United States Patent

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[54] CHIP-REMOVING ROTARY TOOLS

6 Claims, 1 Drawing Fig.

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[50] Field of Search 77/55.3, 68, 70

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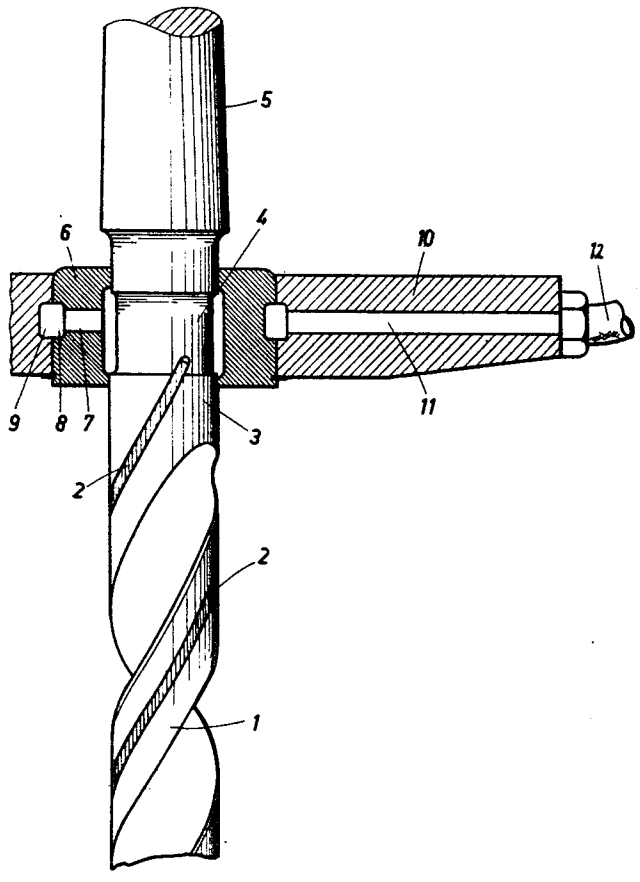
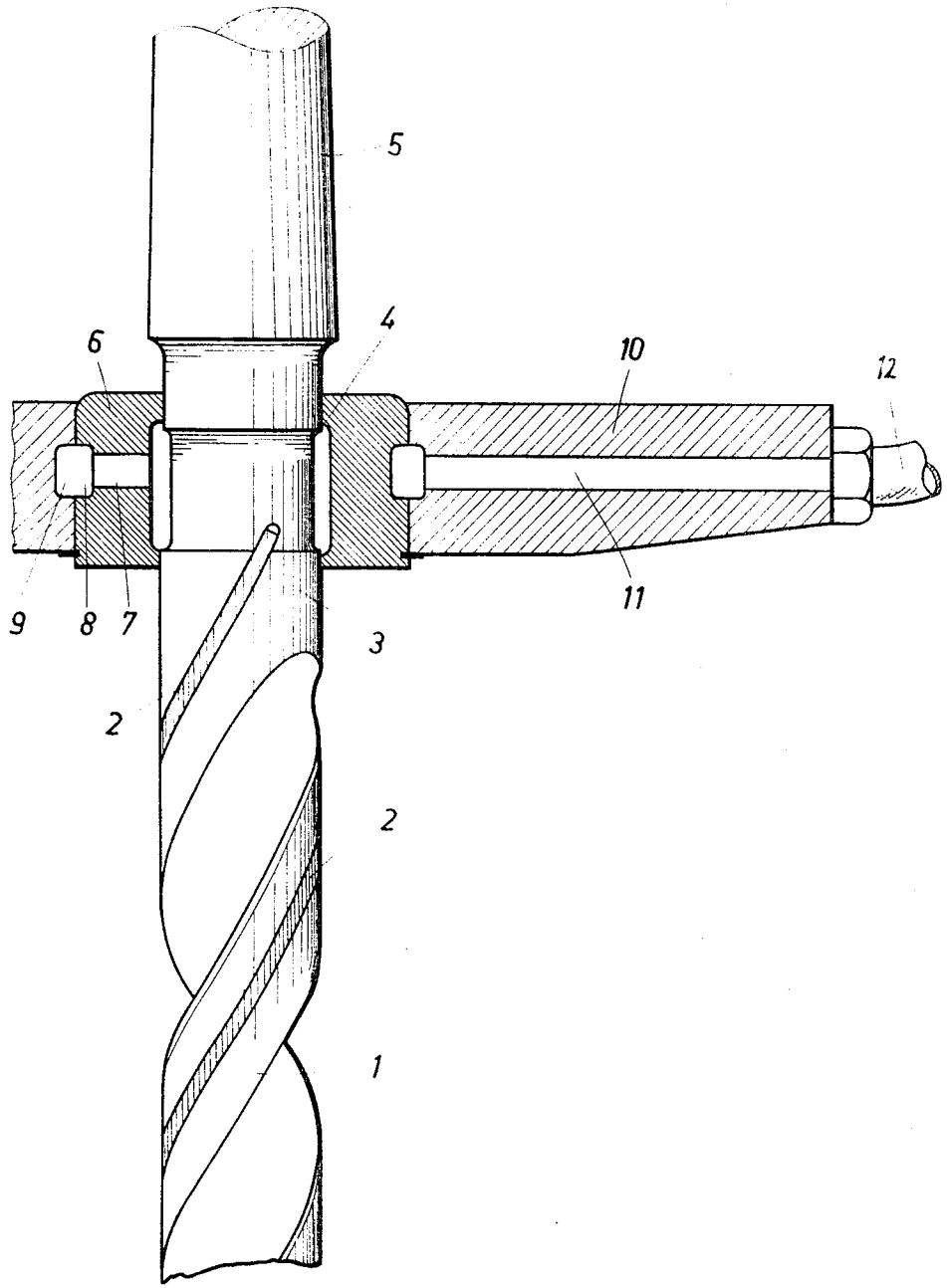
ABSTRACT: A twist drill or the like is provided with coolant ducts opening into a groove between the shank and fluted portions of the drill. The groove is surrounded by a stationary connector through which coolant is supplied.





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CHIP-REMOVING ROTARY TOOLS

The present invention relates to elongated chip-removing rotary tools such as twist drills, countersinks with twisted flutes, counterboring bits and similar tools provided with coolant ducts running along their fluted parts. More particularly the present invention is concerned with such tools as are provided with a connector for supplying coolant from a flexible tube to the ducts in the fluted part.

In known tool constructions which such a coolant supply arrangement, for instance in the case of twist drills, the drill is provided with a central drilled hole in the shank portion which is connected via oblique drilled holes with the coolant ducts. In this case the coolant is either supplied through a central hole in the driving spindle of the drilling machine or through an adapter placed between the drill and the spindle. In the first case a costly drilling machine construction is necessary for the supply of coolant while in the case of the second construction there is the disadvantage that the cantilever leverage effect on the bearing of the drilling machine nearer the tip of the drill is increased owing to the increase in the distance between the bearing and the tip so that the resistance of the drill assembly to torsion and bending is impaired.

One object of the present invention is to provide an arrangement for supplying coolant to a drill which does not increase the cantilever effect on the bearing of the drilling machine nearest to the tip of the drill.

The present invention consists in an elongated chip-removing rotary tool comprising a shank adapted for holding the tool and imparting rotary motion to it, a fluted portion coaxial with the shank, the fluted portion being provided with passage means extending along it for supply of coolant for a cutting operation, and a connector surrounding a part at a position adjacent to mutually adjacent ends of the shank and of the fluted portion, the connector having liquid passage means for leading coolant into the passage means in the fluted portion and having a surface on it for making sealing contact with a surface on the tool while permitting rotation of the tool in relation to the connector and forming a liquid connection between the connector and the passages in the fluted portion of the tool.

In accordance with a preferred feature of the invention at a position adjacent to the adjacent ends of the fluted portion of the tool and of the shank there is a groove which is connected with upstream ends of the passage means.

In accordance with a further feature of the invention the tool comprises a collar fixed on the tool between adjacent ends of the shank and the fluted portion so as to rotate with the tool, the collar having at least one radial duct connecting the passage means in the fluted portion of the tool with passage means in the connector, the collar also having an outer surface which is a surface of revolution inside the connector.

With such an arrangement having a collar a standard dimension for the outer diameter of the collar a can be selected for a range of drills so that a single size of connector can be used for this range. The larger the drill in the driven range the smaller is the radial thickness of the collar or ring. The arrangement can be such that the largest drill in the particular range can have a diameter at a position adjacent to the adjacent ends of a shank and fluted part which is equal to the internal diameter of the connector so that no collar is required.

The invention also consists in a connector for supplying coolant to a rotary elongated chip-removing tool comprising a part with a duct and a part which is adapted to surround part of the tool and form two sliding liquidtight glands against it for the supply of liquid from the connector into one or more ducts opening on the surface of the tool between the two glands.

In accordance with a preferred feature of the connector, the latter is provided with an internal annular groove between the glands.

The drawing shows a rotary tool in accordance with the invention by way of example only. The drawing represents an elevation and partial sections.

The tool shown is in the form of a twist drill **1**. On the lands between its flutes there are coolant ducts in the form of pressed in coolant tubes **2**. Alternatively the coolant ducts or passages can be formed by holes drilled along the fluted part of the drill. The cylindrical part **3** of the drill is provided with an annular groove **4**. Adjacent to the part **3** there is a Morse taper shank **5**. On the part **3** a ring or collar **6** is attached, for example by means of a suitable adhesive. The collar **6** has an outer annular groove **8** which is connected via one or two radial drilled holes **7** with the annular groove **4** of the drill **1**. The ends of the coolant tubes **2** open directly into the groove **4** of the drill at their upstream ends. The ring or collar **6** is journaled in a connector **10** which is prevented from rotation. The connector **10** is provided with a flexible coolant tube **12** which is connected with a passage or duct **11** leading radially to a groove **9** in the connector. As can be seen from the figure, the grooves **8** and **9** are aligned so as to form a single groove which interrupt the cylindrical sliding faces constituting glands on the collar and in the connector **10**.

In operation coolant is supplied via the connecting tube **12** with a pressure of, for example, 3atmospheres gauge and passes through the various internal passages and the groove **4** into the tubes leading along the lands between the flutes of the fluted portion of the drill.

An important advantage of the construction described is that for the supply of liquid coolant to the ducts in the drill it is not necessary, as is the case with the prior art arrangement, to use an adapter coming between the shank of the drill and the drill holding means of the drilling machine for driving it. Such an adapter substantially increases the cantilever leverage on the bearing of the drilling machine nearest the tip of the drill. Furthermore the construction of the twist drill for use in the arrangement described is substantially simpler because no drilled holes must be provided in the drill for connection with the coolant passages running along the drill.

I claim:

1. An elongated chip-removing rotary tool comprising an axially extending shank part, arranged to be held for imparting rotary motion to said tool through said shank, a cylindrical part secured at one end to and extending axially from said shank, a fluted part secured to and extending axially from the other end of said cylindrical part, at least one coolant tube formed in and extending along said fluted part for supplying coolant for a cutting operation, and said coolant tube having the inlet end thereof located in said cylindrical part, an annular shaped connector disposed about said cylindrical part for supplying coolant to said tube, the inner surface of said connector being spaced outwardly from said cylindrical part, wherein the improvement comprises a ring rigidly connected to an disposed about said cylindrical part and the inner surface of said ring and the outer surface of said cylindrical part forming a closed annular inlet chamber for coolant, said coolant tube having its inlet end in communication with said inlet chamber, at least one bore formed in said ring extending between said inlet chamber and the outer surface of said ring, said ring being positioned within said connector and having its radially outer surface in sealing sliding contact with the inner surface of said connector, the inner surface of said connector and the outer surface of said ring forming a closed annular space for admitting coolant from said connector to said ring, said bore in said ring extending between said annular chamber and said annular space located between said connector and said ring for conducting coolant from said annular space to said annular chamber from where the coolant flows into said coolant tube.

2. An elongated chip-removing rotary tool, as set forth in claim **1**, wherein said fluted part having flutes therein spaced apart by lands and said coolant tube extending along said lands from said cylindrical part toward the opposite end of said fluted part.

3. An elongated chip-removing rotary tool, as set forth in claim 1, wherein said cylindrical part having an annular groove formed in its outer surface and said ring having an annular groove formed in its inner surface with the annular grooves in said cylindrical part and said ring being disposed in registration for forming said annular inlet chamber for coolant.

4. An elongated chip-removing rotary tool, as set forth in claim 1, wherein said ring having another annular groove formed in its outer surface and said connector having an annular groove formed in its inner surface arranged in registration with the another annular groove formed in the outer surface of said ring for forming said annular space between said connector and said ring.

5. An elongated chip-removing rotary tool, as set forth in claim 1, wherein said bore in said ring extending radially outwardly from said annular chamber to said annular space between said ring and said connector.

6. An elongated chip-removing rotary tool, as set forth in claim 1, wherein a flexible coolant tube connected to the radially outer surface of said connector, and a duct extending radially through said connector from said annular space between said connector and said ring to said flexible coolant tube.