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JUNK BASKET

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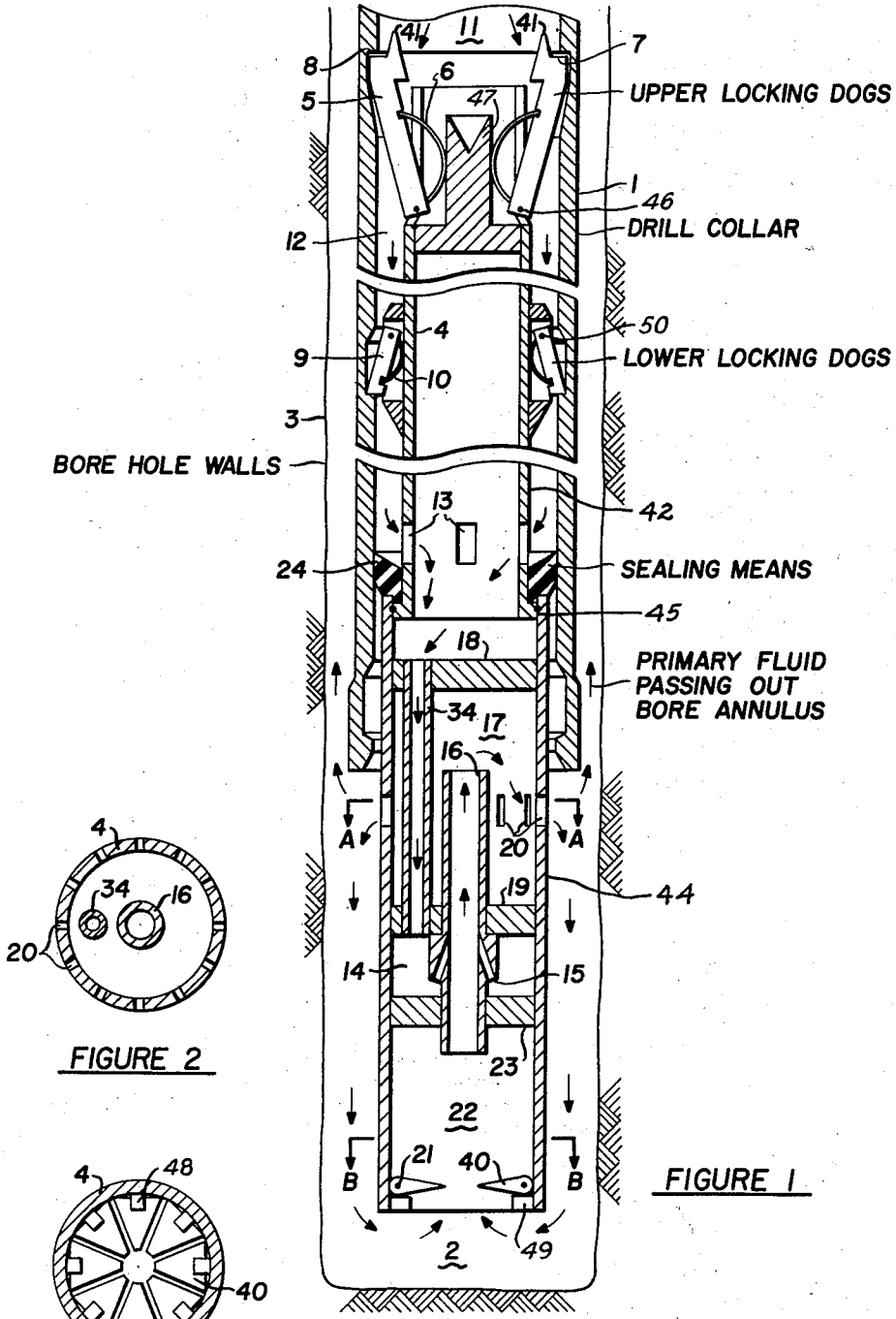


FIGURE 1

FIGURE 2

FIGURE 3

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JUNK BASKET

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The present invention is concerned with an improved apparatus for the removal of objectionable objects from the bottom of a bore hole. The apparatus of the present invention is particularly adapted to be used in conjunction with a drill stem utilizing a retractable bit. In accordance with the present invention the retractable bit can be removed from the bottom of the bore hole and the apparatus or junk basket passed downwardly through the drill stem and used in a manner to remove the objectionable objects from the bottom of the bore hole. The apparatus of the present invention is particularly characterized in that it can be readily positioned at the bottom of the bore hole and that a high velocity fluid flow be obtained therein in order to readily pick up the objectionable objects.

It is well known in the art to drill bore holes into the earth's substrata by various means. Generally, a drill stem and various types of bits are employed wherein the bit is rotated by the rotation of the drill stem. However, in many of these operations various undesirable objects become positioned at the bottom of the bore hole and it is, therefore necessary to remove the same before continuing the drilling operation. In accordance with a specific adaptation of the invention, a bit such as retractable bit is removed and the retractable junk basket positioned at the bottom of the bore hole by means of a wire line and the objectionable object removed therefrom.

The objects and manner of operation of this invention will become apparent as a further description of the invention is given, hence, reference will next be given to the accompanying drawings herein, in which:

Figure 1 illustrates a schematic cross section of a junk basket suitable for practicing the invention;

Figure 2 is a section A—A as shown on Figure 1;

Figure 3 is a section B—B as shown on Figure 1 showing closure formed by flappers **40**.

The present invention may be readily appreciated by reference to the drawing illustrating one adaptation of the same. Referring specifically to the drawing in Fig. 1, a drill collar **1** secured to the lower end of a drill string is illustrated containing secured thereto the junk basket apparatus of the present invention. The entire assembly is shown positioned near the bottom of bore hole **2** concentrically positioned within the bore hole walls **3**. The apparatus of the present invention comprises an outer shell **4** having an upper cylindrical element **42** and a lower cylindrical element **44** which are rigidly secured together at **45** as by welding, for example, or any other suitable means. Upper cylinder **42** has attached at its upper end upper locking dogs **5** actuated by spring element **6**. Upper locking dogs **5** are pivoted at **46** and are urged outwardly by expansion spring element **6**. An upper locking dog spring retainer **47** is mounted on the upper end of cylinder **42** and may enclose the upper end of the cylinder **42**; or if preferred, spring retainer **47** may be constructed such as to provide a fluid passageway through the upper end of cylinder **42**. These locking

dogs contain shoulder elements **7** which seat in the circumferential recess **8** in the drill collar, thus preventing upward movement of the junk basket apparatus with respect to the drill collar. Thus, as the junk basket is lowered downwardly within the drill stem by suitable wire line means to the position below recess **8**, the locking dogs will move outwardly and seat their shoulders under recess **8**. Further downward movement of the junk basket assembly with respect to the drill collar is prevented by lower locking dogs **9** which are actuated by spring elements **10** to seat in a lower circumferential recess in the drill collar. Lower locking dogs **9** are pivoted at **50** and are urged outwardly by expansion spring element **10**.

After the junk basket assembly has been positioned by suitable wire line means, fluid is circulated downwardly within the drill stem. The fluid passes downwardly within the drill collar **1** past the upper locking dogs **5** and downwardly within passage **12** formed between the outer shell of the junk basket and the inner surface of the drill collar. The down flowing liquid passes by lower locking dogs **9** to ports **13** which permit the liquid to flow from the area between the junk basket and the inner wall of the drill collar to within the outer shell **4**.

Lower cylindrical element **44** has an upper enclosed space or chamber **17** formed between an upper partition **18** and an intermediate partition **19**. A lower enclosed space or chamber **14** is formed between intermediate partition **19** and lower partition **23**. Tube element or conduit **34** extends preferably substantially vertically from and through upper partition **18** to and through intermediate partition **19** and provides a fluid passageway between the interior of upper cylindrical element **42** and the lower enclosed space or chamber **14**. Ports **20**, in the walls of chamber **17**, provide fluid communication between the interior of the upper chamber **17** and the annular space between the exterior of lower cylindrical element **44** and the borehole wall. An open-end chamber or space **22** is provided beneath partition **23** in lower cylindrical element **44**. A passageway or a second conduit **16** extends preferably substantially vertically from below lower partition **23** to above said intermediate partition **19** and provides fluid communication from the partially enclosed space or chamber **22** which is formed beneath lower partition **23** and the wall of lower cylindrical element **44**. Conduit **16** is provided with a high velocity jet pump or nozzle comprising upwardly and inwardly directed primary nozzles **15**. Core catches **40**, pivoted about pivot pins **21** with top of hinges being shown at **48** in Fig. 3, are provided at the open end of space **22** and are rotatable about pivots **21** in a 90° arc from a horizontal to a vertical position. Downward rotation beyond these limits is prevented by any suitable means such as stops **49**. Catchers **40** are spaced circumferentially around the inner wall of lower cylindrical element **44** in such a manner that catchers **44** make a partial closure for the lower end of space **22** when in the position shown in Figures 1 and 3. Sealing means **24** are provided to seal the space between the interior of the drill collar and the exterior of the upper cylindrical element. Sealing means **24** are below ports **13** and therefore prevent the flow of fluid downwardly in the drill collar except through ports **13** and on to passageway **34**.

In operation, liquid flowing down past lower locking dogs **9** passes through ports **13** from the space between the shell **4** and the inner walls of the drill collar **1** to the interior of upper cylindrical element **42**. Fluid may also flow through the upper end of upper cylindrical element **42** if it is not completely closed by retainer **47**. The liquid then flows downwardly through conduit **34** to lower chamber **14**. The fluid from lower chamber **14**

passes upwardly and inwardly through primary nozzles **15** up through conduit **16** and into upper enclosed chamber **17**. The fluid then flows through ports **20** in the walls of lower cylindrical element **44** into the annular space between the outer walls of the lower cylindrical element **44** and the walls of the borehole.

The drilling fluid passes upwardly through primary nozzles **15** and aspirates fluid from the bottom of the borehole **2**, through space **22** and thence through the lower end of conduit **16**. The entire mixture flows upwardly and out of the top of conduit **16** to chamber **17**. The fluid from chamber **17** flows through port elements **20** into the annular space between the outer surface of the junk basket and the borehole wall. A portion of the fluid flows upwardly in this space while the remainder flows downwardly in the annular space between the junk basket and the borehole wall and around the lower lip of the junk basket. This recycling fluid flows inwardly into space **22**, past catchers **40**, and upwardly through conduit **16**. Catchers **40** being spaced circumferentially around the inner wall of shell **4** form a partial closure for the lower end of partially enclosed space **22**; and objectional objects or "junk" which may lie in the bottom of the borehole are swept upwardly past catchers **40**, the larger objects being trapped in the partially enclosed space **22**. The smaller materials flow upwardly through conduit **16** and are trapped in the lower part of lower chamber **17**.

When it is desired to remove the junk basket, a circular collar element is lowered downwardly through the drill string by suitable means. This collar seats over ears **41**, forcing the locking dogs inwardly. This release means also latches underneath the lips of the upper locking dogs and provides a means for lifting the apparatus to the surface. A suitable unlocking device or "fishing tool" which may be used with this apparatus is illustrated in U.S. Patent No. 2,764,388 granted September 25, 1956, on an application filed January 29, 1952, by J. M. Camp with attention being directed especially to Figure 7.

As specified above, the present invention is concerned with an improved apparatus for the recovery of objectionable articles from the bottom of the bore hole. The apparatus is particularly characterized by being retractable in that it can be positioned in the bottom of a bore hole and withdrawn without the necessity of pulling the string drill. In essence, the apparatus uses an upflowing aspiration of recycling liquid at the bottom of the bore hole in order to wash or sweep up these undesirable articles to traps or baskets within the apparatus.

What is claimed is:

1. Improved apparatus for removing objects from the bottom of bore holes and designed to be lowered and removed within a pipe string which comprises an upper cylindrical element having ports establishing fluid communication between the inside of said upper cylindrical element and without said upper cylindrical element; means contacting said upper cylindrical element for supporting said apparatus in a well bore; a lower cylindrical element rigidly attached to the lower end of said upper cylindrical element; an upper chamber formed in the upper portion of said lower cylindrical element by an initial partition in the top section of said lower cylindrical element and sealingly engaging the inner wall thereof, a second partition element positioned below said initial partition and sealingly engaging the inner wall of said lower cylindrical element; said upper chamber having outlet ports in the wall thereof; an intermediate chamber in said lower cylindrical element below said upper chamber and formed by said second partition, the walls of said lower cylindrical element and a third partition element positioned below said second partition element and sealingly engaging the walls of the lower cylindrical element; a lower partially enclosed chamber formed in said lower cylindrical element below said intermediate chamber by said third partition, the walls of said lower cylindrical element, and pivoted catcher elements extending outwardly and designed for inward displacement attached at the lower end of said lower cylindrical element; a conduit establishing fluid communication between the upper cylindrical element and said intermediate chamber and non-communicative with said upper chamber, a nozzle extending from said lower chamber into said upper chamber; primary nozzles inclining upwardly through the walls of said nozzle establishing fluid communication between said intermediate chamber and said nozzle, whereby when fluid is sent down the drill pipe, it is directed through the ports of said upper cylindrical element into said upper cylindrical element downwardly through said conduit into the interior of said intermediate chamber, said liquid then being directed upwardly through said primary nozzle into said nozzle aspirating liquid and junk from the bottom of said well bore into said lower chamber upwardly through said nozzle into said upper chamber with the heavy junk objects being dropped in said lower chamber and retained by said catcher elements and the lighter junk objects being entrained in the aspirated fluid and being disposed in said upper chamber with the liquid passing outwardly through said outlet ports in said upper chamber thereby establishing a path of circulation through the lower end of the apparatus.

2. An apparatus for removing objects from the bottom of a borehole comprising a cylindrical element; a first partition element in the top section of said cylindrical element and sealingly engaging the wall thereof; a second partition element positioned below the first partition element and sealingly engaging the inner wall of said cylindrical element, with an upper interior chamber being formed between said first partition element and said second partition element and the walls of said cylindrical element; a third partition element in the lower section of said cylindrical element and sealingly engaging the inner wall thereof, with a lower interior chamber being formed between said second partition element and said third partition element, said first and said third partition elements being spaced intermediate the ends of said cylindrical element with the lower and upper cylindrical element ends opening outwardly above said upper interior chamber and below said lower interior chamber; a first conduit communicating between the lower open end of said cylindrical element and said upper interior chamber, said first conduit being characterized by having a jet passageway for fluid opening thereinto from said lower interior chamber; a second conduit communicating between the upper end of said cylindrical element and said lower interior chamber; port means to discharge fluid from said upper interior chamber to the exterior of said cylindrical element; a series of finger elements disposed in spaced relationship circumferentially of the wall of the lower end of said cylindrical element, with said finger elements mounted for displacement inwardly of said end; and means contacting said cylindrical element for supporting said apparatus in a borehole.

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