Sept. 12, 1967 E. A. ANZALONE 3,341,237

DRILL COUPLING TOOL

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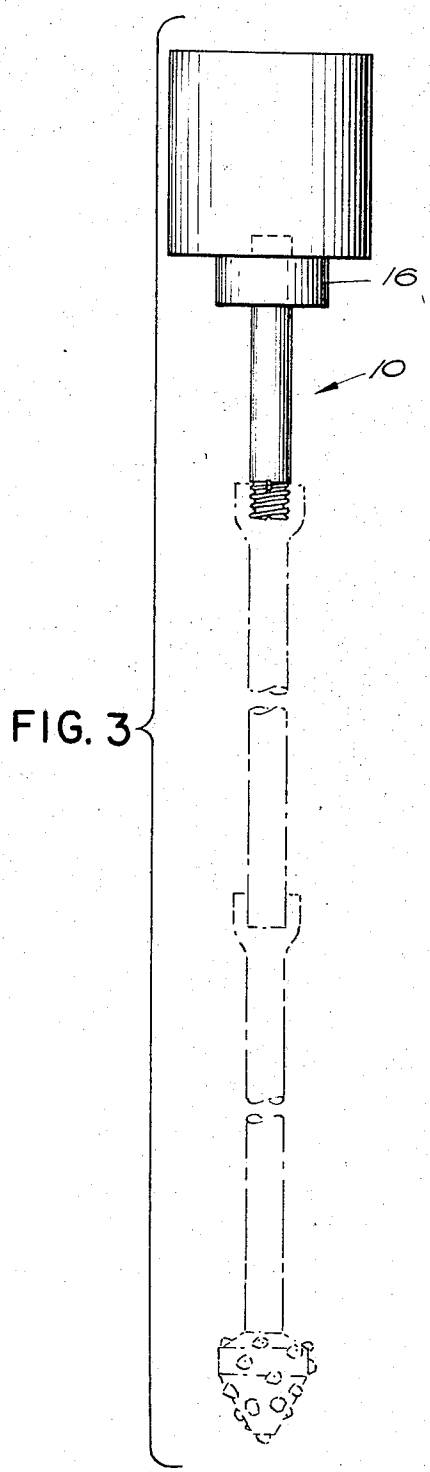

FIG. 3

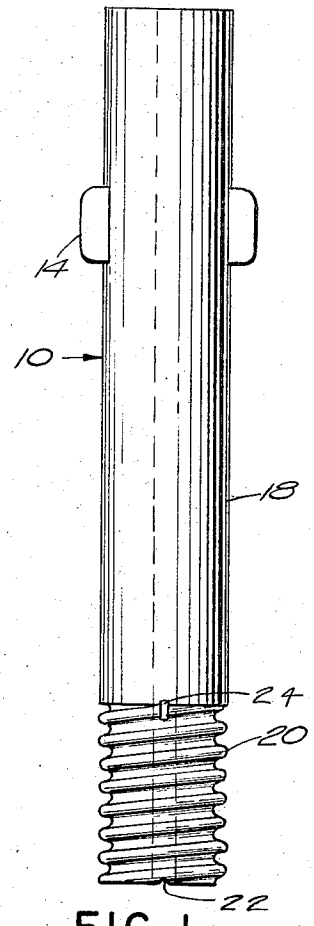

FIG. 1

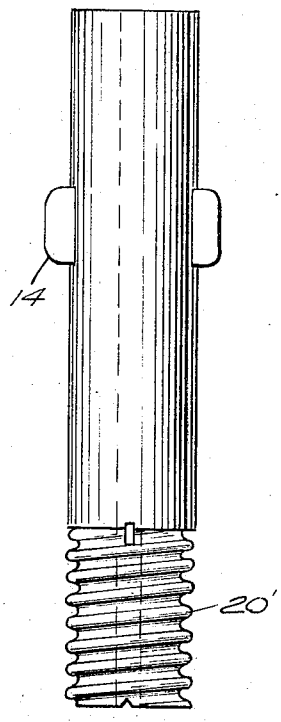

FIG. 4

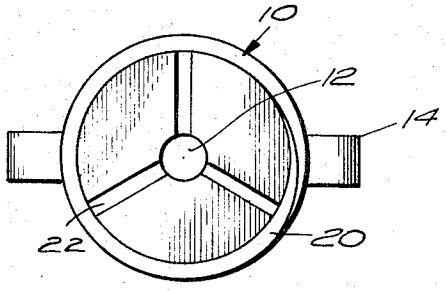

FIG. 2

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DRILL COUPLING TOOL

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ABSTRACT OF THE DISCLOSURE

A coupling tool is provided for connecting the upper end of a string of drill steel to the chuck of a power apparatus which rotates and drives the drill string. The tool is characterized by an elongated shank portion between a threaded end and driving lugs whereby the shock absorbing characteristics of the tool are improved and the tool may be re-threaded after the original threaded end becomes worn. Grooves are provided to permit lubricants to circulate around the threads.

This invention relates generally to drilling equipment and more particularly is directed towards a new and improved coupling tool of the sort used to connect drill steel to a power driven chuck.

In drilling through such things as earth or rock to any great depth the usual equipment employed includes a power source such as a steam, gas or diesel engine drivingly connected to a rotary table or chuck to which is attached a coupling tool. The coupling tool typically is of tubular construction having lugs formed therein for locking with the chuck. The outer end of the tool is threaded for attaching sections of drill steel to the tool to form a string. As the drilling progresses sections of the drill steel are added to the drill string by drawing the tool and its string, disconnecting the tool from the uppermost section of drill steel and reconnecting a new section of drill steel and then again lowering the string back into the hole. At the lower end of the string there is connected a drill head which may be of hardened steel or other suitable cutting material.

In practice the entire string is tubular to permit a flow of a drilling fluid such as air, water or "mud" which is a mixture of various clays and chemicals. In any event the fluid is pumped through the drill sections to provide cooling and to facilitate the removal of cuttings from the bore hole.

Insofar as the coupling tool serves to transmit power from the engine driven chuck to the drill string, it is subjected to a good deal of shock as well as torsional stresses. It will be understood that as drilling progresses the drill tip may work through from a relatively soft stratum into a relatively hard stratum producing shocks which will be transmitted back to the coupling tool. Also because of the heavy weight of the drill string and the high torque required to rotate the string, the coupling tool is under heavy torsional forces. For this reason the coupling tool is subjected to frequent failures which necessitate replacement of the coupling tool.

Also, due to the fact that sections of drill steel are being added or removed from the threaded end of the coupling tool at frequent intervals, the threads are subjected to a good deal of wear. Also, because of the high-torsional strain applied to the drill string, it is usually a difficult job to unscrew the drill steel from the coupling tool.

Accordingly, it is an object of the present invention to provide improvements in drill coupling tools.

Another object of this invention is to provide a drill coupling tool of increased durability and efficiency.

Still another object of this invention is to provide a drill coupling tool in which the threads are lubricated during operation of the drill.

A still further object of this invention is to provide a drill coupling tool which is reuseable in the event that threaded end portion becomes excessively worn.

More particularly this invention features a drill coupling tool comprising a tubular body formed with threads at one end thereof and radially projecting lugs near the opposite end thereof. The tool is formed with an elongated shank between the lugs and the threaded end to enhance the shock absorbing characteristics of the tool and to improve its torsional characteristics.

The threaded end of the tool is formed with a plurality of radially extending grooves between the axial passage of the tool and the outer threaded circumference. Longitudinal grooves are also formed in the outer surface of the tool at the start of the threads. In this fashion the drilling fluid will seep continuously in and around the threads providing constant lubrication to lower the wear between the tool and the drill steel and also to facilitate uncoupling of the members when required.

However, these and other features of the invention, along with further objects and advantages thereof, will become more fully apparent from the following detailed description of a preferred embodiment of the invention, with reference being made to the accompanying drawings, in which:

FIG. 1 is a view in side elevation of a drill coupling tool made according to the invention,

FIG. 2 is an end view thereof,

FIG. 3 is a view in side elevation showing the tool in association with drilling apparatus, and,

FIG. 4 is a side elevation of a worn tool that has been shortened and rethreaded.

Referring now to the drawings, the reference character **10** generally indicates a drill coupling tool typically fabricated from high quality alloy steel having a hardness of about 60 on the Rockwell C scale. The tool is of tubular construction being formed with an axial passage **12** extending lengthwise therethrough as a conduit for drilling fluid which is circulated through the drill string. In practice, the passage **12**, which is more commonly known as the blow hole, has a diameter on the order of 7/16 of an inch in the smaller size tools whereas the larger size tools may have a passage diameter of about 9/16 of an inch.

The tool body is formed with integral lugs **14** extending radially outward from the shank of the tool near the upper end thereof as viewed in FIG. 1. These lugs serve to lock the tool to a chuck **16** in order to prevent the tool from rotating in the chuck. Normally only a pair of lugs is required, one on either side of the tool body.

While the tool may be made in various outside diameters ranging from 1" up to 2¼", for example, a length of about 17"± is required for optimum performance.

In the illustrated embodiment the overall length of the tool is 17" ± with the lugs **14** being about 1½" in length and located about 3½" from the upper end of the tool. The tool is formed with a shank portion **18** approximately 8½" in length. The lower end of the tool is threaded at **20** with the threaded portion covering about 3½" of the length of the tool. The threads may be made up in a variety of selected thread sizes ranging from 1–2" x 150 to 1700, for example. In any event, the shank portion **18** is substantially longer than the shanks of conventional drill coupling tools. Drill coupling tools presently available are relatively short having overall lengths of about 12" with shanks of about only 3 or 4" in length. These relatively short shanks by reason of their inherent stiffness are incapable of standing up under sustained vibration and impacts developed during usual drilling operations. As a result, coupling tools of this type heretofore have had relatively short lives requiring frequent replacement. Insofar as these tools are relatively expensive by reason of the high quality alloy steels employed in their manu-

facture, the replacement of the tools becomes a substantial cost factor in drilling operations.

In the present tool, it has been found that elongating the shank to approximately twice the normal length previously used, the life of the tool may be greatly increased. This increase in length of the tool results from the improved shock absorbing characteristics of the elongated shank. By increasing the length of the shank the tool is better able to absorb torsional as well as axial stresses produced therein during drilling operations.

An additional advantage in fabricating the tool with an elongated shank portion is that the shank portion may be employed to rethread the tool in the event that the original threads become too worn to be of further use. Assuming that after long and heavy use the threads **20** become excessively worn, the tool may be set up on a lathe for example, and the threaded portion cut completely off thus shortening the tool. The remaining shank portion may then be threaded in the same manner as the previous threads thus providing a tool such as shown in FIG. 4 which may be reused. This shortening of the tool thus provides a double life not available in conventional tools which are too short to be rethreaded in this manner.

In order to provide lubrication of the couplings and to alleviate excessive tightening between the tool and sections of drill steel threaded thereto means have been provided to permit the drilling fluid to flow or seep continuously in and around the threads. As best shown in FIGS. 1 and 2, the tool has been formed with a plurality of grooves between the blow hole passage and the outer periphery of the tool at the threaded end thereof. As shown in FIG. 2, the grooves **22** extend radially outward and are spaced equi-distantly about the tool. In the illustrated embodiment, three grooves are formed 120° apart. In this fashion, when the tool is threaded with its grooved end butt against the end of a section of drill steel radial passages will be formed between the blow hole **12** and the threads. Since a certain amount of clearance exists between the threads of the male end of the tool and the threads formed in the female end of the drill steel, the drill fluid will seep out and around the threads. In order to permit the fluid to discharge out of the threads longitudinal grooves **24** are formed in the shank at the start of the threads. These grooves typically are three in number spaced 120° apart and in register with the radial grooves **20**.

By forming the grooves **22** and **24**, a continuous flow or seepage of drilling fluid passes in, around and out of the threads thus maintaining a continuous lubrication

which greatly enhances the wearing characteristics of the threads and also prevents the tool from becoming engaged too tightly with the drill steel. Thus sections of drill steel may be added or removed in a much easier fashion than heretofore and with less wear upon the threads.

It will be appreciated that while the tool described and illustrated herein is of relatively simple construction, it greatly enhances the life expectancy and efficiency of coupling tools without greatly increasing the cost of the same.

While the invention has been described with particular reference to the illustrated embodiment, it will be understood that numerous modifications thereto will appear to those skilled in the art. Accordingly, the above description and accompanying drawings should be taken as illustrative of the invention and not in a limiting sense.

Having thus described the invention, what I claim and desire to obtain by Letters Patent of the United States is:

A drill coupling, comprising

(a) an elongated tubular body of hardened metal,

(b) radially extending lugs formed in said body adjacent one end thereof,

(c) threads formed on the opposite end thereof,

(d) said body being formed with an elongated smooth shank portion between said lugs and said threads and of substantially the same diameter as the threaded end, said shank portion comprising approximately one-half the total length of said body,

(e) said body being radially grooved at the threaded end of said body between the start of said threads and the center of said body and being longitudinally grooved along the outer surface of said body between said shank portion and the end of said threads.

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