Jan. 7, 1969 L. MARK 3,420,322

CORE TAKING APPARATUS

Filed Aug. 10, 1966 Sheet 1 of 2

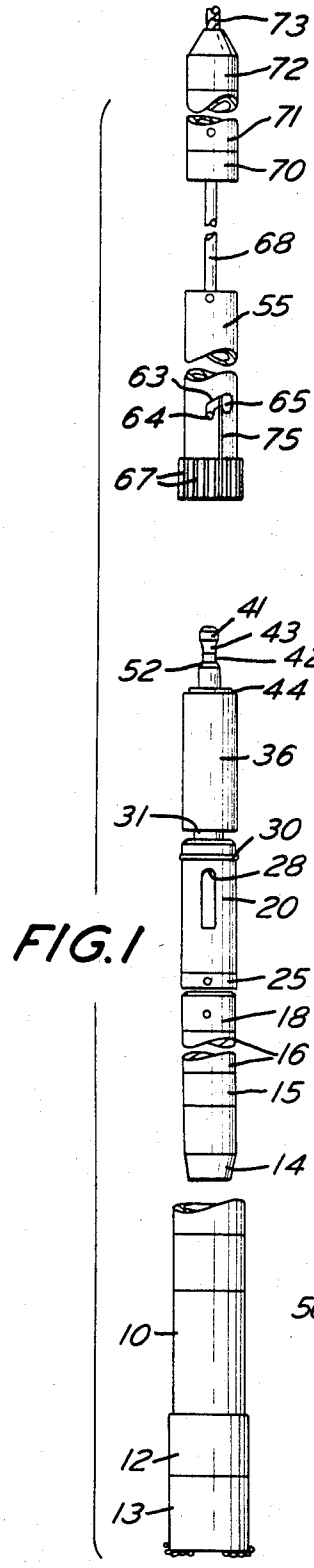


FIG. 1

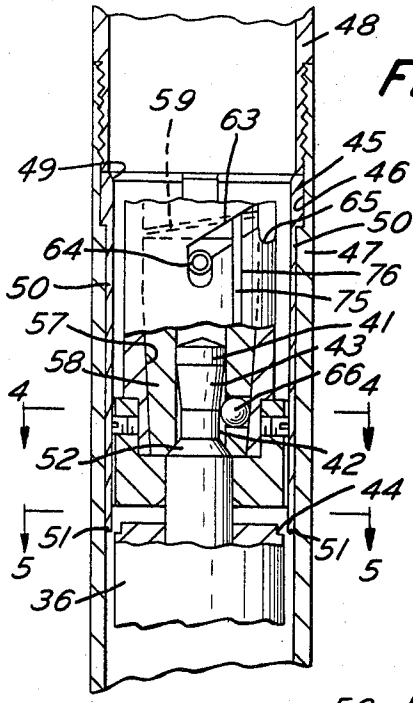


FIG. 3

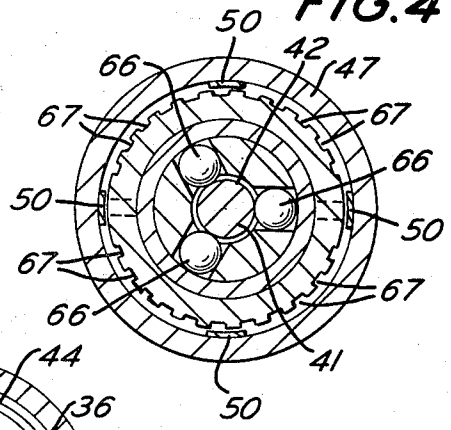


FIG. 4

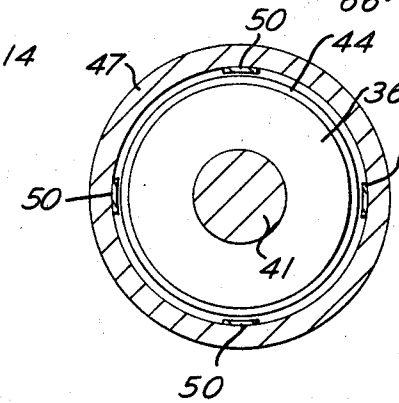


FIG. 5

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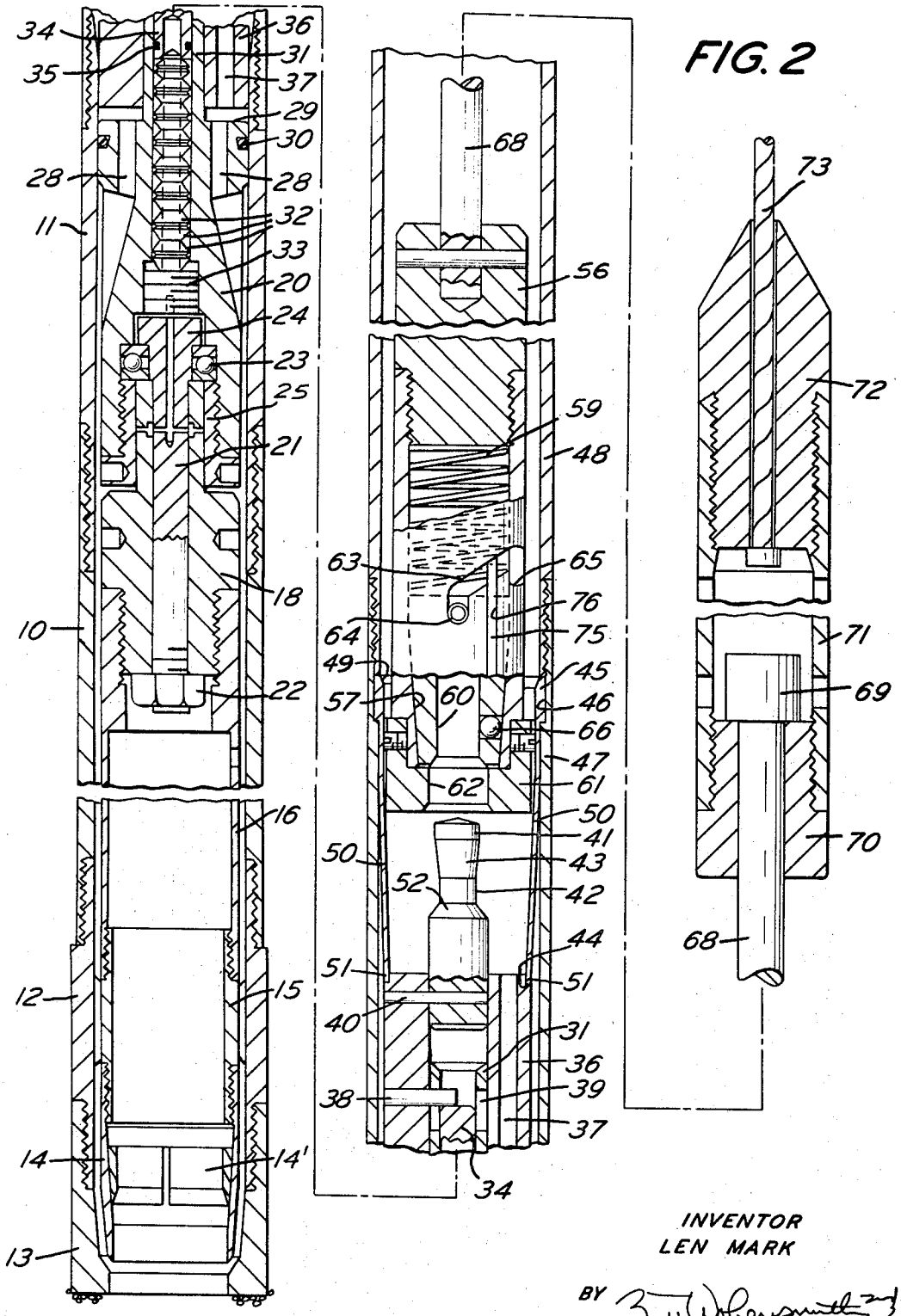
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FIG. 2



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CORE TAKING APPARATUS

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U.S. Cl. 175—246 2 Claims
Int. Cl. E21b 9/20, 25/00

ABSTRACT OF THE DISCLOSURE

A core taking apparatus which has an outer rotatable and driven-core barrel with an inner core barrel assembly including a collecting core barrel mounted in the outer barrel and supported by a bearing so as to be non-rotatable with the outer barrel while drilling. The inner core barrel assembly is removable from the outer core barrel by a retrieving assembly. Latching fingers carried by the outer barrel and self-urged inwardly engage a shoulder on the inner core barrel assembly and normally retain the inner core barrel assembly from upward movement but are released by the retrieving assembly. The non-rotatable character of the collecting core barrel prevents damage to the collected core and obviates injury to the latching fingers and the shoulder which they engage.

This invention relates to core taking apparatus employed with rotary core drilling equipment.

It has heretofore been proposed to use an outer rotary barrel carrying a core bit at its lower end and an inner barrel which receives the core as it is being formed. Suitable apparatus for this purpose is shown in U.S. Patent No. 3,004,614.

In the use of this core taking apparatus of that patent difficulties have been encountered in some instances by reason of solid particles in the hole becoming lodged in such a manner as to prevent the movement of latch fingers and thus hindering the retrieval of the core barrel.

Summary of the invention

This invention relates to core taking apparatus which has an outer rotatable core barrel, and an inner core barrel assembly which has a mounting portion with an inner collecting core barrel carried by a bearing so that the core collecting barrel is free from rotation with the outer barrel and the mounting portion of the inner core barrel assembly. Latching fingers carried by the outer barrel and self-urged inwardly engage a shoulder on the inner core barrel assembly normally retain the inner core barrel assembly from upward movement but are released by the retrieving assembly. The non-rotatable character of the collecting core barrel while drilling prevents damage to the collected core and obviates injury to the latching fingers and shoulder which they engage.

It is the principal object of the present invention to provide, in core taking apparatus having a core barrel assembly and latching mechanism for latching the inner barrel against rising during drilling, improved latching mechanism having greater reliability and freedom from operating difficulties in use.

It is a further object of the present invention to provide simple but effective latching apparatus for the inner core barrel which can readily be released when desired and which is free from likelihood of jamming or holding.

It is a further object of the present invention to provide, in core taking apparatus having an outer barrel, an inner core taking barrel, latching mechanism for retaining the core taking barrel during drilling and retrieving

mechanism for withdrawing the inner barrel with the core therein, an improved construction of spring latches and a latch retainer for mounting the latches at their upper ends with their lower ends movable into and out of latching positions.

Other objects and advantageous features of the invention will be apparent from the description and claims.

The nature and characteristic features of the invention will be more readily understood from the following description taken in connection with the accompanying drawings forming part thereof, in which:

FIGURE 1 is an exploded view in elevation with parts broken away, showing rotary core drilling apparatus embodying the present invention;

FIG. 2 is a part longitudinal sectional view of the apparatus of FIG. 1;

FIG. 3 is a fragmentary longitudinal sectional view illustrating the release of the latching fingers for retrieval of the core barrel;

FIG. 4 is a transverse sectional view, enlarged, taken approximately on the line 4—4 of FIG. 3; and

FIG. 5 is a transverse sectional view, enlarged, taken approximately on the line 5—5 of FIG. 3.

It should, of course, be understood that the description and drawings herein are illustrative merely, and that various modifications and changes can be made in the structure disclosed without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

Referring now more particularly to the drawings, the embodiment of the invention therein illustrated is similar in many respects to the core taking apparatus shown in U.S. Patent No. 3,004,614 but with improved inner core barrel retaining structure and includes an outer core barrel **10** to the upper end of which the sectional drill rod **11** is thread coupled. The lower end of the core barrel **10** has a reaming shell **12** thread coupled thereto and a core bit **13** is thread coupled to the shell **12**. The core bit **13** can be of any desired type, a diamond bit being preferred.

The inner barrel of the core barrel assembly preferably comprises a core lifter case **14** which extends loosely into the drill bit **13** and is threaded onto an inner core barrel extension or coupling section **15**. The core lifter **14** of the inner barrel preferably consists of a resilient split steel ring with slots or ribs engaging the core sample and holding it within the lifter case **14** while the same is being raised. The coupling section **15** and upper inner barrel section **16** are in threaded engagement.

The upper end of the inner barrel section **16** has an elongated plug or cap **18** threaded thereto which has an inner barrel and lower shut off head **20** detachably connected thereto by a spindle **21** and nut **22**. A thrust bearing **23** is provided, engaged by a head **24** on the spindle **21** and retained in assembled relation by a threaded shank **25**, so that the inner core barrel assembly is free from any rotary impelling action by the outer barrel **10** and the parts rigidly connected thereto.

The head **20** has fluid passageways **28** therethrough extending downwardly from a horizontal seating face **29** and at the periphery has a packing **30**, such as an O-ring, carried thereby and engaging the inner surface of the outer barrel **10**.

The head **20** has an upper tubular extension **31** within which a plurality of spring washers **32**, such as Belleville washers, are provided engaged at their lower end with a threaded plug **33** and at their upper end with a spring seal plug **34**. The plug **34** has a peripheral packing ring **35**, such as an O-ring, carried thereby. The tubular ex-

tension 31 has mounted thereon for limited vertical movement a shut-off head 36. The shut-off head has a fluid passageway 37 therein. A pin 38 extending through the extension 31 and into a vertical slot 39 and engaged by the plug 34, permits of limited movement against the resilient force of the spring washers 32 toward a position to shut off flow through the passageway 37 by the face 29.

The shut-off head 36 has rigidly connected thereto by a spring pin 40, a post or head 41 with a locking groove 42 having an upper beveled face 43. The post 41 has a releasing shoulder 52. The shut-off head 36 has a peripheral retaining ledge 44 around the top edge thereof.

In order to releasably retain the inner barrel assembly at its lowermost position during drilling and core collection, a latch finger ring 45 is provided, carried in a groove 46 in a latch case 47 forming part of the outer barrel 10, a latch retainer 48, also forming part of the outer barrel 10 being in threaded engagement with the latch case 47 at this location. The latch finger ring 45 has an upper inner guiding face 49 and has extending downwardly therefrom resilient latch fingers 50 which are biased inwardly and have their end 51 engaged at the ledge 44. The fingers 50 act in compression to retain the inner barrel assembly in core collecting position, and are releasable as hereinafter explained.

Retrieving or overshot mechanism is provided which is capable of being lowered and raised within the outer core barrel 10. The retrieving mechanism is the same as that shown in prior Patent No. 3,004,614 and includes an overshot tube 55 having an upper threaded plug 56 with a tapered internal bore 57 for the reception of a locking cone 58. The cone 58 is spring loaded by a spring 59 and has an axial through bore 60 and a removable lower overshot foot 61 with an internal bore 62 in alignment with the bore 60 for the reception of the post 41.

The foot 61 has grooves 67 along its outer peripheral surface to permit free fluid flow.

The locking cone 58 is engageable directly by the shoulder 52 for upward and releasing movement of the cone 58 when the foot 61 has been removed.

The overshot tube 55 has a cam slot 63 and the locking cone 58 has a cooperating locking pin 64 which is movable in cam slot 63 in the overshot tube 55. The cam slot 63 can have a locking recess 65 for receiving the pin 64 under certain conditions to lock the locking cone 58 in retracted position. The locking cone 58 is provided with radially movable locking balls 66 which are positioned by the tapered bore 57 in the overshot tube 55.

The plug 56 is connected by a spindle 68 with an enlarged head 69 to thread coupled jar members 70, 71 and 72.

From the upper jar member 72 a cable 73 extends upwardly for actuation as desired by the driller to raise and lower the overshot or retriever and the inner barrel assembly. A key 75, carried by the removable foot 61, mounted in a groove 76 in the overshot tube 55 and intersecting the cam slot 63, can be provided if desired.

The mode of operation will now be pointed out.

In normal operation the drill rod 11 is in the hole being drilled and extends to the surface of the earth with the core bit 13 at the bottom of the hole. If drilling fluid is present in the hole the inner core barrel assembly can be dropped by gravity into position. In its descent the core lifter case 14 of the inner core barrel assembly will spring the latch fingers 50 outwardly. The inner core barrel assembly will move downwardly to a position where the ends 51 of the latch fingers 50 are engaged at the ledge 44 and hold the inner core barrel assembly against upward movement. Downward movement is limited by the core bit 13.

The core is collected and retained within the interior of the core lifter case 14, coupling section 15 and core lifter 16.

When it is desired to retrieve or raise the inner barrel of the core barrel assembly to the surface of the earth the driller lowers the retrieving or overshot mechanism into the outer barrel 10 until the lower overshot foot 61 and overshot tube 55 move down over the post 41. As this occurs the locking cone 58 will be forced upwardly against the action of the spring 59 and the locking pin 64 will move along the cam slot 63 toward the outer extremity of the slot 63. The descent of the overshot foot 61 has of course moved the latch fingers 50 out of their holding position shown in FIG. 2 to the released and retained positions shown in FIG. 3, so that the inner core barrel assembly is no longer locked against upward movement but is free to be lifted.

Upon raising of the cable 73 the locking balls 66 in engagement in the slot 42 will lock the retrieving mechanism to the inner core barrel assembly so that the inner core barrel assembly can be raised for access to the core.

The locking recess 65 at the outer end of the cam slot 63 will receive the pin 64 under certain conditions and lock the locking cone 58 in retracted position. The key 75 prevents the pin 64 under usual conditions from being moved into the recess 65.

In the event that drilling fluid is not present in the hole to facilitate the gravity delivery of the inner core barrel assembly to the bottom of the outer core barrel, the retrieving mechanism is attached, above ground, to the inner barrel assembly and the same lowered into position. The retrieving mechanism is then disengaged and lifted to the surface of the ground. For this mode of insertion the foot 61 and the key 75 are removed from the retrieving mechanism. The retrieving mechanism is then coupled to the inner core barrel assembly and the coupled structure lowered into position with the locking balls 66 holding the same in coupled relation during the downward movement.

The retrieving mechanism is then disengaged from the post 41 by the engagement of the shoulder 52 with the overshot tube 55, the elevation of the locking cone 58 to ball releasing and unlocked position, the pin 64 moving along the cam slot into position above the locking groove 65.

As the overshot mechanism is raised the pin 64 will drop into the locking groove 65 to hold the cone 58 against downward movement, thus preventing relocking by the balls 66 as the overshot mechanism is raised the latch fingers 50 will have engaged at the ledge 43 to latch the inner barrel assembly in position and prevent upward movement thereof.

After withdrawal of the retrieving mechanism the foot 61 is replaced for use as previously explained.

The structure as described has adequate provisions for movement of drilling fluid and fluid locking upon raising or lowering of the inner core barrel assembly is avoided.

I claim:

1. In core taking apparatus having

an elongated outer core barrel rotatable on its major axis,

an elongated inner core barrel assembly insertable into and removable from said outer core barrel,

said inner core barrel assembly comprising a mounting portion and an inner collecting core barrel connected to said mounting portion with an interposed thrust bearing whereby said collecting core barrel is rotatably connected to said mounting portion, and retrieving means attachable to said mounting portion

the improvement which comprises

latching means for said inner core barrel assembly releasable by said retrieving means,

said latching means having a mounting portion fixedly attached to the interior of said outer core barrel and having downwardly extending unitary resilient latch fingers with lower self-inwardly urged ends for engagement with said upper portion of said inner core barrel assembly and for release by engagement of said retrieving means

said upper portion of said inner core barrel assembly having a ledge for engagement by said ends of said latch fingers.

2. Core taking apparatus as defined in claim 1 in which said mounting portion of said latching means is a ring interposed in and carried by said outer core barrel.

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U.S. Cl. X.R.

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