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(54) Drilling chuck for a tool for hammer drilling

(57) The drilling chuck has a chuck body (3) for connection to a drive shaft (4, 4.1, 4.2), arranged to apply hammer blows to the tool (1). Guided in the chuck body are chuck jaws (5) which centre and axially guide the tool (1), and which are displaceable radially with respect to the axis of the chuck. At least one entrainment member (18) is provided for preventing the tool (1) from rotating in the chuck body (3). The chuck jaws (5) are of a length which extends axially beyond grooves (1.2) in the shank portion (1.1) of the tool so that these grooves can be engaged by entrainment members (18) which are withdrawn when the tool is to be freed.

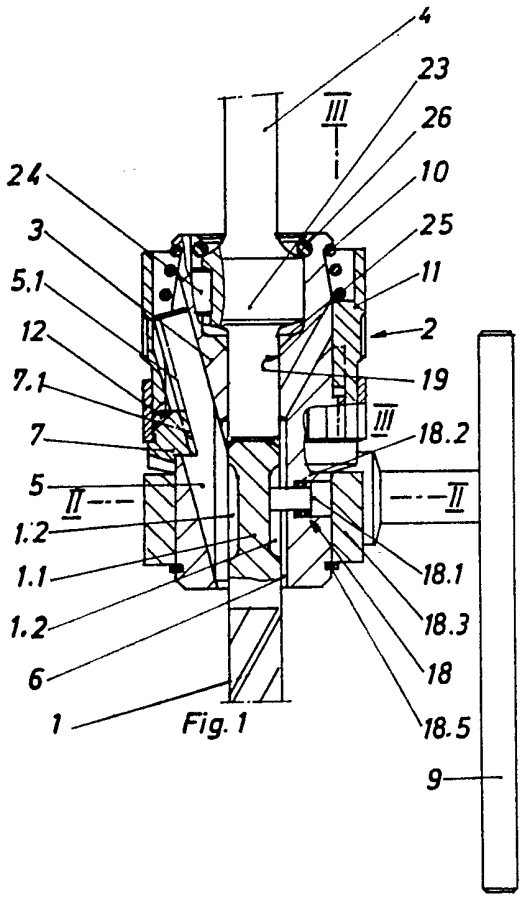

Fig. 1

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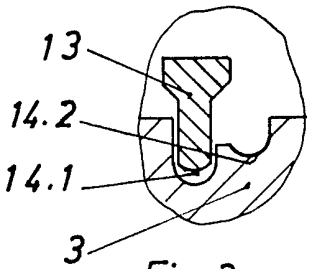


Fig. 3

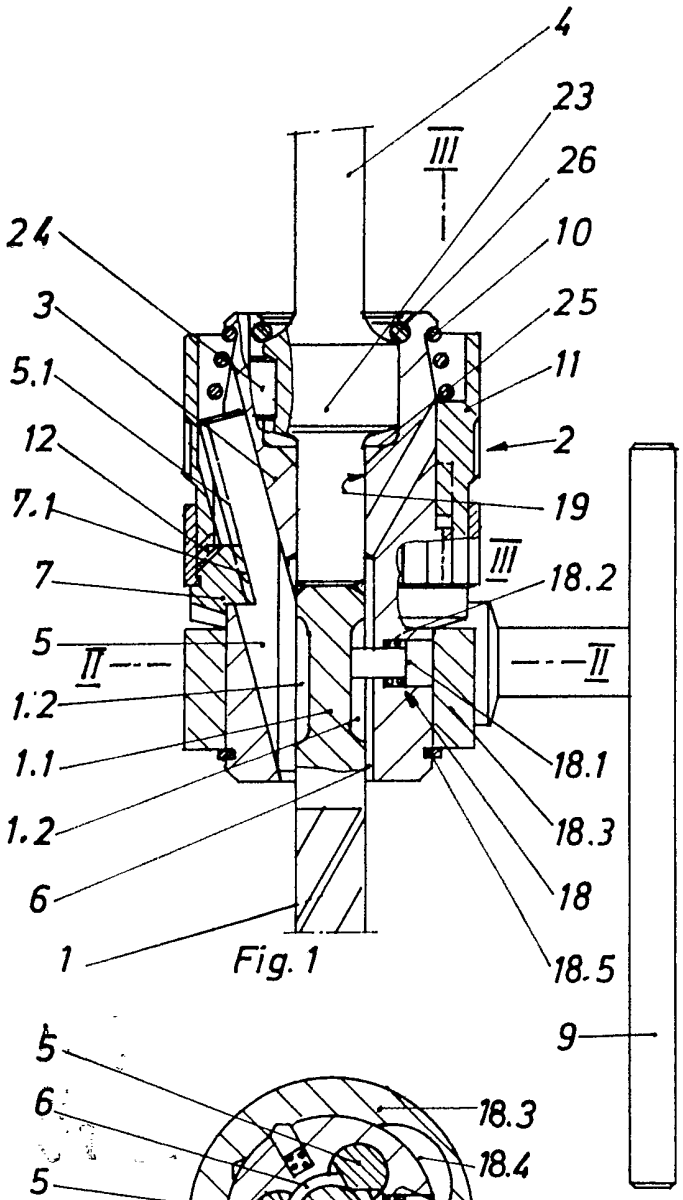


Fig. 1

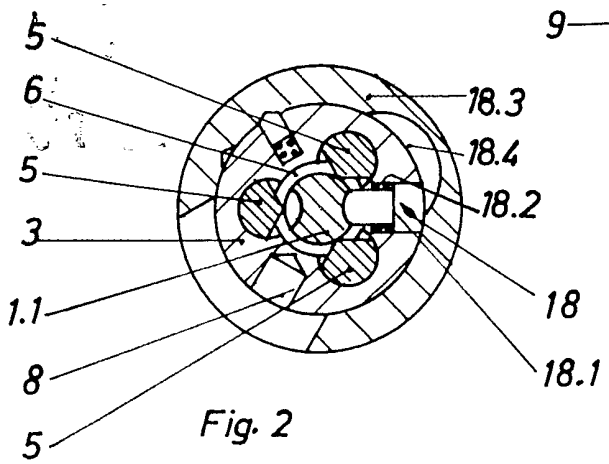


Fig. 2

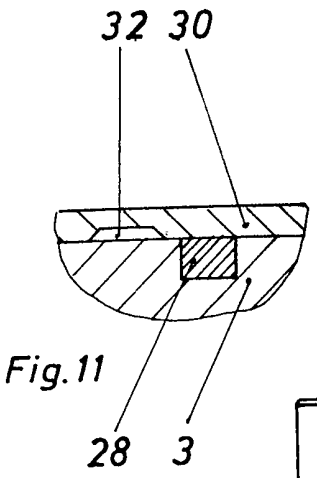


Fig.11

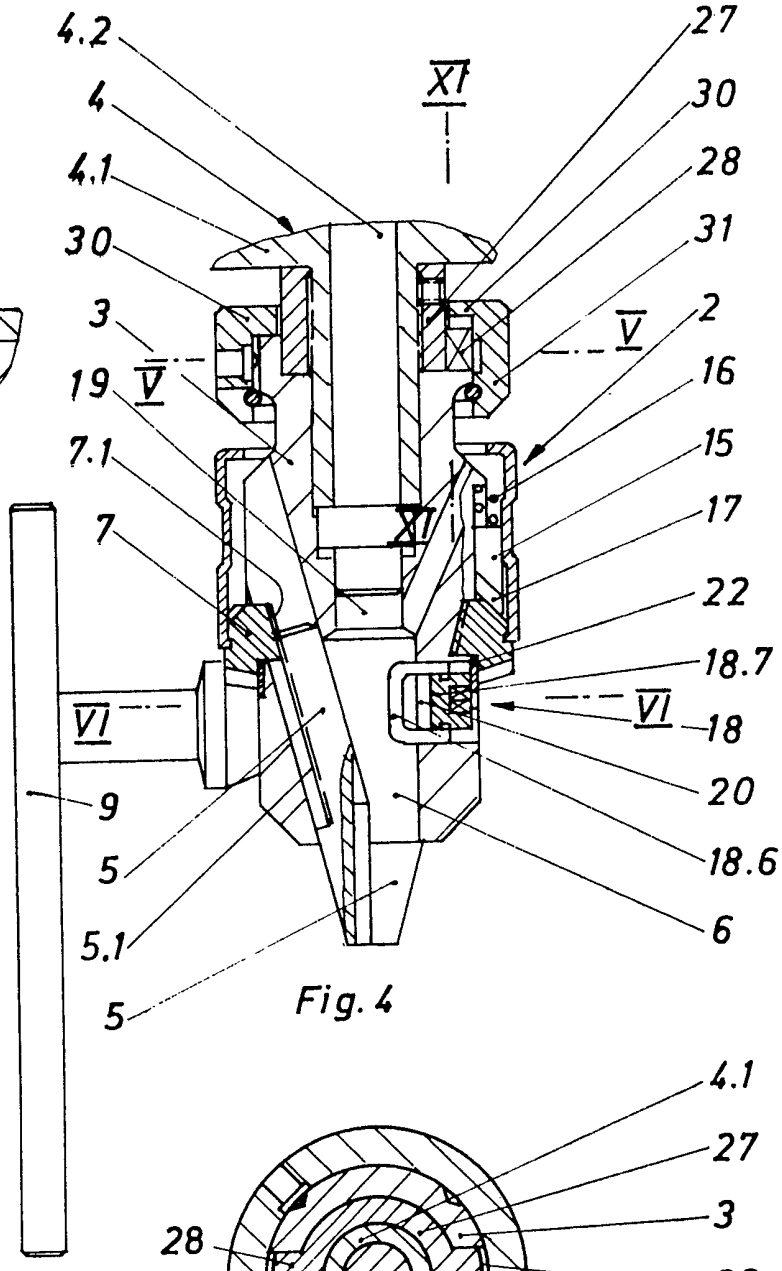


Fig. 4

Fig. 5

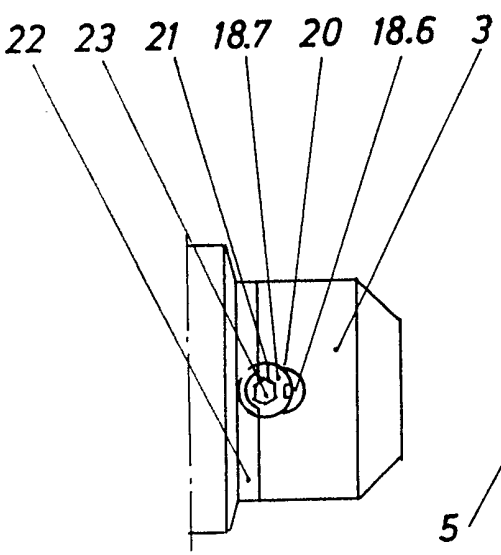


Fig.7

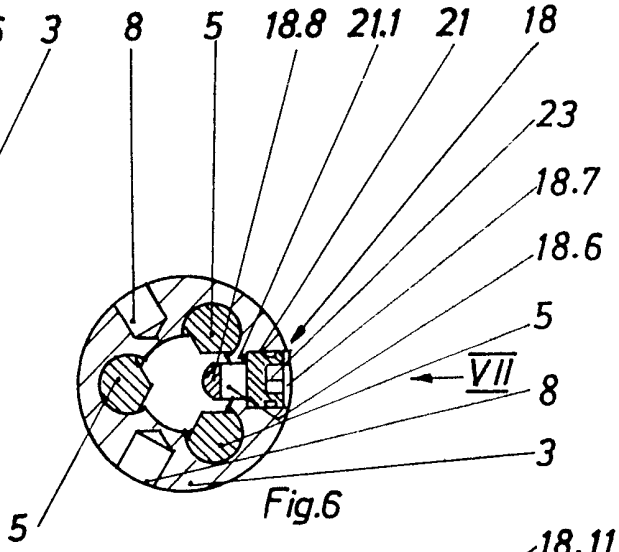


Fig.6

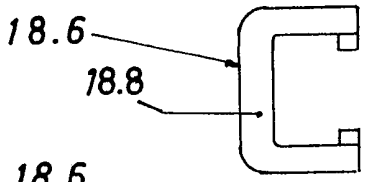
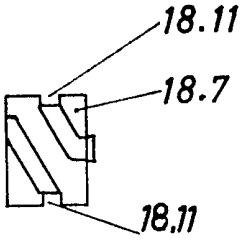


Fig.10



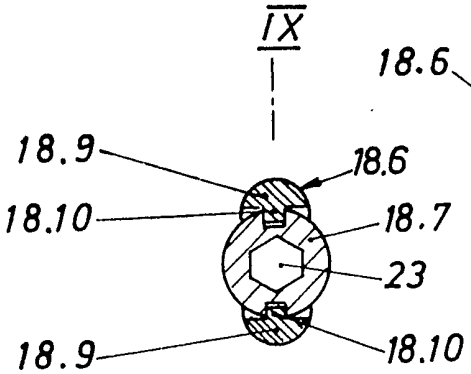


Fig.8

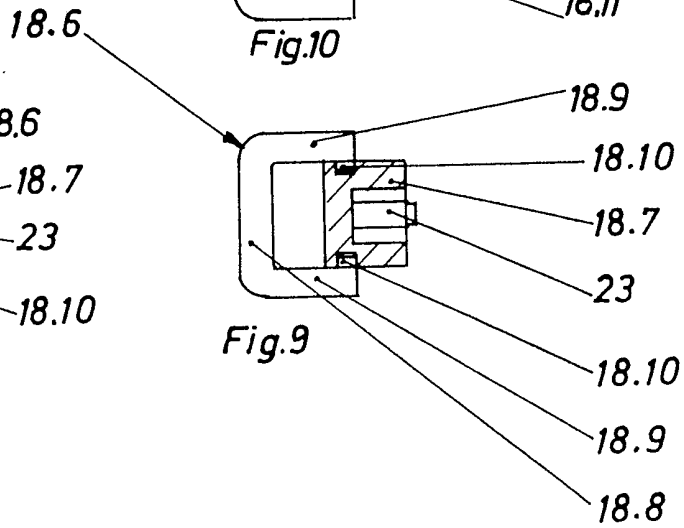


Fig.9

SPECIFICATION

Drilling chuck for a tool for hammer drilling

The invention relates to a drilling chuck for a tool for hammer drilling, having a chuck body for connection to a drive shaft of a drilling machine, the drive shaft being arranged to apply hammer blows to the tool, clamping jaws which centre and axially guide the tool and which form a tool receiving means, which is coaxial with respect to the axis of the chuck, for receiving the shank of the tool and which are displaceable centrally with respect to the axis of the chuck and an entrainment means for rotational entrainment of the tool.

In a clamping chuck of that kind, which is disclosed in German Specification (DE-OS) No. 31 33 085, the tool, with a smooth cylindrical shank portion, is held axially displaceably between the clamping jaws. The entrainment means is a rotary dog which can be clamped from the exterior against the shank portion of the tool and which is adjustable coaxially with respect to the axis of the chuck and which is secured in the clamping chuck in such a way as to be prevented from relative rotational movement and which is displaceable axially at least over a distance corresponding to the hammer stroke movement and radially in accordance with the diameter of the shank portion of the tool. The rotary dog when clamped to the shank portion of the tool participates in the hammer movements of the drilling tool and therefore the mass thereof has a damping effect on the hammer movement or hammer force of the tool. In particular however the quality of the clamping action of the rotary dog on the cylindrical shank portion of the tool, such clamping action serving to provide the rotary drive for the tool, often leaves much to be desired, as a consequence of the hammer loadings. The parts of the rotary dog which are clamped onto the tool can dig into the shank portion of the tool to a greater or lesser degree, whereby the shank portion of the tool which is gripped in the rotary dog may become slack therein. The rotary dog can then slip on the tool both axially and in the peripheral direction, and that adversely affects the rotary drive imparted to the tool.

German Utility Model No. 81 32 988 discloses a hammer drilling tool having an insertion end which has at least one axially closed longitudinal groove, wherein the longitudinal groove is subdivided into longitudinal portions by at least one web portion whose back corresponds to the contour of the insertion end. That configuration of the insertion end permits the tool to be used, and to be interchangeable, both in conventional hammer drilling machines and also in drilling hammers. Besides the regions of the shank portion of the tool, which laterally adjoin the longitudinal sections of the longitudinal groove, the web portion affords the possibility for contact in regard to the jaws of the clamping chuck of a hammer drilling machine so as to ensure that the tool is coaxially gripped in the clamping chuck of the hammer drilling machine. On the other hand, the grooves permit the tool to be held in drilling hammers. The locking elements of the tool holder, which are present in a number corresponding to the number of the above-mentioned grooves in the shank portion of the tool and which engage thereinto, ensure that the tool is held in such a manner as to be secure in the rotational direction while however permitting limited axial play. However, there is no possibility of using a clamping chuck which has locking elements for the grooves of a drilling tool, for gripping drilling tools which have a smooth cylindrical shank portion, that is to say, which does not have such grooves.

The invention is based on the problem, in a clamping chuck of the kind set forth in the opening part of this specification, of so designing the entrainment means as to permit tools which are in themselves intended for conventional hammer drilling machines or for drilling hammers to be held in an equally good and reliable manner which transmits the operating output of the drive machine to the drilling tool with a high degree of efficiency, more specifically foregoing components which are to be clamped on the shank portion of the tool and which are also moved axially with the tool and without adversely affecting rotatary entrainment of the tool in the clamping chuck on the one hand and without adversely affecting the action of guiding and coaxially aligning the tool which is held in the clamping chuck by the engagement of locking elements into the longitudinal grooves in the shank portion of the tool, on the other hand.

According to the invention, a drilling chuck for a tool for hammer drilling comprises a chuck body for connection to a drive shaft which is arranged to apply hammer blows to a tool when mounted in the chuck, the tool having grooves extending along the shank portion thereof, clamping jaws which centre and axially guide such tool and which form a tool receiving means, which is coaxial with respect to the axis of the chuck, for receiving the shank of the tool, and which jaws are displaceable radially with respect to the axis of the chuck, and an entrainment means for rotational entrainment of the tool, the chuck jaws being of a length which extends axially beyond the grooves in the shank portion of the tool, and at least one entrainment member being disposed in the peripheral direction between the chuck jaws, and being radially displaceably guided in the chuck body and being designed to be engaged into the said grooves.

The advantage achieved by the present in-

vention is firstly that conventional drilling tools with a smooth shank portion can be gripped and held in conventional manner between the chuck jaws in the drilling chuck according to the invention, the entrainment member being retracted out of the tool receiving means into the chuck body and the tool receiving means being freed for receiving the shank portion of the tool. On the other hand, in the clamping chuck according to the invention, it is possible to use drilling tools with grooves which extend lengthwise in the shank portion of the tool, by the entrainment member engaging into one of the grooves and ensuring rotary entrainment of the drilling tool without the chuck jaws having to be radially firmly tightened against the shank portion of the tool. Therefore, with the entrainment member engaging into the grooves, the tool is axially loosely held and guided in the tool receiving means of the drilling chuck and is movable with respect to the chuck jaws which are fixed in the drilling chuck and can therefore perform its hammer movements without corresponding axial entrainment of the chuck jaws and thus also without the mass of the jaws exerting a damping effect. The only important consideration in that manner of gripping and operating the tool is that the shank portion of the tool is guided in the tool receiving means axially above and below the grooves in the shank portion of the tool so that engagement of the entrainment member into one of the grooves cannot result in the shank portion of the drill being tilted or jammed in the tool receiving means. In that connection, it may suffice for the chuck jaws to guide the shank portion of the tool axially only on the tool side in front of the grooves, if provision is made in the drilling chuck for guiding the end of the shank portion in another fashion. If, in this connection, the chuck is a drilling chuck with an opening therethrough in the chuck body, through which the hammer blows can be transmitted from the drive shaft directly (for example by means of an anvil) onto the end of the shank portion which is disposed in the tool receiving means, a preferred embodiment of the invention is characterised in that the end portion of the opening, on the tool side, is formed as an axial guide means for the end of the shank portion of the tool, which projects into the opening through the chuck body.

There are various options, in accordance with the invention, in regard to the configuration of the entrainment member. A desirable embodiment is characterised in that the entrainment member is an entrainment pin which is spring-loaded radially outwardly and which abuts against a setting ring which is rotatably guided externally on the chuck body and which holds the entrainment pin in the position of projecting into the tool receiving means and which has recesses into which, when the setting ring is in the appropriate position, the entrainment pin can pass until the tool receiving means is freed. In that case, it is only necessary to rotate the setting ring for the entrainment pin to be pushed forward into the tool receiving means against the force of the spring, or to be withdrawn from the tool receiving means.

Another preferred embodiment of the entrainment member which permits precise adjustment as to how far the entrainment member respectively projects into the tool receiving means is characterised in accordance with the invention in that the entrainment member is formed by a head portion and by a rotary portion which moves the head portion forwardly and back in the workpiece receiving means, wherein the head portion is radially displaceable and non-rotatable about the axis of displacement, whereas the rotary portion is guided in the chuck body radially non-displaceably and rotatably about the axis of displacement and between the head portion and the rotary portion there is a screw connection which converts the rotary movement of the rotary portion into a radial movement of the head portion (with respect to the axis of the chuck). preferably, it is desirable for the head portion to be in the form of a substantially U-shaped loop member which is designed with the back of the U-shaped member projecting into the tool receiving means for engagement into the groove in the tool, and is also guided in an elongate aperture in the chuck body, the long axis of which extends in the direction of the axis of the chuck, and which, at the ends of the limb portions of the U-shaped member, carries pegs which are directed towards each other and which engage into screwthread pitches on the outer peripheral surface of the rotary portion. The cylindrical rotary portion is mounted in a central cylindrical enlargement, which is in the form of a blind hole, in the elongate aperture, and is secured therein by a skirt which partially engages over the rotary portion on the outside thereof and which leaves free a key receiving means which is provided in the rotary portion in the end thereof and which is intended for fitting a key that permits the rotary portion to be turned. The skirt may be formed by an annular band or strip which extends around the chuck body.

The invention is described in greater detail hereinafter with reference to embodiments illustrated in the accompanying drawings, in which:

Figure 1 shows a view in axial section through a drilling chuck;

Figure 2 shows a view taken along line II-II through the drilling chuck shown in Figure 1;

Figure 3 shows a view in section taken along line III-III through the drilling chuck shown in Figure 1;

Figure 4 shows a view in axial section of another drilling chuck;

Figure 5 shows a view in cross-section taken along line V-V through the drilling chuck shown in Figure 4;

Figure 6 shows a view in cross-section taken along line VI-VI through the drilling chuck shown in Figure 4;

Figure 7 shows a view of the drilling chuck shown in Figure 6 in the direction of the arrow VII shown therein;

Figure 8 shows a view in cross-section through the entrainment member of the drilling chuck shown in Figures 4 to 7;

Figure 9 shows a view in section taken along line IX-IX through the entrainment member shown in Figure 8;

Figure 10 shows side views of the two individual components which form the entrainment member illustrated in Figures 8 and 9, illustrated separately from each other; and

Figure 11 shows a view in section taken on lines XIXI in Figure 4.

The drilling chucks 2 shown in the drawings serve to receive a tool 1, which is shown only in Figures 1 and 2, for hammer drilling. The drilling chuck 2 comprises a chuck body 3 for connection to a drive shaft 4, which is adapted to apply hammer blows to the tool 1, of a drilling machine which is in other respects not shown; in the embodiment illustrated in Figure 1, the drive shaft 4 transmits both the rotary and the hammer drive, while in the embodiment shown in Figure 3 the drive shaft 4 is of a two-part construction, namely comprises a drilling spindle 4.1 which only transmits the rotary movement and an anvil 4.2 which is axially displaceably guided in the hollow drilling spindle 4.1 and which transmits only the hammer loading. The drilling chucks 2 have chuck jaws 5 which centre and axially guide the tool 1 and which form a tool receiving means 6, which is coaxial with respect to the axis of the chuck, for receiving the shank portion 1.1 of the tool and which are displaceable centrally with respect to the axis of the chuck. For that purpose, the chuck jaws 5 engage by means of a tooth configuration 5.1 into an internal tooth configuration 7.1 of a toothed ring 7 which is axially non-displaceably and rotatably guided on the chuck body 3 and which can be turned for the purposes of tightening and slackening the chuck, by means of a key 9 which can be fitted to the chuck body 3 in guide receiving means or recesses 8. In order to prevent undesired jaw displacement, the toothed ring 7 can be fixed in its rotational position. For that purpose, the embodiment illustrated in Figure 1 has a locking sleeve 11 which is guided rotatably between two positions and axially displaceably against the force of a spring 10. At its front edge which is towards the tool, the sleeve 11 carries a locking tooth configuration 12 which can engage into a co-operating tooth configuration on the toothed ring 7 and locks the toothed ring 7 when the locking sleeve 11 is in its forward position as illustrated in Figure 1. In contrast, in the axially retracted position, the toothed ring 7 is released for any rotary movement. The two positions of the locking sleeve 11 can be fixed by a detent or retaining means which is shown in Figure 3. For that purpose, the locking sleeve 11 is provided with a projection 13 which can engage into two detent or retaining recesses 14.1 and 14.2 of different depths in the axial direction, on the chuck body 3. Figure 3 shows the locking sleeve 11 in the axially advanced position. If the locking sleeve 11 is urged back against the force of the spring 10 and positioned with the projection 13 in the axially shallower recess 14.2, the locking tooth configurations 12 are out of engagement.

In the embodiment illustrated in Figure 4, axially displaceably guided locking bolt members 15 of which only one is shown in Figure 4 serve for locking the toothed ring 7 on the chuck body. Under the force of springs 16, the locking members 15 engage with their front end 17 that is towards the tool, into corresponding locking recesses in the toothed ring 7, the side surfaces of the locking recesses and the ends of the locking members which engage thereinto being so inclined that, in the engaged condition, the toothed ring 7 is secured against undesired rotational movement, whereas when the toothed ring 7 is moved by hand or by means of the key 9, the locking members 15 can be lifted out of the locking recesses and in that way the toothed ring 7 can be rotated without the need for the locking members 15 previously having to be independently moved into the release position. The chuck body 3 has an opening 19 therethrough, through which the hammer blows can be transmitted from the drive shaft 4 or 4.2 directly onto the end of the shank portion 1.1 of the tool, which is in the tool receiving means 6.

In both embodiments, the chuck jaws 5 are of a length which extends axially beyond grooves 1.2 which are provided in the shank portion 1.1 of the tool. Disposed between the chuck jaws 5 in the peripheral direction is an entrainment member 18 which is radially displaceably guided in the chuck body 3 and which is designed for engagement into the grooves 1.2 which extend lengthwise on the tool 1 in the clamping region thereof. In that connection, it may suffice for the chuck jaws 5 to guide the shank portion 1.1 in the axial direction only on the side towards the tool, in front of the grooves 1.2, if, as in Figure 4, there is the possibility that the end of the shank portion of the tool can project into the end portion of the opening 19 which is towards the tool, that is to say, the opening 19 is formed as an axial guide means for the end of the shank portion 1.1.

In Figures 1 and 2, the entrainment mem-

ber 18 is an entrainment pin 18.1 which is urged radially outwardly by the force of a spring 18.2 and which abuts against a setting ring 18.3 which is guided rotatably on the chuck body 3 on the exterior thereof. The setting ring 18.3 is secured against axial movement by a spring ring 18.5. With its internal peripheral surface, the setting ring 18.3 holds the entrainment pin 18.1 in the position shown in Figures 1 and 2, in which it projects into the tool receiving means 6. At its inside peripheral surface, the setting ring 18.3 has recesses 18.4 into which the entrainment pin 18.1 can pass in a radially outward direction until the tool receiving means 6 is freed, when the setting ring 18.3 is suitably rotated, more specifically when a tool 1 having a smooth ungrooved shank portion 1.1 is to be clamped between the chuck jaws 5.

In the embodiment illustrated in Figures 4 to 10, the entrainment member 18 is formed by a head portion 18.6 and a rotary portion 18.7 which displaces the head portion forward into and backwards from the tool receiving means 6. The head portion 18.6 is radially displaceable with respect to the axis of the chuck and non-rotatable about the axis of displacement, while conversely the rotary portion 18.7 is guided in the chuck body non-displaceably in the radial direction with respect to the axis of the chuck and rotatably about the axis of displacement. Between the head portion 18.6 and the rotary portion 18.7 there is a screwthread connection which converts the rotary movement of the rotary portion 18.7 into a displacement of the head portion 18.6, which is radial with respect to the axis of the chuck. More specifically, the head portion 18.6 is in the form of a substantially U-shaped loop member which is directed with its back 18.8 which projects into the tool receiving means 6, for engagement into the groove 1.2 in the tool, and in particular is of a configuration corresponding to the profile thereof. The head portion 18.6 is guided in an elongate aperture or slot 20 in the chuck body 3, the long axis thereof extending in the direction of the axis of the chuck. In that way, the head portion 18.6 cannot rotate in the elongate aperture 20. Disposed at the ends of the limb portions 18.9 of the U-shaped member are pegs 18.10 which are directed towards each other and which engage into screwthread pitches 18.11 on the outer peripheral surface of the rotary portion 18.7. The cylindrical rotary portion 18.7 is mounted in a central cylindrical enlargement, which is formed as a blind hole 21, of the elongate aperture 20, and is secured therein in the radial direction of the chuck on the one hand by the bottom 21.1 of the blind hole 21 and on the other hand by a skirt 22 which partially engages over the rotary portion 18.7 on the outside thereof and which is in the form of an annular band or strip extending around the chuck body 3. The skirt 22 leaves free a key receiving means or recess 23 which is provided in the rotary portion 18.7 in the end thereof and into which a key (not shown) can be inserted for rotating the rotary portions 18.7 and therewith radially displacing the head portion 18.6.

In addition, although the drilling chuck 2 is nonrotatably carried on the drive shaft 4 or 4.1, it is axially displaceable thereon, with a free play. In the embodiment illustrated in Figure 1, the non-rotatable connection between the chuck body 3 and a collar 23 on the drive shaft 4 is made by axial coupling pins 24 which engage into receiving means or recesses on the one hand in the collar 23 and on the other hand in the chuck body 3, without in so doing impeding axial relative movement as between the chuck body 3 and the drive shaft 4. An axial limit is set on the relative movement, by direct contact between the collar 23 of the drive shaft 4 and an annular shoulder 25 in the chuck body 3. The drilling chuck 2 is secured on the drive shaft 1 by a circlip 26 which is fitted into an annular groove in the chuck body 3 and which engages over the collar 23 on the side that is remote from the annular shoulder 25.

In the embodiment illustrated in Figures 4 and 5, a sleeve 27 if fixedly carried on the drilling spindle 4.1 and carries two radially projecting pegs 28 which engage into recesses 29 in the chuck body 3. The pegs 28 provide for the drilling chuck 2 to be non-rotatably driven by the drilling spindle 4.1. In order at the same time to permit axial movement of the drilling chuck 2 on the drilling spindle 4.1, the recesses 29 are open at the end towards the spindle and have an internal collar portion 30 of a coupling ring 31 engaging thereover. The internal collar portion 30, on its inward surface which is in axially opposite relationship to the pegs 28, has recesses 32 into which the pegs 28 can pass, when the coupling ring 31 is in the appropriate rotational position. When therefore the coupling ring 31 lies with the annular surface of its internal collar portion 30 directly against the pegs 28, as shown in Figure 11, any axial movement between the drilling chuck 2 and the drive spindle 4.1 is prevented. If in contrast the coupling ring 31 is rotated in such a way that the recess 32 moves into a position above the peg 28 in Figure 11, the drilling chuck 2 is freely displaceable with respect to the drilling spindle 4.1, by a distance corresponding to the axial height of the recesses 32.

CLAIMS

1. A drilling chuck for a tool for hammer drilling comprises a chuck body for connection to a drive shaft which is arranged to apply hammer blows to a tool when mounted

in the chuck, the tool having grooves extending along the shank portion thereof, clamping jaws which centre and axially guide such tool and which form a tool receiving means, which is coaxial with respect to the axis of the chuck, for receiving the shank of the tool, and which jaws are displaceable radially with respect to the axis of the chuck, and an entrainment means for rotational entrainment of the tool, the chuck jaws being of a length which extends axially beyond the grooves in the shank portion of the tool, and at least one entrainment member being disposed in the peripheral direction between the chuck jaws, and being radially displaceably guided in the chuck body and being designed to be engaged into the said grooves.

2. A drilling chuck according to Claim 1, having an opening in the chuck body, through which the hammer blows can be transmitted from the drive shaft directly on to the end of the shank portrion of a tool when mounted in the chuck, the end portion of the opening which is positioned towards the tool receiving means being formed as an axial guide means for the end of the shank portion of a tool when it projects into the opening.

3. A drilling chuck according to Claim 1, in which the entrainment member is an entrainment pin which is spring-loaded radially outwardly and which abuts against a setting ring which is rotatable externally on the chuck body and which holds the entrainment pin in a position projecting into the tool receiving means, the setting ring having recesses into which, when the setting ring is in the appropriate position, the entrainment pin can pass enabling the tool to be freed from the tool receiving means.

4. A drilling chuck according to Claim 1, in which the entrainment member is formed by a head portion and a rotary portion which moves the head portion forwardly into and back from the tool receiving means, wherein the head portion is radially displaceable relative to the axis of the chuck and non-rotatable about the axis of displacement, whereas the rotary portion is rotatable in the chuck body non-displaceably relative to the axis of the chuck and rotatably about the axis of displacement, a screw connection being provided between the head portion and the rotary portion.

5. A drilling chuck according to Claim 4, in which the head portion is in the form of a substantially U-shaped member which is designed for engagement into a groove in a tool while the back of the U-shaped member projects into the tool receiving means, and is guided in an elongate aperture in the chuck body, the long axis of which extends in the direction of the axis of the chuck, the ends of the limb portions of the U-shaped member carrying pegs directed towards each other and engaging into screwthreads on the outer peripheral surface of the rotary portion.

6. A drilling chuck according to Claim 5, in which the cylindrical rotary portion is mounted in a partially blind hole in the chuck body, and is secured therein by a skirt which partially engages over the rotary portion on the outside thereof and which leaves free a key receiving means provided for turning the rotary portion.

7. A drilling chuck according to Claim 6, in which the skirt is formed by an annular band which extends around the chuck body.

8. A drilling chuck substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings.

9. A drilling chuck substantially as hereinbefore described with reference to Figures 4 to 11 of the accompanying drawings.

CLAIMS

Amendments to the claims have been filed, and have the following effect:

Claims 1 to 3 above have been deleted or textually amended.

New or textually amended claims have been filed as follows:

1. A drilling chuck for a drilling tool, comprising a chuck body for connection to a drive shaft, chuck jaws which centre and axially guide the tool when mounted in the chuck and which form a tool receiving means for the tool shank, which is coaxial with the axis of the chuck, which are of a length which axially extends when the tool is mounted beyond tool grooves in the tool shank and which are displaceable centrally with respect to the axis of the chuck, and at least one radially adjustably guided entrainment member which is formed for engaging into the grooves extending longitudinally on the tool when mounted in the clamping region thereof, the entrainment member being arranged in the chuck body in the peripheral direction between the chuck jaws, the arrangement being such that when a tool for hammer drilling is in use the impacts of the drive shaft can be transmitted through an opening in the chuck body directly on to the end of the tool shank in the tool receiving means and the chuck jaws on the one hand and the entrainment member on the other hand being adjustable independently of each other.

2. A drilling chuck according to Claim 1, in which the end portion of the opening, that is towards the tool location, is formed as an axial guide for the end of the shank of the tool, that projects into the opening when the tool is mounted.

3. A drilling chuck according to Claim 1, wherein the entrainment member is an entrainment pin which is under the force of a spring in a radially outward direction and bears against an adjusting ring which is mounted rotatably on the exterior of the chuck

body and which holds the entrainment pin in the position of projecting into the tool receiving means and has recesses into which the entrainment pin can pass, when the ring is in a suitable position, for releasing the tool receiving means.

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