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CORE LIFTING ARRANGEMENT FOR DEEP WELL DRILLS

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FIG. 1.

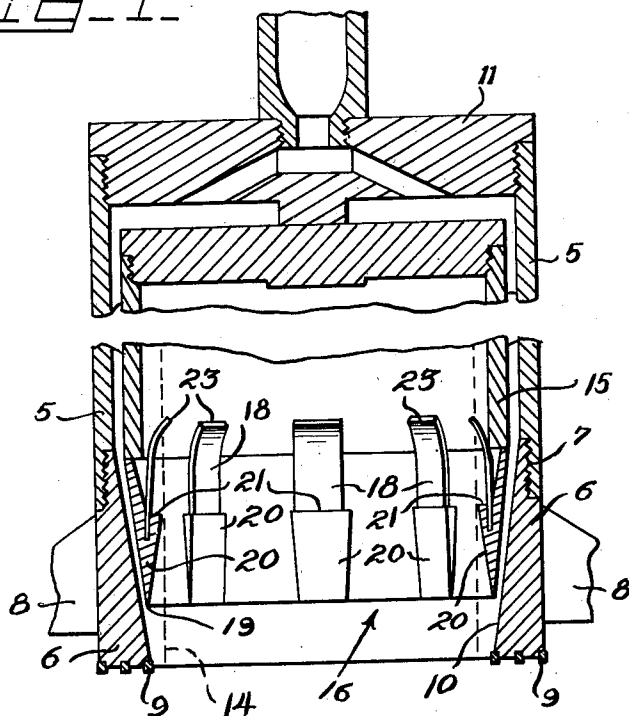


FIG. 2.

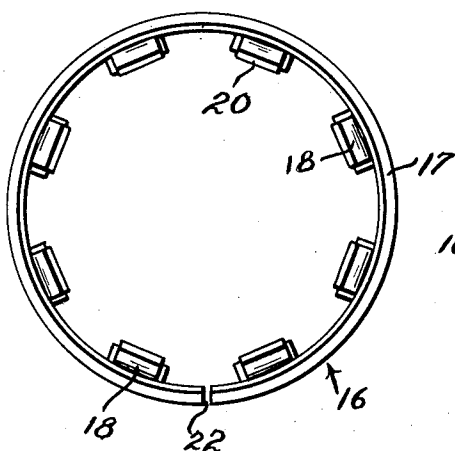
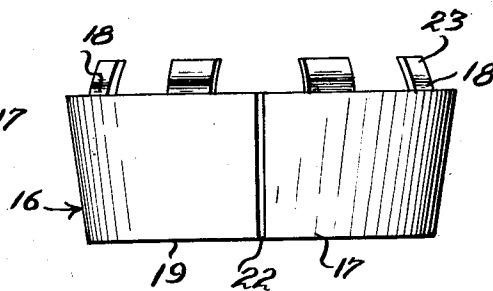


FIG. 3.



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2 Claims. (Cl. 255-72)

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This invention relates to improvements in deep well drilling and it has particular reference to the means for lifting a core or sample of a representative rock formation from the well.

It is an object of the present invention to provide an apparatus of the type above mentioned which is simple and effective and which prevents the dropping of the core from the core barrel during the operation.

It is a further object of the invention to provide a special core lifter to be placed at the end of the core barrel which is capable of gripping the core firmly, of immobilizing or holding the core barrel against rotation and of breaking or detaching the core in a given plane.

It is a further object of the invention to provide a core lifter consisting of expansible means which do not interfere with the relative upward movement of the core within the core barrel during the drilling operation but which obtain a firm grip of the core when the core starts a downward movement within the barrel, thus performing the above mentioned operations.

Still further objects of the invention will be apparent from the following detailed specification.

The invention will be more readily understood when described with reference to the accompanying drawing illustrating one embodiment of the same. It is however to be understood that the fact that only one embodiment of the invention is shown is not to be regarded as limitative. The embodiment of the invention specifically described has been selected as an example in order to explain the principle on which the invention is based and its application. The invention has been explained in such terms that the expert skilled in this art will be able to construct other embodiments of the invention and modifications of the invention are therefore not necessarily departures from the invention.

In the accompanying drawing,

Figure 1 is a sectional elevational view of the lower portion of the outer or drill barrel, the core barrel and the core lifter;

Figures 2 and 3 are a plan view and an elevational view of the core lifter respectively.

In order to facilitate the understanding of the purpose of the invention it may first be mentioned, that the present invention is mainly designed to remove difficulties encountered when a core has to be lifted from a soft formation of rock, which expression covers rocks consisting of a material or of compounds with comparatively weak cohesive power, such as shales, clay or the

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like. It frequently occurs with such material that the core drops out of the core barrel while being hoisted or that it does not break at the bottom so that those parts of the equipment which are hoisted contain only a small portion of the core while the remainder of the core remains at the bottom of the well. The core lifting device according to the invention is most useful in preventing such accidents.

In the drawing the outer barrel 5 forms the drill stem and carries at its end the bit 6 which may be secured to the said outer barrel by means of screw threads 7. The lateral cutters 3 and the annular central cutters 9 are only indicated diagrammatically as they do not form part of this invention.

The inner surface of the bit 6 is conical (at 10) and tapers off from the free end toward the end which is fixed in the barrel by means of the screw threads 7. The upper end of said barrel is fixed to a head 11 which is of the conventional type and need not be described.

Within the outer barrel 5 the inner barrel 15 is mounted which receives the core formed during the operation and which protects it against erosion caused by the water and mud which comes down along the drill barrel. The place occupied by the core is shown at 14 in dotted lines.

At the end of the tube the core lifter 16 is arranged which consists of a steel band 17 which has been split (at 22) and therefore is capable of expansion and contraction to a certain limited extent. This steel band 17 is of conical shape on its outside and in its interior it carries a series of steel springs or prongs 18 which are axially arranged but are curved or bent at their ends 23, as clearly shown in Figures 1 and 3; these ends project somewhat towards the center of the core lifter.

The steel band 17 is provided with a sharp edge 19 at its lower end. It carries a number of bronze wedges 20 in its lower half which are tapering off against the lower sharp edge 19, of the steel band and on the other end terminate in a shoulder 21 which projects to some extent into the space surrounded by the band.

The steel springs or prongs 18 are welded to the band by bronze behind the bronze wedges which perform at this point the function of preventing a breaking of the prongs.

In Figure 1 of the drawing the core lifter 16 is in the position which it assumes during the drilling operation. While drilling is proceeding the outer tube 5 with the drill bit 6 rotates and a core 14 is formed which travels upwardly with-

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in the inner barrel 15, as the drill bit works its way downwardly. The core lifter 16 is expanded by this core and the prongs or springs 20 are pushed back and are firmly pressed against the inner barrel 15 thus preventing this barrel from rotating. The rotation of the inner barrel frequently occurs in constructions which are not provided with special means for stopping such rotation and this leads to a wearing out of the core or at least to strains. The sharp edge 19 of the bore is helpful in starting a core to go through the core lifter.

When a core of the desired length has been formed within the inner barrel 15 and when the barrel is lifted the core 14 will try to go down and will carry the core lifter 16 with it and move it against the tapered bottom portion 10 of the bit 6. Thereby the slitted steel band 17 is squeezed and is pressed tighter against the core. The steel springs or prongs 18 are assisting in this operation because the ends 23 have a firm grip on the core 14 and therefore will cause the core lifter to move with the core.

The squeezing of the core 14 will cause it to break either at the bottom or at the point where the shoulders 21 of the wedges 20 are pressed against it. If the wedges 20 should fail to break the core it will break at the line where the ends 23 of the springs or prongs 18 are biting into it.

When the barrel 5 has been taken out and the drill bit is unscrewed from the barrel the core lifter 16 is removed and can now be used again in a further operation.

It will be obvious that changes of the construction of the drilling equipment have no influence on the essence of the invention.

I claim:

1. An arrangement for lifting cores through a drill pipe comprising an outer barrel, a drill bit provided with a conical inner surface tapering inwardly, an inner core barrel, a core lifter at

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the lower end of said core barrel, said core lifter consisting of an expansible steel band of conical shape, cooperating with the inner conical surface of the drill bit, said steel band being provided with a number of wedges secured thereto, said wedges having their thin edges arranged near the lower end of the steel band while the thick edge of each wedge is located in the interior of the steel band and is provided with a wedge like portion protruding inwardly and a number of axially arranged steel springs forming prongs, welded to the steel band above and behind the wedges and extending substantially in an axial direction, a portion of said axially projecting spring extending over the edge of the steel band and being provided with an inwardly bent end portion.

2. A core lifter for drill pipes comprising a split expansible steel band of conical shape provided with a sharp edge on the smaller side, bronze wedges arranged along said steel bands and fixedly secured thereto, having their sharp edges near the lower edge of said steel bands, and being provided with a wedge shaped portion protruding inwardly from the same, and axially directed elastic steel springs secured on said steel bands above and behind said wedges, projecting upwardly over the edge of the steel band and provided with inwardly bent ends.

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