March 27, 1951 J. H. KIRBY, II 2,546,669

HYDRAULIC SIDE-WALL CORING TOOL

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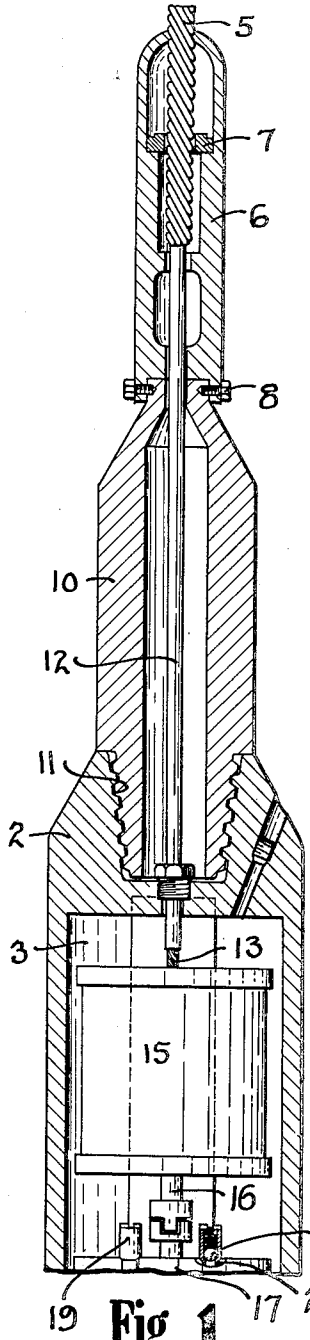

Fig 1

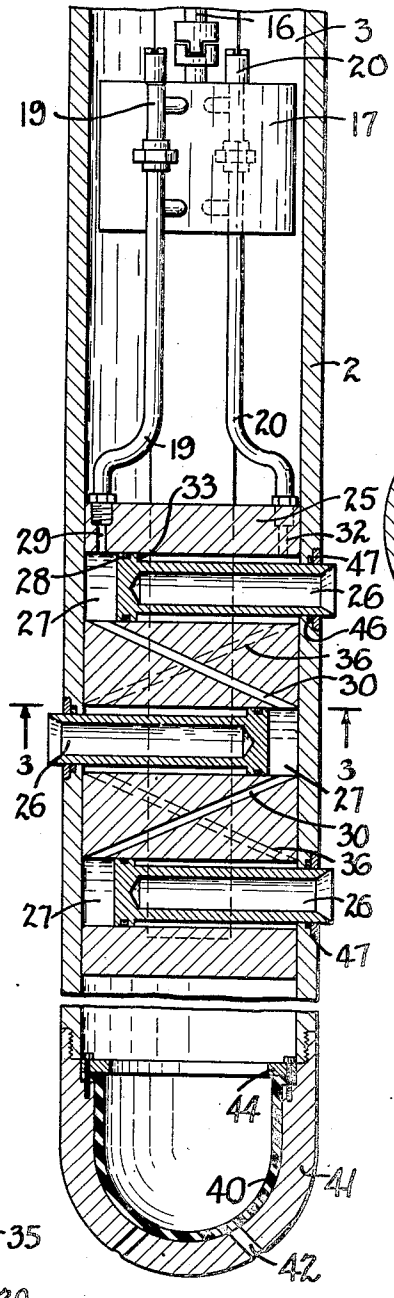

Fig 2

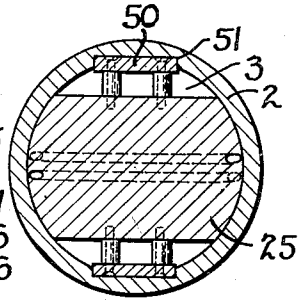

Fig 3

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HYDRAULIC SIDE WALL CORING TOOL

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9 Claims. (Cl. 255—1.4)

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The invention relates to a tool to be lowered into a well bore and then operated hydraulically to obtain samples from the side wall of the bore. This application is a companion application to my co-pending applications, Serial No. 630,199½, and Serial No. 714,324.

It is one of the objects of the invention to provide a side wall sampling tool which is self contained in that the sample tubes are extended and retracted by hydraulic pressure from a motor and pump assembly utilizing liquid carried in the tool.

Another object of the invention is to provide a hydraulically operable side wall sampling tool where the liquid used is contained in the tool and provision made for equalizing the pressure in the tool due to movement of such liquid during operation.

It is also an object of the invention to provide a side wall sampling tool having a chamber therein which carries a supply of liquid, a pump therefor and a motor to operate the pump so as to actuate the sample tubes.

It is also an object to provide side wall sampler tubes supported in a carrier so that the assembly thereof may be inserted and removed relative to the body of the tool.

It is also an object of the invention to provide a wire line hydraulically operable side wall sampler tool.

Another object is to provide a hydraulically operable side wall sampler tool where the pressure to extend the sampler tubes is applied to the tubes simultaneously.

Other and further objects of the invention will be readily understood when the following description is considered in connection with the accompanying drawings wherein:

Fig. 1 is a vertical sectional view of the upper end of a wire line hydraulically operable side wall sampler;

Fig. 2 is a vertical sectional view of the lower end of the tool of Fig. 1;

Fig. 3 is a transverse section on the line 3—3 of Fig. 2.

The tool is made up of a hollow body 2 having the chamber 3 therein. This body is arranged to be lowered and raised in the well bore by a combination support and electric cable 5 which extends through a cap 6 and is sealed therein by a plate 7. This cap is affixed by the screws 8 to a fishing nipple 10 which is in turn threaded at 11 into the top of the body 2. The cable 5 connects to a conduit 12 which extends through the cap 6 and nipple 10 into the chamber 3 so

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that the electric wires 13 may be connected to operate a motor 15.

The motor 15 drives a shaft 16 which operates a hydraulic pump 17 which has the pipes 19 and 20 connected thereto. These pipes are so arranged that when the pump is operated in one direction, liquid such as oil will be picked up by the upper end of the pipe 19, directed through the pump and discharged through the sample pipe 19 into the carrier 25 which supports the sample tubes 26 in the enclosing cylinders 27. Each tube has an enlarged end or piston 28 thereon so that when the pressure liquid is discharged through the passage 29 into the cylinder 27 behind the piston, the tube 26 will be forced laterally so as to extend from the housing 2 and be forced into the side wall of the well bore. Suitable core or sample catcher wires may be provided in the ends of the tubes 26 if desired.

The succeeding tubes 26, arranged to extend alternately in opposite directions, will be caused to move out simultaneously with the first tube by virtue of the passages 30 which extend diagonally through the carrier 25 to the next succeeding cylinders 27.

When it is desired to retract the sample tubes, the motor 15 will be reversed by controls from the surface through the cable 5 and liquid picked through the pipe 19 and discharged into the pipe 20 so as to exert a pressure through the passage 32 into the cylinders 27 around the sample tubes and against the forward edge 33 of the pistons 28. This pressure moves the sample tubes back into the cylinders and any excess liquid will be discharged through the check valve 35 in the top of the pipe 20. This return pressure is conducted to the succeeding cylinders by the passages 36.

In order to equalize the pressure within the tool due to the movement of the pressure liquid into and out of the pump and cylinders, a flexible diaphragm 40 is arranged in the shoe 41 threaded onto the lower end of the body 2. The ports 42 through this shoe cause the diaphragm to flex in response to changes in volume in the tool without contaminating the pressure liquid. This diaphragm is held in position by the retainer plate 44.

Attention is directed to the arrangement of the parts whereby the motor, pump and tube carrier with the sample tubes therein may be passed into the housing or body 2 and the shoe then connected to close the bottom. Suitable packing 46 and retainer plates 47 form a seal

about the sample tubes to prevent leakage therearound. The side plates 50 inserted in the slots 51 space the motor, pump and carrier in their respective positions.

Broadly the invention contemplates a self container hydraulically operable wire line side wall sampler.

What is claimed is:

1. A side wall sampling tool for wells comprising a body, a fishing nipple thereon, a wire line head on said nipple, a combination support and electric circuit cable extending through said head and nipple into said body, said body being hollow to form a reservoir for pressure liquid, a motor in said body, a hydraulic pump also in said body and connected for operation by said motor, a sampler tube carrier in said body, a plurality of alternately oppositely facing core tubes in said carrier, a cylinder for pressure fluid enclosing each core tube, a connection from said pump to said cylinders so that said tubes will be forced laterally from said body by liquid pressure to engage and sample the wall of the well bore, and means to retract said tubes after the cores have been taken.

2. A side wall sampling tool for wells comprising a body, a fishing nipple thereon, a wire line head on said nipple, a combination support and electric circuit cable extending through said head and nipple into said body, said body being hollow to form a reservoir for pressure liquid, a motor in said body, a hydraulic pump also in said body and connected for operation by said motor, a sampler tube carrier in said housing, a plurality of alternately oppositely facing core tubes in said carrier, a cylinder for pressure fluid enclosing each core tube, a connection from said pump to said cylinders so that said tubes will be forced laterally from said housing by liquid pressure to engage and sample the wall of the well bore, said motor and pump being reversible to pump liquid into the opposite ends of said cylinders to return said core tubes.

3. A side wall sampling tool for wells comprising a body, a fishing nipple thereon, a wire line head on said nipple, a combination support and electric circuit cable extending through said head and nipple into said body, said body being hollow to form a reservoir for pressure liquid, a motor in said body, a hydraulic pump also in said body and connected for operation by said motor, a sampler tube carrier in said housing, a plurality of alternately oppositely facing core tubes in said carrier, a cylinder for pressure fluid enclosing each core tube, a connection from said pump to said cylinders so that said tubes will be forced laterally from said housing by liquid pressure to engage and sample the wall of the well bore, said motor and pump being reversible, and a second connection from said pump to said opposite ends of said cylinders to direct liquid to the cylinders to retract said core tubes.

4. A side wall sampler including a body, a plurality of sampler tubes, a carrier for said tubes disposed in said body, a cylinder about each tube, a piston on each tube, means in the body to direct liquid under pressure into said cylinders to either side of said tube piston to extend or retract said tubes, said means including a reversible motor, a reversible pump driven thereby, and connections for the pump so as to pick up liquid from within said body and force such liquid into the cylinders.

5. A side wall sampler including a body, a plurality of sampler tubes, a carrier for said tubes disposed in said body, a cylinder about each tube, a piston on each tube, means in the body to direct liquid under pressure into said cylinders to either side of said tube piston to extend or retract said tubes, said means including a reversible motor, a pump driven thereby, connections for the reversible pump so as to pick up liquid from within said body and force such liquid into the cylinders, and a diaphragm carried by said body to equalize the internal and external pressures by movement in response to the high pressure applied through said housing.

6. In a side wall sampler a body, sample tubes movable laterally therefrom, a cylinder enclosing each tube, a liquid chamber in said body, a reversible pump to pick up liquid from said chamber, a reversible motor to drive said pump, connections from said pump to said cylinders so that the pumped liquid discharges into the cylinders to extend the samplers, and another set of connections from said cylinders to the pump to conduct liquid to retract the tubes when said pump is reversed.

7. In a side wall sampler a body, sample tubes movable laterally therefrom, a cylinder enclosing each tube, a liquid chamber in said body, a reversible pump to pick up liquid from said chamber, a reversible motor to drive said pump, connections from said pump to said cylinders so that the pumped liquid discharges into the cylinders to extend the samplers, and another set of connections from said cylinders to the pump to conduct liquid to retract the tubes when said pump is reversed, and a diaphragm in said chamber exposed to the well pressure and adapted to move in accordance with the variations in volume of liquid in said chamber.

8. A wire line side wall sampler including a combination support and electric cable, a body, hydraulically movable sampler tubes therein, an electric reversible motor in the body connected to said cable, a reversible hydraulic pump in the body connected for operation by said motor, and hydraulic connections from said pump comprising tubes so that liquid pumped by said pump will extend or retract said tubes.

9. A wire line side wall sampler including a combination support and electric cable, a body, hydraulically movable sampler tubes therein, an electric reversible motor in the body connected to said cable, a reversible hydraulic pump in the body connected for operation by said motor, and hydraulic connections from said pump comprising tubes so that liquid pumped by said pump will extend or retract said tubes simultaneously.

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