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ELECTRICAL SYSTEM FOR MOTOR VEHICLES AND THE LIKE.

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1,352,266. Patented Sept. 7, 1920.

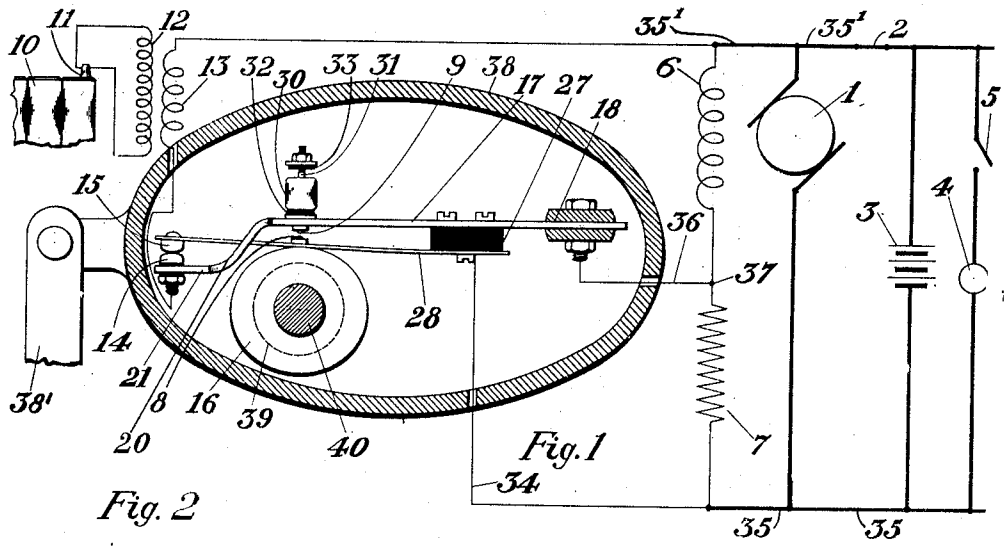


Fig. 1

Fig. 2

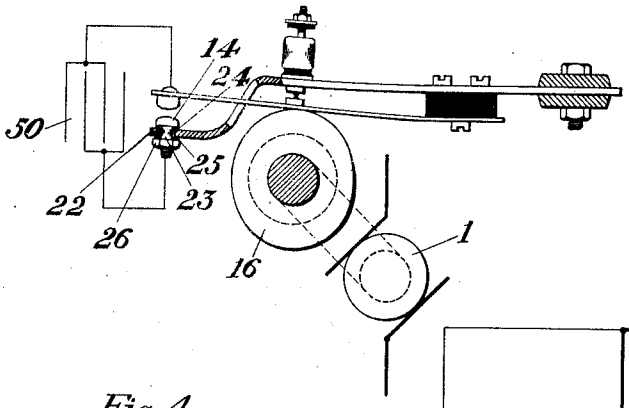


Fig. 3

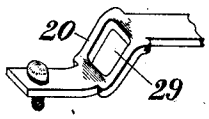
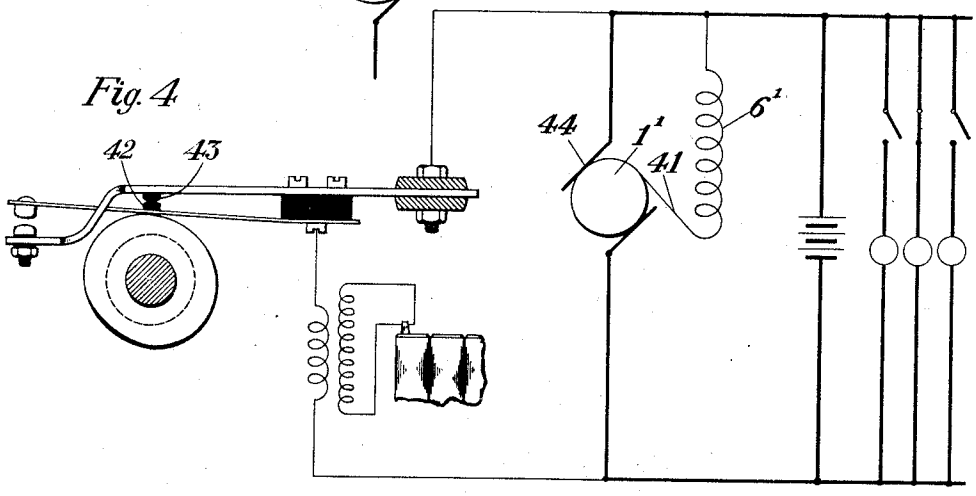


Fig. 4



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ELECTRICAL SYSTEM FOR MOTOR-VEHICLES AND THE LIKE.

1,352,266. Specification of Letters Patent. Patented Sept. 7, 1920.

Application filed April 30, 1919. Serial No. 293,719.

To all whom it may concern:

Be it known that I, MORRIS HIRSCH, a citizen of the United States, and a resident of the borough of Manhattan, in the county, city, and State of New York, have invented certain new and useful Improvements in Electrical Systems for Motor-Vehicles and the like, of which the following is a specification.

This invention relates to electrical devices more particularly for internal combustion engines on motor vehicles.

One of the objects of this invention is to provide a simple and compact ignition device which shall be economical and dependable in use for widely varying speeds of the engine.

Another object is to provide a reliable system of the above type which shall generate electrical current of the proper characteristics, which shall distribute said current in accordance with requirements, and which shall in particular produce an ignition spark of proper intensity for operation at different engine speeds.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

Referring now to the accompanying drawings wherein are shown one or more of various possible embodiments of the several features of this invention, Figure 1 is a diagrammatic view showing the contacts in one position; Fig. 2 is a detail view of the contact portion in another position; Fig. 3 is a fragmentary detail view in isometric projection of my support and Fig. 4 is a view similar to Fig. 1 of a modified form of my invention, showing the breaker contacts in a third position.

Similar reference characters refer to similar parts throughout the different views of the drawings.

Referring now to Fig. 1 of the drawings I have shown a generator 1 of the type commonly employed on motor vehicles. This generator is connected through a switch 2 preferably of the automatic type commonly employed in this relation, to connect it to the storage battery 3 when said switch 2 is closed. As my invention does not reside in this switch its details are neither shown nor described.

Both the generator and the battery supply mains 35 and 35^1 from which current is led to translating devices such as lamps 4, a switch 5 being in each lamp circuit, in accordance with usual practice.

The generator is preferably provided with a shunt field 6 which has in circuit therewith the resistance 7, which resistance is short circuited when contacts 8—9 are closed. My regulator operates on the vibratory principle, alternately cutting the resistance 7 into and out of circuit at a rapid rate thus causing the voltage of the generator to fluctuate rapidly between narrow limits with respect to the voltage for which the machine is to be regulated. As the specific regulating means taken by itself is not my invention, being described and claimed in the patent to Boury No. 1,133,000, granted March 23, 1915, further description of the details of this regulating system will be dispensed with, except in so far as it is involved in certain novel combinations described below.

Referring further to Fig. 1 of the drawings, I have shown a fragmentary diagrammatic view of an internal combustion engine 10 having spark plugs 11 connected to the secondary 12 of an induction coil whose primary is shown at 13 connected at one end to main 35^1 and at the other to one of breaker contacts 14—15, which latter will be described more fully below.

I preferably employ a single cam 16 driven at a rate proportional to that of the generator 1 preferably by direct connection to the generator shaft as shown in Fig. 2. This cam performs the two functions of alternately closing and opening both the regulator contacts 8—9 and the ignition breaker contacts 14—15.

To bring about this action I provide a vibratory support 17 in the form of a leaf spring clamped near one end as at 18 and carrying the contact 9 above referred to on its lower surface at a substantial distance

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from the clamp 18. Near its free end the support 17 is preferably provided with a deflection or offset 20, its extreme free end 21 being preferably substantially parallel to the main portion of the support 17. Near the end 21 of the support and on the upper surface thereof, I preferably mount the ignition contact 14 above referred to, insulating this contact however from the support, preferably by the use of insulating bushing 22 surrounding shank 23 of the contact, and insulating washers 24 and 25 one on each side of the support. On the lower surface of contact 14 I preferably provide a binding post 26 as clearly shown in Fig. 2 which binding post is connected to one end of the primary ignition coil 13 as shown in the drawings.

Secured to the support 17 and insulated therefrom by insulating block 27 I provide a leaf spring member 28 of a greater flexibility than the support 17. The leaf spring extends approximately in parallelism to the bottom of support 17 and the deflection 20 is preferably formed sufficiently wide to allow for an opening 29 therein, through which spring 28 passes free from contact with said deflection. It thus appears that whereas the body of spring 28 is below support 17 the free end of said spring extends above the free end 21 of the support. The regulator contact 8 which coöperates with regulator contact 9, is mounted upon the upper surface of spring 28, and near the extremity of said spring I provide the ignition breaker contact 15, for coöperation with contact 14. The relative dimensions of the parts are so designed that in response to the turning of cam 16, contacts 8—9 close and contacts 14—15 open at the same instant, and vice versa. The usual condenser shown conventionally at 50 in Fig. 2 bridges contacts 14—15.

As in the Boury patent above referred to, I preferably provide a device for exercising a braking effect upon the support 17 in order to prevent this support from following the cam 16 when the latter rotates at speeds below the inherent frequency of said support. By way of example, I have shown for this purpose the specific means employed in Fig. 10 of Boury. This means comprises a mass 30 adapted to slide upon a rod 31 which is fastened to the support 17 and which has cushions 32 and 33 mounted at the lower and upper extremities of the same respectively.

The spring 28 is preferably connected by lead 34 to the main 35 and the support 17 is connected by lead 36 to the connection 37 between field 6 and resistance 7.

The entire combined regulator and ignition breaker is preferably inclosed in a casing 38 having a hub 39 shown in dotted lines inclosing the shaft 40 of cam 16, clamp 18 being rigidly mounted within said casing. This casing may be moved together with its clamp 18 by any desired means (not shown) applied at rod 38^1 to cause the spark to take place at the proper point in the cycle for each operating condition, all in the well-known manner.

In Fig. 1, I have shown the spring 28 in an extreme position, the lowest portion of cam 16 being in contact therewith. In operation, the cam 16 being connected to the generator which in turn is driven from the engine, this cam will rotate at a speed proportional to that of the generator and of course also proportional to that of the engine. As the cam turns from the position shown in Fig. 1 it raises spring arm 28 by deflecting it about its support 27, thus closing contacts 8—9 and simultaneously opening contacts 14—15. A further turning of the cam causes the lifting effect of the cam to be transmitted through closed contacts 8—9 to the support 17 which support becomes deflected with respect to the end clamped at 18. In this continued raising operation contacts 8—9 remain closed and contacts 14—15 remain open as shown in Fig. 2. After the passage of the highest portion of the cam the support 17 tends to restore itself to its position of static equilibrium, but as the speed of rotation of the cam is relatively high this support 17 by reason of its inertia and by reason of the added inertia of mass 30 does not fall back quickly enough to follow the outline of the cam and remains in oscillation about a mean position which is farther removed from the shaft 40 in proportion to its speed. The greater this distance the smaller during each revolution of the cam will be the portion of the period that contacts 8—9 are closed.

When contacts 8—9 are together the resistance 7 is short-circuited, as the current passes from the generator to main 35^1 through field 6, lead 36, support 17, contact 9, contact 8, spring 28 and lead 34 to the main 35 and back to the generator. As an increase in speed diminishes the period of contact and, therefore the period during which the resistance is short-circuited, the effect of an increase in speed will be to weaken the field thus bringing about regulation for substantially constant voltage.

The support spring and contacts being so related to each other, as above described, that ignition breaker contacts 14—15 are in closed position while regulator contacts 8—9 are open and vice versa, and as with increasing speed the period of closure of contacts 8—9 diminishes, it follows that an increase in speed will increase the proportion of the period that contacts 14—15 are closed during any revolution of the cam. The lag of support 17 at high speeds, as is

apparent, enables the spring end 28 to overtake the support end 21 and to move the contact 15 into engagement with contact 14 after a shorter range of movement than at lower speeds.

Thus, as the speed increases, the portion of the period during a revolution of the cam that the ignition breaker contacts are closed prior to opening is increased.

The parts are preferably so proportioned that as the speed increases the said increasing fractions of the lessening cam periods shall remain substantially constant. When contacts 14—15 are closed the current passes from the generator 1 through main 35, conductor 34, spring 28, contact 15, contact 14, primary coil 13 and through the other main 35^1 back to the generator. The periods of closure of contacts 14—15 prior to opening being thus substantially constant for widely varying speeds of the engine and generator, an ignition spark of substantially constant intensity will be evolved regardless of the speed.

If instead of allowing a substantially constant period for building up the magnetic flux in the primary coil, the source of substantially constant voltage be connected to the coil prior to each break for an interval proportional to that of an engine revolution, it is obvious that with increasing speeds the period of building up flux in the primary would diminish with consequent lessening of spark intensity and attendant difficulties. By my invention, a source of constant voltage supplies a substantially constant ignition regardless of the speed.

The modification shown in Fig. 4 differs from that shown in Fig. 1 mainly in the use of third-brush regulation in place of the vibratory voltage regulation. In Fig. 4 I have provided generator 1^1 with an auxiliary third-brush 41 which connects the field 6^1 with the main brush 44. The regulator contacts 8—9 are of course dispensed with and in their place I provide preferably insulating stops 42 and 43 occupying the same location as contacts 8—9 in Fig. 1.

Fig. 4 is in other respects the same as Fig. 1 and the operation of this species is apparent from the description of the operation above.

It will thus be seen that there is herein described apparatus in which the several features of this invention are embodied, and which apparatus in its action attains the various objects of the invention and is well suited to meet the requirements of practical use.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters-Patent is:

1. In combination, an internal combustion engine, an ignition system therefor, including a regulated generator, a breaker cam driven thereby, a primary coil connected to said generator, a vibratory support, a spring having an insulating mount on the lower surface of said support, a deflection in said support, to dispose the free end of said spring above the free end of said support, breaker contacts, one near the free end of said support and the other near the free end of said spring, said cam actuating said spring and said support, and disposed below both said members.

2. In electrical systems for motor vehicles in combination, a generator, a vibratory regulator contact therefor, ignition apparatus connected to said generator, said apparatus including breaker contacts, and a single cam or the like for operating both said regulator and said breaker contacts.

3. In combination, a variable speed engine, a generator driven therefrom, a cam driven at the same speed as said generator, a vibratory regulator for said generator, having a contact actuated by said cam, and ignition apparatus for said engine including a breaker contact also actuated by said cam.

4. In combination, a variable speed engine, a generator driven therefrom, a cam driven from said generator, a vibratory regulator for said generator, ignition apparatus for said engine, including a breaker, the contacts of said regulator, and those of said breaker being all reciprocated by the action of said cam.

5. In combination, a variable speed engine, a generator driven therefrom, a cam driven from said generator, a pair of arms actuated by said cam, each of said arms bearing a vibratory regulator contact for said generator and an ignition breaker contact.

6. In combination, a variable speed engine, a generator driven therefrom, a vibratory regulator for said generator having a frequency proportional to the speed of said generator, ignition apparatus for said engine, including a breaker, and means connecting said regulator with said breaker to close the contacts of the latter substantially when those of the former open, and vice versa.

7. In combination, a variable speed engine, a generator driven therefrom, an ignition system for said engine, including a single breaker, means to lengthen the period of closure of said breaker with increase of speed, a vibratory contact voltage regulator for said generator and means connecting

said breaker with said regulator, to close the contacts of the latter when those of the former open, and vice versa.

8. In combination, a variable speed engine, a generator driven therefrom, an ignition system for said engine including a breaker, a vibratory voltage regulator for said generator, and means for causing the ratio of the period of closure to that of opening of the contacts of said breaker to vary directly as the speed of the engine, and to cause said ratio with respect to the contacts of said regulator to vary inversely as the speed of said engine.

9. In combination, a variable speed engine, a generator driven therefrom, an ignition system for said engine including a breaker, a vibratory voltage regulator for said generator, said breaker having an operating cam, said cam also operating said regulator, and means for causing the ratio of the period of closure to that of opening of the contacts of said breaker to vary directly as the speed of the engine, and to cause said ratio with respect to the contacts of said regulator to vary inversely as the speed of said engine.

10. In combination, a variable speed engine, a generator driven therefrom, an ignition system for said engine including a breaker, a vibratory voltage regulator for said generator, and means for causing the closing phase of the contacts of said breaker, and the opening phase of the contacts of said regulator to remain substantially constant in duration for varying engine speeds.

11. A combined ignition breaker and vibratory regulator comprising a vibratory support a spring having one part secured thereto to vibrate therewith but insulated therefrom, one of said latter elements having a deflection to dispose the free ends of said elements in the relation opposite to that in which they are secured to each other, cooperating breaker contacts on one side of said deflection, coöperating regulator contacts on the other side of said deflection, and a cam for actuating said support and said spring at a point on the same side of said deflection as said regulator contacts.

12. A combined ignition breaker and vibratory regulator, comprising in combination a vibratory support, a spring having one part secured to the lower surface thereof but insulated therefrom, said support having a deflected portion to dispose the free end of said spring above the free end of said support, coöperating breaker contacts one on each of said free ends, regulator contacts, one on said support and one on said spring, the former contact being above the latter for coöperation, one of said breaker and regulator contacts being insulated from the member on which it is mounted, and a cam for actuating said support and said spring at a point in proximity to said regulator contacts.

In testimony whereof I have signed my name to this specification this 23d day of April, 1919.

MORRIS HIRSCH.