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DESCRIPTION

Field of the Invention

[0001] The present invention relates to a disposable syringe and a push rod for use in a disposable syringe.

Background of the Invention

[0002] In order to avoid cross infection caused by repeated use of the syringe, a disposable syringe is extensively used in medical practices. A typical disposable syringe comprises a barrel, a push rod reciprocatingly moveable in the barrel and a rubber piston in contact with the inner wall of the barrel. A distal end of the push rod and a needle seat mounted at a distal end of the barrel form snap-fitting mechanisms which can be engaged with each other. On the push rod is formed a stop flange located at a proximal side of the snap-fitting mechanism, and the rubber piston is mounted between the snap-fitting mechanism of the push rod and the stop flange. The stop flange is a boss-shaped structure and approximately rigid as compared with the rubber piston. During injection, the stop flange pushes and presses the rubber piston so that the rubber piston pushes a liquid medicament out of the syringe. When the rubber piston is pushed to a zero line, i.e., when the injection is finished, the rubber piston is braked. At this time, the push rod continues to be pushed and pressed, the stop flange will presses the rubber piston into deformation so that the push rod can continue to advance distally such that the front end of the push rod is snap-fitted with the needle seat. Then, the push rod is pulled proximally, the needle seat is pulled in the barrel via the snap-fitting mechanism to complete self-destruction of the syringe and prevent the syringe from reuse.

[0003] However, in such disposable syringe in the prior art, in order to obtain an additional stroke whereby the distal end of the push rod continues to advance to engage with the needle seat upon completion of the injection, there is a need to apply a larger force to the push rod to cause the rubber piston to produce sufficient deformation. This causes the syringe strenuous in use and increases the patient's pains.

[0004] Wo 99/06086 A1 relates to a hypodermic syringe which allows for discharging a small quantity of liquid medicament remained within an outlet tube of the prior art syringes, thereby avoiding waste. To this end, an auxiliary piston is further provided within a hollow interior of a piston. When the piston contacts an outlet end wall, a piston rod applies further axial pressure to a head of the auxiliary piston, causing a pointed end of a shaft proceed into the interior of the outlet tube expelling the fluid medicine therefrom.

[0005] US 3 669 111 A relates to an automatic retracting hypodermic syringe that allows for one handed operation and automatic retraction of the syringe.

[0006] US 2005/107747 A1 relates to a retractable safe syringe and employs a structure as described in the Background herein. In particular, after a top surface of a piston contacts a top end wall in the injecting space to complete injection, a pusher rod continues to push and deform a piston, so that a first engaging portion on a needle engages a second engaging portion at the distal end of the push rod to withdraw the needle set into a cylinder.

[0007] US 2007/073223 A1 relates to a push rod of a syringe, in which an extrusion portion corresponds to the rubber piston as defined herein. It proposes to replace the traversal connecting unit in the prior art with an axial rod and posts to reduce cost.

[0008] US 2006/178625 A1 relates to a single use syringe with an impulse reduction system, wherein a breakable connection is provided in a plunger rod assembly. To reduce the impulse generated when the breakable connection breaks, it is proposed to provide an elastic element or a slidingly engageable braking surface in the plunger rod.

[0009] WO 95/30444 A1 relates to a low drag syringe and cartridge. Here, a plunger rod may deform a plunger to pull a radial wall thereof off an inner wall of a barrel, thus reducing the friction between the plunger and the barrel to achieve easy injection.

Summary of the Invention

[0010] In order to solve the above problems, according to an aspect of the present invention, there is provided a disposable syringe, comprising a barrel, comprising a proximal end, a distal end and a hollow interior, the hollow interior being defined by a barrel-shaped inner wall; a push rod located in the interior of the barrel and movable in the barrel, the push rod comprising a proximal end located outside the proximal end of the barrel, a distal end located in the interior of the barrel, and an axis extending through the proximal end and the distal end of the push rod, the distal end of the push rod being provided with a stop flange; a rubber piston mounted on the push rod and located at a distal side of the stop flange and configured to come in contact with the inner wall of the barrel in a liquid tight manner, wherein the stop flange comprises a main body portion formed about the axis of the push rod, and a pushing and pressing portion configured to push and press the rubber piston in a direction of said axis, the pushing and pressing portion forms a cantilever structure extending from the main body portion in a direction away from the axis of the push rod, wherein the pushing and pressing portion is constructed in a way of being more likely to deform compared with the rubber piston such that when the rubber piston is stopped at the distal end of the barrel, only the pushing and pressing portion deforms as continuing to push and press the rubber piston, wherein the disposable syringe further comprises a needle seat located at the distal end of the barrel and comprising a first snap-fitting mechanism; at the distal end of the push rod is provided with a second snap-fitting mechanism located at the distal side of the rubber piston, the second snap-fitting mechanism is adapted to engage with the first snap-fitting mechanism via deformation of the pushing and pressing portion upon completion of the injection.

[0011] According to the present invention, the stop flange comprises a main body portion in the middle and a pushing and pressing portion extending outward from the main body portion. The pushing and pressing portion forms a cantilever structure which is liable to deformation. Therefore, according to a conventional design, the rubber piston may be braked upon completion of the injection; when the pushing and pressing portion continues to push and press the rubber piston, only the pushing and pressing portion deforms, thereby achieving an additional stroke needed when the distal end of the push rod snap-fits with the needle seat and meanwhile lessening the patient's pains.

Brief Description of Drawings

[0012]

Fig.1 is a cross-sectional view of a disposable syringe according to one embodiment of the present invention, wherein the syringe is in an in-injection state.

Fig.2 illustrates a state of the syringe of Fig.1 upon completion of the injection.

Fig.3 is an elevation view of a push rod for use in a disposable syringe according to an embodiment of the present invention.

Fig.4 is an enlarged view of a distal portion of the push rod of Fig.3.

Fig.5 is a cross-sectional view taken along line A-A of Fig.4.

Fig.6 is a cross-sectional view taken along line B-B of Fig.4.

Detailed Description of Preferred Embodiments

[0013] A disposable syringe and a push rod for use in the disposable syringe according to the present invention will be described with reference to the specific embodiments shown in the figures. Those skilled in the art should appreciate that what is shown in the figures is only exemplary and intended to illustrate the present invention, not to limit the present invention.

[0014] The directional terms "distal" and "proximal" used in the following detailed description are relative to medical care personnel such as a nurse for injecting for a patient, and respectively correspond to "up" and "down" of the page of Figs.1-3.

[0015] Fig.1 and Fig.2 respectively illustrate a disposable syringe according to one embodiment of the present invention in two states, namely, an in-injection state and a state upon completion of injection. As shown in the figures, the disposable syringe of the present

invention comprises a barrel 1, a needle seat 2, a push rod 3 and a rubber piston 4. The barrel 1 comprises a proximal end 5, a distal end 6 and a hollow interior 7. The hollow interior 7 is defined by a barrel-shaped inner wall 8. The rubber piston 4 is mounted on the push rod 3 and comes in contact with the inner wall 8 to achieve liquid sealing and the discharge of a liquid medicine needed by the injection. The needle seat 2 is located at the distal end of the barrel 1 and comprises a snap-fitting mechanism (a first snap-fitting mechanism) 9.

[0016] The push rod 3 is mounted in the interior 7 of the barrel 1 and movable in the interior of the barrel 1. Meanwhile, referring to Fig.3, the push rod 3 comprises a distal end 10 located in the interior 7 of the barrel, a proximal end 11 located outside the proximal end 5 of the barrel, and an axis 12 extending through the proximal end 11 and the distal end 10 of the push rod. The distal end 10 of the push rod is provided with a stop flange 13 and a snap-fitting mechanism (a second snap-fitting mechanism) 14 located at the distal side of the stop flange 13. The second snap-fitting mechanism 14 is adapted to engage with the first snap-fitting mechanism 9 upon completion of the injection so that when the push rod 3 is pulled proximally, the needle seat 2 snap-fitted with the push rod 3 can be pulled into the interior 7 of the barrel 1, thereby achieving self-destruction of the disposable syringe. The snap-fitting mechanisms 9 and 14 of the needle seat and of the push rod may be any suitable mechanism known in the art and used for self-destruction of the syringe after use. The present invention does not relate to improvements to the snap-fitting mechanism itself, so the detailed structure of the snap-fitting mechanism will not be descried herein any more.

[0017] Referring to Fig.1 and Fig.2, more specifically, the rubber piston 4 is mounted at the distal end 10 of the push rod 3 and located between the second snap-fitting mechanism 14 of the push rod 3 and the stop flange 13. When the push rod 3 moves distally, the stop flange 13 pushes and presses the rubber piston 4 so that the rubber piston 4 moves distally along with it to discharge the liquid medicament out of the interior 7 of the barrel 1 through a needle on the needle seat 2; after the rubber piston 4 is braked upon completion of the injection, the stop flange 13 continues to push and press the rubber piston 4 to produce an additional stroke needed by the push rod 3 to engage with the needle seat 2.

[0018] Referring to Fig.4, Fig.5 and Fig.6, in the push rod 3 for use in the disposable syringe according to the present invention, the stop flange 13 is preferably made of an elastic material. The stop flange 13 comprises a main body portion 15 formed about the axis 12 of the push rod 3 and a pushing and pressing portion 16 extending from the main body portion 15 in a direction away from the axis 12 of the push rod 3. Therefore, the pushing and pressing portion 16 extending out of the main body portion 15 forms a cantilever structure. In the disposable syringe according to the present invention, the pushing and pressing portion 16 of the cantilever structure is used to push and press the rubber piston 4.

[0019] In specific embodiment shown in the figure, the pushing and pressing portion 16 is comprised of a plurality of finger-like portions. Those skilled in the art can readily envisage that the pushing and pressing portion 16 has a predetermined rigidity by virtue of customary designs such as selection of a material, a selection of the shape and a selection of the cross-

section shape. During the injection, the sum of a frictional force and a liquid medicament resistance between the rubber piston 4 and the inner wall 8 of the barrel 1 is very small. Therefore, when the pushing and pressing portion 16 pushes the rubber piston 4 to move distally, the pushing and pressing portion 16 itself deforms very little or substantially does not deform. Upon completion of the injection, the rubber piston 4 is stopped at the distal end 6 (namely, a zero line) of the barrel 1, and an acting force and a counterforce produced by the pushing and pressing portion 16 continuing to push and press the rubber piston 4 will increase, whereupon only the pushing and pressing portion 16 deforms under the counterforce of the rubber piston 4, i.e., only the pushing and pressing portion 16 deforms and the rubber piston 4 does not deform. The deformation of the pushing and pressing portion 16 provides an additional stroke which is needed when a front end 11 of the push rod 3 continues to move distally and enables the second snap-fitting mechanism 14 of the push rod 3 to engage with the first snap-fitting mechanism 9 of the needle seat 2. As compared with the rubber piston 4, the pushing and pressing portion 16 is more likely to deform. Therefore, as compared with the situation in the prior art in which a larger force is needed to deform the rubber piston 4, in the present invention only a smaller force is needed to finish the additional stroke needed by the push rod 3 for engagement of the snap-fitting mechanisms and to reduce the patient's pains. In the embodiment shown in Fig.5 and Fig.6, the plurality of finger-like portions of the pushing and pressing portion 16 are symmetrically distributed relative to a plane through the axis 12 such as planes 17 and 18, namely, arranged symmetrically relative to the plane. It is appreciated that the plurality of finger-like portions may be distributed symmetrically about the axis 12, namely, arranged symmetrically about the axis. The main body portion 15 in the figure is generally rectangular, four finger-like portions on the upper side and the lower side have the same shape, and two finger-like portions on the left side and the right side have the same shape. However, the finger-like portions on the upper and lower sides and the finger-like portions on the left and right sides are different in length and width. It can be appreciated that the main body portion 15 may be in any shape. The plurality of finger-like portions may be the same or different; they may be distributed symmetrically or asymmetrically. In the embodiment shown in Fig.4, the stop flange 13 is wholly in a shape of a sheet generally perpendicular to the axis, or at least the plurality of finger-like portions therein are in the shape of sheets generally perpendicular to the axis.

[0020] It should be appreciated that the pushing and pressing portion 16 may be in any other shape besides the finger shape, for example, a circular shape or a polygonal shape, so long as it can meet the desired deformation.

[0021] In order to limit the deformation degree of the pushing and pressing portion 16, or in order to prevent too much deformation of the pushing and pressing portion 16, a limiting boss 20 may be disposed at a proximal side of the stop flange 13 of the push rod 3. In a specific example shown in Figs.3 and 4, at the distal end of the push rod 3, a platform (e.g., a circular boss) 19 with ratchets is formed at the proximal side of the stop flange 13. The limiting boss 20 is a boss formed on the platform 19 and having a shape corresponding to the finger-like portion 16.

[0022] In a push rod of a further preferred embodiment not shown, a portion of the push rod 3 closely adjacent to the proximal side of the stop flange 13 is a bendable portion. In the present invention, "closely adjacent" means that there not other structures between two portions. Referring to Fig.3 and Fig.4, in a specific embodiment, the bendable portion 21 is located between the stop flange 13 and the circular boss 19. The bendable portion 21 is formed to have a smaller diameter or thickness than other portions of the push rod 3, or formed by any structure which is known by those skilled in the art and can produce a bent deformation.

[0023] In the case that the whole push rod is rigid, upon injection, if a push force is not coincident with the axis of the push rod, the push rod might deflect to bring the rubber piston to deflect so that a water tight function between the rubber piston and the inner wall of the barrel loses, which causes leakage. When the push rod is assembled in the interior of the barrel, if the axis of the push rod deflects relative to the axis of the barrel, it might be difficult to mount the rubber piston in the barrel. The existence of the bendable portion can solve the above problem, and thereby facilitates use and assembling of the syringe.

[0024] Embodiments of the present invention are described in detail with reference to the drawings. Those skilled in the art should appreciate that the drawings and the corresponding depictions are only intended to illustrate the present invention. On this basis, those skilled in the art may make other variations and improvements which fall within the protection scope of the present invention.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US3669111A **[0005]**
- US2005107747A1 **[0006]**
- US2007073223A1 **[0007]**
- US2006178625A1 **[0008]**
- WO9530444A1 **[0009]**

PATENTKRAV

1. Engangssprøjte, der omfatter:

en cylinder (1), der omfatter en proksimal ende (5), en distal ende (6) og et hult indre (7), hvor det hule indre (7) er defineret af en cylinderformet indvendig væg (8);

en stødstang (3), der er placeret i det indre (7) af cylinderen og kan bevæges i cylinderen (1), hvilken stødstang (3) omfatter en proksimal ende (11), der er placeret uden for den proksimale ende (5) af cylinderen, en distal ende (10), der er placeret i det indre (7) af cylinderen, og en akse (12), der strækker sig gennem den proksimale ende (11) og den distale ende (10) af stødstangen, hvor den distale ende (10) af stødstangen er forsynet med en stopflange (13);

et gummistempel (4), der er monteret på stødstangen og placeret på en distal side af stopflangen (13) og konfigureret til at komme i kontakt med den indvendige væg (8) af cylinderen på en væsketæt måde,

kendetegnet ved, at stopflangen (13) omfatter:

en hovedlegemsdel (15), der dannet omkring aksen (12) af stødstangen, og

en stød- og pressedel (16), der er konfigureret til at støde og presse gummistemplet i en retning af aksen, stød- og pressedelen danner en udliggerstruktur, der strækker sig fra hovedlegemsdelen (15) i en retning væk fra aksen (12) af stødstangen,

hvor stød- og pressedelen (16) er konstrueret på en sådan måde, at det er mere sandsynligt, at den deformeres end gummistemplet (4), således at, når gummistemplet (4) stoppes ved den distale ende af cylinderen, kun stød- og pressedelen (16) deformeres, når gummistemplet fortsat stødes og presses,

hvor engangssprøjten endvidere omfatter et nålesæde (2), der er placeret ved den distale ende (6) af cylinderen og omfatter en første snapmekanisme (9); den distale ende (10) af stødstangen er forsynet med en anden snapmekanisme (14), der er placeret ved den distale side af gummistemplet (4), den anden snapmekanisme (14) er tilpasset til at gå i indgreb med den første snapmekanisme (9) via deformation af stød- og pressedelen (16) efter afslutning af injektionen.

2. Engangssprøjte ifølge krav 1, kendetegnet ved, at stopflangen (13) er fremstillet af et elastisk materiale.

3. Engangssprøjte ifølge krav 1, kendetegnet ved, at stød- og pressedelen (16) er i en form af en plade generelt vinkelret på aksen (12).

4. Engangssprøjte ifølge krav 1, kendetegnet ved, at stød- og pressedelen (16) består af en flerhed af fingerlignende dele, der er symmetrisk fordelt i forhold til et plan (17, 18) gennem aksen (12).

5. Engangssprøjte ifølge krav 1, kendetegnet ved, at stød- og pressedelen (16) består af en flerhed af fingerlignende dele, der er symmetrisk fordelt omkring aksen (12).

6. Engangssprøjte ifølge et hvilket som helst af kravene 1-5, kendetegnet ved, at stødstangen (3) omfatter en bøjelig del (21), der støder tæt op til den proksimale side af stopflangen (13).

7. Engangssprøjte ifølge et hvilket som helst af kravene 1-5, kendetegnet ved, at stødstangen (3) endvidere omfatter et begrænsningsfremspring (20), der er placeret ved en proksimal side af stopflangen (13) for at begrænse et deformationsomfang af stød- og pressedelen (16).

8. Engangssprøjte ifølge krav 7, kendetegnet ved, at stødstangen (3) endvidere omfatter en platform (19) placeret ved den proksimale side af stopflangen (13), og begrænsningsfremspringet (20) er et fremspring dannet på platformen (19) og har en form, der svarer til den fingerlignende del (16).

9. Engangssprøjte ifølge krav 7, kendetegnet ved, at en del af stødstangen (3) mellem platformen (19) og stopflangen (13) er en bøjelig del (21).

DRAWINGS

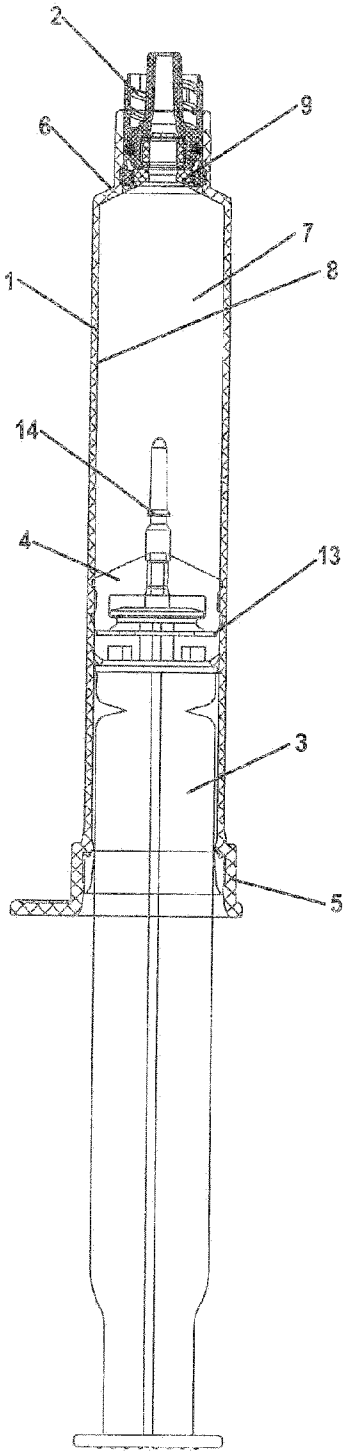

Fig. 1

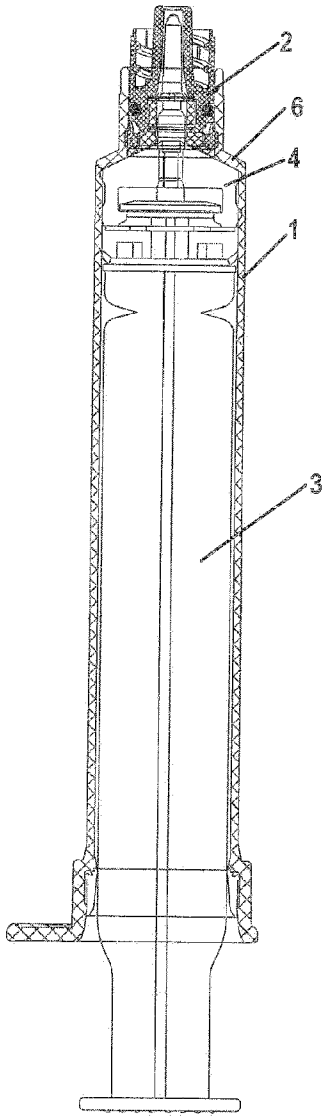

Fig. 2

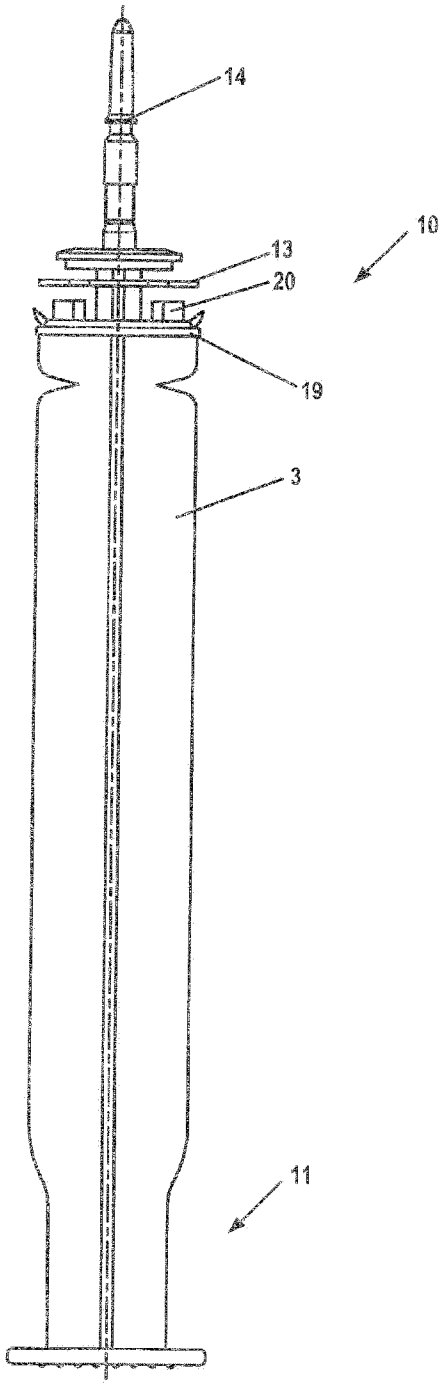

Fig. 3

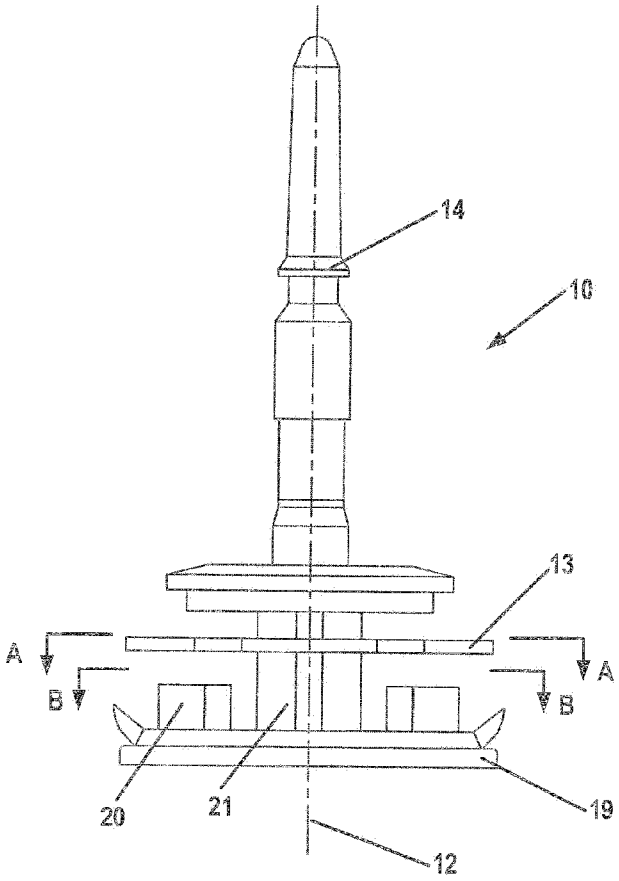

Fig. 4

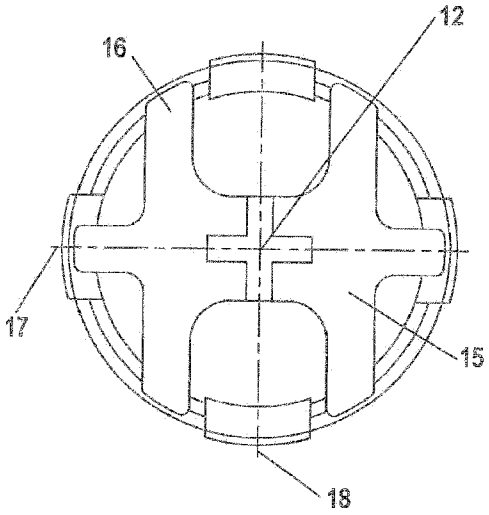

Fig. 5

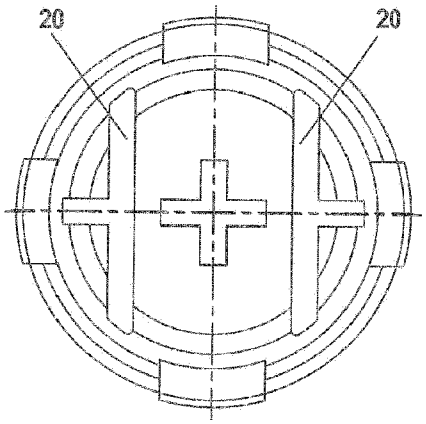

Fig. 6