July 18, 1939. I. E. COFFEY 2,166,901

ELECTRIC CIRCUIT INTERRUPTER

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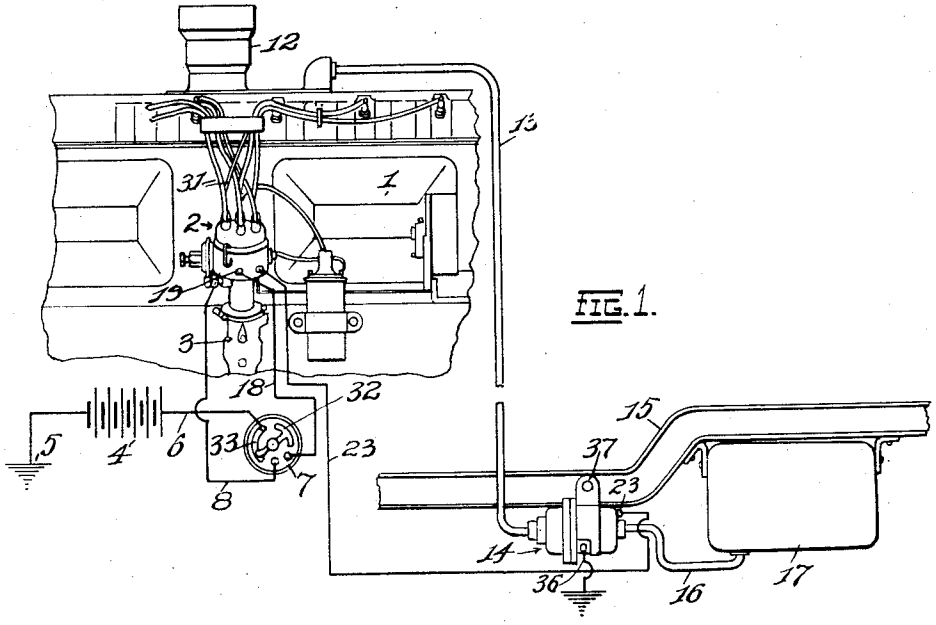


FIG. 1.

FIG. 2.

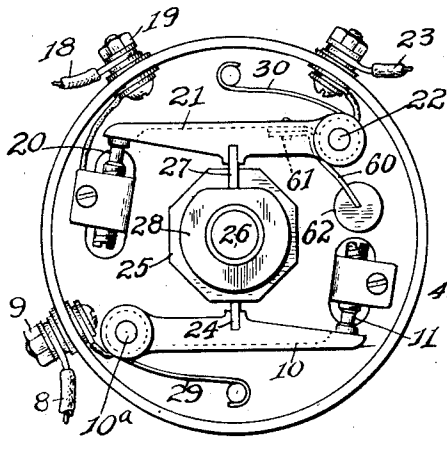
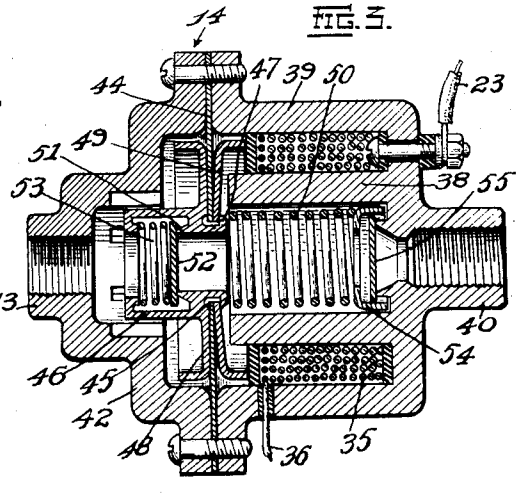


FIG. 3.



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ELECTRIC CIRCUIT INTERRUPTER

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6 Claims. (Cl. 200—27)

This invention relates to mechanism including a reciprocating member and consists, particularly, in means for preventing reciprocation of the member at an excessive rate.

Fuel pumping devices for internal combustion engines, of the type in which a piston or diaphragm is connected to a moving part of the engine, must be constructed to produce a substantial fuel flow when the engine is operating at low and intermediate speeds and means are usually provided for relieving pressure when the engine demands less than the full or potential output of the pump. However, the speed at which reciprocating pumps can be effectively operated is limited, and some means must be provided to insure an adequate flow when the speed of the pump driving member is excessive. Ordinarily, the pulsations of the pump piston or diaphragm must not exceed 1500 or 2000 per minute. The present invention is applicable more particularly to electrical pumps of the type utilizing a magnetic coil and a make and break device comprising a reciprocating member operated from a part movable with the engine crankshaft, such as the distributor cam shaft.

An important object of the present invention is to provide means for preventing actuation of a reciprocating member as described above at faster than a predetermined rate.

Another object is to provide means for operating a fluid pumping device from an engine, together with means for preventing reciprocation of the pumping piston or diaphragm at an excessive rate.

Another object is to provide means for controlling the rate of vibration of a breaker arm such as is ordinarily associated with a rotating cam in an engine distributor or the like.

These objects and other more detailed objects hereafter appearing are attained substantially by the structure illustrated in the accompanying drawing in which:

Fig. 1 is a diagrammatic view showing a portion of an internal combustion engine and associated parts and mechanisms.

Fig. 2 is a top view of the distributor housing with the cover removed.

Fig. 3 is a sectional view of the pumping device.

Fig. 1 shows an engine 1, mounting a distributor, generally indicated at 2, operated in the usual manner by a shaft extending through housing 3 and geared or otherwise connected to the engine cam shaft (not shown). A battery 4 is grounded, as at 5, and connected by a lead 6 to the switch 7. Wire 8 connects switch 7 through terminal 9 with the ignition breaker point 10, shown in Fig. 2, the stationary point 11 being grounded. A carburetor 12 also carried by the engine is connected by a tube 13 to a pumping device, generally indicated at 14, mounted on chassis frame 15, this device in turn being adjacent and connected by a tube 16 to fuel storage tank 17 at the rear.

A third wire 18 also connects switch 7 with the distributor housing, this wire being connected through terminal 19 to a stationary point 20 diagonally opposite ignition point 10. A movable breaker point 21 is pivoted at 22 opposite the pivotal support 10a for ignition breaker point 10 and is connected by an electrical wire 23 to the pumping device 14.

Breaker arm 10 has a finger 24, usually of insulating material, which engages an octagonal cam 25 rigid with the distributor shaft 26. Breaker arm 21 has a finger 27 engaging a second cam 28 on shaft 25. Arms 10 and 21 are constantly urged toward the cams by springs 29 and 30 so that when shaft 25 is rotated the arms will be reciprocated so as to be intermittently moved into and away from electrical contact with stationary points 11 and 20, respectively. Points 10 and 11 are connected to the usual ignition coil 28 for producing a high tension current which is led to the spark plugs by the wires 31.

Switch 7 includes contact elements 32 and 33 which, upon actuation of the switch button, simultaneously connect both the ignition circuit and the fuel pumping circuit with battery 4. Pumping device 14 includes a magnetic coil 35 connected at one end to electrical lead 23 and grounded at the other end as at 36. Device 14 is shown secured to frame 15 by a bracket 37 and obviously suitable insulation must be provided between the coil and the frame since the grounding of the various electrical units, as customary, is effected through the framing.

Coil 35 is wound about a hollow core 38 and is enclosed within a housing or casing 39. A threaded boss 40 communicates with the interior of core 38 and provides an inlet opening for connection with tube 16 from the fuel tank. A separate cap member 42 is bolted to the opposite end of casing 39 and is provided with a threaded boss 43 providing an outlet opening for connection with tube 13 leading to the carburetor. A diaphragm 44 of a suitable fuel resistant material is secured between casing 39 and end member 42 and has a central orifice 45. A valve housing member 46 has a grooved boss 47 in-

serted in orifice 45 and a broad base portion 48 extending over a substantial portion of the surface of the diaphragm. A cup-shaped armature member 49 abuts the opposite face of diaphragm 44 and with the diaphragm forms a fluid tight seal with grooved boss 47. Armature 49 is disposed to be drawn toward coil 35 when the latter is energized. A coiled spring 50 inside core 38 bears against grooved boss 47 and constantly urges the same and diaphragm 44 toward the left or away from coil 35.

Associated with seating shoulder 51 in housing member 46 is a disc valve 52 forming an outlet check, the valve being constantly urged toward its seat by coiled spring 53. At the inner end of inlet boss 40 is a cage 54 receiving an inlet check disc 55.

In operation, intermittent making and breaking of circuit and breaker points 20 and 21 causes reciprocation of diaphragm 49, which in turn draws fuel through boss 40, past check 55 into the interior of core 38 and forces the same past outlet check 52 into tube 12 connecting with the carburetor float bowl.

The arrangement of the diaphragm and check valve is such that any pressure in the fuel tank is utilized to assist in forcing fuel to the carburetor bowl. It has been found that a pumping device as shown will not operate efficiently if the diaphragm reciprocations exceed approximately 1500 per minute. Internal combustion engines of the automotive type ordinarily operate at 4000 R. P. M. or more at the highest speeds and in order to prevent diaphragm 44 from following the engine revolutions at such high speeds, I provide the novel pulsation dampening device shown in Fig. 2. This device comprises a leaf spring element 60 secured to pump breaker arm 21 near pivot 22 thereof, as at 61, and having a weight 62 secured to its free end. As arm 21 is reciprocated under the influence of cam 27 and spring 30, spring element 60 and weight 62 are caused to vibrate in accordance with the natural period of vibration thereof which is dependent upon the length of the spring and the weight of element 62. These factors are preferably arranged so that the natural vibrating period of the weighted spring corresponds with the desired maximum reciprocating rate of diaphragm 44.

In case shaft 25 is rotating at a speed which would otherwise cause arm 21 and diaphragm 44 to reciprocate at too fast a rate, spring element 60 will resist such tendency and, in fact, will prevent reciprocation of the arm at a rate faster than the natural vibration rate of weighted spring. Obviously the length of spring 60 and the weight of element 62 must be correlated with spring 29 and arm 21 to insure proper dampening of breaker arm vibrations at high motor speeds.

The novel pulsation dampening device is particularly advantageous when used in connection with a pumping device of the type described, but the use thereof is not exclusively limited thereto. The novel pumping device shown is very effective for pumping fuel in a system as shown, due to the fact that a continuous stream of liquid can be supplied. Various elements of the motor and vehicle framing are conventional and may be modified as desired. The invention and associated structure may be modified in various respects as will occur to those skilled in the art and the exclusive use of all such modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In a circuit breaker of the class described, a movably mounted member, means for yieldingly reciprocating said member, said means being normally operable at varying rates, and a vibrating element carried by said member so as to mechanically influence the reciprocations of said member according to the natural vibrating period of said element.

2. A device as specified in claim 1 in which said vibrating element comprises elongated structure having a part secured to said reciprocating member and having another part free to vibrate naturally.

3. A device as specified in claim 1 in which said means comprises a spring constantly urging said reciprocating member in one direction and mechanism for causing intermittent positive movement of said member against said means.

4. A device as specified in claim 1 in which said vibrating element comprises a leaf spring secured at one end to said reciprocating member and with the other end free for vibrating.

5. In a device of the class described, a reciprocating member, yielding means constantly urging said member in one direction, mechanical means for intermittently moving said member at a variable rate in the opposite direction against said yielding means, and a leaf spring element secured to said member and having a portion free for vibrating naturally whereby the rate of reciprocation of said member is influenced by the natural vibrating period of said spring element.

6. A device as specified in claim 5 in which weight structure is provided on the vibrating part of said spring element, the weight of said structure and the length and resilience of said spring element being correlated with said reciprocating member and the yielding means operating thereon so that said member cannot reciprocate faster than the vibrating period of said spring element.

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