 1 to 12, **characterized in that** in fluid direction before and/or behind the intermediate member (35) there is arranged at least one foam generator (9.1, 9.2) within the fluid dispensing channel (18). 40
14. Liquid dispenser apparatus (40), comprising: 45
 - a casing (45) with a first shell 46 and a second shell (47), first shell (46) and second shell (47) being pivotably connected with each other and pivotable between an open and a closed position, 50
 - at least one guiding element (41, 42) for positioning of a foaming and dispensing device (10),
 - a foaming and dispensing device (10) according to any of claims 1 to 12, being received and positioned by the at least one guiding element (41, 42), 55
 - an operating element (43) for actuating the

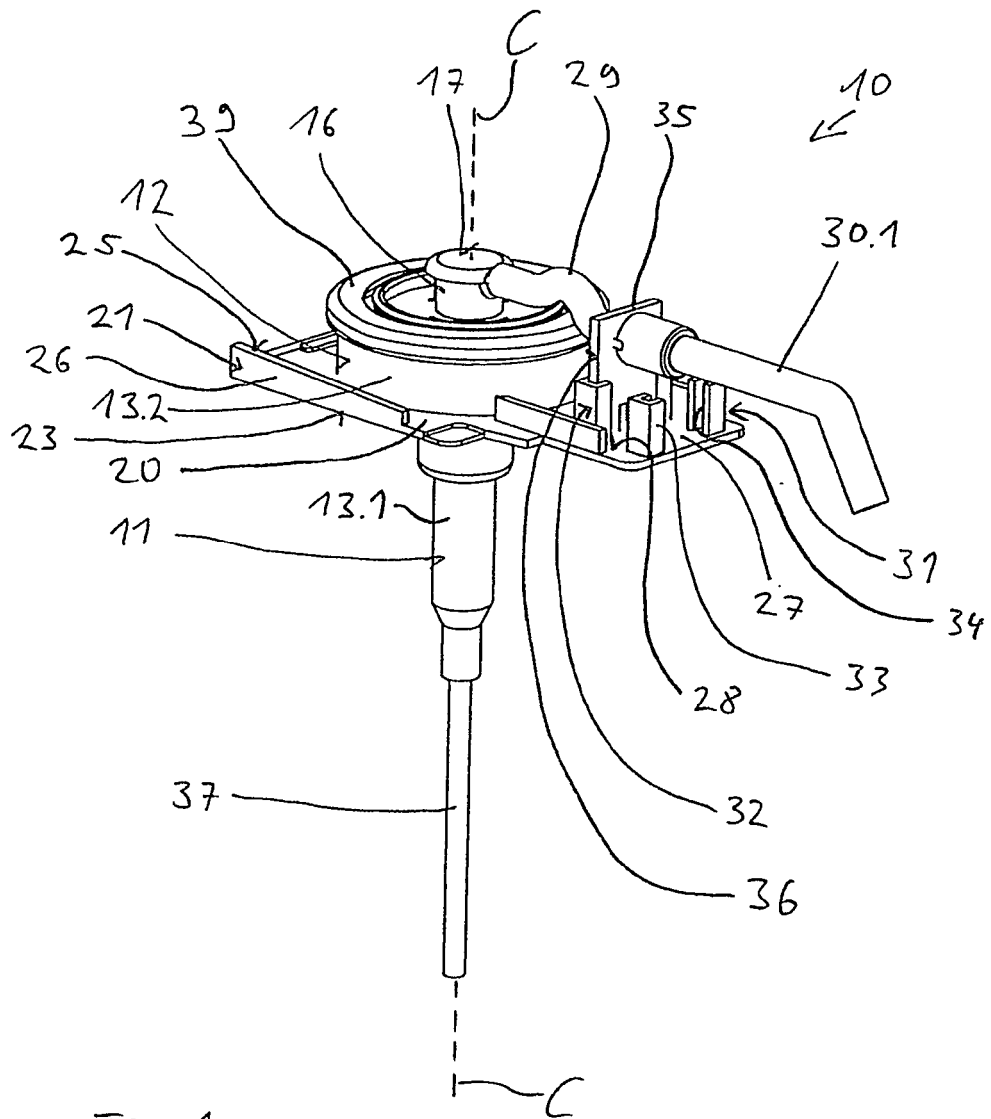


Fig. 1

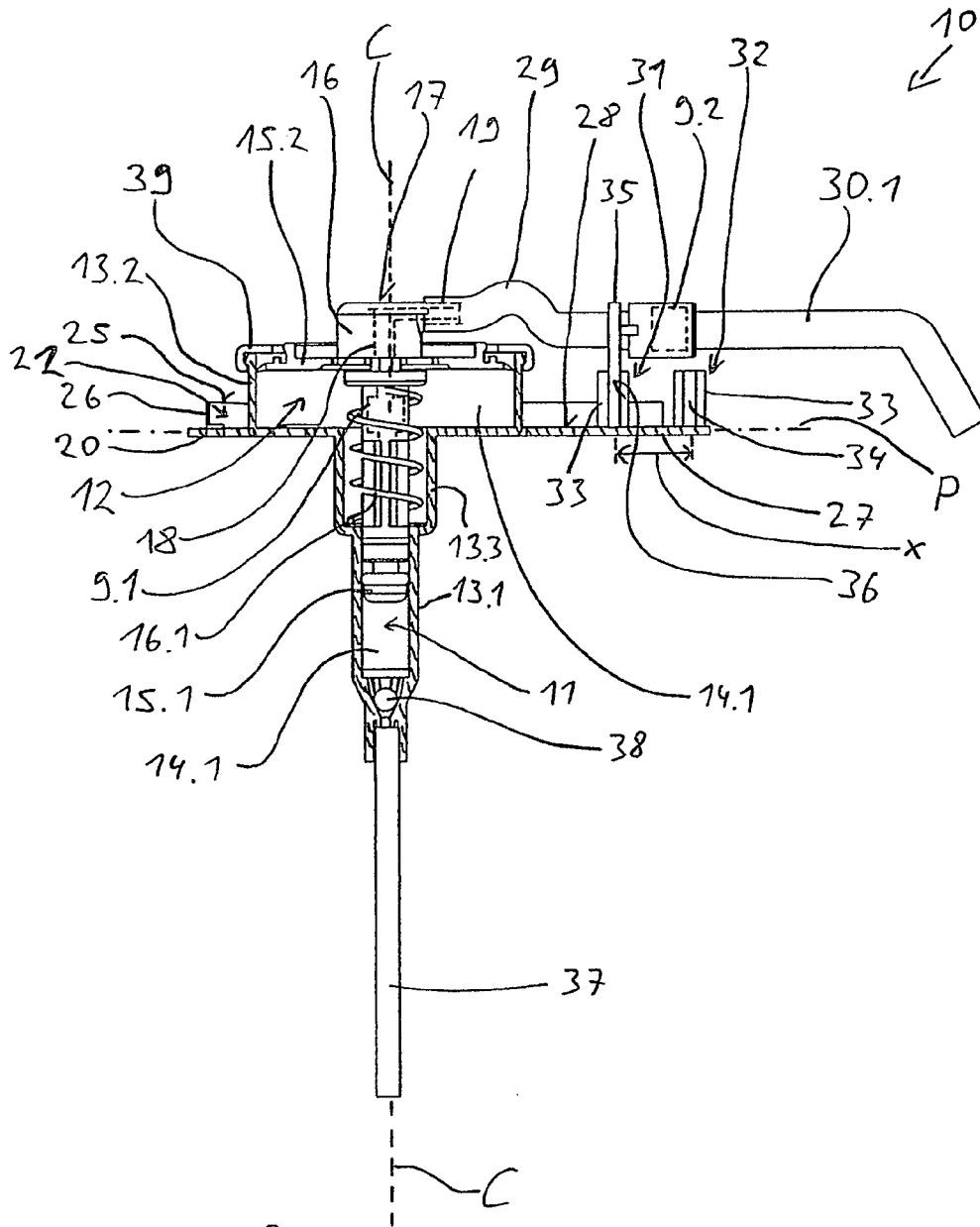


Fig. 2

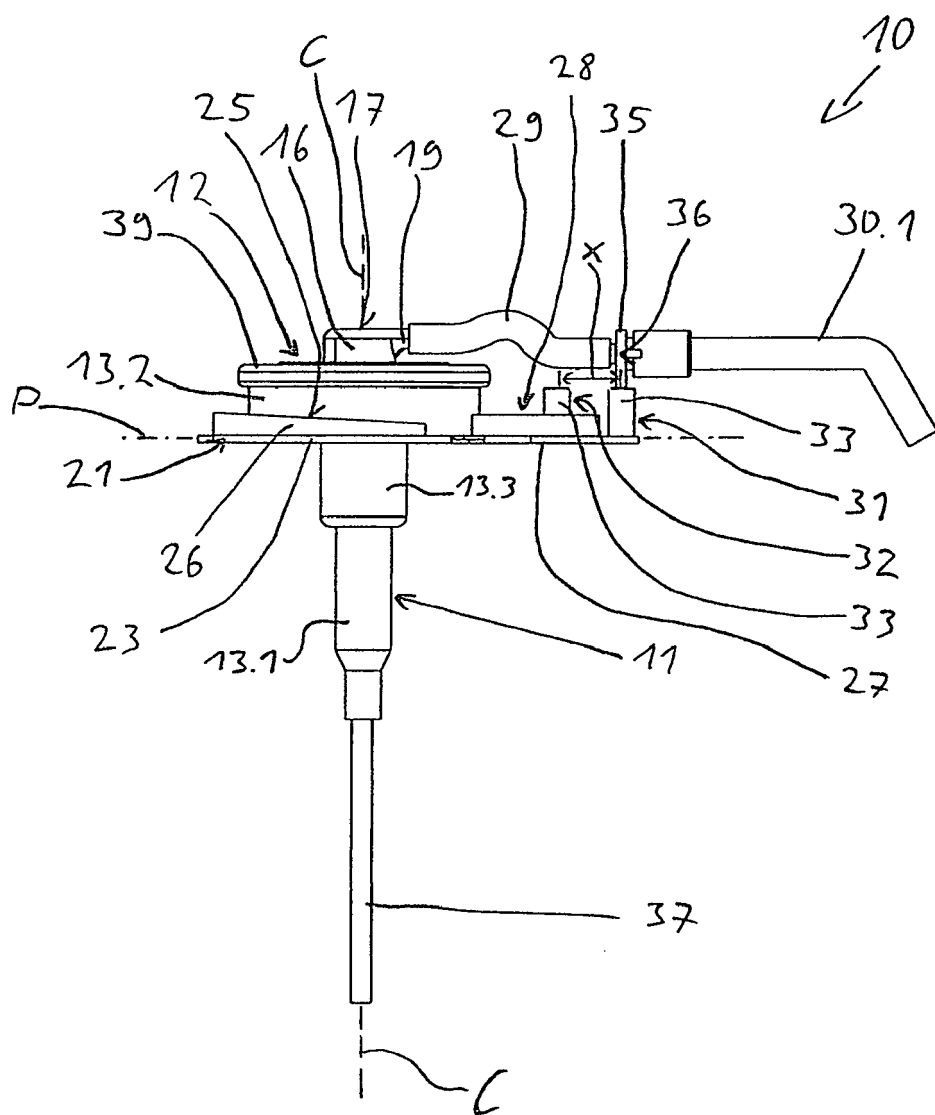
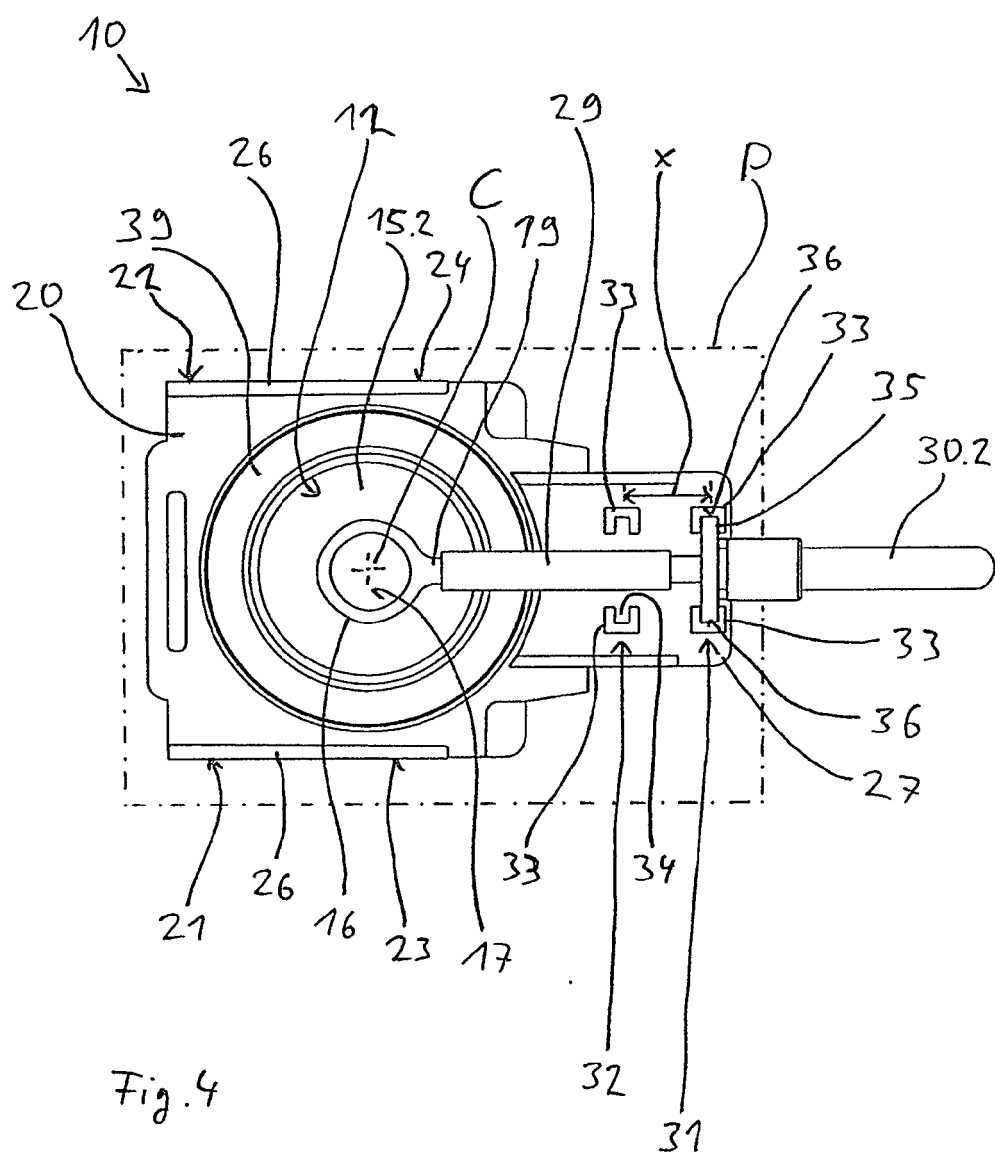
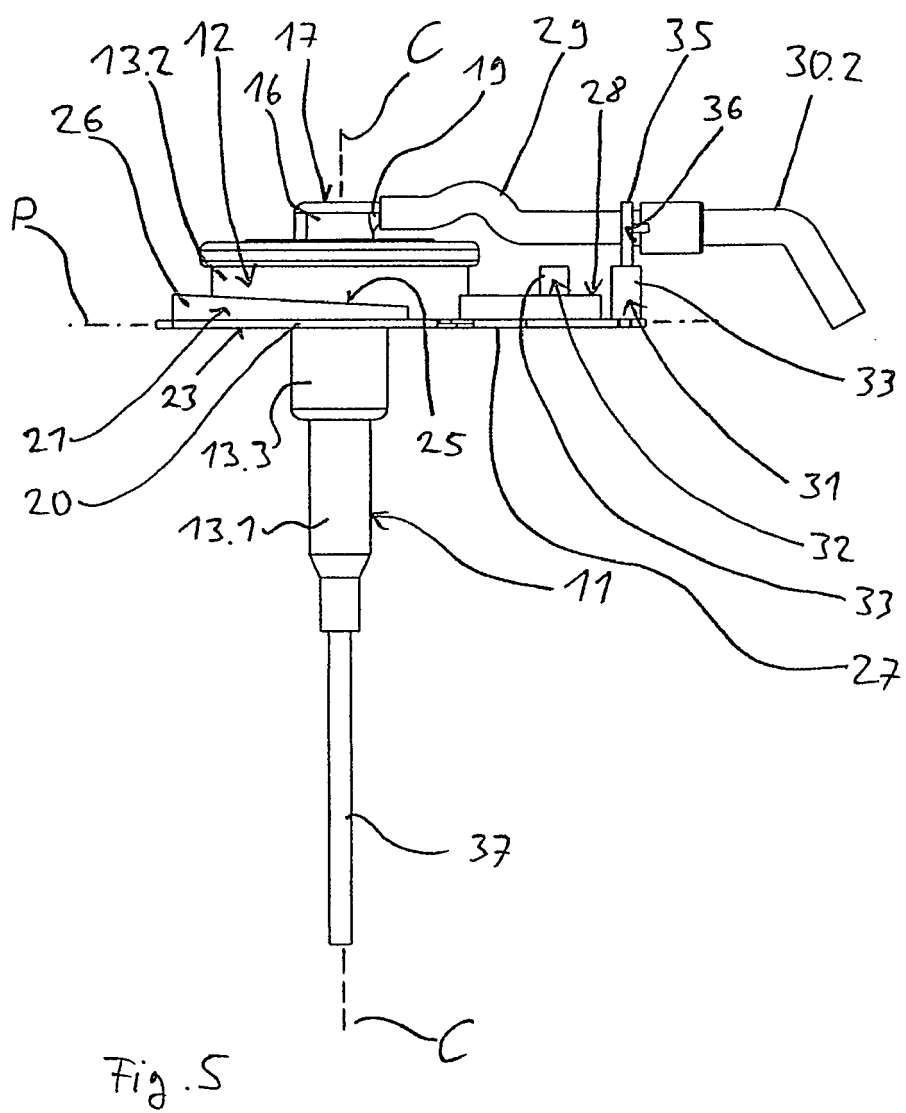
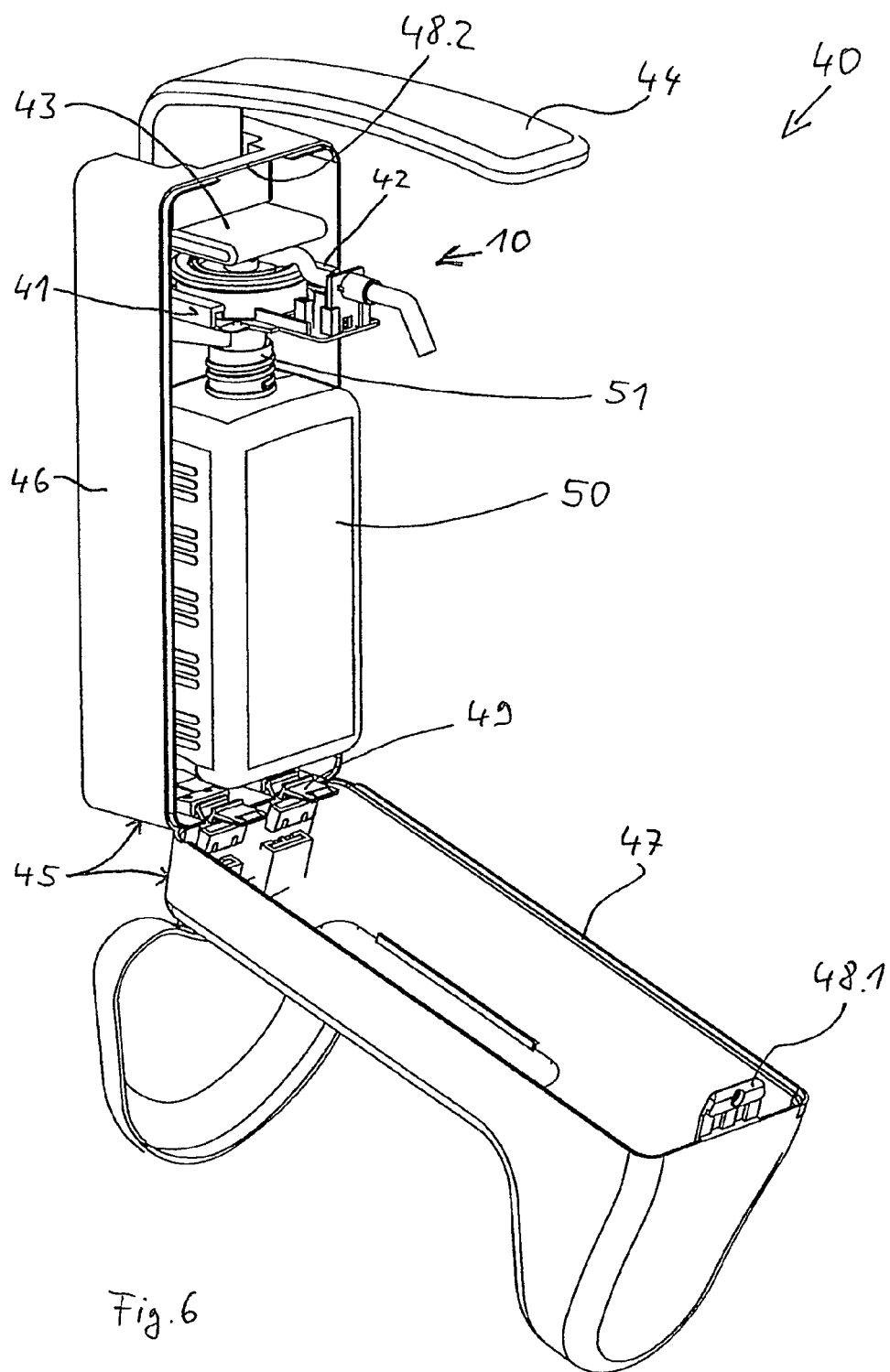


Fig. 3







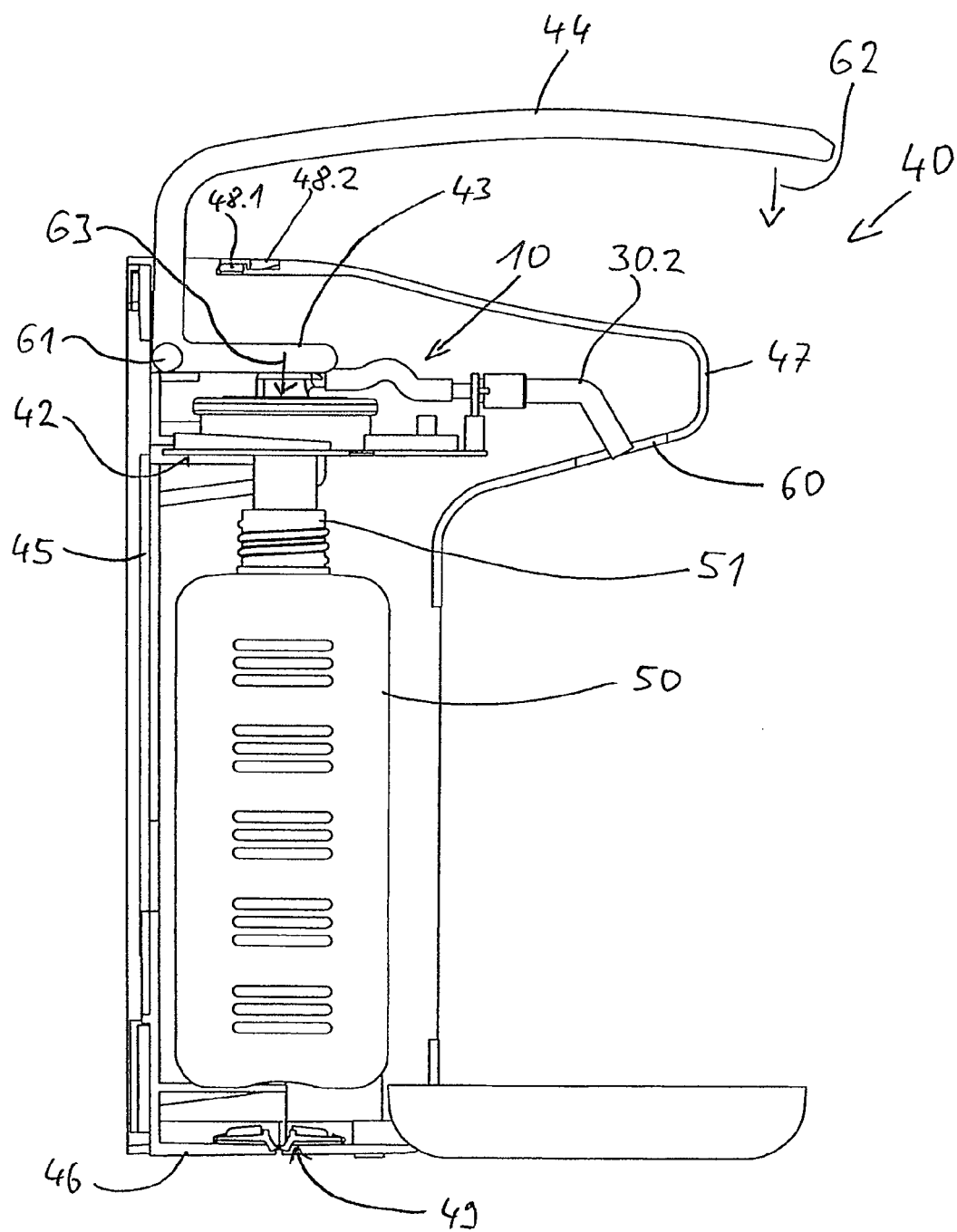


Fig. 7



EUROPEAN SEARCH REPORT

 Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2014/036067 A1 (GOJO IND INC [US]) 6 March 2014 (2014-03-06) * abstract; figures 1,2 * -----	1-14	INV. B05B5/04 B05B7/00 A47K5/14
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X	GB 406 388 A (GEORGE FARGHER HIGHT; CHARLES HENRY WEBB) 1 March 1934 (1934-03-01) * abstract; figure 1 * -----	1,3-6	
			TECHNICAL FIELDS SEARCHED (IPC)
			B05B A47K
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 19 April 2016	Examiner Moroncini, Alessio
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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 EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 00 3013

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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