April 26, 1966 L. MACARDIER 3,247,674

FLOATING DEVICE FOR THE LAYING OR RAISING OF A SUBMARINE CABLE OR PIPE

Filed July 7, 1961 2 Sheets-Sheet 1

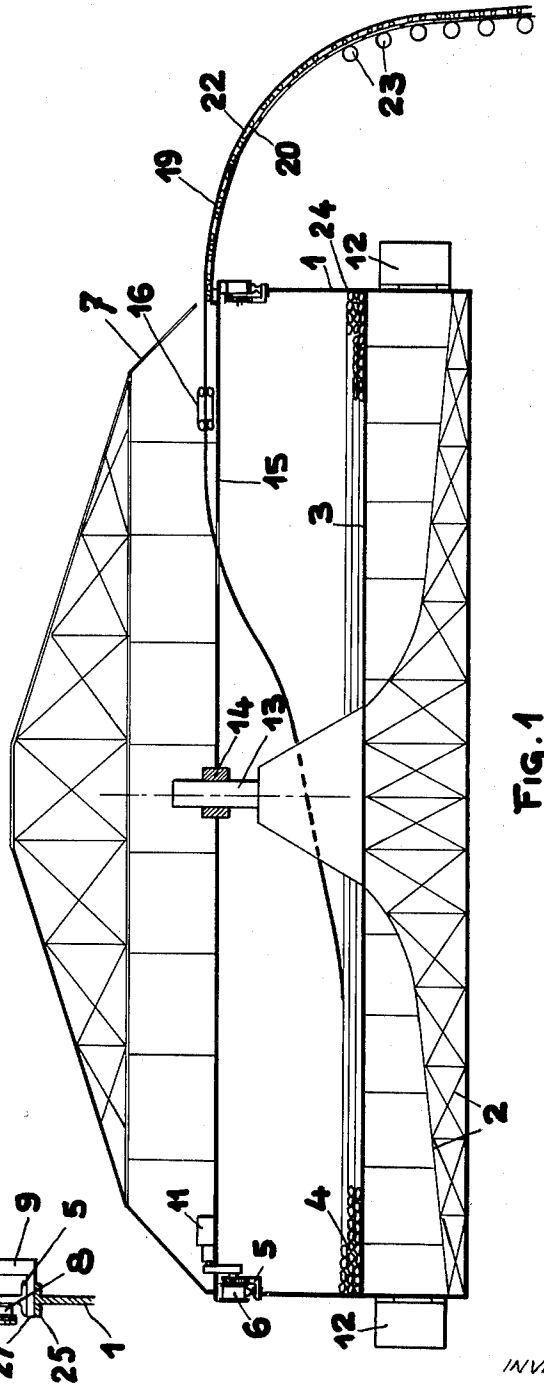

FIG. 1

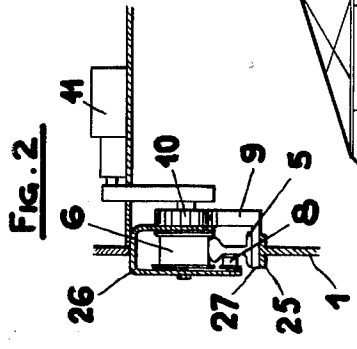

FIG. 2

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FIG. 4

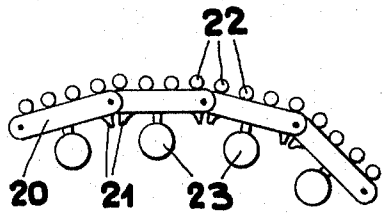
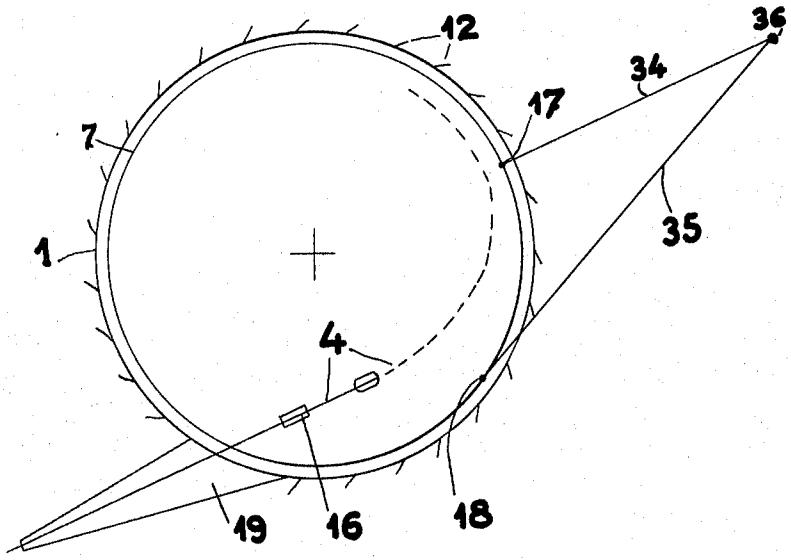


FIG. 3



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3,247,674

FLOATING DEVICE FOR THE LAYING OR RAISING OF A SUBMARINE CABLE OR PIPE

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7 Claims. (Cl. 61—72.3)

It has already been proposed, in order to make possible coupled movements of vertical translation and of rotation of electrical cables to arrange said cables in a cylindrical floating tank adapted to rotate around a vertical axis and to slide vertically with respect to this axis.

The object of the present invention is to provide a device of this kind intended for the laying or raising of a submarine cable or pipe. This device is characterized in that it comprises a dome mounted upon a drum which is rotatable with respect to the dome. The dome may have a central bearing through which the shaft of the floating drum passes. The drum has peripheral members making it possible to cause or to check the rotation of the drum in relation to the dome.

The attached drawings represent, by way of example, a possible embodiment of the device according to the invention.

FIG. 1 is a view of the device in vertical cross-section along the axis of the drum, FIG. 2 is a view of part of FIG. 1 on an enlarged scale, FIG. 3 is a schematic plan view of the whole device, and FIG. 4 is a view of a part of the guide-track of the cable or pipe.

In these figures, a drum **1** in the form of a revolving cylinder having a vertical axis of rotation **13** is provided with a horizontal floor **3** which is securely sealed to the inside wall of the drum **1** along an impervious sealing line **24** on the inner surface of the drum. A plurality of web members **2** are arranged within the drum **1** in diametrical planes forming a supporting truss, which insures the rigidity of the drum **1**. The drum **1** is open at the upper portion and as shown in FIGURE 2 is terminated by an annular edge **25** with T-shaped cross-section, and supporting an annular rail **5**. Mounted on drum **1** is a dome **7** having a central bearing **14** in which the shaft **13** is adapted to rotate. The diametrical cross-section of the lower edge **26** of the dome is in the shape of an inverted U. In this edge **26**, a certain number of rollers **6** are mounted, adapted to run on the rail **5**. A vertical annular toothed rack **9** is supported by a horizontal ring **27** inserted between the edge **25** of the drum **1** and the rail **5**. Toothed rollers **10** mounted along with the rollers **6** are adapted to mesh with this rack. A mechanical or electrical device **11** arranged entirely on the floor **15** of the dome **7** makes it possible to exert either a driving force or a braking force on the toothed rollers **10**, and consequently to cause the drum **1** to rotate in relation to the dome **7** or on the other hand to check its rotation.

A plurality of fins **12** are fixed on the drum **1**, below the line of the water, and are capable of being oriented so as to co-operate in the braking of the rotation of the drum. These fins could be wholly or partially replaced by propellers with axes tangential to the drum, making it possible to exert on the latter a torque or braking action. A plurality of rollers **8** are fixed on the outer walls

of the dome **7** in rolling engagement against the core of the rail **5** so as to prevent the dome **7** from rising above the drum **1**, and also, with the shaft **13**, to contribute to the good centering of the drum **1** in relation to the dome **7**.

The toothed rack **9** could also be arranged outside and not, as shown, inside the rail **5**. The shaft **13** and the bearing **14** could if necessary be eliminated.

A caterpillar drive **16** is situated on the floor **15**, and through this caterpillar drive the cable **4**, to be laid or raised, is passed. It can be actuated so as to co-operate with the toothed rollers **10** in the driving or, vice versa, braking of the cable.

On leaving the dome **7**, the cable **4** passes on an articulated track **19** fixed to the dome. As the laying of the cable progresses, as shown in FIG. 3, the drum **1** rotates clockwise due to the force exerted on the coiled cable by the weight of the cable already laid. Its rotation would cause the rotation of the dome **7** if the latter were not held; however, the dome **7** is secured to and is kept at a constant distance from the tug boat by a first rope **34** going from a point **36** belonging to the ship, to a fixed point **17** of the dome and is kept stretched by the displacement of the point **36** in a direction opposite to that of the drum **1**. A second rope **35** runs from the point **36** to the point **18** on the dome, and prevents the latter from rotating.

FIG. 4 is a schematic representation of the guide track of the cable. This track consists of articulated elements **20** each carrying on its top surface live rollers **22** over which the cable passes, and, in the vicinity of the two ends of its lower surface, stops **21**, which prevent the radius of curvature of the guide track from falling below a minimum radius, in practice the minimum radius of coiling in the drum **1**. Closed floats **23** are arranged below the water-line, and into which more or less water can be admitted according to the weight of the cable to be laid. When laying takes place in shallow water, the cable, in striking on the sea bed, only drags a few floats below the level of the water, and the guide track consequently remains horizontal over nearly its entire length.

The operation of the device is believed apparent from the above description. For example, to lay a submarine cable, drum **1** and dome **7** are towed by a tugboat or similar vessel in a direction indicated by rope **34** in FIGURE 3. Motor **11** is actuated to rotate drum **1** clockwise so that cable **4** unwinds itself onto guide track **19** and is progressively immersed beneath the surface of the water and laid upon the ocean bed. The traction exterted by cable **4** is also effective to turn drum **1** clockwise. Rope **35** prevents dome **7** from turning clockwise along with drum **1** and dome **7** does not rotate. In order to slow down the rate of uncoiling of cable **4**, the rotation of drum **1** may be braked either by means of opening fins **12** to impede rotation, or by slowing down motor **11**.

In order to raise a submarine cable, fins **12** are closed against the surface of drum **1** so that they cease to cause turbulence and impede rotation, and motor **11** is actuated to cause counterclockwise rotation of drum **1** so that the cable will be lifted up and coiled within the drum upon floor **3**.

What I claim is:

1. Apparatus for laying or raising a submarine cable or the like, comprising a floating drum having means for

supporting a cable in coiled form therein, a dome provided with means to allow passage of the cable, said dome being rotatably supported on said drum so as to permit rotation of said drum relative to said dome about a vertical axis, means connected to said dome for preventing rotation thereof, means in said apparatus for causing relative rotation between said dome and said drum, and means for regulating the rate of rotation of said drum relative to said dome.

2. Apparatus as defined in claim 1, wherein said means to regulate the rate of rotation of said drum include a plurality of water-engaging adjustable fins disposed around the periphery of said drum.

3. Apparatus as defined in claim 1, wherein said dome is rotatably supported on said drum by support means including peripheral guide rail means secured to said drum and roller means secured to said dome and engaging said rail.

4. Apparatus as defined in claim 3, wherein said supporting means further comprises a central vertical shaft secured to said drum and received within bearing means secured to said dome.

5. Apparatus as defined in claim 3, wherein said means to regulate the rotation of said drum include a toothed annular rack positioned adjacent to said guide rail means and motor driven toothed rollers cooperating with said rack.

6. Apparatus as defined in claim 3, further comprising a cable guide track attached to said dome provided with float means and adapted to extend into the water during operation.

7. Apparatus for laying a submarine cable or the like, comprising a rotatable essentially annular drum capable of floating in water, an essentially annular dome freely rotatably mounted on said drum for rotation of said drum about a vertical axis and provided with means to receive and allow passage of the cable therethrough, means within said drum for supporting the cable in the form of a coil, cable driving means operatively connected with said dome for driving said cable out of said drum through the means in said dome, means connected with said dome for preventing rotation of said dome, and means in said apparatus for regulating the rate of rotation of said drum to vary the rate at which said cable is laid.

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