April 12, 1932. F. B. RAE 1,853,225

CONTROLLING MEANS FOR SIGNALING APPARATUS

Filed Feb. 20, 1928 2 Sheets-Sheet 1

Fig. 1.

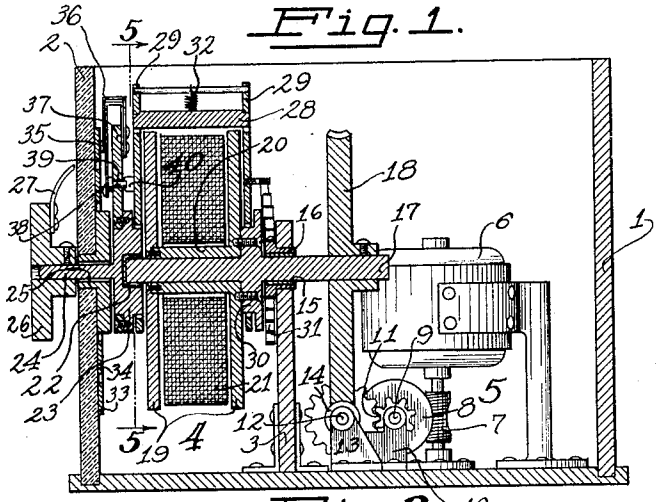


Fig. 5.

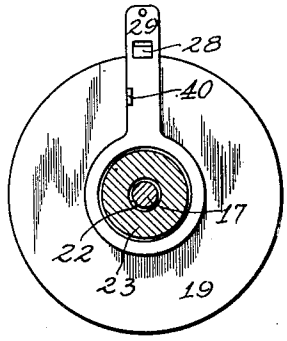


Fig. 2.

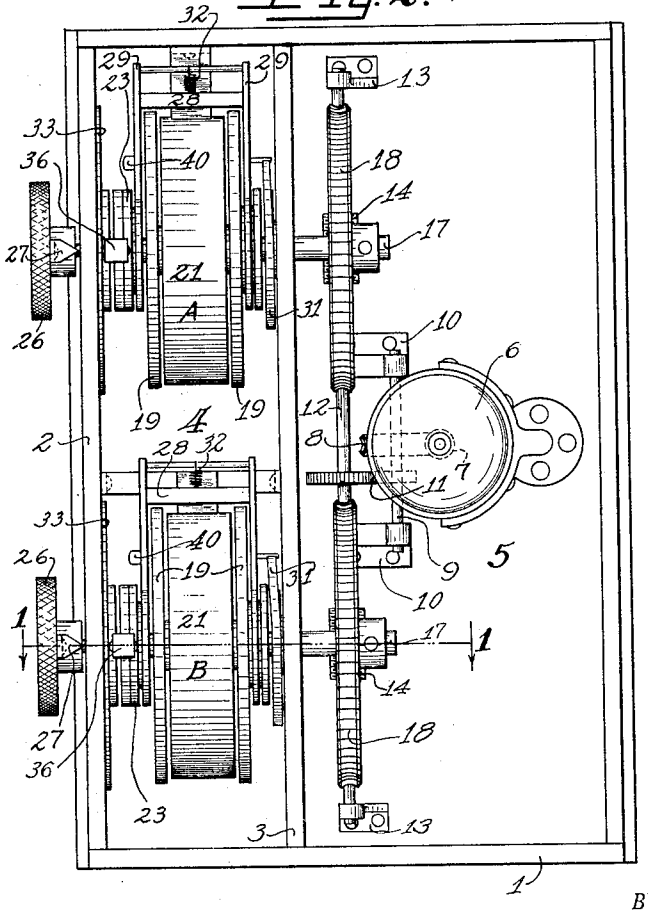
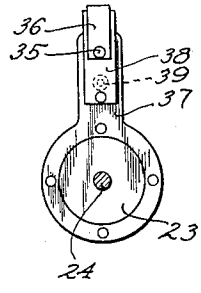


Fig. 6.



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CONTROLLING MEANS FOR SIGNALING APPARATUS

Filed Feb. 20, 1928 2 Sheets-Sheet 2

Fig. 3.

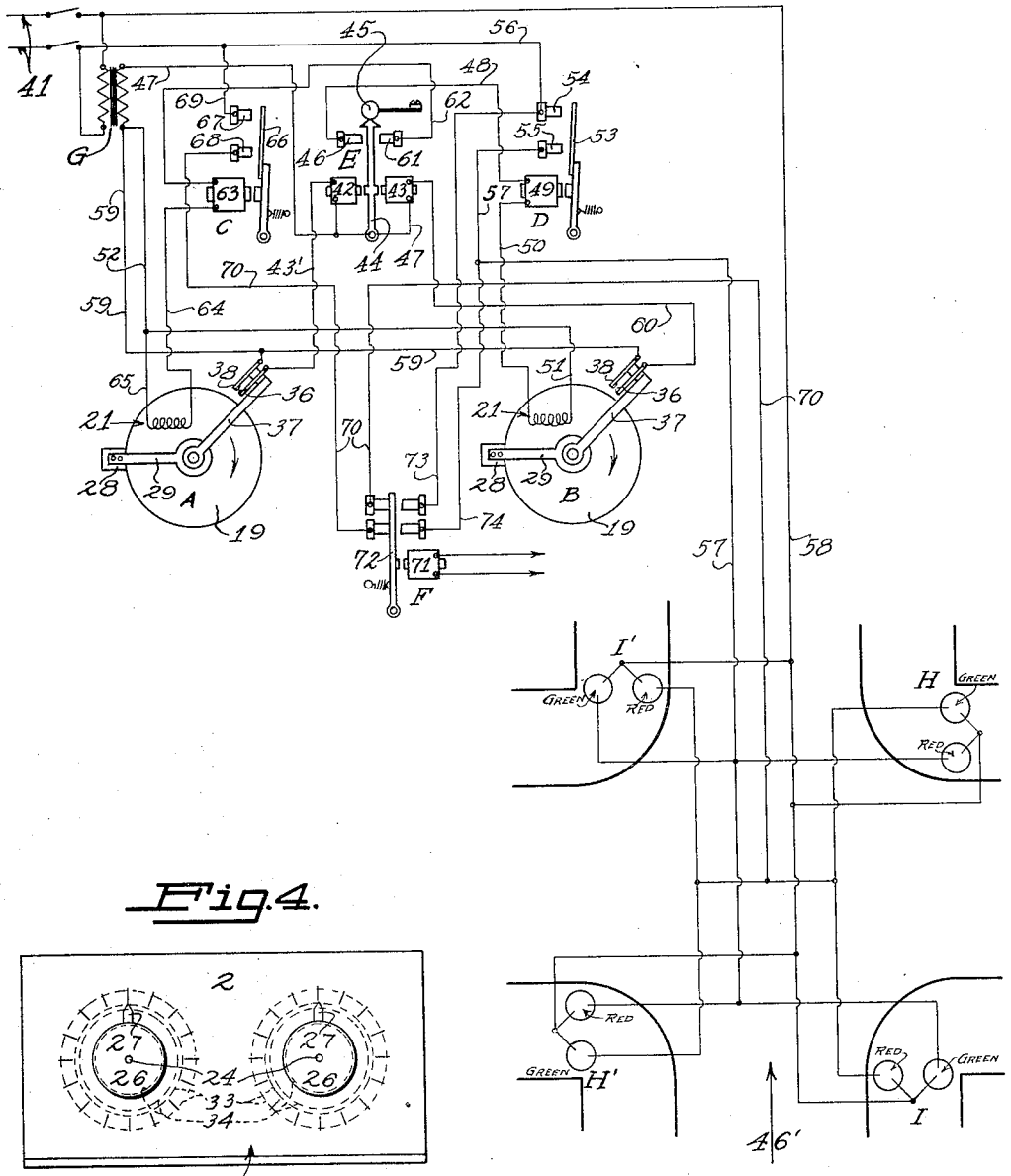

Fig. 4.

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UNITED STATES PATENT OFFICE

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CONTROLLING MEANS FOR SIGNALING APPARATUS

Application filed February 20, 1928. Serial No. 255,575.

My invention relates to that class of timing and code signaling machines in which the prime mover is of the constant speed type which may be driven by a spring, electricity, or other suitable power whereby the timing element is rotated at a uniform and constant rate, each such revolution marking a definite period of time.

The illustrated embodiment while directed specifically to the use of the invention in connection with traffic signals and the automatic timing and control of electrically operated signals at street intersections or other required locations, it is to be understood that the same is adaptable to the timing and control of mechanical or electrical structures generally.

Timing devices, as heretofore designed and constructed for the operation of traffic signals have included within and as a part of their construction contacts for making and breaking the signal circuits. In such construction the signal operating current is passed directly through movable contacts incorporated in the timing mechanism, making adjustments and repairs difficult and also, because of added friction, increasing the work to be done by the driving motor.

In the present invention, the making and breaking of the signaling circuit or circuits controlling or operating apparatus distant therefrom, is performed by separate electrically operated contactors controlled by the timing mechanism, and the prime mover and mechanism of the timing device is thus relieved of the severe strains imposed in operating the contact arms or levers as usually employed.

In its present embodiment, my invention consists of two electro-magnetic units preferably of like construction, each having revolving parts, which are connected by a suitable means and with speed reducing mechanism to a prime mover, as for example, a single synchronous motor, by means of which the movable parts of the units are continuously revolved in the same direction at a predetermined and constant speed. Each magnetic unit of the device is an electro-magnet of novel construction in which the usual iron core is provided with disc plates or flanges at each end, the core and end discs being energized by a suitable wire coil, this coil being so disposed that the iron core and attached end discs may be revolved while the coil remains stationary, thus eliminating movable contacts to energize the coil, further lessening the work upon the prime mover. When this magnet structure is energized by its surrounding coil, magnetic poles of unlike sign are produced at the periphery of the discs. I prefer to suspend an armature relative to the discs to be attracted thereto on the energizing of the coil, and travel therewith, the armature when in contact with both discs, the magnetic circuit will be through the core, the discs and the armature whereby the armature will be magnetically held to the discs. This will occur at any point upon the periphery of the discs that the armature may be placed in contact with them, and if the magnet structure is revolved, it will carry the armature throughout its revolution and until released by the demagnetization of the revolving core and discs, after which it is restored to normal position as hereinafter described.

The cooperating revolving magnet and the armature may then be considered as the two elements of a magnetic clutch in which the armature member is rotatively progressed around a circle equal to the diameter of the disc members during all or such part of the disc circumference as the magnetism of the core and disc extensions retains the clutch members in contact relation.

With the above mentioned and other objects in view, the invention consists in the novel construction and combination of parts hereinafter described, illustrated in the accompanying drawings, and set forth in the claim hereto appended, it being understood that various changes in the form, proportion, size and minor details of construction within the scope of the claim may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings disclosing one embodiment of my invention:—

Fig. 1 is a view in vertical transverse section on line 1—1 of Fig. 2 disclosing one of the magnetic structures of the timing apparatus.

Fig. 2 is a view in top plan of the preferred embodiment of the timing apparatus, illustrating two units.

Fig. 3 is a wiring diagram of the timing mechanism units connected to operate traffic control signals at a street intersection.

Fig. 4 is a view in front elevation of the casing, illustrating the adjusting dials.

Fig. 5 is a view in end elevation of the armature carrying frame.

Fig. 6 is a view in elevation of the breaker arm associated with one of the dials.

In the mechanical embodiment of the invention illustrated in Figs. 1, 4, 5, and 6, the electromagnetic units are illustrated in duplicate, and while so illustrated, it is to be understood that under certain conditions, a single unit may be maintained, and in other installations, a number of units in excess of two, may be desirable.

The units being of identical construction, the description of one is thought sufficient.

In this structure, 1 is a cabinet, preferably provided with a front wall 2, of insulating material of any suitable type.

Extending vertically in the cabinet, longitudinally from end to end, is a wall 3, dividing the cabinet into compartments 4 and 5.

6 is a suitable prime mover, illustrated in the form of a motor, the shaft thereof carrying a worm 7, which intermeshes with a suitable worm gear 8 on a counter-shaft 9, rotatable in brackets 10, in the compartment 5. The shaft 9 has inter-geared connection at 11, with a secondary shaft 12, disposed longitudinally of the cabinet, parallel with the rear face of the wall 3 in the compartment 5, said shaft being rotatable in bearings 13 and carrying worm gears 14 of a number corresponding to the number of electromagnetic units employed in the apparatus, said shaft 12 serving to operate the magnetic units simultaneously at the same speed in corresponding directions.

Each magnetic unit is preferably constructed in the following manner:—Rotatable in a bearing 15, disposed within a bushing 16, extended horizontally through an aperture in the wall 3, is a supporting shaft 17, mounting a gear 18, which intermeshes with its associated worm 14. The shaft 17 mounts at a point within the compartment 4, the discs or circular end plates 19 of an electromagnetic mechanism, said discs being connected by the core portion 20, which mounts between them the coil 21.

It will thus be observed that on the rotation of the shaft 17, the discs 19, together with the core 20, will rotate as a unit while the coil 21 remains stationary. Shaft 17 falls short of extending through the front wall 2 of the cabinet 1, but the same is received within a bearing depression 22 in the hub 23 of an adjustable timing device, formed with a shaft 24, rotatable in a bearing 25 in the front wall 2 of the cabinet 1. The shaft 24 at its outer end carries an adjusting knob 26, mounting a pointer 27, which is adapted, on the rotation of the knob, to travel over time graduation indications, shown in Fig. 4, and which are arranged in circular formation on the face of the front wall 2 around the shaft 24.

Cooperating with the plates 19 is an armature 28 carried by supporting arms 29, disposed parallel with the outer faces of the discs 19, one plate carried by the hub 23 and the other being carried by the flanged portion 30 on the shaft 17.

The arms 29 are free to rotate on their respective supports, and are normally returned to a starting position by the action of the coiled spring 31, attached at one end to the bushing 16, and at its opposite end to one of the arms 29. The armature 28, which is movable at its ends in the arms 29, radially of the discs 19, is normally maintained out of contact with the periphery of the discs by a spring 32.

On the inner face of the front wall 2, surrounding the bearing 25, are a pair of concentrically disposed contact rings 33 and 34. With the former ring there is, at all times, in contact, a finger 35, on a spring arm 36, carried by a radial arm 37, attached to the hub 23. A second spring arm 38 is carried by the arm 37 and the same normally lies in spaced relation to the surface of the ring 34. Contact between finger 38 and ring 34 is made on the outward depression of the actuating pin 39 carried by the arm 37, the pin being forced outwardly when engaged by a projection 40 formed on the outer face of the arm 29, operating immediately in rear of the arm 37.

With the two units A and B constructed and assembled as above described and as illustrated in Figs. 1, 2 and 3 of the drawings, the electrical mechanism and other cooperating elements to connect the timing apparatus to operate traffic signals at a street or highway intersection, is laid out and constructed in the following manner, particularly illustrated digrammatically in Fig. 3.

H, H′, I and I′ indicate pairs of red and green signal lamps, located at the respective four corners of the street intersection, and G is a transformer reducing the signal operating voltage from the power line 41 to the desired voltage required to operate the rotating magnets; the contactors and relays, and the timing system, hereinafter more fully described.

The motor being continuously operated by power from the source 41 revolves the discs 19 of the units A and B, in the direc-

tion of the arrows, at a constant uniform speed, preferably one revolution in 120 seconds.

E is a relay having magnets 42 and 43 in opposing relation to its armature lever 44, the upper end of which lever cooperates with the yieldable stop member 45, acting on the armature to releasably hold the same into the position which it may have last been moved by the energizing of either magnet 42 or 43.

A relay F, hereinafter more fully described, is provided when it is desired to control the traffic signals at a street intersection, having, for example, a steam or electric railway traversing one of the laterals.

Assuming that it is desired to light the red lamps at H and H′, and the green lamps at I and I′ to permit traffic to travel in the direction of the solid arrow 46′ (Fig. 3), and also assuming that armature 44 of relay E makes contact with member 46, the knobs 26 of the respective units are rotated to position the pointers 27 at their respective graduations on their respective dails to indicate a period of 30 seconds. Then current will flow from the low voltage side of the transformer G via wire 47 to armature 44 of relay E to 46, wire 48, to magnet 49 of contactor D, wire 50 to coil 21 of the magnet B, wires 51 and 52 to transformer G, completing the circuit. This will operate magnet D to cause its armature 53 to close the contacts 54—55 and current from the high side of transformer G may be traced by wire 56 through contacts 54—55 through wire 57 to red lamps H—H′ and green lamps I—I′ to wire 58, to the opposite side of the 110 volt supply.

At the same time coil 21 of magnet B having been energized, armature 28 attached to the arms 29, will be magnetically held against the periphery of the discs of the magnet B and will be moved rotatively forward. Assuming that the arm 37 with its contacts 36 and 38 has been in a position represented by 30 seconds on the dial, then at the expiration of the 30 seconds the projection 40 will bear upon and close the contacts 36 and 38. When this takes place, current from the low side of the transformer G may be traced by wire 59, contacts 36 and 38, wire 60, magnet 43 of relay E through wire 47 to the opposite low side of G energizing magnet 43 of relay E. This action breaks the contact between armature 44 and stop 46 thereby de-energizing coil 21 of magnet B and the arm 29 with its attached armature 28 is returned to normal non-operating position by its spring 31. At the same time the magnet 49 of contactor D is de-energized and the reaction of its armature 53 opens the circuit 57—58 at the contacts 54—55 extinguishing the lamps at H—H′ and I—I′. Also at the same time the armature 44 of relay E under the influence of the magnet coil 43 has made contact at stop 61 and a circuit may be traced from transformer G, through 47, armature 44, stop 61, wire 62, magnet 63 of contactor C, wire 64, coil 21 of magnet A, wires 65 and 52 to the opposite side of the transformer G. The magnet A being then energized the armature 28 attached to the arms 29 is picked up by the revolving disc of A and progressed in the direction of the arrow until it reaches and closes contacts 36—38, when a circuit may be traced from the transformer by wire 47, magnet coil 42 of relay E through wire 43′, contacts 36—38, wire 59, to the opposite side of transformer G. During the period of travel of the arms 29 and the armature 28, the contactor C magnet has held its armature 66 closed across stops 67—68 establishing a circuit from the high side of the transformer G to wires 69—56, stops 67—68, wire 70, to the red lamps I—I′ and the green lamps of H—H′, wire 58 to the 110 v. supply.

It will be seen that the action of the machine is to alternately light the signal lamps for a period of time in each case that has been determined by the setting of the indicators 27 of units A and B, and may in either case be any part of the 120 seconds indicated on the dials. The indicators 27 of units A and B may be moved and set for any period of time from 1 to 120 seconds upon either or both dials without interfering with the constant revolution of the magnets A—B.

The function of the relay F is to provide for the continued lighting of the red lamps at railroad crossing during the passage of a train to protect the traffic desiring to cross the tracks. As the train approaches the cross street, it closes a track circuit, not shown, energizing the magnet 71 of relay F to attract its armature 72 to break the lamp circuit 70 and simultaneously to close the shunt circuit 73—74 around the contacts 54—55 of contactor D whereby the current in 56—57 is maintained and the red lamps protecting the cross street remain lighted until the train in passing opens the track circuit and relay F restoring the system to normal. The object of relay F is to open the lamp circuit controlled by relay C and to hold the lamp circuit closed that is controlled by relay D. This action in no way interferes with the operation of the revolving magnets A—B, which at once take up the proper timing of the signal lamps where it finds them.

I claim:—

In combination with a motor, a switch, a clutch member, means for constantly rotating said member from said motor at a uniform speed, a co-operating clutch member having a normal rest position for engagement with said first clutch member, means normally inoperative for engaging said clutching members whereby the second member is caused to revolve, means on said second member for momentarily closing said switch after a predetermined amount of

revolution by said second member, means to restore said co-operating clutch member to normal rest position, a duplicate set of apparatus as above, a go signal, a stop signal, means operated by the closure of the switch of one set to cause to be operative the engaging means of the duplicate set and also causing the engaging means of the one set to be inoperative, and means to display said go signal while one engaging means is operative, and the stop signal while the other engaging means is operative.

In testimony whereof I have signed my name to this specification.

FRANK B. RAE.