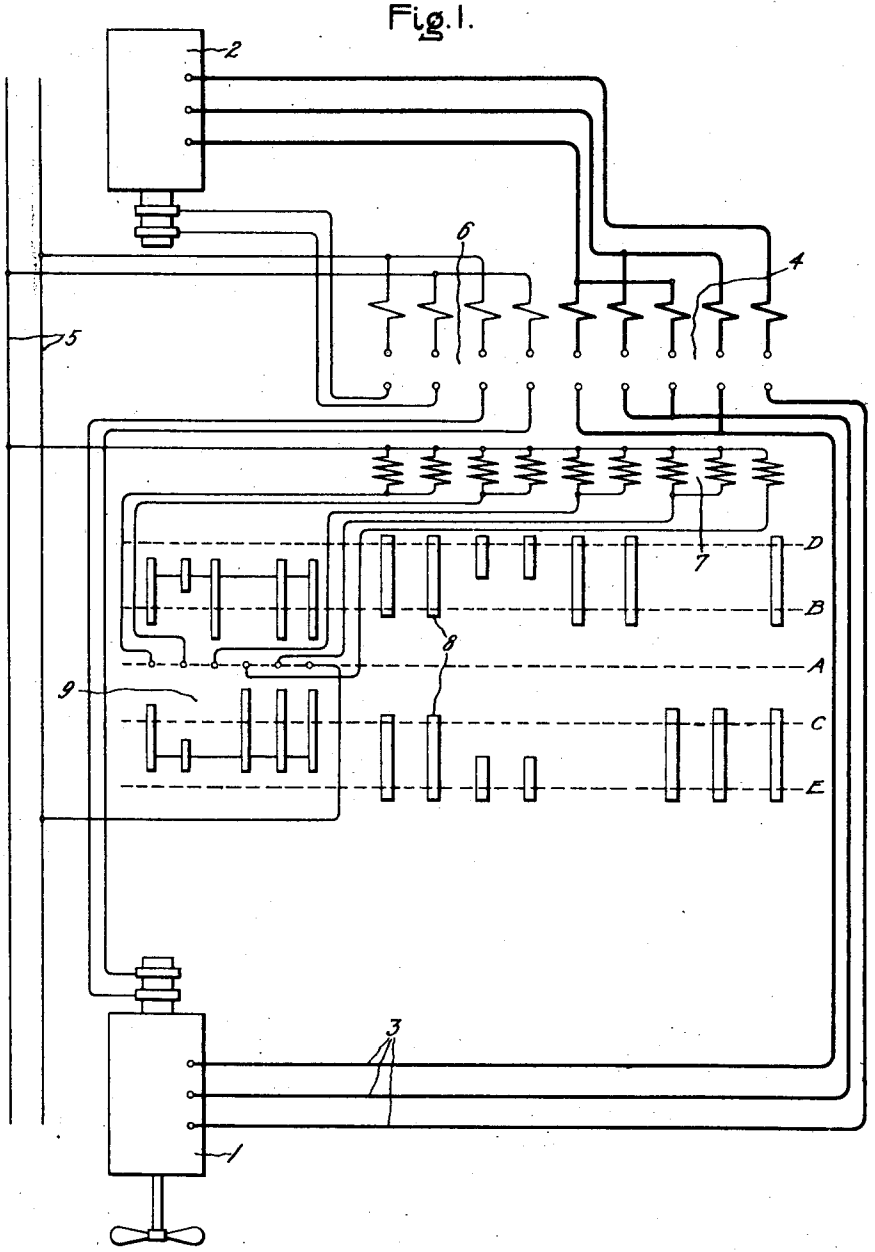
July 23, 1929. G. O. WATSON 1,722,165

SWITCH MECHANISM

Filed April 12, 1927 2 Sheets-Sheet 1

Fig. 1.



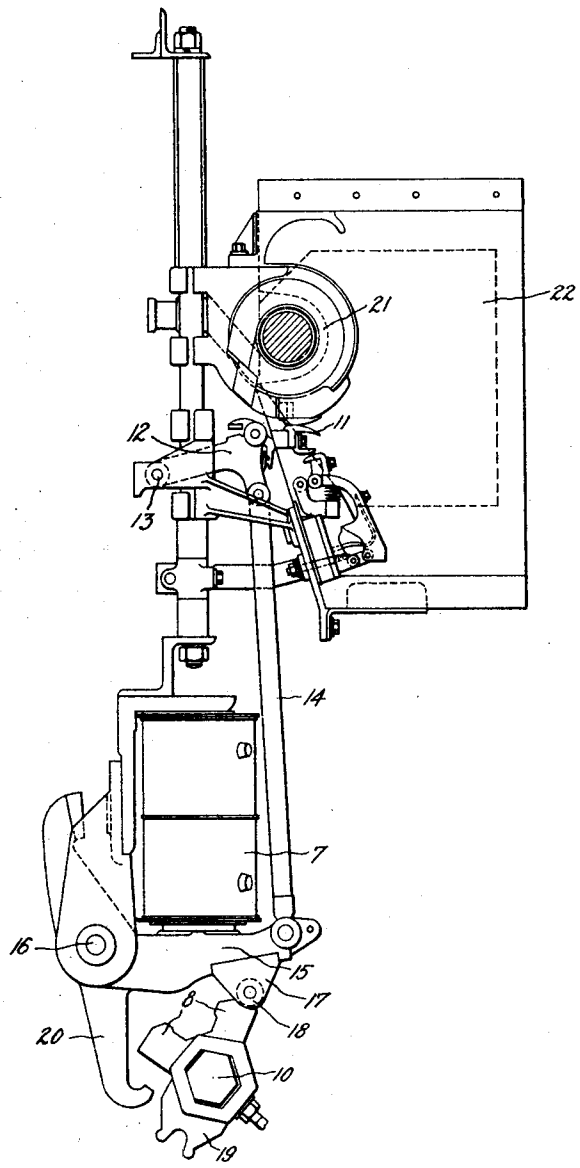
Inventor:
George O. Watson,
by
His Attorney.

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Fig. 2.



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UNITED STATES PATENT OFFICE.

GEORGE OLIPHANT WATSON, OF RUGBY, ENGLAND, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK,

SWITCH MECHANISM.

Application filed April 12, 1927, Serial No. 183,202, and in Great Britain May 21, 1926.

This invention relates to switch mechanisms for controlling electric circuits, and more particularly to contactors for the control of heavy current circuits such as are required, for example, in connection with ship propulsion systems.

In such systems it is desirable that the contactors should be opened and closed rapidly and to ensure such rapid operation it is usual to employ solenoids for operating the contactors. In view of the importance of the control, however, it is always necessary to provide an emergency method of operation in case the solenoids should for any reason fail to operate. It is also necessary to ensure that the contactors will open and to provide mechanical means for opening them in the event of the contacts becoming welded together or otherwise remaining closed when the operating solenoid has been deenergized.

It has already been proposed to use solenoids for operating contactors and to provide cams for emergency operation, but their operation has been separate and independent and not simultaneous. The principal object of the present invention is to provide means for operating the contactors electrically and mechanically, the two means being in operation simultaneously.

In accordance with my invention the operation of the contactors normally is effected by solenoids controlled by a master controller, and a cam shaft connected to be operated simultaneously with the master controller is adapted to follow up the master controller so as to effect both the closing and the opening operation of any of the contactors in the event of failure of operation by the corresponding solenoids.

The accompanying drawings illustrate my invention embodied in an electric ship propulsion system, Fig. 1 being a schematic diagram of the control circuits, and Fig. 2 showing a construction of combined solenoid and cam operated contactor suitable for employment in the system illustrated in Fig. 1.

Referring to the drawings, 1 represents an alternating current propeller motor which is supplied with current from an alternator 2 through leads 3 and reversing contactors 4. The field excitation supply for the motor 1 and alternator 2 is taken from bus bars 5 and is controlled by field contactors 6. The operation of the reversing contactors 4 and the field contactors 6 normally is effected by means of solenoids 7 and cams 8, the selective energization of the solenoids 7 being under the control of a master controller 9 to effect operation of the proper portions of the contactors 4 and 6 for forward and reverse operation of motor 1. The cans 8 are mounted on a cam shaft 10 as shown in Fig. 2, and the cam shaft is operated simultaneously with the master controller in order to insure operation of the selected contactors upon failure of the corresponding operating electromagnets.

In the particular form of contactor shown in Fig. 2, the movable contact 11 of the contactor is carried by an arm 12, which is pivotally mounted on a pin 13 and controlled by an operating rod 14 attached to an armature 15 pivoted on a pin 16. The armature 15 is under the control of the solenoid 7 and is provided with a projection 17 carrying a roller 18 for cooperation with the cams 8. The cam shaft 10 is provided with a separate cam element 19 adapted to contact with a knock-out lever 20 and thereby effect the opening of the contact 11 in the event of the contacts sticking and the contactor remaining in the closed position after the deenergization of the solenoid 7 and movement of the cam shaft to the open position. The contactor is provided, as shown, with the usual blow-out coil 21 and arc chute 22.

In accordance with my invention the master controller 9 and the cam shaft 10 rotate simultaneously and are so timed in relation to each other that the circuit of the solenoids 7 is energized by the master controller 9 just before the cams 8 engage the pivoted armature 15 to close it and the solenoids are deenergized just after the cams have disengaged. In the particular arrangement shown in Fig. 1, the master controller 9 is arranged as an extension on the cam shaft. When the cam shaft and the controller are moved from the stop position A to the ahead starting position B or the astern starting position C, the arrangement of the cams 8 and the contacts on the master controller 9 is such that the cams come into operation immediately after the solenoids have been energized. In this way, should a solenoid fail to operate, the cam which is following up operates the contactor to the closed position, while should the solenoid become deenergized, while the contactor is closed, the contactor will be held closed by the cam until the cam has been rotated out of engagement. Such an ar-

rangement has the advantage of rapid action under normal conditions when the solenoids are functioning correctly, combined with an immediate follow up of the emergency cam shaft under all conditions.

A further feature of my invention is that the cams 8 and contacts on the controller 9 are so arranged that in the ahead running position D or the astern running position E the solenoids 7 are deenergized and the cams 8 alone employed to hold the contactors closed, thereby economizing in the power required to hold the contactors closed.

In order to effect the simultaneous movement of the master controller 9 and the cam shaft 10, they may be mounted on the same shaft or geared together and one of them operated either manually or by power means. For example, the master controller may be operated by a hand-wheel or the cam shaft may be operated by levers or a hand-wheel or by a driving motor which may be either electric, hydraulic, or pneumatic.

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

1. The combination with a movable switch member, of electroresponsive means for operating the switch member, control means for said electroresponsive means, and mechanical means operable simultaneously with said control means for insuring operation of the switch member upon failure of the electroresponsive operating means.

2. The combination with a movable switch member of electroresponsive means for operating the switch member, and a master controller for controlling the energization of said electroresponsive means and having means associated therewith for mechanically operating the switch member upon failure of the electroresponsive operating means.

3. The combination of a movable switch member, of an electromagnet for operating the switch member from one position to another position, means for biasing the switch member to return to said first position upon the deenergization of the operating electromagnet, and a master controller for controlling the energization and deenergization of the electromagnet and having means associated therewith for mechanically operating the switch member to each of said positions upon failure of the electromagnet and the biasing means.

4. The combination with a movable switch member of an electromagnet for operating the switch member from one position to another, means for biasing the switch member to return to said one position upon deenergization of the operating electromagnet, a master controller for controlling the energization of the operating electromagnet, and a cam mechanism mechanically connected to be operated simultaneously with said master controller and having one cam element for operating the switch from said one position to the other position upon failure of the electromagnet and a separate cam element for effecting the return of the switch member to said one position upon failure of the biasing means.

5. The combination with an electroresponsive switch of a cam mechanism for operating the switch and maintaining the same in the operated position, and a master controller mechanically connected with said cam mechanism to control the energization of the switch to effect a quick operation thereof before operation thereof by said cam mechanism.

6. The combination with a plurality of electroresponsive switches, of a master controller for selectively controlling the energization of the said electroresponsive switches to effect operation of different portions thereof and having means associated therewith for mechanically operating the selected portion of the switch members upon failure of the corresponding electroresponsive operating means.

7. The combination of a plurality of switches each biased to one position and having an electromagnet for operating the same to another position, of a master controller for selectively controlling the energization of said electromagnets to effect operation of different portions of the switches, and a cam shaft connected to be operated simultaneously with said controller and having a plurality of cam elements for mechanically operating the selected switch members upon failure of the corresponding operating electromagnet.

8. The combination with a plurality of electroresponsive switches, of a master controller for selectively controlling the energization of said electroresponsive switches to effect operation of different portions thereof and having cam mechanism associated therewith for mechanically holding the selected portion of the switch members in the operated position upon deenergization of the corresponding operating means therefor.

9. The combination with a plurality of electromagnetic switches, of a cam mechanism for selectively operating different portions of the switches, and a master controller mechanically connected with the cam mechanism for energizing the operating electromagnets of the selected portion of the switches to effect a quick electromagnetic operation thereof before mechanical operation thereof by said cam mechanism and for deenergizing the said operating electromagnets after the switches are mechanically held in the operated position.

In witness whereof, I have hereunto set my hand this 28th day of March, 1927.

GEORGE OLIPHANT WATSON.