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EUROPEAN PATENT APPLICATION

- (43) Date of publication:
16.10.2024 Bulletin 2024/42

(21) Application number: 24166171.9

(22) Date of filing: 26.03.2024
- (51) International Patent Classification (IPC):
B05B 15/55 (2018.01) B05B 15/555 (2018.01)
B05B 12/06 (2006.01) B05B 14/00 (2018.01)
B05B 7/24 (2006.01)

(52) Cooperative Patent Classification (CPC):
B05B 15/55; B05B 12/06; B05B 14/00;
B05B 15/555; B05B 7/2478

- (84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: 05.04.2023 IT 202300006651
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SYSTEM FOR WASHING AIRBRUSHES

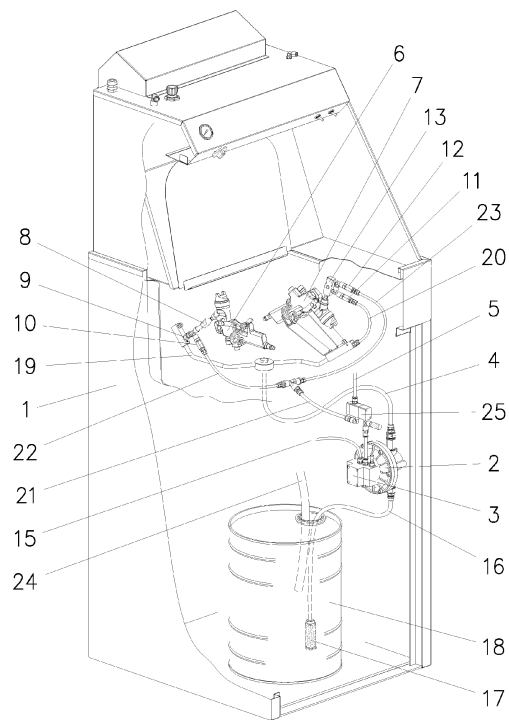
(57) System for washing airbrushes, comprising a pipe (19, 20) for feeding a pressurized detergent liquid to a dispensing nozzle (8, 13) adapted to be placed in fluid communication with the internal duct of the paint channel of an airbrush (6, 7).

Said system being provided immediately upstream of the dispensing nozzle (8, 13) with a first valve holder fitting (9, 11) placed as derivation with respect to a second valve holder fitting (10, 12); the first fitting (9, 11) being dedicated to feeding with detergent liquid coming from the pipe (19, 20) to the dispensing nozzle (8, 13), the second (10, 12) being dedicated to feeding the dispensing nozzle (8, 13) with compressed air coming from a pipe (22, 23) at a pressure higher than that of the detergent liquid.

It being provided that inside the fitting (9, 11) for feeding detergent liquid there is a shutter (9') with a non-return function when compressed air reaches the dispensing nozzle (8, 13) through the fitting (10, 12) and, inside the fitting (10, 12) for the compressed air supply, a shutter (10') is placed with a non-return function when detergent liquid arrives through the fitting (9, 11) from pipe (19, 20) and the flow of compressed air is interrupted.

Means being also provided for generating pulses of compressed air upstream of said pipe (22, 23).

FIG. 2



Description

[0001] The present invention concerns a system for washing airbrushes (also called "spray guns") for painting motor vehicles, according to the general part of claim 1. The present invention further concerns a washing machine for washing airbrushes and a process for washing airbrushes.

[0002] As is well known, when in a body shop it is necessary to clean the dirty airbrushes used for painting the car, equipment is used that automatically or manually allows this operation to be carried out, which is necessary for the reuse of said devices.

[0003] Normal airbrushes used for applying enamel for vehicle body painting are equipped with two mouths or nozzles with threaded or quick-grip connections, one of which is used to convey the paint enamel to be applied to the paint passage channel of the device and the other to send the compressed air to the compressed air passage channel of the device to obtain correct nebulization of the enamel. Once the vehicle painting operation has been completed, the airbrush is disconnected from the paint and compressed air supply sources to undergo the cleaning necessary for its effective reuse. The airbrush washing operation is carried out by connecting the paint passage channel of the airbrush to a supply source of detergent liquid, placing it below the "nebulizer" nozzle of the detergent liquid and activating the control trigger of the airbrush, so as to allow the detergent to pass through the internal channel and the nozzle. The feeding to the "nebulizer" nozzle is guaranteed by a small pneumatic or electric pump, which sends the detergent liquid under pressure to the nozzle, which nebulizes the product.

[0004] The state of the art provides various types of equipment for washing airbrushes, composed of mixed cycle equipment in which in the initial phase the pre-washing of the airbrush and its parts is carried out automatically and in the final phase washing and rinsing are manual, or carried out by equipment in which all the phases, prewash, final wash and rinse are carried out manually.

[0005] In all types of existing washing equipment, the airbrush is currently dismantled, and its components are placed on a surface created inside a casing equipped with a washing tank and which can be closed using a door. Inside the washing tank there is a series of nozzles oriented appropriately which nebulize the product used for cleaning and direct it onto the components of the airbrush to be washed. The cleaning product can be an ecological detergent, or a mixture composed of thinners or liquid solvents often containing toxic, harmful, and flammable chemical compounds such as acetone and its derivatives. The detergent liquid is conveyed to the nozzles under pressure by means of special pneumatic pumps, generally diaphragm, but also electric, which suck the liquid from a tank located inside the casing below the washing tank. The sprayed liquid under pressure acts

on the components of the airbrush deposited in the tank and subsequently, by gravity, settles to the bottom of the tank from which, through a discharge pipe, it returns to the tank, bringing with it the paint residues removed in the washing process. The cycle of suction, washing and return to the tank is repeated several times automatically so that the washing product is used to clean a variable number of spray guns until the quantity of paint residue contained in the cleaning liquid is so high that it does not allow it to be used any longer and therefore the tank containing the used liquid is replaced by a tank with uncontaminated liquid.

[0006] At the end of the automatic washing operation, these components are then treated by manually washing, using a nozzle which is fed with non-polluted detergent liquid, taken from a second container which can also be placed inside the casing of the equipment. In the manual washing phase, the nozzle used is powered by a system that works using the Venturi effect, which requires a considerable quantity of compressed air to generate the depression necessary to obtain a fine atomization of the cleaning liquid.

[0007] In existing manual washing equipment, currently the airbrush is dismantled, and its components are placed on a surface created inside a washing tank. Inside this tub there is a brush with which the various components are cleaned.

[0008] This process involves the need to carry out a final washing operation to be carried out with non-polluted detergent liquid which is sprayed on the component by means of a special nozzle which nebulises the clean detergent liquid using the Venturi effect.

[0009] In the context of the state of the art, a first method for washing airbrushes, without dismantling them, consists in depositing the airbrush inside the tank and inserting a dispensing nozzle inside the hole of the paint channel.

[0010] A second cleaning method without disassembly always involves placing the airbrush inside the tank and placing a delivery nozzle directed upwards, so that it also acts as a support for the airbrush, so that said delivery nozzle can be inserted in the hole of the paint channel.

[0011] With traditional washing systems, in which the nozzle is introduced into the hole of the paint channel, the washing liquid is injected with a small pressure inside the airbrush, but is unable to completely clean all the cavities inside where the paint passes, so traces of the paint may remain, which can create problems when it is necessary to change the colour of the paint to be applied in a subsequent painting.

[0012] To increase the effectiveness of cleaning, some state-of-the-art systems employ the use of compressed air.

[0013] The most important document of the state of the art is the Italian patent 101997900596667, which describes (the references in brackets concern this document) an automatic and manual washing apparatus with variable operation for spray guns (airbrushes) which in-

cludes a tank washing chamber (10) inside which the airbrushes to be cleaned are placed. This tank (10) includes inside an arrangement of ducts (11) for the distribution of the washing fluid and is equipped with nozzles (12) designed to hit the airbrushes with their crossed jet.

[0014] The nozzles (12) are supplied by pumps (16, 17) with a cleaning liquid and can also receive compressed air via a duct (41). This configuration allows for alternating the introduction of small quantities of liquid and repeated alternating quantities of air into the ducts (11). The combined use of detergent and compressed air allows you to exploit both a chemical and mechanical action for cleaning the airbrushes.

[0015] However, the cleaning obtained using equipment of this type is not optimal since the compressed air is introduced into a duct which is occupied by cleaning liquid and therefore there will be a delay in the generation of a compressed air pulse which, before reaching the nozzles, will have to empty the duct from the detergent.

[0016] The faster the alternation between cleaning liquid and compressed air, the better the cleaning.

[0017] The washing system of the present invention differs from current systems in that it exploits a very rapid alternation between detergent liquid and compressed air to obtain optimal cleaning which allows complete and integral cleaning of the paint passage channel of the airbrush. Furthermore, the washing system of the present invention does not require disassembly of the internal components of the airbrush, resulting in a considerable saving of time, as disassembly and reassembly are not necessary.

[0018] The aim of the present invention is to create a system for washing airbrushes for painting vehicles, in particular for painting their bodywork, which allows for better cleaning than known systems.

[0019] A further purpose of the present invention is to provide a washing machine for washing airbrushes with a cleaning efficiency superior to those known in the art.

[0020] A further object of the present invention is to provide an optimal process for washing airbrushes.

[0021] Specifically, the aim of the invention is to create a system which, by means of a particular circuit, allows the washing phase to be carried out effectively, without the need to dismantle the airbrush. This is achieved by combining the use of cleaning liquid with compressed air coming from a separate duct with a particular frequency intermittently, thus achieving a complete cleaning of all traces of paint present inside the airbrush after painting.

[0022] The system is based on the principle of having two separate circuits, one for the detergent liquid and the other for the compressed air, in order to inject the detergent liquid and the compressed air in the following way after introducing the dispensing nozzle into hole of the paint channel of the airbrush:

- Phase I: by means of a special circuit for the liquid only the detergent is injected in the airbrush body;
- Phase II: by means of a special pneumatic circuit,

compressed air is injected intermittently into the body of the airbrush at a pressure much higher than that with which the liquid is injected.

[0023] These phases are repeated alternately several times - liquid, compressed air, liquid, compressed air and so on - so as to allow the compressed air to push the cleaning liquid in all directions, thus obtaining a perfect washing of the internal parts which have been in contact with the paint. It is of the utmost importance that the compressed air is injected into the dispensing nozzle for very short periods and discontinuously, so as to create pulses with consequent pressure waves that amplify the washing effect. The compressed air pulses, in combination with the liquid present inside the paint channel, generate repeated overpressures which cyclically allow the cleaning liquid to reach even the smallest points and interstices inside the airbrush, which are normally not achieved with the sole injection of detergent liquid, as in current known systems.

[0024] To obtain this result, the two circuits, of the detergent liquid and the compressed air, must not allow the two fluids to mix in their respective dispensing phases.

[0025] In a first construction method, designed to wash a single airbrush, the washing equipment is equipped with a pump, for example pneumatic or electric, which conveys the detergent liquid, sucked from one or more containers or vessels, by means of a rigid or flexible pipe to the dispensing nozzle. Before reaching the dispensing nozzle on the section of pipe, located upstream of the dispensing nozzle, a second duct is branched off from which the compressed air arrives alternately. At least a pair of one-way valves placed inside special fittings prevents the detergent liquid from entering the compressed air circuit when phase I is activated and similarly, when phase II is activated, compressed air from entering the compressed air circuit. In the detergent liquid supply circuit. Compressed air pressure pulses can be generated, for example, as follows:

- automatically by means of a valve powered by the compressed air circuit and driven directly by a distribution valve which cyclically activates a diaphragm pump used for dispensing the detergent liquid;
- autonomously by means of an oscillating valve which cyclically sends the air coming from the compressed air pneumatic system or from a tank that can be recharged;
- manually using a push button control or other compressed air device coming from the fuel system. In this case a less efficient result is obtained from a cleaning point of view.

[0026] In any case, different means for generating compressed air pulses can also be used for the purposes of the present invention. The aforementioned solutions are cited by way of example and not by way of limitation.

[0027] In a construction variant, designed to wash a

pair of spray guns at the same time, the washing equipment is also equipped in this case with a pump, for example electric or diaphragm, which conveys the detergent liquid, sucked from a container, by means of a rigid or flexible pipe equipped with a three-way connection, to the dispensing nozzles. Even in this construction variant, before reaching the dispensing nozzle for each pipe located upstream of each nozzle there is a branch from which the compressed air arrives alternatively. One or more one-way valves placed in a specific position in the two pipes prevent the detergent liquid from entering the compressed air circuit when phase I is activated and similarly, when phase II is activated, the compressed air from entering in the detergent liquid supply circuit. Even in this construction variant, the compressed air pressure pulses can, by way of example, be generated as indicated above.

[0028] In summary, the substantial difference of the airbrush washing system referred to in the invention compared to similar known systems consists in carrying out the washing process using detergent liquid and compressed air with alternating pressure pulses very quickly. The intermittent supply of compressed air in specific cycles obtained from a pulse generator allows the air pressure waves necessary to obtain the nebulization of the cleaning liquid, the flow of which can be continuous or intermittent, to be created inside the paint channel of the airbrush.

[0029] A system that has a circuit configuration similar to a system of the invention is disclosed in the US patent US4485840A, in which it is described (the references in brackets concern this document) a system for the production of a two-component adhesive comprising two pipes (45, 51) for the feeding of two pressurized liquids ("water", solvent) to a manifold (49) connected via a duct (55) to a static mixer (57) in turn connected via a duct (59) to a dispensing nozzle (61) suitable for dispensing the two-component adhesive. One-way valves (47, 53) are provided between the pipes (45, 51) and the manifold (49). A further pipe (76) is also provided for supplying compressed air to the manifold (49) and also in this case there is a one-way valve (77) between the pipe (76) and the manifold (49). The one-way valves prevent the fluid (water, solvent, air...) from entering pipes not dedicated to it. Means (78) are also provided for generating pulses of compressed air upstream of said further pipe (76).

[0030] The configuration of the system disclosed in patent US4485840A is not dedicated to cleaning airbrushes and furthermore includes a manifold to receive liquids and compressed air so that these mix before reaching the dispensing nozzle. The main purpose of the presence of compressed air in this system is to allow the expulsion of washing liquids from the manifold.

[0031] Due to the presence of the manifold it is clear that at the outlet of the dispensing nozzle there will be a mixture of compressed air and liquids. Furthermore, even if you wanted to obtain an alternation between liquids and compressed air, you would still have the presence

of the manifold which would have to fill before letting the fluids contained in it exit towards the dispensing nozzle and in any case, all the liquid included in the pipe that connects the manifold to the dispensing nozzle should be expelled before obtaining an output of compressed air only.

[0032] A system of this type is therefore not suitable for application to airbrushes.

[0033] Another system that has a similar circuit configuration is described in US patent US4073664A. Also in this case a system of this type cannot be applied to the cleaning of airbrushes. The supply of detergent and compressed air cannot be smooth and fast enough to ensure adequate cleaning.

[0034] Further advantages and characteristics of the invention will be more evident from the description of one of its possible embodiments, provided by way of non-limiting example only, with the help of the attached drawing tables where:

- the fig. 1 represents the state of the art with a general perspective view of an example of a system for washing an airbrush;
- the fig. 2 represents a general perspective view of the washing system according to the invention for cleaning a pair of airbrushes with the connecting pipes and a support for supporting the second airbrush;
- the fig. 3 represents a perspective view of an airbrush and the components that make up the system for washing airbrushes according to the invention;
- the fig. 4 represents a perspective view of a construction variant consisting of a system according to the invention consisting of a pair of airbrushes arranged in a different way compared to that illustrated in the previous figures;
- the fig. 5 represents a particular perspective view of the components that make up a system for washing airbrushes according to the invention;
- the fig. 6 represents a particular perspective view of a construction variant of a system for washing airbrushes according to the invention;
- the fig. 7 represents a sectional view of a system for washing airbrushes according to the invention during phase I of the washing process, i.e. when the dispensing nozzle is fed only by detergent liquid;
- the fig. 8 represents a sectional view of a system for washing airbrushes according to the invention during phase II of the washing process, i.e. when the dispensing nozzle is powered only by compressed air;
- fig. 9 represents a perspective view of exemplary components present in a cleaning system with automatic feeding mode according to the invention;
- fig. 10 represents a perspective view of a construction variant in which exemplary components present in a cleaning system with autonomous power mode according to the invention are illustrated;
- fig. 11 represents a perspective view of a construc-

- tion variant of a cleaning system according to the invention equipped with a filter separating the paint particles from the detergent liquid used for cleaning;
- the figs. 12 and 13 represent a perspective view (fig. 13) with the indications of rooms and a plan view and a cross-section view (fig. 12) of the embodiment of the cleaning system with separating filter shown in fig. 11;
 - the fig. 14 represents a perspective view of an airbrush and the components that make up a particular embodiment of the system for washing airbrushes according to the invention and includes two views in particular of the airbrush's dispensing nozzles;
 - the figs. 15 and 16 represent respectively a sectional view of a system for washing airbrushes according to the invention during phase I of the washing process, i.e. when the dispensing nozzle is fed only by detergent liquid and a sectional view of a system for washing the airbrushes according to the invention during phase II of the washing process, i.e. when the dispensing nozzle is powered only by compressed air;
 - the fig. 17 represents a general perspective view of the washing system according to the invention for cleaning a pair of airbrushes according to a further embodiment;
 - the fig. 18 represents a perspective view of a construction variant in which two airbrushes are subjected to cleaning;
 - the figs. 19A-B-C represent three operating phases of a timer which can be included in a system according to the invention.

[0035] Fig. 1 shows a system for washing airbrushes of a known type without a circuit for compressed air, in which, inside a gun washing machine 50, is arranged a pneumatic supply pump 510, advantageously of the membrane type, which by means of a pipe 55 sucks the washing liquid, composed of diluent or other detergent, from the container 56; said supply pump 510 sends the cleaning liquid at low pressure via the delivery pipe 54 to the nebulizer nozzle 53, which introduces the washing liquid inside the paint duct of the airbrush 520.

[0036] In fig. 2, according to the invention, a washing system is visible inserted inside the casing 1 of a washing machine constituted in an exemplary embodiment by a feeding pump 2 of the detergent liquid, which is sucked from one or more containers 18 by means of a suction pipe 16 and sends the detergent liquid via a delivery pipe 4 and an intermediate connection to the pipes 19 and 20, which are in communication with the dispensing nozzles 8 and 13 which introduce the detergent liquid inside the pipe of the paint of the airbrushes 6 and 7. The compressed air necessary to obtain the correct flow of the washing system comes from a pipe 5 connected to the compressed air supply system, which, by means of the automatic dosing valve 25, through a pipe 21 sends the compressed air via an intermediate connection to the

pipes 23 and 22, which are in communication with the dispensing nozzles 8 and 13 which cyclically introduce pulses of the compressed air into the paint channel of the airbrushes 6 and 7. Other components forming part of the washing apparatus are also visible in the figure, mainly: a distribution valve 3, fed by compressed air coming from a pipe 15 of the pneumatic circuit, which allows the operation of a feeding pump 2, preferably pneumatic; an automatic dosing valve 25, fed by compressed air coming from a pipe 5 of the pneumatic circuit, which is piloted by the distribution valve 3 for the cyclical pulsed supply of the compressed air to the washing system.

[0037] Fig. 3 shows the washing system comprising a first valve holder fitting 9, which conveys the detergent liquid to the dispensing nozzle 8, as well as a second valve holder fitting 10, which in turn cyclically conveys the pulses of compressed air to the dispensing nozzle 8, connected to the internal paint channel of the airbrush 6.

[0038] There is also an external dispensing nozzle 200 suitable for dispensing detergent liquid on the outside of the airbrush 6, advantageously continuously. There may be additional external dispensing nozzles 200 within a system according to the invention.

[0039] In fig. 4, a construction variant of the washing system for cleaning a pair of airbrushes 6 and 7 is visible, comprising a pair of pipes 19 and 20 for the cleaning liquid which comes from the feeding pump 2 via the delivery pipe 4 and a pair of compressed air pipes 22 and 23, which comes from the pulses automatic dosing valve 25 via pipe 21. The detergent liquid pipes 19 and 20 lead to a pair of valve holder fittings 9 and 11 connected to the dispensing nozzles 8 and 13, while the compressed air pipes 22 and 23 lead to a pair of valve holder fittings 10 and 12 also connected to the dispensing nozzles 8 and 13 of the airbrushes 6 and 7. Advantageously, the second airbrush 7 is supported by a support 26, to which a passing arrangement 27 for the passage of the cleaning liquid can also be fixed.

[0040] External dispensing nozzles 200 are also shown in this figure.

[0041] In fig. 5 according to the invention, in particular the external components of the washing system of an airbrush are visible, consisting of a duct 19 of the detergent liquid coming from the supply pump, which leads to a valve holder fitting 9 and a pipe 22 of the compressed air coming in pulses from the automatic dispensing valve, which is connected to a valve holder fitting 10, both valve holder fittings 9 and 10 being connected to the dispensing nozzle 8. Advantageously, to obtain an optimal cleaning result, they are connected immediately upstream of the dispensing nozzle 8 to allow a very quick alternation between cleaning liquid and compressed air.

[0042] In fig. 6 according to the invention, in particular the external components for washing a second airbrush of the construction variant of the washing system of a pair of airbrushes shown in fig. 4 are visible, consisting of a pipe 20 for the detergent liquid coming from the supply pump which leads to a valve holder fitting 11 and a

pipe 23 for the compressed air coming in pulses from the automatic dispensing valve which leads to a valve holder fitting 12, both connections 11 and 12 being connected to the dispensing nozzle 13.

[0043] Fig. 7 shows phase I of the operation of the washing system, in which the low pressure detergent liquid coming from the feeding pump reaches the valve holder fitting 9 via the pipe 19 and, moving the shutter 9' due to the pressure, opens communication with the pipe connected to the dispensing nozzle 8, through which the detergent liquid flows into the paint channel of the airbrush 6. The pressure existing in the circuit causes the movement of the shutter 10' inserted in the valve holder fitting 10, causing the closure of the communication with the air pipe 22, which in this phase is not supplied by the compressed air supply system.

[0044] Fig. 8 shows phase II of the operation of the washing system in which the compressed air coming from the pipe 22 at a pressure much higher than that of the detergent liquid supply reaches the valve holder fitting 10 and, moving the shutter 10', opens communication with the duct connected to the dispensing nozzle 8, through which the pulsed air cyclically flows into the paint channel of the airbrush 6. The high pressure existing in the circuit causes the movement of the shutter 9' inserted in the valve holder fitting 9, determining the closure of the communication with the detergent liquid pipe 19.

[0045] In essence, the valve holder fittings combined with their shutters constitute one-way valves.

[0046] The configuration of the one-way valves (composed of the valve holder fittings and their shutters) which are connected directly to the dispensing nozzle 8, without any intermediate duct, allows for a very rapid alternation between detergent delivery and compressed air pulses. If you did not have this configuration, in particular if there was a large stretch between the one-way valves and the dispensing nozzle, the cleaning result would not be optimal.

[0047] Fig. 9 shows exemplary components used for the generation of compressed air pressure pulses in the automatic mode, in which a distribution valve 3, fed by the compressed air coming from the pipe 15, connected to a pneumatic supply system, provides for the cyclic operation of a diaphragm pump 2, which sends the detergent liquid to at least one airbrush via the delivery pipe 4 with a cycle alternation that can be set by means of the regulator 3' located on the distribution valve 3. In the phase in which the diaphragm pump 2 sucks the liquid from the tank, the distribution valve 3, by means of the pipe 14, sends the discharge air of the pump 2 to the pulse valve 25, where the discharge valve 14' discharges a part of the air into the environment and at the same time with the remaining air it allows the piloting of the impulse valve 25, which in this way puts the compressed air coming from the pipe 5 into communication with the pipe 21 which supplies, via the pipes 22 and 23, the valve holder fittings 10 and 12; in the subsequent delivery phase the detergent liquid is pushed by the membrane

of the pneumatic pump 2 by means of the distribution valve 3, into the pipe 4, while no air arrives in the pipe 14, so the impulse valve 25 is not piloted and in this way the communication of the compressed air coming from pipe 5 with pipe 21 is interrupted, resulting in a lack of compressed air supply to the valve holder fittings 10 and 12; in this way it is possible to generate the pressure pulses necessary to obtain the detachment of all the paint particles contained within said airbrush.

[0048] Fig. 10 shows an example of the components used for the generation of compressed air pressure pulses in the autonomous mode when a cyclically operating pneumatic feeding pump 2 is not available and a pump with different functioning is used and therefore it is not possible to obtain the alternation between suction phase and delivery phase typical of a diaphragm pump.

[0049] In this mode, an automatic pulse valve 29, fed by the compressed air coming from the pipe 5 connected to the pneumatic supply system, sends the pressure pulses cyclically with an alternation that can be set by means of the regulator 29', by means of the pipe 21 which is connected to the pipes to which one or two airbrushes are connected.

[0050] The aforementioned means for generating compressed air pulses are cited by way of example and can be replaced by equivalent means capable of producing the same result.

[0051] In the figs. 11, 12 and 13 according to the invention a construction variant is represented, in which a system is provided for filtering the particles contained in the detergent liquid after cleaning the airbrush, composed of a containment tank 30 inside which at least four compartments A, B, C and D are obtained by combining the walls of the containment tank 30 with a perforated bulkhead 31, connected in an intermediate position with a blind bulkhead 32, where a series of holes or openings are made on the perforated bulkhead 31.

[0052] This containment tank 30 is suitable for use with universal washing products (detergents) which have characteristics such as to allow the paint particles trapped inside them during the washing phase to settle on the bottom of the container once the detergent liquid is at rest in the containment tank 30.

[0053] The compartment A, in which is inserted the return pipe 24 of the washing detergent which has completed the washing process of the airbrush, is formed by two vertical walls of the containment tank 30, one of which is connected in a vertical position with the perforated bulkhead 31 and the other is connected in a vertical position with the blind bulkhead 32. The compartment B is made up of three vertical walls of the containment tank 30, two of which are opposite connected in a vertical position to the ends of the perforated bulkhead 31.

[0054] The compartment C, in which a filter 17 and the suction pipe 16 of the washing detergent are inserted, is made up of two vertical walls of the containment tank 30, one of which is connected in a vertical position with the perforated bulkhead 31 and the other is connected in a

vertical position with the blind bulkhead 32.

[0055] The compartments A and C are closed at the bottom by a wall 34.

[0056] At the bottom of compartment B there is a filter manifold 33 which separates compartment D from compartment B; where the compartment D is obtained from the union of several sectors 33' of the collector 33, arranged in an oblique position, equipped in the lower union and connection edge with small openings or slits 33" to allow the passage of paint residues from compartment B to compartment D and the subsequent deposit of residues on the bottom of the containment tank 30 when the washing system is stopped.

[0057] In this construction variant, when the washing system is not in operation, the detergent liquid used for cleaning the airbrush, present in the three compartments A, B and C inside the containment tank 30, stabilizes, so that the particles of the colour of the liquid present in compartment B separate from the detergent, fall onto the upper surface of the sectors 33' of the filter collector 33, slide along the inclined walls of the sectors and, passing through the small openings or slits 33", are deposited, forming a removable mud, in compartment D, obtained from the bottom of the containment tank 30 with the collector 33; when the washing system is started the detergent liquid passes through the holes or openings from compartment A to compartment B and from there to compartment C where it is sucked in by the pump passing through the filter 17; therefore, due to the presence of the collector 33, the sludge made up of paint particles remains trapped inside compartment D and does not return to circulation when the washing system is in operation.

[0058] Advantageously, compartment D can house a removable box E equipped with handles F so that the mud made up of paint particles remains inside the box E which can be easily removed by an operator for its emptying using the handles F. This configuration makes it easier to empty the paint deposits from the containment tank 30.

[0059] Fig. 14 illustrates an alternative embodiment, in which a system according to the invention also includes a pipe 41 derived from the pipe 22 which is in communication with a delivery nozzle 42 also suitable for cyclically introducing pulses of compressed air inside the airbrush 6, but in this case inside its compressed air channel. Systems are currently known which introduce a light flow of compressed air (for example 0.5 or 1 bar) inside the compressed air channel of the airbrushes. This is done to prevent cleaning liquid from entering it during washing. This would cause problems in the use of the airbrush, for example it would risk ruining any pressure gauges connected to said compressed air channel and furthermore upon first use of the airbrush after washing there would be an initial mixture of paint and cleaning liquid still contained in the compressed air channel which would ruin the paint job.

[0060] The cleaning liquid that would risk entering the

compressed air channel of the airbrush would be that dispensed by the dispensing nozzles 200 which can be aimed directly towards the spray head 300 of an airbrush 6, 7.

[0061] It usually includes a cap 301 which generates a Venturi effect to extract the paint to be sprayed, which covers the nozzle dedicated to dispensing paint 302 and those dedicated to dispensing compressed air 320 which surround the nozzle 302.

[0062] In known systems, having a constant flow of compressed air coming out of the nozzles 320, the detergent is unable to come into contact with the nozzle dedicated to dispensing the paint 302 and with the area under the cap 301 dedicated to receiving said nozzle 302. These regions are usually dirty with paint because paint particles settle on them during use.

[0063] There is therefore a non-optimal cleaning and by activating the airbrushes 6, 7 after cleaning there would be a transitory phase in which the little paint left on the nozzle 302 would risk mixing with the new paint to be dispensed. There is also a risk that the paint will dry on the 302 nozzle becoming difficult to remove.

[0064] A system with the solution according to the invention allows rapid pulses of compressed air to be delivered also through the nozzles 320 so as to allow the detergent to slightly penetrate the cap 301, wetting the nozzle 302 and the nozzles 320, but not to penetrate into the compressed air channel of the airbrush 6, 7. Between one pulse of compressed air and another, the detergent can carry out its cleaning function which will be strengthened by the mechanical action of the compressed air.

[0065] In systems known in the art with a continuous flow of compressed air in the channel dedicated to the compressed air of the airbrushes 6, 7 the cleaning liquid cannot penetrate inside the cap 301 as it is pushed away from it precisely by this continuous flow.

[0066] The detergent that penetrates inside the cap 301 is the one sprayed for example by the nozzles 200 outside the airbrushes 6, 7.

[0067] Advantageously, the pipe 41 can be connected to means independent of generating compressed air pulses with respect to those acting on the pipe 22. It will be sufficient for these pulses to be synchronized with each other to obtain the desired result. Therefore, it is not necessary for pipe 41 to be derived from pipe 22.

[0068] The compressed air pulses in pipes 41 and 22 can be either simultaneous or staggered. In the figs. 15 and 16 show the phases of dispensing detergent liquid (Fig. 15) and those of compressed air (Fig. 16).

[0069] In this way, instead of having a flow of compressed air with little pressure, pulses at high pressures (for example 8 bar) can be used to facilitate cleaning.

[0070] Furthermore, thanks to the thorough cleaning of the cap 301, the nozzle 302 and the nozzles 320 there is no longer any need to dismantle the cap 301 from the airbrush to obtain complete cleaning.

[0071] Figs. 17 and 18 illustrate an embodiment suitable for washing two airbrushes 6, 7 in which there is a

further pipe 51 connected to a delivery nozzle 52 suitable for cyclically introducing pulses of compressed air only inside the compressed air duct of the airbrush 7.

[0072] A system according to the invention is suitable for cleaning even a greater number than two airbrushes 6, 7, it is sufficient that sufficient pipes 41, 51 and sufficient power of the compressed air pulse generation system are present.

[0073] By way of example and without limitation, a timer 400 is described below, illustrated in the figs. 19A-B-C, can be used to control the different operating phases of a system according to the invention.

[0074] A timer 400 includes a cam 401 preferentially rotated by a pneumatic actuator, but in general by an actuator. It includes a perimeter divided into three regions: a circular region 402, a rectilinear one 403 and a hooked one 404.

[0075] A pressure switch 405 rests on the cam 401 and based on its degree of opening it controls a compressed air circuit to drive the system. The switch 405 is elastically pushed towards its fully open position so as to come into contact with the cam 401.

[0076] The compressed air circuit includes three ducts: an inlet duct 406 connected to the general connection 407 of the compressed air system from which the entire system takes the compressed air, a supply duct 408 which connects to the pipe 22, 23 and to those 41, 51 if present, a pilot duct 409 which feeds the pipe 15 to control the distribution valve 3.

[0077] In fig. 19A the switch 405 is completely open and rests on the surface of the circular region 402. In this configuration compressed air enters from the inlet duct 406 and compressed air exits from the pilot duct 409. In this phase the machine continues to alternate the supply of compressed air pulse cleaning liquid.

[0078] In fig. 19B the switch 405 rests on the surface of the rectilinear region 403. In this configuration compressed air enters from the supply duct 406 and compressed air exits from the supply duct 408. In this way a strong and continuous flow of compressed air is obtained through the airbrushes 6, 7 to dry them completely. Advantageously, this phase lasts thirty seconds. Advantageously, in this phase the compressed air is delivered into pipe 22, 23 and 41, 51 if present.

[0079] In fig. 19C the switch 405 is completely closed and rests on the surface of the hooked region 404. In this configuration both the supply duct 408 and the pilot duct 409 are closed and the system has completed the cleaning cycle.

[0080] This particular timer 400 is functional in solutions in which for regulatory reasons a system according to the invention must not use electronic systems.

[0081] From the above it can be deduced that an optimal procedure for cleaning airbrushes includes a phase of alternating delivery of cleaning liquid and pulses of compressed air inside the paint duct of the airbrush followed by a phase of continuous delivery of a jet of high pressure compressed air.

[0082] Advantageously, the pulses of compressed air, as well as the strong continuous flow of compressed air, can also be delivered inside the compressed air channel of the airbrush. These pulses can be independent and not delivered through the pipe 22, 23.

[0083] An alternative process involves delivering pulses of compressed air, followed by a strong continuous flow of compressed air only into the compressed air channel of an airbrush.

[0084] Operationally, as visible in the figures, with the construction solution of the invention the airbrush washing system combines the detergent liquid with compressed air with a cyclical mode with extremely fast pulses, so as to alternate the feeding of the liquid in low pressure with high pressure compressed air in very close times - for example a few seconds - thus generating violent pulses of pressurized air in the paint duct of the airbrush to cause the complete detachment of all paint residues present. The washing system according to the invention allows a complete washing and cleaning of the airbrush compared to current washing systems of a known type in which when the need to clean the airbrush after the painting process occurs it is also necessary to dismantle the components internal parts of the device to guarantee perfect removal of all remaining paint particles.

[0085] The use of pulsed compressed air, combined with the use of the cleaning liquid according to the invention, causes the complete removal of all traces of paint with the advantage of complete drying in the paint channel of the airbrush, thus terminating the washing cycle with compressed air alone, advantageously both in the channel dedicated to the supply of paint and to the one dedicated to the supply of the compressed air of the airbrush.

[0086] The very short alternation of the liquid dispensing phase with the dispensing of high pressure compressed air causes very intense pressure oscillations inside the airbrush, thus achieving the detachment of all residues of paint from the internal walls of the airbrush itself.

[0087] Furthermore, the possibility of providing pulses also in the channel dedicated to the compressed air of the airbrush increases washing efficiency even further.

[0088] The present invention is susceptible to modifications and variations and its technical details can be replaced with other technically equivalent elements, furthermore the materials and dimensions can be the most varied, depending on the needs, as long as everything falls within the inventive concept defined by the following claims.

Claims

1. SYSTEM FOR WASHING AIRBRUSHES, comprising a pipe (19, 20) for feeding a pressurized detergent liquid to a dispensing nozzle (8, 13) adapted to

be placed in fluid communication with the internal duct of the paint channel of an airbrush (6, 7),

said system being **characterized by the fact that**

immediately upstream of the dispensing nozzle (8, 13) there is provided a first valve holder fitting (9, 11) placed as derivation with respect to a second valve holder fitting (10, 12); the first fitting (9, 11) being dedicated to feeding with detergent liquid coming from the pipe (19, 20) to the dispensing nozzle (8, 13), the second (10, 12) being dedicated to feeding the dispensing nozzle (8, 13) with compressed air coming from a pipe (22, 23) at a pressure higher than that of the detergent liquid;

it being provided that inside the fitting (9, 11) for feeding detergent liquid there is a shutter (9') with a non-return function when compressed air reaches the dispensing nozzle (8, 13) through the fitting (10, 12) and, inside the fitting (10, 12) for the compressed air supply, a shutter (10') is placed with a non-return function when detergent liquid arrives through the fitting (9, 11) from pipe (19, 20) and the flow of compressed air is interrupted;

means being also provided for generating pulses of compressed air upstream of said pipe (22, 23).

2. SYSTEM FOR WASHING AIRBRUSHES, according to claim 1, **characterized by** the fact of comprising at least one pipe (41, 51) in communication with a delivery nozzle (42, 52) suitable for being connected to the compressed air channel of an airbrush (6, 7); it being provided that upstream of the pipe (41, 51) there are means for generating pulses of compressed air.
3. SYSTEM FOR WASHING AIRBRUSHES, according to claim 2, **characterized in that** the pipe (41, 51) is derived from the pipe (22, 23).
4. SYSTEM FOR WASHING AIRBRUSHES according to any of the previous claims, **characterized in that** each of the pipes (19, 20) located upstream of the valve holder fittings (9, 10) is connected to a fitting to connect said pipes to further pipes of the same type for the supply of detergent and compressed air to at least one further system for washing airbrushes according to claim 1 and respectively to a pipe (4) for the supply of detergent liquid and to a pipe (21) for the supply of compressed air.
5. SYSTEM FOR WASHING AIRBRUSHES according to any of the previous claims, **characterized in that** the means for generating pulses of compressed air are constituted by an automatic pulse valve (25),

driven by a distribution valve (3) suitable for controlling a diaphragm feeding pump (2) so that, during the liquid suction phase of the feeding pump (2), said distribution valve (3), via a pipe (14), sends the exhaust air exiting from the pump (2) to the pulse valve (25); it being provided an exhaust valve (14') suitable for discharging part of said exhaust air into the environment, leaving the remaining air to drive said automatic pulse valve (25), which in this condition puts a compressed air feeding pipe (5) in fluid communication with the pipe (22);

and during the liquid delivery phase of the pneumatic pump (2), the lack of air in the pipe (14) drives the pulse valve (25), so as to interrupt the fluid communication between the compressed air feeding pipe (5) and the pipe (22); it being provided that the liquid pushed by the pneumatic pump (2) through a pipe (4) is capable of reaching the pipe (19, 20).

6. SYSTEM FOR WASHING AIRBRUSHES, according to any of the previous claims, **characterized in that** it comprises an automatic pulse valve (29), fed by compressed air coming from a compressed air supply pipe (5), adapted to send strong impulses of compressed air autonomously and cyclically towards the dispensing nozzle (8), wherein the cyclic phase is regulated by a cycle regulator (29').
7. SYSTEM FOR WASHING AIRBRUSHES, according to any of the previous claims, **characterized in that** it comprises a timer (400) for controlling the delivery cycles of detergent liquid and compressed air, which includes a cam (401) rotated by an actuator and which provides a perimeter divided into a circular region (402), a rectilinear region (403) and a hooked region (404); on said cam (401) being pushed by the effect of an elastic element a pressure switch (405) capable of controlling a compressed air circuit according to its degree of opening; said compressed air circuit comprising an inlet duct (406) capable of being connected to a general connection (407) of a compressed air system from which the entire system takes the compressed air, a supply duct (408) which connects to the pipe (22, 23, 41, 51) and a pilot duct (409) which feeds the pipe (15) to control the distribution valve (3);
the timer being configured to:

- with the switch (405) completely open and resting on the surface of the circular region (402) allow the entry of compressed air from the inlet duct (406) and the exit of the compressed air from the pilot duct (409) for the supply of detergent liquid into the system alternating with pulses of compressed air;
- with the switch (405) resting on the surface of the rectilinear region (403) allow the entry of compressed air from the inlet duct (406) and the

exit of compressed air from the supply duct (408) for generation in the system of a strong and continuous flow of compressed air

- with the switch (405) completely closed and resting on the surface of the hooked region (404), close both the supply duct (408) and the pilot duct (409) to complete the system cleaning cycle.

8. WASHING MACHINE FOR WASHING AIRBRUSHES comprising a tank (18) of detergent liquid, a pneumatic system for the supply of compressed air and a pump connected to said tank (18) through a suction pipe (16) for dispensing the detergent liquid, **characterized in that** said pneumatic system and said pump are connected to a system for washing airbrushes according to any of the previous claims to supply compressed air and detergent liquid to the appropriate pipes.

9. WASHING MACHINE FOR WASHING AIRBRUSHES, according to claim 8, **characterized by** the fact of comprising a return pipe (24) of the detergent liquid towards a containment tank (30) and along said pipe comprising a filtering system for the separation of particles of paint contained in the cleaning liquid coming from the airbrush, consisting of the containment tank (30) of the cleaning liquid whose internal volume is divided into four compartments in which one (A), where the return pipe (24) of the detergent liquid is inserted, is obtained from two side walls of the containment tank (30), from a blind bulkhead (32), connected in an intermediate position with a wall of the perforated bulkhead (31), closed at the bottom by a wall (34) in an intermediate position so as to leave a space with respect to the bottom of the containment tank (30); a second compartment (B), where the detergent liquid coming from the compartment (A) is suitable for pouring, is obtained from the vertical walls of the containment tank (30), from the perforated bulkhead (31) connected on its vertical end edges with two opposite walls of the containment tank (30) and at the bottom with a collector (33) in which the paint particles are adapted to decant separating from the detergent liquid when the washing system is not in operation; a third compartment (C), where the suction pipe (16) of the detergent liquid is inserted with a filter (17), is obtained from two side walls of the containment tank (30), also closed by the blind bulkhead (32), also closed at the bottom by the wall (34) like compartment (A) in the same intermediate position, and in an intermediate position with the wall of the perforated bulkhead (31), which by means of the holes made on its surface allows the transfer of the detergent liquid from compartment (B) to compartment (C) where it can be sucked; a fourth compartment (D) equipped with a filter collector (33), placed at a certain distance from

the bottom of the containment tank (30), so as to form a compartment independent from the other three to allow the collection of the sludge made up of particles of paint, being made up of several sectors (33') connected two by two obliquely on the long sides, on which small openings or slits (33'') are placed suitable to be crossed by the paint particles which are deposited to form a layer on the bottom of the containment tank (30) when the washing system is not in operation.

10. WASHING MACHINE FOR WASHING AIRBRUSHES, according to claim 9 **characterized by** the fact that a removable box (E) equipped with handles (F) is housed in the fourth compartment (D).

11. PROCEDURE FOR WASHING AIRBRUSHES **characterized by** the fact that it includes a phase of alternating delivery inside the paint channel of an airbrush of detergent liquid and pulses of compressed air followed by a phase of continuous delivery of a jet of compressed air at high pressure.

12. PROCEDURE FOR WASHING AIRBRUSHES according to claim 11 **characterized by** the fact that the pulses of compressed air as well as the final jet of continuous compressed air are also delivered inside the air channel of an airbrush.

13. PROCEDURE FOR WASHING AIRBRUSHES **characterized by** the fact that the pulses of compressed air and a final jet of continuous compressed air are delivered only inside the air channel of an airbrush.

FIG. 1

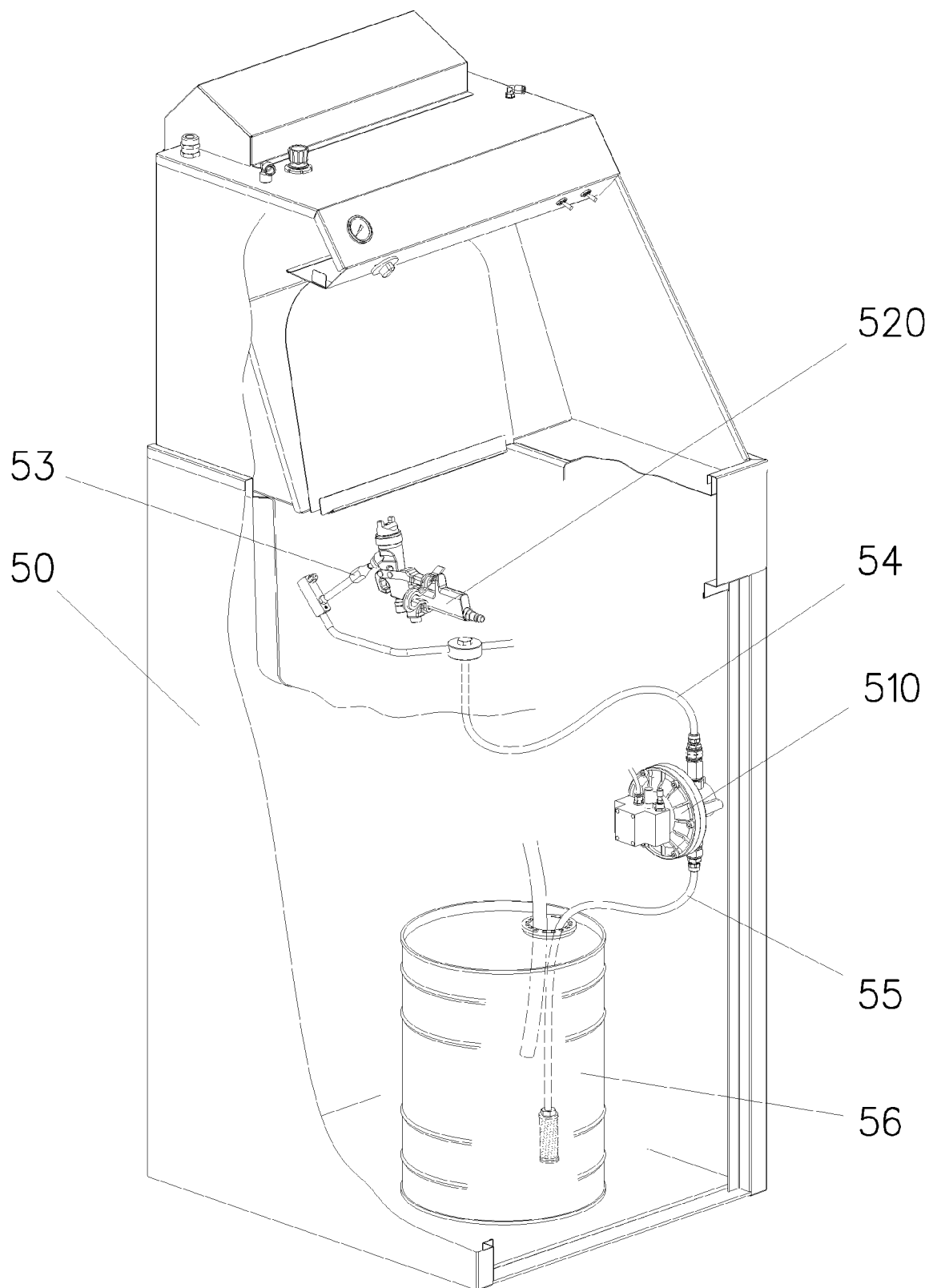


FIG. 2

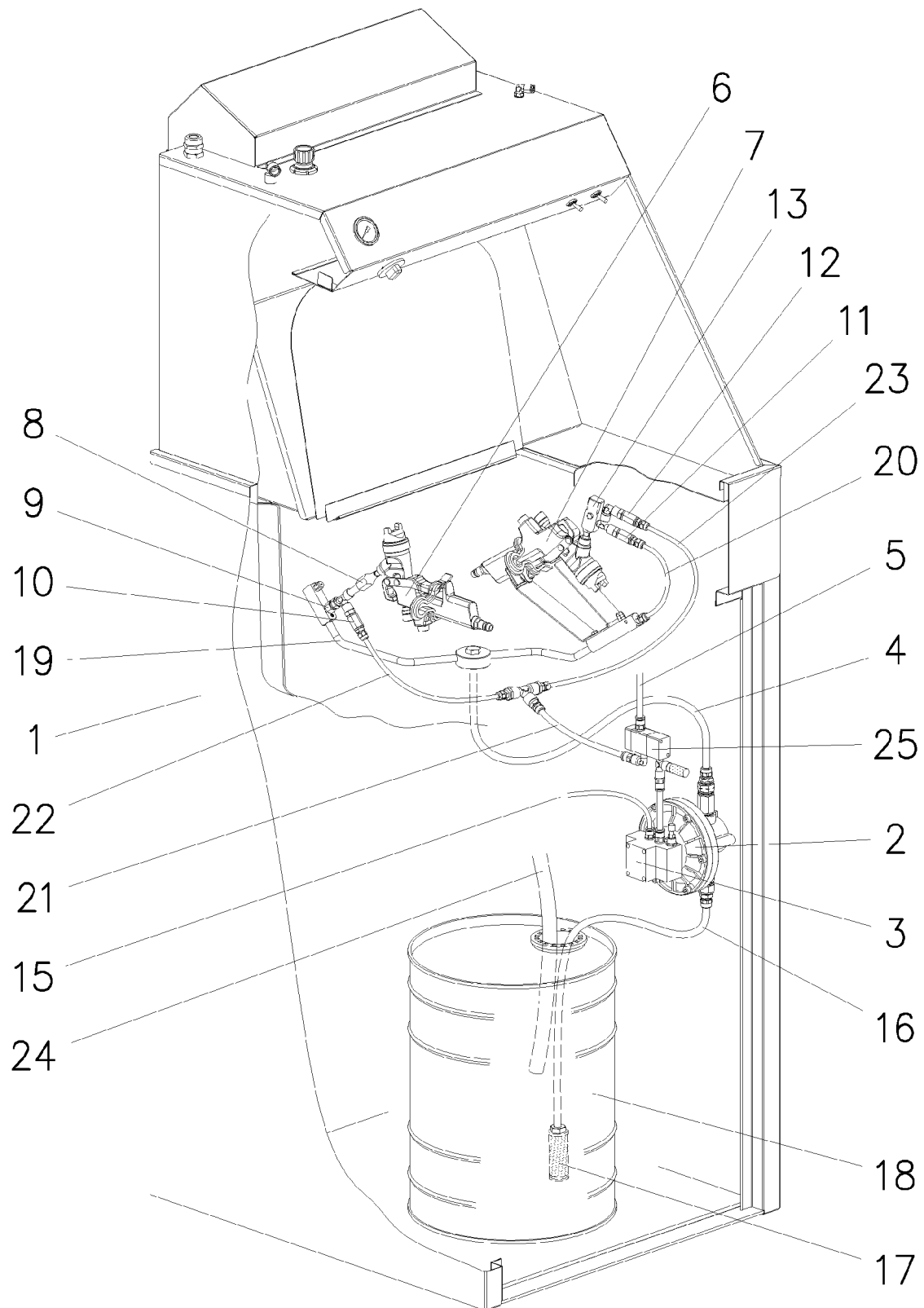


FIG. 3

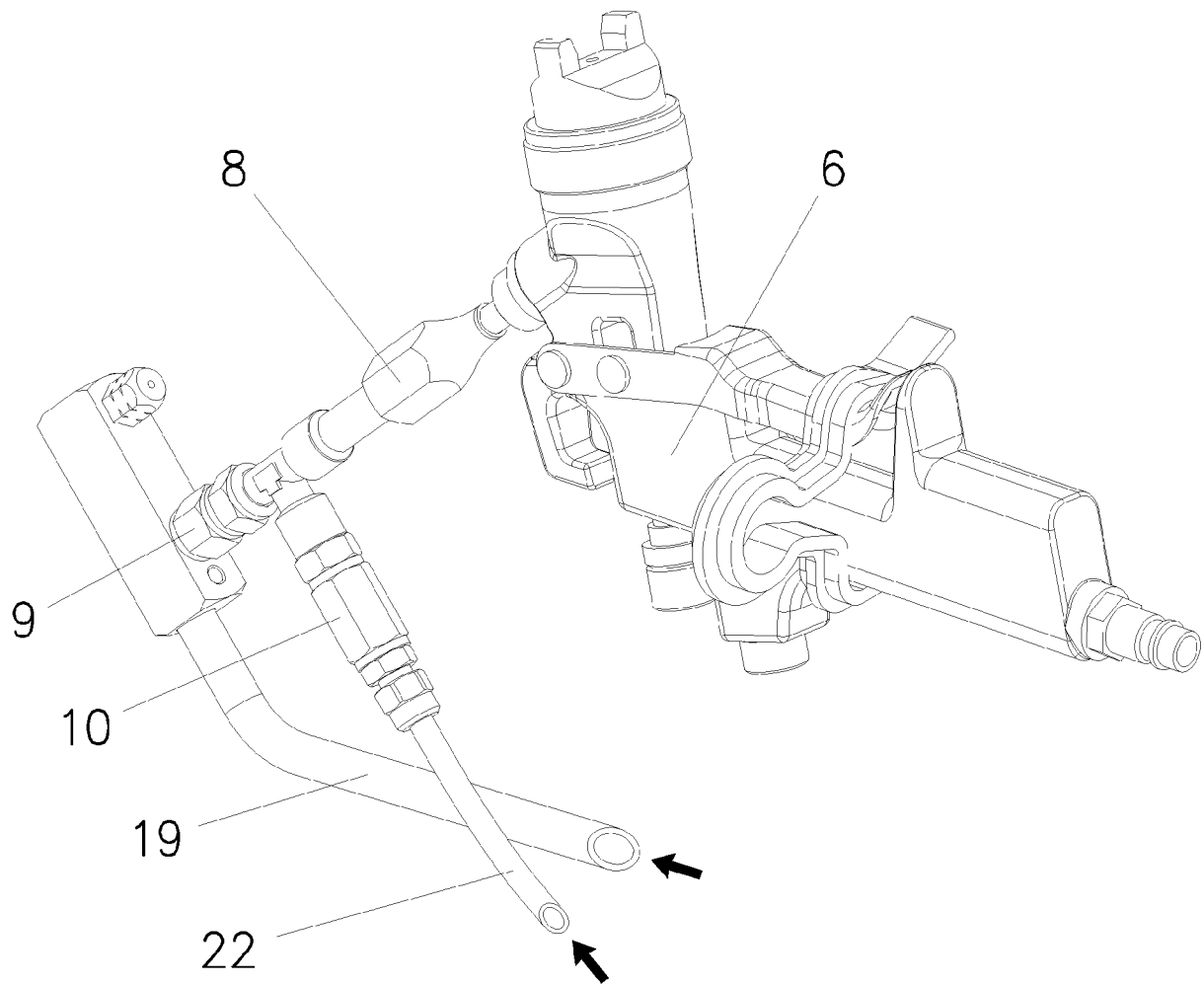
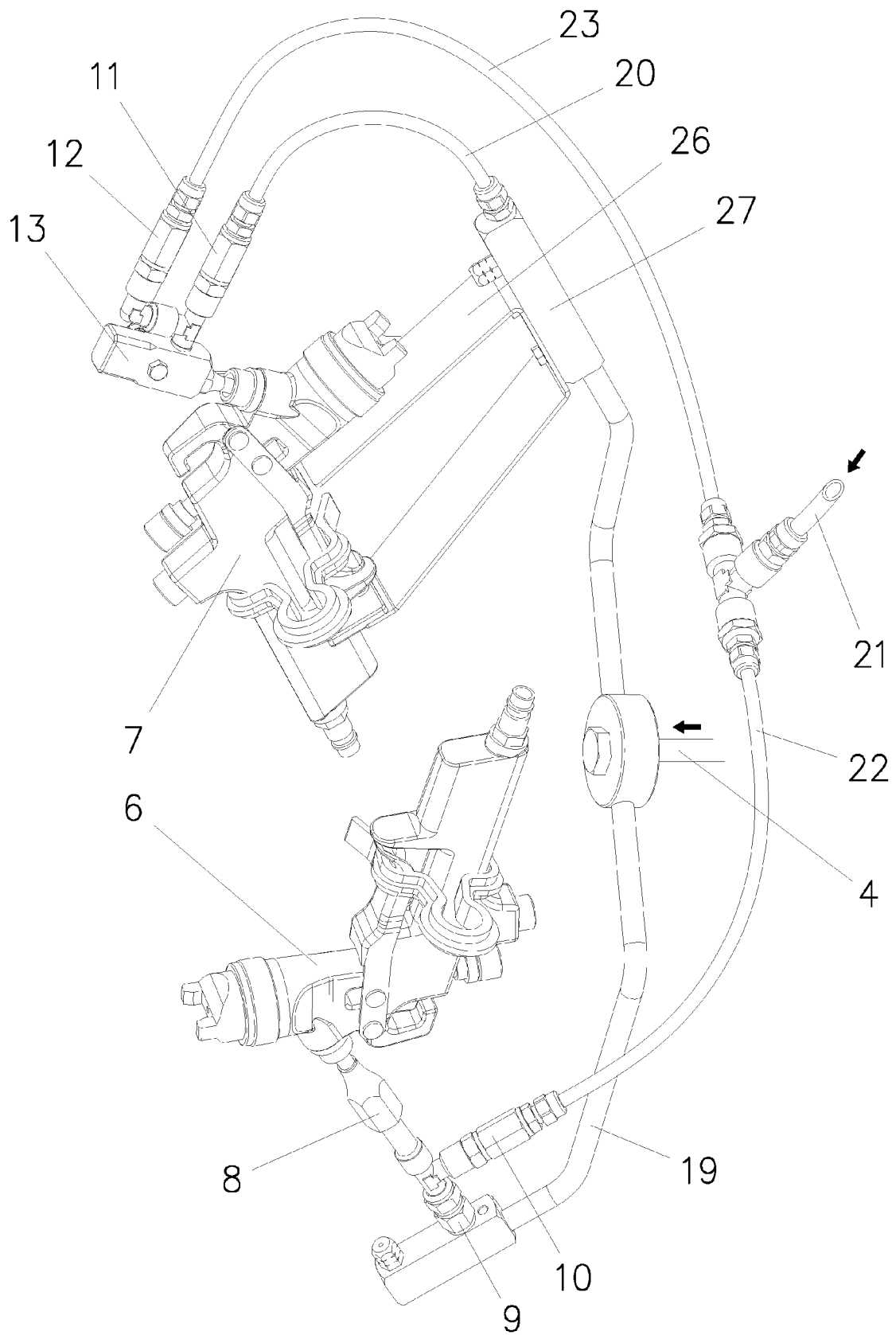
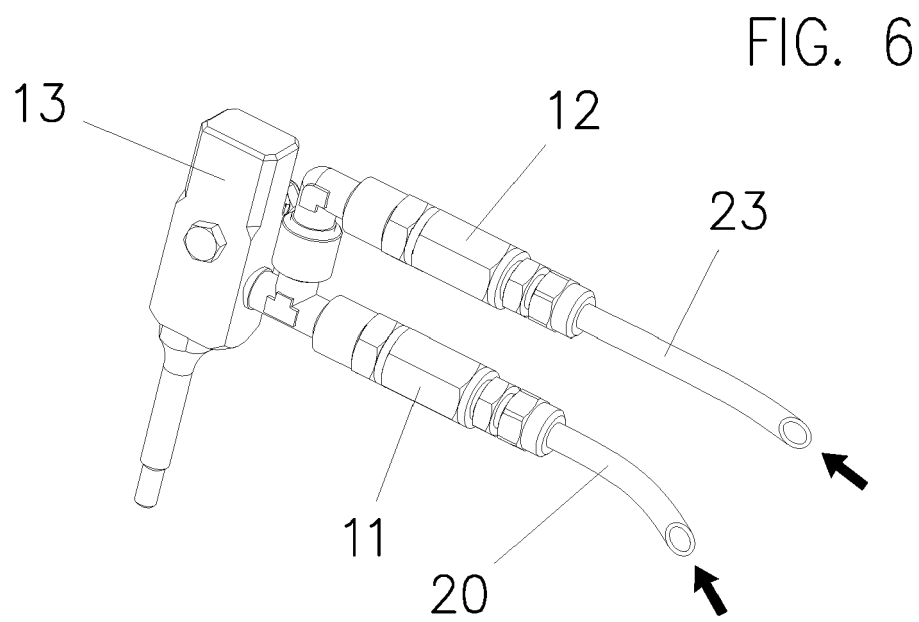
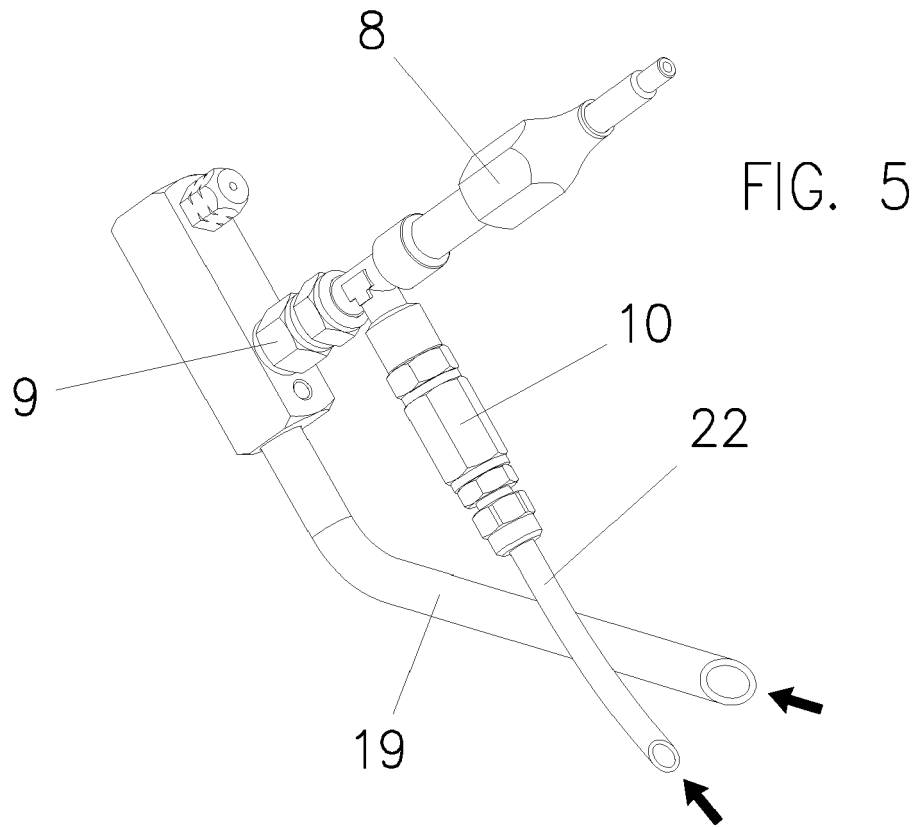
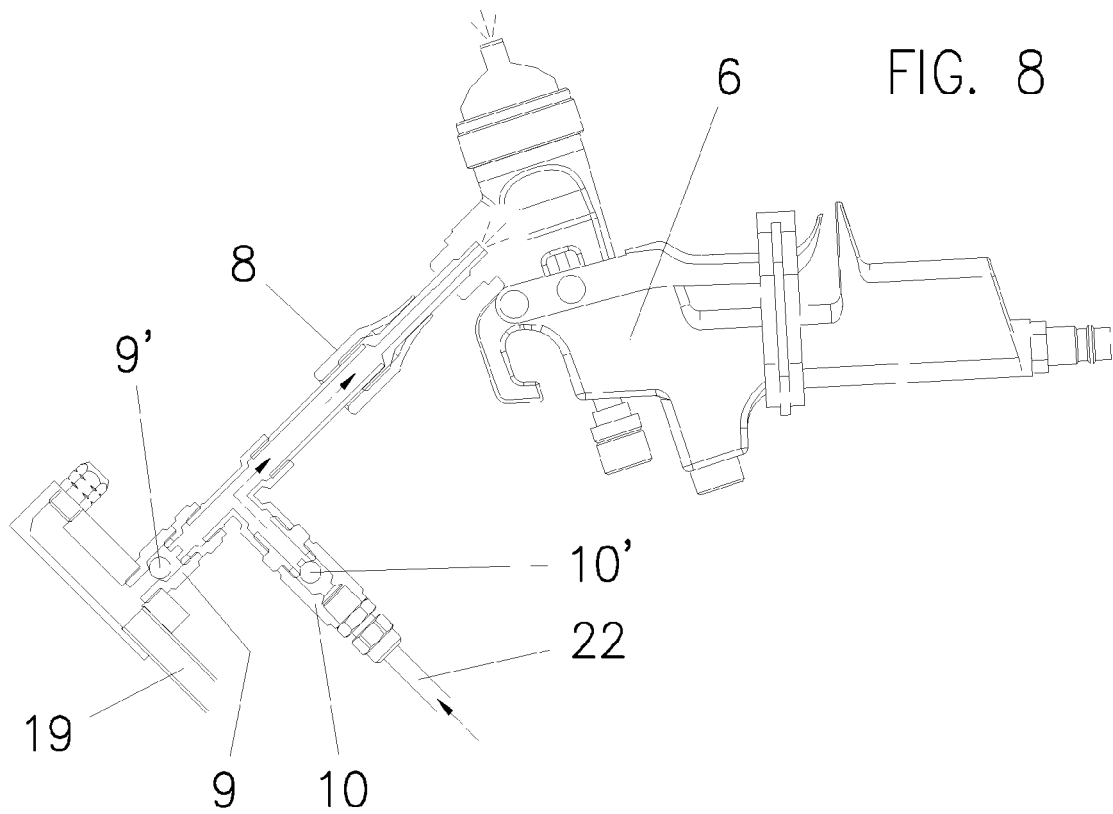
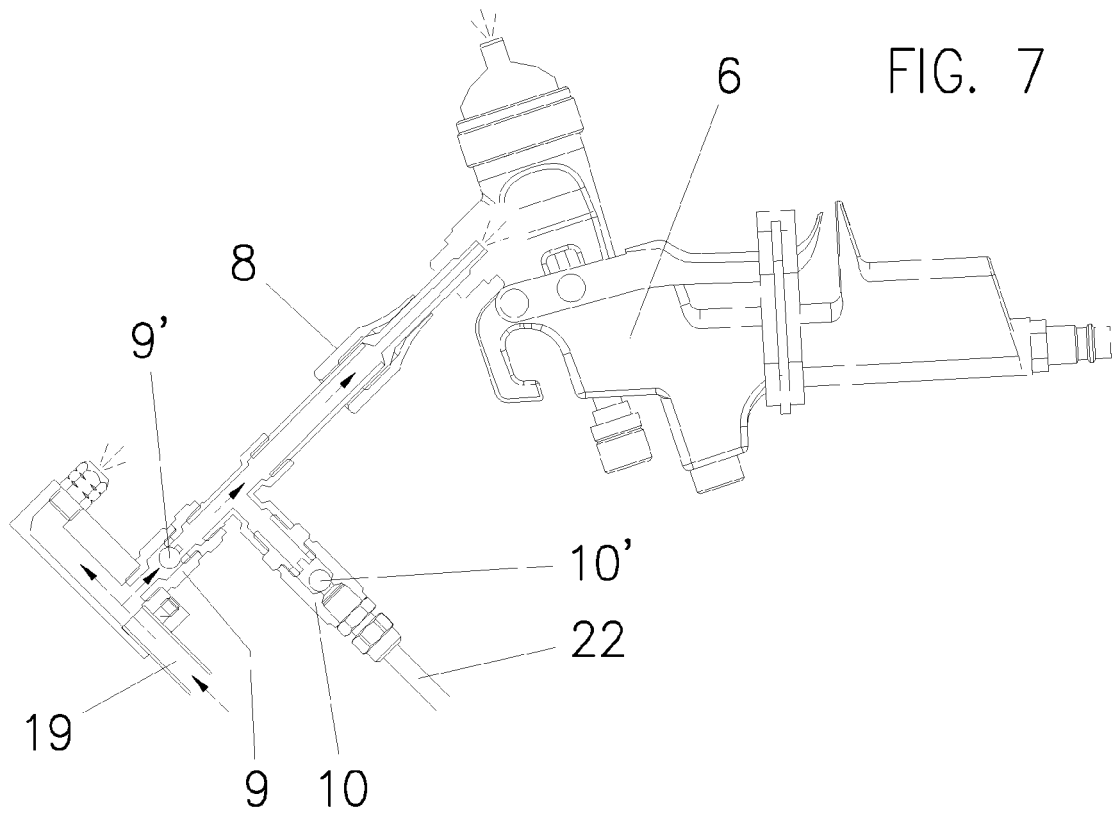


FIG. 4







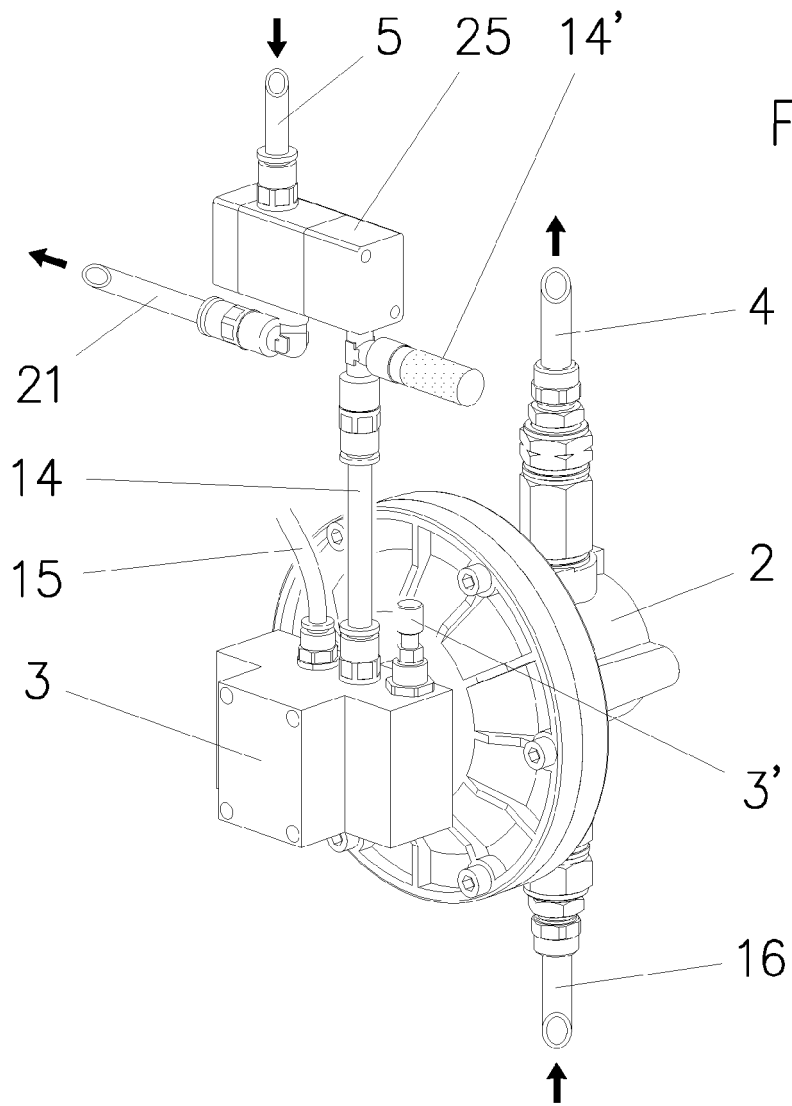


FIG. 9

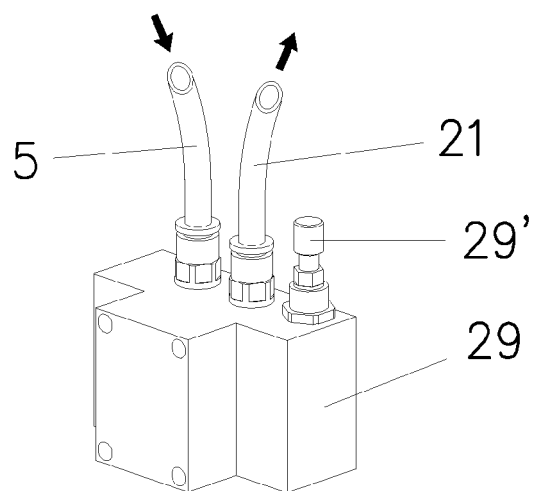
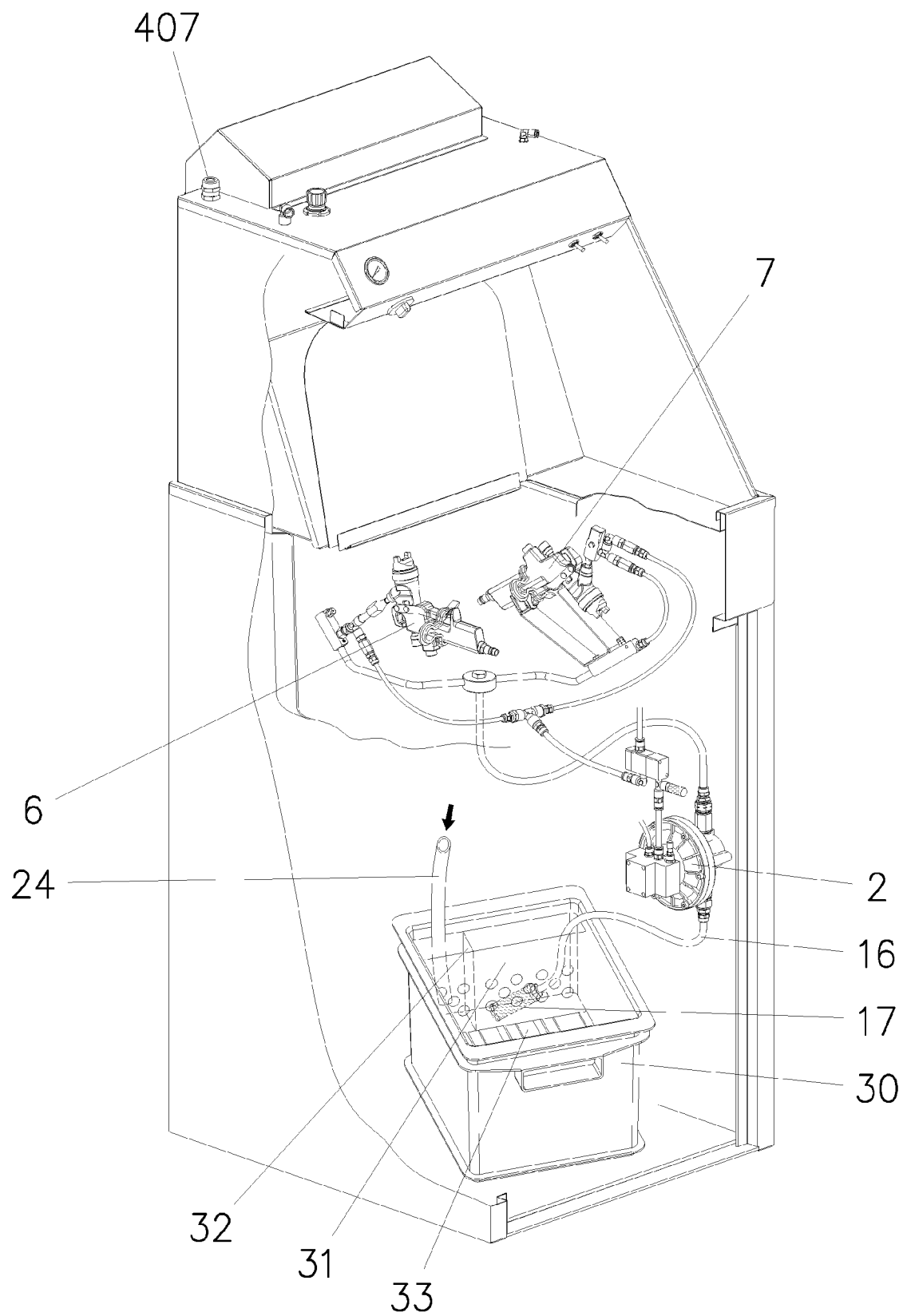
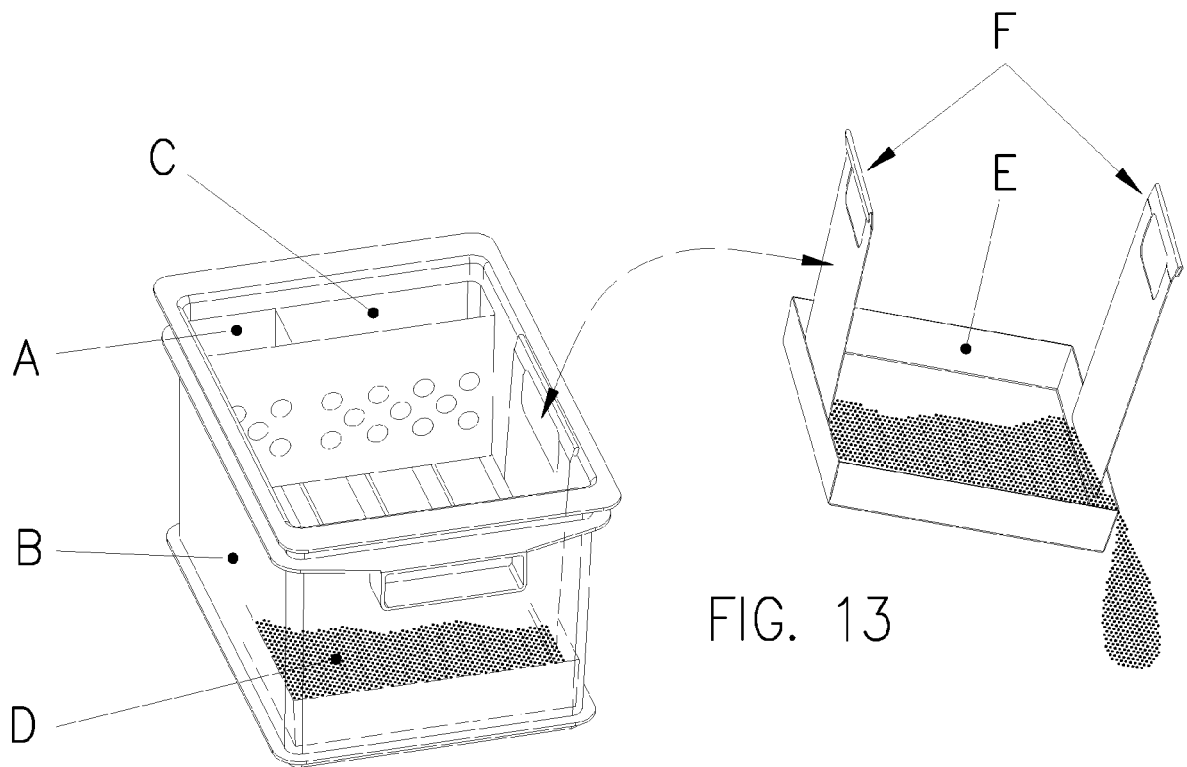
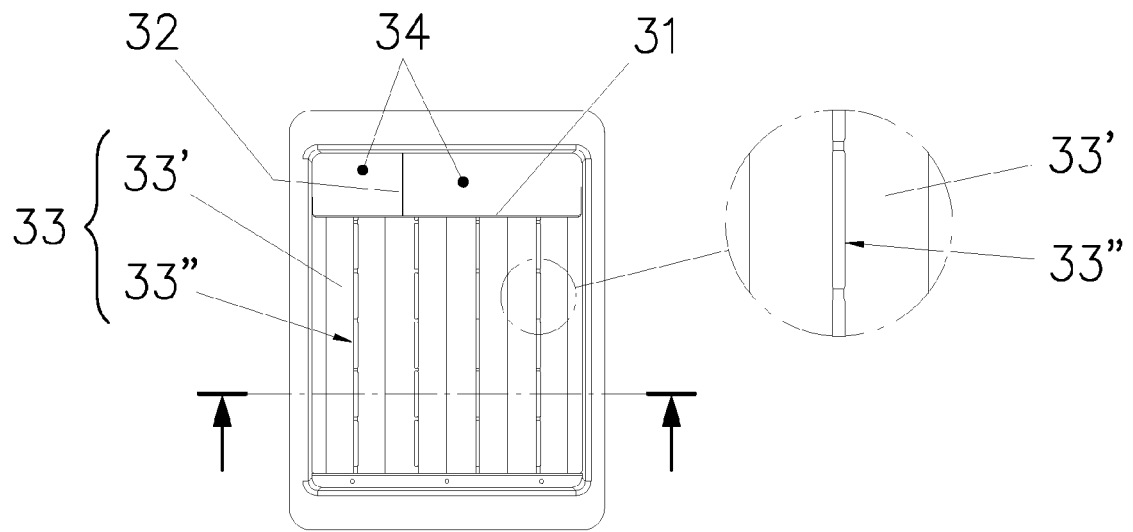
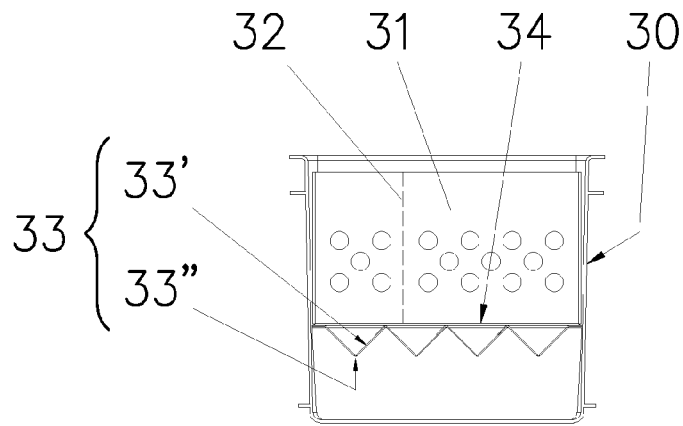


FIG. 10

FIG. 11





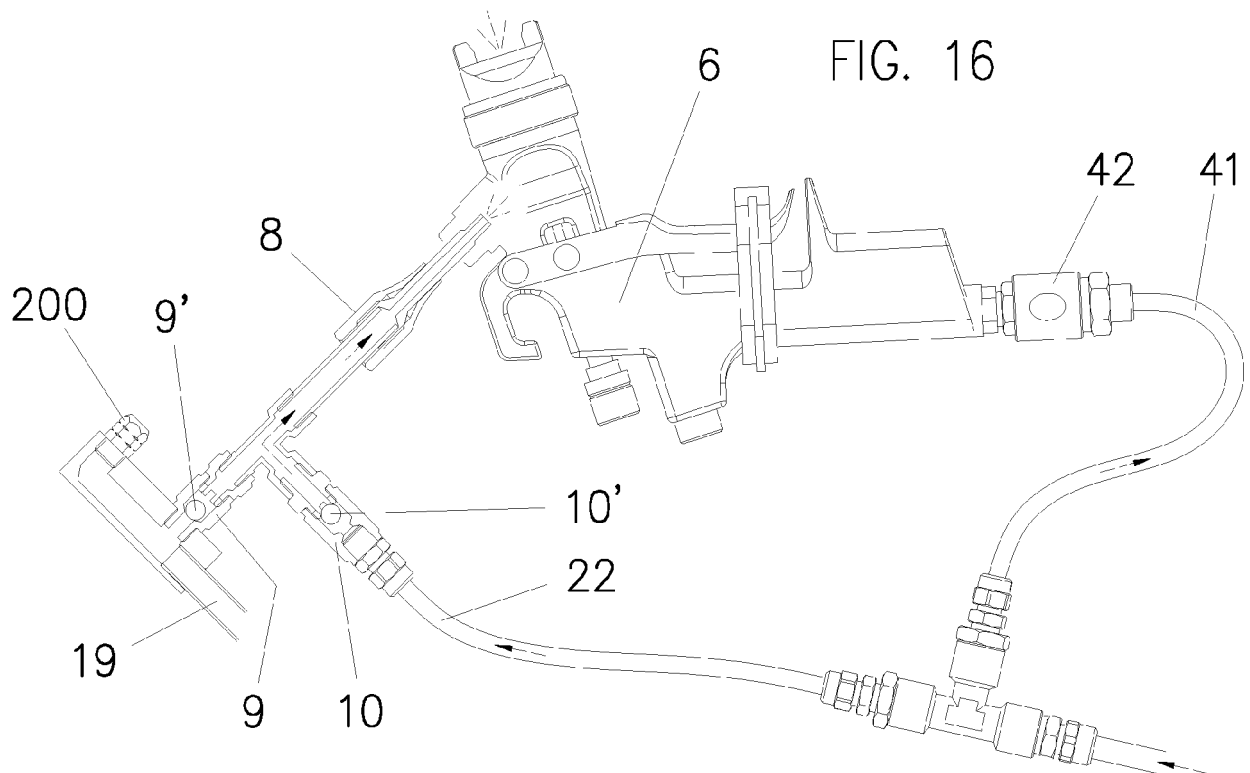
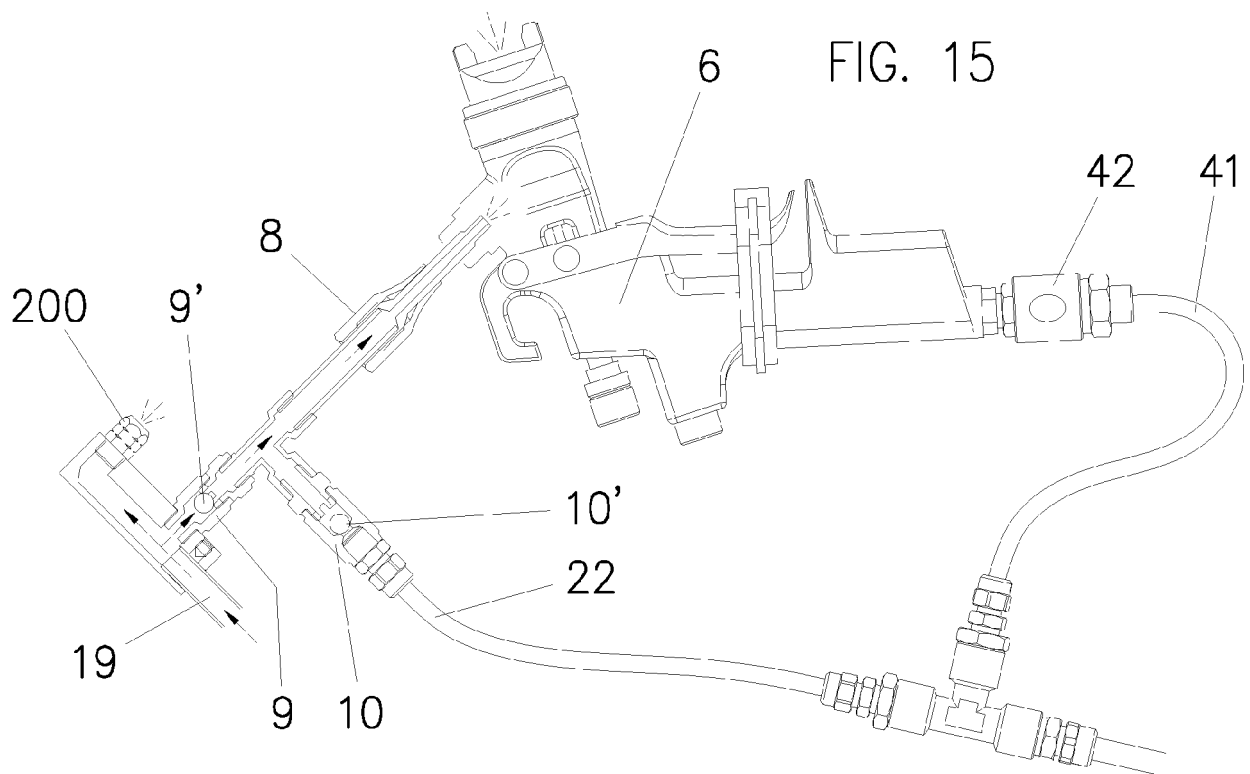


FIG. 17

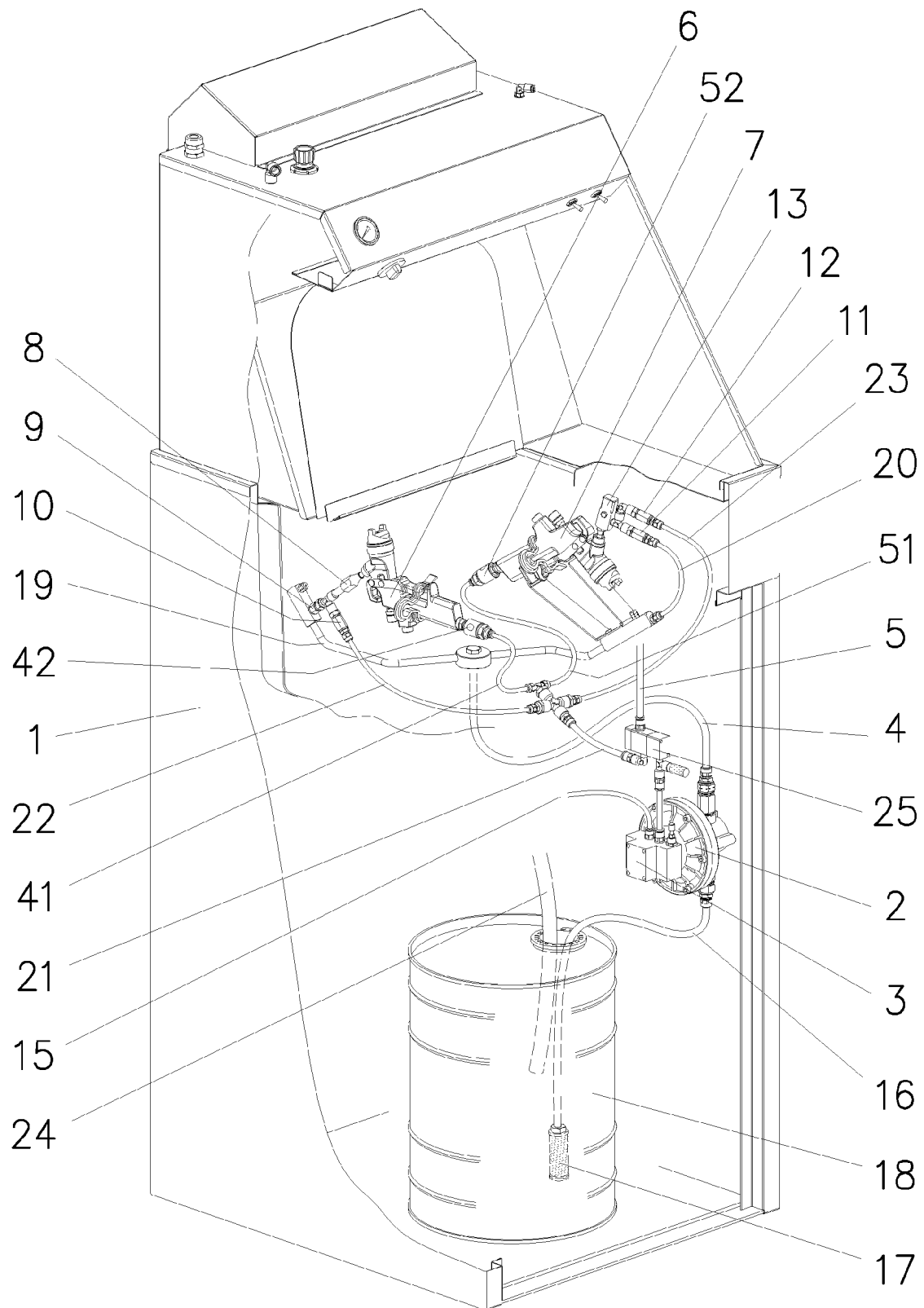
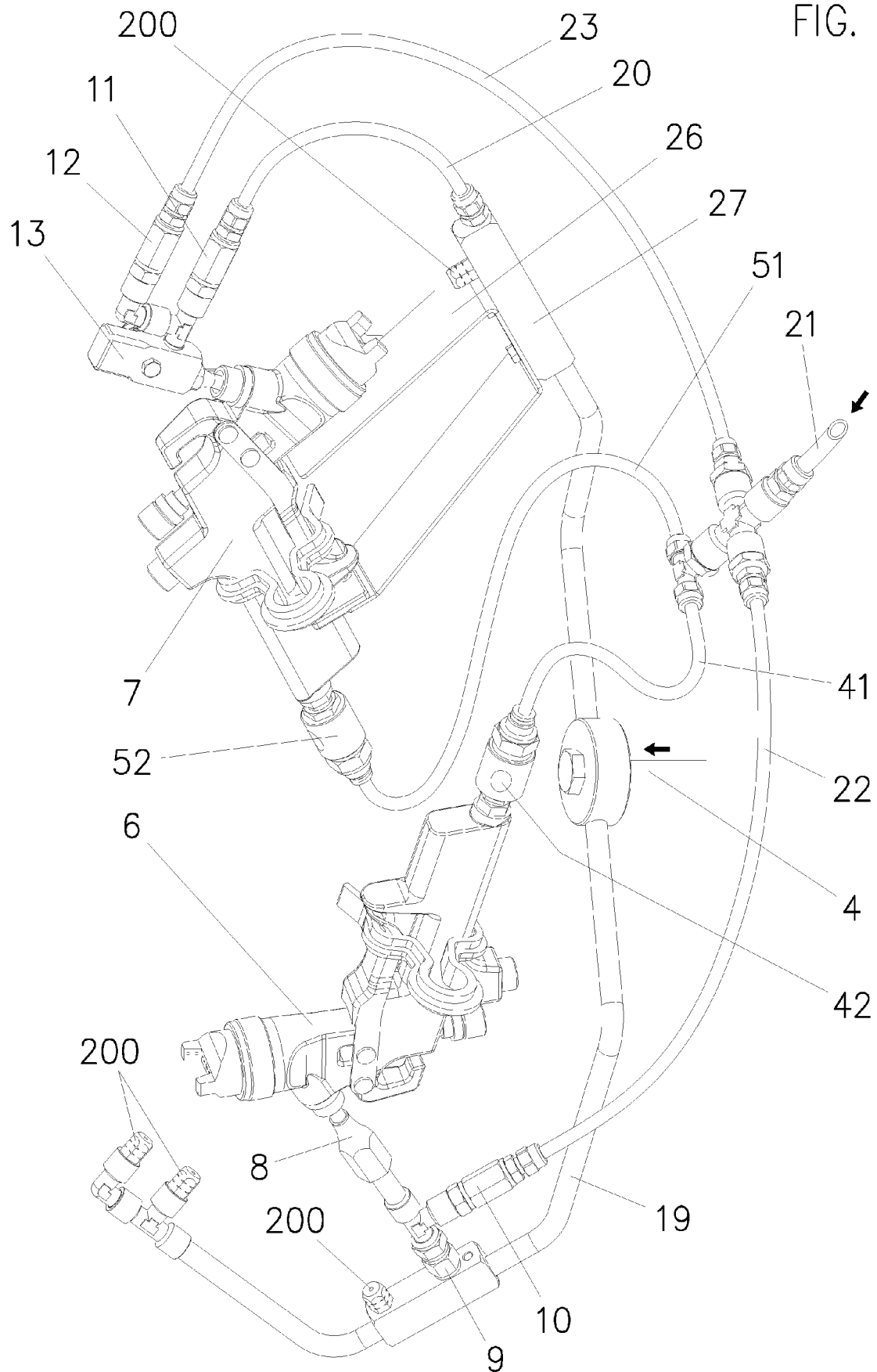
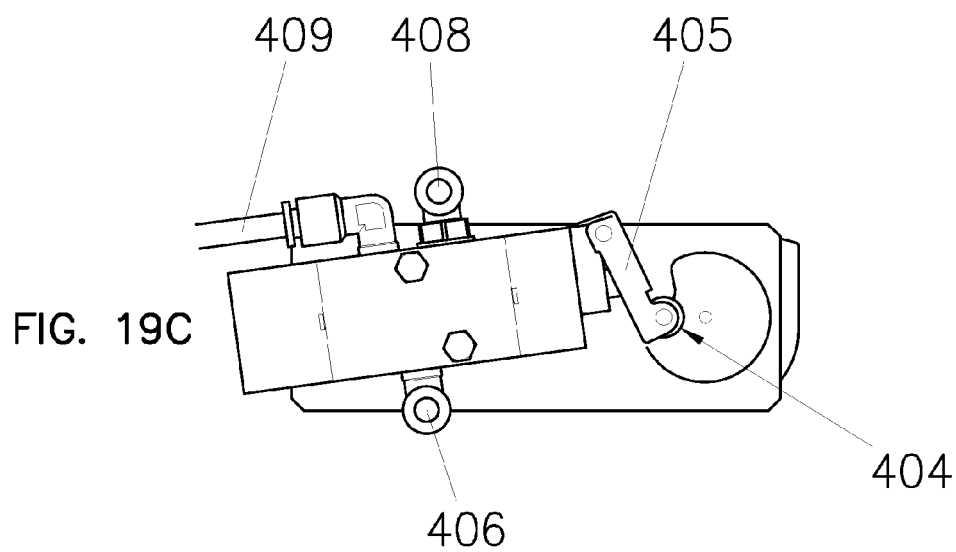
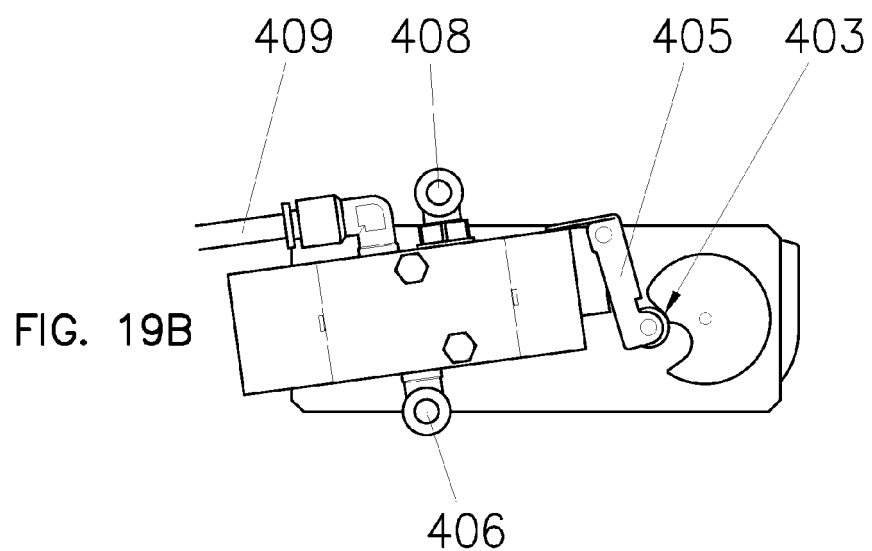
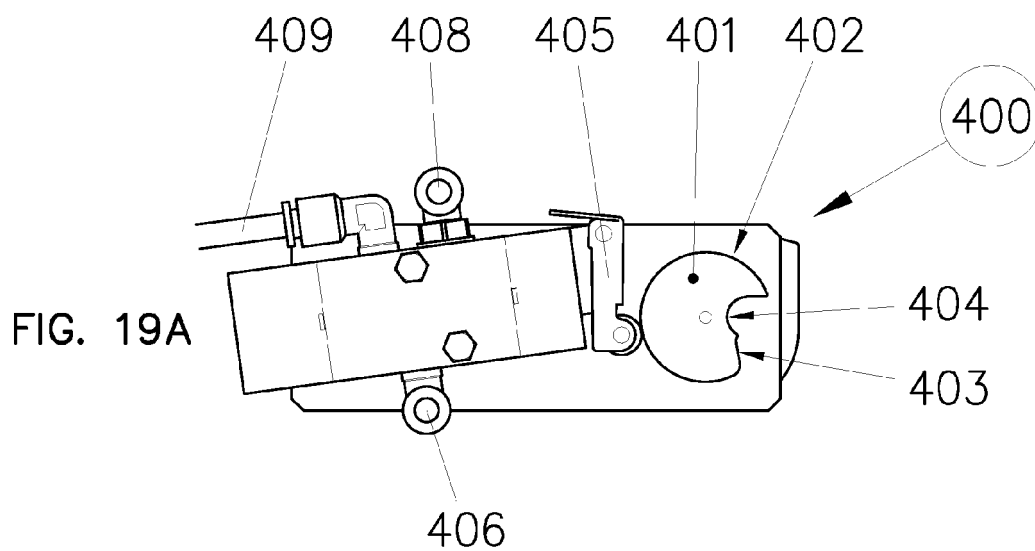


FIG. 18





REFERENCES CITED IN THE DESCRIPTION

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