United States Patent [19]

Cooper et al.

[11] **3,871,487**

[45] **Mar. 18, 1975**

[54] **WIRE LINE SOIL SAMPLER APPARATUS**

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[73] Assignee: **Longyear Company,** Minneapolis, Minn.

[22] Filed: **Feb. 25, 1974**

[21] Appl. No.: **445,643**

[52] **U.S. Cl.** **175/248,** 175/236, 175/238, 175/257

[51] **Int. Cl.** **E21b 9/20,** E21b 25/00

[58] **Field of Search** 175/58, 232, 246, 248, 175/249, 257, 261, 247, 236–240

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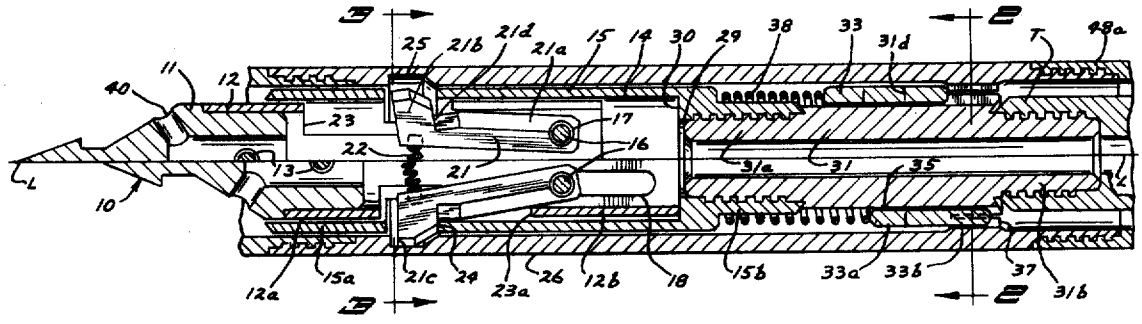
Primary Examiner—David H. Brown

Attorney, Agent, or Firm—Dugger, Johnson & Westman

[57] **ABSTRACT**

Wire line soil sampler apparatus that includes a head assembly having a latch body mounting extendable latches for engaging the latch seat of a drill stem, a latch release member extending into the latch body to retract the latches, a fitting mounted by the latch body, and a locking ring axially movable on the fitting a limited amount that is spring urged to engage a slotted flange of the drill stem to transmit a turning force from the drill stem to the fitting when the head assembly is in a latch seated position. The fitting may mount any one of a number of tools, for example a plug bit, or a soil sample tube that extends through and axially inwardly of the annular bit of the drill stem.

22 Claims, 10 Drawing Figures



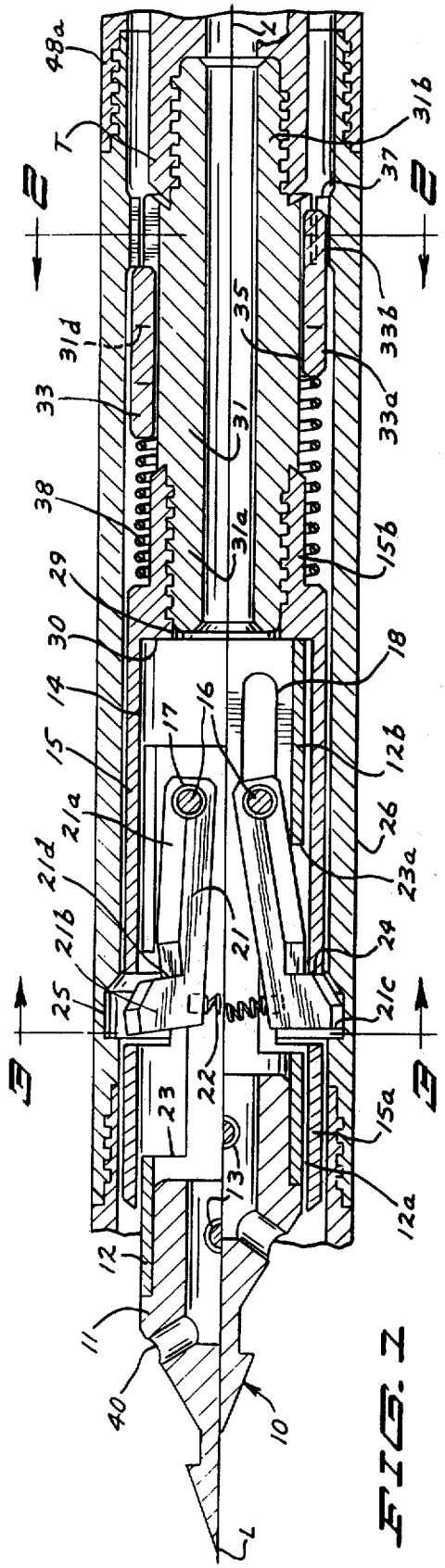

48a
T
2
2
3/b
37
35
33b
31d
33
31
33a
38
31a
15b
29
30
14
18
15
17
16
12b
21a
26
21d
23a
21b
21
24
25
21c
22
3
3
23
15a
13
12a
12
11
40
10
L

FIG. 2

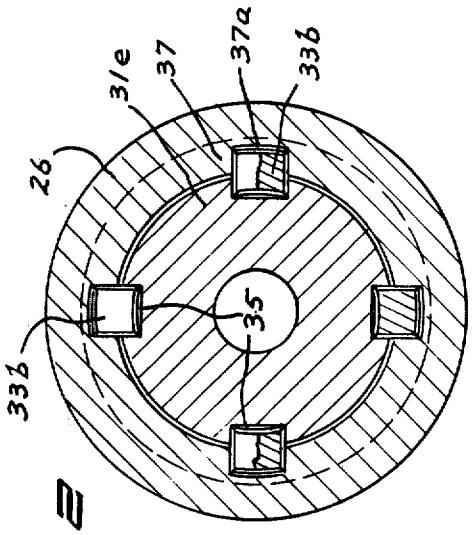
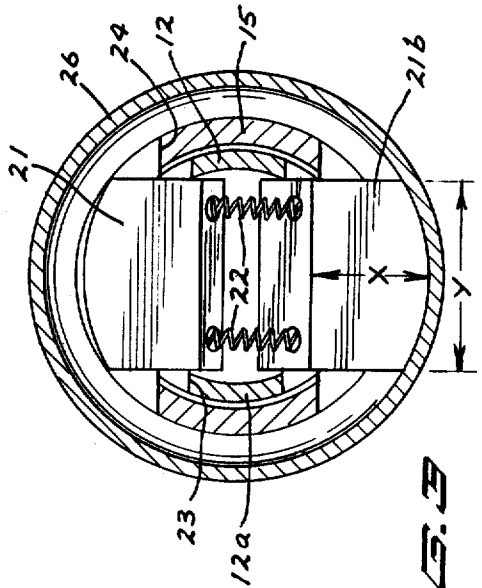

31e
37
37a
33b
26
35
33b

FIG. 3


26
24
12
15
21b
21
22
X
Y
23
12a

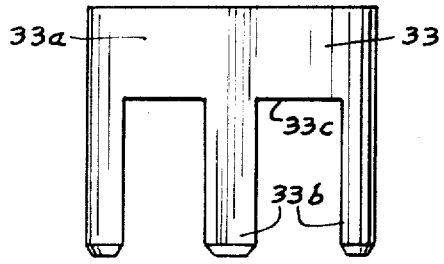


FIG. 5

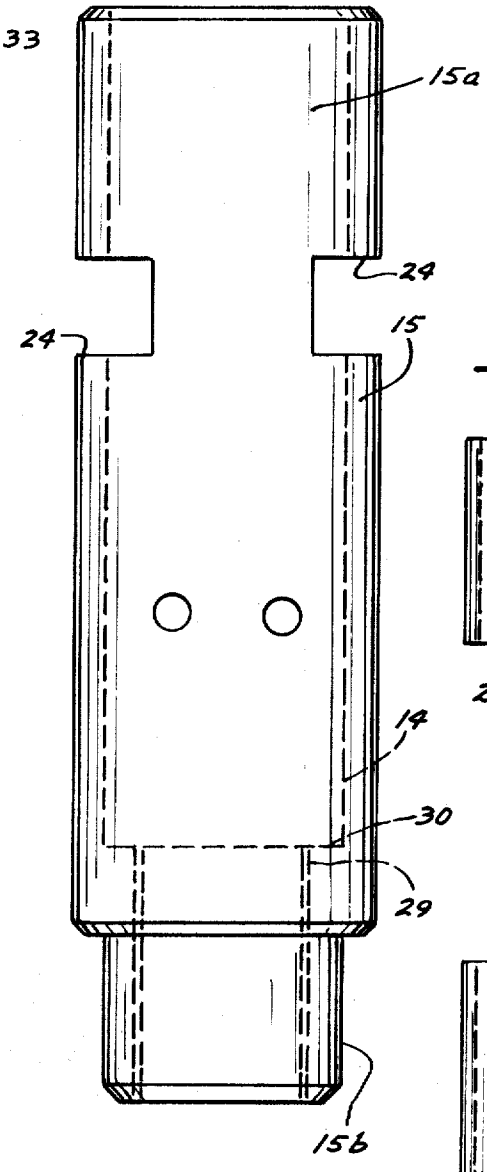


FIG. 6

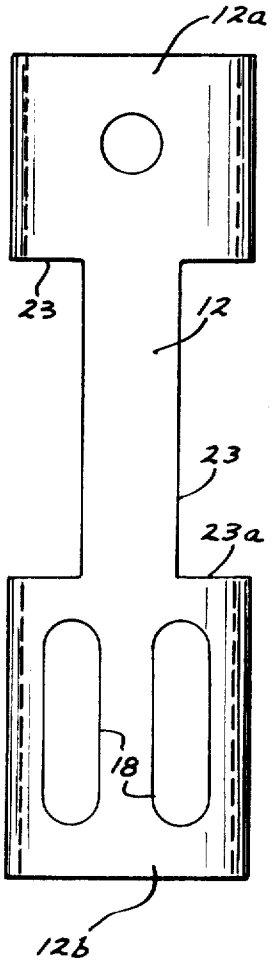


FIG. 4

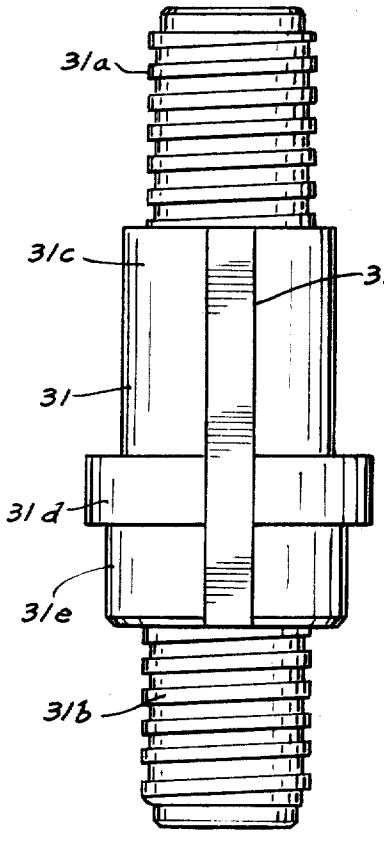


FIG. 7

FIG. 10

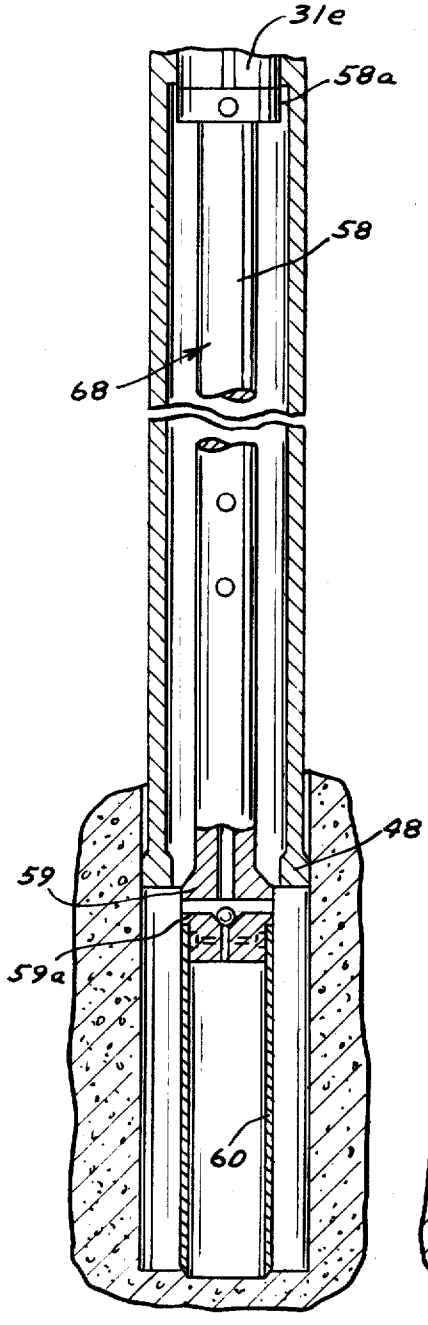


FIG. 9

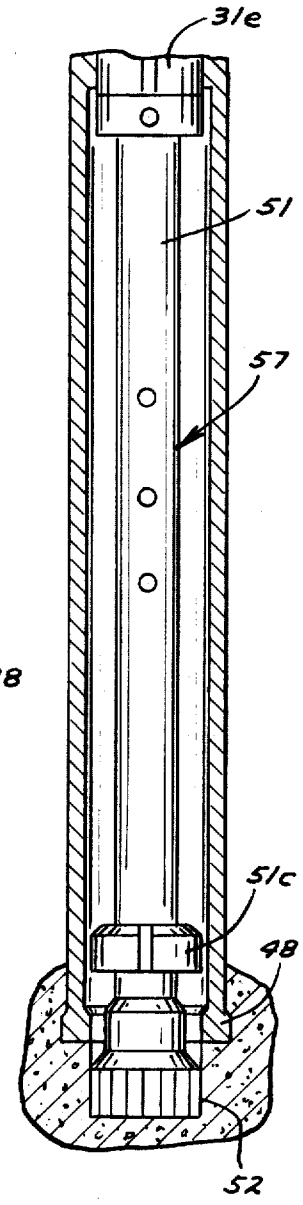
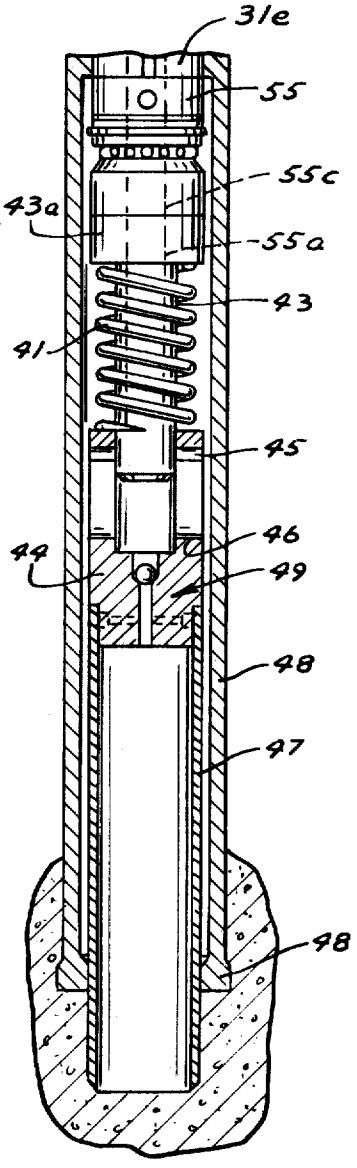


FIG. 8



WIRE LINE SOIL SAMPLER APPARATUS

BACKGROUND OF THE INVENTION

A soil sampling device that is used in a drill stem.

In the prior art it is old to provide a soil sampler that is coupled to a drive rod, for example such as disclosed by U.S. Pat. No. 2,795,395 to Acker, however to retrieve such a sampler, the entire drive rod has to be retracted.

In U.S. Pat. No. 2,829,868 to Pickard et al, there is disclosed a wire line core barrel, however, as a practical matter, for many type soil sampling procedures such apparatus is not suitable. For example, the inner tube thereof is located within the drill stem and thus not suitable for obtaining an undistrubed soil sample. Further, the latches are of a construction and mounted in a manner that the latches only have relatively small cross sectional area portions abutting against the drill stem for transmitting a downward directed force to the latch. Additionally, the turning force from the drill stem to the head portion of the assembly is applied through a vertical shoulder of the locking coupling to a latch, and thus there is only a relatively small area across which such a turning force is applied.

In U.S. Pat. No. 3,635,295 to Cobbs there is disclosed a small bore hole drilling tool that is hydraulically retainable in the bit end of the drill stem. However, there is no coupling attachment between the drill stem and the tool for positively transmitting a downward force from the drill stem to the tool. The tool is provided with driving lugs that are extendable into grooves in the drill stem for transmitting a turning force from the drill stem to the tool. However, such lugs are of a relatively complex construction. Additionally, it would appear that particles can lodge between the drive lug plates and the alignment drum to interfer with, if not preclude, retracting the tool.

In U.S. Pat. No. 3,346,059 to Svendsen there is disclosed a wire line core barrel assembly that is subject to a number of the limitations of U.S. Pat. No. 2,829,868 and does not have an internal axially extending fluid channel.

In order to overcome problems such as the above, as well as others, this invention has been made.

SUMMARY OF THE INVENTION

Wire line soil sampling apparatus that includes a latch body mounting a latch for movement to a drill stem latch seat engaging position, a latch release member for retracting the latch, a fitting connected to the latch body for mounting a tool, and a lock member mounted on the fitting for limited movement and for cooperating with the drill stem to impart a turning movement from the drill stem to the fitting. The tool may be any one of a number of different types of drill bits or soil sample collecting devices that may be passed through the drill stem.

One of the objects of this invention is to provide in a wire line soil sampling device, new and novel latch mechanism and mounting of such mechanism. In furtherance of the last mentioned object, it is another object of this invention to provide latches having relatively large surface area portions for transmitting a downward force from a drill stem to a latch body.

An additional object of this invention is to provide in a wire line soil sampling device, new and novel lock mechanism for transmitting a turning force from a drill

stem to said device, and at the same time permit retracting the device. Another object of this invention is to provide new and novel mechanism in a wire line soil sampling device for releasably retaining the device adjacent the bit end of a drill stem and for positively transmitting a downward force and a turning force from the drill stem to the device.

In furtherance of the above objects, it is another object of this invention to provide a new and novel wire line soil sampling device that may have tools of varying constructions mounted thereby for drilling in soil and collecting soil samples.

In order that the invention described herein may be more fully understood, the meaning of certain terminology as used in the specification will be set forth. The term "inner" refers to that portion of the drill stem or an element of an assembly in its position "for use" in the drill stem which is located axially closer to the bit attached to the drill stem than any other portion of the drill stem or elements being referred to, except where the term refers to the transverse circumference, or the peripheral surface or the diameter of the drill stem of said elements. The term "outer" refers to that portion of the drill stem or of an element in its "position for use" in the drill stem which is located axially closer to the mouth of the drill hole than the other portion of the drill stem or element being referred to except where the term refers to a transverse circumference or the peripheral surface or the diameter of an element or the drill stem.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal cross-sectional view of the head assembly of the soil sampler of this invention in a drill stem adjacent the latch seat, the portion of the head assembly below the central axis L—L being shown in a position for taking the soil sample, and the portion above said central axis being shown in a latch retracted position;

FIG. 2 is a transverse cross-sectional view taken along the line and in the direction of the arrows 2—2 of FIG. 1 with the halves in the same relationship as indicated for FIG. 1;

FIG. 3 is a transverse cross-sectional view generally taken along the line and in the direction of the arrows 3—3 of FIG. 1;

FIG. 4 is a side view of the latch release tube;

FIG. 5 is a side view of the latch body;

FIG. 6 is a side view of the locking ring;

FIG. 7 is a side view of the fitting for connecting the latch body to the tool that is mounted on the head assembly;

FIG. 8 is in part a side view and in part a longitudinal cross-sectional view of one tool that may be mounted on the fitting of the head assembly of FIG. 1;

FIG. 9 is a side view of a second tool that may be mounted on the head assembly of FIG. 1; and

FIG. 10 is in part a side view and in part a longitudinal cross-sectional view of a third tool that may be mounted on the head assembly of FIG. 1.

As viewed in FIG. 1, the left-hand end is the axially outer end of the head assembly (end closest to the surface).

Referring now in particular to FIG. 1–5, the head assembly of this invention, generally designated 10, includes a spear point 11 that extends into the axial outer end portion 12*a* of the latch release tube 12 and is se-

cured in a fixed position relative thereto by the pin **13**. The annular, axially inner end portion **12***b* of the latch release tube is slidably extended into the bore **14** of the latch body **15**, a pair of parallel pins **16** being mounted in fixed positions in the latch body by extending into apertures **17** of the latch body and extended through axially elongated slots **18** of the portion **12***b* of the latch release tube to limit the movement of the latch release tube axially outwardly relative the latch body.

Mounted by the pins **16** to extend within the latch release tube in an axially outward direction is a pair of diametrically opposed latches **21**, each of the latches having a predominately axially elongated portion **21***a* and a predominately transversely extending portion **21***b*. The latches are resiliently urged to a latch seat engaging position shown on the bottom half of FIG. **1** by a coil spring **22**. Each of the latch pin portions **21***b* has a substantially planar, axially outer, transverse surface **21***c*, and a substantially planar, axially inner transverse surface **21***d* substantially parallel to surface **21***c* and extending radially outwardly of portion **21***a* sufficiently that when portion **21***a* abuts against the latch body wall defining bore **14**, surface **21***d* extends radially outwardly by a distance substantially the same as the radially thickness of the part of the axially outer end portion **15***a* that defines the inner edge of each of latch body slots **24**. The dimension Y of surface **21***c* in a direction parallel to central pivot axis of pin **16** is preferrably greater than 50 percent of the inside diameter dimension of each of latch body tubular portions **15***a* and the latch release tube and desirably greater than 75 percent of the inner diameter dimension of the latch release tube; while the maximum dimension X of surface **21***c* that is perpendicular to dimension Y is likewise preferrably greater than 50 percent of the latch release tube inner diameter dimension. Surface **21***d* extends radially outwardly from portion **21***a* a distance greater than the radial thickness of the wall of the latch body that defines the inner edge of each of the latch body slots **24** and is abuttable against the major part of said wall. Further, the outer surface **21***c* has a radially outer edge having a radius of curvature substantially the same as the inner radius of curvature of the drill stem latch seat **25** whereby the surface area of each latch surface **21***c* abuttable against the downwardly facing shoulder of the latch seat **25** is nearly the same as axially adjacent parts of the latch and said shoulder.

The latch release tube has a pair of diametrically opposed slots **23** to permit the latch portions **21***a* to extend in part radially thereinto and the latch portions **21***b* extending radially outwardly through the latch body slots **24** into the latch seat **25** of the drill stem **26** when the latch release tube is in its axially inner position relative the latch body (position of bottom half of FIG. **1**); the latch slots **23** having inner shoulders **23***a* for abutting against the latch portions **21***a* for retracting the latches as the latch release tube is moved axially outwardly relative the latch body.

The axially inner end portion **15***b* of the latch body is of a reduced diameter and has an internally threaded bore **29** extending therethrough to open to bore **14**; the juncture of bores **14** and **29** forming a shoulder **30** to limit the axial inward movement of the latch release tube relative the latch body. An annular fitting **31** has one end portion **31***a* threaded into the bore **29** and an axially opposite threaded end portion **31***b* to which the axially outer end T of a suitable tool is threadably mounted. The fitting has a first diametric portion **31***c* that is of a larger diameter than the maximum thread diameter of portion **31***a* and is joined thereto to extend axially inward thereof, a maximum diameter portion **31***d* joined to portion **31***c* to extend axially inwardly thereof, and an intermediate diametric portion **31***e* extending between threaded portion **31***b* and maximum diameter portion **31***d*, portion **31***e* being of a diameter intermediate the diameters of portions **31***c*, **31***d*. The outside diameter of portion **31***c* is substantially less than the outer side diameter of latch body portion **15***a* other than for part of the axially lower beveled surface thereof.

A lock ring **33** is axially slidably mounted to the fitting, the lock ring having an axially outer annular portion **33***a* and a plurality of circumferentially spaced, axially elongated prongs **33***b* extending axially inwardly of portion **33***a*. The maximum axial length of the lock ring is less than the combined axial lengths of portions **31***c* and **31***d*. Also, the axial length of portion **33***a* is less than the axial length of each of portion **31***c* and the prongs. Additionally, the inside diameter of annular portion **33***c* is substantially less than the outside diameter of the non-beveled part of latch body portion **15***b* and the outside diameter of portion **31***d*, and slightly greater than the outside diameter of portion **31***c* whereby portion **33***c* is axially slidable along fitting portion **31***c* a limited amount as will be set forth hereinafter.

Advantageously, the lock ring has four prongs, the minimum diameter spacing of diametric opposite prongs being slightly greater than the outside diameter of portion **31***c* but less than the outer diameter of each of fitting portions **31***d*, **31***e* while the diametric spacing of the radial outer surfaces of diametrically opposed prongs is substantially the same as the outer diameter of portion **31***d*. Fitting portions **31***c*, **31***d* and **31***e* are provided with axially elongated grooves **35** to have the prongs extend thereinto a permit the lock ring moving axially relative to the fitting but at the same time prevents the fitting from rotating relative to the lock ring when the head assembly is located in a latched, core taking position, and portion **31***e* is radially opposite the landing flange **37** of the drill stem. The landing flange is integrally formed as a part of the drill stem and has an inner diameter substantially smaller than the part of the drill stem on each axially opposite side thereof, and has a plurality of axially elongated grooves **37***a* for having the axially, radially outer end portions of the prongs extend thereinto to prevent the lock ring from rotating relative the drill stem. The inner diameter of the non-grooved portions of the landing flange is of a greater diameter than the outer diameter of fitting diametric portion **31***e* but smaller than the outer diameter of fitting portion **31***d* to provide a shoulder against which the shoulder of the fitting formed by the junction of portions **31***d*, **31***e* abuts to limit the axial inward movement of the soil sampler head assembly relative the drill stem. Further, as the inner diameter of annular portion **33***a* of the lock ring is slightly greater than the maximum diameter of fitting portion **31***c*, but less than the diameter of the non-grooved portion of diametric portion **31***d* whereby shoulders **33***c* formed by the juncture of the prongs **33***b* and the annular portion **33***a* will seat against maximum diameter portion **31***d* of the fitting to limit the axial inward movement of the lock ring relative the fitting **31**. A coil spring **38** is mounted on the

axial inner portion 15*b* of the latch body to have one end bear against the annular shoulder formed by the juncture of latch body portions 15*a*, 15*b* and an opposite end bearing against the axially outer annular surface of the lock ring to constantly resiliently urge the lock ring to a position lock ring shoulders bear against the shoulder formed at the juncture of fitting portions 31*c*, 31*d*. To be mentioned is that even in the maximum axial outer position of the lock ring relative the fitting wherein the lock ring abuts against the latch body, the prongs still extend into parts of the grooves 35 of portion 31*d* so that the lock ring is prevented from rotating relative the fitting.

As may be noted in FIG. 1, the spear point is provided with ports 40 that open to the annular space between the drill stem and spear point to permit passage of fluid therethrough and through the latch release tube, the latch body and the fitting to exit through the tool attached to the fitting.

Any number of different tools may be used with and attached to the fitting of the wire line head assembly of this invention, and thus the description of various tools set forth hereinafter is for purposes of indicating the type of uses of this invention, rather than as a limitation thereon. The soil sampler tool, generally designated 49, that is illustrated in FIG. 8 includes an annular spindle 43 that has an axially inner end portion slidably extended into the inner tube mounting cap 44, a pin 45 being mounted by the spindle to extend radially into the axially elongated slots 46 of the cap to permit limited axial movement of the spindle relative the cap and also provide for fluid flow through the spindle bore 55*a* and axially outwardly through the slots and then through the annular space between the cap and the drill stem. A coil spring 41 is mounted on the reduced diameter part of the spindle to have one end portion bear against the cap for resiliently retaining the cap in a maximum axial inward position relative the spindle and an opposite end bearing against the enlarged diametric portion 43*a* of the axially outer end of the spindle. Portion 43*a* is mounted on the swivel head 55 which in turn is threadingly mounted on portion 31*b* of the fitting. The swivel head has fluid channel 55*c* fluidly connecting the fitting channel to the spindle channel, the swivel head permitting the spindle rotating relative the fitting.

The axially inner end of the cap 44 is pinned to the axial outer end of the soil sampler inner tube 47, tube 47 being of maximum outer diameter to extend through the central aperture of the rotary core bit 48 that is mounted by the axial inner end (outer tube) of the drill stem 26 at threaded joint 48*a*. The inner tube 47 is of axial length to extend axially inwardly of the drill bit when the head assembly is in a latch seated condition and is provided for holding a soil sample.

In FIG. 9 there is illustrated a tool, generally designated 57, for plug drilling and includes a spindle 51 having an axial inner end threadedly mounted on portion 31*b* of the fitting and an enlarged diametric axial inner end 51*c* to form a close fit with the inner wall of the drill stem. Spindle portion 51*c* mounts a drill bit (plug or roller bit) 52 having an outer diameter slightly smaller than the central aperture of the drill bit 48, bits 48, 52 in combination being provided for drilling a hole when no core or soil sample is being taken. When the head assembly is in a latch seated position the bit 52 extends radially adjacent or somewhat axially inwardly of bit 48.

In FIG. 10 there is shown a tool, generally designated 68, having a spindle 58 that at the axial outer end 58*a* is threadably mounted on the fitting portion 31*b* and is of an axial length to have its axial inner end located radially adjacent the drill bit. An inner tube cap 59 is mounted on the axial inner end of the spindle and in turn mounts a soil sampler tube 60 which extends axially inwardly of the cap and drill bit, when the head assembly is in a latch seated position. The tube 60 and cap 59 are of outer diameters which permit them being slidably moved through the central aperture of the bit 48. Spindle 58 is provided with a fluid channel for conducting fluid from the fitting to the cap 59 and discharge fluid through the outlet ports 59*a* axially inwardly of the cap 59.

For purposes of facilitating the description of the use of the apparatus of this invention, it will be assumed that the drill stem is extending into a hole that has been drilled in the earth and the head assembly with a suitable tool thereon is to be lowered through the use of a conventional overshot assembly coupled onto the spear point or is dropped by gravity fall through the drill stem. When the head assembly is moved to a drill position that the fitting portion 31*d* is adjacent the landing flange 37, if the prongs of the lock ring are not aligned with the grooves in the landing flange 37, the prongs in abutting against the nongrooved parts of the landing flange block further inward movement of the lock ring but permit the fitting to be moved axially inwardly to a position that the shoulder formed by the juncture of portions 31*d*, 31*e* abut against the landing flange. When the landing flange stops the inward movement of the lock ring, the spring 38 is compressed due to the weight of the head assembly and the inward movement of the rest of the head assembly relative the lock ring. At the time the fitting properly seats on the landing flange, latch portions 21*b* are radially opposite the latch seat 25 and the springs 22 urge portions 21*b* to move radially outwardly through the latch release tube slots and the latch body slots 24 to latchingly engage the latch seat. This prevents axial outward movement of the head assembly relative the drill stem. As the drill stem is rotated, it now rotates relative the lock ring until the drill stem is rotated to a position relative to the lock ring that the prongs are axially opposite the grooves in the landing flange and thereon spring 38 forces the lock ring axially inwardly so that the prongs or fingers 33*b* extend into the grooves of the landing flange. As a result, the head assembly is now forced to rotate with the drill stem, the landing ring providing a considerable area for transmitting a rotary force from the drill stem to the fitting as the prongs extend in abutting engagement with the landing flange walls defining one axial edges of grooves 37 at least nearly the axial length thereof.

When it is desired to withdraw the head assembly, a suitable overshot tool is lowered to couple onto the spear point and thence retracted to move the spear point axially outward. The initial axial outward movement of the spear point moves the latch release tube to move its shoulders 23*a* relative the latch body to a position for forcing the latches out of the latch seat, the latch release position being illustrated in the upper half of FIG. 1. Shortly thereafter, the axial inner end of the slots 18 abut against the pins 16 and thereupon further axial outward movement of the spear point and latch release tube move the latch body and the structure con-

nected thereto axially outwardly for withdrawing the head assembly with the tool connected thereto.

To be noted is that apertures **17** of the latches through which the pins **16** extend are of sufficiently large diameters relative the pins to permit limited axial movement of the latches relative the pins. Further, the portions **21***b* are of relatively large transverse cross-sectional areas and of a construction that when the drill stem abuts against the top surfaces thereof, the latches can move relative to the pins so that the downward force exerted on the drill stem is transmitted through the latches to the latch body. As a result, hammering blows can be applied to the drill stem and transmitted through the latches to the latch body without being transmitted through the latch pins **16.** Additionally, the latches are located in diametrically opposed positions so as to have maximum transverse cross-sectional area portions abuttable against the drill stem and latch body in the latch extended position, and still permit the latches moving to their retracted positions.

If it is desired to drill holes without taking a soil sample, then the tool of FIG. **9** is threaded onto the fitting. When the hole has been drilled to a sufficient depth to take a sample, the head assembly and tool of FIG. **9** is retracted, the tool of FIG. **9** taken off and replaced with the tool of FIG. **10,** and then the drill stem retracted a predetermined distance. Thereafter, the head assembly with the tool **68** is dropped in the drill stem to the head assembly latch seat position and then the drill stem moved axially inwardly until the inner end of the inner tube **60** abuts against the bottom of the drill hole. Now a predetermined number of hammering blows may be applied to the drill stem for driving the inner tube axially inwardly for collecting the soil sample, and thereafter the head assembly with the tool of FIG. **10** retracted through the drill stem.

With reference to using tool **68,** it is to be noted that tube **60** is driven into the soil a distance less than the axial length thereof inwardly of cap **59,** and accordingly during the time tube **60** is being driven into the soil, bit **48** does not abut against soil axially inwardly thereof to impede the driving of tube **60** into the soil. It is to be understood that tube **60** may be a split barrel of any one of a number of different constructions. For example, it may be of the construction of the soil sampler apparatus of U.S. Ser. No. 300,476, filed Oct. 25, 1972, now U.S. Pat. No. 3,786,877, in which case the cap **59** would be modified to have an externally threaded reduced diameter portion for mounting the apparatus of Ser. No. 300,476.

In place of the tool of FIG. **10,** the tool of FIG. **8** may be mounted on the head assembly. With the tool of FIG. **8,** the inner tube extends forwardly of the rotary drill bit **48** so that the drilling of the hole forces the inner tube **47** ahead of the rotary bit **48** to collect an undisturbed sample. The spring **43** permits the inner tube moving entirely into the drill stem in the event a stone is encountered, thereby preventing damage to the inner tube.

With the apparatus of this invention, latches are provided for releasably blocking upward movement of the head assembly, and at the same time provide relatively large areas for transmitting a downward force from the drill stem to the latch body without the force being transmitted through the latch pins. Additionally, due to the provision of the lock ring there is provided a relatively large area for transmitting a turning force from the drill stem to the head assembly without such a force being transmitted through the latches.

To be mentioned, it is within the purview of this invention to provide an auger blade on the exterior surface of the drill stem for use where liquid cannot be introduced into the hole from which the soil sample is to be taken.

What is claimed is:

1. For use in a drill stem having an axially outer end, an axially inner bit end and a latch seat adjacent the bit end that has an axially inwardly facing shoulder, wire line soil sampling apparatus comprising an axially elongated latch body having a tubular axially outer end portion, said latch body outer end portion having a latch slot opening transversely therethrough, a latch on the latch body end portion that is movable relative thereto between a position extending transversely outwardly through the slot for latchingly engaging the latch seat and a retracted position, said latch has a latch seat engaging portion that is movable predominately transversely as the latch is moved between its positions and is of a transverse width in a direction generally perpendicular to the predominately transverse movement thereof that is greater than 50 percent of the inside diameter of the latch body, means mounting the latch on the latch body for pivotal movement between its positions, latch release means for moving the latch to its retracted position, said latch release means being mounted by the latch body for limited axial movement relative thereto to retract the latch as the release means is moved axially outwardly relative the latch body, and fitting means mounted on the latch body for mounting a tool axially inwardly of the latch body.

2. The apparatus of claim **1** further characterized in that said latch release means comprises an axially elongated latch release tube mounted on the latch body for limited axial movement relative thereto and extending within said latch body tubular portion.

3. The apparatus of claim **2** further characterized in that the latch is mounted to extend within the latch release tube, the latch release tube having a slotted latch retracting portion through which said latch portion is extendable.

4. The apparatus of claim **3** further characterized in that there is provided a second latch on the latch body end portion that is movable relative thereto between a position extending transversely outwardly through the slot for latchingly engaging the latch seat and a retracted position, said second latch having a latch seat engaging portion that is movable predominately transversely as the second latch is moved between its positions, means mounting the second latch on the latch body for pivotal movement between its positions, said latch release tube having a second latch retracting slotted portion for retracting the second latch, said second latch extending within the latch release tube.

5. The apparatus of claim **4** further characterized in that each of the means for mounting a latch includes a transverse pivot member that mounts the respective latch for movement about a transverse axis between the latch positions, said pivot members being mounted on the latch body in parallel relationship.

6. The apparatus of claim **5** further characterized in that each of said latch portions has an axially outwardly transverse surface portion abuttable against the drill stem shoulder, and an axially inwardly transverse surface portion, that the latch body portion has a second

slot that the second latch portion is extendable through, the latch body slots in part being defined by bottom edge wall portions abuttable against the respective latch inward transverse surface portion, and the latches having pivot member apertures sufficiently large to permit the latches inward transverse surface portions being axially spaced from said edge wall portions.

7. The apparatus of claim 6 wherein the drill stem has an axially grooved landing flange axially between the drill bit end and the latch seat, further characterized in that the fitting has an axially grooved, enlarged diametric flange of a larger outer diameter than the inner diameter of the landing flange that is seatable on the landing flange, and a second diametric portion axially outwardly of the enlarged diametric flange that is of an outer diameter smaller than the outer diameter of the enlarged diametric flange, and that there is provided a locking ring axially slidably mounted on the second diametric portion and having an axially inwardly extending finger extendable through the enlarged diametric flange groove and into the landing flange groove, said locking ring having an inner diameter smaller than the outer diameter of the enlarged diametric flange and spring means on the fitting for resiliently urging the locking ring toward the enlarged diametric flange.

8. For use in a drill stem having an axially outer end, an axially inner bit end and a latch seat adjacent the bit end that has an axially inwardly facing shoulder, wire line soil sampling apparatus comprising an axially elongated latch body having a tubular axially outer end portion, said latch body outer end portion having a latch slot opening transversely therethrough, a latch release member having a tubular portion axially slidably extendable into the latch body tubular portion, said latch release tubular portion having a latch retracting slot and opposed, axially elongated pivot member slots, a transverse pivot member mounted by the latch body and slidably extended through the pivot member slots to limit the axial movement of the latch release member relative to the latch body, and a latch pivotally mounted on the pivot member for movement between a latch seat engaging position extending through the latch body slot and the latch retracting slot, and a latch retracted position.

9. The apparatus of claim 8 further characterized in that the latch body slot is in part defined by an axially inner edge wall portion, that the latch has a first latch portion that has an axially outer transverse surface portion abuttable against said shoulder and an axially inward transverse surface portion abuttable against said latch body wall portion.

10. The apparatus of claim 9 further characterized in that the latch has a second portion extending axially inwardly of the latch first portion, said pivot member being located a substantial distance axially inwardly of the latch body edge wall portion and extending within the latch release tube, said latch second portion being pivotally mounted on the pivot member.

11. The apparatus of claim 8 further characterized in that the latch body has a second latch slot diametrically opposite the first mentioned latch body slot, that the latch release member has a second latch retracting slot and second pivot member axially elongated slots, and that there is provided a second pivot member mounted by the latch body and slidably extended through the second pivot member slots, and a second latch mounted on the second pivot member transversely diametrically opposite the first latch for pivotal movement between a latch seat engaging position extending through the latch body second slot and the latch release tube second latch retracting slot, and a latch retracted position.

12. The apparatus of claim 11 wherein the drill stem has a grooved portion axially between the latch seat and the bit end, further characterized in that the fitting has an axially outwardly facing shoulder, lock means axially movable on the fitting between a first position abutting against the fitting shoulder and extendable into the drill stem groove for transmitting rotary movement from the drill stem to the fitting, and a second position axially outwardly relative the fitting shoulder, and means on the fitting for resiliently urging the lock means toward its first position.

13. The apparatus of claim 12 in that the fitting has an axially intermediate portion and an enlarged diametric portion joined to the intermediate portion to extend axially inwardly thereof and form said fitting shoulder, said enlarged diametric flange having a groove extending axially therethrough, and that the lock means includes an annular portion surrounding the fitting intermediate portion and means joined to the annular portion for extending through the flange groove and into the drill stem groove to transmit rotary movement from the drill stem to the fitting.

14. For use in a drill stem having an axially outer end, an axially inner bit end, an axially extending, radially inward abutment portion adjacent the bit end, and a latch seat adjacent the bit end that has an axially downwardly facing shoulder, wire line soil sampling apparatus comprising an axially elongated latch body, a latch mounted on the latch body for movement between a latch seat engaging position and a latch retracted position, a latch release member mounted on the latch body for limited axial movement for moving the latch between its positions, a fitting for mounting a tool such as a sample tube, drill bit, and the like, lock means mounted on the fitting for limited axial movement relative thereto between an axial first position for abutting against the abutment to transmit a turning force from the drill stem to the fitting to rotate the fitting with the drill stem and a second position relative the fitting axially outwardly of the lock means first position, and resilient means on the fitting for resiliently urging the lock means toward its first position.

15. The apparatus of claim 14 further characterized in that the lock means comprises a lock ring having an annular portion and an axially inwardly extending finger integrally joined to the annular portion.

16. The apparatus of claim 14 further characterized in that said fitting has an axially inward, enlarged diametric portion having a groove extending axially therethrough, a second diametric portion joined to the enlarged diametric portion to extend axially outwardly thereof and being of a smaller outer diameter than the outer diameter of the enlarged diametric portion, said lock means comprising a finger of a substantially greater axial length than the axial length of the enlarged diametric flange that is extendable through the flange groove to abut against the abutment and of a greater transverse radial dimension that the radial depth of the flange groove, and means slidably mounted on the second diametric portion for mounting the finger for axial movement between a position ex-

tending axially inwardly of the flange groove and an axially outer position.

17. The apparatus of claim 16 further characterized in that the fitting has a tool mounting portion axially inwardly of the enlarged diametric flange, that the finger mounting means is abuttable against said flange to limit the axial inward movement thereof, that the latch body comprises a tubular portion that pivotally mounts the latch for movement between the latch positions, that the latch release member has a tubular latch retracting portion slidably extended into the latch body tubular portion for retracting the latch, said latch body having a latch engaging portion for receiving an axially inward force directly through the latch in its latch seat engaging position from the drill stem shoulder and said latch extending within the latch release member tubular portion.

18. For use in a drill stem having an axially outer end, an axially inner bit end, an annular landing flange adjacent the bit end that has an axially extending groove opening radially into the interior of the drill stem and axially upwardly, and an annular portion joined to the landing flange to extend axially outwardly thereof and that has an inner diameter that is substantially greater than the inner diameter of the landing flange, a soil sampler head assembly for mounting a tool adjacent the drill stem bit end and withdrawing the tool through the drill stem, comprising a tool mounting fitting, a wire line overshot coupling member, means for joining the coupling member to the fitting, said fitting having a flange adapted to seat on the landing flange to limit the axial inward movement of the fitting relative the landing flange and a lock member mounting portion of a smaller diameter than the fitting flange extending axially outwardly thereof, and a lock member mounted on the lock member mounting portion for axial movement relative the fitting to transmit a turning movement of the drill stem to the fitting, said lock member having a first portion in a lock member axially inward position extendable into the landing flange groove to rotate with the landing flange, and a second portion abuttable against the fitting flange to limit the axial inward movement of the lock member relative the fitting.

19. The apparatus of claim 18 further characterized in that the lock member second portion extends around the fitting mounting position.

20. The apparatus of claim 19 further characterized in that the means joining the coupling member to the fitting includes a latch body attached to the fitting and a latch release tube mounted by the latch body for limited axial movement relative thereto, that there is provided a latch mounted on the latch body that is movable between a latch seat engaging position and a retracted position, said latch being mounted for retraction by the latch release tube being moved axially outwardly relative the latch body, said coupling member, latch body, latch release tube and fitting having a fluid channel extending axially therethrough and spring means acting against the latch body and lock member for resiliently urging the lock member axially inwardly.

21. The apparatus of claim 19 further characterized in that the means for joining the coupling member to the fitting includes a latch body attached to the fitting remote from the fitting flange, that the lock member second portion has an inner diameter smaller than the maximum outer diameter of each of the latch body and the fitting flange and greater than the outer diameter of the fitting second portion, and that the fitting second portion is of an axial length greater than the axial length of the lock member first portion and smaller than the maximum axial length of the lock member.

22. The apparatus of claim 21 wherein the landing flange has a plurality of circumferential spaced, axially extending grooves, further characterized in that the fitting has a third portion joined to the fitting flange to extend inwardly thereof, said third portion being of an axial length at least nearly as great as that of the landing flange, of an outer diameter slightly less than the diameter of the landing flange, and of a diameter substantially greater than the inner diameter of the lock member second portion and substantially smaller than the fitting flange, the fitting flange and fitting protions having a plurality of axially coextensive grooves extending axially the length thereof to open radially outwardly and being circumferentially spaced so that the third portion grooves are radially alignable with the fitting flange grooves, and that the lock member first portion is an axially elongated finger and that the lock member includes additional axially elongated fingers, there being a finger for each landing ring groove, the fingers in the lock member axially inward position extending radially into the fitting grooves, radially outwardly of the third portion to be extendable a substantial distance radially into the landing flange grooves and extendable at least the major portion of the axial length of the third portion grooves and the landing flange grooves when the fitting flange seats on the landing flange.

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