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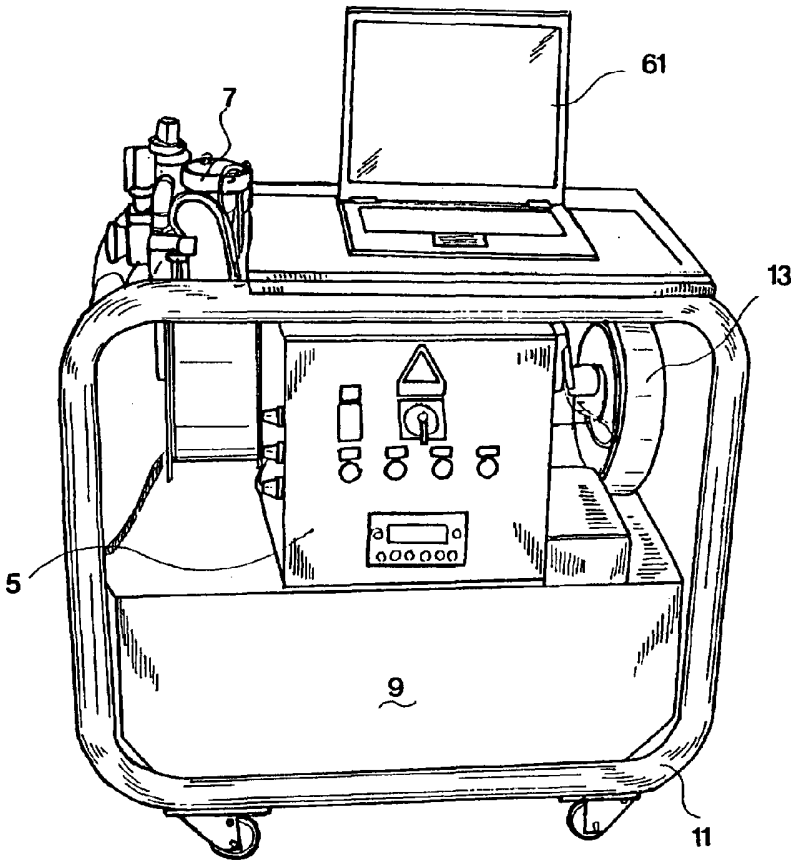
(54) Title: DEVICE FOR THE TESTING AND THE PERIODICAL INSPECTION OF PIPES AND FIRE-PREVENTION EQUIPMENTS CONNECTED TO WATER SUPPLIES



(57) Abstract: A device for the testing and the periodical inspection of pipes or fire-prevention equipments connected to a water source (10), comprises means (7, 8) for pumping an operating liquid, respective inlet (1) and outlet (2) sections of the liquid, and pressure detecting means (3), and is characterized in that it comprises means (5) for controlling the pressure internal to the pipes or equipments ,and means (6) apt to the recording of pressure values at least at predetermined instants during the testing of said pipes or equipments.

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DEVICE FOR THE TESTING AND THE PERIODICAL INSPECTION OF PIPES AND FIRE-PREVENTION EQUIPMENTS CONNECTED TO WATER SUPPLIES

DESCRIPTION

The present invention relates to a device for the testing and the periodical inspection of pipes and fire-prevention equipments, in order to inspect their strength under working conditions.

In several Countries, existing specific fire-prevention rules prescribe, besides specific structural contrivances for the equipments, also that the latter be inspected at the end of their installation and at regular time intervals.

In fact, it is absolutely crucial that such fire protection systems be always ready to operate under the best possible conditions; however, them being used only in case of emergency, without an adequate control it is not possible to check their actual effectiveness in case of need.

The modes for checking the effectiveness of fire-prevention equipments are regulated by the EN European Standards and the ISO Standards, imposing strict controls on the equipments and in particular on the pipes.

More precisely, concerning European rules, it is expressly required that they be subjected to the maximum operating pressure every five years, according to precise testing methodologies.

In particular, in the same European rules it is also indicated the value of the maximum operating pressure. E.g., to date European rules indicate said value to be equal to 1.2 MPa.

Accordingly, such pressure values are also those indicated for the fire-prevention equipments that should be manufactured so as to allow this operating pressure.

The abovementioned standards indicate that during the controlling of the pipes and of the equipments they should be inspected for absence of leaks.

However, it is not specified how such an inspection should take place: a total absence of leaks is hardly achieved since at the fittings no perfect seal is attained, and therefore small discharges of liquid could be mistaken for leaks, or, on the contrary, small leaks in the equipments could be disregarded, as deemed due to defects in the fittings rather than in the pipes or in the equipments.

Therefore, though usually pipes and equipments are actually inspected at each prescribed time interval, the controlling is carried out manually, merely by connecting the pipe to the equipment, opening the water flow and inspecting (verifying) the absence of leaks, according to the subjective criteria described hereto.

Nevertheless, it is absolutely evident that such an operation in no way ensures that the pipe could resist the actual maximum operating pressure, as downstream of the pipe there could be other leaks, possibly hiding damages in the pipes, or pressure drops, due to other reasons, inside the equipment entailing no evident leaks.

In some known equipment controlling devices it is used a pump to be connected to the pipes, ensuring that the test actually takes place at the operating pressure.

Yet, in this case as well there is no actual certainty about the quality of the pipe, since it is impossible to understand whether the latter is capable of keeping the applied pressure constant, or instead the small leaks unavoidably taking place in this kind of equipments suffice to cause a pressure drop such as to invalidate the effectiveness thereof.

In fact, consider that a constant drop of the pressure inside a pipe, even with a modest gradient, within a few minutes could reduce the effectiveness of the fire-prevention equipment, and, in case of big fires, make such means ineffective.

A further contrivance used during the inspections and the testing consists in the use of a manometer, which

is controlled during the test by assigned staff inspecting pressure constancy during the testing.

However, also such a method is not error-free; above all, to the ends of a certification of the equipment it entails operations carried out by a human operator, whose assessments can be quite subjective and approximate.

Moreover, such devices are essentially calibrated on the basis of the values indicated by a specific rule. Should stricter rules come into force, or be used in different Countries, each having different inspection modes for fire-prevention equipments, it would be necessary to manufacture a new device, calibrated and set according to different values of the testing parameters.

Concerning whole fire-prevention equipments, as already highlighted and similarly to pipes a testing is prescribed according to specific procedures, them also codified in the rules.

To date, no device effectively implementing such a procedure is known; this is so since a necessary condition for testing, as prescribed by the rules presently into force, is that the system is brought to hydrostatic conditions for an extremely long time.

To date, fire-prevention equipments are tested by pressurizing the pipes with a hand pump, or with compressed air or bottle gas, or further by pressure from connection to water supplies, and then visually checking any leak.

It is absolutely evident that, apart from not closely following the prescriptions of the rule, such a procedure cannot yield certain and repeatable results, as there are too many manually adjusted factors, hardly controllable and anyhow subjective.

Moreover, aside from making the prescribed procedures hardly feasible, the known testing devices and methods are also unsuitable for the issuing of the certification of compliance to the set standards of the equipment.

In fact, operators carrying out the testing should issue a certification in which its outcome is reported.

Both in case of a positive outcome and of a negative one, it is crucial that the certification actually corresponds to the real conditions of the equipment.

However, it is unthinkable that such manual procedures could be totally error-free. Also, in dubious cases an operator cannot always easily provide a correct interpretation of the outcome of an inspection of the fire-prevention devices.

However, these testing procedures prove particularly delicate as normally these equipments remain unused, in spite of eventually having to be perfectly efficient when needed.

Therefore, the responsibility of having an inspected and ready-to-use equipment is extremely delicate, and all precautions needed to assess the malfunctioning thereof should be adopted.

Hence, the technical problem underlying the present invention lies in providing a testing device for pipes and fire-prevention equipments in general, overcoming the drawbacks mentioned with reference to the known art.

A further object of the present invention is to provide a method allowing to attain an accurate and safe certification of the tested equipment.

Such a problem is solved by a device for the testing of pipes and fire-prevention equipments according to claim 1 and by a method according to claim 13.

The testing device according to the present invention allows to carry out the testing of pipes and equipments in general by perfectly following the procedures prescribed by the standards, in a completely automated manner, maximally limiting the operations manually managed by an operator.

A further advantage lies in that such a device is programmable and therefore easily adaptable to any

different testing typology, both on individual pipes and on whole equipments.

Moreover, the testing method according to the present invention and the related device entail the advantage of safely and univocally providing a certification of the equipment and of its components, with no risk of incurring in dubious or uncertain cases, anyhow not subjectively assessed by an operator.

Other advantages, features and the modes of employ of the present invention will be made apparent from the following detailed description of some embodiments thereof, given by way of a non-limiting example. Reference will be made to the figures of the annexed drawings, wherein:

figure 1 is a schematic illustration of the operation diagram of the device according to the present invention; and

figures 2 to 5 are perspective views, along different observation points, of the device according to the present invention.

Initially referring to figure 1, the operation of the device according to the present invention is schematically depicted therein.

Hereinafter, the term "test" will designate without distinction either a testing procedure or a periodical inspection, expressly indicating where different modes of carrying out the two operations are provided.

The device for the testing and the periodical inspection according to the present invention is initially connected, at an inlet section 1, to a water source 10, which according to a preferred embodiment is represented by the same supply of the fire-prevention equipment. Such a connecting provides to the device an operating fluid that will be used to carry out the tests on equipments and pipes.

In case of tests on pipes, it will also be possible to use, in an extremely easy manner and in no way

invalidating the test, different water sources, e.g. an external tank, not shown in the figure, or a connection to other water supplying sources, not connected to the fire-prevention equipment itself.

The device comprises an outlet section 2, allowing the connection to the pipe to be tested or inspected, whose opposite end is obstructed by a cap or other equivalent closing means, not shown in figure, apt to prevent liquid discharges.

In case of tests on equipments, said inlet 1 and outlet 2 sections are used to serially connect the device to the equipment itself. In practice, by the use of two pipes, or other equivalent connecting means, the two sections are connected to respective sections for supplying the fire-prevention equipment.

Thus, the device behaves as if it were an integral part of the equipment; therefore, in the testing steps that will be detailed hereinafter there could be obtained actual data on the equipment effectiveness, rather than indirect and subjective indications.

By way of example and without limitative purposes, hereinafter reference will be made to the actual rule, issued in the EU, on the testing and the periodical inspection of equipments, the use of the device according to the present invention being immediately transposable to other testing modes.

In particular, as mentioned above, such a testing procedures envisages that the pipe or the equipment be brought to preset pressure values, and that the absence of leaks therein be inspected.

However, finding a total absence of leaks during the testing is usually not realizable, as the leaks can be due to discharges of liquid from gaskets or fittings, and therefore not due to actual yielding or wear of the pipes. In addition, the equipments should foresee no leaks in any one of their components; however, in particularly extended fire-prevention equipments the

leaks are not easily found merely by observing the presence of liquid discharges.

On the contrary, the testing device according to the present invention does not consider a possible liquid discharge as a discriminant in the inspection of the quality of the equipment; rather, it evaluates the characteristics of pipes and equipments on the basis of their ability to hold the operating pressure, or anyhow the pressure set by the standards.

In fact, evidently a pipe may ensure perfect fire-prevention efficiency even when there are small discharges in fittings and gaskets, as long as during the working phases it may ensure a pressure sufficient to have the flow rate required to put out the fire.

However, in this case as well the use of a manometer does not suffice to detect the pressure, as it is not so necessary to know the instantaneous value of the pressure, as much as whether it undergoes undesired variations.

Hence, the device for the testing according to the present invention comprises pressure detecting means 3, in particular, in the present embodiment, a manometer located upstream of the outlet section 2.

Said pressure detecting means 3 have the task of monitoring, during the test, pressure values of the operating liquid present in the pipe or in the equipment connected to the outlet section 2.

The device further comprises means for pumping the operating liquid taken from the water source to which the inlet section 1 is connected.

In fact, usually the water source is not capable of ensuring the pressure required for the testing or the periodical inspection of the equipments or of the pipes, said source being constituted by the equipment itself, which should be inspected at least at the maximum operating pressure that clearly is higher than the average pressure provided thereby.

Therefore, the liquid introduced in the inlet section 1 is subjected to a pumping, causing it, at the outlet section 2, to exhibit the pressure threshold value required by the test that is desirable to carry out.

Moreover, the pumping means is connected to means 5 for controlling the pressure, allowing to control the pumping so as to control the pressure of the delivery liquid, and therefore the pressure arriving to the outlet section 2.

For this purpose the pressure controlling means 5 is circuit connected to the pressure detecting means 3.

Thus, it is possible to carry out a pumping up to a preset threshold value, and then, after having stopped the pumping, to detect the pressure by the detecting means 3.

The pressure controlling means conveniently comprises a programmable control unit 5, allowing to automatize said operation. Thus, the actions manually performed during the test are reduced to a minimum.

As explained hereto, the testing or the inspection is based on the fact that, following the stopping of the pumping, no relevant pressure drops occur inside the pipes or equipments; said drops can unequivocally be due to liquid leaks, thereby being the symptom of a nonconformity of the pipe or of the equipment.

Hence, at least following the stopping of the pumping, the pressure values detected by the detecting means 3 must be recorded by suitable recording means 6.

In fact, without an adequate recording of the pattern of the test, it would not be possible to obtain an accurate certification of the equipment or of the pipe, just because, as explained hereto, the judgment on the actual compliance would be left to the operator's observation.

On the contrary, it is desirable that the testing or the inspection be recorded, so as to ensure tangible proof of the outcome thereof.

In particular, the recording means 6 may comprise a digital memory, e.g., that of a personal computer (PC) 61, connected to the pressure detecting means, or a printer 62, connected directly to the pressure detecting means or to the PC 61.

Evidently, other recording systems may be used in order to obtain a certification of the outcome of the test; however, it is advantageously used a PC since it also allows, as it will be detailed hereinafter, the programming of the control unit and a greater customization of the procedures.

In addition, it ought to be understood that the certification of equipment is an operation entailing heavy responsibilities; hence, the management of the testing modes is conveniently entrusted to suitable software, whose functionalities will hereinafter be described, differentiating the options of modifying the parameters set for the test. Therefore, the operator will have limited or nil ability to modify such settings, which could instead be custom-made for any need during the preparation of the device.

Referring again to figure 1, the pumping means conveniently comprises a pneumatic pump 7 operated by means of a compressor 8.

This choice entails the advantage of avoiding the presence of power-supplied components into contact with the operating liquid. As discussed hereto, this aspect is of particular importance since during the tests liquid leaks occur, and it would be extremely dangerous to use electric pumps on sites where operators have to work in the presence of liquids, in particular water.

Moreover, the pneumatic pump 7 is conveniently of the reciprocating kind, as such a configuration allows to obtain the required pressure values with small energy expenditures and reduced dimensions.

According to a preferred embodiment, the compressor 8 supplies an air accumulation chamber 11, opening the

compressor 8 and the pneumatic pump 7 into each other. The supply to the pneumatic pump 7 is regulated by two valves that are selectively controlled in order to implement the reciprocating motion of the piston.

The device according to the present invention further comprises a tank 9 connected to the inlet section 1, and therefore supplied by the water source of the equipment. To this tank 9 it is further connected the suction duct of the pump 7, which therefore operates on the fluid coming from the water source 10.

Thus, if the water source of the fire-prevention equipment is used, the pumping will be carried out on the liquid coming therefrom.

In case the object of the testing is the whole equipment, the connection is made by serially inserting the device, and therefore the pumping and the entailed pressure control operation will be carried out in the whole equipment.

Thus, it will be possible to observe the pressure variations in the whole equipment by assessing the data recorded in said recording means 6.

Should unexpected or anyhow rather significant variations be recorded during the test, the presence of leaks would be highly probable; therefore the test would yield a negative outcome.

As it has been highlighted, the assessment of the test outcome is advised by the occurrence of excessive pressure gradients, upon reaching the threshold value prescribed by the standard. Actually, the entity of the pressure variation is not indicated by the standard taken as reference in the present embodiment, yet it could easily be set as a result of empirical observations.

However, it has been noted that in case of pipes and equipments in perfect conditions the variation of pressure values is limited to a few percent points, whereas even a small defect in the pipe produces marked deviations from the test value.

Always referring to figure 1, the air accumulation chamber 11 comprises means 12 for draining condensate, which in the present embodiment is a duct connected to the tank 9.

Such condensate draining means 12 prove particularly useful, since in the operations of opening and closing the valves controlling the pneumatic pump part of the liquid under pressure tends to condensate inside the air accumulation chamber, and the draining means 12 serve to prevent the liquid from getting to the compressor 8.

Moreover, referring to figures 2 to 5, the air accumulation chamber 12 is obtained on a support frame of the device, so as to reduce the dimensions and the manufacturing costs thereof. In fact, without such a contrivance the air accumulation chamber, which must resist high pressures, would have had to be specially built and mounted on the device, taking up a considerable volume of the latter.

In addition, as illustrated in figure 1, the device comprises means 13 for cooling the compressor 8, preventing its overheating in case of lengthy tests. Such tests, e.g., take place in case the testing of equipment has to be carried out according to European rules, lasting at least two hours.

Moreover, the device is wheel-mounted and it can be easily hauled in a vehicle and pushed for short stretches, so as to easily reach each individual pipe of an equipment requiring testing. Such a feature proves extremely advantageous, as it avoids collecting all the pipes in order to bring them to a sole testing post.

As indicated above, the device for the testing and the periodical inspection according to the present invention provides a basically fully automated test procedure.

In fact, the testing or inspection method initially provides the connecting of the pipe or of the equipment to the pumping means of the device.

Such a connecting, as specified above, occurs by means of the inlet 1 and outlet 2 sections with the configuration required by the kind of test.

Upon making the connection, the device is thus supplied by a water source, usually, yet not necessarily, coming from the equipment itself.

Thus, it is possible to carry out a pumping of the operating liquid provided by such a water source. The pumping occurs until reaching a preset pressure threshold value. Such a value, usually indicated by the rules, is detected by suitable means 3, and then, by the connection with the controlling means 5, the pumping can be automatically stopped and the flow inside the pipes or equipments blocked, so that, in the absence of leaks, no pressure drops occur.

Also after this step the detecting means 3 continues to detect pressure values, which will be characteristic of the hydraulic conditions inside the pipe or equipment being inspected. Concomitantly, always following the reaching of the threshold value that determines the stopping of the pumping, the recording means records said pressure values at predetermined intervals. The sampling frequency, i.e., the time interval between a recording and the subsequent one, is set on the basis of the length of the test, and, optionally, by the criticalness of the latter. Lengthy tests will require a lower-frequency sampling with respect to shorter tests of components critical to the operation of the fire-prevention equipment, or for equipments in an environment at high risk of fire.

Therefore, the pressure values thus recorded could be used to assess the test outcome. In fact, as briefly explained hereto, in case during the test no evident pressure drops are detected, it can doubtless be deemed that no leaks are present in the pipe or the equipment.

Instead, in case of leak visible pressure drops will be detected. In this case it is possible to set a maximum

tolerance within which the test is automatically signalled as failed.

Basically, the device according to the present invention allows, according to a preferred embodiment, to print the pressure values detected during the test, along with an assessment of the outcome thereof, on the basis of the criteria described above. This feature proves particularly advantageous, as it allows the creation of a document, automatically created and therefore not deriving from subjective assessments of an operator, certifying the test outcome.

Moreover, all values recorded cannot be modified in any way once the test has been performed, providing an even greater certainty to the certification documents.

The management of such parameters is conveniently entrusted to a software allowing, by an access at differentiated levels, to diversify the use of the device.

Hence, an operator will merely be authorized to carry out tests, choosing among a number of standard tests, without however being able to modify any preset parameter, like the pressure threshold value over which the pumping is stopped, the pressure sampling frequency, the threshold within which it is signalled a test with negative outcome.

Said parameters, along with the others indicated hereto, can instead be customized by authorized users, who therefore could shape the tests for each specific need.

In addition, the software according to the present invention allows the modification of the test parameters so as to control the pressure according to different functions. Therefore, it can be desirable to resume the pumping even in a phase subsequent to the reaching of the threshold value indicated by the rules, so as to create stricter tests, in which the pressure follows specific patterns.

In particular, moreover, the threshold value of the pressure at which the pumping should stop can be variable over time, so as to create tests in which the pressure values have a step or ramp pattern.

Always by the device controlling software, it is moreover possible to automatically create test databases, so as to know the conditions of an equipment: which components have been inspected and when, and by which operator these operations have been carried out. All this proves particularly useful as it is important to univocally associate to each individual component the test certifying its good conditions, so that the whole equipment in its entirety be always perfectly efficient.

Thus, in case of malfunctioning, inspecting whether such an event is due to fatality, or to a negligence by those performing the maintenance, becomes prompt.

The present invention has hereto been described with reference to preferred embodiments thereof. It is understood that other embodiments afferent to the same inventive kernel may exist, all falling within the protective scope of the appended claims.

CLAIMS

1. A device for the testing and the periodical inspection of pipes or fire-prevention equipments, connected to a water source (10), comprising means (7, 8) for pumping an operating liquid, respective inlet (1) and outlet (2) sections of said liquid, and pressure detecting means (3),

characterized in that it comprises means (5) for controlling the pressure internal to said pipes or equipments, and means (6) apt to the recording of pressure values at least at predetermined instants during the testing of said pipes or equipments.

2. The device according to the preceding claim, wherein said pumping means comprises a pneumatic pump (7) and a compressor (8) apt to cooperate with said pump (7).

3. The device according to the preceding claim, wherein said compressor (8) comprises an air accumulation chamber (11).

4. The device according to the preceding claim, wherein said air accumulation chamber (11) comprises means (12) for draining condensate.

5. The device according to claims 3 or 4, wherein said accumulation chamber (11) is obtained on a support frame of said device.

6. The device according to one of the preceding claims, comprising a tank (9) for said operating liquid.

7. The device according to claims 5 and 6, wherein said condensate draining means (12) is connected to said tank (9).

8. The device according to one of the preceding claims, wherein said pressure controlling means comprises a control unit (5), circuit connected to pressure detecting means (3).

9. The device according to one of the preceding claims, wherein said means apt to the recording of pressure values comprises a personal computer (61).

10. The device according to one of the preceding claims, wherein said means apt to the recording of pressure values comprises a printer (62).

11. The device according to one of the claims 2 to 10, comprising means (13) for cooling said compressor (8).

12. The device according to one of the claims 3 to 12, wherein said support frame comprises wheels for moving the device.

13. A method for the testing and the periodical inspection of pipes and fire-prevention equipments connected to a water source (10), comprising the steps of:

connecting said pipe or equipment to means (7, 8) for pumping an operating liquid;

pumping said operating liquid apt to reach a preset threshold value of the pressure inside said pipe or equipment;

automatically stopping said pumping action at the reaching of said threshold value;

detecting pressure values of said operating liquid inside said equipments or pipes at least at preset instants after the reaching of said threshold value and the entailed stopping of the pumping action;

recording said pressure values, by suitable recording means (6).

14. The method according to the preceding claim, comprising a further step of identifying the outcome of the testing or of the periodical inspection on the basis of variations of said pressure values recorded after the reaching of said threshold value.

15. The method according to one of the claims 13 to 14, wherein said step of pumping is repeated at preset intervals.

16. The method according to the preceding claim, wherein said threshold value of the pressure is variable over time.

17. The method according to one of the claims 13 to 16, comprising a further step of assessing the outcome of the testing or of the periodical inspection by the variations of the pressure values recorded in said recording step.

18. The method according to one of the claims 13 to 17, wherein said step of connecting said pipe or equipment to said pumping means comprises the further steps of connecting said water source to an inlet section (1), said water source being apt to provide said operating liquid, and said inlet section (1) opening into said pumping means, connecting a first end of said pipe to an outlet section (2), and obstructing a second end of said pipe by closing means.

19. The method according to one of the claims 13 to 17, wherein said water source is obtained from said equipment and wherein said step of connecting said pipe to said pumping means comprises the further steps of connecting respective inlet (1) and outlet (2) sections to said equipment, making a serial connection.

20. A software for implementing the method according to one of the claims 13 to 19.

21. A software according to the preceding claim, comprising a data bank apt to the storing of pressure values obtained from different testing or periodical inspections.

22. The software according to one of the claims 20 to 21, wherein the variation of testing or inspection parameters, such as the pressure

threshold value over which the pumping is stopped, the pressure sampling frequency, the threshold within which it is signalled a test with negative outcome, occurs by identification of the operator.

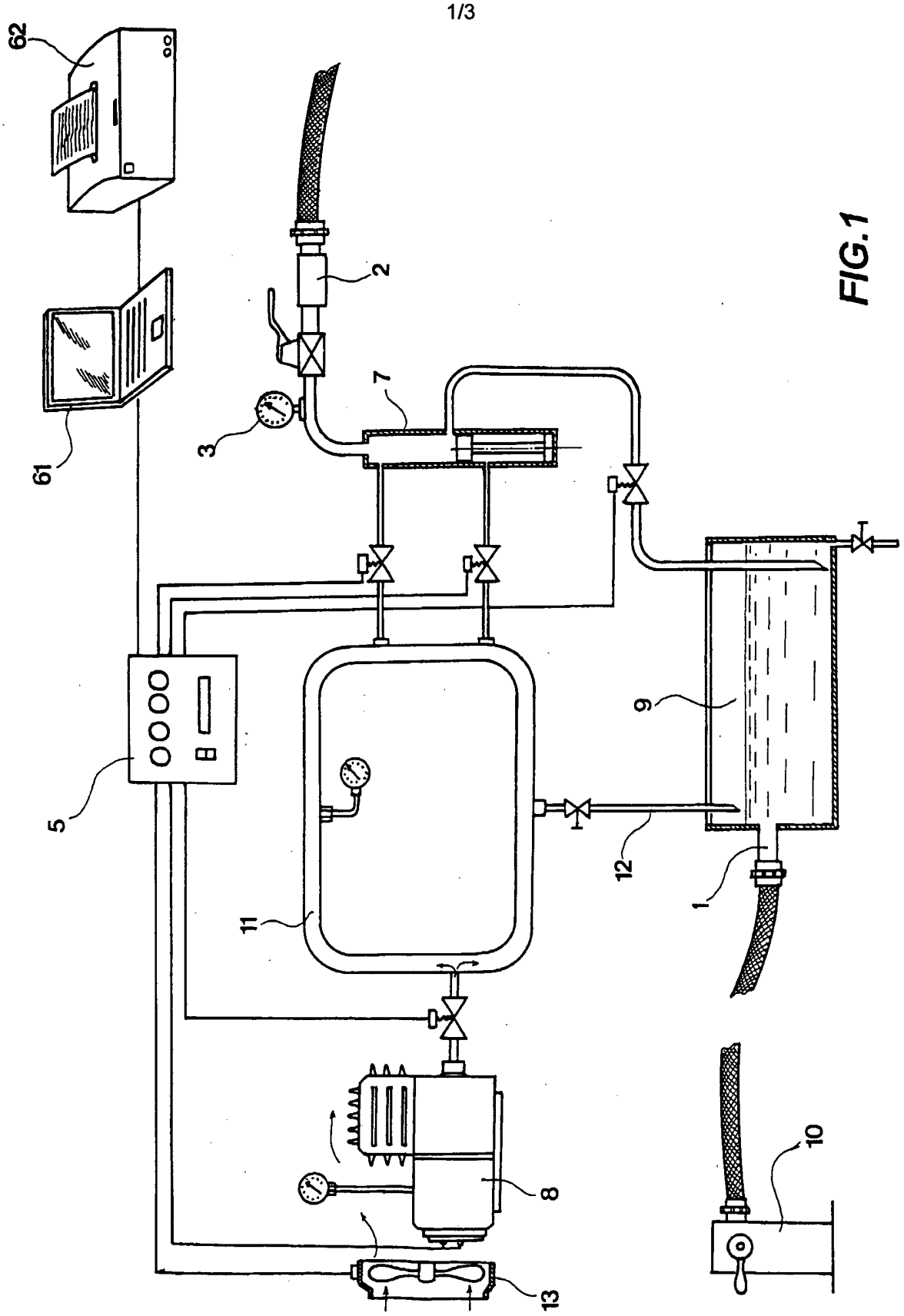

FIG.1

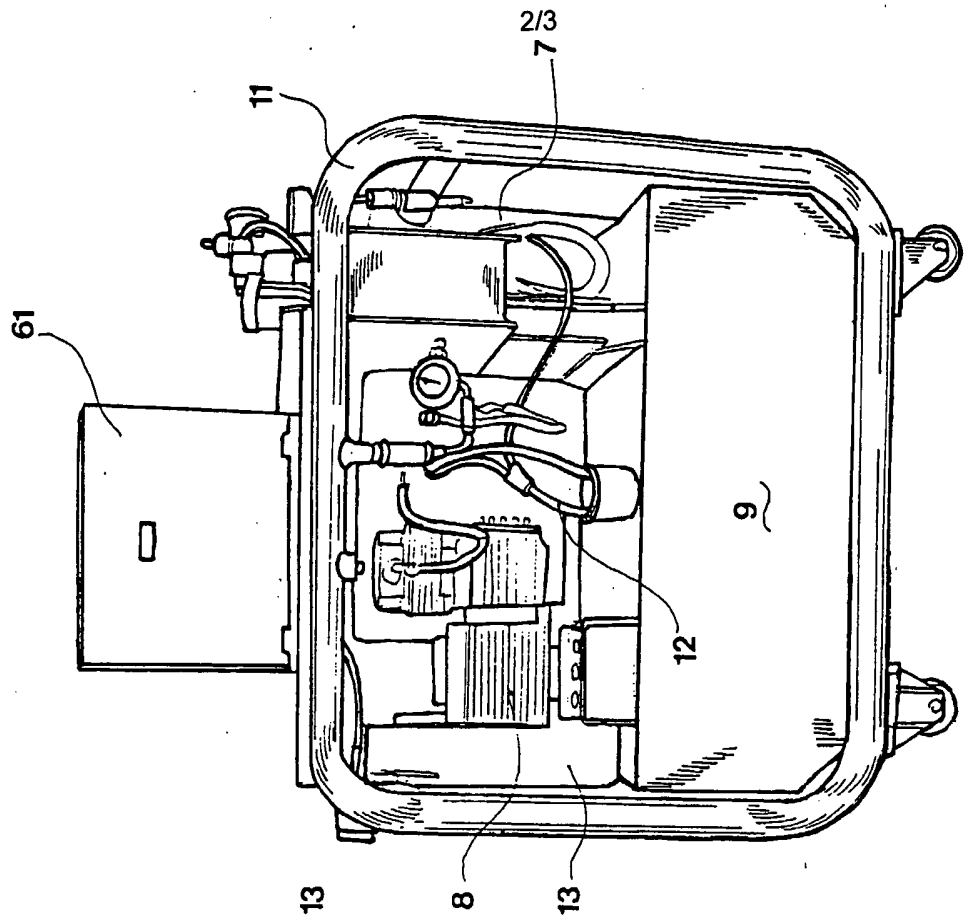

FIG.3

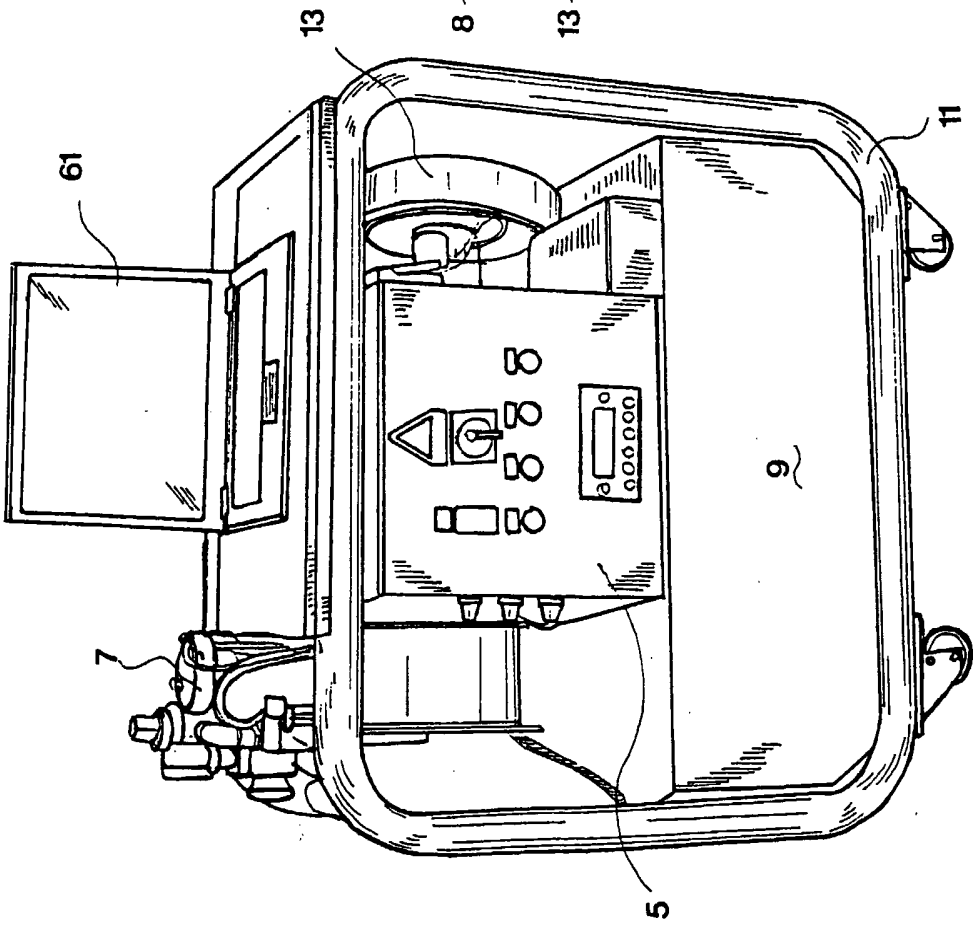

FIG.2

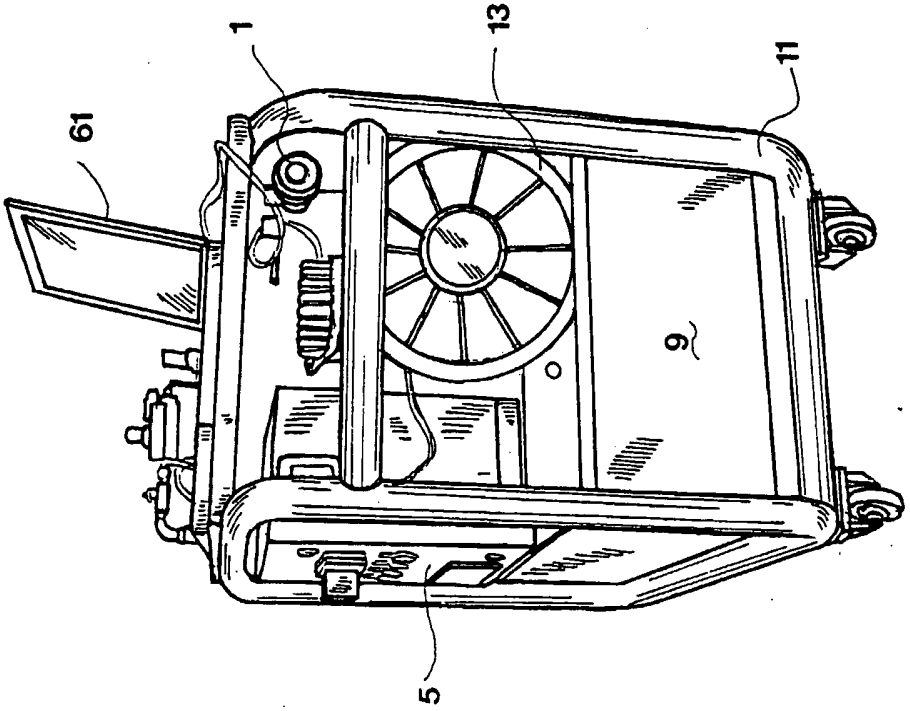

FIG.5

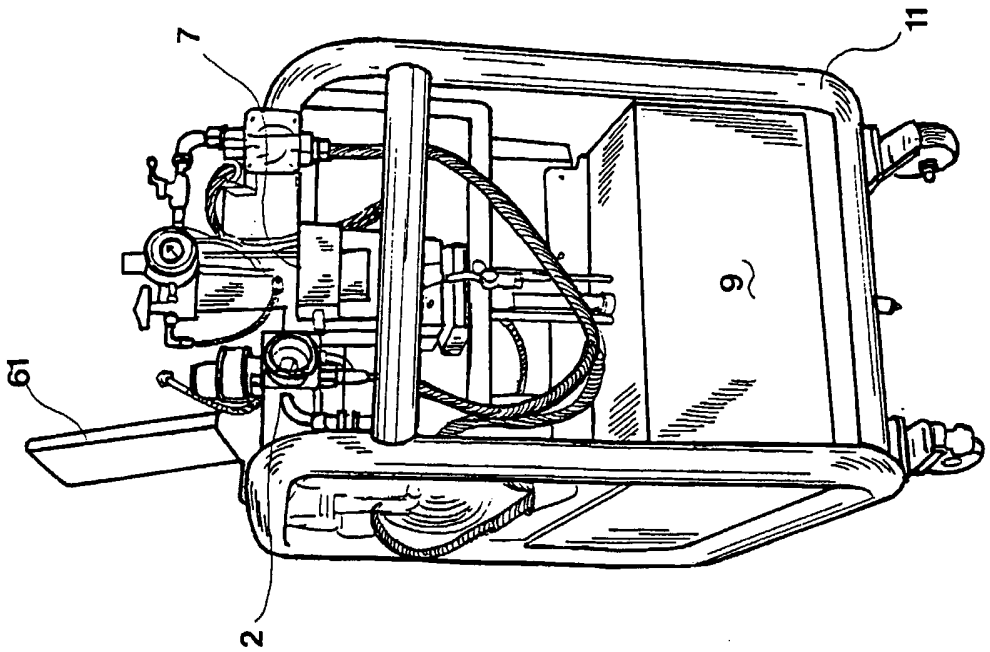

FIG.4

INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2005/000318

A. CLASSIFICATION OF SUBJECT MATTER
A62C37/50

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A62C G01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 2003, no. 12, 5 December 2003 (2003-12-05) & JP 2004 184200 A (KYOWA:KK), 2 July 2004 (2004-07-02) the whole document	1,6, 8-10,13, 14
A		12,15-22
A	US 3 975 944 A (APRILL, JR. ET AL) 24 August 1976 (1976-08-24) column 2, lines 26-28; figure 1	2
A	PATENT ABSTRACTS OF JAPAN vol. 1995, no. 05, 30 June 1995 (1995-06-30) & JP 07 035101 A (HITACHI SEIKI CO LTD), 3 February 1995 (1995-02-03) abstract	3,5

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
21 March 2006	30/03/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	van Bilderbeek, H.

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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 848 536 A (DODGE ET AL) 15 December 1998 (1998-12-15) column 4, lines 33-36 column 6, lines 1,2; figures 1,3,4	4,7,11
A	US 4 599 890 A (GIRONE ET AL) 15 July 1986 (1986-07-15) column 3, lines 9-38; figures 1,2	
A	US 5 272 646 A (FARMER ET AL) 21 December 1993 (1993-12-21) abstract; figures	

INTERNATIONAL SEARCH REPORT

nformation on patent family members

International application No
PCT/IT2005/000318

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2004184200 A	02-07-2004	NONE	
US 3975944 A	24-08-1976	CA 1045409 A1	02-01-1979
JP 07035101 A	03-02-1995	NONE	
US 5848536 A	15-12-1998	NONE	
US 4599890 A	15-07-1986	NONE	
US 5272646 A	21-12-1993	NONE	