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(54) Stabilising tool.

(57) A stabiliser tool for connection in a drill string having a fluted stabilising portion comprising a body part (16) integral with the shank (10) of the tool and a leading end sleeve part or cap (18) removably secured to the shank. The cap (18) can readily by replaced when worn. The tool may be suppled as a set including different interchangeable caps having for example, spiral flutes (22) for normal stabilising operation, or straight flutes to enable the tool to be used as a reamer when drilling rough and abrasive rock formations.

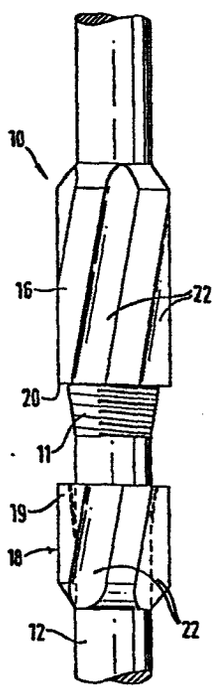

FIG.2.

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STABILISING TOOL

This invention relates to rock drilling and more particularly, to a stabilising tool for connection in a drill string behind a drilling collar carrying a drill bit.

Such stabilising tools which are typically 6 - 8ft. in length, are expensive both to manufacture and refurbish, refurbishment often being necessary since a worn drill bit tends to leave debris which cannot be broken down and transported past the stabiliser with the result that the stabiliser tends to wear badly. When this occurs the string has to be retracted and broken down and the usual spiral stabiliser replaced by a special roller-reamer tool in order to ream the bore before drilling can continue.

Also when drilling at an angle (referred to as directional drilling), as is often the case from an oil rig, the precise location of the drill bit needs to be monitored. To do this magnetic probes are introduced through the drill string into the stabiliser and so as to avoid interference with readings taken, a stabiliser of non-magnetic material must be used. For normal drilling a cheaper steel stabiliser is used.

At the present time, therefore, it is necessary to maintain on the rig a stock not only of spirally and straight-fluted stabilisers but also both varieties of stabilisers in magnetic and non-magnetic material, since to use only non-magnetic stabilisers is prohibitively expensive.

Another problem which is particularly acute for non-

magnetic stabilisers is that the non-magnetic materials require to be worked at low temperatures. Repeated refurbishment by rebuilding of the cutting edges which involves the application of intense localised heat, tends to weaken the stabilisers so reducing their useful life.

U.S. 3 642 079, U.S. 3 933 395 and GB-A-2133059, all disclose stabilisers in which the entire fluted stabiliser portion is removably secured to the shank. Such stabilisers are not however, widely used in practice. In the case of U.S. 3 933 395, the stabiliser portion is formed in two parts which are secured on the shank by threads of opposite hand. One disadvantage of such an arrangement is the tendency for the upper part to work loose and "back-off" . If the drill string jamsso necessitating the use a power jar to reverse the string, too much torque is applied to the lower part resulting in stripping of the mounting threads.

One object of the present invention is at least to mitigate the disadvantages set out above.

According to the present invention, we propose a stabilising tool for connection in a drill string and having a shank adapted for connection by its ends in the drill string and a fluted stabilising portion comprising a body part integral with the shank and a leading end part or cap which is removably secured to the shank.

Also according to the invention we propose a stabiliser tool set comprising a stabilising tool having a shank adapted for connection by its ends in a drill string, in combination

with a plurality of a plurality of interchangeable stabiliser tool caps each being adapted to be removably secured to the shank so as to form the leading end part of a fluted stabiliser portion the remainder or body part of which is integral with the shank.

Both the body part and the cap are fluted, such that the flutes thereof are in alignment with the interface when the cap is secured in position.

The body part preferably has spiral fluting but the cap may have either spiral flutes intended for normal stabilising operation, straight flutes enabling the assembled tool to be used as a reamer when drilling rough and abrasive rock formations.

The stabiliser functioning in the well is controlled by the well structure, i.e. abrasive sand, very hard rock and also bit performance. A bit going below gauge too quickly can virtually wipe the entire string of stabilisers facing out, therefore, leading to the undercutting of bodies and blades rendering the tool useless. The present invention enables the driller to assess the damage done to the stabiliser and if required to fit a mill or a reamer without fully breaking the string or have to keep the bulky stabilisers on the drill floor restricting workspace. He can then carry out drilling again but with a tool fit to cut out any blockage that has been damaging other equipment.

Since the leading edge suffers most of the wear, it will be understood that the cap can readily be replaced when

necessary so avoiding the need to maintaining on the rig a stock of bulky or expensive stabilising tools. Further, only the worn caps need to be sent ashore for refurbishment, so that the shank of the tool is not subject to the repeated application of intense localised heat with the result that the useful life, particularly of non-magnetic stabilisers is much longer than for conventional stabilisers.

By virtue of the present invention, it may even be economic to use only non-magnetic stabiliser shanks so further reducing the necessary stocks on site, since a cap of magnetic material can be used on a shank of non-magnetic material without affecting measurements taken during angles drilled by probes located within the shank.

One embodiment of the present invention will now be described by way of example with reference to the accompanying drawings of which:

Figure 1 shows a stabilising tool;

Figure 2 is an elevation of an exploded view of the stabilising tool of Figure 1;

Figure 3 shows a spirally fluted cap for attachment to the stabiliser body shown in Figure 2;

Figure 4 shows a straight-fluted cap for attachment to the stabiliser body shown in Figure 2; and

Figure 5 shows another straight-fluted cap for attachment to the stabiliser body shown in Figure 2.

Referring now to the drawings, the stabiliser tool has a shank or body (Figures 1 and 2) 10 adapted at each end for connection in a drill string, the leading end 12

being connected in use to a drill collar (not shown) which carries the drill bit. A stabilising portion 14 has a nominal diameter slightly smaller than the diameter of the drill bit and is formed with flutes through which debris is transported upwardly past the stabiliser. The stabilising portion is in two parts; a body part 16 integral with the shank 10 and a removable sleeve or cap 18 having an internal tapered thread 19, which is screwed onto a tapered external thread 11 on the shank 10 and clamped tightly in abutment with a shoulder 20 at the leading end of the body part 16.

The body part 16 has spiral flutes 22 typically forming three cutting blades, but the cap 18 may have spiral flutes as shown in Figures 1 to 3 or straight flutes 23 as shown in Figures 4 and 5. In either case, the body part 16 and cap 18 have the same number of flutes of the same size and shape such that the flutes in the two parts of the stabilising portion are aligned at the interface when the cap 18 is secured in position. Hence, the stabilising tool may be adapted for normal drilling, to act as a reamer by fitting the straight-fluted cap of Figure 4 or for use in milling by fitting the straight-fluted tapered cap shown in Figure 5, when required for example, during drilling through very rough or abrasive rock formations.

The cap 18 constitutes the leading end of the stabilising portion 14 with the result that cutting edges on the cap, which are dressed with diamonds or cutting carbides, will wear first. When the cap wears away it can be unscrewed

and replaced from a stock of caps on the rig. Only the cap needs to be sent away for refurbishing.

Figures 2, 4, and 5 in combination show a multi-purpose stabilising tool set in accordance with the invention. By suitable selection of the removable cap, the stabilising tool can be used as required for normal drilling, reaming or milling.

Typical dimensions for a range of stabilising tools are set out in the drawings and the composition of materials suitable for both non-magnetic and steel stabilising tools are set out below.

	Non Mag XM 19	Steel AISI
C	0.043	.47
Si	0.70	.31
Mn	18.12	1.10
S	0.005	.012
P	0.026	.017
Ni	2.13	.25
Cr	12.14	1.11
Mo	0.86	.33
V	-	-
W	-	-

CLAIMS

1. A stabilising tool having a shank adapted for connection by its ends in a drill string and a fluted stabilising portion comprising a body part integral with the shank and a leading end sleeve part or cap which is removably secured to the shank.

2. A tool according to claim 1 wherein the removable leading end sleeve part or cap has an internal screw thread formed thereon, the said sleeve part or cap being screwed onto an external screw thread on the shank and clamped tightly in abutment with a shoulder provided by the leading end of the body part.

3. A tool according to claim 1 or claim 2 wherein the body part has spiral or helical fluting.

4. A tool according to any one of claims 1 to 3 wherein the removable leading end part or cap has spiral or helical flutes.

5. A tool according to any one of claims 1 to 3 wherein the leading end part or cap has flutes parallel to the axis of the said part or cap.

6. A tool according to claim 5 wherein the removable cap tapers toward the leading end thereof enabling the tool to be used for milling.

7. A tool according to any one of claims 1 to 6 wherein the body part and the leading end part or cap have the same number of flutes, the flutes being of the same size and

shape such that the flutes in the two parts of the stabilising portion are aligned at the interface between the body part and the leading end part of cap when the latter is secured in position.

8. A tool according to any one of claims 1 to 7 wherein the shank is of non-magnetic material and the leading end part of cap is of magnetic material.

9. A tool according to any one of claims 1 to 8 wherein the cutting edges on the cap are dressed with diamonds or carbides.

10. A stabiliser tool set comprising a stabilising tool having a shank adapted for connection by its ends in a drill string, in combination with a plurality of interchangeable stabiliser tool caps each being adapted to be removably secured to the shank so as to form the leading end part of a fluted stabiliser portion the remainder or body part of which is integral with the shank.

11. A tool set according to claim 10 including two interchangeable caps one having spiral or helical flutes and the other having straight flutes.

12. A tool set according to claim 11 wherein the straight fluted cap is tapered to enable use of the tool for milling.

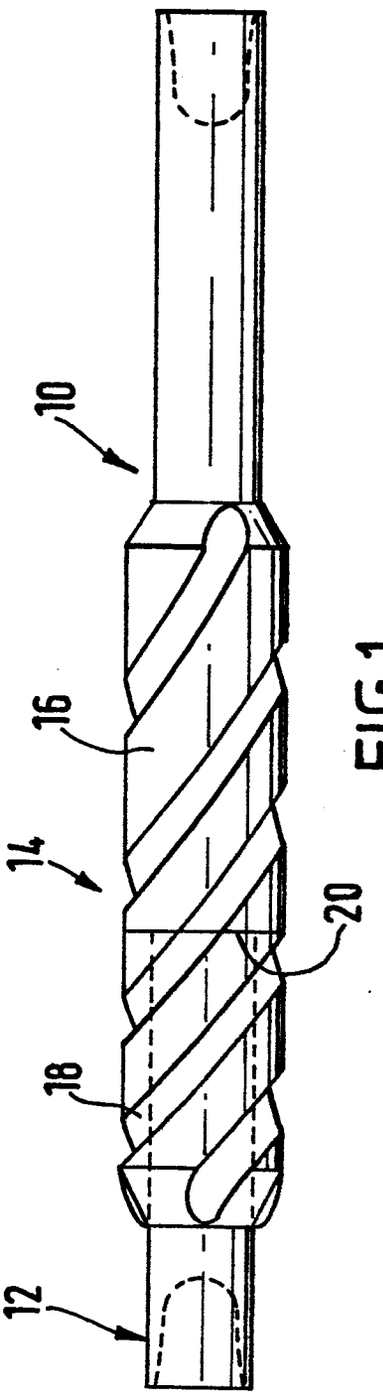


FIG.1.

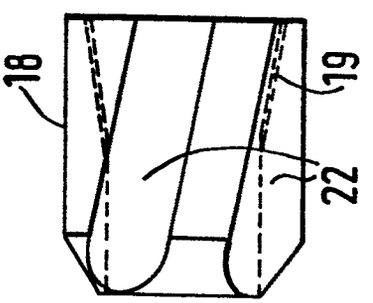


FIG.3.

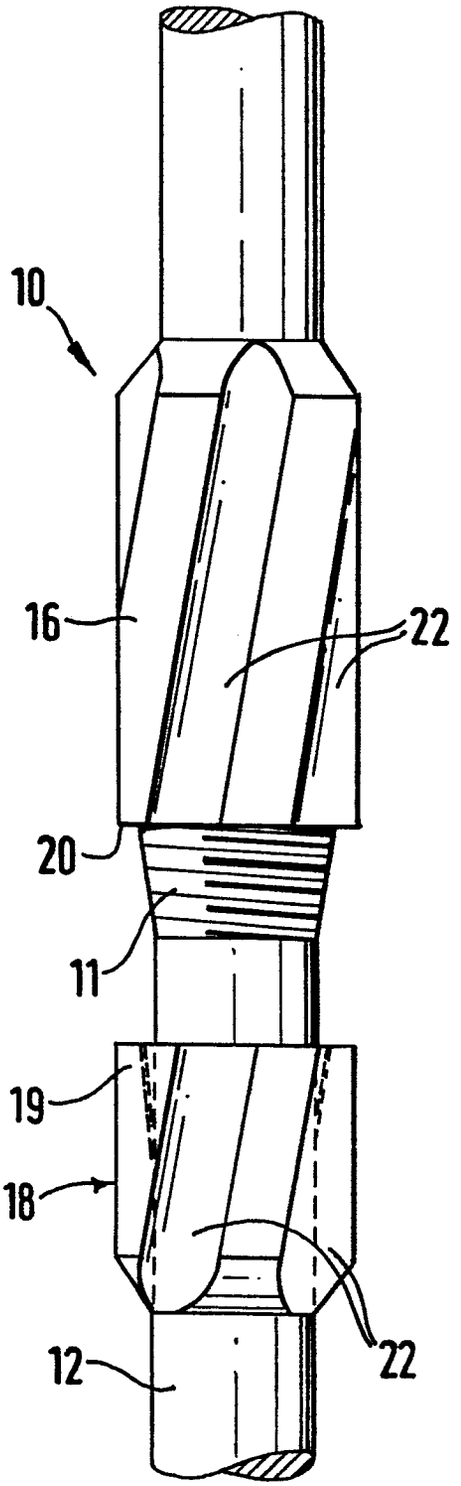
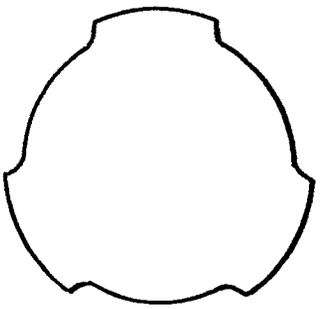


FIG.2.



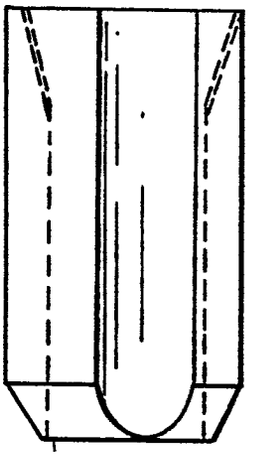


FIG.4.

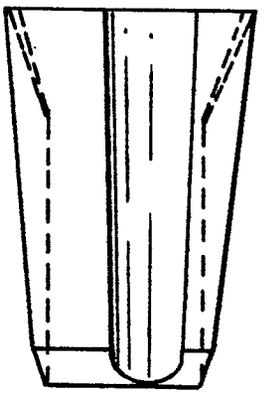


FIG.5.