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

(11) EP 1 004 832 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
29.09.2004 Bulletin 2004/40

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

(21) Application number: **99122745.5**

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

(54) **Electric heater for fluids, in particular paints**

Elektrischer Flüssigkeitserhitzer, insbesondere für Farben

Réchauffeur de fluides, en particulier pour peintures

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE

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

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

(73) Proprietor: **Wagner Colora S.r.l.**
20122 Milano (IT)

(72) Inventors:
- **Giardini, Edo**
  20050 Correzzana (Milan) (IT)
- **Basso, Angelo**
  15060 Castelletto D'Orba (Alessandria) (IT)
- **Landi, Ernestino**
  20065 Inzago (Milan) (IT)

(74) Representative: **Lunati, Vittoriano**
LUNATI & MAZZONI S.a.s.
Via Carlo Pisacane, 36
20129 Milano (IT)

(56) References cited:
CH-A- 97 583
DE-C- 853 781
US-A- 1 375 357
US-A- 2 247 816

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 004 832 B1

Description

[0001] The invention relates to an electric heater for paints, of the type defined in the preamble of Claim 1. Heating of the paint takes place while the paint is running through the circulation duct between a duct inlet and a duct 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 paint temperature, which means is adapted to automatically keep the desired paint temperature by acting on the heating member power supply.

[0003] In order to carry out an efficient heat exchange between the heating member and the paint, while maintaining reduced sizes for the heater, the circulation duct extends close to the heating member 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 members in the form of electric resistors are longitudinally disposed, the circulation 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 member and the circulation duct disposed in a flattened parallelepiped body, at which the duct 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 paint passing therethrough is submitted to high pressures.

[0006] These known electric heaters for paints 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 circulation duct for the purpose of achieving the maximum heat exchange between the heating member and the paint, or as a result of the type of paint employed, such as a particularly reactive catalysed resin, 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 paints 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] Known are also electric heaters for fluids like water, as for instance from US-A-1 375 357, wherein the heating member is sandwiched between two heat exchanger bodies which clamp the heating element between each other and are fastened to each other peripherally outside the heating element by means of bolts. The fluid flow entering an inlet connection is branched into separate fluid flows passing through the heat exchanger bodies, and the heated flows are recollected at an outlet connection of the heater.

[0011] The inlet connection houses means for controlling the power supply of the heating member.

[0012] From DE-C-853 781 an electric heater for fluids flowing with small speed is known, which is particularly intended for infusions into a vein of a patient. The heating body has a hollow cylindrical shape in the interior of which there is arranged a heat exchanger body in the form of a tube of small diameter that can be extracted for disinfecting operations.

[0013] Under this situation, the technical task underlying the present invention is to obviate the above drawbacks and limitations, by providing an electric heater for paints, operation of which, in case of clogging caused by the paint, can be easily restored without being obliged to throw the heater away.

[0014] Within the scope of this technical task, it is an aim of the invention to provide an electric heater for paints having an advantageous cost, taking into account the possibility of restoring the heater after possible clogging of same.

[0015] 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.

[0016] A further by no means last aim of the invention is to devise an electric heater for paints 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 circulation ducts is at all events maintained.

[0017] The foregoing and further aims that will become more apparent in the following are achieved by an electric heater for paints, having the features recited in the appended Claim 1

[0018] Preferred embodiments of the invention are defined in the dependent claims.

[0019] 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.

[0020] With reference to the drawings, an electric heater for paints, in accordance with the invention, is generally identified by reference numeral 1. It comprises a heating body 2, internally housing an electric heating member 3, such as electric resistors, only diagrammatically and partly shown, as their structure and arrangement are known.

[0021] 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 supply cord 5 of heater 1 as well as a cable 6 terminating at a thermostat 7 externally supported by the heating body 2. Thermostat 7, of known type, embodies means 8 for temperature control and regulation, acting on the powersuppty of the heating member 3 in known manner for automatically controlling operation of the heating member to keep the paint to be heated to the wished temperature.

[0022] By way of example only, the heating body 2 has a flattened substantially parallelepiped shape. It is preferably made of a metal alloy casting having a high heat-transmission coefficient, into which the heating member 3 with the respective power connections and connections to the control and regulation means 8 is inserted.

[0023] In accordance with the invention, the heating body 2 externally supports in a removable manner two interchangeable heat exchanger bodies 9 and 16, in which at least one circulation duct 10 for the paint to be heated is provided. Each exchanger body 9, 16 has a flattened substantially parallelepiped shape as well, the sizes of which make the two bodies 9 and 16 matchable by surface contact at one of their respective major faces with opposite faces of the heating body 2 to cause the heat exchanger bodies 9 and 16 to receive heat from the heating body 2.

[0024] In particular, the exchanger bodies 9 and 16 can be removably and interchangeably fastened to the heating body 2 by threaded means consisting of four threaded tie rods 11 for example, adapted to pass through the bodies 2 and 9, 16 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 bodies 2 and 9, 16 against each other tightly and steadily so as to ensure an excellent contact for heat transmission.

[0025] As shown for heat exchanger body 9, duct 10, only diagrammatically and partly shown, extends in the form of a coil for example, within the exchanger body, between a paint inlet fitting 14 and a paint outlet fitting 15, formed in body 9 and adapted for connection, in known manner, with paint-conveying pipes, in particular flexible paint-conveying hoses.

[0026] The exchanger bodies 9, 16 are 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.

[0027] Substantially, each heat exchanger body 9, 16 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.

[0028] By virtue of said technical solution of dividing the electric heater 1 into separate parts, one forming the heating body 2 and the other forming the heat exchanger bodies 9, 16 and of making the exchanger bodies 9, 16 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 paint-circulation duct 10, but each 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.

[0029] 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 bodies 9, 16 constructed in a particularly cheap manner as disposable units, constitute the interchangeable portion of heater 1 in accordance with the invention.

[0030] Practically the out-of-use portion of heater 1 which substantially is always the one in which paint circulation occurs, and hardly the more expensive one enclosing the heating member 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.

[0031] Since manufacture of the exchanger bodies 9, 16 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 an exchanger body 9, 16.

[0032] A further advantageous feature of the heater 1 shown consists in that 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 paint-circulation ducts 10.

[0033] In the first case, the dual heat exchange surface enables the flow rate of the heated paint to be doubled (the temperature being the same) or the paint temperature to be doubled (the flow rate being the same), but also enables the same heater to be used for paints having a very low heat-transmission coefficient, be-

cause the length of the heat-exchange path of travel is doubled.

[0034] In the second case (connection in parallel) simultaneous heating of a double amount of paint is made possible, which will double performance of one and the same heater.

[0035] Alternatively, the two heat exchanger bodies 9 and 16 may be maintained hydraulically separated from each other and in this case the second exchanger body 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 exchanger bodies 9 and 16 can also be applied when two-component systems are for example concerned.

[0036] Finally, still referring to the preferred embodiment depicted in the figures, a thermometer 17 for detecting temperature of the outcoming paint is advantageously provided to be applied to the outlet fitting 15. Reading of thermometer 17 can be used for adjustment of thermostat 7.

[0037] Heater 1, provided with two heat 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.

[0038] Bodies 2, 9 and 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 heat exchanger bodies 9 and 16, on the understanding that arrangement of the exchanger bodies is interchangeable.

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

Claims

1. An electric heater for paints, comprising a heating body (2) intemally housing an electric heating member (3), control means (7, 8) acting on a power supply of said heating member (3) for controlling operation of said heating member (3), and a heat exchanger body (9) provided with a circulation duct (10) and arranged to receive heat from said heating body (2), **characterised in that** said control means (7, 8) are externally supported by said heating body (2) and **in that** said heating body (2) externally supports two heat exchanger bodies (9, 16) constructed as disposable units removably and interchangeably fastened to said heating body (2) at opposite external faces thereof.

2. A heater as claimed in claim 1, **characterised in that** said heat exchanger bodies (9,16) have circulation ducts (10) hydraulically separated from each other.

3. A heater as claimed in claim 1 or 2, **characterised in that** said heat exchanger bodies (9, 16) are made of a metal alloy casting into which at least one circulation duct (10) is buried.

Patentansprüche

1. Ein elektrischer Flüssigkeitserhitzer für Farben, der einen Heizkörper (2) umfasst, welcher innen ein elektrisches Heizelement (3), Steuerelemente (7, 8), die auf einen Netzanschluss des genannten Heizelements (3) zur Steuerung des Betriebs des genannten Heizelements (3) einwirken, und einen Wärmeaustauschkörper (9) beherbergt, der mit einer Umlaufleitung (10) ausgerüstet und angeordnet ist, um die von dem genannten Heizkörper kommende Hitze (2) aufzunehmen, **dadurch gekennzeichnet, dass** die genannten Steuerelemente (7, 8) außen durch den genannten Heizkörper (2) getragen werden, sowie dadurch, dass der genannte Heizkörper (2) außen zwei Wärmeaustauschkörper (9, 16) trägt, die als Einwegeinheiten konstruiert sind, welche entfernbar und austauschbar an dem genannten Heizkörper (2) und an dessen gegenüberliegenden Außenflächen befestigt sind.

2. Ein Erhitzer gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die genannten Wärmeaustauschkörper (9, 16) Umlaufleitungen (10) aufweisen, die hydraulisch voneinander getrennt sind.

3. Ein Erhitzer gemäß Ansprüchen 1 oder 2, **dadurch gekennzeichnet, dass** die genannten Wärmeaustauschkörper (9, 16) aus einem Metallgussstück bestehen, in dessen Innerem mindestens eine Umlaufleitung (10) liegt.

Revendications

1. Un réchauffeur électrique pour peintures, comprenant un corps chauffant (2) logeant à son intérieur un élément chauffant électrique (3), des dispositifs de commande (7, 8) intervenant sur une alimentation de courant dudit élément chauffant (3) pour commander le fonctionnement dudit élément chauffant (3) et un corps échangeur de chaleur (9) équipé d'un conduit de circulation (10) et prédisposé pour recevoir la chaleur dudit corps chauffant (2) **caractérisé par le fait que** cesdits dispositifs de commande (7, 8) sont supportés à l'extérieur par ledit corps chauffant (2) et **par le fait que** ledit corps chauffant (2) supporte extérieurement deux corps

échangeurs de chaleur (9, 16) construits comme des unités jetables fixées de manière amovible et interchangeable audit corps chauffant (2) sur ses faces externes opposées.

2. Un réchauffeur conformément à la revendication 1, **caractérisé par le fait que** lesdits corps échangeurs de chaleur (9, 16) ont des conduits de circulation (10) hydrauliquement séparés l'un de l'autre.

3. Un réchauffeur conformément aux revendications 1 ou 2, **caractérisé par le fait que** lesdits corps échangeurs de chaleur (9, 16) sont réalisés en une coulée d'alliage métallique dans laquelle au moins un conduit de circulation (10) est inséré.

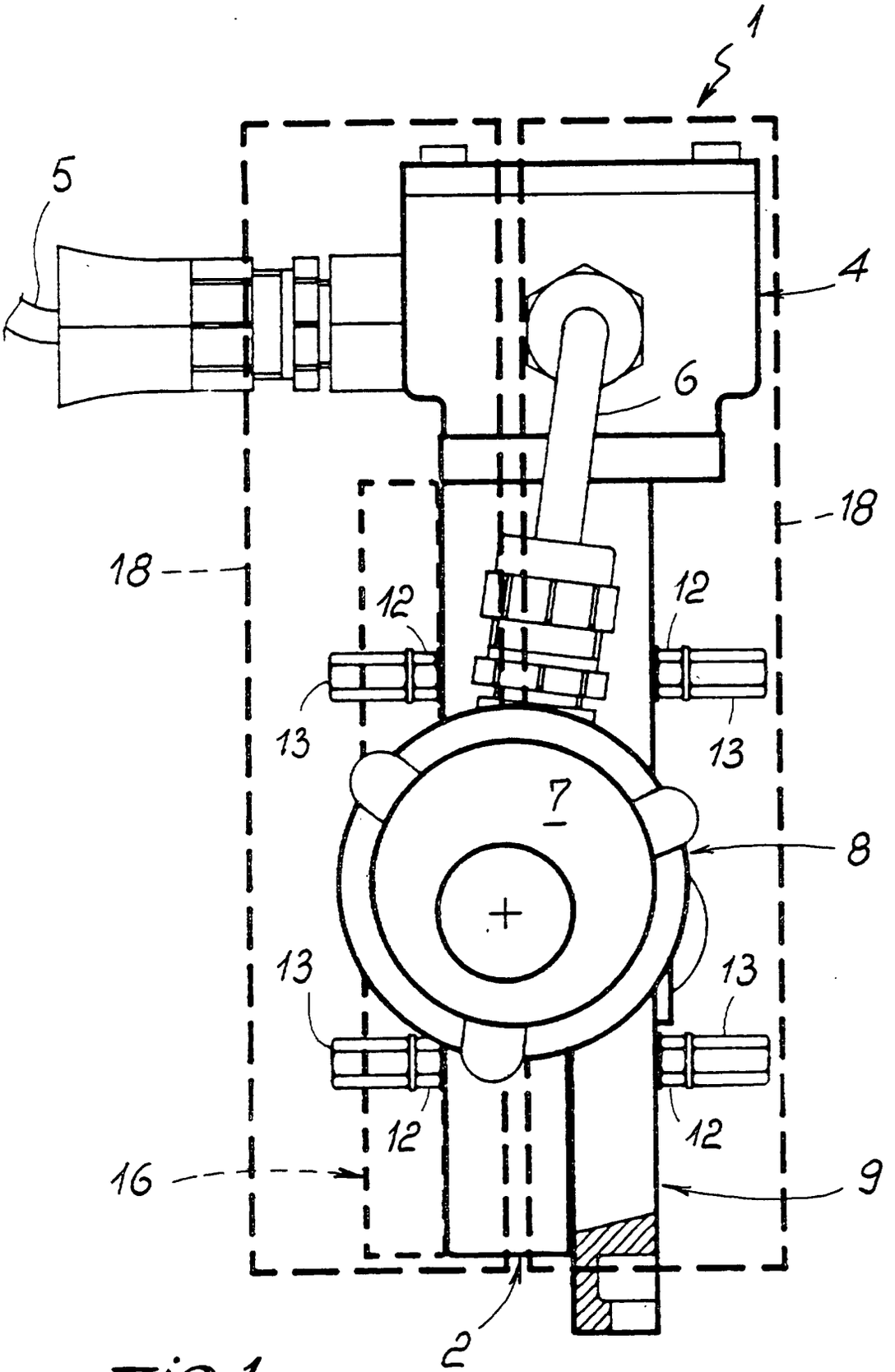


Fig. 1

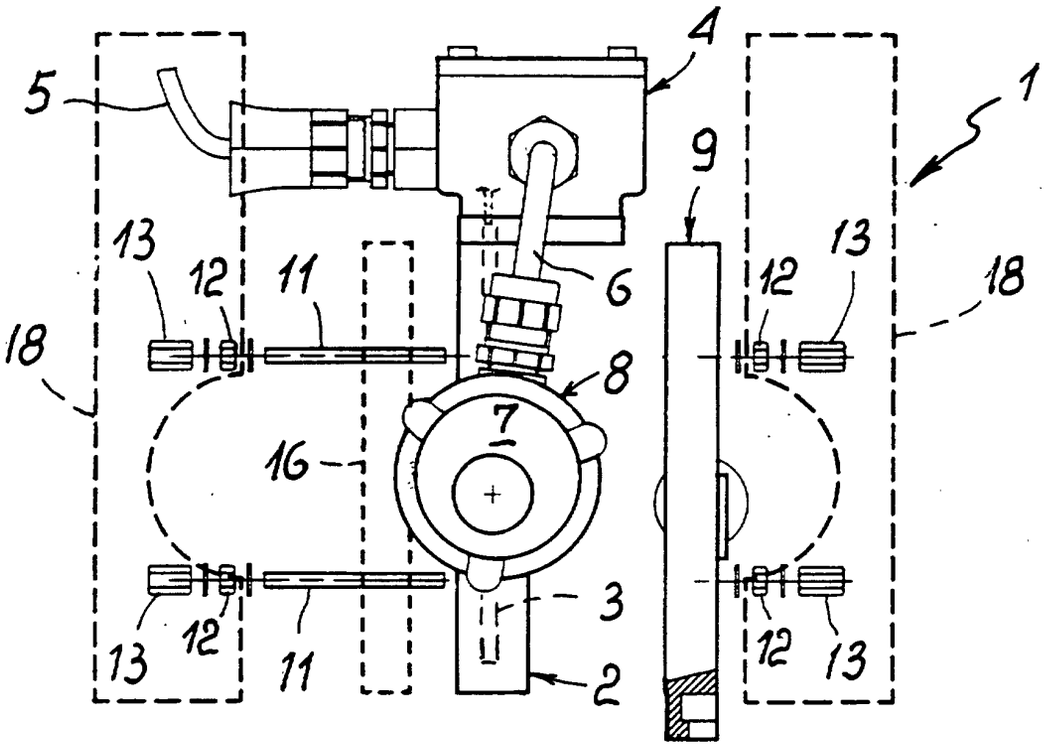

4
5
1
9
13
12
11
6
12
13
18
18
8
7
16
3
13
12
11
12
13
2

Fig.2

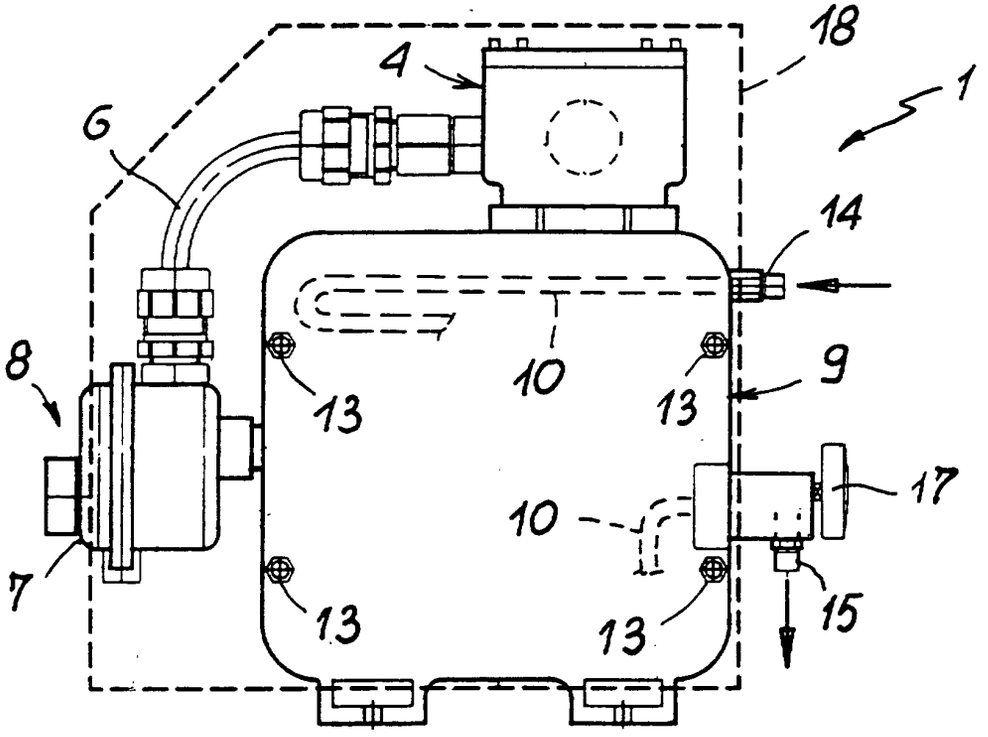

18
4
1
6
14
10
8
13
13
9
17
10
7
13
13
15

Fig.3