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(54) **MIXING VALVE AND ASSEMBLY FOR DILUTING OR MIXING HAZARDOUS SUBSTANCES**

(57) The subject matter of the invention consists in that the assembly for diluting or mixing especially dangerous substances comprises a first container (1), which is closed by a membrane (3), a valve (4) with a knife (13) and a second container (7), which is provided with a pipe throat (16) with a float (10), which is provided with a needle (9).

The invention also relates to a mixing valve, in particular for diluting or mixing hazardous substances, which comprises a valve with a knife and a pipe throat with a float which is provided with a needle.

The valve is provided with a means for non-removable connection to the first vessel, a baffle (5) with a system of openings (6) and a central opening (8).

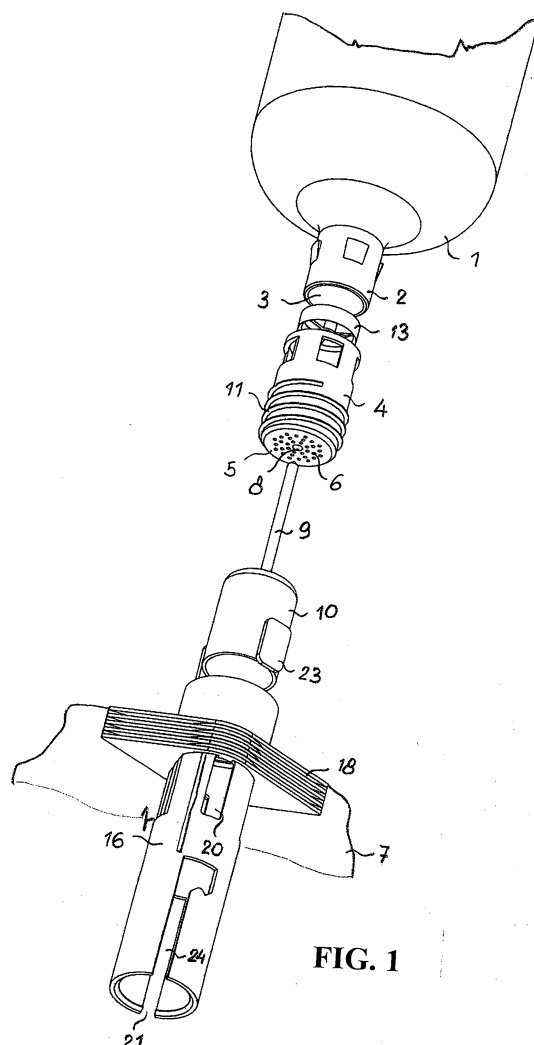


FIG. 1

Description

Technical Field

[0001] The invention relates to a mixing valve and an assembly for diluting, mixing and pouring substances, in particular liquids and possibly also substances of other states of matter, for example gases, in particular in cases where it is undesirable for human to make a direct contact with concentrated liquid or gas.

Background Art

[0002] At present, some technically complex means are available which contribute to the safe dilution, mixing and pouring of substances, especially liquids. These means are technically complicated and require electrical equipment for their function, so they are also expensive. The second known variant for these purposes is a solution which works on the basis of the supply of water under pressure from a hose. Such a solution is disadvantageous because it does not allow the mixing of liquids in the form in which they are commonly sold on the market, for example in PE bottles of various shapes. At present, no technical solution is known which allows diluting or mixing liquid substances or similar mixtures without the use of electrical equipment or dilution using external pressure.

Summary of the Invention

[0003] The subject matter of the invention consists in that a mixing valve, in particular for diluting or mixing dangerous substances, comprises a valve body with a knife and a tubular throat with a float which is provided with a needle.

[0004] The valve body is provided with a means for a non-removable connection to the first container, a baffle with a system of openings and a central opening.

[0005] The valve body is threaded on its lower outer part and a circular knife with a circumferential cutting edge and a contact point for contact with the float needle is housed inside the valve body.

[0006] The pipe throat is provided with an internal thread above the holder and at least one opening below the holder, and in the lower part it is provided with at least one cutout for accommodating a float.

[0007] The pipe throat can be provided on the outer circumference with at least one height-complete or incomplete rib. The pipe throat can be provided with at least two rectangular openings around the circumference, from which the flexible tongue emerges.

[0008] The cut-out for accommodating the float is provided with a slot and at least one retainer in the lower part and it is provided with an approach in the upper part which extends to the highest point followed by the depression.

[0009] The float has the shape of an inverted cylindrical

container, from the bottom of which a needle emerges, while in the lower part at least one throat with a stabilizer is arranged from the outside. The diameter of the float needle may decrease towards its tip. The float can be equipped with an extension with supports and protrusions on its circumference. The float can be provided with a shoulder in its lower outer part on its circumference.

[0010] The invention also relates to an assembly for diluting or mixing particularly dangerous substances, the subject matter of which consists in that it comprises a first container which is closed by a membrane, a valve with a knife and a second container which is provided with a pipe throat with a float provided with a needle.

[0011] It is preferred that the tubular throat with the float, which is provided with the needle, is fixed in the second container by means of a holder by welding or gluing.

[0012] It is further preferred that the second container is formed as a bag of plastic material which is at least partially transparent.

[0013] The invention makes it possible to mix, pour or dilute liquids or other substances quickly and completely safely without contact with the operator, so that it meets all modern requirements for the handling of dangerous substances, in particular liquids. It allows handling for both professional and non-professional workers, while handling is easy, fast and does not require the use of any special equipment that needs a supply of energy for its operation.

[0014] The use of a second bottle in the form of a bag contributes to the improvement of the environment, as the invention allows significant savings in transport, as most hazardous substances are diluted in a relatively large proportion and bottles of this type do not take up much space during transport.

Brief description of the drawings

[0015] The subject matter of the invention is shown in an exemplary embodiment in the accompanying drawings, where Figure 1 shows the invention in an exploded state in a variant in which the float rotates before cutting the membrane, Figure 2 shows in an axonometric view the pipe throat of the second container in a variant in which the float rotates before cutting the membrane, Figure 3 shows in an axonometric view the float in a variant in which the float rotates before cutting the membrane, Figure 4 shows the mixing valve in longitudinal section, Figure 5 shows the knife in an axonometric view, Figure 6 shows the invention in an exploded state in a variant in which the float does not rotate before cutting the membrane, but is held in a position ensuring cutting the membrane by means of a flexible pipe throat body in the lower part of the pipe throat under the holder, Figure 7 shows in an axonometric view the pipe throat of the second container in a variant in which the float does not rotate before cutting the membrane, but is held in a position ensuring cutting the membrane by means of a flexible pipe throat

body in the lower part of the pipe throat under the holder, Figure 8 shows in an axonometric view the float in a variant in which the float does not rotate before cutting the membrane, but is held in a position ensuring cutting the membrane by means of a flexible pipe throat body in the lower part of the pipe throat under the holder, Figure 9 shows the invention in an exploded state in a variant in which the float does not rotate before cutting the membrane, but is held in a position ensuring cutting the membrane by means of a flexible pipe throat body in the upper part of the pipe throat above the holder, Figure 10 shows in an axonometric view the pipe throat of the second container in a variant in which the float does not rotate before cutting the membrane, but is held in a position ensuring cutting the membrane by means of a flexible pipe throat body in the upper part of the pipe throat above the holder, Figure 11 shows in an axonometric view of the float in a variant in which the float does not rotate before cutting the membrane, but is held in a position ensuring cutting the membrane by means of a flexible pipe throat body in the upper part of the pipe throat above the holder.

Detailed Description of the Invention

[0016] The assembly for diluting or mixing hazardous substances, in particular liquids, consists of a first container 1 in which the dangerous substance is stored, a mixing valve body 4 and a second container 7 containing a liquid which is to dilute the hazardous contents of the first container 1 to practically usable composition for a specific purpose in such a way that the external environment cannot be contaminated with a dangerous substance or splashed with a dangerous substance by a person engaged in dilution or mixing.

[0017] The invention is further described in an exemplary embodiment, wherein individual variants of certain parts of the invention being given in particular.

[0018] The throat 2 of the first container 1 is provided with a membrane 3, which serves to prevent the contents of the first container 1, which is most often a liquid, from escaping the interior of this first container 1. A valve body 4 is subsequently connected to the throat 2 of the first container 1. This connection of the valve body 4 to the throat 2 of the first container 1 must be firm and non-removable, so that the attached valve body 4 can no longer be removed. It can be realized, for example, by a bayonet connection which can no longer be released, and this connection cannot be realized by a detachable connection, for example by means of a thread.

[0019] The valve body 4 is provided on its upper side with a baffle 5 provided with an assembly of openings 6 through which the contents of the first vessel 1, which is generally a dangerous liquid, flow in the case of mixing or dilution into a second vessel 7 in which water is usually stored. In the middle of the baffle 5 there is a central opening 8 through which the needle 9 of the float 10 passes. From the outside, the valve body 4 is provided with a thread 11. A shoulder 12 is formed on the underside

of the valve body 4 for precise and stable mounting of the knife 13 which can be moved up and down to a certain extent.

[0020] The knife 13 serves to cut the membrane 3, which is attached to the throat 2 of the first container 1. Before its assembly and non-removable attachment to the first container 1, the knife is stored inside the valve body 4. It most often has a round shape. The outer diameter of the knife 13 must not be larger than the inner diameter of the throat 2 of the first container 1, so that the membrane 3 can be easily cut, since the peripheral part of the circular knife 13 has a cutting edge 14 to remove the tight seal of the first container 1 by the membrane 3 only at the time and in the circumstances in which the person diluting or mixing decides to do so, respectively. The outer circumference of the knife 13 is mounted on a shoulder 12, which is formed inside the valve body 4, and thus forms a support for the correct positioning of the knife 13 and ensuring its function without eventual jamming.

[0021] The middle part of the circular knife 13 cannot be full, i.e. it must have sufficiently large openings through which the contents of the first container 1 can flow during use, i.e. after cutting the membrane 3, into the second containers 7. In the middle, the circular knife 13 is provided with a contact point 15, on which the tip of the needle 9 of the float 10 rests. During dilution or mixing the substances, the needle 9 pushes the knife 13 towards the membrane 3, whereby its cut takes place.

[0022] The pipe throat 16 is fixed to the second container 7 by means of a holder 18, most often so that the holder 18 is heat-sealed to the second container 7 which is formed as a bag of a plastic impermeable material. The holder 18 is mounted on the outside of the pipe throat 16 and provides a secure, impermeable and economically acceptable attachment to the second container 7. The pipe throat 16 is the first component described to have a variant solution.

[0023] The first variant of the pipe throat 16 is shown in Figure 2. Under the holder 18, it has a cylindrical shape in which at least two elongated openings 20 are formed circumferentially, which serve to allow a fluid to flow smoothly throughout the device during mixing or dilution of fluids. At least two height-complete or incomplete ribs 30 can be arranged circumferentially around the elongate openings 20 on the body of the pipe throat 16, which ensure sufficient rigidity of the body of the pipe throat body 16.

[0024] The pipe throat 16 is provided at its end above the holder 18 with an internal thread 17, to which the first container 1 is screwed during dilution or mixing, said first container 1 being provided with a fixed valve body 4 and a membrane 3 which secures the contents of the first bottle 1 against possible undesirable leakage.

[0025] At the opposite end with respect to the point where the internal thread 17 is formed on the pipe neck 16, the float 10 is inserted into the pipe neck 16. At this point, the pipe throat 16 is provided circumferentially by

at least one, but most often by two circumferentially opposite narrow slots 21 through which necks 22 of stabilizers 23 of the float 10 pass.

[0026] The slot 21 is provided with retainers 19 which define a narrow space for inserting the neck 22 of the float stabilizer 23 of the float 10 to accommodate the float 10 in the interior of the pipe throat 16 and prevent the float 10 from being easily ejected from the interior of the pipe throat 16. When filling the second container 7 with a liquid, most often water, the float 10 moves upwards inside the pipe neck 16. The upward movement is made possible by the fact that the float 10 is hollow, which allows it to float on the surface. The tubular throat 16 has a cylindrical shape inside, which allows the float 10 to move only in the up and down direction. On the outside of the pipe throat 16, ribs 30 can be arranged to increase the rigidity of its body, either in the full height, i.e. along the entire length of the lower part of the pipe throat 16 or only along a part of its length.

[0027] However, when the second container 7 is filled to the required amount, the float 10 rises upwards to a point or position where the user can turn it over the malleable walls of the second container 7, which in this case consists of, for example, a plastic bag, the turning being possible in only one direction, whereby the height lock of the float 10 inside the pipe throat 16 is secured. In this position the float 10 is firmly held, and the needle 9 of the float 10 is in a firmly stabilized position relative to the pipe throat 16.

[0028] The turning of the float 10 itself is physically demanding so that children are not capable of this manipulation. This is ensured by the high degree of friction between the mutually moving parts of the float 10 and the pipe throat 16. This prevents the whole system from being used by children, which forms an important safety element of the whole assembly.

[0029] To make the turning of the float 10 more difficult is provided by the design of the float 10 and the tubular throat 16. The float 10 is provided in the lower part with the neck 22 of the stabilizer 23. The tubular throat 16 is provided above the slot 21 circumferentially by at least one but most often two cutouts 24 in which the neck 22 of the stabilizer 23 of the float 10 is moving. The upper edge 29 of the cutout 24 defines the correct height of fixing the upper position of the float 10 and the needle 9 for correct function, i.e. for cutting the membrane 3 which closes the first container 1.

[0030] When the neck 22 of the stabilizer 23 of the float 10 strikes the upper edge 29 of the cutout 24, the float 10 is ready to be locked into the working position of the needle 9. The locking realized so that the person carrying out the mixing or diluting grasps the stabilizers 23 and starts to overcome the resistance against the rotation. The rotation of the float 10 is assisted by the approach 25, after the neck 22 of the stabilizer 23 reaches the highest point 26 of the approach 25, overcomes it by force and the throat 22 is then placed in the depression 27 of the cutout 24, thus completing the process of locking the

float 10 and needle 9 to the correct working position.

[0031] In the upper part, the pipe throat 16 is provided with elongated openings 20, through which the second container 7 is filled with water. Through these elongated openings 7, the contents of the first container 1 is also flowing into the second container 7, thus mixing the two fluids.

[0032] The second container 7 can have any shape, size and material from which it is made. A material which can be reduced before use to take up as little space as possible appears to be particularly advantageous. Such a container is, for example, a plastic bag which can be easily packaged in a container assembly which contains a dangerous content. It is important that at least a part of the second container 7 is transparent, so that in particular the position of the float 10 can be visually inspected before it is locked in the working position.

[0033] The second variant of the tubular 16 is shown in Figures 6 and 7. It has a cylindrical shape under the holder 18, in which at least two elongated openings 20 are circumferentially formed, which serve to allow fluid to flow smoothly throughout the device during mixing or dilution of fluids. Between the elongate openings 20, two notches 31 are optimally formed circumferentially on opposite sides. This design allows the float 10 to be gripped over the malleable walls of the second container 7 to keep it in a position which allows the membrane 3 to be ruptured. At least two rectangular openings 28 can be created circumferentially on the body of the pipe throat 16 to facilitate the grasping of the float 10, from the lower part of which a flexible tongue 36 emerges, which facilitates the gripping and fixing of the float 10 in the position in which the membrane 3 is to be ruptured. It is obvious that the shape of the holes can be other than rectangular. This variant is simpler than the previous variant, because it does not require the float to be provided with stabilizers, nor does it require the modification of the pipe throat 16, which consists in creating a cutout 24 and an approach 25 for locking the float in the correct position.

[0034] The third variant of the pipe throat 16 is shown in Figure 10. This variant allows mixing and pouring in cases where the second vessel 7 is rigid and through their walls it is not possible to act on the float 10 so that it can be secured in the desired position for its basic function, i.e. the rupture of the membrane 3. This is made possible by the fact that the pipe throat 16 is between its upper part with the internal thread 17 and the holder 18 for fixing the pipe throat 16 in the second container 7 provided with a resilient element 32 which allows the user to fix the float 10 from the outside, for example by hand pressing through the resilient element 32 in a position in which it can fulfill its basic function, i.e. the intersecting the membrane 3.

[0035] The resilient element 32 can be made of either a thinner material or a resilient material in order to fix the float 10 in the desired position.

[0036] Said three variants of the pipe throat 16 also require corresponding structural modifications also on

the float 10. The float 10 for the technical solution within the first variant is shown in Figure 3, for the second variant in Figure 8 and for the third variant in Figure 11.

[0037] The float 10 for the above-described first variant is shown in Figure 3 and is characterized by stabilizers 23 which are connected to the body of the float by means of necks 22. The needle 9 itself is in this case graded in diameter so that its smallest diameter passes through the valve 4 and subsequently abuts the contact point 15 of the knife 13 with its smallest diameter.

[0038] The float 10 for the second variant is shown in Figure 8. Its design is simple, preferably it can be provided on its circumference with several, most often two protrusions 33, which prevent slippage in case it is necessary to hold the float 10 in the desired position from the outside of the second container 7. In the lower part, the float is provided with a shoulder 37, which rests in the lower position of the float 10 inside the pipe throat 16 on a circumferentially incomplete flange. This measure is intended to prevent the float 10 from unintentionally sliding out of the body of the pipe throat 16.

[0039] The float 10 for the third variant is shown in Figure 11. Since it is gripped and fixed above the holder 18, i.e. in its upper position only, it can be structurally adapted so that the needle 9 emerges from the attachment 34 of the float 10, which is provided on the circumference with two supports 35.

[0040] Mixing or diluting as follows. After reading the instructions, the user most often fills the second container 7 with water or possibly with another liquid. In the first variant of the technical solution, the float 10 rises to the required level as a consequence of striking the neck 22 of the stabilizer 23 of the float 10 the upper edge 29 of the cutout 24 of the pipe throat 16. At this point, the user rotates the float 10 to the final position from the outside, i.e. through the body of the second container 7, the final position being defined by the depression 27 in the cutout 24 of the pipe throat 16. This locks the float 10 and the needle 9 into the correct working position.

[0041] Subsequently, the user screws the first container 1 onto the second container 7. During screwing, a sealing of the whole system first takes place. Only after the sealing the whole system the tip of the needle 9 of the float 10 strikes the knife 13, which is located inside the valve 4. The knife 13 then pierces the membrane 3, which protects the contents of the first container 1 from unwanted leakage. After cutting the membrane 3, the two fluids in the second vessel 7 are mixed. After emptying the first container 1, the user shakes the entire closed system to mix the two liquids perfectly. Finally, the user unscrews the first container 1. The diluted contents in the second container 7 can be used immediately or can be stored in the second container 7. For this purpose, this container is also provided with a threaded cap 28.

Industrial Applicability

[0042] The mixing valve is used wherever it is neces-

sary to protect the user during dilution from the hazardous properties of chemical or otherwise hazardous substances and mixtures, or wherever it is desirable to restrict access to the contents of the container during dilution.

5 The mixing valve finds maximum use in the chemical, pharmaceutical and food industries.

List of reference marks

10 [0043]

- 1 - first container
- 2 - throat
- 3 - membrane
- 15 4 - body
- 5 - baffle
- 6 - assembly of openings
- 7 - second container
- 8 - central opening
- 20 9 - needle
- 10 - float
- 11 - thread
- 12 - shoulder
- 13 - knife
- 25 14 - cutting edge
- 15 - contact point
- 16 - pipe throat
- 17 - internal thread
- 18 - holder
- 30 19 - retainer
- 20 - opening
- 21 - slot
- 22 - neck
- 23 - stabilizer
- 35 24 - cutout
- 25 - approach
- 26 - highest point
- 27 - depression
- 28 - rectangular openings
- 40 29 - upper edge
- 30 - rib
- 31 - notch
- 32 - flexible element
- 33 - protrusion
- 45 34 - attachment
- 35 - support
- 36 - flexible tongue
- 37 - shoulder

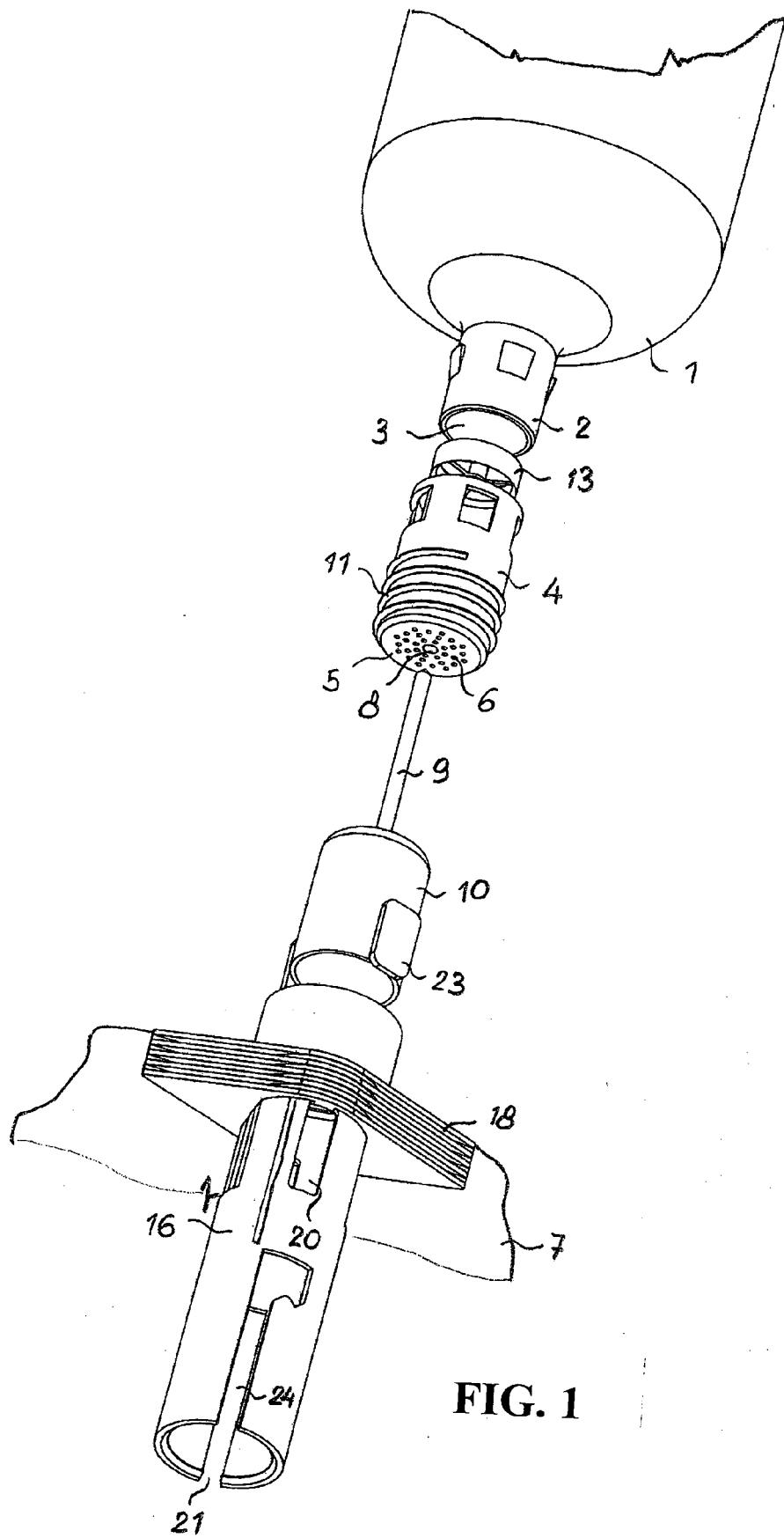
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Claims

1. A mixing valve, in particular for diluting or mixing hazardous substances, **characterized in that** it comprises a valve body (4) with a knife (13) and a pipe throat (16) with a float (10), which is provided with a needle (9).

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2. The mixing valve, in particular for diluting or mixing hazardous substances of Claim 1, **characterized in that** the valve body (4) is provided with means for non-removable connection to the first container (1), a baffle (5) with a assembly of openings (6) and a central opening (8).
3. The mixing valve, in particular for diluting or mixing hazardous substances of Claims 1 and 2, **characterized in that** the valve body (4) is provided with a thread (11) on its lower outer side and a circular knife (13) is arranged inside the valve body (4) with a circumferential cutting edge (14) and a contact point (15) for contact with the needle (9) of the float (10).
4. The mixing valve, in particular for diluting or mixing hazardous substances of Claim 1, **characterized in that** the pipe throat (16) is provided with an internal thread (17) above the holder (18) and at least one opening (20) below the holder (18), and it is provided in the lower part with at least one cutout (24) for accommodating the float (10).
5. The mixing valve, in particular for diluting or mixing hazardous substances of Claims 1 to 4, **characterized in that** the pipe throat (16) is provided with at least one height-complete or incomplete rib (30) on the outer circumference.
6. The mixing valve, in particular for diluting or mixing hazardous substances of Claim 4, **characterized in that** the cutout (24) for accommodating the float (10) is provided at the bottom with a slot (21) and at least one retainer (19) and at the upper part with an approach (25) which extends to the highest point (26), followed by a depression (27) around the circumference.
7. The mixing valve, in particular for diluting or mixing hazardous substances of Claim 1, **characterized in that** the pipe throat (16) is provided around the circumference with at least two rectangular openings (28) from which a flexible tongue (36) emerges.
8. The mixing valve, in particular for diluting or mixing hazardous substances of Claim 1, **characterized in that** the float (10) has the shape of an inverted cylindrical container, from the bottom of which a needle (9) emerges, while in the lower part thereof at least one neck (22) with a stabilizer (23) is arranged from the outside.
9. The mixing valve, in particular for diluting or mixing hazardous substances of Claims 1 and 8, **characterized in that** the diameter of the needle (9) of the float (10) decreases towards its tip.
10. The mixing valve, in particular for diluting or mixing hazardous substances of Claim 1, **characterized in that** the float (10) is provided with an extension (34) with supports (5).
11. The mixing valve, in particular for diluting or mixing hazardous substances of Claim 1, **characterized in that** the float (10) is provided with projections (33) on its circumference.
12. The mixing valve, in particular for diluting or mixing hazardous substances of Claims 1 and 11, **characterized in that** the float (10) is provided with a shoulder (37) at its lower part.
13. An assembly for diluting or mixing particularly dangerous substances, **characterized in that** it comprises a first vessel (1) which is closed by the membrane (3), the mixing valve with the knife (13) and the second vessel (7) which is provided with the pipe throat (16) with the float (10) provided with the needle (9).
14. The assembly for diluting or mixing particularly dangerous substances of Claim 13, **characterized in that** the pipe throat (16) with the float (10) which is provided with the needle (9) are fixed in the second container (7) by means of the holder (18) by welding or gluing.
15. The assembly for diluting or mixing particularly hazardous substances of Claims 13 and 14, **characterized in that** the second container (7) is formed as a bag made of a plastic material which is at least partially transparent.



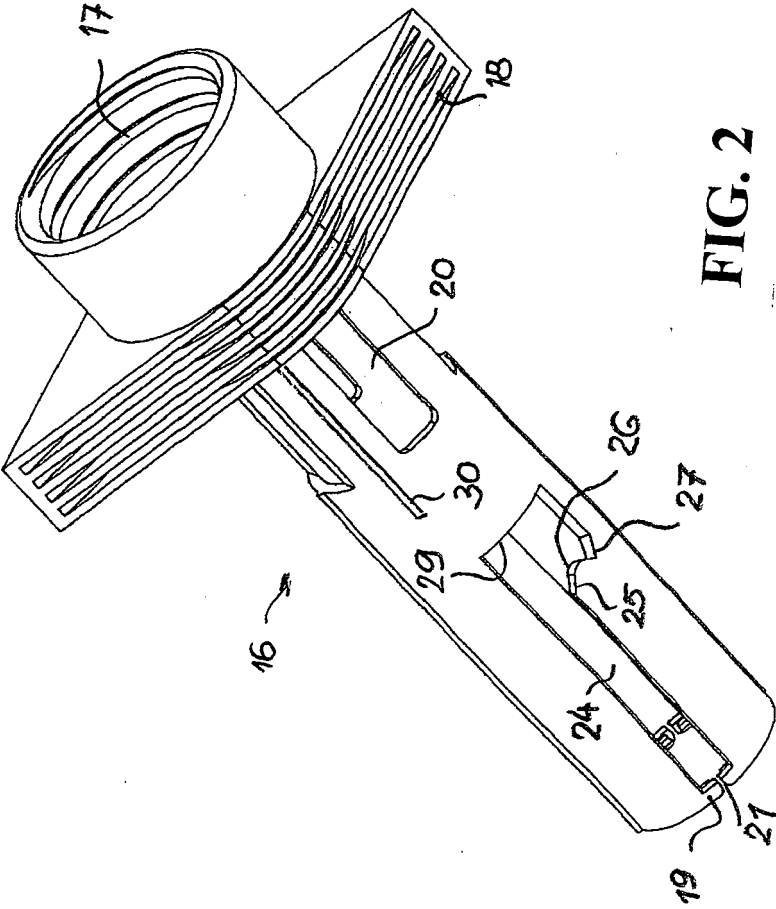


FIG. 2

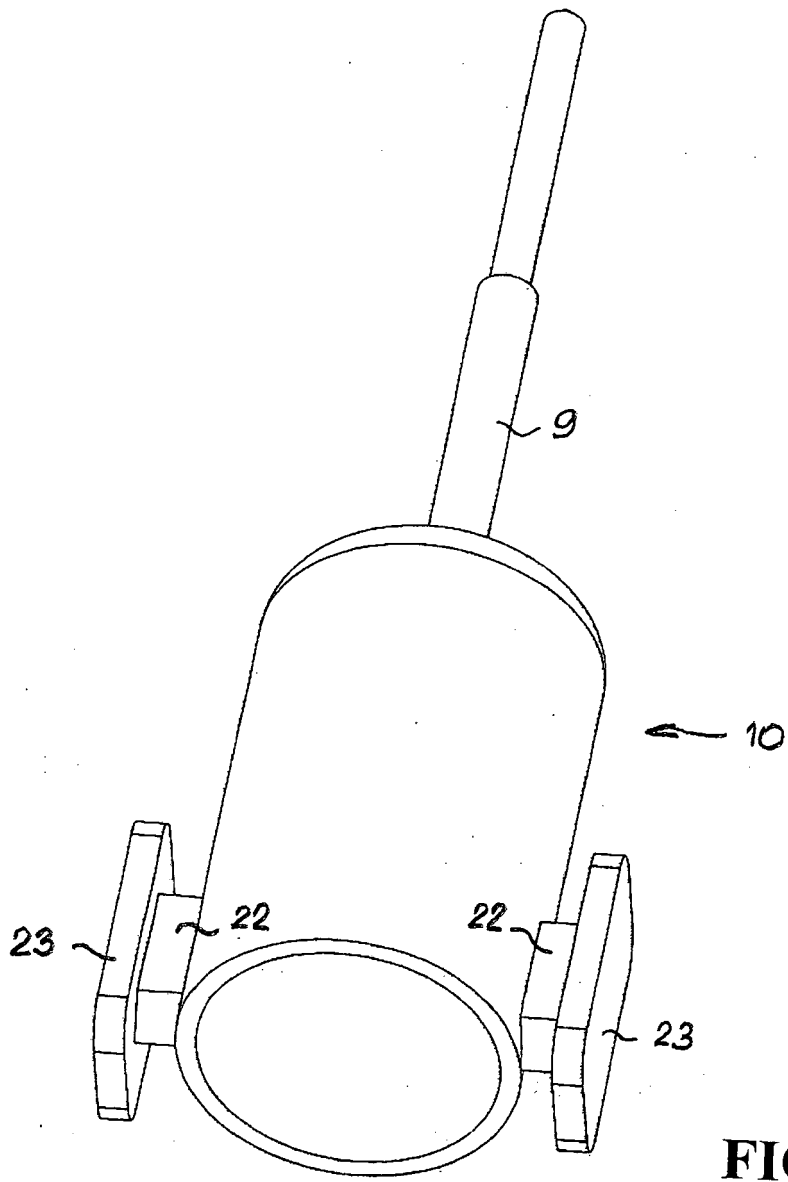


FIG. 3

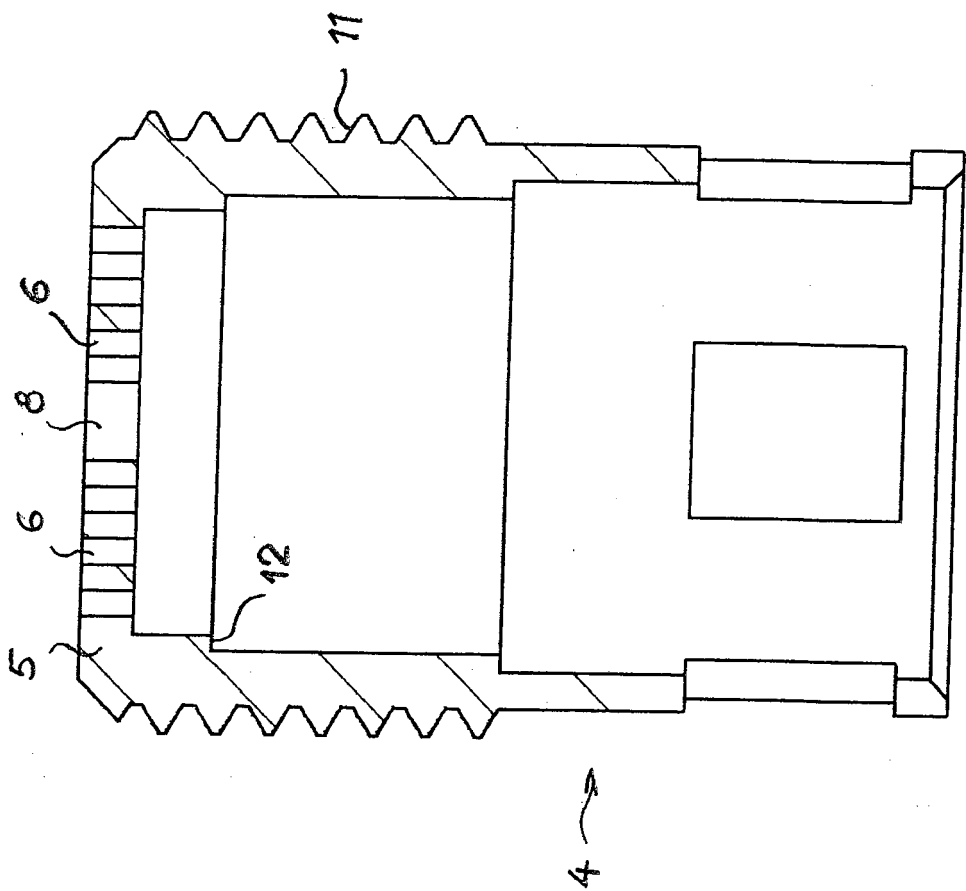


FIG. 4

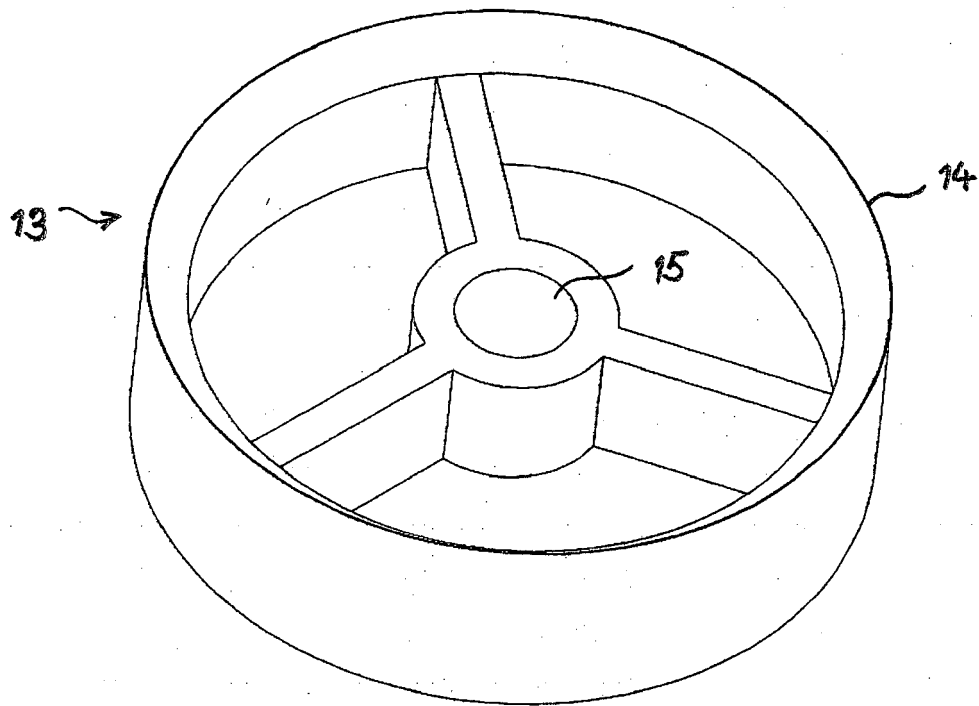


FIG. 5

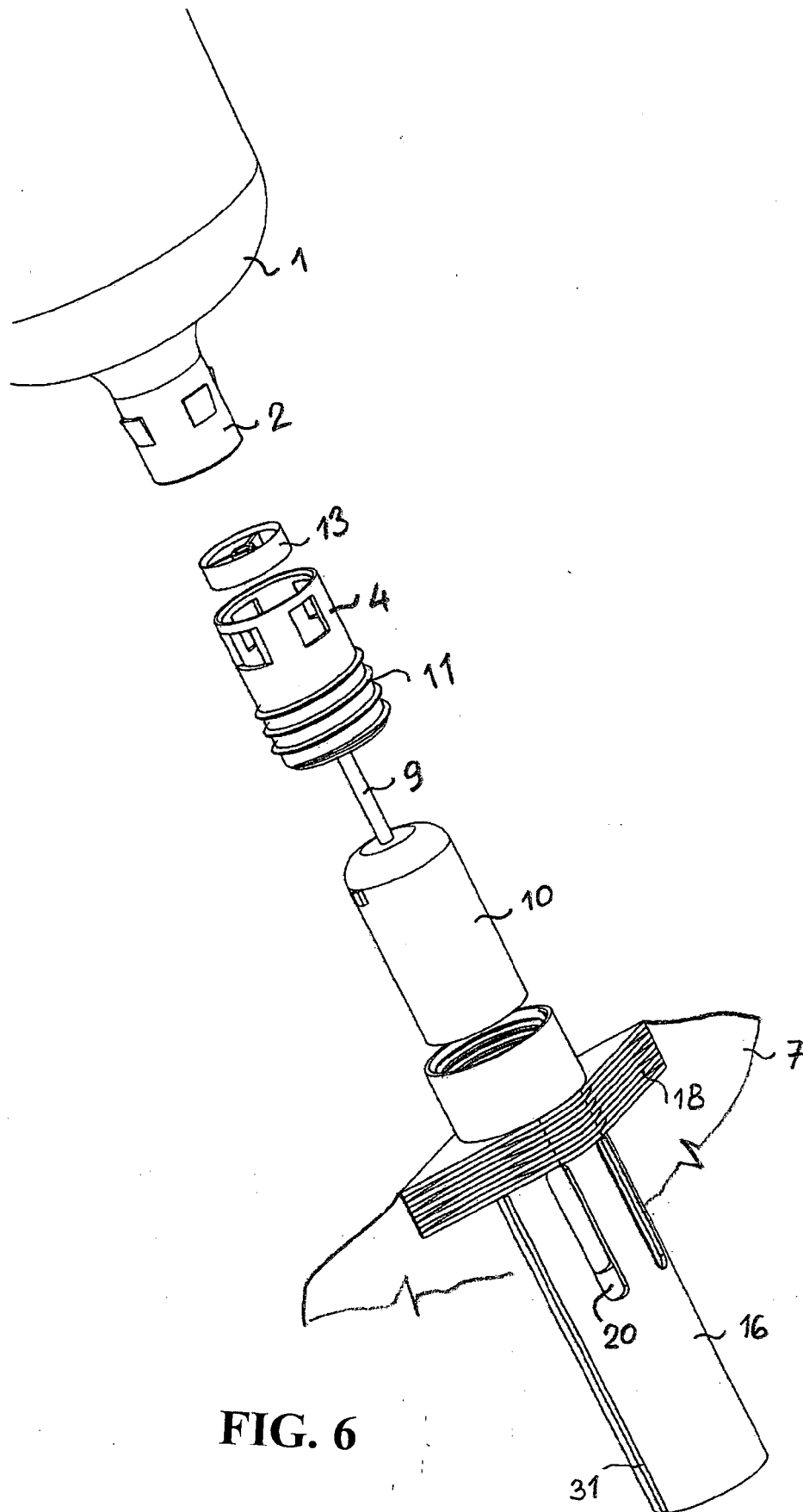


FIG. 6

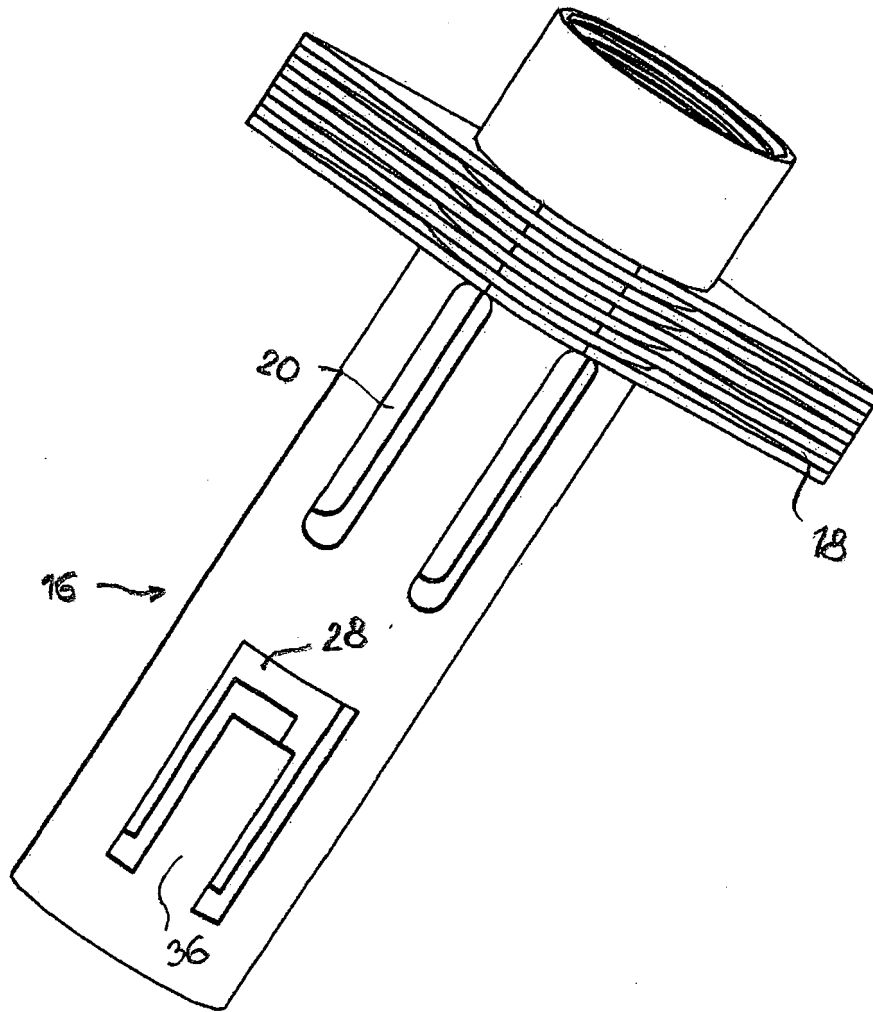


FIG. 7

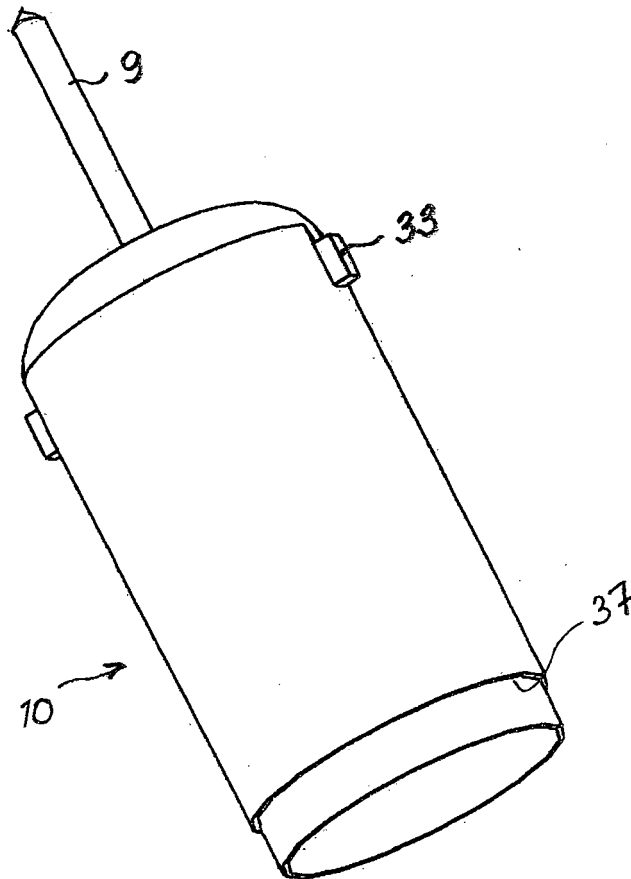


FIG. 8

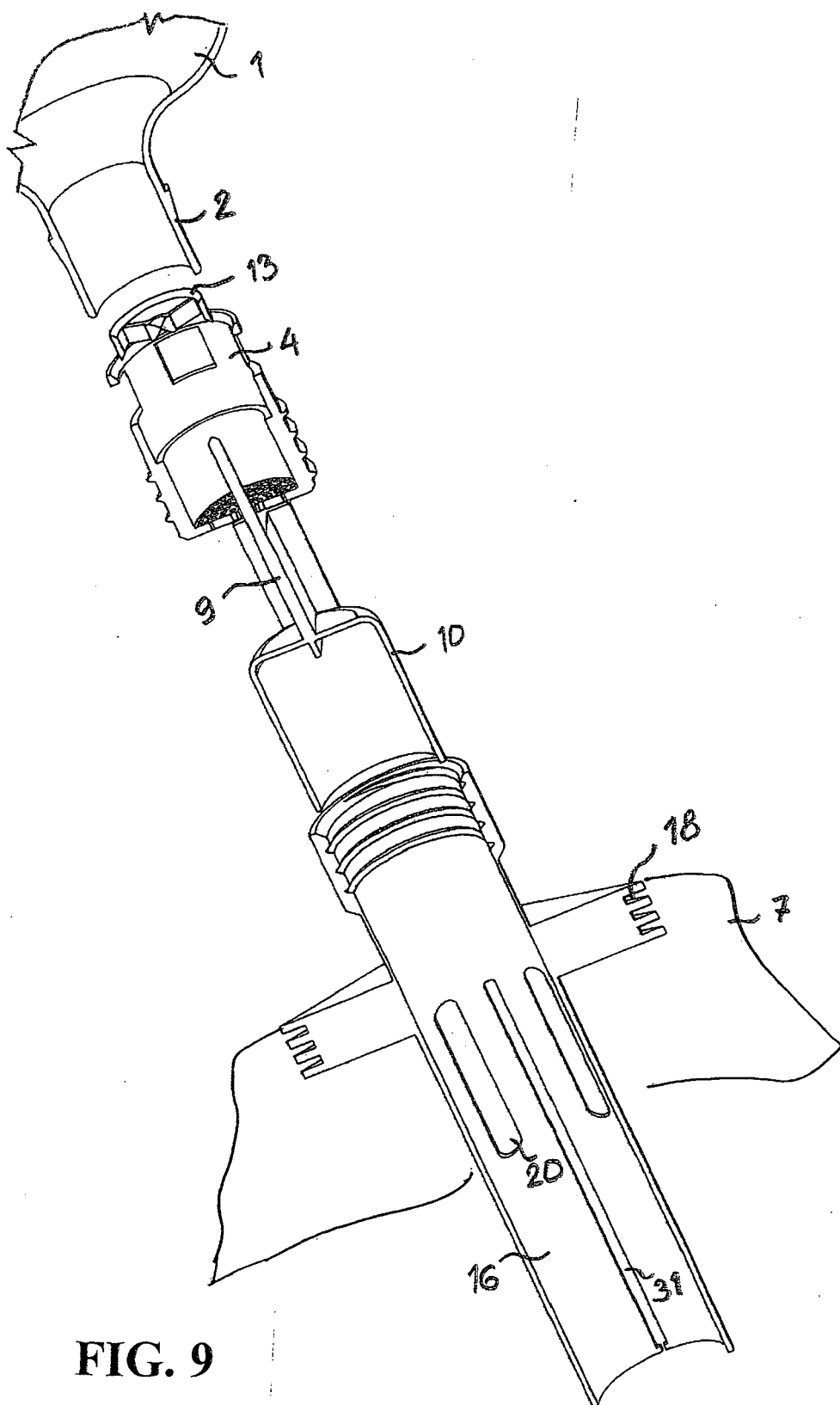


FIG. 9

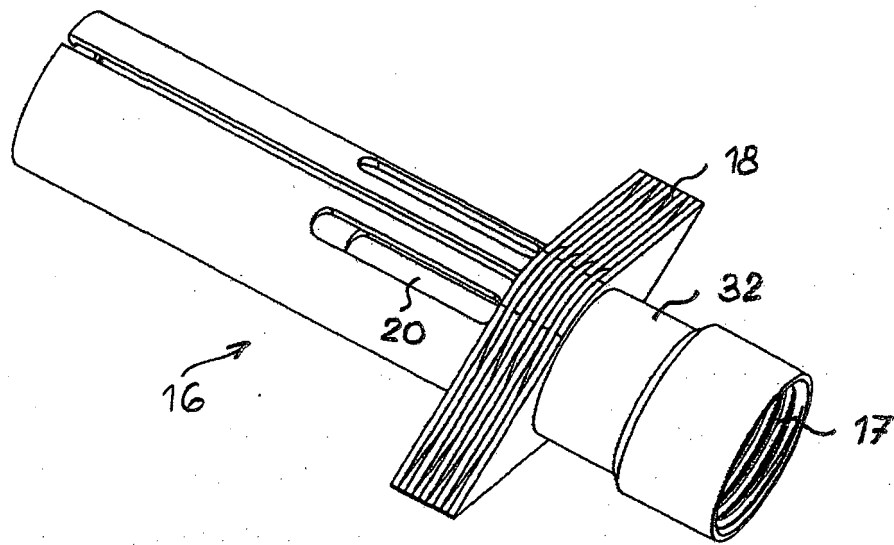


FIG. 10

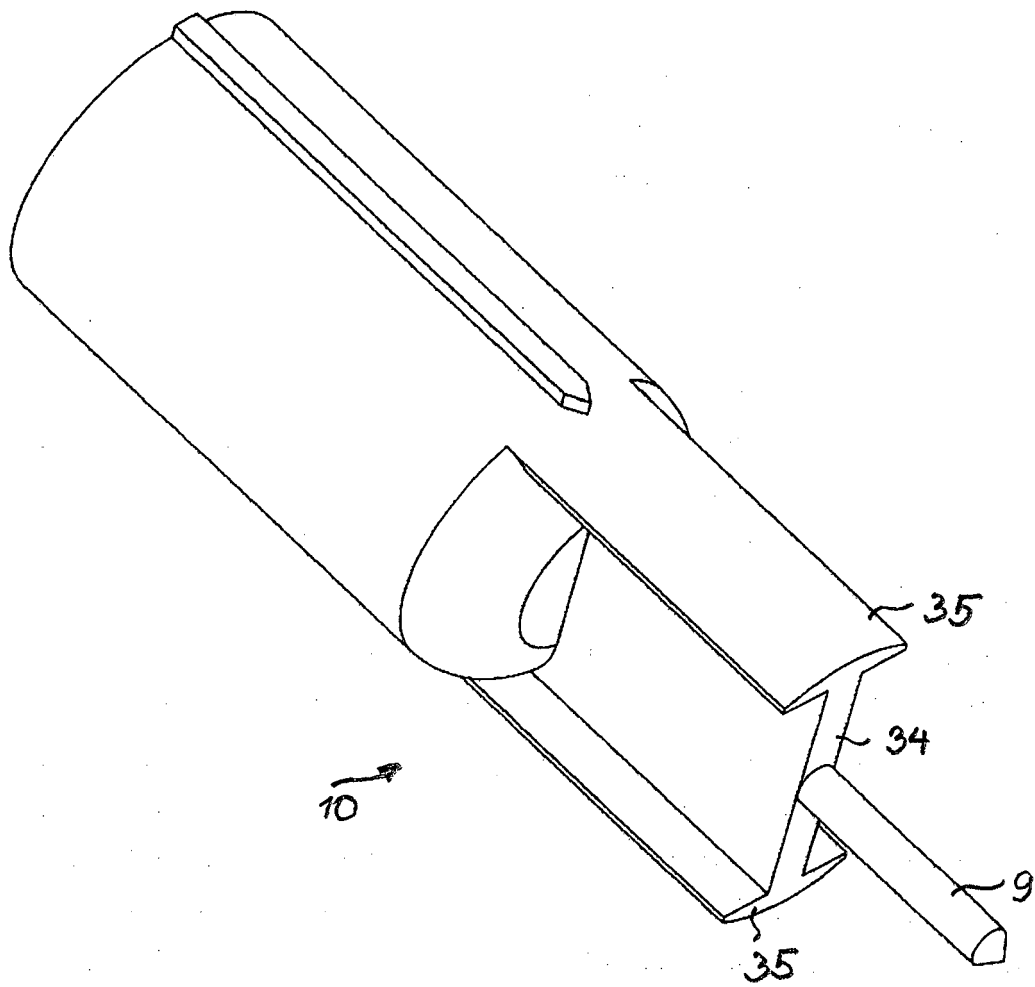


FIG. 11



EUROPEAN SEARCH REPORT

Application Number
EP 20 46 6001

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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)
A	WO 2017/191485 A1 (SUN PHARMACEUTICAL IND LTD [IN]) 9 November 2017 (2017-11-09) * figure 1 *	1	INV. B65D81/32
A	EP 1 177 987 A2 (GEORG MENSCHEN GMBH & CO KG [DE]) 6 February 2002 (2002-02-06) * figures 1,2 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65D A61J
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 2 November 2020	Examiner Bridault, Alain
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			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 20 46 6001

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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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