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(54) **A COMPRESSOR**

VERDICHTER

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Description

[0001] This invention relates to a compressor wherein means are provided to improve the lubrication of moving parts.

[0002] In hermetic piston compressors, preferably utilized in cooling devices, lubrication is necessary in order to prevent the moving parts from being affected by friction during operation. In hermetic piston compressors, the lubrication of the bearings in which the moving parts move is usually achieved by the crankshaft rotation at high revolutions. The lubrication is performed by conveying the oil inside the outer shell of the compressor by means of the oil suction pipe located below the crankshaft. Utilizing the oil inside the compressor, it is achieved to both lubricate the bearings and also to discharge the heat inside the compressor via the upper casing. In compressors, designing the bearings correctly affects the compressor efficiency and life span directly.

[0003] Supplying the bearings with an insufficient amount of oil causes the mechanical efficiency of the compressor to decrease and in the long term, may cause the compressor not to function as a result of the wear that is observed in the bearings. Moreover, the oil also functions as an attenuator between the operating surfaces and contributes to reducing the noise level in the compressor. Therefore, during the entire operating life span of the compressor, lubrication is necessary on a regular uninterrupted basis. However, particularly in variable capacity compressors (VCC), wear problems may be experienced during the startup of the compressor if necessary amount of oil is not transferred to the bearings quick enough. In that case, although the bearings are supplied with necessary amount of oil at high revolutions, it is possible that necessary oil is not transferred to the bearings at low capacity thus at low revolutions, causing wear and affecting the operation of the compressor in the long run.

[0004] In the current state of the art, in the United States Patent Document no. US 6527085, a description is given of an oil suction pipe wherein an oil reservoir is provided.

[0005] In the current state of the art, in the United States Patent Document no. US 4575320, a description is given of an oil storage section located inside the body, above the oil suction pipe.

[0006] The aim of the present invention is the realization of a compressor wherein means are provided to improve the lubrication of moving parts at the startup.

[0007] The cooling device realized in order to fulfill the object of the present invention is explicated in the first claim wherein other features are described in the dependent claims.

[0008] In the compressor, in accordance with the present invention, part of the oil sucked via the suction channel is transferred to the bearing in which the crankshaft moves, by means of a hole on the suction pipe and of a groove located on the outer surface of the crankshaft whereas the other part is transferred to a chamber. By means of another hole positioned at the end of the said groove, the oil reaches the oil transfer channel and is able to climb up to the uppermost portions of the compressor. The other part of the oil passes to the transfer channel via the transfer channel inlet corresponding to the front of the suction channel and climbs up to the upper portions together with the oil coming from the groove. When the crankshaft stops moving, the oil that reaches the chamber via the suction channel at that instant cannot pass to the transfer channel and stays inside the chamber.

[0009] In another embodiment of the present invention, by utilizing a separator, the chamber is divided into compartments. The oil flowing to the chamber leaks from one compartment to another via a passage located below the level of the suction channel outlet of the separator, until the oil level in the compartments at the two sides of the separator is equalized. If the oil rises above the suction pipe, excess oil returns back to the interior of the casing via the suction channel. Thereby, it is achieved that some amount of oil is left inside the chamber when the crankshaft stops moving and at the next startup of the crankshaft the initial oil necessary for the bearing and the crankshaft is easily supplied.

[0010] In an embodiment of the present invention, the crankshaft incorporates a suction channel positioned inside the suction pipe eccentrically with respect to the middle axis wherein the amount of the oil that is transferred to the bearings via the suction channel positioned eccentrically with respect to the middle axis and the oil suction pipe and thus the efficiency of the compressor is increased. Increasing the flow rate of the oil pumped by the suction pipe causes the inner temperature of the compressor casing and thus the temperature of the entering gas sucked to the cylinder to decrease, improving the thermodynamic efficiency of the compressor. Furthermore, by supplying the bearings with oil rapidly at startup, wear at startup is prevented. Especially in variable capacity compressors which may be operated at various speeds determined according to capacity needs, oil may be transferred to the bearings both at high and low speeds, improving the efficiency.

[0011] The compressor realized in order to fulfill the object of the present invention is illustrated in the attached figures where:

Fig. 1 - is a schematic view of a compressor.
Fig.2 - is a perspective view of a crankshaft.
Fig.3 - is a perspective view of a crankshaft incorporating a transfer channel, a chamber and a suction channel at its inner portion.
Fig. 4 - is a schematic view of detail D of a crankshaft.

[0012] Elements shown in figures are numbered as follows:

1. Compressor
2. Motor

3. Transfer channel
4. Separator
5. Crankshaft
6. Passage
7. Accumulation compartment
9. Reservoir
11. Suction channel
12. Suction pipe
13. Transfer channel inlet
14. Chamber
15. Groove inlet
16. Groove outlet
17. Groove

[0013] In home devices, preferably in cooling devices, the cycling of the circulation fluid used for cooling purposes is achieved by means of a compressor (1).

[0014] The compressor (1) comprises a motor (2) and a crankshaft (5) transferring the motion of the motor (2).

[0015] Inside the compressor (1), preferably there is provided a fluid by which the motion of the operating parts is facilitated and the heat generated inside is transferred. In the preferred embodiment, liquid oil is utilized as the fluid.

[0016] The crankshaft (5) incorporates a suction pipe (12) fastened to its lower portion whereby oil is sucked and transferred to the upper portions as the pipe (12) moves together with said crankshaft (5) and, a suction channel (11) located inside the suction pipe (12), preferably in a straight cylindrical form whereby the oil sucked is transferred upwards.

[0017] The crankshaft (5) further comprises a chamber (14) in communication with the suction channel (11), in which the oil sucked via the suction channel (11) accumulates, a groove (17), preferably in helical form, located on the outer surface of the crankshaft (5), providing the oil actuated by the rotary motion to rise and proceed therein, a transfer channel (3) whereby the oil that accumulates inside the chamber (14) and the oil that is transferred by means of said groove (17) is conveyed to upper portions, at least one groove inlet (15) whereby part of the oil coming from the suction channel (11) is transferred to the groove (17) before reaching the chamber (14), a groove outlet (16) connecting the groove (17) and the transfer channel (3) and used to transfer the oil to the transfer channel (3) and, a transfer channel inlet (13) in communication with the chamber (14), whereby the oil inside the chamber (14) is transferred to the transfer channel (3).

[0018] The oil that is sucked by means of the suction pipe (12) and proceeds inside the suction channel (11) under the effect of the force components generated as a result of the rotary motion of the crankshaft (5) rapidly rises and passes through the groove inlet (15) on its path to the helical groove (17) having a form suitable for the movement of the oil. The oil that rises on the groove (17) passes to the transfer channel (3) via the groove outlet (16) and further rises so as to be skid onto the heated parts located at the upper portion of the crankshaft (5). Meanwhile, part of the oil that cannot enter the groove (17) through the groove inlet (15) continues the movement, reaching the chamber (14) and flowing to the accumulation compartment (7). Since the crankshaft (5) continues its motion, under the effect of generated formes, the oil continues to rise passing to the transfer channel (3) via the transfer channel inlet (13) and further rising towards the upper portions.

[0019] When the crankshaft (5) stops, part of the oil that cannot pass to the upper portions accumulate inside the chamber (14). When the crankshaft (5) starts its movement again, that accumulated oil provides the startup lubrication of the crankshaft (5) and the bearing where the crankshaft (5) is located and after the startup, it is conveyed to the upper portion by being joined with the oil that is sucked by the suction channel (11).

[0020] In another embodiment of the present invention, the chamber (14) incorporates at least one separator (4) which is used to divide the chamber (14) into more than one compartment and whereby the oil flowing therein is accumulated and, at least one passage (6) which is located at the lower-most portion of the separator (4) such that the oil accumulated inside the chamber (14) can easily pass between the compartments and which is sized so as to prevent the oil from being rapidly discharged by controlling the flow rate as the oil passes from one compartment to another. In order to collect the oil coming from the section channel (11) inside the chamber (14), the passage (6) is positioned at a level lower than the end of the suction channel (11), which is communicating with said chamber (14).

[0021] In another embodiment of the present invention, the chamber (14) that is divided into two compartments by the separator (4) comprises an accumulation compartment (7) in communication with the suction pipe (14) and a reservoir (9) into which the oil transferred to the accumulation compartment (7) passes by leaking through the passage (6) and wherein said oil is preserved when the crankshaft (5) does not move.

[0022] In this embodiment of the present invention, when the crankshaft (5) starts decelerating, the oil that is elevated by being sucked via the suction pipe (12) and that can not pass to the groove (17) by passing through the groove inlet (15) continues its motion and reaches the chamber (14) and eventually flows into the accumulation compartment (7). After the crankshaft (5) stops, the oil inside the suction pipe (12) continues to move and rise for a while and reaches the accumulation compartment (7). Since the forces forcing the upward motion start to decrease, the oil filled in the accumulation compartment (7) passes through the passage (6) into the reservoir (9). The passing continues until the amount of the oil inside the accumulation compartment (7) and the reservoir (9) equalizes. Thereby, when the crankshaft (5) restarts its motion, it is achieved that necessary amount of oil which can be readily transferred to the transfer channel (3) is collected inside the reservoir (9). When the

crankshaft (5) starts to move, as a result of the effects of the generated formes, oil inside the reservoir (9) starts to rise on the inner lateral surfaces of the chamber (14) and passes through the transfer channel inlet (13) located on top of the separator (4) into the transfer channel (3) and reaches the upper portions. Thereby, it is accomplished that the oil which is necessary at the startup of the crankshaft (5) can immediately be transferred to the bearings and that the moving parts inside the compressor (1) are lubricated and are easily moved since the friction is reduced. Meanwhile, it is achieved to transfer the heat generated during the motion to the casing by means of the oil and thereby to discharge the heat.

[0023] In another embodiment of the present invention, the crankshaft (5) further comprises a suction channel (11), preferably in form of a straight cylinder, which is positioned inside the suction pipe (12) close to the lateral walls, said suction channel, (11) being eccentrically located with respect to the middle center of the suction pipe (12).

[0024] In that embodiment, since the suction channel (11) is eccentrically positioned with respect to the middle axis of the suction pipe (12) and the crankshaft (5), the centrifugal effect on the oil suction generated by the motion of the crankshaft (5) is increased. That situation causes the velocity components of the fluid at the inlet cross-section in radial direction to be large. The radial velocity components of the fluid hitting to the inner wall of the crankshaft (5) transform into axial velocity components. Since the radial velocity component is increased particularly at the inlet cross-section, it is achieved that the oil is elevated more rapidly and thus that the amount of oil sucked is increased.

[0025] In another embodiment of the present invention, a crankshaft (5) incorporating a suction channel (11) in form of a straight cylinder is utilized.

[0026] The amount of oil located inside the chamber (14) and the compressor casing in ac cordance with the present invention, which is used to minimize the friction between the crankshaft (5) and the bearing in which said crankshaft (5) moves, particularly at the startup of the crankshaft (5) is transferred to the interior of the crankshaft (5) to be stored above the casing and from there, it is achieved to easily transfer the oil to upper portions.

[0027] By means of the embodiment in accordance with the present invention, it is accomplished to suck more amount of oil and also to perform lubrication at low speeds. Especially in variable capacity compressors (1), operation is performed without any problems at various speeds. Furthermore, as a result of the described improvement on the lubrication system, the flow rate of the oil is increased, facilitating the movement and the discharge of the heat generated inside the compressor (1) to the external medium. By thermodynamically reducing the temperature of the entering gas as a result of the discharge of the heat inside the compressor (1), it is achieved to improve the volumetric efficiency of the compressor (1).

Claims

1. A compressor (1) utilized in home devices, preferably in cooling devices comprising ; a motor (2) and, a crankshaft (5) transferring the motion of the motor (2) and incorporating a suction pipe (12), fastened to its lower portion, whereby the oil is sucked and transferred to the upper portions as the pipe (12) moves together with said crankshaft (5) and, a suction channel (11) located inside the suction pipe (12), preferably in a straight cylindrical form whereby the oil sucked may be transferred upwards and whereby the crankshaft (5) is having a chamber (14) in communication with the suction channel (11), in which the oil sucked via the suction channel (11) accumulates, **characterized by** a groove (17), preferably in helical form, located on the outer surface of the crankshaft (5), whereby the oil moved by the rotary motion rises and proceeds therein, a transfer channel (3) whereby the oil that accumulates inside the chamber (14) and the oil that is transferred by means of the said groove (17) is conveyed to upper portions, at least one groove inlet (15) whereby part of the oil coming from the suction channel (11) is transferred to the groove (17) before reaching the chamber (14) and, a groove outlet (16) connecting the groove (17) and the transfer channel (3) and being used to transfer the oil to the transfer channel (3).

2. A compressor (1) as described in Claim 1, **characterized by** a crankshaft (5) comprising a transfer channel inlet (13) in communication with the chamber (14), whereby the oil inside the chamber (14) is transferred to the transfer channel (3).

3. A compressor (1) as described in Claim 2, **characterized by** a crankshaft (5) comprising a chamber (14) having at least one separator (4) which is used to divide the chamber (14) into more than one compartment and whereby the oil flowing therein is accumulated, an accumulation compartment (7) in communication with the suction pipe (14) and a reservoir (9) into which the oil transferred to the accumulation compartment (7) passes by leaking through the passage (6) and whereby said oil is preserved when the crankshaft (5) does not move.

4. A compressor (1) as described in Claim 3, **characterized by** a crankshaft (5) incorporating a chamber (14) having at least one passage (6) which is located at the lower-most portion of the separator (4) such that the oil accumulated inside the chamber (14) can easily pass between the compartments and which is sized so as to prevent the oil from being rapidly disharged by controlling the flow rate as the oil passes from one compartment to another.

5. A compressor (1) as described in any of the above

Claims, **characterized by** a crankshaft (5) incorporating a suction channel (11), which is positioned inside the suction pipe (12) close to the lateral walls, said suction channel (11) being eccentrically located with respect to the middle center of the suction pipe (12).

6. A compressor (1) as described in Claim 5, **characterized by** a crankshaft (5) incorporating a suction channel (11) in form of a straight cylinder.

Patentansprüche

1. Kompressor (1), verwendet in Haushaltsvorrichtungen, vorzugsweise in Kühlvorrichtungen, umfassend: einen Motor (2) und eine Kurbelwelle (5), die die Bewegung des Motors (2) überträgt und ein Ansaugrohr (12) aufweist, das an ihrem unteren Abschnitt befestigt ist, wodurch das Öl angesaugt und an die oberen Abschnitte geleitet wird, während sich das Rohr (12) zusammen mit der Kurbelwelle (5) bewegt, und einen Ansaugkanal (11), der im Ansaugrohr (12) angeordnet ist, und vorzugsweise eine gerade zylindrische Form aufweist, wodurch das angesaugte Öl nach oben geleitet werden kann, und wobei die Kurbelwelle (5) eine Kammer (14) aufweist, die mit dem Ansaugkanal (11) in Verbindung steht, und in der sich das Öl ansammelt, das über den Ansaugkanal (11) angesaugt wird, **gekennzeichnet durch** eine vorzugsweise schraubenförmige Nut (17), die an der Außenfläche der Kurbelwelle (5) angeordnet ist, wobei das Öl, das **durch** die Drehbewegung bewegt wird, darin ansteigt und weiterläuft, einen Übertragungskanal (3), **durch** den das Öl, das sich in der Kammer (14) ansammelt, und das Öl, das durch die Nut (17) geleitet wird, zu den oberen Abschnitten befördert wird, wenigstens einen Nuteinlass (15), **durch** den ein Teil des Öls aus dem Ansaugkanal (11) an die Nut (17) geleitet wird, bevor es die Kammer (14) erreicht, und einen Nutauslass (16), der die Nut (17) und den Übertragungskanal (3) miteinander verbindet, und dazu benutzt wird, das Öl zum Übertragungskanal (3) zu leiten.

2. Kompressor (1) nach Anspruch 1, **gekennzeichnet durch** eine Kurbelwelle (5), die einen Übertragungskanaleinlass (13) umfasst, der mit der Kammer (14) in Verbindung steht, und **durch** den das Öl in der Kammer (14) zum Übertragungskanal (3) geleitet wird.

3. Kompressor (1) nach Anspruch 2, **gekennzeichnet durch** eine Kurbelwelle (5), die eine Kammer (14) umfasst, die wenigstens ein Trennelement (4) aufweist, das dazu dient, die Kammer (14) in mehr als einen Raum zu unterteilen, und wobei das darin fließende Öl sich ansammelt, einen Sammelraum (7), der mit dem Ansaugrohr (14) in Verbindung steht, und einen Behälter (9), in den das Öl, das zum Sammelraum (7) geleitet wird, eintritt, indem es **durch** den Durchlass (6) tritt, und **durch** den das Öl aufgenommen wird, wenn sich die Kurbelwelle (5) nicht bewegt.

4. Kompressor (1) nach Anspruch 3, **gekennzeichnet durch** eine Kurbelwelle (5), die eine Kammer (14) aufweist, die wenigstens einen Durchlass (6) aufweist, der am unteren Abschnitt des Trennelements (4) angeordnet ist, derart, dass das Öl, das sich in der Kammer (14) ansammelt, leicht von einem Raum in einen anderen gelangen kann, und der derart abgemessen ist, dass verhindert wird, dass das Öl schnell abgelassen wird, indem die Flussrate geregelt wird, wenn das Öl aus einem Raum in einen anderen gelangt.

5. Kompressor (1) nach einem der vorangehenden Ansprüche, **gekennzeichnet durch** eine Kurbelwelle (5), die einen Ansaugkanal (11) aufweist, der im Ansaugrohr (12) in der Nähe der Seitenwände angeordnet ist, derart, dass der Ansaugkanal (11) in Bezug auf die Mitte des Ansaugrohres (12) exzentrisch angeordnet ist.

6. Kompressor (1) nach Anspruch 5, **gekennzeichnet durch** eine Kurbelwelle (5), die einen Ansaugkanal (11) in der Form eines geraden Zylinders aufweist.

Revendications

1. Un compresseur (1) utilisé dans les appareils ménagers, de préférence dans les dispositifs de refroidissement comprenant un moteur (2), et un vilebrequin (5) servant à transmettre le mouvement du moteur (2) et comportant un tuyau d'aspiration (12), fixé à sa partie la plus basse, par lequel l'huile est aspirée et transmise aux parties supérieures du tuyau (12) qui se déplace en même temps que ledit vilebrequin (5), et un canal d'aspiration (11) situé à l'intérieur du tuyau d'aspiration (12), de préférence dans une forme cylindrique, par lequel l'huile aspirée peut être transmise vers le haut et dans lequel le vilebrequin (5) doit avoir une chambre (14) en communication avec le canal d'aspiration (11), où l'huile aspirée par le canal d'aspiration (11) s'accumulerait, **caractérisé par** une rainure (17), de préférence en forme d'hélice, située sur la surface extérieure du vilebrequin (5), dans laquelle l'huile transmise par le mouvement de rotation s'accumule et y produit un canal de transfert (3) selon lequel l'huile qui s'accumule à l'intérieur de la chambre (14) et l'huile transmise par le biais de ladite rainure (17) est amenée à la partie supérieure, au moins une rainure d'entrée (15) par

laquelle une partie de l'huile provenant de la chaîne d'aspiration (11) est transféré à la rainure (17) avant d'atteindre la chambre (14) et, une rainure de sortie (16) reliant la rainure (17) et le canal de transfert (3), dans le but d'être utilisée pour transmettre l'huile canal de transfert (3).

2. Un compresseur (1) selon la Revendication 1, **caractérisé par** un vilebrequin (5) comprenant une entrée de canal de transfert (13) en communication avec la chambre (14) par laquelle l'huile accumulée dans la chambre (14) est transmise dans le canal de transfert (3).

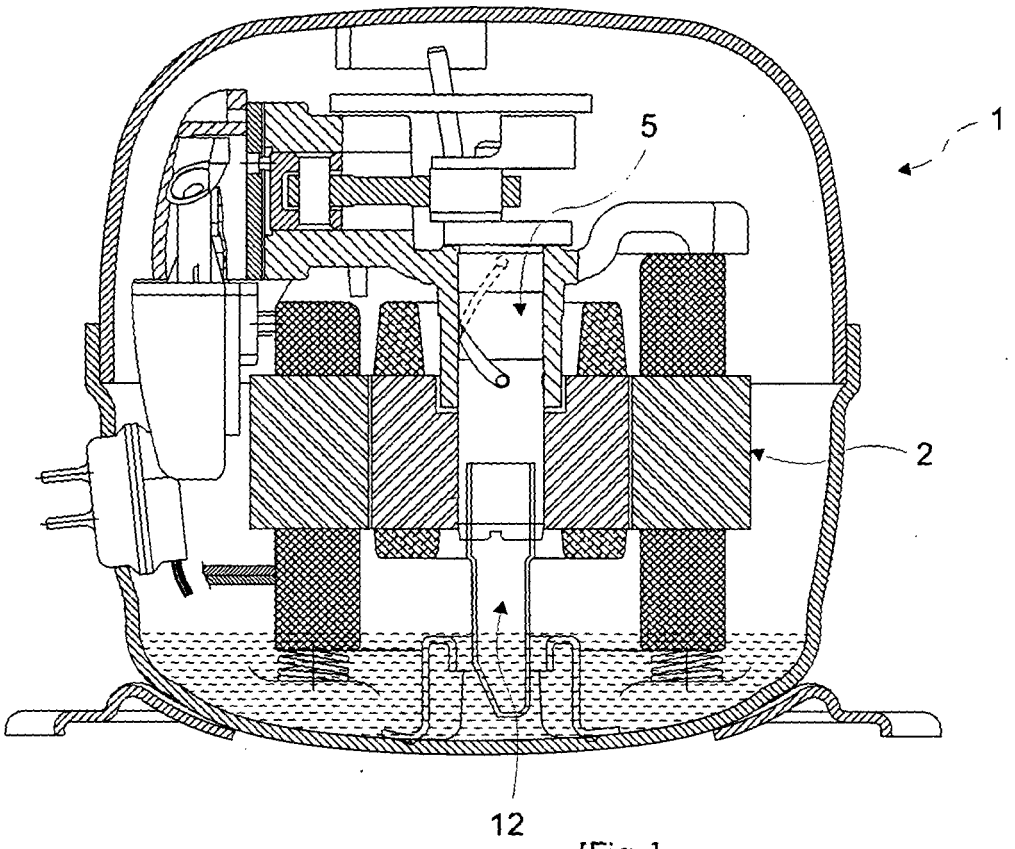
3. Un compresseur (1) selon la Revendication 2, **caractérisé par** un vilebrequin (5) comprenant une chambre (14) qui a au moins un séparateur (4) utilisé pour diviser la chambre (14) en plusieurs compartiments et dans laquelle l'huile coulée dedans est accumulée, un compartiment d'accumulation (7) en communication avec le tuyau d'aspiration (14) et un réservoir (9) dans lequel l'huile transmise au compartiment d'accumulation (7) passe en fuyant par un passage (6) et dans lequel l'huile est conservée lorsque le vilebrequin (5) n'est pas en marche.

4. Un compresseur (1) selon la Revendication 3, **caractérisé par** un vilebrequin (5) incorporant une chambre (14) qui a au moins un passage (6) situé à la partie la plus basse du séparateur (4) pour ainsi assurer que l'huile accumulée dans la chambre (14) puisse facilement passer entre les compartiments et à une telle grandeur qu'il puisse empêcher l'huile de se décharger rapidement en contrôlant le taux de flux quand l'huile passe d'un compartiment à un autre.

5. Un compresseur (1) selon l'une des Revendications précédentes, **caractérisé par** un vilebrequin (5) incorporant un canal d'aspiration (11) situé dans le tuyau d'aspiration (12) tout près des murs latéraux, ledit canal d'aspiration (11) étant excentriquement situé à l'égard du moyen centre du tuyau d'aspiration (12).

6. Un compresseur (1) selon la Revendication 5, **caractérisé par** un vilebrequin (5) incorporant un canal d'aspiration (11) en forme de cylindre droit.

Figure 1



[Fig.]

Figure 2

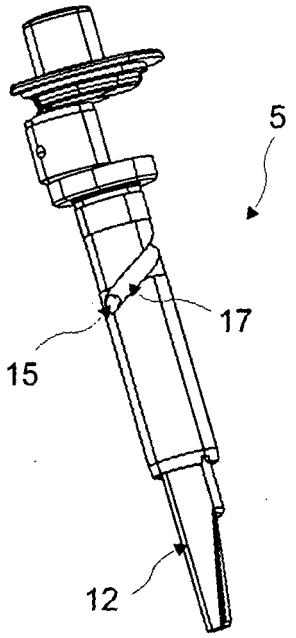


Figure 3

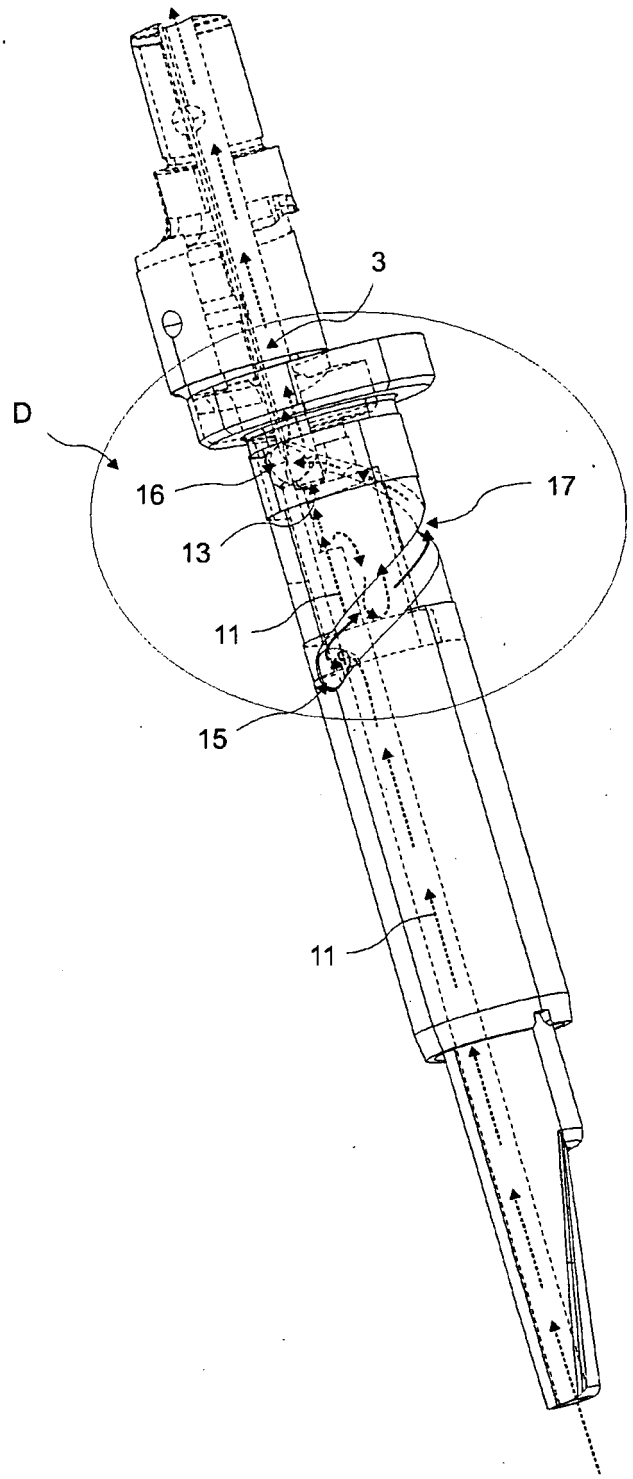
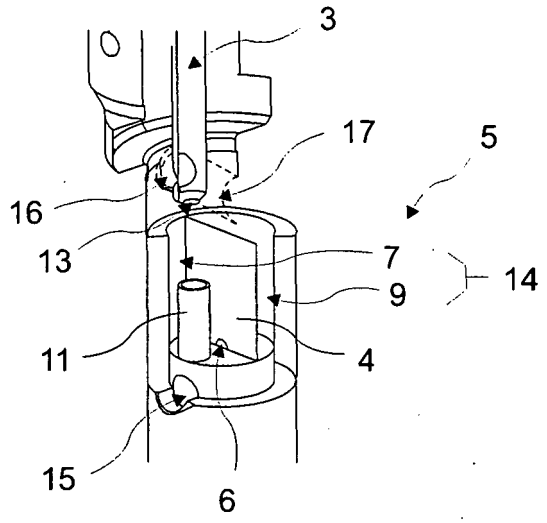


Figure 4



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- US 4575320 A **[0005]**