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APPARATUS FOR SUBMARINE GEOPHYSICAL PROSPECTING

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Fig. 1.

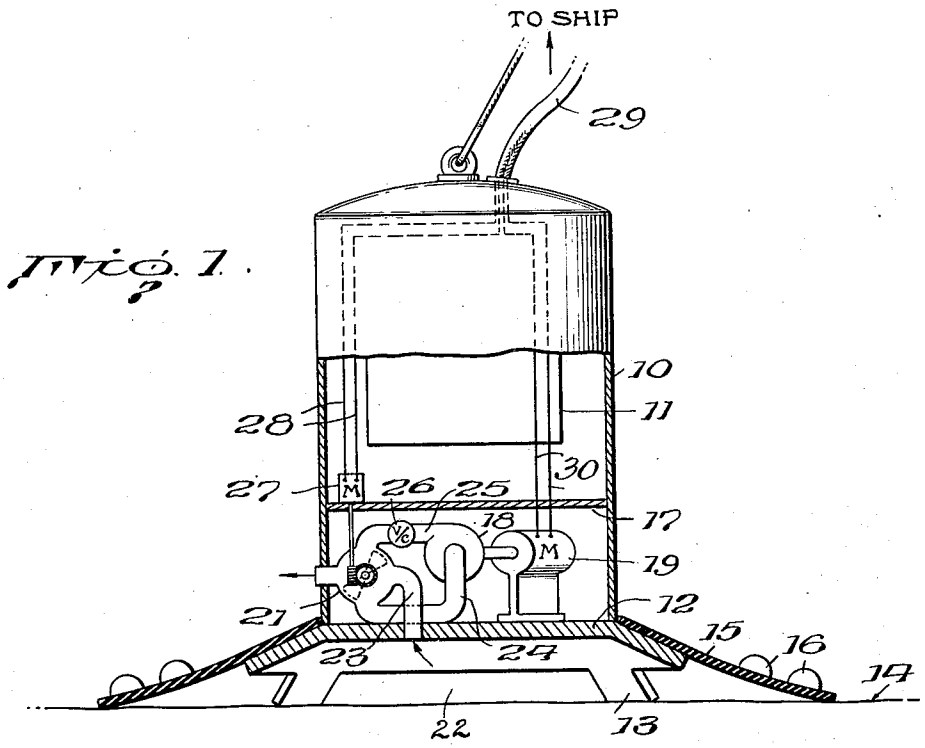
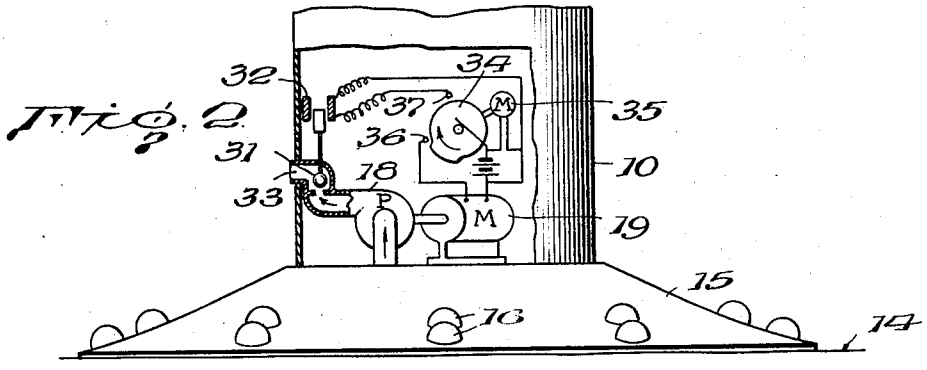


Fig. 2.



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APPARATUS FOR SUBMARINE GEOPHYSICAL PROSPECTING

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4 Claims. (Cl. 265—1.4)

This invention relates to apparatus for submarine geophysical prospecting.

This application is a continuation in part of my copending application Serial No. 388,889 filed April 16, 1941, which is in turn a continuation-in-part of my application Serial No. 284,980 (Patent 2,253,472).

It is sometimes desirable to conduct geophysical explorations in territory covered by shallow seas, as oil is known to occur on the continental shelf of this and other continents. Some types of geophysical apparatus, notably gravimeters, must be solidly positioned with respect to the earth and must be very accurately leveled. Difficulty in achieving these ends has limited underwater geophysical exploration.

In the present invention, means are provided for holding such apparatus firmly and solidly against an ocean floor, even though the floor is soft, and though currents are present.

According to the invention there is provided a suitable water-tight container, to hold an instrument, and having a base arranged in effect as a giant, flexible suction cup or sucker. Means are provided, operable by remote control (from a ship) or by a time switch control associated with the container, for partially exhausting the space below the base whereby the apparatus is held down firmly by hydrostatic pressure. Means are provided for releasing the pressure when desired.

In the accompanying drawing there are shown diagrammatically two examples of specific embodiments of apparatus within the purview of the invention. In the drawing,

Fig. 1 is a view partly in vertical section and partly in elevation of one construction, making use of separate pressure-holding and intake-exhaust valves, and

Fig. 2 is a view of a modification employing a single valve.

Referring to Fig. 1, a water-tight container 10 is provided, of any suitable design and construction, adapted to contain a geophysical instrument 11, such as a gravimeter, movably mounted by means not shown for leveling under a suitable control, not shown. Suitable mounting and leveling means are disclosed and claimed in my copending application Serial No. 388,889 and Patent No. 2,253,472. The container is fitted with a flared base 12, advantageously of steel or other suitable metal, having feet 13, conveniently three in number, adapted to rest on an ocean floor 14 or to sink into it if it is soft.

The base is surrounded with a frustoconical skirt or apron 15, advantageously of rubber or other suitable flexible water-tight material, adapted to make contact with the floor as shown, forming a large suction cup. The skirt is attached to the base by vulcanizing or any other suitable means. Weights 16 hold the skirt down initially. For use on smooth bottoms the skirt does not need to be of flexible material.

Container 10 is partitioned at 17 and in the space below the partition is mounted a pump 18, driven by a motor 19, and connected with a two-way valve 21 adapted in one position to connect the space 22 below the base with the pump intake, through conduits 23 and 24, and to connect the pump outlet to the outside through a conduit 25 containing a check valve 26. In its other position the valve reverses these connections so that the pump can draw water from outside and deliver it to space 22.

Valve 21 is operated by a motor 27 which may be electrically controlled from a ship (not shown) through power leads 28 contained in a control cable 29, or if desired, controlled by a time switch, as will be described in connection with Fig. 2.

In operation, valve 21 being in the position shown, motor 19 is operated, through power leads 30, to partly evacuate space 22. Leads 30 and 28 go to a suitable source of power, controlled by switches, on the ship (not shown). Valve 26 holds pressure when the motor stops. After the measurement has been made valve 21 is turned and the pump started up, to deliver sea water to space 22. If the pump is of centrifugal type it need not be operated at this stage; the water simply flows through its clearances.

In Fig. 2 a single valve 31, operated by a solenoid 32 is employed, in a conduit 33 leading from the pump to outside. On operating the pump, space 22 is partly exhausted, after which the valve serves as a check valve to hold pressure, until opened by energization of the solenoid.

Valve 31 and the pump motor can be operated from a ship as in Fig. 1, or by means of a time switch as shown in Fig. 2. As shown, a contactor 34, rotated at slow uniform rate by a motor 35, first closes a battery circuit at 36 to operate the pump motor long enough to partly exhaust space 22. Then, after a predetermined time, long enough for the measurement to be completed, the contactor closes a circuit at 37 which causes the valve to open and stay open long enough for equalization of pressure in space 22.

What I claim is:

1. In apparatus for performing measurements

at the floor of bodies of water, a submersible watertight container adapted to contain a measuring instrument, cable means attached to the container for lowering it to the floor, a concave base for the container constructed and arranged to define therebelow a space between the base and the floor, a suction pump associated with the container having an inlet communicating with said space and an outlet delivering to the water outside the container, and power means for driving the pump.

2. In apparatus for performing measurements at the floor of bodies of water, a submersible watertight container adapted to contain a measuring instrument, cable means attached to the container for lowering it to the floor, a base for the container having downwardly projecting portions adapted to support the container on said floor, an annular flexible skirt secured in watertight relation to the periphery of the base and of concave shape so as to define, in cooperation with said base, a space between the base and the floor, weights on the skirt to bend it downwardly, conduit means connecting said space and the water outside the container, a suction pump in the conduit means, power means for driving the pump, and electrically controlled means for starting and stopping the power means.

3. In apparatus for performing measurements at the floor of bodies of water, a submersible watertight container adapted to contain a measuring instrument, cable means attached to the container for lowering it to the floor, a concave base for the container constructed and arranged to define therebelow a space between the base and the floor, a suction pump associated with the container, conduit means connecting the pump to the said space and leading from the pump outlet to the surrounding water, power means for actuating the pump, valve means in said conduit means adapted in one position to establish communication between the pump outlet and the surrounding water and in another position to dis-establish said communication, and means for actuating said valve means.

4. In apparatus for performing measurements at the floor of bodies of water, a submersible watertight air-filled container adapted to contain a measuring instrument, cable means attached to the container for lowering it to the floor, a concave base for the container constructed and arranged to define therebelow a space between the base and the floor, conduit means leading from the said space to the surrounding water adjacent the casing, a suction pump in said conduit means, power means for actuating the pump, check-valve means in the conduit so constituted as to close against pressure of the surrounding water, and power means adapted on actuation thereof to open the check-valve means against said pressure.

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