March 19, 1946. F. J. RUSSELL 2,396,972

SWITCHING MECHANISM

Filed Dec. 18, 1943

Fig. 1

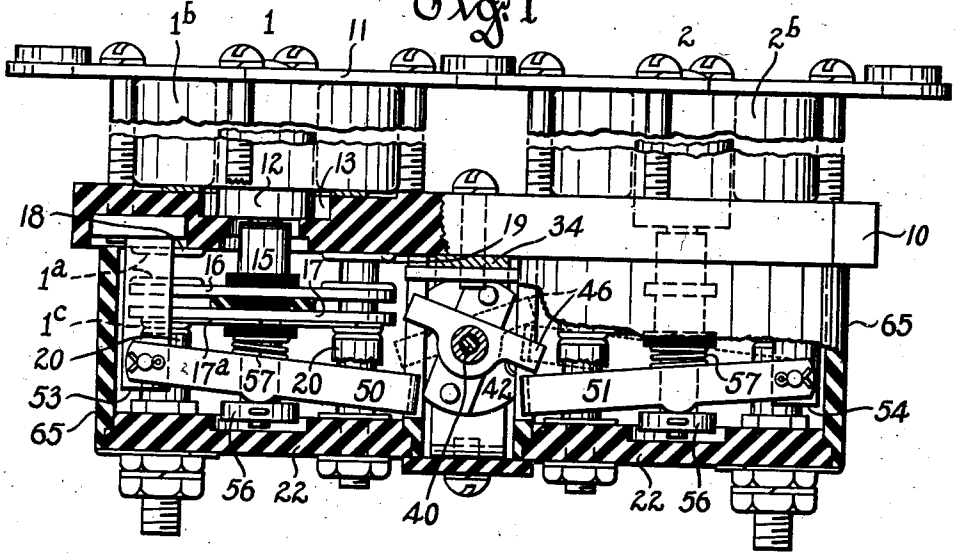


Fig. 2

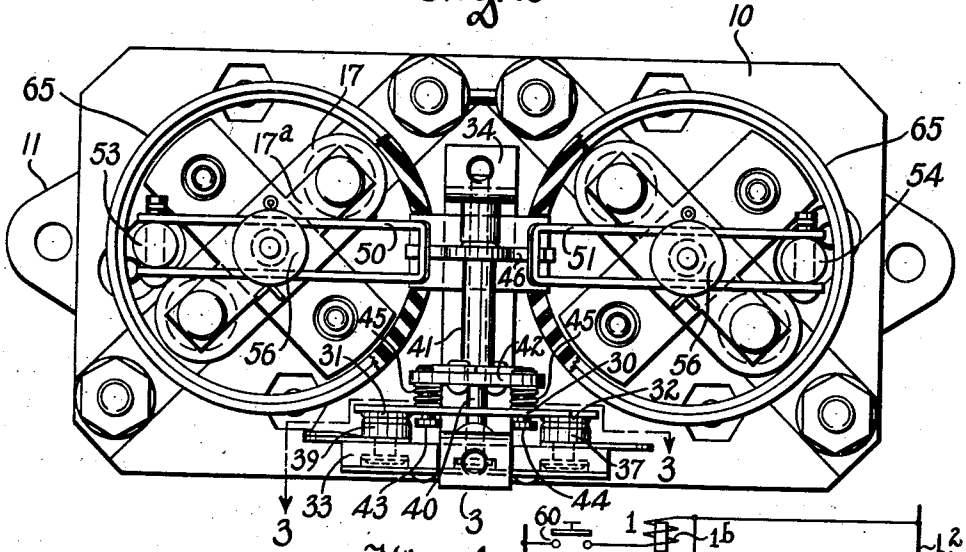


Fig. 3

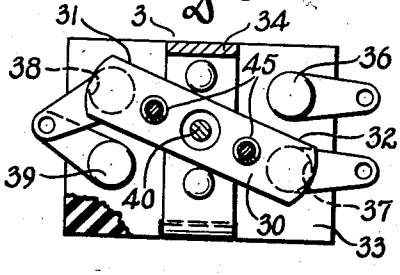
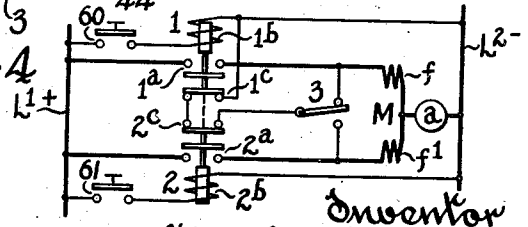


Fig. 4



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SWITCHING MECHANISM

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5 Claims. (Cl. 172—179)

This invention relates to switching or contacting mechanisms and is particularly applicable to those employed for reversing and effecting dynamic braking of a split field series motor such as are commonly employed on airplanes.

An object of the invention is to provide a mechanism for the aforestated and other uses which will be simple, compact and more positive in action.

Another object is to provide a mechanism of the aforesaid character enabling employment of contactors generally of a form now in extensive use.

Various other objects and advantages of the invention will hereinafter appear.

One embodiment of the invention is illustrated in the accompanying drawing which will now be described, it being understood that the embodiment illustrated is susceptible of various modifications without departing from the scope of the appended claims.

In the drawing:

Figure 1 is an elevational view partly in section of the switching or contactor mechanism;

Fig. 2 is a bottom view of the mechanism shown in Fig. 1 with certain insulating parts removed and certain parts shown in section;

Fig. 3 is a sectional view on line 3—3 of Fig. 2, and

Fig. 4 is a diagrammatic view showing use of the switching or contactor mechanism in conjunction with a split field series motor.

To facilitate a general understanding of the switching or contactor mechanism and the manner of functioning thereof reference will first be made to the diagrammatic view of Fig. 4 of the drawing. As there illustrated the mechanism comprises electromagnetic contactors 1 and 2 of the double throw type. More specifically contactor 1 has contacts 1^a to connect in series across lines L^1 and L^2 the armature a of motor M and series field winding f of said motor while contactor 2 has contacts 2^a to connect across lines L^1 and L^2 the motor armature a and a second series field winding f^1 of motor M. The contacts 1^a and 2^a are normally disengaged to be engaged upon energization of their respective contactors, the contactor 1 having an operating winding 1^b and the contactor 2 having an operating winding 2^b. Contactor 1 has normally engaged contacts 1^c while contactor 2 has normally engaged contacts 2^c in series relation with the contacts 1^c. The contacts 1^c and 2^c jointly complete a dynamic braking circuit for the motor M through the series field winding f or the series field winding f^1 according to the setting of a double throw switch 3. The mechanism illustrated is designed to coordinate the double throw switch mechanically with the two contactors 1 and 2 to set the switch upon operation of either contactor, in a position such that the proper dynamic braking circuit will be completed upon release of the contactor last to operate. More specifically the coordination is such that operation of either contactor moves the double throw switch to a corresponding position unless it is already in such position, the switch 3 remaining in that position until shifted by operation of the other contactor. This coordination avoids needless operations of the double throw switch, and as will appear may be accomplished through use of simple and reliable interconnections applicable to various types of contactors and double throw auxiliary switches.

Referring now to the embodiment shown in Figs. 1 to 3, contactors 1 and 2 are fixed in a side by side relation to an insulating plate 10 on which the double throw switch 3 is mounted with its axis disposed between the two contactors, the latter being suitably spaced to receive therebetween operating connections for the switch 3.

The contactors 1 and 2 are alike and hence description of one will suffice for both, whereas a detailed description is unnecessary in view of the nature of the invention and the fact that the contactors are of a well known form. Referring to the contactor 1, its operating winding 1^b is clamped by a plate 11 against the insulating plate 10 and said winding has a plunger 12 in axial alignment with a shouldered opening 13 in the plate 10, a shoulder of said opening forming a support or stop for said plunger. The plunger has an extension 15 projecting through the insulating plate 10 and carries two contact carrying bars 16 and 17 suitably spaced and insulated from one another and from the plunger extension 15. The contact carrying bar 16 constitutes the bridging member of contacts 1^a of Fig. 4 while the contact carrying bar 17 constitutes the bridging member of contacts 1^c of Fig. 4. The bar 16 has at opposite ends contact portions to engage contacts 18 and 19 fixed to the insulating plate 10 while the bar 17 carries a spring plate 17^a having at opposite ends contact portions to engage contacts 20 and 21 carried by an insulating block 22 bolted to the insulating plate 10 in a spaced relation therewith. The bars 16 and 17 are suitably fixed to the plunger extension, which preferably has a resilient connection (not shown) with the plunger 12 and the plunger may be assumed to be suitably biased to the position shown in Fig. 1, for bridg-

ing contacts 20 and 21 and for disengaging the bar 16 from contacts 18 and 19. The winding 15 when energized moves the plunger 12 to disengage the contacts of bar 17 from contacts 20 and 21 and to engage bar 16 with its contacts.

The switch 3 as shown in Figs. 1, 2 and 3 is of the double break type comprising a centrally pivoted contact bar 30 having at opposite ends contact portions 31 and 32 to engage stationary contacts carried by an insulating plate 33 which in turn is carried by a bracket 34 bolted to the insulating plate 10. Insulating plate 33 carries contacts 36 and 37 to be engaged selectively by contact portion 32 of bar 30 and carries contacts 38 and 39 to be engaged selectively by contact portion 31 of said bar which thus serves to bridge contacts 37 and 38 or contacts 36 and 39. The contact bar 30 is oscillatable about a shaft 40 carried by the bracket 34, said bracket and shaft extending into the space between the switches 1 and 2 to a point beyond the plane of the plungers thereof. On the shaft 40 is an oscillatable sleeve 41 having fixed to one end an insulating cross member 42 carrying pins 43 and 44 extending through contact bar 30, said pins carrying springs 45 to press said bar into firm engagement with the contacts to be bridged thereby, assuming said sleeve 41 to be restrained against axial movement as is contemplated. The pins 43 and 44 interlock the contact bar 30 and sleeve 41 for oscillation of the former by the latter and said sleeve has fixed thereto at its other end a cross bar 46 through the medium of which it may be oscillated by the switches 1 and 2.

More specifically the cross bar 46 on sleeve 41 has its opposite extremities in the path of levers 50 and 51 associated with switches 1 and 2. Each lever comprises a U-shaped strap which straddles the plunger extension of its respective switch and which has its free ends pivotally connected to a supporting stud. The two levers 50 and 51 have supporting studs 53 and 54, respectively, which are fixed to the insulating plate 10 and said levers have their transverse extremity parts engageable with the extremities of the cross bar 46 of sleeve 41. Each lever is operatively connected with the plunger extension of its respective switch through the medium of a collar 56 fixed to the plunger extension, the lever in each instance being pressed against the collar 56 by a spring 57 interposed between the contacts and the lever. Thus response of either switch effects movement of its respective lever to shift the switch from one operative position to its other operative position through oscillation of the sleeve 41. The position assumed by the switch 3 obviously depends upon which of the switches 1 and 2 operates and obviously the position of switch 3 is free from influence by release of either switch 1 or switch 2. Thus if upon response of either switch 1 or switch 2 the switch 3 is in the desired position switch 3 is not operated, being meanwhile held firmly in position by its contact pressure.

Obviously such mechanism will function as hereinbefore set forth and in a positive and reliable manner, to afford, if desired, reversing and dynamic braking of a split field series motor. Again referring to the diagram Fig. 4, the same shows in addition to the elements aforementioned, push button switches 60 and 61 to control the operating windings of switches 1 and 2, respectively. As will be understood, the push button switches are biased to open position so that when they are released they deenergize their respective switches to disconnect the motor from the supply circuit and to establish the prearranged dynamic braking connections for the motor.

Also it is to be noted that the switching or contactor mechanism shown is of unit form, with the elements coordinated for compactness and also accessibility. Preferably the plate 11 is employed as the supporting medium of the unit, being to that end provided with projecting and perforated supporting lugs, and preferably each of the switches has a cylindrical insulating housing 65 for its contact parts. As shown in Fig. 1, each cylindrical housing may be interposed and supported between the insulating plate 10 and one of the insulating plates 22, the housings being slotted to give clearance for the overlapping parts, cross member 46 and the levers 50 and 51. The provisions for ready assembly of parts and for easy access to individual parts will be obvious without further description.

What I claim as new and desire to secure by Letters Patent is:

1. In a reversing controller for a split field series motor having different sets of dynamic braking connections to be selected according to the direction of rotation of the motor, in combination, direction controlling switches each having normally closed auxiliary contacts to be common to the different sets of dynamic braking connections, a selector switch for the different sets of dynamic braking connections to which said auxiliary contacts are common, and operating connections between said direction controlling switches and said selector switch rendering operation of either direction controlling switch effective to set said selector switch for proper selection, said selector switch when set by either direction switch remaining in unchanged position pending operation of the other direction switch.

2. In a reversing controller for a split field series motor having different sets of dynamic braking connections to be selected according to the direction of rotation of the motor, in combination, direction controlling switches each having normally closed auxiliary contacts common to both sets of the dynamic braking connections, a selector switch for selecting the dynamic braking connections to which said auxiliary contacts are common, operating connections between said direction controlling switches and said selector switch rendering operation of either of said direction controlling switches effective to set said selector switch for proper selection, said selector switch when set by either direction switch remaining in unchanged position pending operation of the other direction switch, and said selector switch having means rendering it resistive to change in position while free from influence by said direction controlling switches.

3. In combination, a pair of separately operable electromagnetic switches having normally engaged auxiliary contacts, a multi position switch which jointly with said auxiliary contacts affords different circuits selectively, and operative connections between said electromagnetic switches and said multi position switch rendering the latter subject to a given setting upon response of one of said electromagnetic switches and to a different setting upon response of another, said multi position switch inherently retaining its last setting pending response of one of said electromagnetic switches providing for a different setting thereof.

4. A unitary device having in combination, a

pair of separately operable electromagnetic switches arranged in a side by side relation and having normally engaged auxiliary contacts, a double throw selector switch which jointly with said auxiliary contacts affords different circuits and which inherently tends to retain its last setting, and operating connections between said selector switch and said electromagnetic switches comprising oppositely disposed levers individual to and operable by said electromagnetic switches and an oscillatable member to be rocked in one direction only by one of said levers and in a reverse direction only by another of said levers to render setting of said selector switch incidental to operation of either of said electromagnetic switches to disengage its auxiliary contacts.

5. A unitary device having in combination, a pair of separately operable electromagnetic switches arranged in a side by side relation and having normally engaged auxiliary contacts, a double throw selector switch which jointly with said auxiliary contacts affords different circuits and which inherently tends to retain its last setting, said selector switch having wiping contacts including an oscillatable contact and having means to afford it contact pressure and to constitute an oscillating medium therefor projecting into the space between said electromagnetic switches, and levers individual to and operable by said electromagnetic switches to oscillate said actuating medium as a function of progressive operation of said electromagnetic switches, thereby to insure a setting of said selector switch determined by the electromagnetic switch last energized.

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