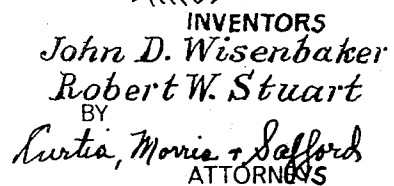


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Oct. 15, 1968

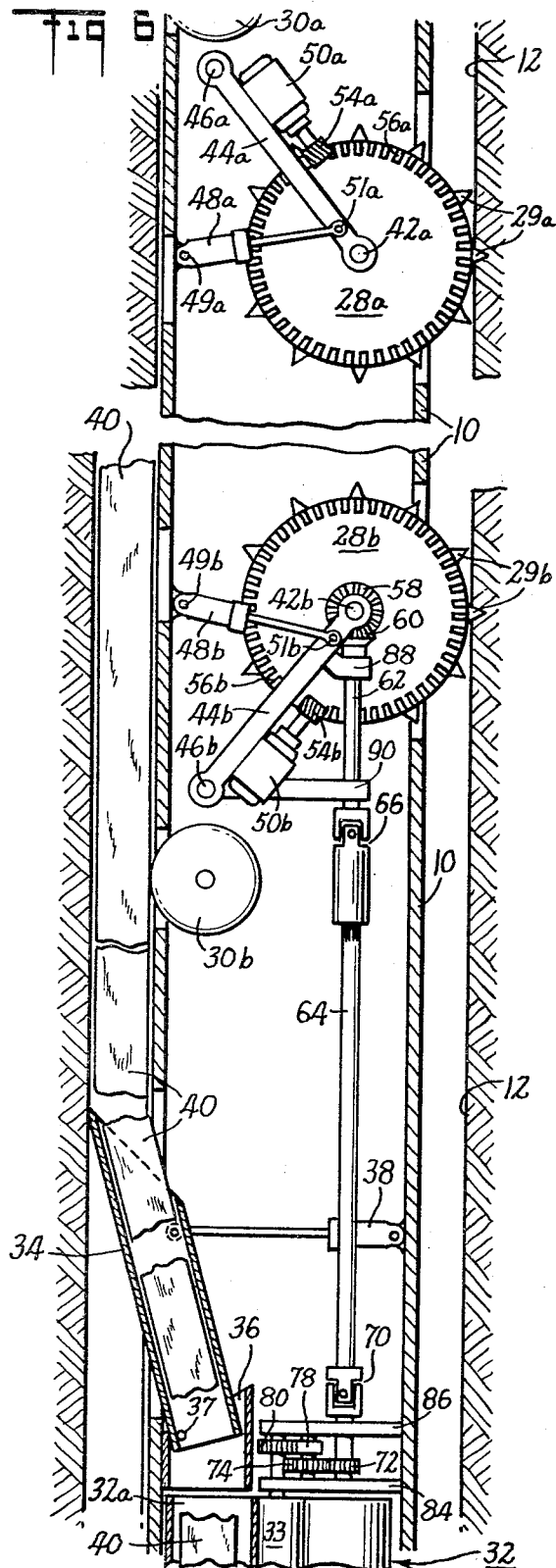
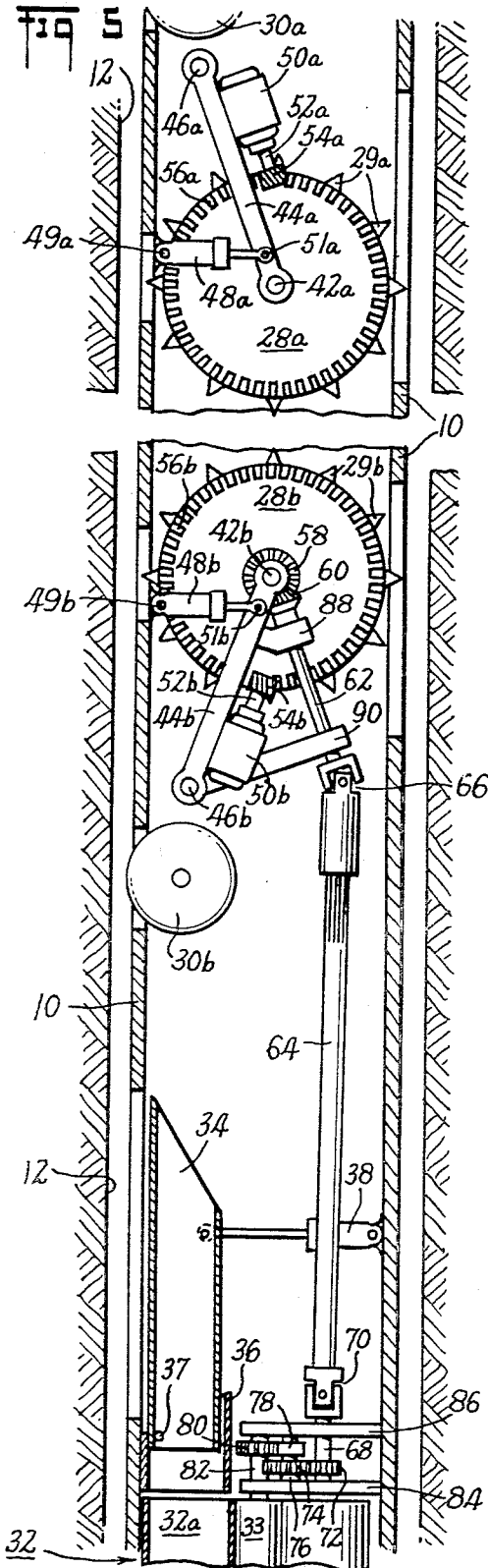
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SAMPLING DEVICE

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SAMPLING DEVICE

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16 Claims. (Cl. 175—77)

ABSTRACT OF THE DISCLOSURE

A sidewall coring tool having a housing movable bodily lengthwise of the borehole by drive means engaging the sidewall and motor driven cutting blades arranged in a V with its apex located outwardly of the housing to cut a generally prism-shaped sample from the side wall as the housing is thus moved. A multi-chambered sample collecting chamber, rotatable to bring its several chambers successively in sample-receiving position beneath the cutting blades, may be provided to increase the length of the sample which can be stored in the tool.

The present invention relates, in general, to geological exploration equipment and, in particular, to a device for recovering a core sample from the sidewall of a bore hole.

In searching for oil, gas and other underground deposits of minerals, exploratory holes are drilled and core samples are taken so that an evaluation may be made of the geological, mineralogical and physical properties and characteristics of the strata of interest. Information is obtained from these samples as to, for example, porosity, permeability, fluid content, grain size, compressibility, acoustical qualities, mineral composition and acid solubility.

In order to derive an accurate evaluation of the properties and characteristics of the strata of interest, the sample preferably is taken over a substantial length of the sidewall of a bore hole so that a continuous profile may be examined. For the most part, the core sampling equipment which is available presently is not capable of cutting sufficiently long samples in a single cutting operation. The usual mode of operation of presently available equipment involves lowering the core sampling equipment into the bore hole to cut a sample, raising the core sampling equipment up out of the bore hole to remove the sample, and returning the core sampling equipment to the point at which the previous sampling was terminated so that another sample may be taken. This type of operation is apt to cause a loss in continuity of the profile being cut. In addition, the repeated up and down trips of the core sampling equipment requires an excessive amount of time, particularly for deep bore holes, which results in an inefficient operation.

Accordingly, it is an object of the present invention to provide a new and improved core sampling device.

It is another object of the present invention to provide a core sampling device by means of which continuous samples of substantial length may be taken from the sidewall of a bore hole.

It is a further object of the present invention to provide a core sampling device which retains a sample in a state similar to that in which the sample was present in the formation from which it was cut.

It is yet another object of the present invention to provide a core sampling device which is relatively simple in construction and reasonable in cost.

In a preferred embodiment of the present invention, the core sampling device includes a support assembly adapted to be lowered into a bore hole from which a sample is to be cut and recovered. Mounted on the sup-

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port assembly are cutting means and drive means for the cutting means. The cutting means are in a V configuration with the apex of the V directed outwardly of the support assembly toward the sidewall at one side of the bore hole from which the sample is to be taken. Means are provided for moving the cutting means transversely into and out of the formation beyond the sidewall. Also mounted on the support assembly are presser means which move transversely into yieldable engagement with the opposite sidewall of the bore hole to press the support assembly against the side of the bore hole from which the sample is to be taken. The presser means also are mounted for movement of the support assembly along the longitudinal axis of the bore hole. Accordingly, means are provided for moving the support assembly longitudinally of the bore hole with the result that the support assembly "walks" up the bore hole as the cutting means make a pair of longitudinally coextensive cuts in a V configuration thereby forming a sample in the general shape of an elongated triangular prism. Collecting means, associated with the support assembly, are provided for receiving the sample.

For a better understanding of the present invention, together with other and further objects thereof, reference is made to the following description, taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

Referring to the drawings:

FIGURE 1 illustrates a core sampling device constructed in accordance with the present invention as it is being lowered into a bore hole;

FIGURE 2 shows the core sampling device of FIGURE 1 at the completion of the cutting of a sample;

FIGURE 3 is a horizontal section taken along line 3—3 of FIGURE 2;

FIGURE 4 is a horizontal section taken along line 4—4 of FIGURE 3;

FIGURE 5 shows a portion of the core sampling device of FIGURE 1, on an enlarged scale, as it is being lowered into or withdrawn from a bore hole; and

FIGURE 6 shows a portion of the core sampling device of FIGURE 1, on the same scale as FIGURE 5, as it is moving upward in the bore hole and a sample is being cut.

Referring to FIGURES 1 through 4, inclusive, a support assembly 10, in the form of a steel cylindrical housing, for example 4 to 6 inches in diameter and 20 feet long, serves to contain the components necessary to make a cut and recover a core sample. The support assembly 10 is lowered into and raised from a bore hole 12 by means of a cable 14 attached to the support assembly at its upper end and connected to suitable hoisting equipment (not shown) at ground level. The cable 14 also may contain a plurality of insulated electrical wires through which electricity is supplied to control and power a number of actuators and motors mounted within the support assembly. The functions of these motors and actuators will be considered in more detail hereinafter.

Mounted in the support assembly 10 is a pair of cutting wheels 16a and 16b. These cutting wheels are arranged in a V configuration, as best shown in FIGURE 3, with the apex of the V directed outwardly of the support assembly toward the sidewall of the bore hole. The cutting wheels 16a and 16b may employ diamonds or other suitable cutting elements on their cutting surfaces. A motor 18, pivotally mounted in the support assembly 10 on a pin 19, imparts the necessary drive to the cutting wheels 16a and 16b when electrical power is supplied from ground level through the wires of cable 14.

An actuator 20 extends between the inside wall of the housing 10 and an arm 22 fixed to a cutting wheel support member 24. In its extended position, the actuator 20 op-

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poses a compressed spring 26 which tends to move the cutting wheels 16a and 16b outwardly toward the sidewall of the bore hole. When electrical power is supplied to the actuator 20 from ground level, the actuator permits the compressed spring 26 to extend so that the cutting wheels 16a and 16b, as well as the motor 18, move from the positions shown in FIGURE 1 to the positions shown in FIGURE 2. An opening is provided in the housing 10 through which the cutting wheels 16a and 16b project when the actuator 20 is energized. It will be appreciated that the actual transverse movement of the cutting wheels 16a and 16b into engagement with the sidewall of the bore hole takes place at a point deeper in the bore hole than illustrated in FIGURE 2. FIGURE 2 shows the core sampling device at the completion of the cutting of a sample but with the cutting wheels 16a and 16b still in the sidewall of the bore hole. In order to remove the core sampling device from the bore hole, electrical power from ground level is supplied to the actuator 20 to retract the cutting wheels from the sidewall and return them to the position illustrated in FIGURE 1. For a more detailed description of the mechanism which may be used to support the cutting wheels 16a and 16b and impart the proper drives and movements to the cutting wheels, reference is made to U.S. Patent 3,173,500.

Also mounted in the support assembly 10 is a spaced pair of presser wheels 28a and 28b with each of the presser wheels provided with lugs 29a and 29b, respectively, along its periphery. The presser wheels 28a and 28b are arranged to be movable transversely from the retracted positions illustrated in FIGURE 1 to the extended positions illustrated in FIGURE 2 at which they project through openings in the housing 10 to engage the sidewall of the bore hole opposite from the wall from which the sample core is to be taken. As the presser wheels 28a and 28b engage the sidewall of the bore hole, the support assembly 10 is moved in the opposite direction and presses against that wall of the bore hole from which the sample core is to be taken. A pair of rotatable bearing wheels 30a and 30b, projecting through openings in the housing 10, permit the support assembly 10 to move lengthwise along the bore hole.

In effect, the support assembly 10 "walks" up the bore hole as the presser wheels 28a and 28b rotate. The mechanism which moves the presser wheels 28a and 28b transversely into engagement with the sidewall and the mechanism which rotates these wheels and thus drives the support assembly 10 upwardly along the bore hole will be described in detail hereinafter.

Attached to the support assembly 10 at its bottom is a core catcher 32 formed of five tubular receptacles 32a, 32b, 32c, 32d and 32e which are secured to a central spindle 33. The lower end of spindle 33 rests in a low friction cup 35 at the bottom end of the support assembly 10. The arrangement of the tubular receptacles 32a-32e is best illustrated in FIGURE 4. The core catcher 32 is provided with a lead section 34 which is hollow and of triangular cross-section at its upper end and of circular cross-section at its lower end. The lead section 34 is mounted pivotally on a guide collar 36 by a pin 37. An actuator 38, responsive to electrical signals from ground level, causes the lead section 34 to move from the retracted position illustrated in FIGURE 1 to the extended position illustrated in FIGURE 2 and vice versa.

The tubular receptacles 32a-32e are arranged to follow a circular path about the longitudinal axis of the spindle 33 and the support assembly 10 so as to come successively into register with the guide collar 36 at intervals corresponding to uniform distances of vertical movement of the support assembly. The core catcher 32 is coupled mechanically to the mechanism which causes the support assembly to move upwardly so that after a predetermined distance of upward movement of the support assembly, the tubular receptacles are indexed and a different tubular receptacle is positioned beneath the guide collar 36.

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In operation, the support assembly 10 is lowered into the bore hole 12 by means of a cable 14 with the cutting wheels 16a and 16b, the presser wheels 28a and 28b, and the lead section 34 of the core catcher 32 all retracted into the support assembly. At the desired depth, the presser wheels 28a and 28b are moved outwardly into engagement with the sidewall of the bore hole 12. This movement forces the opposite surface of the support assembly 10 toward that portion of the sidewall from which the sample core is to be taken. The motor 18 is energized to cause the cutting wheels 16a and 16b to commence rotation while the cutting wheels are still within the housing. Next, the actuator 20 is energized to permit spring 26 to push the cutting wheels 16a and 16b outward into the sidewall of the bore hole 12. The cutting wheels have diamonds at the outer faces as well as at their peripheries so that they can cut their way "sidewise" into the sidewall of the bore hole.

As the cutting wheels 16a and 16b cut into the sidewall, the entire support assembly 10 is moved upward longitudinally of the bore hole to cause the cutting wheels to make a pair of longitudinally coextensive cuts in a V configuration, thereby forming a sample 40 in the general shape of an elongated triangular prism. The actuator 38 is energized to force the lead section 34 of the core catcher outwardly to follow the kerf provided by the cutting wheels 16a and 16b. The severed core sample 40 passes through the lead section 34 and the guide collar 36 into the tubular receptacle located beneath the guide collar. After a predetermined distance of upward movement of the support assembly, at which time the tubular receptacle beneath the guide collar 36 is filled with sample cuttings to near its capacity, the core catcher 32 is rotated so that an empty tubular receptacle is positioned beneath the guide collar to receive the next length of the core sample. After the desired length of core sample has been taken from the sidewall, the cutting wheels 16a and 16b, the presser wheels 28a and 28b, and the lead section 34 are retracted into the support assembly and the support assembly is hoisted out of the bore hole.

FIGURES 5 and 6 illustrate the details of the mechanism which moves the presser wheels 28a and 28b into and out of engagement with the sidewall of the bore hole 12 and the mechanism which causes the support assembly to move upward as a sample core is being taken. In FIGURE 5, the presser wheels 28a and 28b are shown retracted within the support assembly 10, while in FIGURE 6, the presser wheels are shown in engagement with the sidewall of the bore hole 12. Referring to FIGURES 5 and 6, the presser wheel 28a turns about a shaft 42a which, in turn, is supported by a pair of lever arms 44a (only one of which is shown in FIGURES 5 and 6) disposed on either side of the presser wheel 28a. The opposite ends of the lever arms 44a are mounted pivotally on a pin 46a secured to the inside surface of the housing 10.

The presser wheel 28a is moved outwardly and retracted through the opening in the housing 10 by means of an actuator 48a by power supplied from ground level. One end of the actuator 48a is pivotally mounted on a pin 49a secured to the inside surface of the housing 10, while the moving part of the actuator 48a is secured pivotally to one of the lever arms 44a by means of a pin 51a. When energized, the actuator 48a, acting upon the lever arm 44a, causes the presser wheel 28a to move from the position illustrated in FIGURE 5 to the position illustrated in FIGURE 6 and vice versa.

The mechanism for moving presser wheel 28b outwardly from or inwardly to the housing 10 is similar to the mechanism used for the same movements of presser wheel 28a. Therefore, a detailed description of the components used in connection with these movements of presser wheel 28b is unnecessary. Components for moving presser wheel 28b have been given the same reference numerals fol-

lowed by the reference character *b* as the corresponding components used in moving presser wheel 28*a*.

A motor 50*a*, mounted on one of the lever arms 44*a*, causes presser wheel 28*a* to rotate to move the support assembly 10 upward. Specifically, secured to the output shaft 52*a* of the motor 50*a* is a pinion 54*a* which engages a ring gear 56*a* arranged on one side of the presser wheel 28*a* near its periphery. As the motor 50*a* is energized by signals from ground level, the pinion 54*a* drives the presser wheel 28*a* and causes it to rotate. The lugs 29*a* on the periphery of the presser wheel 28*a* dig into and are retracted from the side wall of the bore hole and the support assembly 10 "walks" up the bore hole. A similar arrangement is used in driving the presser wheel 28*b* to cause the support assembly 10 to move upward. Again, components of the mechanism used for driving presser wheel 28*b* have been given the same reference numerals as corresponding components which drive presser wheel 28*a*, followed in this case by the reference character *b*.

The mechanism by which the tubular receptacles of the core catcher 32 are indexed will be described with reference to FIGURES 4, 5 and 6. Secured to the presser wheel 28*b* at its center and rotatable therewith is a beveled ring gear 58. A beveled pinion 60, secured to one end of a shaft 62, engages ring gear 58. The shaft 62 is coupled to another shaft 64 by means of a first universal joint 66 and the shaft 64, in turn, is coupled to a shaft 68 by means of a second universal joint 70. Secured to the shaft 68 and rotatable therewith is a spur gear 72 which meshes with another spur gear 74. The latter gear 74 is secured to a shaft 76 to which an intermittent gear 78 is also secured. The intermittent gear 78 is seen to have only three teeth which intermittently engage a spur gear 80. This gear 80 is secured to a shaft 82 which, in turn, is secured to the spindle 33 to which the tubular receptacles 32*a*-32*e* are attached. The shafts 68, 76 and 82 turn in place in suitable bearings (not shown) held in a pair of brackets 84 and 86 which extend from the inside wall of the housing 10.

As the presser wheel 28*b* rotates to move the support assembly upward, the ring gear 58 at the center of the presser wheel 28*b* also rotates to drive the beveled pinion 60 and the shaft 62. The turning of the shaft 62 is coupled through the universal joint 66 to the shaft 64 and through the universal joint 70 to the shaft 68. This causes gear 72 to turn and drive gear 74. The intermittent gear 78, fixed to the same shaft 76 as is the gear 74, also turns. However, the gear 80, with which the three teeth of the intermittent gear 78 mesh, only is rotated one-fifth of a revolution each time the three teeth of the intermittent gear engage the teeth of gear 80. This causes the indexing of a new and empty tubular receptacle (32*a*-32*e*) beneath the guide collar 36. The gear ratios between ring gear 58 and beveled pinion gear 60, gear 72 and gear 74, and intermittent gear 78 and gear 80 are arranged so that gear 80 undergoes a movement of a fractional turn after the presser wheel 28*b* has made so many rotations as to correspond to an upward movement approximately equal to the length of the tubular receptacles 32*a*-32*e*, for example 10 feet.

Secured to one of the lever arms 44*b* is a pair of brackets 88 and 90. These two brackets serve to align the shaft 62 in the manner indicated in FIGURE 6 after the presser wheels 28*a* and 28*b* have been moved outwardly to engage the sidewall of the bore hole 12. The shaft 62 is journaled in suitable bearings (not shown) held in the brackets 88 and 90.

From the foregoing, it may be concluded that a core sampling device constructed in accordance with the present invention is an extremely versatile tool. While in most cases, continuous samples of substantial length will be taken, the cutting operation can be stopped at any point and the tool advanced to another point to continue the sample cutting so that samples may be taken from several

different points. For either type of operation, the samples are taken without the need for removing the tool from the bore hole.

While there has been described what is at present considered to be the preferred embodiment of this invention it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and it is, therefore, aimed to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What we claim is:

1. An apparatus for cutting and recovering a formation sample from the sidewall of a bore hole comprising a support assembly adapted to be lowered into said bore hole on a cable, cutting means mounted on said support assembly in a V configuration with the apex of said V directed outwardly of said assembly toward the sidewall at one side of said bore hole, drive means on said support assembly for said cutting means, means for moving said cutting means transversely into and out of the formation beyond said sidewall, presser means mounted on said support assembly for transverse movement into yieldable engagement with the opposite sidewall of said bore hole to press said support assembly against said one side of said bore hole, means for moving said presser means transversely into yieldable engagement with the opposite sidewall of said bore hole, said presser means also being movably mounted for movement of said support assembly longitudinally of said bore hole, means for moving said presser means to move said support assembly longitudinally of said bore hole to cause said cutting means to make a pair of longitudinally coextensive cuts in a V configuration thereby forming a sample in the general shape of an elongated triangular prism, and collecting means associated with said support assembly and adapted for receiving said sample.

2. The apparatus of claim 1 in which said cutting means are cutting wheels with cutting elements provided on the faces thereof for cutting not only during the longitudinal movement but also during the transverse movement of said cutting wheels.

3. An apparatus for cutting and recovering a formation sample from the sidewall of a bore hole comprising a support assembly adapted to be lowered into said bore hole on a cable, cutting means mounted on said support assembly in a V configuration with the apex of said V directed outwardly of said assembly toward the sidewall at one side of said bore hole, drive means on said support assembly to rotate said cutting means, means for moving said cutting means transversely into and out of the formation beyond said sidewall, drive elements mounted on said support assembly for both transverse movement and longitudinal driving movement, means for moving said drive elements transversely into and out of engagement with the opposite sidewall of said bore hole, means for driving said drive elements to move said support assembly longitudinally of said bore hole to cause said cutting means to make a pair of longitudinally coextensive cuts in a V configuration thereby forming a sample in the general shape of an elongated triangular prism, and collecting means associated with said support assembly and adapted for receiving said sample.

4. An apparatus for cutting and recovering a formation sample from the sidewall of a bore hole comprising a support assembly adapted to be lowered into said bore hole on a cable, cutting means mounted on said support assembly in a V configuration with the apex of said V directed outwardly of said assembly toward the sidewall at one side of said bore hole, drive means on said support assembly to rotate said cutting means, means for moving said cutting means transversely into and out of the formation beyond said sidewall, presser means mounted on said support assembly for transverse movement into yieldable engagement with the opposite sidewall of said bore hole to press said support assembly

against said one side of said bore hole, means for moving said presser means transversely into yieldable engagement with the opposite sidewall of said bore hole, said presser means also being movably mounted to permit movement of said support assembly longitudinally of said bore hole, means for moving said presser means to move said support assembly longitudinally of said bore hole to cause said cutting means to make a pair of longitudinally co-extensive cuts in a V configuration thereby forming a sample in the general shape of an elongated triangular prism, collecting means on said support assembly having an input end mounted for transverse movement, and means to move said input end transversely into and out of said formation in line with said cutters whereby as said support assembly moves along said bore hole, said input end will follow the path of said cutting means and said collecting means will receive said sample as it is cut.

5. Apparatus for cutting and recovering formation samples from the sidewall of a bore hole comprising a housing adapted to be lowered into said bore hole on a cable, a first opening in said housing, a pair of rotatable cutters mounted for movement transversely of said housing to project through said opening into the formation beyond the sidewall of said bore hole, said cutters being arranged in a V configuration with the apex of said V directed outwardly of said housing, first drive means to rotate said cutters to form cuts in said formation, second drive means to move said cutters transversely from within said housing through said first opening into cutting relation with said formation and back into said housing, a second opening in said housing, a rotatable drive wheel mounted for movement transversely to project through said second opening into engagement with the sidewall of said bore hole, third drive means to move said drive wheel transversely through said second opening into driving engagement with said sidewall, and fourth drive means for rotating said drive wheel to move said housing longitudinally of said bore hole to cause said cutters to cut and separate completely from said formation a sample in the general shape of a triangular prism, and collecting means within said housing for receiving said sample.

6. Apparatus for cutting and recovering formation samples from the sidewall of a bore hole comprising a housing adapted to be lowered into said bore hole on a cable, a first opening in said housing, a pair of rotatable cutters mounted for movement transversely of said housing to project through said first opening into the formation beyond the sidewall of said bore hole, said cutters being arranged in a V configuration with the apex of said V directed outwardly of said housing, first drive means to rotate said cutters to form cuts in said formation, second drive means to move said cutters transversely from within said housing through said first opening into cutting relation with said formation and back into said housing, a second opening in said housing, a rotatable drive wheel mounted for movement transversely to project through said second opening into engagement with the sidewall of said bore hole, third drive means to move said drive wheel transversely through said second opening into driving engagement with said sidewall, and fourth drive means for rotating said drive wheel to move said housing longitudinally of said bore hole to cause said cutters to cut and separate completely from said formation a sample in the general shape of a triangular prism, collecting means within said support assembly having an input end mounted for transverse movement, and fifth drive means to move said input end transversely into and out of said formation in line with said cutters whereby as said support assembly moves along said bore hole, said input end will follow the path of said cutting means and said collecting means will receive said sample as it is cut.

7. Apparatus for cutting and recovering formation samples from the sidewall of a bore hole comprising a housing adapted to be lowered into said bore hole on a cable,

a first opening at one side of said housing, a pair of rotatable cutters mounted for movement transversely of said housing to project through said first opening into the formation beyond the sidewall of said bore hole, said cutters being arranged in a V configuration with the apex of said V directed outwardly of said housing, first drive means to rotate said cutters to form cuts in said formation, second drive means to move said cutters transversely from within said housing through said first opening into cutting relation with said formation and back into said housing, second and third openings spaced longitudinally in the other side of said housing, a pair of rotatable drive wheels spaced longitudinally and mounted for movement transversely to project through said second and third openings, respectively, into engagement with the sidewall at the opposite side of said bore hole, third and fourth drive means to move said pair of drive wheels transversely through said second and third openings, respectively, into driving engagement with said sidewall, fifth and sixth drive means for rotating said pair of drive wheels to move said housing longitudinally of said bore hole to cause said cutters to cut and separate completely from said formation a sample in the general shape of a triangular prism, and collecting means within said housing for receiving said sample.

8. An apparatus for cutting and recovering a formation sample from the sidewall of a bore hole comprising a first support assembly adapted to be lowered into said bore hole on a cable, cutting means mounted on said first support assembly, drive means on said first support assembly for said cutting means, means for moving said cutting means transversely into and out of the formation beyond said sidewall at one side of said bore hole, presser means mounted on said first support assembly for transverse movement into engagement with the opposite sidewall of said bore hole to press said first support assembly against said one side of said bore hole, means for moving said first support assembly longitudinally of said bore hole to cause said cutting means to cut an elongated sample from said formation, and collecting means associated with said first support assembly and adapted for receiving said sample, said collecting means comprising a second support assembly mounted for rotation about a vertical axis, a plurality of vertically extending tubes mounted on said second support assembly at uniform radial distances from said axis, and means for rotating said second support assembly through incremental fractional revolutions equal to the angular spacing of said tubes to bring said tubes successively into position to receive successive portions of said sample as said sample is cut by said cutting means.

9. The apparatus of claim 8 in which said means for rotating said second support assembly are driven in response to the operation of said means for moving said first support assembly longitudinally of said bore hole.

10. An apparatus for cutting and recovering a formation sample from the sidewall of a bore hole comprising a first support assembly adapted to be lowered into said bore hole on a cable, cutting means mounted on said first support assembly in a V configuration with the apex of said V directed outwardly of said first support assembly toward the sidewall at one side of said bore hole, drive means on said first support assembly to rotate said cutting means, means for moving said cutting means transversely into and out of the formation beyond said sidewall, presser means mounted on said first support assembly for transverse movement into yieldable engagement with the opposite sidewall of said bore hole to press said first support assembly against said one side of said bore hole, said presser means also being movably mounted for movement of said first support assembly longitudinally of said bore hole, means for moving said first support assembly longitudinally of said bore hole to cause said cutting means to make a pair of longitudinally coextensive cuts in a V configuration thereby forming a sample in the general shape of an elongated triangular prism, and collecting means associated with said first support assembly and

adapted for receiving said sample, said collecting means comprising a second support assembly mounted for rotation about a vertical axis, a plurality of vertically extending tubes mounted on said second support assembly at uniform radial distances from said axis, and means for rotating said second support assembly through incremental fractional revolutions equal to the angular spacing of said tubes to bring said tubes successively into position to receive successive portions of said sample as cut by said cutting means.

11. An apparatus for cutting and recovering a formation sample from the sidewall of a bore hole comprising a first support assembly adapted to be lowered into said bore hole on a cable, cutting means mounted on said first support assembly in a V configuration with the apex of said V directed outwardly of said first support assembly toward the sidewall at one side of said bore hole, drive means on said first support assembly to rotate said cutting means, means for moving said cutting means transversely into and out of the formation beyond said sidewall, presser means mounted on said first support assembly for transverse movement into yieldable engagement with the opposite sidewall of said bore hole to press said first support assembly against said one side of said bore hole, said presser means also being movably mounted for movement of said first support assembly longitudinally of said bore hole, means for moving said presser means to move said first support assembly longitudinally of said bore hole to cause said cutting means to make a pair of longitudinally coextensive cuts in a V configuration thereby forming a sample in the general shape of an elongated triangular prism, and collecting means associated with said first support assembly and adapted for receiving said sample, said collecting means comprising a receiving element adapted to receive said sample as it is cut by said cutting means, a second support assembly mounted for rotation about a vertical axis, a plurality of vertically extending tubes mounted on said second support assembly at uniform radial distances from said axis, and means for rotating said second support assembly through incremental fractional revolutions equal to the angular spacing of said tubes to bring said tubes successively into position to receive successive portions of said sample from said receiving element as said sample is cut by said cutting means.

12. An apparatus for cutting and recovering a formation sample from the sidewall of a bore hole comprising a first support assembly adapted to be lowered into said bore hole on a cable, cutting means mounted on said first support assembly in a V configuration with the apex of said V directed outwardly of said first support assembly toward the sidewall at one side of said bore hole, drive means on said first support assembly to rotate said cutting means, means for moving said cutting means transversely into and out of the formation beyond said sidewall, presser means mounted on said first support assembly for transverse movement into yieldable engagement with the opposite sidewall of said bore hole to press said first support assembly against said one side of said bore hole, said presser means also being movably mounted for movement of said first support assembly longitudinally of said bore hole, means for moving said presser means to move said first support assembly longitudinally of said bore hole to cause said cutting means to make a pair of longitudinally coextensive cuts in a V configuration thereby forming a sample in the general shape of an elongated triangular prism, and collecting means associated with said first support assembly and adapted for receiving said sample, said collecting means comprising a receiving element mounted for movement between a retracted position clear of said sidewall and an extended position at which said receiving element projects into said sidewall beneath said cutting means to receive said sample, means for moving said receiving element between said retracted posi-

tion and said extended position, a second support assembly mounted for rotation about a vertical axis, a plurality of receptacles mounted on said second support assembly at uniform radial distances from said axis, and means for rotating said second support assembly through incremental fractional revolutions equal to the angular spacing of said receptacles to bring said receptacles successively into position to receive successive portions of said sample from said receiving element as said sample is cut by said cutting means.

13. The apparatus of claim 12 in which said means for rotating said second support assembly are driven in response to the operation of said means for moving said presser means to move said first support assembly longitudinally of said bore hole and the rotation of said second support assembly is intermittent.

14. The apparatus of claim 11 in which said receiving element is V-shaped at one end to receive said sample and circular at its second end to discharge said sample to said tubes.

15. An apparatus for cutting and recovering a formation sample from the sidewall of a bore hole comprising a support assembly adapted to be lowered into said bore hole on a cable, cutting means mounted on said support assembly, drive means on said support assembly for said cutting means, means for moving said cutting means transversely into and out of the formation beyond said sidewall at one side of said bore hole, presser means mounted on said support assembly for transverse movement into yieldable engagement with the opposite sidewall of said bore hole to press said support assembly against said one side of said bore hole, means for moving said presser means transversely into yieldable engagement with the opposite sidewall of said bore hole, said presser means also being movably mounted for movement of said support assembly longitudinally of said bore hole, means for moving said support assembly longitudinally of said bore hole to cause said cutting means to cut an elongated sample from said formation, and collecting means associated with said support assembly and adapted for receiving said sample.

16. An apparatus for cutting and recovering a formation sample from the sidewall of a bore hole comprising a support assembly adapted to be lowered into said bore hole on a cable, cutting means mounted on said support assembly in a V configuration with the apex of said V directed outwardly of said assembly toward the sidewall at one side of said bore hole, drive means on said support assembly to rotate said cutting means, means for moving said cutting means transversely into and out of the formation beyond said sidewall, drive elements mounted on said support assembly for longitudinal driving movement, means for bringing said drive elements into and out of engagement with the sidewall of said bore hole, means for driving said drive elements to move said support assembly longitudinally of said bore hole to cause said cutting means to make a pair of longitudinally coextensive cuts in a V configuration thereby forming a sample in the general shape of an elongated triangular prism, and collecting means associated with said support assembly and adapted for receiving said sample.

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