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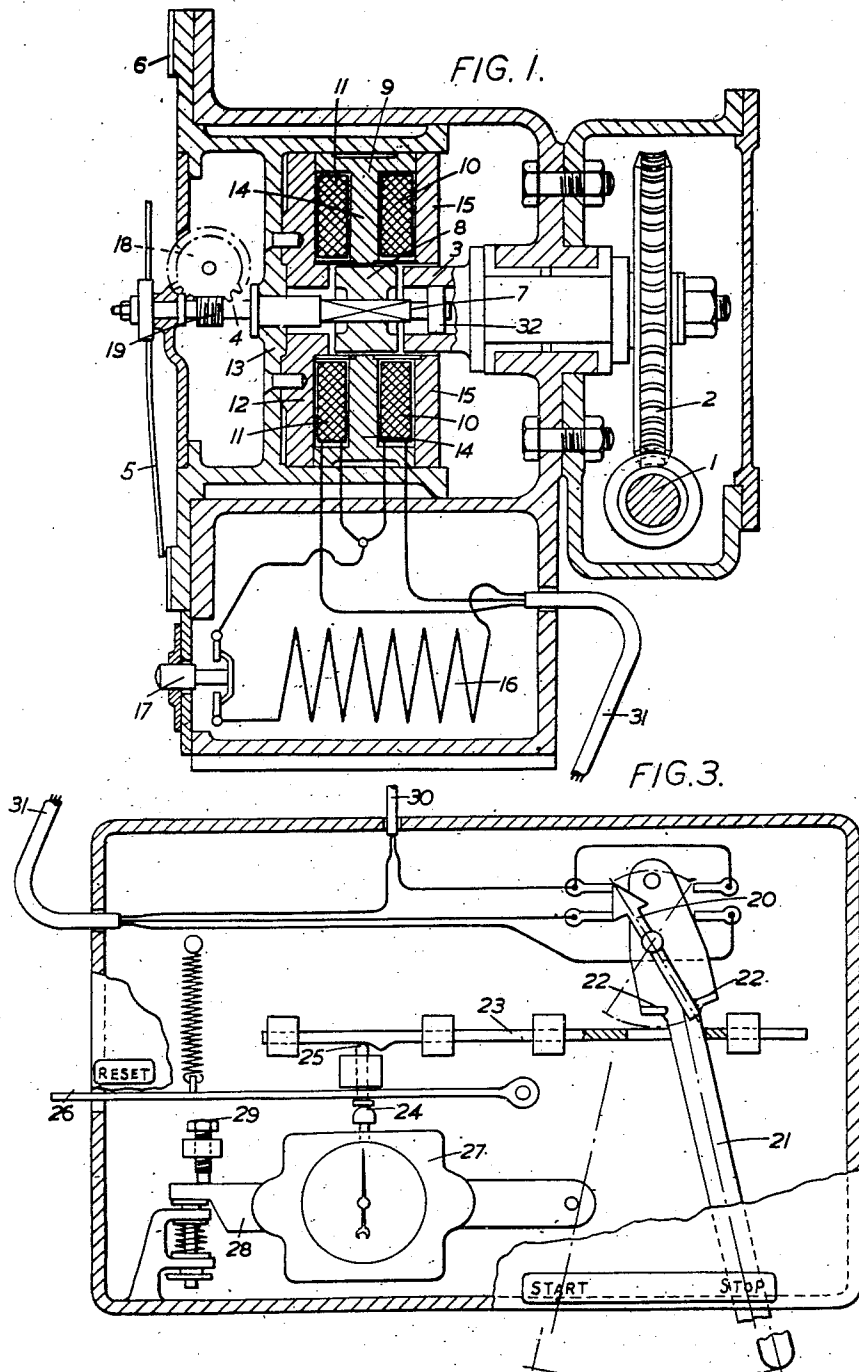
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2,448,643

REVOLUTION COUNTER ADAPTED TO OPERATE OVER
VARIABLE PREDETERMINABLE PERIODS OF TIME

Filed Nov. 19, 1943

2 Sheets-Sheet 1



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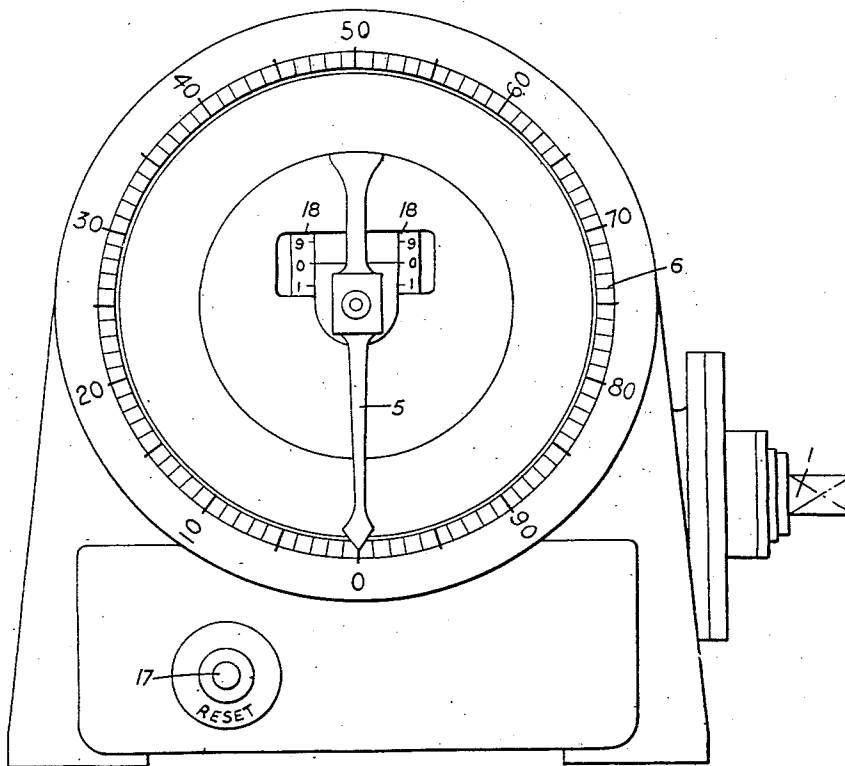
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FIG. 2.



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2,448,643

REVOLUTION COUNTER ADAPTED TO OPERATE OVER VARIABLE PREDETERMINABLE PERIODS OF TIME

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Application November 19, 1943, Serial No. 510,897
In Great Britain December 2, 1942

2 Claims. (Cl. 235-104)

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This invention relates to counters intended for use during machinery tests or industrial operations where it is required to obtain an accurate count of revolutions or other mechanical movements over a short period of time, the dial of the instrument being suitably calibrated for the operations to be counted, the invention being particularly concerned with revolution counters suitable for use on ships to record the revolutions made by the propeller shaft during trial runs over the measured mile.

In the usual type of existing counters the figures are continually moving and the time is taken by a stop watch independently operated by hand, and considerable skill is required to obtain an accurate record of the revolutions and the corresponding time, especially when taken over a short period.

According to the present invention the counter is so constructed that it gives a standing record of the count and also the time over which the revolutions or other movements are counted and arranged so that the time over which the count is taken may be varied to suit requirements.

The starting and stopping of the counter is automatically synchronized with the starting and stopping of the watch or clock, whilst the time over which the count is taken may be varied at will to suit requirements.

Several counters may be operated simultaneously to obtain a record of the revolutions made by a number of shafts over the same period of time.

In order that the said invention may be clearly understood and readily carried into effect, the same will now be described more fully with reference to the accompanying drawings, wherein—

Figure 1 is a longitudinal sectional view of the counter;

Figure 2 is a front elevation thereof; and

Figure 3 is a sectional view of the control unit.

The invention will now be described in detail as applied to a revolution counter consisting of two separate interconnected units, the one unit comprising the revolution counter proper and the other unit containing the stop watch or clock and operating gear for starting and stopping the watch and the indicating mechanism of the revolution counter.

The revolution counter proper preferably includes a worm shaft 1 which is driven by suitable means from the main shafting, the speed of which is to be measured and in this connection it is preferred that the worm shall run at a lower speed than the shafting, for example, at one-fifth of the shaft speed. The worm meshes with a worm wheel 2, the latter revolving a spindle 3 upon which it is mounted at a speed of one revolution per hundred revolutions of the main shafting. Concentrically arranged with

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respect to the worm wheel spindle is a further spindle 4 spaced therefrom which latter carries a pointer 5 adapted to move over a suitably calibrated dial 6, the pointer spindle being formed with a squared portion 7 upon which is mounted a floating armature 8 which is free to slide endwise of the squared portion of the spindle. The inner end of this spindle is held concentrically with the shaft 3 by a ball bearing 32 mounted in the bore of the latter shaft. Disposed around the armature but spaced therefrom is an iron annulus 9 forming a part of an electro-magnet including two spaced pancake coils 10 and 11 which surround the shaft 4, and are connected with opposing polarities. An iron plate like member 12 also surrounding the pointer spindle is secured to a fixed part 13 of the casing, the plate like member 12 and parts 14 and 15 forming the poles of the electromagnet, the device constituting a magnetic clutch.

When current is passed through the coil 10 the armature 8 is pulled lengthwise of the pointer spindle into contact with the end of the worm wheel spindle 3, thereby connecting together the worm wheel spindle and pointer spindle 4 in driving relationship, thus causing the pointer 5 to move over the calibrated dial.

When current is cut off from the aforesaid coil and passed through the remaining coil, the armature 8 is pulled in the opposite direction into contact with the fixed part 12 of the electro-magnet, thus stopping the pointer and maintaining it in that position. A resistance 16 is included in the coil circuit to reduce the main voltage to that required for the magnet, a push switch 17 being provided to break the electrical circuit and so render the pointer free for resetting by hand to the zero marking on the dial ready for the next count. The circumference of the dial is preferably divided into one hundred divisions, each division representing one revolution of the main shafting. Index drums 18 are driven by means of worm gearing 19 from the pointer spindle and register the number of complete turns made by the pointer.

The flow of electric current to the coils of the magnetic clutch is controlled by operating gear which may be incorporated in the casing of the revolution counter or may as shown form a separate unit, the latter arrangement being preferred, thereby enabling several counters to be operated simultaneously from one control.

The control gear includes a two-way switch 20 actuated by a hand lever 21 for closing the electrical circuit to either of the coils of the electro-magnet, the switch arm being engaged by projections 22 on the lever, and a sliding cam bar 23 which is interlocked with said hand lever and operates the stop watch control knob 24 through the medium of a tappet pin 25. A lever

26 is also provided for the purpose of resetting the stop watch independently of the cam bar, the stop watch 27 being mounted upon an adjustable spring support 23 for the purpose of preventing excessive pressure being applied to the watch knob, the position of the watch being adjustable by means of a suitable adjustable stop member 29. Suitable conducting leads 30 are taken from the mains to the two-way switch and from the two-way switch to the two coils of the electro-magnet, the latter leads being indicated by reference numeral 31.

Operation of the revolution counter is as follows: Assuming the apparatus is to be used, for example, on a twin screw vessel making trial runs over the measured mile, one counter would be connected with each shaft and one control unit would be provided common to both counters, the control unit being placed at any convenient point on the vessel, such as in the engine room or on the navigating bridge. Electric current is switched on to the control unit and the pointer and index drums of each counter are set to zero by depressing the push button switches and spinning the pointers round by hand. The push switches are then released and the pointers are firmly held in place due to the electric current passing through the coil which serves to move the armature onto the fixed pole 12 of the electro-magnet.

Assuming that the control unit is placed in the engine room, on receiving a signal from the bridge that the vessel is commencing the run over the measured mile, the lever of the control gear is moved over to the start position and the pointers of both counters immediately commence to revolve and the watch is simultaneously started under the action of the cam bar.

On receiving the signal that the run over the measured mile is completed, the control lever is moved in the opposite direction to the stop position which stops the points of both counters and also the watch. A standing reading of revolutions and time is now displayed, from which revolutions per minute are calculated and after the readings have been recorded, the counter pointers and index drums are reset to zero in the manner previously described and the watch is reset by depressing the resetting lever on the control unit.

Alternatively, the control unit may be arranged on the navigating bridge so that the lever can be operated immediately the mile posts come into line when entering and leaving the measured course, the time and revolutions registered corresponding exactly to the run over the course.

The watch operating gear may be wholly mechanical as hereinbefore described or may, alternatively, consist of an electro-magnet or similar device.

What I claim and desire to secure by Letters Patent of the United States is:

1. A revolution counter adapted to be effectively connected to, and disconnected from, the rotary means the revolutions of which are to be counted over a given period of time, comprising a graduated counter to display the number of revolutions of the said rotary means made over the selected period, a spindle driving the counter, a further spindle adapted to be driven from the said rotary means, a reduction gear to connect said latter spindle to the rotary means, an electro-magnetic clutch interposed between the two

spindles adapted to effect momentarily the effective connection and disconnection of the two spindles, an armature of said clutch in slidable and positive driving connection with said first-mentioned spindle, a pair of co-axial coils of said clutch spaced apart and disposed about said armature, a housing accommodating the clutch and spindles, a relatively fixed clutch face in said housing adapted to be engaged by said armature to arrest rotation of the first-mentioned spindle, a clutch face associated with the second-mentioned spindle adapted to be engaged by the armature to effectively connect the two spindles, and means to alternately connect the two coils to a source of electrical energy, the arrangement being such that the operative displacement of said armature eliminates any measurable lag or lost motion between the said rotary means and the spindle driving the counter.

2. A revolution counter adapted to be effectively connected to, and disconnected from, the rotary means the revolutions of which are to be counted over a given period of time, comprising a graduated counter to display the number of revolutions of the said rotary means made over the selected period, a spindle driving the counter, a further spindle co-axially aligned with the aforesaid spindle and adapted to be driven from the said rotary means, a reduction gear to connect said further spindle to the rotary means, an electro-magnetic clutch co-axial with and interposed between the two spindles adapted to effect momentarily the effective connection and disconnection of the two spindles, an armature of said clutch slidable upon and in permanent positive driving engagement with the first-mentioned spindle, three annular pole members and two coils disposed about the armature the two coils being spaced apart by the intermediate one of the annular members, one end annular member being formed with a clutch face co-operating with an end annular face of the armature, the other clutch face co-operating with the armature being formed on the spindle driven from the said rotary means, a housing accommodating the clutch and spindles, means to alternately connect the said two coils to a source of electrical energy to produce axial displacement of the armature alternately in opposite directions, a switch to break the electrical circuit to render the counter free for re-setting, and index means driven from the first-mentioned spindle to register the number of complete set of indications of the counter, the arrangement being such that the operative displacement of said armature eliminates any measurable lag or lost motion between the said rotary means and the spindle driving the counter.

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