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APPARATUS FOR PERFORMING A DRILLING OPERATION ON A WORKPIECE

Filed July 29, 1963

2 Sheets-Sheet 2

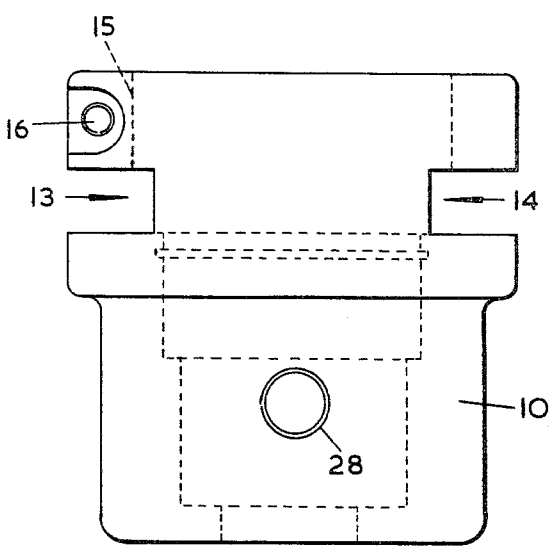


FIG. 2.

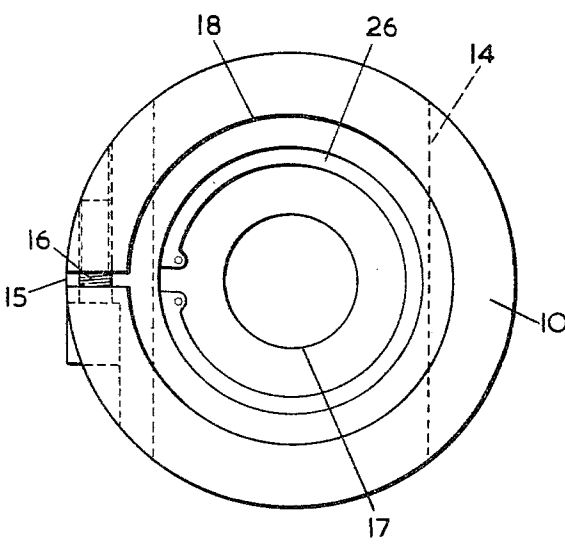


FIG. 3.

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APPARATUS FOR PERFORMING A DRILLING OPERATION ON A WORKPIECE

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3 Claims. (Cl. 51—241)

The invention relates to apparatus for performing a drilling operation on a workpiece, using a drill bit having a longitudinal duct for conveying a lubricating fluid from a laterally-directed inlet port adjacent one end of the duct to at least one laterally-directed delivery port adjacent the other end of the duct and in the drilling zone. The term "drilling operation" as used herein is intended to cover not only the drilling, or dressing of a hole in a workpiece, but also similar operations on the exterior of a cylindrical workpiece, and the drill bit, in consequence, can either be one of which the external surface does the work, or one provided with an abrasive bore.

With drilling apparatus of this kind there has hitherto been difficulty in feeding lubricant to the drill bit owing to it having been the practice to feed the lubricant to the drilling zone from a chamber supported from the spindle of the drilling machine such that a flexible supply pipe for the chamber gave rise to an asymmetrical drag causing the seals used to become worn unevenly. It is the object of the invention to provide improved means for lubricating the drill bit, such that this disadvantage is at least mitigated.

According to the invention the apparatus includes a sleeve to be made fast with a non-rotary portion, of a drilling machine, which coaxially surrounds the driven spindle, of the machine, to which the drill bit is to be drivingly connected, means within the said sleeve defining with the drill bit, when the latter is in position, an annular chamber sealed at its axial ends, the drill bit, when in driving engagement with the driven spindle, having its laterally-directed inlet port within the chamber, and the sleeve being provided with means for feeding the lubricating fluid to the chamber.

According to a feature of the invention the sleeve is a cup-like body with an aperture in the bottom wall through which the drill bit is to extend, the body having a bore at the end adjacent the lip of the cup to engage over a hollow, non-rotary, cylindrical portion of the drilling machine surrounding the driven spindle, and the cup-like body having a coaxial bore of smaller diameter adjacent its inner end to form the outer periphery of the chamber.

In such a case, and according to a further feature, the axial ends of the chamber are formed by facing annular sealing members which effect a seal with the smaller diameter bore and are adapted for their inner peripheries to effect a sealing engagement with the drill bit when the latter is placed in position.

Again in such a case, and according to yet another feature, the cup-like body is formed internally with an annular step intermediate the aperture in its bottom wall and the inner end of the smaller diameter bore to provide an abutment for the annular sealing member at that end.

Again in such a case, and according to a still further feature, the smaller diameter bore is provided adjacent its outer end with a removable abutment for the annular sealing member at that end. This removable abutment, according to another feature, is in the form of an annular plug held against outward movement from the smaller diameter bore by an expanding split ring engaged in an annular groove in the latter.

According to a still further feature the inner periphery of the annular chamber is formed by a cylindrical member, provided with the laterally-extending inlet port and an axial bore which is axially located in the said sleeve and has its ends adapted to effect driving connections between an aligned adapter to be drivingly connected to the driven spindle, and a drill bit having an axial bore and the laterally-extending delivery port or ports.

According to another feature the sleeve is provided with an axial slit extending through its open end, and with a screw member extending across the slit for enabling it to be clamped over a hollow, non-rotary, cylindrical portion of the drilling machine surrounding the driven spindle.

According to another feature the sleeve is provided with a radial duct which extends into the annular chamber and is formed with a screw-thread for connection to an external union for a flexible supply line from a source of the lubricant.

In the accompanying drawings:

FIGURE 1 is an axial section through one form of apparatus in accordance with the invention;

FIGURE 2 is a side elevation of the cup-like sleeve shown in FIGURE 1;

FIGURE 3 is a plan view of FIGURE 2, and

FIGURE 4 is a side elevation illustrating a modified construction.

Referring to FIGURES 1 to 3 the apparatus shown comprises a cup-like sleeve 10 which, at its open end is adapted to be clamped over a non-rotary cylindrical extension 11 of the drilling machine surrounding the driven spindle 12, which latter is indicated by chain lines. This portion of the cup-like sleeve is provided with diametrically-opposed windows 13, 14, and the portion extending between window 13 and the outer end is provided with an axial slit 15 across which extends a clamping screw 16, the windows being for enhancing the clamping effect.

The bottom wall of the sleeve 10 is provided with an aperture 17 through which the drill bit, presently to be described, can extend, and between this aperture and the bore 18 which embraces portion 11, the sleeve is provided with a bore 19 adjacent its inner end, and with an intermediate bore 20 which is of greater diameter than bore 19 so as to provide a step 21. It will be seen that a central cylindrical portion 22 of the drill bit provides the inner periphery of an annular chamber of which the outer periphery is formed by a portion of bore 19, and that the axial ends of this chamber are defined by facing seals 23, 24. Seal 24 is held against step 21 by an annular plug 25 which is located by an expanding split ring 26 in the bore 20, and the pressure of a lubricating fluid fed from a source through a rubber tube 27 and a union 28, urges seal 23 against a step 29 extending between bore 19 and aperture 17. Plug 25 can conveniently be made from the well-known rigid plastic sold under the Trade Mark Perspex.

The drill bit has an operative portion 30 integral with one end of cylindrical portion 22, and the other end of the latter is integral with a morse-taper stem 31 adapted at 32 for driving connection to driven spindle 12. Portion 22 is shown having two intersecting diametrical ducts 33 and 34, and these acts as inlet ports communicating with an axial bore 35 adapted to discharge lubricant through three laterally extending delivery ports 36 arranged in the working zone between the turns of a helical land 37 of diamond dust. This portion of the drill bit is shown as being conical for dressing a conical hole in a workpiece. It will be understood, however, that the drill bit can have an operative portion of a different character, for example, it could take the form of a simple

fluted drill bit or it could be formed hollow and be provided with an abrasive bore.

The modification illustrated by FIGURE 4 consists in substituting for the one-piece drill bit of FIGURE 1 three, separate, interconnected portions 22a, 30a, and 31a. It will be seen that portions 22a and 30a have a taper fit and a screw-threaded connection at 37, and that portions 22a and 31a have a taper fit at 38. With this construction portion 22a is located in the body by a flange 39 being engaged in bore 19 between step 29 and seal 23.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. Apparatus for performing a drilling operation on a workpiece, comprising a spindle, a non-rotary sleeve coaxial with said spindle, said spindle adapted to be driven, said spindle adapted coaxially to support and drive a drill bit, said drill bit having a cylindrical portion intermediate its ends, said cylindrical portion having a longitudinal duct which communicates at the end adjacent the spindle with a laterally-directed inlet port and which communicates with a laterally-directed delivery port in the operative portion of said drill bit, said sleeve having a bore of greater diameter than the cylindrical portion of said drill bit whereby an annular space is formed between them when the drill bit is in position, facing annular sealing members spaced in said bore for defining with the cylindrical portion of said drill bit when the latter is in position an annular chamber sealed at its axial ends, the bore in the sleeve provided with two steps to act as respective abutments for the annular sealing members, the annular sealing member nearer the spindle located in the bore in the sleeve and abutted against its coacting step in the bore by a cylindrical plug held in the bore by an expanding split ring engaged in an annular groove in the sleeve, the cylindrical portion when said drill bit is in position having its laterally-directed inlet port within the annular chamber, and said sleeve having an inlet for lubricating fluid to be fed to the chamber.

2. Apparatus for performing a drilling operation on a workpiece, comprising a spindle, a non-rotary sleeve coaxial with said spindle, said sleeve cup-like in form with a coaxial aperture in its bottom wall, said cup-like sleeve having an annular lip to engage over a hollow non-rotary cylindrical portion of a drilling machine surrounding said spindle, means holding said annular lip engaged with said cylindrical portion, said holding means comprising an axial slit extending through the annular lip and clamping screw means extending across the slit, said spindle adapted to be driven, said spindle adapted coaxially to support and drive a drill bit, said drill bit having a cylindrical portion intermediate its ends, said cylindrical portion having a longitudinal duct which communicates at the end adjacent the spindle with a laterally-directed inlet port and which communicates with a laterally-directed delivery port in the operative portion of said drill bit, said sleeve having a bore of greater diameter than the cylindrical portion of said drill bit whereby an annular space is formed between them when the drill bit is in position, facing annular sealing members spaced in said bore, two steps in the sleeve bore to act as respective abutments for the annular sealing members, a cylindrical plug held in the sleeve bore by an expanding split ring engaged in an annular groove in the sleeve to locate the annular sealing member nearer said

spindle abutted against its coacting step for defining with the cylindrical portion of said drill bit when the latter is in position an annular chamber sealed at its axial ends, the drill bit when in position extending through the aperture in the bottom wall of said cup-like sleeve and having the laterally-directed inlet port in its cylindrical portion within the annular chamber, and said sleeve having an inlet for lubricating fluid to be fed to the chamber.

3. Apparatus for performing a drilling operation on a workpiece, comprising a spindle, a non-rotary sleeve coaxial with said spindle, said sleeve cup-like in form with a coaxial aperture in its bottom wall, said cup-like sleeve having an annular lip to engage over a hollow non-rotary cylindrical portion of a drilling machine surrounding said spindle, means holding said annular lip engaged with said cylindrical portion, said holding means comprising an axial slit extending through the annular lip and clamping screw means extending across the slit, said spindle adapted to be driven, a drill bit, said drill bit having a cylindrical portion intermediate its ends, said cylindrical portion having a longitudinal duct which communicates at one end with a laterally-directed inlet port and at the other end with a laterally-directed delivery port in the operative portion of the drill bit, said spindle and the end of said drill bit adjacent its laterally-directed inlet port adapted to be drivingly interconnected coaxially with each other with said drill bit extending through the coaxial aperture, said sleeve having a bore of greater diameter than the cylindrical portion of said drill bit whereby an annular space is formed between them, facing annular sealing members axially spaced in the annular space whereby the bore the cylindrical portion of said drill bit and annular sealing members define an annular chamber sealed at its axial ends, two steps in the sleeve bore to act as respective abutments for the annular sealing members, a cylindrical plug held in the sleeve bore by an expanding split ring engaged in an annular groove in the sleeve to locate the annular sealing member nearer said spindle abutted against its coacting step, said sleeve having an inlet for lubricating fluid to be fed to the chamber, and the laterally-directed inlet port of the cylindrical portion of said drill bit communicating with the chamber whereby to convey the lubricating fluid through the longitudinal duct to the laterally-directed delivery port.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,229,427

January 18, 1966

David Goodhew

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 1 and 2, for "David Goodhew Staplehurst, of Tonbridge, Kent, England" read -- David Goodhew, of Staplehurst, Tonbridge, Kent, England --; in the heading to the printed specification, line 4, for "David Goodhew Staplehurst, Tonbridge, Kent, England" read -- David Goodhew, Staplehurst, Tonbridge, Kent, England --.

Signed and sealed this 6th day of December 1966.

(SEAL)

Attest:

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