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(54) An improved moveable valve assembly for liquid atomizers.

(57) There is disclosed a moveable valve assembly for a liquid atomizer, which assembly comprises a piston body (B) having an exhaust hole therein and the moveable valve body (A) which is receivable within the piston body (B). The moveable valve body (A) has an upper rod portion (A1) and a lower hollow sleeve portion (A2) and the assembly further comprises a spring (A22) for urging the valve body (A) toward the piston body (B) in a manner so as to engage the valve head with the exhaust hole. In one embodiment the lower hollow sleeve (A2) has a wider portion around the exterior thereof which wider portion has an inclined lower face and an upper face having a plurality of annual projections which are engageable with corresponding annual recesses located on a lower face of the piston body.

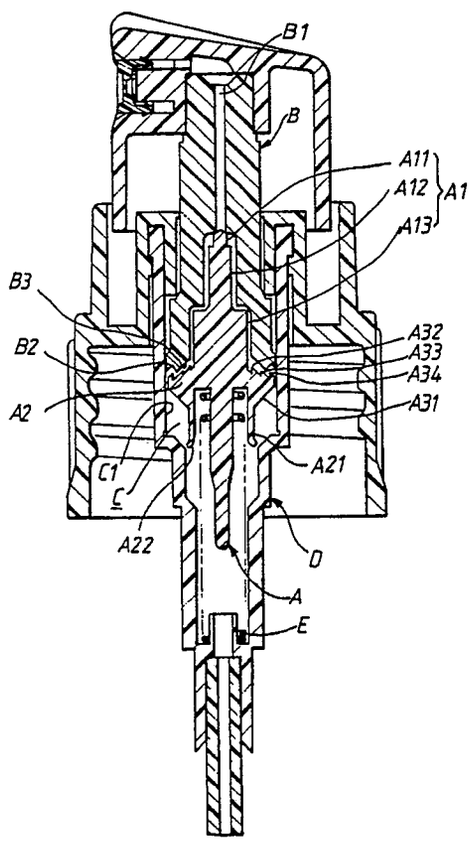

FIG. 6

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AN IMPROVED MOVEABLE VALVE ASSEMBLY FOR LIQUID ATOMIZERS

The present invention relates to an improved moveable valve assembly for liquid atomizers which mainly comprises a piston assembly and a moveable valve body including an upper solid rod and a lower hollow sleeve. The upper solid rod consists of three rod portions each having a different diameter form the other such that the intersection between any two of three rod portions may be respectively formed into a tapered shoulder , a recess or a socket with a flattened shoulder to serve as pressure concentrating points whereby the pressure generated by the pressurized liquid can be efficiently applied to those pressure concentrating points in order to overcome the compression force provided by a spring located under the moveable valve body and in turn to enable a valve head to disengage from a corresponding exhaust hole. The lower hollow sleve is provided at the lower end of its vertical side with an outward projection and with an inclined extension below the projection end with an inclined extension below the projection such that the pressure generated by the pressurized liquid can be applied to the upper side of the projection to force the moveable valve body downward while the pressure applied to the inclined extension makes an inner arcuate flange of the inclined extension closely contact a valve hole so as to achieve a fluidtight effect , and in turn to expedite the formation of pressurized liquid in a compressed chamber.

In addition, the lower hollow sleeve may be provided with a thick solid portion wherein the top side of the thick solid portion is formed with a plurality of tooth-shaped annular portions to enforce the pressurizing offect applied thereto whereby the atomization of the liquid can be rapidly completed.

BACKGROUND OF THE INVENTION

The preset invention relates to a manual type miniature atomizer, and more particularly for an improved moveable valve assembly for liquid atomizers in which the moveable valve body cam be promptly actuated to proceed with a reciprocating motion in response to a user's slight depressive operation.

Due to their complicated structures , conventional atomizers, especially those for being mounted to perfume bottles , require a user to apply singnificant force to the atomizer head thereof in order to press it downward. However, this will make user feel uncomfortable. Besides, owing to the complexity of the constituted components , not only the internal liquid pressure can not be efficiently produced, but also the resulting liquid pressure fails to be specifically applied to certain pressure concentrating points. Under such circumstances , the moveable valve body can not be promptly forced downward in response to a slight depression of the atomizer head so that the related valve head can not simultaneously disengage form thecorresponding valve hole to allow the liquid (such as perfume) contained in the bottle to be sprayed out through said valve hole.

Although U.S. patent Nos. 4,369,900 and 4,462,549 have disclosed certain valves possessing outward projecting shoulders . However , none of such projecting shoulders are designed to serve as pressure (generated by the pressurized liquid) concentrating points , rather said projecting shoulders are to provide an improved fluidtight effect for a pressurized chamber during the compressing operation.

Moreover , as shown in FIG. 1, it illustrates an atomizer manufactured by Coster Tecnologie Speciali S.P.A. wherein the shoulder of the moveable valve is designed to be inclined However , such an arrangement fails to make the pressurized liquid contained in a compressed chamber effectively applied to the inclined shoulders. In other words, the moveable valve cannot efficiently overcome the opposite compression force created by a spring to make a valve head disengage from a corresponding exhaust hole. Therefore, in operation, a user needs to apply a quite strong force to have the moveable valve moved downward and then to allow the pressurized liquid to be sprayed ont of the atomizer.

Under such circumstances , the users will be most unlikey to appreciate such a product and may negate the quality thereof accordingly.

In view of the above, it is clear that the techniques about how to modify the shape of a moveable valve have not yet been disclosed in the related prior references.

SUMMARY OF THE INVENTION

The present invention relates to an improved moveable valve assembly for liquid atomizers which mainly comprises a piston body and a moveable valve body including an upper solid rod and a lower hollow sleeve. The upper solid rod consists of three rod portions each having a different diameter from the other such that the intersection between any two of three rod portions may be respectively formed into a tapered shoulder, a recess or a socket with a flattened shoulder to serve as pressure concentrating points whereby the pressure generated by the pressurized liquid

can be efficiently applied to those pressureconcentrating points in order to overcome the compression force provided by a spring located under the moveable valve body and in turn to enable a valve head to disengage from a corresponding exhaust hole. The lower hollow sleeve is provided at the lower end of its vertical side with an outward projection such that the pressure generated by the pressurized liquid can be applied to the upper side of the projection to force the moveable valve body downward while the pressure applied to the inclined extension makes an inner arcuate flange of the inclined extension closely contact a valve hole so as to achieve a fluidtight effect, and in turn so expedite the formation of pressured liquid in a compressed chamber.

In addition the upper periphery of the sleeve may be provided with a thick solid portion, the top side of which is formed with a plurality of tooth-shaped annular portions whereby upon operation the thick solid portion can apply a larger compression force to the liquid contained in a compressed chamber and then the pressurized liquid will effectively force the moveable valve to more downward with the aid of the tooth-shaped annvlar portions as well as a corresponding inverted v-shaped groove and corresponding trumpet-shaped inner annular portion respectively formed in the lower side of the piston body such that a triangular valve body may simultaneously disengage from a corresponding exhaust hole to allow the pressarized liquid to be sprayed out of the atomizer through a hollew tubular portion.

It is an object of the present invention to provide an improved moveable valve assembly for liquid atomizers which makes the user feel comfortable upon depessing the atomizer head.

It is a further object of the present invention to provide an improved valve assembly for components and inexpensive constitution.

These and other features, objects and advantages of the present invention will become apparent upon reading the following descirption thereof with reference to the accompanying drawings which :

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal sectional view showing a prior art atomizer ;

FIG. 2 is a perspective view of the present invention ;

FIG. 3 is a longitudinal sectional view illustrating a first embodiment of the present invention ;

FIG. 4 is a local enlarged sectional view showing the relative positions of various components of a first embodiment of the present invention before the atomizer head is pressed ;

FIG. 5 is a local enlarged seetional view showing the relative positions of varions components of a first embodiment of the present invention after the atomizer body is pressed ;

FIG. 6 is a longitudinal sectional view showing the relative positions of various components of a second embodiment of the present invention before the atomizer head is pressed ;

FIG. 7 is a longitudinal sections view showing the relative positions of varions components of a second embodiment of the present invention after the atomizer bead is pressed ; and

FIG. 8 is a local sectional view showing a second embodiment of the present invention .

DETAIL DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 2, 3 and 4, the moveable valve assembly for liquid atomizers of the first preferred embodiment of the present invention mainly comprises a piston body (B) and an moveable valve body (A) consisting of an upper solid rod (A1) and a lower cylindrical sleeve (A2). The upper solid rod (A1) is received into a piston body (B) in such a manner that a triangular exhaust valve head (A101) at the top of said rod (A1) closely contact an exhaust hole located at the bottom of a hollow tubular portion (B1) of the piston body (B) to restrict the liquid to flow into the lower space of the tubular portion (B1). In operation, upon pressing an atomized head downward, the piston body (B) together with the moveable valve body (A) are driven downward.

In this way, when an inner arcuate flange (A201) formed at the lower sleeve (A2) of the moveable valve body (A) contacts a corresponding valve hole, the liquid contained in the moveable valve body (A) will b e enclosed therein in a fluidtight manner. At this instant, the moveable valve body (A) is continuously pressed downward thereby the liquid contained therein is compressed and the pressure generated by the pressurized liquid shall be applied to the moveable valve body (A) . As soon as the liquid pressure overcomes the compression force provided by a spring (E) disposed in the sleeve (A2) the moveable valve body (A) will be simultaneously forced downward to disengage the valve head (A101) from the exhaust hole (B101) so that the pressurized liquid can be sprayed out from the piston body (B) through the hollow tubular portion (B1).

In view of the above, it is understood that the most important thing is to make the inner arcuate flange (A201) at the lower sleeve (A2) of the moveable valve body (A) smoothly contact the corresponding valve hole and to securely terminate the communication between the inside and the outside of the compressed chamber(C). This may facilitate the formation of the pressurized liquid

contained the compressed chamber (C). In addition, the measure regarding how to make the pressure generated by the pressurized liquid be concentrated to the moveable valve body (A) in turn to simultaneously open the exhaust hole (B101) is another important factor to be taken into consideration.

To achieve the aforesaid purposes , the upper solid rod (A1) of the moveable valve body (A) is designed in such a manner that said rod (A1) mainly consists of a first rod portion (A11), a second rod portion (A12) and a third rod portion (A11) is formed into a triangular valve head (A101) while the intersection between the first rod portion (A11) and the second rod portion (A12) is formed with a taperes shoulder (A102) acting as a first pressure concentrating point. The intersection between the second rod portion (A12) and the third rod portion (A13) also has a tapered shoulder (A103) and a projection shoulder (A104).

An inverted triangular recess (A105) is formed between said tapered shoulder (A103) and projection shoulder (A104) in order to both receive more liquid therein and serve as a second pressure concentrating point. The tapered shoulder (A103) can further direct the vertical force component of the force provided by the pressurized liquid to the recess (A105). The lower end of the third rod portion (A13) possesses a tapered shoulder (A106) similar to the tapered shoulder (A103) of the second rod portion (A12), and further forms with the upper end of a sleeve (A2) a flattened shoulder (A202) as well as a flange (A203) to serve as a third pressure concentrating point. The tapered shoulder (A106) of the third rod portion (A13), in addition to having the ability of directing the force as the aforesaid tapered shoulder (A103) does, is designed to cooperate with the upper end of the sleeve (A2) so as to provide a thicker portion (A204) which shall not be inwardly deformed when the sleeve (A2) of the moveable valve body (A) is compressed under high pressure. The lower end of the vertical side (A205) of the sleeve (A2) is provided with an outward projection (A206). The upper side of said projection (A26) is used to concentrate the pressure applied thereto and serve as a fourth pressure concentrating point. The lower side of said projection (A206) has an inwardly inclined extension (A207) which is provided at its interior with an inner arcuate flange (A201). In operation, the pressurized liquid will be concentrated on the upper side of the projection (A206) to force it downward. The inclined extension (A207) below said projection (A206) is inwardly compressed under the horizontal force applied to the inclined surface thereof. Due to such an inward compression action, the extension (A207) can closely contact a corresponding valve hole to prevent the liquid from leaking into the compressed chamber during the compression stroke.

Referring to FIG. 6, it shows a longitudinal sectional view of the second preferred embodiment of the present invention wherein a thick solid portion (A3) is formed on the upper periphery of the sleeve (A2). The thick solid portion (A3) is formed by extending outward from the vertical side (A21) of the sleeve (A2) a solid portion with a larger diameter in comparison with the diameter of the sleeve (A2). The lower side of the thick solid portion (A3) is formed into an inclined portion (A31) and the upper side thereof is provided with a plurality of concentric tooth-shaped annular portions , for example , a first annular portion (A34), a second annalar portions (A33) and a third annular portion (A32) as shown in FIG. 6, to guide the liquid applied thereto. The piston body (B) is provided at its lower side with an inverted V-shaped groove (B2) and a trumpet-shaped inner annular portion (B3) respectively corresponding to the aforesaid annular portions of the thick solid portion (A3).

As shown in FIG. 7, as the piston body (B) is pressed downward, the moveable valve (A) will be driven to move downward accordingly.

In this way , when an outward extension (A22) of the sleeve (A2) closely contact a cylinder (D) the space above the cylinder (D) will be formed into a closed compressed chamber (C). the liquid contained in the compressed chamber (C) will become more pressurized as the piston body (B) is further pressed downward.

The pressurized effeet will be come more significant with the provision of the thick solid portion (A3). In this instant, the pressurized liquid below the thick solid portion (A3) will be forced to flow upward through the space formed between the thick solid portion (A3) and the wall (C1) of the compressed chamber (C). Referring to FIG. 4 the upward pressurized liquid will first contact the inverted V-shaped groove (B2) of the piston body (B) and be directed to the first annular portion (A34) of the thick solid portion (A3) to force the moveable valve (A) downward. Similarly, the pressurized liquid coming from the first annular portion (A34) will be directed to the inner annular groove (B3) of the piston body (B) and then be directed to the third annular portion (A32) of the thick solid portion (A3) to further force the moveable valve (A) downward. Finally the pressuized liquid will be directed upward through the space formed between the third rod portion (A13) and the inner wall of the piston body (B). Since the above mentioned various actions are completed simultaneously the pressure applied to the moveable valve (A) is both concentrative and effective such that the moveable valve (A) can easily overcome the opposite com-

pression force generated by the spring (E) and then move downward.

The moveable valve (A) will continue to move downward to make the triagular valve head disengage from the exhaust hole (B101) so that the pressurized liquid can be sprayed out of the atormizer through the hollow tubular portion (B1). The special arrangement of the tooth-shaped annular portions also will prevent the l iquid from easily sliding downward along the inclined portion so as to expedite the formation of the pressure concentration effect.

In view of the construction as described above, the present invention provides at least four pressure concentrating points respectively located at four different positions such that the presure provided by the pressurized liquid can be efficiently applied to said four pressure concerntrating points whereby the moveable valve (A) in turn is driven downward to disengage the valve head (A101) from the exhaust hole (B101) whereby the pressurized liquid can be sprayed out from the atomizer through the hollow tubular portion (B1) of the piston body (B). In addition, since the thick solid portion (A3) of the sleeve (A2) possesses a larger volume, the capability of pressurizing the liquid contained in the compressed chamber will be significently increased Furthermore, the improved structure achieved by the provision of the tooth-shaped annular portions (A32), (A33) and (A34), as well as the inverted V-shaped groove (B2) and the trumpet-shaped inner annular portion (B3) will facilitate the application of the pressurized liquid to the moveable valve (A) on a simultaneous and continuous manner so as to force the moveable valve (A) to overcome the opposite force generated by the spring (E) and then to disengage the valve head from the exhaust hole (B101) Accordingly it is believed that the present invention can effectively eliminate the drawbacks existing in the prior art and thus successfully provide an improved atomizer.

The features disclosed in the foregoing description, in the following claims and/or in the accompanying drawings may, both separately and in any combination thereof, be material for realising the invention in diverse forms thereof.

Claims

1. An improved moveable valve assembly for liquid atomizers comprising :
   A piston body ;
   A moveable valve body consisting of an upper solid rod and a lower hollow sleeve being received in said piston body; and
   A spring disposed below said moveable valve body to compress said moveable valve body upward such that a triangular valve head of said moveable valve body can securely close an exhaust hole of said piston body.

2. An improved moveable valve assembly for liquid atomizers as claimed in claim 1, wherein said upper solid rod comprises a plurality of rod portions each having a different diameter from the other so that the intersection between any two of said rod portions may be respectively formed into a tapered shoulder, a recess or a socket with a flattened shoulder so as to facilitate the pressure generated by the pressurized liquid being concentrated thereon.

3. An improved moveable valve assembly for liquid atomizers as claimed in claim 1, wherein said lower hollow sleeve of said moveable valve body is provided at the lower end of its vertical side with an outward projection such that the downward force generated by the pressurized liquid can be applied to the upper side of said projection, and where the lower side of said projection is formed with an inwardly inclined extension which is furnished at its interior with an inner arcuate flange so that said inner flange is arranged to closely contact a corresponding valve hole in orde r to terminate the communication between the inside and the outside of a compressed chamber during the reciprocating motion of said moveable valve body.

4. An improved moveable valve assembly for liquid atomizers as claimed in Claim 1, wherein said lower hollow sleeve is provided with a thick solid portion with a larger diameter in comparison with the diameter of said lower hollow sleeve and said thick solid portion is provided at its lower side with an inclined portion and at its upper side with a plurality of concentric annual portions to guide the liquid applied thereto and wherein said piston body is furnished at its lower side with an inverted V-shaped groove and a trumpet-shaped inner annular portion respectively corresponding to said annular portions of said thick solid portion.

5. A moveable valve assembly for a liquid atomizer, which assembly comprises a piston body (B) having an exhaust hole (B101), a moveable valve body (A) receivable in the piston body (B), comprising an upper rod (A3) having a valve head (A101) engageable with the exhaust hole (B101) and a lower hollow sleeve (A2), and urging means (E) for urging the valve body (A) toward the piston body (B) so that the valve head (A1 01) engages with the exhaust

hole (B101).

6. A moveable valve assembly as claimed in Claim 5 wherein the lower hollow sleeve (A2) comprises a wider portion (A3), having a greater external dimension than the remainder of the lower hollow sleeve, the wider portion (A3) having an inclined lower face (A31), the upper face of the wider portion (A3) comprising at least one annular projection or recess (A33) engageable with a corresponding annular recess or projection (B2) located on a lower face of the piston body (B).

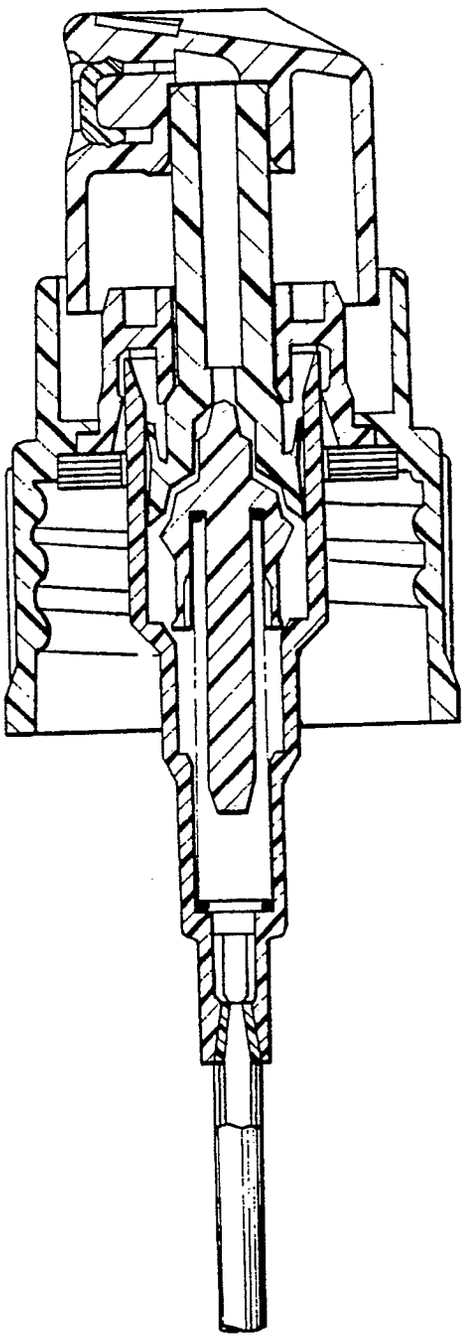


FIG. 1
PRIOR ART

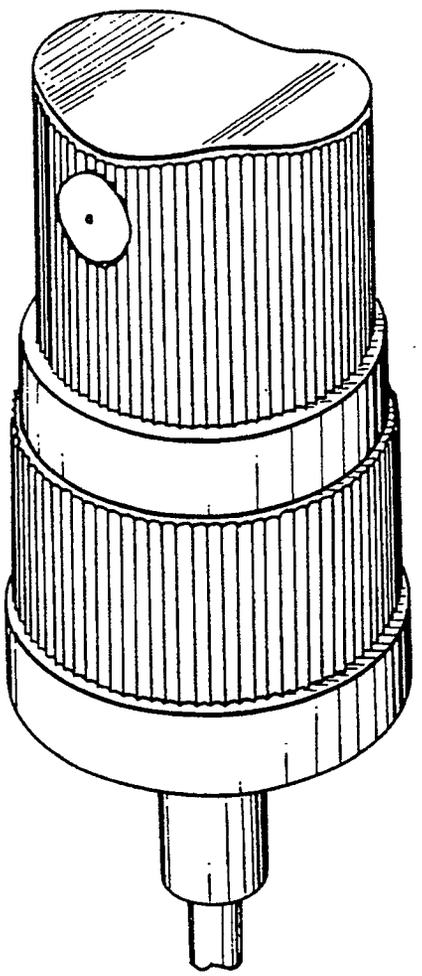


FIG. 2

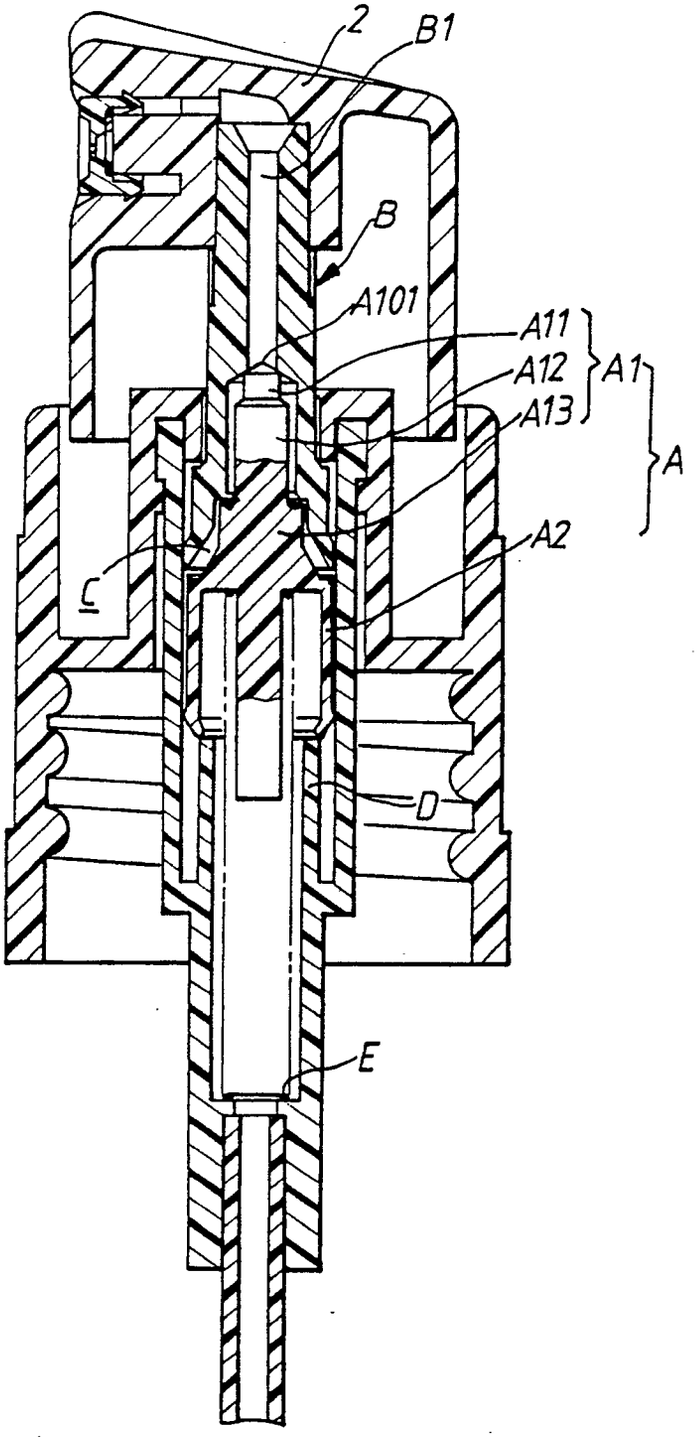


FIG. 3

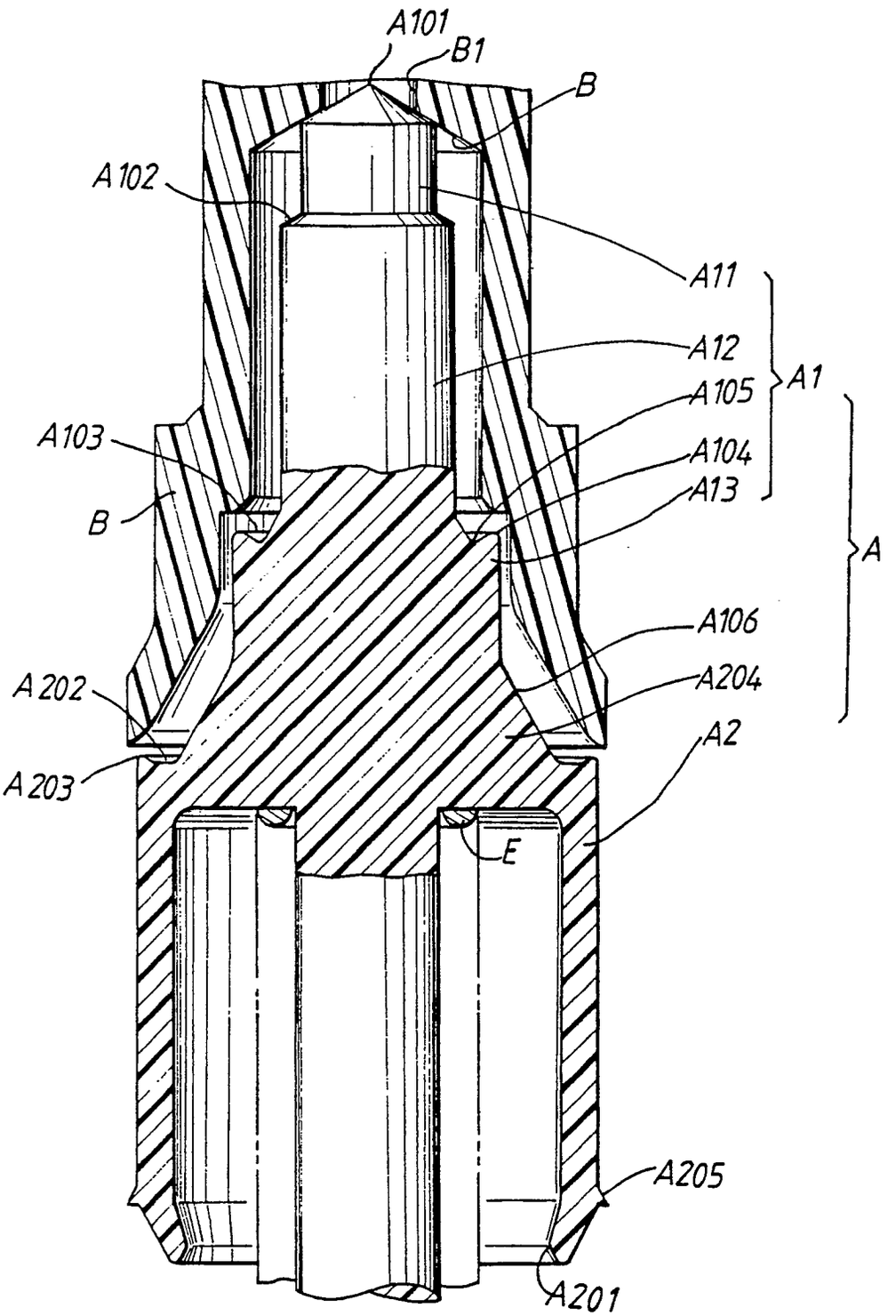
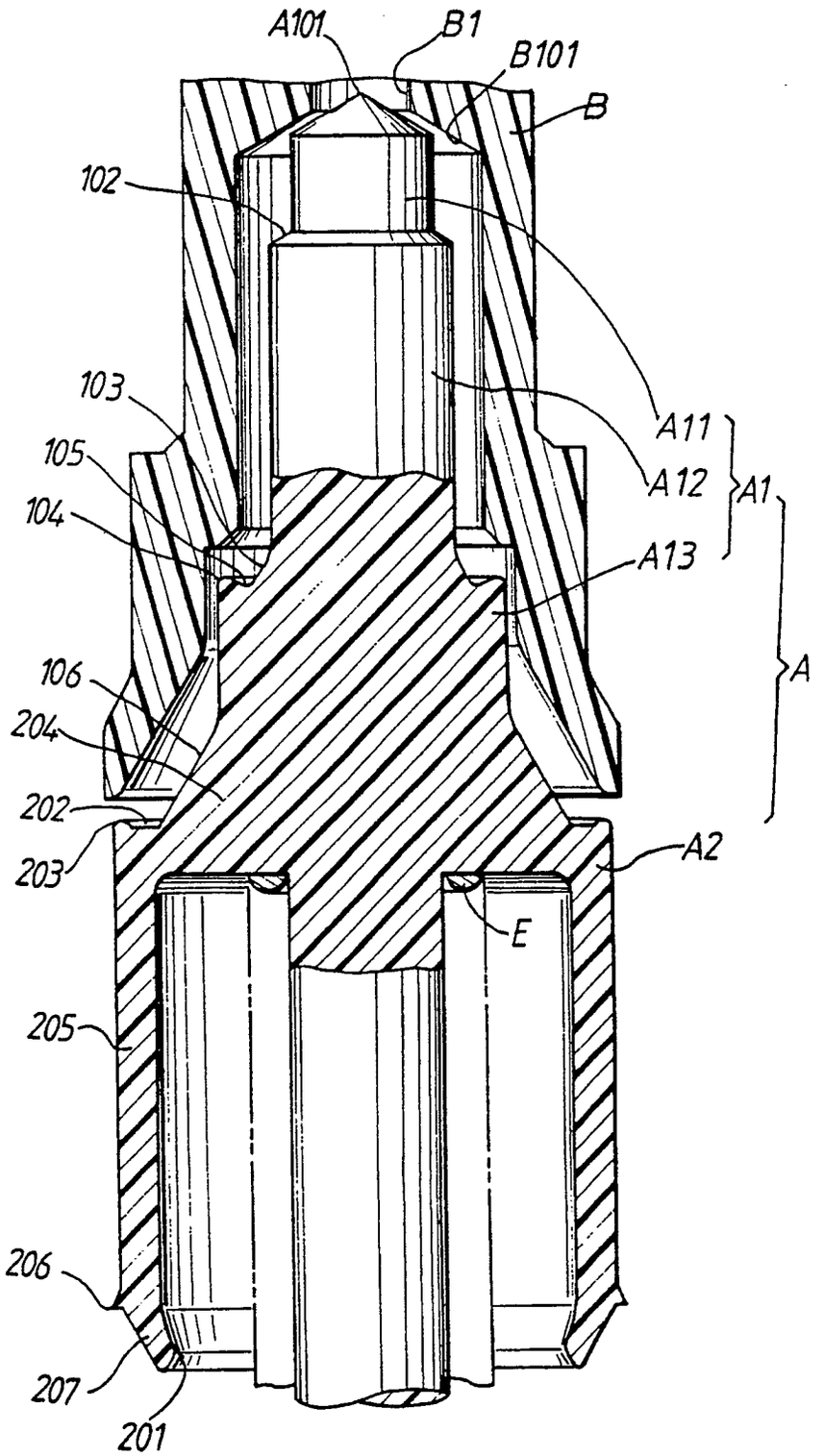

A101
B1
B
A102
A11
A12
A1
A105
A103
A104
B
A13
A
A106
A202
A204
A2
A203
E
A205
A201

FIG. 4


A101
B1
B101
B
102
103
105
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106
204
202
203
A11
A12
A1
A13
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A2
E
205
206
207
201

FIG. 5

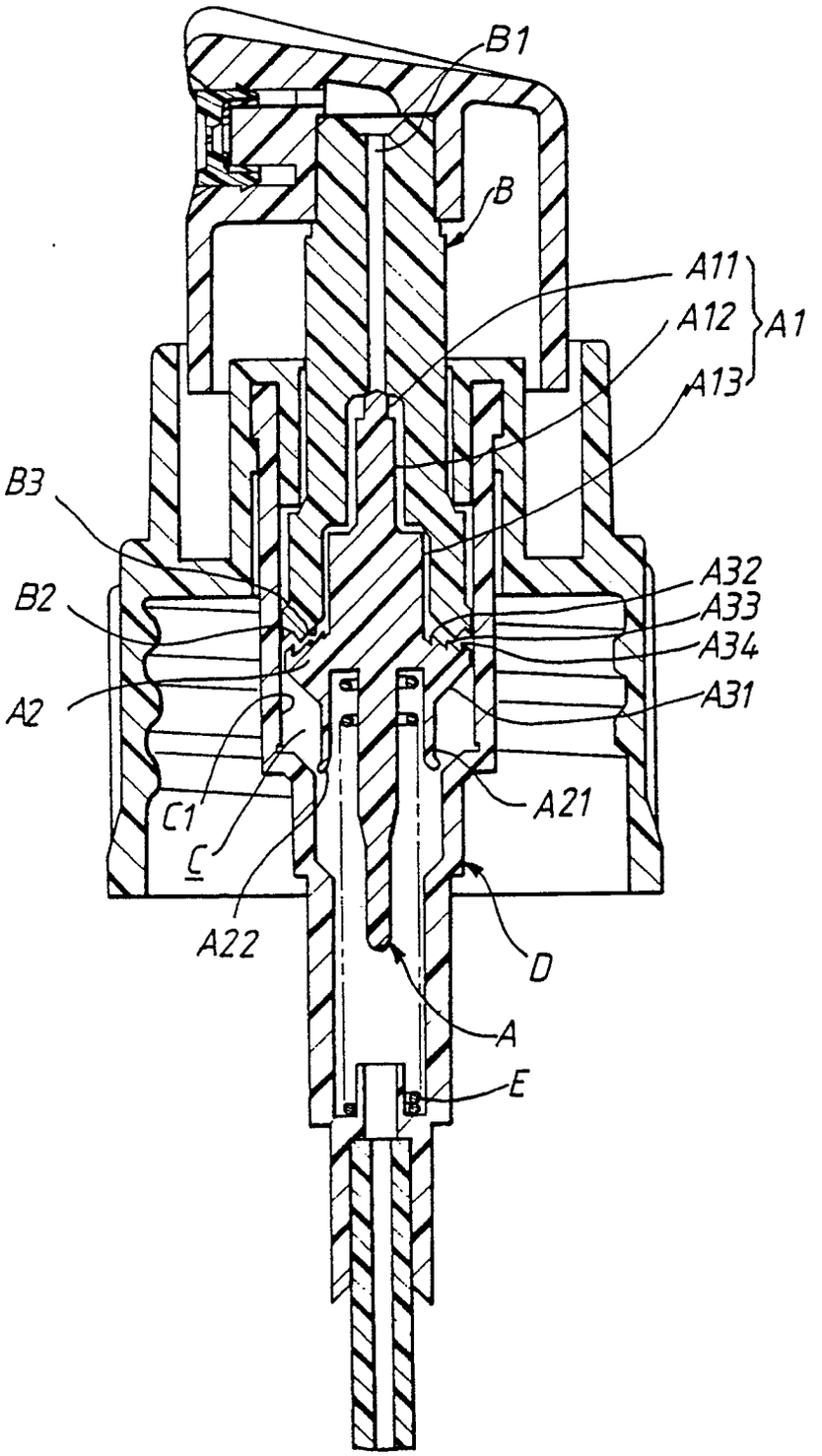

FIG. 6

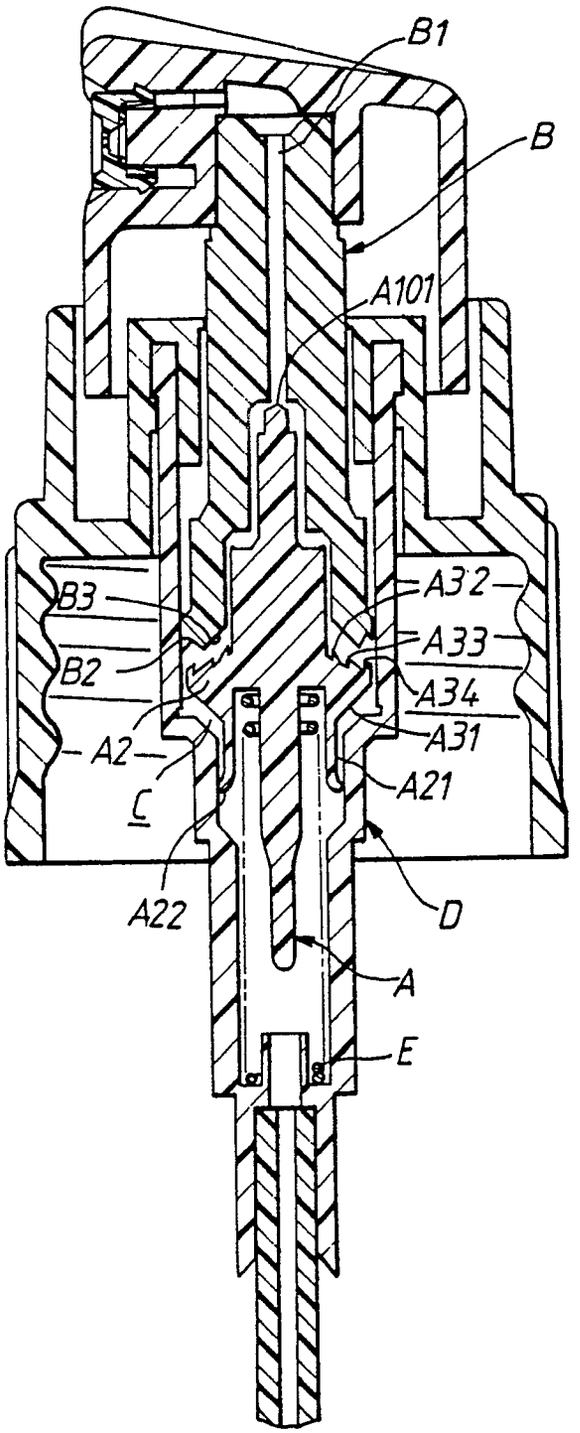

FIG. 7

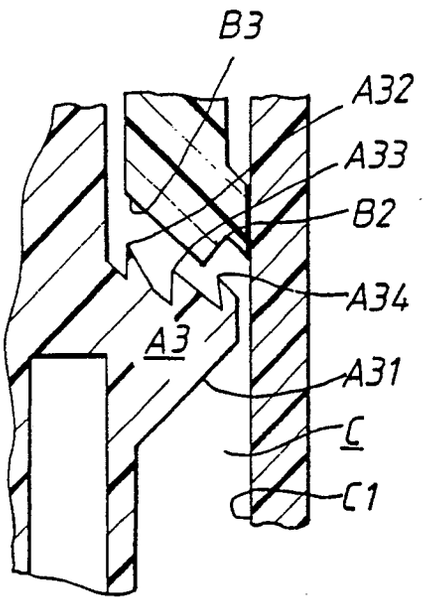

FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 10 6795

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 821 928 (C.Y. SU) * Column 2, line 23 - column 3, line 4; figures 2,2a *	1,3-6	B 05 B 11/00
Y		2	
Y	FR-A-2 512 517 (AEROSOL INVENTIONS & DEV. S.A., AID S.A.) * Figures 1,2 *	2	
A	FR-A-2 349 749 (EMSON RESEARCH INC.) * Page 11, lines 21-32; figure 3 *	4,6	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 05 B

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	08 May 91	BREVIER F.J.L.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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