

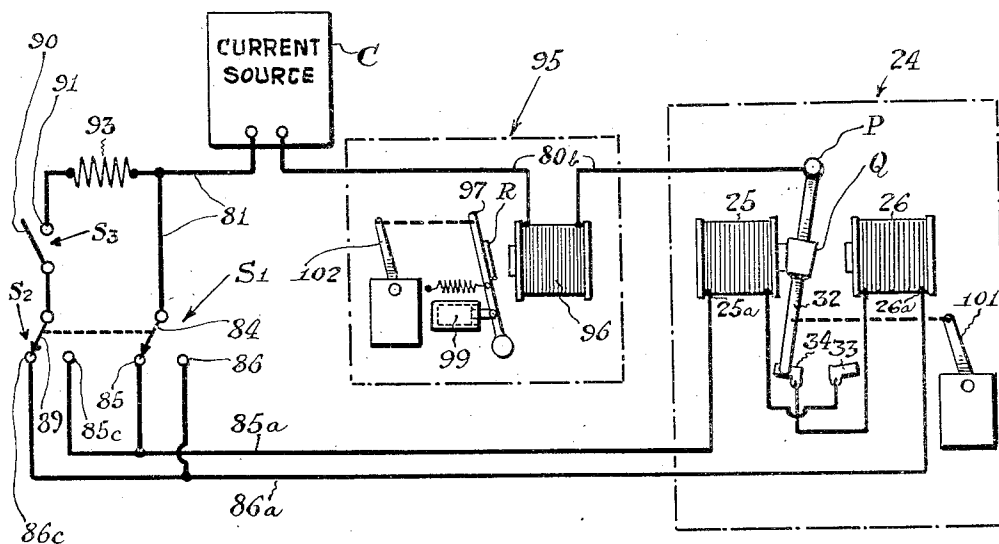
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ELECTRICAL CONTROL SYSTEM

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ELECTRICAL CONTROL SYSTEM

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This invention relates to electrical control systems, and more particularly to such systems wherein a plurality of work systems are to be selectively energized.

This application is filed as a continuation in part of my co-pending application Serial No. 176,799, filed November 27, 1937, now Patent No. 2,218,542 dated October 22, 1940.

An object of my invention is to selectively operate a pair of work systems, by currents supplied thereto in common, in a novel and advantageous manner.

Another object is to provide a pair of work systems selectively operable by currents which are supplied thereto in common and which are differentiated from each other in a very simple manner.

Another object is to provide a pair of work systems selectively operable by currents which are supplied thereto in common and which are differentiated from each other in respect of amplitude.

Another object is to appropriately increase the differentiation of currents already differentiated from each other in a very simple manner.

Another object is to appropriately increase the differentiation of currents already differentiated from each other in respect of amplitude.

Another object is to incorporate, with a work system which is operable between two conditions with automatic limitation of duration of the operating currents, a second work system which may be operated selectively with respect to the first through the same conductors as are provided for the first.

Other and allied objects will more fully appear from the following description and the appended claims.

In the description of the invention hereinafter set forth reference is had to the accompanying drawing, wherein the single figure is a schematic diagram of a typical embodiment of the invention.

An important feature of my invention concerns the selective operation of a pair of work systems, to which currents are supplied in common, by the selective supplying of the current at either of two different amplitudes. Such selective operation in its broadest aspect is known; but my invention contemplates its performance in a novel and advantageous manner. According to an important aspect of the invention, the currents, by hypothesis differentiated from each other simply in respect of amplitude, are caused to be further differentiated from each other in

respect of duration—the double differentiation permitting considerable choice and very simple arrangements of the work systems, while retaining their intended selective response.

5 While I intend no unnecessary limitation of my invention in respect of how the differentiation of durations shall be effected, I prefer that this be done in response to the postulated difference of amplitudes. Further, while I intend no unnecessary limitation in respect of where the differentiation of durations shall be effected, I have preferred to effect it, and will describe an embodiment of my invention in which it is effected, in one of the two work systems. A typical embodiment of that work system is conveniently first described.

Reference being had to the drawing, this work system will be found designated generally as 24. It has been shown as being of a type comprising 20 two electromagnets 25 and 26 having respective first terminals 25a and 26a; a pole 32 pivoted as at point P and carrying an armature Q arranged for alternate attractions by the electromagnets to swing the pole 32 back and forth between two discrete positions; a load device 101 of any desired character, electrical or mechanical, linked to the pole 32 and thereby moved or operated between two positions; and contacts 33 and 34 respectively in series with the second terminals of the electromagnets 25 and 26 and arranged to be alternately contacted by the pole 32. Through one or the other of these contacts pole 32 in each of its two positions completes a circuit for a respective one of the electromagnets; and the arrangement of the pole and these contacts is such that upon actuation of the electromagnet whose circuit is completed through pole 32 in the position which the pole then occupies, that electromagnet, acting on the armature, will attract the pole to its other position—breaking the circuit of the electromagnet which was actuated and preparing the circuit of the other electromagnet for operation, as well as operating the load device.

45 This typical work system 24 has been illustrated and described in an elementary schematic form in the interest of greatest simplicity. Various refined embodiments thereof are well known in the art—for example, one has been disclosed in U. S. Patent No. 1,380,486 to Langley—and reference may be had to that art for preferred details of construction.

50 As is well understood, an operating system for a work circuit of the described type may be provided by any suitable current source C having one

terminal connected for example to the pole 32 through a conductor 80b, and having its other terminal arranged for alternate connection to electromagnet terminals 25a and 26a for example through conductor 81, single-pole double-throw switch S₁, and respective conductors 85a and 86a. When, as illustrated, pole 84 of switch S₁ is touching the switch contact 85, electromagnet 25 will have been last actuated and will have thrown pole 32 and load device 101 to their illustrated leftward positions, the electromagnet 25 therefore having become open-circuited at 33 and the electromagnet 26 having been prepared for next actuation. On the other hand, when switch pole 84 is moved to touch the contact 86, electromagnet 26 will be actuated and will throw pole 32 and load device 101 to their rightward positions, thus open-circuiting the electromagnet 26 and preparing the electromagnet 25 for next actuation. Thus it will be understood that the position of the pole 84 controls the position or condition of the load device 101 in the work system 24. And it will be understood that a supply of current to the work system 24 through either of the conductors 85a and 86a will, by reason of the described open-circuiting actions, be automatically limited in duration—typically to a substantially momentary pulse, which is, however, sufficient for the throw of the pole 32 and load device 101 from the one to the other position.

A typical embodiment of the second work system has been designated generally as 95. This may typically include an electromagnet 96 connected to be supplied with current in common with the work system 24—for example, serially interposed in the conductor 80b above-mentioned. This electromagnet may be arranged to attract a pivoted arm 97, for example through an armature R secured on that arm, from a leftward position to which the arm may be spring-biased, to a rightward position. A load device 102 of any desired character, electrical or mechanical, may be linked to or otherwise associated with the arm 97 and thereby moved or operated between two positions or conditions; assuming the device 102 to comprise an electrical switch, it and the arm and electromagnet would constitute a relay.

The combination of electromagnet 96 and arm 97 is readily made unresponsive to any supply of current through the conductor 80b which has actuated the work system 24, in view of the limitation of duration of that supply already discussed. In relay parlance, 96—97 is simply made "slow-acting"; and as a non-limitative example of a means of doing this, there has been schematically illustrated as attached to the arm 97 a dash-pot device 99, which may be adjusted to render negligible the movement of arm 97 which can occur during the limited duration of a current supply which has actuated work system 24.

Thus the limitation of duration is relied on for non-actuation of the work system 95 by, or its non-response to, a current supply which is intended to actuate the work system 24. On the other hand there may be relied on, for non-actuation of the work system 24 by (or its non-response to) a current supply intended to actuate the work system 95, the limitation of amplitude of current supply inherent in the postulated amplitude differentiation—e. g., while the work system 95 may be arranged to be actuated by a current supply at either of the two amplitudes (assuming that supply to have a sufficient duration), the work system 24 may be arranged to remain un-

actuated by current supplied at one (the smaller) of the two amplitudes. Such arrangements will be understood to be readily incorporated by such simple expedients for example as properly establishing the constants of the coils and other parameters of the electromagnet 96 on the one hand and of the electromagnets 25 and 26 on the other.

It will therefore be understood that upon the supply of current at the larger of the two amplitudes there will be actuated the work system 24, but not the work system 95 in view of the limitation of the supply to a duration shorter than required for actuation of 95. On the other hand, upon the supply of current at the smaller of the two amplitudes there will be actuated the work system 95, but not the work system 24 in view of the limitation of the supply to an amplitude smaller than required for actuation of 24. The proper selective actuation of the work systems by the two current supplies thus depends both on the amplitude differentiation and on the duration differentiation.

In the drawing I have illustrated a typical means for selectively supplying the actuating currents of two different amplitudes. The switch S₁, already described, may be taken as the means for supplying the larger-amplitude current. For the supply of the smaller amplitude current there may be suitably shunted about the switch S₁ another switch S₃ having a current-limiting resistance 93 in series with it.

The lower-shown extremity of switch S₁ of course consists of a pair of contacts 85 and 86, to which the abovementioned shunt circuit S₃—93 must be suitably connected. It will be observed that, excepting momentarily upon a throwing of switch S₁, the pole 84 of that switch touches that one of the contacts 85 and 86 whose conductor and electromagnet (85a—25 or 86a—26) is open-circuited (at 33 or 34). To be effective, however, the shunt circuit S₃—93 should normally be connected to that one of those two conductors (and electromagnets) which is not open-circuited. Therefore the lower extremity of the shunt circuit S₃—93 may be connected to the contacts 85 and 86 (and thus conductors 85a and 86a) through a single-pole double-throw switch S₂, whose pole 89 is linked (for example mechanically) to the switch S₁ to be thrown concomitantly therewith, but which has its contacts (85c and 86c, respectively connected with 85 and 86) arranged oppositely to those of switch S₁. Thus in an electrical sense the switch S₃ is always thrown oppositely to switch S₁; and it renders available, for the passage of current to work system 95 (through 24), that one of the two conductors 85a and 86a which is left uncontacted by switch S₁.

While no unexpressed limitation thereto is intended, it may be pointed out that the described embodiment of the invention has an especial utility when one of the work systems is to be kept for relatively long periods in each of its two conditions, or positions of its included load device. In such an instance it is this work system which will preferably be of the general kind typified by 24, the automatic limitation of current supply thereto, upon throw to either position, serving the known function of reducing current consumption, electromagnet overheating, and the like. But at the same time, according to a pertinent aspect of this invention, that automatic limitation of duration is employed to serve the further function of effecting the additional

differentiation of current supplies which makes possible the selective actuation of a second work system as well, without increase in the number of conductors between the control point and the work systems.

Other uses and utilities will readily suggest themselves to those skilled in the art, as will also many modifications of the disclosed embodiment and of components thereof. Such modifications as are within the scope of the following claims may be made without departing from the spirit or scope of the invention.

I claim:

1. In an electrical system including means selectively operable to supply currents of two different amplitudes: the combination of means limiting the duration of the supply of one of said currents; and two current-operable work systems both supplied with said currents throughout their durations, one of said systems being responsive only to the limited-duration supply of said one current and the other of said systems being responsive only to a longer supply of the other current.

2. In an electrical system including means selectively operable to supply currents of two different amplitudes: the combination of a pair

of electromagnets each actuatable only by the larger-amplitude current; means operated by each electromagnet upon its actuation for disconnecting that electromagnet from said supply means and connecting the other electromagnet with said supply means, whereby each supply of said larger-amplitude current is limited to a substantially momentary supply; and a work system, actuatable by the smaller-amplitude current but unactuatable by momentary current supply, connected to receive current from said supply means in common with either of said electromagnets.

3. In an electrical system including switch means throwable between two positions: the combination of a first electrically operable work system; a pair of conductors alternately contacted by said switch means and therethrough selectively energizable to operate said work system between two conditions; a second electrically operable work system; and means for rendering the conductor which is unenergized through said switch means effective to supply current to said second work system, comprising switch means linked with and thrown oppositely to said first-mentioned switch means.

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