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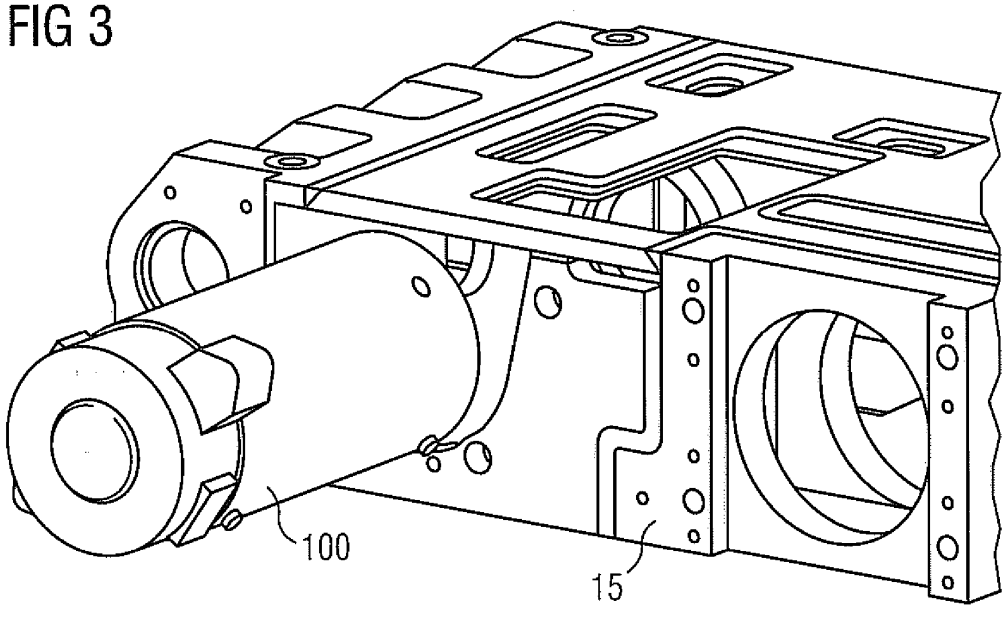
(54) Shearer loader for underground mining with bearing units within mainframe

(57) The present disclosure refers to a shearer loader (10) for underground mining. A shearer loader (10) may comprise a mainframe (15) extending in a longitudinal axis and having a first end portion (30) and a second end portion (35) opposite the first end portion (30). A ranging arm (20, 25) may be swivel-mounted at least at one of the first and second end portions (30, 35) of the mainframe (15), the ranging arm (20, 25) being provided with at least one cutting drum (40, 45) pivot-mounted at the ranging arm (20, 25). At least one shearer loader component (100) may be configured to be mounted to the mainframe (15) in a removable manner, but fixedly mounted to the mainframe (15) during operation of the shearer loader (10). At least one bearing unit (115) might be arranged at the mainframe (15) at such a position that the at least one bearing unit (115) supports the at least one shearer loader component (100) when it is moved with respect to the mainframe (15) during assembly or disassembly.

FIG 3



EP 2 905 421 A1

Description

Technical Field

[0001] The present disclosure refers in general to a shearer loader for underground mining. More particularly, the disclosure refers to a shearer loader comprising a mainframe extending in a longitudinal axis and having a first end portion and a second end portion opposite the first end portion. A ranging arm is swivel-mounted at least at one of the first and second end portions of the mainframe. The ranging arm may be provided with at least one cutting drum pivot-mounted at the ranging arm. At least one shearer loader component is configured to be mounted at the mainframe in a removable manner, for example a haulage motor or an electrical control box.

[0002] Further, the present disclosure refers to a method for assembly a shearer loader component at the mainframe of the shearer loader. In addition, the present disclosure refers to a method for disassembly a shearer loader component from a mainframe of the shearer loader.

Background

[0003] Shearer loaders for underground mining are also known as longwall shearers. Such shearers comprise a mainframe with fabricated structure to meet even the toughest mining conditions. During operation of a longwall shearer the mainframe is travelling along rails and the cutting drum rotates to cut the desired mineral, in particular underground coal. The cutting drum rotates about an axis perpendicular to the mine wall and includes vanes extending along the cutting drum. The ranging arm can raise the drum to mine material at different heights.

[0004] A longwall shearer having two cutting drums at different ends of the mainframe is for example shown in US 7,954,904 B2, US 2012/0267940 Al and AU-B-83820/91.

[0005] Due to the tough conditions during operation of longwall shearers large and/or heavy shearer components may have to be replaced. Assembly and removal of such major shearer components from the mainframe of the shearer shall be easy and safe. However, due to the fact that longwall shearers have different sizes, the mainframe and other major components of the shearer have different dimensions. Hence, sometimes the available clearance or free space for removal and assembly of such major components in or from the machine may be very small. The latter is particularly the case if the longwall shearer is a low height machine for low seams. In this case, the remaining clearance in the mainframe for the major components like e.g. a haulage motor is very small. Accordingly, the use of cranes and forklifts to handle the shearer components to be assembled or removed from the mainframe of the shearer could be problematic.

Summary of the Disclosure

[0006] In one aspect of the present disclosure, a shearer loader for underground mining is disclosed. A shearer loader may comprise a mainframe extending in a longitudinal axis and having a first end portion and a second end portion opposite the first end portion. A ranging arm may be swivel-mounted at least at one of the first and second end portions of the mainframe. The ranging arm is provided with at least one cutting drum pivot-mounted at the ranging arm. At least one shearer loader component might be configured to be mounted at the mainframe in a removable manner. Further, the shearer loader may comprise a bearing unit arranged at the mainframe at such a position that the bearing unit supports the at least one shearer loader component when it is to be moved with respect to the mainframe. Moving of the shearer loader component may be necessary if the component has to be mounted to or dismounted from the mainframe, i.e. for example if the component has to be replaced or a maintenance of that component is necessary

[0007] In another aspect of the present disclosure a method for assembly a shearer loader component at a mainframe of the shearer loader is disclosed. The method may comprise the method steps of putting the shearer loader component on a bearing unit provided at the mainframe of the shearer loader and moving, particularly rolling or sliding, the shearer loader component supported by the bearing unit to the desired location at the mainframe. In addition, the shearer loader component may be mounted to the mainframe.

[0008] Another aspect of the present disclosure refers to a method for disassembly a shearer loader component from a mainframe of the shearer loader. That method may comprise the steps of dismounting the shearer loader component from the mainframe and moving the same supported by a bearing unit provided at the mainframe of the shearer loader to a desired location. In addition, the method may comprise the method step of sliding the shearer loader component on the bearing unit to a desired location.

Brief Description of the Drawings

[0009]

[09] Fig. 1 is a schematic side view of an exemplary longwall shearer according to the present disclosure;

[10] Fig. 2 is a schematic font view of the longwall shearer of Fig. 1;

[11] Fig. 3 is a perspective view of a part of a mainframe of a longwall shearer shown in Fig. 1 and 2 and a haulage motor to be mounted thereon;

[12] Fig. 4 is a schematic perspective sectional view of a haulage motor at a mainframe of the longwall shearer of Figs. 1 and 2;

[13] Fig. 5 is a schematic perspective sectional view similar to that of Fig. 4, but the haulage motor is al-

ready moved;

[14] Fig. 6 is a further schematic perspective sectional view similar to that of Figs. 4 and 5, but the haulage motor is further moved to its final position;

[15] Fig. 7 is a schematic front view of the haulage motor on a bearing unit of the mainframe of the longwall shearer shown in Figs. 1 and 2;

[16] Fig. 8 shows a detail of the support of the haulage motor shown in Fig. 7;

[17] Fig. 9 shows another perspective view of an assembled haulage motor at the mainframe of the longwall shearer shown in Figs. 1 and 2;

[18] Fig 10 shows a perspective view of the haulage motor of Figs. 3-9;

[19] Fig. 11 is a schematic perspective view of a part of the mainframe of the longwall shearer of Fig. 1 and 2, where the haulage motor of Fig. 10 is to be mounted;

[20] Fig. 12 is a perspective top view of a bottom portion of that part of the mainframe shown in Fig. 11;

[21] Fig. 13 is a schematic perspective view of a bearing unit to be arranged at the mainframe of the longwall shearer of Figs. 1 and 2;

[22] Fig. 14 is another schematic perspective view of the bearing unit shown in Fig. 13 with an elevated upper bearing block;

[23] Fig. 15 is a schematic sectional view of the bearing unit shown in Figs. 13 and 14;

[24] Fig. 16 is a schematic perspective view of a roller element of a bearing unit shown in Figs 13 to 15.

Detailed Description

[0010] Fig. 1 shows a schematic side view of an exemplary embodiment of a longwall shearer 10 according to the present disclosure. The longwall shearer comprises a mainframe 15 and two ranging arms 20, 25. The two arranging arms 20, 25 are swivel-mounted at respective end portions 30, 35 of the mainframe 15. Both ranging arms 20, 25 are provided with cutting drums 40, 45. Each cutting drum 40, 45 is pivot-mounted at an end of the associated ranging arm 20, 25. The ranging arms 20, 25 and the respective cutting drum 40, 45 is adjustable to the height of a seam 50 to be mined.

[0011] Fig. 2 shows a schematic front view of the longwall shearer 10 of Fig. 1. As usual, the longwall shearer 10 runs on rails 60, 65 of a conveyer 55. The longwall shearer 10 is driven by a haulage motor 100 (not shown in Figs. 1 and 2) mounted within the mainframe 15 and connected to a gear for propelling longwall shearer 10 on a tooth rack 70. The tooth rack 70 extends along the rail 60 of conveyer 55.

[0012] The longwall shearer shown in Figs. 1 and 2 is adapted to load seams. For example, the longwall shearer 10 may cover seam heights from 63 to 126 inches (1.6 to 3.2 m). Due to the low seam shearer applications, the mainframe 15 of shearer loader 10 has to be quiet compact and, therefore, the assembly and disassembly of some major shearer loader components like, e.g. a haulage motor 100, might be difficult due to the weight and little space available for handling these components.

[0013] Particularly, haulage motor 100 may have to be assembled to the mainframe 15 of shearer loader 10 underground or has to be removed for maintenance purposes. Handling of such a shearer loader component like the haulage motor 100 by a crane or forklift could be difficult and even impossible.

[0014] As already mentioned before, the whole longwall shearer loader 10 moves on rails 60, 65 driven by a haulage motor 100, see for example Fig. 11. Such a haulage motor 100 may provide a maximum power rating of 100kW and has an overhaul weight of approximately 500 kg at the minimum. A haulage motor 100 configured to be used in a rather small longwall shearer loader 10 might have a diameter of at least 400 mm and a length of at least 900 mm. Haulage motors for other longwall shearer larger dimensions might be larger and heavier.

[0015] The haulage motor 100 has to be connected to a gear box located within mainframe 15, see for example Figs. 9 to 12. Fig. 12 shows a part of the mainframe 15 without haulage motor 100. Contrary to the view shown in Fig. 12, Fig. 10 shows a view including haulage motor 100 mounted to the mainframe 15.

[0016] Due to the weight and the dimensions and also due to the small clearance within mainframe 15, the assembly and disassembly of haulage motor 100 might be difficult to be carried out with known handling equipment.

[0017] Referring to Figs. 3-12, according to the present disclosure a bottom portion 105 of mainframe 15 located in front of a mounting flange 110 for a haulage motor 100 is provided with one or more bearing units 115. A fixed support flange 120 can be arranged on the bottom portion 105 such that the bearing units 115 are located between support flange 120 and mounting flange 110, see for example Figs. 4-6 and Fig. 12.

[0018] A bearing unit 115 is shown in more details in Figs. 13-16. Here, a bearing unit 115 comprises a lower bearing block 125 fixed to the bottom portion 105 of mainframe 15 by, for example, welding. As shown in Figs. 14 and 15, lower bearing block 125 comprises a center hole 145 and a flat upper face 160. An upper bearing block 130 comprises a flat lower face 165 and a centering pin 140. The centering pin 140 of the upper bearing block 130 fits in center hole 145 of lower bearing block 125.

[0019] In the exemplary embodiment of a bearing unit 115 shown in Figs. 13-15 four roller elements 135 are removably arranged on upper bearing block 130.

[0020] The principle structure of an exemplary embodiment of roller element 135 is shown in Fig. 16. The roller element 135 has a shaft 165 and an upper contact face 150. A lubricated roller 155 or ball is freely rotatable supported within the roller element 135.

[0021] Due to the above structure of a bearing unit 115 the upper bearing blocks can be replaced, if desired. The rollers 155 allow support of a load like, e.g., haulage motor 100 to be moved thereon in any desired direction par-

allel to the plane defined by upper bearing block 130. In addition, a load supported by one or more bearing units 115 may even be rotated around an axis extending parallel to the plane defined by the upper bearing block 130.

[0022] As shown in Figs. 14 and 15, the upper bearing block 130 can be lifted from the lower bearing block 125. Due to this configuration of an exemplary embodiment of a bearing unit 115 a shim (not shown) may be placed between the two faces 165 and 160 of the upper and lower blocks 130, 125. Dependent from the height of the shim the support height of the bearing unit 115 can be adjusted to the component to be supported.

[0023] Different longwall shearers 10 have different dimensions and, most likely, the haulage motors to be used therein have different dimensions, too. If the bearing units 115 shall be used in all kind of longwall shearers 10, the support height for the haulage motor 100 might be different.

[0024] Due to use of at least one shim to be placed between a lower bearing block and an upper bearing block, the same kind of bearing units can be used in different longwall shearers even if the respective haulage motors have different sizes. Of course, the same applies to other shearer loader components to be moved with respect to the frame during assembly or disassembly.

[0025] A mainframe according to the present disclosure may not only protect all the modular shearer loader components but also enables selective overhaul and modular unit exchange for the most efficient maintenance in the industry.

Industrial Applicability

[0026] Longwall shearers 10 disclosed herein are configured for underground mining. For maintenance haulage motor 100 may be removed from the mainframe 15 of the longwall shearer 10 and later be assembled again.

[0027] Referring now to Figs. 3 to 5, 7 and 8, the mounting process is explained in more details. As shown in Fig. 3, haulage motor 100 can be placed on support flange 120 by means of known equipment (not shown). Supported by support flange 120 the haulage motor is pushed horizontally in the direction to a mounting flange 110. Haulage motor 100 has finally be mounted to mounting flange 110 during operation of the longwall shearer 10.

[0028] Due to the arrangement of one or more bearing units 115 between support flange 120 and mounting flange 110, haulage motor 100 is supported across the whole distance to the mounting flange 110. Hence, it might not be necessary to use forklifts or similar devices for moving the haulage motor 100 up to mounting flange 110. As the bearing units 115 have for example roller elements 155, the forces necessary for pushing haulage motor 100 to mounting flange 110 are relatively low and a worker might easily handle the transport, although the clearance in the mainframe is very small.

[0029] The roller elements 155 allow movement of a load in all directions. Therefore, it might be very easy for a worker to rotate haulage motor 100 already pushed to the correct mounting position in the correct mounting orientation. When haulage motor 100 is correctly oriented, haulage motor can easily mounted to mounting flange 110 by for example bolts (not shown). That handling might be very difficult with support by means of common devices in the small clearance provided in the mainframe.

[0030] Although the preferred embodiments of this invention have been described herein, improvements and modifications may be incorporated without departing from the scope of the following claims.

Claims

1. A shearer loader (10) for underground mining, comprising:

   a mainframe (15) extending in a longitudinal axis and having a first end portion (30) and a second end portion (35) opposite the first end portion (30);
   a ranging arm (20, 25) swivel-mounted at least at one of the first and second end portions (30, 35) of the mainframe (15), the ranging arm (20, 25) being provided with at least one cutting drum (40, 45) pivot-mounted at the ranging arm (20, 25);
   at least one shearer loader component (100) configured to be mounted to the mainframe (15) in a removable manner, but fixedly mounted to the mainframe (15) during operation of the shearer loader (10); and
   at least one bearing unit (115) arranged at the mainframe (15) at such a position that the at least one bearing unit (115) supports the at least one shearer loader component (100) when it is moved with respect to the mainframe (15) during assembly or disassembly.

2. The shearer loader (10) of claim 1, the at least one bearing unit (115) including at least one lower bearing block (125) mounted to the mainframe (15) and an upper bearing block (130) configured to be engaged with the lower bearing block (125), the upper bearing block (130) supports at least one bearing element (135).

3. The shearer loader (10) of claim 2, the at least one lower bearing block (125) being fixedly mounted to the mainframe (15).

4. The shearer loader (10) of any one of the preceding claims, the at least one lower bearing block (125) including at least one engagement part (145) configured to be engaged with at least one corresponding engagement part (140) of the at least one upper bearing block (130).

5. The shearer loader (10) of any one of the preceding claims, wherein the bearing unit (115) comprises a plurality of ball bearings (135) and/or slide bearings.

6. The shearer loader (10) of any one of the preceding claims, wherein the bearing unit (115) is configured to be positioned at different heights with respect to the mainframe (15).

7. The shearer loader (10) of any one of claims 2 to 6, wherein a shim having a defined height is provided between the lower bearing block (125) and the upper bearing block (130) to provide support for the shearer loader component (100) dependent from the dimensions of the shearer loader component (100) to be supported.

8. The shearer loader (10) of any one of the preceding claims, the at least one shearer loader component is at least one of the group of components comprising a haulage motor (100), a power drive configured to swivel the at least one ranging arm, a power drive configured to pivot the at least one cutting drum (40, 45), and an electrical control box.

9. The shearer loader (10) of any one of the preceding claims, the at least one shearer loader component (100) has a mass of at least 200 kg, preferably more than 400 kg or 500 kg.

10. The shearer loader (10) of any one of the preceding claims, the at least one shearer loader component (100) has a length of at least 500 mm, particularly more than 800 mm, and/or a diameter of at least 200 mm, particularly more than 350 mm.

11. A method for assembly a shearer loader component (100) at a mainframe (15) of a shearer loader (10), the method comprising the method steps of:

putting the shearer loader component (100) on at least one bearing unit (115) provided at the mainframe (15) of the shearer loader (10);
moving the shearer loader component (100) supported by the at least one bearing unit (115) to the desired location at the mainframe (15).

12. The method of claim 11, further comprising:

mounting the shearer loader component (100) to the mainframe (15)

13. A method for disassembly a shearer loader component (100) from a mainframe (15) of a shearer loader (10), the method comprising the method steps of:

dismounting the shearer loader component (100) from the mainframe (15);
moving the shearer loader component (100) supported by at least one bearing unit (115) provided at the mainframe (15) of the shearer loader (10) to a desired location.

14. The method of claim 13, further comprising:

removing the shearer loader component (100) from the mainframe (15) of the shearer loader (10).

15. The method of any of claims 11 to 14, further comprising:

rotating the shearer loader component (100) on the at least one bearing unit (115).

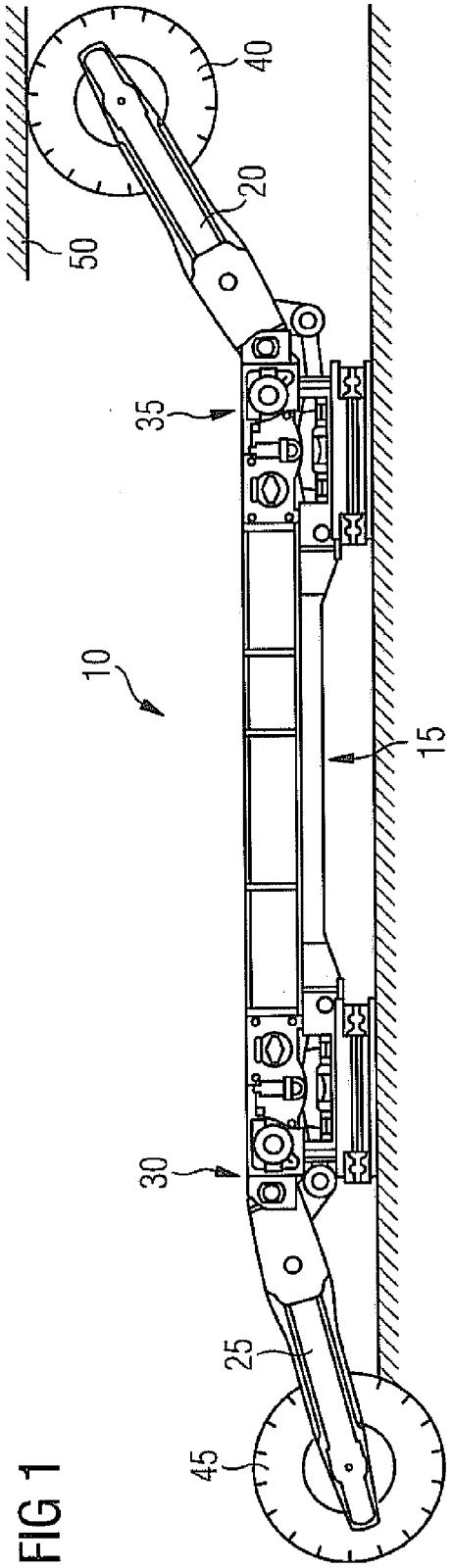


FIG 1

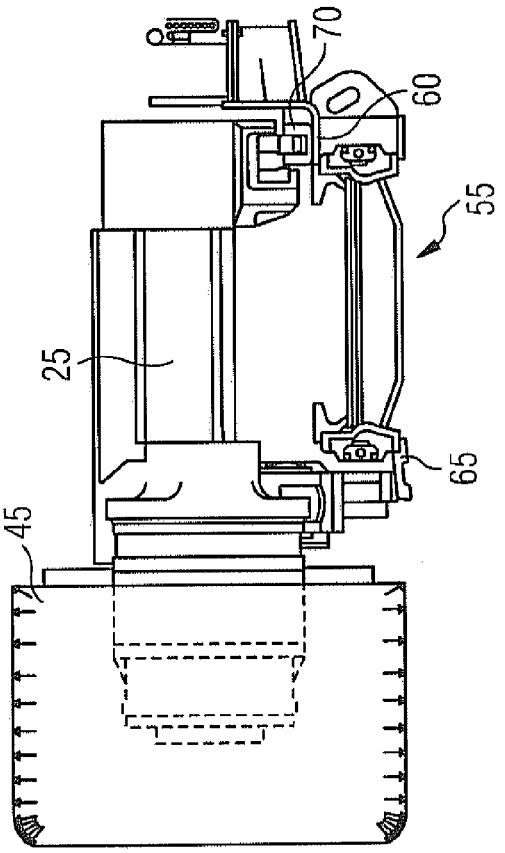


FIG 2

FIG 3

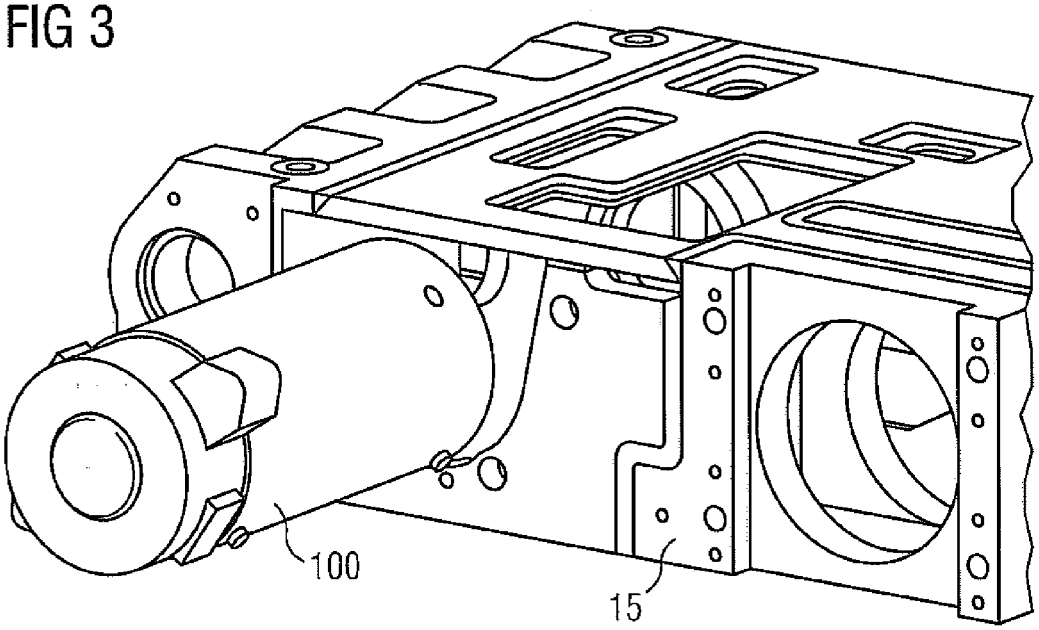


FIG 4

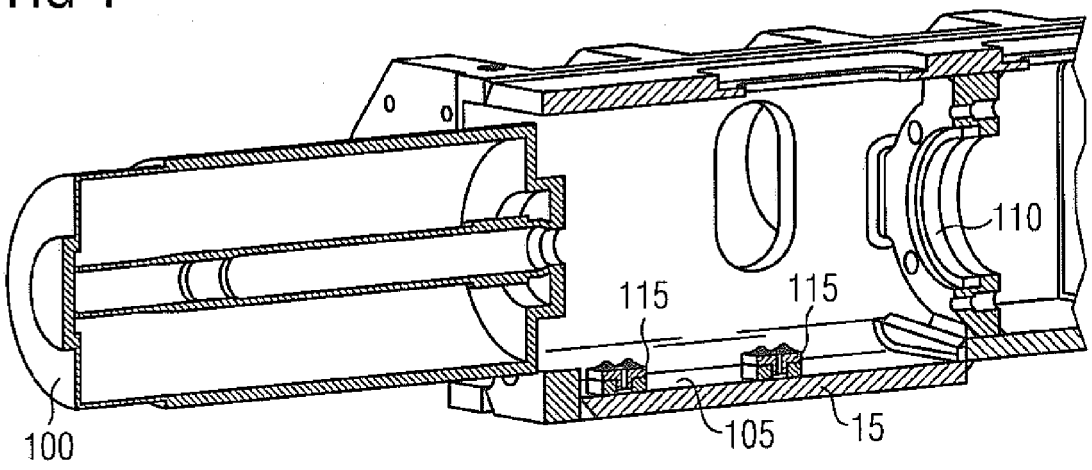


FIG 5

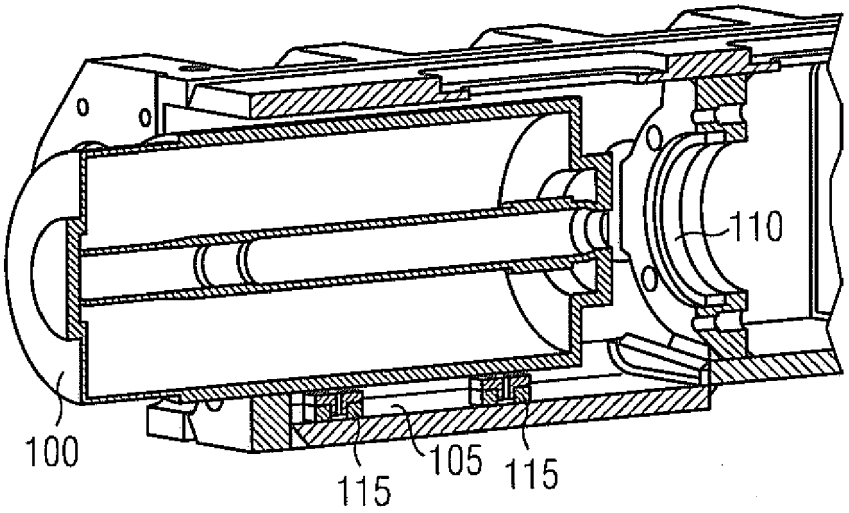


FIG 6

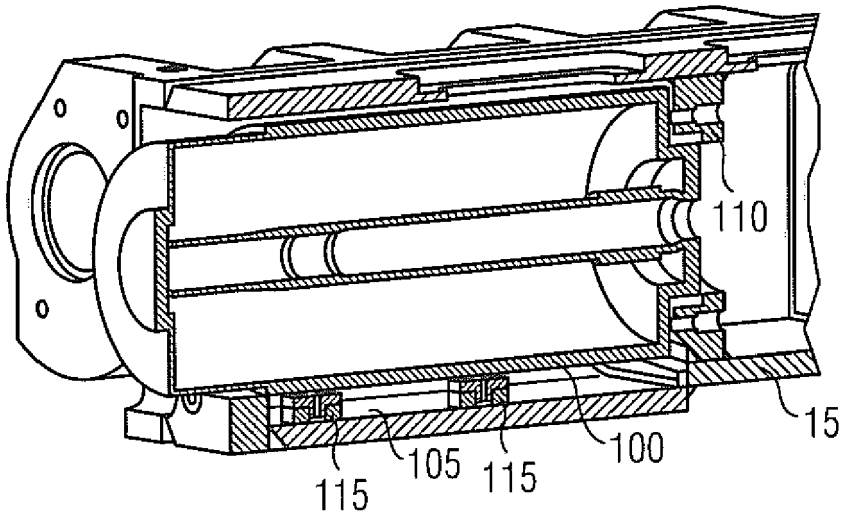


FIG 7

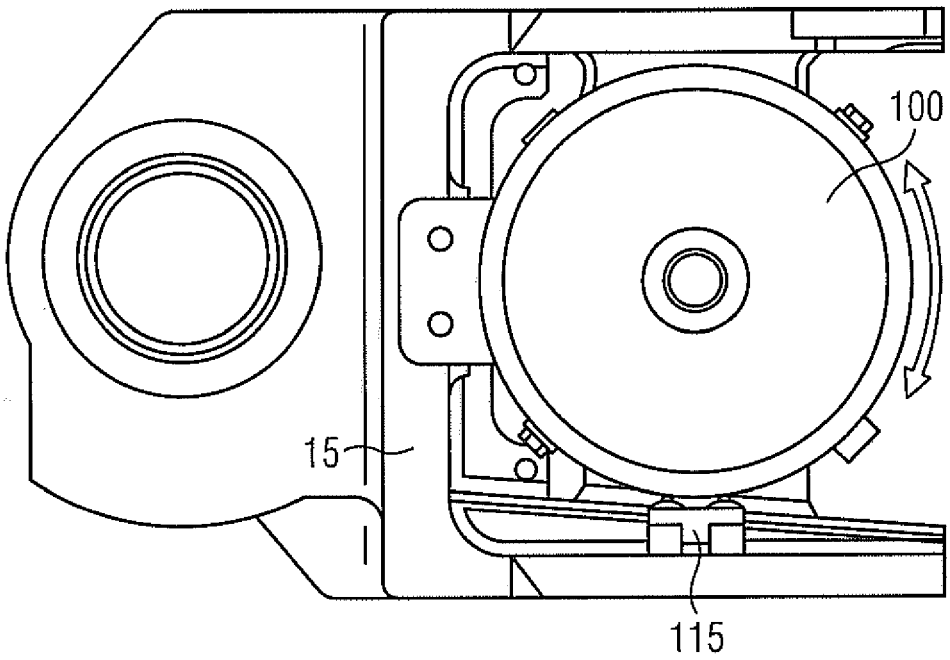


FIG 8

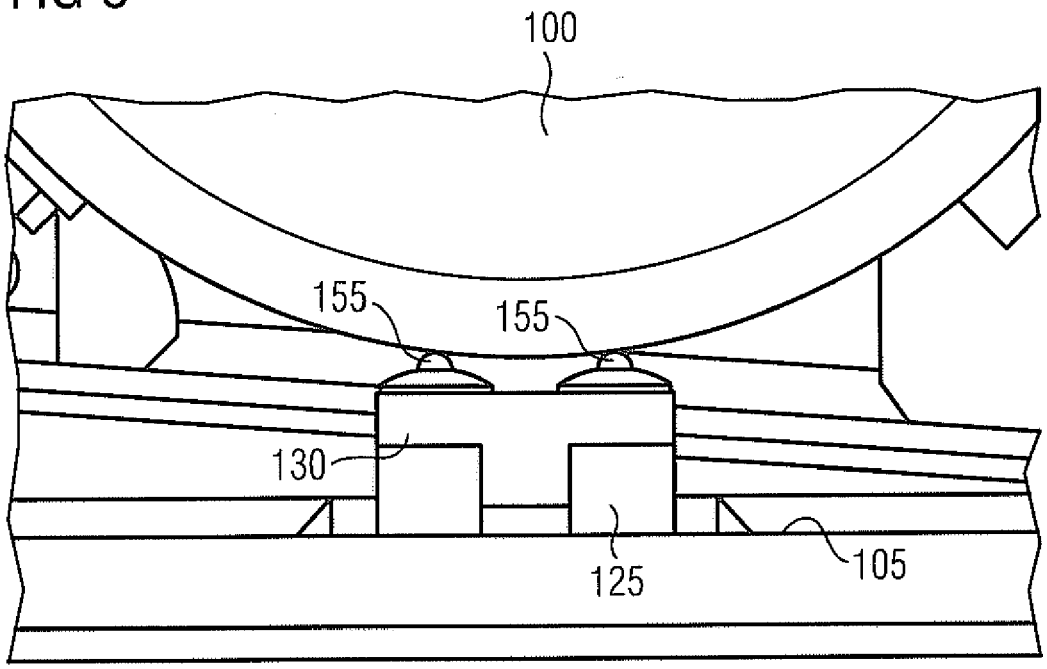


FIG 9

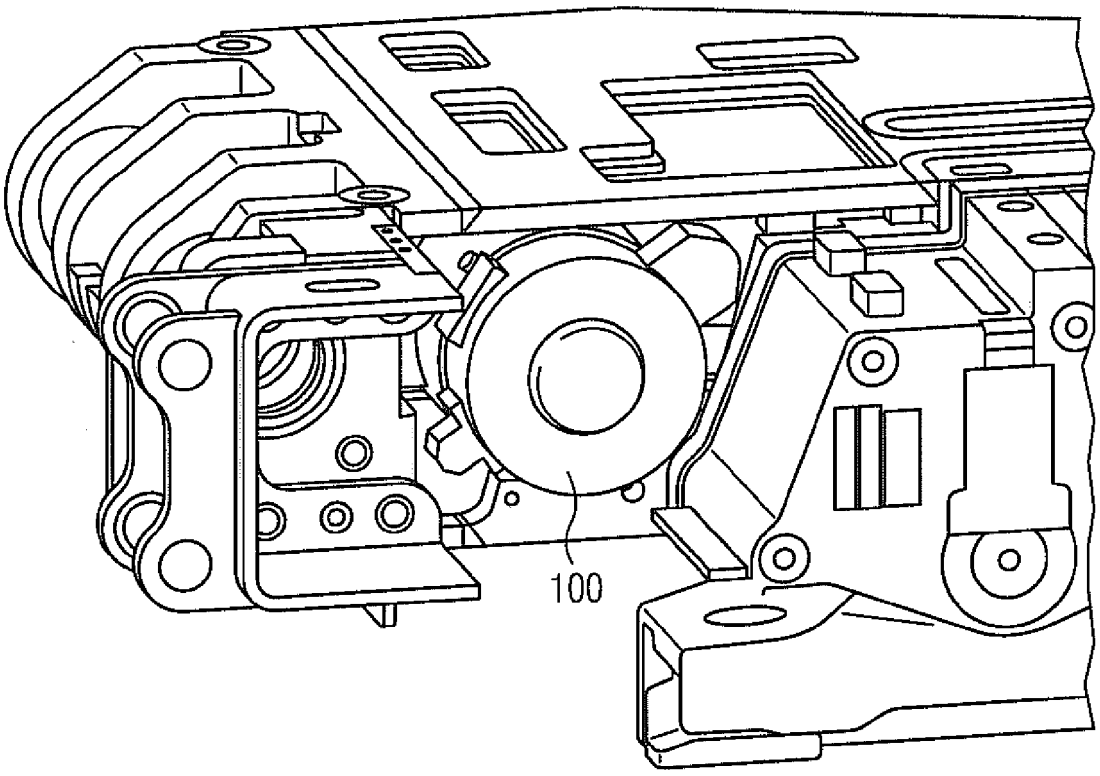


FIG 10

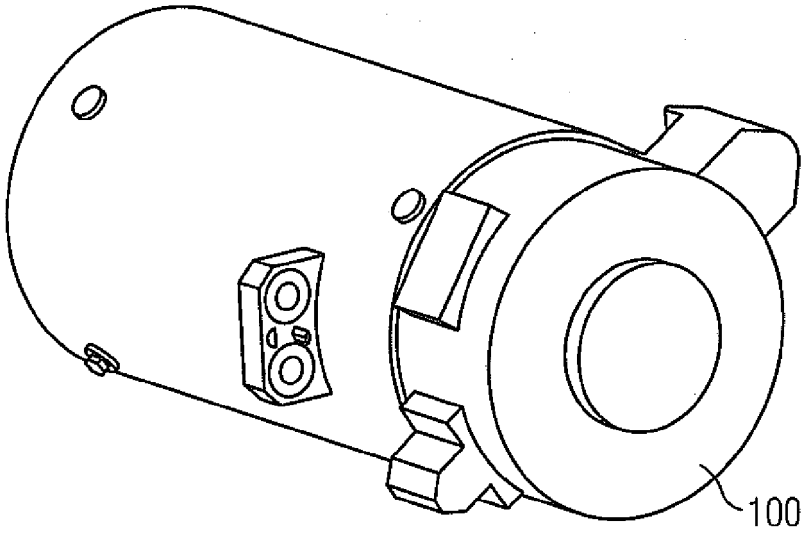


FIG 11

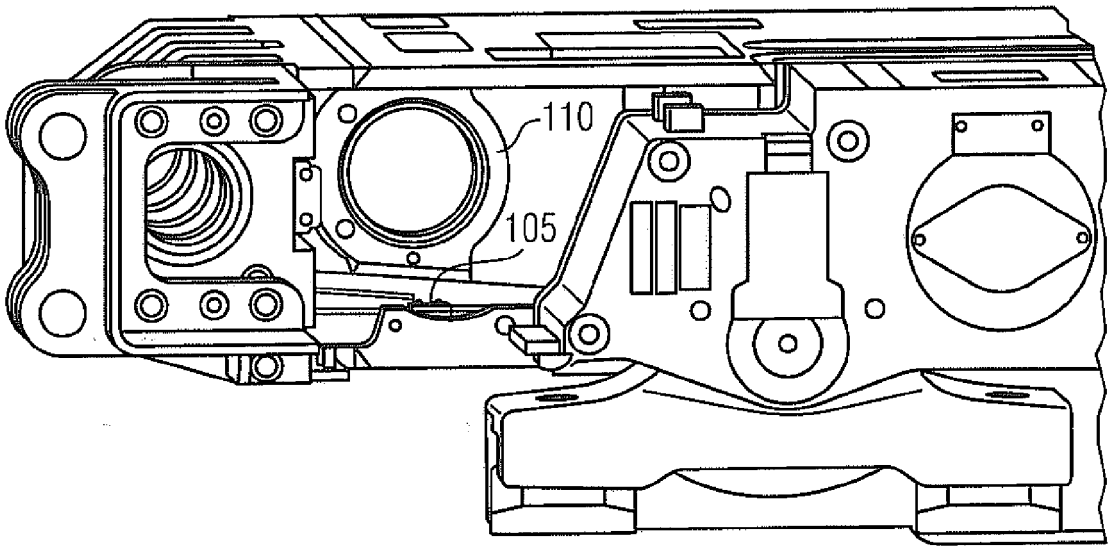


FIG 12

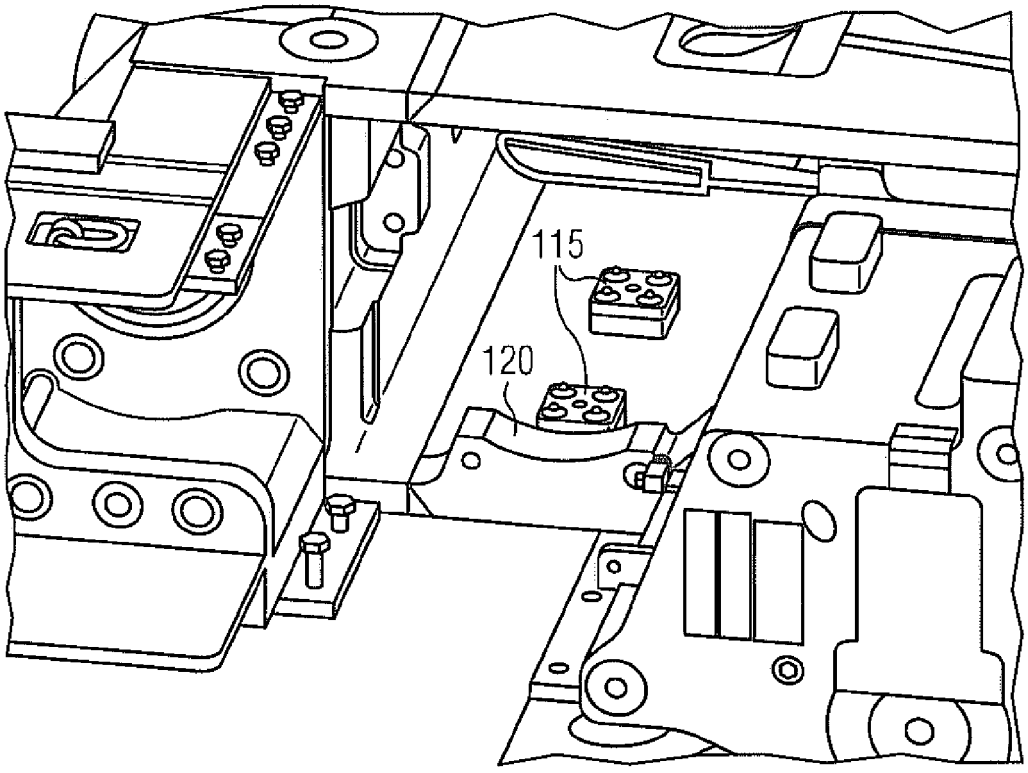


FIG 13

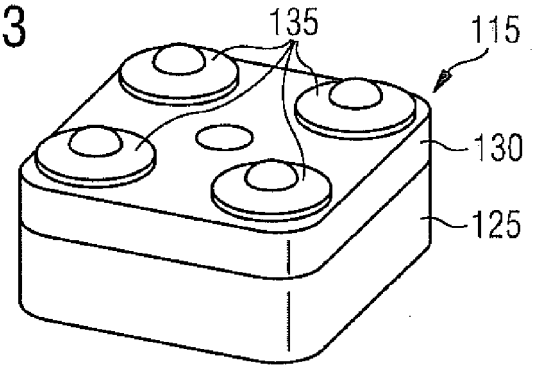


FIG 14

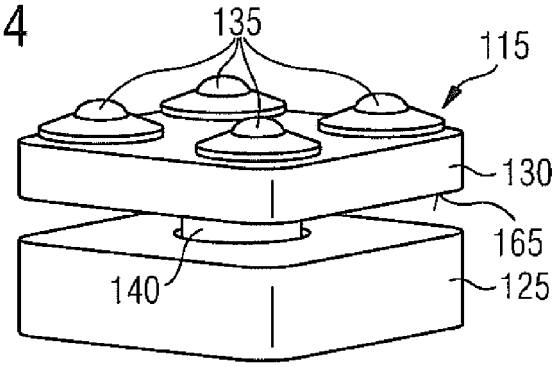


FIG 15

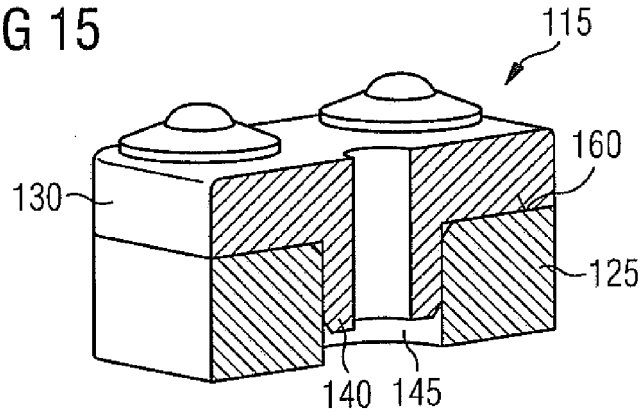
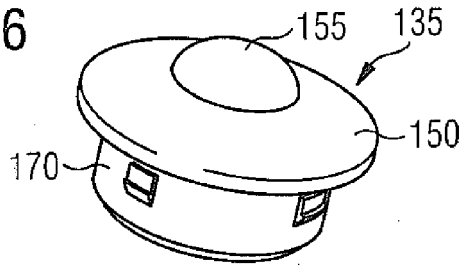


FIG 16



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EUROPEAN SEARCH REPORT

Application Number
EP 14 15 4360

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	US 557 340 A (THOMSON JOHN) 31 March 1896 (1896-03-31)	11-15	INV. E21C27/02
A	* page 2, lines 33-88; figures 2, 6 * -----	1-10	E21C31/12
X	US 4 027 918 A (HUJIMORI MASAO ET AL) 7 June 1977 (1977-06-07) * column 2, line 57 - column 3, line 19; figure 1 * -----	11-15	

TECHNICAL FIELDS SEARCHED (IPC)

E21C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 May 2014	Manolache, Iustin

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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26-05-2014

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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