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**(54) MOUNTING BASE FOR A DOOR HANDLE SENSOR**

(57) The present invention provides a mounting base (10) for a door handle sensor that allows the sensor to be mounted on an inner side of a door (8), rather than in a handle (2) located on an outer side of the door (8). The mounting base (10) comprises a unitary moulded body having an inner surface shaped to conform with an inner side of a door (8), a first mounting aperture (11) formed at a first end, a second mounting aperture (12) formed at a second end, a central portion (13) for containing a sensor, a first flexural hinge (14) formed between the first mounting aperture (11) and the central portion (13), and

a second flexural hinge (15) formed between the second mounting aperture (12) and the central portion (13). The mounting base (10) has a simple construction that can conform to a curved door (8). The present invention also provides vehicle door opening mechanism (1) comprising a handle (2) mountable on an outer side of a door (8) having a remotely operable locking mechanism, a mounting base (10) according to the present invention, and a sensor mounted in the central portion (13) of the mounting base (10).

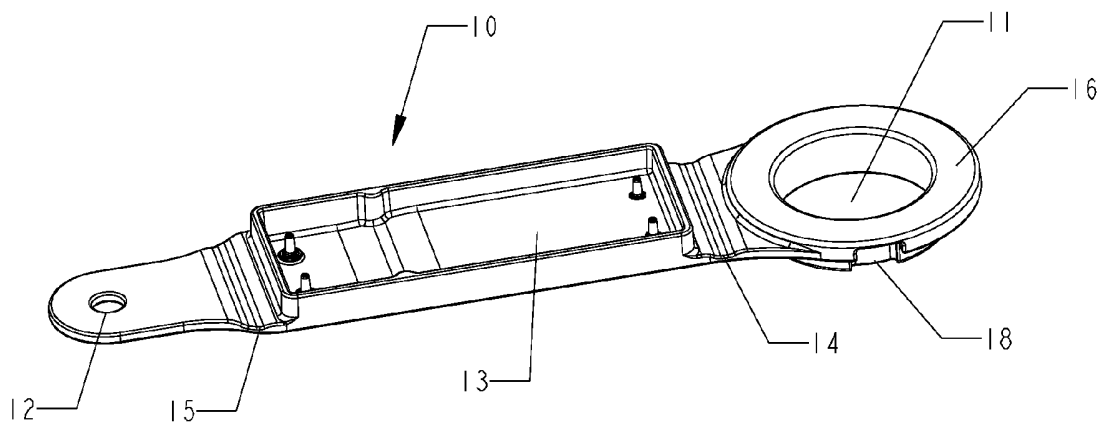


Figure 3

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## Description

### Field of the Invention

**[0001]** The present invention relates to remotely operable vehicle door handles. In particular, the present invention relates to the mounting of sensors, such as capacitive sensors, for remotely operating vehicle door handles.

### Background to the invention

**[0002]** Mechanical push button locking handles are commonly used on many vehicles, particularly off-road, agricultural, and commercial vehicles. In these locks a key is inserted in a locking cylinder and rotated through approximately 90° in a first direction to unlock the handle, then rotated back to its original position, and the key is then removed from the locking cylinder. When the handle is unlocked the push button of the handle can then be pressed in to disengage a latch, unlock the vehicle and allow the handle to be used in order to open the vehicle. In order to lock the handle the key is inserted into the locking cylinder and rotated 90° in a second direction to lock the handle. The key is then removed from the locking cylinder. When the handle is locked it is not possible to depress the push button.

**[0003]** Remote keyless entry systems are also increasingly common in many vehicles. In such entry systems a user may have a fob that interacts with a sensing element and a controller located in a locking mechanism that act to lock and unlock the mechanism. In particular, when the sensing element detects a locking signal from the fob the controller controls the locking mechanism to unlock by operating suitable actuating means. When the sensing element detects an unlocking signal from the fob then the mechanism is operated to lock by suitable actuating means.

**[0004]** There are many locking mechanisms that combine manual locks with remote keyless entry systems that allow a user to either use a fob or a key to lock or unlock the locking mechanism. A door handle that operates in this manner is disclosed in GB1904952.7 and is shown in Figure 1. This door handle is described below.

**[0005]** There is an issue with remotely locking door handles, such as that shown in Figure 1, in that the mounting sensors for detecting locking and unlocking signals can be difficult. There is no safe, reliable, or simple method of mounting a sensor in the handle of Figure 1. Currently, the sensor is mounted in the base of the handle and is therefore external to the vehicle. This takes up space within the handle and becomes an integral part of the handle. This is a bulky construction that results in the handle protruding away from the door a significant distance. Further, it is not possible to access or replace a sensor when necessary without dismantling the handle. This means that in most cases it is necessary to completely replace a handle in order to replace a sensor,

something that is clearly undesirable.

**[0006]** In light of the above, there is a need for an improved mounting for sensors for door operating mechanisms, particularly door operating mechanisms for use in vehicles. Any such improved mounting should allow access to and replacement of a sensor without requiring complete replacement of a handle that is used with the sensor.

### 10 Summary of the Invention

**[0007]** The present invention provides a mounting base for a door handle sensor comprising:  
a unitary moulded body having:

- an inner surface shaped to conform with an inner side of a door;
- a first mounting aperture formed at a first end;
- a second mounting aperture formed at a second end;
- a central portion;
- a first flexural hinge formed between the first mounting aperture and the central portion; and
- a second flexural hinge formed between the second mounting aperture and the central portion.

**[0008]** The mounting base of the present invention provides a simple mounting base for a door handle that can eliminate the need for additional holes in a door, and eliminate the need for additional fasteners. With fewer holes in a door, and fewer fasteners, the overall installation cost and labour is less than mountings according to the prior art. The present invention also provides a modularity that in some embodiments can allow the mounting of a sensor for locking/unlocking a mechanism of the door handle. Alternatively the mounting base can be used without a sensor as a mounting detail for a door handle.

**[0009]** In embodiments of the invention the central portion of the mounting base is sized and shaped to contain a sensor. Such embodiments are advantageous in that they provide a simple mounting base for a door handle sensor that allows the sensor to be located apart away from the door handle mechanism. In addition, by mounting a sensor on the inner side of a door within a mounting base, it is possible to form a door handle that does not extend away from the door as far as prior art door handles. This can reduce the chances of the handle being struck while driving close to stationary objects.

**[0010]** The mounting base can be positioned on an inner side of a door, on the opposing side from a door handle. The flexural hinges of the mounting base allow it to be mounted to surfaces that are curved, for example glass doors as commonly found on agricultural and construction vehicles.

**[0011]** The mounting base of the present invention has a unitary moulded body that can be formed of any suitable material. In embodiments of the invention the body may be formed of a suitable polymer. The unitary body may be injection moulded or formed through any other appro-

priate moulding process.

**[0012]** In use, in embodiments of the invention in which the central portion is sized and shaped to contain a sensor, a door handle sensor, such as a capacitive sensing printed circuit board (PCB) or any other sensing element may be mounted in the central portion of the mounting base. This can be done in any manner apparent to a person skilled in the art. For example, a PCB or other sensor can be retained in the central portion of the mounting base by potting the sensor in with epoxy resin or other suitable potting substance. The central portion may be comprised of a tray in which a sensor can be located.

**[0013]** In use, the first aperture of the mounting base may be aligned with a mounting of a handle of a vehicle door operating system. The mounting base may be affixed to a door by means of the mounting of a handle of a vehicle door operating system extending through the first aperture and then being clamped in position on an inner side of a door by means of a nut or other suitable locking means.

**[0014]** In order to ensure that the mounting base has a degree of flexural compliance and to ensure that an unduly high point load is not generated at the first aperture of the mounting base, in embodiments of the invention it may be advantageous that a load spreading washer is formed around the first mounting aperture to spread the compression from a nut or bolt about a greater surface of the mounting base 10. As will be readily understood, a load spreading washer will preferably be formed to have a broad load spreading surface on an outer side of the mounting base that is not adjacent a door when the mounting base is in use. A load spreading washer may be formed in any manner apparent to a person skilled in the art. A load spreading washer may be formed as a 'top-hat' load spreading washer having a form that spreads compression forces about the washer.

**[0015]** If a load spreading washer of a mounting base according to the present invention is a 'top-hat' load spreading washer it may comprise a compression limiter at an axially inner end to ensure that the mounting base cannot be deformed by overtightening of a locking means on the washer. A compression limiter can also serve to prevent over-compression of a door on which the mounting base is mounted. This can be particularly important if the door is formed of glass that may crack if over-compressed.

**[0016]** If a sensor is contained within a mounting base according to the present invention on an inner side of a door and a handle of a door operating system is correspondingly mounted on an outer side of a door then it may be necessary that one or more wires pass from the mounting base to the handle to allow operation of the handle by the sensor. In order to facilitate this, in embodiments of the invention one or more wire grooves can be formed in an outer side of the mounting base to allow wires to pass through the mounting base adjacent the first mounting aperture, for example on a radially outer side of a load spreading washer of the mounting base.

A groove on an outer side of a load spreading washer may be preferred to a slot formed in a side wall of a load spreading washer as a groove can maintain the structural integrity of the washer to avoid distortion or collapse under load. This ensures that wire(s) are not damaged when a nut or other mounting means is tightened on the load spreading washer. Nevertheless, in alternative embodiments of the invention a slot for one or more wires may be provided in a load spreading washer or in another part of the mounting base to allow wire(s) to pass there-through.

**[0017]** The central portion of the mounting base may be formed to contain a sensor in any appropriate manner. For example, the central portion may be formed as a tray for containing a sensor as discussed above. In embodiments of the invention the central portion may comprise a potting material for covering the sensor. In alternative embodiments the central portion may comprise a lid for covering the sensor. A lid may be openable or permanently attached and may be attached to the mount in any appropriate manner.

**[0018]** The present invention also provides a vehicle door opening mechanism comprising:

- a handle mountable on an outer side of a door having a remotely operable locking mechanism;
- a mounting base according to the present invention; and
- a sensor mounted in the central portion of the mounting base.

**[0019]** The vehicle door opening mechanism of the present invention may comprise any handle that can be remotely operated utilising a capacitive sensor and that can be mounted on an outer side of a door. One such suitable handle is shown in the Figures and is discussed below. The handle may be either solely remotely operable or may also be mechanically operable.

**[0020]** The sensor of the vehicle door opening mechanism may be a capacitive sensor.

**[0021]** In embodiments of the invention the handle and the mounting base may be formed such that, when mounted on a door, the mounting base extends parallel to the handle. This may be advantageous in that it provides a more compact and aesthetically pleasing mechanism, particularly if the mechanism is mounted on a glass door.

**[0022]** As set out above, in embodiments of the invention the first aperture of the mounting base will be aligned with a mounting of the handle and the mounting base and the handle will be mounted together by means of a mounting means extending from the handle, through a door, and through the first aperture of the mounting base. Advantageously, the mounting base will also be fixed to the door at the second end of the mounting base. This mounting base be fixed to a door at a second end in any manner apparent to the person skilled in the art. For example, the mounting base may be fixed to a door at its

second end by means of a bolt extending through the second aperture and into an end of the handle.

**[0023]** Features and advantages of the invention will be apparent from the embodiment shown in the Figures and described below.

#### Drawings

#### **[0024]**

Figure 1 is a remotely operable door handle according to the prior art;

Figure 2 is a side view of an embodiment vehicle door opening mechanism according to the present invention;

Figure 3 is a three-dimensional view of a mounting base according to an embodiment of the present invention;

Figure 4 is a side view of the mounting base of Figure 3; and

Figure 5 is a close-up of a mounting between a first end of the mounting base and the door handle of Figure 2.

**[0025]** A door opening mechanism 1 according to the prior art is shown in Figure 1. The mechanism 1 comprises a handle 2 that is mounted to a door (not shown) by means of nut 3 and washer 4 cooperating with an outer threaded part 6 of a locking mechanism 5, wherein when mounted on a door the locking mechanism extends through the door. The door opening mechanism 1 shown in Figure 1 is capable of mechanical and remote operation. The door opening mechanism 1 comprises a capacitive sensor (not shown) on a printed circuit board (PCB) that is mounted within the handle 2 and potting material is formed over the PCB. The capacitive sensor acts to sense a signal from a remote controller to operate an actuator 7 that can operate the locking mechanism 5 to lock and unlock the door operating mechanism 1. The precise operation of the door opening mechanism 1 is not relevant to the present invention and is not discussed further.

**[0026]** An embodiment of a door opening mechanism 1 according to the present invention is shown in Figure 2. The door opening mechanism 1 of the present invention has substantially the same features as the embodiment according to the prior art shown in Figure 1. Therefore, the same reference numerals will be used to show the features present in the embodiment of the present invention where appropriate.

**[0027]** The door opening mechanism 1 comprises a handle 2 that is mounted to an outer side of a door 8 by means of a nut 3. The door 8 is a glass door as might be found on agricultural or construction vehicles. A mounting base 10 according to the present invention is mounted to an inner side of the door 8. Details of the mounting base can be seen in Figures 3 and 4. The mounting base 10 is mounted to the door 8 at a first end as the threaded

part 6 of the locking mechanism 5 extends through a first aperture 11 of the mounting base. The mounting base 10 is fixed to the door 8 at a second end by means of a second mounting bolt 9 of the handle 2, which extends through the door 8 and a second aperture 12 of the mounting base.

**[0028]** The mounting base 10 consists of a unitary moulded body having a first end and a second end. The first aperture 11 is formed at the first end and the second aperture 12 is formed at the second end. A central portion 13 for containing a sensor (not shown) is formed between the first end and the second end. A first flexural hinge 14 is formed between the first aperture 11 and the central portion 13 and a second flexural hinge 15 is formed between the second aperture 12 and the central portion 13. The first and second flexural hinges 14, 15 allow the mounting base to conform to a curved surface without placing undue stress on the mounting base 10.

**[0029]** The central portion 13 comprises an open box in which the sensor is mounted. The sensor is a capacitive sensor mounted on a PCB and is potted in the central portion 13 using an epoxy resin, which serves to facilitate environmental sealing of the sensor and retain the sensor within the central portion 13.

**[0030]** An inwardly projecting 'top-hat' load protecting washer 16 is formed around the first aperture 11. In use, the load protecting washer 16 extends inwards from the mounting base 10 and through the door 8. The load protecting washer 16 has a broad axially outer surface to spread the pressure from the bolt 3 about the surface of the washer 16. A compression limiter 17 is formed at an axially inner end of the load protecting washer 16. The compression limiter 17 acts to ensure that the mounting base 10 cannot be over-deformed when tightening the nut 3. The compression limiter 17 also acts to prevent cracking of the glass door 8 due to over tightening.

**[0031]** A groove 18 is formed in an outer side of the load protecting washer 16 to allow wire(s) (not shown) from the sensor to pass through the door 8 from the mounting base 10 to the handle to operate an actuator 7 located therein. The groove 18 maintains the structural integrity of the load protecting washer 16 such that it cannot distort or collapse when a compression load is applied. This ensures that the wires are not damaged when the door opening mechanism 1 is mounted on the door 8. The groove 18 is aligned with a corresponding mating groove 20 in the threaded part 6 of the locking mechanism 5, through which the wires are routed to the actuator 7. As the mounting base 10 is affixed to the door 8 at both its first end and the second end the groove 18 of the mounting base 10 can be rotationally indexed with the groove 20 of the locking mechanism 5 without difficulty.

#### **Claims**

1. A mounting base (10) for a door handle sensor comprising:

a unitary moulded body having:

an inner surface shaped to conform with an inner side of a door;  
 a first mounting aperture (11) formed at a first end;  
 a second mounting aperture (12) formed at a second end;  
 a central portion (13);  
 a first flexural hinge (14) formed between the first mounting aperture (11) and the central portion (13); and  
 a second flexural hinge (15) formed between the second mounting aperture (12) and the central portion (13).

2. A mounting base (10) according to claim 1, wherein the central portion (13) is sized and shaped to contain a sensor.

3. A mounting base according to claim 1 or claim 2, wherein a load spreading washer (16) is formed around the first mounting aperture (11) and extends from the inner surface of the mounting base (10).

4. A mounting base (10) according to claim 3, wherein a wiring groove (18) is formed in a radially outer side of the load spreading washer (16) to allow one or more wires to pass adjacent the first mounting aperture (11).

5. A mounting base (10) according to any preceding claim, wherein a compression limiter (17) is formed at an axially outer edge of the load spreading washer (16).

6. A mounting base (10) according to any preceding claim further comprising a potting material within the central portion (13).

7. A mounting base (10) according to any preceding claim, wherein a wiring groove (18) is formed adjacent the first mounting aperture (11) to allow one or more wires to pass adjacent the first mounting aperture (11).

8. A vehicle door opening mechanism comprising:

a handle (2) mountable on an outer side of a door (8) having a remotely operable locking mechanism;  
 a mounting base (10) according to any of claims 1 to 7; and  
 a sensor mounted in the central portion (12) of the mounting base (10).

9. A vehicle door opening mechanism according to claim 8, wherein the locking mechanism is also me-

chanically operable with a key.

10. A vehicle door opening mechanism according to claim 8 or claim 9, wherein the handle (2) and mounting base (10) are formed such that, when mounted on a door (8), the mounting base (10) extends parallel to the handle (2).

11. A vehicle door opening mechanism according to any of claims 8 to 10, further comprising a bolt (9) for mounting the second end of the mounting base (10) to the door.

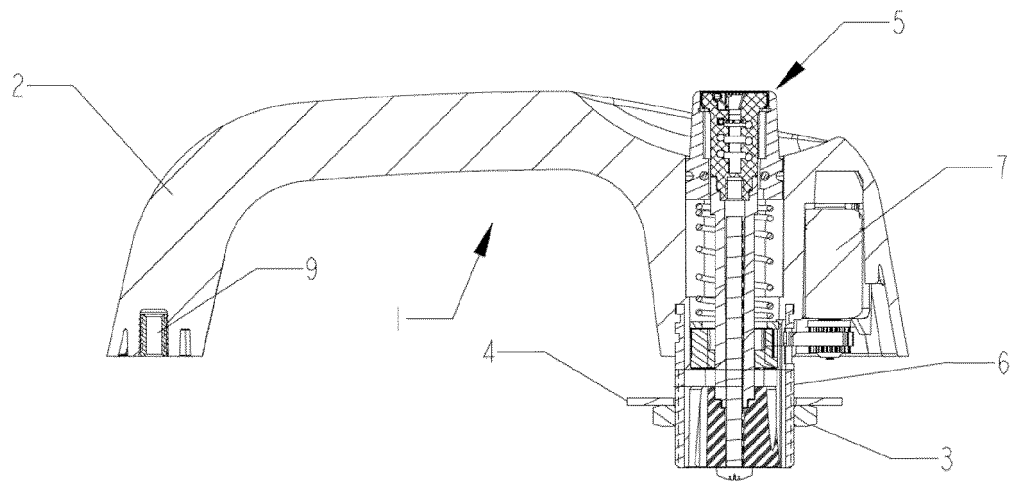


Figure 1

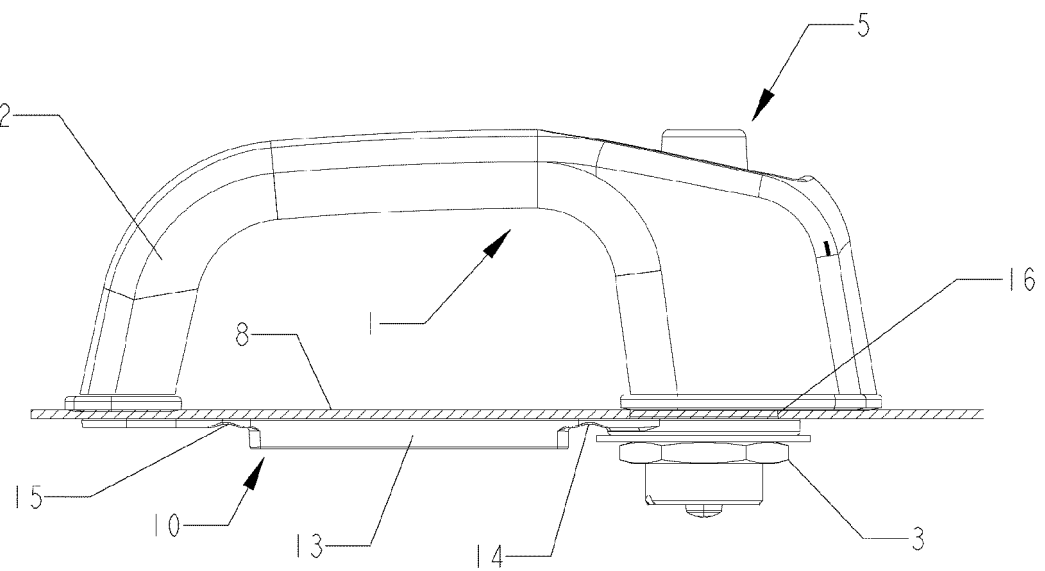


Figure 2

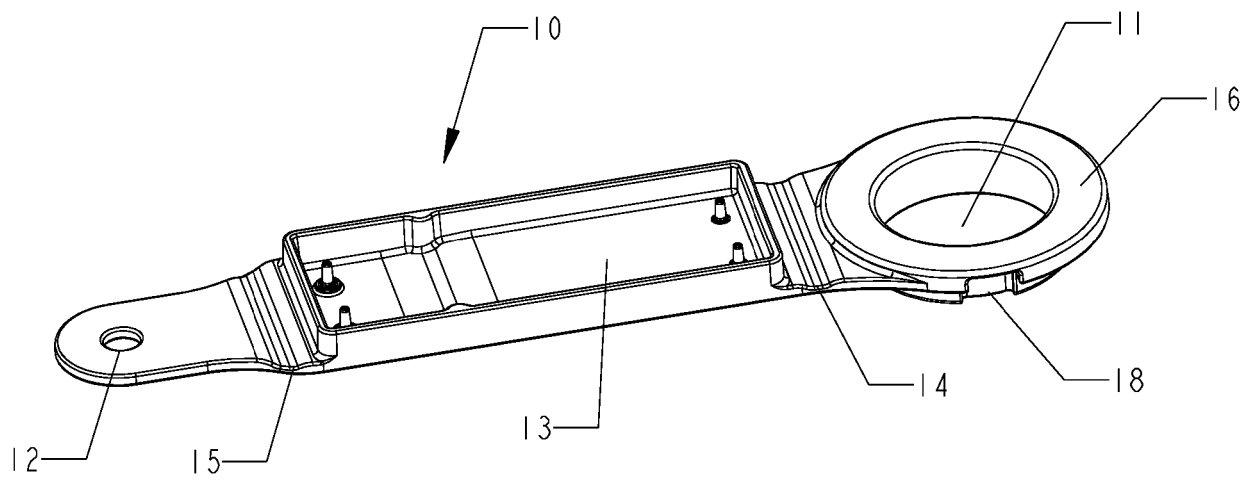


Figure 3

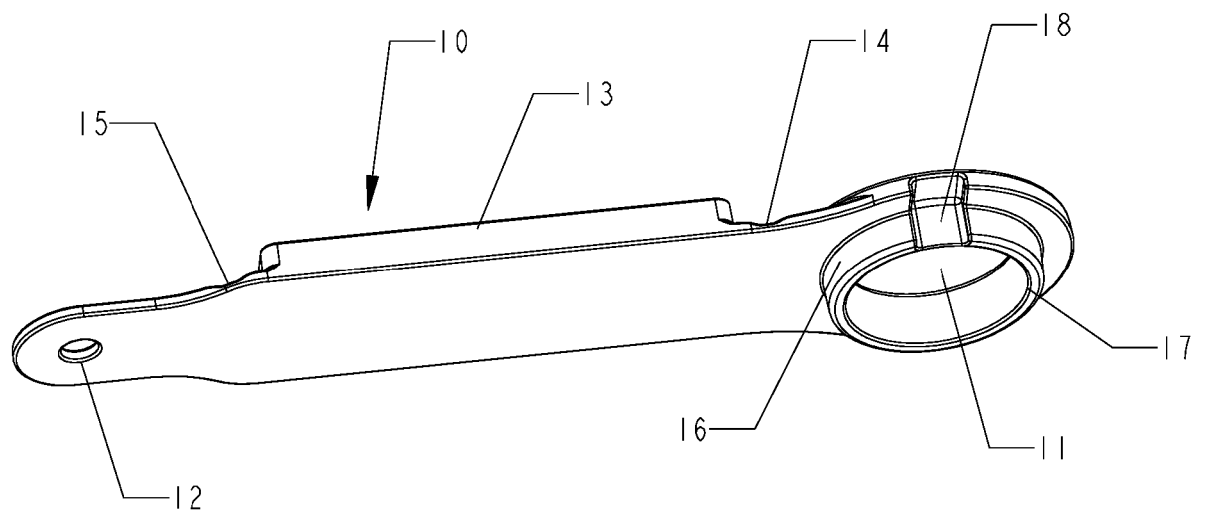


Figure 4

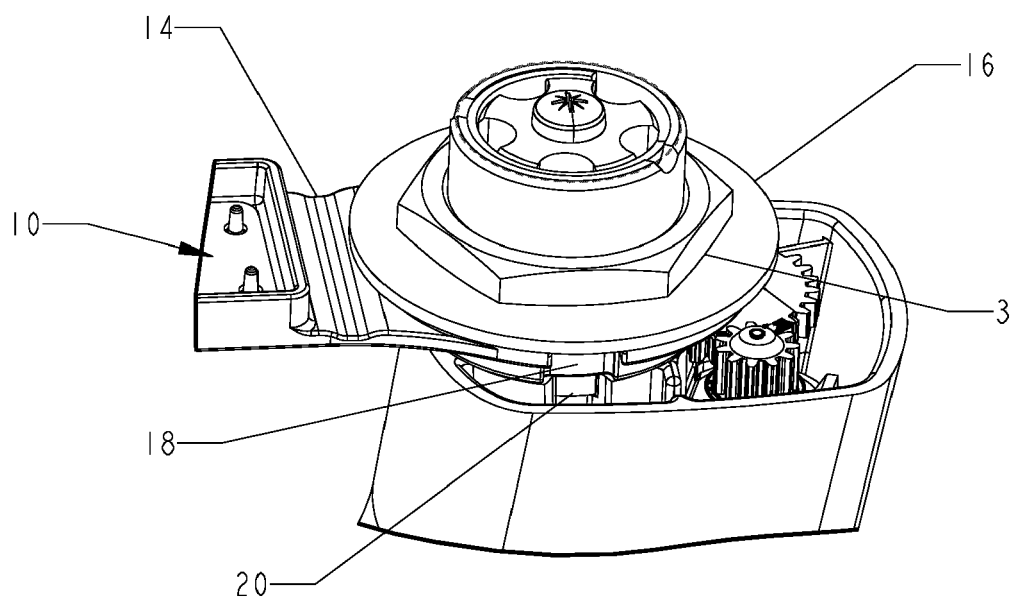


Figure 5





## EUROPEAN SEARCH REPORT

Application Number  
EP 20 18 3951

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 10 November 2020	Examiner Antonov, Ventseslav
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**REFERENCES CITED IN THE DESCRIPTION**

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