April 14, 1953 J. C. STOKES 2,634,953

SLUSH NOZZLE FOR DRILL BITS

Filed Dec. 13, 1948 2 SHEETS—SHEET 1

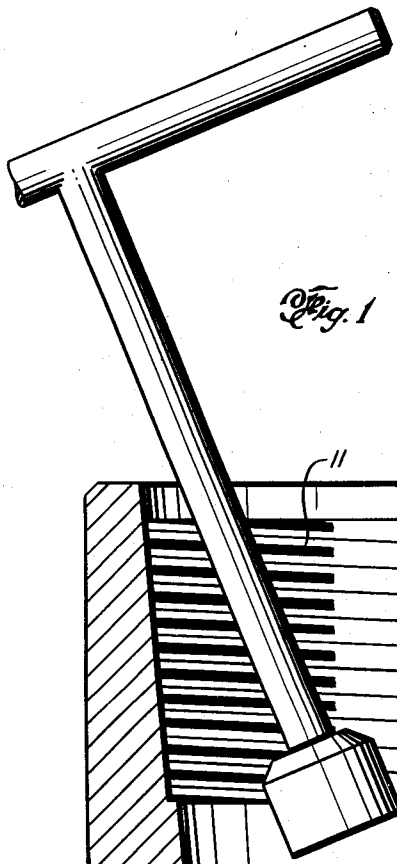


Fig. 1

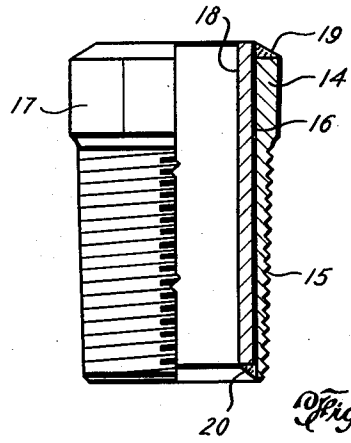
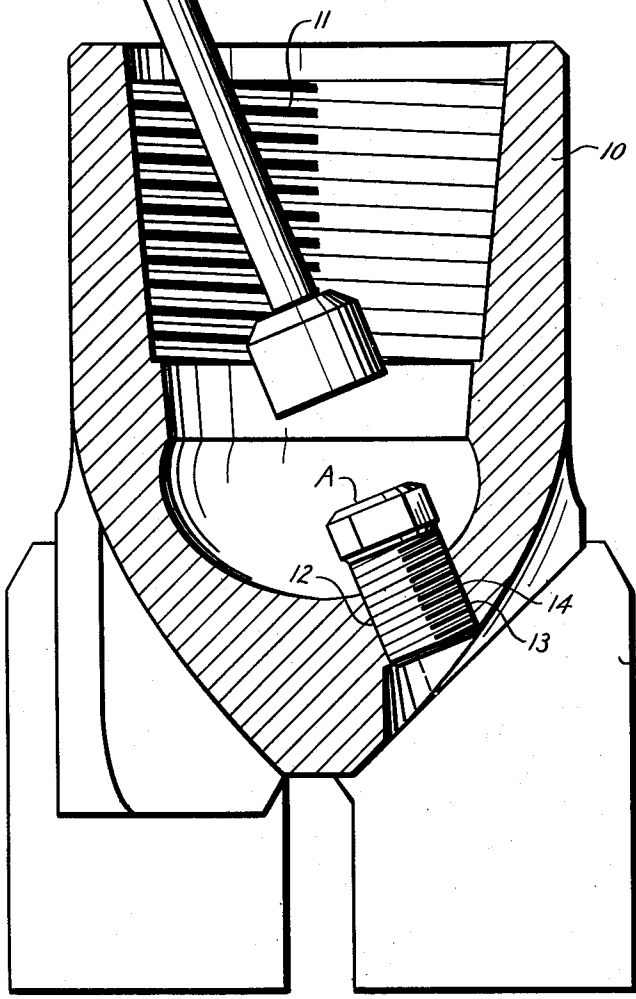


Fig. 2



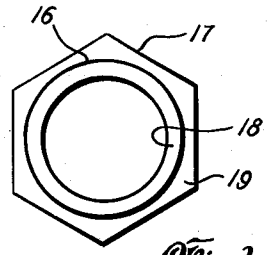


Fig. 3

John C. Stokes
INVENTOR
BY J. Vincent Martin
and
Jos E. Edwards
ATTORNEYS

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SLUSH NOZZLE FOR DRILL BITS

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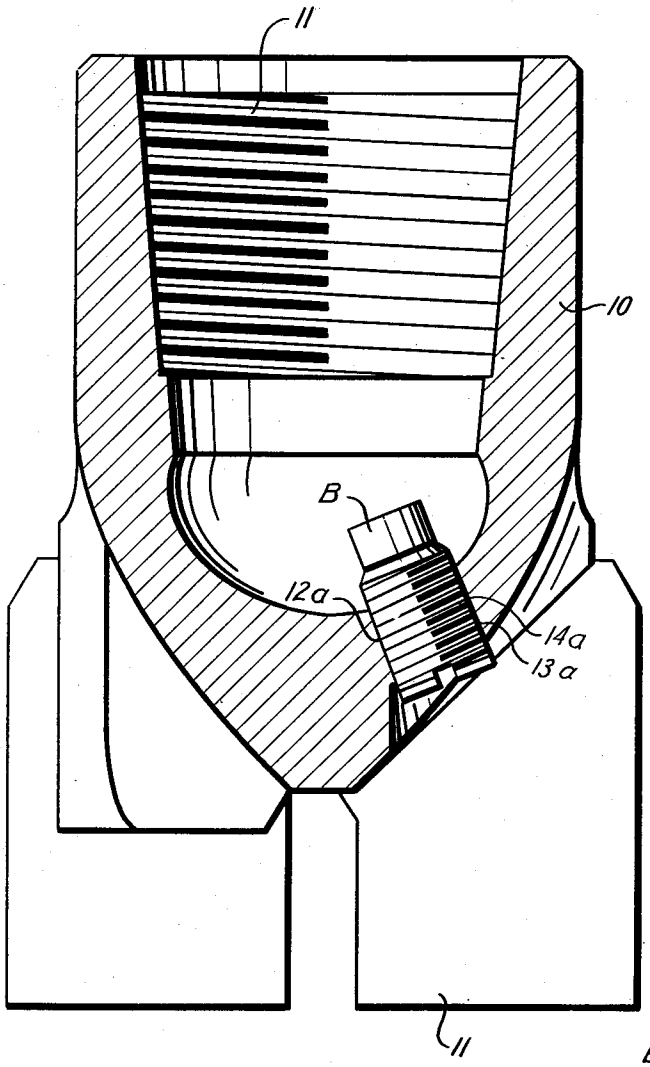


Fig. 4

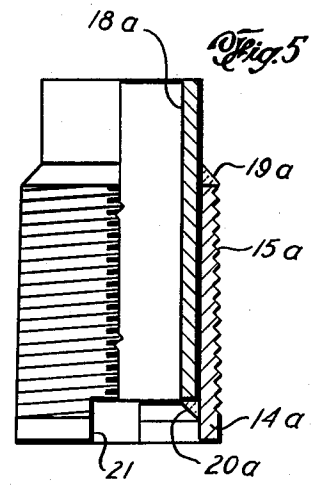


Fig. 5

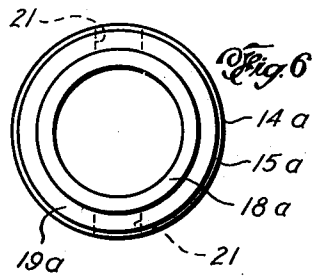


Fig. 6

John C. Stokes
INVENTOR
BY J. Vincent Martin
and
Jos E. Edwards
ATTORNEYS

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SLUSH NOZZLE FOR DRILL BITS

John C. Stokes, Houston, Tex., assignor to Reed Roller Bit Company, Houston, Tex., a corporation of Texas

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1 Claim. (Cl. 255—61)

1

This invention relates to new and useful improvements in slush nozzles for drill bits and relates particularly to means for mounting said nozzles.

In the drilling of wells, a mud laden fluid generally known as slush or drilling mud is pumped downwardly through the drill stem and is directed outwardly through slush openings in the drill bit at the lower end of the drill stem, returning to the surface of the earth through the annular space between the drill stem and well bore. The slush or drilling fluid is circulated at relatively high pressures and velocities and is extremely abrasive, with the result that the bore of the slush openings in the bit body are subjected to wear. In order to prevent abrasion and cutting out of the walls of the slush openings, it has become the practice to mount abrasion-resistant nozzles in said openings. Because of the excessive abrasive action of the circulating fluid, it is preferable that the slush nozzle or tube be constructed of a material which is particularly resistant to such abrasion so that extended use with minimum deformation of the nozzle bore may be obtained; however, because the nozzle will eventually become worn and require replacement, it is also desirable that the nozzle be mounted for easy replacement within the slush opening of the bit.

Probably the best known material having maximum abrasion-resistant qualities is tungsten-carbide, and this material has been found satisfactory for the construction of slush nozzles. But tungsten-carbide, because of its extreme hardness, cannot be accurately shaped or worked after forming, either by grinding or cutting and therefore, a slush nozzle constructed of tungsten-carbide does not lend itself to removable mounting within a drill bit body.

It is, therefore, one object of the present invention to provide an improved slush nozzle which has the wall of its bore, through which the drilling fluid is circulated, constructed of an abrasion-resistant material and which may be removably mounted with a drill bit body whereby replacement of the nozzle is facilitated.

An important object of the invention is to provide an improved slush nozzle wherein the slush tube proper is constructed of an abrasion-resistant material and is bonded to an outer bushing by welding or brazing, with the latter being formed with screw-threads whereby the unit may be readily mounted in and removed from a threaded opening in the drill bit body; the use of threads for making the connection permitting mounting and removal of the nozzle unit in the field and without the use of any special tools or equipment.

2

Another object is to provide an improved slush nozzle unit comprising a tubular abrasion-resistant tube which is welded within the bore of a mounting bushing, with the latter having external threads which are preferably formed on a taper similar to standard pipe threads, whereby a leak-proof connection between the bushing and bit body is assured and the use of special packing or seals is not required.

Still another object of the invention is to provide an improved slush nozzle unit which is particularly adaptable for mounting in a blade-type bit and which is constructed so that it may be mounted in said bit either from the exterior or the interior of said bit body.

The construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein an example of the invention is shown, and wherein:

Figure 1 is a transverse, sectional view of a blade-type bit having a slush nozzle unit, constructed in accordance with the invention, mounted therein.

Figure 2 is a view, partly in section and partly in elevation of the slush nozzle,

Figure 3 is a plan view thereof,

Figure 4 is a view, similar to Figure 1, and illustrating a slightly modified form of the invention,

Figure 5 is a view, partly in section and partly in elevation of the form of nozzle shown in Figure 4, and

Figure 6 is a plan view of the nozzle shown in Figure 5.

In the drawings, the numeral 10 designates the body of a drill bit having radially disposed cutting blades 11 at its lower end. The upper end of the bore 11 of the bit body is formed with the usual screw threads, whereby the bit may be coupled to the lower end of a drill stem (not shown) in the usual manner. An inclined fluid circulating or slush opening 12 is formed in the lower portion of the bit body 10 and is disposed adjacent each bit blade 11, whereby drilling fluid circulated downwardly through the opening is directed into contact with the surface of the blade to wash the same during the drilling operation. The wall of each opening 12 is formed with screw threads 13.

The improved slush nozzle unit A is adapted to be mounted within each slush opening 12 and

includes an outer bushing 14 provided with external threads 15. The bushing has an axial bore 16 extending entirely therethrough and one end of said bushing has its external surface formed with suitable wrench flats 17. A slush tube or nozzle 18 which is constructed of tungsten-carbide or other suitable abrasion-resistant material is insertable within the bushing 14 and extends substantially throughout the length thereof. It is preferable that one end of the tube 18 project a slight distance beyond the end of the bushing whereby an annular bead of welding material 19 may secure the tube to the bushing. It is pointed out that since the tube 18 is constructed of tungsten-carbide or other abrasion-resistant material, the material of said tube does not lend itself to shaping after it is once formed and it would be substantially impossible to provide threads on the external surface of the tube 18. Thus, the tube actually forms an abrasion-resistant liner or sleeve within the bore of the bushing and obviously, when the bushing is in place within the slush opening 12, the circulating fluid or slush flows downwardly through the slush tube. Since the tube is constructed of a hard, long wearing material, cutting out and excessive wear of the nozzle is minimized.

It is preferable that the threads 15 on the bushing and the internal threads 13 within each slush opening 12 be formed on a taper, similar to the usual pipe threads, so that when the bushing is mounted within the opening, a fluid-tight seal is produced. It is also preferable that the wrench flats 17 be provided at the upper end of the unit so that the slush nozzle unit may be mounted within the opening from the interior of the bit body. This may be accomplished by engaging any suitable socket wrench with the wrench flats, said wrench operating through the bore 11 from the upper end of the bit body. When replacement of the unit A is necessary, this may be readily accomplished in the field since no special tools or equipment are required. The arrangement makes it possible to employ the abrasion-resistant material for lining the slush opening 12 and yet make the nozzle readily replaceable when desired. As has been noted, the tungsten-carbide or abrasion-resistant tube 18 extends substantially throughout the length of the bore 16 of the bushing, and as illustrated, one end of said tube terminates short of the lower end of the bushing to accommodate an annular weld 20. It is preferable that the welds 20 be within the lower portion of the bore of the bushing rather than at the extremity of the bushing because of the threads 15 which are formed on the exterior of the bushing and which might be subject to damage by a welding operation.

It is not necessary that the nozzle unit be mounted in position from within the body 10 of the drill bit and in Figures 4–6, a slightly modified form of the invention is shown. In this form, a nozzle unit B which includes an outer bushing 14*a* and an inner slush tube 18*a* is adapted to be mounted within a slush opening 12*a* within the bit body 10 by introducing the unit from the exterior of said body. The bushing 14*a* has external screw threads 15*a* arranged to engage internal threads 13*a* within the opening and the end of the bushing is formed with

transverse slots 21 in its lower peripheral portion, whereby a screw driver or wrench having a transverse rib may be engaged therewith to tighten the unit B within the opening. As illustrated, the lower end of the inner slush tube 18*a* terminates short of the lower end of the bushing and is welded to the bore thereof by the welding material 20*a*. The opposite or upper end of the tube 18*a* is shown as projecting some distance beyond the upper end of the bushing, being welded to said upper end of the bushing at 19*a*. It is apparent that this form functions in the same manner as the first form of the invention and provides a nozzle unit which is readily removable from the bit body. While being readily replaceable because of the screw threaded mounting, the unit still provides an inner lining or tube 18*a* which may be constructed of tungsten-carbide or other hard abrasion-resistant material. In both forms of the invention, the threaded bushing which may be easily mounted or removed from the bit body has the inner lining or sleeve formed by the abrasion-resistant tubes 18 and 18*a*. In the first form, the unit A is inserted through the bore 11 into the bit body and is threaded into the opening, while in the second form, shown in Figures 4–6, the unit is introduced into the opening 12 from the exterior of the pin. Although the tubes 18 and 18*a* have been described as welded to the bushings, it is apparent that brazing or some other suitable bonding means may be employed for securing these parts together.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claim, without departing from the spirit of the invention.

Having described the invention, I claim:

A slush nozzle unit for drill bits, including, a tubular bushing having screw threads on its external surface, said threads being formed on a taper, an abrasion-resistant slush tube extending within said bushing but having the lower end of the tube above the lower end of the bushing, a weld between the tube and the bushing at their lower ends with such weld being disposed inwardly of the bushing threads to avoid damage to said threads during welding, and said slush tube being constructed of a hardened metallic material which does not lend itself to machining operations.

JOHN C. STOKES.

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