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(54) Sandblasting machine for the superficial cleaning of any kind of object.

(57) A sandblasting machine for the superficial cleaning or sandblasting of whatever objects, particularly usable in the building field or in the carpentry.

The machine essentially consists in an under pressure tank (1) containing the sand, which feeds, through at least one hole (17) suitable to the closed, an ejection chamber (13) of the sand, which on that purpose receives compressed air by a feeding duct (21).

The machine includes also feeding equipments of the water which can be sent in alternative both into the sand tank (1) and, through proper plugging devices, into the feeding duct of the compressed air (21), when the hole (17) connecting the tank under pressure (1) with the ejection chamber (13) is closed.

By means of this machine it is possible to operate in a self-contained way the complete sandblasting cycle, beginning from the propre sandblasting, that is the throwing against the surface to be cleaned of dry or wet sand, up to the final stages of washing and drying of the said surface.

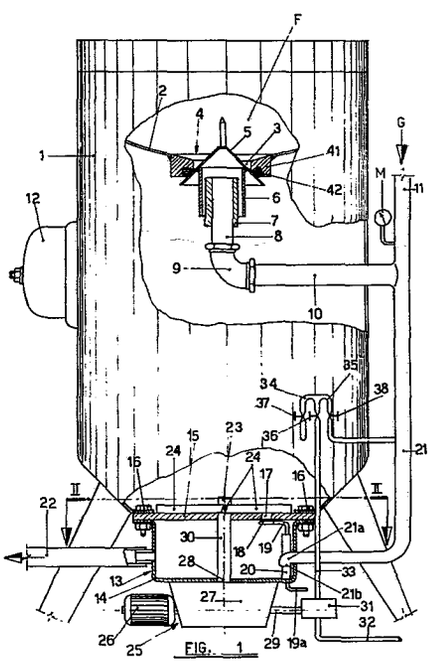

FIG. 1

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"SANDBLASTING MACHINE FOR THE SUPERFICIAL CLEANING OF ANY KIND OF OBJECTS"

The present invention relates to a sandblasting machine suitable to carry out the superficial cleaning of any kind of objects, especially in the building field, for instance the cleaning of façades of buildings, and in the heavy carpentry field, for instance in the car-bodies work, in the shipyard and similar ones.

Obviously these examples are not restrictive of the invention as the machine, owing to its versatility of uses is usable in other fields not particularly mentioned.

According to one of the basic features of the machine of the present invention, it is suitable to perform, by itself in autonomous way, without other equipments, the complete sandblasting cycle which begins with the proper sandblasting, that is the throwing of dry or wet sand on the surface to be clean and goes on to the final washing and drying operations of the surface.

The machine according to the present invention allows,

therefore, to perform, besides the sandblasting, further operations for which subsidiary equipments are generally requested, with evident great drawbacks among which the expensive costs.

Further on the machine according to the present invention allows to eliminate the drawbacks of the traditional sanders, as for instance the possibility to use normal quarry sand instead of more expensive quartzose sand and to re-use the sand already used.

The sandblasting machine in subject allows moreover the complete elimination of the powder which arises during the sandblasting as it is possible to use wet sand.

The sandblasting machine according to the present invention, including an under-pressure tank containing the sand, connected to a feeding apparatus of compressed air and provided with an exit duct of the sand, is characterized by the fact that, between the under-pressure tank and the exit duct of the sand a sand ejection chamber is interposed, which receives the sand from the tank through a drilled diaphragm suitable to be closed and it is also connected with the feeding apparatus of the compressed air, pumping devices being provided for the inlet of the water inside the tank through a first duct provided with interception means, and at last a second duct being provided with interception means as well, for the inlet of water inside the compressed air feeding duct to the ejection chamber.

The features and the advantages of the sandblasting machine according to the present invention will be clear by the following detailed specification of two not restrictive embodiments, made with reference to the

annexed figures of which:

FIGURE 1 is an assembly schematic view with parts partially broken away of a first embodiment of the machine according to the present invention;

FIGURE 2 is a sectional view of the machine taken along the section II-II of Fig. 1;

FIGURE 3 is a diagram showing a detail of the water feeding circuit of the first embodiment of the sandblasting machine;

FIGURE 4 is a side assembly view with parts partially broken away of a second embodiment of the sandblasting machine;

FIGURE 5 is a schematic side view in reduced scale of the second embodiment of the machine.

Reference will be made at first, to figures 1 to 3 for the detailed description of the first embodiment of the sandblasting machine according to the invention.

With particular reference to Fig. 1, the sandblasting machine according to the invention includes an under pressure tank, containing the sand, which consists of an essentially cylindrical body 1, provided in its upper part with a seal closing element or cover 2. The cover 2 is provided centrally with a hole 3 for the inlet of the sand into the tank 1, in the direction of the arrow F.

The hole 3 is provided in known way with a closing valve 4 suitable to close the hole 3, when compressed air is let into the tank 1.

The valve 4 consists in traditional way, of a bell-shaped substantially conical element 5 having its apex turned upward and its taper larger than the opening of the hole 3.

Inside the bell-shaped element 5 a cylindrical sleeve 6 is fastened, for instance by welding, and it is sliding upon an essentially tubular body 7 integral with the end of a duct 8 through which compressed air is let into the tank 1. The duct 8 is connected by a fitting 9 to another tubular piece 10, which is connected by a duct 11 with a compressed air feeding apparatus not shown the air being fed according to the direction of the arrow G. On the duct 11 a pressure gauge M is shunted by which the feeding pressure of the compressed air can be checked.

By 12 a known man-hole cover is shown for the closing of the tank 1 which allows to have a manual access inside this last, when inspection or maintenance are necessary.

The tank 1 is provided, at its lower end with a chamber for the ejection of the sand, indicated in its whole by 13. The ejection chamber 13 is embodied by an essentially cylindrical body 14 closed in its lower part and opened in its upper one, of which on the open base a diaphragm 15 is fixed, embodied by a disk having its diameter substantially equal to the diameter of the outline of the open base of the body 14.

The fastening of the body 14 and of the diaphragm 15 to the lower open base of the tank 1 is schematically represented by locking nuts 16, which will be fitted evenly spaced on the outline of the components to be locked. It is obvious that this fastening includes also all those sealing and clamping means not particularly shown as known to a person skilled in the art.

The diaphragm 15, as can be seen, also in Fig. 2, is provided with a hole 17 which connects the inside of the tank 1 with the inside of the ejection chamber 13 allowing

the passage of the sand from the tank into the said chamber.

The machine according to the invention includes means to close the hole 17 which consists in the illustrated embodiment of a disk-shaped element 18, shown also in Fig. 2 with dotted lines. It is fixed at the end of a Z-shaped operating rod 19 whose central part is seal revolving inside a sleeve 20 integral with the inner wall of the chamber 13. The end 19a of the rod 19 projects from the chamber 13 to allow the operating by the operator.

In that way the element 18 can be placed, as shown in Fig. 2, directly below the hole 17, preventing the sand from passing from the tank 1 to the ejection chamber 13 or moved from this position, allowing, in that way, the sand pass into the chamber 13.

With particular reference to Fig. 1, the compressed air feeding duct 11 estends below with a piece 21, whose end 21a bends downward with an exit mouth 21b of the air into the ejection chamber 13 of the sand.

The sand, under the action of the air, gets out of the ejection chamber 13 through a duct 22, at whose end a known output nozzle (not shown) of the sand will be provided.

In order to make easier the passage of the sand from the tank 1 to the ejection chamber through the hole 17, the machine according to the invention includes a rotor 23 fitted up with arms or radial vanes 24, which, during the rotation of the rotor 23, pushes the sand lying on the upper face of the diaphragm 15 towards the hole 17.

The action of the rotor 23 turns out particularly favour able when the sand is wet and, on that purpose, the control of the rotor operating is arranged preferably when this

condition occurs.

Obviously the rotor 23 can be operated also when the sandblasting machine works with dry sand. The components of the machine will be adjusted on that purpose.

In the lower part of the ejection chamber 13 a motor-reducer 25 is fixed in whatever known way, which is embodied by a driving motor 26 and a known reduction unit 27 which has two shafts coming out, respectively 28 and 29.

The motor-reducer 25 operates, by the shaft 28, the rotations of the rotor 23; the shaft 28 in fact extends with a piece 30 which passes through the ejection chamber 13.

By the shaft 29, the motor-reducer 25 operates a pump 31, which provides the sandblasting machine with water, coming from a feeding station, not shown, according to the direction of the arrow T through a duct 32.

The delivery duct 33 of the pump 31 parts in two distinct feeding ducts 34 and 35 which provide respectively the inlet of water inside the tank 1 and inside the piece 21 of the duct feeding the compressed air.

As can be seen from Fig. 1, said delivery duct 33 is fitted up with a known nonreturn valve 36 in order to assure the water reach, during the operating, the tank 1 or the duct 21.

The duct 33, by an offtake, parts at one side in the duct 34, joined by a known stop valve 37 with the tank 1 for the inlet of water in its inside. At the other side, the duct 33 extends in the second duct 35, fitted up, as well, with a known stop valve 38 which is connected with the duct 21.

As it appears from Fig. 3, this detail not being shown

in Fig. 1, on the pump 31 a by-pass circuit is provided in order to allow anyhow the operating of the pump 31 and hence the water circulation even when the valves 37 and 38 are closed.

In fact, in this condition of operating with dry sand, the water must not arrive both inside the tank 1 and inside the ejection chamber 13, but the rotor 23 must rotate all the same and therefore the motor-reducer 25 must be operated.

The by-pass which allows this working includes an offtake 39, which joints at one end with the delivery duct 33 and at the other end with the inlet duct 32, establishing in that way a closed ring inside which the water circulates in the above said conditions.

On the offtake 39 a boost control valve 40 is profitably inserted which, in the working by wet sand, allows to adjust the pressure value of the inlet of water, which therefore results different from the pressure supplied by the pump 31.

This adjustement is important, as it is necessary constantly to check the pressure of the water in comparison with the compressed air's one.

The working of the sandblasting machine according to this first embodiment is evident from the previous description, but only on purpose of clarification the basic stages are stated here below.

The loading of the sand in the tank 1 is made through the hole 3 when the compressed air is not supplied and therefore the bell-shaped element 5 is in its low position, separated from the hole 3, owing to the sleeve 6, which slides on the tubular portion 7.

When the filling of the tank 1 is made, compressed air is let, through the duct 11, in the feeding ducts 8 and 10, and its action will immediately make the bell-shaped element 5 rise up and remain firmly pressed against the inner edge of the hole 3 which, on that purpose, will be provided with seat units as that schematically shown in Fig. 1 and embodied by a ring-shaped body 41 equipped with a rubber seal 42.

The action of the compressed air will be such one as to cause the passage of the sand from the tank 1 into the ejection chamber 13 through the hole 17, which will be previously get free from the plugging disk 18.

In order to make easier said passage, the motor-reducer 25 can be started causing the rotation of the rotor 23. In this stage of working, all the valves 36, 37 and 38, which allow the feeding of the water, are closed. Being the pump 31, working, the water will circulate in the by-pass 39, 32 and 33.

The compressed air, let in the ejection chamber 13 through the duct 21,will put the machine in the position of operating with dry sand which will be projected against the surface to be cleaned, through the duct 22.

When the stopping of this working is desired in order to work with wet sand, for instance to eliminate the powder and dust developped during the sandblasting, it is sufficient to open the valves 36 and 37 so that the water can enter the delivery duct 33 and, through the duct 34, it can be inlet into the tank 1.

By the valve 40, inserted in the by-pass, it is possible anyhow to adjust the feeding pressure of the water getting free its value from the value supplied by the pump 31.

In this stage of working the action of the rotor 23 is more effective than in the previous stage as it performs a thrust on the sand towards the passage hole 17.

At the end of the proper sandblasting, that is those operations made by dry or wet sand, in the case a cleaning of the surface, that is its washing up, is desired by the user, the machine can easily be arranged as follows.

The user will provide to close the letting-in valve 37 of the water into the tank 1, to close the passage 17 disposing in front of it the disk-shaped element 18 by driving the lever 19.

In that way no more sand will arrive inside the ejection chamber 13.

At this point the valve 38 will be opened, allowing the letting in of water into the duct 21, which brings the compressed air into the ejection chamber 13 and in its inside therefore water under pressure arrives both because its own pressure and because the compressed air's one. Also in this stage of working it is possible, of course, to operate the adjusting valve 40 in order to adjust the pressure of the water.

At the end of the washing up of the surface to be treated, in the case the user wants to provide to its drying, it is sufficient to close the valve 38 stopping, in that way, the feeding of water into the chamber 13, which only the compressed air will arrive to, through the duct 11 and 21. The sandblast will provide only compressed air through the duct 22.

During this stage of working it is advisable to stop the input of the motor-reducer 25 as the rotation of the rotor 23 is no longer necessary, nor the feeding of water.

Obviously, the working stages above specificated can take place in a different order from that above related, according to the user's specific requirements, that he must fulfil, getting extremely versatile the machine according to the present invention, and adaptable one to whatever requested processing.

The sandblasting machine according to the invention, in its second embodiment, is particularly suitable to carry out the cleaning of metallic surfaces, and, therefore, for being used by a car body maker in the restoration and/or maintenance of a motor-vehicle.

It is known that a damaged car which had an accident, has to undergo a restoration process of its body whose basic peculiarity is a perfect cleaning of the metallic surface specially in those areas in which the metal presents more or less complex folds and very deep receding zones which are difficult to approach.

At present the said cleaning is defective and it is made by means of emery papers, by the worker who scratches manually the deformed surface as far as possible.

The imperfect cleaning of the metallic surface prevents a proper application of the so called body stopper, by which the surface of the car body is smoothed before the painting.

The sandblasting machine according to the invention, in this second embodiment, with reference to Figs. 4 and 5, comprises a tank for the sand 1, which is provided, in its uppert part, with a hole for the inlet of the sand to which a shutter is joined, suitable to seal close said hole when compressed air is inlet into the tank 1 through a pipe 10 connected with an adducting duct of compressed

air 11, coming from a suitable feeding station according to the direction of the arrow G.

The above-mentioned shutter of the tank 1, is completely described with reference to the first embodiment.

On the feeding duct of the compressed air 11, a pressure-gauge M for measuring the pressure of the air inlet into the tank 1 and an air valve S are provided.

With the tank of the sand 1 a tank for the water 1a is joined, seal closed as well, which, separated from the tank 1, is fixed to it in known way, for instance by fastening flanges 41.

The tank 1a is connected, by a pipe 42 provided with an air valve 43, to the tank 1 so that, when the sand tank is put under pressure by feeding compressed air through the pipe 10, the water tank 1a is put under pressure as well. Obviously the said water tank will be provided with a valve device 60 suitable to allow its filling with water before its setting under pressure.

The water tank 1a is provided in its lower part, with a pipe 44, fitted up with a known interception valve 45 for the inlet of water into a delivery duct 46 to which, as later on will be specificated, sand and water arrive as well. The delivery duct 46 is provided at its end with a not shown output nozzle, which is fit to allow the throwing of the mixture sand-water in the direction of the arrow U.

The delivery duct 46 is connected, through a pipe 47, with the duct 11 bringing the compressed air, below the shunt 10 which inlets the said air into the tank 1.

On the bottom of the sand tank 1, a closing plate 15 is seal-fixed, which can be locked as specificated and

shown with reference to the previously described embodiment, which is provided with a hole 17 for the coming out of the sand towards a T shunt 48 joining the pipe 47 bringing the compressed air with the delivery duct 46 and with a share of pipe 49 which receives the sand from the hole 17.

At the hole 17 for the coming out of the sand, is connected an hand operable shutter, like that specificated in the application for the first embodiment, essentially embodied by a proper shutter device 18, fit to be placed or not, upon the hole 17, which is hold by a substantially S-shaped driving rod, whose central branch 19 is rotating inside a passing-by hole of the closing plate 15, by appropriate seal equipments. The driving rod has a radialward projecting part 19a from the tank 1 for the operating of the shutting device 18.

Inside the tank 1, only a little over the inner surface of the plate 15 in order to allow the movements of the shutting device 18, a rotor 23 fitted up with radial arms or vanes is provided which during its rotation, push on the sand situated on the upper face of the plate 15, towards the hole 17.

According to the present invention, at least one of the radial vanes 24 of the rotor 23 is provided with an appendix bended upward, substantially in contact with the inner truncated conical wall of the tank 1, marked 50, which is suitable to embody substantially a scraping device of the said surface for the removal of possibly stiked sand at this surface, bringing it, in this way, towards the bottom of the tank 1.

The rotor 23, whose shaft 30 is seal-passing through

a hole of the shutting plate 15, is driven through a reducer 27 fixed at the plate 15, by a driving motor 26 fixed by means of a flange to the tank 1.

The operating of the machine, according to the invention, is extremely simple.

A first the filling up of the sand tank 1 is provided and of the water' one 1a as well.

Compressed air is inlet through the duct 10, 11 into the tank 1 and through the shunt 42, the water tank 1a is set under pressure. In this first stage the shutting device 18 of the sand lies over the exit hole 17 and the valve 45 is closed.

Also a valve 51 inserted on the duct 47 of the compressed air will be obviously closed.

In order to start the machine, simultaneously the valve 51 of the compressed air and the valve 45 of the water will be opened and the shutting device 18 will be displaced. In such a way, at the same time compressed air, water and sand are inlet in the delivery duct 46 and their flows can be adjusted by the respective valves;

At the same time the motor-reducer 26, 27 will be started in order to make the rotor 23 rotate.

Hence a facility in using the machine, especially as regards the metering of the flows of water and sand, according to the user's specific requirements, flows which do not require too great power and on that purpose, the pressure of the compressed air may be simply the available one at any car-body maker's and he will not be obliged to purchase a special compressor generally more expensive than the sandblasting machine itself.

Obviously the machine can work also with dry sand by

closing the interception valve 45 and inletting therefore into the delivery duct 46 only compressed air and sand.

A final cleaning can be made at last, by closing the shutting device 18 too, inletting therefore into the delivery duct 46 only compressed air.

As particularly shown in Fig. 4 the piece 49 of the T shaped shunt, which connects the delivery compressed air is fitted up with a swelling so as to embody substantially a little chamber inside which the sand can expand before falling down in the delivery duct 46. This allows to obtain a limited turbulence of the sand and its uniform spreading in the duct 46.

It is obvious that changes and/or modifications can be made to the sandblasting machine according to the present invention, without departing from the protective scope of the invention itself.

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CLAIMS

1. Sandblasting machine, including an under pressure tank containing sand, connected with a compressed air feeding station and provided with a delivery duct of the sand, characterized by the fact that, between the tank under pressure (1) and the delivery duct (22) of the sand, an ejection chamber (13, 48) of the sand is interposed, which receives the sand from the tank (1) through a perforated diaphragm (15) fitted to be plugged, said chamber being connected with the compressed air feeding station, means being provided for the supply of water at least to the feeding duct (21) of compressed air to the ejection chamber (13).

2. Sandblasting machine according to claim 1, characterized by the fact that it includes pumping devices (31) for the inlet of water into the tank (1) through at least a first duct (34) provided with plugging equipments (37), a second duct (35) at least being provided, fitted up with plugging equipments (38) as well, for the inlet of water into the duct (21) feeding with compressed air the ejection chamber (13).

3. Sandblasting machine according to claim 1, characterized by the fact that said ejection chamber (13) is fixed to the lower base of the tank (1) by the interposition of an essentially disk-shaped body (15) fit to embody the said diaphragm which is eccentrically provided with at least a hole (17) for the passage of the sand from the tank (1) into the ejection chamber (13), said hole (17) being provided with plugging equipments (18).

4. Sandblasting machine according to claim 3, characterized by the fact that said plugging equipments include a

plugging device (18) which is integral with a control lever (19) having a part seal-rotating inside a sleeve (20) placed inside the chamber (13) and an end part (19a) placed outside the chamber (13) fitted up to control the movement of the plugging device (18).

5. Sandblasting machine according to claims 1 and 3,characterized by the fact that, inside the tank (1) substantially above the diaphragm (15), a rotor (23) is provided with radial vanes (24) suitable to rise the sand up over the hole (17), said rotor (23) being driven by a motor-reducer (25).

6. Sandblasting machine according to claims 1 and 5, characterized drive a pump (31) for the feeding of the sandblasting with water.

7. Sandblasting machine according to claims 1 and 6, characterized by the fact that the pump's (31) delivery duct (33) branches out in a first duct (34) connected with the tank (1) for the inlet of water inside the latter and in a second duct (35) connected with the duct (21) feeding compressed air to the ejection chamber (13) for the inlet of water inside this last.

8. Sandblasting machine according to claims 1 and 6, characterized by the fact that the pump (31) is provided with a by-pass (39, 32, 33) on which a valve (40) is inserted for the adjustment of the pressure of the water.

9. Sandblasting machine according to claim 1, characterized by the fact that it includes, joined with the sand tank (1), a water tank (1a) under pressure as well, the delivery duct (46) for the ejection of the sand being connected with the tank (1) through a shunt placed in correspondence of the said exit hole (17),and with

the water tank (1a) through another shunt (44) provided with plugging equipments, said two shunts being joined with a duct (47) bringing compressed air.

10. Sandblasting machine according to claim 9, characterized by the fact that said water tank (1a) is connected, through a pipe (42) with the inside of the sand tank (1).

11. Sandblasting machine according to claim 9, characterized by the fact that said shunt (49) for the coming out of the sand from the sand tank (1) is in its lateral surface swelled outward defining a chamber fit to allow a light swire of the sand.

12. Sandblasting machine according to claim 5, characterized by the fact that the rotor (23) provided with radial vanes (24) has at least one of said vanes provided with an appendix (50) extending substantially as far as to touch the inner lower lateral surface of the sand tank (1).

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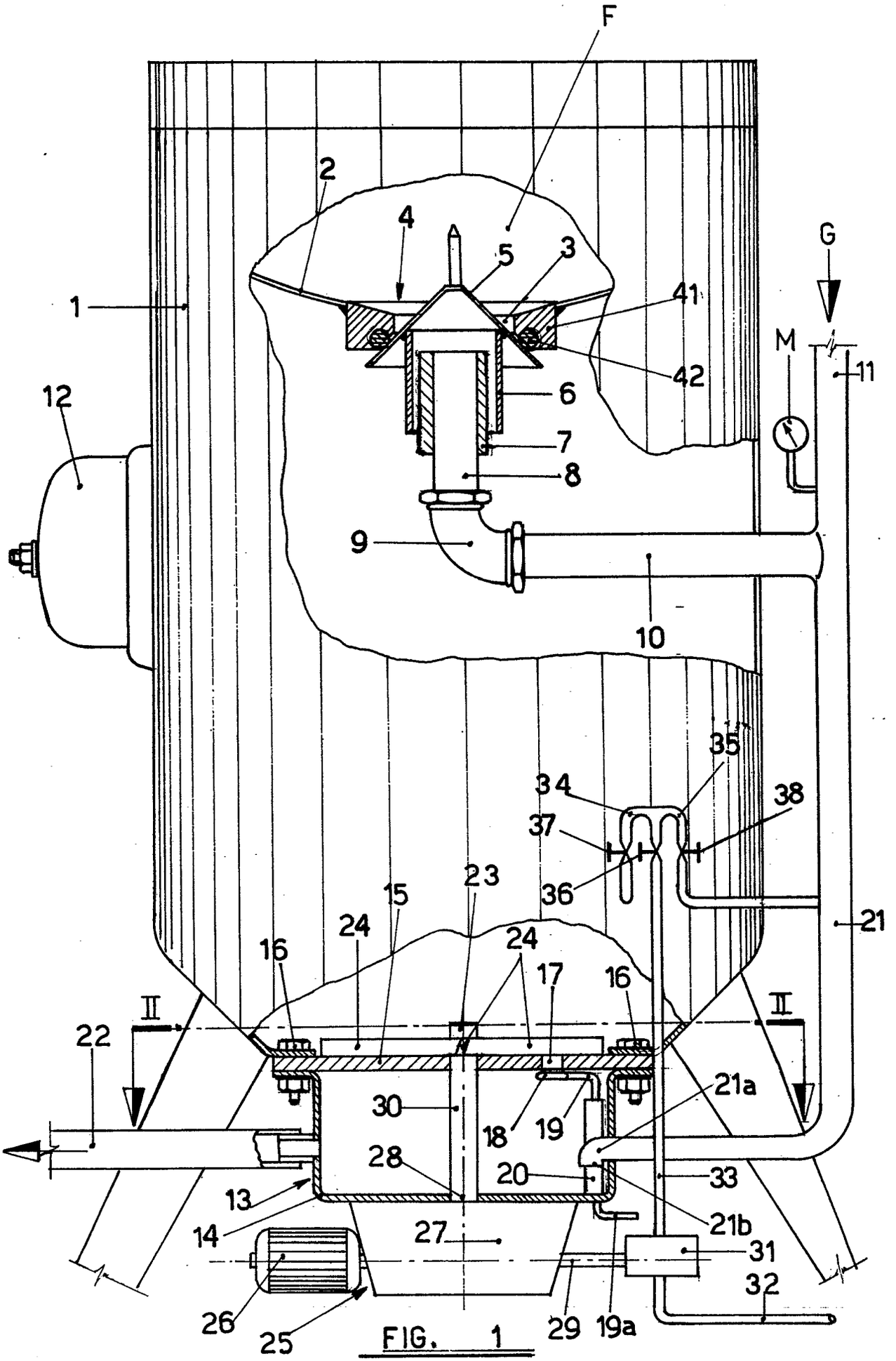

FIG. 1

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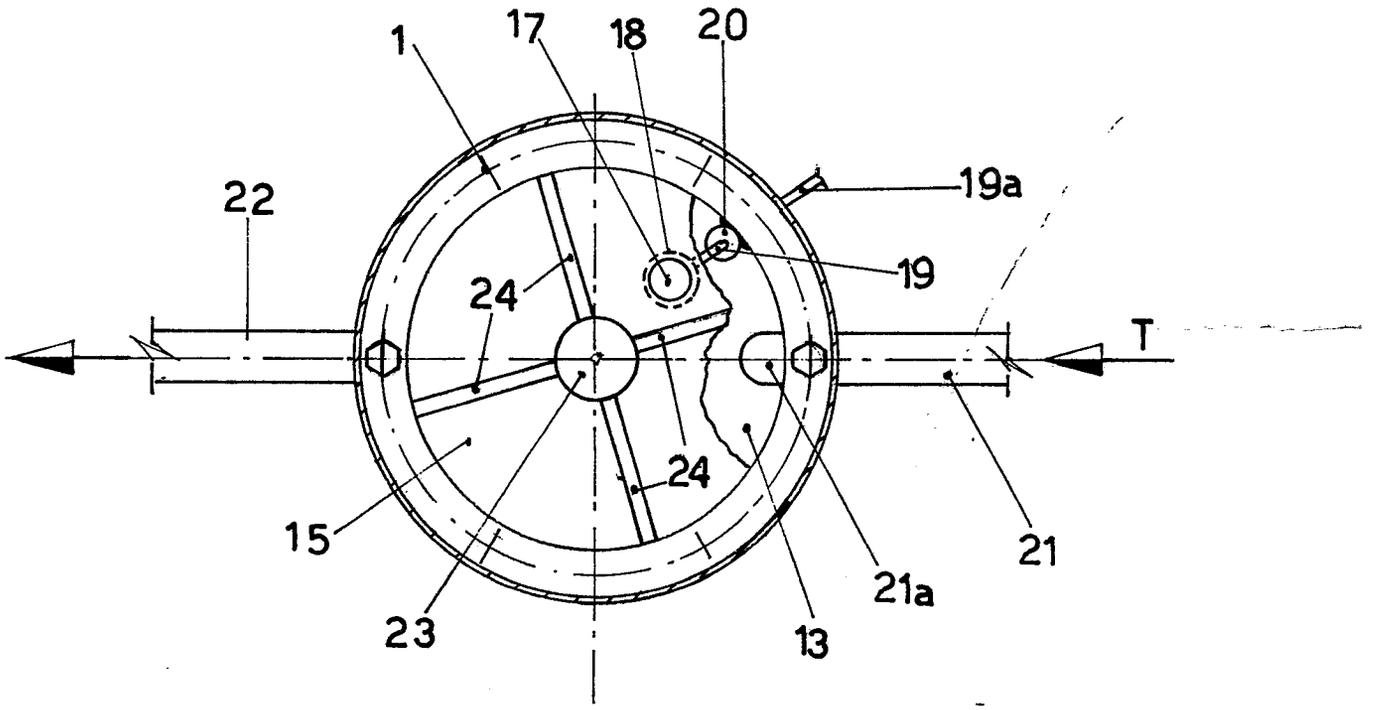

FIG. 2

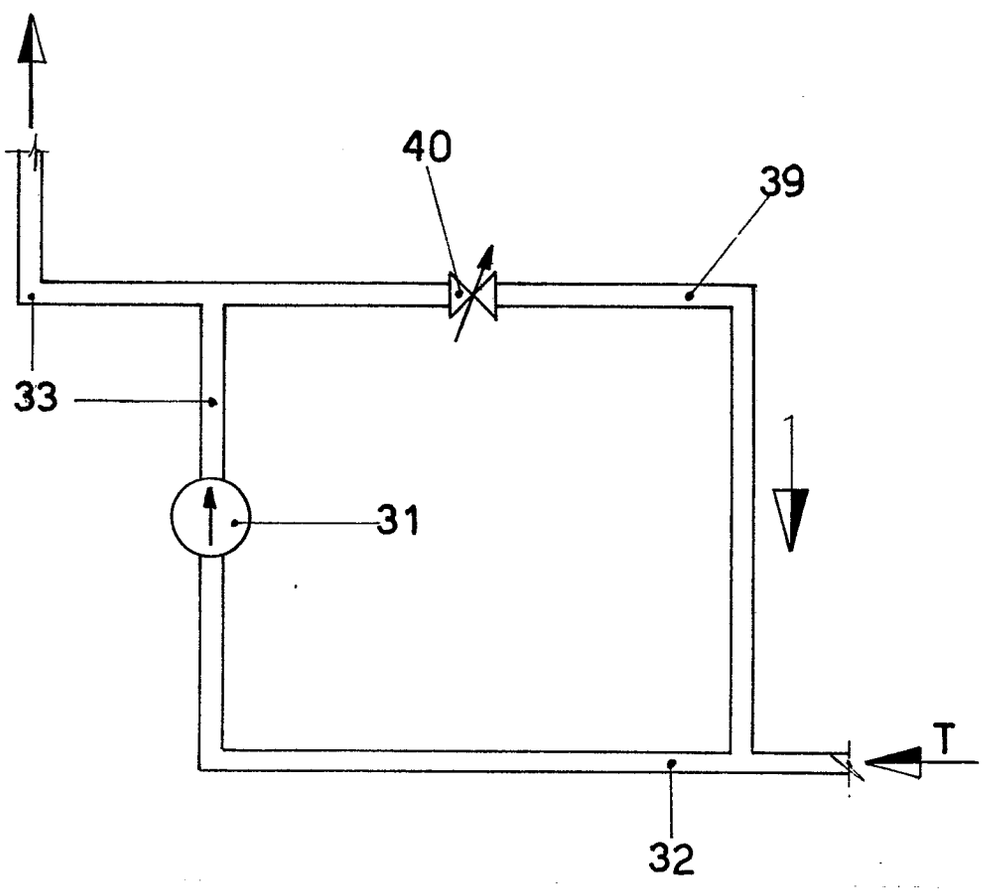

FIG. 3

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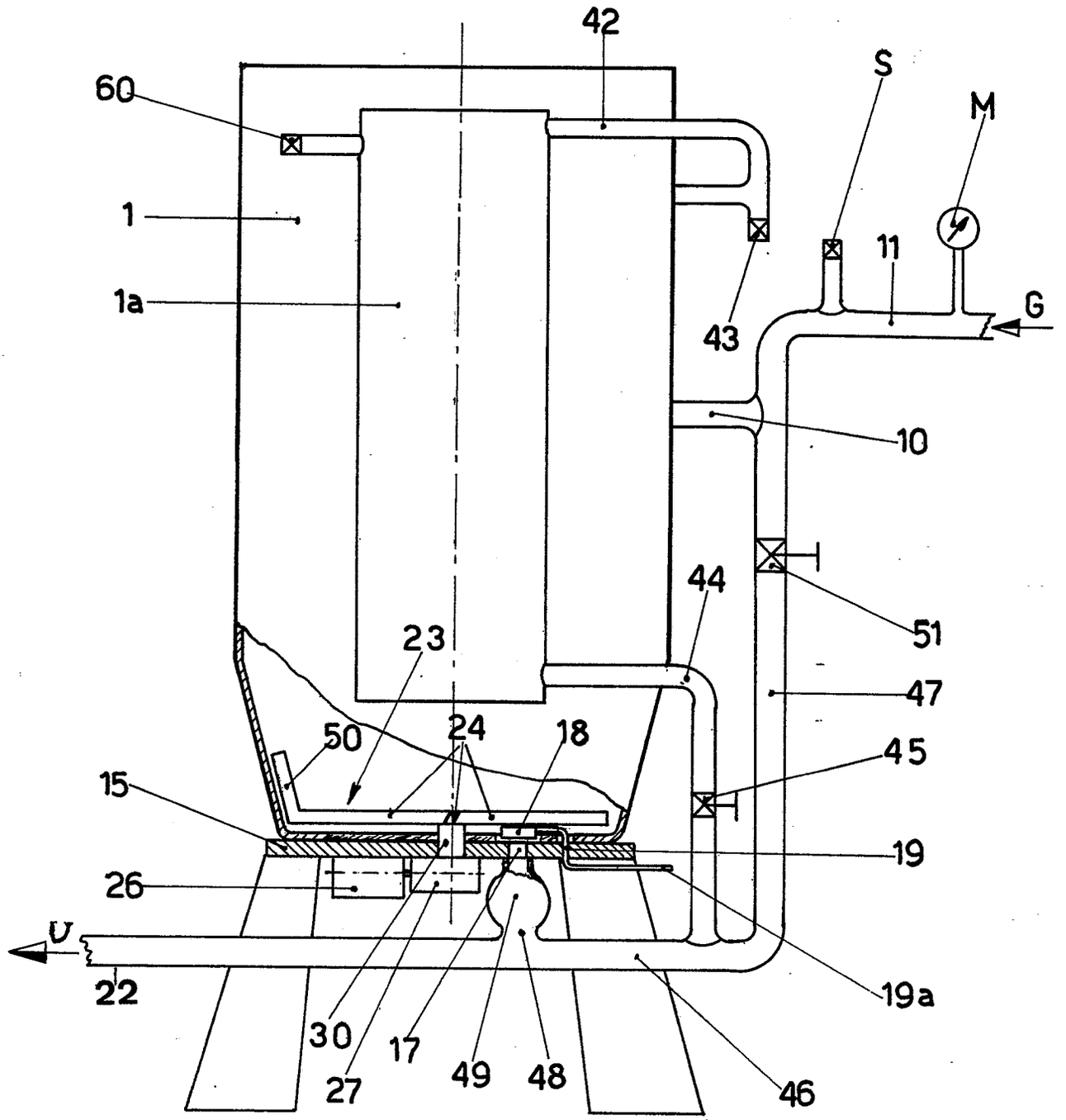

FIG.4

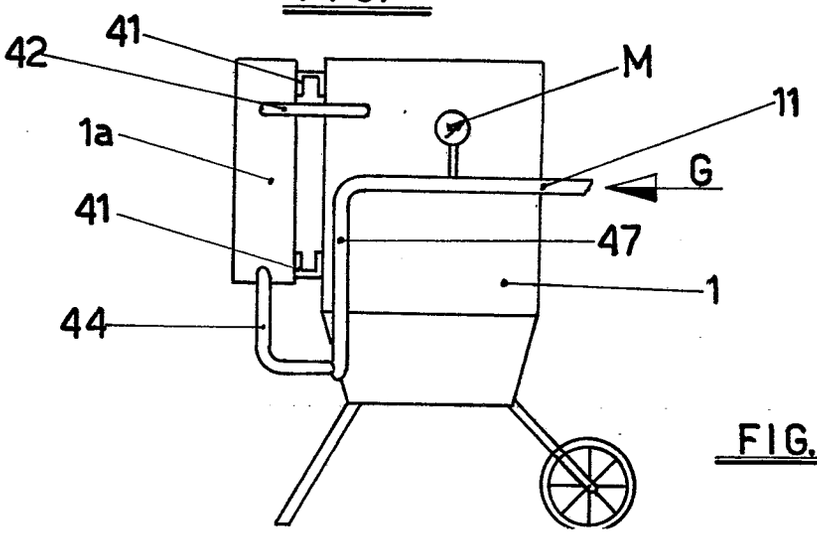

FIG. 5