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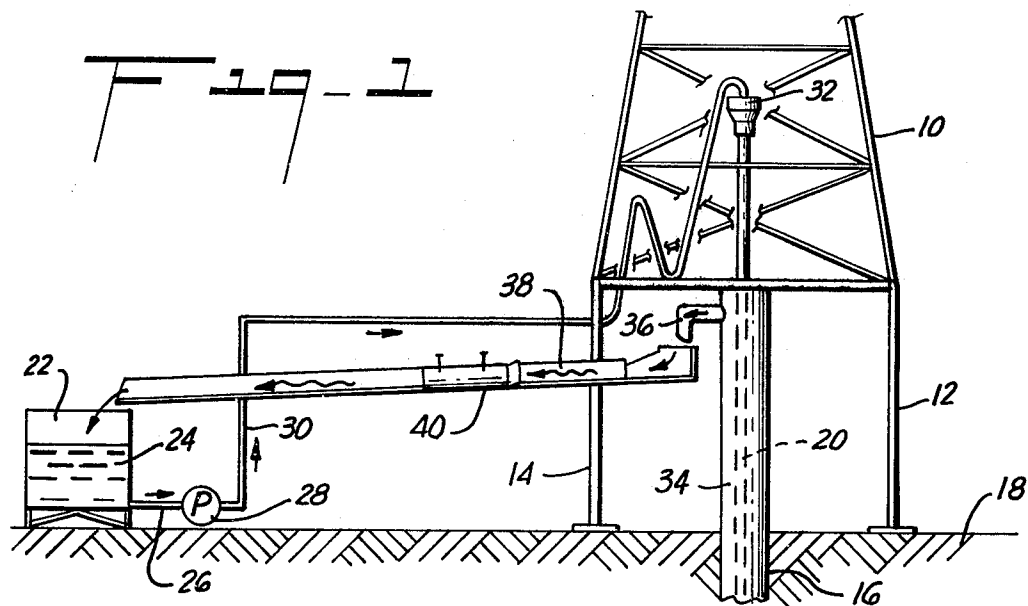
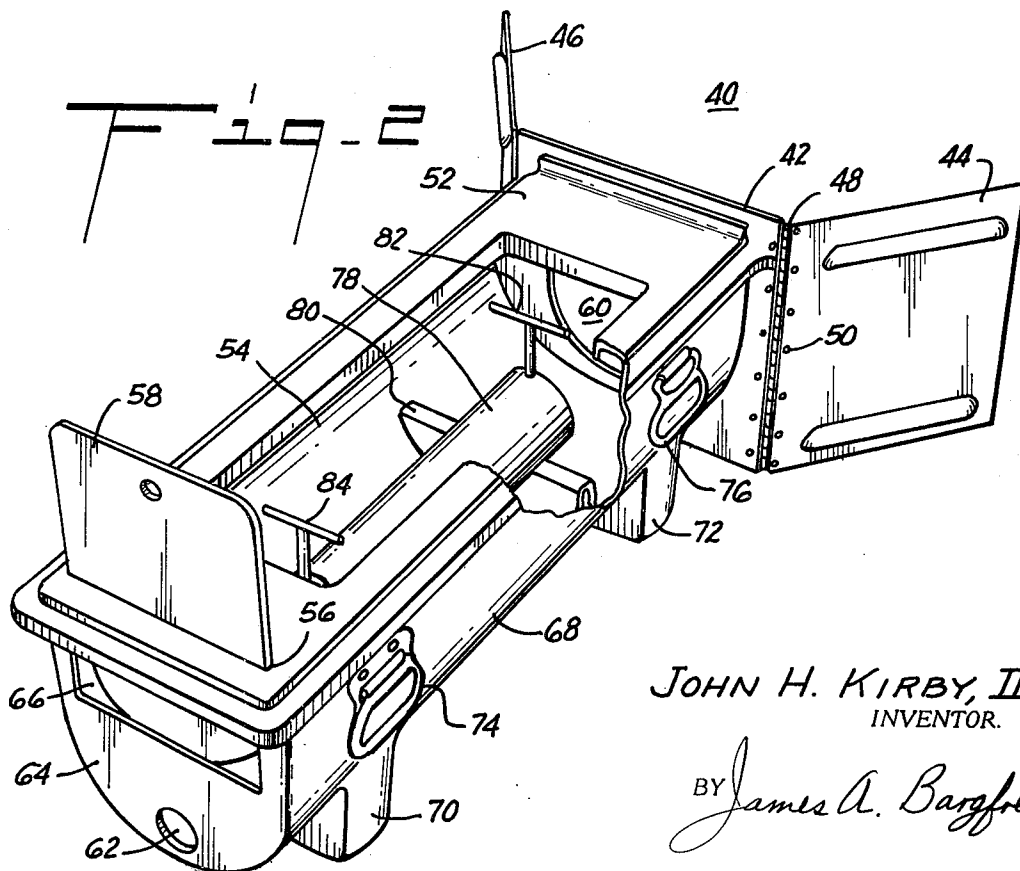
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DITCH MAGNET

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DITCH MAGNET

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1 Claim

ABSTRACT OF THE DISCLOSURE

Apparatus for positioning in the mud circulation system during milling or cutting operations in a well bore thereby removing ferrous particles from such mud circulation system after the mud comes from such well bore.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention is directed to apparatus which is utilized in removing ferrous particles from the mud circulation system utilized during milling or cutting operations performed in a well bore. Known apparatus utilized in removing some of such ferrous particles from the mud circulation system lacks mobility, effectiveness, versatility, and the ability to be transported easily to offshore well locations.

Description of the prior art

Prior art apparatus is available which may be positioned in a mud circulation system during milling or cutting operations performed in a well bore and such apparatus removes some of the ferrous particles which are in the mud circulation system as the mud is removed from the bore hole. However, such prior art apparatus is cumbersome, is not effective in removing all of the ferrous materials which are in the mud circulation system, and the mud flow is not agitated or diverted to allow a maximum volume of mud to be influenced by the magnetic field of the prior art devices. The present invention is directed to apparatus which causes agitation of the mud flow and allows the magnet assembly of the present invention to remove much more ferrous material from the mud flow than is possible with prior art apparatus. The present invention also provides a structure having a better magnetic flux-flow than in prior art apparatus.

Summary of the invention

The present invention provides portable apparatus including a housing for positioning in the mud circulation system utilized when drilling a well. Coupled to the housing are a plurality of hinged doors and the housing has handle means coupled thereto for ease in moving such apparatus from one location to another. Disposed in the housing are a plurality of baffle supports on which a magnetic assembly rests. Such magnetic assembly includes three magnets positioned so that the like polarity poles of two magnets are positioned adjacent each other to provide a strong magnetic flux-flow. The magnets are disposed in a non-magnetic housing which has handle means for ease in removing the magnet assembly from the housing for cleaning accumulated ferrous particles from such magnet assembly. The housing has a slot opening wherein a discharge flow regulating gate may be positioned to control the volume of the mud which passes through such housing.

Brief description of the drawings

In the drawings:

FIGURE 1 is a side elevational view showing a typical mud circulation system utilized while drilling a well with

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the apparatus of the present invention positioned in such mud circulation system;

FIGURE 2 is a perspective, partially cut-away view of the apparatus of the present invention;

FIGURE 3 is a sectional elevational view of the apparatus of the present invention;

FIGURE 4 is a sectional side view of the magnet assembly of the present invention;

FIGURE 5 is a partial sectional end view of the apparatus of the present invention taken along line 5—5 of FIGURE 3; and

FIGURE 6 is a perspective side view of the magnet assembly of the present invention.

Description of the preferred embodiment

Referring now to the drawings in detail, FIGURE 1 shows a typical mud circulation system which is utilized while drilling a well and while milling or cutting ferrous material in a well bore. A derrick structure 10 is positioned on support members 12 and 14 in a manner well known in the art. Surface pipe is set in the surface 18 and drillpipe 20 is positioned within the surface pipe 16.

A mud tank 22 having mud 24 positioned therein acts as a storage facility for the mud utilized in milling or cutting operations. Mud 24 is brought through line 26 to the pump 28 where the mud is brought under pressure through line 30 to the rotary swivel 32 and through the drillpipe 20 to milling or cutting apparatus at the bottom of the well bore. The mud is fed through such apparatus during milling or cutting operations. The mud then is brought through the annulus 34 between the drillpipe 20 and the surface pipe 16 through opening 36 and into trough 38. Disposed in trough 38, which may be positioned to allow gravity flow, is housing 40. As will be explained in detail subsequently, housing 40 contains magnetic means which remove ferrous material from the mud 24 as it flows through trough 38. After the mud passes through the housing 40, the gravity flow allows the mud to return to mud tank 22. It will be appreciated that variations may be made regarding positioning of the various elements shown in the mud circulation system but housing 40 of the present invention is to be placed between the output of mud from the well bore and the mud storage tank. The present invention removes ferrous particles from the mud circulation system prior to passage of the mud through the mud pump 28 thereby minimizing wear on the pump parts.

FIGURE 2 is a perspective side view of housing 40 shown in FIGURE 1. Housing 40 includes an end member 42 having doors 44 and 46. Door 44 may be coupled to end 42 through suitable fastening means 48 which may include hinges and a plurality of rivets such as rivet 50. Door 46 is coupled to end member 42 through similar fastening means.

Doors 44 and 46 are hinged so that the housing 40 may be adapted to various sizes of troughs. Thus, housing 40 may be positioned in mud flow systems of various sizes and various capacities.

Coupled to end 42 is upper member 52 having an opening 54. Member 52 has a slot 56 at one end so that a gate 58 may be positioned in the slot 56 for controlling the quantity of mud which flows in opening 60 and which flows out of opening 62.

Opening 62 is positioned in end member 64 which has an opening 66.

Member 68 is coupled between end 42 and end 64 and member 68 has supports 70 and 72 positioned thereon.

Handles 74 and 76 are coupled on one side of member 68 and similar handles may be positioned on the other side of housing 40 to allow the apparatus of the present invention to be positioned easily in the flow-trough of a mud circulation system.

Opening 54 allows easy removal of magnet assembly 78 for removing ferrous particles which have accumulated on magnet assembly 78.

The magnet assembly 78 rests on two supports or baffles but only one support or baffle 80 may be seen in FIGURE 2. Magnet assembly 78 has handles 82 and 84 positioned on each end of the magnet assembly 78 to allow magnet assembly 78 to be removed from the supports or baffles such as support 80.

It will be appreciated in viewing FIGURE 2 that the apparatus of the invention allows mud to pass through opening 60 over baffles such as baffle 80 and then the mud passes over or near the magnet assembly 78. The mud then flows through opening 62 and the gate 58 controls the volume of mud which passes through the apparatus of the invention.

FIGURE 3 is a sectional side view of the housing 40 of the present invention. Door 46 is shown coupled to end member 42 as explained previously. The mud flow is shown by the arrows and the mud passes over or near magnet assembly 78 as explained previously. The baffle 80 which was explained in connection with FIGURE 2 is visible in FIGURE 3 along with baffle 86. Baffle 88 is positioned between baffles 80 and 86 and causes turbulence in the flow of mud so that magnet assembly 78 acts on as much mud volume as possible thereby removing more ferrous material from the mud flow than has been heretofore possible with known apparatus similar to apparatus of the present invention.

It will be appreciated that baffles 80 and 86 are of a cradle or support type and hold magnet assembly 78 in position while the mud flows under, over and around the magnet assembly 78.

FIGURE 3 shows the manner in which gate 58 restricts the flow of mud through the apparatus of the present invention according to the requirements of a particular mud circulation system. Thus, the present apparatus has great versatility of use in mud circulating systems.

FIGURE 4 is a sectional side view of magnet assembly 78. A non-magnetic housing 90 which may be made from fiber glass encloses three magnets 92, 94 and 96. The three magnets are so positioned that the like polarity poles are near each other. Spacers 98, 100, 102 and 104 are positioned between the magnets and between the non-metallic housing and the magnets. Handles 84 and 82 are positioned on each end of the magnet assembly to allow the magnet assembly 78 to be easily moved.

It will be appreciated in viewing FIGURE 4 that the positioning of the three magnets allows large cylindrical magnets to be utilized and the non-metallic housing 90, which may be of fiber glass provides a better magnetic flux-flow thereby giving a better result because more ferrous particles are removed from the drilling mud.

FIGURE 5 is a sectional end view of the apparatus of the present invention taken along line 5-5 of FIGURE 3. Handle 82 is shown coupled to the magnet assembly 78 which is positioned on support 80. Support 72 is shown in FIGURE 5 and it will be appreciated that the mud flow through the apparatus of the present invention allows the mud to pass within the magnetic field of the magnet assembly to provide maximum removal of ferrous particles from the drilling mud.

FIGURE 6 is a perspective side view of the magnet assembly 78 showing handles 82 and 84 positioned on the ends of the magnet assembly as explained previously.

Thus, the apparatus of the present invention provides improved means for removing ferrous particles from the circulation mud utilized in milling and cutting operations in a well bore. The apparatus of the present invention is characterized by its light weight which enables such apparatus to be easily and inexpensively used in off-

shore operations. The apparatus of the present invention further provides a better magnet flux-flow through utilization of a non-magnetic housing such as Fiberglass for enclosing a plurality of magnets. The apparatus of the present invention is adaptable for use with various size flowtroughs and for mud circulation systems having various capacities.

I claim:

1. A mud circulation system including in combination: a mud storage source, pump means coupled to said source for pumping mud into a well bore, and

magnet housing means positioned between said well bore and said mud storage source for removing ferrous particles from the mud, said magnet housing means including in combination:

an elongated housing having an input opening in one end, an output opening in the other end, a top connected to both said ends, an elongated opening in said top of said housing between said input opening and said output opening, a slot near said top and end near said output opening, and first and second support members on the bottom of said housing, first and second doors hinged about vertical axes and coupled to said housing at the input end,

handle means coupled above said first and second support members on said housing,

a plurality of baffle members disposed in said housing below said elongated opening, and

a magnet combination positioned on said plurality of baffle members, said magnet combination including first, second and third cylindrical magnets each having a south pole and a north pole and aligned to form a single cylinder in which the poles of said second cylindrical magnet are the same as the poles of the adjacent magnets, a non-magnetic housing including first and second ends, enclosing said magnets with a plurality of non-magnetic separators being disposed between said magnets and between said housing and said first and third magnets, and first and second handle means coupled respectively to said first and second ends of said non-magnetic housing whereby the mud passing through said mud circulation system is agitated continuously by passage over said plurality of baffle members to allow said magnet combination to pick up ferrous particles in the mud as the mud comes from the well bore.

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