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(54) Device for securing the inlet and/or outlet of a silo and a coupling flange which can work in conjunction with the device concerned

(57) Device for securing the inlet (2) of a silo against incorrect filling, which inlet (2) is of the type which is provided with a coupling flange (12) which can work in conjunction with a corresponding coupling flange (13-14) of a pipe (15) or of a plug (16), characterised in that it mainly consists of an element (6) which can be moved between at least two positions, a secured position in which the element (6) is situated in front of the coupling flange (12) of the inlet (2) concerned of the silo and hereby prevents a coupling or uncoupling with a plug (16) or pipe (15), and a second position respectively, whereby the element (6) has been removed from in front of the coupling flange (12).

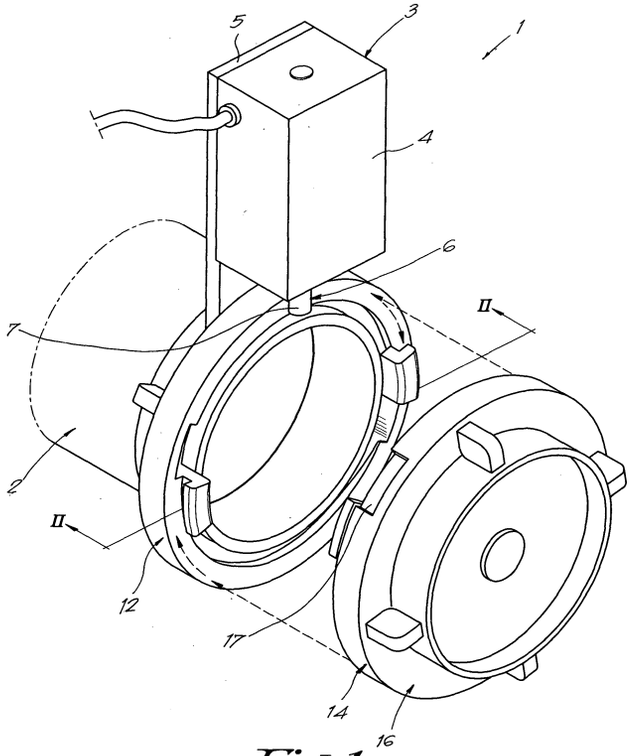

Fig. 1

EP 1 593 613 A1

Description

[0001] The present invention concerns a device for securing the inlet and/or outlet of a silo, more particularly against incorrect filling or emptying of the silo.

[0002] It is known that, for the filling of silos, use is made of a flange coupling between a coupling flange at the inlet of the silo on the one hand, and a coupling flange of a plug or pipe through which a product can be transported from or to the silo on the other hand.

[0003] The above-mentioned coupling flanges are hereby standardised, whereby practically every silo has the same type of coupling flange, such that a pipe of practically any type of tanker can be coupled with its coupling flange to the inlet of a silo.

[0004] However, a disadvantage thereof is that the pipe of a tanker with a specific content can be coupled erroneously to the inlet of a silo with another content, which entails the risk that it is possible to fill up a silo with a wrong product, such that it will then have to be emptied and cleaned before it can be used again, which may cost relatively much time and money.

[0005] Moreover, the erroneous filling up of a silo can lead to dangerous situations, for example when two products are mixed which together form an explosive mixture.

[0006] In order to remedy the above-mentioned disadvantages, it is known to secure silos against being filled up incorrectly by means of a controlled valve which is provided in the inlet of a silo and which can be opened in a controlled manner when the silo concerned is being filled up.

[0007] A disadvantage of such a known valve is that it allows for the coupling of a pipe to the inlet of a wrong silo, and that a wrong product is only stopped by the valve in the inlet of the silo.

[0008] In case of an attempt to fill a silo with a wrong product, traces of the wrong product may remain in the inlet of the silo, as a result of which said inlet may need to be washed exhaustively in some cases, which may be expensive and time-consuming.

[0009] Another disadvantage of such a valve is that it must be internally provided in the inlet, which is relatively difficult.

[0010] Another disadvantage is that the valve is relatively difficult to access, and consequently relatively difficult to replace or to maintain.

[0011] Another disadvantage of such an inner valve is that, while a product is being pumped in or out of the silo, it causes an extra heating of the product as a result of the friction between the product and the opened valve; moreover, such an inner valve gives rise to a larger resistance when the product flows through the inlet than in the case of unsecured silos.

[0012] Another disadvantage is that an inner valve may possibly give rise to obstructions, resulting in loss of time and possibly dangerous situations, for example when the product is harmful to man and/or the environment.

[0013] The present invention aims to remedy one or several of the above-mentioned and other disadvantages.

[0014] To this end, the invention concerns a device for securing the inlet of a silo against erroneous filling, which inlet is of the type which is provided with a coupling flange which can work in conjunction with a corresponding coupling flange of a plug or of a pipe, whereby this device mainly consists of an element which can be moved between at least two positions, a first position in which the element is situated in front of the coupling flange of the inlet of the silo concerned, and hereby prevents a coupling or uncoupling with a plug or pipe, and a second position respectively, whereby the element has been removed from in front of the coupling flange.

[0015] An advantage of the present device according to the invention is that a coupling between a pipe and the inlet of a silo can be prevented until for example an authorised person unlocks the silo, and the above-mentioned element can be removed from in front of the coupling flange of the silo.

[0016] The device according to the invention is preferably positioned entirely outside the silo.

[0017] An advantage thereof is that the device is not situated in the product flow while a silo is being filled, such that additional pressure losses and additional heating of the product as a result of friction with parts of the device can be avoided.

[0018] Another advantage is that an external device allows for a smooth flow of products through the inlet of the silo with a relatively small risk of obstructions.

[0019] Another advantage of such a device is that it can be easily mounted and is relatively easily accessible for possible maintenance or control, such that equipping a flange coupling with an external blocking mechanism may be relatively cheap.

[0020] The present invention also concerns a coupling flange which can work in conjunction with the above-mentioned device according to the invention, whereby this coupling flange is provided with one or several recesses for the above-mentioned element along its perimeter.

[0021] An advantage of such a coupling flange according to the invention is that it can be locked to the inlet of the silo as it is coupled, by putting the above-mentioned element in the recess.

[0022] In order to better explain the characteristics of the present invention, the following preferred embodiments of a device for securing the inlet of a silo and of a coupling flange working in conjunction therewith, are described as an example only without being limitative in any way, with reference to the accompanying drawings, in which:

figure 1 schematically represents a device according to the invention in perspective, provided at an inlet of a silo;

figures 2 to 5 represent a section according to line II-II in figure 1, for different working positions;
figure 6 represents an identical view as in figure 1, but whereby the inlet of the silo is coupled to a pipe;
figure 7 represents an identical view as in figure 1, but whereby the inlet of the silo is sealed;
figure 8 schematically represents a control for several devices according to the invention.

[0023] Figure 1 represents a device 1 according to the invention which is provided in this case on the outer side of an inlet 2 of a silo which is not represented in the figures.

[0024] The device 1 mainly consists of a locking mechanism 3 with a housing 4 which is provided on a fastening plate 5 which is in this case fixed to the outer perimeter of the inlet 2.

[0025] The locking mechanism 3 comprises a movable element 6 which is preferably provided with an electric excitation.

[0026] As is represented in figures 2 to 5, the above-mentioned element 6 in this case consists of a pen 7 which can be axially moved, made of a ferromagnetic material, whereby a spring 8 is provided around the pen 7 in the known manner, whereby the pen 7 is provided with an electromagnetic excitation in the form of an electromagnet 9, and whereby the pen 7 can be pulled out and can be pulled back through a passage 10 in the side wall 11 of the housing 4 directed towards the inlet 2.

[0027] The inlet 2 of the silo is provided with a coupling flange 12 which, as is represented in figures 6 and 7, can work in conjunction with a corresponding coupling flange 13 or 14 of a pipe 15 of for example a tanker or of a plug 16.

[0028] In this case, the coupling flanges 12 to 14 are of the type which can be coupled by means of a rotational movement, more particularly of the type that is called a bayonet coupling.

[0029] Over the perimeter of the coupling flange 13-14 of the pipe 15 or plug 16 are hereby preferably provided one or several radial recesses 17, one of which can each time be positioned opposite to the locking mechanism 3 when the pipe 15 or plug 16 is coupled.

[0030] The use of a device 1 according to the invention for securing the inlet 2 of a silo is relatively simple and as follows.

[0031] Figure 2 represents the locking mechanism 3 in rest, whereby the above-mentioned electromagnet 9 is not excited and whereby the pen 7 is pushed in front of the inlet 2 of the silo, in a secured position, by the spring 8.

[0032] In this secured position of the pen 7 it is impossible to couple the coupling flange 13 or 14 of the above-mentioned pipe 15 or the above-mentioned plug 16 to the coupling flange 12 of the inlet 2.

[0033] In order to be able to couple the pipe 15 or the plug 16 to the inlet 2 of the silo, the electromagnet 9 must be excited, whereby the pen 7 is partly drawn back into the housing 4, under the influence of the created magnetic field, against the force of the spring 8, and is thus removed from in front of the coupling flange 12 of the inlet 2 of the silo.

[0034] When, as is represented in figure 4, a pipe 15 is coupled to the inlet 2, the excitation of the electromagnet 9 can be interrupted, whereby the spring 8 pushes the above-mentioned pen 7 up against the perimeter of the coupling flange 13 of the pipe 15.

[0035] When the pipe 15 is subsequently uncoupled, the spring 8 will push the pen 7 in a radial direction in front of the coupling flange 12 of the inlet 2 again, as a result of which this inlet 2 is secured again.

[0036] When, as is represented in figure 5, plug 16 is coupled to the inlet 2 and the excitation of the electromagnet 9 is interrupted, the pen 7 will be pushed out into the recess 17 in the coupling flange 14 of the plug 16, whereby the pen 7 prevents the plug 16 from being uncoupled from the inlet 2, until the pen 7 is drawn in again by means of an excitation of the above-mentioned electromagnet 9.

[0037] Naturally, also the coupling flange 13 of the pipe 15 can be provided with a recess 17, such that also the pipe 15 can be locked in relation to the inlet 2 of the silo.

[0038] It should be noted that the above-mentioned element 6 must not always be a sliding pen 7, but that it is also possible to apply a rotatable hook or the like.

[0039] Nor must the drive of the element 6 necessarily be of the electromagnetic type. A relatively simple and manual alternative could for example be a door lock, whereby the pen 7 can be pulled in or out by simply turning a key; naturally, also a pneumatic cylinder or the like can be used to this end.

[0040] Figure 8 schematically' represents a computer network, whereby different devices 1 according to the invention are coupled to a control box 18, which can be either or not controlled by means of a computer 19 or the like onto which one or several card readers 20 or the like are connected, whereby it becomes possible to lock or release different silos with electronic cards.

[0041] Further, the locking mechanism 3 can be equipped with means which allow to detect the different possible positions of the element 7, such that it is possible to exert a sound control over the accessibility to the different silos, for example in an industrial zone.

[0042] These means allow to detect the different possible positions of the element, which positions are represented in figures 2 tot 5, namely a first extreme position, whereby the element 6 has been placed in front of the coupling flange 12 of the inlet; a second extreme position, whereby the element 6 has been entirely removed from in front of the inlet 2 of the silo; a first intermediate position, whereby the element 6 rests in the recess 17 in the perimeter of the plug 16; and an second intermediate position, whereby the element 6 rests against the perimeter of the coupling flange 13 of a pipe 15.

[0043] Such means are sufficiently known and hence are not further described here.

[0044] Finally, it should be noted that not only the inlet 2 of the silo can be secured. Naturally, it is also possible to provide such a protection on the outlet thereof.

[0045] The present invention is by no means limited to the embodiments described as an example; on the contrary, such a device according to the invention for securing the inlet or outlet of a silo and such a coupling flange which can work in conjunction with such a device, can be made according to different variants while still remaining within the scope of the invention.

Claims

1. Device for securing the inlet (2) of a silo against incorrect filling, which inlet (2) is of the type which is provided with a coupling flange (12) which can work in conjunction with a corresponding coupling flange (13-14) of a pipe (15) or of a plug (16), **characterised in that** it mainly consists of an element (6) which can be moved between at least two positions, a secured position in which the element (6) is situated in front of the coupling flange (12) of the inlet (2) concerned of the silo and hereby prevents a coupling or uncoupling with a plug (16) or pipe (15), and a second position respectively, whereby the element (6) has been removed from in front of the coupling flange (12).

2. Device according to claim 1, **characterised in that** it is provided entirely outside the silo.

3. Device according to claim 1, **characterised in that** the above-mentioned element (6) is a shifting pen (7).

4. Device according to claim 3, **characterised in that** the pen (7) is provided with an electromagnetic excitation.

5. Device according to claim 3, **characterised in that** it is provided with a spring (8) which pushes the pen (7) back in a radial direction into the secured position.

6. Device according to claim 1, **characterised in that** it is controlled by means of a control box (18), which can control several devices (1).

7. Device according to claim 1, **characterised in that** it is equipped with means which allow to detect the position of the element (6).

8. Device according to claim 7, **characterised in that** these means are connected to a computer (19), either or not via a control box (18).

9. Device according to claim 8, **characterised in that** one or several card readers (20) are connected to the above-mentioned computer (19).

10. Coupling flange which can work in conjunction with a device according to any one of the preceding claims, **characterised in that** it is provided with one or several radial recesses (17) for the element (6) on its perimeter.

11. Coupling flange according to claim 10, **characterised in that** it is part of a plug (16) or a pipe (15) .

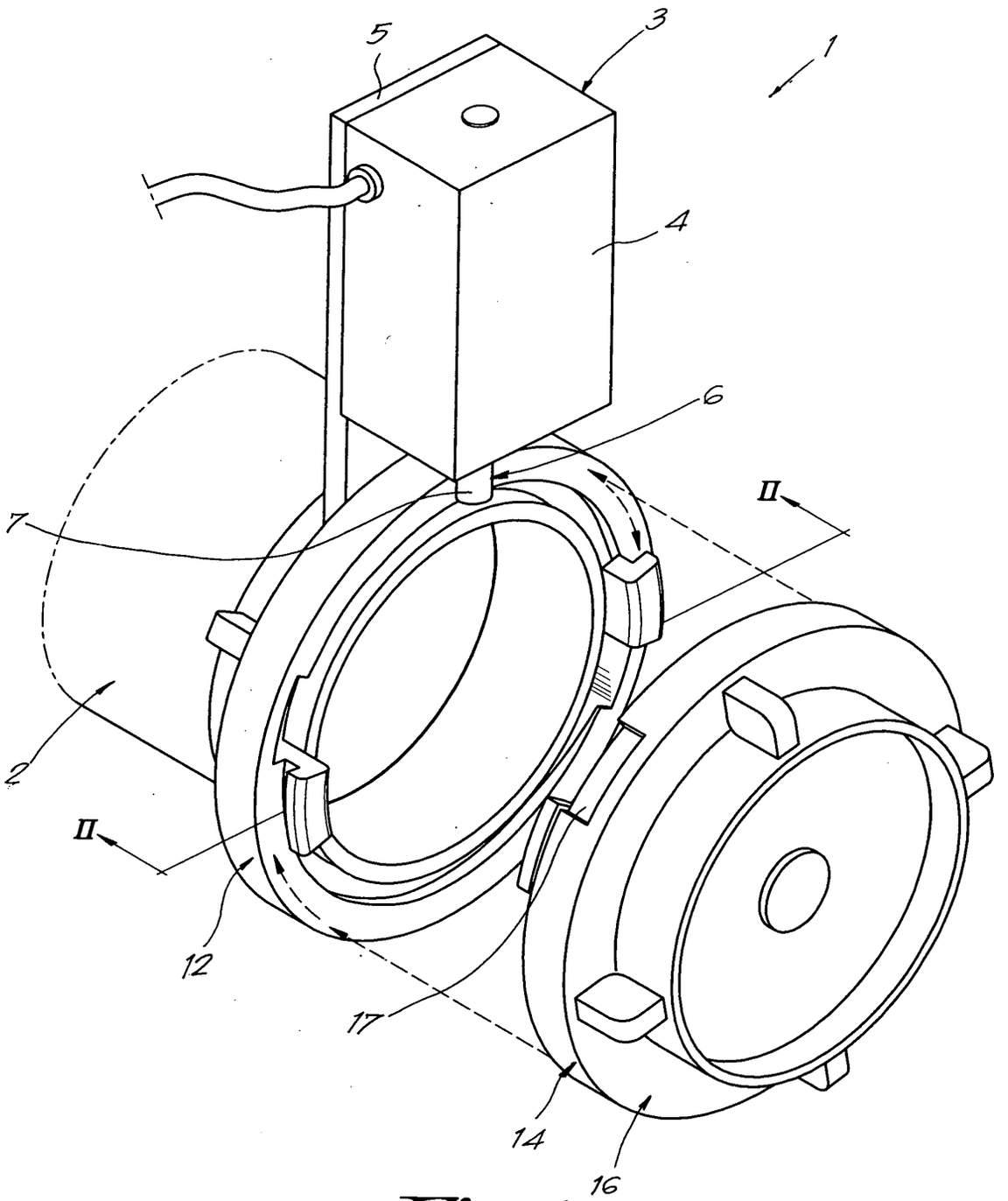

Fig. 1

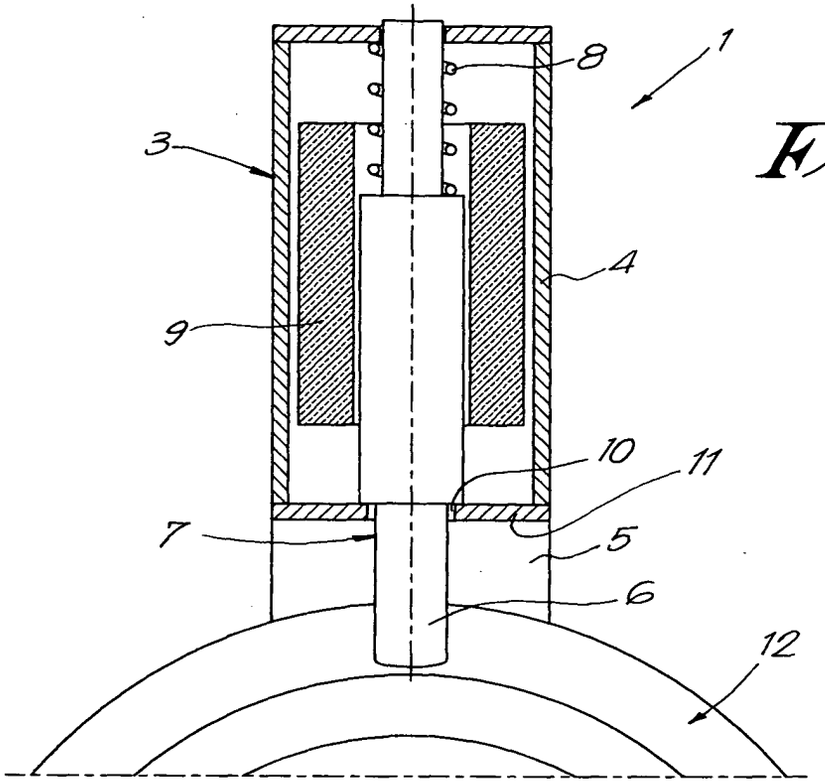

Fig.2

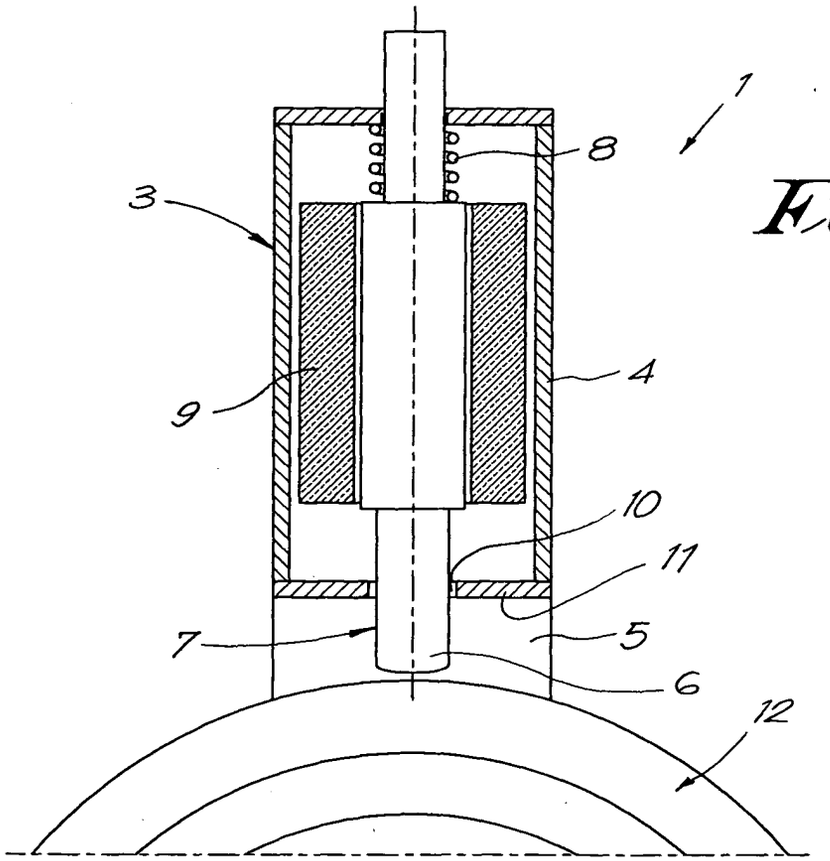

Fig.3

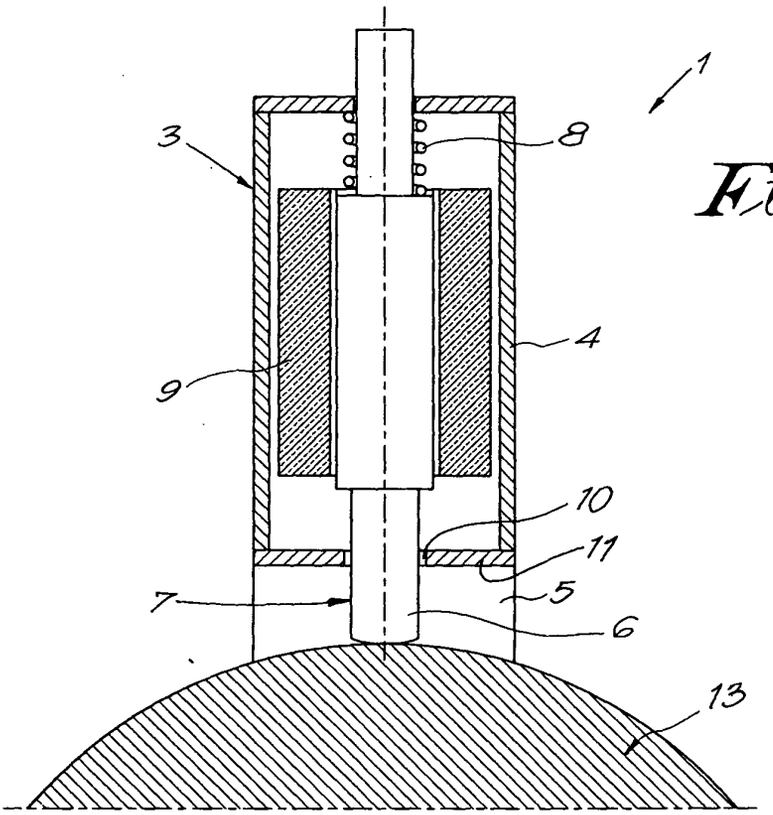

Fig.4

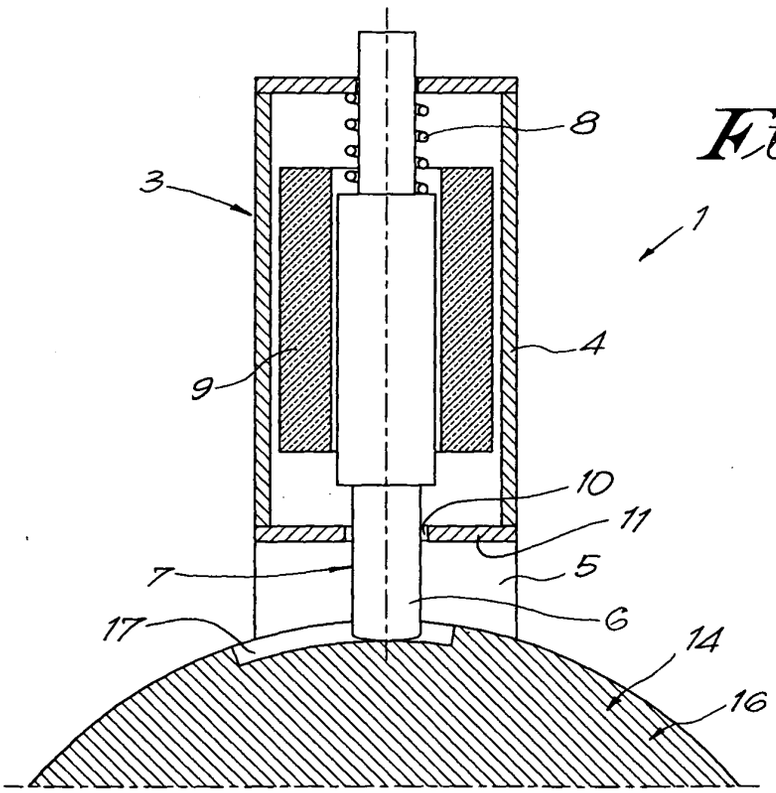

Fig.5

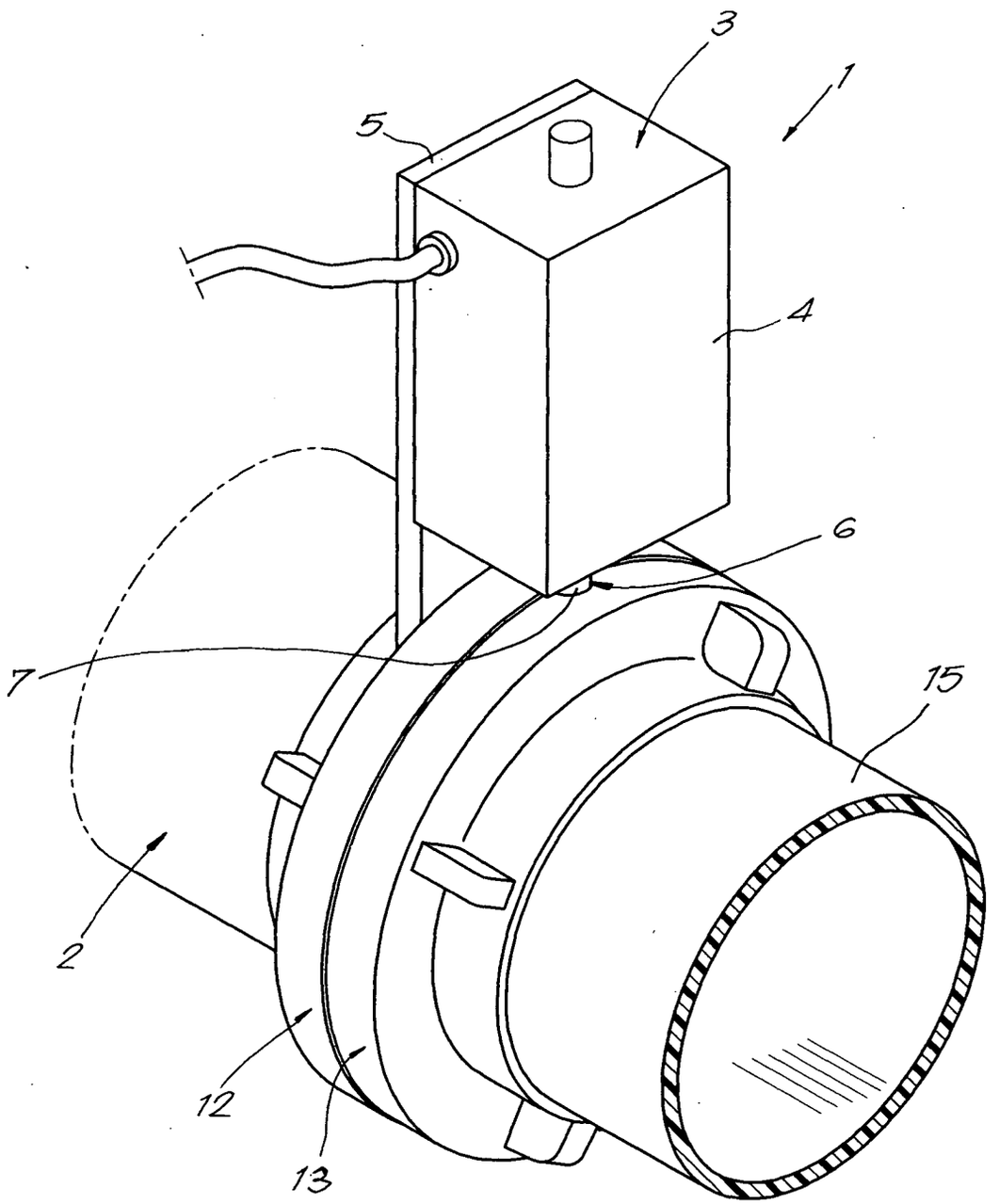

Fig.6

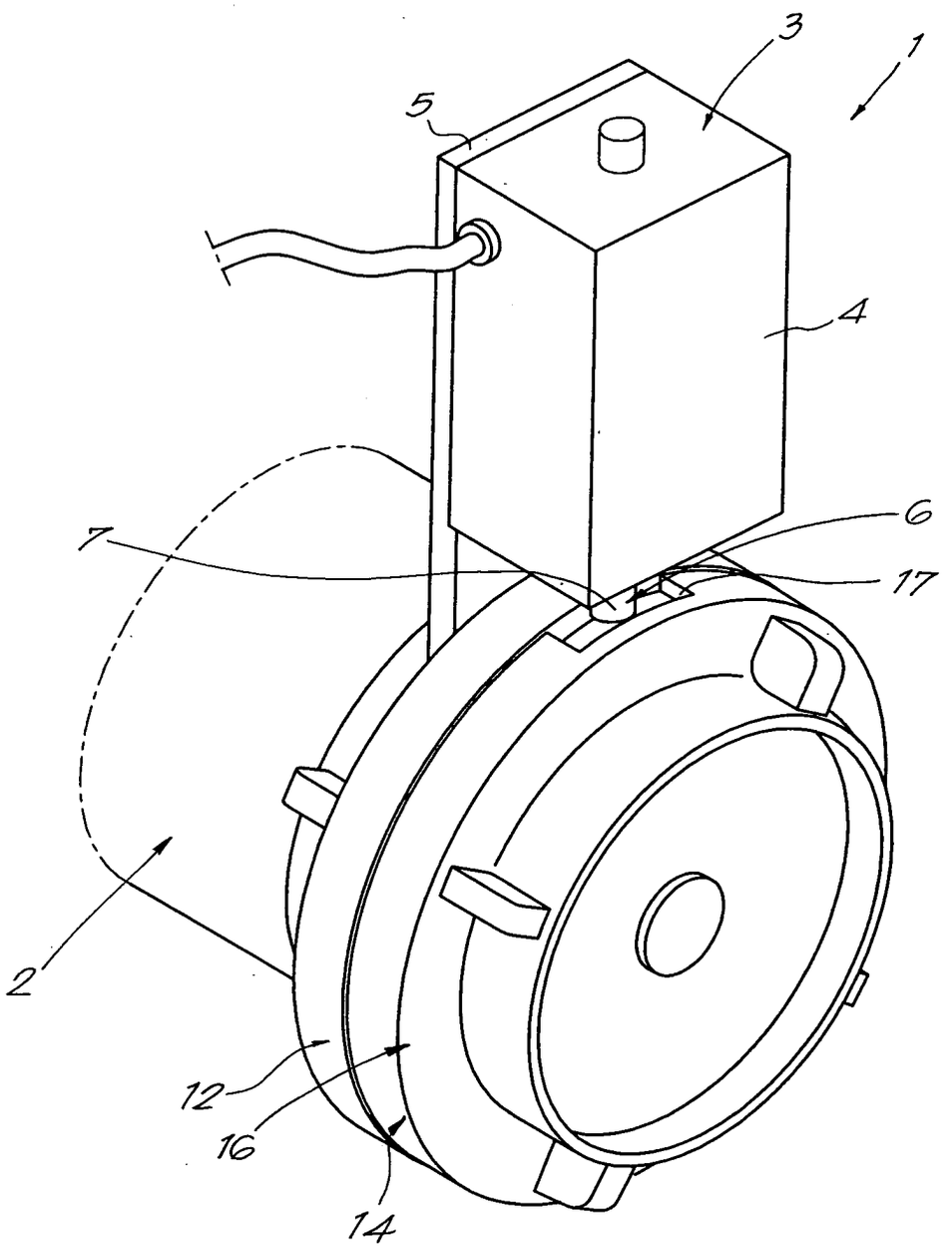

Fig.7

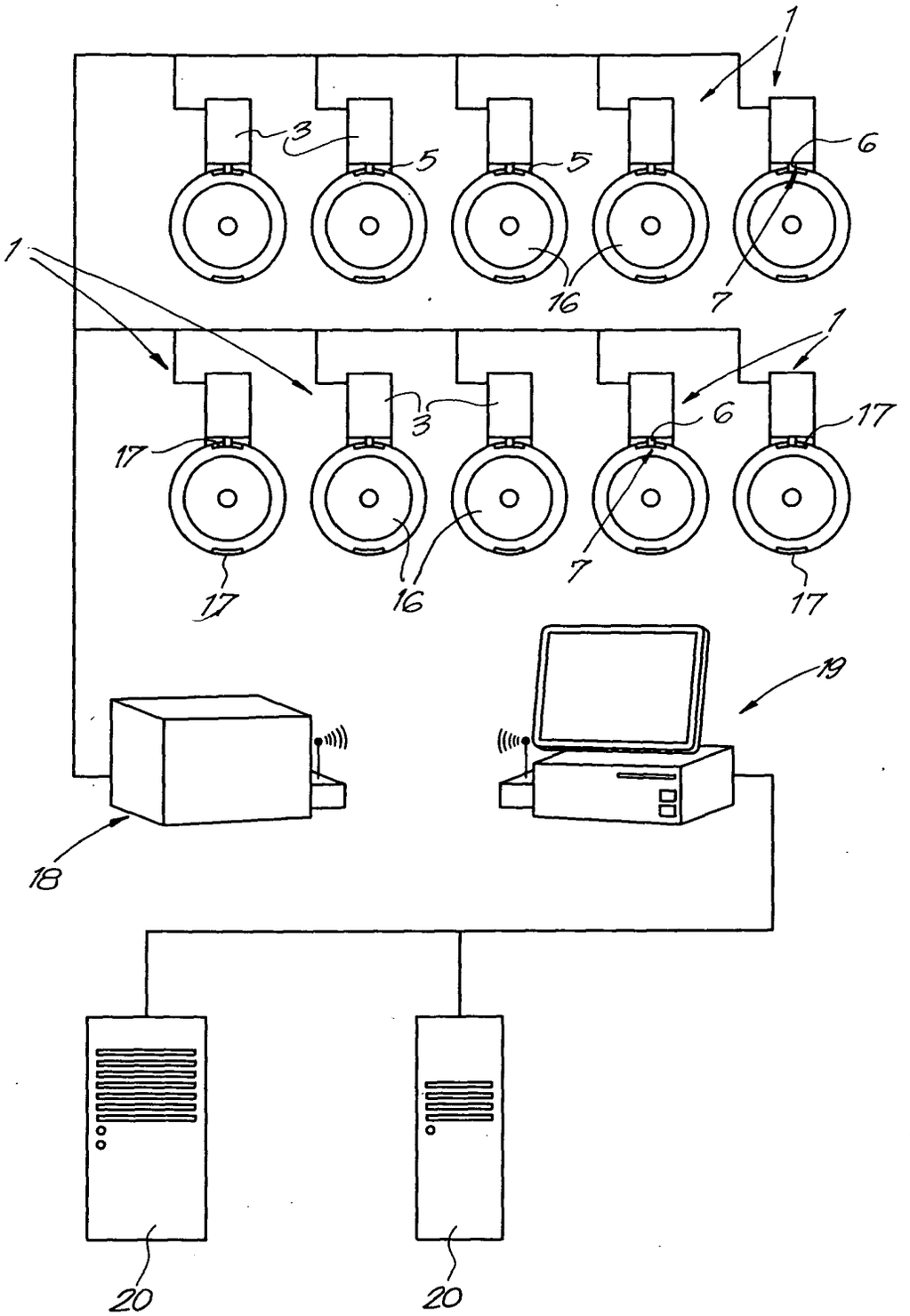

Fig.8

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EUROPEAN SEARCH REPORT

Application Number
EP 05 07 6005

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.7)
X	US 5 188 486 A (JOHNSON JAMES W ET AL) 23 February 1993 (1993-02-23) * column 3, line 11 - line 28; figures *	1-3,5,7, 10,11	B65D90/54 B61D7/16
X	US 2002/190068 A1 (FINNELL SCOTT A ET AL) 19 December 2002 (2002-12-19)	1-3,7,8	
A	* paragraphs [0008], [0011], [0015], [0051], [0064], [0069], [0083]; figures 2,3,11 *	4,6,9	
X	US 5 301 985 A (TERZINI VITTORIO) 12 April 1994 (1994-04-12) * column 3, line 60 - column 4, line 34; figures 3,4 *	1,3,10, 11	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65D
B61D
F16L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 July 2005	Zanghi, A

CATEGORY OF CITED DOCUMENTS

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3

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2002190068 A1	19-12-2002	US 2002100225 A1	01-08-2002
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