Nov. 6, 1928. 1,690,132

F. M. ROSENZWEIG

SPEED CONTROL MECHANISM

Filed June 14, 1924 2 Sheets-Sheet 1

Fig. 1.

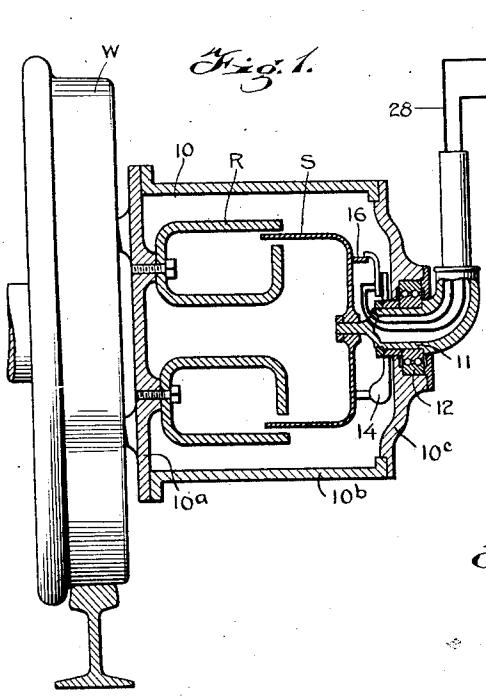


Fig. 1a

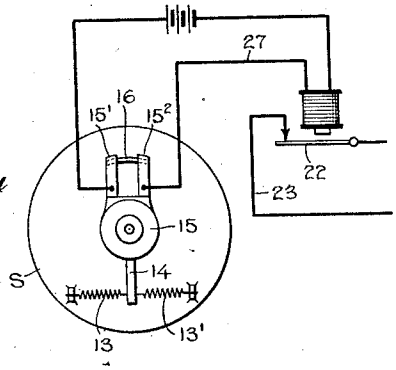


Fig. 2.

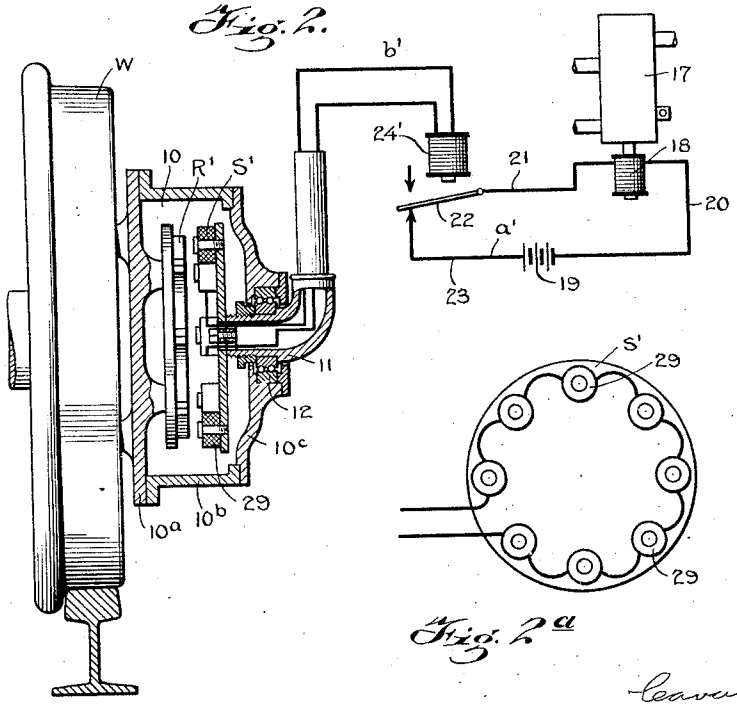
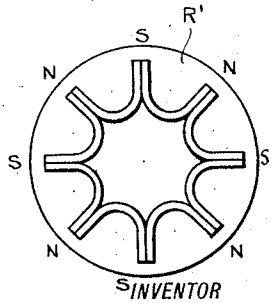


Fig. 2a

Fig. 2b



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Fig. 3.

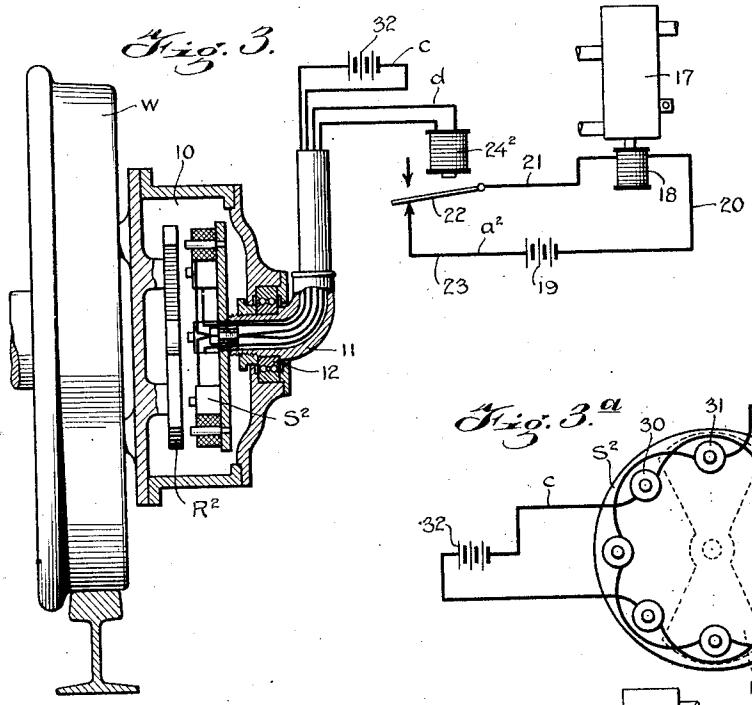


Fig. 3.a

Fig. 4.

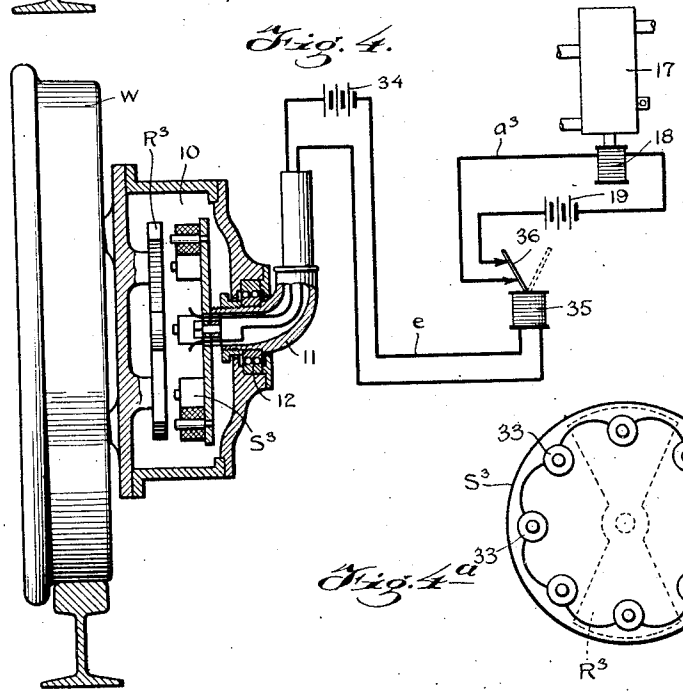


Fig. 4.a

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UNITED STATES PATENT OFFICE.

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SPEED-CONTROL MECHANISM.

Application filed June 14, 1924. Serial No. 719,948.

This invention relates to the art of automatic train control, and relates more particularly to automatic train control systems in which the speed of the vehicle or train is controlled under predetermined roadside or vehicle conditions; and has special reference to the provision of a novel speed controller mechanism employed in such systems.

A prime desideratum of my present invention comprehends the provision of a speed controller mechanism connected to the running gear of the vehicle for direct operation thereby, the speed controller mechanism being constructed and designed to withstand the severe service conditions to which it is normally subjected in the movement of trains and to control automatic train control circuits in a reliable manner.

As is disclosed and claimed in the copending application of A. G. Shaver to speed controller, Ser. No. 303,191, filed June 10, 1919, it has been demonstrated that for obtaining reliability and dependability of operation, it is highly desirable to mount the speed controller in train control systems directly on a wheel of the vehicle, so that the speed controller elements are directly driven from the running gear, the construction permitting moreover the arrangement of the elements in a compact manner and the efficient housing of the same. The direct mounting and operation of the speed controller is accomplished in the preferred construction by connecting or attaching a movable or rotor element to a wheel of the vehicle or to the outer end of the axle of the wheel so as to be supported by, for rotation with, the wheel, and by mounting a relatively stationary or stator element in a position for cooperation with the rotor element, the cooperation between the two being designed for operating and controlling vehicle carried circuits.

In the speed controller mechanism of my present invention, this general assembly disclosed in said copending application is adopted to retain its attendant advantages, the present invention being directed to improvements therein in which the rotor and stator elements are inductively related so as to eliminate the necessity of contacting engagement therebetween in the operation of the controller.

To the accomplishment of the foregoing and such other object as may hereinafter appear, my invention consists in the elements and their relation one to the other, as hereinafter particularly described and sought to be defined in the claims; reference being had to the accompanying drawings which show preferred embodiments of my invention, and in which:

Figs. 1 and 1ª are views showing one form of my invention in which the rotor and stator elements are inductively related, and

Figs. 2 to 4ª inclusive are views showing modifications of the invention.

Referring first to Figs. 1 and 1ª of the drawings, in which I show an eddy current induction type of speed controller, the invention in its more generic aspects comprises a rotor R which is directly attached or connected to the wheel W of the vehicle which may be the front wheel of the pony truck of the locomotive, and a stator S which is inductively related to the rotor R, the stator being adapted to be held relatively stationary during the rotation of the rotor R and the wheel W, the cooperation between the rotor and the stator being designed for operating and controlling vehicle carried circuits in accordance with predetermined speed conditions.

In the preferred construction the rotor R is attached or connected to a support generally designated as 10 which comprises a casing section having a rear wall portion 10^a, a side wall portion 10^b and a front wall portion 10^c, the rotor R being fixed to the rear wall portion 10^a and the latter being secured directly to the front face of the wheel of the vehicle W in any approved manner.

The stator S preferably is arranged to be carried by the rotor support 10, and for accomplishing this I provide a second casing section 11 carried by the front casing wall 10^c, the section 11 being supported in said wall by means of anti-friction bearing means 12, the stator S being mounted on the second casing section 11. Desirably the casing section 11 takes the form of a conduit for the conductors connecting the stator S and the circuit means to be described hereinafter.

In the form of the invention shown in Figs. 1 and 1ª, the rotor R comprises a magnet and the stator S comprises a copper or aluminum cup in which eddy currents are produced when the magnet revolves, these eddy currents reacting with the magnetic field of the revolving magnet so as to produce a torque on the stator cup in the di-

rection of the rotary motion. The stator S is mounted on the casing section 11 so as to permit of a partial rotation thereof, this partial rotation being opposed by the tension of the springs 13 and 13′ connecting the stator cup to a stud 14 forming part of a switch or contact member 15, which latter is fixed to the casing section 11. The stator S is provided with a complemental switch or contact member 16 arranged normally for engaging the contact fingers 15′ and 15^2 of the switch member 15, the construction being such that when the stator S is given a sufficient partial rotation in response to a predetermined speed of rotation of the rotor R, the switch contacts will open either in one or in the other direction, depending upon the direction of rotation of the wheel W. With this construction, it will be evident, therefore, that when a predetermined speed of the vehicle is exceeded, a circuit which is normally closed by the switch contacts may be opened to operate train control systems.

The train control circuits which may be operated are conventionally shown in Figs. 1 and 1^a of the drawings, and while I have shown these circuits operated in response to vehicle conditions such as a change of speed of the vehicle, it will be evident that these circuits may be connected to be operated by changes in roadside conditions so that the control of the vehicle may be made responsive to "clear," "caution" or "danger" traffic conditions. The controlled circuit may comprise a pneumatic valve 17 for controlling the air brake system, said pneumatic valve being operated by an electromagnet 18 connected in a circuit *a* having the battery 19, the conductor 20, conductor 21, relay contact 22, and conductor 23. The relay contact may be controlled by a relay element 24 located in a controlling circuit *b* having a battery 25, a conductor 26, a conductor 27 connecting the relay to the contact finger 15^2, and a conductor 28 connecting the battery 25 to the second contact finger 15′. It will be apparent that with this construction when the speed of the vehicle is below a predetermined limit, the circuits *a* and *b* will be closed to maintain the normal operation of the valve 17, while when the predetermined speed is exceeded, the circuit *b* will be opened, opening the circuit *a* and effecting a deenergization of the magnet 18 and a control operation of the valve 17.

By mounting the speed controller directly on the wheel of the vehicle, it will be seen that the speed control elements are arranged for direct operation to obtain maximum reliability and dependability in service, the construction also permitting the rotor and stator elements or sections R and S to be compactly arranged and protectively housed in an efficacious manner.

Referring now to Figs. 2, 2^a and 2^b of the drawings, I show a modification of the invention in which the rotor and stator elements are of the A. C. generator type. The casing sections and the structure provided for supporting the rotor and stator are in general similar to that heretofore described, and are denoted by similar reference characters. The rotor R′ in this form of my invention comprises a permanent magnet having a construction as shown in Fig. 2^b of the drawings for producing a revolving field when rotated. The stator S′ comprises a plurality of electromagnets 29, 29 arranged as shown in Figs. 2 and 2^a of the drawings and connected together in a circuit b′ in series with the relay 24′. This circuit *b′* is normally deenergized for closing the valve control circuit *a′*, the latter circuit being otherwise similar to that heretofore described, the parts of which are denoted by similar reference characters. With this construction when the permanent magnets revolve, an alternating current is induced in the circuit *b′*, and when the speed of the vehicle exceeds a predetermined limit, this current is of sufficient magnitude to energize the relay 24′ sufficiently to open the contact 22 and operate the valve 17.

Referring now to Figs. 3 and 3^a of the drawings, I show a speed control mechanism of the inductor-generator type. The rotor R^2 comprises a bar of iron having oppositely arranged wings as clearly shown in Fig. 3^a of the drawings, and the stator S^2 comprises two sets of electromagnets 30, 30 and 31, 31, the first set being connected in series in a circuit *c* so as to be energized by a battery 32, the second set being connected in series in a circuit *d* for energizing the relay 24^2. With this construction when the iron rotor revolves, the field poles of the circuit *c* will induce an alternating current in the circuit *d*, and when the predetermined speed is exceeded, this current is of a magnitude sufficient for energizing the relay 24^2 to operate the circuit a^2 in a manner similar to that heretofore described in connection with Fig. 2 of the drawings.

Referring to Figs. 4 and 4^a of the drawings, I show a still further modification of the invention embodying a self-induction type of rotor and stator mechanism. In this form of my invention, the rotor R^3 also comprises a bar of iron having opposite wing sections as shown in Fig. 4^a, and the stator S^3 comprises a plurality of electromagnets 33, 33 wound so that adjacent magnets have opposite polarities, as shown in Fig. 4^a of the drawings, the said magnets being arranged in series in a circuit *e*, the said circuit including a battery 34 and a frequency relay 35. With this construction when the rotor revolves in front of the poles of the magnets 33, the self-induction of the circuit

e will be varied, resulting in the superposing of an alternating current on the direct current furnished by the battery 34, this alternating current operating the frequency relay 35. Normally the armature 36 of the relay 35 is arranged to close the valve control circuit a^3 having a construction similar to that heretofore described in connection with Fig. 1 of the drawings, and when a predetermined speed of operation of the rotor R^3 is reached, the frequency relay 35 will move the armature 36 from the full to the dotted line position shown, opening the circuit a^3 for deenergizing the electromagnet 18 and for producing the control operation of the air brake valve 17.

While I have shown the preferred forms of my invention, it will be apparent that many changes and modifications may be made in the structure disclosed without departing from the spirit of the invention, defined in the following claims.

I claim:

1. In a vehicle control mechanism, the combination with a wheel of the vehicle, of a speed controller comprising a relatively movable section connected to said wheel and carried thereby and a relatively stationary section inductively related to the relatively movable section.

2. In a vehicle control mechanism, the combination with a wheel of the vehicle, of a speed controller comprising a rotor section connected to said wheel at the exterior thereof, a stator section inductively related to the rotor section, and circuit means connected to the stator section.

3. In a vehicle control mechanism, the combination with a wheel of the vehicle, of a speed controller comprising a relatively movable section connected to said wheel and carried thereby, a relatively stationary section carrying magnetic devices inductively related to the movable section and circuit means controlled by the cooperation of said sections.

4. In a vehicle control mechanism, the combination with a wheel of the vehicle, of a speed controller comprising a rotor section connected to said wheel and carried thereby and a stator section inductively related to and carried by the rotor section.

5. In a vehicle control mechanism, the combination with a wheel of the vehicle, of a speed controller comprising a rotor section connected directly to said wheel for rotation therewith, a stator section inductively related to and carried by the rotor section and circuit means connected to the stator section and controlled by the cooperation of said rotor and stator sections.

6. In a vehicle control mechanism, the combination with the truck of the vehicle, of a speed controller comprising a relatively movable section connected to the truck with the axis of the said section aligned with the axle of the truck, and a relatively stationary section inductively related to the relatively movable section, and vehicle control means controlled by the cooperation of the relatively movable sections.

7. In a vehicle control mechanism, the combination with the truck of the vehicle, of a speed controller comprising a rotor section connected to the truck with the axis of the said section aligned with the axle of the truck, a stator section inductively related to the rotor section and circuit means connected to the stator section and controlled by the cooperation of said rotor and stator sections.

8. In a vehicle control mechanism, the combination with a wheel of the vehicle, of a speed controller comprising a support attached to for bodily rotation with said wheel of the vehicle, a rotor connected to the support, a stator carried by said support and inductively related to said rotor and vehicle control means controlled by the cooperation of the rotor and stator.

9. In a vehicle control mechanism, the combination with a wheel of the vehicle, of a speed controller comprising a casing and support attached to for bodily rotation with said wheel of the vehicle, a rotor connected to and housed by the support, a stator inductively related to said rotor, and circuit means connected to the stator.

10. In a vehicle control mechanism, the combination with a wheel of the vehicle, of a speed controller comprising a casing and support attached to for bodily rotation with said wheel of the vehicle, a rotor connected to the support and a stator carried by said support inductively related to said rotor, the said rotor and stator being arranged to be housed by said support, and circuit means connected to the stator.

11. In a vehicle control mechanism, the combination with the truck of the vehicle, of a speed controller comprising a first section attached exteriorly to the truck with the axis of the same aligned with the axle of the truck, a second section adapted to be held stationary during the rotation of the wheel, bearing means supporting the second section on the first section, and inductively related rotor and stator elements carried respectively by said first and second sections.

12. In a vehicle control mechanism, the combination with the truck of the vehicle, of a speed controller comprising a first section attached exteriorly to the truck with the axis of the same aligned with the axle of the truck, a second section adapted to be held stationary during the rotation of the wheel, bearing means supporting the second section on the first section, a rotor element carried by the first section, a stator element inductively related to said rotor element and

carried by the second section, and circuit means connected to said stator element and controlled by the cooperation of the rotor and stator elements.

13. In a vehicle control mechanism, the combination with the truck of the vehicle, of a speed controller comprising a first section attached exteriorly to the truck with the axis of the same aligned with the axle of the truck, a second section adapted to be held stationary during the rotation of the wheel, bearing means supporting the second section on the first section, and inductively related rotor and stator elements carried respectively by said first and second sections, the said sections forming a casing for housing the rotor and stator elements.

14. In a vehicle control mechanism, the combination with the truck of the vehicle, of a speed controller comprising a first casing section attached exteriorly to the truck with the axis of the same aligned with the axle of the truck, a second casing section adapted to be held stationary during the rotation of the wheel, anti-frictional bearing means supporting the second section on the first section, a rotor element carried interiorly by the first section, and a stator element carrying magnetic devices inductively related to said rotor element carried by the second section.

15. In a vehicle control mechanism, the combination with the wheel of a vehicle, of a speed controller comprising a relatively movable magnetic section connected to said wheel and carried thereby and a relatively stationary circuit conrtolling section arranged to be influenced by the movement of the relatively movable section.

16. In a vehicle control mechanism, the combination with the wheel of a vehicle, of a speed controller comprising a magnetic rotor section connected to said wheel at the exterior thereof and a circuit controlling stator section arranged to be influenced by the rotation of said rotor.

17. In a vehicle control mechanism, the combination with the wheel of a vehicle, of a speed controller comprising a magnetic rotor section connected to said wheel at the exterior thereof, a stator section inductively related to said rotor section and influenced by the rotation of the latter, and circuit means connected to said stator section.

Signed at Niagara Falls, in the county of Niagara and State of New York, this 9th day of June A. D. 1924.

FRED M. ROSENZWEIG.