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EP-A- 0 311 586 **SE-B- 459 081**

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Description

The present invention is directed to a nozzle unit for the automatic injection of a treatment fluid into a cavity, comprising a spray nozzle with a bore, a nozzle holder in which the spray nozzle is secured, a pneumatic cylinder assembly having a cylinder device defined by a cylindrical wall, and forward and rear cylinder end walls, and having a piston device translatably disposed in the cylinder assembly and a piston rod whose ends are fixedly secured respectively to the piston device and nozzle holder for moving the latter in relation to the cylinder device, the piston device being arranged to engage end-position senders adjacent at least one of the cylinder end walls, a bellows device which encloses the piston rod and which is fixedly secured to the forward cylinder end wall and the nozzle holder, means for feeding treatment fluid and means for feeding gas under pressure to a mixing assembly in order to mix the fluid and the gas and to expel the resulting mixture, means for feeding working gas to the cylinder assembly, and a mount on the cylinder assembly for mounting the nozzle unit to a positioning unit.

More particularly, the invention is directed towards a nozzle unit for various treatment processes concerning cavities and the like in constructions which are to be surface treated or filled with a fluid. The unit is especially intended for injecting rust protectant into cavities and beams in vehicle chassis wherein their inner surfaces are coated with a rust protecting oil, wax or similar, and is intended, together with a plurality of similar nozzle units, to automatically treat a vehicle chassis on a production line.

A nozzle unit of this sort is described in Swedish patent no. 8703858-4 (publication no. 459 081) which represents the prior art as referred to in the preamble of claim 1. However, this prior art nozzle unit has a comparatively large number of connecting hoses, which can hinder the unit in its operation and adjustment and which are exposed to the risk of damage.

The object of the invention is to provide a nozzle unit having a minimal number of externally located, stationary lines at a safe distance from the spray nozzle of the unit.

A further object of the invention is to provide a nozzle unit with a comparativelely simple construction, which is easy to clean and which lacks seals for the mixing assembly, an advantage with aggressive fluids.

These objects are attained in accordance with the invention in a nozzle unit as defined in the introductory passage, which is characterized in that the piston device and the piston rod present through going, concentrically oriented bores, the piston rod bore being aligned with the spray nozzle bore, a connecting nipple is disposed at the rear cylinder end wall for feeding treatment fluid to a stock conduit fixedly secured to this end wall and which is concentrically disposed in the cylinder assembly and inserts into the piston device bore and the piston rod bore, and which, in the projecting state of the nozzle unit, is arranged, together with a conduit means for feeding mixing gas, to discharge at the inner end of the mixing assembly.

Further developments of the invention are apparent from the features indicated in the subsidiary claims.

A preferred embodiment of the invention will now be described by way of example and with reference to the accompanying drawings in which:

Fig. 1 depicts in side view a preferred embodiment of the invention;
Fig. 2 depicts in central longitudinal section the nozzle unit of Fig. 1;
Fig 3 depicts in enlarged scale the area around the forward cylinder end wall of the nozzle unit and the discharge of the stock pipe; and
Fig. 4 illustrates a control circuit for the nozzle unit presented.

Referring initially to Figs. 1 and 2, the nozzle unit of the invention comprises an interchangable spray nozzle 1 having a central bore 27, which is releasably secured in a nozzle holder 2. The connecting end of the spray nozzle has a control peg with which the spraying direction of the nozzle is adjusted by the peg being fitted into a slot in the nozzle holder, which is schematically depicted in the right hand part of Fig. 2. Reference numeral 3 generally indicates a pneumatic cylinder assembly which is preferably of the Atlas Copco C 43 MD type with rotationally rigid piston rod 4. In addition to the piston rod 4, the cylinder assembly 3 comprises a cylindrical wall 5 having attached forward and rear cylinder end walls, respectively 6 and 7. A piston device 8 is arranged to reciprocate between the cylinder end walls and is equipped with conventional seals. The piston device presents a through going, concentrically arranged bore 9 in which the piston rod 4 is secured. The nozzle holder 2 is fixedly secured to the end of the piston rod which projects from the cylinder assembly, for example with a jam nut and a locking screw. A bellows device 10 protectively encloses the projecting piston rod 4 and is conveniently secured adjacent the forward cylinder end wall 6 and the nozzle holder 2.

Fig. 1 also depicts the nozzle unit signal valve 11, working valve 12 with its choke valve 13 and stock valve 14 with its connecting nipple 16 for a treatment fluid (stock) line. Reference numeral 17 indicates the associated control circuit which, together with the above mentioned valves will be presented in more detail below and with reference to Fig. 4.

Figs. 2 and 3 will now be referred to for a more detailed description of the internal construction of the nozzle unit. The piston rod 4 which is shown in its completely projecting state, presents a through going and concentrically arranged bore 18 and 19, the bore 18 in the projecting portion of the piston rod having a lesser internal diameter than that of the bore 19 in the piston rod in the inserting portion of the piston device. An intermediate portion 20 having a diameter varying in the lon-

gitudinal direction from the bore 18 to the bore 19 and preferably, but not necessarily, of conical form, communicates the bores with each other, see Fig. 3 in particular. Additionally, a pneumatic, spray position signal sender 11, 26 is disposed in the forward cylinder end wall 6, which will be described in more detail in connection with Fig. 4. An electric, home position sender 29 is disposed in the rear end wall, which is schematically depicted in Fig. 1. Aside from these end position senders, means 21 for feeding working gas under pressure to the cylinder assembly 3, and for venting, are respectively arranged for driving the piston device 8 and consequently the piston rod 4 forwards and backwards in the cylinder assembly.

The stock valve 14 is fixedly linked with the rear cylinder end wall 7 and fixedly supports a stock feed conduit 22 which is concentrically arranged in relation to the cylindrical wall 5 and which discharges in the vicinity of the forward cylinder end wall 6. The stock feed conduit 22 accordingly extends through the bore 9 in the piston device 8 and into the bore 18-20 in the piston rod, the outer diameter of the stock feed conduit being in all essential respects of similar size to the bore 18 in the projecting portion of the piston rod, but being substantially smaller than the bore 19 in the inserting portion of the piston rod. The stock pipe 22 is slidably supported in the various positions of the piston rod 8 between the rear cylinder end wall 7 and a short distance in front of the forward cylinder end wall, with a sealing fit in the smaller bore 18 in which the stock conduit then discharges. However, in the projected state of the nozzle unit, i.e. when the piston device 8 is in its forwardmost position, as depicted in Figs. 2 and 3, the stock conduit 22 discharges into the intermediate portion 20 of the through going bore in the piston rod 4 and allows the working gas from the rear connection 21 to flow through the space (channel means) 23 between the stock pipe 22 and the larger bore 19, through the bores 20 and 18 and out through the bore 27 in the spray nozzle 1.

Finally, a mount 28 is disposed on the cylinder assembly 3 for mounting the nozzle unit on or adjacent a mechanical positioning unit (not depicted), such as those of the prior art in this technical field, see for example the above mentioned Swedish patent no. 8703858-4 to which reference is made in this context. With the assistance of the positioning unit, either a group of nozzle units is positioned in an exact location relative to a vehicle chassis which is to be treated, or the chassis is positioned in an exact location in relation to the group of nozzle units.

The nozzle unit of the present invention preferably works in the manner indicated below.

After the nozzle unit and the cavity in the chassis which is to be treated therewith have been made to assume an exact position in relation to each other, the spray cycle is started with a pneumatic control signal 15 which is ceased when the predetermined amount of stock has been sprayed into the cavity. This control may, for example, be carried out with a program in a computer unit (not depicted). In the starting position, however, the control signal is without pressure, which leads to the cylinder assembly 3 being subjected to pressure on the minus side (on the right hand side of the piston device 8 in Fig. 2) and therefore also the piston device in the home position at the rear cylinder end wall 7, which is detected by the electrical home position sender 29. When the control signal 15 is generated, it prompts the working valve 12 to change position against the action of a compression spring (see Fig. 4 which depicts the starting position for the nozzle unit), the working gas being allowed to flow from the working gas feed line 24, through the valve 12 and the connection 21 in the rear cylinder end wall 7, and into the plus side of the cylinder assembly 3 (to the left of the piston device 8 in Fig. 2). At the same time, the minus side is vented through the connection 21 in the forward cylinder end wall 6, the piston device 8 moving towards the forward end wall and projecting the hollow piston rod 4 fixed to the piston device therefrom, the spray nozzle 1 secured in the free end of the piston rod being inserted into the cavity which is to be treated. The control signal also branches off to signal valve 11, as is shown with the arrows 15 in Fig. 4.

When the piston device reaches its outer end position adjacent the forward cylinder end wall 6, i.e. the position depicted in Figs. 2 and 3, the nozzle unit is in its spray position and the piston device 8 acts on the operating means 26 of the forward end position sender, which in turn shifts the signal valve 11 against the action of a compression spring, wherein the control signal can pass through the signal valve 11 and be transmitted to the stock valve 14. However, if the spray nozzle 1 can not be entirely projected into the cavity which is to be treated, for example due to missing the spray opening, the signal valve will not be activated in this event and the stock valve will not be acted on by any signal, thus providing automatic monitoring. The control signals allowed through will, however, shift the stock valve 14 against the action of a compression spring, wherein the treatment fluid is allowed to flow from the treatment fluid feed line 25, through the stock conduit 22 and into the bore 18 in the piston rod 4 via its intermediate portion 20.

The sealing fit between the stock conduit 22 and the through going bore 18 in the projecting portion of the piston rod leads to the stock conduit acting as a choke for the working gas which is introduced through the rear cylinder end wall 7, so that the piston device 8 is driven with full gas pressure from the starting position adjacent the cylinder end wall 7 to a position shortly in front of the outermost position adjacent the forward cylinder end wall 6, as depicted in Figs. 2 and 3, i.e. the spray position of the nozzle unit. When the piston device has reached the spray position, the stock conduit 22 discharges into the intermediate portion 20, which means that the working gas can flow through the channel means 23 and into the bore 18. This construction ensures that the piston device works at full pressure during the "plus movement", i.e. shifting towards the spray position, and that the spray

nozzle 1 obtains full blowing gas pressure during the spray process.

When the stock valve 14 is opened, the treatment fluid is consequently fed through the stock conduit 22 and sprays out within the through going bore 18, 20 in the piston rod 4, where it is atomized and mixed with the working gas (the blowing air) from the "plus side" of the cylinder assembly 3 (the side adjacent the rear cylinder end wall 7). The mixture of blowing air and treatment fluid, which is mixed in the through going bore 18, is thereafter sprayed out into the cavity in the chassis (above all due to the pressure of the blowing gas) through the spray nozzle 1 which is secured in the nozzle unit holder 2 on the end of the piston rod.

The working valve 12 is fed with working gas via a distributor block which distributes working gas to several nozzle units in a group. The treatment stock which is to be sprayed is fed from a common feed line 25, wherein the spray amount of stock is measured with a geared meter (not depicted) which is common for the entire group. When the pre-programmed amount has been applied, a magnetic valve (not depicted) ceases the control signal 15. When the control signal disappears, this means that the stock valve 14 closes immediately. The signal to the working valve 12 is evacuated via choke valve 13 which maintains the valve 12 in the open position for 0.5 - 1. seconds after the stock valve has closed. This subsequent blowing is carried out to blow the nozzle clean from stock. When the working valve has returned to the initial position, the air feed from the plus side of the cylinder swaps over to the minus side of the cylinder. The piston device and the nozzle are then returned to the home position, which is detected with the home position sender 29 in the rear cylinder end wall 7, which gives a clear signal to the control system that the spray cycle has been completed.

Aside from oil and wax, the treatment fluid may be paint, powder material and similar. The working gas is preferably air but may, if so desired, be any inert gas or gas selected for compatibility with the treatment fluid. It is also possible, when necessary, to swap the working gas for a fluid of some other sort than treatment fluid, for example a liquid such as a diluent.

The advantages of the nozzle unit are over and above those apparent from the above, in that prior art nozzle units have all the valves etc needed for operating the unit centrally located in the plant and connected to the nozzle unit with hoses. In order to operate a unit, at least four hoses are required, three for compressed air and one for spray stock. Two of these hoses are movable at the nozzle unit. In accordance with the invention, the valves have been shifted out to the cylinder - the air valve for the working air and the stock valve. Now only two hoses are required. None are movable. The stock is now sprayed out through the hollow piston rod of the cylinder, and the position of the cylinder directly activates the opening of the stock valve, which means simplifications in the control system which controls the process. Fewer signals are needed for operation.

The invention is not limited to the embodiment described above and depicted on the drawings, but rather may be altered within the scope of the patent claims.

Claims

1. A nozzle unit for the automatic injection of a treatment fluid into a cavity, comprising a spray nozzle (1) with a bore, a nozzle holder (2) in which the spray nozzle is secured, a pneumatic cylinder assembly (3) having a cylinder device defined by a cylindrical wall (5), and forward and rear (6, 7) cylinder end walls, and having a piston device (8) translatably disposed in the cylinder assembly and a piston rod (4) whose ends are fixedly secured respectively to the piston device and the nozzle holder for moving the latter in relation to the cylinder device, the piston device being arranged to engage end-position senders (26) adjacent at least one of the cylinder end walls (6), a bellows device (10) which encloses the piston rod (4) and which is fixedly secured to the forward cylinder end wall (6) and the nozzle holder (2), means (16, 22) for feeding treatment fluid and means (21, 23) for feeding gas under pressure to a mixing assembly (18) in order to mix the fluid and the gas and to expel the resulting mixture, means (12, 24) for feeding working gas to the cylinder assembly (3), and a mount (28) on the cylinder assembly for mounting the nozzle unit to a positioning unit **characterized in that**
the piston device (8) and the piston rod (4) present through going, concentrically oriented bores (9, 18-20), the piston rod bore (18-20) being aligned with the bore (27) in the spray nozzle (1), a connecting nipple (16) is disposed at the rear cylinder end wall (7) for feeding treatment fluid to a stock conduit (22) fixedly secured to this end wall and which is concentrically disposed in the cylinder assembly (3) and inserts into the bores (9, 18-20) in the piston device (8) and the piston rod (4), and which, in the projecting state of the nozzle unit, is arranged, together with a channel means (23) for feeding mixing gas, to discharge at the inner end of the mixing assembly (18).

2. A unit according to claim 1, **characterized in that** both the through going bore (9) in the piston device (8) and the through going bore (19) in the inner end of the piston rod (4) present a larger internal diameter than the external diameter of the stock pipe (22), whereby the space between the outer diameter of the stock conduit and said through going bores form the channel means (23) for feeding gas to the mixing assembly (18).

3. A unit according to claim 2, **characterized in that** the through going bore (18-20) in the piston rod presents a substantially conical portion (20) which is located between said bores (18, 19) having differ-

ent diameters and which, in the projecting state of the nozzle unit, is located adjacent the discharge of the stock conduit (22).

4. A unit according to claim 3, **characterized in that** the diameter of the bore in the piston rod having the lesser diameter (18) is substantially similar to the external diameter of the stock conduit (22).

5. A unit according to any one of claims 1 to 4, **characterized in that** a connection (21) for the working gas of the cylinder assembly (3) is disposed adjacent the rear cylinder end wall (7), and that in the projected state of the nozzle unit, the gas from this connection, under pressure, is made to flow into the mixing assembly (18) as mixing gas.

6. A unit according to any one of claims 1 to 5, **characterized in that** the bore in the piston rod (4) having the lesser diameter (18) serves as the mixing assembly.

7. A unit according to any one of the preceding claims, **characterized in that** a connection (21) for the working gas of the cylinder assembly (3) is disposed adjacent the respective cylinder end walls (6, 7), which connections are in communication with a source of working gas (24) via a working valve device (12) which is controlled by a control signal (15), that the end position sender (26) in the forward cylinder end wall (6) is arranged to operate a signal valve (11) to feed, or alternatively to cease said control signal (15) to a stock valve (14) which is disposed between the stock conduit (22) and a source of treatment fluid (25), whereby the treatment fluid is allowed to flow, or alternatively is prevented from flowing, into the stock conduit.

8. A unit according to claim 7, **characterized in that** a choke valve (13) is disposed in the control signal line system immediately adjacent the working valve (12).

9. A unit according to any one of the preceding claims, **characterized in that** a flow meter is disposed in the stock supply line (25) to the unit and is connected to a regulator unit which is arranged to provide the control signal (15).

10. A unit according to claim 10, **characterized in that** the regulator unit is in communication with a magnetic valve in the line system for the control signal (15) respectively to allow through and to stop the control signal to the working valve (12), and to the signal valve (11) and the stock valve (14).

Patentansprüche

1. Düseneinheit für das automatische Einspritzen einer Behandlungsflüssigkeit in einen Hohlraum mit einer Sprühdüse (1) mit einer Bohrung, einem Düsenhalter (2), in welchem die Sprühdüse befestigt ist, einer pneumatischen Zylinderanordnung (3) mit einer Zylindereinrichtung, die von einer zylindrischen Wand (5) und vorderen und hinteren (6, 7) Zylinderendwänden begrenzt ist und eine in der Zylinderanordnung verschiebbar angeordnete Kolbeneinrichtung (8) und eine Kolbenstange (4) hat, deren Enden in bezug auf die Kolbeneinrichtung und den Düsenhalter fest fixiert sind, um letzteren in bezug auf die Zylindereinrichtung zu bewegen, wobei die Kolbeneinrichtung so angeordnet ist, daß sie in Eingriff mit Endpositionssendern (26) in Nachbarschaft zu wenigstens einer der Zylinderendwände (6) steht, einer Balgeinrichtung (10), die die Kolbenstange (4) einschließt und die fest an der vorderen Zylinderendwand (6) und dem Düsenhalter (2) befestigt ist, Einrichtungen (16, 22) zur Einführung von Behandlungsflüssigkeit und Einrichtungen (21, 23) zum Einführen von Gas unter Druck in eine Mischanordnung (18), um die Flüssigkeit und das Gas zu vermischen und das resultierende Gemisch auszupressen, Einrichtungen (12, 24) zum Einführen von Arbeitsgas in die Zylinderanordnung (3) und einer Anordnung (28) auf der Zylinderanordnung zur Befestigung der Düseneinheit an einer Positioniereinheit, **dadurch gekennzeichnet**, daß die Kolbeneinrichtung (8) und die Kolbenstange (4) durchgehende, konzentrisch ausgerichtete Bohrungen (9, 18 bis 20) haben, wobei die Kolbenstangenbohrung (18 bis 20) mit der Bohrung (27) in der Sprühdüse (1) fluchtet, ein Verbindungsnippel (16) an der hinteren Zylinderendwand (7) angeordnet ist, um Behandlungsflüssigkeit in eine Vorratsleitung (22) einzuführen, die fest an dieser Endwand fixiert ist und die konzentrisch in der Zylinderanordnung (3) angeordnet ist und in den Bohrungen (9, 18 bis 20) in der Kolbeneinrichtung (8) und der Kolbenstange (4) steckt und die in vortretendem Zustand der Düseneinheit zusammen mit einer Kanaleinrichtung (23) für ein Einführen von Mischgas so angeordnet ist, daß es am inneren Ende der Mischanordnung (18) abgenommen wird.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß sowohl die durchgehende Bohrung (9) in der Kolbeneinrichtung (8) als auch die durchgehende Bohrung (19) in dem Inneren Ende der Kolbenstange (4) einen größeren inneren Durchmesser als der äußere Durchmesser der Vorratsleitung (22) haben, wobei der Raum zwischen dem Außendurchmesser der Vorratsleitung und den durchgehenden Bohrungen die Kanaleinrichtung (23) zum Einführen von Gas in die Mischanordnung (18) bilden.

3. Einheit nach Anspruch 2, **dadurch gekennzeichnet**, daß die durchgehende Bohrung (18 bis 20) in der Kolbenstange einen im wesentlichen konischen

Abschnitt (20) besitzt, welcher zwischen den Bohrungen (18, 19) mit unterschiedlichen Durchmessern angeordnet ist und im vortretenden Zustand der Düseneinheit nahe dem Austritt der Vorratsleitung (22) angeordnet ist.

4. Einheit nach Anspruch 3, **dadurch gekennzeichnet**, daß der Durchmesser der Bohrung in der Kolbenstange mit dem kleineren Durchmesser (18) im wesentlichen ähnlich dem Außendurchmesser der Vorratsleitung (22) ist.

5. Einheit nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet**, daß eine Verbindung (21) für das Arbeitsgas der Zylinderanordnung (3) in Nachbarschaft zu der hinteren Zylinderendwand (7) angeordnet ist und daß in dem vortretenden Zustand der Düseneinheit das Gas aus dieser Verbindung unter Druck zum Einfließen in die Mischanordnung (18) als Mischgas gebracht wird.

6. Einheit nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet**, daß die Bohrung in der Kolbenstange (4) mit dem geringeren Durchmesser (18) als die Mischanordnung dient.

7. Einheit nach einem der vorausgehenden Ansprüche, **dadurch gekennzeichnet**, daß eine Verbindung (21) für das Arbeitsgas der Zylinderanordnung (3) in Nachbarschaft zu den betreffenden Zylinderendwänden (6, 7) angeordnet ist, wobei diese Verbindungen in Verbindung mit einer Quelle für Arbeitsgas (24) über eine Arbeitsventileinrichtung (12) stehen, die durch ein Steuersignal (15) gesteuert wird, daß der Endpositionssender (26) in der vorderen Zylinderendwand (6) so angeordnet ist, daß er ein Signalventil (11) zur Beschickung betätigt oder stattdessen das Steuersignal (15) zu einem Vorratsventil (14) unterbricht, welches zwischen der Vorratsleitung (22) und einer Quelle für Behandlungsflüssigkeit (25) angeordnet ist, wobei man die Behandlungsflüssigkeit in die Vorratsleitung fließen läßt oder stattdessen am Fließen hindert.

8. Einheit nach Anspruch 7, **dadurch gekennzeichnet**, daß ein Drosselventil (13) in dem Steuersignalleitungssystem unmittelbar in Nachbarschaft zu dem Arbeitsventil (12) angeordnet ist.

9. Einheit nach einem der vorausgehenden Ansprüche, **dadurch gekennzeichnet**, daß ein Strömungsmesser in der Vorratszufuhrleitung (25) zu der Einheit angeordnet und mit einer Reglereinheit verbunden ist, die so angeordnet ist, daß sie das Steuersignal (15) liefert.

10. Einheit nach Anspruch 10, **dadurch gekennzeichnet**, daß die Reglereinheit in Verbindung mit einem Magnetventil in dem Leitungssystem für das Steuersignal (15) steht, um das Steuersignal zu dem Arbeitsventil (12) und zu dem Signalventil (11) und dem Vorratsventil (14) hindurchzulassen und zu stoppen.

Revendications

1. Ensemble à buse destiné à l'injection automatique d'un fluide de traitement dans une cavité, comprenant une buse de pulvérisation (1) ayant un trou, un support (2) de buse dans lequel est fixée la buse de pulvérisation, un ensemble à vérin pneumatique (3) ayant un dispositif à cylindre délimité par une paroi cylindrique (5), et des parois d'extrémité avant et arrière (6, 7) du cylindre, et ayant un dispositif à piston (8) qui est mobile en translation dans l'ensemble à cylindre et une tige (4) de piston dont les extrémités sont fixées respectivement au dispositif à piston et au support de buse afin que ce dernier soit déplacé par rapport au dispositif à cylindre, le dispositif à piston étant destiné à coopérer avec des organes (26) de transmission de signal de position d'extrémité adjacents à l'une au moins des parois d'extrémité (6) du cylindre, un dispositif à soufflet (10) qui entoure la tige (4) du piston et qui est fixé à la paroi d'extrémité avant (6) du cylindre et au support (2) de buse, un dispositif (16, 22) destiné à transmettre du fluide de traitement et un dispositif (21, 23) destiné à transmettre un gaz sous pression à un ensemble (18) de mélange du fluide et du gaz et d'expulsion du mélange résultant, un dispositif (12, 24) destiné à transmettre un gaz de travail à l'ensemble à vérin (3), et un organe de montage (28) placé sur l'ensemble à vérin et destiné au montage de l'ensemble à buse sur une unité de positionnement, caractérisé en ce que

le dispositif à piston (8) et la tige de piston (4) ont des trous débouchants, orientés concentriquement (9, 18-20), le trou (18-20) de la tige de piston étant aligné sur le trou (27) de la buse de pulvérisation (1), un embout (16) de raccordement est placé au niveau de la paroi d'extrémité arrière (7) du cylindre pour la transmission d'un fluide de traitement à un conduit (22) de matière de stockage fixé à cette paroi d'extrémité et qui est placé concentriquement dans l'ensemble à vérin (3) et pénètre dans les trous (9, 18-20) du dispositif à piston (8) et de la tige (4) de piston, et qui, dans l'état en saillie de l'ensemble à buse, est destiné, en coopération avec un dispositif (23) à canal d'alimentation en gaz de mélange, à provoquer une évacuation à l'extrémité interne de l'ensemble de mélange (18).

2. Ensemble selon la revendication 1, caractérisé en ce que le trou débouchant (9) du dispositif à piston (8) et le trou débouchant (19) de l'extrémité interne de la tige (4) de piston ont un diamètre interne supérieur au diamètre externe du conduit (22) de matière de stockage, si bien que l'espace compris entre la

périphérie externe du conduit de matière de stockage et les trous débouchants forme le dispositif à canal (23) destiné à transmettre le gaz à l'ensemble de mélange (18).

3. Ensemble selon la revendication 2, caractérisé en ce que le trou débouchant (18-20) formé dans la tige de piston a une partie pratiquement conique (20) placée entre les trous (18, 19) ayant des diamètres différents et qui, lorsque l'ensemble à buse est en saillie, est placé près de l'évacuation du conduit de matière de stockage (22).

4. Ensemble selon la revendication 3, caractérisé en ce que le diamètre du trou formé dans la tige du piston ayant un diamètre relativement petit (18) est pratiquement égal au diamètre externe du conduit de matière de stockage (22).

5. Ensemble selon l'une quelconque des revendications 1 à 4, caractérisé en ce qu'un raccord (21) du gaz de travail de l'ensemble à vérin (3) est placé près de la paroi de l'extrémité arrière (7) du cylindre, et en ce que, lorsque l'ensemble à buse est avancé, le gaz provenant de ce raccord et qui est sous pression circule dans l'ensemble de mélange (18) sous forme du gaz de mélange.

6. Ensemble selon l'une quelconque des revendications 1 à 5, caractérisé en ce que le trou formé dans la tige (4) du piston ayant un diamètre relativement petit (18) est utilisé comme ensemble de mélange.

7. Ensemble selon l'une quelconque des revendications précédentes, caractérisé en ce qu'un raccord (21) du gaz de travail de l'ensemble à vérin (3) est placé près des parois respectives d'extrémité (6, 7) du cylindre, les raccords étant en communication avec une source de gaz de travail (24) par l'intermédiaire d'un dispositif (12) à soupape de travail qui est commandé par un signal de commande (15), en ce que l'organe (26) de transmission d'un signal de position d'extrémité placé dans la paroi d'extrémité avant (6) du cylindre est destiné à commander une soupape de signalisation (11) afin qu'il transmette ou au contraire cesse de transmettre le signal de commande (15) à une soupape de matière de stockage (14) qui est placée entre le conduit de matière de stockage (22) et une source d'un fluide de traitement (25), si bien que le fluide de traitement peut circuler ou au contraire ne peut pas circuler dans le conduit de matière de stockage.

8. Ensemble selon la revendication 7, caractérisé en ce qu'une soupape à gicleur (13) est placée dans le circuit de la conduite de signalisation de commande et est immédiatement adjacente à la soupape de travail (12).

9. Ensemble selon l'une quelconque des revendications précédentes, caractérisé en ce qu'un débitmètre est placé dans la conduite (25) d'alimentation en matière de stockage de l'ensemble et est raccordé à un ensemble à régulateur qui est destiné à transmettre le signal de commande (15).

10. Ensemble selon la revendication 9, caractérisé en ce que l'ensemble à régulateur communique avec une soupape magnétique placée dans le circuit de circulation du signal de commande (15) afin qu'il permette le passage du signal de commande à la soupape de travail (12) et à la soupape (11) de signalisation et à la soupape (14) de matière de stockage ou l'arrête.

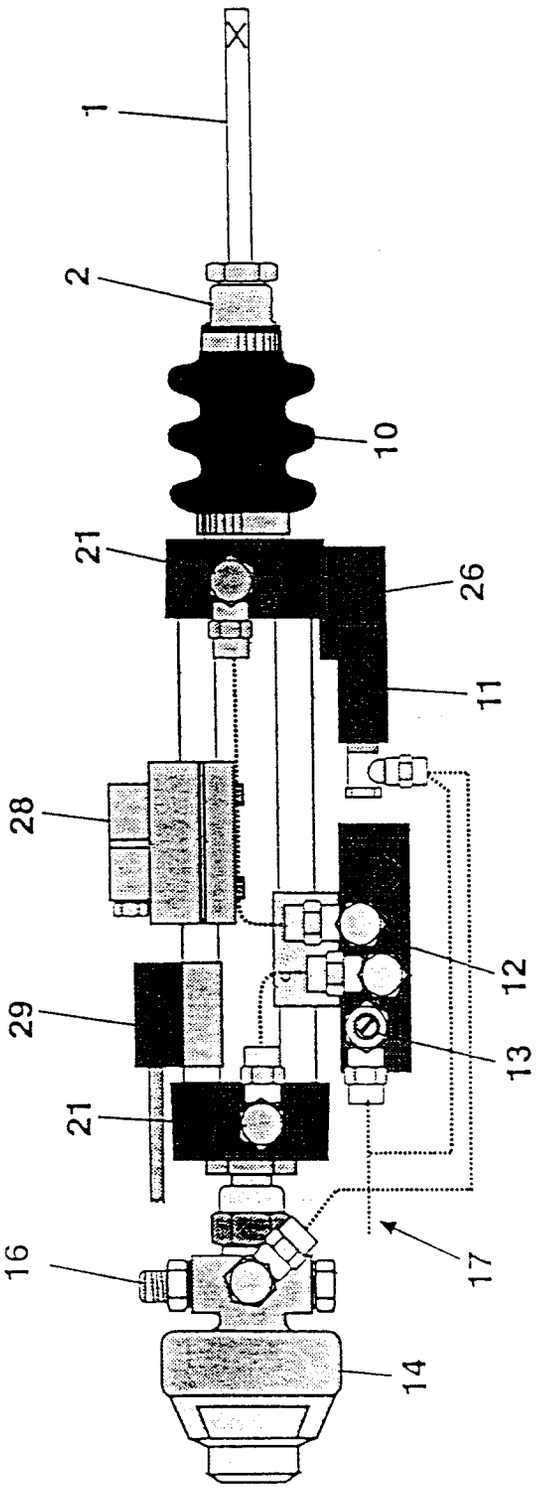

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Fig. 1

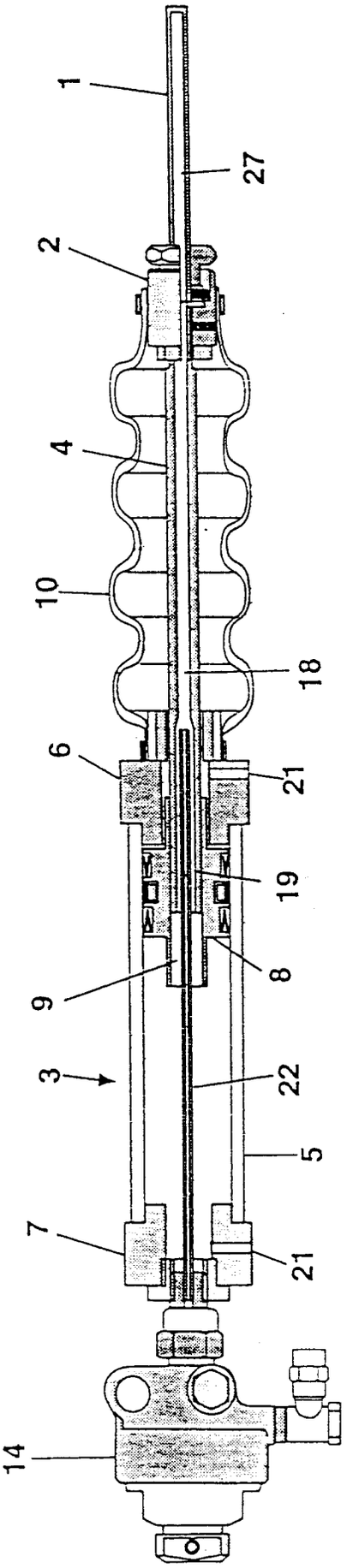

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Fig. 2

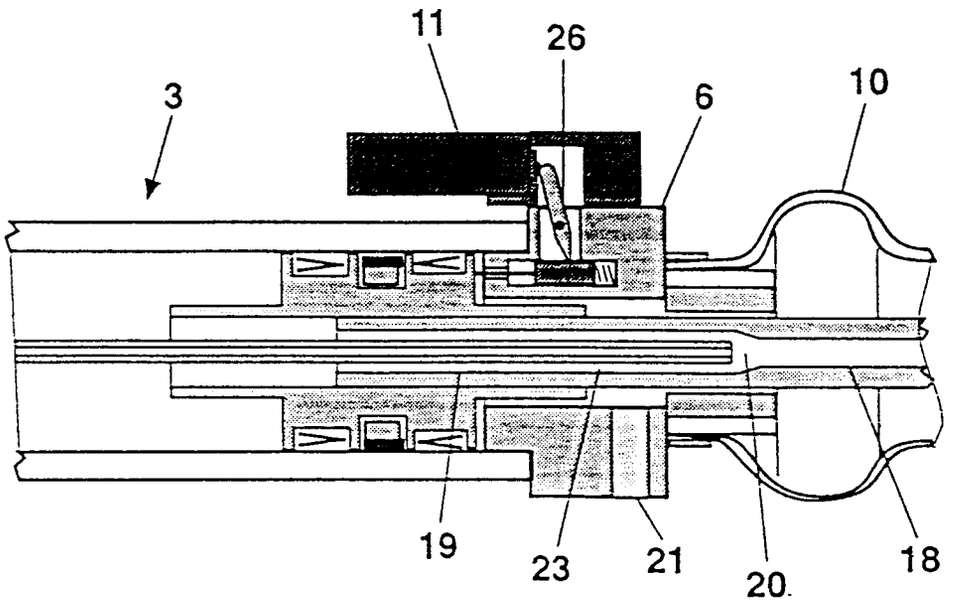


Fig. 3

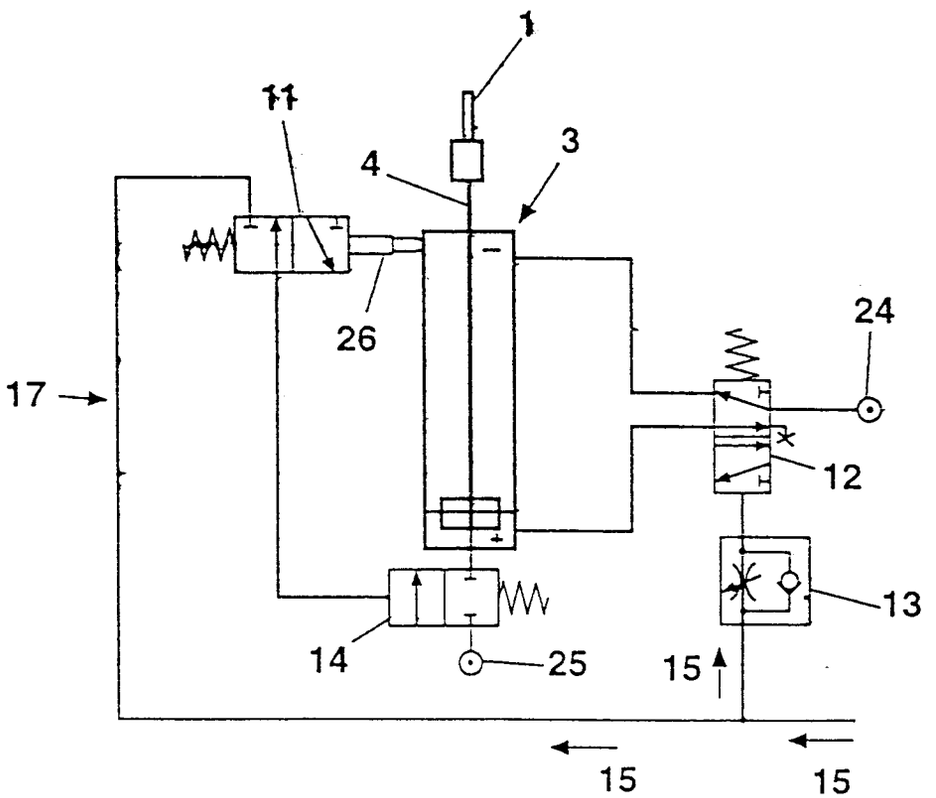


Fig. 4