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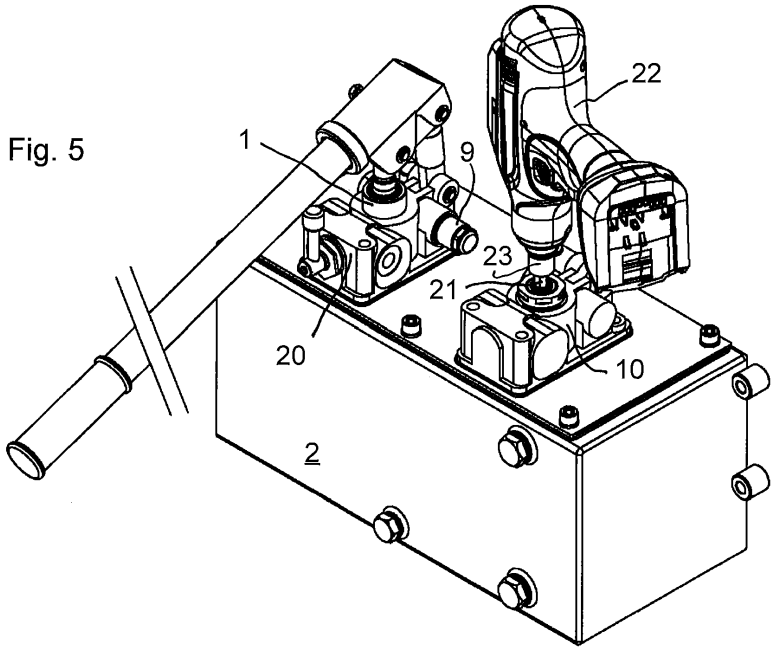
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(54) HYDRAULIC PUMPING DEVICE FOR OCCASIONAL USE

(57) A hydraulic pumping device for occasional use comprises a reservoir (2) of hydraulic liquid; a first manually-driven reciprocating pump (1); a second mechanically-driven rotary pump (2); at least one intake filter (3) and control valves for controlling the delivery and the return from or to the controlled hydraulic circuit to which the pumping device is connected; said mechanically-driven rotary pump (2) being of the volumetric type with rotating internal members; provided with a rotary control shaft end (21) coming out of the casing of the device; the shaft end being provided with an axial coupling (24) for rotary control; a mechanical rotation driving means driving said second rotary pump when connected with its mandrel (23) to said axial coupling.

Fig. 5



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Description

Field of the invention

[0001] The present invention relates to a hydraulic pumping device for occasional use in which the device is installed on a simple hydraulic circuit such as for the movement of one or two hydraulic cylinder/cylinders for the occasional movement of the apparatus or machinery in which it is/they are installed. In particular the device is provided for manual and/or facilitated driving.

Prior art

[0002] The prior art comprises various constructive solutions in which one associates, in a small hydraulic circuit, for the driving of one or a few cylinders, a reservoir with a manual, generally reciprocating, pump, and a rotary pump, mechanically driven by means of an electric motor installed on the hydraulic control unit obtained from the combination in one single device of the reservoir and of the two pumps, along with the hydraulic valves which are necessary to control said hydraulic circuit.

[0003] In the art, as stated above, a dual-purpose device for the manual or hydraulic driving of a hydraulic cylinder is known from the document CN2823627Y. A manual pump is connected to said cylinder, sucking from a tank, by means of a slide valve for the control of the dual-purpose action of the cylinder; this simple circuit is connected, in the branches of connection to said hydraulic cylinder, to a hydraulic supply circuit from said tank to the cylinder with a gear rotary pump driven by a reversible electric motor; that is to say, the driving of the hydraulic cylinder is prevailing with the electric motor and only in case of power failure, that is to say, if one is not able to normally use the circuit with the electric motor, the driving occurs manually.

[0004] Moreover, the prior art document CN201963631 U is known, in which a hydraulic control unit is described, which is provided with a manual pump, a reciprocating pump driven by a compressed air piston and with an electric motor that drives a hydraulic positive-displacement pump to supply the hydraulic circuit to which this control unit is connected; the aim dealt with consists in providing a user with versatility of use of the control unit using electric or pneumatic power supply where available or, otherwise, the usual mechanical driving by the user's arms. Therefore, for a correct use of the control unit, the latter must be used where there is an electricity network or a pressurized air network to prevent the operator from operating manually the manual piston hydraulic pump.

[0005] Moreover, in the prior art, the document WO 00/68063 A1 discloses a hydraulic cylinder supply system for lifting the cab of a truck and carry out mechanical interventions in the members of the truck itself. These trucks are provided with a hydraulic system for lifting the cab and with hydraulic connections to an external hydraulic circuit present in the workshop. Furthermore, a version of the hydraulic circuit is provided in which an electric motor, actuating a pump, both installed on the truck, carries out the necessary movement of the cab by means of said hydraulic driving. Furthermore, said installed pump can be controlled from outside by a rotary actuator like a drill or screwdriver, battery-operated as well; said hydraulic driving for lifting the cab being able to be performed with the usual hydraulic jack present in the truck for changing tires.

[0006] Moreover, similar hydraulic circuits, in which manual driving is only a safety option, are expensive and, in the non-infrequent case in which manual driving is a standard procedure, due to the large number of operations left to the user, the latter may find themselves unable to carry them out at the right time for the management of said operations.

[0007] This case is rather usual in waste collection parks, that is, the so-called waste separation and recycling areas, when these are subdivided by type and the parks are small-sized but are provided with containers or large cases with a cover openable/closable with hydraulic cylinder/cylinders, so the driving of the cylinders occurs upon opening the cover of each container and the closing occurs upon complete filling of the container or upon replacing the latter for turnover with transport towards the disposal place or, for specific types of waste, to the place for recycling.

[0008] Therefore, the use deriving therefrom is very different from the use provided in the prior art document, that is to say, the driving occurs rarely, that is to say, occasionally, even if the covers of the containers have large masses so as to be able to be moved only with one or two cylinders and a specific hydraulic circuit, very simple indeed, but always to be connected to the cylinders, in order to be able to operate, to control, the cover at the required moment after or before the movement of the container from the waste collection park or waste separation and recycling area. Therefore, maintaining the only manual pump at the moment provided in this type of small hydraulic circuits leads to overburdening manual work, for the pumping time and also for the related effort, certainly in the opening or lifting of the cover, while the employment of a hydraulic circuit provided with electric motor driving is more expensive and also not always easy to use since the electric drive is to be connected to the necessary power supply.

[0009] These containers are often equipped with simple hydraulic circuits and are placed, in the waste separation and recycling area, where there is no electrical power supply points or they can even be placed where the presence of power supply is unadvisable or forbidden for safety reasons, like for fire prevention.

[0010] As a consequence, the movement of the covers of said containers is uncomfortable, tiresome and/or long, if the hydraulic circuit is provided with a small-displacement manual pump; thus, the proliferation of said waste separation and recycling areas or parks has brought

about the need to overcome the above-mentioned drawbacks related to the length of the driving and/or to the efforts made.

[0011] The above-mentioned prior art is susceptible of remarkable improvements as to the possibility of providing a hydraulic pumping device for occasional use, which overcomes the above-mentioned drawbacks and makes the potentially involved simple hydraulic systems suitable for an occasional and cost-effective employment.

[0012] Therefore, the technical problem that is at the basis of the present invention consists in providing a hydraulic pumping device for occasional use in which the resident and installed circuit connected to the hydraulic cylinder/cylinders is versatile and cheap, but enables an activation of the hydraulic device without generating in the user too much effort and/or long operating times, that is to say, it must be fast also in the movement of hydraulic systems with non-minimum volumes of pumped fluid.

[0013] An additional and further aim of the present invention consists in enabling its use also in places without electrical power supply.

[0014] Finally, an additional part of the above-mentioned technical problem concerns the possibility to operate the hydraulic pumping device also in case of environments with danger of fire or with bad safety conditions in the use of electric circuits.

Summary of the invention

[0015] This technical problem is solved, according to the present invention, by a hydraulic pumping device for occasional use, comprising a reservoir of hydraulic liquid; a first manually-driven reciprocating pump; a second mechanically-driven rotary pump; at least one intake filter and control valves for controlling the delivery and the return from or to the controlled hydraulic circuit to which the hydraulic pumping device is connected; characterised in that said second mechanically-driven rotary pump is of the volumetric type with internal rotating members, provided with an end of the rotary drive shaft coming out of the casing of the device; the shaft end being provided with an axial coupling for rotary control; a mechanical rotation driving means driving said second rotary pump when connected with its mandrel to said axial coupling.

[0016] Moreover, in an improved embodiment: said mechanical driving means consists of an electric drill provided with a power supply battery.

[0017] In an additional and advantageous embodiment: said mechanical driving means consists of an electric screwdriver provided with a power supply battery.

[0018] In a further embodiment variant: said mechanical driving means consists of a pneumatic screwdriver provided with a reservoir for compressed air.

[0019] Finally, in an additional embodiment: said mechanical driving means consists of a pneumatic drill provided with a reservoir for compressed air.

[0020] The characteristics and the advantages of the present invention, in the realization of a hydraulic pumping device for occasional use, are mentioned in the following description of a schematic embodiment given as a non-exhaustive and indicative example, with reference to the two enclosed drawing tables.

Short description of the drawings

[0021]

Figure 1 shows a schematic and perspective view of a hydraulic pumping device for occasional use according to the present invention;

Figure 2 shows a limited schematic longitudinal section view of the hydraulic liquid reservoir, of the device of previous Figure 1, viewed from the front side, in which one can see the components inside the hydraulic liquid reservoir and, in addition, the external rotation mechanical means applied to the rotary shaft of the rotary mechanical pump;

Figure 3 shows a schematic representation of a simple circuit for the control device of one or more single-acting hydraulic cylinders;

Figure 4 shows a schematic representation of a simple circuit for the control device of one or more double-acting hydraulic cylinders;

Figure 5 shows a perspective schematic view of the device of Figure 1 in which the external rotation mechanical means applied to the rotary shaft of the rotary mechanical pump is also shown.

Detailed description of a preferred embodiment

[0022] Figures 1, 3 and 4 show the embodiment applied to the apparatus or machine that needs to perform the hydraulic movement of its own hydraulic cylinders. In it a manual pump 1 sucks the hydraulic liquid from a reservoir 2 by means of a filter 3; the delivery duct 4 is directly connected 5 to the hydraulic cylinder (not shown) ; between the filter 3, the manual pump 1 and the delivery duct 4 there are non-return valves 6, 7 and 8 for preventing the backflow of the hydraulic liquid; in the connection point, between the non-return valves 7 and 8 a maximum pressure valve 9 is also connected as well as the supply of hydraulic liquid received from the rotary hydraulic pump 10 with external mechanical driving; this rotary pump, too, has in the delivery branch 11 a non-return valve 12; the rotary pump 10 sucks by means of a specific filter 13 the hydraulic liquid from the reservoir 2. So in the hydraulic circuit 14 for single-acting cylinder/cylinders there is a manually-controlled gate valve 15 for keeping or removing the hydraulic liquid pumped in the connected branch 5 and discharging it by the duct 16 into the reservoir 2. Whereas, in the case of a hydraulic circuit 17 for double-acting cylinder/cylinders, the connection of the delivery branch 4 and of the discharge duct 16 to the ducts 18 and 19 occurs through the manually-operated slide valve 20, as it can also be seen in the other Figures 1, 2 and 5. Finally, the rotary hydraulic pump 10, with

external mechanical driving, has a shaft end 21 for the rotary driving of the rotary hydraulic pump itself.

[0023] In Figures 2 and 5 the hydraulic device according to the invention is depicted with a mechanical means that applies the rotary action to the shaft end 21 of the rotary hydraulic pump 10. The means is depicted as a drill or screwdriver 22 provided with an electric motor supplied by an electric battery, not shown here, but, as known, directly present on the mechanical means itself. The mandrel 23 of the drill or screwdriver 22 being provided with an axial coupling 24 for the coupling on the shaft end 21 of the rotary hydraulic pump 10.

[0024] The application of the hydraulic pumping device for occasional use occurs by installing the latter in the machinery, or in another means that needs occasional movement. Particularly in the waste collection containers in which the hydraulic system consists of one or two cylinders and the movement is limited to the opening or closing of their cover only. In fact, the device provided by the invention has only one rotary hydraulic pump 10 mounted in parallel to the manual pump 1. The cost of this variation with respect to the usually installed system is very low, it being sufficient to mount a gear pump as a rotary hydraulic pump. As in the case of the sizing of the manual pump 1, which is calculated on the basis of the displacement ratio between the manual pump and the volume of the cylinder or cylinders to be moved. This allows to evaluate the theoretical effort and the time employed by the operator for the complete movement of the system. Likewise, the rotary hydraulic pump 10 has a displacement that is correlated to the type of driving provided by the drill or screwdriver 22.

[0025] Upon activation the operator has two possibilities, the usual manual driving or the mechanized driving by inserting the mandrel 23 in coupling with the shaft end 22 of the rotary hydraulic pump 10. Thus, the operator can use the energy stored in the battery of said drill or screwdriver and, by performing the action of reaction to the counter-rotation of the handle only, transfer the rotary mechanical energy to the rotary hydraulic pump 10, so that it can pump the necessary amount of hydraulic liquid into the hydraulic circuit through the connection 5, if towards single-purpose cylinder/cylinders, or through the ducts 18-19, if the driving occurs for double-acting cylinder/cylinders.

[0026] After the movement has been completed, the drill or screwdriver 22 can be detached and inserted in another device according to the invention of a further hydraulic system, or container, which needs movement. The use of these subsequent movements can continue until the battery has sufficient energy for driving.

[0027] In the use as a source of rotary mechanical energy one can also advantageously use a pneumatic motor or the like, which operates with the air pressure stored in a mobile reservoir that the user carries around as he/she performs in sequence the actions of rotation of hydraulic devices according to the invention. In this case the pneumatic drive, although requiring larger size and mass with respect to said battery-operated drill or screwdriver 22, also allows to safely drive small hydraulic circuits in environments or places that are at risk of fire or explosion.

[0028] Tests were made to check the capacities of a battery-operated drill or screwdriver 22 with the following results.

Example 1) For the movement of a hydraulic cylinder with a capacity of 1500 cc a device according to the invention was arranged, consisting of a manual pump with 20 cc displacement (10 + 10 cc in the two directions of reciprocating motion); moreover, a volumetric gear pump with a displacement of 0.9 cc per revolution and a drill or screwdriver 22 with 400 W power and normal rotation at about 2200 rpm were mounted. The test allowed to verify that by manual driving the pump 1 was moved with about 80 actions employing three minutes or little less for the complete movement of the cylinder involved; moreover, by using the drill or screwdriver 22, the employed time was of little less than 50 seconds and, obviously, the operator's effort was much lower with respect to the effort of about 150 N on the arm of the manual pump and, what's more, applied for about 80 times in the manual pumping action.

Example 2) For the movement of two 1500 cc hydraulic cylinders in parallel, with overall capacity of 3000 cc, a device according to the invention was arranged, consisting of a manual pump with 6 cc displacement (3 + 3 cc); moreover, a volumetric gear pump with a displacement of 0.5 cc per revolution and a drill or screwdriver 22 with 320 W power and normal rotation at about 2200 rpm were mounted. The test allowed to verify that by manual driving the pump 1 was moved with about 500 actions employing sixteen minutes or little less for the complete movement of the driven cylinders; moreover, by using the drill or screwdriver 22, the employed time was of little less than three minutes and, obviously, the operator's effort was much lower with respect to the effort of about 80 N on the arm of the manual pump and, what's more, applied for about 500 times in the manual pumping action.

[0029] The advantages, in the making and use of a hydraulic pumping device for occasional use, are represented by construction simplicity and application simplicity for realizing facilitated driving with the use of a drill or screwdriver, be it battery or compressed air operated.

[0030] In conclusion, the most evident advantages are obtained thanks to the practicality of facilitated driving by using one single drill or screwdriver that the user can keep at the workplace and move from one device to another device that, being mounted in a machinery or container that has to be actuated occasionally, can be easily driven when needed and rapidly without needing to make a complete motorized system for each machinery or con-

tainer.

[0031] Obviously, in order to meet specific and contingent needs, a person skilled in the art can make several changes to the above-described hydraulic pumping device for occasional use, said changes being all contained within the scope of protection of the present invention as defined by the following claims. Moreover, although less advantageously, as the mechanical driving means of the rotation of the rotary mechanical driven pump, which operates when connected with its mandrel to said axial coupling, one can use an electric drill or screwdriver connected by cable to the electrical power supply, if in the area in which the device according to the invention is operated electrical power supply is available from the mains. Besides electrical power supply, a pneumatically-operated drill or screwdriver can be used in the driving phase of the rotary mechanical driven pump, when it is adequately supplied by a compressed air distribution network, if available in the area in which the device according to the invention is used. As a further variant, there is also the possibility to use rotary volumetric pumps with screws, lobes or the like in addition to gears, which are advantageous due to their low cost.

Claims

1. Hydraulic pumping device for occasional use, comprising a reservoir (2) of hydraulic liquid; a first manually-driven reciprocating pump (1); a second mechanically-driven rotary pump (2); at least one intake filter (3) and control valves for controlling the delivery and the return from or to the controlled hydraulic circuit to which the hydraulic pumping device is connected; **characterised in that** said second mechanically-driven rotary pump (2) is of the volumetric type with rotating internal members; provided with a rotary control shaft end (21) coming out of the casing of the device; the shaft end being provided with an axial coupling (24) for rotary control; a mechanical rotation driving means driving said second rotary pump when connected with its mandrel (23) to said axial coupling.

2. Pumping device, according to claim 1, wherein the second pump is of the volumetric type with gears.

3. Pumping device, according to claim 1, wherein the second pump is of the volumetric type with lobes.

4. Pumping device, according to claim 2 or 3, wherein said mechanical driving means consists of an electric drill equipped with a power supply battery.

5. Pumping device, according to claim 2 or 3, wherein said mechanical driving means consists of an electric screwdriver equipped with a power supply battery.

6. Pumping device, according to claim 2 or 3, wherein said mechanical driving means consists of a pneumatic screwdriver equipped with a reservoir for compressed air.

7. Pumping device, according to claim 2 or 3, wherein said mechanical driving means consists of a pneumatic drill equipped with a reservoir for compressed air.

8. Pumping device, according to claim 2 or 3, wherein the mechanical driving means of the rotation of the mechanically-driven rotary pump is an electric drill or screwdriver connected by cable to the electrical power supply.

9. Pumping device, according to claim 2 or 3, wherein the mechanical driving means of the rotation of the mechanically-driven rotary pump is a pneumatic drill or screwdriver supplied by a compressed air distribution network.

Fig. 1

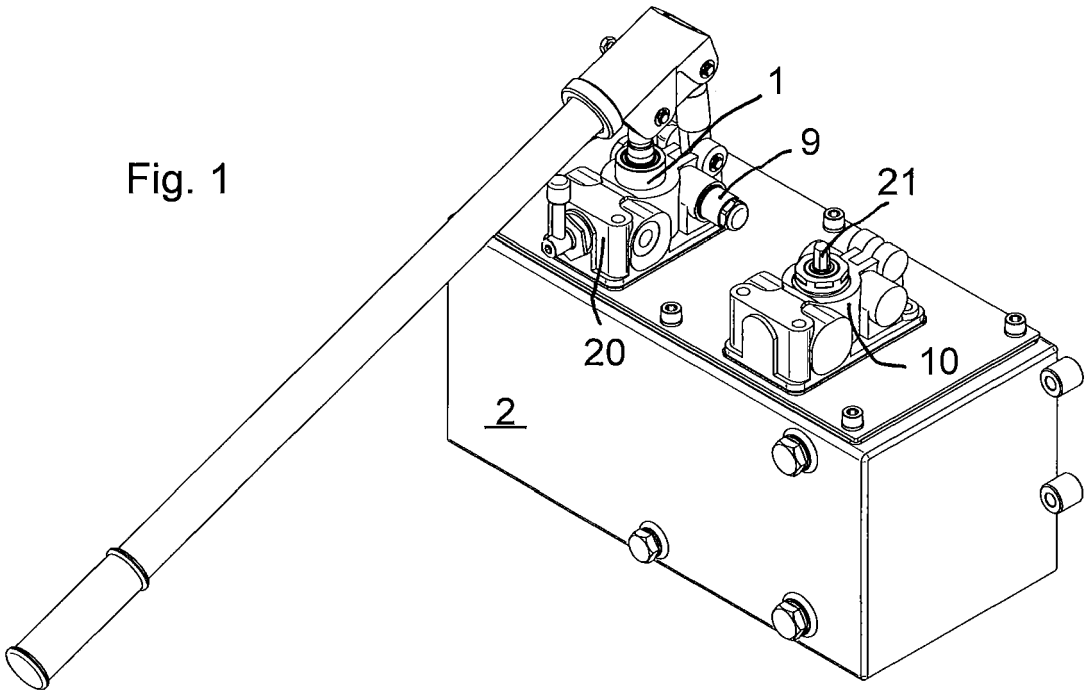
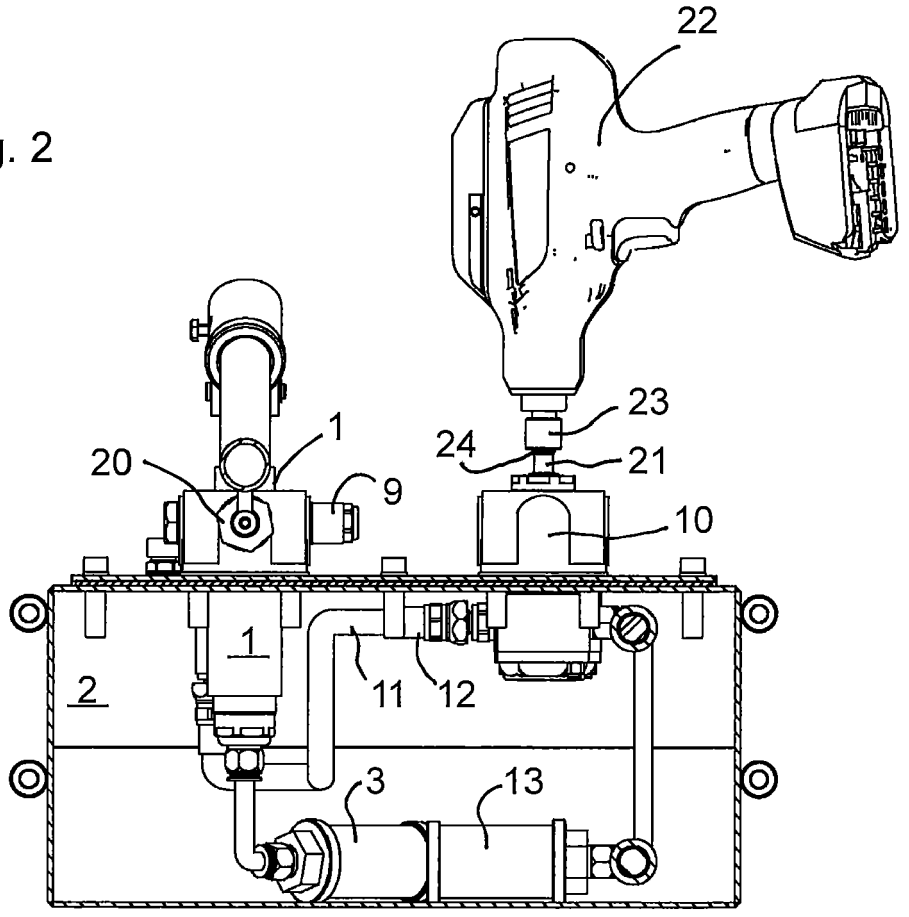


Fig. 2



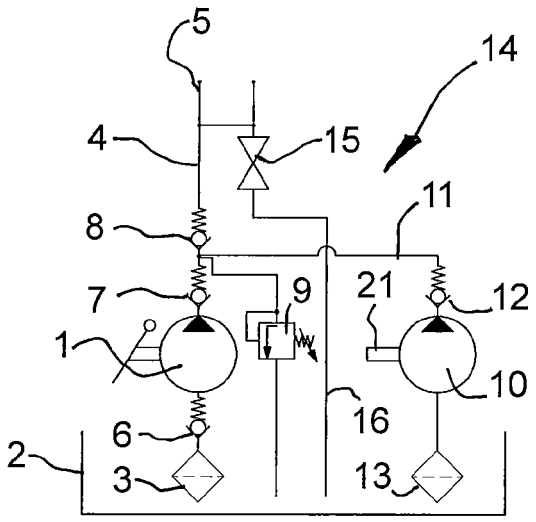


Fig. 3

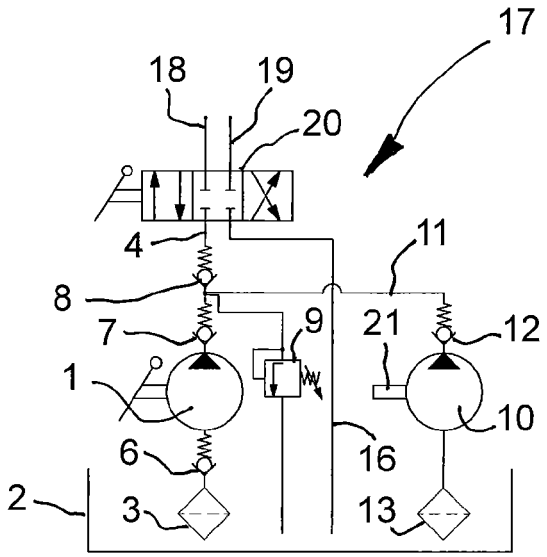
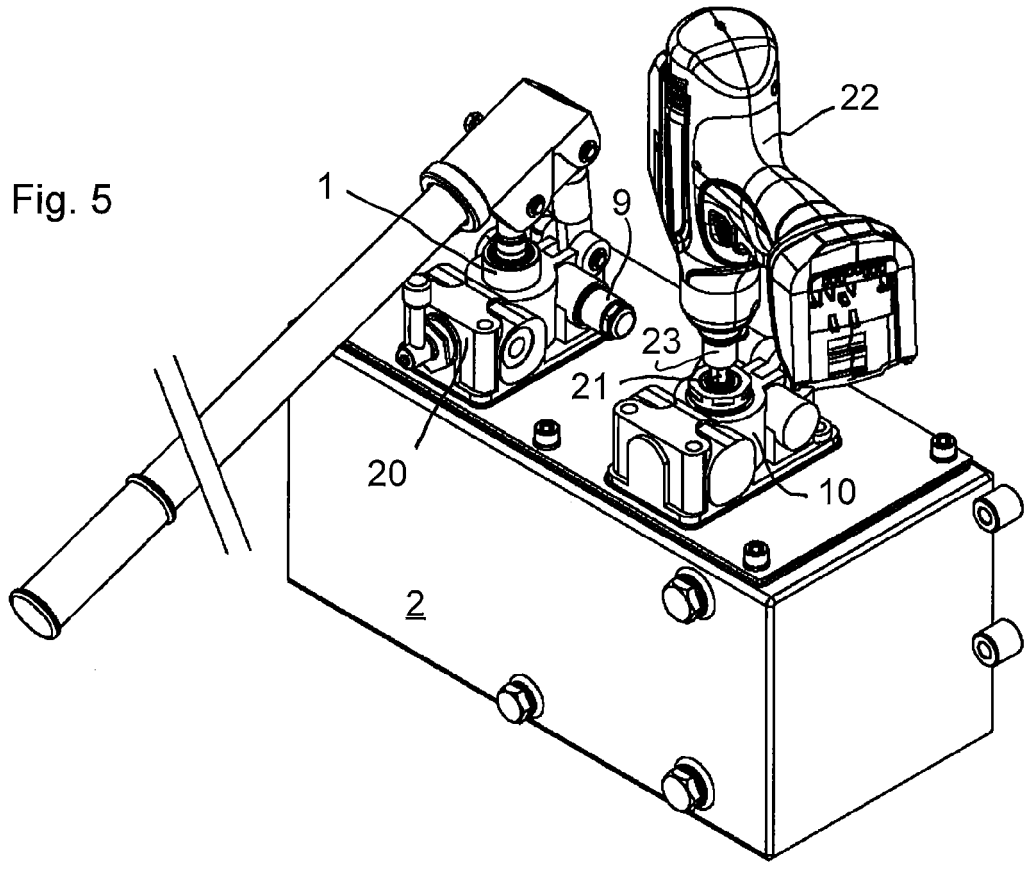


Fig. 4

Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 17 02 0108

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 July 2017	Bocage, Stéphane

CATEGORY OF CITED DOCUMENTS

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