(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 004 832 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
31.05.2000 Bulletin 2000/22

(51) Int. Cl.[7]: **F24H 1/12**

(21) Application number: **99122745.5**

(22) Date of filing: **16.11.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **27.11.1998 IT MI980770 U**

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(54) Electric heater for fluids, in particular paints

(57) The electric heater (1) for fluids comprises a heating body (2) provided with electric heating elements (3), and at least one fluid-circulation duct (10), adapted to receive heat from the heating body (2). The duct (10) is formed in an exchanger body (9), to be removably fastened to the heating body (2) in a manner adapted to transmit heat to the related duct (10). Thus the exchanger body (9) is interchangeable and can be replaced in case of clogging of the duct (10). Two exchanger bodies (9, 16) can be fastened to one and the same heating body (2), on opposite sides thereof.

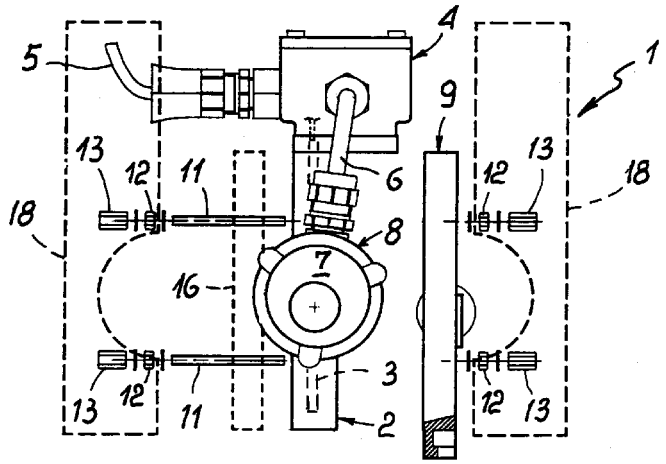

Fig.2

EP 1 004 832 A2

Description

[0001] The invention relates to an electric heater for fluids, in particular paints, of the type comprising a heating body, provided with electric heating elements, and a duct for circulation of the fluid to be heated, arranged to receive heat from the heating body. Fluid heating takes place while the fluid is running through said duct between a fluid inlet and a fluid outlet, each provided with connection fittings in particular for flexible fluid-conveying hoses.

[0002] Associated with the heating body is appropriate means for control and regulation of the fluid temperature, which means is adapted to automatically keep the desired fluid temperature by acting on the heating element power supply.

[0003] In order to carry out an efficient heat exchange between the heating elements and the fluid, while maintaining reduced sizes for the heater, the fluid duct extends close to the heating elements as much as possible, in the form of a coil, a helix or a spiral, for example.

[0004] It is known that, for instance, a typical heater of this kind has a substantially cylindrical heating body in which the heating elements in the form of electric resistors are longitudinally disposed, the fluid duct extending around said resistors in a helical configuration, whereas the electric connections and the control means are received in a head portion of the heating body.

[0005] Another known heater has, instead, a substantially parallelepiped shape, with the heating elements and the fluid duct disposed in a flattened parallelepiped body, at which the fluid inlet and outlet fittings terminate and on which the means for temperature control and regulation is fastened, said means being connected to a head portion housing the electric connections. Heaters of the above type are particularly employed in spray painting and in this case a sufficiently strong structure is required because the fluid passing therethrough is submitted to high pressures.

[0006] These known electric heaters are generally very practical, but they are not free from drawbacks and limitations. In fact, it may happen that, due for example to tortuousness of the fluid duct for the purpose of achieving the maximum heat exchange between the heating elements and the fluid, or as a result of the type of fluid employed, such as a particularly reactive catalysed resin or paint, the duct clogs up, which will make it impossible to use the heater.

[0007] In this case, practically it is no longer possible to restore the apparatus operation and it is absolutely necessary to throw the apparatus away, resorting to a new heater. This fact involves many expenses. In addition, these heaters are generally of little versatility, as they are constructed for reduced flow rates and heat exchanges within a limited range of values.

[0008] Thus, for instance, the same heater which may be utilised with satisfactory results with a substance, may be quite inappropriate for another substance, due to a very different coefficient of heat transmission. In addition, the same heater used with fluids of high viscosity generates such a high flow resistance (pressure drop) that use of it becomes impossible. Therefore, in the above mentioned cases some results can only be achieved if several heaters, connected in series or in parallel to each other are available, which brings about higher costs.

[0009] Likewise, use of two heaters is required when painting systems providing two components are involved.

[0010] Under this situation, the technical task underlying the present invention is to obviate the above drawbacks and limitations, by providing an electric heater for fluids, in particular paints, operation of which, in case of clogging caused by the fluid, can be easily restored without being obliged to throw the heater away.

[0011] Within the scope of this technical task, it is an aim of the invention to provide an electric heater for fluids having an advantageous cost, taking into account the possibility of restoring the heater after possible clogging of same.

[0012] A still further aim of the invention is to devise a heater of the concerned type, which is substantially more versatile as regards its possibilities of use, in particular a heater which can be used also with paints having greatly differentiated coefficients of heat transmission.

[0013] A further by no means last aim of the invention is to devise an electric heater to be also used in two-component systems, in which the advantage of restoring operation of the same in case of possible clogging of the fluid ducts is at all events maintained.

[0014] The foregoing and further aims that will become more apparent in the following are achieved by an electric heater for fluids, in particular paints, having the features recited in the appended Claim 1.

[0015] Preferred embodiments of the invention are shown in the sub-claims.

[0016] The detailed description of an electric heater in accordance with the invention is now given, by way of non-limiting example, with reference to the accompanying drawings, in which:

- **Fig. 1** is a side view of a heater in accordance with the invention;
- **Fig. 2** is a view of the same heater with its component parts separated therefrom;
- **Fig. 3** is a front view of the heater shown in the preceding figures.

[0017] With reference to the drawings, an electric heater for fluids, in particular paints, in accordance with the invention is generally identified by reference numeral 1. It comprises a heating body 2, internally provided with electric heating elements 3, such as electric

resistors, only diagrammatically and partly shown, as their structure and arrangement are known.

[0018] The heating body 2 has a head portion 4, in which the electric connections are arranged in known manner. In particular, connected with the head portion 4 is the power cord 5 of heater 1 as well as a cable 6 terminating at a thermostat 7 fastened to the heating body 2. Thermostat 7, of known type, embodies means 8 for temperature control and regulation, acting on the power supply of the heating elements 3 in known manner to automatically keep the fluid to be heated to the wished temperature.

[0019] By way of example only, the heating body 2 has a flattened substantially parallelepiped shape; obviously it could also have a different shape, a cylindrical or conical shape, for example. It is preferably made of a metal alloy casting having a high heat-transmission coefficient, into which the heating elements 3 with the respective power connections and connections to the control and regulation means 8 are inserted.

[0020] In accordance with the invention, the heating body 2 can be associated in a removable manner with an interchangeable exchanger body 9, in which at least one circulation duct 10 for the fluid to be heated is provided. The exchanger body 9 has a flattened substantially parallelepiped shape as well, the sizes of which make the two bodies 2 and 9 matchable by surface contact at one of their respective major faces.

[0021] In particular, the exchanger body 9 can be fastened to the heating body 2 by threaded means consisting of four threaded tie rods 11 for example, adapted to pass through the two bodies 2 and 9 at right angles to the major faces thereof, and of respective pairs of nuts and lock nuts 12 and 13, to be screwed down on the tie rods 11 from the outside, to lock the two bodies 2 and 9 against each other tightly and steadily so as to ensure an excellent contact for heat transmission.

[0022] Duct 10, only diagrammatically and partly shown, extends in the form of a coil for example, within the exchanger body 9, between a fluid inlet fitting 14 and a fluid outlet fitting 15, formed in body 9 and adapted for connection, in known manner, with fluid-conveying pipes, in particular flexible fluid-conveying hoses.

[0023] The exchanger body 9 is preferably made of a metal alloy casting, having a high coefficient of heat transmission, into which the circulation duct 10 is buried and from which fittings 14 and 15 emerge.

[0024] Substantially, body 9 is made in the cheapest way, so that it can be replaced without involving high costs in case of anomalies such as clogging of duct 10.

[0025] By virtue of said technical solution of dividing the electric heater 1 into at least two parts, one forming the heating body 2 and the other forming the exchanger body 9, and of making the exchanger body 9 also interchangeable, it is no longer necessary to throw the whole electric heater away in case of failures such as clogging, obstructions or corrosion of the fluid-circulation duct, but the exchanger body can be removed and replaced by another one which is identical with or equivalent to the former, so as to restore operation of the heater.

[0026] It is to be noted that all the most expensive elements are placed on the heating body 2 which constitutes the portion of heater 1 in accordance with the invention to be reutilised, whereas the exchanger body 9, made in a particularly cheap manner, constitutes the interchangeable portion of heater 1 in accordance with the invention.

[0027] Practically the out-of-use portion of heater 1 which substantially is always the one in which fluid circulation occurs, and hardly the more expensive one enclosing the heating elements and holding the temperature control and regulation means, can be replaced with a very reduced cost as compared with the cost of the whole apparatus.

[0028] Since manufacture of the exchanger body 9 is carried out in the cheapest manner, only a small additional cost is involved as compared with a current heater of equivalent performance, so that the greater cost of a heater 1 in accordance with the invention is already widely recovered after the first replacement of the exchanger body 9.

[0029] A further advantageous feature of the heat exchanger 1 shown consists in arranging a second exchanger body 16, made in the same way as the exchanger body 9 for example, and susceptible of fastening to the heating body 2 on the opposite side relative to the exchanger body 9. The second exchanger body 16 is shown in chain lines in Figs. 1 and 2.

[0030] In this way, versatility of heater 1 is greatly increased. In fact, arrangement of a second exchanger body 16 enables the exchange surface to be doubled, by completely utilising the thermal potential of the heating body 2. The two exchanger bodies 9 and 16 can be connected with each other in series or in parallel as regards the respective fluid-circulation ducts 10.

[0031] In the first case, the dual heat exchange surface enables the flow rate of the heated fluid to be doubled (the temperature being the same) or the fluid temperature to be doubled (the flow rate being the same), but also enables the same heater to be used for fluids having a very low heat-transmission coefficient, because the length of the heat-exchange path of travel is doubled.

[0032] In the second case (connection in parallel) simultaneous heating of a double amount of fluid is made possible, which will double performance of one and the same heater.

[0033] Alternatively, the two exchangers 9 and 16 may be maintained hydraulically separated from each other and in this case the second exchanger 16 can be employed to simultaneously heat a second different fluid, for heating the atomisation air for example, in low- or medium-pressure air-mixed painting systems. This hydraulically-separated arrangement of the two exchangers 9 and 16 can also be applied when two-

component systems are for example concerned.

[0034] Finally, still referring to the preferred embodiment depicted in the figures, a thermometer 17 for detecting temperature of the outcoming fluid is advantageously provided to be applied to the fluid outlet fitting 15. Reading of thermometer 17 can be used for adjustment of thermostat 7.

[0035] Heater 1, provided with one or two exchanger bodies, is then preferably enclosed in a protective casing consisting of two shell halves 18 removably coupled with each other in such a manner that only the connection fittings 14 and 15 and the regulation means for fluid temperature are allowed to emerge therefrom.

[0036] Many modifications may be made to the invention, all of them falling within the scope of the inventive idea characterising it. For instance, the heating body 2 and the exchanger body 9 (or exchanger bodies 9 and 16) may have a substantially cylindrical or conical shape, instead of having a parallelepiped shape, in this case being removably coupled with each other axially.

[0037] Bodies 2 and/or 9 and/or 16 can have a hollow cylindrical form and be removably fastened together, one at the inside of the other; for instance, the exchanger body 9 could be disposed internally of the heating body 2 or externally thereof. Where two exchanger bodies 9 and 16 are provided, they can be advantageously respectively arranged one at the inside and the other at the outside of the hollow cylindrical exchanger body 2.

[0038] Alternatively, bodies 2, 9 and possibly 16 may have a disc-shaped or substantially disc-shaped conformation and be coupled with each other at their flat faces, in particular they can be provided with a central disc-shaped heating body 2 and two side disc-shaped exchanger bodies 9 and 16, on the understanding that arrangement of the exchanger bodies is interchangeable.

[0039] The exchanger body or bodies 9 and/or 16 may internally house more than one fluid circulation duct 10, two ducts for example for two different fluids.

Claims

1. An electric heater for fluids, in particular paints, comprising a heating body (2) provided with electric heating elements (3), and at least one fluid-circulation duct (10) arranged to receive heat from said heating body (2),

- characterised in that said at least one circulation duct (10) is formed in at least one exchanger body (9) to be removably fastened to said heating body (2), said echanger body being interchangeable.

2. A heater as claimed in claim 1, wherein said heating body (2) and said at least one exchanger body (9) have a substantially parallelepiped shape and can be removably coupled with each other at one of their respective major faces.

3. A heater as claimed in claim 1, wherein said heating body (2) and said at least one exchanger body (9) have a substantially cylindrical form and can be removably coupled with each other in an axial direction.

4. A heater as claimed in claim 1, wherein said heating body (2) and/or said at least one exchanger body (9) have a substantially hollow cylindrical shape and can be removably coupled together, at the inside of each other.

5. A heater as claimed in claim 1, wherein two exchanger bodies (2, 16) are provided, to be removably fastened to said heating body (2) at opposite sides thereof.

6. A heater as claimed in claim 1, wherein said at least one exchanger body (9) is made up of at least one circulation duct (10) buried in a metal alloy casting, from which respective fluid inlet and fluid outlet fittings (14 and 15) emerge.

7. A heater as claimed in claim 6, wherein said at least one circulation duct (10) extends in the form of a coil.

8. A heater as claimed in claim 1, wherein said heating body (2) and said at least one exchanger body (9) are enclosed in a protective casing consisting of two shell halves (18) to be removably coupled with each other.

9. A heater as claimed in claim 1, wherein means (8) for control and regulation of the fluid temperature is provided, said control and regulation means (8) comprising a thermostat (7) acting on the power supply of said electric heating elements (3).

10. A heater as claimed in claim 1, wherein a thermometer (17) is provided which is applied to an outlet fitting (15) of said at least one fluid-circulation duct (10).

11. A heater as claimed in claim 1, wherein threaded means (11) is provided which is adapted to lock said at least one exchanger body (9) against said heating body (2),

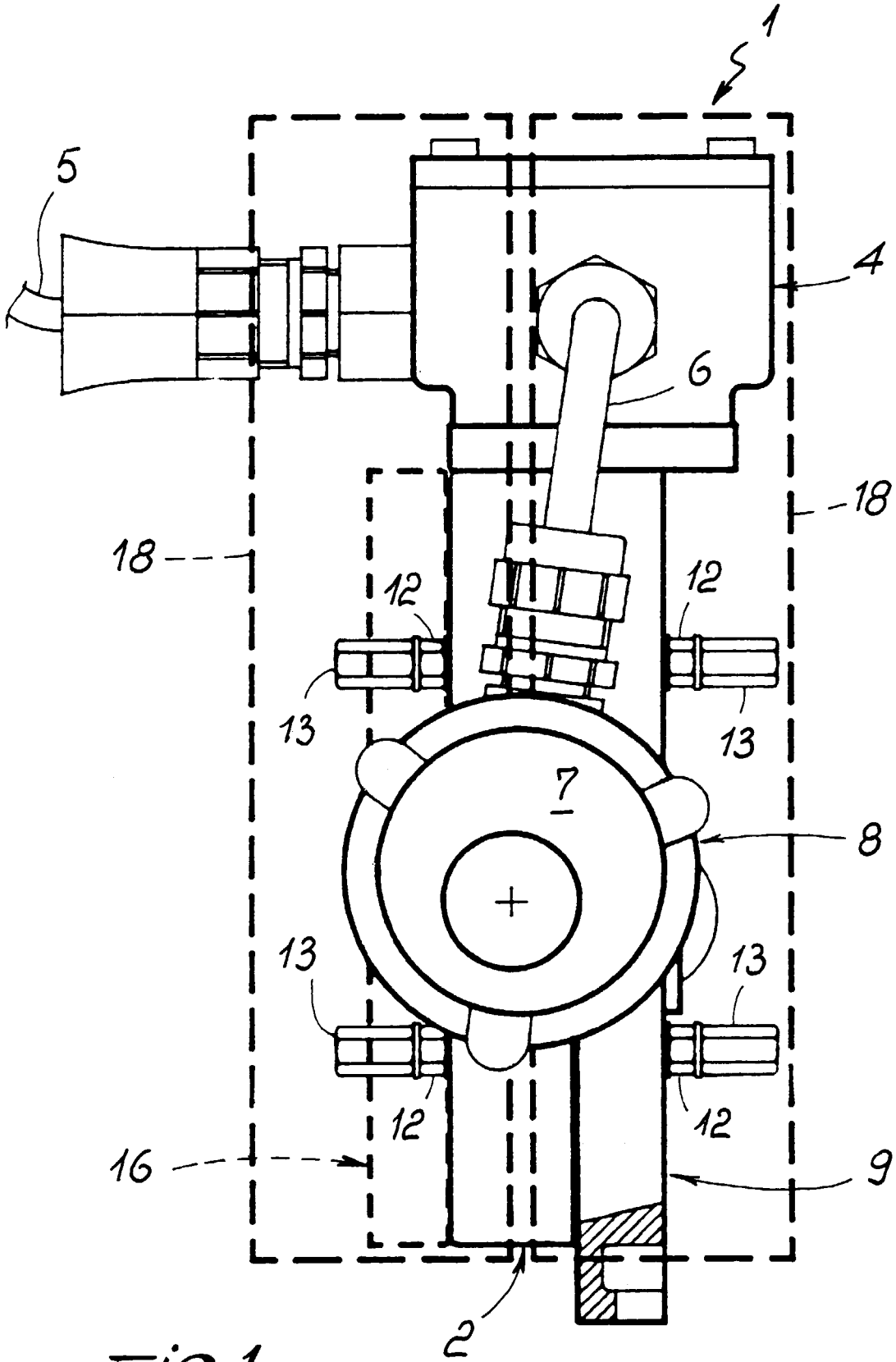

Fig.1

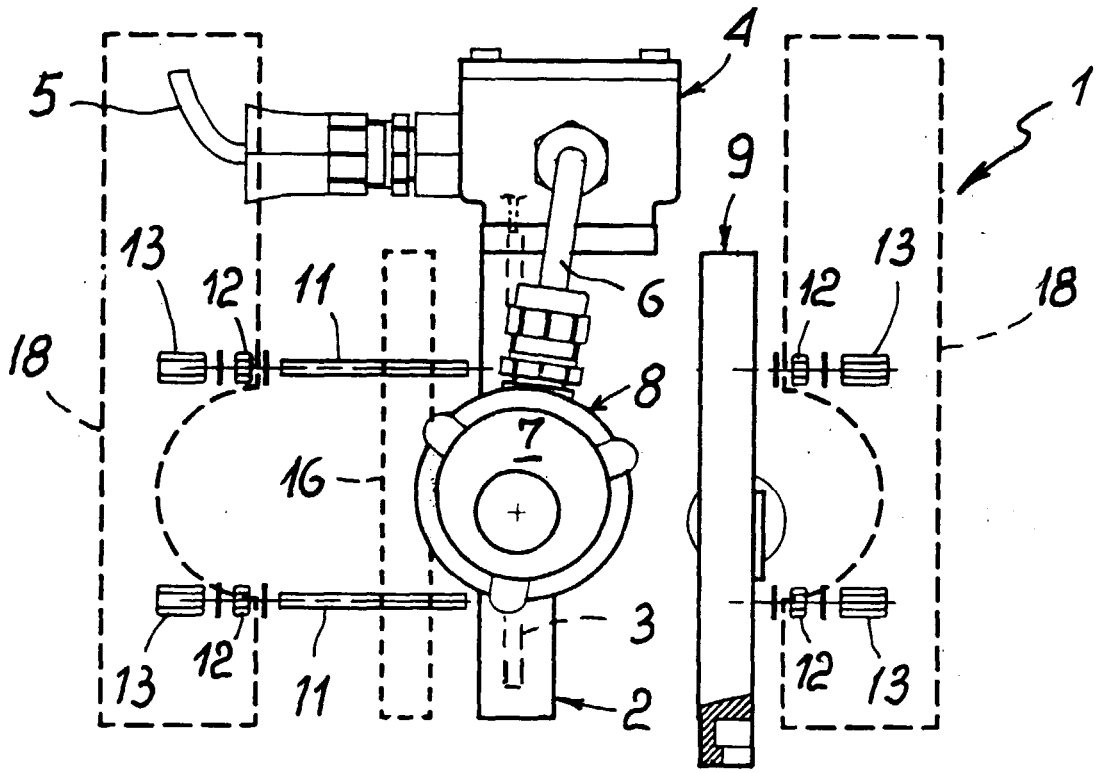

Fig.2

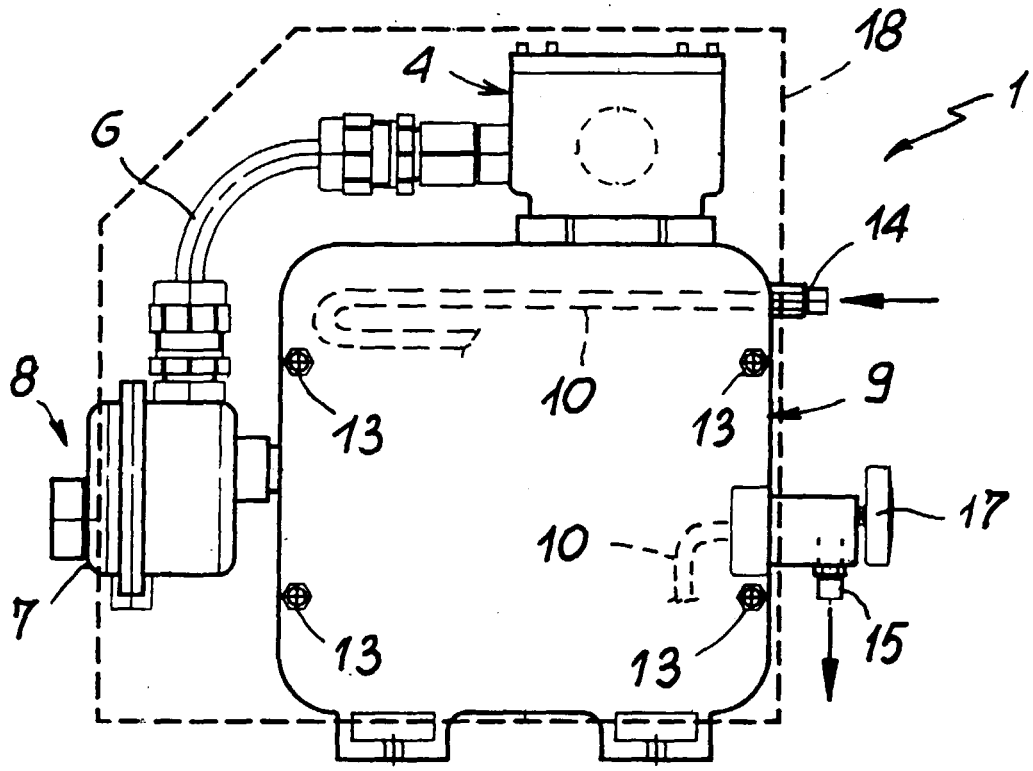

Fig.3