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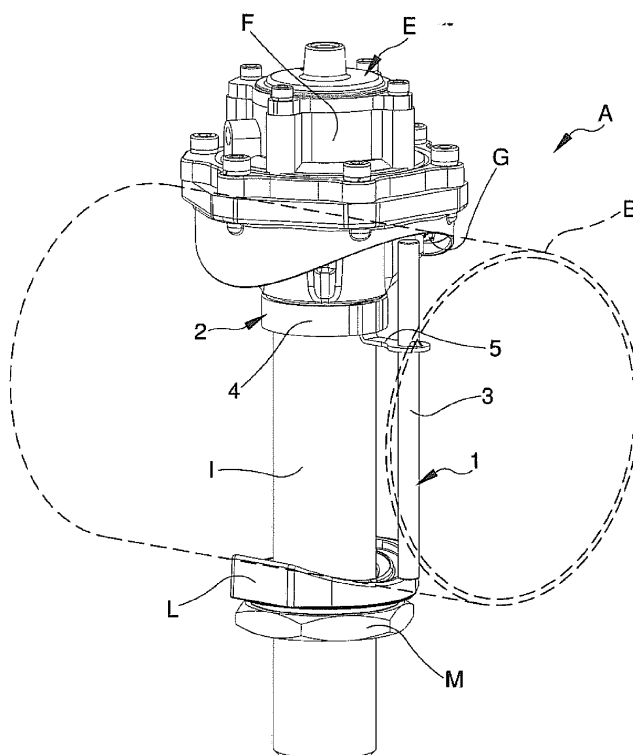
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(54) **Reinforcement device for containment tanks of a pressurized gas in industrial filter cleaning system**

(57) The reinforcement device (1) for containment tanks of a pressurized gas in industrial filter cleaning systems comprises supporting means (2, 2') associable with a valve device (E) suitable for being fitted at least partially inside a containment tank (B) of a pressurized gas, and

at least a reinforcement element (3) associated with the supporting means (2, 2') and having at least a first and a second extremity which can be positioned in proximity of two substantially opposite portions of the inner surface of the tank (B).

Fig. 1



## Description

**[0001]** The present invention relates to a reinforcement device for containment tanks of a pressurized gas in industrial filter cleaning systems.

**[0002]** In the industrial field, the use has been known for some time of specific dust abatement systems for air cleaning.

**[0003]** Such systems, in point of fact, allow filtering the dirty air extracted by a system, trapping the dusts by means of suitable filtering elements.

**[0004]** In most cases, the filtering elements consist of so-called "sleeves" or alternatively "cartridges".

**[0005]** The sleeves, in particular, are fabric filters of different types, depending on the characteristics of the air to be cleaned, and can be made up, e.g., of a series of cylindrical bags arranged alongside one another and made of material with permeability such as to allow the transit of gas and trapping the dust and particulate of various kinds.

**[0006]** The cartridges on the other hand consist of a rigid and suitably shaped filtering material.

**[0007]** Such filtering stations also have specific systems for cleaning the filtering elements, suitable for intervening periodically to detach the trapped dusts from the filtering elements.

**[0008]** A particular type of such cleaning devices contemplates the injection of a pulse of compressed air inside the filtering elements by means of the action of valves that can be operated electrically and which are fitted side by side on a compressed-air storage tank.

**[0009]** The injected compressed air acts in the direction opposite to the normal flow of extracted air to be cleaned and causes the shaking or vibration of the filtering elements, inducing the precipitation of the dusts deposited on the outer surface of the filtering elements themselves.

**[0010]** The precipitated dusts are then collected up to be retrieved or rejected. Different types of pulse valves exist which differ in terms of operation, size and type of installation with respect to the compressed-air tank.

**[0011]** Valves are known, for example, having a threaded or flanged connection that can be coupled to a complementary threaded section or to a corresponding flange respectively made overhanging from the outer surface of the compressed-air tank.

**[0012]** Also known are so-called "integrated" valves which, instead of being connected to the tank by means of a flanged or threaded coupling, cross the tank itself transversally and are in fact integral with it.

**[0013]** The integrated valves comprise, in particular, a valve body which houses the actual valve element, made up, e.g., of a membrane solenoid valve.

**[0014]** In particular, the valve body has one or more openings for letting in the compressed air from the tank and a compressed-air outlet mouth.

**[0015]** The valve element is suitable for controlling the flow of air from the inlet openings towards the outlet

mouth.

**[0016]** The integrated valves also comprise a compressed-air outlet duct, conventionally known as "shooting duct", which, once fitted, crosses the tank transversally.

**[0017]** The shooting duct has a first compressed-air inlet extremity associable, e.g., by screwing, with the outlet mouth of the valve body and a second compressed-air outlet extremity associable with the filtering elements of the dust abatement system.

**[0018]** The valve element, therefore, is electrically controlled to carry out the injection of compressed air from the tank, through the inlet openings on the valve body, through the first extremity of the shooting duct, as far as the second extremity and towards the filtering elements.

**[0019]** The use of such integrated valves has however a number of drawbacks.

**[0020]** The compressed-air tank in fact commonly has an elongated tubular shape with round cross section and two openings have to be made diametrically opposite on this to allow fitting the shooting duct of each of the valves.

**[0021]** The valve is then fastened to the tank by means of a connection element fitted around the second extremity of the shooting duct and positioned in contact with the outer surface of the tank.

**[0022]** A ring nut that can be screwed onto a threaded section of the second extremity or the shooting duct then allows securing the connection element and the valve body on the tank surface, in correspondence to the openings.

**[0023]** Suitable seals are placed between the valve body and the tank and between the connection element and the tank.

**[0024]** Once the air is pressurized inside the tank and during the use of the valve, however, the openings made produce an imbalance between the pressure forces applied on the inner surface and the resistance opposed by the wall of the tank itself.

**[0025]** Such imbalance results in the out-of-roundness of the tank section, which is therefore crushed along the longitudinal axis of the valve, where the openings are located, and widened along a direction perpendicular to such axis.

**[0026]** This out-of-roundness, furthermore, is all the more accentuated, the more the tank thickness is reduced.

**[0027]** To overcome this drawback, a known method is to fit a bar inside the tank made of metal or other material, with variable section which, once positioned with its extremities in the proximity of the holes and along the direction of crushing of the tank, opposes the out-of-roundness of the tank itself.

**[0028]** In particular, the metal bar is fastened at one extremity to the inner surface of the tank by means of a welding procedure.

**[0029]** Such welding procedure nevertheless has the following drawbacks:

- normally, the room available to work is very little and the area to be welded is not very accessible and this often results in imperfect welding, which means work has to be begun again;
- the welding procedure can produce a lot of splashes that must be cleaned and this cleaning operation is difficult and onerous time-wise due to the lack of accessibility of the welding bead;
- because of the high temperatures reached, the welding procedure can result in the melting, or in any case a strong heat alteration, of a portion of the tank, damaging it.

**[0030]** The main object of the present invention is to provide a reinforcement device for containment tanks of a pressurized gas in industrial filter cleaning systems which permits contrasting the out-of-roundness of the tank and, at the same time, avoiding welding operations being made inside the tank itself.

**[0031]** Another object of the present invention is to provide a reinforcement device for containment tanks of a pressurized gas in industrial filter cleaning systems which permits the use of tanks with walls of less thickness, with consequent cutting of total costs.

**[0032]** Another object of the present invention is to provide a reinforcement device for containment tanks of a pressurized gas in industrial filter cleaning systems that allows overcoming the mentioned drawbacks of the state of the art in the ambit of a simple, rational, easy and effective to use as well as low cost solution.

**[0033]** The above objects are achieved by the present reinforcement device for containment tanks of a pressurized gas in industrial filter cleaning systems characterised by the fact that it comprises supporting means associable with at least one valve device suitable for being fitted at least partially inside a containment tank of a pressurized gas, and at least one reinforcement element associated with said supporting means and having at least a first and a second extremity which can be positioned in proximity of two substantially opposite portions of the inner surface of said tank.

**[0034]** Other characteristics and advantages of the present invention will become more evident from the description of two preferred, but not sole, embodiments of a reinforcement device for containment tanks of a pressurized gas in industrial filter cleaning systems, illustrated purely as an example but not limited to the annexed drawings in which:

figure 1 is an axonometric view of a first embodiment of the device according to the invention fitted on an industrial filter cleaning system;  
figure 2 is an axonometric and exploded view of the device of figure 1;  
figure 3 is an axonometric view of a second embodiment of the device according to the invention fitted on an industrial filter cleaning system;  
figure 4 is an axonometric and exploded view of the

device of figure 3.

**[0035]** With particular reference to such figures, globally indicated by 1 is a reinforcement device for containment tanks of a pressurized gas in industrial filter cleaning systems.

**[0036]** In particular, by "industrial filter cleaning systems" is meant conventional-type systems, used in the industrial field to clean filtering elements suitable for air treatment.

**[0037]** Such systems are therefore commonly used and known and are suitable for periodically operating to detach trapped dusts from the filtering elements.

**[0038]** The figures partially show an example of industrial filter cleaning system, indicated altogether by the reference A, to which has been fitted the reinforcement device 1 according to the invention in a first embodiment (figures 1 and 2) and in a second embodiment (figures 3 and 4).

**[0039]** In particular, the system A comprises a tank B with elongated tubular shape and round cross section (only partially visible in the illustrations) suitable for containing a gas under pressure, e.g., compressed air.

**[0040]** A first and a second opening C and D are made along the tank B in correspondence to diametrically opposite portions to allow fitting a valve device, indicated altogether by the reference E, usable to inject a pulse of compressed air inside the filtering elements to be cleaned.

**[0041]** The valve device E is preferably of the type of a so-called "integrated" valve or the like.

**[0042]** In particular, the valve device E comprises a valve body F housing the control means for the dispensing of the flow of gas coming from the tank B, consisting, e.g., of a membrane solenoid valve.

**[0043]** In particular, the valve body F has one or more openings G for the inlet of the compressed air from the tank B and a mouth H for the outlet of the compressed air.

**[0044]** The membrane solenoid valve inside the valve body F is suitable for controlling the flow of air from the openings G towards the mouth H.

**[0045]** The valve device E also comprises a duct I for the outlet of the compressed air, conventionally known as "shooting duct", which, once installed, crosses the tank B transversally.

**[0046]** The duct I has a first compressed-air inlet extremity associable with the mouth H of the valve body, e.g., by means of the threaded means, and a second compressed-air outlet extremity protruding from the second opening D and which is associable with the filtering elements of the dust abatement system.

**[0047]** The valve device E is then electrically controlled to inject compressed air from the tank B, through the openings G onto the valve body F, through the first extremity of the duct I, as far as the second extremity of the duct I and towards the filtering elements.

**[0048]** The valve device E is then fastened to the tank B by means of a connecting element L fitted around the

second extremity of the duct I and positioned in contact with the outer surface of the tank itself.

[0049] A ring nut M which can be screwed onto a threaded section of the second extremity of the duct I then allows securing the connection element L and the valve body F to the surface of the tank B, in correspondence to the first and second opening C and D.

[0050] Suitable seals are placed between the valve body F and the tank B and between the connection element L and the tank B to prevent air from escaping.

[0051] The function of the reinforcement device 1 is to contrast the out-of-roundness of the tank B once the air inside it is pressurised and during the use of the valve device E.

[0052] The reinforcement device 1, in particular, comprises supporting means associable with the valve device E, altogether indicated by the reference 2 in the first embodiment of the invention (figures 1 and 2) and by the reference 2' in the second embodiment of the invention (figures 3 and 4).

[0053] The reinforcement device 1 also comprises at least a reinforcement element 3 with a substantially elongated shape associated integral with the supporting means 2, 2' and having a first and a second extremity positionable in correspondence to two opposite portions of the inner surface of the tank B, in the proximity of the first opening C and of the second opening D, respectively. With particular reference to the first embodiment shown in the figures 1 and 2, the reinforcement device 1 comprises supporting means 2 associable with the valve body F of the valve device E.

[0054] In particular, the supporting means 2 are composed of a holding element having a ring portion 4 positionable around a protruding portion N of the valve body F having the mouth H for the outlet of the compressed air.

[0055] The protruding portion N is fitted through the first opening C and extends inside the tank B.

[0056] Usefully, the ring portion 4 can be fitted to measure on the protruding portion N, making the holding element 2 integral with the valve body F.

[0057] The holding element 2 also comprises an arm 5 which extends from the ring portion 4 and to which the reinforcement element 3 is fastened integral. Usefully, the arm 5 extends overhanging from the ring portion 4 along a direction substantially at right angles with respect to the longitudinal axis of the valve device 2.

[0058] The reinforcement element 3 is composed of a bar that can be made of metal material, e.g., aluminium, or other non-metal material, e.g., synthetic fibres or thermoplastic materials.

[0059] The bar 3 is fastened to the free extremity of the arm 5 and extends along a direction substantially parallel to the longitudinal axis of the duct I, with the extremities arranged in correspondence to opposite portions of the inner surface of the tank B, in the proximity of the first opening C and the second opening D, respectively.

[0060] The reinforcement element 3 can be fastened

to the arm 5 using different methods of known type such as, e.g., interlocking and welding.

[0061] With particular reference to the second embodiment shown in the figures 3 and 4, the reinforcement device 1 comprises supporting means 2' associable with the duct I of the valve device E.

[0062] In particular, the supporting means 2' are composed of a pair of holding elements, arranged aligned the one with the other.

[0063] Each holding element 2' has a ring portion 4' positionable around a section of the duct I.

[0064] Usefully, the ring portions 4' can be fitted to measure on the duct I.

[0065] Each holding element 2' also comprises a pair of arms 5' extending from the ring portion 4' and to which are fastened respective reinforcement elements 3. Usefully, the arms 5' extend overhanging from substantially opposite parts of the ring portion 4', along a direction substantially at right angles with respect to the longitudinal axis of the valve device 1.

[0066] The reinforcement elements 3 are composed of respective bars that can be made of metal material, e.g., aluminium, or non-metal material, e.g., synthetic fibres or thermoplastic materials.

[0067] Each bar 3 is fastened at two points to the free extremity of the respective arms 5' of each of the holding elements 2' and extends along a direction substantially parallel to the longitudinal axis of the duct I, with the extremities arranged in correspondence to the opposite portions of the inner surface of the tank B, in the proximity of the first opening C and of the second opening D, respectively. Each reinforcement element 3 can be fastened to the respective arm 5' using different methods of known type such as, e.g., interlocking and welding.

[0068] In both the embodiments of the reinforcement device 1, therefore, once the system A has been assembled, the bars 3 arrange themselves parallel with the duct I, with the extremities arranged in correspondence to opposite portions of the inner surface of the tank B, in the proximity of the first opening C and of the second opening D, respectively.

[0069] It has in practice been ascertained how the described invention achieves the proposed objects.

[0070] In particular, the fact is underlined that the reinforcement device according to the invention allows contrasting the out-of-roundness of the tank and, at the same time, avoiding welding operations inside the tank itself.

[0071] Furthermore, the reinforcement device according to the invention allows using tanks with walls of lower thickness, with a consequent reduction in the total costs of building the industrial filter cleaning system.

## Claims

1. Reinforcement device (1) for containment tanks of a pressurized gas in industrial filter cleaning systems, **characterised by** the fact that it comprises support-

ing means (2, 2') associable with at least one valve device (E) suitable for being fitted at least partially inside a containment tank (B) of a pressurized gas, and at least one reinforcement element (3) associated with said supporting means (2, 2') and having at least a first and a second extremity which can be positioned in proximity of two substantially opposite portions of the inner surface of said tank (B).

2. Reinforcement device (1) according to the claim 1, **characterised by** the fact that said supporting means (2) are associable with the valve body (F) of said valve device (E) suitable for housing the control means for the dispensing of the gas flow coming from said tank (B). 10
3. Reinforcement device (1) according to the claim 1, **characterised by** the fact that said supporting means (2') are associable with at least a shooting duct (I) of the compressed air of said valve device (E). 20
4. Reinforcement device (1) according to one or more of the preceding claims, **characterised by** the fact that said supporting means (2, 2') comprise at least a holding element (2, 2') associable with a section of said valve device (E). 25
5. Reinforcement device (1) according to the claim 4, **characterised by** the fact that said holding element (2, 2') comprises at least a ring portion (4, 4') which can be positioned around said section of the valve device (E). 30
6. Reinforcement device (1) according to the claim 5, **characterised by** the fact that said holding element (2, 2') comprises at least an arm (5) which extends from said ring portion (4, 4'), said reinforcement element (3) being integrally associated with said arm (5). 35  
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7. Reinforcement device (1) according to the claims 2 and 5, **characterised by** the fact that said ring portion (4) of the holding element (2) can be positioned around at least a protruding portion of said valve body (F). 45
8. Reinforcement device (1) according to the claims 3 and 5, **characterised by** the fact that said ring portion (4') of the holding element (2') can be positioned around at least a section of said shooting duct (I). 50
9. Reinforcement device (1) according to one or more of the preceding claims, **characterised by** the fact that said reinforcement element (3) has a substantially elongated shape. 55
10. Reinforcement device (1) according to one or more of the preceding claims, **characterised by** the fact

that said reinforcement element (3) comprises at least a bar (3) or the like.

11. Reinforcement device (1) according to one or more of the preceding claims, **characterised by** the fact that it comprises at least two of said reinforcement elements (3).
12. Reinforcement device (1) according to the claim 11, **characterised by** the fact that said two reinforcement elements (3) are substantially parallel to one another.
13. Reinforcement device (1) according to the claims 6 and 11, **characterised by** the fact that said holding element (2') comprises at least two of said arms (5) which extend from substantially opposite parts of said ring portion (4'), said two reinforcement elements (3) being associated with said arms, respectively (5).

Fig. 1

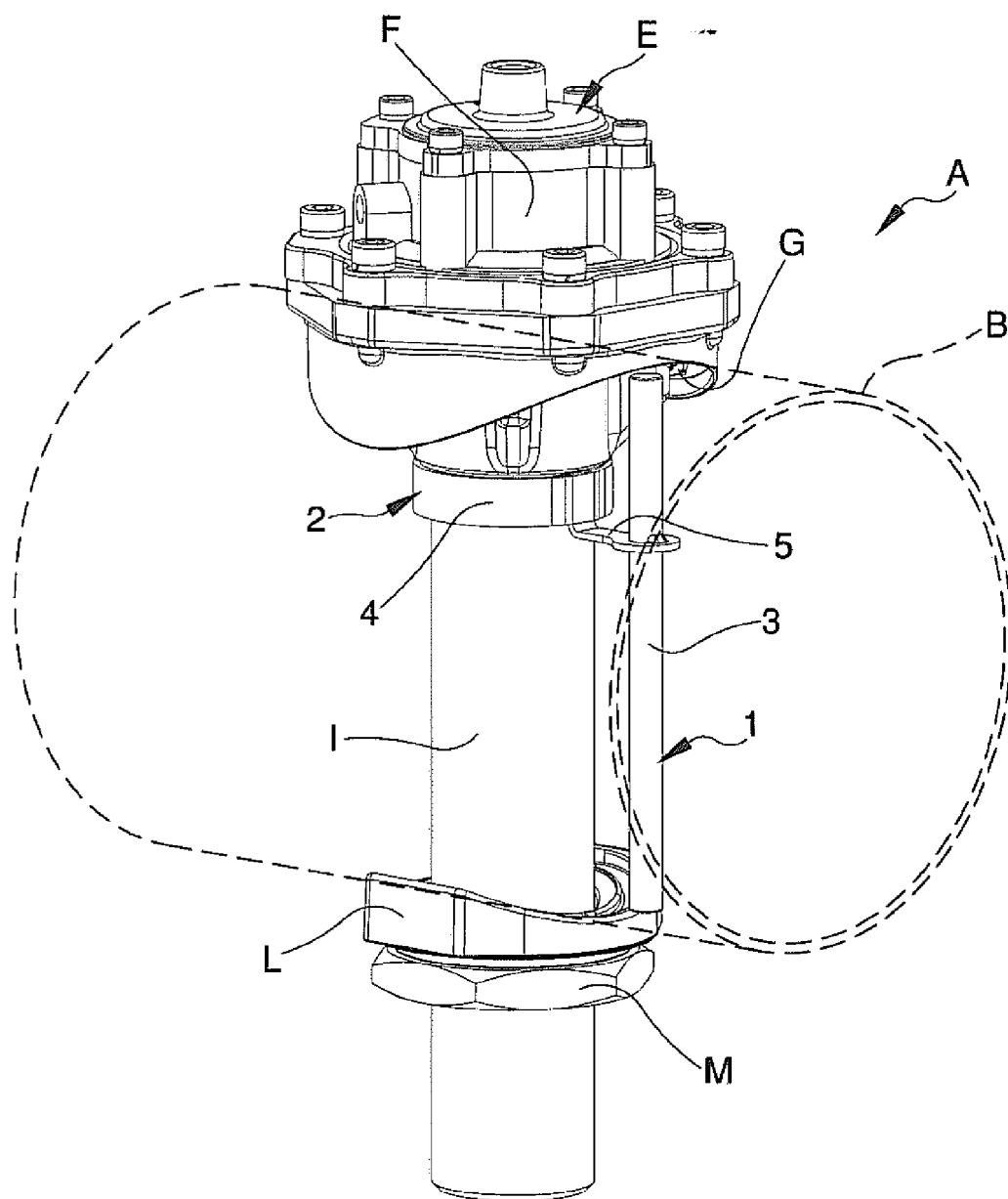


Fig. 2

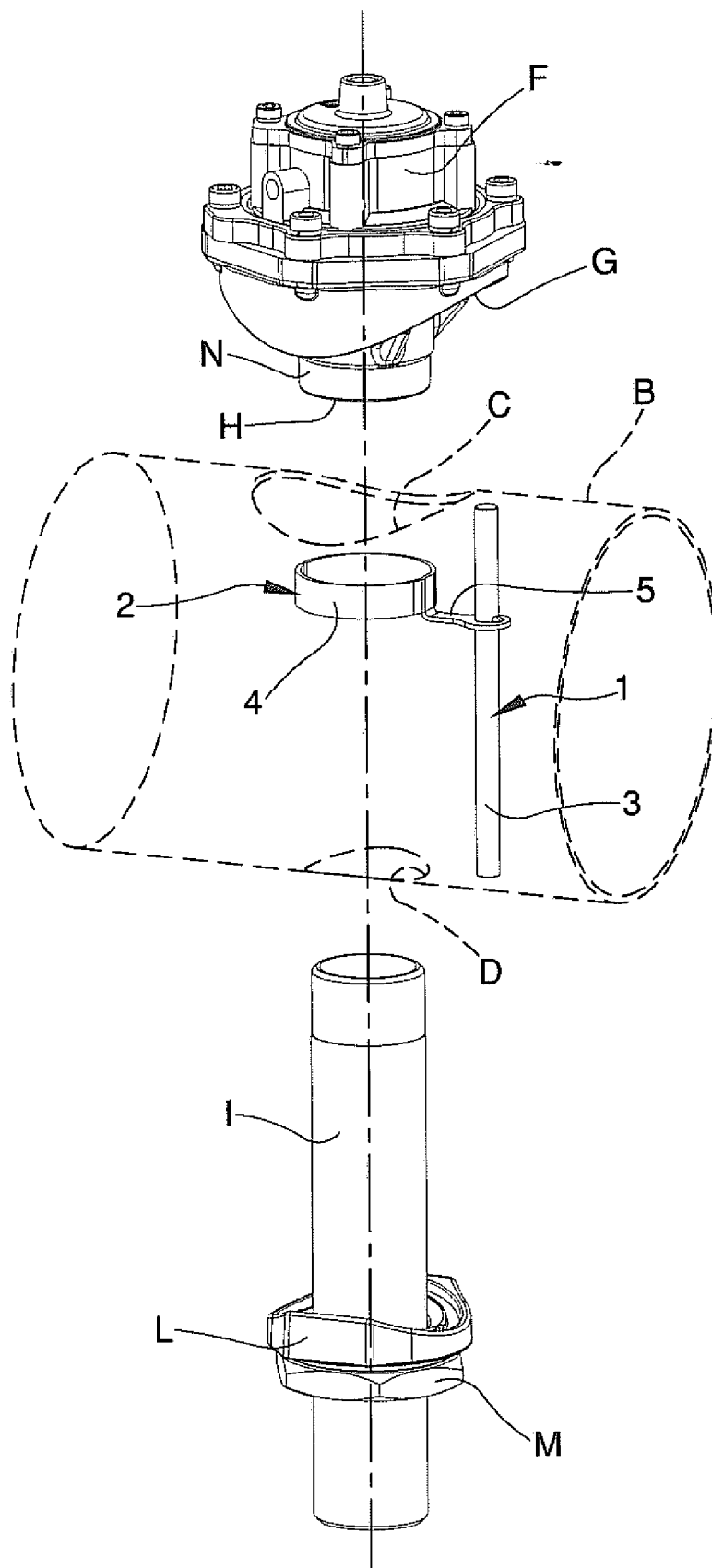


Fig. 3

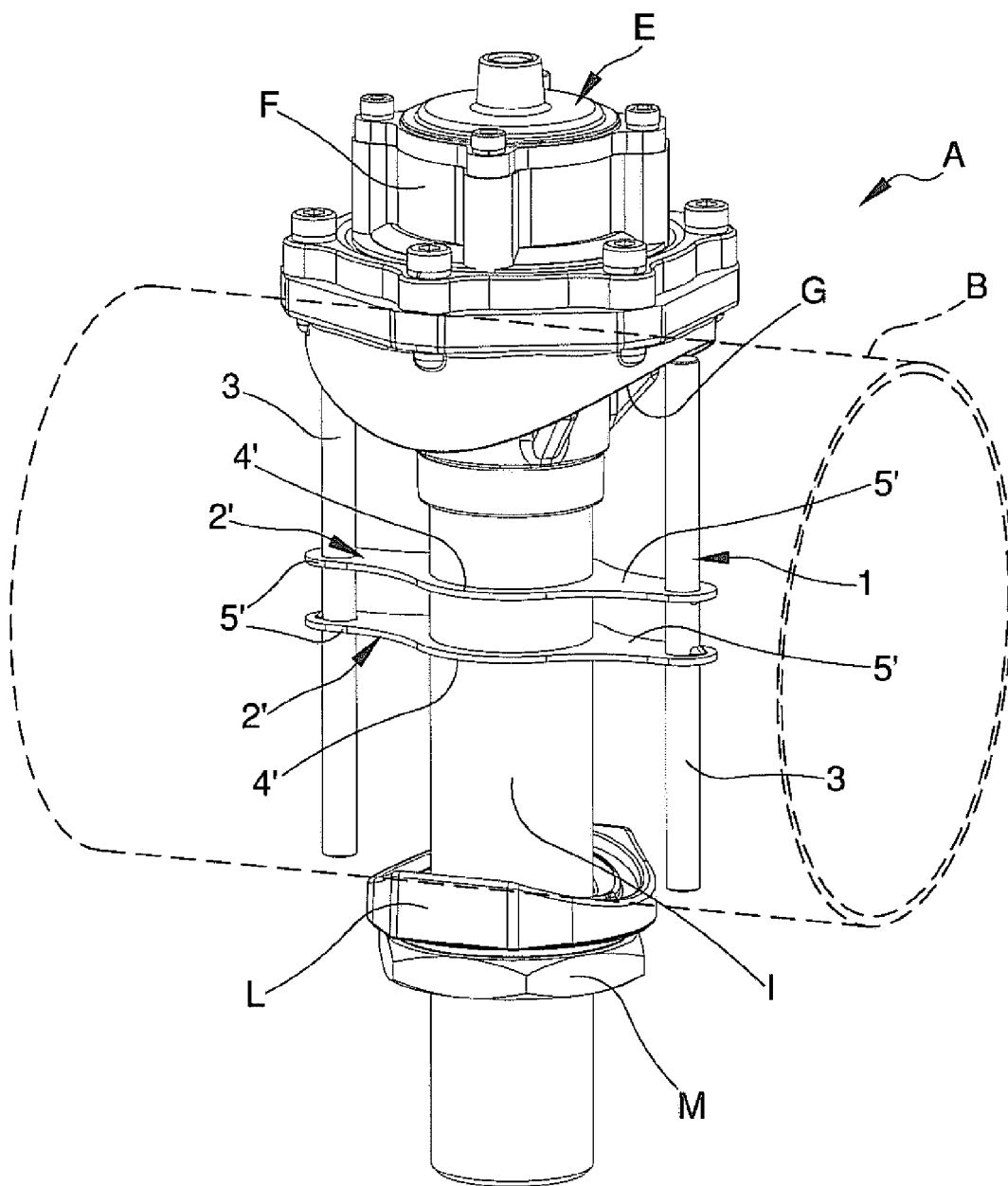
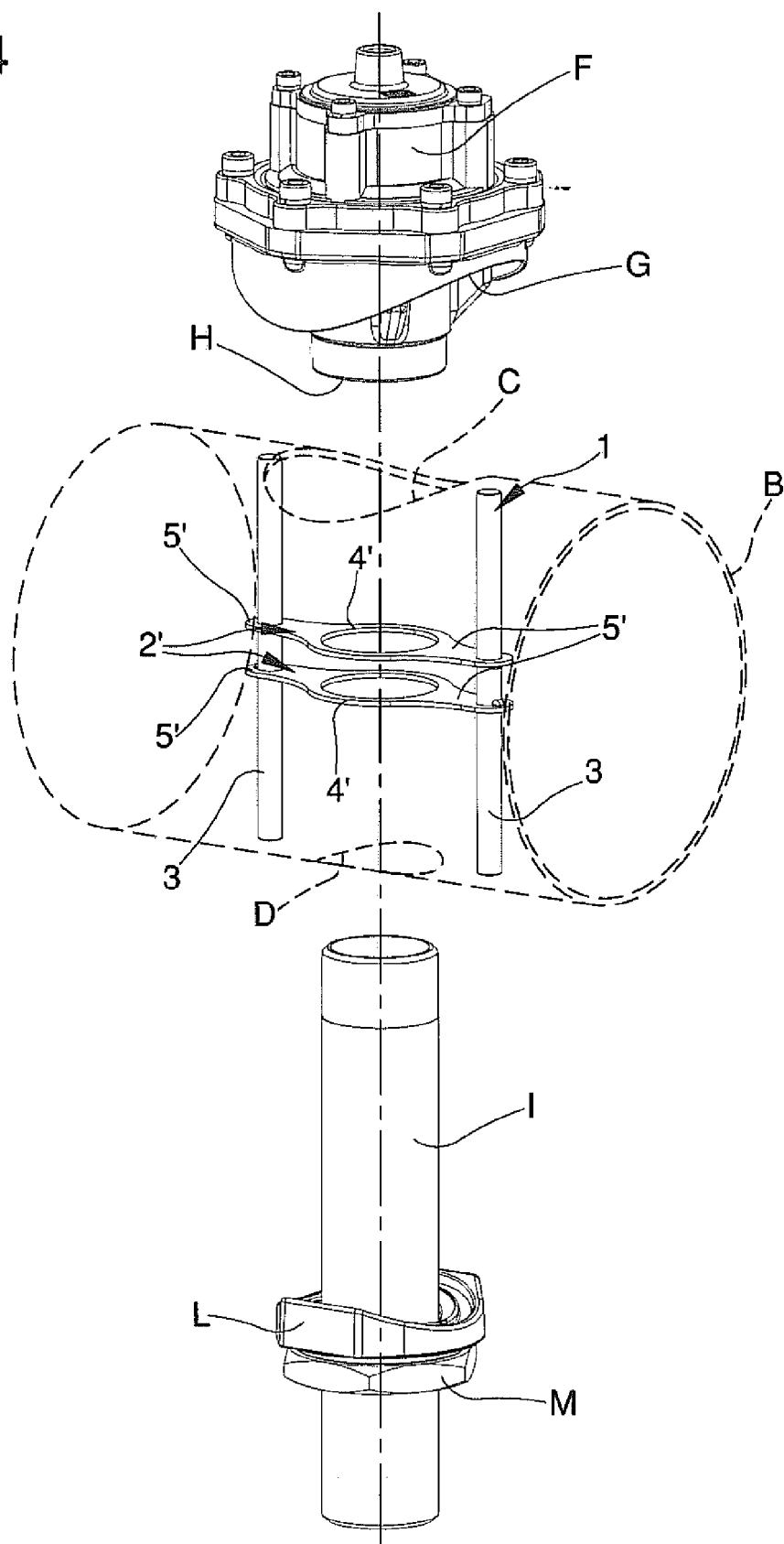


Fig. 4





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Application Number  
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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                      |                                                            |                                            |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                      |                                                            |                                            |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                      | Date of completion of the search<br><b>8 February 2012</b> | Examiner<br><b>Stängl, Gerhard</b>         |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>.....<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                      |                                                            |                                            |

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 11 18 1282

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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