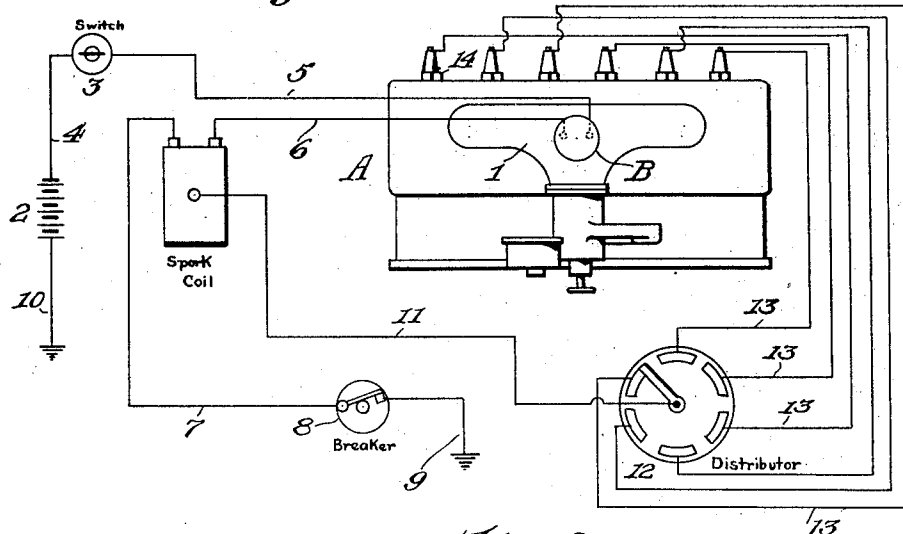
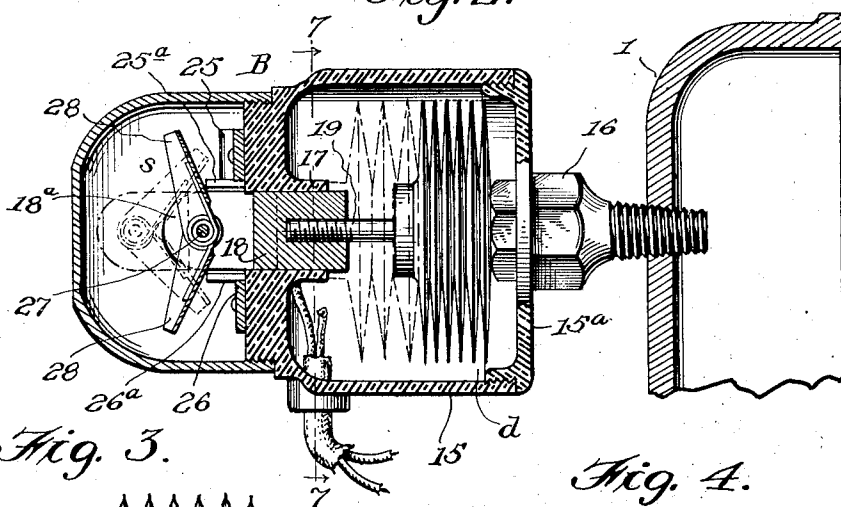
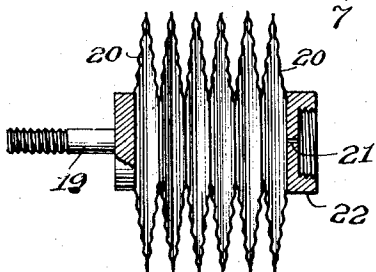
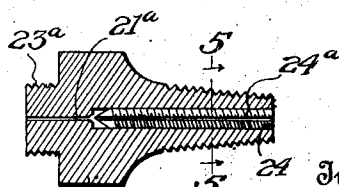


1,414,913.

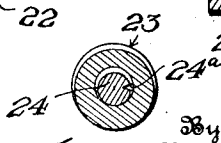
2 SHEETS—SHEET 1.



Robert Watson

Attorney

Fig. 5.



Witnesses

James Carter

G. H. WHITTINGHAM.
IGNITION CIRCUIT CONTROLLER.
APPLICATION FILED AUG. 7, 1919.

1,414,913.

Patented May 2, 1922.

2 SHEETS—SHEET 2.

Fig. 6.

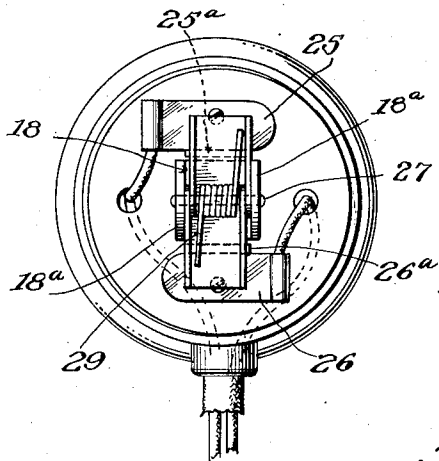


Fig. 7.

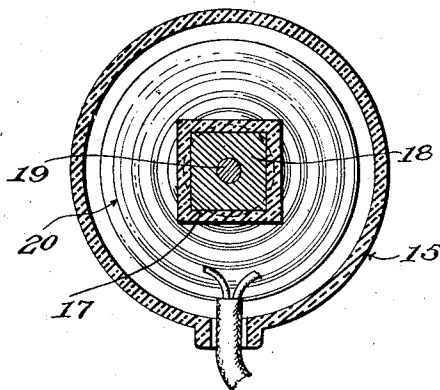


Fig. 8.

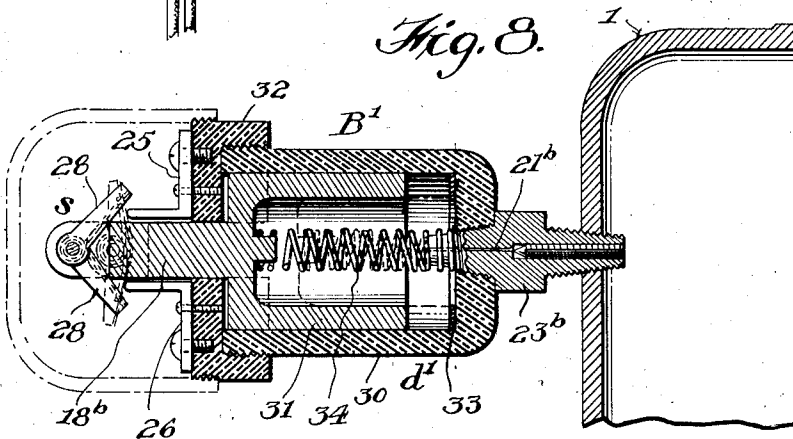
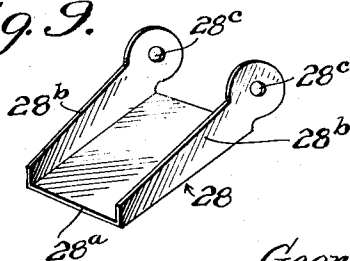


Fig. 9.



Witnesses

James Carter

Inventor

George H. Whittingham

By

Robert Watson

Attorney

UNITED STATES PATENT OFFICE.

GEORGE H. WHITTINGHAM, OF BALTIMORE, MARYLAND.

IGNITION-CIRCUIT CONTROLLER.

1,414,913.

Specification of Letters Patent.

Patented May 2, 1922.

Application filed August 7, 1919. Serial No. 315,874.

To all whom it may concern:

Be it known that I, GEORGE H. WHITTINGHAM, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Ignition-Circuit Controllers, of which the following is a specification.

This invention relates to automatic circuit controllers of the kind illustrated in my co-pending application Serial No. 271,135, filed January 14, 1919, adapted particularly for interrupting the primary circuits of ignition systems associated with internal combustion engines, the purpose of the invention being to provide a mechanism which will insure the opening of the primary circuit after the motor has stopped, and thus prevent the discharge of the battery which might otherwise occur if the operator should leave the circuit closed at the usual dashboard switch while the engine is stopped.

In carrying out my invention, I provide a closed air chamber having a wall, or walls, movable in response to changes in atmospheric pressure within the chamber, and having a restricted inlet and outlet passageway which is connected to the intake pipe of the motor, the volumetric capacity of the air chamber being large and the cross-sectional area of the passageway being relatively very small so that an appreciable time, several seconds, will be required for the chamber to fill or exhaust through said passageway, and the movement of the wall of the chamber will be correspondingly slow. A normally open switch is provided in the main circuit, and one of the switch members is supported on the movable wall of the chamber so as to be moved into and out of engagement with the stationary member, or members, of the switch as the chamber contracts or expands. In order to provide for the delayed opening of the switch, after the stoppage of the motor, the volumetric capacity of the chamber is large and the inlet opening is relatively small, as previously stated, and the form of the chamber is such that its movable wall will have a considerable distance to travel after the switch contacts have been brought together. To permit of this extended movement, one of the switch members is mounted so that it may yield after being brought into engagement with the opposing member, or members, and, in order to keep the contact surfaces clean and bright at all times, this yielding switch member is designed so as to

have a slight rubbing contact with the opposing member or members without, however, causing undue wear. The controlling device thus constructed will maintain the primary circuit of the ignition system closed as long as the motor is in operation, regardless of the jolting of the vehicle or circumstances which cause a brief rise in pressure in the intake pipe, such as back firing; but if the engine is stopped for a period of a few seconds, the primary circuit of the ignition system will be opened and discharge of the battery will be prevented. A switch for this purpose must be durable and reliable at all times, and in the forms of the invention shown in the drawing, the arrangement is such that the contact surfaces will always be clean.

In the accompanying drawing,

Fig. 1 is a diagrammatic view illustrating the circuit controlling device of my invention in association with an internal combustion engine;

Fig. 2 is a central, longitudinal section through the controlling device, in its preferred form, a part of the intake pipe of the engine being also shown;

Fig. 3 is a central, longitudinal section through the metal bellows illustrated in Fig. 2;

Fig. 4 is a central, longitudinal section through the nipple which connects the bellows with the intake pipe;

Fig. 5 is a section on the line 5—5 of Fig. 4;

Fig. 6 is an end view of the controlling device shown in Fig. 2, with the dust cover removed;

Fig. 7 is a section on the line 7—7 of Fig. 2;

Fig. 8 is a central, longitudinal section through a modified form of controlling device; and,

Fig. 9 is a perspective view of one of the contact arms or leaves of the switch.

Referring to Figs. 1 and 2, of the drawing, A indicates an internal combustion engine, and B indicates the circuit controlling device of my invention, which device is connected to and supported by the intake pipe 1 of the engine. The battery which supplies current for the ignition circuits of the motor is indicated at 2, and the switch for turning on and off the current, which is usually mounted on the dashboard of the vehicle, is indicated at 3. The primary circuit of the

system extends from battery 2, through conductor 4 to a switch 3, thence through conductor 5 to one terminal of the controlling device B, thence through conductor 6 to the spark coil, thence through conductor 7 to the automatic circuit breaker 8, and thence to the ground through conductor 9, and the current following the course indicated, returns to the battery through grounded conductor 10. The secondary winding of the spark coil is connected through conductor 11 to the distributor 12, and conductors 13 extend from the distributor to the various spark plugs 14, in the usual way.

Referring to Figs. 2 to 7, of the drawing, which show the construction of the preferred form of the invention in detail, the controlling device comprises a suitable casing 15, the base 15^a of which is provided with a threaded nipple 16, by which the device may be connected to the intake pipe 1 of an internal combustion engine, as shown. The part 15^a of the casing is preferably made of molded insulating material and is threaded on to the base 15^a, which is preferably of metal. The end of the casing opposite the base has a squared opening 17 which serves as a guideway for a plunger 18, of insulating material, which is connected by a threaded rod 19 to one end of a metal bellows 2, arranged within the casing. This diaphragm, as shown in Figs. 2 and 3, comprises a plurality of spring metal disks 20, connected together to form a closed chamber having walls which readily collapse or expand in response to changes in air pressure within the chamber. The chamber has a small inlet and outlet opening 21 through a threaded fitting 22, which latter is adapted to engage the threaded end 23^a of a nipple 23, having an opening 21^a which registers with the opening 21 when the parts are assembled. Within the nipple is arranged a needle valve 24, having a small groove 24^a extending along one side, and by adjusting the valve forwardly or backwardly the outlet passage-way 21—21^a from the chamber may be more or less throttled or restricted. The volumetric capacity of the bellows chamber is large compared with the size of the inlet and outlet opening 21, so that several seconds will be required to exhaust or fill the chamber with air through said opening, and the movement of the chamber walls will be correspondingly slow.

Upon the insulated portion of the casing, at opposite sides of the squared opening 17, are stationary contacts 25 and 26, to which the wires 5 and 6 are connected, said contacts having up-turned flanges 25^a and 26^a. The plunger 18 has a pair of ears 18^a which project beyond the casing 15 and carry a cross-pin 27 upon which is mounted a pair of yielding contact arms or leaves 28, adapted to engage the flanges 25^a and 26^a when the

bellows is collapsed, as shown in Fig. 2 in full lines, these arms, however, being held out of engagement with the flanges when the bellows is expanded, as indicated in dotted lines. The arms or leaves 28 are alike, and one of these is illustrated in detail in Fig. 9. As shown in said figure, the arm comprises a flat contact portion 28^a, having upturned flanges 28^b at its sides, said flanges having eyes or perforations 28^c, to receive the pin 27. These arms are arranged upon the pin so that they project oppositely, and a spring 29, coiled about the pin 27, has its ends bearing upon the arms and tending to hold them in the position shown in dotted lines in Fig. 2, and also in full lines in Fig. 8. When the plunger is moved inward, by the slow collapse of the bellows, the contact arms near the commencement of this movement will engage the contact flanges at the outer edges of the latter, and as the plunger moves inward, these arms will rock over the flanges with a slight rubbing movement and finally rest upon the inner edges of the flanges as shown in full lines in Fig. 2. When the bellows expands, the contact arms will move in the reverse direction, swinging about their common axis and in rubbing engagement with the stationary contacts until near the end of the movement of the plunger when they will leave the contacts, interrupting the circuit. This rubbing contact of the parts causes the contact surfaces to remain clean and bright at all times. The spring 29 tends constantly to move the plunger outward and the spring metal in the bellows has a similar tendency, so that when the pressures within and without the bellows are the same the contact arms of the switch will be held out of engagement with the stationary contacts.

The flanges 25^a and 26^a constitute stops against which the yielding contact arms 28 fulcrum, and while it is preferable that both of these stops shall be contact pieces, to be bridged by the contact arms, it is obvious that only one stop need be a contact piece, if the contact arms themselves be connected to one side of the circuit.

In operation, the ignition circuit is normally open at the switch of the circuit controlling device. To start the engine, the operator closes the dashboard switch 3, as usual, and cranks the engine. The suction in the intake pipe, resulting from the cranking, causes a suction through the restricted orifice 21, and as the air is exhausted from the bellows chamber, the yielding switch arms 28 are brought into engagement with the stationary contacts, thus completing the ignition circuit, and as the operation of the engine then commences, the suction exhausts the bellows chamber and the switch arms take the position shown in Fig. 2. Owing to the slow movement of the bellows and the distance which the switch arms must travel

in order to become disengaged from the stationary contacts, a rise in pressure in the intake pipe such as might be caused by back firing of the engine, or other causes, will not result in a dis-engagement of the switch members, nor can they be dis-engaged by any jolting of the vehicle. The switch will therefore remain closed under all conditions while the engine is running. If the motor becomes stalled, however, the pressure in the intake pipe will rise and the bellows chamber will gradually fill and expand and the primary circuit of the ignition system will be broken at the switch of the controlling device, thus preventing any discharge of the battery through the ignition circuit, even though the operator should fail to open the circuit at the switch 3. If, while the engine is running, the operator desires to stop it, he will open the switch 3, and in a few seconds after the engine has stopped, the circuit will be interrupted at the controlling device by the filling and expansion of the bellows chamber. Should the operator, then, through carelessness or otherwise, close the switch 3, without starting the engine, the primary circuit will remain open at the controlling device and the battery cannot become discharged.

In Fig. 8, I have shown a modified form of controlling device, B', in which the air chamber d', instead of being made of a metal bellows, is composed of a molded cylinder 30 and a hollow plunger 31 which fits closely within it, the cylinder and plunger forming a chamber of large volumetric capacity compared with the size of the inlet and outlet opening 21^b, in a nipple 23^b, which connects the interior of the chamber with the intake pipe 1 of the engine. A cap 32 extends over one end of the cylinder 30 and has an opening through which a plunger 18^b, connected to the end of the hollow plunger 31, extends. The switch arms 28 are the same in construction as in the previously described figures and mounted in the same manner upon the plunger and in the same relation to the stationary contact members 25 and 26. A gasket 33, preferably of pure rubber, fits into the bottom of the cylinder 30, in position to be engaged by the open end of the hollow plunger 31 when the latter is moved to the inner position, indicated in dotted lines. A spring 34 normally holds the hollow plunger in its outer position, shown in full lines.

It will be evident that when the pressure in the intake pipe is lowered by cranking the engine, the pressure within the chamber d' will be gradually lowered, and the hollow plunger 31 will move inward, closing the switch; also, when the engine is stopped, the leakage of air through the restricted passageway 21 will slowly fill the chamber and the spring 34 will move the switch to open

position. The parts 30 and 31 may be made of molded material, fitting nearly air-tight, and when the part 31 is sucked down against the gasket 33, the latter forms a seal which prevents any leakage of air between the cylinder and piston.

When the members are seated one against the other, a sealed chamber of relatively large volumetric capacity is formed, with a restricted passageway leading from said chamber to the intake pipe of the engine, and the suction of the engine maintains a low pressure in this chamber. Hence, the movable member 31, carrying the switch contact, will be held to its seat by the suction as long as the engine is in operation. After the engine has stopped, the member 21 remains on its seat until the pressure in the sealed chamber rises sufficiently to permit the seal to be broken by the pressure of the spring, and said member then travels slowly outward and opens the switch.

What I claim is:

1. A vacuum-controlled switch adapted for operation by the suction of an internal combustion engine, comprising an expansible and contractible air chamber having a wall normally in expanded position and movable in response to reduction in internal air pressure to its contracted position, said chamber having a relatively small inlet opening adapted to retard the flow of air into the chamber and cause slow movement of the wall, two contact members adapted to engage at the commencement of the contracting movement of the chamber and to separate at the end of the expanding movement, one of said contact members being yieldingly connected to said movable wall, said chamber having a relatively long contracting movement after the closure of the switch and a relatively long expanding movement prior to the opening of the switch.

2. A vacuum-controlled switch adapted for operation by the suction of an internal combustion engine, comprising an expansible and contractible air chamber having a wall normally in expanded position and movable in response to reduction in internal air pressure to its contracted position, said chamber having a relatively small inlet opening adapted to retard the flow of air into the chamber and cause slow movement of the wall, two fixed contact pieces, a yielding contact member secured to said wall and adapted to bridge said contact pieces at the commencement of the contracting movement of said chamber and to break contact with said pieces at the end of the expanding movement thereof, said chamber having a relatively long contracting movement after the closure of the switch and a relatively long expanding movement prior to the opening of the switch.

3. A vacuum-controlled switch adapted

for operation by the suction of an internal combustion engine, comprising an expansible and contractible air chamber having a wall normally in expanded position and movable
 5 in response to reduction in internal air pressure to its contracted position, said chamber having a relatively small inlet opening adapted to retard the flow of air into the chamber and cause slow movement of the
 10 wall, two spaced contact pieces, a rod secured to said wall and movable in a line between said contact pieces, a contact member comprising two spring-pressed arms pivoted on said rod and adapted to bridge said contact
 15 pieces at the commencement of the contracting movement of the chamber and to break contact with said pieces at the end of the expanding movement thereof, said chamber having a relatively long contracting
 20 movement after the closure of the switch and a relatively long expanding movement prior to the opening of the switch.

4. A vacuum-controlled switch adapted for operation by the suction of an internal
 25 combustion engine, comprising an expansible and contractible air chamber having a wall normally in expanded position and movable in response to reduction in internal air pressure to its contracted position, said chamber
 30 having a relatively small inlet opening adapted to retard the flow of air into the chamber and cause slow movement of the wall, two spaced stops, one, at least, of which

is a contact piece, a rod secured to said wall and movable in a line between said stops, a
 35 contact member comprising two oppositely-extending arms yieldingly mounted on the rod and adapted to bridge said stops at the commencement of the contracting movement of the chamber and to separate from said
 40 stops at the end of the expanding movement thereof, said chamber having a relatively long contracting movement after the closure of the switch and a relatively long expanding movement prior to the opening of the switch.
 45

5. A vacuum-controlled switch comprising fixed and movable cylindrical members having heads and fitting telescopically together, one member adapted to seat against the other and form therewith a sealed chamber
 50 of relatively large volumetric capacity, when the members are pressed together, one member having a restricted passageway for connecting said sealed chamber with the intake pipe of an internal combustion engine, a
 55 spring normally holding said members apart, said spring adapted to yield and allow the members to seat by the suction of the engine, and a normally open switch adapted to be
 60 closed by said movable member at the commencement of its movement from normal position and to be opened by said latter switch at the end of its movement from the seated position.

In testimony whereof I affix my signature. 65
 GEORGE H. WHITTINGHAM.