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CORE DRILLING APPARATUS

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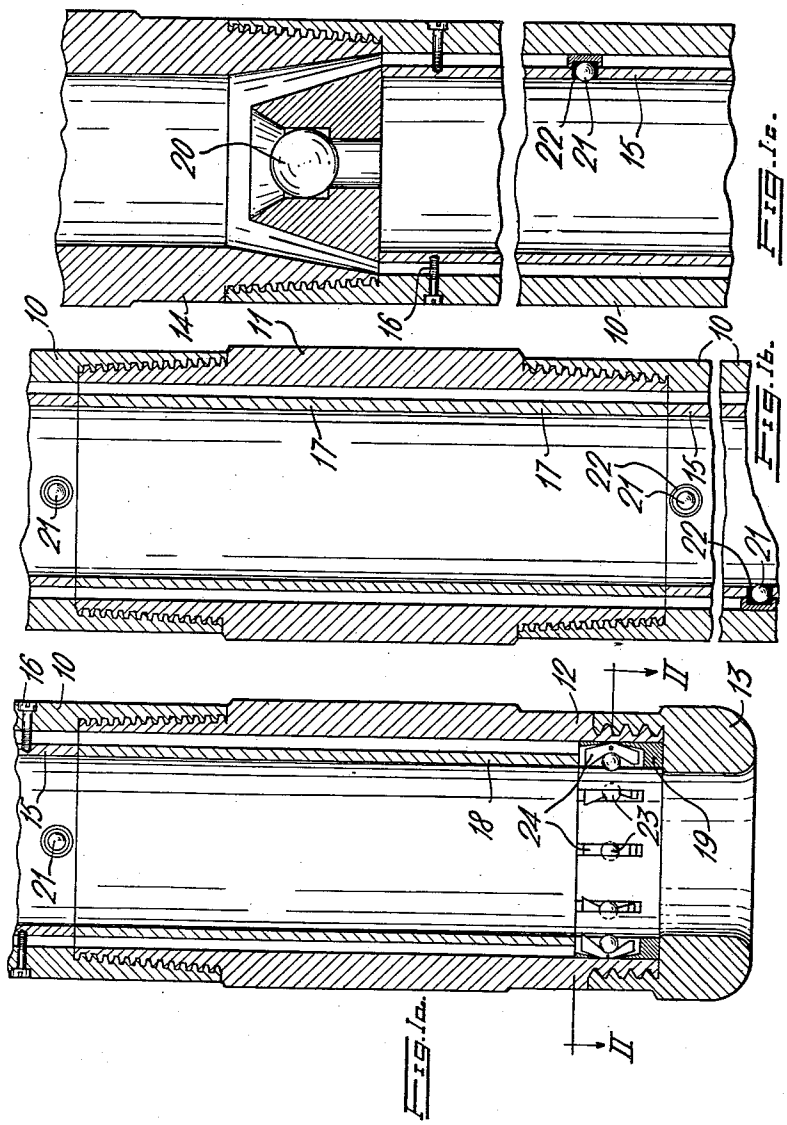


Fig. 1a.

Fig. 1b.

Fig. 1c.

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CORE DRILLING APPARATUS

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This invention relates to improvements in core drilling apparatus.

In the forms of apparatus employed hitherto the core of rock cut by the drill bit is stabilized to prevent its fracturing or crumbling by virtue of support it receives from direct contact with an inner barrel of the drill string. This inner barrel is fixed, and the outer barrel which carries the drill bit rotates around it. Some difficulty has been experienced in the past with this arrangement, there being a tendency for the inner barrel to clog and break loose from its fixings to be dragged around by the outer barrel.

In accordance with the present invention the inner barrel is not stationary, but is connected to the outer barrel to rotate with it, bearings being provided projecting from the inside face of the inner barrel to engage and support the core relative to which it is rotating.

One example of a drill string embodying the present invention is illustrated in the accompanying drawings, FIGURES 1A to 1C, which are continuations one of the other that together serve to make up a longitudinal central section of a drill string assembly.

The drawings show outer core barrel sections **10**, connected together by barrel couplings **11**, and terminating at the lower end in a core barrel bit stabilizer **12** to which there is screwed a diamond bit **13**. At the upper end, the core barrel section **10** is connected to a top adaptor section **14**. Each of the outer sections **10** has secured to it an inner core barrel section **15** by suitable fixing means such as set screws **16**. Further inner core barrel sections **17** are similarly secured within barrel couplings **11**, and inner core barrel section **18** is similarly secured within bit stabilizer **12**, with core cutter housing **19** positioned between barrel section **18** and bit **13**. The set screws fixing sections **17** and **18** to the outer members **11** and **12** are not visible in the drawing because they are disposed around the structure away from the plane on which the drawing section is taken. They are conventional in nature and similar to the set screws **16** that are shown. At the top end of the string, inner core section **15** has mounted on it a ball type check valve **20** that will permit flow of gas or liquid up out of the core space defined by the inner faces of the inner core sections, but will check any tendency for return flow.

Situated in the walls of the inner sections **15** and spaced apart from each other both longitudinally and circumferentially are balls **21** mounted as free turning bearings in retaining supports **22** in such a manner as to project out into the core space.

An annular core cutter housing **19** retains a circumferential series of balls **23** which similarly project into the core space. These balls **23** cooperate with core cutters **24** in a manner which forms the subject matter of companion patent application of even date Serial No. 184,181. For the purposes of the present application, balls **23** may be considered simply as bearings that serve a generally similar function to the balls **21**, namely to act

as bearings to support the core in the core space while rotating therearound.

As will by now have become apparent, the joining together of the inner and outer barrels has, in effect, reduced the drill string to a single rotating barrel, with no non-rotating parts at all. Normally it will be desirable to maintain individual inner and outer barrels in order to provide, in the space between the barrels, a passageway for drilling fluid to circulate. However, in any instance where adequate circulation of fluid can be otherwise provided for (for example—downward flow along the outside of the outer barrel and return flow in the core space), the distinction between inner and outer barrels can be dispensed with and a single barrel provided to fulfill both functions. Such a single barrel would, of course, carry suitable bearings (preferably balls, but rollers may be employed) projecting from its inner face in the same general manner as illustrated in the drawings in connection with the inner barrel. Thus, in its broad scope the drill string assembly of the invention may be said to comprise rotating barrel means presenting an inner cylindrical face to a core of rock cut by the drill bit, such inner face carrying bearings distributed along and around its surface and projecting into the core space to establish travelling engagement with the core which such bearings support.

I claim:

1. In core drilling apparatus, a drill string assembly comprising

(*a*) barrel means having an inner cylindrical face defining a core space,

(*b*) means for rotating said barrel means,

(*c*) a drill bit secured to an end of said barrel means to form a core,

(*d*) and a plurality of free running spherical bearings fixed in position on said barrel means to rotate therewith,

(*e*) said bearings being distributed around and along said inner face in position to project therefrom into the core space for supporting a core therein,

(*f*) and each of said bearings being mounted to be freely rotatable about all axes through its centre.

2. In core drilling apparatus, a drill string assembly comprising

(*a*) an outer barrel,

(*b*) means for rotating said outer barrel,

(*c*) a drill bit secured to an end of said outer barrel to form a core,

(*d*) an inner barrel having an inner cylindrical face defining a core space,

(*e*) means fixing said barrels together to rotate as a unitary structure,

(*f*) and a plurality of free running spherical bearings fixed to said inner barrel to rotate therewith,

(*g*) said bearings being distributed around and along said inner face in positions to project therefrom into the core space for supporting a core therein,

(*h*) and each of said bearings being mounted to be freely rotatable about all axes through its centre.

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