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3,357,504

STRADDLE PACKER WIRE LINE TESTER

Filed June 7, 1965

3 Sheets-Sheet 1

Fig. 1

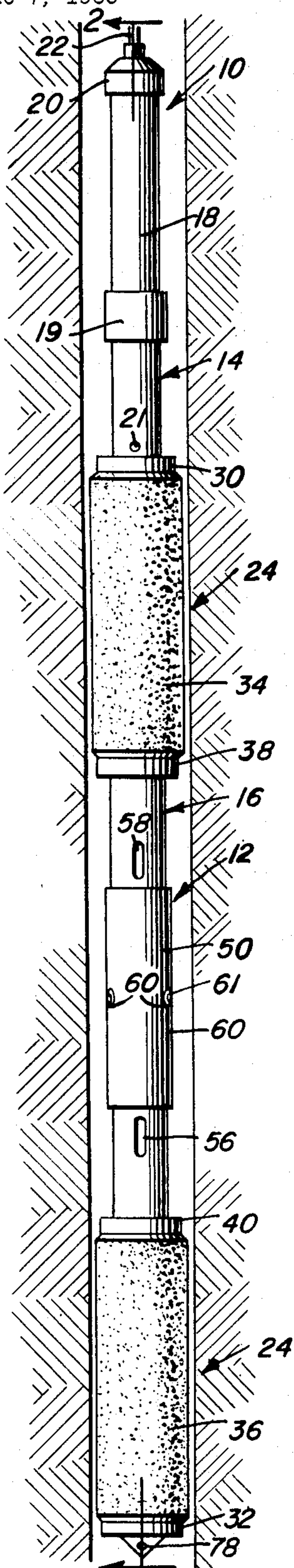
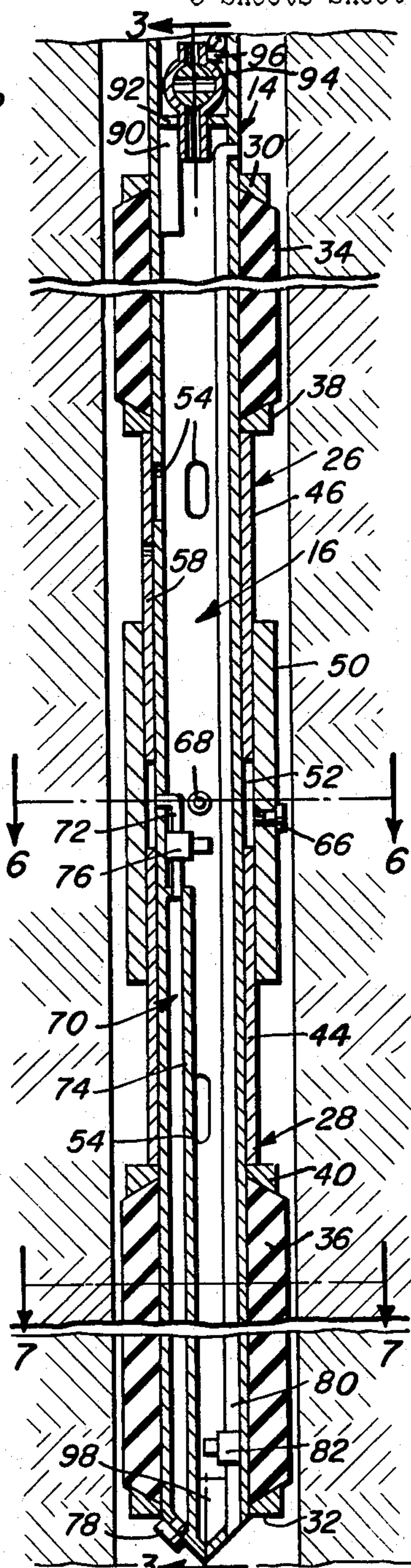


Fig. 2

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Fig. 3

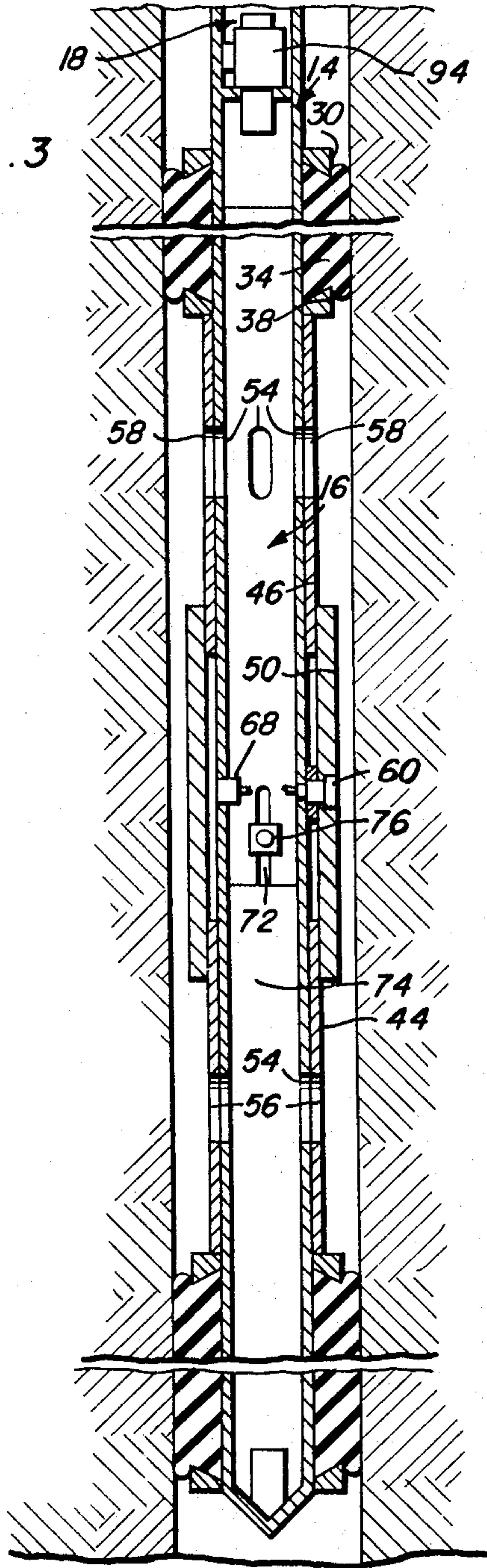
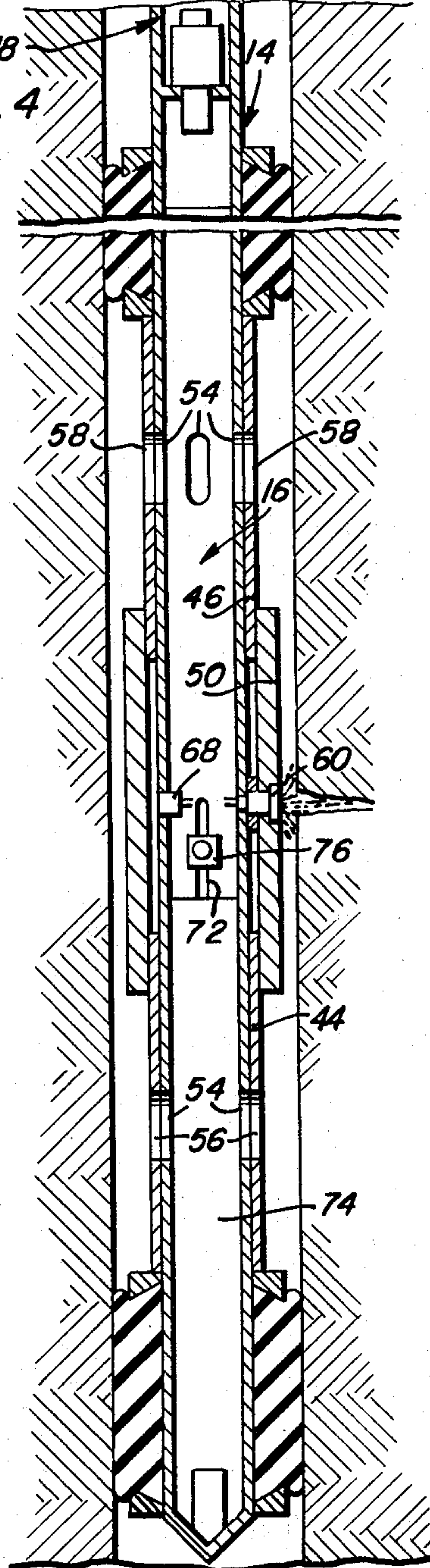


Fig. 4



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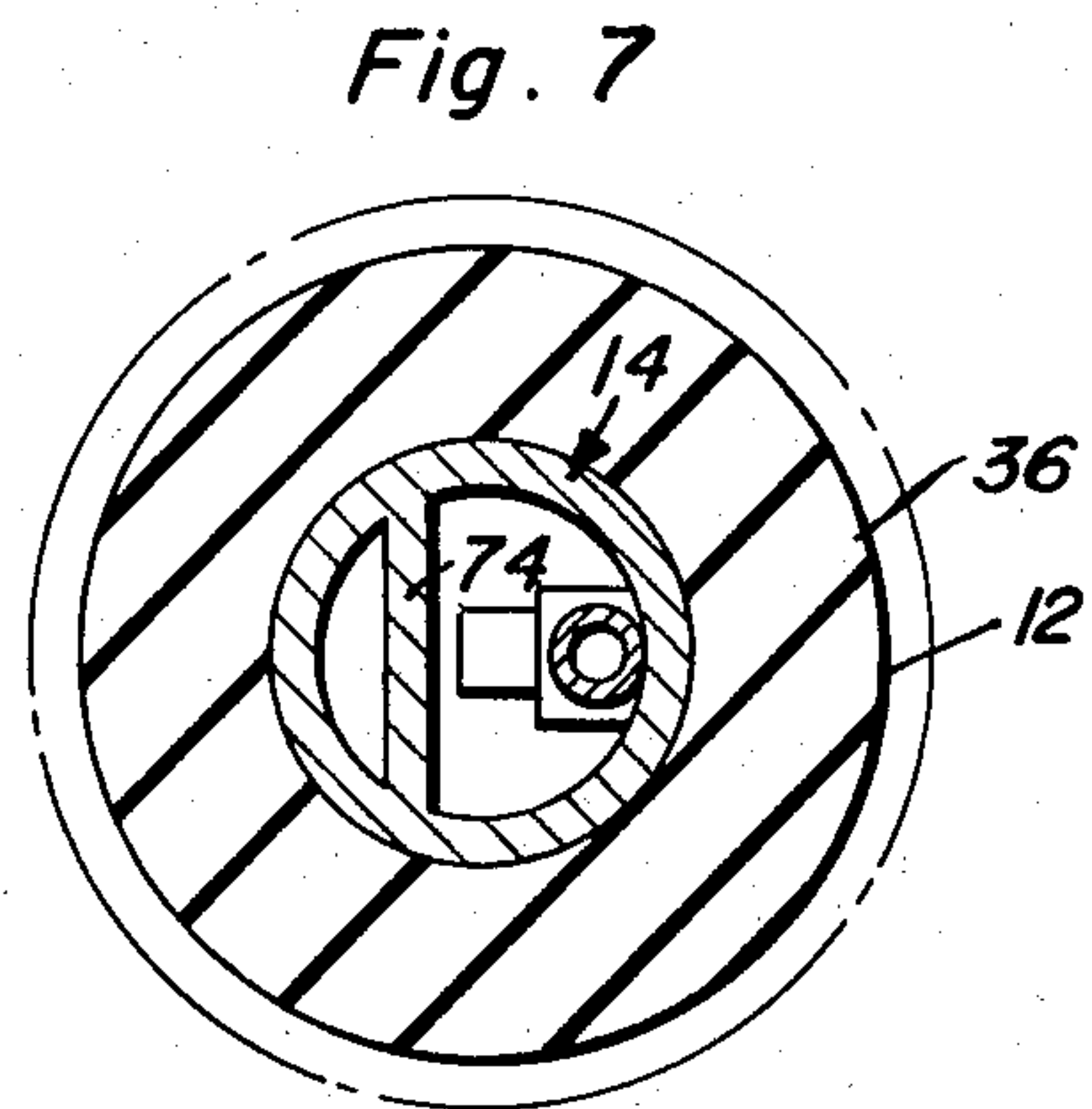
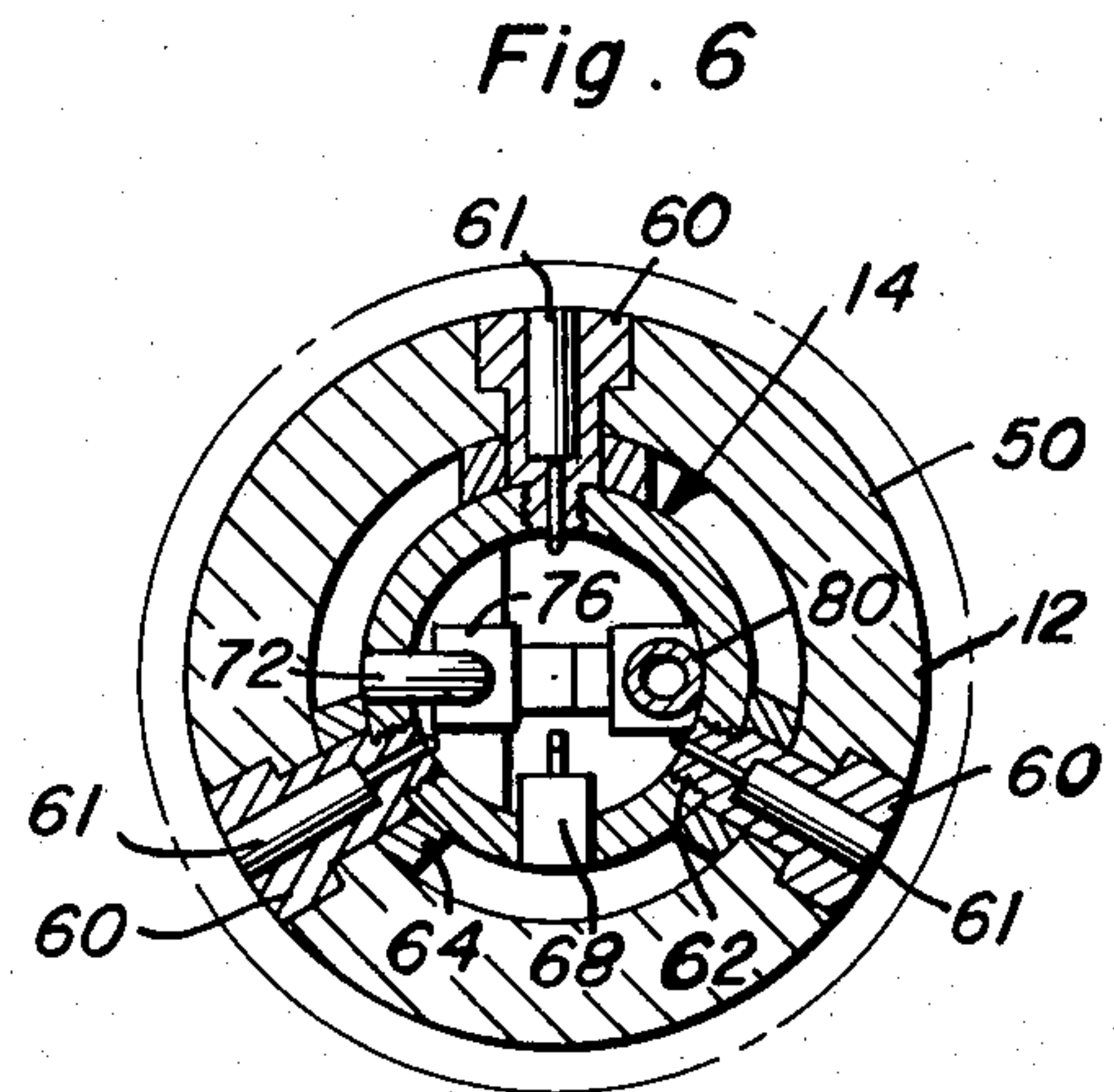
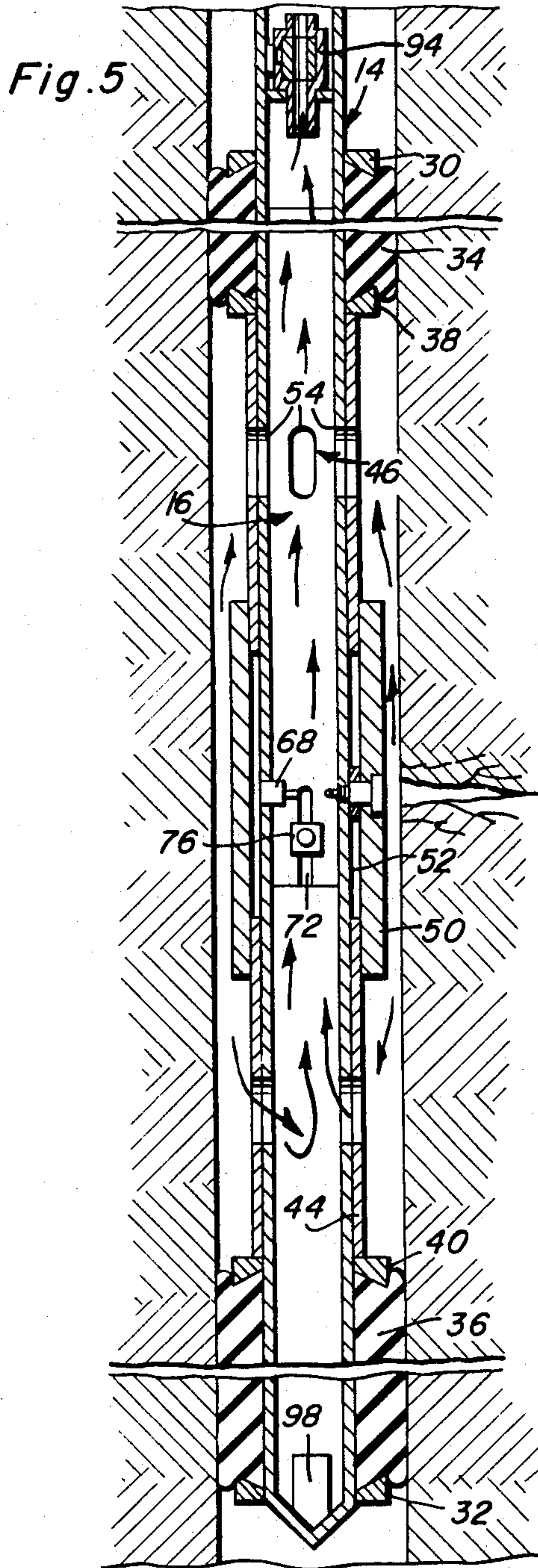
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STRADDLE PACKER WIRE LINE TESTER
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 9 Claims. (Cl. 175—4.52)

ABSTRACT OF THE DISCLOSURE

A wire line well testing tool having an elongated cylindrical body member provided with a straddle packer means for selectively positioning the tool to isolate a portion of a well bore, wherein packers are expanded into gripping engagement with a bore by expanding gas produced by the ignition of a combustible gas or the detonation of an explosive within a firing chamber comprising a part of the packer setting means and wherein movement of the annular piston simultaneously actuates a valve means to permit formation fluid to enter the body of the tester so as to permit it to be analyzed by a plurality of instruments therein and/or recovered thereby.

This invention relates generally to a well testing tool adapted to be lowered into and raised from a well bore by means of a cable connected to suitable hoisting means at the earth's surface. More specifically, this invention relates to a wire line tester utilizing a straddle packer to obtain data pertaining to the productivity of a formation penetrated while drilling a well. Thus, the expanded packers prevent the drilling fluid in the annulus from entering the section between the packers which is undergoing testing thereby assuring that only the fluids from the isolated test region can freely enter a fluid recovery chamber provided in the wire line tester of the present invention.

Heretofore, various constructions have been proposed for fluid sampling wire line testers to permit the collecting of fluid samples from a well bore. However, many of the devices are less than satisfactory in operation due to the fact that they do not obtain truly representative samples from that portion of the well bore undergoing testing. In addition, most generally, the wire line testers presently utilized rely upon hydrostatic or formation pressure to actuate the various components associated with the collection of fluid samples or data pertaining thereto.

Another problem often encountered with wire line testers proposed heretofore is that of testing a relatively impermeable zone within the bore of the well. This is particularly compounded by the fact that during the drilling of a well it is necessary to maintain control of the well and stabilize the walls of the well by maintaining the hydrostatic pressure of the drilling mud at a greater pressure than the formation pressure at any given depth. This inevitably leads to a certain amount of clogging of the interstices of the formation thereby making it difficult to obtain a truly representative sample of the formation fluid at any given point within the well.

Heretofore, most generally, fluid recovering wire line testers were only capable of recovering a relatively small volume of formation fluid thereby resulting in a high proportion of inconclusive tests which are accordingly time consuming and costly in an industry that is becoming more and more cost conscious.

This invention proposes to overcome the above mentioned shortcomings of fluid recovering wire line testers, known heretofore, by setting forth a novel construction for a wire line testing tool which is suspended from the well head by a multistrand insulated electrical cable similar to that used to run electrical logs, which testing tool utilizes a straddle packer arrangement to isolate a

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portion of a well bore, wherein the packers are expanded into gripping engagement with the bore, or casing of the well by an annular piston driven by expanding gas from the ignition of a combustible gas or the detonation of an explosive within a firing chamber.

It is another object of this invention to provide a straddle packer wire line tester which is provided with a fluid recovery chamber which may be selectively altered so as to vary the chamber capacity as required.

A further object of this invention is to provide a straddle packer wire line tester of novel construction which permits each step of the test to be monitored at the well head thereby assuring that any irregularities arising during the course of the test can be readily and quickly detected.

Still another object of this invention is to provide a straddle packer wire line tester having a plurality of outwardly directed shaped charges mounted on the exterior thereof, on the portion of the tester between the packers, thereby permitting selective fracturing of the formation being tested in order to assure that a truly representative sample of formation fluid is obtained thus substantially eliminating inconclusive tests.

A still further object of this invention is to provide a novel structure for a straddle packer wire line tester which can be modified at the well site to test the bottom few feet of the bore hole by replacing the lowermost packer with a spring steel cage, or inactivating the lowermost of the two packers.

Still another object of this invention is to provide a wire line tester of the type described which is provided with a pressure equalizing tube so that hydrostatic pressure can be substantially equalized above and below the tool during testing thereby overcoming the tendency of the pressures within the well to displace the set tool.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is an elevational view illustrating the tool of the present invention as it is lowered into the well bore;

FIGURE 2 is a fragmentary vertical sectional view of the tool taken substantially along the plane of the line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary vertical sectional view of the tool taken substantially along the plane of the line 3—3 of FIGURE 2 illustrating the tool with the straddle packer members fully expanded into gripping engagement with the well bore;

FIGURE 4 is a fragmentary vertical sectional view of the tool further illustrating the fracturing of a formation by one of a plurality of shaped charges provided on the exterior of the tool;

FIGURE 5 is a fragmentary vertical sectional view of the tool showing the flow path of the formation fluid through the intermediate test chamber of the tester and into the formation fluid recovery chamber.

FIGURE 6 is an enlarged horizontal section view taken substantially along the plane of the line 6—6 of FIGURE 2 illustrating the placement of a plurality of shaped charges and certain details of the packer expanding means; and

FIGURE 7 is an enlarged horizontal sectional view taken substantially along the plane of the line 7—7 of FIGURE 2.

In an exemplary embodiment of this invention the straddle packer wire line tester comprises a straddle packer arrangement wherein the packers are expanded by a piston driven by a combustible gas in a firing chamber which is ignited thereby driving the pistons toward the

packers and expanding them. Simultaneously a plurality of fluid entry ports provided in the pistons are shifted to match fluid entry ports provided in the outside housing of the piston chamber thus opening the interior of the wire line tester to the annulus between the packers.

A plurality of shaped charges mounted on the outside of the firing chamber are then ignited to selectively perforate the formation being tested to facilitate fluid flow from the formation into the bore hole in the region between the packers. A valve at the base of the formation fluid recovery chamber is then actuated to release the trapped hydrostatic pressure in the test chamber. This valve is then closed and initial shut-in pressure of the formation is recorded and relayed to the well head through the wire line which is provided with a plurality of insulated electrically conductive cables. A conventional pressure "bomb" or pressure measuring device may be positioned in the test chamber to be used to make a chart of pressures encountered during the test relative to elapsed time to provide a check on the pressure sensing transducer utilized to relay flow and shut-in pressures to the well head. After the initial shut-in pressure has stabilized an electromagnetically operated valve at the base of the fluid recovery chamber is actuated from the well head to bring the fluid recovery chamber into communication with the test chamber. Fluid resistivity of the fluid entering the fluid recovery chamber is measured by a resistivity measuring device and the data is relayed simultaneously to the well head where it may be recorded for future use.

When a test is concluded, the valve between the recovery and test chambers is closed by command from the well head and the final shut-in pressure is sensed and relayed to the well head. The straddle packers are then released by actuating an exhaust valve which connects the firing chamber with a gas expansion chamber within the tool thereby venting the expanded gases from the firing chamber into the exhaust chamber thus permitting the resiliency of the rubber packers to return the pistons to their original position thereby permitting the wire line tester to be moved within or withdrawn from the bore hole. The exhaust chamber is preferably fitted with a check valve so that as the pressure of the exhaust gas within the exhaust chamber overcomes hydrostatic pressure within the well when the tool is withdrawn from the well the exhaust gases will be bled off.

Referring now to the drawings and FIGURE 1 in particular there is illustrated a straddle packer wire line tester indicated generally at 10 which is in position in a well bore adjacent to a portion of a formation indicated generally at 12 which is to be tested for productivity or the like. The wire line tester 10 includes a housing means or mandrel indicated generally at 14 which provides a housing means for a test chamber indicated generally at 16 and a fluid recovery chamber 18. The recovery chamber 18 is provided with a drain plug 21, seen best in FIGURE 1. The upper portion of the mandrel 14 is provided with a cable head or connector 20 to which is secured a wire line 22 provided with a plurality, and preferably at least six, insulated electrical conductors similar to that used to run electrical logs. As will become clear hereinafter a total of at least six electrical "channels" will be necessary for the proper operation of the various test components within the wire line tester tool 10.

The wire line tester 10 is further provided with a straddle packing means indicated generally at 24 which comprises an upper packer assembly 26 and a lower packer assembly 28. The packer assemblies 26 and 28 include respective abutments 30 and 32 which may be threadably secured to the mandrel 14 or secured by means of welding, for example. A pair of respective packer members 34 and 36, which are preferably formed of a relatively rigid yet resilient oil resistant rubber such as neoprene rubber, for example, are slidably received about the outer diameter of the mandrel 14.

A pair of slidable abutments 38 and 40 are slidably carried by the outer diameter of the mandrel 14 and are secured to a pair of sliding pistons 44 and 46 which are slidably carried by the outer diameter of the mandrels 14. Although not shown, the sliding pistons 44 and 46 are preferably keyed to the mandrel 14 in a manner which permits sliding motion of the pistons 44 and 46 relative to the mandrel 14 while preventing rotation of the pistons 44 and 46 relative to the mandrel 14 for reasons which will become clear. The abutments 38 and 40 are secured to the packers 34 and 36 by suitable means such as by adhesive bonding, for example.

An annular cylinder 50 is secured to the outer diameter of the mandrel 14 in spaced apart relation therefrom, as seen best in FIGURE 6. Accordingly, it will be seen that an annular firing chamber 52 is defined between the outer diameter of mandrel 14, the inner diameter of the cylinder 50 and the axial surfaces of the ends of the sliding pistons 44 and 46.

As seen best in FIGURE 2 the mandrel 14 is provided with a plurality of fluid entry ports 54 in the mandrel 14 which are preferably positioned about the periphery of the mandrel 14 at a point between the cylinder 50 and the upper and lower packers 26 and 28. The slidable pistons 44 and 46 are also provided with a plurality of fluid entry ports 56 and 58 which are positioned in the respective slidable pistons 44 and 46 so as to register with the ports 54 in the mandrel 14 when the pistons 44 and 46 are moved into the position shown in FIGURES 3, 4 and 5, in a manner to be described.

The firing chamber 52 is preferably charged with a combustible gas which is preferably not susceptible to spontaneous combustion at the high temperatures and pressures existent in deep wells and is also capable of a great increase in volume upon combustion. As it will become readily apparent as the description proceeds the combustible gas in the firing chamber 52 is utilized to urge the sliding pistons 44 and 46 outwardly thereby carrying the respective sliding abutments 38 and 40 therewith to expand the resilient packers 34 and 36 by virtue of their compression against their respective fixed abutments 30 and 32. The movement of which pistons would correspond to sliding pistons 44 and 46 and the packers 34 and 36 in the position illustrated in FIGURES 3, 4 and 5, wherein the packers 34 and 36 grippingly engage the wall of the bore hole.

As seen best in FIGURE 6 the cylinder 50 is maintained in spaced apart relationship from the test chamber portion 16 of the mandrel 14 by a plurality of shaped charge receivers 60 which are threadably received as at 62 in suitable threaded apertures in the mandrel 14. The receivers 62 are provided with shaped charges 61 which may be detonated from the well head by suitable electrical connection, not shown. In addition, each shaped charge receiver 60 may further be provided with a spacer 64 to assist in maintaining the cylinder 50 in proper spaced apart relation with regard to the mandrel 14. The firing chamber 52 may be charged with the combustible gas through a suitable charging port 66 which is threadably or otherwise secured in a suitable aperture in the cylinder 50, which aperture communicates with the firing chamber 52. Although not shown, the charging port 66 is preferably provided with a means to prevent the escape of the charging gas thereby facilitating charging of the firing chamber 52.

An electrically operated squib or igniting device 68, seen best in FIGURES 2 and 6 is positioned in communication with the firing chamber 52 to provide a means of igniting the combustible gas contained therein. Although not shown, the electrically operated igniting device 68 is connected by a suitable electrical conductor to the cable 22 and thence to the well head. As seen best in FIGURE 2 a gas exhausting means indicated generally at 70 is provided for the accumulation of the expanded gas from the firing chamber 52 subsequent to the

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setting of the packers 34 and 36 in order to release the packers. The exhausting means includes a conduit 72 which communicates with the firing chamber 52 and connects the firing chamber 52 with a gas exhausting chamber 74 which has a considerably greater volumetric capacity than the firing chamber 52 in order to permit exhausting of the combustion products within the firing chamber 52 when it is desired to release the packers 34 and 36. The flow of gas through the conduit 72 is regulated by a solenoid operated packer release valve 76 interposed in the conduit 72 between the firing chamber 52 and the exhaust chamber 74. Although not shown, a suitable electrical conductor connects the solenoid valve 76 with the cable 22 and thence to the well head. The gas exhaust chamber 74 is further provided with a pressure release check valve 78 which coacts in a manner to be described to vent excessive pressure from the exhaust chamber 74 as the wire line tester is withdrawn from the well bore subsequent to testing.

From the foregoing it will be understood that the fluid entry ports 54, 56 and 58 must be partially or wholly in registry to permit the entrance of fluid from the well bore into the test chamber portion 16 of the mandrel 14.

As seen best in FIGURE 2 the wire line tester 10 is further provided with a pressure equalizing tube 80 which permits equalization of the hydrostatic pressures above and below the packers 34 and 36 when the packers are in the set position as shown in FIGURES 3, 4 and 5. A manually operated valve 82 is interposed in the pressure equalizing tube 80 to permit blocking of the pressure equalizing tube 80 as desired. The manually operated hydrostatic pressure blocking valve is preset before the tool is lowered into the well. The valve 82 is left open if both packers 34 and 36 are to be used. When only the top packer 34 is to be used the valve 82 is closed prior to lowering the wire line tester into the bore hole, and accordingly the valve 82 remains closed throughout the test.

The test chamber portion 16 of the mandrel 14 is further provided with a pressure sensing transducer means 90 which is preferably positioned adjacent the upper portion of the chamber 16 in the proximity of a bulkhead 92 which divides the test chamber portion 16 from the fluid recovery portion 18. The bulkhead 92 is threadably connected to both the test chamber portion 16 and the fluid recovery portion 18, in a manner not illustrated, to facilitate the servicing of the various components within the two chambers. The pressure sensing transducer means 90 is electrically connected to the well head in a manner similar to the connection provided for the various other electrically operated components of the tool 10. A solenoid operated valve 94 is provided to selectively control the passage of fluid from the test chamber 16 into the fluid recovery chamber 18. Although not shown, the solenoid operated valve 94 is connected by a suitable electrical conductor to the wire line or cable 20 to and thence to the well head. A fluid resistivity sensing transducer means 96 is provided in the upper portion of the solenoid operated valve 94 to permit measurement of the fluid resistivity as it enters the fluid recovery chamber 18 from the test chamber 16 through the solenoid operated valve 94 as seen best in FIGURE 5, wherein the arrows illustrate the flow of fluid from the bore hole into the test chamber 16 through the aligned apertures 54, 56 and 58 and thence through the solenoid control valve 94 into the fluid recovery chamber 18.

As seen best in FIGURE 1 the recovery chamber 18 is preferably provided with a threaded coupling member 19, or the like, to facilitate the insertion of intermediate lengths of tubing to vary the length of the recovery chamber 18 to facilitate the recovery of varying amounts of fluid from the packed region between the straddle packers during testing.

The straddle packer wire line testing tool 10 may further be provided with a pressure bomb 98 which is preferably

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positioned adjacent the downwardly converging bottom wall of the test chamber 16. The pressure bomb 98 is of a standard type as previously described.

Having described the construction and coaction of the various components of my wire line tester a typical sequence of steps utilizing the straddle packer wire line tester tool 10 of the present invention will be described. FIGURES 1 through 5 sequentially illustrate the utilization of the tester of the present invention.

Referring specifically again to FIGURE 1 the wire line tester 10 is illustrated as having been lowered into an uncased bore hole with the portion of the tester 10 between the straddle packers 34 and 36 adjacent that portion of the formation 12 to be tested for productivity, etc. At this point the tool 10 is supported from the well head solely by means of the wire line 22. Although not mentioned previously it will be understood that the six or more insulated electrically conductive cables incorporated in the wire line 22 are connected to suitable control switches, recording devices, etc., located at the well head for the sequential operation of the various components of the tool and/or recordation of information being transmitted back to the well head from the various components situated within the wire line tester 10. In the position shown in FIGURE 1 and the corresponding fragmentary sectional view FIGURE 2, it will be seen that the misalignment of the fluid entry ports 54, 56 and 58 does not permit entry of fluid from the bore hole into the test chamber portion 16. It will also be noted that the packers 34 and 36 are in their unexpanded state due to the retracted position of the slidable pistons 44 and 46. Accordingly, fluid is free to flow past the packers 34 and 36. However, it will be understood that just prior to introducing the tool into the well it is necessary to open the valve 82 to provide communication between the region of the bore beneath the tester with the region of the bore above the tester when the packers are set to prevent any undue differential in hydrostatic pressures above and below the packers. At this stage of the operation of the device the solenoid operated valve 94 between the test chamber 16 and recovery chamber 14 would be in the closed position. Although the valve 94 is illustrated as being of a rotary type as seen in FIGURE 2, it will be understood that any suitable type of solenoid operated valve would be satisfactory.

Referring now to FIGURE 3 it may be seen that the straddle packers 34 and 36 have been expanded into sealing and gripping engagement with the wall of the bore hole by virtue of the fact that the igniting device 68 has been energized from the well head to initiate combustion and attendant expansion, of the combustible gas contained within the firing chamber 52 thereby forcing the sliding pistons 44 and 46 outwardly relatively to the annular cylinder 50 thus compressing the resilient rubber packers between their respective sliding abutments 38 and 40 carried by the pistons 46 and 44, and their respective fixed abutments 30 and 32 to effect a radial expansion of the respective packer members into gripping engagement with the wall of the bore hole. It will be understood of course that during the setting of the packers the solenoid operated packer release valve 76 will be closed thereby preventing the venting of the combustible gas or the products of combustion into the gas exhaust chamber 74. It will be further noted, that as the sliding pistons 44 and 46 move into the position shown in FIGURE 3 the fluid entry ports 54, 56 and 58 in the respective members 14, 44 and 46 come into either partial or complete registry thereby permitting fluid from the annulus between the tool and the wall of the bore to enter the test chamber 16. The valve 94 is then actuated from the well head to release the trapped hydrostatic pressure in the test chamber 16. The valve 94 is then reclosed and the initial shut-in-pressure is sensed by the pressure sensing transducer means 90 which transmits the data to the well head. After the initial shut-in-pressure has

stabilized the recovery chamber valve 94 is again opened allowing the accumulation of formation fluid in the fluid recovery chamber 18. The fluid resistivity of the formation fluid entering the fluid recovery chamber 18 may be sensed by the fluid resistivity transducer 96 which then transmits the information to the well head.

The shaped charges 61 are detonated, as illustrated in FIGURE 4, to create a plurality of fissures in the formation 12 adjacent to the shaped charge holding members 60 to facilitate the flow of fluid from the formation 12 into the annulus between the straddle packers. The sequential operation of the valve 94 to effect sensing of the initial shut-in-pressure is identical to that described above in the discussion of the operation of the tool as shown in FIGURE 3.

Referring now particularly to FIGURE 5, a plurality of arrows illustrate the flow of formation fluid through the aligned apertures 54, 56 and 58 into the test chamber 16 and thence through the open fluid recovery chamber valve 94 into the fluid recovery chamber 18. When the test is concluded, the valve 94 at the base of the recovery chamber 18 is closed and final shut-in-pressure is sensed by the pressure sensing transducer means 90 and relayed to the well head for observation and recordation. The resilient packers 34 and 36 are then released by actuating, or opening the packer release valve 76, by command from the well head, to permit exhausting of the products of combustion from the firing chamber 52 into the gas exhaust chamber 74 thereby allowing the resilient packer members 34 and 36 to assume their original shape and accordingly drive the sliding pistons 44 and 46 back into the position illustrated in FIGURES 1 and 2.

The straddle packer line tester tool 10 may then be withdrawn from the bore hole by means of the wire line 22. As the tool 10 is withdrawn from the bore hole the hydrostatic pressure of the drilling mud or fluid within the bore hole will decrease. Accordingly, to prevent excessive pressure buildup within, or rupturing of the exhaust gas chamber 74 the pressure relief check valve 78 bleeds off the exhaust gases in a controlled manner thereby precluding the presence of dangerously excessive pressure within the chamber 74 when the tool 10 is pulled from the bore hole. Upon withdrawal of the tool 10 from the bore hole the fluid retained in the recovery chamber 18 may be drained by removal of the drain plug 21 at the base of the recovery chamber 18 for measurement and analysis.

Although not shown, means may be provided to utilize the tool 10 to test the bottom of the bore hole by providing a means of securing the sliding piston 44 relative to the mandrel 14 thereby preventing expansion of the lower packer 36 while permitting the setting of the upper packer 34 thereby defining a test region which extends substantially from the lower end of the packer 34 to the bottom of the bore hole. The sequential operation of such an embodiment would be substantially identical to the operation of the exemplary embodiment described supra.

It may therefore be seen that a novel construction has been provided for a straddle packer wire line tester which may be conveniently and readily utilized to carry out a number of bore hole tests wherein the testing procedure and recovery of data therefrom is greatly facilitated by the ability to control all the operating components of the device from the well head without having to rely upon conditions within the well for the operation of the vital components thereof.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. In combination a well tool provided with means to

be suspended in a well bore by a wire line and controllable from the well head to test a formation for productivity and the like comprising a mandrel, straddle packer means carried by said mandrel, said mandrel including a test chamber portion and a fluid recovery chamber portion, fluid entry means coacting with said packer means to introduce formation fluid into said test chamber from the region between said packer means, said test chamber being provided with pressure sensing transducing means operative from the well head, valve means mounted in the tool and operative from the well head to selectively permit flow of fluid from said test chamber portion into said fluid recovery chamber portion and said packer means including a packer setting means, said packer setting means including opposed annular packer expanding pistons slidably carried by said mandrel and having their opposed axial surfaces maintained in spaced apart relationship, annular cylinder means positioned in overlying sealing relationship to the opposed ends of said slidable pistons to define an annular axially expansible firing chamber between said mandrel, said cylinder means, and the opposed ends of said slidable pistons, means for charging said firing chamber with a combustible charge, and charge ignition means mounted within the tool and actuatable from the well head to ignite said charge to drive said slidable pistons outwardly to expand said packers.

2. The combination of claim 1 wherein said fluid recovery portion of said mandrel is provided with a joint means whereby the capacity of said recovery chamber may be varied by adding intermediate chamber portions.

3. In combination a well tool provided with means to be suspended in a well bore by a wire line and controllable from the well head to treat and test a formation for productivity and the like comprising a mandrel, straddle packer means carried by said mandrel, shaped charge receiver means carried by said mandrel and said straddle packer means, shaped charges carried by said charge receiver means, means operable from the well head to detonate said shaped charges whereby the formation may be selectively fractured, said mandrel including a test chamber portion and a fluid recovery chamber portion, fluid entry means coacting with said packer means to introduce formation fluid into said test chamber, said test chamber being provided with pressure sensing transducing means operatively connected to the well head, valve means operatively controlled from the well head to selectively permit flow of fluid from said test chamber portion into said fluid recovery chamber portion, said straddle packer means including a packer setting means, said packer setting means including opposed annular packer expanding pistons slidably carried by said mandrel and having their opposed axial surfaces maintained in spaced apart relationship, annular cylinder means positioned in overlying sealing relationship to the opposed ends of said slidable pistons to define an annular axially expansible firing chamber between said mandrel, said cylinder means, and the opposed ends of said slidable pistons, means for charging said firing chamber with a combustible charge, and charge ignition means mounted within the tool and actuatable from the well head to ignite said charge to drive said slidable pistons outwardly to expand said packers.

4. The combination of claim 3 wherein said fluid recovery portion of said mandrel is provided with a joint means whereby the capacity of said recovery chamber may be varied by adding intermediate chamber portions.

5. In combination a well tool provided with means to be suspended in a well bore by a wire line and controllable from the well head to test a formation for productivity and the like comprising a housing, a pair of spaced bore hole packers slidably on said housing, a pair of abutments secured to said housing outwardly of each of said packers, packer setting means operatively associated with said housing and positioned between said packers to compress said packers against said fixed abutments to effect radial expansion of said packers into gripping, sealing en-

gagement with the wall of the bore to isolate the region between said set packers, fluid recovery means adapted to recover fluid from the region isolated, said fluid recovery means including a first fluid entry means provided in said housing intermediate of said spaced packers, a second fluid entry means provided in said packer setting means, said second fluid entry means adapted to be out of registry with said first fluid entry means when said packers are in their unset position, said second fluid entry means adapted to move into registry with said first fluid entry means to admit fluid to said housing when said packer setting means is actuated to set said packers, and sensing means mounted within said housing to obtain and transmit data to the well head pertaining to conditions within said region isolated said packer setting means including opposed annular packer expanding pistons slidably carried by said housing and having their opposed axial surfaces maintained in spaced apart relation, annular cylinder means positioned in overlying sealing relationship to the opposed ends of said slidable pistons to define an annular axially expansible firing chamber between said housing, said cylinder means, and the opposed ends of said slidable pistons, means for charging said firing chamber with a combustible charge, and charge ignition means mounted within the tool and actuatable from the well head to ignite said charge to drive said slidable pistons outwardly to expand said resilient packers.

6. The combination of claim 5 including firing chamber combustion gas exhausting means, said exhausting means including an exhaust gas expansion chamber mounted within said test chamber portion, conduit means operatively connecting said firing chamber to said exhaust chamber, valve means interposed in said conduit means to selectively control the exhausting of said firing chamber, and said valve means being operable from the well head.

7. The combination of claim 6 wherein said exhausting means includes an exhaust chamber pressure condition responsive relief valve means.

8. The combination of claim 5 including means for equalizing the hydrostatic pressure above and below said packers, said equalizing means comprising a pressure equalizer tube mounted within said housing, said tube having a first and a second end, said first end communicating with the well bore above said isolated region, said second end communicating with said well bore below said isolated region, and valve means interposed in said pressure equalizer tube.

9. In combination a well tool provided with means adapted to be suspended in a well bore by a wire line and controllable from the well head to test a formation for productivity and the like comprising a housing, a pair of spaced bore hole packers slidable on said housing, a pair

of abutments secured to said housing outwardly of each of said packers, packer setting means operatively associated with said housing and positioned between said packers to compress said packers against said fixed abutments to effect radial expansion of said packers into gripping, sealing engagement with the wall of the bore to isolate the region between said set packers, fluid recovery means adapted to recover fluid from the region isolated, said fluid recovery means including a first fluid entry means provided in said housing intermediate of said spaced packers, a second fluid entry means provided in said packer setting means, said second fluid entry means adapted to be out of registry with said first fluid entry means when said packers are in their unset position, said second fluid entry means adapted to move into registry with said first fluid entry means to admit fluid to said housing when said packer setting means is actuated to set said packers, sensing means mounted within said housing to obtain and transmit data to the well head pertaining to conditions within said region isolated, said packer setting means including opposed annular packer expanding pistons slidably carried by said mandrel and having their opposed axial surfaces maintained in spaced apart relation, annular cylinder means positioned in overlying sealing relationship to the opposed ends of said slidable pistons to define an annular axially expansible chamber means between said mandrel, said cylinder means and the opposed ends of said slidable pistons, and means mounted within the tool and actuatable from the well head to pressurize said expansible chamber means to drive said slidable pistons outwardly to expand said packers.

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