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RHEOSTAT CONTROL SYSTEM

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Fig. 1

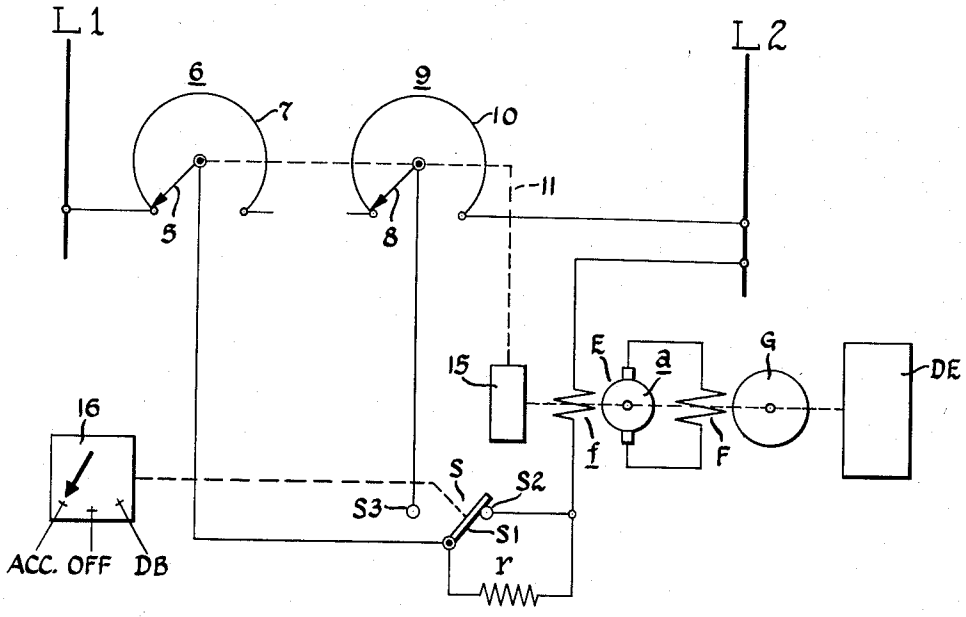



Fig. 2

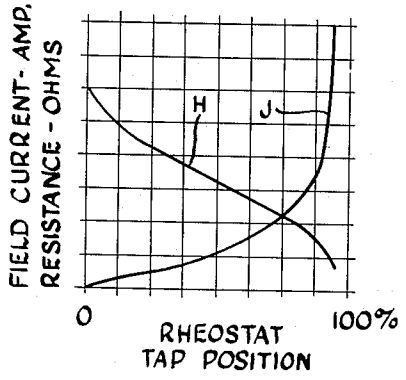
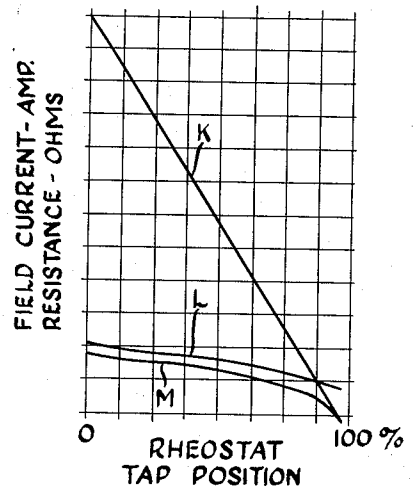



Fig. 3




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# RHEOSTAT CONTROL SYSTEM

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4 Claims. (Cl. 322—29)

This invention relates to a rheostat control system.

While not limited thereto the present invention is particularly adapted for controlling the excitation of the fields of exciters which supply the fields of main generators in locomotive diesel-electric drives.

It is a primary object of the present invention to provide an improved rheostat control system affording either series or combined series and potentiometer type rheostat control selectively.

Another more specific object, through use of such rheostat control in conjunction with locomotive diesel-electric drives, is to provide one pattern of exciter field excitation vs. rheostat position for accelerating and running operation and another for dynamic braking operation, and

A still further specific object is to obtain simplification of control for locomotive diesel-electric drives through employment of the aforementioned rheostat control.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate a preferred embodiment of the invention which will now be described in detail, it being understood that the embodiment illustrated is susceptible of modification in respect of details without departing from the scope of the appended claims.

In the drawings:

Figure 1 is a diagrammatic showing of a rheostat control system incorporating the invention as applied to the control of an exciter field in a diesel-electric drive.

Fig. 2 is a graph depicting the variations in field current and rheostat resistance with change in tap position for one operating condition of the control system of Fig. 1, and

Fig. 3 is a graph depicting the variation in field current, total current and resistance of another rheostat with change in tap position in another operating condition of the control system of Fig. 1.

Referring to Fig. 1, the reference numeral DE designates a diesel engine which drives a D. C. main generator G and an exciter E of a locomotive diesel-electric drive. Generator G has a field winding F which is connected across terminals of armature *a* and exciter E. Exciter E has a field winding *f* which is connected at one end to the negative potential line L2 of a source of D. C. voltage supply and at its other end to a stationary contact S2 of a single pole double throw switch S and to the contactor S1 of said switch in series with a current limiting fixed resistor *r*. Contactor S1 is connected to the adjustable tap 5 of a rheostat 6 which also has a resistance element 7 connected at one end to the positive potential line L1 of the aforementioned source.

Stationary contact S3 of switch S is connected to adjustable tap 8 of a rheostat 9 which also has a resistance element 10 connected at one end to supply line L2. A rotatable shaft, schematically depicted at 11, is adapted to simultaneously rotate taps 5 and 8 of rheostats 6 and 9 to corresponding points on their respective associated resistance elements under the direction of a load regulating governor schematically depicted at 15. Governor 15



which is schematically depicted as being driven by the diesel engine DE may be assumed to be responsive to changes in speed and load on engine DE to rotate shaft 11 in accordance therewith.

A master throttle controller, which is schematically depicted at 16 and which may be of any preferred type, is shown as having mechanical connection with the contactor S1 of switch S. Controller 16, for the sake of simplifying the understanding of the present invention, is depicted as having only three operating positions namely "Off," "Acc" (for accelerating) and "DB" (for dynamic braking). It may be assumed that operation of the controller 16 to "Acc" position will operate contactor S1 to engage contact S2 as depicted in Fig. 1, and that operation of controller 16 to either the "Off" or "DB" positions will operate contactor S1 to engage contact S3.

With controller 16 moved to "Acc" position and contactor S1 closed to contact S2, field winding *f* of exciter E will be connected between supply lines L1 and L2 in series with rheostat 6, and the energization of such field winding may be assumed to vary with change in position of tap 5 on resistance element 7 according to the curve H of Fig. 2. The amount of resistance of rheostat 6 effectively connected in series with field winding *f* for the same changes in tap position may be assumed to vary according to the curve J. The form of curve J will of course depend upon the total amount of resistance of element 6 and its ohmic taper per unit of length and may be varied to meet particular conditions. The variation in exciter field current depicted by curve H has been found to be particularly suitable when the main generator is supplying the truck driving motors during acceleration and normal running.

When controller 16 is moved to "DB" position contactor S1 will then be closed to contact S3 and the rheostat 9 will then be connected in parallel with the series combination of resistor *r* and field winding *f* of exciter E between contactor S1 and supply line L2. It will be observed that under these operating conditions that for every change in series resistance afforded by rheostat 6 that there will be a change in parallel branch resistance afforded by rheostat 9. Assuming that the effective resistance afforded by resistance element 9 varies in accordance with the straight line K of Fig. 3 for changes in position of tap 8, and that the change in resistance afforded by rheostat 6 is in accordance with curve of Fig. 2 as aforeindicated, then the total current flowing in the circuit will vary as the curve L and the current flowing through the exciter field *f* will vary according to the curve M of Fig. 3. The variation in energization of the exciter field winding in accordance with curve M which affords zero energization in one extreme position of the rheostats taps is desirable when the truck driving motors of a locomotive diesel-electric drive are connected for dynamic braking operation.

It will be apparent that the same results can be obtained in the system of Fig. 1 if the electrical connections to the end terminals and tap of rheostat 6 and/or rheostat 9 are interchanged. The arrangement of windings and taps of rheostats 6 and 9 can take various preferred forms.

I claim:

1. In combination, a source of voltage, a load device, control means comprising a first rheostat, a second rheostat and means operable to simultaneously adjust the taps of said rheostats on their respective resistance elements, and means operable to selectively connect said load device either in series with said first rheostat across said source of voltage or in parallel with said second rheostat and together with the latter in series with said first rheostat across said voltage source.

2. The combination according to claim 1 character-

ized by said taps of said rheostats being adjusted simultaneously to corresponding points on their respective resistance elements.

3. The combination according to claim 1 together with a resistor connected in series with said load device by operation of the last mentioned means to effect the last recited connections.

4. In a diesel-electric drive, the combination with an exciter having a field winding, a main generator having a field winding connected to the armature of said exciter and a diesel engine driving said exciter and generator, of



a source of D. C. voltage, a first rheostat, a second rheostat, means providing simultaneous adjustment of the taps of said rheostats on their respective resistance elements in accordance with changes in speed and load on said engine, and means operable to selectively connect said exciter field winding either in series with the first rheostat across said source of voltage or in parallel with the said second rheostat and together with the latter in series with said first rheostat across said source of voltage.

No references cited.