Nov. 17, 1953 M. GALIN 2,659,549

CABLE-FEED MECHANISM FOR CABLE SHIPS

Filed July 1, 1950

FIG. 1.

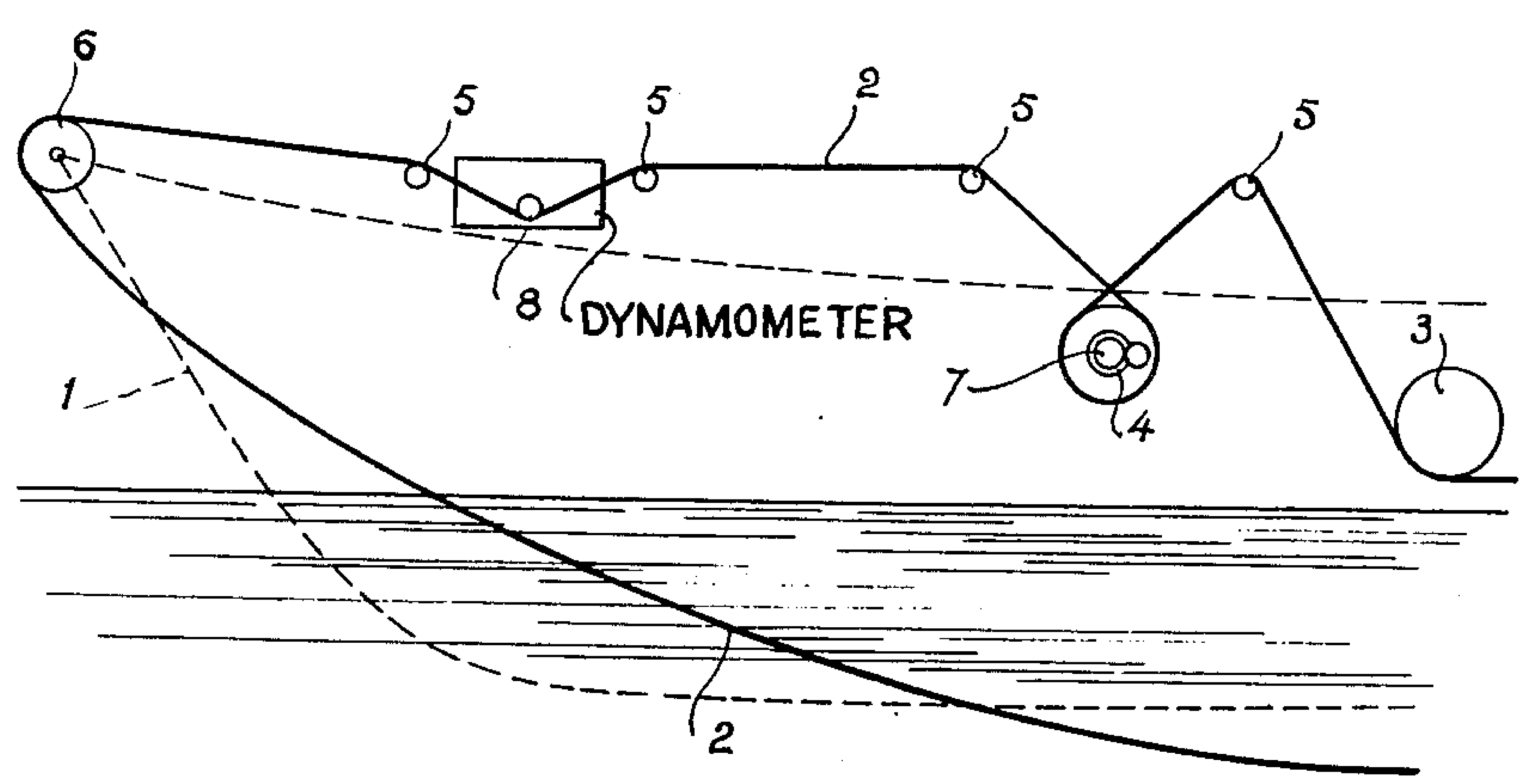
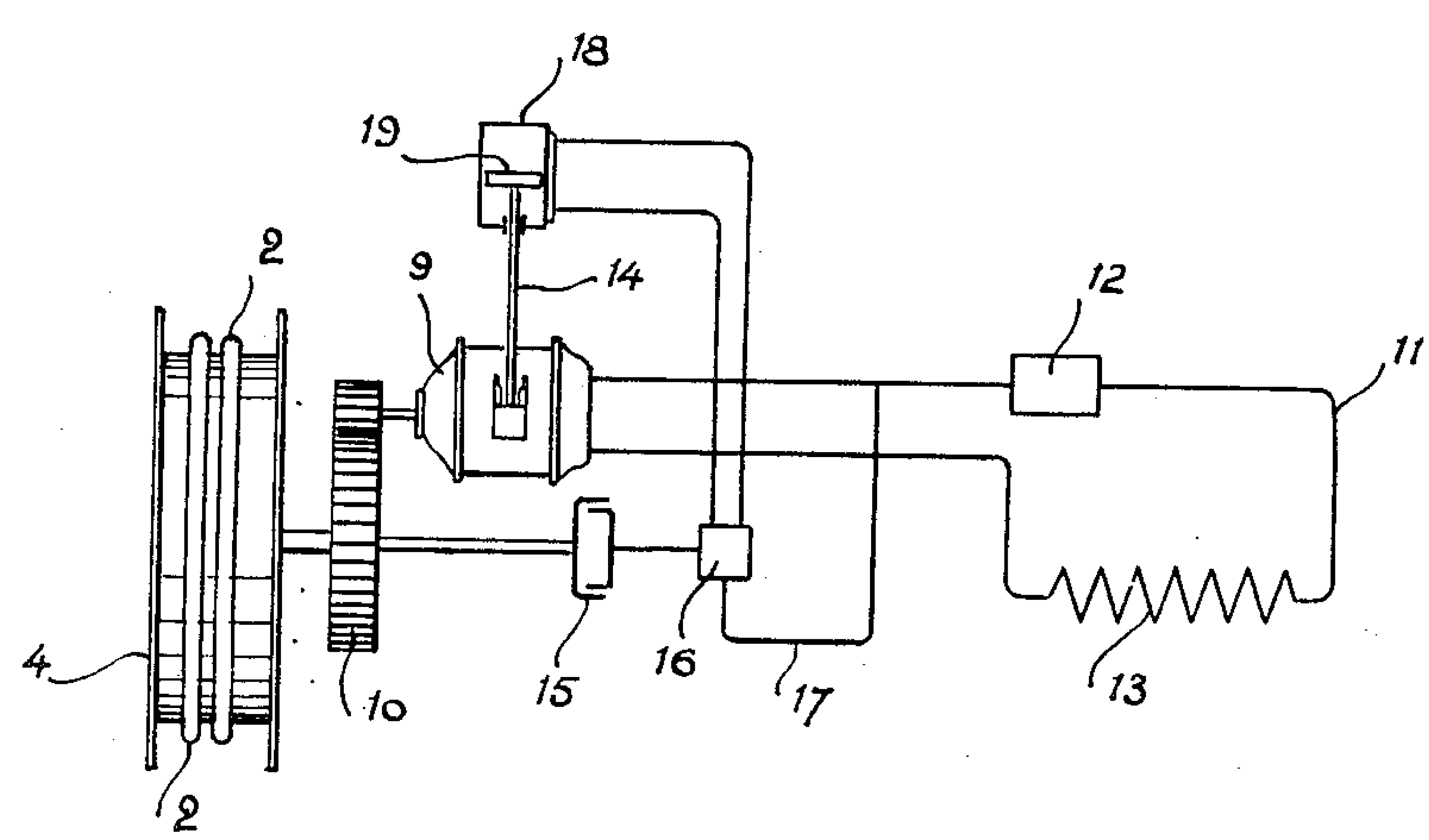


FIG. 2.



INVENTOR
Marc Galin
By George H. Corey
ATTORNEY

Patented Nov. 17, 1953

2,659,549

UNITED STATES PATENT OFFICE

2,659,549

CABLE-FEED MECHANISM FOR CABLE SHIPS

Marc Galin, Le Canet-Marseille, France, assignor to Etablissements Paul Duclos, Le Canet-Marseille, France, a corporation of France

Application July 1, 1950, Serial No. 171,677

Claims priority, application France August 23, 1949

3 Claims. (Cl. 242—155)

This invention relates to improvements in the mechanism for feeding or unwinding cables on board ships used for laying submarine cable.

In cable ships a mechanism is provided for unwinding the cable as the ship advances. This mechanism usually comprises a cable-drum provided with brake means and is generally so contrived as to impart a substantially constant tension to the cable.

However, quite serious difficulty is encountered when it is desired to maintain a constant tension on the cable regardless of the many and sundry hitches that inevitably occur during a cable laying operation. This is especially true when the ship has considerable pitching motion or further when a deep change of level occurs in the ocean bottom over which the cable is being laid.

The ship's pitching movements, and changes of level in the ocean bottom, both result in considerable variations in the rate of feed of the cable, producing inertia stresses which exert considerable influence of the tension to which the cable is subjected.

In the case of the ship's pitching, such stresses are substantially proportional to, and of opposite direction from, the amplitude of the pitching motion responsible for them, that is, the elongation or deviation of the ship from the horizontal plane.

Where a change of level occurs, an increase in the rate of feed of the cable results and every change in the gradient of the ocean bottom brings about a substantial stress due to inertia. Most troublesome however are sudden variations in depth, such as occur when an ocean deep is encountered, because such variations or drops in level cause the cable to unreel suddenly by a length equivalent to twice the vertical extent of the drop, with resulting inertia stresses of considerable magnitude, which would quickly attain dangerous values unless they are taken up by adequate brakage.

The variations in cable tension due to variations in the rate of cable feed are usually avoided by providing the cable drum with a variable-braking device. The braking action is controlled manually or automatically with regard to the variations in cable feed, or preferably as a function of the acceleration of the cable, that is to say as a function of the actual cable tension resulting from such variations.

Hydraulic braking has already been suggested as the best suited for this purpose, the braking effect being produced by the resistance of a pump

associated with the cable drum and arranged to exert a variable resistance corresponding with the variations in tension of the cable.

To take up such variations, the solution advocated in the past was to use a pump having a constant cylinder capacity and variable delivery pressure, by means of which the braking stress could be made to vary through control of the delivery pressure of the pump.

This variation in the delivery pressure may be achieved by adjusting the bias load of a valve interposed on the delivery of the pump. This method however lacks accuracy, requires complicated structure to carry it into practice and is hard to work. For these reasons it has never been much used.

It is generally preferred to use a variable restriction interposed in the circuit of the volume-pump, and adapted to create a variable resistance and consequently a variable pressure of the fluid delivered by the pump and thus a variable braking force, which can be made to correspond with the variations in the pull of the cable. This solution while simpler than the first-mentioned one, is not however without its serious shortcomings. The resistance opposed by the restriction to the flow of fluid, the rate of flow of which is adjusted in accordance with the speed of the ship (which normally is the same as the rate of feed of the cable) depends on that speed. Consequently, the adjustment of the pressure which controls the braking force should be made in correlation both with the tension of the cable and with the speed of the ship. This results in complication and lack of safety.

My present invention has for its object to provide a method and means for braking the feed of the cable whereby the above drawbacks are averted and whereby the braking force may be made to correspond accurately with the instantaneous tension of the cable, thus providing instant compensation for any variation in said tension in order to achieve a substantially constant tension regardless of any irregularities encountered in the process of cable-laying.

According to the invention, the rate of feed of the cable is controlled or braked by means of a pump having a variable cylinder capacity delivering fluid at constant pressure. The braking stress is controlled by acting upon the cylinder capacity rather than upon the delivery pressure of the pump. The cylinder capacity is adjusted to correspond at each instant with the tension of the cable, thus compensating for any variation in said tension in a direct and immediate manner.

The result is an accurate adjustment which is independent of the speed of the ship. The operation requires reduced muscular exertion and the necessary equipment is simpler and less expensive.

The arrangement according to the invention lends itself to the provision of automatic adjustment, in which the cylinder capacity is controlled by means of an accelerometer driven from the cable drum. The accelerometer is responsive to variations in the rate of feed of the cable, i. e. to accelerations, and therefore to the inertia stresses to which the cable is subjected, and is made to control through any suitable means which may be mechanical, hydraulic or electrical in character, the instantaneous rate of flow of the pump, the braking force developed by which will accordingly be varied in a manner directly corresponding to the cause which is to be compensated for.

The accompanying drawings diagrammatically illustrate one form of embodiment of the invention, given by way of a nonrestrictive example.

Fig. 1 is a general view of the cable feed mechanism.

Fig. 2 is a diagram of the braking device.

In the cable ship indicated by its outline 1, the cable 2 unwound from the cable drums 3 arranged in the cable-tank, is wound around the unreeling or feed drum 4. Thence it is led over a set of rollers 5 to the davit 6 arranged at the bows of the ship at the upper part of the stem, from which it runs down into the sea.

It is the drum 4 which controls the rate of feed of the cable by means of a braking device diagrammatically indicated at 7. The braking force must be so adjusted as to maintain the tension of the cable, as measured by dynamometer 8, at a constant value.

The braking device comprises a pump 9 of the variable cylinder capacity type driven by the drum 4 (Fig. 2) through the medium of a reducer gear 10. The pump 9 operates in a closed circuit 11. This circuit includes a constant pressure valve 12 and a cooler 13 for dissipating the heat from the fluid under pressure.

The variable delivery or displacement pump 9 may advantageously be of the rotary type having radial or axial pistons, in which the displacement per revolution is controlled by altering the setting of the pistons relatively to a fixed distributor. However, any other suitable type of variable delivery or variable displacement pump may be used.

The adjusting system of the pump 9 may be controlled from a control rod 14, thereby controlling the pump's cylinder displacement, while the pressure of delivery is maintained constant by the valve 12.

The arrangement allows of manual control, wherein the rod or lever 14 is actuated in accordance with the variations in tension of the cable 2. In practice, it is somewhat difficult for the operator to discern with clearness the variations in acceleration, and it will be sufficient if he keeps to the indications supplied by the dynamometer 8 to make the necessary maneuvers.

However, one of the chief advantages of the braking system according to the invention is the simplicity with which it lends itself to automatic operation. Thus, the delivery adjusting member 14 of pump 9 may be controlled from the variations in tension of the cable as measured by the dynamometer 8 and acting through a transmission at an appropriate distance.

A more desirable method will consist of controlling the pump through the variations in the rate of feed of the cable. For this purpose, an accelerometer 15 is provided connected for movement with the drum 4, and the movable or responsive element of the accelerometer is made to control the adjusting member 14.

In the form of embodiment of Fig. 2, the accelerometer is of the inertia-acting type, for instance a structure of a type similar to the dampers used to damp vibrations in internal combustion engines.

The movable or responsive member of the accelerometer 15 actuates a distributor 16 which communicates through a pipe 17 with the delivery of the pump 9.

The distributor controls the intake of liquid under pressure into a cylinder 18 in which a piston 19 is movable. The piston 19 carries a piston rod 14 which actuates the eccentric displacement adjusting ring of the pump 9.

The accelerometer 15 is driven from the drum 4, as stated, and detects any variations in acceleration to which the cable 2 may be subjected. Depending on the direction of this variation, the accelerometer acts on the distributor 16 to move the double-acting piston 19 in one or the other direction, thereby causing the rate of delivery of the pump to vary in a direction corresponding to the braking force to be produced.

For example, if for any reason the cable tension increases so as to accelerate the drum, then the accelerometer 15 operates the valve 16 to supply fluid to cylinder 18 and move the piston 19 in a direction to decrease the pump delivery. The braking action is therefore decreased and the decrease in the pump delivery and the braking action continues until such time as the acceleration of the cable stops. The tension in the cable is relieved by reducing the braking action during periods of an accelerated cable movement. In a similar manner, the braking action is increased during deceleration of the cable so as to maintain the tension in the cable and prevent it from becoming slack.

An automatic braking effect is thus obtained which is in direct correlation with the positive or negative accelerations in the feed of the cable 2.

Provision should be made for eliminating automatic operation and reverting to manual control in the case of difficult or critical operations. Furthermore, means should be provided for instantaneously short-circuiting the automatic system in case of an emergency requiring instantaneous action.

It will be understood that while a hydraulic control was illustrated for adjusting the delivery of the pump 9, electrical or mechanical means may be employed instead.

What I claim is:

1. Apparatus for regulating the tension in a cable to maintain said tension substantially constant, comprising a drum about which the cable is wound, a variable delivery pump connected to said drum to be driven thereby, means for regulating the discharge pressure of said pump at a substantially constant value, a closed liquid circuit including said pump, a cooling coil in said circuit for dissipating heat from the liquid therein, an accelerometer driven by said pump, and means operated by the accelerometer for de-

creasing the delivery of the pump in response to acceleration of the drum and increasing the pump delivery in response to deceleration of the drum.

2. Apparatus for regulating the tension in a cable to maintain said tension substantially constant, comprising a drum about which the cable is wound, a variable delivery pump connected to said drum to be driven thereby, means for regulating the discharge pressure of said pump at a substantially constant value, a closed liquid circuit including said pump, a cooling coil in said circuit for dissipating heat from the liquid therein, an accelerometer driven by the drum, a liquid distributor valve operated by the accelerometer and supplied with liquid from said pump, a double acting cylinder controlling the delivery of the pump, said cylinder being supplied with liquid by said distributor valve, said accelerometer, distributor valve and cylinder cooperating to decrease the delivery of the pump in response to acceleration of the drum and increase the pump delivery in response to deceleration of the drum.

3. Apparatus for regulating the tension in a cable to maintain said tension substantially constant, comprising a drum about which the cable is wound, a variable delivery pump connected to said drum to be driven thereby, means for regulating the discharge pressure of said pump at a substantially constant value, a closed liquid circuit including said pump, an accelerometer driven by said pump, and means operated by the accelerometer for decreasing the delivery of the pump in response to acceleration of the drum and increasing the pump delivery in response to deceleration of the drum.

MARC GALIN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
21,371	Scott	Aug. 31, 1858
635,235	Christ	Oct. 17, 1899
1,106,588	Schnitzler et al.	Aug. 11, 1914
2,091,418	Schoene	Aug. 31, 1937
2,244,830	Doe et al.	June 10, 1941
2,249,947	Doe	July 22, 1941
2,261,261	Kubera	Nov. 4, 1941
2,402,789	Tweedale	June 25, 1946