

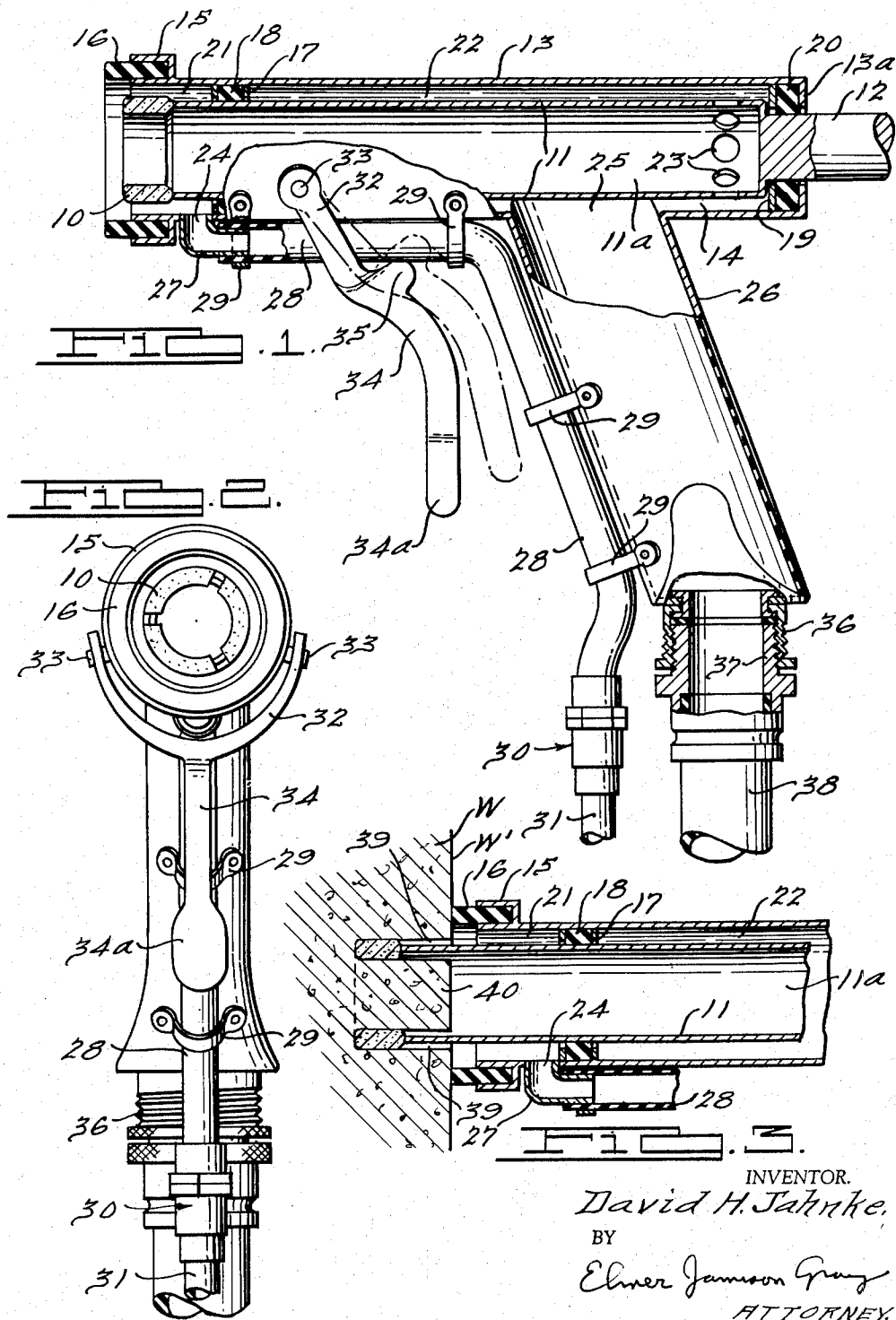
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CORE BIT DRILLING TOOL

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CORE BIT DRILLING TOOL

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This invention relates to drilling tools and more particularly to tools embodying core bits or core drills useful in drilling with a coolant into various wall surfaces or formations. The core bits incorporated in the tools or devices are frequently equipped with diamonds on the cutting or drilling portions thereof in order to increase the drilling or cutting rate and prolong the life of the bits. The drilling tool embodying the present invention is equipped with improved means not only for introducing under pressure a coolant liquid to the drilling or cutting locality so as to cool and flush the working face or portions of the core bit but also for disposing of the coolant and cuttings after the coolant has passed the bit face.

In the construction industries, for example, drilling with a coolant of floors, walls and ceilings is frequently accomplished by means of portable hand drills not in themselves equipped to introduce the coolant, such as water, to the working face of the cutting or core bit. This practice has necessitated the use with the tool of a water swivel which is attached to the drill and to which the cutting bit is attached. During drilling operations the water or other coolant liquid is introduced to the center cavity of the core bit and is forced across the cutting face after which the cuttings and coolant are allowed to escape around the exterior or periphery of the bit. This practice has resulted in a number of disadvantages. For example, in drilling vertically overhead it has presented the danger of the coolant and/or cuttings being carried by the force of gravity into the operating mechanism or onto the operator himself. In addition, it has frequently necessitated the collection or disposal of the coolant and cuttings by means of pumps or other added equipment. Frequently it has added unnecessarily and objectionably to the distance between the work surface and the motivating unit.

The present invention eliminates the foregoing disadvantages including the necessity of using a water swivel and, as distinguished from conventional practice, provides a convenient, effective and relatively simple method of performing the functions of introducing coolant and removing cuttings at the bit face and also disposing of the coolant and cuttings in effective and efficient manner after they have passed the bit face. In addition to the foregoing the tool embodying the present invention provides a safe, convenient and easy means for enabling the operator to hold and control the tool and the cutting bit carried thereby at any locality and during the entire period of operation.

In accordance with the embodiment of the invention herein illustrated, by way of example, there is provided an annular diamond studded core bit suitably affixed to the forward end of a hollow tube or bit body. The rear end of this tubular bit body is affixed to a power driven shaft operative to rotate the bit body as well as the core bit. In the fully retracted position thereof the tubular bit body and core bit are entirely encased within a sta-

tionary cylindrical shell or jacket of somewhat larger diameter than the cylindrical bit body so as to provide a relatively narrow annular space therebetween. The forward end of the stationary shell or jacket carries a sealing ring adapted to be held against and in sealing engagement with the surface of the material being drilled and to encircle the drill opening therein. Adjacent to but rearwardly of the foregoing sealing ring there is interposed between the tubular bit body and the outer cylindrical shell a second sealing ring. At the rear end of the outer shell there is interposed between the shell and, for example, the operating shaft a third sealing ring. The three sealing rings in effect divide the annular space between the tubular bit body and the outer shell or jacket into two longitudinally spaced front and rear water tight chambers sealed one from the other. The rear end of the tubular bit body is provided with annularly spaced ports or apertures for enabling the coolant therein to pass from the bit body into the rear water tight chamber. During operation liquid coolant is introduced under pressure into the front water tight chamber from where it is forced into the area between the core bit and the material being drilled. Thence the coolant is forced around the face of the bit past the core and into the cylindrical bit body from where it is discharged through the ports or apertures therein into the rear water tight chamber. From this chamber the coolant and the cuttings entrained therewith flow through a hollow handle, attached to the outer shell or jacket adjacent the rear end thereof, and into a hose for convenient disposal.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a fragmentary sectional side elevation illustrating a core bit drilling tool constructed in accordance with the present invention.

Fig. 2 is a front end elevation of the structure shown in Fig. 1.

Fig. 3 is a fragmentary sectional view of the forward portion of the tool shown in Fig. 1 but illustrating the core bit in operating position.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the accompanying drawings there is illustrated, by way of example, a core bit drilling tool provided with an annular core bit or cutting head 10 which is preferably diamond studded. This core bit is suitably secured in fixed relation to the forward end of a hollow tube or cylindrical bit body 11. The rear end of the tube 11 is suitably affixed in sealing relation to the forward end of a power driven shaft 12 operative to rotate the tube 11 and the core bit 10 carried thereby.

In its fully retracted position shown in Fig. 1 the tube 11 is housed within a stationary cylindrical shell or jacket 13, the latter being of somewhat greater diameter than the tube 11 so as to provide an annular space 14 therebetween. The length of the shell or jacket 13 will vary in accordance with the length of the hollow inner tube 11 which in turn is determined by the depth of the hole to be drilled in the work. Secured to the forward end of the outer shell or jacket 13 is an annular retainer

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member 15 forming with the end of the shell an annular slot into which a front sealing ring 16 extends and is held in fixed position therein in any suitable manner. The sealing ring 16 may be fabricated from soft synthetic rubber and, as illustrated in Fig. 1, projects somewhat forwardly of the bit 10 in the latter's fully retracted position. Rearwardly of the front sealing ring 16 and preferably proximate thereto is an annular metallic holder 17 disposed within the cylindrical shell 13 and secured thereto. A front slip sealing ring 18 is secured within the holder 17 and projects slightly inwardly thereof to effect sealing engagement with the tubular bit body 11. This sealing ring may also be fabricated from soft synthetic rubber. The outer cylindrical jacket 13 terminates in an inwardly flanged rear end 13a apertured to freely receive the shaft 12. Adjacent this flanged end there is secured within the jacket 13 a retainer ring 19 also apertured to receive freely the shaft 12. A rear slip sealing ring 20, preferably formed of synthetic rubber, is held between the flange 13a and the retainer ring 19 and is adapted to have slip sealing engagement with the shaft 12.

It will be observed that a front annular chamber 21 is formed between the sealing rings 16 and 18, this chamber being water tight through the medium of these sealing rings during operation of the tool, as shown in Fig. 3. A rear water tight annular chamber 22 is formed between the front sealing ring 18 and the rear sealing ring 20, this annular chamber being disposed in the space between the outer shell or jacket 13 and the inner tube 11 and being sealed by virtue of the coaction of the sealing rings 18 and 20, respectively, with the tubular bit body 11 and the shaft 12. The rear end of the tubular bit body 11 is provided with a series of annularly spaced ports or apertures 23 providing communication between the end of the bit body and the rear end of the annular chamber 22. From the foregoing it will be seen that in operation the three yieldable sealing rings 16, 18 and 20, formed preferably of synthetic rubber, in effect divide the annular space 14 between the tubular bit body 11 and the outer shell or jacket 13 into two longitudinally spaced front and rear water tight chambers 21 and 22 which are sealed one from the other.

In advance of the front sealing ring 18 the outer shell or jacket 13 is provided with a water inlet 24. This jacket is also provided with an enlarged rear outlet opening 25 providing communication between the annular space 14 and a hollow cylindrical handle 26 which preferably inclines downwardly and rearwardly. Held in fixed communication with the water inlet opening 24 is an annular hose connection or coupling member 27 which is secured to the shell or jacket 13. Removably attached to this coupling 27 in embracing relation thereto is a heavy duty rubber hose 28. This hose extends rearwardly to a point proximate to the upper end of the handle 26 and thence extends downwardly along the front face of the handle. The hose member 28 may be held in position by means of a suitable number of clips 29 embracing the hose and attached to the shell 13 and the handle 26. Through the medium of any conventional coupling 30 the lower end of the rubber hose 28 may be attached to a flexible inlet hose 31 also preferably formed of heavy duty rubber. The inlet hose 31 is connected to a source of water supply from which water under pressure may be forced through the inlet hose 28 and coupling 27 into the front annular chamber 21.

As illustrated particularly in Fig. 2, a yoke member 32 embraces the lower part of the shell 13, the upper ends of the yoke being pivoted at 33 to opposite sides of the shell. As illustrated in Fig. 1, the yoke 32 is inclined downwardly and rearwardly and terminates in a depending handle 34 provided with a terminal finger engaging portion 34a suitably disposed in advance of the handle 26. The yoke 32 is formed with a projecting sealing knob 35 normally disposed immediately below and in close rela-

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tion to the rubber hose 28. It will be apparent from a consideration of Fig. 1 that when the hollow handle 26 is grasped in the hand the finger engaging portion 34a may be readily retracted, as illustrated in broken lines in Fig. 1, so as to cause the sealing knob to compress the rubber hose 28 so as either to restrict or fully prevent the flow of water therethrough.

The lower end of the hollow handle 26 is provided in any conventional manner with a threaded connection 36 into which the threaded nipple 37 of a garden hose 38 of any standard type may be detachably connected. From this construction it will be apparent that the water or other liquid coolant together with the cuttings entrained therewith will be discharged from the chamber 22 through the hollow handle 26 and thence through the discharge hose 38 to the desired locality for convenient disposal thereof.

With reference to Fig. 3 it will be seen that, during rotation of the bit 10 and progressive forward travel imparted thereto by the shaft 12, the bit while rotating about its central axis will drill an annular hole 39 in the work W. During such operation the front sealing ring 16 will be held in sealing engagement with the face W' of the work thus sealing the annular chamber 21 between the sealing rings 16 and 18. During the drilling operation performed by the annular bit or cutting head 10 a core 40 of the work will be produced and will progressively project into the central cavity 11a of the cylindrical bit body 11. While this operation proceeds the liquid coolant is introduced under pressure through the inlet 24 into the front annular chamber 21 by means of the hose 28. Since the coolant liquid is under pressure it is consequently forced into the annular area or space 39 lying between the bit body 11 and the adjacent surface of the material being drilled. Thence the coolant is forced around the face of the bit 10 and past the core 40 into the central passage 11a of the bit body 11. The coolant and cuttings entrained therewith flow to the rear end of the bit body 11 and thence pass through the ports or apertures 23 into the rear water tight chamber 22 formed between the tube 11 and the cylindrical shell or jacket 13. From the chamber 22 the coolant and entrained cuttings pass through the hollow handle 26 and thence through the discharge hose 38.

I claim:

1. In a drilling device, a tubular bit body, a core bit supported on the forward end of said body, a cylindrical shell embracing said bit body and having the cylindrical wall thereof spaced outwardly of said body to provide a longitudinally extending annular space therebetween, sealing means on the forward end of said shell for sealing the same when in engagement with the face of the work, a second sealing means interposed between said shell and bit body to provide a chamber between both of said first and second named sealing means, a third sealing means providing a second chamber between said shell and body at a locality intermediate said second and third sealing means, said bit body being provided with a port means for the flow of liquid coolant from said bit body into said second chamber, means for introducing liquid coolant into said first named chamber, and means communicating with said second named chamber for discharging liquid coolant therefrom.

2. In a drilling device, a tubular bit body, a core bit supported on the forward end of said body, a cylindrical shell embracing said bit body and having the cylindrical wall thereof spaced outwardly of said body to provide a longitudinally extending annular space therebetween, sealing means on the forward end of said shell for sealing the same when in engagement with the face of the work, a second sealing means interposed between said shell and bit body to provide a chamber between both of said first and second named sealing means, a third sealing means providing a second chamber between said shell and body at a locality intermediate said second and third sealing

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means, said bit body being provided with a port means for the flow of liquid coolant from said bit body into said second chamber, means for introducing liquid coolant under pressure into said first named chamber for flow around the face of the core bit and thence away from the bit through said bit body and said port means into said second named chamber, and means for discharging liquid coolant from said second named chamber.

3. In a drilling device, a tubular bit body, a core bit supported on the forward end of said body, a cylindrical shell embracing said bit body and having the cylindrical wall thereof spaced outwardly of said body to provide a longitudinally extending annular space therebetween, sealing means on the forward end of said shell for sealing the same when in engagement with the face of the work, a second sealing means interposed between said shell and bit body to provide a chamber between both of said first and second named sealing means, a third sealing means providing a second chamber forwardly thereof between said shell and body and rearwardly of said second sealing means, said bit body being provided with a port means for the flow of liquid coolant from said bit body into said second chamber, means for introducing liquid coolant into said first named chamber, and means including a handle having a passage therethrough communicating with said second named chamber for discharging liquid coolant therefrom.

4. In a drilling device, a tubular bit body, a core bit supported on the forward end of said body, a cylindrical shell embracing said bit body and having the cylindrical wall thereof spaced outwardly of said body to provide a longitudinally extending annular space therebetween, sealing means at the forward end of said shell for sealing the same when in engagement with the face of the work, a second sealing means interposed between said shell and bit body to provide a chamber between both of said first and second named sealing means, a third sealing means providing a second chamber between said shell and body and between both of said second and third sealing means, said bit body being provided with a port means for the flow of liquid coolant from said bit body into said second chamber, means for introducing liquid coolant under pressure into said first named chamber for flow around the face of the core bit and thence away from the bit through said bit body and said port means into said second named chamber, and means including a handle having a passage therethrough communicating with said second chamber for discharging liquid coolant therefrom.

5. In a drilling device, a tubular bit body having a core bit at the forward end thereof, a hollow shell embracing said bit body and spaced outwardly thereof, sealing means for sealing the forward end of said shell against the face of the work, a second sealing means interposed between said shell and bit body to form with said first named sealing means a chamber between the shell and bit body, a third sealing means providing a second chamber between said shell and body and between both of said second and third sealing means, means for introducing liquid coolant into said first named chamber for flow around the core bit and thence into said bit body, said bit body being provided with a port means in advance of said third sealing means for the flow of liquid coolant from the bit body into said second chamber, and means communicating with said second chamber for discharging liquid coolant therefrom.

6. In a drilling device, a tubular bit body having a core bit at the forward end thereof, a hollow shell embracing said bit body and spaced outwardly thereof, sealing means carried by the forward end of said shell for sealing the same against the face of the work, a second sealing means interposed between said shell and bit body to form with said first named sealing means a chamber between the shell and bit body, a third sealing means providing a second chamber between said shell and body rearwardly of said second sealing means, means for in-

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roducing liquid coolant into said first named chamber for flow around the core bit and thence into said bit body, said bit body being provided with a port means in advance of said third sealing means for the flow of liquid coolant from the bit body into said second chamber, and means including a handle having a passage therein communicating with said second chamber at a locality intermediate said second and third sealing means for discharging liquid coolant therefrom.

7. In a drilling device, a tubular bit body having a core bit at the forward end thereof, a hollow shell embracing said bit body and spaced outwardly thereof, sealing means carried by the forward end of said shell for sealing the same against the face of the work, a second sealing means interposed between said shell and bit body to form with said first named sealing means a chamber between the shell and bit body, a third sealing means providing a second chamber between said shell and body rearwardly of said second sealing means, a conduit communicating with said first named chamber for introducing liquid coolant under pressure thereinto for flow around the core bit and thence into said tubular bit body, means for controlling the flow of coolant from said conduit into said first named chamber, said bit body being provided with a port means for the flow of liquid coolant from said bit body into said second chamber, and means for discharging liquid coolant from said second chamber at a locality intermediate said second and third sealing means.

8. In a drilling device, a tubular bit body having a core bit at the forward end thereof, a hollow shell embracing said bit body and spaced outwardly thereof, sealing means carried by the forward end of said shell for sealing the same against the face of the work, a second sealing means interposed between said shell and bit body to form with said first named sealing means a chamber between the shell and bit body, a third sealing means providing a second chamber between said shell and body rearwardly of said second sealing means, a conduit communicating with said first named chamber for introducing liquid coolant under pressure thereinto for flow around the core bit and thence into said tubular bit body, means for controlling the flow of coolant from said conduit into said first named chamber, said bit body being provided with a port means for the flow of liquid coolant from said bit body into said second chamber at a locality intermediate said second and third sealing means, and means including a handle attached to said shell and having a passage therein communicating with said second chamber for discharging coolant therefrom.

9. A drilling device according to claim 7 wherein said controlling means includes a pivotally mounted manually operable lever.

10. A drilling device according to claim 8 wherein said controlling means includes a pivotally mounted manually operable lever disposed proximate to said handle.

11. In a drilling device, a tubular bit body having a core bit at the forward end thereof, a hollow shell embracing said bit body and spaced outwardly thereof, sealing means carried by the forward end of said shell for sealing the same against the face of the work, a second sealing means interposed between said shell and bit body to form with said first named sealing means a chamber between the shell and bit body, a third sealing means providing a second chamber between said shell and body rearwardly of said second sealing means, a flexible conduit communicating with said first named chamber for introducing liquid coolant under pressure thereinto for flow around the core bit and thence into said tubular bit body, a swingable manually operable lever having means engageable with said flexible conduit to compress the same and control the flow of coolant into said first named chamber, said bit body being provided with a port means for the flow of liquid coolant from said bit body into said second chamber, and con-

duit means for discharging liquid coolant from said second chamber.

12. A drilling device according to claim 11 wherein a depending handle is attached to said shell and through which said conduit means extends.

13. In a drilling device, a substantially cylindrical outer jacket adapted to be held in predetermined position relative to the work being drilled, work drilling means including a tubular bit body and a rotary and axially shiftable shaft secured to the rear end of the bit body and extending therewith axially of and interiorly of said jacket, a core bit secured to the forward end of said bit body, a plurality of longitudinally spaced sealing devices for forming between said jacket and work drilling means a pair of longitudinally extending front and rear chambers sealed one from the other during the drilling operation, conduit means for introducing liquid coolant under pressure into said front chamber for flow around the core bit and thence rearwardly into said tubular bit body, said bit body being provided with a port means for the flow of liquid coolant from said bit body into said rear chamber at a locality intermediate said sealing devices, and means communicating with said rear chamber for discharging liquid coolant therefrom.

14. In a drilling device, a substantially cylindrical outer jacket, a handle extending from said jacket for manually holding said jacket in predetermined position relative to the work being drilled, work drilling means including a tubular bit body and a rotary and axially shiftable shaft secured to the rear end of the bit body and extending therewith axially of and interiorly of said jacket, a core bit secured to the forward end of said bit body, a plurality of longitudinally spaced sealing devices for forming between said jacket and work drilling means a pair of longitudinally extending front and rear chambers sealed one from the other during the drilling operation, conduit means for introducing liquid coolant under pressure into said front chamber for flow around the core bit and thence rearwardly into said tubular bit body, said bit body being provided with a port means for the flow of liquid coolant from said bit body into said rear chamber, and means including a passage in said handle communicating with said rear chamber for discharging liquid coolant therefrom.

15. A drilling device according to claim 13 wherein

means is provided for controlling the flow of liquid coolant through said conduit means into said front chamber.

16. A drilling device according to claim 13 wherein manually operable lever means disposed proximate to said handle is provided for controlling the flow of liquid coolant through said conduit means into said front chamber.

17. A drilling device according to claim 11 wherein said lever is pivotally mounted on said shell, a depending handle being attached to said shell adjacent said lever and through which said conduit means extends.

18. In a drilling device, a substantially cylindrical outer jacket, a handle extending from said jacket for manually holding said jacket in predetermined position relative to the work being drilled, work drilling means including a tubular bit body and a rotary and axially shiftable shaft secured to the rear end of the bit body and extending therewith axially of and interiorly of said jacket, a core bit secured to the forward end of said bit body, a plurality of longitudinally spaced sealing devices for forming between said jacket and work drilling means a pair of longitudinally extending front and rear chambers sealed one from the other during the drilling operation, conduit means including a flexible hose for introducing liquid coolant under pressure into said front chamber for flow around the core bit and thence rearwardly into said tubular bit body, said bit body being provided with a port means for the flow of liquid coolant from said bit body into said rear chamber at a locality intermediate said sealing devices, means communicating with said rear chamber for discharging liquid coolant therefrom, and a swingable manually operable lever engageable with said hose for compressing the same and controlling the flow of liquid coolant into said front chamber.

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