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54 **Cutter.**

57 There is described a cutter for use in oil well bores and in particular for the removal of packers from oil well bores. The cutter is in the form of an elongate body member to which a drill string may be attached at one end. On the opposite end of the body member there are provided a first and second set of cutting blades, the second set of cutting blades being of greater radial extension than the first set of cutting blades.

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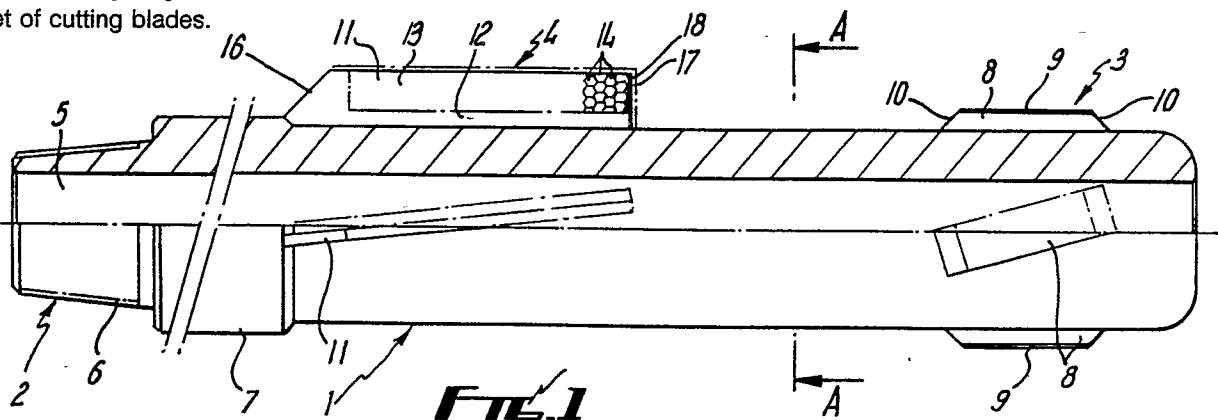


Fig. 1

"Cutter"

This invention relates to a cutter for use in oil well bores.

One application of the cutter of the invention is in the removal of packers from oil well bores.

Oil well bores are provided with packers which fit within the well bore and may, for example, be provided with a valve or some other assembly. The packers commonly comprise a metal cylindrical body which is secured in the well bore by means of upward and downward facing barbs which prevent, respectively, upwards and downwards movement of the packer within the well bore.

Such packers may become damaged and have to be removed from the well bore. This is achieved by lowering a milling cutter into the well bore on the end of a drill string and rotating the milling cutter to remove the upward facing barbs from the packer. A retrieving tool is then used to remove the remaining parts of the packer from the well bore.

According to the present invention there is provided a cutter comprising an elongate body member, one end portion of the body member being provided with drill string connecting means, the opposite end portion of the body member being provided with a first set of cutting blades, wherein a second set of cutting blades, of greater radial extension than said first set of cutting blades, is provided intermediate said end portions of the body member.

Preferably, the first set of blades are helically mounted on the body member. Four blades may be provided and the blades may be dressed with tube borium or a material having similar properties.

Preferably also, the second set of blades are helically mounted on the body member. Twelve blades may be provided and may have carbide cutting bits. The carbide may be provided in the form of inserts retained in brass.

Preferably also, the body member is provided with a central through bore to allow the passage of drilling mud through the cutter.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a part sectional side view of a cutter in accordance with the present invention;

Fig. 2 is a sectional end view on line A-A of Fig. 1; and

Fig. 3 is a side view of one of the second set of blades of Fig. 1.

Referring to the drawings, a cutter for use in the removal of packers from oil well bores comprises an elongate body member 1, one end portion of the body member 1 being provided with drill string connecting means 2, the opposite end por-

tion of the body member being provided with a first set of cutting blades 3, a second set of cutting blades 4 being located intermediate said end portions of the body member 1.

5 The body member 1 is in the form of an elongate cylinder and is provided with a central through bore 5 to permit the passage of drilling mud through the cutter.

10 The drill string connecting means 2 is in the form of a standard cone type screw thread 6 to enable the cutter to be fixed to the end of a drill string (not shown). A drive bushing 7 is located on the body member 1 adjacent the screw thread 6.

15 The first set of cutting blades 3 is located adjacent the rounded free end of the body member 1. Four blades 8 are provided and are mounted on the body member 1 in a left hand helix. The blades 8 are of steel and are dressed with tube borium 9 to provide a hard cutting surface.

20 In this embodiment each blade 8 is eight inches long, one and a quarter inches wide and three-quarters of an inch thick and has 45° inward sloping ends 10. The blades 8 are fixed to the body member 1 and are turned until they define a radius of eight and three-eighths of an inch. The layer of tube borium 9 is then applied and ground until the outer face of the blades 8 define a diameter of 25 eight and a half inches.

30 The second set of blades 4 extends along the surface of the body member 1 from the drive bushing 7. Twelve blades 11 are provided and are welded to the body member 1 at a 3° left hand helix. Each blade 11 comprises a steel mounting portion 12 and a cutting portion 13 which is formed from a plurality of carbide inserts 14 set in brass 15. 35

40 In this embodiment each steel mounting portion 12 is fourteen and a quarter inches long, two and a half inches wide and three-eighths of an inch thick below the cutting portion 13 and has a thicker end portion 16 adjacent the drive bushing 7. The thicker end portions 16 are turned until the outer edges define a diameter of eleven and one-eighth inch and the leading edges 17 of the blades 11 are 45 diametered and machined so that the leading edge 17 are in line.

50 After cleaning and polishing the surface of the mounting portions 12 carbide inserts 14 and brass 15 are laid on each mounting portion 12. The carbide inserts 14 are three-eighths of an inch diameter SANDVIK RCMX 10 0300 Grade S6 (uncoated) and are arranged in alternate radial layers of three and four along the mounting portion 12. The layers of inserts 14 are arranged such that adjacent blades 11 alternate between having a three insert layer 18 leading edge and a four insert layer 19 leading edge.

A further layer of one-eighth of an inch thick brass 20 is applied to the leading edges 17 before the blades 11 are ground to a diameter of eleven inches.

Twelve steel back up rods 21, thirteen and a half inches long and half an inch in diameter, are each welded between adjacent blades 11 at the body member 1 to provide additional support for the blades 11. The welds 22, between each rod 21 and the leading blade 11 adjacent the rod 21, must lie below the diameter of the first set of blades 3. Modifications and improvements may be made without departing from the scope of the invention.

Claims

1. A cutter comprising an elongate body member, one end portion of the body member being provided with drill string connecting means, an opposite end portion of the body member being provided with a first set of cutting blades, wherein a second set of cutting blades, of greater radial extension than said first set of cutting blades, is provided intermediate said end portions of the body member.

2. A cutter as claimed in Claim 1, wherein the first set of blades are helically mounted on the body member.

3. A cutter as claimed in either preceding claim, wherein the second set of blades are helically mounted on the body member.

4. A cutter as claimed in any preceding claim, wherein the first set of blades comprises four blades.

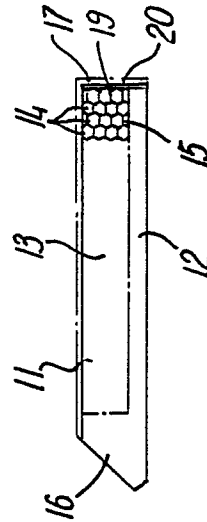
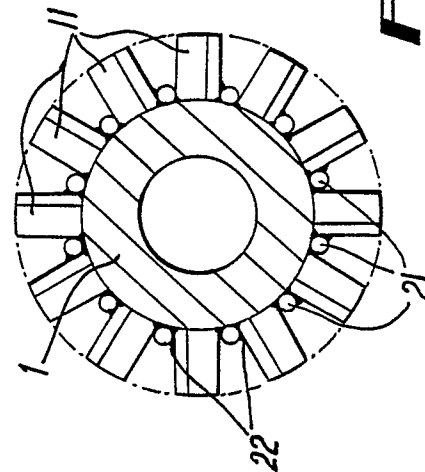
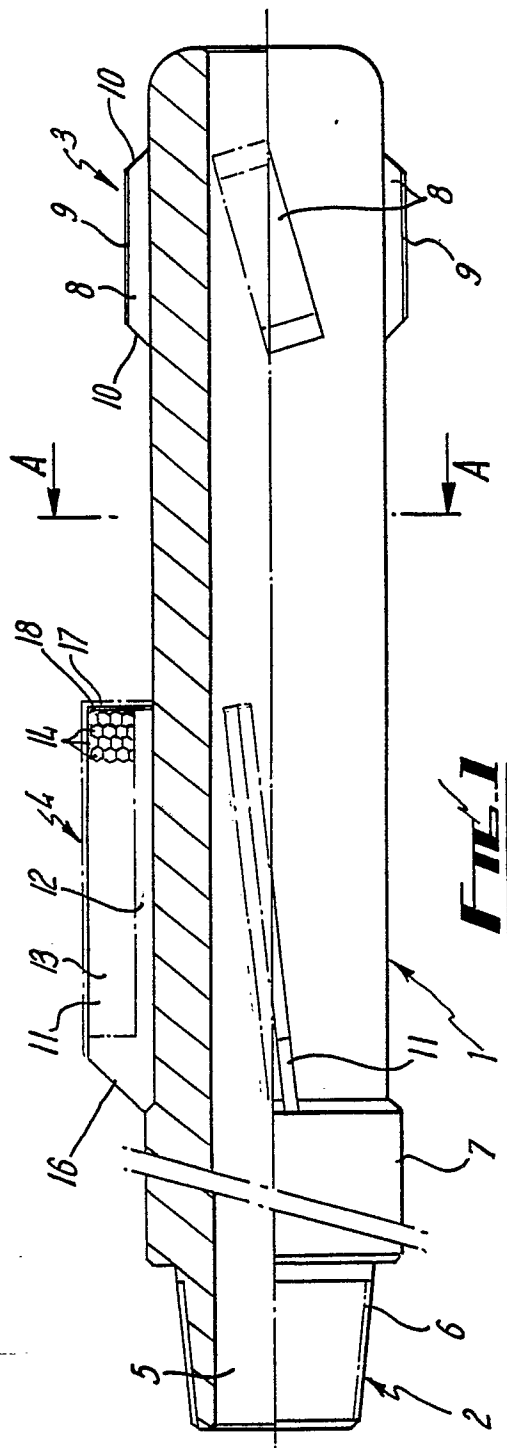
5. A cutter as claimed in any preceding claim, wherein the second set of blades comprises twelve blades.

6. A cutter as claimed in any preceding claim, wherein the blades are dressed with tube borium.

7. A cutter as claimed in any preceding claim, wherein the blades are provided with carbide cutting bits.

8. A cutter as claimed in Claim 7, wherein the carbide cutting bits are in the form of inserts retained in brass.

9. A cutter as claimed in any preceding claim, wherein the body member is provided with a central through bore to allow the passage of drilling mud through the cutter.



FILE 2

FILE