Device Converting Manual Hydraulic Valve to Smart Valve

The present invention relates to hydraulic systems. More specifically, the present invention relates to hydraulic systems used in combination with heavy equipment which would benefit from an electromechanical device providing remote control of the manual hydraulic valves through a remote control or via the Internet from a smartphone or other similar mobile electronic device.

BACKGROUND OF THE PRESENT INVENTIONT

Heavy equipment is universally used all over the world and 90% of heavy equipment relies on or utilizes hydraulic systems in some manner. Hydraulic systems cannot be matched when it comes to high power density. Hydraulic systems are able to create incredible propulsive force with even a small amount of fluid.

A hydraulic drive system typically consists of three parts: (1) a hydraulic pump driven by an electric motor or combustible engine which acts as the generator of force; (2) Pipes, valves, and filters to control and guide the system; and (3) an actuator to direct it.

On a piece of heavy equipment, a hydraulic system generally consists of a hydraulic pump installed on the diesel engine portion of the piece of heavy equipment. Typically, the hydraulic pump withdraws the oil from the oil tank and pumps it into the hydraulic control valves which in turn control the direction of the oil reaching the hydraulic cylinders and hydraulic motors. This then results in a propulsive force which is obtained from pumping the oil into by the pump into the cylinders.

The desired propulsive force is calculated according to the function performed by the equipment. This force is not less than several tons. The role of the hydraulic control valves is to change the force direction.

In a significant percentage of equipment, such as cranes, winches, excavators, dumpers and a range of other equipment, these valves depend on manual control using a human element to obtain the required function. Safety is always a concern when humans are using large machinery or hydraulic machinery as the forces created by these devices is enough to quickly and easily several injure or kill a worker before the machinery can be stopped.

Therefore, what is needed is a means for providing remote control of the manual hydraulic valves through a remote control or via the Internet.

SUMMARY OF THE INVENTION

The present invention is an eelectromechanical device that combines the field of mechanical and electronic engineering, where it is linked with manual hydraulic valves and transforms it into smart valves that can be programmed and remotely controlled with high accuracy to preserve the human element in places of danger as well as raise the efficiency of equipment, as the device solves this technical problem, which is the reliance on a human element to control the equipment. The technology taught by the present invention is unique, novel, non-obvious, simple, and cheap compared to other technologies.

The general embodiment of the present invention requires a servo motor, an adapter made of aluminum, and a brass/copper coupling with internal and external threads assembled together. This assembled device is then added to any hydraulic valve for any heavy equipment that works by hydraulics, whether old or modern, such as excavators, bulldozers, cranes, and winches. After installing the device, this equipment turns into a smart equipment or robot that can be programmed and fully controlled remotely, whether through a remote control or via the Internet.

In the present invention, an electromechanical device is added for remote control of the manual hydraulic valve through a remote control or via the Internet.

The present invention teaches an electromechanical device design based on a mechanical and electronic engineering system in which the inner shaft of a manual hydraulic control valve is connected with a servo motor via the aluminum junction and brass/copper bushing in order to control the change in the direction of the hydraulic valve through the engine, thus changing the direction of the oil pressure reaching the hydraulic cylinder or the hydraulic motor depending on the application of the equipment and obtaining the required movement with high accuracy.

The servo motor with screws is an electric motor that converts digital pulses into mechanical rotation, dividing each cycle into a correct number of steps, and is widely used in the manufacture of robots due to its accuracy. The servo motor with screws is attached to the opposing or opposite end of the body 18 of the of the aluminum junction with respect to the protruding section, where the protruding section provides means for attachment to a hydraulic control valve after the hydraulic control valve zipper has been opened and removed the hydraulic control valve.

The servo motor with screws is assembled with the screw shaft through the brass/copper bushing. The screw shaft converts the rotary motor movement into a linear motion with a certain force that pushes the hydraulic control valve shaft forward and backward by installing the screw shaft nut with the hydraulic valve shaft.

The aluminum joint/junction is an aluminum box installed on the hydraulic control valve after its Spring has been opened and removed. At the opposing end from the connection to the hydraulic control valve 14 aluminum joint/junction, the servo motor is installed with the screw shaft and brass/copper bushing inside and connected to the hydraulic control valve shaft.

After assembling the device with the hydraulic valve, the device is controlled by an electronic circuit that works with radio waves; it is a transmitter (remote control) with proportional electrical switches and a data receiver linked to the servo motor.

The servo motor is characterized by the possibility of being controlled remotely and programmed to perform the required function, whether by radio waves or via the Internet.

The servo motor can also be connected to an electronic circuit (Arduino) to control it via the Internet. Through the remote control and/or the Internet, the device controls the hydraulic valve with exceedingly high precision.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated herein form a part of the specification, illustrate the present invention and, together with the description, further explain the principles of the present invention and to enable a person skilled in the pertinent art to make and use the present invention.

Figure 1 is a front-side perspective view of the device of the present invention which consists of three main elements: an aluminum junction; a brass/copper bushing, and a servo motor with screws.

Fig. 2 is a rear-side perspective view of the device of the present invention which consists of three main elements: an aluminum junction; a brass/copper bushing, and a servo motor with screws.

Fig. 3 s a front-side perspective cut away view of the device of the present invention which consists of three main elements: an aluminum junction; a brass/copper bushing, and a servo motor with screws.

Fig. 4 is a front planar view of the device of the aluminum junction as taught by the present invention.

Fig. 5 is a top planar view of the device of the aluminum junction as taught by the present invention.

Fig. 6 is a front-side perspective view of the device of the aluminum junction as taught by the present invention.

Fig. 7 is a side planar cut away view of the device of the aluminum junction as taught by the present invention.

Fig. 8 is a front-side perspective view of the brass/copper bushing taught by the present invention.

Fig. 9 is a front planar view of the brass/copper bushing nut taught by the present invention.

Fig. 10 is a side planar view of the brass/copper bushing taught by the present invention establishing the A plane of reference for Fig. 11.

Fig. 11 is a sectional planar view along plane A-A of the brass/copper bushing taught by the present invention.

Fig. 12 is a front-side perspective view of the servo motor with screws taught by the present invention.

Fig. 13 is a front planar view of the servo motor with screws taught by the present invention.

Fig. 14 is a top planar view of the servo motor with screws taught by the present invention.

Fig. 15 illustrates a perspective view where a pluarality of devices taught by the present invention are linked with a plurality of manual hydraulic valves which transforms the manual hydraulic valves into smart valves that can be programmed and controlled remotely.

Fig. 16 illustrates a planar view where a pluarality of devices taught by the present invention are linked with a plurality of manual hydraulic valves which transforms the manual hydraulic valves into smart valves that can be programmed and controlled remotely and .establishing the B plane of reference for Fig. 17.

Fig. 17 illustrates a sectional planar view along plane B-B where a device taught by the present invention is linked with a manual hydraulic valve which transforms the manual hydraulic valve into smart valves that can be programmed and controlled remotely.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

In the following detailed description of the present invention of exemplary embodiments of the present invention, reference is made to the accompanying drawings (where like numbers represent like elements), which form a part hereof, and in which is shown by way of illustration specific exemplary embodiments in which the present invention is practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the present invention, but other embodiments are utilized, and logical, mechanical, electrical, and other changes are made without departing from the scope of the present invention. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is defined only by the appended claims.

In the following description, numerous specific details are set forth to provide a thorough understanding of the present invention. However, it is understood that the present invention is practiced without these specific details. In other instances, well-known structures and techniques known to one of ordinary skill in the art have not been shown in detail in order not to obscure the present invention.

The present invention is an eelectromechanically device that combines the field of mechanical and electronic engineering, where it is linked with manual hydraulic valves and transforms it into smart valves that can be programmed and remotely controlled with high accuracy to preserve the human element in places of danger as well as raise the efficiency of equipment, as the device solves this technical problem, which is the reliance on a human element to control the equipment. The technology taught by the present invention is unique, novel, non-obvious, simple, and cheap compared to other technologies. The general embodiment of the present invention requires a servo motor, an adapter made of aluminum, and a brass/copper coupling with internal and external threads assembled together. This assembled device is then added to any hydraulic valve for any heavy equipment that works by hydraulics, whether old or modern,

such as excavators, bulldozers, cranes, and winches. After installing the device, this equipment turns into a smart equipment or robot that can be programmed and fully controlled remotely, whether through a remote control or via the Internet.

In the present invention, an electromechanical device is added for remote control of the manual hydraulic valve through a remote control or via the Internet. Figure 1 is a front-side perspective view of the device of the present invention which consists of three main elements: an aluminum junction 11; a brass/copper bushing 12, and a servo motor with screws 13.

Fig. 2 is a rear-side perspective view of the device of the present invention which consists of three main elements: an aluminum junction; a brass/copper bushing, and a servo motor with screws. The device of the present invention consists of three main elements: an aluminum junction 11; a brass/copper bushing 12 and a servo motor with screws 13.

Fig. 15 illustrates a perspective view where a plurality of devices taught by the present invention are linked with a plurality of manual hydraulic valves 14 which transforms the manual hydraulic valves 14 into smart valves that can be programmed and controlled remotely.

Fig. 16 illustrates a planar view where a pluarality of devices taught by the present invention are linked with a plurality of manual hydraulic valves 14 which transforms the manual hydraulic valves 14 into smart valves that can be programmed and controlled remotely and .establishing the B plane of reference for Fig. 17.

Fig. 3 s a front-side perspective cut away view of the device of the present invention which consists of three main elements: an aluminum junction 11; a brass/copper bushing 12, and a servo motor with screws 13. Fig. 17 illustrates a sectional planar view along plane B-B where a device taught by the present invention is linked with a manual hydraulic valve 14 which transforms the manual hydraulic valve 14 into smart valves that can be programmed and controlled remotely.

Referring to Figs. 3, and 15-17, the present invention is a device for converting manual hydraulic valves 14 to smart valves. The present invention teaches an electromechanical device design based on a mechanical and electronic engineering system in which the inner shaft 15 of a manual hydraulic control valve 14 is connected with a servo motor 13 via the aluminum junction 11 and brass/copper bushing 12 in order to control the change in the direction of the hydraulic valve 14 through the engine, thus changing the direction of the oil pressure reaching the hydraulic cylinder or the hydraulic motor depending on the application of the equipment and obtaining the required movement with high accuracy.

The servo motor with screws 13 is an electric motor that converts digital pulses into mechanical rotation, dividing each cycle into a correct number of steps, and is widely used in the manufacture of robots due to its accuracy. Fig. 12 is a front-side perspective view of the servo motor with screws taught by the present invention. Fig. 13 is a front planar view of the servo motor with screws taught by the present invention. Fig. 14 is a top planar view of the servo motor with screws 13 taught by the present invention.

The servo motor with screws 13 is attached to the opposing or opposite end of the body 18 of the of the aluminum junction 11 with respect to the protruding section 19, where the protruding section 19 provides means for attachment to a hydraulic control valve 14 after the hydraulic control valve 14 zipper has been opened and removed the hydraulic control valve 14. The servo motor with screws 13 is characterized by a simplicity of design, obtaining high torques at low speeds, great control accuracy and quick response when starting and stopping movement, as well as different engine speeds depending on the function you perform in the equipment.

Fig. 10 is a side planar view of the brass/copper bushing taught by the present invention

establishing the A plane of reference for Fig. 11. Fig. 11 is a sectional planar view along plane A-A of the brass/copper bushing taught by the present invention. Fig. 8 is a front-side perspective view of the brass/copper bushing 12 taught by the present invention. Fig. 9 is a front planar view of the brass/copper bushing nut 17 taught by the present invention.

Referring to Figs. 8-11, the servo motor with screws 13 is assembled with the screw shaft 16 through the brass/copper bushing 12. The screw shaft 16 converts the rotary motor movement into a linear motion with a certain force that pushes the hydraulic control valve shaft 15 forward and backward by installing the screw shaft nut 17 with the hydraulic valve shaft 15.

The servo motor 13 is characterized by the possibility of being controlled remotely and programmed to perform the required function, whether by radio waves or via the Internet.

Fig. 4 is a front planar view of the device of the aluminum junction 11 as taught by the present invention. Fig. 6 is a front-side perspective view of the device of the aluminum junction as taught by the present invention. Figs 4 and 6 provide views the body 18 of the of the aluminum junction 11 is shown with a protruding section 19 for attachment to a hydraulic control valve 14 after the hydraulic control valve 14 zipper has been opened and removed the hydraulic control valve 14 is connected to the protruding section 19 as shown in Figs. 15 and 17.

Fig. 5 is a top planar view of the device of the aluminum junction as taught by the present invention. Fig. 7 is a side planar cut away view of the device of the aluminum junction as taught by the present invention.

Now referring to Figs. 4-7, an aluminum joint/junction 11 is an aluminum box installed on the hydraulic control valve 14 after its zipper has been opened and removed. At the opposing end from the connection to the hydraulic control valve 14 aluminum joint/junction 11, the servo motor 13 is installed with the screw shaft 16 and brass/copper bushing 12 inside and connected to the hydraulic control valve shaft 15.

After assembling the device with the hydraulic valve 14, the device is controlled by an electronic circuit that works with radio waves; it is a transmitter (remote control) with proportional electrical switches and a data receiver linked to the servo motor 13.

The servo motor 13 can also be connected to an electronic circuit (Arduino) to control it via the Internet. Through the remote control and/or the Internet, the device controls the hydraulic valve 14 with exceedingly high precision.

With respect to any necessary software or computer programming, the system is set to run on a computing device or mobile electronic device. A computing device or mobile electronic device on which the present invention can run is comprised of a CPU, storage device, keyboard, monitor or screen, CPU main memory and a portion of main memory where the system resides and executes. Any general-purpose computer, smartphone, or other mobile electronic device with an appropriate amount of storage space is suitable for this purpose. Computer and mobile electronic devices like these are well known in the art and are not pertinent to the present invention. The system can also be written in several different languages and run on a number of different operating systems and platforms.

Although the present invention has been described in considerable detail with reference to certain preferred versions thereof, other versions are possible. Therefore, the point and scope of the appended claims should not be limited to the description of the preferred versions contained herein.

ABSTRACTS

A device for converting manual hydraulic valve to smart valve where an electromechanical device is added for remote control of the manual hydraulic valve through a remote control or via the Internet. The present invention consists of three main elements: an aluminum junction; a brass/copper bushing, and a servo motor with screws. The present invention teaches an electromechanical device design based on a mechanical and electronic engineering system in which the inner shaft of a manual hydraulic control valve is connected with a servo motor via the aluminum junction and brass/copper bushing in order to control the change in the direction of the hydraulic valve through the engine, thus changing the direction of the oil pressure reaching the hydraulic cylinder or the hydraulic motor depending on the application of the equipment and obtaining the required movement with high .

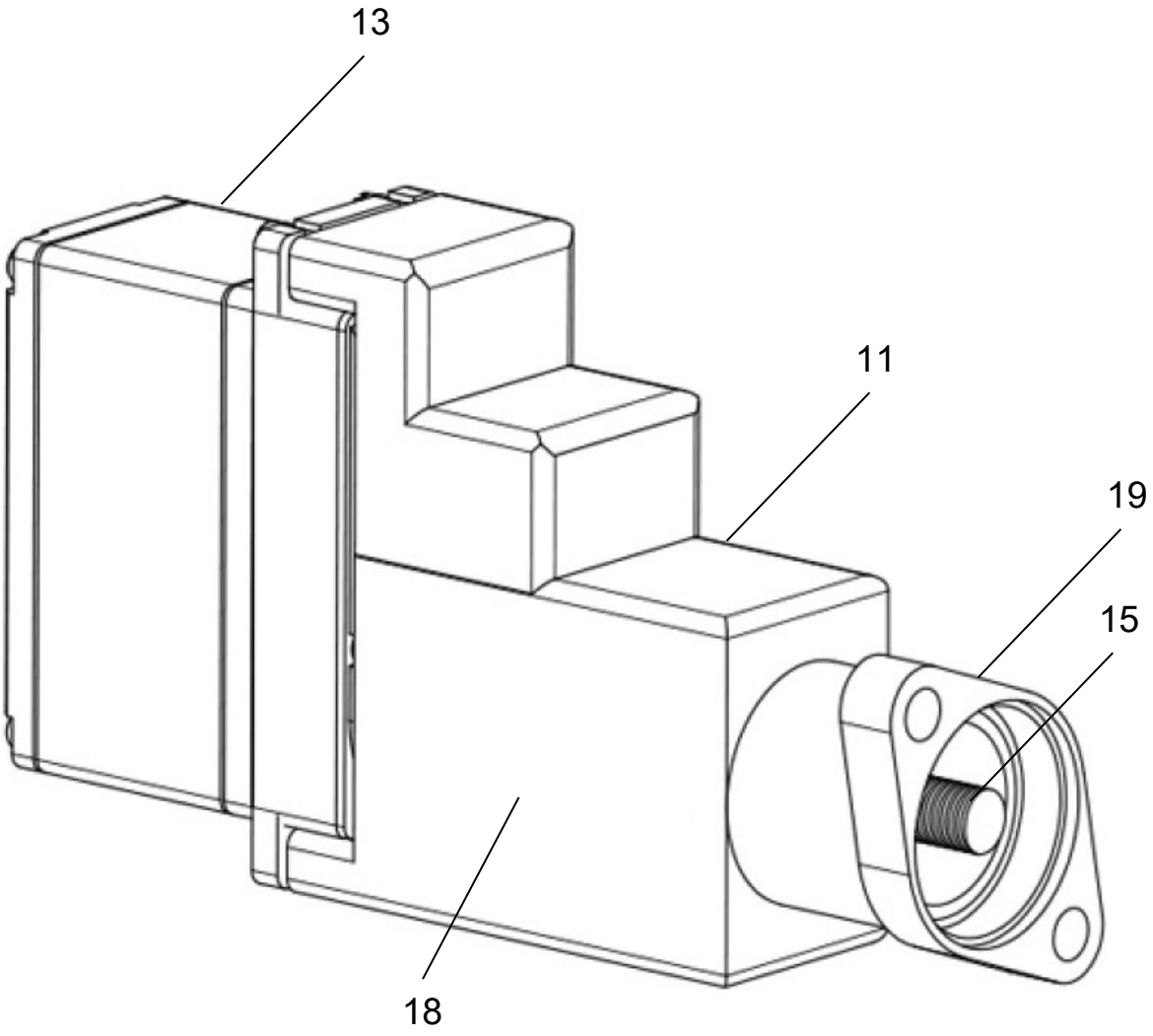

Fig. 1

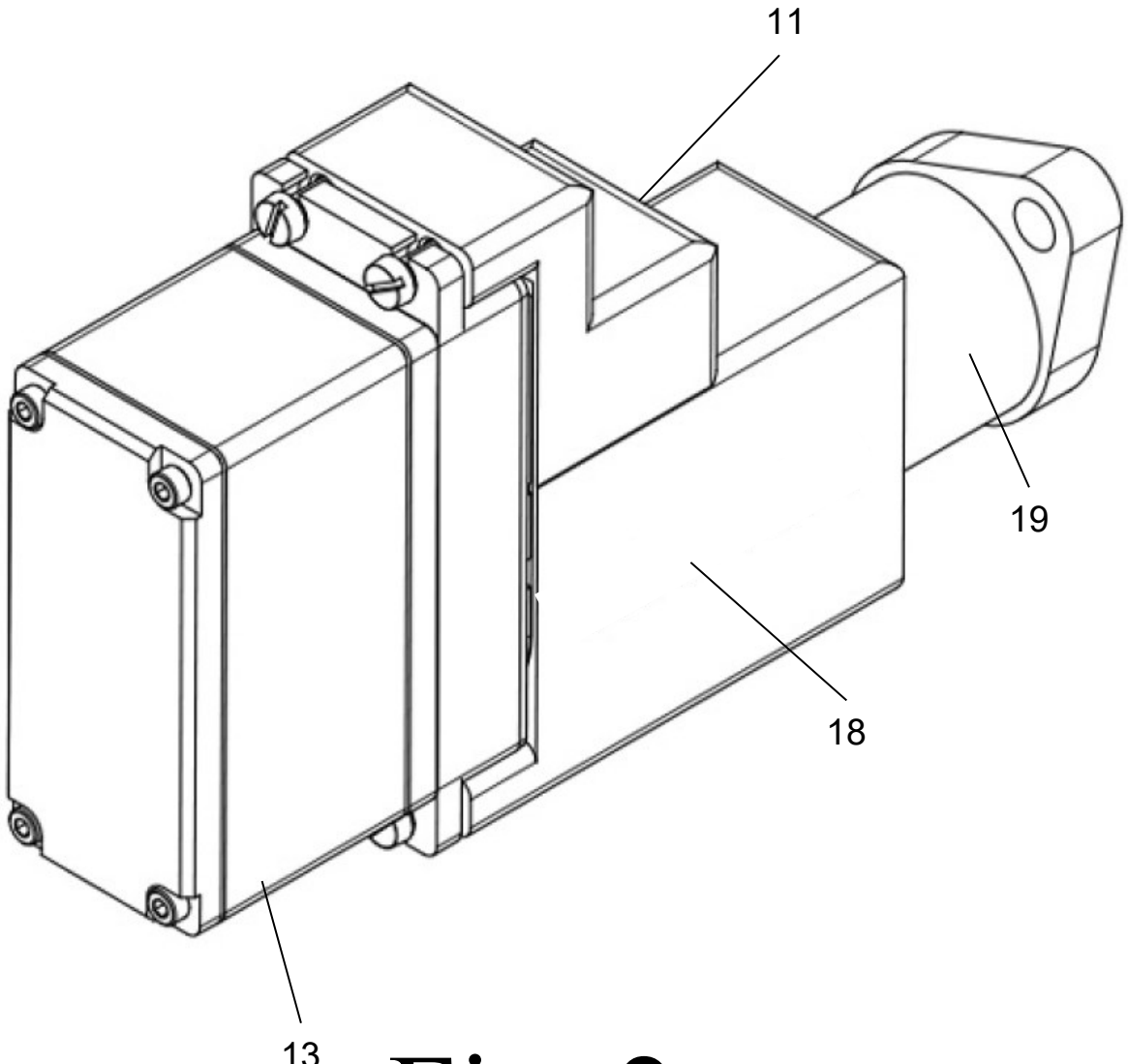

Fig. 2

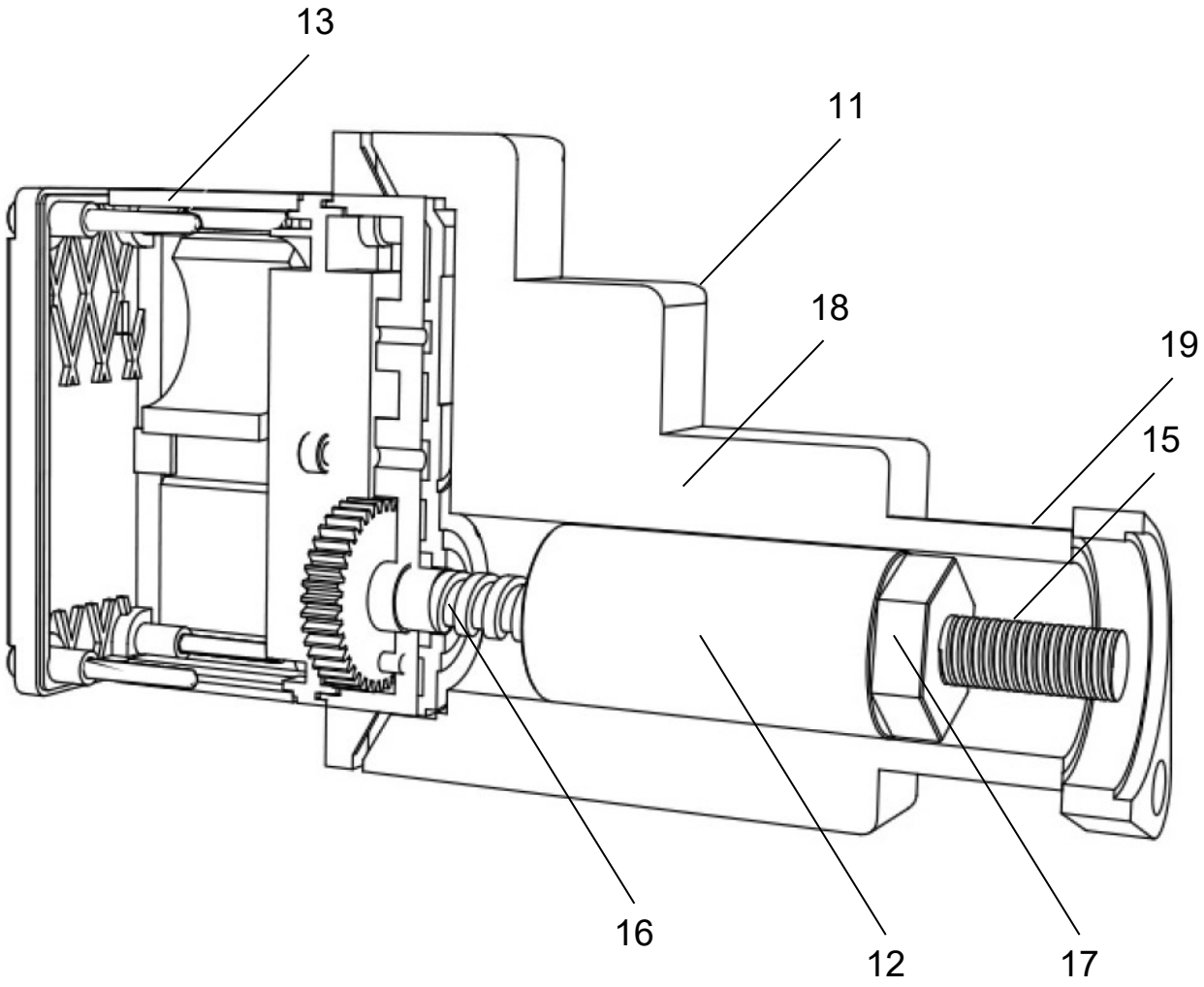

Fig. 3

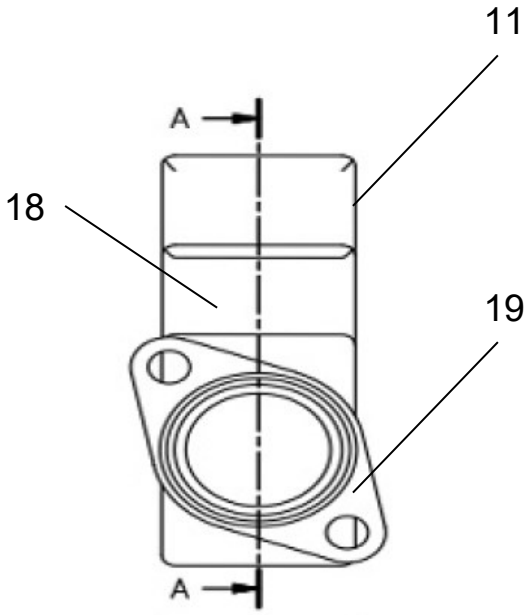

Fig. 4

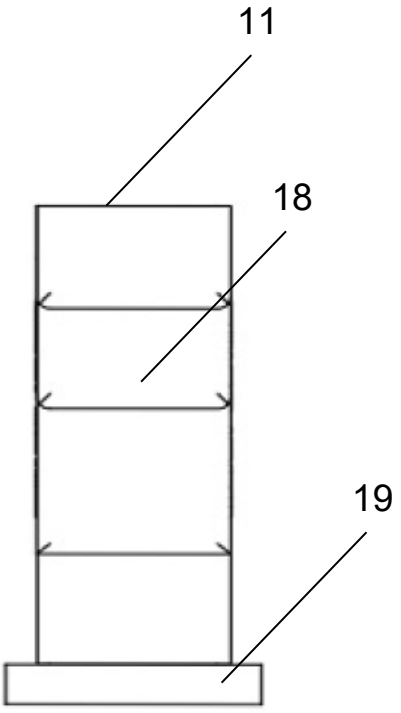

Fig. 5

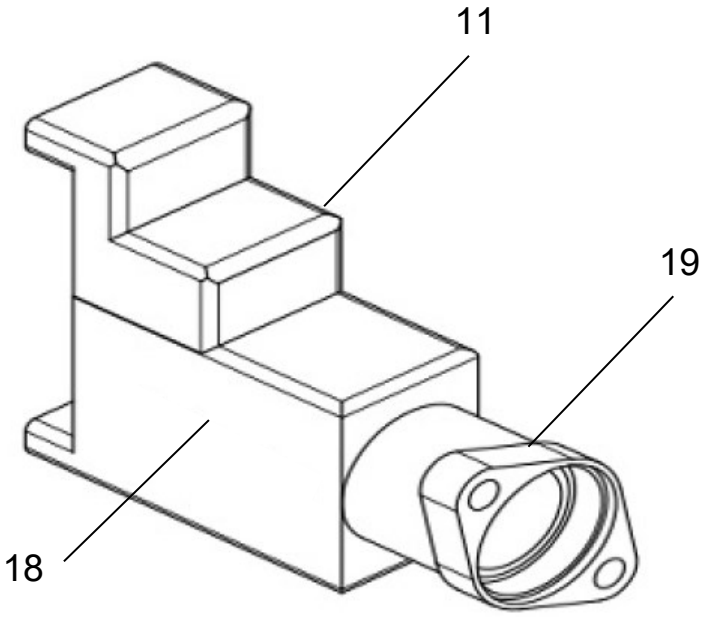

Fig. 6

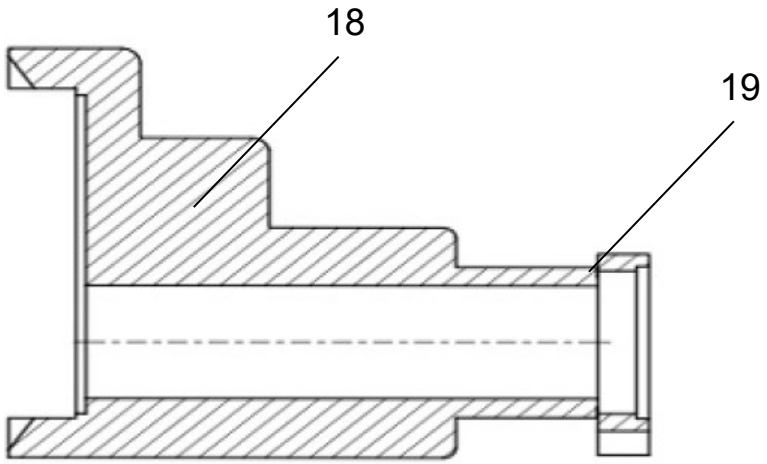

Fig. 7

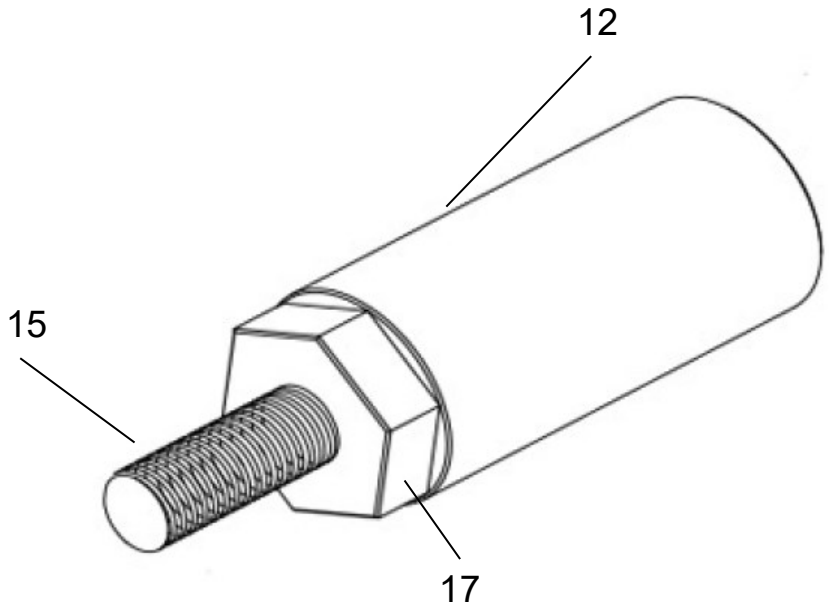

Fig. 8

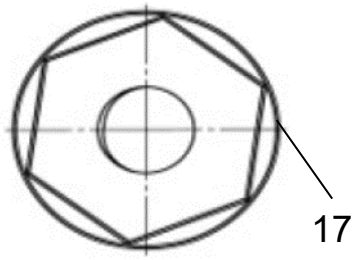

Fig. 9

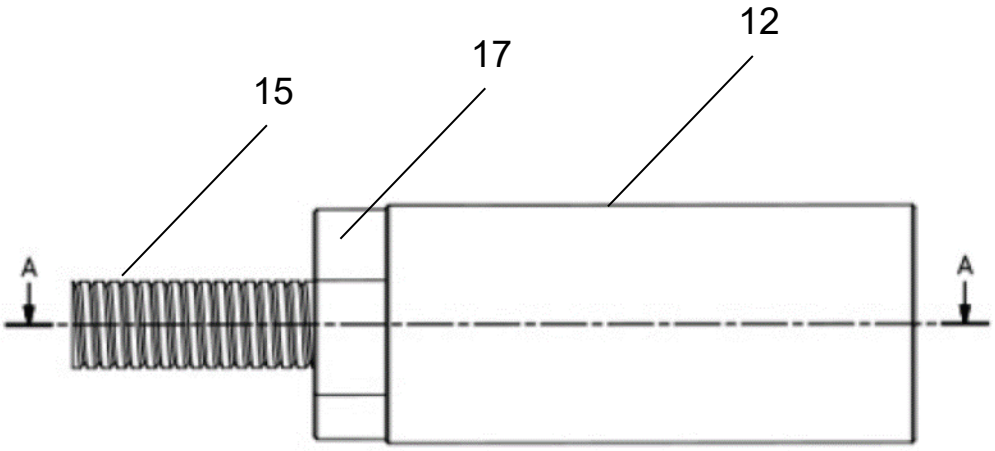

Fig. 10

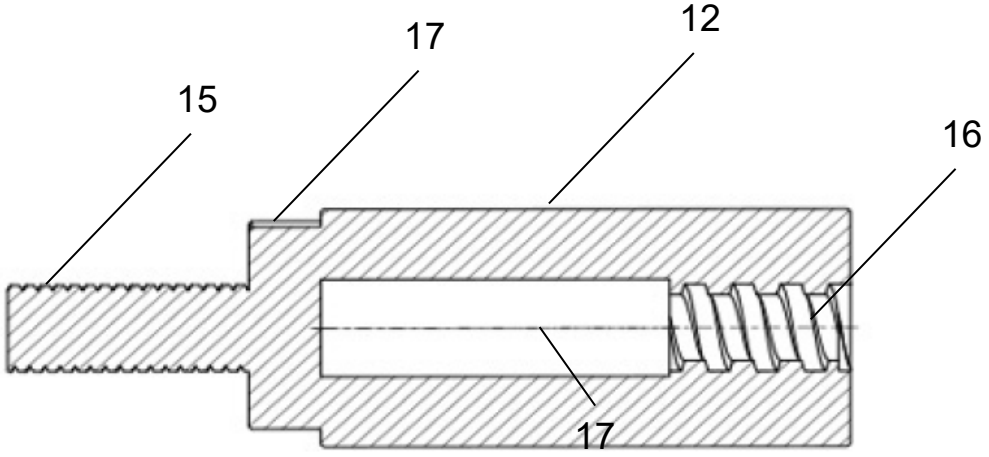

Fig. 11

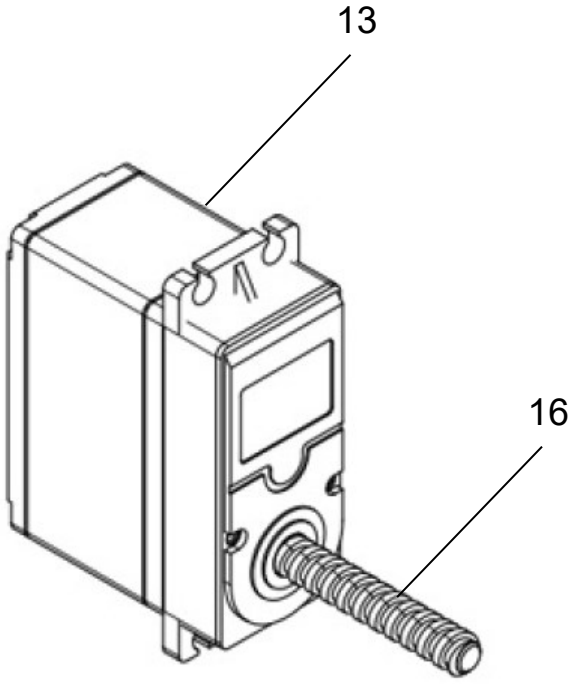

Fig. 12

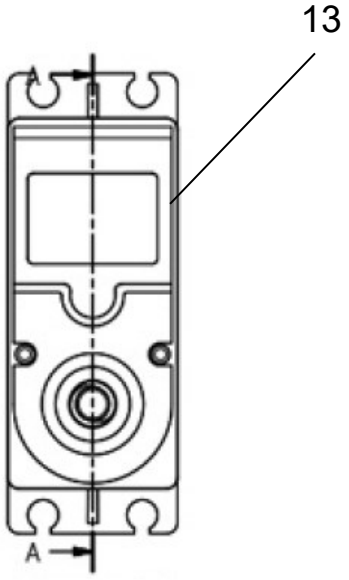

Fig. 13

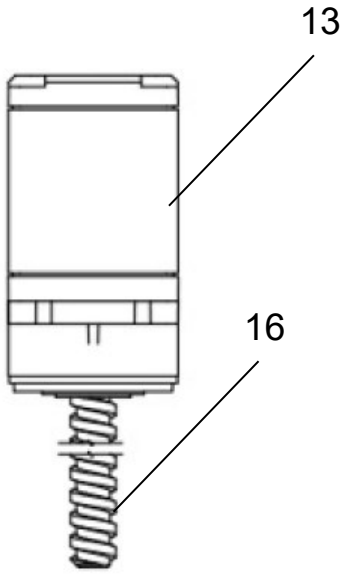

Fig. 14

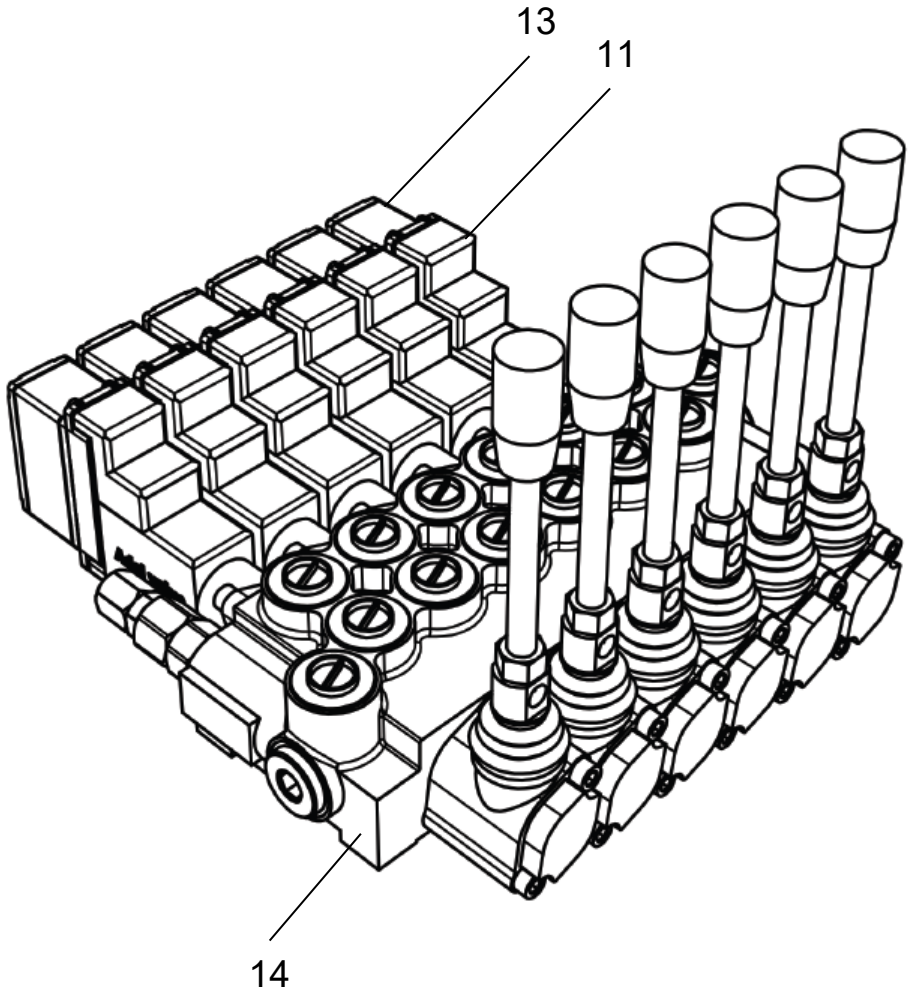

Fig. 15

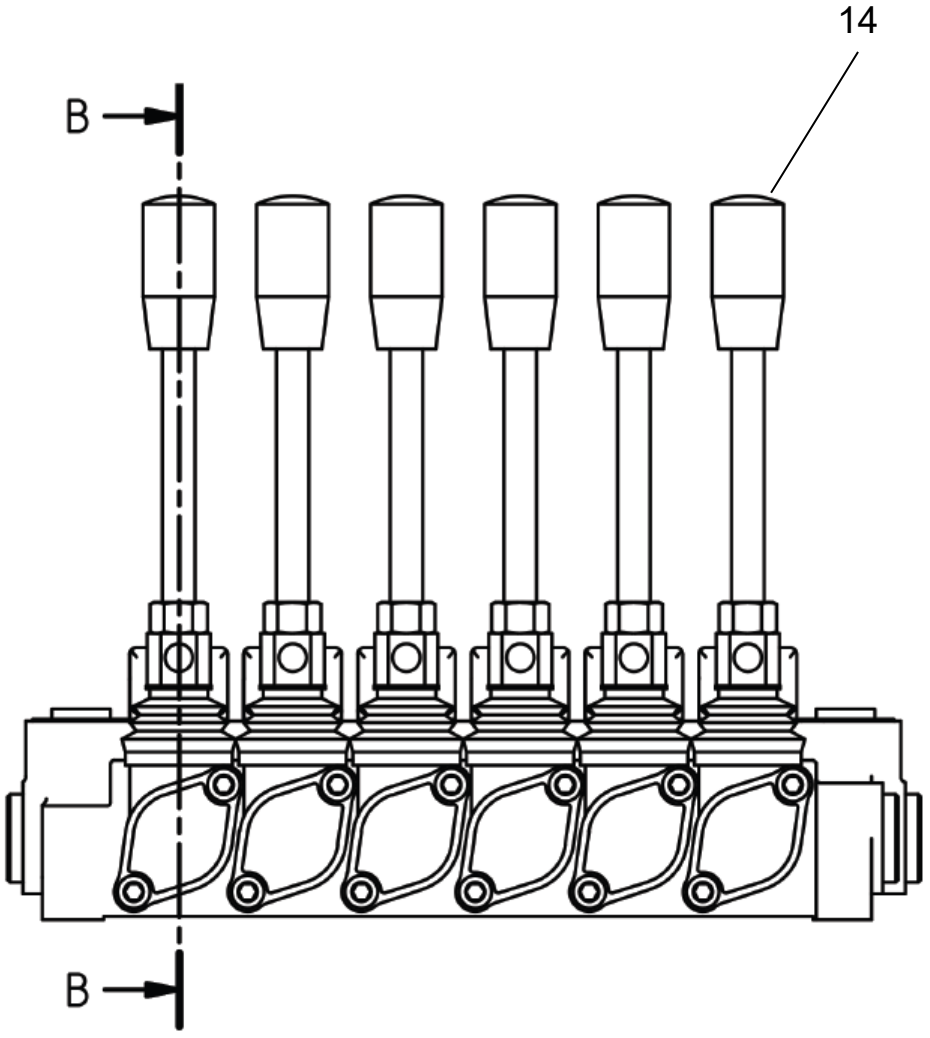

Fig. 16

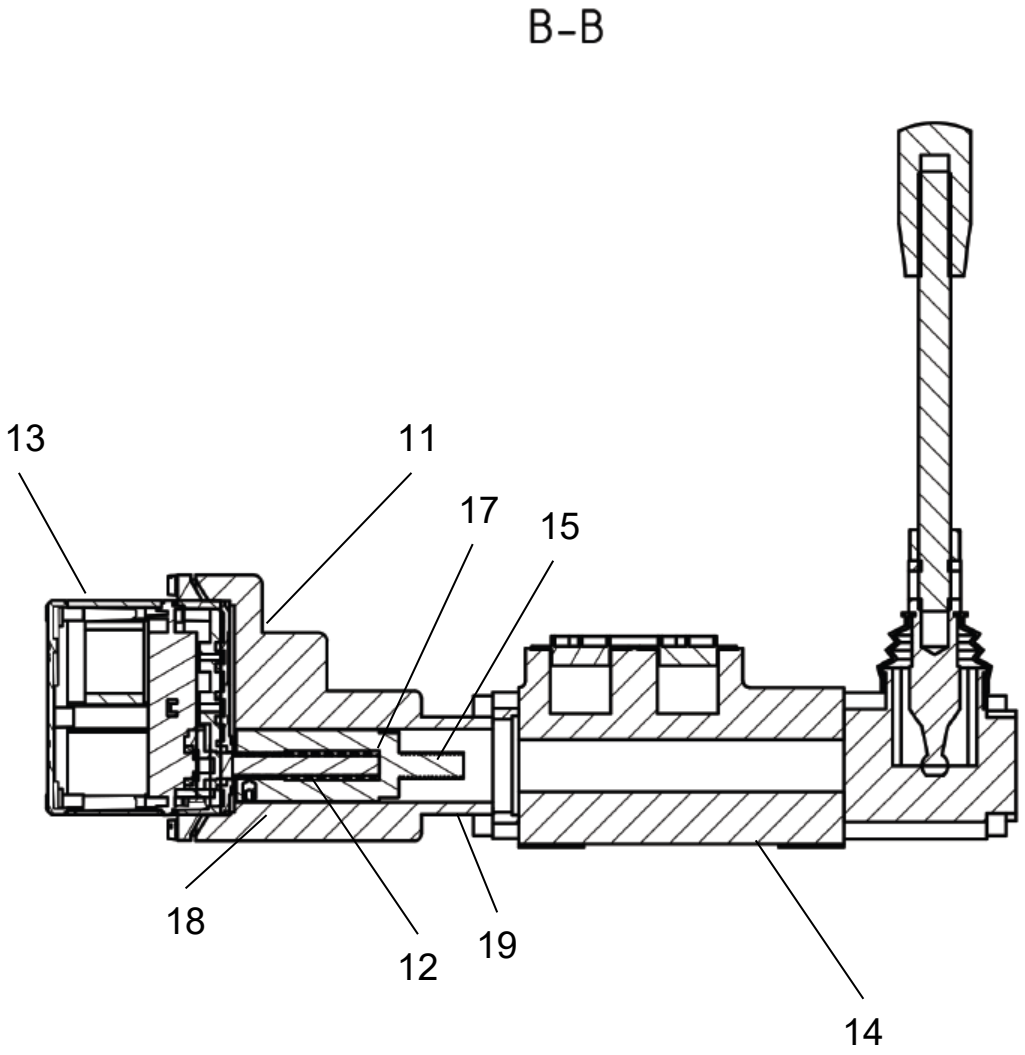

Fig. 17