H. E. WALLACE.

CURRENT REGULATOR FOR AUTOMOBILE HEADLIGHT CIRCUITS.

APPLICATION FILED DEC. 10, 1919.

1,410,975. Patented Mar. 28, 1922.

2 SHEETS—SHEET 1.

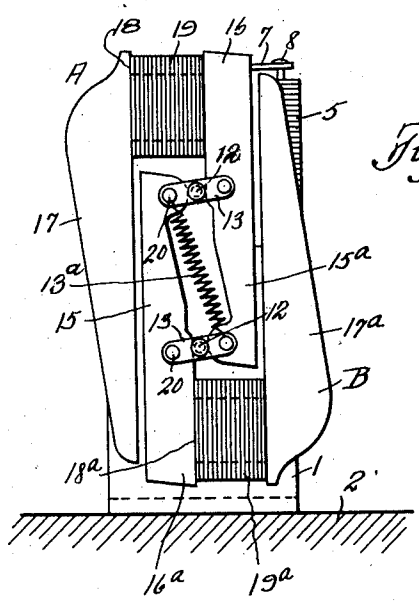
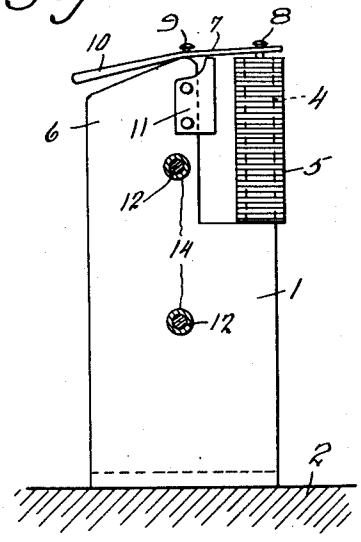


Fig. 1

Fig. 3



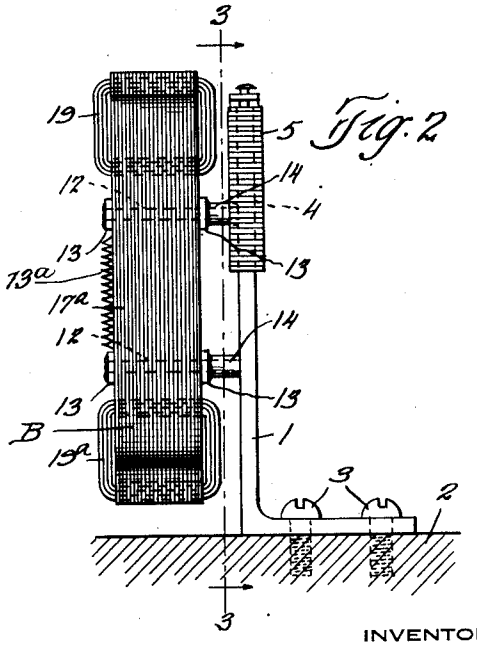


Fig. 2

WITNESSES

W. R. Wagner.

H. T. Chapman.

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Harry E. Wallace

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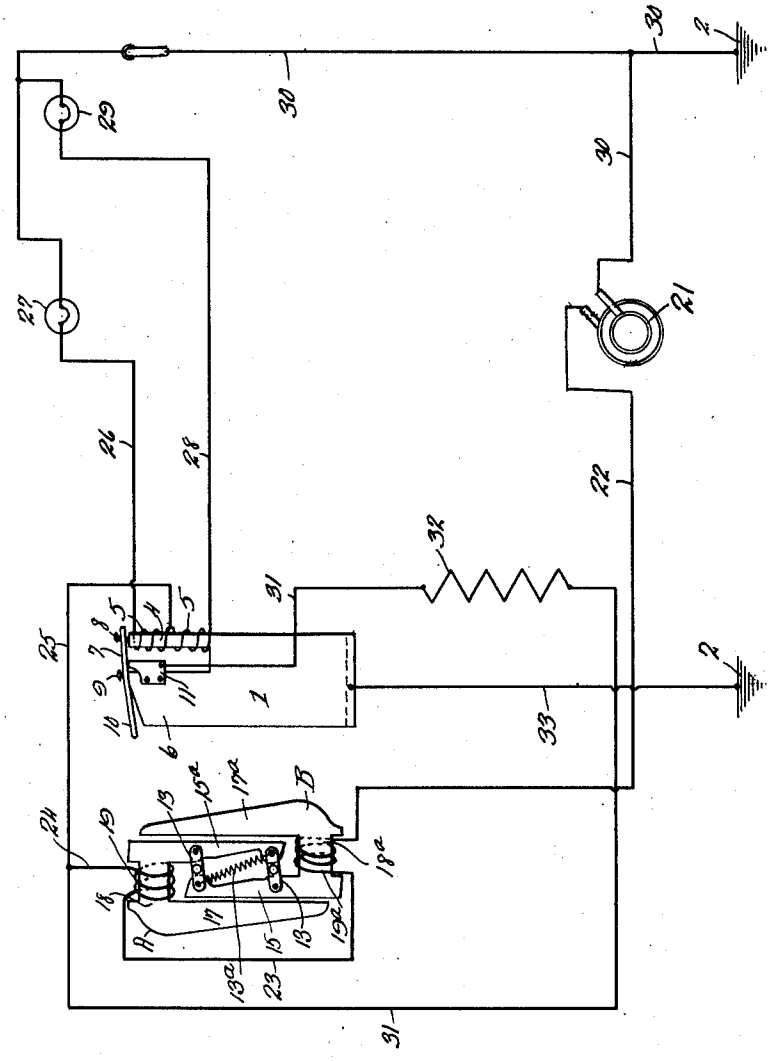
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Fig. 4



WITNESSES

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CURRENT REGULATOR FOR AUTOMOBILE HEADLIGHT CIRCUITS.

1,410,975. Specification of Letters Patent. Patented Mar. 28, 1922.

Application filed December 10, 1919. Serial No. 343,804.

To all whom it may concern:

Be it known that I, HARRY E. WALLACE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Current Regulator for Automobile Headlight Circuits, of which the following is a specification.

This invention has reference to current regulators for automobile headlight circuits, and its object is to provide means for the automatic control of the current supplied to the headlights of the automobile, especially where the current is subject to great variation.

The invention comprises an electromagnetic structure responsive to mutual induction between associated parts subjected to alternating electric currents such as are produced by the magneto of the Ford automobile, although not necessarily confined to such particular current source. The invention contemplates the maintenance of a substantially constant out-put from a relatively low speed of travel of the vehicle up to a high speed of travel, with the electro-magnetic device or structure introducing conditions preventing any rise in current after the attainment of a predetermined maximum.

While the idea of the invention is not broadly new, the means by which the idea is carried out is believed to be novel.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming part of this specification, with the understanding, however, that the invention is not confined to any strict conformity with the showing in the drawings, but may be changed and modified so long as such changes and modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings,

Figure 1 is an elevation of an apparatus embodying the invention.

Figure 2 is an elevation of the apparatus shown in Figure 1, as seen from the right hand side thereof.

Figure 3 is a section on the line 3—3 of Figure 2.

Figure 4 is a diagram of the electric circuits.

Referring to the drawings, there is shown a support or bracket 1 which may be made fast to any part of the engine or of the automobile, but preferably the engine, because the engine is made of metal and provides a convenient ground. In Figures 1, 2 and 3, a small portion of the engine is indicated at 2, the same showing 2 also being indicated in Figure 4 by the conventional sign of a ground. The bracket 1 may be secured to the engine 2 or any suitable metallic part by screws 3 or otherwise.

The bracket 1 is formed of suitable height or extent and at one side has a prolongation 4 constituting a core of an electro-magnet with the core surrounding by a coil 5. Alongside of the core 4 is a projection of the bracket 1 constituting a pole-piece 6 in substantially parallel relation with the prolongation or pole-piece 4. On top or at the free end of the pole-piece 6 there is mounted an armature 7 having one end overlying the free end of the pole-piece 4 and there held and guided by a headed pin 8, so that the armature 7 may have a limited rocking movement about a pin 9, holding it on the extremity of the pole-piece 6. The armature 7 is loosely traversed by the pins 8 and 9 and the end of the armature remote from the pole-piece 4 is overbalanced as indicated at 10 to normally hold, by gravity, that end of the armature traversed by the pin 8 away from the free end of the electro-magnet made up of the pole-piece 4 and coil 5.

Fast to, but insulated from, the pole-piece 6 is a contact member 11 in the path of the lighter end of the armature 7 and in position to be engaged by the armature 7, when the latter is attracted by the magnet core 4, so as to then complete a circuit, as will hereinafter appear.

The bracket 1 carries pins 12 on which are mounted rock arms 13. The pins 12 also carry spacing sleeves 14.

The rock arms 13 are spaced apart lengthwise of the respective pins 12, and mounted on the pins between the arms are like legs 15, 15^a, of corresponding U-shaped cores 16, 16^a of two similar electric magnets A, B, respectively, each with a leg 17, 17^a, spaced from the other leg 15, 15^a, respectively, by a yoke portion 18, 18^a, respectively, surrounded by a coil 19, 19^a, respectively.

The legs 15, 15^a of the two electro-magnets A, B each enter the other electro-magnet between the legs thereof to a point close to the coil 19 or 19^a, as the case may be, so that

the two legs 15, 15ª are closely adjacent. The outer face of each leg 15, 15ª is flat and the inner face of each leg 17, 17ª is flat and is arranged closely adjacent to the flat outer face of the other leg 15, 15ª. The links or rock arms 13 serve as parallel connections for the magnets A, B, so that these two magnets may move relatively to each other with the adjacent flat faces of the arms always parallel, but because of the parallel action of the links 13, these faces progressively approach each other or recede one from the other.

Ford automobiles are customarily provided with sources of current such as alternating current generators 21. One side of the generator 21 is connected by a conductor 22 to one terminal of the coil 19ª, the other terminal of which coil is connected by a conductor 23 to one terminal of the coil 19. Leading from the other terminal of the coil 19 is a conductor 24 connected by another conductor 25 to the mid-point of the coil 5, which latter is wound to produce opposing fluxes in the core 4. One end of the coil 5, which is thus connected up in opposition, is connected by a conductor 26 to a headlight lamp 27. The other end of the coil 5 is connected by a conductor 28 to another headlight lamp 29, and both lamps 27 and 29 are connected in multiple by a conductor 30 to the other side of the magneto 21, and also to ground.

Branched off from the conductor 25, where joined to the conductor 24 or at any other suitable point, is a conductor 31 including an ohmic resistance 32 beyond which the conductor 31 is connected to the contact member 11. The bracket or support 1 has already been described as connected to the ground 2, but in the diagram, Figure 4, this bracket is indicated as connected to ground by a conductor 33, with the understanding that such ground may be directly produced instead of through the conductor 33.

The controller comprising the magnets A and B and associated parts, is so constructed and proportioned, that with the engine running at a comparatively low speed, say that which will propel the vehicle at about ten miles an hour on high gear, the light emitted by the lamps will approximate the maximum light desired and which, without the presence of the controller, would correspond to the light usually furnished by the Ford headlights when the vehicle is traveling on high gear at about twenty miles per hour. If now, the speed of the vehicle be increased to about fifteen or twenty miles per hour the voltage out-put of the magneto is correspondingly increased, wherefore there is a tendency to an increase of current in the magnets A and B so that they are more strongly energized, causing the arms 15 and 17 and the arms 15ª and 17ª to approach at their adjacent surfaces. The current controller is responsive to changing conditions as to engine speed, varying the magnetic reluctance of the controller circuit, so as to automatically limit the current furnished by the magneto to the lamps when such current has reached the predetermined maximum which it is desired should pass through the lamps. This prevents over-illumination and avoids undue electric strains on the lamps which strains would tend to be destructive to the lamp filaments.

The magnets A and B of the current controller tend to operate in opposition to the action of gravity, this tendency being in part overcome by the spring 13ª. The arrangement avoids the necessity of the use of relatively heavy springs susceptible to breakdowns. The structure is adapted for manufacture at a relatively small cost, since accuracy of workmanship and consequent machining are practically eliminated.

It is desirable to maintain the circuits in balance, but the circuit is sometimes thrown out of balance by the breaking of one or the other of the headlights 27 or 29. To compensate for this condition, each headlight has included in its circuit a respective one of the two sections of the coil 5. When both lamps 27 and 29 are in good condition, current coming from the magneto 21 passes through both headlight lamps 27, 29 through the sections of the coil 5 in opposition and through the circuit controller A, B. The core 4 is then subjected to opposing magnetic forces which neutralize each other, so that the armature 7, being overbalanced by its heavy end 10, remains out of engagement with the contact 11, wherefore the ohmic resistance 32 is cut out of circuit, such ohmic resistance being equal to the ohmic resistance of either lamp 27 or 29. If, now, one of the lamps burns out or is broken for any cause, current passes to the coil 5 and flows through but one-half of such coil, while the other half of the coil is dead. Therefore, the core 4 is energized and the armature 7 is attracted, thus completing a circuit from the magneto through the current controller A, B, to the conductor 25 to one-half of the coil 5, thence through the unbroken lamp, back to the magneto. The current also flows from the magneto 21 and conductor 22 through the current controller A, B, thence through conductor 24, conductor 31, and ohmic resistance 32, to the contact 11, and back to ground by way of conductor 33 returning by way of the conductor 30 to the magneto.

Because the cores of the magnets A, B are subjected to alternating current, they are made laminated in accordance with the usual practice. By supporting the magnets A, B of the regulator pendently with parallel motion connections, the regulator will oper-

ate in close correspondence to the variations in current, due to the variations in speed of the engine. The coils 19 and 19ª comprise reactance coils each with a core movable toward and from the other core so as to vary the magnetic reluctance of the coils which act after the fashion of a single coil with a movable core member.

The two magnets A and B substantially balance each other by gravity. They are held apart in opposition to magnetic attraction by a spring 13ª attached at the ends to diagonally opposite pins 20. The spring 13ª may be a coiled spring, as shown, or of any other suitable type.

The gravity switch 7 for introducing the resistance is particularly valuable because of the low frequency at which the device is often required to operate. Spring arrangements act as vibrators and close the circuit intermittently. There is no rebound in the case of the gravity switch and hence, intermittent action which would occur with a spring controlled switch, is obviated.

What is claimed is:

1. A regulator for an electric circuit having a current source greatly variable in speed, comprising reactance coils with pendently associated normally separated cores having adjacent parallel faces, and parallel motion connections between the cores.

2. A regulator for an electric circuit in which there is a current source subject to marked variations in speed and producing corresponding variations in voltage, comprising U-shaped cores with adjacent parallel faces, and with parallel link connections between the adjacent legs of the cores, and energizing coils for the cores to be included in circuit with the current source.

3. A regulator for an electric circuit containing a current source producible of great variations in voltage, comprising U-shaped cores with adjacent parallel faces, and each with a coil thereon for connection to the current source, each core having one leg shorter than the other and the associated cores having the shorter legs adjacent to each other and between the longer legs, and parallel motion links connecting the shorter legs.

4. A regulator for an electric circuit containing a current source producible of great variations in voltage, comprising U-shaped cores with adjacent parallel faces, and each with a coil thereon for connection to the current source, each core having one leg shorter than the other and the associated cores having the shorter legs adjacent to each other and between the longer legs, and parallel motion links connecting the shorter legs, said links each being pivotally connected at the ends to the respective legs and each provided with an intermediate pivotal support carrying the links and cores.

5. A regulator for an electric circuit in which there is a current source producing great variations in voltage, comprising two U-shaped cores each with one leg longer than the other and each core being provided with a coil for inclusion in circuit with the circuit source, the cores having the shorter legs adjacent and between the longer legs and the outer surfaces of the shorter legs being presented toward the inner surfaces of the longer legs, and supports for the cores whereby they are carried pendently, comprising rock arms or links spaced lengthwise of the cores and pivoted at the ends to the shorter legs of the cores and pivotally carried intermediate of the length of said arms, whereby the cores are disposed upright and moved with relation to each other by parallel motion.

6. A regulator for an electric circuit having a current source subject to considerable variation in speed, comprising reactance coils with normally separated cores having adjacent parallel faces in inductive relation and having parallel motion connections.

7. A regulator for an electric circuit having a current source subject to considerable variation in speed, comprising reactance coils with normally separated cores having adjacent parallel faces in inductive relation and having parallel motion connections, said cores being reversely related and pendently supported.

8. A regulator for an electric circuit having a current source subject to considerable variation in speed, comprising adjacent reactance coils with inductively related cores both movable lengthwise of and toward and from each other.

9. A regulator for an electric circuit having a current source subject to considerable variations in voltage, said regulator comprising a support with associated reactance coils having cores in inductive relation and with a portion of the core of each coil located between portions of the core of the other coil, and said cores and coils being mounted to move toward and from each other with their adjacent faces maintained parallel.

10. A regulator for an electric circuit having a current source subject to considerable variations in voltage, said regulator comprising a support with associated reactance coils having cores in inductive relation and with a portion of the core of each coil located between portions of the core of the other coil, and said cores and coils being mounted to move toward and from each other with their faces maintained parallel, and said cores also being mounted in a substantially upright position on the support.

11. A regulator for an electric circuit having a current source subject to considerable variations in voltage, comprising a support, rockable U-shaped cores with coils thereon

mounted on the support, the cores of each coil being in inductive relation to the cores of the other coil and having a parallel-motion approach and recession.

12. A regulator for an electric circuit having a current source varying considerably in voltage, comprising associated inductance coils each having its cores reversed with respect to the cores of the other and mounted to move both lengthwise of the cores and perpendicularly to said length.

13. A regulator for an electric circuit subject to considerable variations in voltage, comprising a pair of inductance coils each with a U-shaped core located reversely to the core of the other coil and each having its legs inductively related to the opposite legs of the other coil, and parallel-motion connections between the cores for the mutual approach and recession of said cores.

14. A regulator for the headlight system of an automobile having a current source varying considerably in voltage, comprising inductance means included in circuit with the current source and with both of the headlights in parallel, and also having means for introducing electro-magnetic reactance corresponding to the variations in voltage, and means for introducing into the circuit in parallel with the headlights, another circuit including an ohmic resistance equal to that of a headlight for restoring the current value of the headlight circuit.

15. A headlight system for automobiles provided with a current source subject to considerable variations in voltage, comprising electric headlights arranged in circuits in parallel, an electro-magnetic switch having opposed energizing coils arranged in the respective headlight circuits, and ohmic resistance corresponding to that of a headlight circuit and arranged in parallel with the headlight circuits, said switch being normally biased to open position, and in circuit with said ohmic resistance for closing the ohmic resistance circuit in the event of either headlight failing, and a regulator for the headlight comprising inductance coils included in circuit with the current source and provided with cores mounted to have a substantially parallel motion towards and from each other to electro-magnetically maintain a substantially constant flow of current through the headlights irrespective of the variations in voltage supplied by the current source.

16. A headlight system for automobiles, provided with a current source subject to considerable variations in voltage, comprising electric headlights arranged in parallel circuits, a normally balanced electro-magnetic switch having opposed energizing coils individual to a respective headlight, an ohmic resistance, and a normally open circuit for coupling the ohmic resistance in the headlight circuit in the event of either headlight failing.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

HARRY E. WALLACE.

Witnesses:

F. M. DAVIDSON.

CRESCENTIA M. HUSS.