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(54) **Mechanism for transforming alternative linear motion of at least one piece into continuous rotational motion applied to at least one axis.**

(57) A mechanism to transform alternative linear motion into rotational motion in a single direction of rotation, which consists of a hydraulic circuit that comprises at least one hydraulic motor and at least one double-effect hydraulic cylinder, or at least two single-effect hydraulic cylinders, where moving piston rods transfer fluid from one chamber to another and generate rotational motion in the axes of the hydraulic motors connected to the hydraulic circuit.

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Description

Technical Field of the Invention

[0001] This invention belongs to the technical field of motion transformation systems, specifically applied to the field of mechanics, vehicle propulsion systems, and self-generating electricity, among others.

Background of the Invention

[0002] There are systems that transform alternative linear motion into continuous rotational motion, such as the systems that allow for the functioning of most internal combustion engines, or those that activate a dynamo or an alternator to obtain electric power. Said systems transform an alternative motion into a continuous rotational motion. The systems commonly used to obtain a continuous rotational motion are two, namely: connecting rod/crankshaft, and free wheel.

[0003] Most vehicles include a connecting rod/crankshaft mechanism in an internal combustion engine. If we take the example of a free wheel mechanism, it will only be possible to benefit from just one of the directions of the alternative motion.

Solution proposed for the Invention

[0004] This mechanism offers another way of transforming alternative linear motion into a continuous rotational motion.

[0005] The invention described herein proposes a mechanism that is made up of mechanical pieces which, using hydrodynamics, transforms alternative linear motion into rotational motion applied to at least one axis.

[0006] Following is a comparison of this invention against the well-known systems referred to above:

A. In regards to connecting rod/crankshaft systems, which, as it is well known, can convert an alternative linear motion into a continuous circular motion, the creation described herein implies:

1 A simpler solution.
2 A reduced number of pieces.
3 A better use of forces.
4 Greater energy efficiency.
5 Less maintenance required.
6 Less defective points.
7 A better distribution of the elements it comprises.
8 An almost instantaneous halt of the mechanism, while preserving unused energy.
9 Greater accuracy for controlling the mechanism as well as in its performance level.
10 The absence of sudden movements in the mechanisms at the start point and during operation.
11 Not having the need for combustion in order to operate, so there is the possibility of operation out of water, as well as totally or partially submerged.
12 A non-polluting operation.

[0007] B. In regards to free wheel systems, which, as it is well known, can convert an alternative linear motion into a continuous circular motion, transmission to the resistant axis is only possible in one direction, so only half of the alternative linear motion cycle is used. However, with the creation described herein, it is possible to use both directions of the alternative motion and thus obtain greater efficiency. Additionally, the mechanism presented herein includes the possibility to freely determine the axis or axes that provide the rotating motion.

[0008] If we take, for example, either an alternator or any vehicle, this invention is capable of making any one of them function without the need for an internal combustion engine.

[0009] This mechanism can do without connecting rod/crankshaft systems or free wheel systems.

Brief description of figures

[0010]

Figure 1 shows a mechanism that comprises one double-effect hydraulic cylinder and two hydraulic motors with two directions of rotation.

Figure 2 shows a mechanism that comprises two single-effect hydraulic cylinders and two hydraulic motors with two directions of rotation.

Figure 3 shows a mechanism that comprises one double-effect hydraulic cylinder and one hydraulic motor with two directions of rotation.

Figure 4 shows a mechanism that comprises one double-effect hydraulic cylinder and one hydraulic motor with a single direction of rotation.

Figure 5 shows a mechanism that comprises two double-effect hydraulic cylinder and four hydraulic motors with a single direction of rotation.

Figure 6 shows a mechanism that comprises a double-effect hydraulic cylinder and two hydraulic motors with only one direction of rotation.

Description of the invention

[0011] With one or more pieces that define an alternative linear motion, which are not part of the invention, the mechanism proposed consists of:

1. At least one double-effect hydraulic cylinder and

none or more than one single-effect hydraulic cylinder, or, instead, at least one pair of single-effect hydraulic cylinders and none or one or more double-effect hydraulic cylinders.

2. One element long enough to transport the fluid between the remaining components in the circuit as it will be shown hereinafter, the necessary connectors to accomplish this, and sufficient fluid so as to totally fill the hydraulic circuit assembled.

3. It is possible to include as many non-return valves (blocking valves) as deemed necessary.

4. It is possible to include as many directional valves as deemed necessary.

5. It is possible to include at least one shut-off valve to prevent the flow of the fluid through the hydraulic circuit.

6. It is possible to include an auxiliary fluid reservoir, connected to the circuit through a valve allowing the total shut-off of the fluid flow between the reservoir and the mechanism's circuit.

7. It is possible to consider the inclusion flywheels of the variable load type, or any type, preferably on the axis of at least one of the hydraulic motors in the mechanism.

[0012] The circuit is to be assembled in such a manner that, during operation, fluid transits continuously between the chambers, or there is at least one nozzle that may be modified for the fluid to transit between chambers. If when the fluid transits from one chamber to another if flows through at least one hydraulic motor, the axis (or axes) of such motor(s) will rotate. After the fluid has gone through all the chambers of all the hydraulic cylinders in the circuit, the cycle starts over again. This will be determined by a sequence that will activate the pistons, so the cycle corresponding to each mechanism is thus defined. If in the cycle of a mechanism the fluid does not go through any chamber of a piston, said chamber is not considered as belonging to that hydraulic circuit in that mechanism.

[0013] When the hydraulic circuit is set up without the fluid, it is possible to push all the single-effect hydraulic cylinders that are part of the mechanism's hydraulic circuit to the point where their chambers are reduced to their respective minimum capacities, and set the pistons of all the double-effect hydraulic cylinders in the circuit to a position where each chambers of the cylinder has the same capacity as the other. Under such circumstances of the hydraulic circuit, it is possible to modify a single piston of a single-effect hydraulic cylinder so that the size of the chamber defined by that position of the piston defines the route of the pistons in the circuit. In such situation the whole circuit if filled with fluid and no gas is left inside the circuit. The amount of fluid within the hydraulic circuit remains the same throughout the operation of the mechanism, and it will not change if subject to regular conditions. The amount of fluid within the hydraulic circuit may be modified if necessary, though it is preferable to modify it when the mechanism has stopped.

[0014] In the event that an auxiliary reservoir is installed, it is possible to consider the maximum load of the only single-effect hydraulic cylinder used -as described for the loading- in the filling process, while the auxiliary reservoirs are free from fluid and the corresponding valves that connect them to the circuit are shut off. After the hydraulic circuit is filled, and when only one single-effect hydraulic cylinder is filled to its maximum capacity, and provided no other piston has been modified, it is possible to open at least one valve connecting an auxiliary reservoir to the circuit and modify the piston of the only single-effect hydraulic cylinder that is full, to discharge the amount of fluid deemed convenient into any of the auxiliary reservoirs installed. This will allow the decrease of the route of pistons from the possible maximum. Then all the valves connecting the auxiliary reservoirs to the circuit must be shut off, prior to activating the mechanism for operation.

[0015] In order to stop, in not more than one cycle, all the pistons in the hydraulic cylinders, it is possible to use a valve that will totally shut off the circulation of the fluid in at least one point along the circuit where the access to one chamber is disabled, or where the outlet of a chamber is closed. This allows for the possibility of installing a shut-off valve in each chamber in the hydraulic cylinder, so that when all of them are shut off, all the hydraulic cylinder pistons in the circuit will stop immediately.

[0016] It is possible to consider, in selecting at least one of the non-return valves installed pursuant to the indications in item 3, the convenience of introducing a second non-return valve in the opposite direction, between the same points at which each valve selected was connected to the circuit. In such case, it is possible to use at least one directional valve for every pair of non-return valves installed in opposite directions to one another, between the same points of the circuit that allow selection of the branch line that will be used by the flow. It is also possible to install, in each of those branch lines, shut-off valves so that when only one of them is open it will also determine the branch line through which the flow will circulate.

[0017] Another possibility is to install a piece to perform more than one function, such as for example, a three-way valve with two adjustable flowing positions for selecting the branch line through which the fluid will flow and the corresponding volume of flow. Another possibility is for the valve installed to act as non-return as well. Another option to consider is using both hydraulic cylinders as hydraulic engines with a built-in function such as a non-return blocking function, the shut-off function, the throttling function, or any other.

[0018] There is the possibility of connecting hydraulic cylinders in series to the circuit, and there is the possibility of connecting hydraulic cylinders in parallel to the circuit.

[0019] There is the possibility of connecting hydraulic motors in series to the circuit, and there is the possibility of connecting hydraulic motors in parallel to the circuit.

[0020] Description of components included in the mechanisms presented in the figures:

1. Single-effect hydraulic cylinder
2. Double-effect hydraulic cylinder
3. Hydraulic motor with one direction of rotation
4. Hydraulic motor with two directions of rotation
5. Element for transferring fluid through the circuit
6. (Non-return) blocking control valve with 2 connections
7. 3-way, two position, directional control valve
8. 4-way, two position, directional control valve
9. 2-way throttle valve for flow control
10. 2-way, two position directional control valve
11. Auxiliary reservoir

[0021] Some of the preferred elements for transferring the fluid through the circuit are, by way of example: hose, pipe, tube and duct. Once the element for transferring the fluid has been selected, this will define the corresponding connectors to be used.

[0022] The fluid preferred for use inside the hydraulic circuit is mineral oil, but it is also possible to use synthetic oil, water or a water-oil emulsion.

[0023] Another preferred piece for providing the alternative linear motion, which is not part of this invention, is at least one pneumatic cylinder piston rod of any type. Another preferred piece for providing the alternative linear motion, which is not part of this invention, is at least one pair of pedals of a linear pedaling system.

[0024] The preferred flywheel type is that with a variable load, whose moment of inertia varies in a direct proportion to its rotational speed.

Industrial Application

[0025] The mechanisms to apply the system described may be manufactured, for example, at a metallurgy workshop with a milling cutter and a windlass, or similar tools. All the pieces necessary for assembling the mechanism have been available in the market for several years already. In what concerns hydraulic elements, some examples are: single-effect cylinders, double-effect cylinders with a unilateral piston rod, double-effect cylinders with a bilateral piston rod, motors of any type, with either a single direction of rotation or two directions of rotation, non-return valves, throttle valves, adjustable throttle valves, shut-off valves, adjustable shut-off valves, directional valves, and fluid reservoirs, among other elements.

[0026] For a better understanding of the descriptions herein, and only by way of example, and without limitations or reservations as to the rights assigned to the mechanism referred, following is an explanation of some examples.

[0027] The hydraulic cylinders, as well as the hydraulic motors, the valves, the reservoirs and all other components included in the hydraulic circuit are to be connected to it by means of an adequate element capable of transferring the fluid and bearing the pressure to be exerted, with the use of connectors appropriate for such purposes.

[0028] In the event of using flywheels in the mechanism's axes, this must be done in such a way that the flywheel is fully bonded to the axis on which it is mounted, with which it will have to share its rotation axis.

[0029] They symbols used in the figures below correspond to DIN / ISO 1219 standard.

[0030] Except as otherwise indicated, the term "bond" will be used to describe the connection of an element adequate for transferring the fluid, with another element adequate for transferring the fluid in such a way that said connection implies more than two channels

FIGURE 1

[0031] The mechanism consists of a double-effect hydraulic cylinder (2), a pair of hydraulic motors (4) with two directions of rotation, two pairs of non-return valves (6) each with its corresponding 3-way directional valves (7) and two positions to diverge the path in order to make the motors (4) change their direction of rotation, one adjustable shut-off valve (9), one valve to shut-off the hydraulic circuit (10), an element long enough (5) to transfer the fluid through the circuit, the necessary and appropriate connectors, and the fluid necessary to fill the circuit.

[0032] In regular functioning conditions, the alternative linear motion used must be provided by another piece that is not part of the invention, applied to the end of the piston rod that sticks out of the cylinder, so that during half of the cycle, the piston rod will exert a pressure on the fluid contained in the CI chamber making it circulate, to the extent that valve (10) allows for such circulation, through channel VCI towards the YII joint, and through the valve (10) installed in the path between the channel and the joint referred. At this point, if the valve (7) installed in the path that connects -without flowing through any other joint- the YII joint with the YIS joint is in the position that only allows circulation of the fluid from the YII joint to the YIS joint and the other valve (7) of the example is in the position that does not allow circulation of the fluid from joint YDS to joint YDI -without flowing through any other joint-, then the fluid will only circulate through the path that goes from the YII joint to the YIS joint, without flowing through any other joint. This will allow for the fluid going through the YIS joint to reach the motor (4) through channel VMII and it will go through that motor (4) and exit through channel VMIS making it rotate in one direction. From that point, the fluid that was displaced will reach the YDI joint, from where it will access chamber CD after flowing through channel VCD. Under the circumstances described, no fluid will flow from the YDI joint towards

the YDS joint because in the latter, pressure will be higher than in the VCD channel, so the fluid will enter the CD chamber through the VCD channel.

[0033] In the other half of the cycle, the direction of the alternative linear motion provided by the piece which is not part of the invention and activates the piston rod of the hydraulic cylinder (2) will change. Therefore, the piston rod will start exerting pressure on the fluid contained in chamber CD and will make the fluid contained in said chamber CD flow from channel VCD towards the YDI joint, with the maximum volume of fluid possible going through the valve (9) installed in the path between the channel and the joint referred. At this point, if the valve (7) installed in the path that connects -without flowing through any other joint- the YDI joint with the YDS joint is in the position that only allows circulation of the fluid from YDI to YDS, and the other valve (7) of the example is in the position that does not allow circulation of the fluid from joint YIS to joint YII -without flowing through any other joint-, then the fluid will only circulate through the path that goes from the YDI joint to the YDS joint, without flowing through any other joint. This will allow for the fluid to access the motor (4) through channel VMDI and exit through channel VMDS making it rotate in one direction. From that point, the fluid that was displaced will reach the YII joint, from where it will access chamber CI after flowing through channel VCI. Under the circumstances described, no fluid will flow from the YII joint towards the YIS joint because in the latter, pressure will be higher than in the VCI channel, so the fluid will enter the CI chamber through the VCI channel.

[0034] The only case remaining to be considered is the one where both valves (7) in the example are in the other position that allows the fluid to flow from joint YIS towards joint YII, and the fluid to flow from joint YDS to joint YDI, without flowing through any other joint. In this configuration, when pressure is increased in chamber CI, the flow will exit through channel VCI, going through the valve (10) -if possible- towards the YII joint. From there it will only flow towards the VMSD channel to go through the motor (4) and exit through the VMDI channel, making the motor rotate but in the opposite direction as it did with the valves (7) in the other position. From there it will reach the CD chamber, going through the YDS joint, the YDI joint and the VCD joint.

[0035] In the other half of the cycle, and without changing the position of any valve (7), it is all similar, except that when the motor is run through from the VMIS point to the VMII point, it is the other motor that rotates in the direction opposite to the direction of rotation it had with the valves (7) in the other position.

[0036] In this example, what has been shown for both valve (10) and valve (9) applies throughout the whole cycle since they are located at points of the circuit that are shared by all the paths that enter or exit one of the chambers.

Description of the drawing

[0037] Figure 1 shows a mechanism that consists of a double-effect hydraulic cylinder (2) and two hydraulic motors with two directions of rotation (4). In order to control the flow that transits the circuit, the hydraulic circuit has an adjustable throttle valve (9). Two pairs of non-return valves (6) are also included to control, in combination with their corresponding 3-way valves with two positions (7), the direction of the fluid's flow as it transits the motors. There is also a valve (10) to shut off the circuit and bring the rod pistons to full stop. All connections between the pieces are to be made with an element (5) adequate for the fluid to be transferred, and with appropriate connectors.

FIGURE 2

[0038] The mechanism consists of two single-effect hydraulic cylinders (1), one pair of hydraulic motors (4) with two directions of rotation, two pairs of non-return valves (6), two 3-way valves (7) with two positions, one adjustable shut-off valve (9), one valve (10) to shut off the hydraulic circuit, one ancillary hydraulic reservoir (11) with a shut-off valve (10), an element long enough to transfer the fluid in the circuit, adequate connectors, and the fluid necessary to fill the circuit.

[0039] Under normal circumstances, the alternative linear motion used must be provided by other pieces that are not part of the invention, applied to the end of the piston rods that stick out of both hydraulic cylinders (1). The preferred functioning shall be that where the action exerted on the piston rods is alternated, so that during half of the cycle the pressure will be on the fluid contained in chamber CI, thus forcing it to flow -if allowed by the valve (10)- through channel VCI towards joint YII, and through the valve (10) installed in the path between the channel and the joint referred. At that point, if the valve (7) installed in the path that connects -without flowing through any other joint- the YII joint with the YIS joint is in the position that only allows circulation of the fluid from the YII joint to the YIS joint and the other valve (7) of the example is in the position that does not allow circulation of the fluid from joint YDS to joint YDI -without flowing through any other joint-, then the fluid will only circulate through the path that goes from the YII joint to the YIS joint, without flowing through any other joint. This will allow for the fluid going through the YIS joint to reach the motor (4) through channel VMII and it will go through that motor (4) and exit through channel VMIS making it rotate in one direction. From that point, the fluid that was displaced will reach the YDI joint, from where it will access chamber CD after flowing through channel VCD. Under the circumstances described, no fluid will flow from the YDI joint towards the YDS joint because in the latter, pressure will be higher than in the VCD channel, so the fluid will enter the CD chamber through the VCD channel. And the fluid displaced from chamber CI will enter cham-

ber CD, expelling the piston rod to the outside of the cylinder.

[0040] In the other half of the cycle and during the preferred functioning, pressure is exerted on the fluid contained in chamber CD, forcing it to circulate from channel VCD towards joint YDI, and going, with the maximum volume of fluid possible, through the valve (9) installed in the path between the channel and the joint referred. At this point, if the valve (7) installed in the path that connects -without flowing through any other joint- the YDI joint with the YDS joint is in the position that allows circulation of the fluid from YDI to YDS, and the other valve (7) of the example is in the position that does not allow circulation of the fluid from joint YIS to joint YII -without flowing through any other joint-, then the fluid will only circulate through the path that goes from the YDI joint to the YDS joint, without flowing through any other joint. This will allow for the fluid to access the motor (4) through channel VMDI and exit through channel VMDS making it rotate in one direction. From that point, the fluid that was displaced will reach the YII joint, from where it will access chamber CI after flowing through channel VCI. Under the circumstances described, no fluid will flow from the YII joint towards the YIS joint because in the latter, pressure will be higher than in the VCI channel, so the fluid will enter the CI chamber through the VCI channel. And the fluid displaced from chamber CD will enter chamber CI, expelling the piston rod to the outside of the cylinder.

[0041] In the case where both valves (7) in the example are in the other position that allows, without going through any other joint, for the fluid to flow from joint YIS towards joint YII, and for the fluid to flow from joint YDS towards joint YDI, during the preferred functioning, when pressure in chamber CI is increased, the fluid will exit through channel VCI, going through valve (10) if possible, towards joint YII. From there, it will only be possible for it to flow towards channel VMDS to go through the motor (4) and exit through channel VMDI, making it rotate, but this time in the direction opposite to the one it rotated in with the valves (7) in the other position. From there it will reach chamber CD going through the YDS joint, the YDI joint, the YTA joint and the VCD channel. In the other half of the cycle, during the preferred functioning and with no changes in the position of any of the valves (7), everything is similar, except that, upon going through the motor from point VMIS to point VMII, it is the other hydraulic motor (4) the one that rotates in the direction opposite to the direction it had with the valves (7) in the other position.

[0042] In this example, what was described for both valve (10) and for valve (9) applies to the whole cycle as they are located at points of the circuit that are shared by all the paths that reach or exit from a chamber.

[0043] In what concerns the auxiliary fluid reservoir (11), it will only have to be connected to the circuit by opening the shut-off valve (10) that connects the VTA channel to the YTA joint, when an adjustment of the route of the piston rods is required. To adjust them, the procedure preferred consists of -after one of the hydraulic cylinders (1) has been filled -while the other one remains absolutely empty like the auxiliary reservoir (11)- taking the valve (10) installed at joint YTA and channel VTA to a position where the fluid flow is possible, while the piston rod of the empty hydraulic cylinder (1) is maintained in a fixed position and the other piston rod is adjusted to the position required. Then the valve (10) installed at joint YTA and channel VTA is to be set in the position where it will disable the flow of fluid.

Description of the drawing

[0044] Figure 2 shows a mechanism that consists of two single-effect hydraulic cylinders (1) and two hydraulic motors with two directions of rotation (4). There is a shut-off valve in the hydraulic circuit (10), and also two pairs of non-return valves (6) to control the direction of the fluid's flow as it transits the motors. This is achieved in combination with a 3-way directional valve with two positions (7) for each pair. There is also an auxiliary reservoir (11) with its own shut-off valve (10). An adjustable throttle valve (9) is installed to control volume of the flow. All connections between the pieces are to be made with an element (5) adequate for the fluid to be transferred, and with appropriate connectors.

FIGURE 3

[0045] The mechanism consists of a double-effect hydraulic cylinder (2), one hydraulic motor (4) with two directions of rotation, two pairs of non-return valves (6), one shut-off valve (10), one 4-way valve (8) with two positions, an element long enough (5) to transfer the fluid through the circuit, appropriate connectors, and the fluid necessary to fill the circuit.

[0046] In regular operating conditions, the alternative linear motion used must be provided by another piece that is not part of the invention, applied to the end of the piston rod that sticks out of the cylinder, so that during half of the cycle, the piston rod will exert a pressure on the fluid contained in the CI chamber making it circulate, to the extent that valve (10) allows for such circulation, through channel VCI towards the YII joint, and inevitably towards the YDS joint, since the non-return valve located in the path which, without going through any other joint, connects the YII joint with the YIS joint does not allow the fluid to flow from joint YII towards joint YIS. At this point, and depending on the position of the 4-way valve (8) with two positions, the fluid will transit the hydraulic motor (4) from channel VMD towards channel VMI, or from channel VMI towards channel VMD, which will make the hydraulic motor (4) rotate in one direction or another, and in either case will reach the YIS joint.

[0047] From there, the fluid displaced will reach the YDI joint and will enter the CD chamber, going through the VCD channel. Under such circumstances there will

be no fluid circulation from the YIS joint towards the YII joint because in the YII joint the pressure will be greater than in the YDI joint, so the fluid will enter the CD chamber through the VCD channel.

[0048] In the other half of the cycle, the direction of the linear alternative motion provided by the piece that is not part of the invention and activates the piston rod of the hydraulic cylinder (2) will change, so the piston rod will start exerting pressure on the fluid contained in chamber CD thus making the fluid contained in said chamber CD circulate from channel VCD towards joint YDI, to then inevitably continue towards joint YDS, since the non-return valve located in the path which connects joint YDI with joint YIS without going through any other joint does not enable the fluid to flow from joint YDI towards joint YIS. At this point, and depending on the position of the 4-way valve (8) with two positions, the fluid will transit the hydraulic motor (4) in one direction or the opposite, and in either case will reach the YIS joint.

[0049] From there, the fluid displaced will reach the YII joint and will enter the CI chamber, going through the VCI channel. Under such circumstances there will be no fluid circulation from the YIS joint towards the YDI joint because in the YDI joint the pressure will be greater than in the YII joint, so the fluid will enter the CI chamber through the VCI channel.

[0050] In this example, what has been described for the valve (10) applies to the whole cycle, since it is located at a point shared by all the paths that reach or exit a chamber.

Description of the drawing

[0051] Figure 3 shows a mechanism that comprises a double-effect hydraulic cylinder (2), a hydraulic motor with two directions of rotation (4), four non-return valves (6), one 2-way valve with two positions (10), and a 4-way valve with two positions (8). All connections between the pieces include an element appropriate (5) for transferring the fluid and the necessary connectors.

FIGURE 4

[0052] The mechanism consists of a double-effect hydraulic cylinder (2), a hydraulic motor (3) with one direction of rotation, two pairs of non-return valves (6), an element long enough (5) to transfer the fluid through the circuit, appropriate connectors, and the fluid necessary to fill the circuit.

[0053] In regular operating conditions, the alternative linear motion used must be provided by another piece that is not part of the invention, applied to the end of the piston rod that sticks out of the cylinder, so that during half of the cycle, the piston rod will exert a pressure on the fluid contained in the CI chamber making it circulate through channel VCI towards the YII joint, and inevitably towards the YDS joint, since the non-return valve located in the path which, without going through any other joint, connects the YII joint with the YIS joint does not allow the fluid to flow from joint YII towards joint YIS. After going through the YDS joint, the fluid will transit the hydraulic motor (3) from channel VMD towards channel VMI, which will make the hydraulic motor (3) rotate. From the exit of the hydraulic motor (3), the fluid will reach joint YIS, and from there, the fluid displaced will reach the YDI joint and will enter the CD chamber, going through the VCD channel. Under such circumstances there will be no fluid circulation from the YIS joint towards the YII joint because in the YII joint the pressure will be greater than in the YDI joint, so the fluid will enter the CD chamber through the VCD channel.

[0054] In the other half of the cycle, the direction of the linear alternative motion provided by the piece that is not part of the invention and activates the piston rod of the hydraulic cylinder (2) will change, so the piston rod will start exerting pressure on the fluid contained in chamber CD thus making the fluid contained in said chamber CD circulate through channel VCD towards joint YDI, to then inevitably continue towards joint YDS, since the non-return valve located in the path which connects joint YDI with joint YIS without going through any other joint does not enable the fluid to flow from joint YDI towards joint YIS. After going through the YDS joint, the fluid will transit the hydraulic motor (3) from channel VMD towards channel VMI, which will make the hydraulic motor (3) rotate. From the exit of the hydraulic motor (3), the fluid will reach joint YIS, and from there, the fluid displaced will reach the YII joint and will enter the CI chamber, going through the VCI channel. Under such circumstances there will be no fluid circulation from the YIS joint towards the YDI joint because in the YDI joint the pressure will be greater than in the YII joint, so the fluid will enter the CI chamber through the VCI channel.

Description of the drawing

[0055] Figure 4 shows a mechanism that comprises a double-effect hydraulic cylinder (2), a hydraulic motor with one direction of rotation (3), and four non-return valves (6). All connections between the pieces include an element appropriate (5) for transferring the fluid and the necessary connectors.

FIGURE 5

[0056] The mechanism consists of two double-effect hydraulic cylinders (2), four hydraulic motors (3) with one direction of rotation, an element long enough to transfer the fluid in the circuit (5), adequate connectors, and the fluid necessary to fill the circuit.

[0057] Under regular circumstances, the alternative linear motion used must be provided by other pieces that are not part of the invention, applied to the end of the piston rods that stick out of the two hydraulic cylinders (2). The preferred functioning shall be that where the action exerted on the piston rods is alternated, so that during

half of the cycle the piston rods will exert pressure directly on CICI and on chamber CSCD, and during the other half of the cycle they will continue to exert pressure, one on chamber CSCI and the other on chamber CICD.

[0058] When the chambers object of the direct pressure of a piston rod are chambers CICI and CSCD, the fluid will flow through channel VCICI to go through joint YII and then make one of the hydraulic motors (3) rotate when transiting it from channel VMIDI towards channel VMIDS. Then, and going through joint YIS, the fluid will enter the CSCI chamber through channel VCSCI. Concurrently with this, and in the same half of the cycle, the fluid pressed in chamber CSCD will exit through channel VCSCD towards joint YDS and will continue to make another hydraulic motor (3) rotate when transiting it from channel VMDIS towards channel VMDII. Then, and going through joint YDI, the fluid will enter chamber CICD through channel VCICD.

[0059] When the chambers on which pressure is exerted directly by a piston rod are chambers CICD and chamber CSCI, the fluid will flow through channel VCICD to go through joint YDI and then make one of the hydraulic motors (3) rotate when transiting it from channel VMDDI towards channel VMDDS. Then, going through joint YDS, the fluid will enter chamber CSCI and will exit through channel VCSCI towards joint YIS, and continuing to make another hydraulic motor (3) rotate when transiting it from channel VMIIS towards channel VMIII. And then, going through joint YII, the fluid will enter chamber CICI through channel VCICI.

Description of the drawing

[0060] Figure 5 shows a mechanism that consists of two double-effect hydraulic cylinders (2) and four hydraulic motors with a single direction of rotation (3). All connections between the pieces are made with an element appropriate (5) to transfer the fluid, and with the necessary connectors.

FIGURE 6

[0061] The mechanism consists of a double-effect hydraulic cylinder (2), two hydraulic motors (3) with a single direction of rotation, an element appropriate (5) to transfer the fluid through the circuit, appropriate connectors, and the fluid necessary to fill the circuit.

[0062] In regular operating conditions, the alternative linear motion used must be provided by another piece that is not part of the invention, applied to the end of the piston rod that sticks out of the cylinder, so that during half of the cycle, the piston rod will exert a pressure on the fluid contained in the CI chamber making it circulate through channel VCI towards the YI joint, and inevitably towards the VMII channel to make the hydraulic motor (3) rotate when transiting it and exiting through channel VMIS and then going through joint YD, and then entering the CD chamber through channel VCD. When pressure is exerted on the fluid contained in chamber CD, this will make the fluid go through channel VCD towards joint YD, and then flowing through the only path possible towards channel VMDI, and transiting the hydraulic motor (3) to then exit through channel VMDS and flowing past joint YI to enter chamber CD through channel VCD. In either case, the fluid ends up entering the chamber on which no pressure is being exerted because it is the area with the lower pressure in the hydraulic circuit.

Description of the drawing

[0063] Figure 6 shows a mechanism that consists of a double-effect hydraulic cylinder (2) and two hydraulic motors (3) with a single direction of rotation. All connections between the pieces are made with an appropriate element (5) for transferring the fluid and with the necessary connectors.

Claims

1. A mechanism for transforming alternative linear motion of at least one piece into continuous rotational motion applied to at least one axis, **characterized in that** it includes the following components:

   a) At least one hydraulic motor (3, 4)
   b) At least one double-effect hydraulic cylinder (2) activated in a way to describe an alternative linear motion, or at least two single-effect hydraulic cylinders (1) activated in a way to describe an alternative linear motion.
   c) An element to transport the fluid between said at least one hydraulic motor (3, 4) and said at least one double-effect hydraulic cylinder (2) or said at least two single-effect hydraulic cylinders (1) connected by means of appropriate connectors connected in such a way that, as a consequence of fluid transfer among chambers of said at least one double-effect hydraulic cylinder (2) or said at least two single-effect hydraulic cylinders (1), the fluid will activate said at least one hydraulic motor (3, 4) making it to rotate in one direction.
   d) Enough fluid to fill the hydraulic circuit.

2. A mechanism pursuant to claim 1, wherein it includes at least one double-effect hydraulic cylinder (2) and at least one single-effect hydraulic cylinder activated in a way to describe an alternative linear motion.

3. A mechanism pursuant to claim 1, wherein it includes at least two single-effect hydraulic cylinders (1) and at least one double-effect hydraulic cylinder activated in a way to describe an alternative linear motion.

4. A mechanism pursuant to any previous claim 1 to 3,

wherein the circuit includes at least one controlling device, which, in one of the positions prevents the fluid from flowing in the circuit.

5. A mechanism pursuant to claim 4, **characterized in that** said controlling device is adjustable.

6. A mechanism pursuant to any previous claim 1 to 3, wherein the circuit includes at least one directioning device to block the flow of fluid in one direction.

7. A mechanism pursuant to any previous claim 1 to 3, wherein the circuit includes at least one directioning device to direct the fluid in sectors of the hydraulic circuit where there are alternative paths to unite two points.

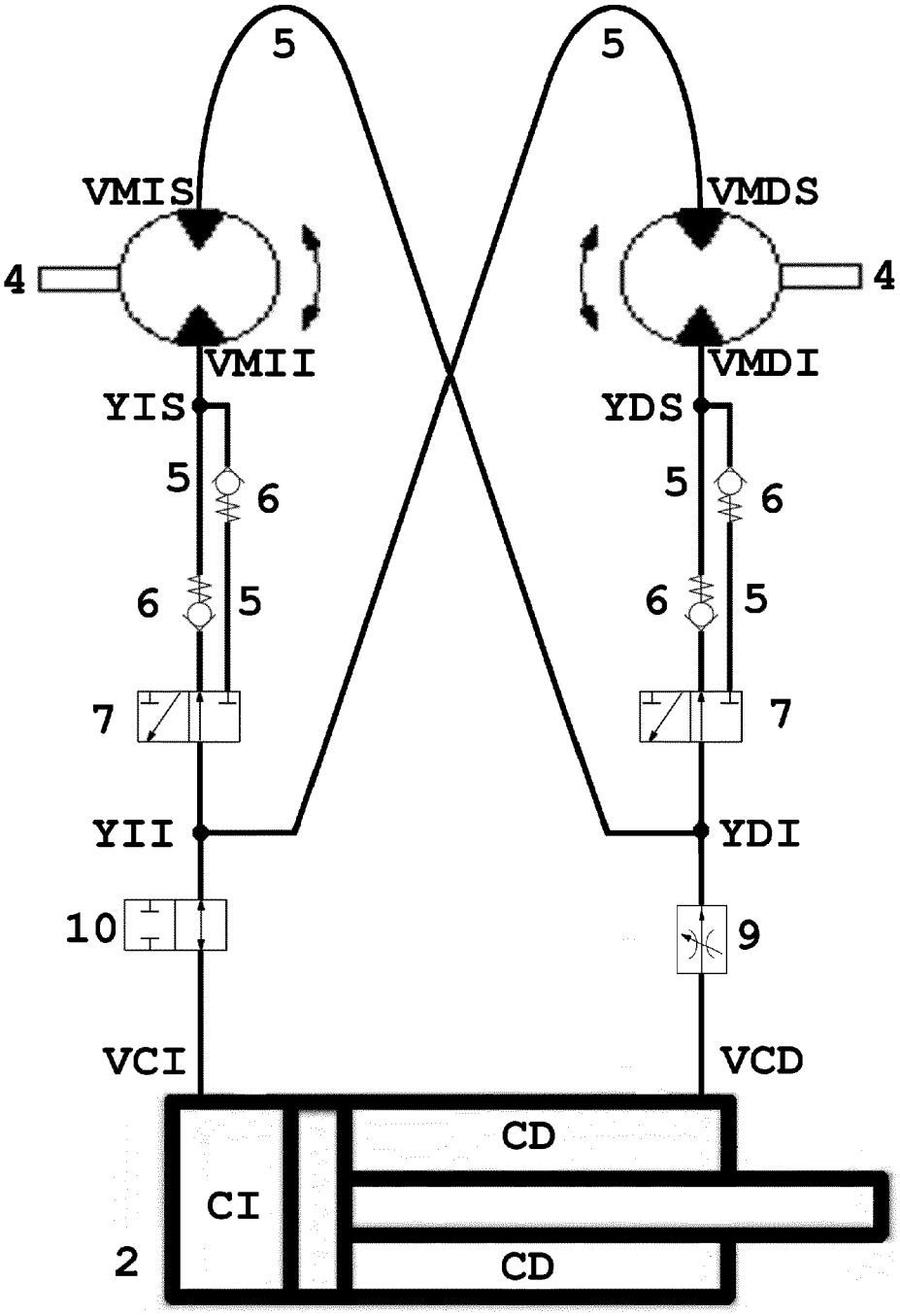
8. A mechanism pursuant to any previous claim 1 to 3, wherein the circuit includes at least one directioning device to interchange the sectors to which two points in the circuit are connected.

9. A mechanism pursuant to any previous claim 1 to 3, wherein the circuit includes at least one controlling device to adjust the volume of fluid that flows in the circuit.

10. A mechanism pursuant to any previous claim 1 to 3, wherein the circuit is connected to at least one auxiliary hydraulic reservoir with a controlling device to shut off the fluid flow in the channel that connects it to the circuit.

11. A mechanism pursuant to any previous claim 1 to 3, wherein at least one hydraulic motor (3, 4) has a flywheel installed in it.

Fig. 1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VMDS
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VMII
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Fig. 2

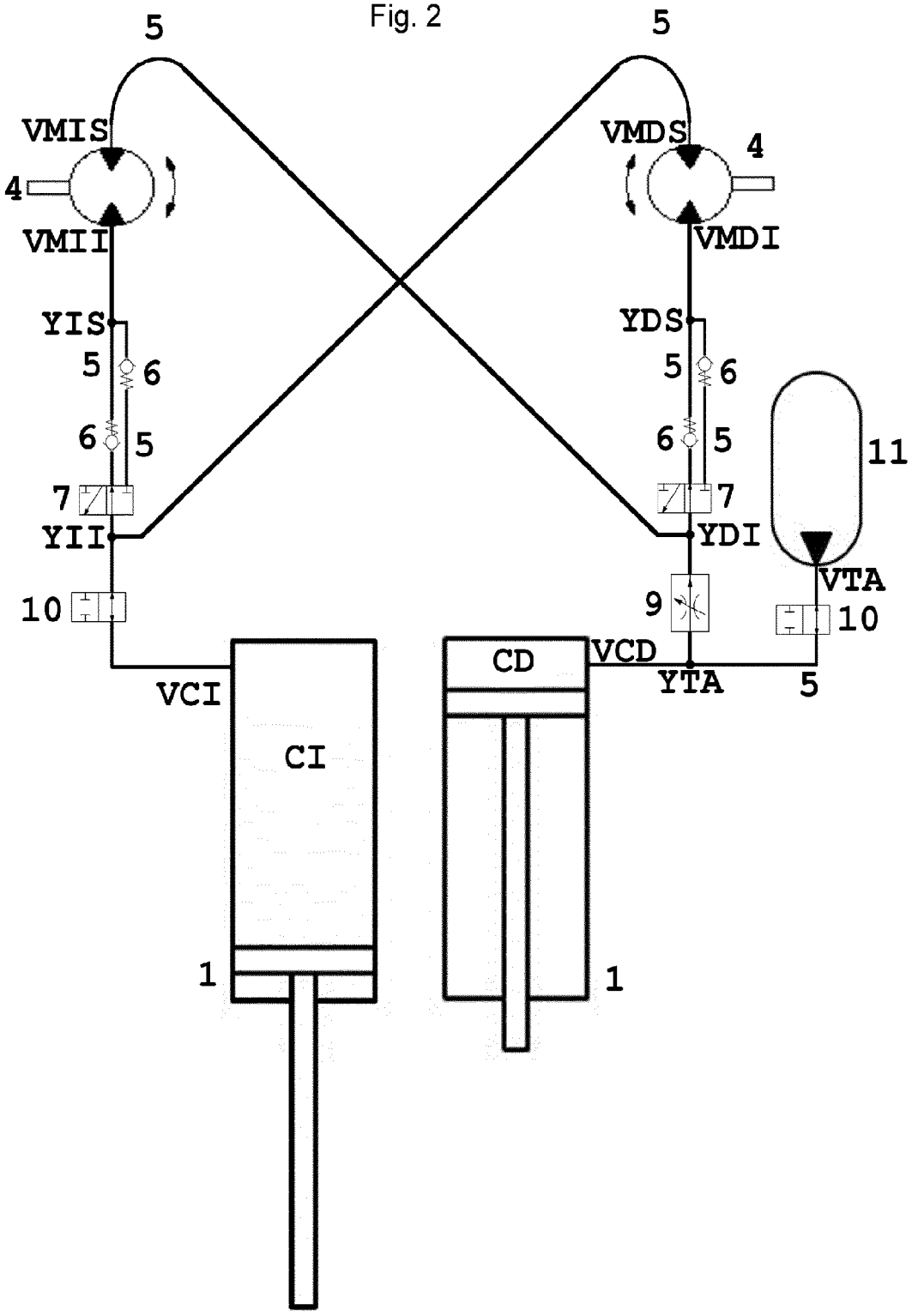
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Fig. 3

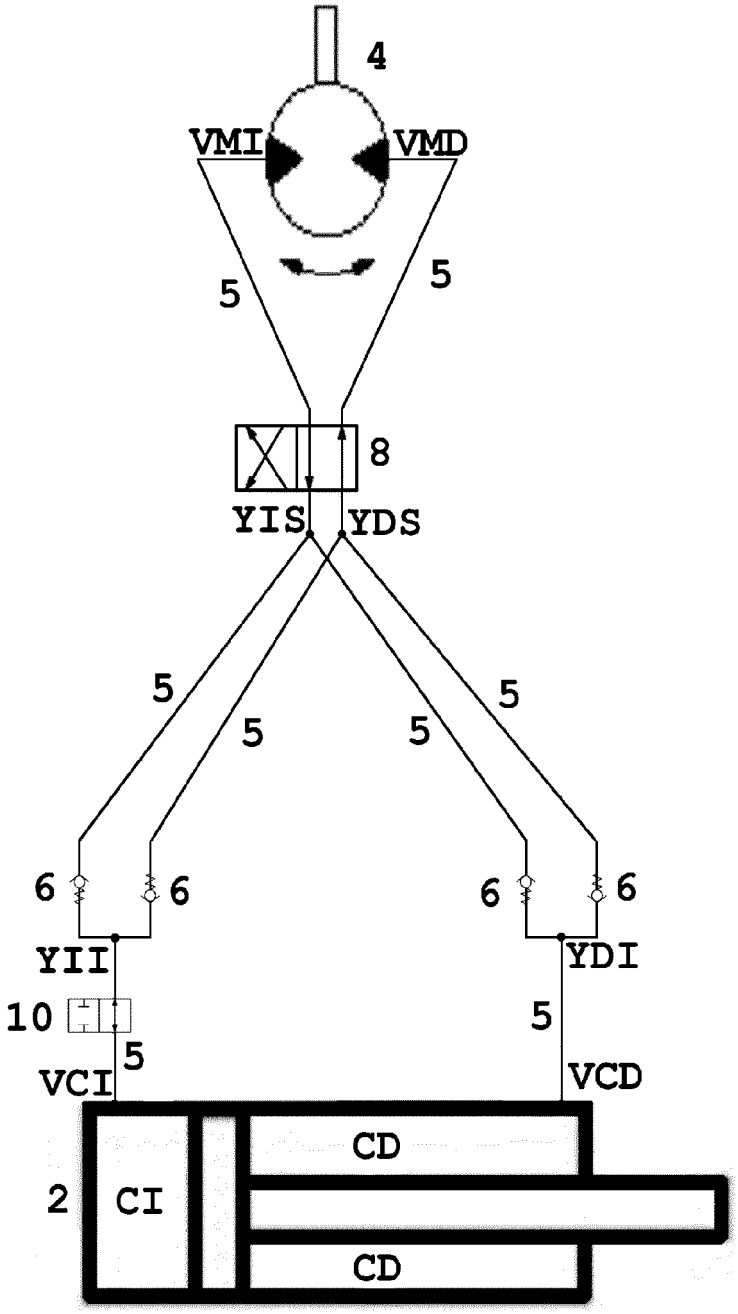

Fig. 4

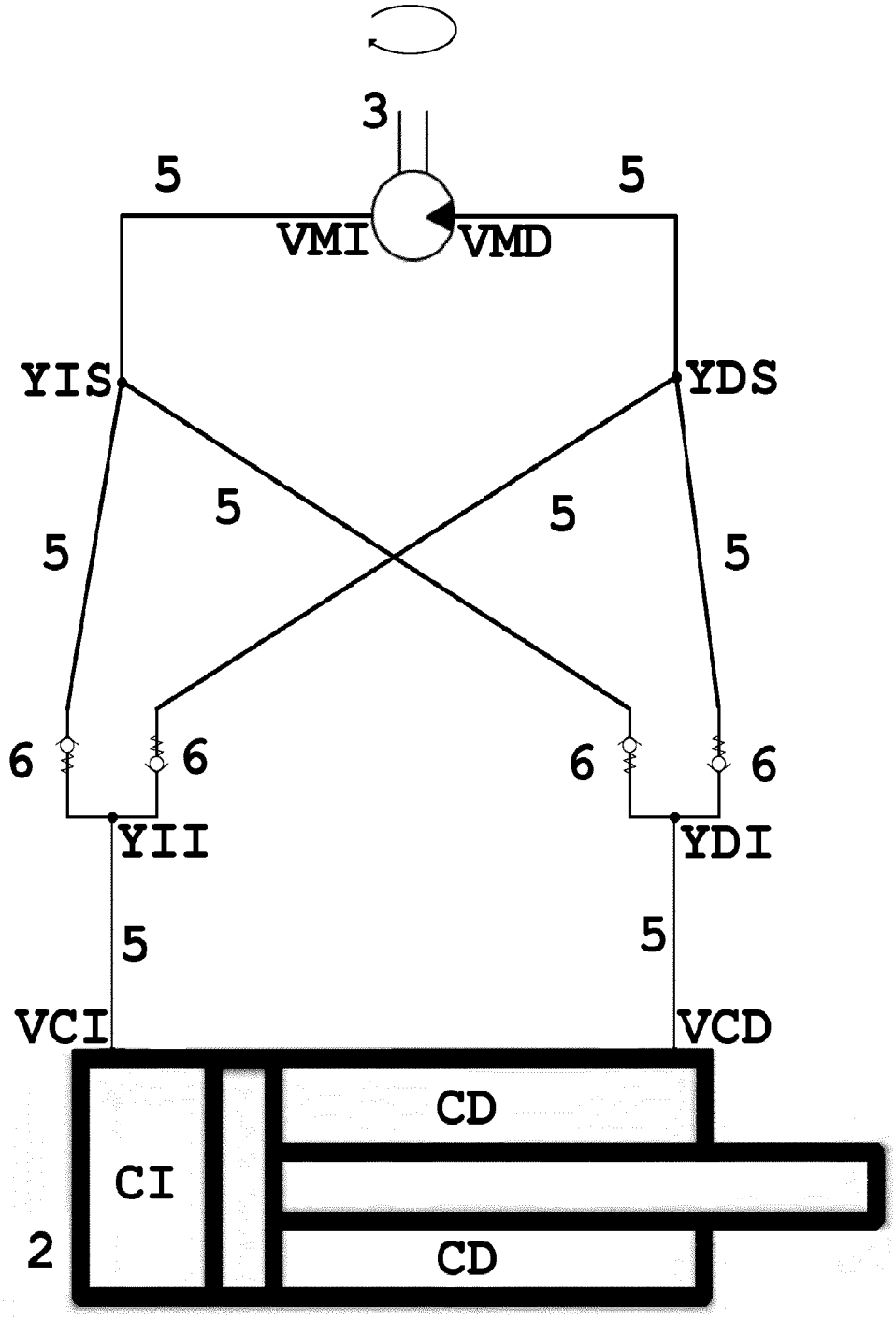

Fig. 5

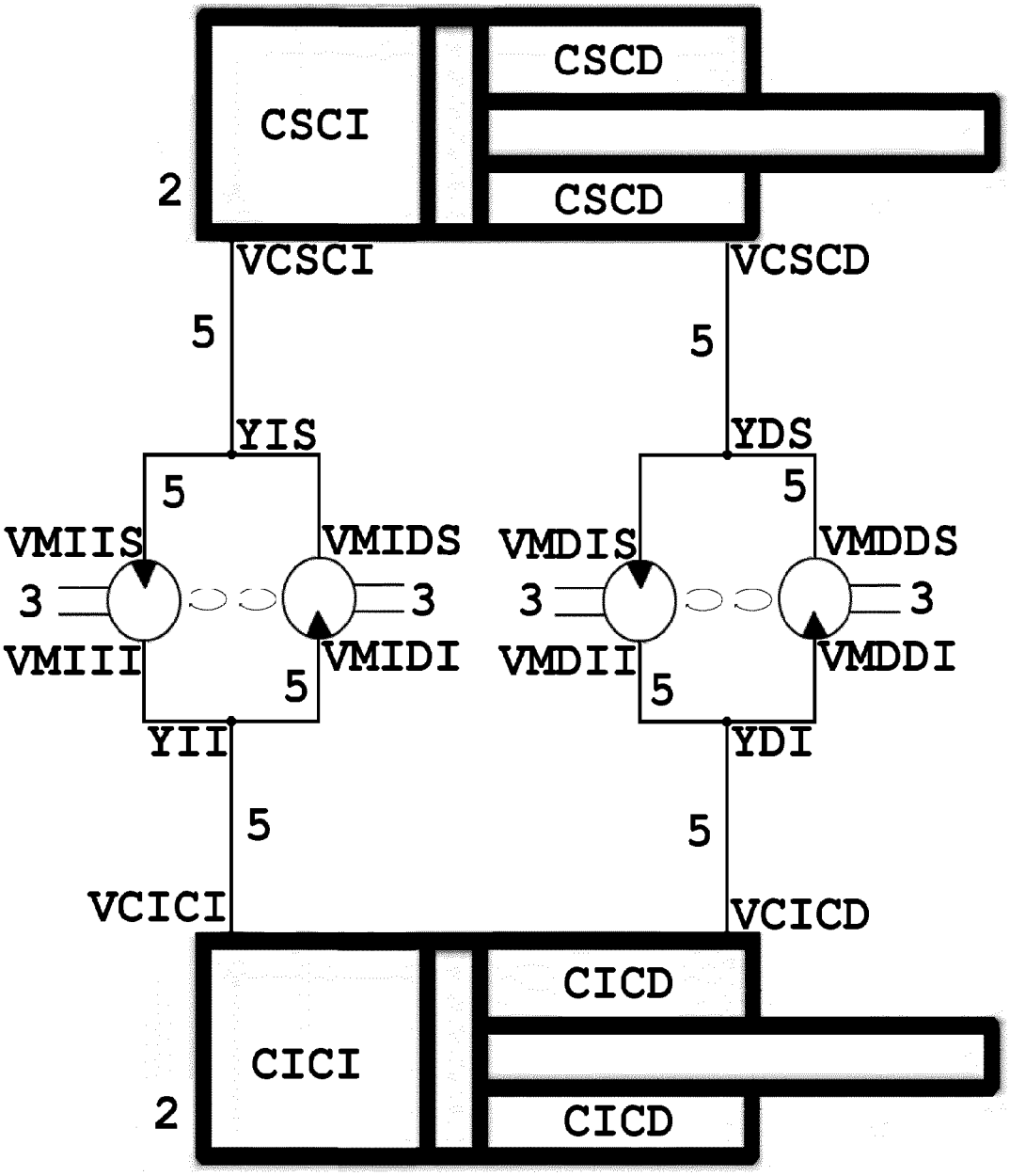
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Fig. 6