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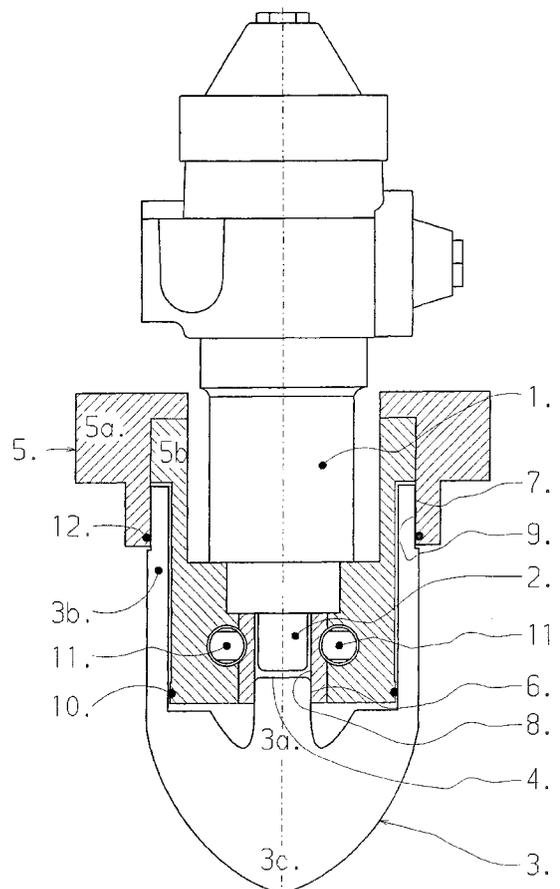
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(54) Tool for percussion apparatus

(57) A tool for a percussion apparatus, comprising an impact surface (4) to be impacted by an impact piston (2) and at least one guide surface in the axial direction of the tool (3).

The tool end intended to face the percussion apparatus (1) comprises a socket-like guide portion (3b), within which the front end of the percussion apparatus (1) can be placed, and at least one guide surface (7) is formed at that end of the socket-like guide portion (3b) which faces the percussion apparatus (1).

Fig 1



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## Description

The invention relates to a tool for a percussion apparatus, comprising an impact surface intended to be impacted by an impact piston of the percussion apparatus and a blade extending from the impact surface forward in the axial direction of the tool and at least one guide surface in the axial direction of the tool, the guide surfaces being intended to guide an axial movement of the tool with respect to the percussion apparatus together and in contact with at least one corresponding guide surface of the percussion apparatus.

In hydraulically, pneumatically or electrically driven percussion apparatuses of different kinds, a tool is used which is impacted by the impact piston of the percussion apparatus when different materials, such as concrete, stone, asphalt, tree or the like are broken or cut. Such percussion apparatuses can also be used when penetrating the ground, such as frozen ground, soft stone and so on. Both light manual percussion apparatuses and heavy ones to be mounted on bases of different kinds are available, the driving power of these apparatuses being generally obtained from separate power units located at the end of hoses or cables.

When the percussion apparatus is in use, the impact piston of the apparatus makes reciprocating impact movement guided by guides provided therein, such as control valves or respective switches. At the lower end of the percussion apparatus, in the impact direction of the impact piston, there is a tool, the receiving or impact surface of which is impacted by the impact piston when the apparatus is in use, which impact piston provides the tool with an impact impulse or force causing the desired material to break. The tool moves guided with respect to the percussion apparatus in such a way that the tool comprises guide surfaces and the percussion apparatus comprises corresponding guide surfaces, the surfaces gliding with respect to each other in the axial direction of the tool and keeping the tool in the right position with respect to the percussion apparatus. Guide surfaces can be formed directly on the percussion apparatus and the tool. The guide surfaces may also comprise changeable wear sockets or a coating, as the guide surfaces of the tool known at present. The material can be tempered steel, cast iron, bronze plastic, bronze teflon, various ceramics or the like.

The tools used in the known solutions are generally rather thin and long and their ends facing the impact piston are mounted in a space formed at the front end of the percussion apparatus, where their movement and position are guided by means of various wear sockets or the like. This leads to that bending stresses in the tools become rather strong and the total length of the apparatus becomes rather long. These facts are in many cases detrimental and a thin tool often causes unnecessary breakages of the tool, which raises the costs of equipping and also causes delays in the work. In addition, because of its length, the percussion apparatus

is more difficult to handle or to place in small or narrow spaces.

The object of this invention is to provide a tool and how to guide this tool with respect to the percussion apparatus in such a way that the known drawbacks are avoided and a reliable and safe solution is achieved. The tool according to the invention is characterised in that the end of the tool intended to face the percussion apparatus comprises a socket-like guide portion dimensioned in such a way that the front end of the percussion apparatus for the tool can be placed within the socket-like guide portion and that at least one guide surface is formed at that end of the socket-like guide portion which faces the percussion apparatus.

An essential idea of the invention is that the tool end facing the impact piston is formed socket-like in such a way that the end of the percussion apparatus facing the tool can be placed inside the socket-like portion of the tool. Another essential idea of the invention is that a movement of the tool is guided by guide surfaces provided on its socket-like portion by the aid of guide surfaces provided on the percussion apparatus. Still another essential idea of the invention is that the impact surface of the tool is within the socket-like portion of the tool so that the rear guide point of the tool is situated backwards from the impact surface.

An advantage of the tool according to the invention is that the whole constituted by the percussion apparatus and the tool can be made considerably shorter than the known solutions. Further, it is possible to use a tool being more firm than those of the known solutions, and therefore, this tool resists stresses better than the tools of the known solutions.

The invention is described in greater detail in the attached drawings, in which

Figure 1 shows schematically an embodiment of a tool according to the invention constituting a whole with a percussion apparatus, partly in section,

Figure 2 shows schematically a second embodiment of the tool according to the invention at the front end of the percussion apparatus, partly in section,

Figure 3 shows schematically a third embodiment of the tool according to the invention at the front end of the percussion apparatus, in section, and

Figures 4a to 4c show examples of some alternative cross-sections of a socket-like portion of the tool on the line A - A indicated in Figure 3.

Figure 1 shows schematically a percussion apparatus 1, which can be hydraulically, pneumatically or electrically driven. Inside the percussion apparatus 1 moves an impact piston 2, the end of which can be seen in the section of the front part of the actual percussion apparatus in the figure. At the front end of the percussion apparatus 1, below that in the figure, there is a tool 3 comprising a pin-like part 3a in the middle and an impact

surface 4 to be impacted by the impact piston 2 at that end which faces the percussion apparatus 1. At the front end of the percussion apparatus 1, there is further a surrounding guide 5. The tool 3, in turn, comprises a socket-like guide portion 3b extending outside and around that guide 5 end which faces the tool 3 and thus also around the front end of the percussion apparatus 1. The front end of the tool comprises a blade 3c, which can be shaped in different ways and is suitable for the purpose. For instance, the guide 5 can comprise, as shown in the figure, two separate parts 5a and 5b to be joined together or it can be manufactured of only one part. In practice, the guide 5 can also be a part of the percussion apparatus.

The tool 3 comprises two guide surfaces 6 and 7, the guide surface 6 being provided on the outer surface of the pin-like guide part 3a and the guide surface 7 on the outer surface of the upper end of the socket-like guide portion 3b. Correspondingly, the inner surface of the front end of the percussion apparatus 1 comprises a guide surface 8 of the guide surface 6 of the pin 3a and the guide 5 comprises, in turn, a guide surface 9 for the guide surface 7 of the socket-like portion 3b. When the tool 3 moves in the longitudinal direction of the percussion apparatus, it glides back and forth under the influence of impacts of the impact piston 2 guided by the guide surfaces 6, 8 and 7, 9, respectively. Between the guide 5 and the socket-like portion 3b, there can be one or more seals 10, 12 preventing various fluids and also dust from passing by.

The percussion apparatus 1 and the guide 5 are connected together for instance by locking means 11 shown in the figures, which means can be any locking means known per se, or the percussion apparatus and the guide 5 may be integral. Correspondingly, the tool 3 can be locked in its longitudinal direction movably to the guide 5 in such a way that it cannot get loose by itself, by using any locking method known per se, such as locking pins 13 or the like, through an elongated opening 14 in the tool.

Figure 2 shows another embodiment of the arrangement according to the invention. This corresponds to the embodiment of Figure 1 except that here the guide surface 6' which is closer to the point of the tool 3 is formed on the inner surface of the socket-like guide portion 3b, in the vicinity of the front end of the socket-like guide portion 3b, and, on the other hand, the corresponding guide face 8' is formed at the front end of the guide, on its outer surface. In other respects, the components of this embodiment and their operation are similar to those in Figure 1 and provided with the same reference numerals, for which reason it is not necessary to describe them here in further detail.

Correspondingly, Figure 3 shows a third embodiment of the arrangement according to the invention. In this embodiment, the front end of the tool 3 is guided in the same way as in Figure 2, but at the upper end of the tool, a guide surface 7' of the socket-like guide portion

3b of the tool is formed on the inner surface of the socket-like guide portion 3b, and in turn, a corresponding guide surface 9' is formed on the outer surface of the guide 5. The guide surfaces 6, 7 may also constitute an integral axial longish guide surface and, respectively, the guide surfaces 8' and 9' on the guide 5 facing the percussion apparatus or on the body of the percussion apparatus may constitute an integral guide surface. The guide surfaces may also be implemented in such a way that there is an integral guide surface on one side and, on the other side, there are two guide surfaces at a distance from each other for instance in the manner shown in Figure 3. In other respects, the reference numerals, operation and structure of the components of Figure 3 correspond to the same components in Figures 1 and 2.

Figures 4a to 4c show schematically some alternative cross-sections of the socket-like portion 3b of the tool on the line A - A indicated in Figure 3. Figure 4a shows schematically an angular alternative cross-section, which is advantageous in use, because it locks the tool 3 non-rotatable with respect to the percussion apparatus 1 and thus stresses less the locking means of the tool, which keep the tool connected to the percussion apparatus. In this embodiment, a sliding surface 7' can be provided substantially on the whole inner periphery or it may be provided for instance on four sides, which make pairs perpendicular to each other. Pentagonal or hexagonal cross-sections or cross-sections having different numbers of angles can also be used in the same manner, of course.

Figure 4b shows, in turn, a typical conventional circular cross-section, in which the sliding surface 7' is formed cylindrical on the whole inner surface.

On the other hand, Figure 4c shows an embodiment, in which the sliding surfaces 7' are only parts of the cylindrical surface so that grooves remain between the parts of the sliding surface, which grooves do not serve as sliding surfaces.

The embodiments of sliding surface illustrated in Figures 4 to 4c by aid of examples can be applied in a manner obvious to one skilled in the art both to the inner and outer surfaces of the socket-like portion 3b and also to the outer and inner surfaces of the guide 5 or the percussion apparatus 1. Likewise, in the embodiment of Figure 4c, grooves between both the inner and outer sliding surfaces 7' can be used to prevent the tool 3 from rotating with respect to the percussion apparatus 1.

The invention has been presented above in the description and the drawings only by aid of examples and it is not in any way restricted thereto. As was stated earlier, the power source of the impact operation of the percussion apparatus can be either hydraulic, pneumatic or electric. The essential thing is that the tool comprises a socket-like guide portion, within which the front end of the percussion apparatus can be placed, and that guide surfaces facing back from the impact point of the impact piston and supporting and guiding the tool during its movement are provided between the percussion appa-

ratus and the tool. The invention can also be applied in such a way that the main part of the percussion apparatus is inside the socket-like portion of the tool, the percussion apparatus being at its one end connectable for instance to a working machine and remaining simultaneously almost entirely protected by the socket-like guide portion of the tool. Further, the socket-like guide portion can have a round, angular or oval cross-section or it can have another suitable form. Because its form deviates from the round form, it stays automatically non-rotatable with respect to the percussion apparatus. It is also clear that the guide surfaces 6/8, 6', 8', 7/9, 7', 9' do not need to extend as an integral surface around the tool and the guide, respectively, but they can be shaped of parts of a guide surface at suitable distances in different ways, between which parts there are no guide surfaces in contact with each other. Likewise, various ways of lubricating the surfaces between the tool 3 and the guide 5 can be implemented in manners known per se. The guide surface 7, 7' at that end of the socket-like guide portion 3b which faces the percussion apparatus 1 can either extend to the edge of the socket-like guide portion or to be at a distance from it towards the point of the tool 3, depending on the situation.

#### Claims

1. Tool for a percussion apparatus, comprising an impact surface (4) intended to be impacted by an impact piston (2) of the percussion apparatus (1) and a blade extending from the impact surface (4) forward in the axial direction of the tool and at least one guide surface in the axial direction of the tool (3), the guide surfaces being intended to guide an axial movement of the tool (3) with respect to the percussion apparatus (1) together and in contact with at least one corresponding guide surface of the percussion apparatus, **characterised** in that the end of the tool (3) intended to face the percussion apparatus (1) comprises a socket-like guide portion (3b) dimensioned in such a way that the front end of the percussion apparatus (1) for the tool (3) can be placed within the socket-like guide portion (3b) and that at least one guide surface (7, 7') is formed at that end of the socket-like guide portion (3b) which faces the percussion apparatus.
2. Tool according to claim 1, **characterised** in that, in the middle of the tool (3), at the front end of the socket-like guide portion (3b), there is a pin-like part (3a) intended to be pushed inside the front end of the percussion apparatus (1) and that the impact surface (4) is located at the end of the pin-like part (3a).
3. Tool according to claim 2, **characterised** in that at least one guide surface (6) of the tool is formed on the outer surface of the pin-like part (3a).
4. Tool according to claim 1 or 2, **characterised** in that at least one guide surface is an inner surface (6') at the front end of the socket-like guide portion (3b), in the vicinity of the impact surface.
5. Tool according to any preceding claim, **characterised** in that the guide surface (7) at that end of the socket-like guide portion (3b) which is intended to face the percussion apparatus (1) is formed on the outer surface of the socket-like guide portion (3b).
6. Tool according to any one of the claims 1 to 4, **characterised** in that the guide surface (7') at that end of the socket-like guide portion (3b) which is intended to face the percussion apparatus (1) is formed on the inner surface of the socket-like guide portion (3b).
7. Tool according to any preceding claim, **characterised** in that at least one of the guide surfaces (6; 6'; 7; 7') of the tool is substantially cylindrical.
8. Tool according to any preceding claim, **characterised** in that it comprises at least on one level a plurality of guide surfaces located on different sides of the socket-like guide portion (3b) of the tool (3), which guide surfaces together form a guide surface guiding the tool (3) and keeping it in the right direction.
9. Tool according to any preceding claim, **characterised** in that at least one of the guide surfaces (6; 6'; 7; 7') has a polygonal cross-section.
10. Tool according to any preceding claim, **characterised** in that the guide surfaces (7', 6') on the socket-like guide portion form in the longitudinal direction of the socket-like guide portion (3b) an integral guide surface having substantially the same length as the socket-like guide portion (3b).



Fig 2

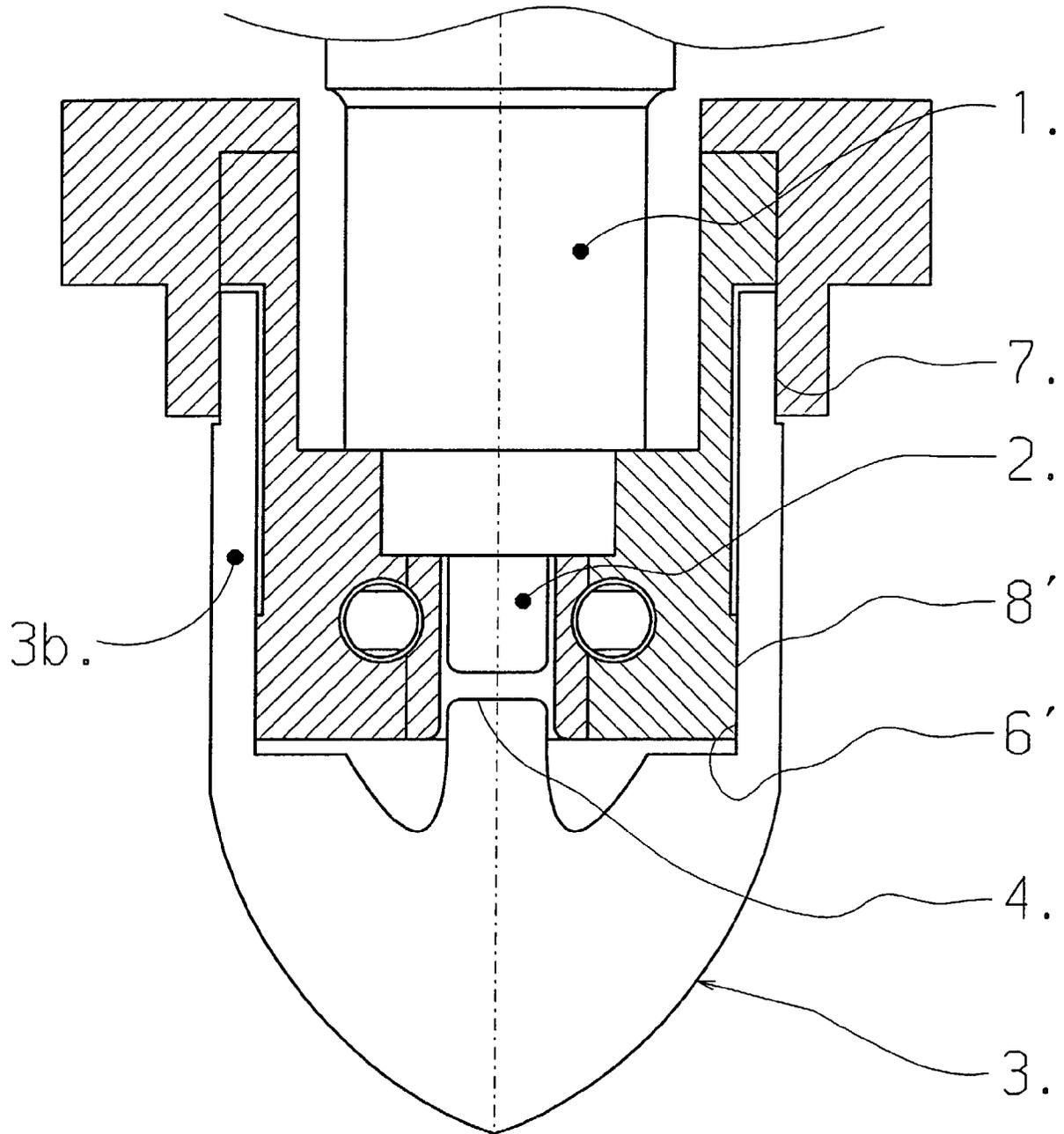
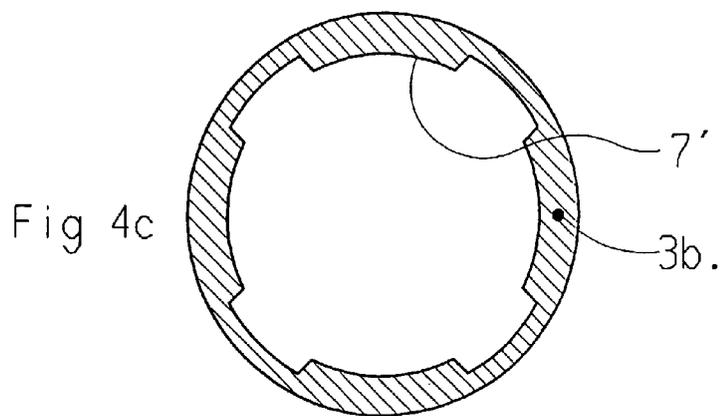
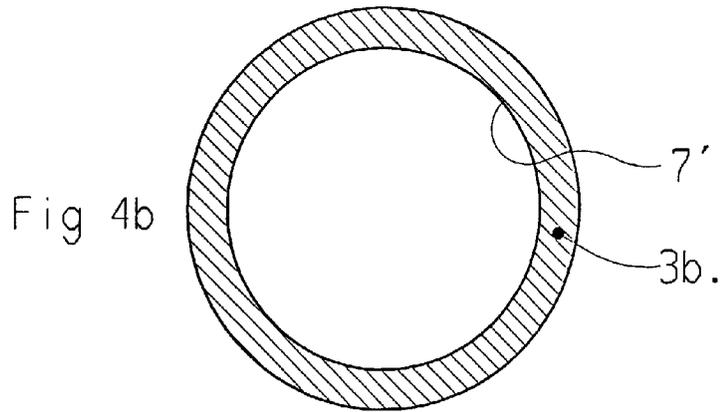
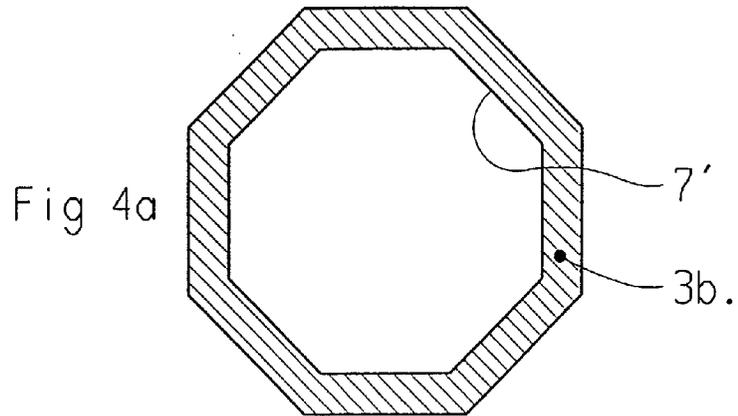




Fig 4

Section A-A





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EUROPEAN SEARCH REPORT

Application Number  
EP 97 66 0150

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 3 797 586 A (SMITH A ET AL) * column 4, line 40 - column 5, line 21; figure 2 *	1,4,6-8, 10	B25D17/02
X	DE 21 57 259 B (TRACTO-TECHNIK PAUL-SCHMIDT) * figures 6-8 *	1-4,6-8	
A	WO 89 04418 A (UNDERGROUND TECHNOLOGIES INC)		
A	US 4 102 534 A (BENEDICT NEIL W ET AL)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B25D E21B
Place of search	Date of completion of the search	Examiner	
THE HAGUE	8 May 1998	Rambaud, P	
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