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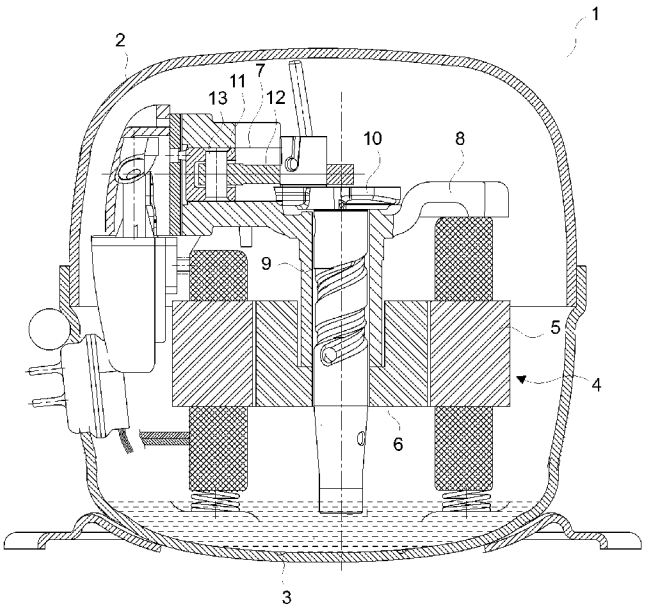
(54) Title: A COMPRESSOR WHEREIN EASE OF ASSEMBLY IS PROVIDED BETWEEN MOVABLE COMPONENTS

Figure 1




(57) Abstract: The present invention relates to a compressor (1) comprising an upper casing (2) that covers the movable components and a lower casing (3) that contains the oil on the base thereof and that supports the components therein; a motor (4) that is composed of two components, that is a stator (5) and a rotor (6); a cylinder (7) that provides the pumping of the refrigerant gas; a cylinder block (8); a piston (11) that enables the refrigerant gas to be compressed in the cylinder (7); a crank (10) that transfers the movement received from the motor (4); a connecting rod (12) that transfers the movement received from the crank (10) to the piston (11); a crankpin (13) that connects the connecting rod (12) and the piston (11) to each other, and a bearing (9) that enables the crank (10) to be borne to the cylinder block (8) in the radial direction.

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Description

# A COMPRESSOR WHEREIN EASE OF ASSEMBLY IS PROVIDED BETWEEN MOVABLE COMPONENTS

[0001] The present invention relates to a compressor comprising a channel that joins the piston locking pin hole and the core gap.

[0002] In cooling devices, the circulation of the refrigerant liquid used for refrigeration is provided by a compressor. In the assembly of the movable components such as piston, crankpin and connecting rod, the crankpin is mounted so as to pass through the piston crankpin hole and the connecting rod crankpin hole while the connecting rod is in the core gap. In order to keep the said three components together, a locking pin passes through the locking pin hole on the piston to enter the locking pin hole on the crankpin so as to be locked. The length of the crankpin is selected so as to match the piston locking pin hole and comprise the crankpin locking pin hole. Thus, the locking pin passes through both and can be locked in the crankpin locking pin hole in a snap-fit manner. The locking pin hole on the piston can be produced by boring or directly in the mold wherein the piston is produced with powder metallurgy.

[0003] In the state of the art, the wall thickness between the piston locking pin hole and the upper surface of the core gap is referred to as the plane. As the distance of the plane decreases, production problems such as the ricocheting of the drill during the boring process or the hole not being produced in the mold may arise. Due to the said problems, there is minimum value limitation for the plane distance. A similar limitation is also present when the piston locking pin hole is desired to be produced in the powder metallurgy mold since the producer demands a minimum plane in this section. The plane distance can be increased by decreasing the core gap or moving the position of the piston locking pin hole upwards. In the first one of the said solutions, decreasing the core gap will cause the bearing length of the connecting rod crankpin hole to decrease. In the second solution, since the locking pin hole on the crankpin is required to move upwards when the position of the locking pin hole on the piston changes, the length of the crankpin increases. This causes the mass of

the crankpin to increase and causes the crankpin to be close to the body cylinder inner surface.

[0004] In the state of the art Japanese Patent Application No. JP2010242592, a piston locking pin hole is disclosed.

[0005] The aim of the present invention is the realization of a compressor wherein the position of the piston locking pin hole is kept the same while the plane distance is decreased.

[0006] The compressor realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a channel that opens between the piston locking pin hole and the core gap and that joins the piston locking pin hole and the core gap. In an embodiment of the present invention, the width of the channel is equal to the diameter of the locking pin at the most. In the preferred embodiment of the present invention, the width of the channel is smaller than the diameter of the locking pin. When the locking pin is placed into the piston locking pin hole, a space as much as the width of the channel remains between the locking pin and the core gap.

[0007] In an embodiment of the present invention, the sides of the channel are parallel to each other.

[0008] In another embodiment of the present invention, the sides of the channel are inclined and in an embodiment, the sides gets closer towards the piston locking pin hole and in another embodiment the sides gets away from each other.

[0009] In another embodiment of the present invention, the channel extends along the piston locking pin hole.

[0010] In another embodiment of the present invention, the channel extends along the core gap.

[0011] By opening a channel between the piston locking pin hole and the core gap, the position of the piston locking pin hole is kept the same, the minimum plane distance remaining between the hole and the core gap upper surface is decreased and the hole gets closer to the core gap. The width of the channel to be opened should be smaller than or equal to the diameter of the locking pin. Although the opened channel decreases the

plane distance, the piston locking pin hole is further moved closer to the core gap upper surface and the piston locking pin hole can be easily produced in the powder metallurgy mold.

[0012] The model embodiments related to the compressor realized in order to attain the aim of the present invention are shown in the attached figures where

[0013] Figure 1 – is the schematic view of the compressor of the present invention.

[0014] Figure 2 - is the schematic view of the crank, the piston, the crankpin, the connecting rod and the locking pin.

[0015] Figure 3 - is the perspective schematic view of the piston, the piston locking pin hole, the core gap and the channel.

[0016] Figure 4 - is the front schematic view of the piston, the piston locking pin hole, the core gap and the channel.

[0017] Figure 5 - is the schematic view of the crankpin and the crankpin locking pin hole.

[0018] Figure 6 – is the schematic view of the connecting rod.

[0019] The elements in the figures are numbered as follows:

1. Compressor
2. Upper casing
3. Lower casing
4. Motor
5. Stator
6. Rotor
7. Cylinder
8. Cylinder block
9. Bearing
10. Crank
11. Piston
12. Connecting rod
13. Crankpin
14. Locking pin
15. Channel

16. Piston crankpin hole
17. Connecting rod crankpin hole
18. Piston locking pin hole
19. Crankpin locking pin hole
20. Core gap
21. Plane

[0020] The compressor (1) comprises an upper casing (2) that covers the movable components and a lower casing (3) that contains the oil on the base thereof and that supports the components therein; a motor (4) that is composed of two components, that is a stator (5) and a rotor (6); a cylinder (7) that provides the pumping of the refrigerant gas; a cylinder block (8); a piston (11) that enables the refrigerant gas to be compressed in the cylinder (7); a crank (10) that transfers the movement received from the motor (4); a connecting rod (12) that transfers the movement received from the crank (10) to the piston (11); a crankpin (13) that connects the connecting rod (12) and the piston (11) to each other, and a bearing (9) that enables the crank (10) to be borne to the cylinder block (8) in the radial direction (Figure 1, Figure 5 and Figure 6).

[0021] The compressor (1) furthermore comprises

- a core gap (20) wherein the connecting rod (12) enters,
- a piston locking pin hole (18) that is arranged on the piston (11) and that extends parallel to the core gap (20),
- a plane (21) that remains between the piston locking pin hole (18) and the core gap (20), and
- a channel (15) that extends on the plane (21) between the piston locking pin hole (18) and the core gap (20) and that joins the piston locking pin hole (18) and the core gap (20)

[0022] (Figure 3 and Figure 4).

[0023] In the assembly of the components such as the piston (11), the crankpin (13) and the connecting rod (12), the crankpin (13) is mounted so as to pass through the piston crankpin hole (16) and the connecting rod crankpin hole (17) of the compressor (1) while the connecting rod (12) is in the core gap (20). The compressor (1) comprises a locking pin (14) that

keeps the said three components (11, 12 and 13) together. The locking pin (14) passes through the piston locking pin hole (18) so as to enter the crankpin locking pin hole (19) and locks all the components to each other. The length of the crankpin (13) is selected so as to match the piston locking pin hole (18) and comprise the crankpin locking pin hole (19). Thus, the locking pin (14) passes through both and can be locked in the crankpin locking pin hole (19) in a snap-fit manner (Figure 2).

[0024] The plane (21) distance is decreased by means of the channel (15) opened between the piston locking pin hole (18) and the core gap (20). Thus, with requiring to be processed during the production, the piston locking pin hole (18) is enabled to be taken out of the mold with the minimum plane (21) distance. Moreover, a shorter crankpin (13) can be used with the plane (21) distance decreasing. Using a shorter crankpin (13) means a lighter movable mass and this provides increase in mechanical efficiency and decrease in vibrations while the inertia forces decrease.

[0025] In the preferred embodiment of the present invention, the width of the channel (15) is smaller than or at the most equal to the diameter of the locking pin (14). When the locking pin (14) is placed into the piston locking pin hole (18), a space as much as the width of the channel (15) remains between the locking pin (14) and the core gap (20).

[0026] In an embodiment of the present invention, the opposite sides of the channel (15) are parallel to each other.

[0027] In another embodiment of the present invention, the opposite sides of the channel (15) are inclined towards each other. In a version of this embodiment, the inclination of the sides gets closer towards the piston locking pin hole (18). In another version, the inclination of the sides moves away from each other towards the piston locking pin hole (18).

[0028] In another embodiment of the present invention, the channel (15) extends along the core gap (20) upper surface.

[0029] In another embodiment of the present invention, the channel (15) extends along the piston locking pin hole (18). In this embodiment of the present invention, the piston (11) extends so as to pass the crankpin hole (16)

longitudinally.

## Claims

1. A compressor (1) **comprising** an upper casing (2) that covers the movable components and a lower casing (3) that contains the oil on the base thereof and that supports the components therein; a motor (4) that is composed of two components, that is a stator (5) and a rotor (6); a cylinder (7) that provides the pumping of the refrigerant gas; a cylinder block (8); a piston (11) that enables the refrigerant gas to be compressed in the cylinder (7); a crank (10) that transfers the movement received from the motor (4); a connecting rod (12) that transfers the movement received from the crank (10) to the piston (11); a crankpin (13) that connects the connecting rod (12) and the piston (11) to each other, and a bearing (9) that enables the crank (10) to be borne to the cylinder block (8) in the radial direction, **characterized by**
   - a core gap (20) wherein the connecting rod (12) enters,
   - a piston locking pin hole (18) that is arranged on the piston (11) and that extends parallel to the core gap (20),
   - a plane (21) that remains between the piston locking pin hole (18) and the core gap (20), and
   - a channel (15) that extends on the plane (21) between the piston locking pin hole (18) and the core gap (20) and that joins the piston locking pin hole (18) and the core gap (20).
2. A compressor (1) as in Claim 1, **characterized by** the channel (15) the width of which is smaller than or at the most equal to the diameter of the locking pin (14).
3. A compressor (1) as in Claim 1 or 2, **characterized by** the channel (15) providing that a space as much as the width of the channel (15) remains between the locking pin (14) and the core gap (20) when the locking pin (14) is placed into the piston locking pin hole (18).
4. A compressor (1) as in Claim 1 or 2, **characterized by** the channel (15) the opposite sides of which are parallel to each other.
5. A compressor (1) as in Claim 1 or 2, **characterized by** the channel (15) the opposite sides of which are inclined towards each other.
6. A compressor (1) as in Claim 5, **characterized by** the channel (15) the sides of which have an inclination that gets closer towards the piston locking pin hole

(18).

7. A compressor (1) as in Claim 5, **characterized by** the channel (15) the sides of which have an inclination that moves away from each other towards the piston locking pin hole (18).
8. A compressor (1) as in Claim 1, **characterized by** the channel (15) that extends along the core gap (20) upper surface.
9. A compressor (1) as in Claim 1, **characterized by** the channel (15) that extends along the piston locking pin hole (18).
10. A compressor (1) as in Claim 1, **characterized by** the channel (15) that extends so as to pass through the piston crankpin hole (16) longitudinally.

**Figure 1**

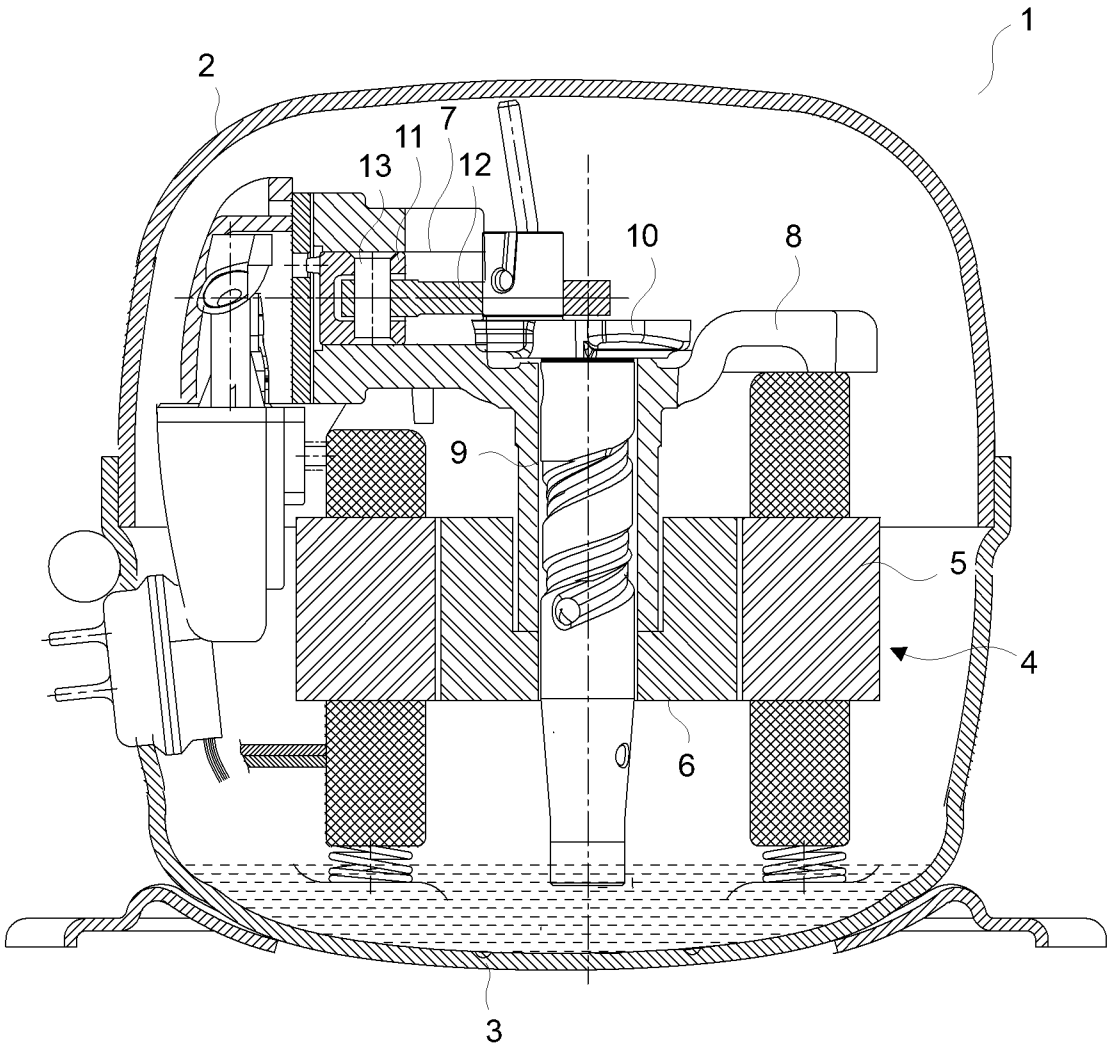


**Figure 2**

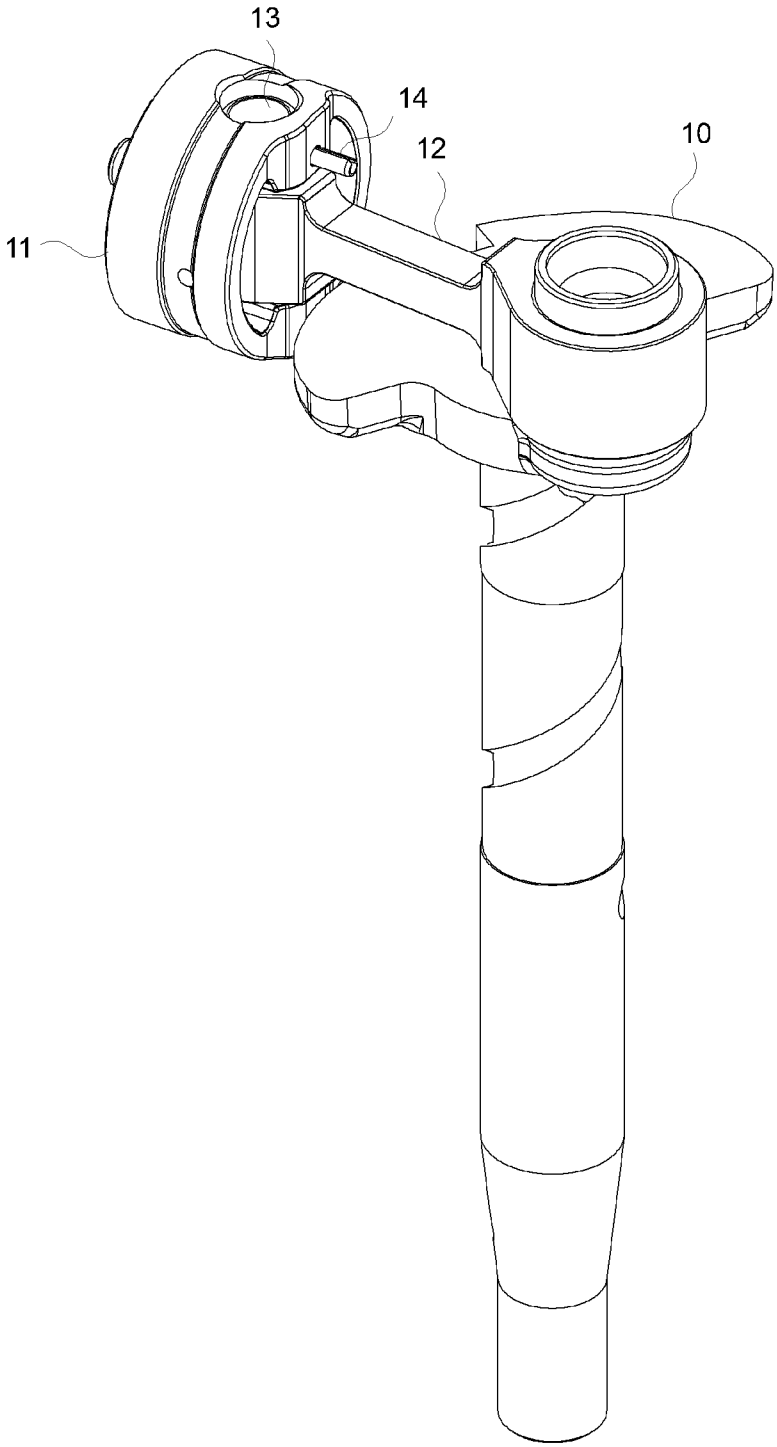


**Figure 3**

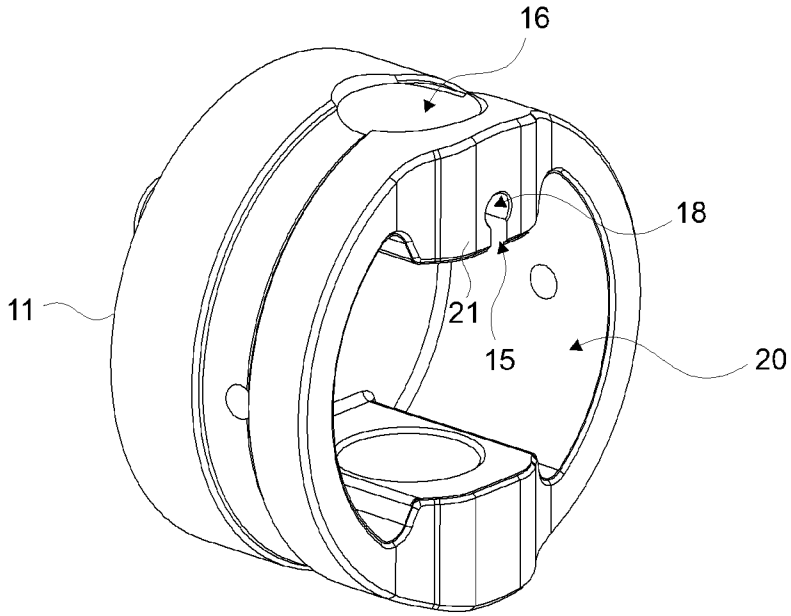



**Figure 4**

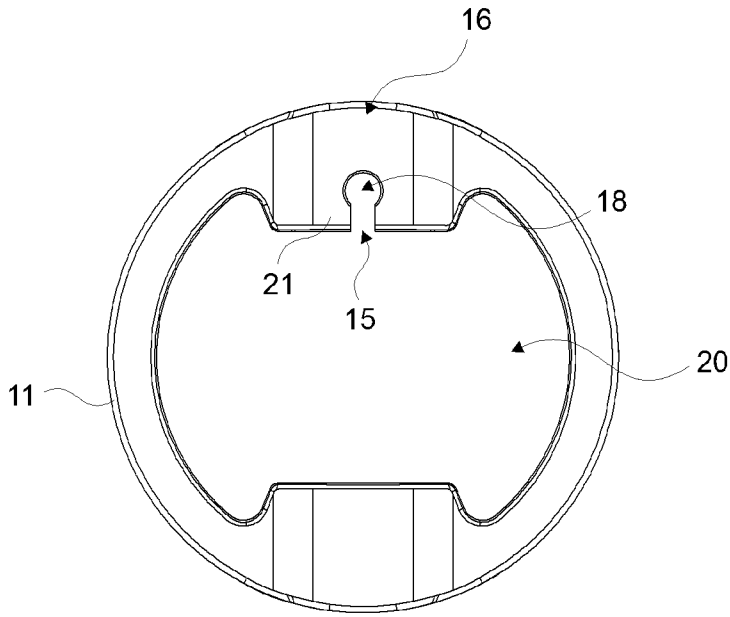


**Figure 5**

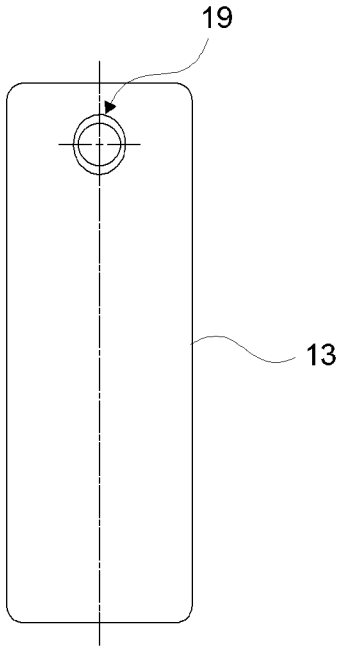
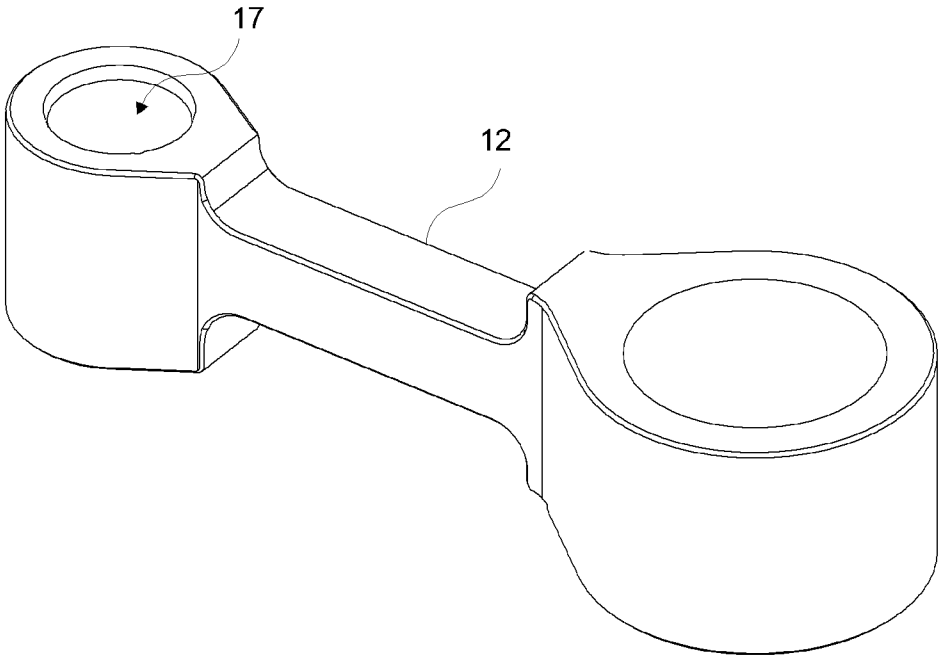



**Figure 6**



# INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/054903

A. CLASSIFICATION OF SUBJECT MATTER
INV. F04B39/00 F04B39/14
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | CN 101 354 031 A (SAMSUNG KWANGJU ELECTRONICS CO [KR])<br>28 January 2009 (2009-01-28)<br>abstract; figures 1-6 | 1-10 |
| X | JP 2010 242592 A (PANASONIC CORP)<br>28 October 2010 (2010-10-28)<br>abstract; figures 4,6 | 1-10 |
| A | US 5 542 341 A (MONK DAVID T [US] ET AL)<br>6 August 1996 (1996-08-06)<br>abstract; figure 1 | 1 |

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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| 4 May 2017 | 16/05/2017 |

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
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| | | KR 100856798 B1 | 05-09-2008 |
| JP 2010242592 A | 28-10-2010 | NONE | |
| US 5542341 A | 06-08-1996 | NONE | |