July 5, 1938. C. M. POTTER 2,122,697

INSTRUMENT CARRIER

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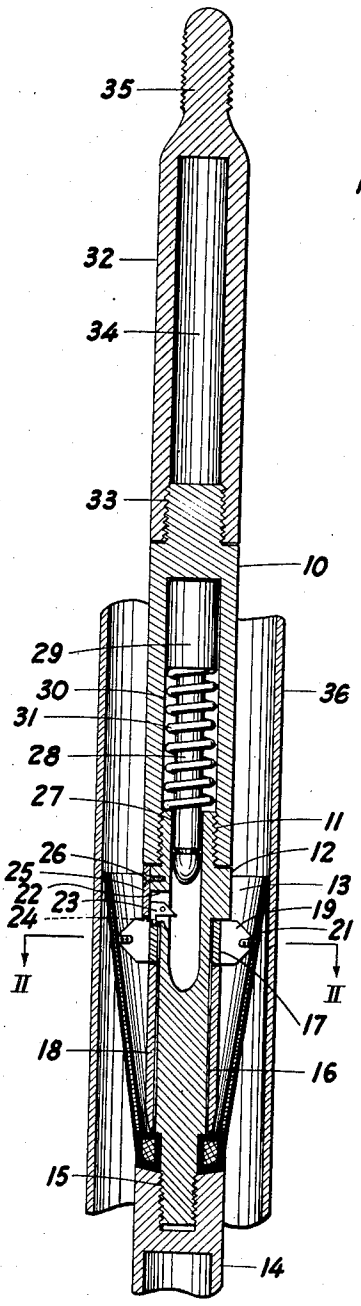


Fig. 1

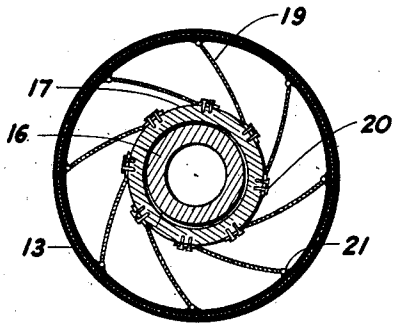


Fig. 2

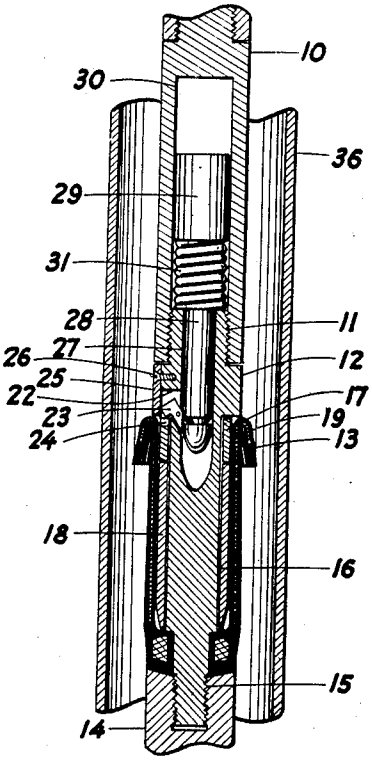


Fig. 3

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INSTRUMENT CARRIER

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6 Claims. (Cl. 33—205)

This invention relates to a carrier for instruments of the type that are sent to the bottom of deep wells for the purpose of determining the pressure, temperature, inclination, and the like, and more particularly relates to a free carrier that is impelled to the bottom of the well under the action of a fluid pumped downwardly through a pipe, and thereafter returns by its own buoyancy, as distinguished from one which is lowered at the end of a wire or cable and is subsequently raised thereby.

In the drilling of deep wells it is the practice to use a hollow stem or drill pipe to support and turn the drill bit. Fluid such as water or mud is pumped downwardly through the drill pipe, to cool the bit and wash the cuttings back up to the surface. Instruments for determining inclination of the drill hole, for example, are usually sent down the bore of the drill pipe at the end of a wire or cable and, after a suitable time, withdrawn to the surface and observed. Under certain circumstances, the introduction of such wires or cables is hazardous and objectionable. An alternative that is sometimes followed is to secure the instrument in a section of the drill pipe, immediately above the bit, which requires removal of the entire string of pipe before the instrument can be taken out and read.

It is an object of this invention to provide a free carrier for an instrument which is to be sent down a well, which is adapted to be positively carried down by the circulating fluid in the drill pipe, and which will be equally positively returned to the surface by virtue of its construction and inherent buoyancy in the fluid.

Another object is to provide a carrier that will automatically be actuated when it arrives at the bottom of the drill pipe, so that it will be in condition to return to the surface.

Another object is to provide a buoyant carrier with means for initially overcoming its buoyancy so that it may be sent down a drill pipe with the circulating fluid, and thereafter be actuated to cause it to return to the surface of its own accord.

Another object is to provide an improved means for positioning and selectively actuating a collapsible packer on a device of this nature.

These and other objects and advantages will be more fully apparent from the following description and from the accompanying drawing, which forms a part of this specification and illustrates a preferred embodiment of this invention.

In the drawing:

Figure 1 is a vertical sectional view of a carrier embodying this invention, with the packer in expanded position and ready to be sent down the drill pipe.

Figure 2 is a horizontal sectional view on the line II—II of Figure 1, and illustrates the arrangement of the packer skirt and expander therefor.

Figure 3 is a vertical sectional view of a portion of the carrier shown in Figure 1, but with the packer in its closed or collapsed position.

Referring to the drawing and particularly to Figure 1, the reference number 10 represents the body of the carrier threaded at 11 onto the mandrel 12 which carries the packer 13. Packer 13 is preferably of a molded flexible material such as vulcanized rubber and is clamped between the lower end of mandrel 12 and base 14 as by the threaded connection 15. Base 14 may terminate at its lower end in a spring or other shock absorbing device to prevent too great shock to the instrument under conditions to be described below.

Mandrel 12 is provided with a reduced diameter 16 for a portion of its length, and at the upper end of this reduced diameter portion a rotatable latch ring 17 is positioned by means such as a spacing sleeve 18. Packer expanding means such as a plurality of tangentially arranged flat springs 19 are secured at one end to the outer surface of ring 17 as by screws 20 and are secured at the other end to the skirt of packer 13 as by the hinged brackets 21. Springs 19 are biased to collapse the packer 13 to the closed position shown in Figure 3, and in order to do so must first rotate latch ring 17 in a clockwise direction relative to packer 13, from the position shown in Figure 2. Conversely, if latch ring 17 is rotated counterclockwise with respect to packer 13, the skirt of packer 13 will be expanded outwardly to the open position shown in Figure 1.

In order to secure latch ring 17 in the open position of Figure 1, mandrel 12 is provided with a slot 22 in which is pivoted a pawl 23, the outer end of which is adapted to be received in a notch 24 in ring 17. A cover plate 25 may be secured over slot 22 and pawl 23 as by a screw 26. The inner end of pawl 23 extends into a bore 27 in mandrel 12, in which bore the stem 28 of an inertia member 29 is adapted to move. The main body of inertia member 29 is received in a bore 30 in the carrier body 10 and is normally held in the upper position shown in Figure 1, as by spring 31.

An instrument carrying section 32 is secured to the top of body 10 as by the threaded connection 33, and is provided with a chamber 34 into which any suitable surveying instrument may be placed. A short threaded stub 35 is preferably provided on top of section 32 so that a fishing tool may be used to recover the carrier should it become stuck in the drill pipe.

The body 10, mandrel 12, base 14 and instrument section 32 are preferably made of a very light metal alloy such as an aluminum or a magnesium alloy, in order that the whole assembly will be buoyant in the mud or circulating fluid. To this end, the base 14 may be hollow for a portion of its length.

In operation, the skirt of packer 12 is pulled outwardly until latch ring 17 is turned counterclockwise to the position shown in Figure 1, whereupon the outer end of pawl 23 will engage notch 24 in ring 17 and hold it in that position, with the packer 13 expanded. The carrier, with the instrument in place in chamber 34, is then placed in the drill pipe 36 in the usual manner and is pumped down with the circulating fluid, the expanded packer serving to assist in the operation by sealing the space between the drill pipe 36 and the carrier body.

As soon as the carrier strikes the bottom of the drill pipe, which is closed by the drill bit, except for one or two small fluid passages, the inertia member 29 will move downwardly relative to the carrier body so that stem 28 will strike the inner end of pawl 23. This will release ring 17 so that springs 19 will collapse the packer 13 to the position shown in Figure 3. Continued pumping of circulation fluid will assist the rim of the packer 13 to fold downwardly, as shown, and will also serve to hold the carrier at the bottom of the drill pipe until the normal operating or recording period of the instrument has elapsed. As soon as the pumping is stopped, the carrier, by virtue of its positive buoyancy, will rise to the surface and can then be removed from the drill pipe in the normal manner.

Although a specific construction embodying this invention has been described and illustrated, it is to be understood that the invention is not limited to that specific device, and all such modifications and changes as come within the scope of the appended claims are embraced thereby.

I claim:

1. An instrument carrier adapted to be pumped down a drill pipe with a circulating fluid, comprising a buoyant body, a flexible packer secured to said body, a rotatable ring on said body, spring means connecting said packer with said ring, a latch for said ring to hold said packer in expanded position and means associated with said body and adapted to release said latching means to retract said packer when said body reaches the bottom of said pipe.

2. An instrument carrier according to claim 1 in which said last named means comprises an inertia member carried by said body and movable with respect thereto, and said latching means comprises a pawl adapted to be contacted by said member when said body reaches the bottom of said pipe.

3. An instrument carrier adapted to be pumped down a drill pipe with a circulating fluid, comprising a buoyant body, a flexible packer secured to said body, a rotatable ring on said body, spring means connecting said packer with said ring and adapted to urge said packer to a collapsed position, an inertia member slidably mounted in said body, and a pawl for holding said ring in position to expand said packer, said member being normally restrained from contacting said pawl but adapted to release it when said body strikes the bottom of said pipe.

4. An instrument carrier adapted to be pumped down a drill pipe with a circulating fluid, comprising a buoyant body, a flexible extensible packer carried by and surrounding said body, a movable ring on said body, means connecting said packer with said ring, and releasable latching means in said body for holding said ring in a position to maintain said packer in its extended position, said latching means comprising an inertia member carried by said body and movable with respect thereto, said inertia member so constructed and arranged as to actuate said latching means when said body reaches the bottom of said pipe.

5. An instrument carrier according to claim 4 in which said movable ring is rotatable to expand said packer and to contract the same.

6. An instrument carrier adapted to be pumped down a drill pipe with a circulating fluid, comprising a buoyant body, a flexible extensible packer carried by and surrounding said body, a rotatable ring on said body, means connecting said packer with said ring to rotate said packer and wrap it about said body, and releasable latching means in said body for holding said ring in a position to maintain said packer in its unwrapped extended position.

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