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(54) **ROCK DRILLING RIG AND METHOD OF HANDLING DRILL BITS**

(57) A rock drilling rig and method of handling drill bits. The rock drilling rig (1) comprises a drilling boom (3) provided with a rock drilling unit (4). The rock drilling rig also comprises one or more drill bit magazines (10) for storing the drill bits (9). The magazine comprises a bit

change position (13) defined by physical guide surfaces (14) capable to direct the rock drilling unit into correct position and orientation for executing change of the drill bit.

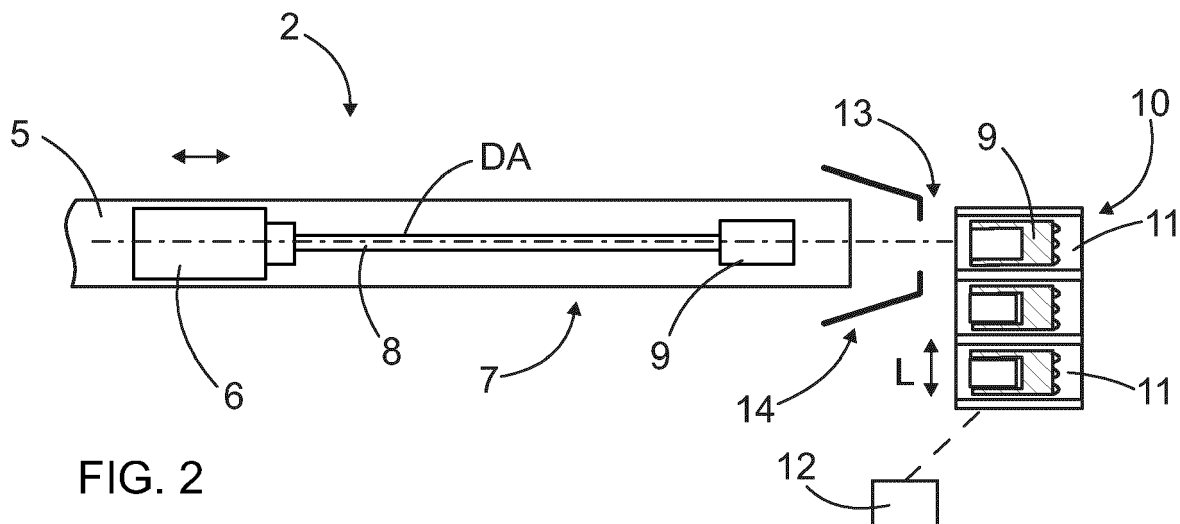


FIG. 2

Description

Background of the invention

[0001] The invention relates to a rock drilling rig for drilling drill holes to a rock surface. The rock drilling rig is provided with a drill bit magazine for storing drill bits.

[0002] The invention further relates to a method of handling drill bits in a rock drilling rig.

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

[0004] Rock drilling rigs provided with drilling units are used in mines and at other work sites for drilling holes to rock material. The rock drilling unit comprises a rock drilling machine for generating needed rotation and impact pulses for a drilling equipment connected to the drilling machine. The drilling equipment may comprise one or more drill rods or tubes and a drill bit at the outermost end of the drilling equipment. The drill bits wear during use and a need exists to change them time to time. For executing the drill bit change and collection from the magazine some solutions have been developed. However, the present solutions 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 for handling drill bits.

[0006] The rock drilling rig according to the invention is characterized by the characterizing features of the independent apparatus claim.

[0007] The method according to the invention is characterized by the characterizing features and steps of the independent method claim.

[0008] An idea of the disclosed solution is that a rock drilling rig comprises one or more drill bit magazines for storing several drill bits which are mountable and detachable to a drilling tool connected to a rock drilling machine. In connection with the magazine there is a bit change position provided with physical guide surfaces defining predetermined position and orientation for a rock drilling unit at the bit change position. Then the rock drilling unit can be moved to the bit change position under physical guidance provided by the physical guide surfaces.

[0009] In other words, the bit change position defines an accurate and concrete location wherein relative position and orientation between the magazine and the rock drilling unit are known and co-operation between the magazine and the rock drilling unit is realized.

[0010] According to an embodiment, a front end portion of the feed beam is configured to be guided by means of the physical guide surfaces. Thus, the physical guide surfaces are designed and dimensioned so that the front end portion of the feed beam can come into contact with the guide surfaces without being damaged.

[0011] According to an embodiment, the front end por-

tion of the feed beam may comprise contact surfaces, which may be specially designed for co-operating and matching with the guide surfaces of the magazine.

[0012] According to an embodiment, the physical guide surfaces at bit change position comprises at least one stop element against which a front end of the feed beam is to be moved in longitudinal direction of the feed beam. There is also one or more slanting surfaces for guiding the feed beam towards the stop element in predefined orientation. In other words, the physical guide surfaces are for stopping and directing the feed beam to a desired distance and orientation.

[0013] According to an embodiment, the physical guide surfaces form a tapering guide space configured to receive at least partly a front portion of the feed beam. The tapering guide space or funnel type structure may comprise a stop plate and two or more lateral guide elements mounted angularly in relation to the stop plate.

[0014] According to an embodiment, the magazine comprises several bit spaces for receiving the drill bits and the magazine is movable by means of at least one actuator in relation to the bit change position for aligning each of the bit spaces selectively with the bit change position. In other words, the magazine can store several drill bits and the magazine can be indexed to move the bit spaces to the bit change position so that worn drill bits can be placed to empty spaces of the magazine and new drill bits can be taken from the magazine.

[0015] According to an embodiment, the magazine is a linearly movable structure. Then the magazine comprises several bit space arranged in linear configuration. Then the structure of the magazine may be simple.

[0016] According to an embodiment, the magazine is a rotating structure movable around rotation axis. The rotating magazine may have compact structure whereby placing of the magazine is easy.

[0017] According to an alternative embodiment, the magazine is a non-movable structure. Then an internal structure of the magazine is provided with the several bit spaces and there is a feed device inside the magazine for moving the drill bits between the bit spaces and the bit change position. In other words, a frame of the magazine is fixed and inside the magazine are means for storing and handling the drill bits so that they can be collected and returned to one predetermined position which is the bit change position.

[0018] According to an embodiment, the magazine is configured to store and handle only new or serviced drill bits. Then used worn or broken drill bits are removed and placed somewhere else than to the magazine. The used drill bits can be collected to a separate storage basket or may be dropped on the ground and collected later, for example.

[0019] According to an embodiment, the magazine comprises a frame and a bit receiving structure supported to the frame and comprising several bit spaces. The bit receiving structure is made at least partly of resilient material so that at least the bit spaces are limited

by the resilient material thereby providing friction locking surfaces towards the drill bits insertable inside the bit spaces. In other words, the magazine is provided with a simple and inexpensive system for holding the drill bits inside the bit spaces.

[0020] According to an embodiment, the bit receiving structure is made of polymer material, such as polyurethane.

[0021] According to an embodiment, the bit receiving structure may be a changeable wear part which can be easily and quickly removed from the frame and changed.

[0022] According to an alternative embodiment, the bit spaces are provided with spring elements or separate friction elements for holding the drill bits.

[0023] According to an embodiment, the rock drilling rig comprises at least one control unit for controlling movements of the drilling boom and the drilling unit. The control unit uses a coarse positioning phase and a fine positioning phase when moving the drilling unit towards the bit change position. The coarse positioning phase comprises movement control steps for moving the drilling unit close to the guide surfaces of the bit change position. The fine positioning phase comprises movement control steps for moving the drilling unit with limited speed rate and along the guide surfaces to the bit change position. In other words, the drilling unit is moved automatically to the bit change position. In the coarse positioning phase the drilling unit can be moved with greater movement speed close to the guide surfaces and from thereon with slower movement speed and in physical guidance of the guided surfaces.

[0024] In the coarse positioning phase several alternative free movement paths defined by the control unit can be implemented, whereas in the fine positioning phase only one guided movement path defined by the guide surfaces is implemented.

[0025] According to an alternative embodiment, the drilling boom and the rock drilling unit are manually controlled. Then an operator positions the drilling boom close to the guide surfaces and continues positioning thereafter under physical guidance of the guide surfaces. Structure of the guide surfaces can be designed so that good visibility to the front part of the feed beam is ensured during the positioning.

[0026] According to an embodiment, the magazine is mounted on the carrier. On the carrier there may be available space for placing the magazine. Further, weight of the magazine and the drill bits is not directed to the drilling boom.

[0027] According to an embodiment, the rock drilling rig comprises two or more booms, wherein at least one of the booms is the drilling boom and at least one another boom is a neighboring boom. The magazine is mounted to a structure of the neighboring boom. In other words, there are two or more booms on the carrier and the magazine is mounted to the neighboring boom so that it can serve the rock drilling unit mounted to drilling boom.

[0028] The magazine can be mounted to any kind of

boom of the rock drilling rig. The boom provided with the magazine may then be a drilling boom, a bolting boom, a man gage boom, or an additional boom used for charging, or executing other measures in the mine.

[0029] According to an embodiment, the rock drilling rig comprises at least two drilling booms provided with the rock drilling units. Then at least one magazine is mounted to at least one drilling boom or to at least one feed beam of the at least one rock drilling unit.

[0030] In other words, there may be a first boom unit and second boom unit both comprising drilling booms and rock drilling units. A first boom unit may be provided with a first magazine serving for the second boom unit, and the second boom unit may be provided with a second magazine for serving the first boom unit. Thus, both boom units are holding the magazines for the neighboring boom units.

[0031] According to an embodiment, the magazines are mounted on a bottom of the drilling boom.

[0032] According to an embodiment, the magazines are mounted on a bottom of the feed beam.

[0033] According to an embodiment, the rock drilling rig is a long hole rock drilling rig for drilling production drill holes in transverse direction in relation to longitudinal axis of the carrier. The rock drilling rig comprises one drilling boom provided with a ground support for supporting the drilling boom vertically against a floor of an underground tunnel and the rock drilling unit is mounted rotatably to the drilling boom by means of a horizontal rotation joint thereby allowing the drilling of the transverse directed drill holes. The magazine is mounted to the drilling boom and the rock drilling unit is turnable in relation to the horizontal rotation joint to face towards the magazine.

[0034] In other words, the relative positions of the boom mounted magazine and the rock drilling unit are so arranged that the rock drilling unit can be directed by turning it in relation to the horizontal rotation joint towards the magazine. Thus, the turning movement of the rock drilling unit serves as a simple coarse positioning phase and when the rock drilling unit is aligned with the bit change position, then the feed beam can be moved forwards in assistance with the physical guide surfaces.

[0035] The positioning of the rock drilling unit to the bit change position can be executed with relatively simple movements, quick and reliably.

[0036] According to an embodiment, the rock drilling rig is the above mentioned long hole rock drilling rig, and the bit change position of the magazine is facing upwards. Then the drilling unit can be simply turned so that it is facing downwards towards the upwards directed bit change position. The upwards directed position of the bit change position may be vertical or upwardly inclined position.

[0037] According to an embodiment, the rock drilling rig is the above mentioned long hole rock drilling rig, and loosening of connecting screws of the drill bits by means of impact pulses is configured to be executed when the drill bits are in the magazine.

[0038] The loosening of the drill bit in the magazine and the use of impact pulses is possible since the magazine is well supported. The magazine is supported to the drilling boom which is supported to the ground by means of the ground support. Then the forces of the loosening are directed via the magazine and the drilling boom to the ground. Of course, the magazine is designed to tolerate the impact pulses and other forces which may be directed to the magazine when loosening the connecting threads.

[0039] According to an embodiment, the disclosed solution relates also to a method of handling drill bits in a rock drilling rig. The method comprises: storing several drill bits in at least one drill bit magazine; handling the drill bits by moving a drilling boom and a rock drilling unit mounted to the drilling boom; and positioning the rock drilling unit to the magazine for at least taking the drill bits from the magazine. The method further comprises positioning the rock drilling unit under physical guidance to a bit change position of the magazine which is provided with physical guide surfaces defining predetermined position and orientation for the rock drilling unit at the bit change position.

[0040] The above disclosed embodiments may be combined in order to form suitable solutions having those of the above features that are needed.

Brief description of the figures

[0041] Some embodiments are described in more detail in the accompanying drawings, in which

Figure 1 is a schematic side view of a rock drilling rig provided with means for storing and handling drill bits,

Figure 2 is a schematic top view of a rock drilling unit positioned close to a linearly movable drill bit magazine,

Figure 3 is a schematic top view of a rock drilling unit positioned close to a rotationally movable drill bit magazine,

Figure 4 is a schematic side view showing a drill bit magazine mounted on a carrier of a rock drilling rig,

Figures 5 - 7 are schematic views showing some constructions of possible physical guide surfaces for guiding a rock drilling unit to a bit change position,

Figure 8 is a schematic diagram showing some features regarding a manual positioning and an automated positioning when gathering drill bits from a drill bit magazine,

Figures 9 and 10 are schematic top views of two neighbouring rock drilling units collecting new drill bits in a diagonal manner,

Figures 11 and 12 are schematic side views of a long-hole rock drilling rig in a drilling position and in a drill bit change position,

Figure 13 is a schematic side view of drill bit magazine comprising resilient material for holding a drill bit in place inside the magazine, and

Figures 14 - 17 are schematic top views of some alternative structures for guide surfaces and positioning control movements.

[0042] 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

[0043] Figure 1 shows a rock drilling rig 1 comprising a carrier 2, at least one drilling boom 3 and a drilling unit 4 at a distal end portion of the boom 3. The drilling unit 4 comprises a feed beam 5 and a rock drilling machine 6 supported on the feed beam 5 and arranged to be move longitudinally along drilling axis DA by means of a feed device. Drilling tools 7, such as drill rods 8 and drill bits 9 may be fastened to the drilling machine 6 for directing impact pulses and rotation to rock surface being drilled. The drill bits 9 wear and may be damaged, wherefore there is a need to provide new drill bits 9 for ensuring efficient rock drilling.

[0044] The rock drilling rig 1 is provided with one or more drill bit magazines 10 for storing several drill bits 9. The drill bit magazine 10 may be designed for receiving used drill bits and for offering new drill bits, or alternatively it may be designed for storing only new drill bits and the used drill bits may be dropped on a floor of a mine space, for example. In Figure 1 several possible locations for the drill bit magazines 10 are shown. The drill bit magazines 10 may be mounted to the drilling boom 3, to the feed beam 5, or on the carrier 2. The drill bit magazine 10 is provided with means for assisting positioning measures of the drilling boom and the rock drilling unit 4 properly so that drill bit changing measures are facilitated and quickened. The assisting means may be either part of the drill bit magazine, in connection with the drill bit magazine, or separate elements or structures arranged close to the drill bit magazine 10. For clarity reasons the guiding and assisting means are not shown in Figure 1.

[0045] Figure 1 further discloses that the rock drilling rig 1 may be controlled manually by means of an on-board operator 11, or it may be remote controlled from a control room 12 under control of a remote-operator 13. For the remote control there may be scanners and cameras 14 for providing needed data for the remote-operator 13. A remote control unit RCU is for communicating with a control unit CU of the rock drilling rig 1. The drill bit changing operation is a demanding task for the on-board operator 11 and especially for the remote-operator 13 only provided with scanner or camera data. The rock drilling rig 1 may also be an automatic device controlled by the control unit CU. Then a control system executes the drill bit change measures based on sensing data and scanners. Accurate positioning to the drill bit magazine is very demanding task also for the automated control system. Therefore, the disclosed solution provides as-

sistance and improvement for all of these differently controlled rock drilling rigs 1.

[0046] Figure 2 discloses a rock drilling unit 2 which is positioned at a distance from a drill bit magazine 10 comprising several bit spaces 11 wherein drill bits 9 can be stored. The drill bit magazine 10 can be moved linearly L by means of an actuator 12 so that selected bit space 11 can be positioned to a bit change position 13. The actuator 12 for moving or indexing the drill bit magazine 10 may be a hydraulic cylinder, hydraulic motor, or any other suitable device. In connection with the bit change position 13 there are physical guide surfaces 14 defining predetermined position and orientation for the rock drilling unit 2 at the bit change position 13. The physical guide surfaces 14 assist movement of the rock drilling unit 2 correctly to the bit change position 13 by providing physical guidance and support. Thus, the physical guide surfaces 14 can direct a feed beam 5 at an end phase of the positioning correctly so that drilling axis DA is orientated to the predetermined bit change position 13 and allow thereby collecting drill bits 9 therefrom. A rock drilling machine 6 can be moved on the feed beam 5 by means of a feed device in forward and reverse direction when the drill bits 9 are handled, and a rotation device of the rock drilling machine 6 can be rotated selectively in both rotation directions for coupling and uncoupling connection threads between a drill tube 8 and the drill bit 9.

[0047] Figure 3 discloses a solution which differs from the one shown in Figure 2 in that there is a rotating drill bit magazine 10 which can be indexed by means of an actuator 12 being or a rotation device, such as a hydraulic motor. Then the drill bit magazine 10 can be rotated R around rotation axis 15 so that desired bit space 11 can be positioned to a bit change position 13. A rock drilling unit 2 is guided to the bit change position 13 by means of guide surfaces 14 providing physical positioning support.

[0048] Figure 4 discloses that a drill bit magazine 10 and physical guide surfaces 14 may be mounted on a carrier 2 of a rock drilling rig. Then a rock drilling boom is provided with joints allowing a rock drilling unit to be turned towards the carrier and to execute change of the drill bit. The drill bit magazine 10 may comprise several bit spaces and may be movable in relation to a bit change position 13.

[0049] Figure 5 discloses physical guide surfaces 14 having an integrated structure shape of which is resembling a funnel 16 or cone piece. There is bottom serving as a stop element 17 against which a front end of a feed beam 5 can be moved in a longitudinal direction. Slanting surfaces 18 can provide guidance for the feed beam 5 when being positioned towards the stop element 17. At a front end of the feed beam 5 may be shaped surfaces 19 which can facilitate the guidance, and which are designed to tolerate forces directed to them under physical guidance.

[0050] Figure 6 discloses two separate physical guide surfaces 14 wherein each of them comprises a stop element 17 and a slanting surface 18 integrated to be

one piece. Number of the separate guide surfaces 14 may be one, two or more. Further, a front end portion of a feed beam 5 may be provided with guide pieces 20 for facilitating guidance of the feed beam 5 and for protecting a basic structure of the feed beam 5.

[0051] Figure 7 discloses physical guide surfaces 14 comprising one or more slanting surfaces 18 and a stop element 17. A feed beam 5 may comprises one or more guide pieces 20.

[0052] Figure 8 discloses some features relating to drill bit change operation and control of a rock drilling unit. The rock drilling rig can be positioned to a drill bit magazine by means of manually controlled movements 21 or automatically controlled movements 22. In the manual control 21 an operator 23 controls the rock drilling unit either on-board or remotely. The operator 23 has directed visibility to the drill bit magazine or is provided with camera views are provided for the control. There are physical guide surfaces 14 for facilitating accurate positioning to a bit change position at the drill bit magazine at a final phase of the positioning movement.

[0053] In the automatic control 22 a control unit CU comprises a processor wherein is executed a control algorithm 24 or computer program product for controlling the positioning movements. The automatic control 22 comprises a coarse positioning phase 25 and a fine positioning phase 26. In the coarse positioning phase 25 the rock drilling rig is moved along free movements paths defined by the control unit CU and proved by a collision examination 27. During the coarse positioning phase 25 fast speed movements 28 can be implemented. After the coarse positioning phase 25 is completed and the rock drilling unit is positioned close to the drill bit magazine, the fine positioning phase 26 is initiated. Then the control unit CU implements slow movement speed 29 and the physical guide surfaces 14 when positioning the rock drilling unit accurately to the bit change position.

[0054] The drill bit change may also include control measures 30 of an actuator of a drill bit magazine. The actuator may be controlled manually by the operator or automatically under control of the control unit.

[0055] Figures 9 and 10 disclose that a rock drilling rig may comprise a first drilling boom 3a provided with a first rock drilling unit 4a and a neighboring second drilling boom 3b provided with a second rock drilling unit 4b. There may be drill bit magazines 10 together with physical guide surfaces 14 mounted to feed beams 5 of the rock drilling units 4a and 4b. In Figure 9 the first rock drilling unit 4a is executing drilling and the second rock drilling 4b is moving towards a bit change position at the drill bit magazine 10a located on the feed beam 5a on of the first rock drilling unit 4a. The physical guide surfaces 14 make final steps of the positioning easier. Alternatively, or in addition to, the boom 3a may also comprise a drill bit magazine 10c. In Figure 10 the first rock drilling unit 4a is coarse positioned close to the drill bit magazine 10b mounted to a feed beam 5b of the second rock drilling unit 4b. Thus, the drill bit magazines 10a, 10c; 10b can

serve neighboring drilling units 4b; 4a in a diagonal manner.

[0056] Figures 11 discloses in a drilling position a long hole or production rock drilling rig 1 for drilling production drill holes in transverse direction in relation to longitudinal axis of a carrier 2. The rock drilling rig 1 comprises one drilling boom 3 provided with a ground support 31 for supporting the drilling boom 3 vertically against a floor 32 of an underground tunnel 33. A rock drilling unit 4 is mounted rotatably to the drilling boom 3 by means of a horizontal rotation joint 34 thereby allowing the drilling of the transverse directed drill holes. A drill bit magazine 10 is mounted to the drilling boom 3. The magazine 10 and physical guide surfaces 14 may be located on the ground support 31 whereby they are well supported against the floor 32. The rock drilling unit 4 is turnable in relation to the horizontal rotation joint 34 to face towards the magazine 10 and the guide surfaces 14. Then a feed beam may be moved longitudinally towards the guide surfaces 14 which guide the drilling unit 4 to a correct bit change position.

[0057] Figure 13 discloses a drill bit magazine 10 mounted on a bottom surface 35 of a feed beam 5. The magazine 10 may be directed in a longitudinal direction of the feed beam 5 whereby the feed beam receives well possible additional loadings. Alternatively, it may be slightly angled in relation to the feed beam for improving accessibility.

[0058] The magazine 10 comprises a frame 36 and a bit receiving structure 37 supported to the frame 36 and comprising several bit spaces 11 for receiving drill bits 9. The bit receiving structure 37 is made at least partly of resilient material so that at least the bit spaces 11 are limited by the resilient material thereby providing friction locking surfaces towards the drill bits 9 inserted inside the bit spaces 11.

[0059] The magazine 10 may comprise fast locking means allowing the bit receiving structure 37 to be removed easily and changed. It is also possible that the bit receiving structure 37 is loaded with new drill bits and thereafter mounted in one unity to the frame 36. Thus, the magazine 10, when being emptied, can be quickly provided with a replacement setting of new drill bits preloaded into the bit spaces 11.

[0060] Figure 14 discloses guide surfaces 14 having L-shaped configuration and comprising a stop surface 17 and a side surface 38 integrated to one piece. A feed beam 5 may comprise guide pieces 39. In a coarse positioning phase the feed beam 5 may be moved against the side surface 38, as it is shown in Figure 14. Then the feed beam 5 is oriented in accordance with the side surface 38. In a fine positioning phase, the feed beam 5 may be moved longitudinally along the side surface 38 towards the stop surface 17, as it is shown in Figure 15.

[0061] Figures 16 and 17 disclose a solution that differs from the one shown in Figures 14 and 15 in that the structure of the guides surfaces 14 is different. In Figures 16 and 17 the guide surfaces 14 comprise a stop surface

element 40 and a side surface element 41 which are separate pieces. The positioning measures may be similar as in Figures 14 and 15.

[0062] 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 (1) for drilling drill holes to a rock surface,
wherein the rock drilling rig (1) comprises:

a movable carrier (2);
at least one drilling boom (3) mounted movably on the carrier (2) and provided with a rock drilling unit (4) comprising a feed beam (5) and a rock drilling machine (6) mounted movably on the feed beam (5); and

at least one drill bit magazine (10) for storing several drill bits (9) which are mountable and detachable to a drilling tool (7) mountable to the rock drilling machine (6);

characterized in that

in connection with the at least one magazine (10) there is a bit change position (13) provided with physical guide surfaces (14) defining predetermined position and orientation for the rock drilling unit (4) at the bit change position (13);
and wherein the rock drilling unit (4) is configured to be moved to the bit change position (13) under physical guidance provided by the physical guide surfaces (14).

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

the physical guide surfaces (14) at bit change position (13) comprise at least one stop element (17) against which a front end of the feed beam (5) is to be moved in longitudinal direction of the feed beam (5), and further, at least one slanting surface (18) for guiding the feed beam (5) towards the stop element (17) in predefined orientation.

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

the magazine (10) comprises several bit spaces (11) for receiving the drill bits (9) and the magazine (10) is movable by means of at least one actuator (12) in relation to the bit change position (13) for aligning each of the bit spaces (11) selectively with the bit change position (13).

4. The rock drilling rig as claimed in any one of the preceding claims 1 to 3, **characterized in that**

the magazine (10) comprises a frame (36) and a bit receiving structure (37) supported to the frame (36) and comprising several bit spaces (11);

and the bit receiving structure (37) is made at least partly of resilient material so that at least the bit spaces (11) are limited by the resilient material thereby providing friction locking surfaces towards the drill bits (9) insertable inside the bit spaces (11).

5. The rock drilling rig as claimed in any one of the preceding claims 1 to 4, **characterized in that**

the rock drilling rig (1) comprises at least one control unit (CU) for controlling movements of the drilling boom (3) and the rock drilling unit (4); the control unit (CU) is configured to implement a coarse positioning phase (25) and a fine positioning phase (26) when moving the rock drilling unit (4) towards the bit change position (13); and wherein the coarse positioning phase (25) comprises movement control steps for moving the rock drilling unit (4) close to the guide surfaces (14) of the bit change position (13), and the fine positioning phase (26) comprises movement control steps for moving the rock drilling unit (4) with limited speed rate (29) and along the guide surfaces (14) to the bit change position (13).

6. The rock drilling rig as claimed in any one of the preceding claims 1 to 5, **characterized in that** the magazine (10) is mounted on the carrier (2).

7. The rock drilling rig as claimed in any one of the preceding claims 1 to 5, **characterized in that**

the rock drilling rig (1) comprises at least two booms, wherein at least one of the booms is the drilling boom (3) and at least one another boom is a neighboring boom; and the magazine (10) is mounted to a structure of the neighboring boom.

8. The rock drilling rig as claimed in any one of the preceding claims 1 to 5, **characterized in that**

the rock drilling rig (1) comprises at least two drilling booms (3a, 3b) provided with the rock drilling units (4a, 4b); and wherein at least one magazine (10) is mounted to at least one drilling boom (3a, 3b) or to at least one feed beam (5a, 5b) of the at least one rock drilling unit (4a, 4b).

9. 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 a long hole rock drilling rig (1) for drilling production drill holes in transverse direction in relation to longitudinal axis of the carrier (2);

and wherein the rock drilling rig (1) comprises one drilling boom (3) provided with a ground support (31) for supporting the drilling boom (3) vertically against a floor (32) of an underground tunnel (33) and the rock drilling unit (4) is mounted rotatably to the drilling boom (3) by means of a horizontal rotation joint (34) thereby allowing the drilling of the transverse directed drill holes;

and wherein the magazine (10) is mounted to the drilling boom (3) and the rock drilling unit (4) is turnable in relation to the horizontal rotation joint (34) to face towards the magazine (10).

10. A method of handling drill bits (9) in a rock drilling rig (1), wherein the method comprises:

storing several drill bits (9) in at least one drill bit magazine (10);

handling the drill bits (9) by moving a drilling boom (3) and a rock drilling unit (4) mounted to the drilling boom (3); and

positioning the rock drilling unit (4) to the magazine (10) for at least taking the drill bits (9) from the magazine (10);

characterized by

positioning the rock drilling unit (4) under physical guidance to a bit change position (13) of the magazine (10) which is provided with physical guide surfaces (14) defining predetermined position and orientation for the rock drilling unit (4) at the bit change position (13).

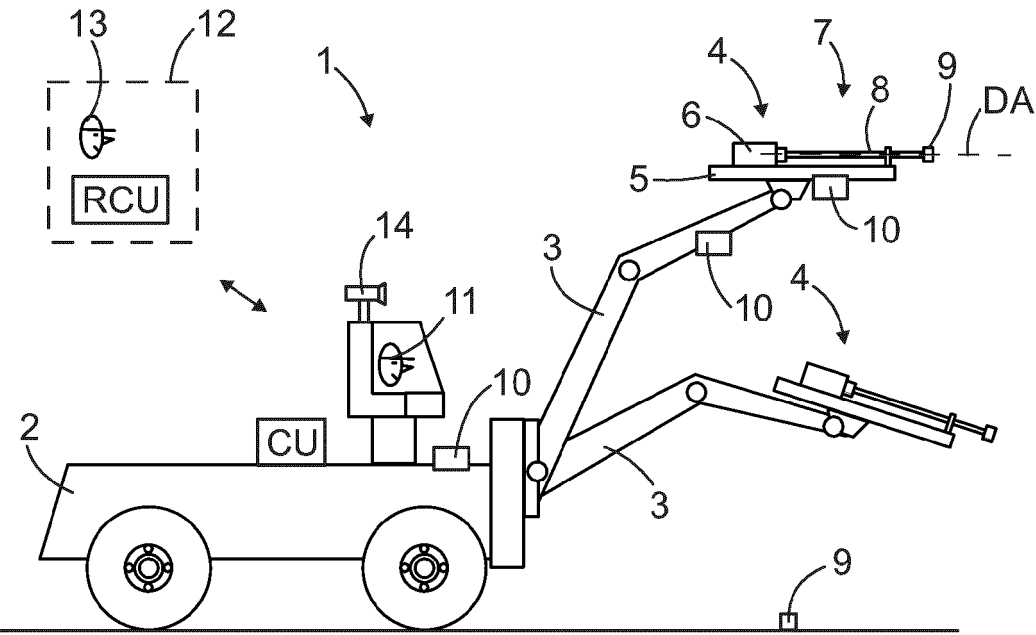


FIG. 1

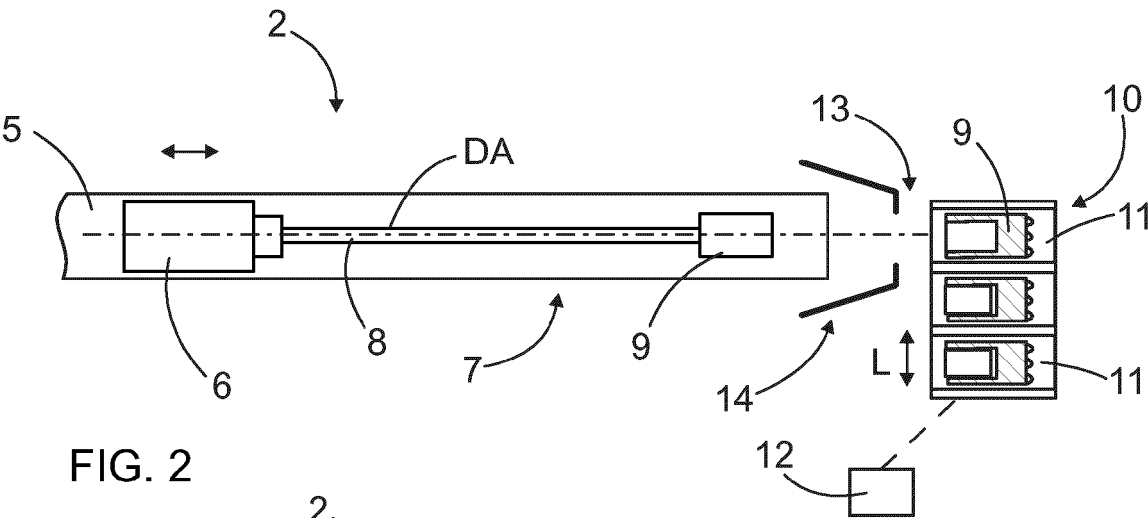


FIG. 2

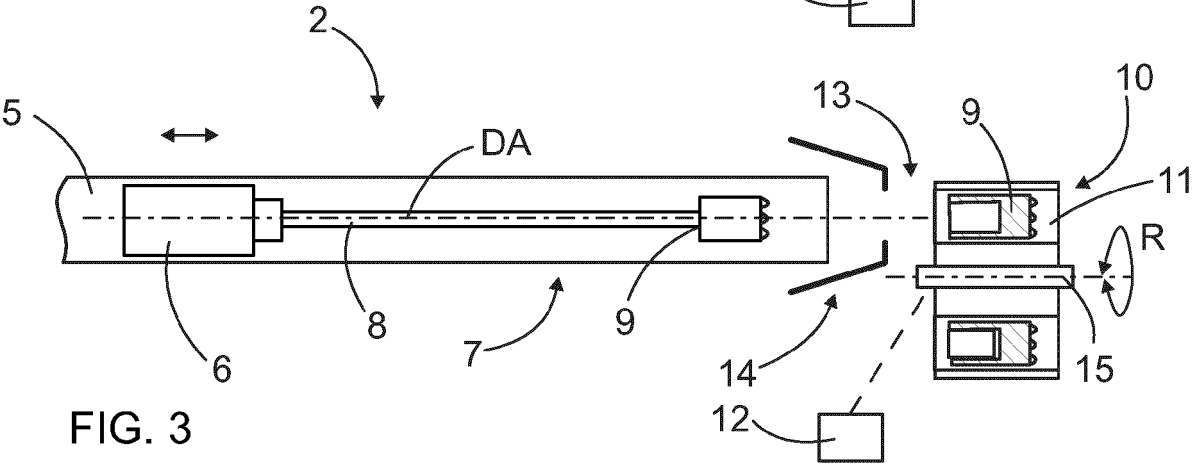
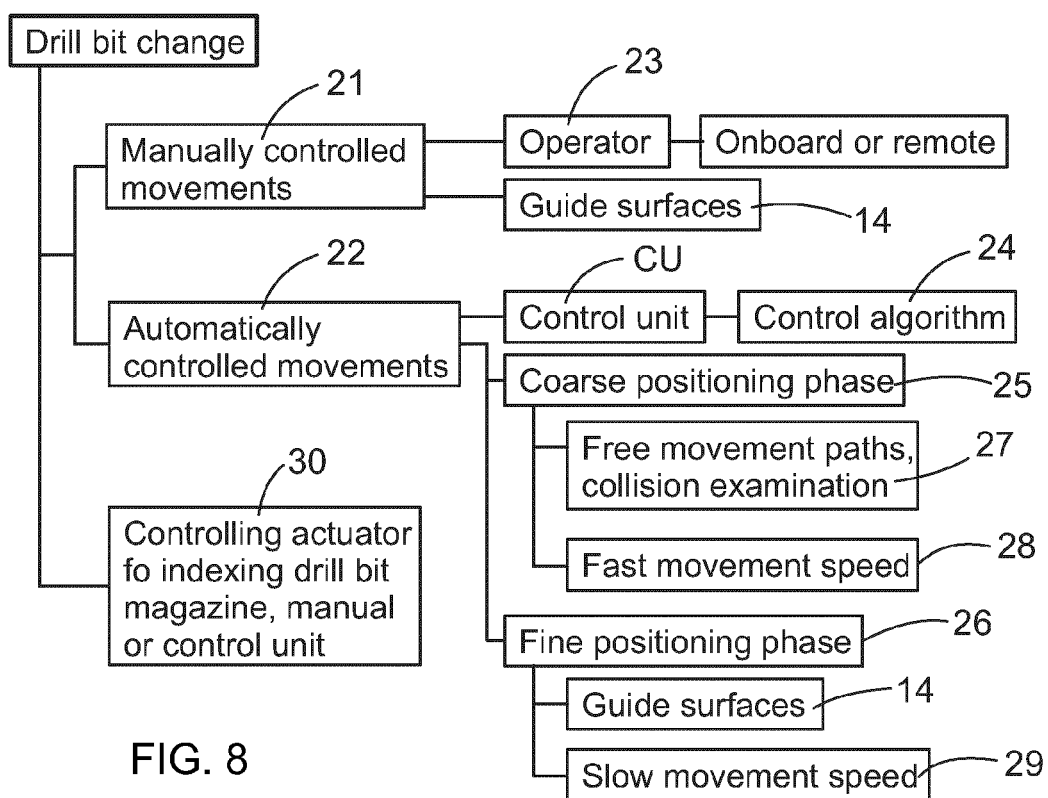
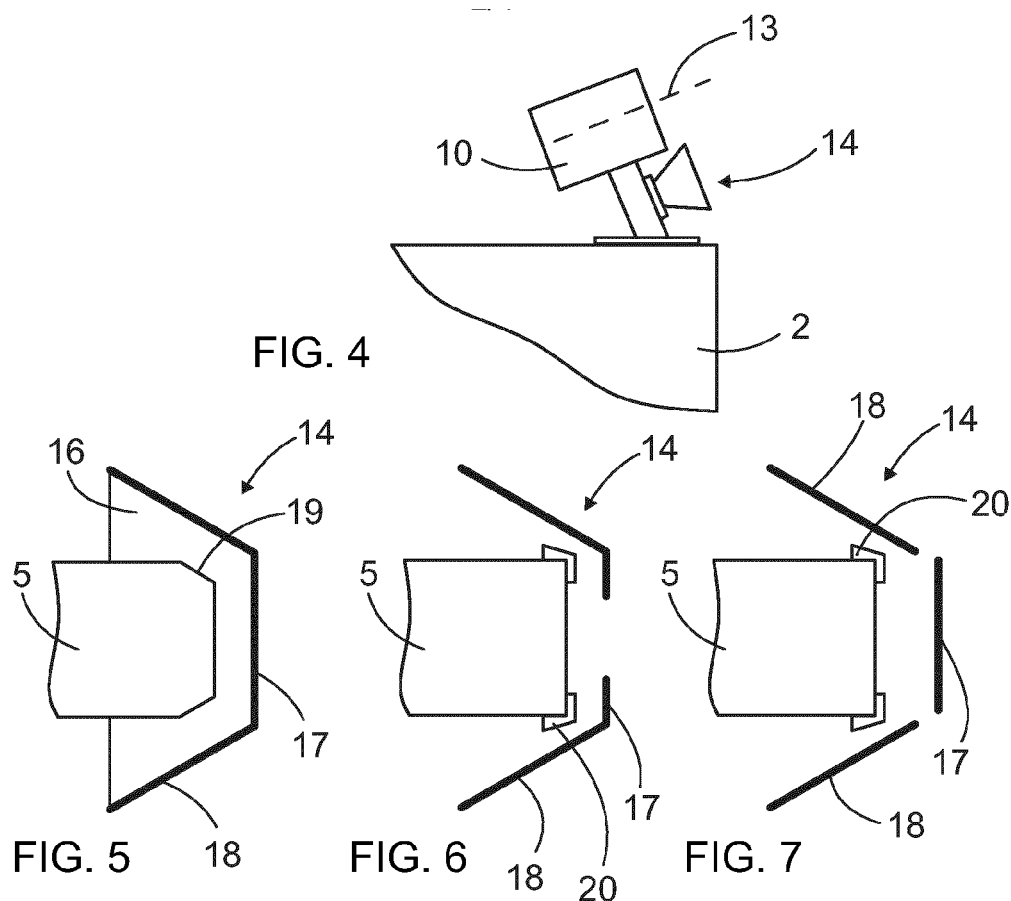
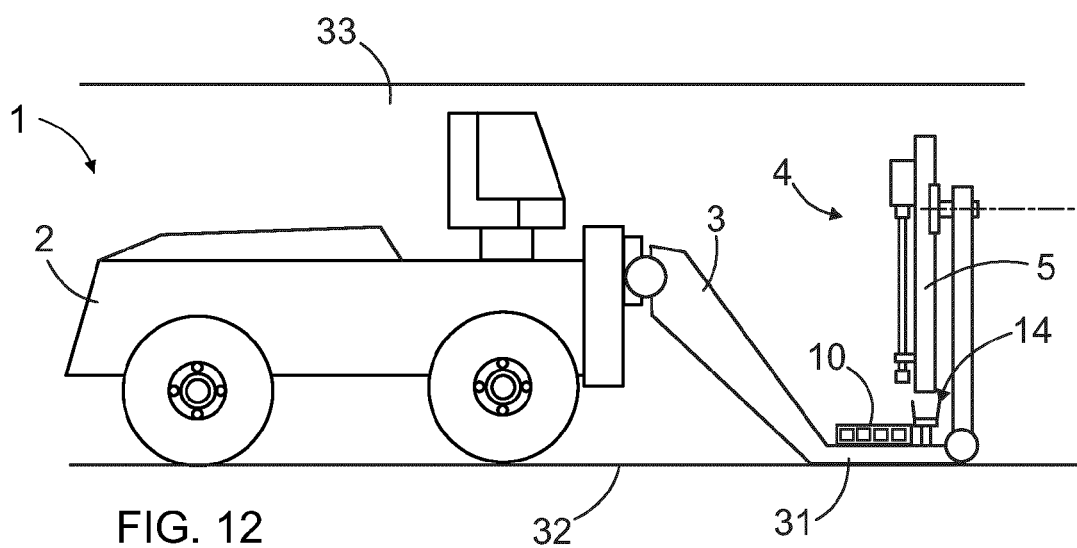
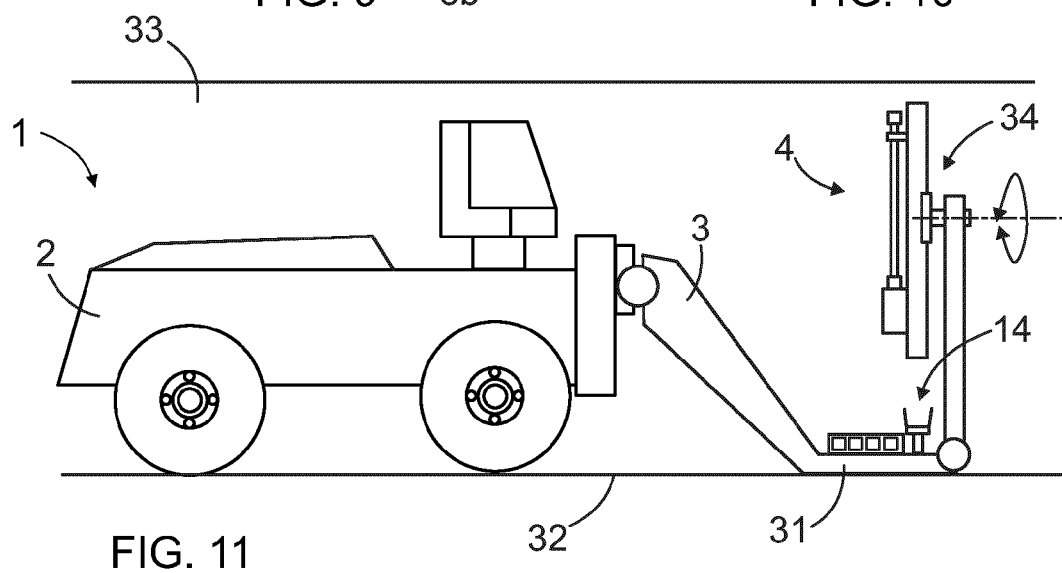
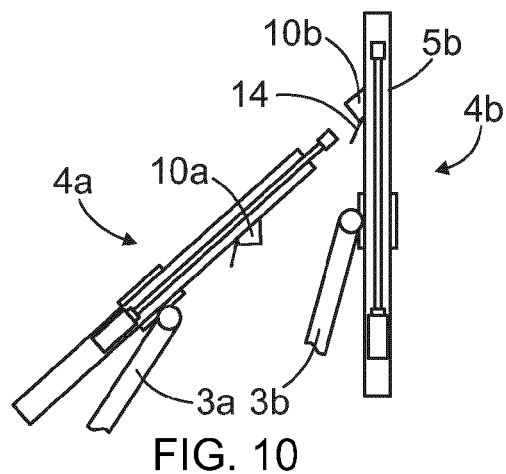
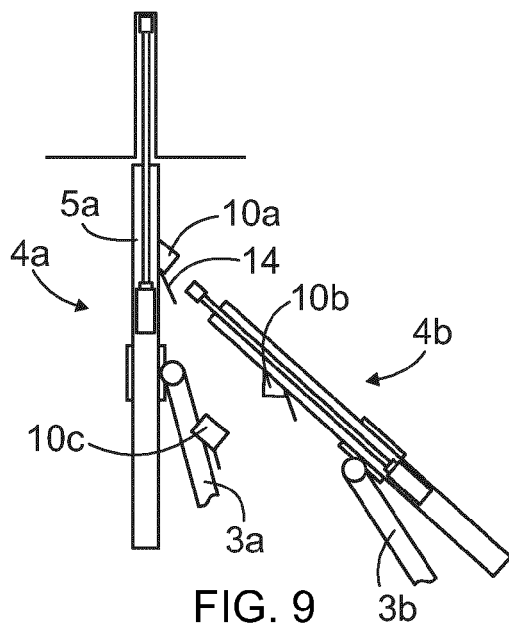
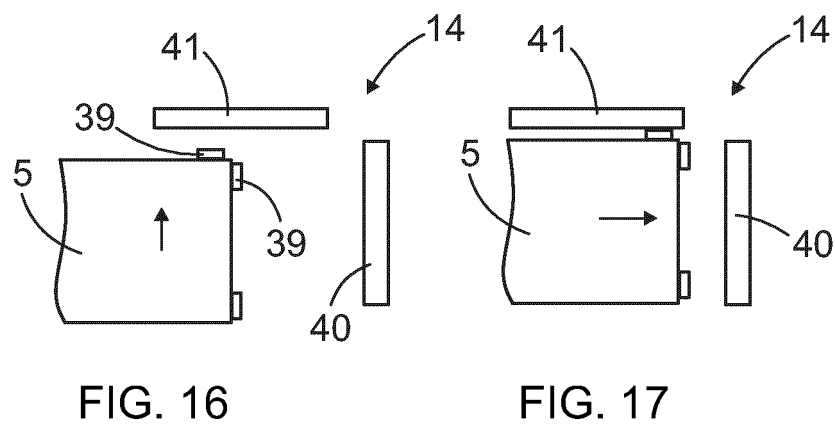
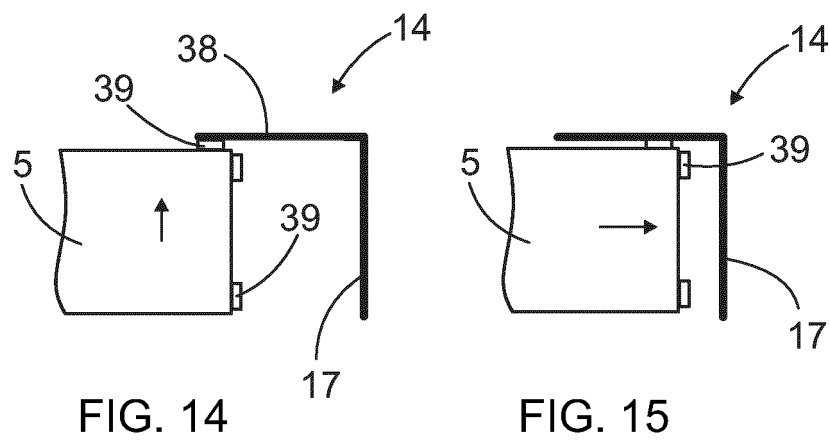
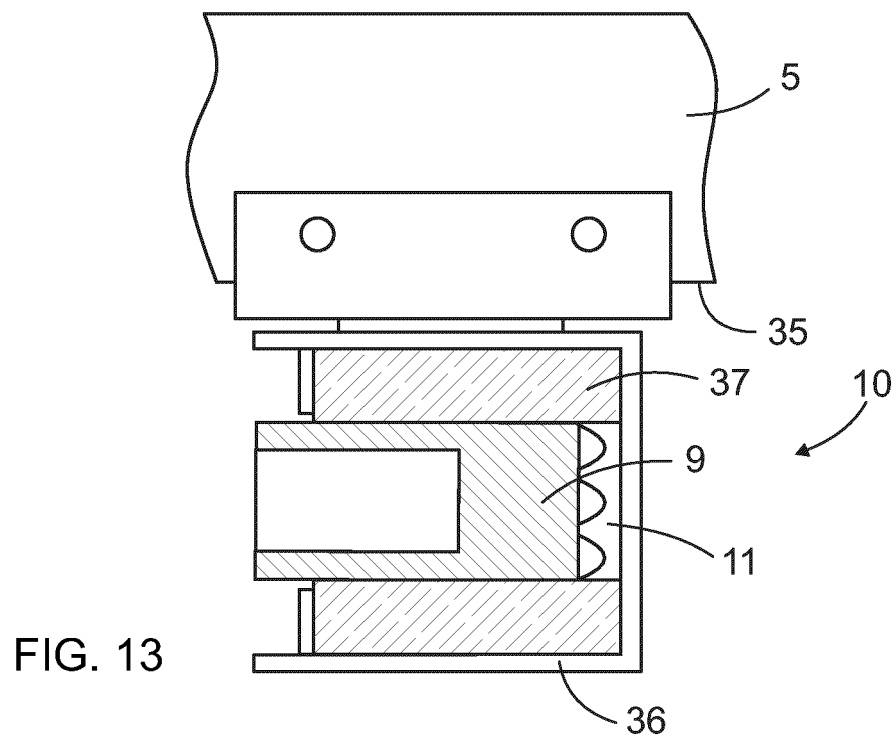


FIG. 3









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