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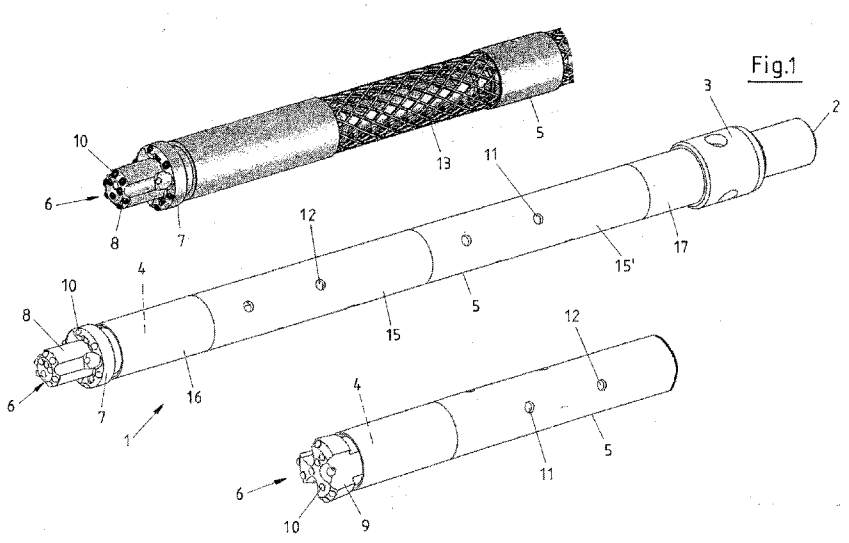
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(54) Title: DEVICE FOR A DRAINAGE BORING SYSTEM



(57) Abstract: The present invention provides a device providing a combined boring and placement system for jacket tubes (5), which after introduction into a borehole, for the creation of a drainage system or a pipe roof or an anchoring or a tubular pile, remain in the rock mass and which, when creating the borehole, with an extension piece (4) of a drill rod assembly (2), wherein the extension piece (4) is fitted with a non-recoverable drill bit (6) which for this purpose can be partially or fully detached from the extension piece (4), wherein the drill bit(6) is connected with the assigned extension piece(4) of the drill rod assembly(2) via a locking element (20) that secures it against rotation, which to this end is arranged in a cage (21) formed by the drill bit (6), extension piece(4) and jacket tube(5) and which can be released by the jacket tube (5) covering the cage (21).

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Device for a drainage boring system

The invention concerns a device for a combined boring and placement system for jacket tubes, which after introduction into the borehole for creation of a drainage system or a pipe roof or an anchoring or a tubular pile remain in the rock mass and which when creating the borehole are connected via a coupling sleeve with the extension piece of the drill rod assembly, wherein the extension piece is fitted with a non-recoverable drill bit which for this purpose can be partially or fully detached from the extension piece.

A number of solutions are known for such a boring and placement system for jacket tubes. WO 98/21439 and WO 89/58132 disclose how, during the creation of the borehole, for example using a percussion or rotary percussion drilling machine, a jacket tube is introduced into the borehole such that upon completion of the borehole, part of the drill bit together with the drill rod assembly can be removed from the borehole, while the jacket tube itself remains in the borehole. Then a mortar or a multi-component adhesive is introduced into this jacket tube, so that together with the curable material it can act as an anchor in the borehole. By the skilled introduction of a plurality of such jacket tubes in approximately the same plane the creation of advantageous piperoofs can also be achieved. EP 1 381 756 B2 discloses how a jacket tube is used having a continuous or at least substantially continuous slot and which is introduced with a stress, so that upon completion of the drilling work and removal of the drill rod assembly, with the drill bit remaining in the borehole, through expansion it provides a certain securing of the rock mass. Here the jacket tube or the drill bit or the tip of the drill rod assembly are connected together in such a way that the jacket tube can be introduced simultaneously into the borehole during drilling work. The jacket

tube is therefore pulled. Because of the longitudinal slot the drilling debris released by creating the borehole is initially not specifically discharged at one point from the borehole, so that it is only with difficulty that it can be captured and removed. In the worst case scenario the drilling debris collects in the cladding around the jacket tube, so that the mortar or stabilisation material cannot be subsequently introduced into this area. For this reason this “expandable anchor” can generally not be used with a multi-purpose coupling sleeve. Furthermore, where the drilling spear is fully enclosed, during drilling the drilling debris can only escape if during percussion drilling a slot remains for a short period between the coupling sleeve and drilling spear. For this reason this system can only work with a slotted drilling spear. Finally, a targeted release of the drill bit upon completion of drilling work is difficult or impossible, because the drill bit has become too securely attached to the corresponding cone end of the drill rod. Finally, as mentioned, the simultaneous introduction of the jacket tube when creating the borehole is difficult.

Use of so-called folding drilling systems is also known (DE 10 2005 046 495.5). With such a drill head system, the actual drill bit parts are configured such that they are matched to the internal section of the jacket tube to be positioned and similarly to conventional drill bits for the inner drill string can be moved backwards and forwards as required in the jacket tube. For the cutting of the borehole two or more folding elements are provided for the jacket tube, which can be folded radially markedly beyond the external diameter of the jacket tube. This position is also the drilling position, wherein a hole can be drilled which is greater than the external diameter of the jacket tube. The folding elements are designed and mounted in such a way that upon withdrawal of the drill rod assembly they automatically collapse. An advantage of this system is that there are no non-recoverable components, no rotation against the direction of rotation of drilling is necessary and that also unintended retraction of the system does not cause any damage. The disadvantage of this system is that it can only be used form diameters of $\geq$ 102 mm. At lower diameters the folding systems in particular could no longer be put into practice in a satisfactory manner.

The object of the invention now is to further develop a device for a boring and placement system such that boreholes of less than 102 mm, such as in particular 76 mm and also 64 mm, can also be produced and with a sufficiently secure connection between drill bit and drill rod assembly but with easy release of such a connection and with jacket tubes which can also be used as drainage pipes.

The object is achieved according to the invention in that the drill bit is connected with the allocated extension piece of drill rod assembly via a locking element that secures it against rotation, which to this end is arranged in a cage formed by the drill bit, extension piece and jacket tube, preferably secured in the axial, radial and tangential directions, and which can preferably be released from this via the assigned jacket tube covering the cage. Typically, the jacket tubes via the coupling sleeve, which can be coupled to the extension piece in a releasable manner, can be inserted with the drill rod assembly into the borehole and can be used as drainage pipes.

With such a boring and placement system the jacket tube, or typically more accurately the jacket tubes are inserted via the coupling sleeve into the borehole, wherein via an embodiment to be explained further on it is ensured that only a part of the impact and rotational energy is transferred via the coupling sleeve to the jacket tube. The main impact energy and the main torque are transferred by the extension piece to the drill bit, which ensures that the rock mass is crushed in the direction of drilling and in so doing the borehole is created. The extension piece of the drill rod assembly for its part is typically secured against rotation via the locking element with the drill bit, so that via the extension piece it is ensured that whatever the design of the drill bit this will always be provided with the necessary rotational and impact energy. Here the rotational energy or the torque is transferred via the locking element, which has a correspondingly suitable design and arrangement, which likewise will be explained in more detail further on. Since the jacket tube as such is inserted via the coupling sleeve into the borehole and in fact follows the outer rim of the drill bit, once the end position has been reached the coupling

sleeve can be positioned and influenced in such as way that it does not move the jacket tube any further, if via the rotary percussive hammer the extension piece with the corresponding part or the entire drill bit is driven a little further into the borehole. This further driving of this part exposes the cage, because now it is no longer covered by the jacket tube, so that the locking element can leave the cage and thus release the connection. Once this connection has been released the extension piece of the drill rod assembly together with the envisaged part of the drill bit or also completely without the drill bit can be recovered, in that it is withdrawn though the jacket tube from the borehole. Since the locking element not only has the job of transferring the torque, but above all of ensuring the connection between the extension piece and drill bit or ring drill bit, when the locking element is released this coupling or connection is also released, so that the non-recoverable part of the drill bit or even the entire drill bit is pushed away into the borehole. This is all surprisingly simple, wherein not just one part of the drilling work and positioning work is simplified, but both, e.g. the creation of the borehole and the fixing of the jacket tube in the borehole itself, which unobstructed by the release of the drill bit at the lowest part of the borehole is now clear and can be used as a drainage pipe.

Earlier on it was also mentioned that it is above all also a case of being able to safely create borehole diameters in ranges below 102 mm with jacket tubes. As a rule it is then sufficient if a cage and a locking element are used. If, however, correspondingly larger diameters are required, then it is advantageous to provide a plurality of cages for the locking elements spread over the extent of the extension piece of the drill rod assembly and the drill bit. As a rule there will be two or three, and in some cases even four, of these depending on which diameter range is desired and needed.

Fixing the locking element in the cage on the one hand, but above all a certain flexibility of the extension piece of the drill rod assembly or of the drill bit is provided if the cage is designed to allow the locking element a defined room for manoeuvre. Here, according to a suitable configuration, it is provided that the cage

is designed to limit the room for manoeuvre of the locking element radially to 0.5 – 1.5 mm, tangentially to 0.5 - 3 mm and/or axially to 5 – 50 mm. With a cage designed in this way the locking element, irrespective of its form can take up and maintain its position securely within the cage, regardless of what direct loading it experiences. It can also be moved in its optimal position, however, because the defined room for manoeuvre allows this at any time. As mentioned, fixing of the locking element in the cage is thus also precluded.

If a non-recoverable ring drill bit is used, then it is advantageous if the cage in the case of such a non-recoverable ring drill bit and pilot drill bit is created by a longitudinal groove in the pilot drill bit, the sides of a locking window of the ring drill bit and the overlapping inner wall of the jacket tube. It will be clear from just the description that this cage securely accommodates the locking element and accommodates it such that during drilling work it is always securely arranged in the cage and in the process can perform the aforementioned dual function in particular in the case of the non-recoverable ring drill bit. The ring drill bit is provided with the necessary torque and at the same time it is ensured that the ring drill bit and the pilot drill bit adopt and retain on the extension piece of the drill rod assembly the precise position that is necessary for creating an optimum borehole. Whatever the loading, the pilot drill bit or in particular the ring drill bit cannot leave the specified position, but during drilling both these always adopt the specified optimum position, so that a secure and even creation of the desired borehole can be achieved.

If a completely non-recoverable full face bit is used, then it is an advantage if the cage, in the case of a drill bit in the form of such a non-recoverable full face drill bit is formed by an annular groove in the pilot adapter of the extension piece, the sides of the locking window of the full face bit and the overlapping inner wall of the jacket tube. Here also the precise arrangement and maintenance of the specified position of the full face bit on the extension piece are ensured and at the same time it is ensured that the necessary torque is reliably transferred from the extension piece or the pilot adapter to the full face bit.

According to a suitable further development it is provided that the locking element is designed as a locking bolt or locking ball. It is suitable here for the locking bolt to be used on the non-recoverable ring drill bit and the pilot drill, while the locking ball can in particular be used on the non-recoverable full face.

A further possibility for torque transmission is if the torque is transferred by the pilot adapter to the non-recoverable full face bit via a polygonal journal on the pilot adapter and a corresponding, polygonal inner contour on the full face bit and the components are correspondingly designed.

For ease of assembly and so that such drilling devices always have the same design, it is provided that, apart from the jacket tube sections, a jacket tube start piece assigned to the drill bit and a jacket tube end piece assigned to the adapter are provided, wherein the MF drill rod assembly of the extension piece to ensure sufficient coverage has approximately the same length as the jacket tube pieces. In particular because the MF drill rods and the jacket tubes are of the same length it is ensured that the front jacket tube or the jacket tube start piece also always covers the cage described such that the locking element during the drilling process and when in the waiting position always remains securely housed in the cage. Here the normal manufacturing tolerances for both systems are coped with without problems by the drilling system overall.

Because the jacket tube as a whole or the jacket tubes according to the invention is/are not drawn into the borehole, but are rather pushed into it, it is necessary for the coupling sleeve to be designed accordingly, as has already been explained above. This coupling sleeve can then perform the necessary functions, if it comprises an impact, slide and ejection adapter and a slide and ejection bell that comprises these and covers the jacket tubes. The adapter or more accurately the impact, slide and ejection adapter, is connected between the drill rod assembly and the rotary drill hammer and ensures that above all the described impact energy and also the torque of the hammer is transferred to the drill rod assembly

and thus to the drill bit. The adapter is at the same time a sliding adapter, because it impinges via the covering sliding and ejection bell on the jacket tube or the jacket tubes and pushes these evenly into the borehole. It serves as an ejection part, which is explained only in extensive detail below, in that it delivers the arriving drilling debris at a constant rate from the borehole, so that the minimum clogging within the borehole occurs. Such jacket tubes are according to the invention mainly used as drainage systems, so that after the drilling debris later on also water or other fluids can also emerge and be drained off, if the coupling sleeve remains on the end of the jacket tube. To open the cage by releasing the connection between the coupling sleeve and the jacket tube, the extension rod or the drill rod assembly is pushed further into the borehole.

Typically, there must be a suitable connection between the sliding and ejection bell and the impact, slide and ejection adapter, in order then that with the jacket tube at a standstill the rest of the device can be driven as far as necessary further into the rock mass. For this a particularly suitable solution is one in which the sliding and ejection bell is connected to the adapter via an impact ring designed to be detachable, which is arranged in a correspondingly shaped annular groove of the adapter. This impact ring thus ensures that the impact energy is transferred as much as necessary by the drill rod assembly to the jacket tube, which actually has to be inserted with it into the rock mass or into the borehole. This impact ring has a detachable design, in order that at the moment described above it is possible to release the connection between the drill rod assembly and the jacket tube. It is designed such that during the actual drilling work it ensures that the jacket tube is pushed with it into the borehole and upon completion of the drilling work the drill rod assembly alone can then be pushed further into the borehole. With the further driving-in the cage is opened, because the jacket tube no longer actually covers the cage and the connection between the extension piece and the drill bit is removed. Via the annular groove in the adapter the impact energy is absorbed to a sufficient extent and via the impact ring and sliding and ejection bell transferred to the jacket tube. The sliding and ejection bell itself, on

the other hand, sits in a sliding manner on the adapter, thus on the impact, sliding and ejection adapter.

The release of the impact ring from the adapter is achieved in a particularly suitable manner if the impact ring is comprised two half-shells, which are held together by an elastic O-ring arranged in the annular groove which can be removed from its seat. Such an elastic O-ring keeps the half-shells in the seat and in the active position without any problem, especially as these two half-shells or the impact ring actually sit firmly in the pre-formed annular groove. If now the O-ring is detached and the two half-shells removed, the sliding and ejection bell no longer experiences any impacts and slides on the adapter, so that the drill rod assembly without taking the jacket tube with it can be drilled further into the rock, until the locking elements or the locking element have or has dropped out of the cage.

In order then to ensure again that in particular the impact energy is securely transferred to the sliding and ejection bell, and that therefore the impact ring does not in any way slide over the sliding and ejection bell or slip off, the invention provides that the impact ring positioned in the annular groove is designed to interfere with and be located in a supporting groove formed in the bell. During active work the impact ring is thus also retained by the bell, so that the elastic O-ring really only needs to hold the two half-shells together. Upon completion of the actual drilling work and removal of the O-ring the two half-shells are removed from the annular groove and the supporting groove, so that then as shown the drill rod assembly can be drilled further into the rock mass without taking the jacket tube with it.

The jacket tubes can at the same time in an especially simple and suitable manner be used as drainage pipes, if as proposed according to the invention they have through-holes arranged and formed distributed over their circumference and length or a mesh design. In particular with said through-holes it is ensured that

through the impacts over-stressing of the jacket tubes cannot occur. The same applies if the mesh design is correspondingly strong or “impact resistant”.

The drilling debris is to the greatest possible extent delivered from the borehole, in order not to unnecessarily impede later work, which is achieved in that in order to discharge the drilling debris between the ring drill bit and pilot drill bit and further between the pilot drill bit and jacket tube or between the full face bit and the jacket tube start piece longitudinal grooves and then a sufficiently dimensioned annular space between the extension piece of the drill rod assembly and the jacket tube are provided, and on the coupling sleeve a longitudinal channel between the adapter and sliding and ejection bell and finally an adjoining ejection window in the sliding and ejection bell. This embodiment ensures that said drilling debris is delivered at an intended point and thus can also be reliably collected. A channel system within the drill rig as a whole is created, so that the drilling debris via the flushing medium, in particular flushing water, can be easily and reliably delivered, without leading the clogging at any point.

The invention is characterised in particular in that with the drilling system described, unlike the known folding drilling system it is possible to also drill at diameter ranges of significantly less than 102 mm. Where non-recoverable drill bits are used, both ring and full face, unlike the prior art with the new system there are no functional defects to complain of. During the drilling process the connection created between the drill rod assembly and the drill bit is so solid and secure that the impact energy can be effectively transferred from the carrier element to the non-recoverable drill bit and also the part drill bit, such that guided rotation and torque transfer are fully guaranteed and that the non-recoverable drill bit cannot unintentionally slip off or be removed from the carrier element in any drilling situation. Furthermore, the invention means that the desired decoupling of the non-recoverable drill bit once drilling is complete can take place easily, quickly, securely and without any additional dangers. This also means that for decoupling no rotation against the direction of rotation is necessary. The invention allows the use of non-recoverable ring drill bits and also the use of non-recoverable full face

bits. It therefore covers a very broad range of dimensions and applications and allows corresponding optimisations.

Further details and advantages of the object of the invention are provided by the following description of the attached drawing, in which a preferred embodiment with the necessary details and individual parts is presented. This shows as follows:

Figure 1 a boring and placement rig with jacket tubes having through-holes or a mesh design and with a ring drill bit and pilot drill bit and with a full face bit;

Figure 2 the boring and placement device with ring and pilot drill bit in cross-section;

Figure 3 the boring and placement device with full face bit in cross-section;

Figure 4 the ring- and pilot drill bit according to Figure 2 in frontal view;

Figure 5 the full face bit according to Figure 3 in frontal view;

Figure 6 the front section of the device according to Figure 2 in an enlarged representation;

Figure 7 the front part of the device according to Figure 3 in an enlarged representation, and

Figure 8 the end piece according to Figure 2 or Figure 3 turned towards the drill hammer (not shown) in an enlarged representation.

Figure 1 shows a boring and placement device 1 without the associated drill hammer, in particular rotary drill hammer. This is connected to the drilling rig at the point identified by 2, wherein 2 is also the actual drill rod assembly. The middle representation in Figure 1 shows a boring and placement device 1 composed of a number of parts. At the connection end the coupling sleeve 3 is provided, which ensures that the rotational energy of the rotary drill hammer is transferred from the drill rod assembly 2 to the jacket tube 5 or the jacket tubes. These jacket tubes 5 enclose the extension piece 4 of the drill rod assembly 2 and the drill rod assembly

2 itself and at the front end carry the drill bit 6. In the middle representation and also the top representation a non-recoverable ring drill bit 7 and a pilot drill bit 8 are shown, while in the bottom representation a full face bit 9 is shown. All drill bits 7, 8, 9 are fitted with hard metal pins 10 and ensure that the impact and rotational energy exerted by the rotary drill hammer is employed so that the upcoming rock mass which is not shown here is crushed and a drill hole results.

The jacket tubes 5 are provided with through-holes 11, 12 in both the middle and bottom representations while in the top representation a mesh construction 13 is shown, via which the jacket tubes 5 remaining in the boreholes can simultaneously be used as drainage pipes.

In Figure 1 the jacket tube 5 comprises the jacket tube sections 15, 15' and the jacket tube start piece 16 and the jacket tube end piece 17. These jacket tubes 15, 16, 17 have a certain length and serves to ensure that the locking element 20 used as an important connection element always remains in the cage 21 visible in Figure 2, immediately drilling work is carried out.

Figure 2 shows the boring and placement device 1 in the middle of Figure 1, wherein the cross-section illustrates how the drill rod assembly 2 extends as far as the extension piece 4, which has a threaded connection with the drill rod assembly 2. This extension piece 4 carries at its front end pilot drill bit 8 or transitions into this pilot drill bit 8. Via the flushing hole 55 shown the flushing liquid, which is introduced via the channel 54 of the drill rod assembly 2, is also forced into the borehole. The ring drill bit 7 is arranged on this pilot drill bit 8 in a detachable or displaceable manner. The two are held together by means of the aforementioned locking element 20, which here takes the form of a locking bolt 32. This locking element 20 is arranged in a longitudinal groove 22 of the pilot drill bit 8 and protrudes over this longitudinal groove 22 into and through the locking window 23 which is formed in the ring drill bit 7. As a result the locking window 23 with sides 24 results, which always ensure that the ring drill bit 7 rotates along with the pilot drill bit 8. Here the cage 21 is covered via the inner wall 25 of the jacket

tube 5 or the jacket tube start piece 16. During drilling work joint rotation and movement of the drill bit 7 is thus ensured, while the covering jacket tube 5 via the coupling sleeve 3 is moved together with the drill rod assembly 2. The first drill rod of the drill rod assembly 2 in the representation according to Figure 2 and Figure 3 is referred to as the MF drill rod 34. It has the same length as the individual jacket tube sections 15, 15', so that the necessary coverage of the cage 21 via the jacket tube 5 is always ensured.

The entrainment or pushing of the jacket tube 5 by the coupling sleeve 3 is explained in more detail above. Figure 3 shows a design in which instead of the partitioned drill bit 6 a full face bit 9 is used. This full face bit 9 is also equipped with hard metal pins 10. The delivery from the flushing hole takes place here via the flushing hole 56 in the full face bit 9.

The full face bit 9, as clearly shown in Figure 3 but especially also in Figure 7, is mounted on an extension piece 4 in the form of a pilot adapter 28, wherein this pilot adapter 28 also has a threaded connection with the drill rod assembly 2.

A locking element 20, here in the form of a locking ball 33, again provides a connection secured against rotation between the full face bit 9 and drill rod assembly 2. This locking ball 33 is at first seated in the annular groove 27, which can be seen from Figure 7 and between the sides 30 of the locking window 29 in the full face bit 9 or in its shaft 35. This cage 21 is again covered by the jacket tube 5 or more accurately by the jacket tube start piece 16.

Figure 4 is a frontal view of the combined ring drill bit 7 and pilot drill bit 8, while Figure 5 is a front view of the full face bit 9. It can be seen that all these drill bits are fitted with a plurality of hard metal pins 10.

Figures 6 and 7 are enlargements of the front parts of the boring and placement devices 1 shown in Figures 2 and 3. Building on that which has already been stated above, here it is shown how the drilling debris in the representation

according to Figure 6 initially flows via the longitudinal groove 45 between the ring drill bit 7 and pilot drill bit 8, before ingress from the longitudinal groove 46 between the jacket tube and pilot drill bit into the annular space 48. Discharge of the flushing medium is managed in a similar way in accordance with Figure 7. Here the drilling debris initially via the longitudinal groove 45 between the shaft 35 of the full face bit 9 and the inner wall 25 of the jacket tube start piece16 reaches the longitudinal groove 47 between the full face bit 9 and jacket tube 5. For both of these the rear section, which is shown and explained in Figure 8, has the same design. The drilling debris is delivered via the annular space 48 or 49, which extends around the drill rod assembly 2, before reaching via the longitudinal channel 50 the impact, slide and ejection adapter 36 or the sliding and ejection bell 37. Here the longitudinal channel 50 leads into a kind of annular recess 52 and from there via the ejection window 51 into the environment. Here the drilling debris can thus be securely collected and disposed of.

The impact, slide and ejection adapter 36 has the connection 60 to the drill hammer and also the connection to the drill rod assembly 2, wherein here a screw thread is provided. The inner channel for the flushing medium is labelled 54. The ejection bell 37 is mounted on the impact, slide and ejection adapter 36, wherein the impact ring 38 ensures that this sliding and ejection bell 37 moves as well, while the sliding and ejection bell 37 in itself is arranged in a sliding manner on the adapter 36.

This sliding and ejection bell 37 has a sliding surface 58, via which it is ensured that when the sliding and ejection bell 37 moves with the drill rod assembly 2 the jacket tube 5 or the jacket tubes is/are also displaced. In order to ensure that the sliding and ejection bell 37 is moved with the impact, slide and ejection adapter 36, the impact ring 38 is arranged in an annular groove 39 of the adapter. This comprises two half-shells 40, 41 and an O-ring 42 holding these together. In the design according to Figure 8 it protrudes into the sliding and ejection bell 37, which has a supporting groove 59 for this purpose. This results in the supporting surface labelled 43, which ensures that the impact ring 38 always

carries with it the sliding and ejection bell 37 described and thus also the jacket tube 5, as long as it is in the position shown in Figure 8.

The jacket tubes 5 are slid by the sliding and ejection bell 37 over the corresponding sliding surface and moved forwards as drilling progresses. The latter receives the sliding force and thus the sliding movement for its part from the impact, slide and ejection adapter 36 and the half-shells 40, 41 of the impact ring 38 affixed thereto. Part of the impact energy of the drill hammer or rotary drill hammer machine is therefore transferred by the adapter 36 via this impact ring 38 and the sliding and ejection bell 37 outwards to the jacket tubes 5 and therefore promotes their forward movement.

The main component of the impact energy is transferred by the spigots or the connection 60 of the rotary percussion drilling machine via the adapter 36 to the MF drill rod 8 and the furthest forward drill rod 7. In the system with non-recoverable ring drill bit 7 the impact energy is then transferred further into the pilot drill bit 8, in which it is transferred in part to the front side via the hard metal pins 10 or also plates to the rock and there causes the demolition of the rock in a central area of the bottom of the borehole, part of it being transferred via the locking element 20 and the associated design of the pilot drill bit 8 to the ring drill bit 7, which thus brings about the rock removal in the annular area assigned to it.

In the system with non-recoverable full face bit 9 the impact energy is passed on to the pilot adapter 28, which then transfers this in full to the full face bit 9. Through the hard metal pins 10 or other cutting elements on the front side of the full face bit 9 the rock is removed at the bottom of the borehole. Torque transfer in the drill string or in the drill rod assembly 2 is performed by the spigots or the connection 60, via the impact, slide and ejection adapter 36, the MF drill rod 8, the first drill rod 7 and the pilot adapter 28 in each case via a threaded joint. Torque transfer from the pilot drill bit 8 to the non-recoverable ring drill bit 7 takes place as mentioned via the locking bolt 32 or via the locking ball 33 and via the sides 30 of

the annular groove 27 in the pilot adapter 28, so that here also the desired drilling work can be reliably performed.

Torque transfer by the pilot adapter 28 to the non-recoverable full face bit 9 takes place in a variant of the locking bolt 32 or the locking ball 33, via the side 30 of the annular groove or of the locking window 29 and then to the full face bit 9. In a second variant torque transfer by the pilot adapter 28 to the non-recoverable full face bit 9 takes place via a polygonal journal on the pilot adapter 28 and a corresponding polygonal internal contour on the non-recoverable full face bit 9 or its shaft 35.

The room for manoeuvre for the locking bolt 32 or the locking ball 33 in the cage 21 is ultimately determined by the size of the components. Radial plays of 0.5 – 1.5 mm, tangential plays of 0.5 – 3 mm and axial plays of 5 – 50 mm are suitable. In order to guarantee limitation of the outward radial movement, the jacket tube 5 or the jacket tube start piece 16 should be in the correct axial position, e.g. it must fully cover the locking window 23 or 29 or securely overlap this. This is easy to achieve by making the MF drill rods 34 and the die jacket tubes 5 the same length.

Once the drilling process is complete upon reaching the drill hole depth, first the O-ring 42 and then the half-shells 40, 41 of the impact ring 38 on the impact, slide and ejection adapter 36 are removed. In this way the positive-locking fit between the impact, slide and ejection adapter 36 and sliding and ejection bell 37 is released. Now drilling with the drill system as a whole is continued, typically for a further 10 - 20 cm. Due to the absence of a positive-locking fit only the inner drill string or drill rod assembly 2 moves forwards and the outer area with the sliding and ejection bell 37, jacket tube end piece 17, jacket tube sections 15, 15' and jacket tube start piece 16 remain in place. In this way the relative positions of the non-recoverable drill bit 6 – irrespective of whether it is a non-recoverable ring drill bit 7 or non-recoverable full face bit 9 – and the jacket tube start piece 16 remain the same. The cage 21 for the locking element 20 is opened and the locking

element 20, supported by the rotational and forward movement of the drilling system, can leave this cage and safely drop away. In this way, without the complicated manoeuvring that is usually necessary with the existing systems, the securing of the non-recoverable drill bit 6 to the remainder of the drill rod assembly 2 is very simply and easily removed. This leaves the way free to remove the inner drill rod assembly 2 without obstruction and risks and in fact through the entire jacket tube 5. This jacket tube 5 remains in its entirety with the non-recoverable drill bit 6 in the borehole, wherein the jacket tube end piece 17 is naturally recovered and can be reused.

CLAIMS

1. A device providing a combined boring and placement system for jacket tubes (5), which after introduction into a borehole, for the creation of a drainage system or a pipe roof or an anchoring or a tubular pile, remain in the rock mass and which, when creating the borehole, are connected with an extension piece (4) of a drill rod assembly (2), wherein the extension piece (4) is fitted with a non-recoverable drill bit (6) which for this purpose can be partially or fully detached from the extension piece (4),

characterised in that,

the drill bit (6) is connected with the assigned extension piece (4) of the drill rod assembly (2) via a locking element (20) that secures it against rotation, which to this end is arranged in a cage (21) formed by the drill bit (6), extension piece (4) and jacket tube (5) and which can be released by the jacket tube (5) covering the cage (21).

2. Device according to claim 1 **characterised in that,** the jacket tube (5) via the coupling sleeve (3), which can be coupled to the drill rod assembly (2) in a releasable manner, can be inserted therewith into the borehole and can preferably be used as a drainage pipe.

3. Device according to claim 1,

characterised in that,

a plurality of cages (21) for the locking elements (20) are provided spread over the extent of the extension piece (4) of the drill rod assembly (2) and the drill bit (6).

4. Device according to one of the above claims,

characterised in that,

the cage (21) is designed to allow the locking element (20) a defined room for manoeuvre.

5. Device according to claim 4,

characterised in that,

the cage (21) is designed to limit the room for manoeuvre for the locking element (20) radially to 0.5 – 1.5 mm, and/or tangentially to 0.5 - 3 mm and/or axially to 5 - 50 mm.

6. Device according to one of the above claims,

characterised in that,

the cage (21) in the case of a non-recoverable ring drill bit (7) and pilot drill bit (8) is created by a longitudinal groove in the pilot drill bit (8), the sides (24) of a locking window (23) of the ring drill bit (7) and the overlapping inner wall (25) of the jacket tube (5).

7. Device according to one of the above claims,

characterised in that,

the cage (21) in the case of a drill bit (6) designed as a non-recoverable full face bit (9) is formed by an annular groove (27) in the pilot adapter (28) of the extension piece (4), the sides (30) of the locking window (29) of the full face bit (9) and the overlapping inner wall (25) of the jacket tube (5).

8. Device according to one of the above claims,

characterised in that,

the locking element (20) is designed as a locking bolt (32) or as a locking ball (33).

9. Device according to one of the above claims,

characterised in that,

for transfer of torque by the pilot adapter (28) to the non-recoverable full face bit (9) a polygonal journal on the pilot adapter (28) and a corresponding, polygonal inner contour on the full face bit (9) are provided for the purpose.

10. Device according to one of the above claims,

characterised in that,

apart from the jacket tube sections (15) a jacket tube start piece (16) assigned to the drill bit (6) and a jacket tube end piece (17) assigned to the adapter (36) are provided, wherein the MF drill rod (34) of the extension piece (4) in order to ensure sufficient coverage is approximately the same length as the jacket tube sections (15).

11. Device according to claim 1,

characterised in that,

the coupling sleeve (3) comprises an impact, slide and ejection adapter (36) and sliding and ejection bell (37) enclosing this and the jacket tubes (5).

12. Device according to claim 11,

characterised in that,

the sliding and ejection bell (37) is connected to the adapter (36) via an impact ring (38) designed to be detachable, which is arranged in a correspondingly formed annular groove (39) of the adapter (36).

13. Device according to claim 12,

characterised in that,

the impact ring (38) is comprised two half-shells (40, 41), which are held together by an elastic O-ring (42) arranged in the annular groove (39) which can be removed from its seat.

14. Device according to claim 12,

characterised in that,

the impact ring (38) positioned in the annular groove (39) is designed to interfere with and be located in a supporting groove (43) formed in the bell (37).

15. Device according to claim 1,

characterised in that,

the jacket tubes (5) have through-holes (11, 12) distributed over their circumference and/or length or a mesh construction (13).

16. Device according to claim 1,

characterised in that,

for removal of the drilling debris between the ring drill bit (7) and the pilot drill bit (8) and further between the pilot drill bit (8) and jacket tube (5) or between the full face bit (9) and the jacket tube start piece (16) longitudinal grooves (45, 46, 47) and then an annular space (48, 49) between the extension piece (4), drill rod assembly (2) and jacket tube (5), and on the coupling sleeve (3) a longitudinal channel (50) between the adapter (36) and the sliding and ejection bell (37) and finally an adjoining ejection window (51) in the sliding and ejection bell (37), are provided.

17. A method for creating a drainage system, pipe roof, an anchoring, or a tubular pile comprising the combined boring and placing of jacket tubes using a device according to any preceding claim.

18. A drainage system, pipe roof, an anchoring or a tubular pile formed using the device of any one of claims 1 to 15 or the method of claim 16.

Fig.1

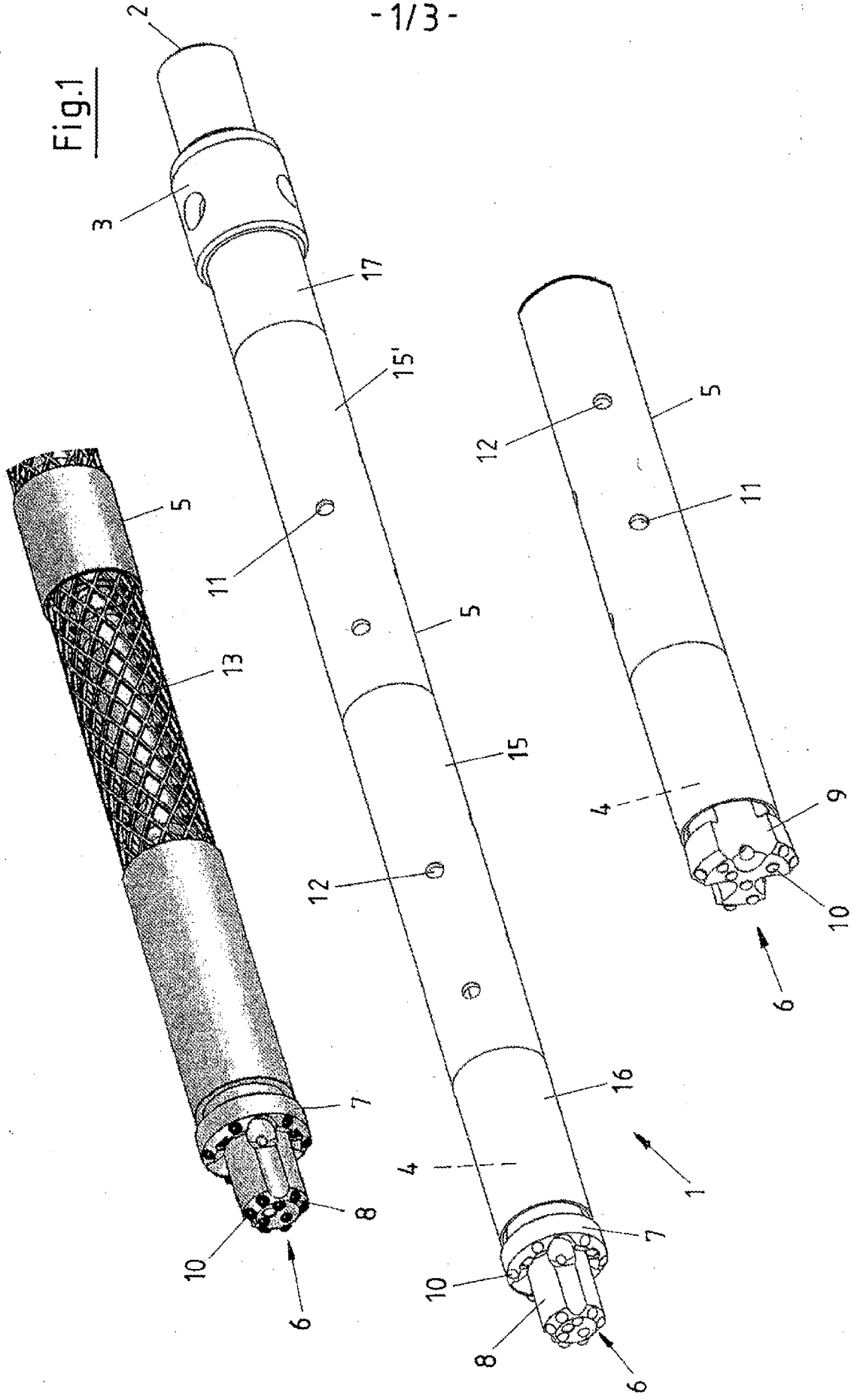


Fig.2

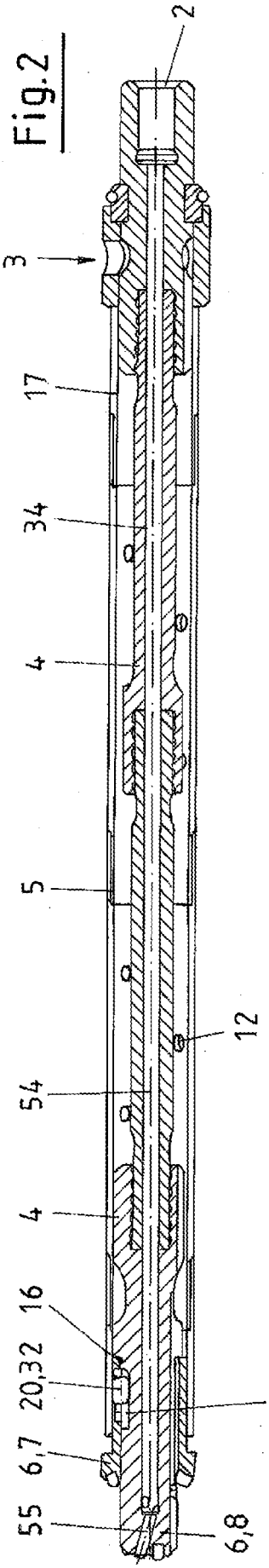


Fig.3

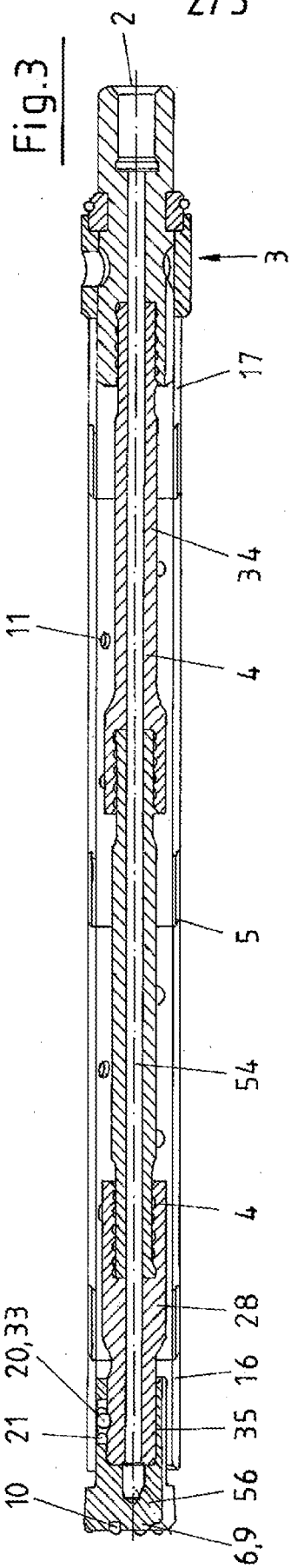


Fig.5

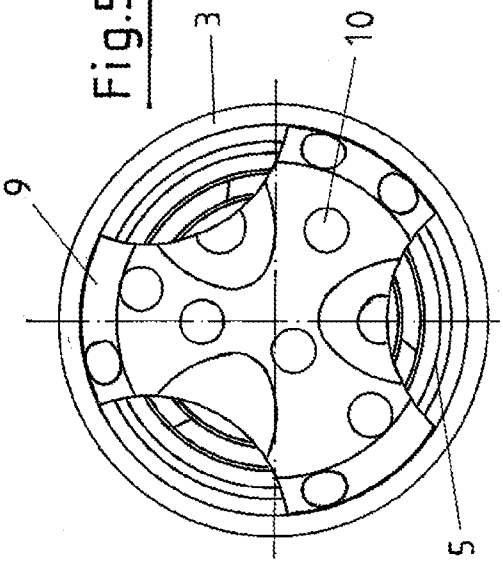


Fig.4

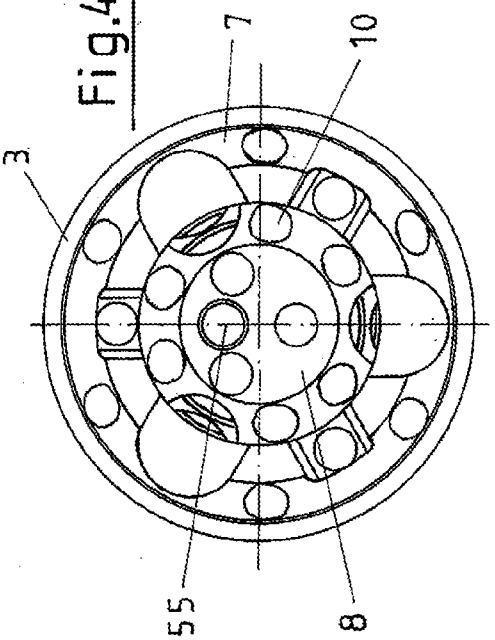


Fig.6

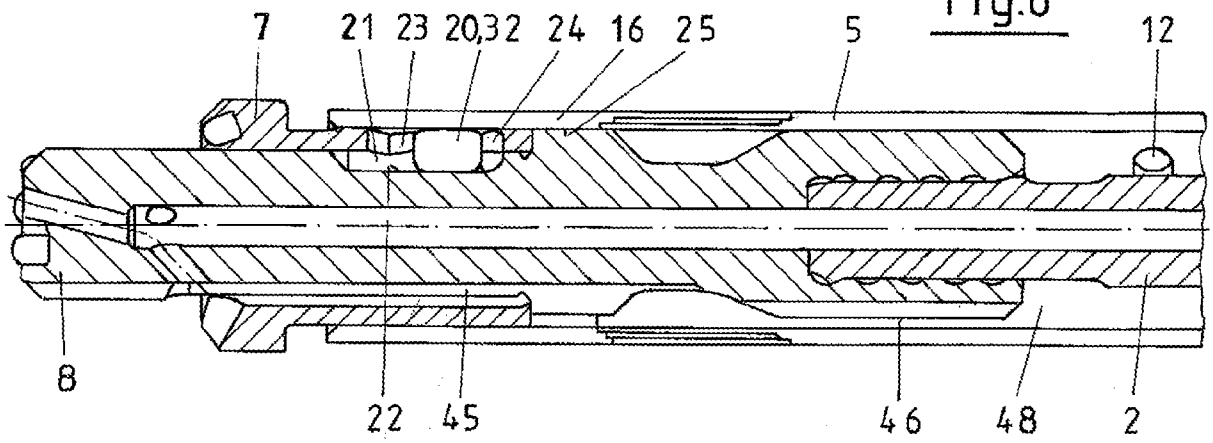


Fig.7

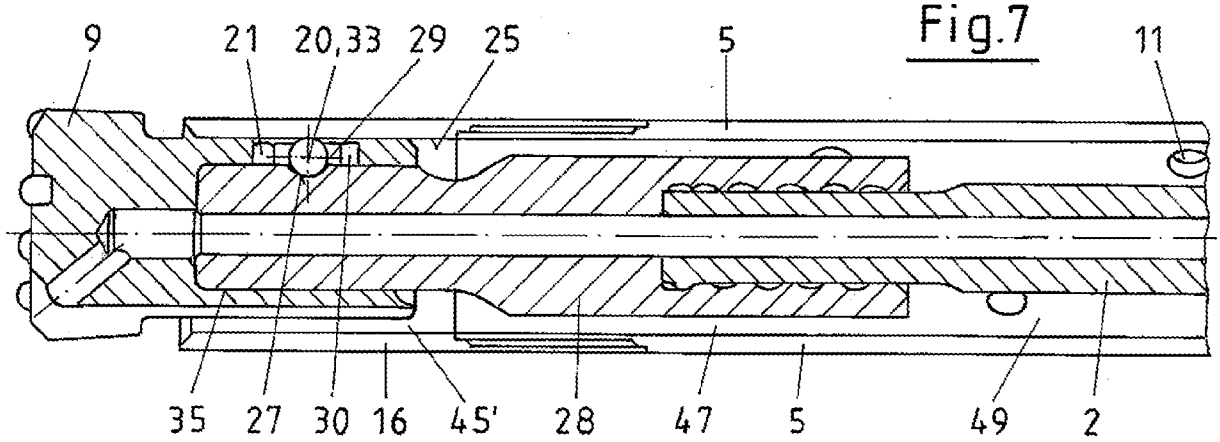


Fig.8

