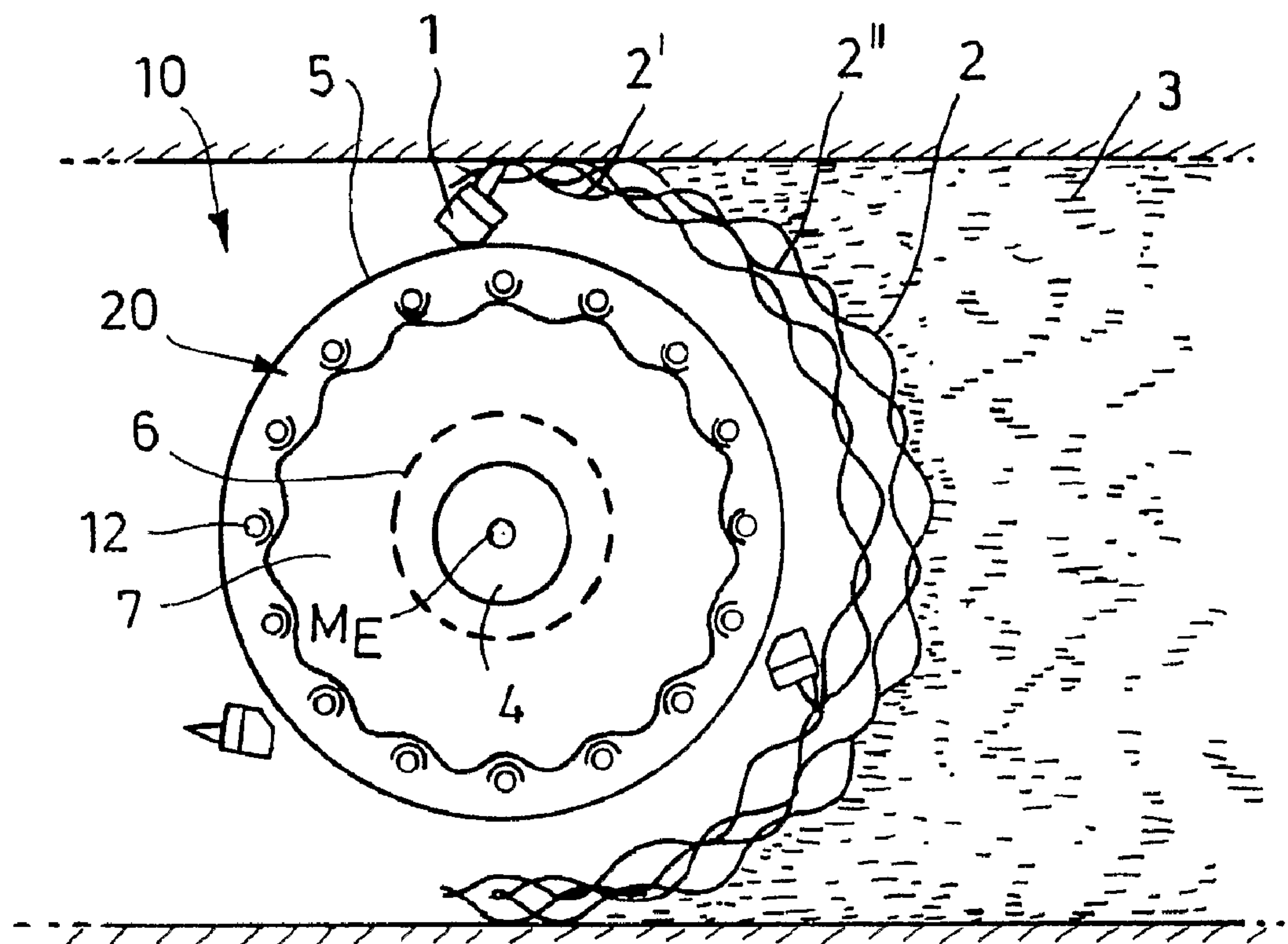




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(57) Abrégé/Abstract:

The present invention relates to a device 10 for mining mineral raw materials or roadheading (tunnelling) roadways or tunnels, having at least one rotatable driven tool 1 which is superimposed by impacts. The device 10 can be used especially for mining hard rock such as platinum ore and has a sleeve 6 supported rotatably in a casing in whose sleeve boring is mounted an eccentric shaft 4. This is joined at one end of the eccentric shaft 4 to the tool 1, and mounted rotatably eccentrically to the sleeve axis and about the eccentric shaft axis M_E . The device has a drive, whose drive shaft is coupled to the sleeve 6 and a mechanism for introducing a



(57) **Abrégé(suite)/Abstract(continued):**

rotation into the eccentric shaft 4. This mechanism comprises according to the present invention a cycloid drive 20 arranged outside the sleeve 6 whose input and output shaft comprises the eccentric shaft 4. The cycloid drive 20 has in one embodiment a cam disc 7 with a cycloid outer circumference 8, torsionally fixed to the eccentric shaft 4, which circulates in an outer ring 11, which is provided with concentrically arranged roller bodies 12 as outer rollers. By the rolling movement of the cam disc 7 against the outer ring 11 the cam disc 7 is displaced about its own axis when the sleeve 6 is rotating and hereby the eccentric shaft 4 is also rotated at a reduced speed about its own axis M_E .

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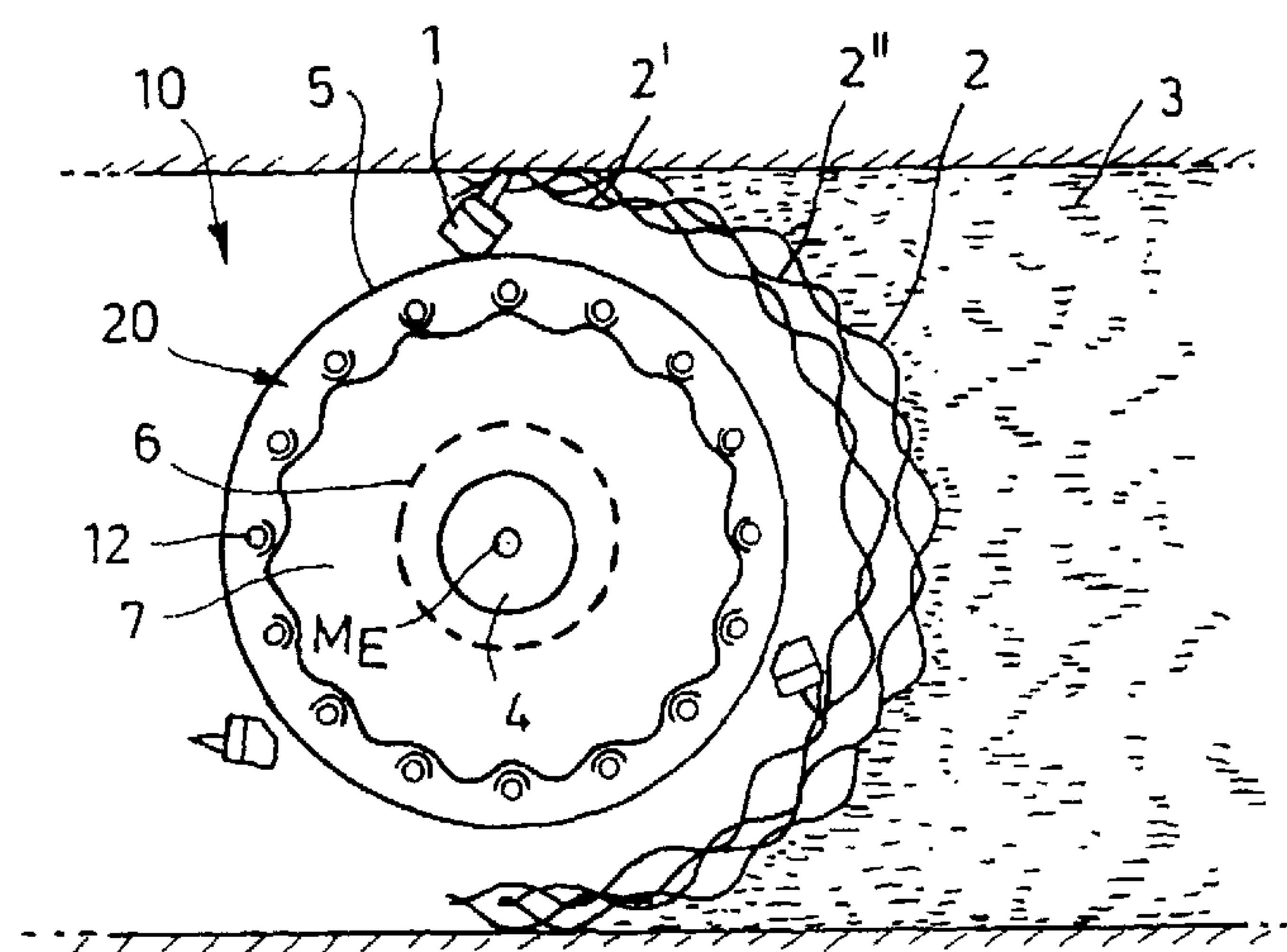
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(54) Title: A MINING OR TUNNELLING DEVICE



(57) Abstract: The present invention relates to a device 10 for mining mineral raw materials or roadheading (tunnelling) roadways or tunnels, having at least one rotatable driven tool 1 which is superimposed by impacts. The device 10 can be used especially for mining hard rock such as platinum ore and has a sleeve 6 supported rotatably in a casing in whose sleeve boring is mounted an eccentric shaft 4. This is joined at one end of the eccentric shaft 4 to the tool 1, and mounted rotatably eccentrically to the sleeve axis and about the eccentric shaft axis M_E . The device has a drive, whose drive shaft is coupled to the sleeve 6 and a mechanism for introducing a rotation into the eccentric shaft 4. This mechanism comprises according to the present invention a cycloid drive 20 arranged outside the sleeve 6 whose input and output shaft comprises the eccentric shaft 4. The cycloid drive 20 has in one embodiment a cam disc 7 with a cycloid outer circumference 8, torsionally fixed to the eccentric shaft 4, which circulates in an outer ring 11, which is provided with concentrically arranged roller bodies 12 as outer rollers. By the rolling movement of the cam disc 7 against the outer ring 11 the cam disc 7 is displaced about its own axis when the sleeve 6 is rotating and hereby the eccentric shaft 4 is also rotated at a reduced speed about its own axis M_E .



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A Mining or Tunneling Device

The present invention relates to a device for mining mineral raw materials or for tunnelling or roadheading tunnels or galleries, with at least one driven rotating impact overlaying tool, especially for the mining of hard rock such as platinum ore or copper and for the roadheading of tunnels or roadways, with a sleeve supported rotatably in a housing in whose sleeve boring an eccentric shaft which is joined at one end to the tool is mounted eccentrically to the sleeve axis and is rotatable about the eccentric shaft axis, with a drive whose drive shaft is coupled to the sleeve and with a device for introducing rotation into the eccentric shaft.

A mining machine based on the preamble of Claim 1 is known from EP-A-1,138,869. This mining device the eccentric shaft is mounted in a sleeve, which can be driven by the drive, which carries the tool at its head. The sleeve is balanced midway between its bearings with a counter weight calculated for the tool. To strengthen the bearings of the eccentric shaft in the sleeve, especially with regard to the impact overlaying applied via the eccentric shaft, an additional strengthening bearing is arranged in a head end sleeve extension. The application of rotation to the eccentric shaft is effected in the device according to EP-A-1,138,869 by a separate drive for the eccentric. For the coupling of the separate drive to the eccentric shaft various designs have been proposed. One design foresees as a device a step down gear, which has an external crown wheel mounted centrally with the drive shaft of the drive on the housing, which drives the eccentric shaft via the internal crown wheel of a hollow wheel joined to the eccentric shaft. In this system two separate drives for the eccentric shaft and the sleeve are present and the direction of rotation and the speed

of rotation of the eccentric shaft can be adjusted. An alternative design comprises a drive-coupled drive shaft to the sleeve and an axial pressure accepting hydrostatic sliding bearing on the eccentric shaft end. With this design the eccentric shaft revolutions are identical to the eccentrically induced self-rolling revolutions and can in any case be controlled within limits by the hydrostatic sliding bearing. In a third system the introduction of rotation into the eccentric shaft from outside is affected by Kardan, cam followers or a pair of gear wheels.

In order to be able to mine even hard rock such as platinum ore with the impact overlaying tools, high tool circumferential speeds and consequently also comparatively high revolutions of the eccentric shaft are necessary. The use of a second separate drive as with the generic state of the art takes account of this profile of requirement but however at the expense of the compactness of the mining machine because of the necessary additional assembly space for the second drive. The coupling of the rotation of the second drive to the eccentric shaft end, moving eccentrically relatively to the housing, is not addressed by the designs outlined in the preceding text which correspond to the requirement profile for a sufficiently high speed of revolutions and a sufficiently high transmissible torque.

It is an aim of the present invention to produce a mining or tunnelling (roadheading) machine, which makes possible high circumferential tool speeds with a single drive in a compact construction.

Accordingly the present invention is directed to a device as laid out in the opening paragraph of the present specification, in which the device comprises a cycloid drive arranged outside the sleeve, whose input and output shafts comprises, especially consists of the eccentric shaft. A cycloid gearbox has by definition a cam disc with a cycloid

toothings or contours on the outer circumference, which circulates in an external ring, which has concentrically arranged rolling bodies, which work together with the cycloid disk contour by positive engagement. The eccentric shaft moving around eccentrically in the sleeve causes a planetary movement of the cam disc in the outer ring, whereby or because of which the cycloid curved sections of the cam disc roll on the concentrically arranged roller bodies of the outer ring which form outer rollers and hereby is set into a rotation about its own axis. This rotation is in opposite sense to the rotational direction exerted by the sleeve on the eccentric shaft. As is known for cycloid gearboxes, the rolling movement of the cam disc on the roller bodies leads to a movement of the cam disc by one cycloid curve section further in the outer ring for each full revolution of the sleeve. The rotation of the cam disc about its axis can be introduced into the eccentric shaft; so as to generate its revolution about its own axis. The eccentric shaft forms therefore in the cycloid drive employed in the invention on the one hand its input shaft and indeed with a rotational speed corresponding to that of the sleeve and on the other hand also its output shaft, that is with the speed of revolutions about the eccentric shaft axis. The transmission ratio between the rotational speed of the sleeve and the rotational movement of the eccentric shaft about its own axis is dependent upon the number of the curved sections of the cam disc. The especial advantages of the cycloid drive are further, that with a cycloid drive a significantly higher torque than with commercially available toothed gear drives can be transmitted into the eccentric shaft, since, in contrast to gear wheel drives, in the cycloid drives at any time several cycloid curve sections are in contact with the roller bodies. With the cycloid drive therefore the torque can be transmitted with significantly higher overload safety in spite of the shocks

introduced into the eccentric shaft owing to the impact overlaying of the tool. Furthermore the cycloid drive caters for a rotational drive for the eccentric shaft although overall only one electrical power consuming drive is present.

In a preferred embodiment an overload coupling is assigned to the cycloid drive in order to protect the cycloid drive and the drive against overload and possibly to be able to limit the rotational speed of the eccentric shaft about its own axis and the torque. The overload coupling can here be formed especially from a friction clutch working as a brake. Depending on the construction of the cycloid gear the friction clutch can be radially operating or axial operating.

In a first construction of the cycloid drive according to the invention this has at least one cycloid cam disc torsionally fixed to the eccentric shaft, cycloidal on its outer circumference, circulating in an outer ring, concentrically arranged roller bearings as outer rollers. The cycloid contour on the outer edge of the cam disc divides the cam disc into curved sections with cycloid contour, whereby each curved section corresponds to a tooth in a cycloid gearing. The cam disc rotates concentrically about the axle of the eccentric shaft whilst the roller bearings of the outer ring are arranged concentrically about the sleeve axis. With the roller bearings and the cycloid geometry of the eccentric curved sections a pure rolling movement of the cam disc in the outer ring is achieved without sliding and without noteworthy frictional losses. The rotation of the eccentric disk effected in the cycloid drive is immediately introduced into the eccentric shaft. Preferably with the previously mentioned construction of the cycloid drive, the overload coupling can be assigned to the outer ring which is mounted so as to rotate concentrically with the sleeve axis and the overload coupling works as an axial brake. The outer ring can preferably here be joined torsionally fixed to a cap shaped carrier element for

spring loaded friction pads, which can press with an adjustable pressure force against a brake disk torsionally fixed to the housing. As long as there is no overload, the outer ring with the roller bearings stands firmly and the transmission ratio between the rotation of the sleeve and that of the eccentric shaft is exclusively determined by the number of the curved sections. In the case of an overload, the outer ring turns with the circulating sleeve, so that the revolutions of the eccentric shaft about its own axis can sink, possibly as low as nil (zero).

In a second embodiment of the cycloid drive according to the invention at least one cam disc is mounted rotatably on the eccentric shaft, which is cycloidal at its outer circumference and circulates in an outer ring having concentrically arranged roller bearings. The cam disc is further provided with bolt cut outs into which the follower bolts of a follower disk sitting onto the eccentric shaft engage. The transmission of torque can be effected as a purely rolling movement.

In the second embodiment of the cycloidal drive according to the invention the overload coupling is preferably assigned to the follower disk. In an especially simple embodiment the overload coupling comprises the tensioning set with which the follower disk is fastened to the eccentric shaft. The tensioning set can preferably be arranged between an axial drum extension of the follower disk and the outer cladding of the eccentric shaft to form a radial brake. In an alternative embodiment the follower disk can be supported rotatably on the eccentric shaft and a coupling arrangement acting as an axial brake is joined to the eccentric shaft end as an overload coupling, which comprises friction pads pressed against the rear side of the follower disk. In order to be able to adjust the operating point of the overload coupling, the springs of the overload coupling can be disk springs whose spring force

can be adjusted by means of tensioning screws and tensioning disks.

Further preferably the mining or tunnelling machine can have several tools, especially chisels, which are fastened onto a tool carrier, distributed about its circumference, which can be exchangeably joined to the other end of the eccentric shaft. A comparatively simple construction results if the number of the roller bodies exceeds the number of curve sections by exactly 1.

An example of a mining device constructed in accordance with the present invention will now be explained with reference to the accompanying drawings, in which:

Figure 1 shows a schematic side view of the functional principle of platinum mining using a mining machine having an impact-overlapping tool driven in rotation by a cycloid drive;

Figure 2 shows a schematic side view of a cycloid drive;

Figure 3 shows a schematic longitudinal section through a mining machine with a cycloid drive and an overload coupling in accordance with a first embodiment of the present invention;

Figure 4 shows a schematic longitudinal section through a mining machine with a cycloid drive and an overload protector in accordance with a second embodiment of the present invention; and

Figure 5 shows a section of an alternative embodiment for an overload protection of the cycloid drive shown in Figure 4.

In Figure 1 a mining machine referenced overall with 10 is shown which loosens broken rock at the face 2 of a platinum ore face 3 by means of an impact overlaying and rotating tool 1, so as to mine this. The tool 1, which can be formed from a chisel such as a roller chisel is fastened to a tool carrier 5 rotating about the central axis M_E of an eccentric shaft 4 and performs in the rotation of the mining machine 10 an overlaid impact wave shaped mining movement which is indicated by the different mining fronts 2, 2', 2''. The wave shaped impact overlaid movement of the chisel points of the tool 1 are obtained by the eccentric mounting of the eccentric shaft 4 in the sleeve boring of a sleeve 6, which can be driven by a fast rotating drive which will be explained later, not shown in Figure 1 and Figure 2. The rotation of the sleeve 6 about the sleeve central axis M_H leads to an eccentric rotational movement of the eccentric shaft 4 about the sleeve central axis M_H of the sleeve so that the tool 1 fastened to the tool carrier 5 is impacted onto the mining front 2 and moved away from it. So as now to overlay the impacting movement of the tool 1 with a rotational movement, the eccentric shaft 4 is assigned the cam disc 7 of a cycloid drive referenced 20 overall. As Figure 1 and Figure 2 show clearly the cam disc 7 has a cycloid contour on its outer circumference 8 and a regular cycloid gearing with curve sections 9, 9', 9'', 9''' etc formed identically to each other. The cam disc 7 is arranged inside an outer ring 11, which is arranged concentrically about a sleeve axis M_H and is provided concentrically about this with roller bodies 12, which interoperate with the curved sections 9, 9', 9'', 9'''. Owing to the circulating movement of the rotationally driven sleeve 6 the cam disc 7 runs within the outer ring 11 and hereby rolls with the curve sections 9, 9', 9'', 9''' on the roller bodies 12. The direction of the circulatory movement of the cam disc 7 in the outer ring 11 corresponds to the direction

of rotation H of the sleeve 6. The cam disc 7 is smaller in diameter than the diameter of the circle formed by the roller bodies 12 and in the embodiment shown the cam disc 7 has one curved section 9 fewer than the outer ring 11 has roller bearings 12. With each rotation of the sleeve 6 in the direction of rotation H the eccentric shaft 4 mounted eccentrically in it similarly completes a rotary movement whereby it rolls with the curved sections 9, 9', 9'', 9''' on the roller bodies 12 and owing to the movement of rolling moves by one curved section 9, 9'', 9''' against the direction of rotation H of the sleeve 6 with respect to the starting position. This rotation of the cam disc 7 in the opposite direction forcibly induced by the cycloid drive 20 is now introduced into the eccentric shaft 4, which is thereby displaced in a rotation in the direction of the arrow E about the eccentric shaft axis M_E . The rotation of the eccentric shaft 4 in the opposite direction to the direction of rotation H of the sleeve 6 occurs with a step down ratio into a slower region, which is determined by the number of the curved sections 9 of the cam disc 7. The eccentric shaft 4 forms both the input shaft for the cycloid drive 20 and also its output shaft, whereby the input revolutions of the cycloid drive corresponds to the eccentric circulation of the eccentric shaft 4 and the output revolutions of the cycloid drive 20 correspond to the self rotation of the eccentric shaft 4 about the eccentric shaft axis M_E . Figure 1 and Figure 2 make plain that several curved sections 9, 9', 9'', 9''' of the cam disc 7 lie against the roller bodies 12 of the outer ring 11 in each position and only a few curve sections such as the curve section 9'''' transmit no force. With the cycloid drive 20 therefore a high torque can be transmitted smoothly so that the transmission of power in comparison to gear wheel drives is already substantially improved with the application of a single cam disc. The transmission of power can be

improved by the application of several cam discs and the loading of each cam disc can thereby be reduced. The impact effect of the tool 1 can be selected in accordance with the requirements list for the mining device by means of the diameter and/or the eccentricity of the eccentric shaft 4 relative to the sleeve axis M_H .

Figure 3 shows a mining machine 10 schematically in a sectional view, which is provided with a cycloid drive 20 in accordance with a first embodiment, wherein the same references are used as in the description of the principles using Figure 1 and Figure 2. In a housing 21 a sleeve 6 is mounted rotatably by means of tool-side roller bearings 22 and drive side self aligning roller bearings 23, which has a sleeve extension 24 on the tool side and is joined torsionally fixed to a toothed wheel drum 25 on the drive side. The sleeve 6 is driven by means of a gear wheel 17 mounted on the drive shaft 15 of a fast running drive 16, which engages its outer teeth in the external teeth of the gear wheel drum. The sleeve rotates in operation of the mining machine 10 about the sleeve axis M_H , which coincides with the housing axis of the housing 21.

In the sleeve boring of the sleeve 6 an eccentric shaft 4 is eccentrically mounted by means of a tool-side eccentrically sited self-aligning roller bearing 26 in a sleeve extension 24 and an eccentrically sited self-aligning bearing 27 in the gear wheel drum 25. The bearing system has the effect that the eccentric shaft can rotate about the eccentric shaft axis M_E , whilst it rotates with the circulatory movement of the sleeve 6. On the left hand end of the eccentric shaft as shown in Figure 3 a tool carrier 5 is fastened by means of bolts 29a on the end 28 onto which the tools 1 can be exchangeably fastened. Between the end of the housing 21 and the rear side of the tool carrier 5 and between a bearing ring 29 sealing the sleeve extension 24 on the end and the rear

side of the tool carrier 5, sealing lips 30, 31 are arranged which seal the inner space of the housing 21 from the outer side of the housing. To balance the sleeve 6 a counterweight 34 is fastened to the sleeve extension 24 matched to the position of the sleeve boring and the weight of the eccentric shaft and consequently close to the tool 1 and to the forward end of the eccentric shaft.

At the other end of the eccentric shaft 32 inside the housing 21 and outside the sleeve 6 and the sleeve drum 25 firmly fixed to it the cycloid drive 20 is arranged in accordance with a first embodiment. In the embodiment according to Figure 3 the cycloid gear 20 has a cam disc 7 torsionally fixed on the shaft extension of the eccentric shaft end 32 which is provided with a cycloid contour or gearing on the outer circumference 8. The contour of the cycloid gearing with the cycloid curve sections 9 can for instance be extracted from Figure 1 and Figure 2. The cam disc 7 runs within an outer ring 11 which is provided with roller bearings 12 as rolling bodies for the curved sections 9 whereby the roller bodies 12 as explained further above are arranged evenly distributed on a circular track. In the upper roller bearing 12 in Figure 3 engages one of the curved sections of the cam disc 7, whilst the lower roller bearing 12' is unloaded and lies free.

The outer ring 11 carrying the roller bearings 12 is arranged concentrically to the sleeve axis M_H and can be joined torsionally fixed to the housing 21 of the tool 10. In the embodiment shown however the cycloid drive 20 has an overload coupling assigned to it, which is referenced 40 overall, which is designed as an axial brake and retains the outer ring 11, which is mounted in a manner, which is not shown so as to rotate in the housing 21, in its position. To this end the overload coupling 40 includes, torsionally fixed to the outer ring 11, for instance screwed, a cap shaped carrier element 41

which has a disk shaped part 42 which is provided on the rear with friction pads 44, and has a drum shaped part 43, onto which a disk spring packet 45 is supported, which presses a pressure plate 47 provided with a second frictional lining 46 against a brake disk 48. The cap shaped brake disk 48 is screwed torsionally fixed to the housing end 33 of the housing 21. The spring force of the disk spring packet 45 acts in the direction of the first friction pad 44 so that the carrier element 41 is retained by the applied pressure force which can be adjusted by means of the tensioning screws 49 and the tensioning plate 50, transmitted via the friction pads 44, 46 onto the brake disk 48; consequently the rotating mounted outer ring 11 is also retained with the same force and the same braking torque. In the event that the torque introduced via the eccentric shaft 4 onto the cam disc 7 and transmitted onto the roller bearings 12 of the outer ring 11 exceeds the preset braking torque, the carrier element 41 can move relative to the brake disk 48. Hereby the outer ring 11 turns relative to the housing 21 and the cam disc 7 with it at the circulatory movement, whereby the revolutions of the eccentric shaft 4 decrease. The overload coupling 40 can according to the same principle also be adjusted to preset the revolutions of the eccentric shaft 4, insofar as the slip between the brake disk and the carrier element is controlled.

Figure 4 shows a second embodiment of a mining machine 110 with a cycloid drive 120 according to a second form of construction. Identical and similar components are provided with reference numbers increased by 100. The rotating arrangement of the sleeve 106 and the eccentric shaft 104 in the housing 121 is identical as in the embodiment according to Figure 3 so that no further repeated explanation is made here. The drive-side eccentric shaft end 132 is extended as opposed to the previous embodiment almost as far as the housing end 133 of the housing 121. The eccentric shaft end 132 carries

outside of the sleeve end of the sleeve 106 formed from the gear wheel drum 125 a cam disc 107 which is mounted via a roller bearing ring 113 rotating on the eccentric shaft 104 or the eccentric shaft end 132. The cam disc 107 has also a cycloidal outer contour 108 with a cycloid gearing formed from the curved sections 109, which work together with roller bearings 112 which are supported on an outer ring 111. The outer ring 111 is joined firmly to the housing 121 or it is formed from a flange ring of the housing. The cam disc 107 runs as already described with reference to Figure 1 and Figure 2 corresponding to the circulation of the eccentric shaft 104 in the outer ring 111 and its curved sections 109 roll on the roller bodies 112. Hereby the cam disc 107 is set in rotation against the direction of rotation of the sleeve 106, whose direction of rotation corresponds to the circulatory movement of the eccentricity of the eccentric shaft 104. The rotation of the cam disc 107 about the eccentric shaft axis M_E , which is forced to arise owing to the rolling movement of the cycloid gearing on the roller bodies 112 is introduced into a follower disk 114 in the cycloid gear 120 and transmitted from this to the eccentric shaft 104, so that the eccentric shaft 104 as explained further above is forcibly set into rotation about the eccentric shaft axis M_E , and thus driven in rotation. The cam disc 107 has, for transmission, bolt cut outs 118 arranged concentrically around the eccentric shaft axis M_E into which bolts 119 engage which are fastened to the radial part 151 of the follower disk 114. Rolling bodies can be fixed onto the bolts 119 so as to reduce the friction between the bolt cut outs 118 and the bolts 119. For the rotational lock with the eccentric shaft 104 the follower disk 114 has an axial drum extension 152 completing the radial part 151, which is tensioned against the outer side of the eccentric shaft end 132 by a tensioning set 153. With the tensioning set 153 an overload coupling in the form of a

radially operating brake can be effected since via the tensioning set 153, the maximum torque, which can be introduced by the following disk 114 into the eccentric shaft end 132, can be pre-set. The tensioning set 153 can for instance include cone shaped tension rings 154, 155 whose separation can be changed by means of screws, not shown, and which work together with cone shaped sockets 156, 157 to tension the follower disk 114 onto the eccentric shaft end 132. Here also the friction can be increased by friction pads or similar.

Figure 5 shows an alternative embodiment for a safety coupling 240, which is arranged on a cycloid drive 220, which has a cam disc 207, mounted on the eccentric shaft 204 via a bearing ring 213 and an outer ring 211 with roller bodies 212 and corresponds in construction to the cycloid drive according to Figure 4. The cam disc 207 has bolt cut outs 218, into which the follower bolts 219 engage, which are fastened concentric and torsionally fixed in a follower disk 214. The follower disk 214 has a socket 260 on its inner circumference, which sits with minimum play on an extension of the eccentric shaft end 232. The follower disk 214 includes a disk part 261 on whose front side the follower bolts 219 extend and against whose rear side abuts a pressure plate 263 provided with friction pads 264. The pressure plate 263 is pressed against the rear side of the disk part 261 by means of plate springs 265 whereby the spring force of the plate springs 265 can be adjusted by means of tensioning screws 266, an axially moveable tension plate 268 and a tension disk 267, which is fastened torsionally fixed onto a conical shaft section 234 on the eccentric shaft end 232. Here also the overload coupling 240 works as a clutch and if a torque, adjustable via the plate springs 265 is exceeded the power transmission from the follower disk 214 to the eccentric shaft 204 is interrupted, so that its speed of revolutions sinks.

For a man skilled in the art a series of modifications arise from the foregoing description, which fall within the areas of protection of the claims. The arrangement and construction of an overload coupling is only given as an example and further modifications will present themselves to a man skilled in the art without further explanation. In the Figures, only one cam disc is shown in each case, however several cam discs could also be present. Further to this other forms of construction of cycloid gears can also fall within the scope of protection of the claims, insofar as these employ the eccentric shaft both as an input and also an output shaft and the cycloid drive is used in connection with impact overlaying working tools and devices. The device or machine according to the invention may also be used for mining other mineral raw materials such as other ores, copper, potash or rock salt as well as for the tunnelling or roadheading of tunnels, roadways or galleries in hard rock formations or the like.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A device for mining mineral raw materials of roadheading tunnels or roadways, with at least one driven rotating impact overlaying tool especially for the mining of hard rock such as platinum ore or for the roadheading of tunnels or roadways, the device comprising:

- a housing
- a sleeve supported rotatably in the housing and defining a central axis of the sleeve,
- an eccentric shaft bearingly carried in the sleeve, the eccentric shaft being:
 - joined at one eccentric shaft end with the tool,
 - mounted eccentrically with respect to the sleeve axis and
 - rotatable about an eccentric shaft axis,
- a drive for driving the eccentric shaft and
- a drive shaft of the drive coupled to the sleeve and
- an arrangement for introducing rotation into the eccentric shaft,
characterized in that the rotation introduction arrangement comprises:
 - a cycloid drive (20; 120; 220) arranged outside the sleeve (6; 106), input and output being provided by the eccentric shaft (4; 104; 204),
and in that an overload coupling (40; 140; 240) is assigned to the cycloid drive (20; 120; 220).

2. A device according to claim 1, **characterized in that** the overload coupling (40; 140; 240) is a clutch.

3. A device according to claim 1 or claim 2, **characterized in that** the cycloid drive (20) has at least one cam disc (7) torsionally fixed to the eccentric shaft (4), cycloidal

on its outer circumference, circulating in an outer ring (11), having cocentrically arranged roller bearings (12).

4. A device according to claim 3, **characterized in that** the overload coupling (40) is assigned to the outer ring (11) which is mounted so as to rotate concentrically with the sleeve axis (M_H).

5. A device according to claim 3 or claim 4, **characterized in that** the outer ring (11) is joined with torsional fixture to a carrier element (41) for spring loaded friction pads (44; 46), which can press with adjustable pressure force against a braking disk (48) torsionally fixed to the housing (21).

6. A device according to claim 1 or claim 2, **characterized in that** the cycloid drive (120; 220) has at least one cam disc (107; 207) mounted rotatably on the eccentric shaft (104; 204), which is cycloidal at its outer circumference (108; 208) and circulates in an outer ring (111; 211) having concentrically arranged roller bearings (112; 212); said at least one cam disc (107; 207) being provided with bolt cut outs (118; 218) into which follower bolts (119; 219) of a follower disk (114; 214) sitting on the eccentric shaft engage.

7. A device according to claim 6, **characterized in that** the bolt cut outs (118; 218) and the bolts (119; 219) are arranged concentrically and/or roller bodies are fixed on top of the bolts.

8. A device according to either of claims 6 or 7, **characterised in that** the overload coupling (140; 240) is assigned to the follower disk (114; 214).

9. A device according to claim 8, **characterised in that** the overload coupling (140) comprises a tensioning set (153) with which the follower disk (114) is fastened on the eccentric shaft (104).
10. A device according to claim 9, **characterised in that** the tensioning set (153) is arranged between an axial drum extension (152) of the follower disk (114) and the outer cladding of the eccentric shaft (104).
11. A device according to any one of claims 6 to 8, **characterised in that** the follower disk (214) is supported rotatably on the eccentric shaft (104) and a coupling arrangement is joined to the eccentric shaft end (232) as an overload coupling (240).
12. A device according to claim 11, **characterised in that** the coupling arrangement has friction pads (264) arranged on a pressure plate (263), which is pressed by means of springs against the follower disk (214).
13. A device according to any one of claims 7 to 12, **characterised in that** springs of the overload coupling are plate springs (45; 265) whose spring force is adjustable by means of tensioning screws (49; 266) and tensioning disks (50; 267; 268).
14. A device according to any of claims 6 to 13, **characterised in that** several tools are fastened and distributed about the circumference on a tool carrier (5) which is joined exchangeably to an end (28) of the eccentric shaft.
15. A device according to any of claims 6 to 14, **characterised in that** the cycloidal drive includes a cam disc having several curved sections (9; 9'; 9'') whereby the number of the roller bodies (12; 112; 212) exceeds the number of the curved sections (9, 9', 9'') by exactly 1.

Fig.1

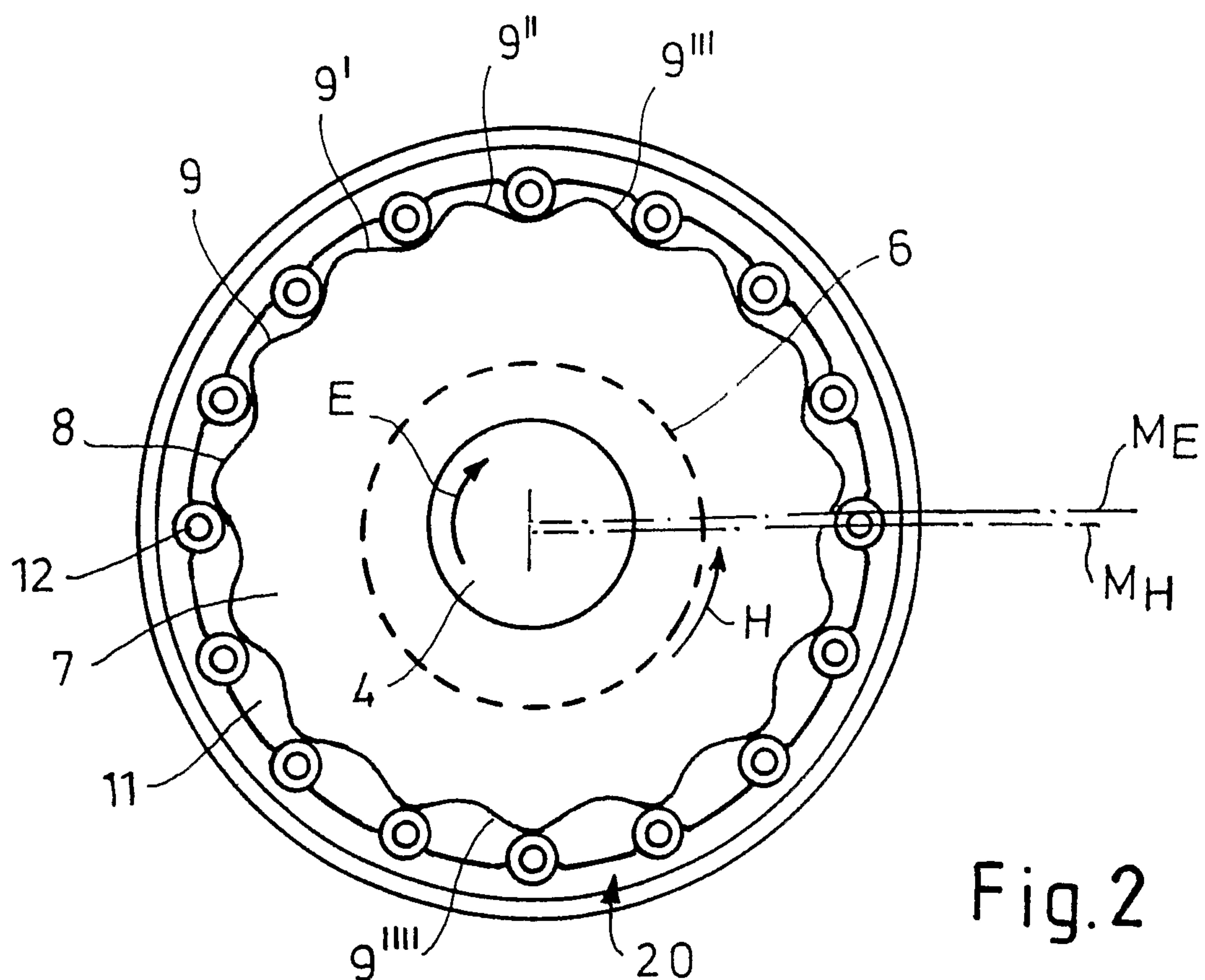
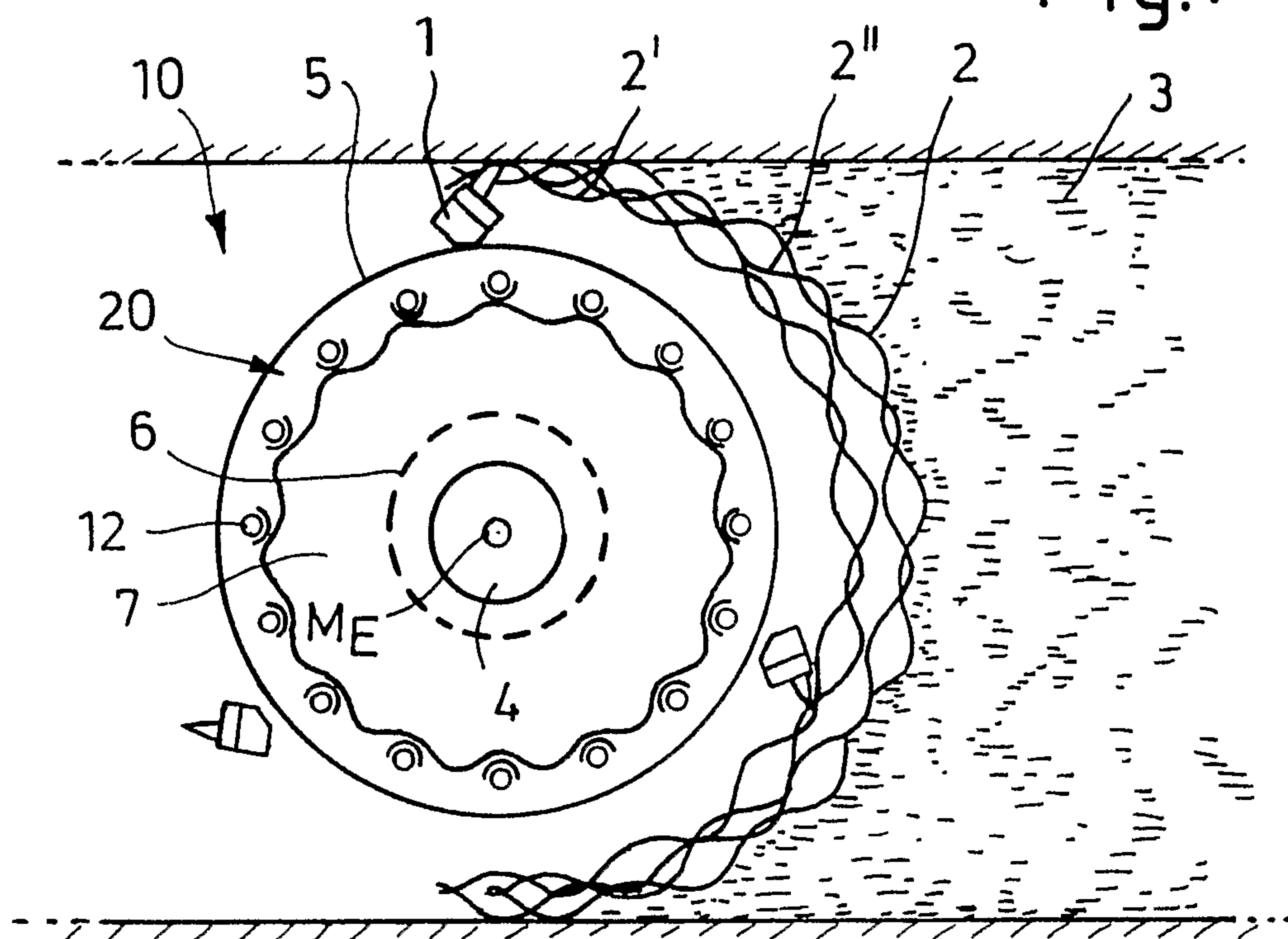
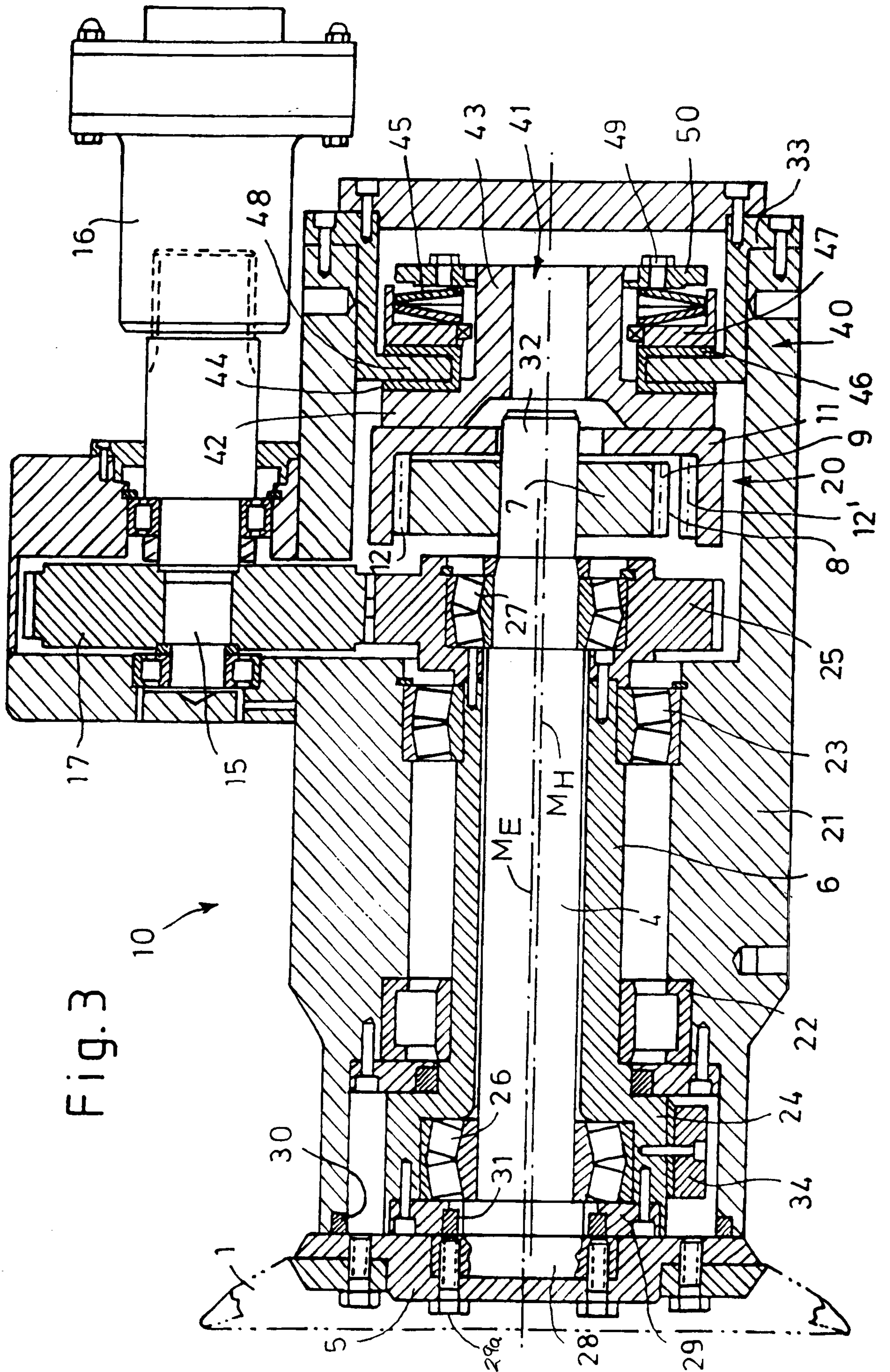


Fig.2

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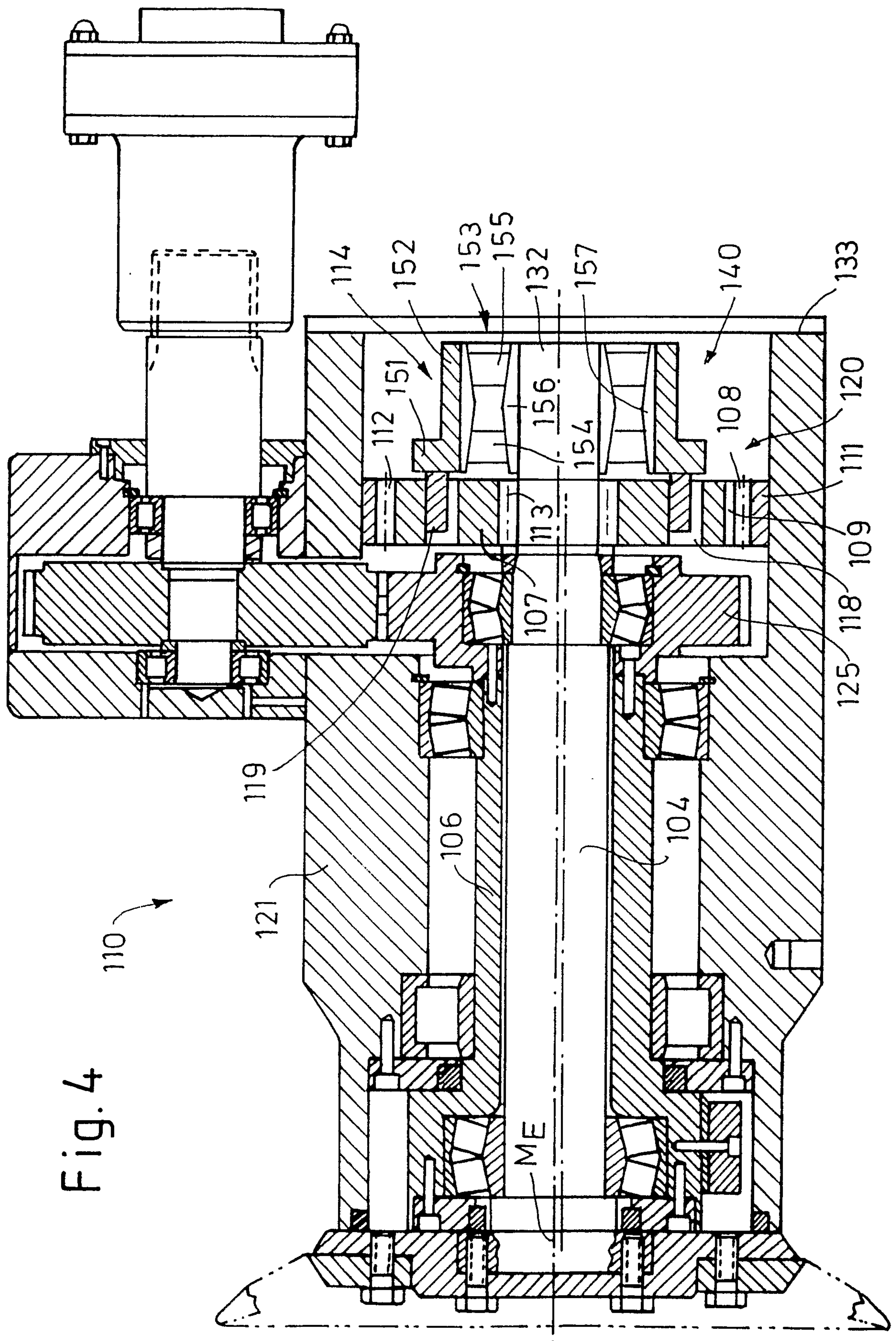


Fig. 5

