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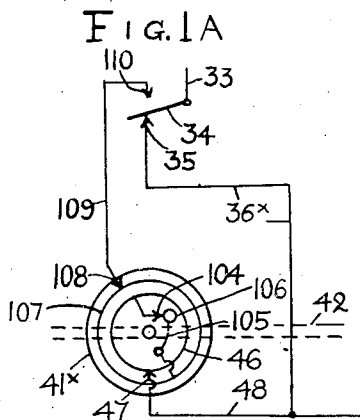
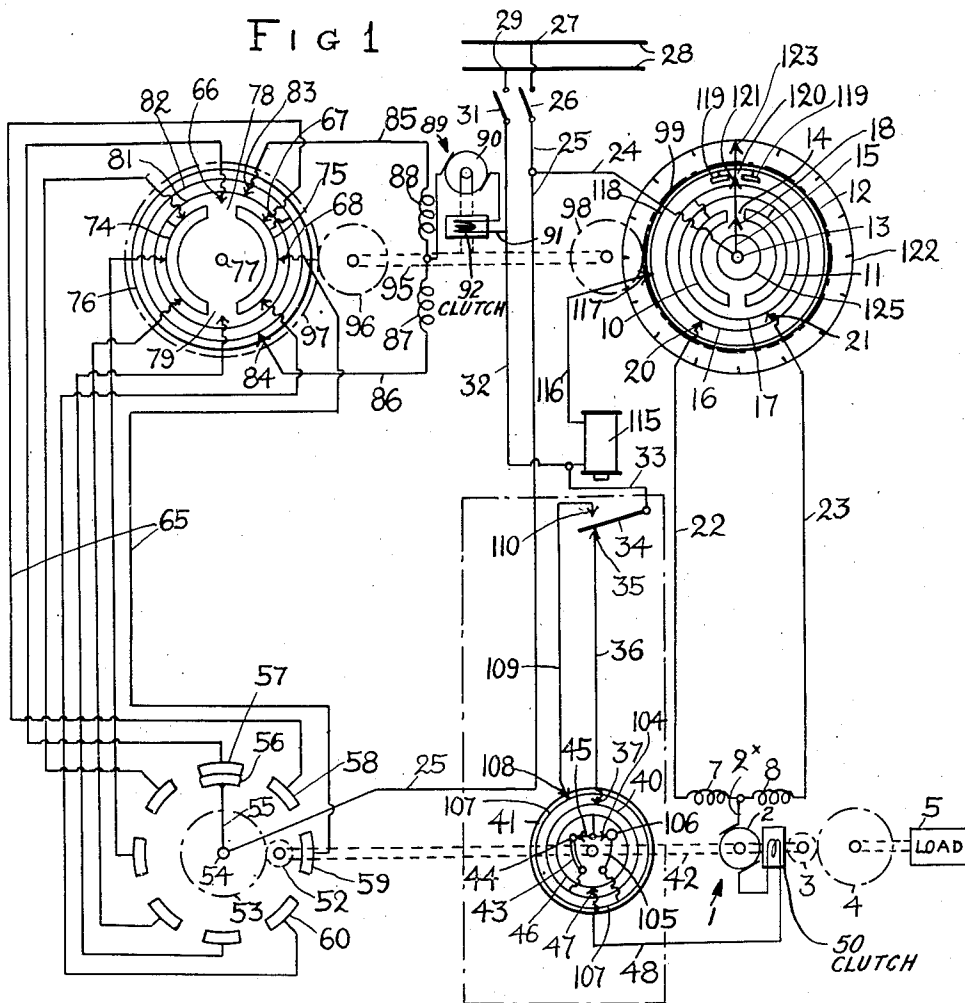
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2,455,901

REMOTE CONTROL WITH MULTIPLE SPEED GOVERNOR

Filed Dec. 22, 1944

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

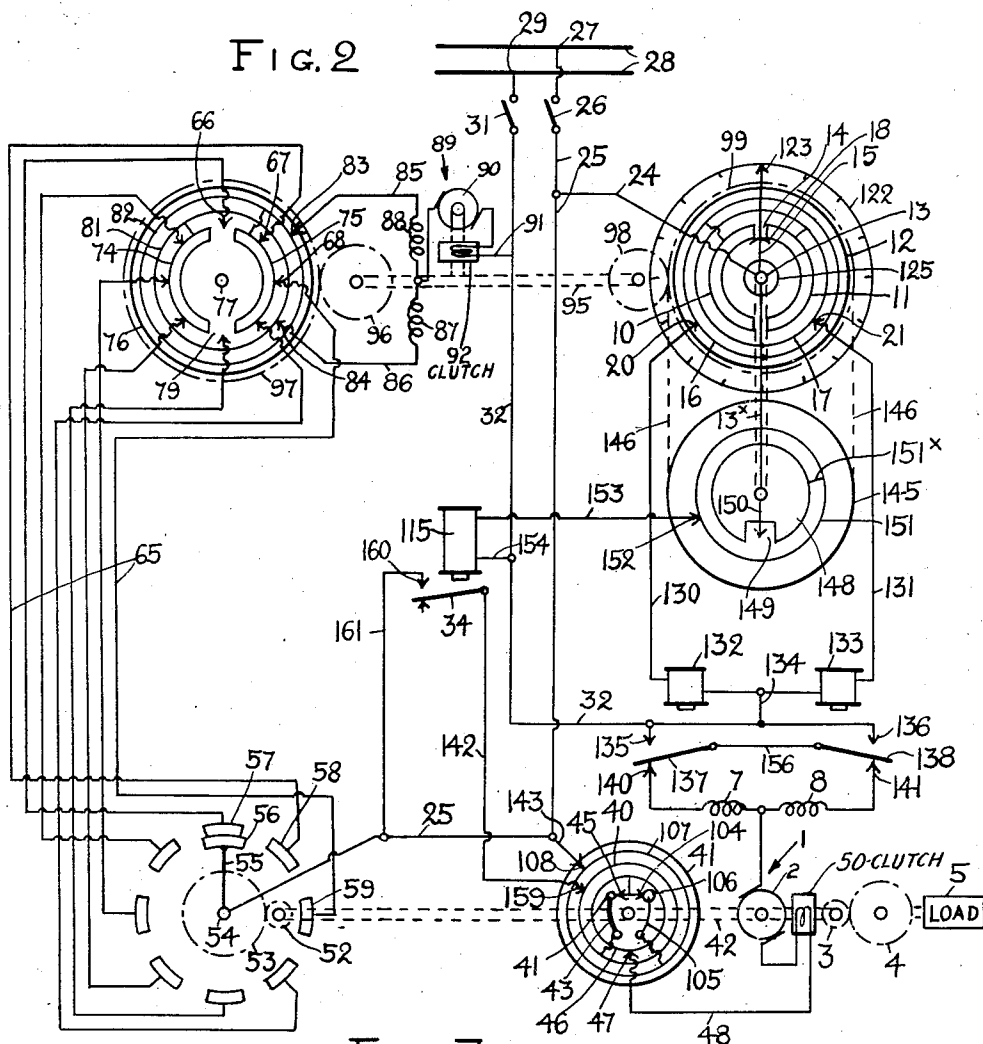
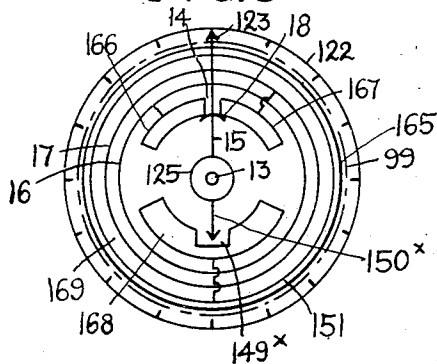


Fig. 3



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REMOTE CONTROL WITH MULTIPLE-SPEED GOVERNOR

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8 Claims. (Cl. 318—31)

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This invention relates to remote control systems for energizing a motor to place an object or load at a desired point or position. More particularly, the invention relates to governing means for regulating the speed of the load motor.

The prime object of the invention is to provide means in a remote control system for holding the motor speed at a considerably reduced limit during the short interval of time during the stopping of the load at the desired end point; at other times, the load motor rotates at its normal running speed, which is also regulated by the improved governing means of this invention. By limiting motor speed to the reduced limit during the interval of stopping, inertia effect which would otherwise cause overrunning and hunting, may be greatly cut down.

For the attainment of this and such other objects as may appear or be pointed out herein, I have shown a number of modified forms of my invention in the accompanying drawings, wherein:

Fig. 1 is a diagrammatic view of a remote control system embodying the improved governing means of this invention, in which the improved governing means is associated with the contact arm of the primary controlling device;

Fig. 1A is a fragmentary portion of the circuit of Fig. 1 showing a governor having only a reduced-speed element;

Fig. 2 is a similar diagrammatic view, but showing a modified form in which the improved governing means includes an insulated disc and contact arm separate from the insulated disc and contact arm of the primary controlling device; and

Fig. 3 is a diagrammatic front view of a composite insulated disc for both the primary control contact arm and the contact arm of the improved governing means.

Referring first to Fig. 1, the improved remote control system of this invention comprises a reversible electric motor generally designated 1, the armature 2 of which is connected by gears 3, 4 with a useful load 5. The motor field comprises reversing winding 7, 8, each individually connected in series with the armature 2. The motor 1 is shown of a series wound type although any other suitable type of motor can be used, A-C or D-C. The control for load motor 1 is located at a control point, which may be remote from the motor, and comprises a pair of relatively movable members. One of the pair of members is an insulated disc 12 rotatively mounted on a shaft 13 and carrying electrical conducting elements in the form of metal segments 10 and 11, the upper

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adjacent ends of which are separated by a gap 14. The other of the pair of members is a contact arm 15 secured to rotate with shaft 13 and provided with a contact 18 slidably engageable with the conducting segments 10 and 11.

The segments 10, 11 are connected to collector rings 16, 17, respectively, engaged by brushes 20, 21, connected by leads 22, 23 to one end of the respective field windings 7 and 8. The other ends of the windings have a common lead 2* to the armature circuit, which will be more fully described subsequently.

Contact arm 15 is connected by a lead 24 to a wire 25 and through a switch 26 to one terminal 27 of a source of current 28. The other terminal 29 is connected through a switch 31 and leads 32, 33 to a relay armature 34, normally engaging a contact point 35, connected by a lead 36 to a contact brush 37 of a rotary speed governor. The latter comprises an insulated disc 41 secured to rotate with a shaft 42 which is an extension of the armature shaft of motor 1. Disc 41 carries a collector ring 40 engaged by said contact brush 37 and electrically connected to a switch arm 43, the lower end of which (as shown in Fig. 1) is pivotally mounted on disc 41; conveniently, the collector ring 40 is shown connected at the pivoted end of switch arm 43. Switch arm 43 is a relatively heavy spring, by reason of which its distal end normally engages a contact point 45 which is connected to a second collector ring 46. The latter ring is engaged by a contact brush 47 connected by lead 48, through the coil of a conventional electromagnetic clutch and/or brake 50, to the armature circuit, which includes armature 2 and the aforementioned common lead 2* to field windings 7 and 8. Said clutch 50 serves to couple the motor to the load when the armature circuit and the clutch coil are energized and for uncoupling the motor and braking the load when the armature circuit and the clutch coil are deenergized. The function of the rotary governor is to break the armature circuit when the motor passes a predetermined high speed, which occurs when centrifugal force acting on switch arm 43 causes it to move outwardly away from contact 45. To augment this centrifugal action the distal end of arm 43 may be weighted, as indicated at 44.

Current supply switches 26 and 31 are closed for placing the apparatus in operation. To start load motor 1, contact arm 15 is moved, by knob 125 secured to shaft 13 or by other instrumentality, away from normal position (as shown in Fig. 1) in which its contact 18 is disposed at gap 14 and thus engages neither one of segments

10 and 11, to a position in which 18 engages one of the pair of segments, depending upon the direction in which it is desired motor 1 to rotate. Assuming that arm 15 is turned clockwise to engage its contact 18 with segment 11, a circuit is completed from terminal 27, through closed switch 26, leads 25 and 24, contact arm 15 and its contact 18, to segment 11 and through its collector ring 17 and brush 21, lead 23 and field winding 8 of motor 1, common lead 2*, armature 2, electromagnet coil 50, lead 42, brush 47, inner collector ring 46, contact 45, centrifugal switch arm 43, outer collector ring 40, brush 37, lead 36, contact 35, relay armature 34, leads 33 and 32, closed switch 31, and thus back to the other terminal 29. Load motor 1 thus rotates, in the selected direction, until gap 14 is again brought into alignment with contact arm 15. Insulated disc 12 is rotated, in a direction to enable gap 14 to overtake the selectively adjusted arm 15, by a pilot motor 89, the armature 90 of which is secured on a shaft 95. At the right end of shaft 95 is secured a toothed or friction pinion 9 which drives a gear 93 secured to insulated disc 12.

Pilot motor 89, in addition to its function in rotating disc 12 (as just explained), also functions in synchronizing instrumentalities for causing load motor 1 to stop in a position corresponding to the selectively adjusted position of contact arm 15, which will now be described. Shaft 42 of load motor 1 rotates, through suitable gears 52 and 53, a shaft 54 to which is secured a contact arm 55. Contact arm 55, which is part of a commutator device at the remote point, is provided at its distal end with a contact 56 slidably engaging a plurality of concentrically disposed, stationary contacts 57, 58, 59, 60 and others not designated. The stationary contacts are individually connected by wires 65 to corresponding contact brushes 66, 67, 68, etc., at the control point, which are engageable with one or the other of a pair of conducting segments 74 and 75 mounted on an insulated disc 76 rotatable about a shaft 77. Adjacent ends of segments 74 and 75 are separated by gaps 78 and 79 which are wider than the contact brushes 66, 67, etc., so that the brushes are ineffective to bridge the gaps and contact both segments simultaneously. Segments 74 and 75 are connected to collector rings, respectively, 81 and 82, engaged by their respective brushes 83 and 84, which are connected by leads 85 and 86, to one end of respective reversible field windings 87 and 88 of the aforementioned pilot motor 89. The other ends of windings 87 and 88 are connected by a common lead to the armature circuit, which includes armature 90 and the coil of a conventional electromagnetic clutch and/or brake 92 associated with pilot motor 89, and connected by short lead 91 to wire 32 which, as already described, leads to one terminal 29 of the current supply. The circuit just traced, going through one or the other of reversible windings 88, 89 depending upon which one of the pair of segments 74 and 75 is engaged by an energized stationary brush 66, 67, 68, etc., is completed through the engaged segment (74 or 75) and the energized brush (66, 67 or 68, etc.), its respective wire 65, to the corresponding stationary commutator contacts 57, 58, 59, 60, etc., and thus through rotatable contact 56 to contact arm 55. Contact arm 55 is connected through lead 25 back to the other terminal 27 of the current supply. The aforementioned disc 76, which carries segments 74 and 75 of the pilot motor control device, is rotated

by pilot motor 89 by means of a toothed or friction pinion 96 secured on the left end of shaft 95 and meshing with a gear 97 secured to rotate with disc 76.

It has already been explained that the displacement of contact arm 15 either to the left or right of its normal position—(as shown in Fig. 1), in which its contact 18 is at gap 14 between conducting segments 10, 11—will cause load motor 1 to rotate in the desired direction. Rotation of the load motor will cause a concurrent turning of commutator arm 55, which is instrumental in causing a synchronized turning of pilot motor 89, in the following manner: When rotatable arm 55 of the commutator is in the position shown with its contact 56 engaging stationary contact 57, disc 76 of the pilot motor control device being at its corresponding synchronized position with brush 66 (which corresponds to stationary contact 57 of the commutator) at gap 78, the circuit (previously traced) is broken at brush 66—gap 78. Rotation of load motor 1 now turns commutator arm 55 clockwise to engage its contact 56 with the next stationary contact 58, and thus to complete the circuit through the corresponding brush 67 of the pilot motor control device, segment 75 and through its associated field winding 87. The resulting rotation of pilot motor 89 causes a concurrent turning of both insulated disc 12 and insulated disc 76 of the pilot motor control device. Disc 12 is turned in a direction to cause gap 14 to overtake the displaced contact arm 15 and to cause its contact 18 to be free of both segments 10 and 11, thus breaking the circuit to the field winding 8, and thereby bringing load motor 1 to a stop.

Disc 76 of the pilot motor control device is likewise turned in a direction to cause gap 78 (as shown in Fig. 1) to reach stationary brush 67 (which is in energized condition, as described above, by reason of the engagement of commutator contact 56 with the corresponding stationary contact 58). The brushes 66, 67, 68, etc., being narrower than gaps 78, 79, the arrival of gap 78 at energized brush 67 will break the circuit to field winding 87, thus bringing pilot motor 89 to a stop.

The turning of commutator arm 55, by load motor 1, to bring its contact 56 into engagement with successive ones of the stationary contacts 57, 58, 59, etc., will cause a synchronized turning of pilot motor control disc 76, by its energization of pilot motor 89, gap 78 reaching the energized one of the brushes 66, 67, 68, etc., corresponding to the engaged commutator contact 57, 58, 59 to break current supply to the pilot motor. Concurrently the pilot motor rotates insulated disc 12 to bring gap 14 progressively nearer to the contact arm 15 in its selectively advanced position. Current is continued to be supplied to the load motor 1, thus causing commutator arm 55 to continue to turn and engage successive commutator contacts 57, 58, 59, etc. This stepped advance of commutator arm 55 and pilot motor control disc 76 will continue until gap 14 reaches the contact arm 15, at which time the load motor will be stopped, thus stopping the commutator arm 55 at its last engaged commutator contact and stopping disc 76 with the last corresponding brush at its gap 78.

Contact arm 15 is provided with a pointer 123 which cooperates with a fixed circular scale 122 to enable the operator to place the load at the desired end point, without the use of a back-indicator since the position of the load is di-

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rectly or proportionally synchronized with contact arm 15.

Pivoted switch arm 43 has been described above as forming part of a rotary speed governor. More particularly, centrifugally-influenced arm 43 is effective to break the circuit to load motor 1 when its speed exceeds a predetermined normal running speed. It has been found desirable that the motor rotate at a considerably reduced speed during the interval approaching the stopping of the load at the desired end point, in order to reduce inertia effect which would otherwise cause overrunning and hunting. For this purpose, a second switch arm 105 is pivotally mounted on rotary disc 41 of the speed governor with its distal end normally engaging contact 104, connected in common with contact 45 of the switch arm 43, to collector ring 40. Switch arm 105 is a considerably weaker spring than 43 and, in addition, carries a heavier weight 106 at its distal end than weight 44 of switch arm 43, so that it will move outwardly away from its contact 104 at a speed considerably less than the normal running speed at which switch arm 43 functions. The pivoted end of reduced-speed arm 105 is connected to a collector ring 107, engaged by a brush 108 which is connected by lead 109 to a contact point 110 associated with relay armature 34, which has previously been described in connection with the circuit to normal-speed arm 43. Relay armature 34 is associated with a relay 115, one terminal of which is connected through lead 32 to one terminal 29 of the current source; the other relay terminal is connected through lead 116 to a brush 117 engaging a collector ring 118 carried on disc 12 and connected to a pair of contacts 119 separated by a gap 120. Contact arm 15 carries a supplementary contact 121 which engages one or the other of the disc contacts 119 simultaneously with the engagement of the disc segments 10, 11 by contact 18 of contact arm 15.

As previously described, the circuit to the load motor is broken when gap 14 overtakes contact 18 of the contact arm 15. But before this occurs, one or the other of the pair of contacts 119 of disc 12 (depending upon the direction of rotation) will have engaged supplementary contact 121, to complete a circuit from one terminal 27 of the current source, through lead 24, arm 15, its supplementary contact 121, contact 119, collector ring 118, brush 117, lead 116, relay 115, and through lead 32 back to the other supply terminal 29. The resulting energization of relay 115 will attract relay arm 34 away from contact point 35, with which it is in normal contact, and into engagement with contact point 110, thus breaking the said circuit to 43 and completing a circuit through collector ring 107, to the reduced-speed switch arm 105. Thus, for the short interval that supplementary contact 121 is in engagement with contacts 119, 119 (which, incidentally, occurs not only when the gap 14 approaches contact arm 15 in stopping the load motor, but also occurs when the contact arm 15 is displaced away from gap 14 in starting the motor), motor speed will be held down to the desired reduced limit by switch arm 105. Instead of a pair of supplementary contacts 119, 119 separated by gap 120, a single supplementary contact may be provided. The advantage of a pair of contacts resides in the fact that when contact 121 is at the gap, the relay will be deenergized, thus saving current which otherwise would be wasted.

The improved speed regulating means of this

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invention may, if desired, dispense with the normal-speed governor arm and limit motor speed only during the stopping of the motor as the load approaches the desired end point. This is illustrated in Fig. 1A which is a fragmentary portion of the circuit diagram of Fig. 1, wherein the corresponding superseded portion is shown boxed by a dot-and-dash rectangle. Only the reduced-speed switch arm 105 and its contact 104 are present on insulated disc 41*. Lead 36* from relay contact 35, instead of going to normal-speed collector ring 40, as in Fig. 1, is connected directly to wire 48 leading to the motor armature. As in Fig. 1, relay 115 is energized, when contact arm 15 in approaching gap 14 engages supplementary contacts 119, 119 to attract relay armature 34 to engage relay contact 110 and complete the circuit to reduced-speed switch arm 105. At all other times relay 115 is deenergized so that its armature 34 engages contact 35; this circuit through lead 36 is necessary to complete the motor circuit to supply terminal 27.

The system of Fig. 2 differs from that of Fig. 1 described above, principally in the arrangement for operating the normal-speed switch arm 43 and the reduced-speed switch arm 105; there are also minor differences in the two systems which will be pointed out below. Instead of a supplementary contact (121) on contact arm 15 and cooperating contacts (119) on insulated disc 12 as in Fig. 1, a separate insulated disc 145 is employed in Fig. 2, devoted solely to the control of the rotary speed governor. Insulated disc 145 is, like insulated disc 12, rotatively mounted on shaft 13 but is mechanically connected with disc 12 to rotate therewith; this is diagrammatically shown in Fig. 2 by broken lines 146. Disc 145 mounts a circular metal plate 148 having a peripheral recess 149. A contact arm 150 is, like contact arm 15, secured to shaft 13 in a predetermined angular relation to contact arm 15, and is electrically connected thereto, as diagrammatically indicated by lead 13*. The distal end of contact arm 150 is engaged with circular plate 148 except at its recess 149. Circular plate 148 is connected by short lead 151* to a collector ring 151, engaged by a brush 152 which is connected by lead 153 to one terminal of relay 115, the other terminal of which is connected by short lead 154 to wire 32 leading to one supply terminal 29. The relay circuit to the other terminal 27 is completed through leads 25, 24, and contact arm 150 (when its distal end is not disposed in recess 149 of circular plate 148). Relay 115 when energized, as just described, attracts relay armature 34 to complete a circuit to the reduced-speed switch arm 105.

The distal ends of switch arms 43 and 105 are normally engaged with contact points, respectively, 45 and 104, which are connected to collector ring 46 leading, through brush 47, to the armature circuit of load motor 1, precisely as in Fig. 1. Also as in Fig. 1 the pivoted end of switch arm 43 is connected to collector ring 40 while the pivoted end of switch arm 105 is connected to collector ring 107. The remainder of the circuits from the normal-speed collector ring 40 and the reduced-speed collector ring 107 differ from that of Fig. 1 and will now be described. Collector ring 107 of the reduced-speed arm 105 is engaged by brush 108 which is connected by short lead 143 to wire 25 which leads back to supply terminal 27. Hence current is always supplied to the reduced-speed governor. On the other hand, current is supplied to the normal or high-speed arm 43 at all times

except when contact arm 15 is close to gap 14. The normal-speed circuit is traced from normal-speed collector ring 40 through brush 159 and lead 142 to relay armature 34, to relay contact 160 (when relay 115 is energized), and through lead 161 to current supply wire 25. It is thus seen that governor arms 43 and 105 are in parallel circuits, one common juncture being at short lead 143, the other common junction being at the collector ring 46 leading to the armature circuit of motor 1.

Recess 149 of circular plate 148 is so disposed relatively to gap 14 that contact arm 150 will be at recess 149 when gap 14 is at, or close to, the contact arm 15 (as diagrammatically shown in Fig. 2). It is at this time, more particularly, when gap 14 approaches contact arm 15 (to stop the load motor), that it is desirable that the motor rotate at reduced speed. The circuit to relay 115 is broken when contact arm 150 reaches recess 149 (as shown) to deenergize the relay and permit its armature 34 to disengage contact 160 (under urgency of a spring, not shown); this breaks the circuit to normal-speed arm 43. It is thus seen that only the reduced-speed arm 105 is effective to govern motor speed when gap 14 approaches contact arm 15, and hence will hold motor speed to the desired reduced limit.

When gap 14 is not close to contact arm 15, at which time there is no need to hold motor speed down to the reduced limit, the contact arm 150 will have been displaced relative to recess 149 and will engage the circular plate 148 to complete the circuit to relay 115. Energization of relay 115 will attract its armature 34 to complete the normal-speed circuit. It was explained above that current is always supplied the reduced-speed arm 105; hence in the normal running condition of the motor, current will be supplied to both arms 43 and 105 (in parallel circuits, as explained above). However, the reduced-speed switch arm 105 will move outwardly away from its contact 164 when the motor speed exceeds the reduced limit, thus leaving the normal or high speed switch arm 43 effective to govern motor speed.

One of the incidental differences between the systems of Figs. 1 and 2 concerns the energization of reversible field windings 7 and 8 of load motor 1. In Fig. 1 the field windings are connected directly to the collector rings of their respective segments 10, 11 of insulated disc 12; in Fig. 2, a pair of relays 132 and 133 are interposed. One terminal of relay 133 is connected by lead 131 to collector ring 17 of segment 11, while one terminal of relay 132 is connected by lead 130 to collector ring 16 of segment 10. The other terminals of relays 132 and 133 are connected by short lead 134 to wire 32 leading back to the current source. Armature 137 of relay 132 normally engages contact 140 leading to field winding 7 while armature 138 of relay 133 normally engages contact 141 leading to field winding 8. Energization of relay 132 will attract armature 137 to engage a contact 135 on current supply wire 32, thus completing a circuit from current source, through relay armature 137, a connecting lead 156, and the other relay armature 138, to contact 141 and thus to field winding 8. If the other relay 133 is energized, its armature 138 will be attracted to engage a contact 136 on current supply wire 32, to supply current to the other field winding 7 via relay armature 137 which remains engaged with its contact 140.

As described above, the circular plate 148 dur-

ing normal running of the motor when the load end point is not being approached, is engaged by contact arm 150 to maintain relay 115 energized to attract its armature 34 to complete the circuit to the normal-speed switch arm 43. The reverse arrangement may be used, in which relay 115 is normally—i. e., when the load end point is not approached—deenergized; in this case the active relay contact will be the lower one (instead of the upper contact 160, as shown) so that the circuit to the normal-speed switch arm 43 will be normally completed. The circular plate 148 would be dispensed with entirely so that the circuit to relay 115 will be broken during normal running. The insulated disc 145 would bear merely a small contact plate (not shown) substantially the size and shape of recess 149 and engageable by contact arm 150 when the load end point is approached, to energize relay 115 to attract relay armature 34 away from the lower (and active) contact, thus breaking the circuit to normal-speed switch arm 43.

In instances where the total range of angular load displacement is less than 90° in either direction from a normal rest position, the segments 10 and 11 of disc 12 and the circular plate 148 of disc 145 may be combined in a single disc 169, Fig. 3, in which segments 10 and 11 find their counterparts in the form of arcuate segments 166 and 167, respectively, each less than 90° and occupying the upper half of the disc, the adjacent ends of the two segments being separated by gap 14. Circular plate 148 finds its counterpart in an arcuate segment 168 which occupies the lower half of disc 169 and which is provided with a centrally disposed recess 149* in its inner arcuate edge. Contact 18 of contact arm 15 engages segments 166 and 167; the distal end of a contact arm 150*, which is a diametrically opposite extension of the contact arm 15, engages the segment 168 except in the central position shown, in which the distal end of arm 150* is disposed within recess 149*. Segments 166 and 167 are connected to collector rings, respectively, 16 and 17 while segment 168 is connected to collector ring 151; these collector rings and the contact arms 15 and 150* are connected in a wiring diagram precisely as shown in Fig. 2, and hereinabove described, the operation being the same.

The reverse arrangement suggested above in connection with the circular plate 148 and recess 149 of Fig. 2, may be employed in Fig. 3 (with similar changes in the active contact of relay 115) by replacing segment 168 by a small contact plate (not shown) substantially the size and shape of recess 149*.

As has been previously explained in connection with Fig. 1 the arrangement shown in Fig. 2, with either separate discs 12 and 145 or with the composite disc 169 of Fig. 3, may eliminate the normal-speed switch arm 43 and function to limit motor speed only during the stopping of the motor as the load approaches the desired end point. In this case, the rotary governor and circuit will be quite similar to that shown in Fig. 1A except that relay armature arm 34 will engage contact 35 when the relay is energized and will engage contact 110 when deenergized (just the reverse of that shown in Fig. 1A). Recurring to Fig. 2, during normal motor rotation, i. e. when load end point is not being approached, relay 115 would be energized to attract its armature 34, Fig. 1A, into engagement with contact 35 (as stated above, in the reverse of the armature operation shown) to complete the circuit through

collector ring 46 to the motor. As the load end point is approached, the circuit to relay 115 will be broken at recess 149, Fig. 2, so that relay armature 34 will now engage contact 110 (Fig. 1A, with the reversed armature arrangement mentioned above) to complete the circuit through collector ring 107 to the reduced-speed switch arm 105.

I claim:

1. In a remote control system for placing a load at any desired end point, in combination, a pair of relatively movable members, one of the members having electrical conducting elements separated by a gap, the other member having a contact element slidably engageable with the said conducting elements, a motor for moving the load, circuit means including the said motor and elements and a source of current supply, one of the said pair of members being selectively adjusted to cause displacement between said gap and contact element and engagement thereof with one or the other of the said conducting elements depending upon the direction in which it is desired the motor to rotate, means under control of the load motor for turning the other member of the pair in a direction to cause alignment of contact element and the said gap to stop the motor, a rotary speed governor driven by the said motor, contacts on the governor connected to the said motor circuit, a pair of switch arms mounted on the governor and spring urged into engagement with the said contacts, the said pair of switch arms being distally weighted, the said spring-urged arms and distal weights being arranged to cause one of the said pair of switch arms to disengage its said contact at a predetermined normal running speed and to cause the other switch arm to disengage its contact at a reduced speed, a relay having an armature connected to one supply terminal and engageable with one or the other of a pair of contacts, the said normal-speed switch arm being connected to one of the said relay contacts and the said reduced-speed arm being connected to the other relay contact, a pair of supplementary contacts carried on one of the said pair of relatively movable members one on each side of the said gap and adapted to be engaged by the other of the members, the said other member being connected to one supply terminal, circuit means including the said relay and pair of supplementary contacts and the other supply terminal whereby the relay will be energized when the members of said pair are close to alignment of contact element and gap, said relay armature being engaged in the deenergized condition of the relay with the said relay contact leading to the normal-speed governor arm whereby when the members of said pair are not close to alignment the said normal-speed governor will be operative, and the armature being engaged in the energized condition of the relay with the said relay contact leading to the reduced-speed governor arm whereby when the members of said pair are close to alignment the said reduced-speed governor will be operative.

2. In a remote control system for placing a load at any desired end point, in combination, a pair of relatively movable members, one of the members having electrical conducting elements separated by a gap, the other member having a contact element slidably engageable with the said conducting elements, a motor for moving the load, circuit means including the said motor and elements and a source of current supply, one of the said pair of members being selectively adjusted

to cause displacement between said gap and contact element and engagement thereof with one or the other of the said conducting elements depending upon the direction in which it is desired the motor to rotate, means under control of the load motor for turning the other member of the pair in a direction to cause alignment of contact element and the said gap to stop the motor, a rotary speed governor driven by the said motor, a contact on the governor connected to the said motor circuit, a switch arm mounted on the governor and spring urged into engagement with the said contact, the said arm being distally weighted, the said spring-urged arm and distal weight being arranged to cause said switch arm to disengage its said contact at a predetermined reduced speed, a relay having an armature connected to one supply terminal and engageable with one or the other of a pair of contacts, the said switch arm being connected to one of the said relay contacts, the other relay contact being connected to the said motor circuit, a pair of supplementary contacts carried on one of the said pair of relatively movable members one on each side of the said gap and adapted to be engaged by the other of the members, the said other member being connected to one supply terminal, circuit means including the said relay and pair of supplementary contacts and the other supply terminal whereby the relay will be energized when the members of said pair are close to alignment of contact element and gap, said relay armature being engaged in the deenergized condition of the relay with the said relay contact leading to the motor circuit, and the armature being engaged in the energized condition of the relay with the said relay contact leading to the reduced-speed governor arm whereby when the members of said pair are close to alignment the said reduced-speed governor will be operative.

3. In a remote control system for placing a load at any desired end point, in combination, a pair of relatively movable members, one of the members having electrical conducting elements separated by a gap, the other member having a contact element slidably engageable with the said conducting elements, a motor for moving the load, circuit means including the said motor and elements and a source of current supply, one of the said pair of members being selectively adjusted to cause displacement between said gap and contact element and engagement thereof with one or the other of the said conducting elements depending upon the direction in which it is desired the motor to rotate, means under control of the load motor for turning the other member of the pair in a direction to cause alignment of contact element and the said gap to stop the motor, a rotary speed governor driven by the said motor, contacts on the governor connected to the said motor circuit, a pair of switch arms mounted on the governor and spring urged into engagement with the said contacts, the said pair of switch arms being distally weighted, the said spring-urged arms and distal weights being arranged to cause one of the said pair of switch arms to disengage its said contact at a predetermined normal running speed and to cause the other switch arm to disengage its contact at a reduced speed, a second pair of relatively movable members, individual ones thereof being arranged to move concomitantly with respective ones of the first said pair of movable members, one of the second said pair of members having a conducting surface provided with a recess, the

other member of the pair having a contacting element engageable with the said conducting surface, the members of the said two pairs being angularly associated so that the contacting element of the second pair will be disengaged at the said recess when the members of the first said pair are close to alignment of contact element and gap, the contacting element of the second pair being connected to one supply terminal, a relay having an armature connected to the said supply terminal; a circuit including the said contacting surface of the second pair, the said relay and the other supply terminal whereby the said relay is energized except when the said contacting element is disengaged at the said recess, a second circuit including the said normal-speed governor arm, the said relay armature and a supply terminal so that current is supplied to the normal-speed governor arm except when the said contacting element is disengaged at the said recess whereby no current is supplied to the said normal-speed governor arm when the members of the first said pair are close to alignment of contact element and gap, the reduced-speed governor arm being directly connected to a supply terminal so that current is constantly supplied thereto during motor rotation whereby only the reduced-speed governor arm is effective when the members of the first pair are close to alignment.

4. In a remote control system for placing a load at any desired end point, in combination, a pair of relatively movable members, one of the members having electrical conducting elements separated by a gap, the other member having a contact element slidably engageable with the said conducting elements, a motor for moving the load, circuit means including the said motor and elements and a source of current supply, one of the said pair of members being selectively adjusted to cause displacement between said gap and contact element and engagement thereof with one or the other of the said conducting elements depending upon the direction in which it is desired the motor to rotate, means under control of the load motor for turning the other member of the pair in a direction to cause alignment of contact element and the said gap to stop the motor, a rotary speed governor driven by the said motor, a contact on the governor connected to the said motor circuit, a switch arm mounted on the governor and spring urged into engagement with the said contact, the said switch arm being distally weighted, the said spring-urged arm and distal weight being arranged to cause the switch arm to disengage its said contact at a predetermined reduced speed, a second pair of relatively movable members, individual ones thereof being arranged to move concomitantly with respective ones of the first said pair of movable members, one of the second said pair of members having a conducting surface provided with a recess, the other member of the pair having a contacting element engageable with the said conducting surface, the members of the said two pairs being angularly associated so that the contacting element of the second pair will be disengaged at the said recess when the members of the first said pair are close to alignment of contact element and gap, the contacting element of the second pair being connected to one supply terminal, a relay connected to the said supply terminal; a circuit including the said contacting surface of the second pair, the said relay and the other supply terminal whereby the said relay is energized except when the said contact-

ing element is disengaged at the said recess, a second circuit including the said governor arm, the armature of the said relay and a supply terminal so that current is supplied to the governor arm when the said contacting element is disengaged at the said recess whereby no current is supplied to the governor arm when the contact element and gap are out of alignment, the motor being then directly connected to a supply terminal so that current is supplied thereto during motor rotation.

5. In a remote control system for placing a load at any desired end point, in combination, a pair of relatively movable members, one of the said members being an insulated disc having a pair of arcuate conducting elements each less than 90° of a circle and separated by a gap, the other member having a contact arm provided with a contact element slidably engageable with the said conducting elements, a motor for moving the load, circuit means including the said motor and elements and a source of current supply, one of the said pair of members being selectively adjusted to cause displacement between said gap and contact element and engagement thereof with one or the other of the said conducting elements depending upon the direction in which it is desired the motor to rotate, means under control of the load motor for turning the other member of the pair in a direction to cause alignment of contact element and the said gap to stop the motor, contacts on the governor connected to the said motor circuit, a rotary speed governor driven by the said motor, a pair of switch arms mounted on the governor, and spring urged into engagement with the said contacts, the said pair of switch arms being distally weighted, the said spring-urged arm and distal weights being arranged to cause one of the said pair of switch arms to disengage its said contact at a predetermined normal running speed and to cause the other switch arm to disengage its contact at a reduced speed, the said insulated disc having an arcuate conducting segment less than 180° of a circle and provided with a centrally disposed recess, and the said contact arm having a contact extension slidably engageable with the said conducting segment except at its said recess, the said composite contact arm of the pair of relatively movable members being connected to one supply terminal, a relay having an armature connected to the said supply terminal, a circuit including the said conducting segment, the said relay and the other supply terminal whereby the said relay is energized except when the said contact extension is disengaged at the said recess, a second circuit including the said normal-speed governor arm, the said relay armature and a supply terminal so that current is supplied to the normal-speed governor arm except when the said contact extension is disengaged at the said recess whereby no current is supplied to the said normal-speed governor arm when the members of said pair are close to alignment of contact element and gap, the reduced-speed governor arm being directly connected to a supply terminal so that current is constantly supplied thereto during motor rotation whereby only the reduced-speed governor arm is effective when the members of said pair are close to alignment.

6. In a remote control system for placing a load at any desired end point, in combination, a pair of relatively movable members, one of the said members being an insulated disc having a pair of arcuate conducting elements each less

than 90° of a circle and separated by a gap, the other member having a contact arm provided with a contact element slidably engageable with the said conducting elements, a motor for moving the load, circuit means including the said motor and elements and source of current supply, one of the said pair of members being selectively adjusted to cause displacement between said gap and contact element and engagement thereof with one or the other of the said conducting elements depending upon the direction in which it is desired the motor to rotate, means under control of the load motor for turning the other member of the pair in a direction to cause alignment of contact element and the said gap to stop the motor, a contact on the governor connected to the said motor circuit, a rotary speed governor driven by the said motor, a switch arm mounted on the governor and spring urged into engagement with the said contact, the said switch arm being distally weighted, the said spring-urged arm and distal weight being arranged to cause the switch arm to disengage its said contact at a predetermined reduced speed, the said insulated disc having an arcuate conducting segment less than 180° of a circle and provided with a centrally disposed recess, and the said contact arm having a contact extension slidably engageable with the said conducting segment except at its said recess, the said composite contact arm of the pair of relatively movable members being connected to one supply terminal, a relay connected to the said supply terminal, a circuit including the said conducting segment, the said relay and the other supply terminal whereby the said relay is energized except when the said contact extension is disengaged at the said recess, a second circuit including the said governor arm, the armature of said relay and a supply terminal so that current is supplied to the governor arm when the said contact extension is disengaged at the said recess whereby no current is supplied to the said governor arm when the contact element and gap are out of alignment.

7. In a remote control system for placing a load at any desired end point, in combination, a pair of relatively movable members, one of the members having electrical conducting elements separated by a gap, the other member having a contact element slidably engageable with the said conducting elements, a motor for moving the load, circuit means including the said motor and elements and a source of current supply, one of the said pair of members being selectively adjusted to cause displacement between said gap and contact element and engagement thereof with one or the other of the said conducting elements depending

upon the direction in which it is desired the motor to rotate, means under control of the load motor for turning the other member of the pair in a direction to cause alignment of contact element and gap to stop the motor, a rotary speed governor driven by the said motor, contacts on the governor connected to the said motor circuit, a pair of switch arms mounted on the governor and spring urged, into engagement with the said contacts, the said pair of switch arms being distally weighted, the said spring-urged arms and distal weights being arranged to cause one of the said pair of switch arms to disengage its said contact at a predetermined normal running speed and to cause the other switch arm to disengage its contact at a reduced speed, and means associated with the said pair of movable members operative when the members of the said pair are close to alignment of contact element and gap for rendering the normal-speed governor arm effective for control of the motor speed during the normal running of the motor and placing the motor under control the reduced-speed governor arm as the load approaches the desired end point.

8. In a remote control system for placing a load at any desired end point, in combination, a reversible motor for moving the load, a pair of relatively movable members, one of the members being selectively adjusted to either side of a neutral position to rotate the motor in the desired direction, means under control of the motor for moving the other member in a direction to overtake the said selectively adjusted member at the said neutral position to stop the motor, a speed governor driven by the said motor having a normal-speed and a reduced-speed switch arm, and control means associated with said pair of members and under control thereof for rendering the normal-speed governor arm effective for control of the motor speed during normal running of the motor and for placing the motor under control of the reduced-speed governor arm when the members of said pair are close to the said neutral position whereby the motor speed will be reduced as the load approaches the desired end point.

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