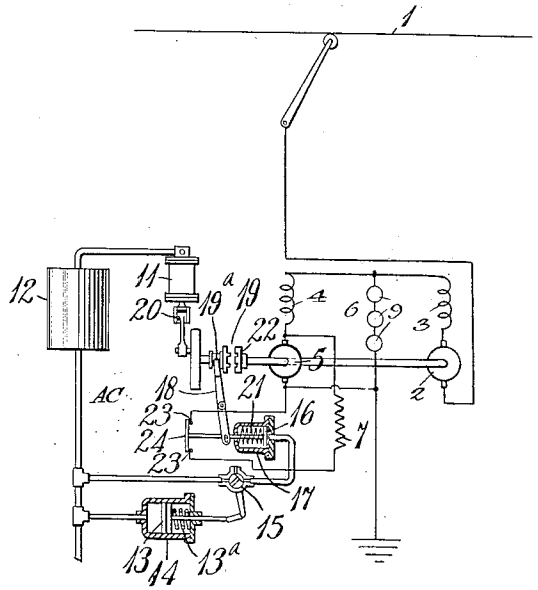
R. E. FERRIS.

ELECTRICAL APPARATUS.

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1,231,584. Patented July 3, 1917.



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ELECTRICAL APPARATUS.

1,231,584. Specification of Letters Patent. Patented July 3, 1917.

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To all whom it may concern:

Be it known that I, RALPH E. FERRIS, a citizen of the United States, and a resident of Swissvale, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electrical Apparatus, of which the following is a specification.

My invention relates to electrical apparatus, and it has special reference to means for obviating the use of a shunt coil to prevent excessive speed in dynamotors or other compound-wound dynamo-electric machines.

The object of my invention is to provide means of the above-indicated character which shall be simple in construction and effective and reliable in operation and which shall eliminate certain present defects of operation, such as sparking or flashing upon the resumption of current after a sudden interruption, which abnormal operating conditions are largely brought about by reason of the damping effect of the inductive shunt field winding.

According to my invention, I provide a non-inductive resistance that is disposed in shunt to the armature, either permanently or under light load conditions, and I dispense with the usual shunt field. By suitable design of parts, the main series field winding will be traversed by a current of such relation to that flowing in the armature that the speed of the machine will not reach an excessive value, as will be understood by those skilled in the art.

The single figure of the accompanying drawing is a diagrammatic view of an electrically operated system embodying my invention.

Referring to the drawing, the system here shown comprises a suitable supply-circuit 1; a dynamo-electric machine, such as the well-known dynamotor that is adapted for use in railway vehicles to drive an air-compressor AC or the like and is provided with a high-voltage or motor armature winding 2, a series field winding divided into two portions 3 and 4, and a low-voltage or generator armature winding 5; a suitable translating device 6 that is adapted to act as load for the generator portion of the machine; and a second translating device 7 that may be disposed for permanent or intermittent connection, as predetermined, across the generator armature winding 5. Although, by way of illustration, I have shown my invention in connection with a dynamotor, for which use it is particularly adapted, it will be understood that the application of the invention is not limited to that special type of machine, but is capable of a much wider range.

The translating device 6 may be connected from a point intermediate the series winding portions 3 and 4 to ground or other negative conductor, and may comprise a series of incandescent lamps 9 or other suitable apparatus.

The translating device 7 may comprise a suitable resistor or its equivalent.

The air-compressing apparatus AC comprises a compressor pump 11, a source of fluid pressure, such as a tank 12, a piston and cylinder 13 and 14, a regulating valve 15 and a second piston and cylinder 16 and 17, which piston is connected by a rocking lever 18 to one member 19ª of a clutch 19. The valve 15 is biased to its exhaust position by the action of the air pressure on the piston 13 and in opposition to a spring 13ª. The clutch member 19 is suitably associated with a crank 20 of the pump 11 and is biased to the off position by a spring 21 which is associated with the piston 16. The clutch member 19 is adapted to make mechanical connection with clutch member 22 which is secured to the shaft of the armature 5, under predetermined conditions, as specified below. The translating device 7 is connected across the terminals of the armature 5 through stationary contact members 23 and a bridging contact member 24 which is mechanically associated with the lever 18.

A general description of the operation of the above-described embodiment of my invention may be stated as follows: When both the air-compressor hereinbefore mentioned and the translating device 6 are in operation, there is a sufficient load on the machine to keep down the speed within reasonable limits, even without utilizing the shunt translating device 7; but, if the load is reduced to a relatively low value, the speed will rapidly increase, in accordance with the well-known characteristic curve of a series machine, unless some means is employed to maintain a

sufficiently strong field current, with respect to the armature current, to prevent an excessive rise in speed. As is well known, a shunt field winding will perform this function, but, by reason of its damping effect, is disposed to prevent the proper mutual building up of the field and armature currents upon the resumption of the line current after a sudden interruption thereof and, consequently, sparking or flashing insues at the brushes. By using the translating device 7, suitably disposed and of proper resistance, a sufficient current is diverted from the armature to maintain the proper relation between field and armature currents to prevent an excessive speed, as will be understood. Moreover, the above-mentioned sparking and flashing difficulty is entirely obviated by employing my invention.

The detailed operation of the apparatus may be described as follows: Under light load conditions, that is, when certain of the lamps or other translating devices 9 are in circuit alone, the clutch member 19 occupies its inoperative position and the air pump is inactive. However, when the pressure from the tank 12 falls below a predetermined value, the piston 13 is operated by means of the spring 13[a] to actuate the valve 15 to admit pressure to the cylinder 17. The piston 16 is then operated against the action of the spring 21 and the lever 18 is swung about its pivotal point, whereby the clutch member 19 is caused to engage the member 22. In this manner, the compressor pump is set into action to gradually raise the pressure in the tank 12. When the piston 13 is oppositely actuated by the increased air pressure, the valve 15 is moved into its exhaust position, thus allowing the spring 21 to return the piston 16 to its off position and disconnect the clutch member 19 from the member 22.

When the piston 16 is operated against the action of the spring 21, the bridging contact member 24 is actuated to break contact with the stationary contact members 23, thereby opening the circuit of the translating device 7. However, as the pump 11 is set into action at this time, the load upon the machine is sufficient to prevent it from attaining an excessive speed. When the clutch 19 is thrown out, the bridging contact member 24 returns to its former position to make contact with the contact members 23, thereby reinserting the translating device 7 across the terminals of the armature 5 to maintain the speed within predetermined limits, in a manner hereinbefore described.

Inasmuch as various changes in the arrangement of parts and circuit connections may be effected within the spirit and scope of my invention, I desire that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. The combination with a dynamo-electric machine having an armature, of a translating device, a source of fluid pressure, a compressor pump therefor, a clutch interposed between said armature and said pump means for normally separating the clutch members and for connecting said device across the armature, and means dependent upon the pressure of said source for effecting engagement of said clutch members and breaking the circuit of said translating device.

2. The combination with a dynamo-electric machine having an armature, of a translating device, a fluid-pressure system, having a fluid pump adapted to be operated by said machine, means for connecting said device across said armature under predetermined conditions in said system, and means for disconnecting said device under other predetermined conditions.

3. The combination with a dynamo-electric machine having an armature, of a translating device, a fluid-pressure system adapted to be operatively associated with said machine, automatic means for connecting said device across said armature upon disassociation of said system and said machine, and automatic means for disconnecting said device from said armature when the system is operatively associated with the machine.

4. The combination with a dynamo-electric machine having an armature, a translating device, and a fluid-pressure system having a pump adapted to be mechanically connected to the armature of said machine, of means for connecting said device across said armature under predetermined conditions of said system, and means for disconnecting said device under other predetermined conditions.

5. The combination with a dynamo-electric machine having an armature, of a translating device comprising a resistor, a fluid-pressure system having a pump adapted to be operated by said machine, means for connecting said device across said armature under predetermined conditions of said system, and means for disconnecting said device under other predetermined conditions.

6. The combination with a dynamo-electric machine having an armature, of a translating device comprising a resistor, a fluid-pressure system adapted to be operatively associated with said machine, means for connecting said device across said armature upon disassociation of said system and said machine, and means for disconnecting said device from said armature when the system is operatively associated with the machine.

7. The combination with a dynamo-electric machine having an armature, of a translating device, a fluid-pressure system having a fluid pump, means for mechanically con-

necting said pump to said armature under predetermined conditions, means for connecting said device across said armature upon disassociation of said system and said machine, and means for disconnecting said device from said armature when the system is operatively associated with the machine.

In testimony whereof, I have hereunto subscribed my name this 24th day of Dec. 1913.

RALPH E. FERRIS.

Witnesses:
JOHN W. SHALLENBERGER,
B. B. HINES.