

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 783 923 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
17.06.1998 Bulletin 1998/25

(51) Int. Cl.⁶: **B05B 1/00**, B08B 3/02

(21) Application number: **95120119.3**

(22) Date of filing: **19.12.1995**

(54) **Method and apparatus for controlling the flow of cleaning liquid through a high-pressure cleaner**

Verfahren und Vorrichtung zum Regeln der Strömung einer Reinigungsflüssigkeit durch einen Hochdruckreiniger

Méthode et appareil pour la commande d'écoulement d'un liquide de nettoyage traversant un nettoyeur à haute pression

(84) Designated Contracting States:
DE DK FR GB IT SE

(43) Date of publication of application:
16.07.1997 Bulletin 1997/29

(73) Proprietor: **KEW INDUSTRI A/S**
9560 Hadsund (DK)

(72) Inventor: **Nikolajsen, Martin**
DK-9000 Aalborg (DK)

(74) Representative:
Roerboel, Leif et al
BUDDE, SCHOU & CO. A/S,
Vestergade 31
1456 Copenhagen K (DK)

(56) References cited:
EP-A- 0 263 196 **DE-U- 8 814 243**

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

EP 0 783 923 B1

Description

TECHNICAL FIELD

The present invention relates to a known method and a know apparatus of the type set forth in the preambles of claims 1 and 3, respectively.

BACKGROUND ART

A number of different methods and apparatuses are known, all being variants of the type referred to above. Thus, e.g. methods are known, in which high-pressure cleaners with automatic control valves are used, said control valves having influence on the flow of cleaning liquid and being connected to sensors sensitive to the outlet pressure and/or the volume of flow from the cleaning gun. The adjustment of the desired flow of cleaning liquid takes place on the basis of the changes occurring in the volume of flow and/or the outlet pressure as sensed by the sensors, in that the valves will be controlling the motor-pump unit and set the latter to the desired mode of operation, e.g. full, partial or no flow corresponding to the motor-pump unit being driven without limitation, with partial return flow or full return flow, respectively.

In recent years, the development of dedicated control methods for high-pressure cleaners has in this connection especially been concentrated on providing automatic control units, which in addition to influencing the flow of cleaning liquid directly, at the same time in certain operating modes can influence the start/stop function of the motor-pump unit indirectly. These known high-pressure cleaners with automatic control units, of which the latter alone comprise a considerable number of components, are usually provided with other control components, such as e.g. for relieving the pressure in the units during operating modes, in which the flow is interrupted temporarily, for which reason they are partly relatively complicated and hence relatively costly to manufacture, partly not quite as reliable in operation as could be desired, especially considering that it must be possible to operate high-pressure cleaners under optimal safety conditions for the personnel using them.

DISCLOSURE OF THE INVENTION

It is the object of the present invention to provide a method and an apparatus of the kind referred to initially, capable of being used in connection with control of the flow of cleaning liquid to be ejected in varying quantities from the cleaning gun with a view to adapt the volume of flow of cleaning liquid to each particular cleaning situation for the surface to be cleaned, as simply and safely as possible and at the lowest possible cost, and this object is achieved by means of the steps and features set forth in the characterizing clauses of claims 1 and 4, respectively.

Thus, the present invention provides a method of controlling the flow of cleaning liquid to be ejected from the cleaning gun, in a simple manner making it possible to operate the high-pressure cleaner in an advantageous manner with varying and - if so desired - extra large volumes of cleaning liquid being supplied to the primary flow path from a secondary flow path, and - not least - with highly reliable operation and under optimal safety conditions in all modes of operation. Likewise, the present invention provides an apparatus comprising a high-pressure cleaner having a smaller number of components, for this reason being considerably simpler in construction and hence considerably cheaper to manufacture, and in addition more reliable in operation and hence more safe and reliable in use than the previously known high-pressure cleaners. With a high-pressure cleaner, in which the piston in the automatic control unit in an operational mode, in which the ejection of additional cleaning liquid is desired, may be made to function as a valve for the supply of additional cleaning liquid via a secondary flow path to the cleaning liquid already flowing through the primary flow path, it is ensured in a simple manner partly that additional cleaning liquid is not delivered to the cleaning gun except when it is open, partly that it is sufficient to have one single connection to the injector, resulting in a considerably simplified and safer construction, especially because it is possible with advantage to utilize the pressure-control conduits already present. Further, the control function, previously being taken care of in a number of different single units, is now unified in a single unit.

Additional advantageous embodiments of the method and the apparatus according to the invention, the effects of which are explained in the following detailed portion of the present description, are set forth in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following detailed portion of the present description, the invention will be explained in more detail with reference to the exemplary embodiment of an apparatus according to the invention shown in the drawings, in which

Figure 1 is a diagrammatic view of the high-pressure cleaner, in which the automatic control unit is shown in an operational mode comprising ejection of cleaning liquid at a relatively high pressure, and in which the primary flow path is shown with fully black arrows, and

Figure 2 shows the apparatus in the same manner as in Figure 1, but in an operational mode, in which cleaning liquid is ejected at a relatively low pressure, and in which additional cleaning liquid is supplied via the secondary flow path shown with the arrows having black contours only.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The embodiment of a high-pressure cleaner to be used in accordance with the invention and shown in the drawing comprises an inlet conduit (1), advantageously adapted to be connected to a suitable source of cleaning liquid, normally constituted by water, such as an ordinary water supply, a high-pressure pump (2) comprising an inlet valve (3), a cylinder (4) with associated movable piston (5), a motor (6) and an outlet valve (7), the latter through a first outlet conduit (8) being connected to the nozzle inlet part of an injector (9), the outlet of which is connected through a second outlet conduit (10) to a cleaning gun (11), the latter advantageously comprising adjustment means for adjusting the flow resistance for the outflowing cleaning liquid.

Likewise, the embodiment of a high-pressure cleaner shown in the drawing comprises an automatic control unit (20) for regulation and control of the cleaning liquid flowing through, said unit (20) being fluidically connected, partly to the inlet conduit (1) through a first pressure-control conduit (13), partly to an outlet conduit (8) through a second pressure-control conduit (14) as well as to the suction inlet part (37) of the injector (9) through a third pressure-control conduit (15). Electrically, the unit (20) is connected to the power supply circuit of the motor (6) in a manner not shown through a start/stop switch (16).

The following explanation will demonstrate in more detail how the automatic control unit (20) co-operates with the remaining components in the high-pressure cleaner.

The automatic control unit (20) comprises a generally cylindrical housing (17), which is hollow and likewise having a cylindrical internal shape, one end of which is permanently closed, while the opposite end is closed by a gland (18), the latter advantageously co-operating with a partition (19) and possibly a third chamber (25) constituting the guides for the piston assembly (43).

The piston assembly (43) is mainly cylindrical in shape and divides the cavity between the gland (18) and the partition (19) in two spaces or chambers (23, 24), of which the first chamber (23) lies between the internal end wall of the gland (18) and the piston assembly (43), while the second chamber (24) lies between the piston assembly (43) and the partition (19).

Through the gland (18) a switching rod (35) extends, advantageously being permanently secured to one end of the piston assembly (43), while its free end is movable towards and away from an operating member on the start/stop switch (16) so as to cause the switch to make or break the power supply circuit to the motor (6).

The opposite end of the piston assembly (43) may advantageously comprise a cylindrical part (36) with reduced diameter co-operating with the cylindrical surface of the third chamber (25) in the housing (17). This

third chamber (25) may be made to communicate with the second chamber (24) through a relief channel (27). The second chamber (24) accommodates a spring (28) acting upon the piston assembly (43) with a given force in the direction towards the right in the drawing.

The piston assembly (43) is advantageously composed of at least two piston parts (22, 21), of which the first piston part (22), situated in the first chamber (23), may have its end facing the gland (18) adapted to form a loose or fixed connection to the switching rod (35). Consequently, the opposite end faces the second piston part (21), and may advantageously be secured by means of a securing device, such as a split pin or the like. Otherwise, the piston assembly (43) may comprise channels for cleaning liquid to flow through, or else the two piston parts (22, 21) may comprise channels allowing cleaning liquid to flow through. The arrangement of a piston assembly (43) composed of two parts (22, 21) makes it easy to manufacture and assemble the piston assembly, and also to dismantle it in connection with repairs and maintenance, and also makes easy and simple to place in position the remaining components associated with the piston. The piston part (21), in the exemplary embodiment shown constituting the relatively largest part of the piston assembly (43), is generally shaped as a hollow cylinder, the outside and inside walls of which both have a stepped configuration comprising three steps of successively decreasing diameter. The end with the largest diameter is placed to embrace part of the first piston part (22). The opposite end, i.e. the cylindrical part (36) with reduced diameter, in which a duct (32) is formed, protrudes into the third chamber (25). Inside the central section of the second piston part (21) a check valve is arranged, in the example shown consisting of a spring (29) and a ball (30), of which the spring (29) abuts against both the internal end surface on the first piston part (22) and against the ball, the latter abutting against a seat in the second piston part (21). In this manner, the spring (29) acts upon the ball (30) with a given force in the direction towards the left in the drawing.

The movement of the piston assembly (43) in the cavity in the housing (17) of the control unit (20) may advantageously be defined, partly by the end of the first piston part (22) facing the gland (18), partly by the step surface connecting the end part (36) and the central section of the second piston part (21).

As will be evident from e.g. Figure 1, the first chamber (23) is connected to the suction inlet part (37) of the injector (9) through the third pressure-control conduit (15), the second chamber (24) is connected to the first outlet conduit (8), i.e. to the pressure side of the pump (2), via the second pressure-control conduit (14), while the third chamber (25) and the connecting duct (26) are connected to the inlet conduit (1) through the first pressure-control conduit (13).

As may be seen on Figure 1, the piston assembly (43) is advantageously constructed in such a manner,

that there is a small difference between the effective piston-pressure areas in the first and the second chamber, so that in an operating situation, in which the pressure in the chambers (23, 24) are equal ($P_2 = P_3$), i.e. when for instance the cleaning gun (11) is made inactive, the piston assembly (43) will move in a given desired direction. In the example shown in the drawing, the piston-pressure area is largest on the part of the piston assembly (43) facing the chamber (23), i.e. in this case the piston will move towards the left in the drawing. As will likewise be understood, the movements towards the left may be counteracted somewhat by the spring (28) acting upon the piston assembly (43) in the opposite direction. When the transition step surface between the end part (36) and the central section abuts against the partition (19), the piston assembly (43) will have carried out a movement causing the switching rod (35) to be no longer in engagement with or pressing against the operating member of the switch (16), i.e. the power supply circuit for the motor (6) is interrupted and the pump (2) stops. During the movement of the piston assembly (43), the relief channel (27) will be connected to the third chamber (25), thus causing a general pressure relief of the whole system in the high-pressure cleaner. The lowering of the pressure is in fact controlled by the spring (28), since the force, with which the spring acts upon the piston assembly (43), decides for how long the relief channel (27) is connected to the pressure-control connection (13, 26) comprising the connecting duct (26) and the first pressure-control conduit (13), in which there is normally a pressure P_1 that is less than P_2 and P_3 , the pressure normally being water-mains pressure, i.e. from 0 to approximately 10 bars.

When the force on the spring (28) is substantially equal to or somewhat larger than the resultant hydraulic force on the piston assembly (43), the latter will slowly slide backwards towards the right in the drawing until the relief channel (27) has moved past the seal (34) at the partition (19), after which a position of equilibrium for the piston assembly (43) will be established. Normally, this equilibrium position will be adjusted to occur at a pressure of about 20 bars, but may naturally be selected according to need. The length of the switching rod (35) and the part of movement of the piston assembly (43) to this equilibrium position are attuned to each other in such a manner, that the operating member on the start/stop switch (16) is not actuated, i.e. the power supply circuit for the motor (6) is still interrupted, this meaning that the pump (2) is likewise inoperative. Not until the cleaning gun (11) is actuated again, i.e. when cleaning liquid again can flow through it, the motor (6) and the pump (2) are again set in motion.

When the cleaning gun (11) is opened, an immediate lowering of pressure occurs in the first chamber (23) via the third pressure-control conduit (15) and in the second chamber (24) via the second pressure-control conduit (14). Subsequently, the resultant hydraulic force on the piston assembly (43) will make the latter move

towards the right in the drawing, i.e. the switching rod (35) is made to engage or press on the operating member of the start/stop switch (16) so that the power supply to the motor (6) is connected and the motor can drive the pump (2). I.e. the high-pressure cleaner will now run in e.g. normal high-pressure operation, with the primary liquid-flow path through the high-pressure cleaner being open to the cleaning liquid and extending from the inlet conduit (1) through the pump (2) and the first outlet conduit (8), the injector (9) and the second outlet conduit (10) to the cleaning gun (11) and the adjustment means (12), consequently at a high pressure and with a relatively small quantity of liquid per unit time out through the outlet nozzle of the cleaning gun (11).

Thus, during normal operation, the pressure P_2 will correspond approximately to the output pressure of the pump, normally lying in the interval 80-120 bars, both in the second pressure-control conduit (14) and in the second chamber (24), and a pressure P_3 in the first chamber (23) being less than the pressure P_2 due to the lowering of pressure in the suction inlet (37) of the injector (19) caused by the flow of the cleaning liquid through the latter, hence also in the first chamber (23) via the third pressure-control conduit (15). In the third chamber (25), the connecting duct (26) and the first pressure-control conduit (13), the inlet pressure of the cleaning liquid will reign. Thus, the resultant hydraulic force on the piston assembly (43) will make it remain in the position shown to the right in the drawing. In this normal operating condition, the adjustment means (12) on the cleaning gun (11) for varying the quantity of cleaning liquid to be ejected will be set to a relatively small outflow opening for the cleaning liquid. As mentioned above, it is desirable in many situations to be able to change the operation of the high-pressure cleaner from normal operation at a high pressure to a operating condition, in which the pressure is somewhat lower. This is especially desired in situations requiring flushing or rinsing after an effective cleaning at a high pressure, or if it is desired to soak or soften dirt on the surface to be cleaned before high pressure is applied to the cleaning liquid and consequently to the high-pressure cleaner. In many cases of flushing at a low pressure, the quantity of cleaning liquid is, however, experienced as being insufficient, and for this reason it is desirable to be able to increase the quantity of liquid in a simple manner.

By adjusting the outflow adjustment means (12) in a manner to increase the outflow opening for the cleaning liquid, the flow velocity of the cleaning liquid will increase, thus creating a lower pressure in the suction inlet of the injector (9) and hence in the third pressure-control conduit (15) and likewise in the first chamber (23). At the same time, this reduced pressure causes the check valve (29, 30) in the piston assembly (43) to open, thus allowing additional cleaning liquid to flow via the secondary flow path extending from the inlet conduit (1), through the first pressure-control conduit (13), the connecting duct (26) and the third chamber (25),

through the inlet duct (32), the check valve (29, 30) and the piston assembly (43), such as through flow ducts (not shown) in the first piston part (22), to the first chamber (23) and from the latter to the cleaning gun (11) via the third pressure-control conduit (15), the injector (9) and the latter's suction inlet (37) as well as the second outlet conduit (10). Thus, a simple and reliable flow passage for additional cleaning liquid has been established in a simple manner by using the pressure-control conduits already described, and trials have shown that with the normal pressure conditions mentioned above, it is possible to increase the quantity of cleaning liquid from e.g. 7 l/min. to 12 l/min.

The magnitude of the lower pressure required to open the check valve (29, 30) can be determined by the characteristics of the spring (29), and will also depend on the pressure P_1 of the cleaning liquid reigning in the inlet conduit (1).

LIST OF PARTS

P_1	pressure	
P_2	pressure	
P_3	pressure	
1	inlet conduit	25
2	high-pressure pump	
3	inlet valve	
4	cylinder	
5	piston	
6	motor	30
7	outlet valve	
8	first outlet conduit	
9	injector	
10	second outlet conduit	
11	cleaning gun	35
12	adjustment means	
13	first pressure-control conduit	
14	second pressure-control conduit	
15	third pressure-control conduit	
16	start/stop switch	40
17	housing	
18	gland	
19	partition	
20	automatic control unit	
21	second piston part	45
22	first piston part	
23	first chamber	
24	second chamber	
25	third chamber	
26	connecting duct	50
27	relief channel	
28	spring	
29	spring	
30	ball	
31	seal	55
32	inlet duct	
33	channel	
34	seal	

35	switching rod
36	cylindrical part/end part
37	suction inlet part
43	piston assembly

Claims

1. Method for controlling the flow of cleaning liquid in a high-pressure cleaner and of the kind comprising the formation of a primary flow path for the cleaning liquid to parts of the high-pressure cleaner comprising

a) an inlet conduit (1) for cleaning liquid at a relatively low pressure (P_1), a motor-pump unit (6, 2), the suction side of which is connected to the inlet conduit (1), and the pressure side (8) of which, in which there is a pressure (P_2), is connected to the nozzle inlet part of an injector (9), the outlet of which is connected to a cleaning gun (11) having means (12) for varying the amount of cleaning liquid being ejected, and
b) an automatic control unit (20) for controlling the cleaning liquid flowing through and comprising

b1) a housing (17) with an internal cylindrical chamber, in which

b2) a spring-loaded (28) piston (43) with end surfaces having differing effective surface areas is supported sealingly and slidingly and thus dividing the chamber into three part-chambers (23, 24, 25), of which the first (23) is connected to the suction inlet (37) of the injector (9) via a pressure-control conduit (15), in which there is a pressure (P_3), and the second part-chamber (24) is connected to the pressure side (8) of the pump (2) via a pressure-control conduit (14), and the third part-chamber (25) is connected to the inlet conduit (1) via a pressure-control connection (13, 26), as well as

b3) a switching rod (35) connected to the piston (43) and by the latter being movable towards and away from an operating member on a start/stop switch (16) inserted in the power supply circuit of the motor (6) so as to be able to make or break the supply circuit for the motor,

whereas the method comprises the following steps c and d:

c) during the operation of the high-pressure cleaner a resultant hydraulic force on the piston (43) is created so as to cause the latter to be in a position, in which it acts upon the switching rod (35) for connection and operation of the

start/stop switch (16) for the motor-pump unit (6, 2), and

d) by changing the adjustment means (12), a relatively large quantity of cleaning liquid per unit time is ejected at a relatively low pressure, so that a relatively low pressure (P_3) is created across the suction inlet part (37) of the injector (9),

characterized in

e) that in order to exploit said relatively low pressure (P_3) a secondary flow path for the cleaning liquid is established through parts of the high-pressure cleaner by additionally providing flow channels for cleaning liquid in the piston (43) so as to make it possible to supply additional cleaning liquid to the liquid flow of the primary flow path from the secondary flow path extending from the inlet conduit (1) via the pressure-control connection (13, 26), the part-chambers (25, 23) on each side of the piston (43) and the pressure-control conduit (15) to the injector (9) and the latter's suction inlet (37).

2. Method according to claim 1, **characterized in** that the flow of additional cleaning liquid in the piston (43) from the inlet (1) to injector (9) occurs by opening a check valve (29, 30) in the piston (43), the opening characteristics of said check valve determining the moment in time and the quantity of the additional supply of cleaning liquid.

3. Apparatus for controlling the flow of cleaning liquid through a high-pressure cleaner and of the type, in which a primary flow path for the cleaning liquid is established through parts of the high-pressure cleaner comprising

a) an inlet conduit (1) for cleaning liquid at a relatively low pressure (P_1), a motor-pump unit (6, 2), the suction side of which is connected to the inlet conduit (1) and the pressure side (8) of which, in which there is a pressure (P_2), is connected to the nozzle inlet part of an injector (9), the outlet part of which is connected to a cleaning gun (11) with adjustment means (12) for varying the amount of cleaning liquid being ejected, as well as

b) an automatic control unit (20) for controlling the flow of cleaning liquid and comprising

b1) a housing (17) with a cylindrical internal chamber, in which a spring-loaded (28) piston (43) having end surfaces with differing effective surface areas is supported sealingly and slidingly and thus dividing the chamber into three part-chambers (23, 24, 25), of which the first (23) is connected

to the suction inlet (37) of the injector (9) via a pressure-control conduit (15), in which there is a pressure (P_3), and the second part-chamber (24) is connected to the pressure side (8) of the pump (2) via a pressure-control conduit (14), and the third part-chamber (25), by means of a partition (19) being separated from the second chamber (24) and in which one end (36) of the piston (43) is supported, is connected to the inlet conduit (1) via a pressure-control connection (13, 26), as well as

b2) a switching rod (35) connected to the piston (43) and by the latter being movable towards and away from an operating member on a start/stop switch (16) inserted in the power supply circuit of the motor (6) in order to in this manner to be able to make and break the supply circuit for the motor,

characterized in

c) that the piston (43) comprises at least one through-flow duct so as to allow additional cleaning liquid to be supplied through a secondary flow path extending from the inlet conduit (1) via the pressure-control connection (13, 26), the part-chambers (23, 25) on each side of the piston (43) and the pressure-control conduit (15) to the ejector (9) and the latter's suction inlet (37).

4. Apparatus according to claim 3, **characterized in** that the flow of additional cleaning liquid through the piston (43) from the inlet (1) to the injector (9) occurs upon opening of a check valve comprising a ball (30) and a spring (29) in the piston (43).

5. Apparatus according to claim 3 or 4, **characterized in** that the piston (43) consists of two piston parts (21, 22), in which a through-flow duct (32) for the check valve (29, 30) is formed.

Patentansprüche

1. Verfahren zum Regeln der Strömung einer Reinigungsflüssigkeit in einem Hochdruckreiniger und von der Art, daß es die Bildung eines Hauptströmungsweges für die Reinigungsflüssigkeit an Teilen des Hochdruckreinigers umfaßt, umfassend:

a) eine Einlaßleitung (1) für Reinigungsflüssigkeit bei einem relativ niedrigen Druck (P_1), eine Motorpumpeneinheit (6, 2), deren Saugseite mit der Einlaßleitung (1) verbunden ist, und deren Druckseite (8), an der ein Druck (P_2) vorherrscht, mit dem Düseninlaßteil einer Einspritzeinrichtung (9) verbunden ist, deren Auslaß mit einer Reinigungspistole (11) ver-

bunden ist, die ein Mittel (12) aufweist, um die ausgestoßene Menge an Reinigungsflüssigkeit zu verändern, und

b) eine automatische Regelungseinheit (20) zum Regeln der durchströmenden Reinigungsflüssigkeit und umfassend

b1) ein Gehäuse (17) mit einer zylindrischen Innenkammer, in der

b2) ein federbelasteter (28) Kolben (43) mit Endflächen, die unterschiedliche wirksame Oberflächenbereiche aufweisen, abdichtend und gleitend gelagert ist und somit die Kammer in drei Teilkammern (23, 24, 25) teilt, von denen die erste (23) mit dem Saugeinlaß (37) der Einspritzeinrichtung (9) über eine Druckregelungsleitung (15) verbunden ist, in der ein Druck (P_3) vorherrscht, und die zweite Teilkammer (24) mit der Druckseite (8) der Pumpe (2) über eine Druckregelungsleitung (14) verbunden ist, und die dritte Teilkammer (25) mit der Einlaßleitung (1) über eine Druckregelungsverbindung (13, 26) verbunden ist, wie auch

b3) eine Schaltstange (35), die mit dem Kolben (43) verbunden ist und durch den letztgenannten in Richtung zu und weg von einem Betriebselement an einem Start-/Stop-Schalter (16) bewegbar ist, der in die Energieversorgungsschaltung des Motors (6) eingefügt ist, um so in der Lage zu sein, die Versorgungsschaltung für den Motor zu schließen oder zu unterbrechen, während das Verfahren die folgenden Schritte c und d umfaßt:

c) daß während des Betriebs des Hochdruckreinigers eine resultierende hydraulische Kraft auf den Kolben (43) erzeugt wird, um so zu bewirken, daß der letztgenannte eine Position einnimmt, in der er auf die Schaltstange (35) für eine Verbindung und einen Betrieb des Start-/Stop-Schalters (16) für die Motorpumpeneinheit (6, 2) wirkt, und

d) daß durch Ändern des Einstellmittels (12) eine relativ große Menge an Reinigungsflüssigkeit pro Zeiteinheit bei einem relativ niedrigen Druck ausgestoßen wird, so daß ein relativ niedriger Druck (P_3) über das Saugeinlaßteil (37) der Einspritzeinrichtung (9) erzeugt wird, **dadurch gekennzeichnet,**

e) daß, um den relativ niedrigen Druck (P_3) auszunutzen, ein Sekundärströmungsweg für die Reinigungsflüssigkeit durch Teile des Hochdruckreinigers dadurch ausgebildet ist, daß zusätzlich Strömungskanäle für Reinigungsflüssigkeit in dem Kolben (43) vorgese-

hen sind, um es so zu ermöglichen, zusätzliche Reinigungsflüssigkeit an die Flüssigkeitsströmung des Hauptströmungsweges von dem Sekundärströmungsweg zu liefern, der sich von der Einlaßleitung (1) über die Druckregelungsverbindung (13, 26), die Teilkammern (25, 23) auf jeder Seite des Kolbens (43) und die Druckregelungsleitung (15) zu der Einspritzeinrichtung (9) und dem Saugeinlaß (37) der letztgenannten erstreckt.

2. Verfahren nach Anspruch 1,

dadurch gekennzeichnet,

daß die Strömung an zusätzlicher Reinigungsflüssigkeit in dem Kolben (43) von dem Einlaß (1) zu der Einspritzeinrichtung (9) durch Öffnen eines Rückschlagventiles (29, 30) in dem Kolben (43) auftritt, wobei die Öffnungseigenschaften des Rückschlagventiles den Zeitpunkt und die Menge der zusätzlichen Lieferung an Reinigungsflüssigkeit bestimmen.

3. Vorrichtung zum Regeln der Strömung einer Reinigungsflüssigkeit durch einen Hochdruckreiniger und von dem Typ, bei dem ein Hauptströmungsweg für die Reinigungsflüssigkeit durch Teile des Hochdruckreinigers ausgebildet ist, umfassend:

a) eine Einlaßleitung (1) für Reinigungsflüssigkeit bei einem relativ niedrigen Druck (P_1), eine Motorpumpeneinheit (6, 2), deren Saugseite mit der Einlaßleitung (1) verbunden ist, und deren Druckseite (8), an der ein Druck (P_2) vorherrscht, mit dem Düseninlaßteil einer Einspritzeinrichtung (9) verbunden ist, deren Auslaßteil mit einer Reinigungspistole (11) verbunden ist, die ein Einstellmittel (12) aufweist, um die ausgestoßene Menge an Reinigungsflüssigkeit zu verändern, als auch

b) eine automatische Regelungseinheit (20) zum Regeln der Strömung der Reinigungsflüssigkeit und umfassend

b1) ein Gehäuse (17) mit einer zylindrischen Innenkammer, in der ein federbelasteter (28) Kolben (43), der Endflächen mit unterschiedlichen wirksamen Oberflächenbereichen aufweist, abdichtend und gleitend gelagert ist und somit die Kammer in drei Teilkammern (23, 24, 25) teilt, von denen die erste (23) mit dem Saugeinlaß (37) der Einspritzeinrichtung (9) über eine Druckregelungsleitung (15) verbunden ist, in der ein Druck (P_3) vorherrscht, und die zweite Teilkammer (24) mit der Druckseite (8) der Pumpe (2) über eine Druckregelungsleitung (14) verbunden ist, und die dritte Teilkammer (25), die mittels einer

Abteilung (19) von der zweiten Kammer (24) getrennt ist und in der ein Ende (36) des Kolbens (43) gelagert ist, mit der Einlaßleitung (1) über eine Druckregelungsverbindung (13, 26) verbunden ist, wie auch 5

b2) eine Schaltstange (35), die mit dem Kolben (43) verbunden ist und durch den letztgenannten in Richtung zu und weg von einem Betriebselement an einem Start-/Stop-Schalter (16) bewegbar ist, der in die Energieversorgungsschaltung des Motors (6) eingefügt ist, um auf diese Weise in der Lage zu sein, die Versorgungsschaltung für den Motor zu schließen und zu unterbrechen, 10 15

dadurch gekennzeichnet,

c) daß der Kolben (43) zumindest einen Durchflußkanal umfaßt, um so zuzulassen, daß zusätzliche Reinigungsflüssigkeit durch einen Sekundärströmungsweg geliefert wird, der sich von der Einlaßleitung (1) über die Druckregelungsverbindung (13, 26), die Teilkammern (23, 25) auf jeder Seite des Kolbens (43) und die Druckregelungsleitung (15) zu der Einspritzeinrichtung (9) und dem Saugeinlaß (37) der letztgenannten erstreckt. 20 25

4. Vorrichtung nach Anspruch 3, **dadurch gekennzeichnet,** 30
daß die Strömung an zusätzlicher Reinigungsflüssigkeit durch den Kolben (43) von dem Einlaß (1) zu der Einspritzeinrichtung (9) beim Öffnen eines Rückschlagventiles auftritt, das eine Kugel (30) und eine Feder (29) in dem Kolben (43) aufweist. 35

5. Vorrichtung nach Anspruch 3 oder 4, **dadurch gekennzeichnet,** 40
daß der Kolben (43) aus zwei Kolbenteilen (21, 22) besteht, in denen ein Durchflußkanal (32) für das Rückschlagventil (29, 30) ausgebildet ist. 45

Revendications

1. Procédé pour contrôler le débit de liquide de nettoyage dans un nettoyeur à haute pression et du genre comprenant la formation d'un trajet primaire d'écoulement pour le liquide de nettoyage vers des parties du nettoyeur à haute pression, comprenant : 50

a) un conduit d'entrée (1) pour du liquide de nettoyage à une pression relativement faible (P_1), une unité de motopompe (6, 2), dont le côté d'aspiration est relié au conduit d'entrée (1), et dont le côté pressurisé (8), dans lequel règne une pression (P_2), est relié à la partie d'entrée de buse d'un éjecteur (9), dont la sor-

tie est reliée à un canon de nettoyage (11) comprenant des moyens (12) pour faire varier la quantité de liquide de nettoyage éjecté ; et

b) une unité (20) de contrôle automatique pour contrôler le liquide de nettoyage s'écoulant à travers et comprenant :

b1) un logement (17) avec une chambre cylindrique intérieure, dans laquelle

b2) un piston (43) sollicité par un ressort (28) et qui présente des surfaces d'extrémité dont les aires effectives de surface sont différentes, est supporté de façon étanche et coulissante et divise ainsi la chambre en trois parties de chambre (23, 24, 25), dont la première (23) est reliée à l'entrée d'aspiration (37) de l'éjecteur (9) via une conduite (15) de contrôle-pression, dans laquelle règne une pression (P_3), et la deuxième partie de chambre (24) est reliée au côté pressurisé (8) de la pompe (2) via un conduit (14) de contrôle-pression, et la troisième partie de chambre (25) est reliée au conduit d'entrée (1) via une liaison (13, 26) de contrôle-pression, ainsi que

b3) une tige de commutation (35) reliée au piston (43) et étant susceptible d'être déplacée par ce dernier pour se rapprocher et s'éloigner d'un organe d'actionnement sur un interrupteur (16) marche/arrêt inséré dans le circuit d'alimentation de puissance du moteur (6), de façon à être capable d'établir ou de couper le circuit d'alimentation du moteur,

le procédé comprenant par ailleurs les étapes suivantes c) et d) :

c) pendant le fonctionnement du nettoyeur à haute pression, on crée une force hydraulique résultante sur le piston (43), de façon à obliger ce dernier à être dans une position dans laquelle il agit sur la tige de commutation (35) pour provoquer la connexion et le fonctionnement de l'interrupteur marche/arrêt (16) pour l'unité de motopompe (6, 2) ; et

d) en modifiant les moyens de réglage (12), une quantité de liquide de nettoyage relativement importante par unité de temps est éjectée à une pression relativement faible, de telle sorte qu'une pression relativement faible (P_3) soit créée à travers la partie d'entrée d'aspiration (36, 37) de l'éjecteur (9), caractérisé en ce que :

e) afin d'exploiter ladite pression (P_3) relativement faible, un trajet secondaire d'écoulement pour le liquide de nettoyage est établi à travers des parties du nettoyeur à haute pression en

prévoyant additionnellement des cannaux d'écoulement pour le liquide de nettoyage dans le piston (43), de façon à permettre de fournir du liquide de nettoyage additionnel au débit de liquide du trajet primaire d'écoulement à partir du trajet secondaire d'écoulement s'étendant depuis le conduit d'entrée (1), via la liaison contrôle-pression (13, 26), les parties de chambre (25, 23) de chaque côté du piston (43) et le conduit contrôle-pression (15) vers l'éjecteur (9) et l'entrée d'aspiration (37) de ce dernier.

2. Procédé selon la revendication 1, caractérisé en ce que l'écoulement du liquide de nettoyage additionnel dans le piston (43) depuis l'entrée (1) vers l'éjecteur (9), se produit en ouvrant un clapet anti-retour ou valve de retenue (29, 30) dans le piston (43), les caractéristiques d'ouverture de ladite valve de retenue déterminant l'instant où se produit l'alimentation additionnelle en liquide de nettoyage, ainsi que la quantité de ce liquide.

3. Appareil pour contrôler le débit de liquide de nettoyage à travers un nettoyeur à haute pression, et du type dans lequel un trajet primaire d'écoulement pour le liquide de nettoyage est établi à travers des parties du nettoyeur à haute pression, comprenant :

- a) un conduit d'entrée (1) pour du liquide de nettoyage à une pression relativement faible (P_1), une unité de motopompe (6, 2), dont le côté d'aspiration est relié à la conduite d'entrée (1), et dont le côté pressurisé (8), dans lequel règne une pression (P_2), est relié à la partie d'entrée de buse d'un éjecteur (9), dont la partie de sortie est reliée à un canon de nettoyage (11) avec des moyens de réglage (12) pour faire varier la quantité de liquide de nettoyage éjecté ; ainsi que
b) une unité automatique de contrôle (20) pour contrôler le débit du liquide de nettoyage, et comprenant :

- b1) un boîtier (17) avec une chambre cylindrique intérieure, dans laquelle un piston (43) sollicité par un ressort (28) et présentant des surfaces d'extrémité avec des aires de surface effective différentes, est supporté de façon étanche et coulissante et divise ainsi la chambre en trois parties de chambre (23, 24, 25), dont la première (23) est reliée à l'entrée d'aspiration (37) de l'éjecteur (9) via une conduite de contrôle-pression (15), dans laquelle règne une pression (P_3), et la deuxième partie de chambre (24) est reliée au côté pressurisé (8) de la pompe (2) via un conduit contrôle-

pression (14), et la troisième partie de chambre (25) étant séparée au moyen d'une séparation (19) de la seconde chambre (24) et dans laquelle une extrémité (36) du piston (43) est supportée, est reliée à la conduite d'entrée (1) via une liaison contrôle-pression (13, 26), ainsi que

b2) une tige de commutation (35) reliée au piston (43) et étant susceptible d'être déplacée par ce dernier pour se rapprocher et s'éloigner d'un organe d'actionnement sur un interrupteur marche/arrêt (16) inséré dans le circuit d'alimentation de puissance du moteur (6), afin d'être capable de cette façon d'établir ou de couper le circuit d'alimentation pour le moteur,

caractérisé en ce que :

c) le piston (43) comporte au moins un canal de passage d'écoulement, de façon à permettre à du liquide de nettoyage additionnel d'être fourni par un trajet secondaire d'écoulement s'étendant depuis le conduit d'entrée (1), via la liaison de contrôle-pression (13, 26), les chambres partielles (23, 25) de chaque côté du piston (43) et le conduit de contrôle-pression (15) vers l'éjecteur (9) et l'entrée d'aspiration (37) de ce dernier.

4. Appareil selon la revendication 3, caractérisé en ce que l'écoulement du liquide de nettoyage additionnel à travers le piston (43) depuis l'entrée (1) vers l'éjecteur (9) se produit à l'ouverture d'un clapet anti-retour comprenant une bille (30) et un ressort (29) dans le piston (43).
5. Appareil selon la revendication 3 ou 4, caractérisé en ce que le piston (43) se compose de deux parties de piston (21, 22), dans lesquelles est formé un conduit d'écoulement traversant (32) pour le clapet anti-retour (29, 30).

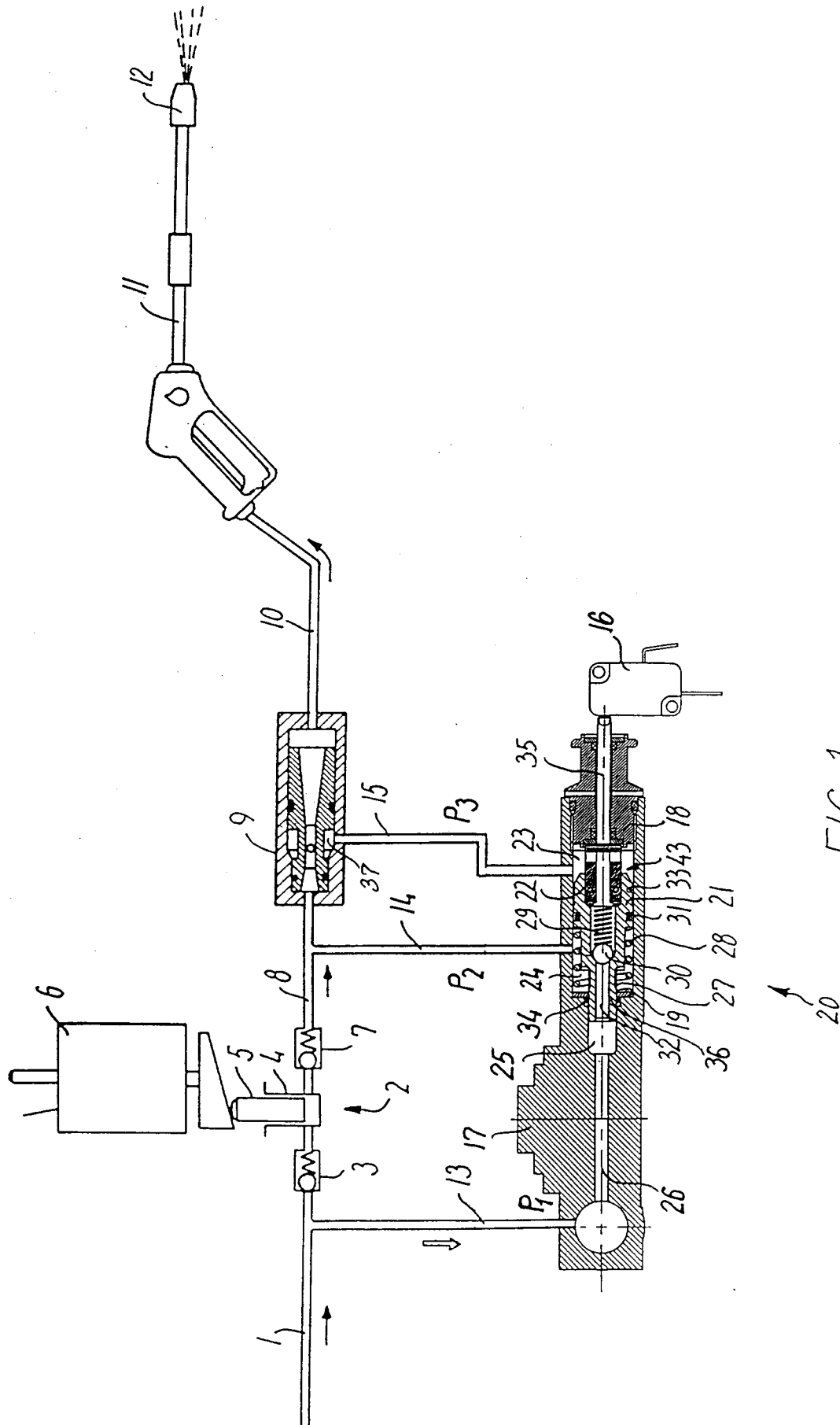


FIG. 1

