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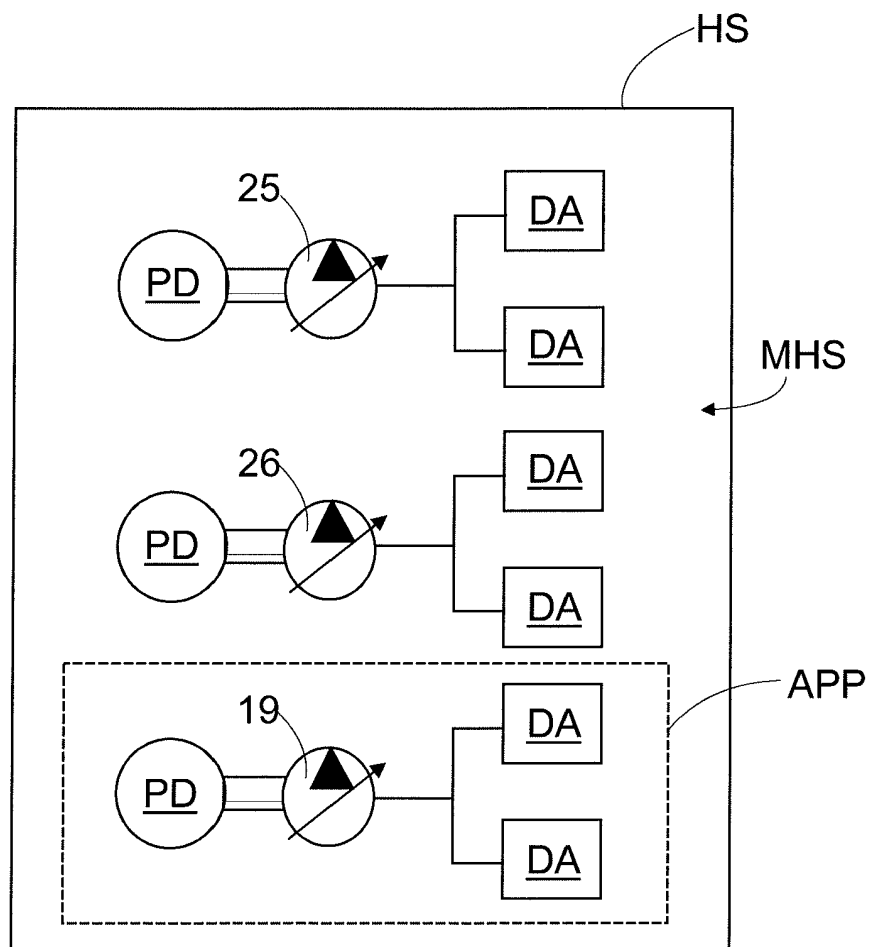
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(54) **Rock drilling rig and method of drilling**

(57) The invention relates to a rock drilling rig and method of drilling. The rock drilling rig (1) comprises a hydraulic system (HS) and several hydraulic drilling actuators (DA) connected to the hydraulic system. The hydraulic system comprises at least one first hydraulic

pump (25), at least one second hydraulic pump (26) and at least one third hydraulic pump (19). At least one of the pumps (25, 26, 19) is shared with two or more drilling actuators executing the same operation relating to the drilling.

FIG. 2



Description

Background of the invention

[0001] The invention relates to a rock drilling rig, which comprises at least two drilling units. The drilling unit comprises a drilling machine, which has hydraulic drilling actuators for executing percussion, rotation and feed. The rock drilling rig further comprises a hydraulic system for delivering needed hydraulic power to the hydraulic actuators.

[0002] The invention further relates to a drilling method wherein drill holes are drilled by means of a rock drilling rig comprising a carrier, and at least two drilling units. Hydraulic power is produced by means of at least one pump and the produced hydraulic power is conveyed to hydraulic drilling actuators comprising an impact device, a rotation device and a feed device.

[0003] The field of the invention is defined more specifically in the preambles of the independent claims.

[0004] In mines and at other work sites, rock drilling rigs provided with drilling units are used for drilling bore holes into rock surfaces and soil. The rock drilling rig comprises several hydraulic actuators and devices wherefore the rig is provided with a hydraulic system for producing the needed hydraulic energy. Known hydraulic systems of rock drilling rigs have shown to contain some disadvantages.

Brief description of the invention

[0005] An object of the invention is to provide a novel and improved rock drilling rig and method of drilling.

[0006] The rock drilling rig according to the invention is characterized in that the hydraulic system is provided with at least one first pump arranged to produce hydraulic power for at least one impact device; the hydraulic system is provided with at least one second pump arranged to produce hydraulic power for at least one rotation device; the hydraulic system is provided with at least one third pump arranged to produce hydraulic power for at least one feed device; and at least one of the mentioned at least one first, second and third pump is shared with at least two drilling actuators serving the same drilling operation.

[0007] The method according to the invention is characterized by producing hydraulic power for at least one impact device with at least one first pump; producing hydraulic power for at least one rotation device with at least one second pump; producing hydraulic power for at least one feed device with at least one third pump; and sharing produced hydraulic power of at least one of the mentioned at least one first, second and third pump with at least two drilling actuators serving the same drilling operation.

[0008] An idea of the disclosed solution is that the rock drilling rig comprises a hydraulic system provided with one or more first hydraulic pumps, one or more second

hydraulic pumps and one or more third hydraulic pumps. The first pump is arranged to produce hydraulic power for at least one impact device, the second pump is arranged to produce hydraulic power for at least one rotation device and the third pump is arranged to produce hydraulic power for at least one feed device. One or more of the mentioned first, second and third pumps is shared with two or more drilling actuators serving the same drilling operation.

[0009] An advantage of the disclosed solution is that hydraulic capacity of the first, second and third pumps may be dimensioned according to hydraulic need of actuators they serve and the pumps may be driven more accurately according to the required hydraulic power. Thus, power consumption of the rock drilling rig may be decreased. Further, when one or more of the pumps is shared with several hydraulic actuators, the number of the hydraulic pumps may be reasonable.

[0010] According to an embodiment, the hydraulic system of the rock drilling rig is provided with one or more first pumps arranged to produce hydraulic power, which is utilized for executing percussion. The produced hydraulic power of the at least one first pump is shared with at least two impact devices.

[0011] According to an embodiment, the hydraulic system of the rock drilling rig is provided with one or more second pumps arranged to produce hydraulic power, which is utilized for executing rotation. The produced hydraulic power of the at least one second pump is shared with at least two rotation devices.

[0012] According to an embodiment, the hydraulic system of the rock drilling rig is provided with at least one third pump arranged to produce hydraulic power, which is utilized for executing feeding. The produced hydraulic power of the at least one third pump is shared with at least two feed devices.

[0013] According to an embodiment, the rock drilling rig comprises two or more drilling units, which are provided with impact devices. The hydraulic system is provided with several first pumps for providing hydraulic energy for the impact devices. The number of the first pumps corresponds to the number of the impact devices, whereby each of the first pumps is dedicated to produce hydraulic power for only one impact device. Further, the hydraulic system may be provided with one second pump arranged to produce hydraulic power, which is shared with all rotation devices of the rock drilling rig. The auxiliary hydraulic power pack is arranged to produce hydraulic power, which is shared with all feed devices of the rock drilling rig.

[0014] According to an embodiment, the hydraulic system of the rock drilling rig comprises one shared power device arranged to drive all the first and second pumps. The third pump may comprise a dedicated power device. Hence, the hydraulic system may comprise only two power devices.

[0015] According to an embodiment, the rock drilling rig is electrically powered. Thus, the rig may comprise

one or more electrical motors for driving the hydraulic pumps of the hydraulic system.

[0016] According to an embodiment, the rock drilling rig is electrically powered. A drive system of the rig comprises an electrical drive motor. In addition to produce the needed driving force, the electrical drive motor is also arranged to drive at least all the first hydraulic pumps of the hydraulic system. Thus, the electrical drive motor produces rotation for one or more first pumps producing hydraulic power for percussion devices. In addition to, the drive motor may also drive one or more second pumps producing hydraulic power for rotation devices.

[0017] According to an embodiment, the hydraulic system of the rock drilling rig is provided with one or more first pumps arranged to produce hydraulic power, which is utilized for executing impacts or percussion. The produced hydraulic power of the at least one first pump is adjustable allowing the percussion power of the powered impact devices to be controlled by adjusting the at least one first pump. Thanks to the control of the pump no other control valves or elements are necessarily needed in pressure lines, whereby power losses caused by the control elements may be avoided.

[0018] According to an embodiment, all the hydraulic first, second and third pumps of the rock drilling rig are adjustable pumps. An advantage of this embodiment is that number of control valves and elements of the hydraulic system may be decreased.

[0019] According to an embodiment, the at least one first pump is adjustable pump provided with adjustable displacement capacity. By varying the displacement capacity of the pump produced hydraulic power of the auxiliary power pack may be adjusted. Furthermore, the second and third pumps may also be adjustable pumps the displacement capacity of which may be adjusted.

[0020] According to an embodiment, the at least one first pump is driven by means of adjustable rotation speed. The first pump may be a pump provided with a fixed displacement capacity. Thus, the pump may be a centrifugal pump or a gear pump, for example. Produced hydraulic power of the first pump may be adjusted by adjusting rotation speed of the centrifugal pump. Furthermore, the second and third pumps may also be fixed displacement pumps the rotation speed of which may be adjusted.

[0021] According to an embodiment, the produced hydraulic power of the at least one first pump is adjustable allowing the percussion power of the powered impact devices to be controlled by adjusting the at least one first pump. The produced hydraulic fluid flow is directed to the one or more impact devices through ON/OFF -valves. Thus, the percussion power of the one or more impact device is controlled by adjusting the one or more first pumps instead of using control valves or corresponding control elements arranged in feed ducts. The ON/OFF -valves do not throttle the hydraulic fluid flow and cause power losses.

[0022] According to an embodiment, one or more first

pumps and one or more second pumps are driven by means of one first power device. Between the first power device and the pumps may be a transmission box or other suitable system for providing suitable transmission ratio for the pumps. Further, the third pump of the hydraulic system is driven by means of a dedicated second power device.

[0023] According to an embodiment, the hydraulic system comprises at least one auxiliary hydraulic power pack. The auxiliary power pack comprises a dedicated third pump and a dedicated second power device. The auxiliary power pack may be operated independently relative to other hydraulic pumps of the hydraulic system. Hydraulic power capacity of the third pump of the auxiliary hydraulic power pack may be dimensioned to be relatively small as compared to capacity of other hydraulic pumps of the hydraulic system. The auxiliary power pack may serve as an aid power source, and/or it may be arranged to provide hydraulic power for hydraulic actuators requiring relatively low fluid flow.

[0024] According to an embodiment, the rock drilling rig is provided with a drive system, which comprises one or more hydraulic driving aid actuators. The hydraulic system comprises a third pump arranged to produce the hydraulic power also for the hydraulic driving aid actuators. The driving aid actuator may be a steering actuator or braking actuator. The steering actuator may be a hydraulic steering cylinder or motor arranged to turn wheels of a carrier, or alternatively is arranged to turn front and rear body of the carrier relative to each other when the carrier is provided with an articulated steering system. The hydraulic steering system may also comprise power steering equipment for facilitating steering. The braking system may comprise operational braking actuators and parking brake actuators in connection with wheels.

[0025] According to an embodiment, the rock drilling rig is provided with a compressed air system comprising one or more compressors. Compressed air produced by the compressor may be used for flushing drill holes or it may serve as a pneumatic power for actuating one or more actuators. The compressor is driven by one or more hydraulic motors. The third hydraulic pump of the hydraulic system is arranged to provide the needed hydraulic power also for driving the hydraulic motor of the compressor.

[0026] According to an embodiment, the rock drilling rig is provided with a flushing system comprising one or more flushing pumps for producing a flushing flow of water or corresponding flushing liquid. The flushing fluid flow may be fed to drill holes during drilling in order to flush drilling cuttings. The flushing pump may be driven by means of one or more hydraulic motors. The third hydraulic pump of the hydraulic system is arranged to provide the needed hydraulic power also for at least one flushing pump for producing flow of a flushing fluid.

[0027] According to an embodiment, the feed device of the drilling unit is provided with two speed settings namely a slow feed and a fast feed. The slow feed is

used during drilling when rotation is on and the fast feed is used when the drilling is paused or stopped. The third pump of the hydraulic system provides the hydraulic power for the slow feed of the feed device. The fast feed of the feed device is powered by means of hydraulic fluid flow produced by the first pump. When the drilling is paused or stopped, then the percussion is also off and available hydraulic power capacity may be conveyed to the feed devices and utilized for producing the fast feed. Alternatively, hydraulic fluid flow of the second pump is conveyed to the feed device for producing the fast feed. When the drilling is paused or stopped, then the rotation is also off and available hydraulic power capacity may be conveyed to the feed devices and utilized for producing the fast feed. The fast feed is not performed when drilling is on.

[0028] According to an embodiment, the at least one first and second pumps has one shared power device, which is connected to one transmission device, such as a gear box. The transmission device is arranged to transmit dedicated rotational speed for each of the first and second pumps so that the pumps may be driven with suitable rotation speeds.

[0029] According to an embodiment, hydraulic power is produced to each of the impact devices with dedicated first pumps. Thus, the number of first pumps corresponds to the number of drilling units of the rig. However, hydraulic power is produced for all rotation devices by means of one second pump. Furthermore, hydraulic power is produced for all feed devices by means of one third pump.

[0030] According to an embodiment the rock drilling rig is electrically powered. The rock drilling rig may be connected to an electrical network of a mine or corresponding external electrical supply system for providing the rig with needed power. Alternatively, or in addition to, the rock drilling rig may comprise one or more electrical energy storages, such as batteries, for storing electrical energy. The electrical energy discharged from the energy storage may be utilized in transfer drives and for performing drilling and other work tasks of the rock drilling rig.

[0031] According to an embodiment, the rock drilling rig is electrically powered and comprises one single electric drive motor for performing driving of the rig. The drive motor is configured to drive all hydraulic pumps of a main hydraulic system or main power pack of the rig. Between the drive motor and the pumps may be a transmission unit for transmitting the power to the hydraulic pumps. The transmission unit may comprise a mechanical transmission, such as a gear box. Thanks to this embodiment only one single motor is need for powering the main hydraulic system and a driving system. Thus, amount of motors on a carrier may be minimized, whereby less space is needed and the disclosed system may also aid achieving cost savings.

[0032] According to an embodiment, the rock drilling rig is provided with a main combustion engine for producing the needed energy for driving the driving equip-

ment and the hydraulic system. The rock drilling rig also comprises an auxiliary hydraulic power pack, which may be powered by means of a dedicated combustion engine for producing needed energy for driving a dedicated hydraulic pump of the auxiliary power pack.

[0033] It should be noted that the above-disclosed embodiments and their features may be combined in various ways. Different combinations may thus be formed as necessary.

Brief description of the figures

[0034] Some embodiments are described in more detail in the accompanying drawings, in which

Figure 1 is a side view of a rock drilling rig provided with several booms,

Figure 2 shows schematically a hydraulic system comprising first pumps, second pumps and third pumps arranged to provide hydraulic power for drilling actuators,

Figure 3 is a schematic and greatly simplified view of a hydraulic system of a rock drilling rig, which comprises a main hydraulic system and an auxiliary hydraulic power pack, and

Figure 4 is a schematic and greatly simplified view of a hydraulic system of a rock drilling rig, which rig comprises several drilling units.

[0035] For the sake of clarity, the figures show some embodiments of the disclosed solution in a simplified manner. In the figures, like reference numerals identify like elements.

Detailed description of some embodiments

[0036] Figure 1 shows a rock drilling rig 1 equipped with several drilling booms 2. The rock drilling rig 1 further comprises a carriage 3 that may be moved by means of drive equipment 4. The drive equipment 4 comprises one or more drive motors 5 and one or more power transmission means 6 for transmitting drive power to one or more wheels 7. The drive power transmission may comprise a mechanical gear system and mechanical power transmission members or, alternatively, the drive power transmission may be hydraulic or electric. The drilling booms 2 are provided with rock drilling units 8. The number of the drilling booms and drilling units may be one, two, three or even greater. It is also possible that the rock drilling rig 1 comprises one or more drilling units and one or more alternative mining work devices, such as a bolting device or an injection device.

[0037] The rock drilling rig 1 of Figure 1 comprises three rock drilling units 8 connected to drilling booms 2. The drilling unit 8 may comprise a feed beam 9 and a rock drilling machine 10 supported on it. The rock drilling machine 10 may be moved on the feed beam 9 by means of a feed device 11. At a front end of the rock drilling

machine 10 may be a shank for connecting a drilling tool 12. The tool 12 may be rotated by means of a rotating device 13. The rock drilling machine 10 may also comprise an impact device or percussion device 14 for generating impact pulses to the tool 12.

[0038] At a drilling site, one or more drill holes are drilled with the drilling unit 8. The drill holes may be drilled in a horizontal direction, as is shown in Figure 1, or alternatively, in a vertical direction or in a desired angular direction. The drill holes may be drilled to a rock material or soil.

[0039] Figure 1 further shows that the rock drilling rig 1 may be electrically powered. A mine or construction site where the rock drilling rig 1 operates may be provided with an electrical network 15. The rock drilling rig 1 may be connected to the electrical network 15 with one or more connection cables 16. The connection cable 16 may be arranged on a reel or cable drum 17, which may be rotated by means of a cable drum actuator. Alternatively, or in addition to, the rock drilling rig 1 may be equipped with one or more energy storages 18, from which electric current may be discharged and which may correspondingly be charged with electric current. The energy storage 18 may be a battery, capacitor, or the like.

[0040] The rock drilling rig 1 comprises a basic or main hydraulic system MHS for producing and delivering hydraulic power for hydraulic actuators of the rig 1. The main hydraulic system MHS comprises one or more hydraulic pumps which may be driven by one common power device. Thus, the hydraulic pumps may be driven by means of the drive motor 5 of the drive system 4 when the rock drilling rig 1 is electrically powered. In addition to the main hydraulic system MHS, the rock drilling rig 1 may comprise one or more auxiliary hydraulic power packs APP for producing assisting hydraulic power for the main hydraulic system MHS or for driving particular hydraulic devices of the rig 1. The auxiliary hydraulic power pack APP may operate independently since it comprises a hydraulic pump and power device of its own. The auxiliary power pack APP may be positioned relatively freely on the carrier 3, which facilitates layout design of the rig 1. Despite the fact that the use of the auxiliary power pack APP is especially beneficial in electrically powered rock drilling rigs 1, it may also be applied in other type of rigs.

[0041] Figure 2 shows a hydraulic system HS of the rock drilling rig in a greatly simplified manner. The hydraulic system HS comprises one or more first hydraulic pumps 25, one or more second hydraulic pumps 26 and one or more third hydraulic pumps 19 for producing hydraulic fluid flows which are conveyed to hydraulic drilling actuators DA. The first pump 25 may supply hydraulic power for one or more impact devices, the second pump 26 may supply hydraulic power for one or more rotation devices, and the third pump 19 may produce hydraulic power for one or more feed devices. Each of the pumps 25, 26, 19 may have a dedicated power device PD or alternatively one or more shared power devices may be

applied. The third pump 19 and a dedicated power device, such as an electrical motor, may constitute an auxiliary hydraulic power pack APP. The first pump 25, the second pump 26 and one or more power devices PD driving the pumps may constitute a basic or main hydraulic system MHS. Figure 2 further discloses that the pumps 25, 26, 19 may be adjustable pumps, whereby produced hydraulic power of the pumps may be adjusted according to power need of the drilling actuators DA.

[0042] Figure 3 discloses a hydraulic system of a rock drilling rig in a greatly simplified manner. The hydraulic system HS comprises a main hydraulic system MHS and an auxiliary hydraulic power pack APP.

[0043] The main hydraulic system MHS comprises a first hydraulic pump 25 for producing hydraulic power for a percussion or impact device 14. A second hydraulic pump 26 is arranged to produce hydraulic power for a rotation device 13. The second pump 26 may also supply pressure fluid to a feed device 11 b when fast feed is executed. During drilling, rotation device 13 powered by the second pump 26 is on, and also slow feed powered by the auxiliary power pack APP is on. When the drilling is stopped or paused, typically the rotation device 13 is also stopped and no hydraulic power is needed for the rotation device 13. Hence, the available hydraulic fluid flow produced by the second pump 26 may be utilized to produce the fast feed 11 b. The main hydraulic system MHS may comprise only one first pump 25 and one second pump 26 when the rock drilling rig comprises one drilling unit 8. If the rig is provided with two or more drilling units 8, number of the first pumps 25 is in accordance with the number of the drilling units 8. However, the second pump 26 may provide needed hydraulic power for one or more rotation devices, in other words, the second pump 26 is shared with all rotation devices 13 of the rig. Produced hydraulic power of the first pump 25 and the second pump 26 may be adjusted. Displacement capacities of the pumps 25 and 26 may be adjusted in order to affect the produced hydraulic power of the pumps.

[0044] The first pump 25 and the second pump 26 may be driven by means of one shared power unit, which may be a drive motor 5 of the rig. The drive motor 5 may be connected to a transmission box 27 by means of an input shaft 28. The first pump 25 and the second pump 26 may be rotated by means of a first output shaft 29 of the transmission box and a second output shaft 30 may transmit torque through drive transmission means 6 to wheels 7.

[0045] The auxiliary power pack APP may be arranged to provide hydraulic power to a drilling system DS and to auxiliary devices AD. Hydraulic fluid flow may be conveyed from the auxiliary power pack APP to the drilling system DS for assisting or boosting a main hydraulic system of a rock drilling rig. However, the auxiliary power pack APP may be arranged to produce power for one or more desired hydraulic devices of the drilling system DS. The third pump 19 of the auxiliary power pack APP may serve as hydraulic power source for executing slow feed 11a of several drilling units during drilling operations.

[0046] The auxiliary power pack APP may also be arranged to produce hydraulic fluid flow for hydraulic boom actuators 22. The auxiliary devices AD may relate to controlling of a carrier of the rock drilling rig. Thus, the auxiliary devices AD may be hydraulic driving aid actuators such as a braking actuator 23 and a steering actuator 24. Hydraulic fluid flow may be conveyed from the auxiliary power pack APP to a braking system for pressurizing operational and parking brakes, and to the steering system for pressurizing steering cylinders and a power steering system. Thus, the auxiliary hydraulic power pack APP may always provide sufficient hydraulic power for the auxiliary devices so that their operation is ensured in all circumstances. In addition to the braking actuator 23 and the steering actuator 24, the auxiliary devices AD may comprise a cable drum actuator 17 for rotating and braking rotation of a cable drum or corresponding drum.

[0047] Figure 3 also shows an alternative solution, wherein hydraulic fluid flow for providing the fast feed 11 b of the feed device 11 is produced by means of the first pump 25 instead of the second pump 26. An alternative pressure medium duct 35 is shown in Figure 3 for illustrating this embodiment. When drilling is paused, the impact device is also paused. Thus, available hydraulic power capacity of the first pump 25 may be used for executing the fast feed 11 b. The fast feed 11 b is needed only when the drilling is off or paused.

[0048] Figure 4 discloses a hydraulic system HS of rock drilling rig having several drilling booms and drilling units 8a, 8b. The main hydraulic system MHS is substantially similar to the solution shown in Figure 3. The hydraulic system HS comprises two first pumps 25a, 25b because the rig has two drilling units 8a, 8b both of them provided with impact devices. The first pumps 25a, 25b may be arranged to be rotated by a first output shaft 29. A second pump 26 may be rotated by means of a third output shaft 31 and the second pump 25 may provide hydraulic power for all rotation devices of the drilling units 8a, 8b. If the rig comprises a third drilling unit 8c, a third first pump 25c may be arranged to be rotated by the third output shaft 31, or alternatively it may be connected to the first output shaft 29.

[0049] The auxiliary hydraulic power pack APP of Figure 4 may be similar to the one shown in Figure 3. However, the auxiliary power pack APP may also provide hydraulic power for a flushing fluid pump 32, such as a water pump, and for a compressor 33.

[0050] In Figures 3 and 4 valves, valve blocks or other suitable control elements 34 allowing control of produced fluid flows are also shown in a greatly simplified manner.

[0051] It may also be possible to share one or more first pumps and to produce hydraulic power for two or more impact devices by means of the shared first pump. Alternatively, all the impact devices may have dedicated first pumps for percussion purpose, but one of the first pumps may be configured to produce hydraulic power for executing fast feed 11 b of several feed devices.

[0052] The drawings and the related description are

only intended to illustrate the idea of the invention. In its details, the invention may vary within the scope of the claims.

Claims

1. A rock drilling rig comprising:

a carrier (3);
 at least two drilling booms (2) arranged on the carrier (3);
 at least two drilling units (8), which are located at distal ends of the drilling booms (2), and wherein the drilling unit (8) comprises a drilling machine (10) provided with a hydraulic impact device (14) and a hydraulic rotation device (13), and the drilling unit (8) further comprises a hydraulic feed device (11) for feeding the rock drilling machine (10);
 at least one boom actuator (22) for moving the drilling boom (2) relative to the carrier (3);
 a hydraulic system (HS) for delivering hydraulic power to the hydraulic drilling actuators (DA), whereby drilling operations percussion, rotation, feed and boom movements are hydraulically operated;
 and wherein the hydraulic system (HS) comprises at least one pump for producing the hydraulic power, at least one power device for driving the pump, pressure medium ducts for conveying hydraulic fluid and control means for affecting delivery of the hydraulic fluid;
characterized in that
 the hydraulic system (HS) is provided with at least one first pump (25) arranged to produce hydraulic power for at least one impact device (14);
 the hydraulic system (HS) is provided with at least one second pump (26) arranged to produce hydraulic power for at least one rotation device (13);
 the hydraulic system (HS) is provided with at least one third pump (19) arranged to produce hydraulic power for at least one feed device (11); and
 at least one of the mentioned at least one first, second and third pump is shared with at least two drilling actuators (DA) serving the same drilling operation.

2. The rock drilling rig as claimed in claim 1, **characterized in that**

the hydraulic system (HS) is provided with several first pumps (25), the number of the first pumps (25) corresponds to the number of the impact devices (14), whereby each of the first pumps (25) is dedicated to produce hydraulic power for only one impact

- device (14);
the hydraulic system (HS) is provided with one second pump (26) arranged to produce hydraulic power, which is shared with all rotation devices (13) of the rock drilling rig (1); and
the hydraulic system (HS) is provided with one third pump (19) arranged to produce hydraulic power, which is shared with all feed devices (11) of the rock drilling rig (1).
3. The rock drilling rig as claimed in claim 1 or 2, **characterized in that**
the hydraulic system (HS) comprises a shared power device (PD, 5) arranged to drive all the first and second pumps (25, 26).
 4. The rock drilling rig as claimed in any one of the preceding claims 1 to 3, **characterized in that**
the produced hydraulic power of the at least one first pump (25) is adjustable allowing the percussion power of the powered impact devices (14) to be controlled by adjusting the at least one first pump (25).
 5. The rock drilling rig as claimed in any one of the preceding claims 1 to 4, **characterized in that**
the at least one first pump (25) and the at least one second pump (26) are driven by means of one first power device (5); and
the third pump (19) is driven by means of one second power device (20).
 6. The rock drilling rig as claimed in any one of the preceding claims 1 to 5, **characterized in that**
the rock drilling rig (1) is electrically powered and is provided with a drive system (4) comprising an electrical drive motor (5); and
the electrical drive motor (5) is arranged to drive at least the at least one first pump (25).
 7. The rock drilling rig as claimed in any one of the preceding claims 1 to 6, **characterized in that**
the third pump (19) and the second power device (20) constitute an auxiliary hydraulic power pack (APP) being connected to the hydraulic system (HS).
 8. The rock drilling rig as claimed in claim 6 or 7, **characterized in that**
the drive system comprises at least one hydraulic driving aid actuator (23, 24); and
the third pump (19) is arranged to produce the needed hydraulic power for the hydraulic driving aid actuator (23, 24).
 9. The rock drilling rig as claimed in any one of the preceding claims 1 to 8, **characterized in that**
the feed device (11) is provided with two speed settings slow feed (11a) and fast feed (11b), wherein the slow feed (11a) is used during drilling and the fast feed (11 b) is used when the drilling is paused; the third pump (19) provides the needed hydraulic power for the slow feed_ (11 a) of the feed device (11); and
the hydraulic fluid flow produced by the first or second pump (25, 26) is conveyed to the feed device (11) during the fast feed (11 b).
 10. The rock drilling rig as claimed in any one of the preceding claims 1 to 9, **characterized in that**
the at least one first and second pumps (25, 26) have one shared power device (5);
the shared power device (5) is connected to one transmission device (27); and
the transmission device (27) is arranged to transmit dedicated rotational speed for each of the first and second pumps (25, 26).
 11. A method of drilling, the method comprising:
drilling drill holes by means of a rock drilling rig (1) comprising a carrier (3) and at least two drilling booms (2) provided with drilling units (8); and
producing hydraulic power by means of at least one pump and conveying the produced hydraulic power to hydraulic drilling actuators (DA) comprising impact devices (14), rotation devices (13) and feed devices (11);
characterized by
producing hydraulic power for at least one impact device (14) with at least one first pump (25);
producing hydraulic power for at least one rotation device (13) with at least one second pump (26);
producing hydraulic power for at least one feed device (11) with at least one third pump (19); and
sharing produced hydraulic power of at least one of the mentioned at least one first, second and third pump (25, 26, 19) with at least two drilling actuators (DA) serving the same drilling operation.
 12. The method as claimed in claim 11, **characterized by**
producing hydraulic power to each of the impact devices (14) with dedicated first pumps (25);
producing hydraulic power for all rotation devices (13) by means of one second pump (26); and
producing hydraulic power for all feed devices (11) by means of one third pump (19).

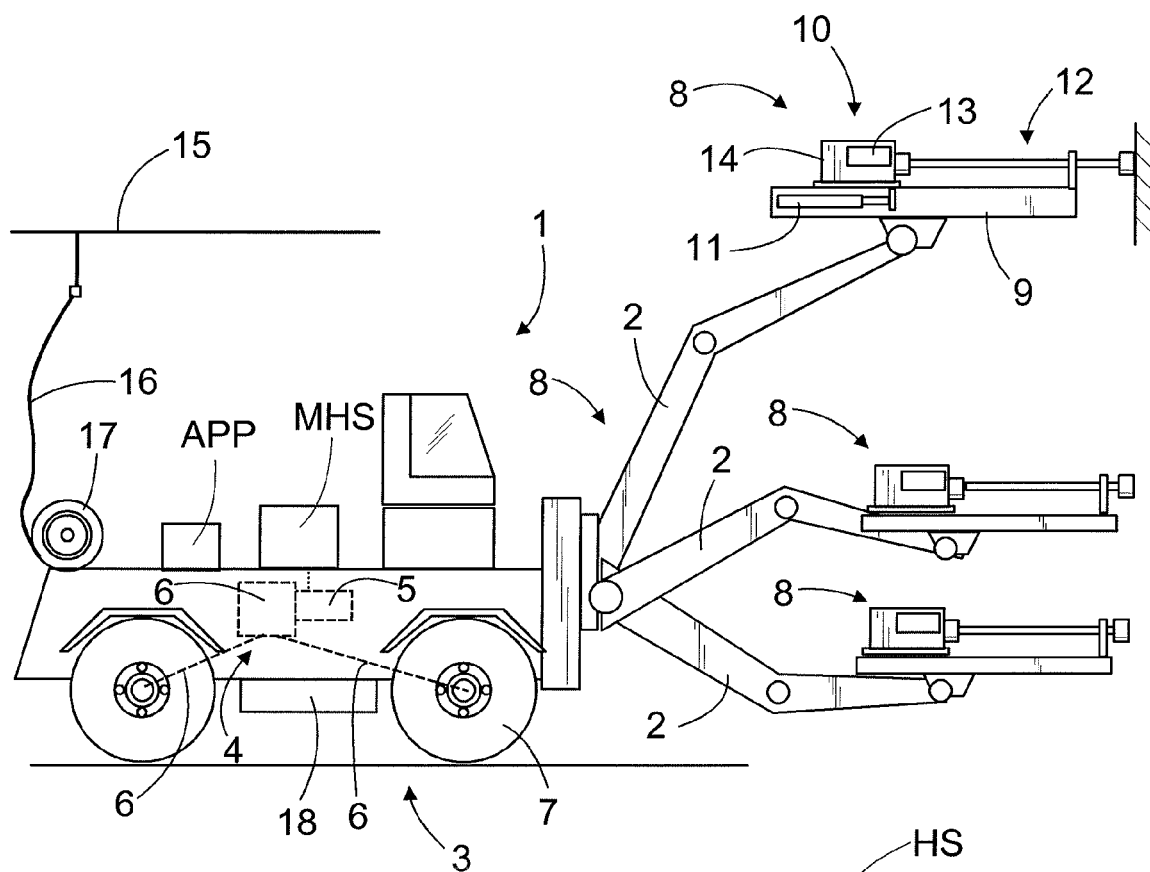


FIG. 1

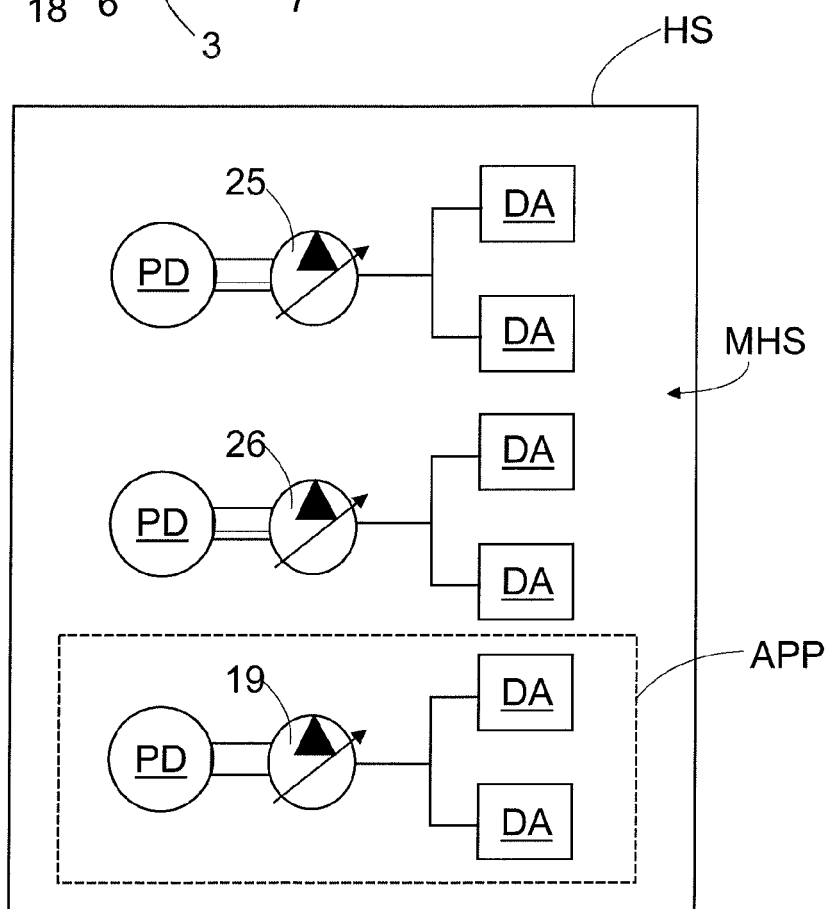


FIG. 2

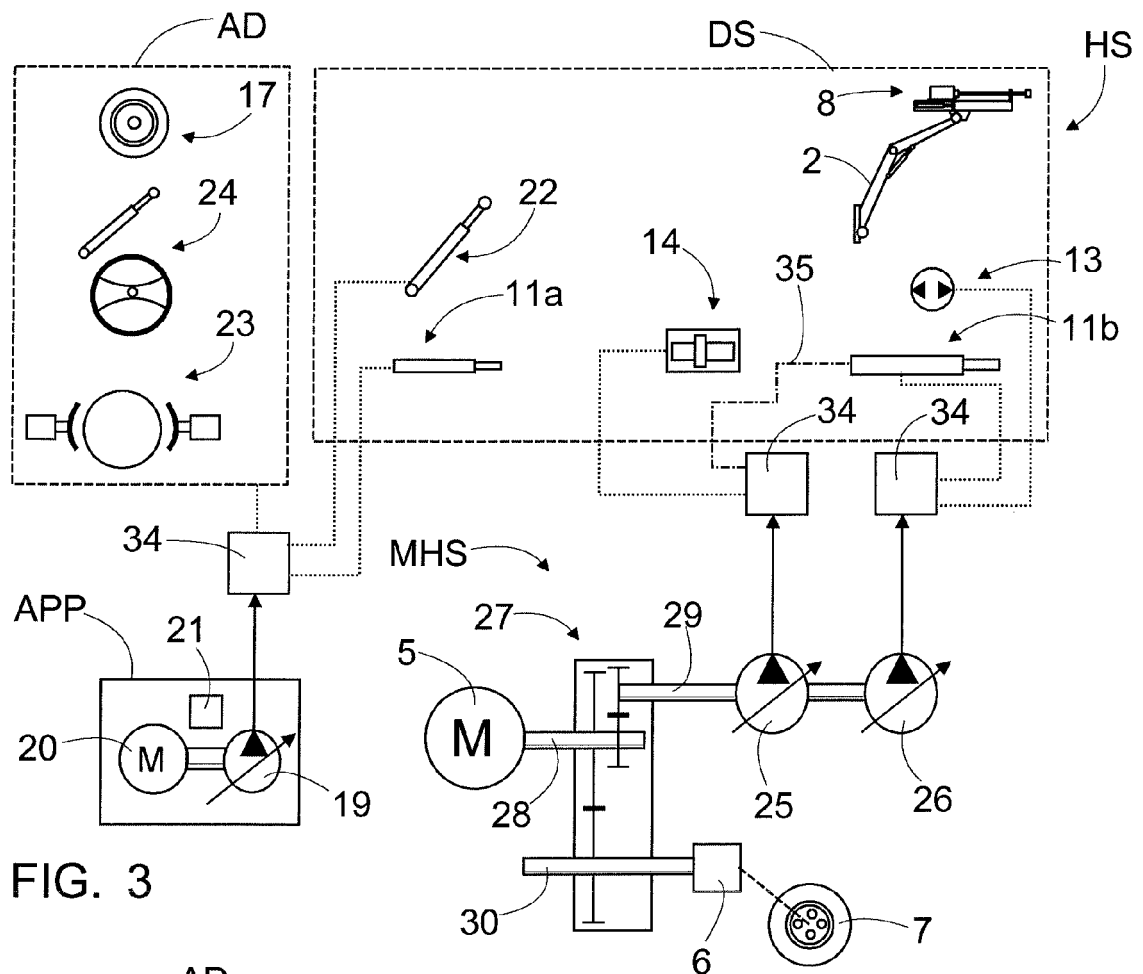


FIG. 3

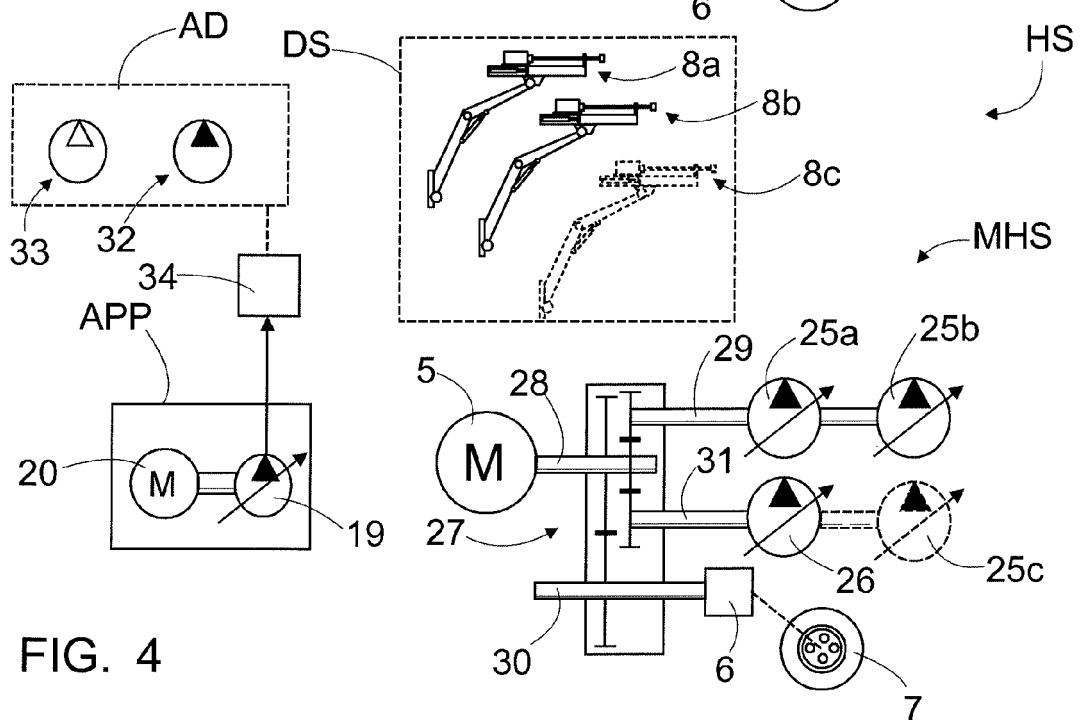


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 14 17 2334

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2004/065761 A1 (SANDVIK TAMROCK OY [FI]; MUONA JOUKO [FI]; NIEMI JAAKKO [FI]; OSARA JU) 5 August 2004 (2004-08-05) * paragraphs [0005], [0015] - [0020], [0022], [0026], [0029]; figures 1,3 *	1-12	INV. E21B7/02
A	US 2005/056439 A1 (SAHA HEIKKI [FI] ET AL) 17 March 2005 (2005-03-17) * paragraphs [0024], [0037]; figure 2 *	1-12	
A	EP 0 300 080 A1 (KLEMM BOHRTECH [DE]) 25 January 1989 (1989-01-25) * column 6, line 25 - column 7, line 1 * * column 11, line 3 - line 8 *	1-12	
A	EP 2 514 911 A1 (KLEMM BOHRTECHNIK GMBH [DE]) 24 October 2012 (2012-10-24) * abstract; claim 1 *	1-12	
A	WO 00/08303 A1 (SANDVIK TAMROCK OY [FI]; POEYSTI TAPANI [FI]; NIEMI JAAKKO [FI]; RAEMO) 17 February 2000 (2000-02-17) * page 3, line 19 - page 4, line 8 *	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			E21B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 October 2014	Examiner Schneiderbauer, K
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