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(54) **ALTERNATIVE PISTON PUMP FOR MACHINES DISPENSING DYES, PAINTS OR SIMILAR PRODUCTS**

HUBKOLBENPUMPE FÜR FARBSTOFFE, FARBEN, LACKE ODER ÄHNLICHE PRODUKTE
ABGEBENDE MASCHINEN

POMPE À PISTON ALTERNATIVE POUR MACHINES DISTRIBUANT COLORANTS, PEINTURES
OU PRODUITS SIMILAIRES

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(56) References cited:
**EP-A- 0 410 394 EP-A2- 1 426 619
WO-A-00/46506 DE-A1- 1 403 790
JP-A- 2004 257 262 JP-A- 2006 132 502**

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns an alternative piston pump, able to be used in machines dispensing fluids such as dyes, paints or similar products. In particular, the pump is able to take in and dispense, with every cycle, a defined quantity of said fluids from a storage container to a delivery unit.

BACKGROUND OF THE INVENTION

[0002] An alternative piston pump is known, able to pump fluids such as dyes, paints or similar products.

[0003] The known pump comprises a cylinder, internally hollow, inside which a piston is able to slide, provided with sealing gaskets scraping the walls of the cylinder.

[0004] One disadvantage of the known pump is that the sealing gaskets with which the piston is provided wear as the pumping cycles follow each other. The loss of seal between the piston and the cylinder entails a serious deterioration of the dosing accuracy and repeatability of the pump, which causes the wrong colors to be made.

[0005] Solid particles which are normally present in the dyes penetrate between the worn gaskets of the piston and the internal wall of the cylinder and cause scores to be made on the internal surface of the cylinder. Moreover, the worn gaskets of the piston allow the air to enter into the pump, causing the dyes to dry and deteriorate. This entails the mechanical blockage of and consequent damage to the actuation systems of the pump.

[0006] All this entails high maintenance costs for the replacement of the damaged parts.

[0007] An alternative pump of the bellows type is also known, suitable to operate on corrosive, caustic, acid or toxic fluids. This known pump comprises a cylinder, internally hollow, inside which a piston is able to slide with ample play.

[0008] The cylinder is closed at the ends by two closing plates. A first of the two closing plates is provided with a hole, into which the rod of the piston is inserted, which is connected to an actuation device.

[0009] A metal bellows is disposed inside the cylinder and is fixed on one side to the piston and on the other side to said first closing plate.

[0010] One disadvantage of this known pump is that the bellows and the piston are two separate elements and this entails problems in the making and the functioning of the pump.

[0011] Another disadvantage of this known pump is that its constituent parts are made of very expensive materials, such as stainless steel or special alloys, which must be subjected to complex and costly working steps.

[0012] A further disadvantage of this known pump is that its actuation device works on compressed air, or pressurized fluids, so that it does not have high pumping

accuracy and therefore it is not suitable for use in machines dispensing dyes or similar, where it is indispensable that the quantities delivered are always in very precise doses. JP 2006 132502 A discloses an alternative pump having the features of the preamble of the main claim 1.

[0013] Purpose of the present invention is to achieve an alternative piston pump which is economical, simple to make, which does not need frequent maintenance operations, and which also guarantees high pumping accuracy.

[0014] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0015] The present invention is set forth and characterized in the independent claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0016] In accordance with the above purpose, an alternative piston pump able to take in and dispense a determined quantity of a fluid product such as a dye, a paint or a similar product, comprises a container having a cylindrical cavity, inside which a piston is able to slide axially, and a sleeve, extendible axially and rigid radially, inserted into the cylindrical cavity and having a first end connected to the piston.

[0017] According to a first characteristic of the present invention, the sleeve extendible axially and rigid radially has a second end connected to a closing plate, able to close one end of the cylindrical cavity. Moreover, at least the piston and the sleeve are made in a single piece, using a techno-polymer as constructive material.

[0018] According to a further characteristic, the closing plate is also made in a single piece with the sleeve and the piston.

[0019] According to another variant, not only the sleeve extendible axially and rigid radially and the piston, but also the container and the closing plate are made using techno-polymers.

[0020] The use of this type of material allows to have a pump that is economical, due to the limited cost of this material, and also easy to make. According to a variant, the sleeve extendible axially and rigid radially is coaxial with the cylindrical cavity and forms, with the wall of the latter, an annular chamber.

[0021] In this way, during the sliding of the piston, no friction is created between the sleeve extendible axially and rigid radially and the internal wall of the cylindrical cavity. Thus the phenomena of wear of the constituent parts of the pump are cancelled, and consequently the operations of maintenance, the possibility of errors and the consequent damage.

[0022] According to a preferential form of the present invention, an external linear actuation means, for exam-

ple comprising a motor of the step-by-step type, is able to compress and expand the sleeve extendible axially and rigid radially.

[0023] The pump according to the present invention also comprises a tube able both to be inserted with ample play inside the sleeve extendible axially and rigid radially, and also to be fixed to the piston. The tube is connected to the linear actuation means by means of connection means, advantageously removable.

[0024] According to another variant of the present invention, the connection means comprises a shaft, able to be inserted and fixed in an axial cavity of the tube.

[0025] The tube functions as a guide for the sleeve extendible axially and rigid radially, so that the latter does not bend laterally during the compression and expansion steps.

[0026] According to the invention, the tube is made in a single piece with a plate provided with at least two guide hollows, into which at least two fixed guide rods are able to be inserted, along which the tube is able to slide.

[0027] Therefore, the use of the linear actuation means and the tube allows the pump to have great pumping accuracy so as to deliver very precise doses of dye, for example in the range of some cm³ per cycle (for example between about 2.5 cm³ and about 30 cm³).

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a three-dimensional view of a pump according to the present invention;
- fig. 2 is a lateral view of fig. 1;
- fig. 3 shows a section from III to III of fig. 2;
- fig. 4 is a detail of fig. 3.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

[0029] With reference to figs. 1 to 3, an alternative piston pump 10, able to take in and dispense a determinate quantity of a dye, a paint or a similar product, comprises a container 11, substantially cylindrical in shape, preferably made of techno-polymer material, provided with a cylindrical cavity 17.

[0030] The pump 10 is connected to a valve unit 12 and to a linear actuation unit 13. The latter in this case comprises a motor 14, of the step-by-step type, and an electronic card 15 to control the latter. The valve unit 12 and the linear actuation unit 13 are of a known type and therefore are not described here in detail.

[0031] The container 11 is provided at one end (below in fig. 3) with an annular flange 16, with a diameter greater than the external diameter of the remaining part of the

container 11.

[0032] The pump 10 also comprises a closing plate 18, annular in shape and with a diameter equal to that of the annular flange 16. The container 11, on the opposite side to the annular flange 16, is provided with two mouths 19, of which one is able to convey inside the cylindrical cavity 17 the dye arriving from outside, through an intake pipe 20, whereas the other is able to convey the dye from the cylindrical cavity 17 towards the outside, through a delivery pipe 21. Said pipes 20 and 21 are made inside the container 11 and their opening and closing is regulated by the valve unit 12.

[0033] The pump 10 also comprises a sleeve extendible axially and rigid radially 22 (fig. 3), hollow internally and having the external part shaped as a coil (fig. 4). The sleeve 22 is shaped so that a first end 22a defines, in a single piece therewith, a piston 23, having the shape of a disk. The sleeve 22 and the piston 23 are disposed coaxially inside the cylindrical cavity 17.

[0034] The sleeve extendible axially and rigid radially 22 is also provided, at a second end 22b, opposite the first end 22a, with a flange 24 having a diameter greater than the diameter of the remaining part of the sleeve extendible axially and rigid radially 22. The flange 24 is interposed and fixed between the annular flange 16 and the closing plate 18, by means of screws or bolts 25.

[0035] According to an advantageous form of embodiment, the sleeve 22 is in a single piece with the closing plate 18, whereby the closing plate 18 also performs the function of the flange 24 that is thus not provided.

[0036] The sleeve 22, the piston 23, the container 11, the closing plate 18 and the flange 24, if provided, are advantageously all made using techno-polymers.

[0037] The external lateral surface of the sleeve extendible axially and rigid radially 22 forms an annular chamber 26 (fig. 4) with the wall of the cylindrical cavity 17. The presence of the annular chamber 26 guarantees that there is no friction between the inside of the container 11 and the sleeve extendible axially and rigid radially 22.

[0038] Inside the sleeve extendible axially and rigid radially 22 a tube 27 is inserted slidingly and with ample play; this functions as a guide for the sleeve extendible axially and rigid radially 22 and allows the latter not to bend laterally. The tube 27 is also provided with a cylindrical cavity 28, coaxial, inside which a shaft 29, fixed to the motor 14, is able to be inserted with precision. The shaft 29 is provided with a threaded end, screwed into the cylindrical cavity 28 of the tube 27.

[0039] The piston 23, in turn, is fixed to the tube 27 by means of a clamping screw 30. In this way the motor 14 is able to command the axial movement of the tube 27, and hence of the piston 23. The sleeve extendible axially and rigid radially 22, made in a single piece with the latter, is able to expand and compress.

[0040] The tube 27 comprises, at an external end, a plate 32 substantially rectangular in shape, on the two shorter sides of which corresponding semi-circular hollows 33 are made, into each of which a fixed guide rod

34 is inserted.

[0041] The two rods 34 are fixed at one end in the closing plate 18 and, at the other end, to the linear actuation unit 13.

[0042] The pump 10 as described heretofore functions as follows.

[0043] In order to effect a cycle to pump the dye, the linear actuation unit 13 is actuated, so as to move downwards (fig. 3) the shaft 29, the tube 27 and the piston 23, connected with each other. The sleeve extendible axially and rigid radially 22 is consequently compressed, thus expanding the free volume of the cylindrical cavity 17, which causes the dye to be taken in, which flows through the intake pipe 30 into the cylindrical cavity 17. Then, the linear actuation unit 13 is actuated, so that the shaft 29, the tube 27 and the piston 23 invert their motion and go upwards. The sleeve extendible axially and rigid radially 22 expands and reduces the volume of the cylindrical cavity 17. In this way the quantity of dye previously taken in, compressed by the piston 23, is expelled through the delivery pipe 21.

[0044] It is clear that modifications and/or additions of parts may be made to the alternative piston pump as described heretofore, without departing from the field and scope of the present invention, which is defined by the appended claims.

Claims

1. Alternative piston pump, able to take in and dispense a determinate quantity of a dye, paint or similar product, comprising a container (11) having a cylindrical cavity (17) inside which a piston (23) is able to slide axially, and a sleeve extendible axially and rigid radially (22), inserted into said cylindrical cavity (17) and having a first end (22a) connected to said piston (23), wherein said sleeve extendible axially and rigid radially (22) has a second end (22b) connected either through a flange (24) to a closing plate (18) or made in a single piece with a closing plate (18) that performs the function of a flange, said flange (24) or plate (18) being able to close one end of said cylindrical cavity (17), and wherein at least said piston (23) and said sleeve extendible axially and rigid radially (22) are made in a single piece, **characterized in that** it also comprises a tube (27) disposed inside said sleeve extendible axially and rigid radially (22) and fixed to said piston (23) and **in that** said tube (27) is made in a single piece with a plate (32) provided with at least two guide hollows (33), slidingly cooperating with corresponding fixed guide rods (34).
2. Pump as in claim 1, **characterized in that** said container (11), said sleeve extendible axially and rigid radially (22), said piston (23) and said closing plate (18) are made of plastics of the technical type.
3. Pump as in claim 2, **characterized in that** said plastics of the technical type are techno-polymers.
4. Pump as in claim 1, **characterized in that** said sleeve extendible axially and rigid radially (22) is coaxial with said cylindrical cavity (17) and forms, with the wall of said cylindrical cavity (17), an annular chamber (26).
5. Pump as in any claim hereinbefore, **characterized in that** external linear actuation means (13) is able to compress and expand said sleeve extendible axially and rigid radially (22).
6. Pump as in claim 1, **characterized in that** said tube (27) is connected to said linear actuation means (13) by means of connection means (29).
7. Pump as in claim 6, **characterized in that** said connection means comprises a shaft (29).
8. Pump as in claim 7, **characterized in that** said shaft (29) is fixed in an axial cavity (28) of said tube (27).
9. Pump as in claim 5, **characterized in that** said external linear actuation means (13) comprises a motor of the step-by-step type (14).
10. Pump as in any claim hereinbefore, **characterized in that** said container (11) also comprises first conveyor means (20) located at the end of the container (11) facing said piston (13) and able to convey said quantity of dye inside said cylindrical cavity (17), when said sleeve extendible axially and rigid radially (22) is compressed.
11. Pump as in claim 10, **characterized in that** it also comprises second conveyor means (21) located as well at the end of the container (11) facing said piston (13) and able to convey said quantity of dye outside said cylindrical cavity (17), when said sleeve extendible axially and rigid radially (22) expands, wherein the opening and closing of said first (20) and second (21) conveyor means are regulated by valve means (12).

Patentansprüche

1. Alternierende Kolbenpumpe, welche in der Lage ist, eine bestimmte Menge an Farbstoff, Farbe oder ähnlicher Produkte aufzunehmen und abzugeben, umfassend einen Container (11), welcher eine zylindrische Kavität (17) aufweist, in welcher ein Kolben (23) in der Lage ist, axial zu gleiten, und eine axial ausdehnbare und radial starre Hülse (22), welche in die zylindrische Kavität (17) eingesetzt ist und ein erstes Ende (22a) besitzt, welches mit dem Kolben (23) ver-

- bunden ist, wobei die axial ausdehnbare und radial starre Hülse (22) ein zweites Ende (22b) besitzt, welches entweder über einen Flansch (24) mit einer Verschlussplatte (18) verbunden ist oder in einem Stück mit der Verschlussplatte (18), die die Funktion eines Flansches erfüllt, gefertigt ist, wobei der Flansch (24) oder die Platte (18) in der Lage sind, ein Ende der zylindrischen Kavität (17) zu schließen, und wobei zumindest der Kolben (23) und die axial ausdehnbare und radial starre Hülse (22) aus einem Stück gefertigt sind, **dadurch gekennzeichnet, dass** die alternierende Kolbenpumpe weiter eine Röhre (27) umfasst, welche in der axial ausdehnbaren und radial starren Hülse (22) angeordnet ist und an dem Kolben (23) angebracht ist und dass die Röhre (27) aus einem Stück mit einer Platte (32), welche mit zumindest zwei Führungslöchern (33) ausgestattet ist, gefertigt ist, wobei die Führungslöcher (33) mit entsprechenden starren Führungsstäben (34) gleitend kooperieren.
2. Pumpe nach Anspruch 1, **dadurch gekennzeichnet, dass** der Container (11), die axial ausdehnbare und radial starre Hülse (22), der Kolben (23) und die Verschlussplatte (18) aus Kunststoffen technischer Art gefertigt sind.
 3. Pumpe nach Anspruch 2, **dadurch gekennzeichnet, dass** die Kunststoffe technischer Art Tecnopolymer sind.
 4. Pumpe nach Anspruch 1, **dadurch gekennzeichnet, dass** die axial ausdehnbare und radial starre Hülse (22) mit der zylindrischen Kavität (17) koaxial ist und mit der Wand der zylindrischen Kavität (17) eine ringförmige Kammer (26) bildet.
 5. Pumpe nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein äußeres lineares Antriebsmittel (13) in der Lage ist, die axial ausdehnbare und radial starre Hülse (22) zu komprimieren und auszudehnen.
 6. Pumpe nach Anspruch 1, **dadurch gekennzeichnet, dass** die Röhre (27) mit dem linearen Antriebsmittel (13) durch Verbindungsmittel (29) verbunden ist.
 7. Pumpe nach Anspruch 6, **dadurch gekennzeichnet, dass** das Verbindungsmittel eine Welle (29) umfasst.
 8. Pumpe nach Anspruch 7, **dadurch gekennzeichnet, dass** die Welle (29) in einer axialen Kavität (28) der Röhre (27) befestigt ist.
 9. Pumpe nach Anspruch 5, **dadurch gekennzeichnet, dass** das äußere lineare Antriebsmittel (13) ei-

nen schrittweisen Motortyp (14) umfasst.

10. Pumpe nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Container (11) auch erste Fördermittel (20) umfasst, welche am Ende des Containers (11), dem Kolben (13) gegenüberliegend, angebracht sind und in der Lage sind, die Menge an Farbstoff in die zylindrische Kavität (17) zu fördern, wenn die axial ausdehnbare und radial starre Hülse (22) komprimiert wird.
11. Pumpe nach Anspruch 10, **dadurch gekennzeichnet, dass** sie auch zweite Fördermittel (21) umfasst, welche ebenfalls am Ende des Containers (11), dem Kolben (13) gegenüberliegend, angeordnet sind und in der Lage sind, eine Menge an Farbstoff aus der zylindrischen Kavität (17) heraus zu fördern, wenn sich die axial ausdehnbare und radial starre Hülse (22) ausdehnt, wobei das Öffnen und Schließen der ersten (20) und zweiten (21) Fördermittel von Ventilmitteln (12) geregelt wird.

Revendications

1. Pompe à piston alternatif, pouvant recevoir et distribuer une quantité déterminée d'un colorant, d'une peinture ou d'un produit similaire, comportant un conteneur (11) ayant une cavité cylindrique (17) à l'intérieur de laquelle un piston (23) peut coulisser axialement, et une chemise axialement extensible et radialement rigide (22), insérée dans ladite cavité cylindrique (17) et ayant une première extrémité (22a) reliée audit piston (23), dans laquelle ladite chemise axialement extensible et radialement rigide (22) a une seconde extrémité (22b) reliée soit par une bride (24) à une plaque d'obturation (18) soit fabriquée d'un seul tenant avec une plaque d'obturation (18) qui remplit la fonction d'une bride, ladite bride (24) ou ladite plaque (18) pouvant obturer une extrémité de ladite cavité cylindrique (17), et dans laquelle au moins ledit piston (23) et ladite chemise axialement extensible et radialement rigide (22) sont fabriqués d'un seul tenant, **caractérisée en ce qu'elle** comporte également un tube (27) disposé à l'intérieur de ladite chemise axialement extensible et radialement rigide (22) et fixé audit piston (23), et **en ce que** ledit tube (27) est fabriqué d'un seul tenant avec une plaque (32) munie d'au moins deux creux de guidage (33), coopérant de manière coulissante avec des tiges de guidage fixes correspondantes (34).
2. Pompe selon la revendication 1, **caractérisée en ce que** ledit conteneur (11), ladite chemise axialement extensible et radialement rigide (22), ledit piston (23) et ladite plaque d'obturation (18) sont constitués de matières plastiques du type technique.

3. Pompe selon la revendication 2, **caractérisée en ce que** lesdites matières plastiques du type technique sont des technopolymères.

4. Pompe selon la revendication 1, **caractérisée en ce que** ladite chemise axialement extensible et radialement rigide (22) est coaxiale à ladite cavité cylindrique (17) et forme, avec la paroi de ladite cavité cylindrique (17), une chambre annulaire (26). 5
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5. Pompe selon l'une quelconque des revendications ci-dessus, **caractérisée en ce que** des moyens externes d'actionnement linéaire (13) peuvent comprimer et détendre ladite chemise axialement extensible et radialement rigide (22). 15

6. Pompe selon la revendication 1, **caractérisée en ce que** ledit tube (27) est lié auxdits moyens d'actionnement linéaire (13) par des moyens de liaison (29). 20

7. Pompe selon la revendication 6, **caractérisée en ce que** lesdits moyens de liaison comportent un arbre (29). 25

8. Pompe selon la revendication 7, **caractérisée en ce que** ledit arbre (29) est fixé dans une cavité axiale (28) dudit tube (27).

9. Pompe selon la revendication 5, **caractérisée en ce que** lesdits moyens externes d'actionnement linéaire (13) comportent un moteur du type pas à pas (14). 30

10. Pompe selon l'une quelconque des revendications ci-dessus, **caractérisée en ce que** ledit conteneur (11) comporte également des premiers moyens de transport (20) positionnés sur l'extrémité du conteneur (11) faisant face audit piston (13) et pouvant transporter ladite quantité de colorant à l'intérieur de ladite cavité cylindrique (17), lorsque ladite chemise axialement extensible et radialement rigide (22) est comprimée. 35
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11. Pompe selon la revendication 10, **caractérisée en ce qu'elle** comporte également des seconds moyens de transport (21) également positionnés sur l'extrémité du conteneur (11) faisant face audit piston (13) et pouvant transporter ladite quantité de colorant à l'extérieur de ladite cavité cylindrique (17), lorsque ladite chemise axialement extensible et radialement rigide (22) se détend, dans laquelle l'ouverture et la fermeture desdits premiers (20) et seconds (21) moyens de transport sont régulées par des moyens formant soupape (12). 45
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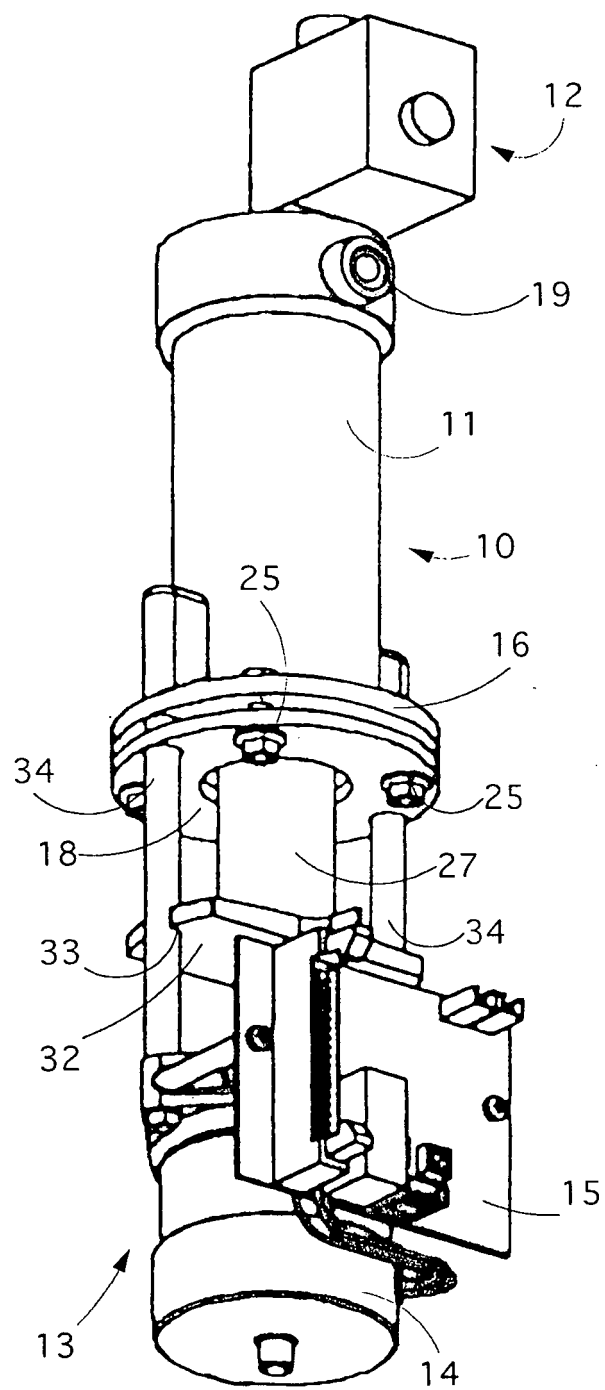


fig. 1

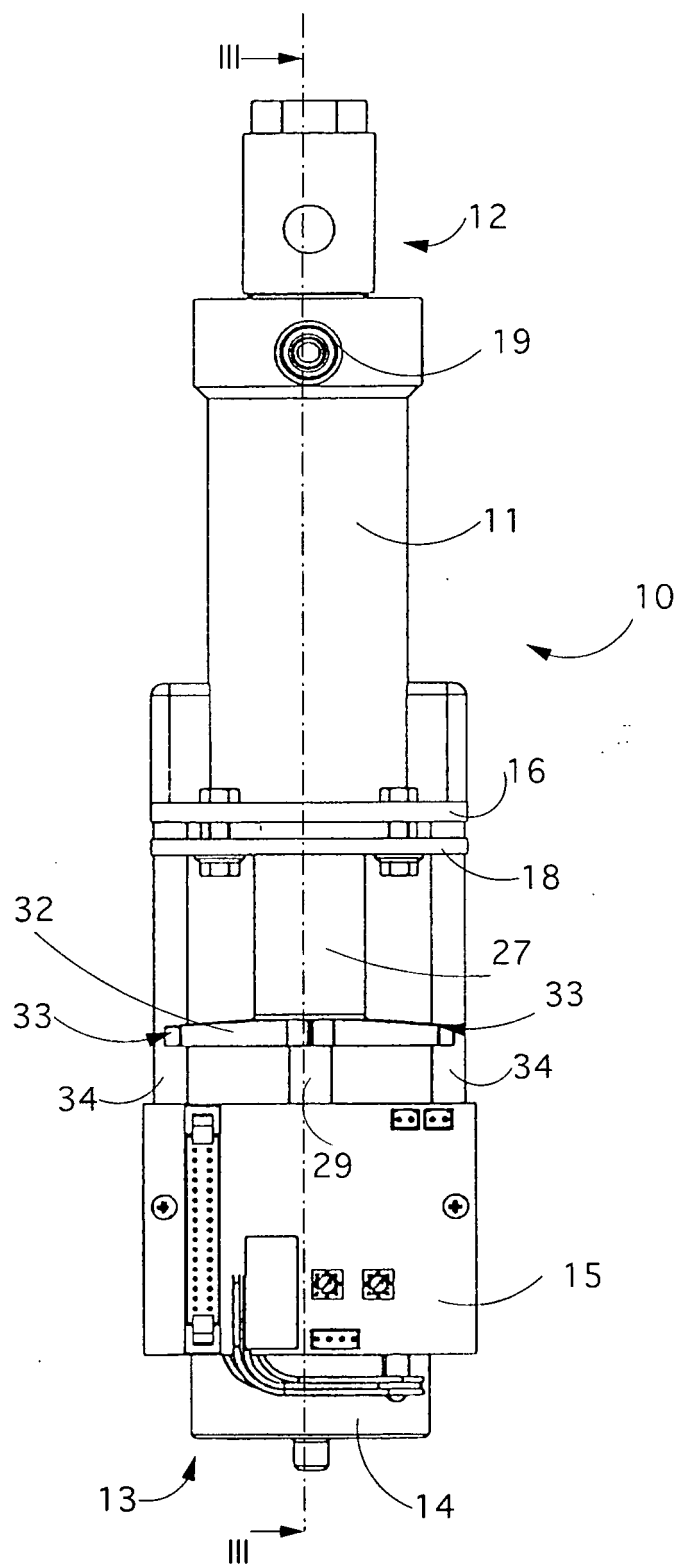


fig. 2

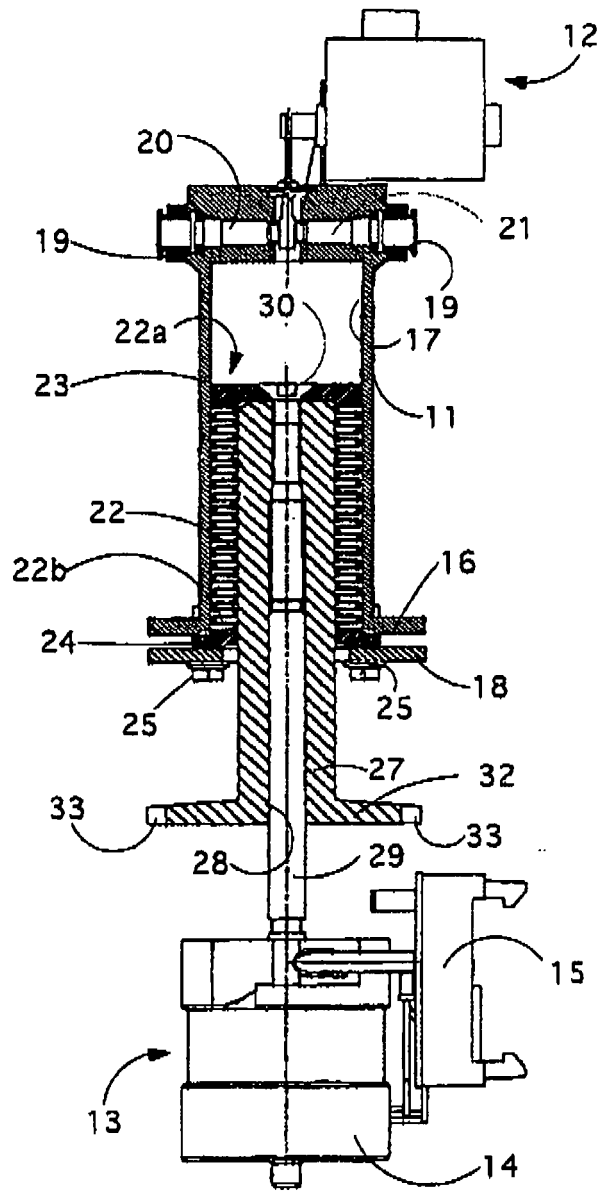


fig. 3

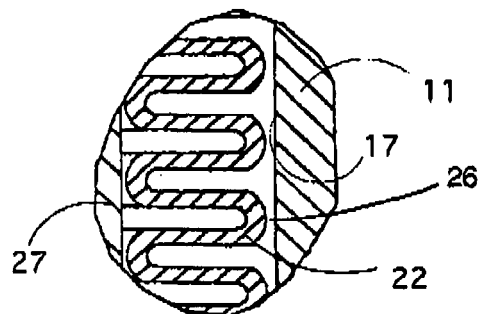


fig. 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006132502 A [0012]