Aug. 28, 1923. 1,466,012

C. A. BOWLUS

CIRCUIT BREAKER

Filed Oct. 27, 1919

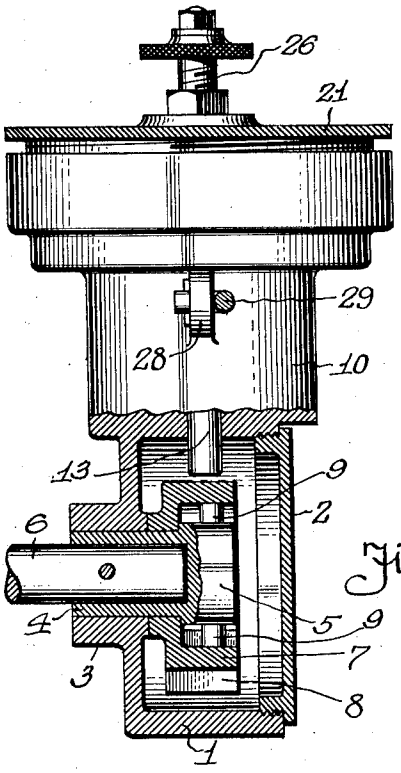


Fig. 1.

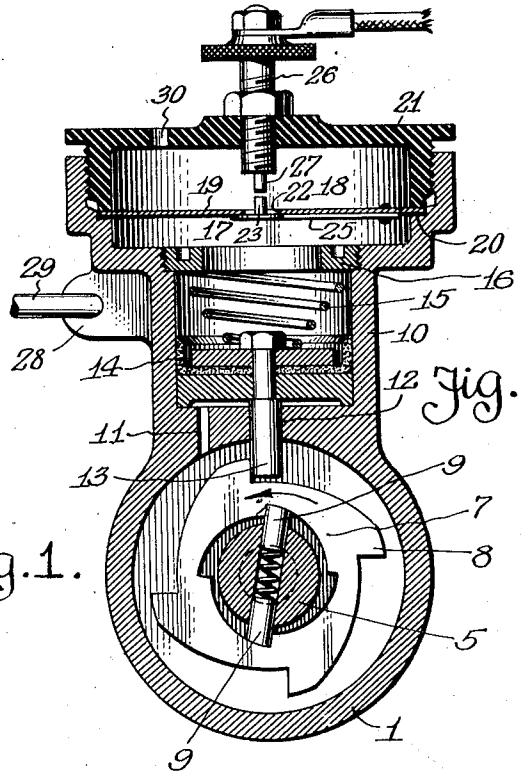


Fig. 2.

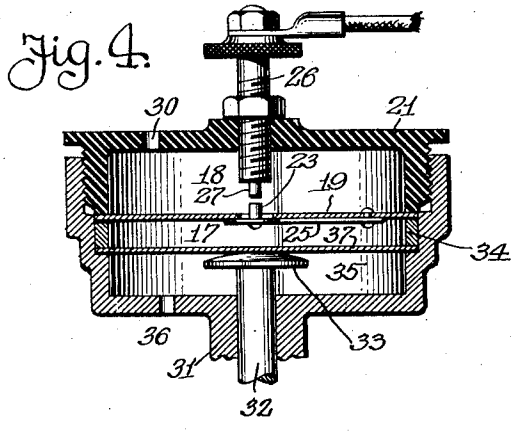


Fig. 4.

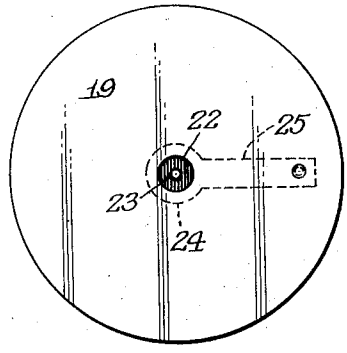


Fig. 3.

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Patented Aug. 28, 1923. 1,466,012

UNITED STATES PATENT OFFICE.

CLAUDE A. BOWLUS, OF BIRMINGHAM, MICHIGAN.

CIRCUIT BREAKER.

Application filed October 27, 1919. Serial No. 333,544.

To all whom it may concern:

Be it known that I, CLAUDE A. BOWLUS, a citizen of the United States of America, residing at Birmingham, in the county of Oakland and State of Michigan, have invented certain new and useful Improvements in Circuit Breakers, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a circuit breaker, and has special reference to a mechanical and pneumatically actuated device that may be used as a timer or distributor in connection with the ignition system of an internal combustion engine; as a flasher in connection with electrical signs, and generally as a device adapted to be intermittently actuated for making and breaking electrical circuits.

The primary object of my invention is to provide positive and reliable means in a manner as herein set forth, for effecting a quick make and break of an electric circuit including a stationary contact member and a movable contact member, said movable contact member being under the influence of a diaphragm associated with pneumatic means by which the diaphragm is controlled so that the movable contact member is operated in synchronism with the pneumatic means or any mechanical means associated with the pneumatic means.

Another object of my invention is to provide resilient means for making an electrical contact and pneumatic means for controlling or releasing said resilient means, said resilient and pneumatic means being compactly arranged so that the device will occupy a comparatively small space, particularly when used in connection with the ignition system of an automobile or similar vehicle.

A still further object of my invention is to provide a circuit breaking device wherein the parts are constructed with a view of reducing the cost of manufacture, and at the same time retain those features by which a positive operation and non-interference of the back fire of an engine are secured. With such ends in view, my invention resides in the novel construction to be hereinafter considered and then claimed.

Reference will now be had to the drawing, wherein—

Figure 1 is a side elevation of the circuit breaker partly broken away and partly in section;

Fig. 2 is a vertical cross sectional view of the same;

Fig. 3 is a plan of the diaphragm, adapted to form part of the device, and

Fig. 4 is a vertical sectional view of a modified form of the device.

The device comprises a cylindrical housing 1 having a detachable front plate 2 and a concentric bearing 3, said bearing supporting the hub portion 4 of a one-way clutch 5 within the housing 1, and mounted in the hub 4 is a driven shaft 6 constituting cam operating means and representing the cam or timer shaft of an internal combustion engine when my device is associated with such engine and the ignition system thereof.

Loose on the one-way clutch 5 is a clutch member 7 having a plurality of equally spaced peripheral cams 8 and this clutch member is normally engaged by the pawls or dogs 9 of the one-way clutch, which as shown in Fig. 2 establishes rotative continuity between the cams and the clutch member when the shaft 6 is rotated in a counterclockwise direction, and should said shaft be accidentally driven in a clockwise direction, the one-way clutch releases the cams relative to the driven shaft 6, and no material damage is done to the housing 1.

On the housing 1 is a cylinder 10 communicating with said housing through a vent 11 and the partition which separates the cylinder from the housing is provided with a central opening 12 for a piston 13 which is reciprocated in one direction by the cams 8. The piston 13, within the cylinder 10, is provided with a piston head 14 and engaging said piston head is a coiled spiral spring 15 retained within the cylinder 10 by a retaining ring 16 screwed in the outer end of said cylinder. The expansive force of the spring 15 is sufficient to hold the piston head 14 normally at the inner end of the cylinder 10 and the expansive force of said spring reciprocates the

piston head in an opposite direction from that produced by the cams 8 contacting with the end of the piston rod 13. It is now apparent that when the driven shaft is placed in operation the piston head 14 will be reciprocated within the cylinder 10 and will vary the atmospheric pressure within the outer end of the cylinder 10.

The outer end of the cylinder 10 is enlarged to provide two chambers 17 and 18 separated by a diaphragm 19 seated on an annular shoulder 20 in the enlarged end of the cylider, this enlarged end also supporting a cap 21, preferably made of insulating material, and preferably screwed into the enlarged end of the cylinder 10. The cap 21 retains the diaphragm 19 seated on the shoulder 20 and such diaphragm is preferably made of brass or such material that will permit of said diaphragm being flexed by atmospheric pressure produced in the chamber 17 by the piston head 14 being reciprocated through the medium of the driven shaft 6. The diaphragm 19 has a central opening 22 and protruding into said opening into the chamber 18 is a contact point 23 carried by the head 24 of a resilient arm or contact member 25 riveted or otherwise connected to the lower face of the diaphragm 19. Only one end of the arm or member 25 is connected to the diaphragm so that the opposite end thereof will be free to act relative to the diaphragm 19, as will hereinafter appear. The resilient contact member affords a closure for the opening 22 and the resiliency of said contact member maintains it normally closed relative to said diaphragm. Centrally of the cap 21 is a stationary or fixed contact member 26 having a contact point 27 within the chamber 18 and adapted to be engaged by the contact point 23. The stationary contact member serves as a binding post and suitable electrical connections may be established with said stationary contact member and also with the movable contact member through the cylinder 10 and the diaphragm 19. The chamber 18 communicates with a vent opening 30 in the cap 21.

The cylinder 10 has a side lug 28 connected to a rod or coupling member 29 and the rod or coupling member 29 may be employed for shifting the cylinder 10 and the housing 1, relative to the shaft 6, so that the intermittent operation of the circuit breaker may be advanced or retarded as is the usual practice in connection with the timer or distributor of an ignition system.

In operation, an outward stroke of the piston head 14 compresses the air within the chamber 17 and jointly flexes the diaphragm 19 and the resilient contact member until the contact point 23 of said contact member engages the fixed contact point 27, when the resilient contact member is retarded or temporarily held while the diaphragm 19 continues to flex and move away from the head 24 of the resilient contact member, thereby providing a space between the head 24 and the diaphragm 19 which opens the opening 22 and establishes communication between the chambers 17 and 18 so that pressure in said chambers may equalize and readily permit the diaphragm 19 and the resilient contact member 25 to assume normal position as the piston head 14 is retracted by the expansive force of the spring 15. Releasing the atmospheric pressure below the diaphragm 19 causes the contact point 23 to quickly break from the contact point 27 and it is in this manner that the movable contact member 25 is intermittently actuated to make and break circuits including the contact points 23 and 27.

Reference will now be had to Fig. 4 of the drawing showing a slight modification of my invention, wherein the piston head 14 and the spring 15 are dispensed with. In this construction it is possible to entirely dispense with the cylinder 10 or make said cylinder of such a size that it will simply serve as a guide 31 for a tappet rod 32 having a head 33, said tappet rod being actuated similar to the piston rod 13 of the preferred form of construction. In addition to the diaphragm 19 another diaphragm 37 is employed and spaced from the diaphragm 19 by a spacing ring 34, thus providing another chamber 35 in addition to the chambers 17 and 18. The chamber 35 contains the head 33 of the tappet rod 32 and said chamber communicates with the atmosphere through a vent 36. When the diaphragm 37 is flexed by the tappet rod 32, in contradistinction to air pressure means, the air within the chamber 17 causes the diaphragm 19 to flex and establish an electrical connection between the contact points, and the flexure of the diaphragm 37 may be depended on to restore the tappet rod 32 to normal position or a spring or other means may be resorted to for such purpose. In this modification the diaphragm 37 serves practically the same purpose as the piston head 14, and since many devices may be utilized, particularly in connection with an internal combustion engine, for producing a change in atmospheric pressure relative to a diaphragm, I do not care to confine my invention to the precise means shown for this purpose, and would have it understood that various other changes may be resorted to as are permissible by the appended claims.

What I claim is:—

1. In a circuit breaker wherein a circuit is adapted to be intermittently broken during each revolution of a rotary member, a diaphragm, a fixed contact at one side thereof, a relatively movable contact carried by the opposite side of said diaphragm and ex-

tending therethrough, and means axially of said diaphragm and actuated by virtue of said rotary member adapted to flex said diaphragm to cause said movable contact to engage said fixed contact.

2. A circuit breaker as characterized in claim 1, wherein said diaphragm may be further flexed after said movable contact has engaged said fixed contact.

3. In a circuit breaker, a diaphragm having an opening, a fixed contact at one side thereof, a relatively movable contact carried by the opposite side of said diaphragm and normally closing the opening thereof, and means adapted to flex said diaphragm to cause said movable contact to engage said fixed contact and cause said movable contact to open the opening of said diaphragm by further flexure of said diaphragm after engagement of the contact.

4. In a circuit breaker, a resilient diaphragm, a fixed contact at one side thereof, a relatively movable contact carried by the opposite side of said diaphragm, fluid pressure means active against said diaphragm and effective to the extent of closing a circuit, said diaphragm being constructively arranged to release the contacts automatically under reduced pressure.

5. In a circuit breaker wherein a circuit is adapted to be intermittently broken during each revolution of the rotary member, chambers, a diaphragm separating said chambers, normally open contacts in said chambers, one of said contacts serving as a valvular member to maintain one of said chambers closed, and means axially of said diaphragm and actuated in the closed chamber by virtue of the rotary member for flexing said diaphragm to close said contacts.

6. A circuit breaker comprising chambers, a diaphragm separating said chambers, a contact in one chamber, a contact carried by the diaphragm in the other chamber and extending through said diaphragm into the first mentioned chamber and adapted to engage the contact therein, and means adapted to act against said diaphragm and the contact thereof to simultaneously shift said diaphragm and contact, and then shift the diaphragm independent of this contact.

7. A circuit breaker comprising a driven shaft, pneumatic means disposed in alinement with said shaft and actuated thereby, and make and break electrical connections in alinement with said driven shaft and said pneumatic means and established by said pneumatic means.

8. In a circuit breaker, a fixed contact, a resilient diaphragm provided with a contact adjacent said fixed contact, a casing enclosing said diaphragm, and said contacts, said diaphragm being constructively arranged at one end of said casing, and a cam actuated piston at the opposite end of said casing adapted to vary the air pressure in the casing, said diaphragm being adapted to close the circuit in synchronism with impulses of the piston and automatically open the circuit by releasing the air pressure at such times as the piston may rest.

9. A circuit breaker comprising adjacent parts, one supported by the other and movable together by air pressure to make an electrical connection with the parts having a relative configuration so that when one of said parts is retarded by making such electrical connection, the other part moves independent of the retarded part, releases the air pressure, and permits the retarded part to quickly break the electrical connection.

10. In an ignition device the combination of an engine cylinder having a flexible diaphragm at one end, a contact carried by the diaphragm, a stationary contact, and a piston operated by the engine to move in the chamber and cause the diaphragm to flex.

In testimony whereof I affix my signature in the presence of two witnesses.

CLAUDE A. BOWLUS.

Witnesses:
KARL H. BUTLER,
ANNA M. DORR.