Jan. 6, 1953 G. C. FRICKE ET AL 2,624,325

CARBURETOR CONTROL MECHANISM

Filed July 1, 1950 2 SHEETS—SHEET 1

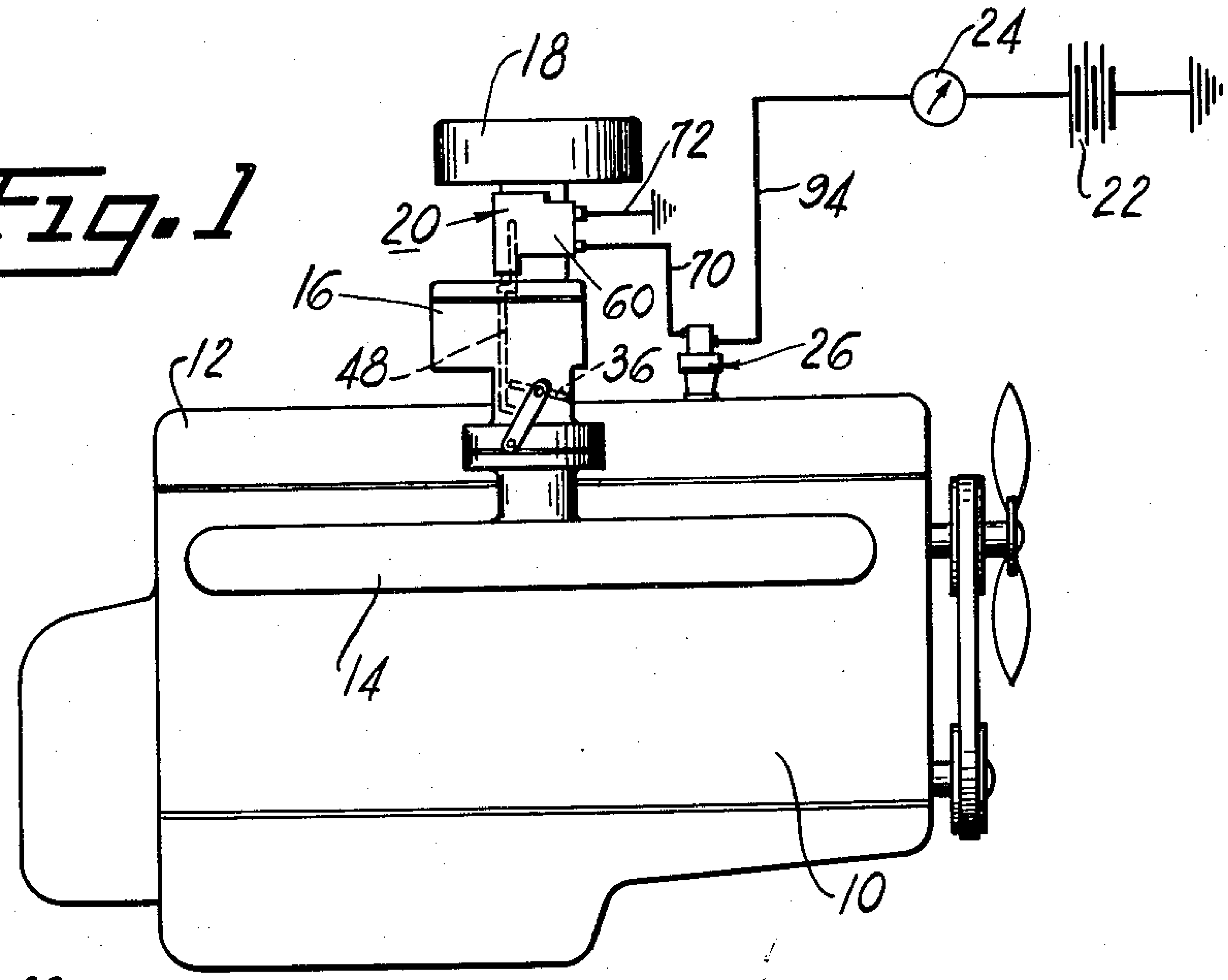

Fig. 1

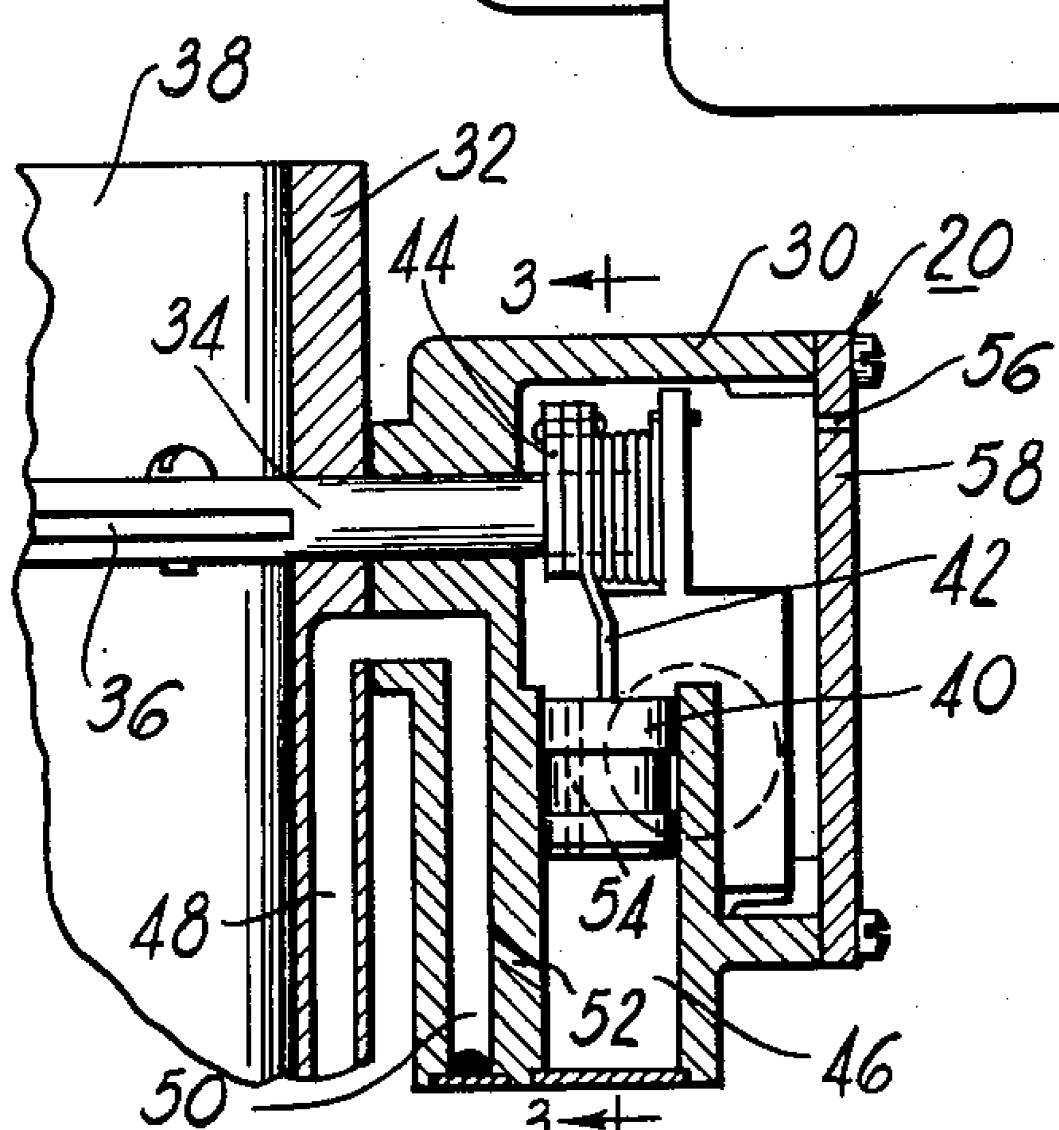

Fig. 2

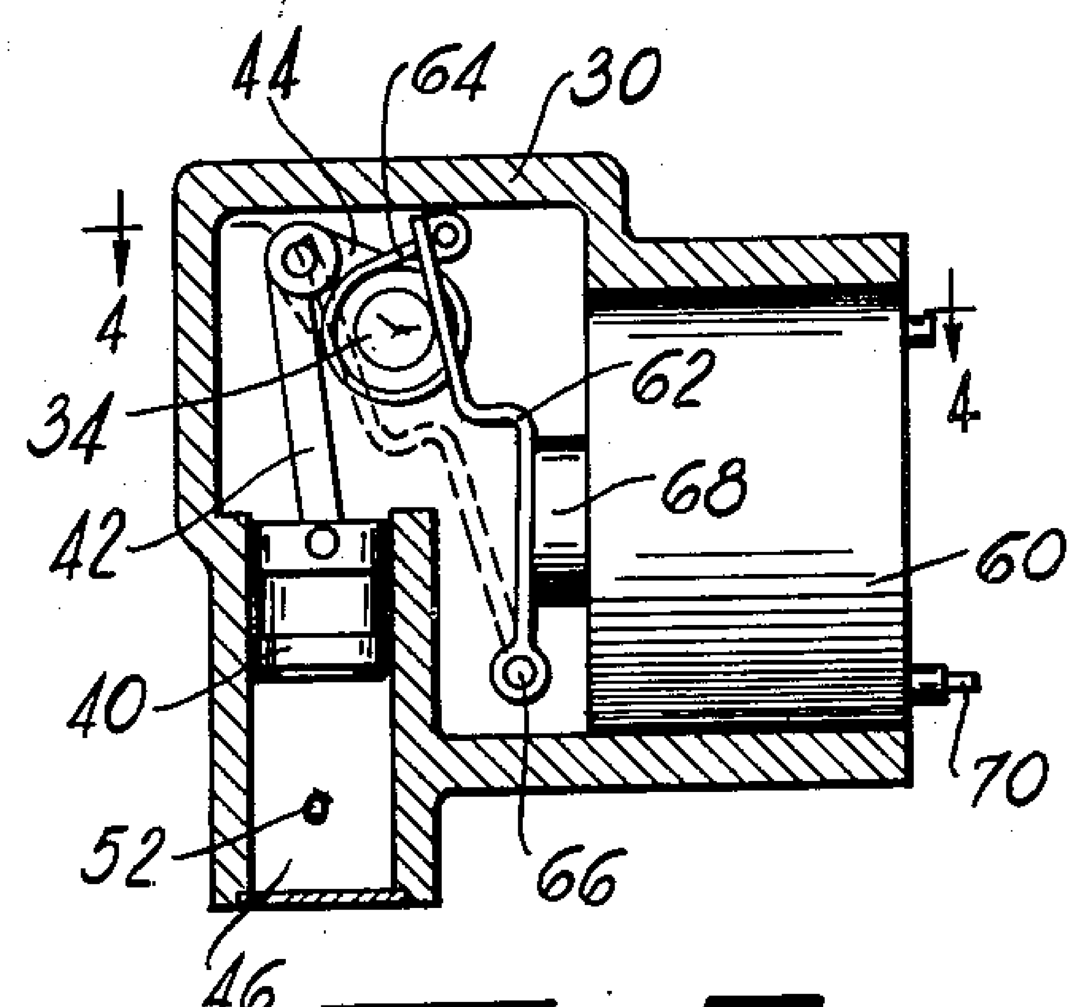

Fig. 3

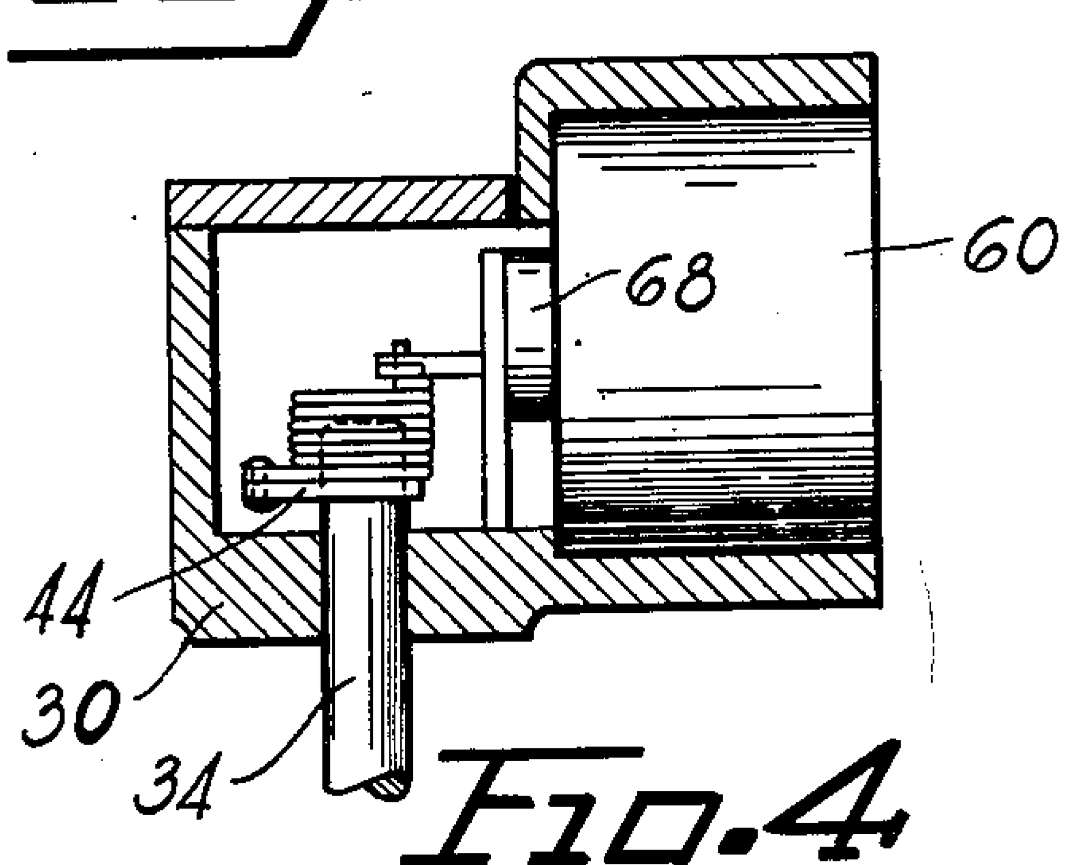

Fig. 4

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CARBURETOR CONTROL MECHANISM

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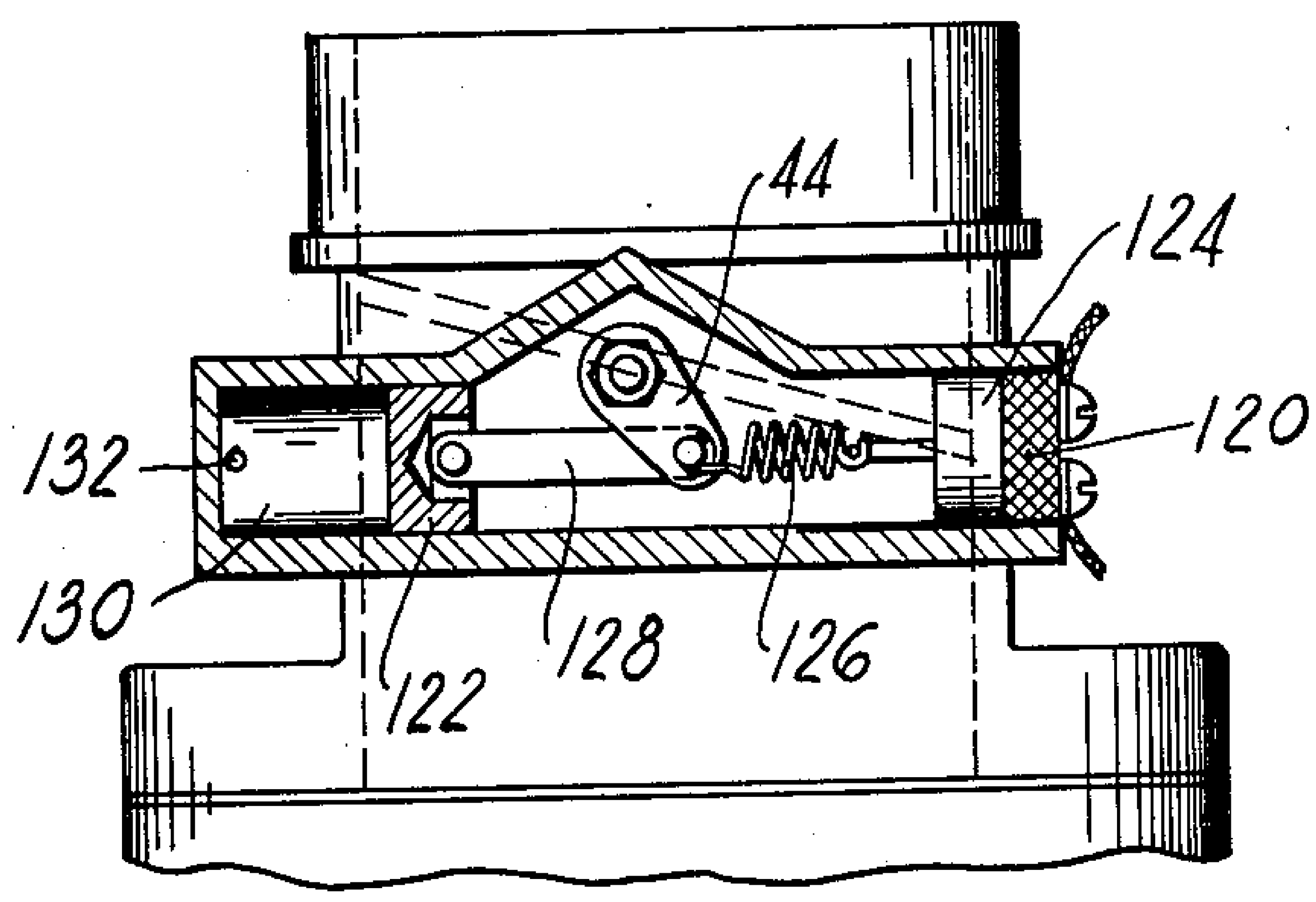

Fig. 5

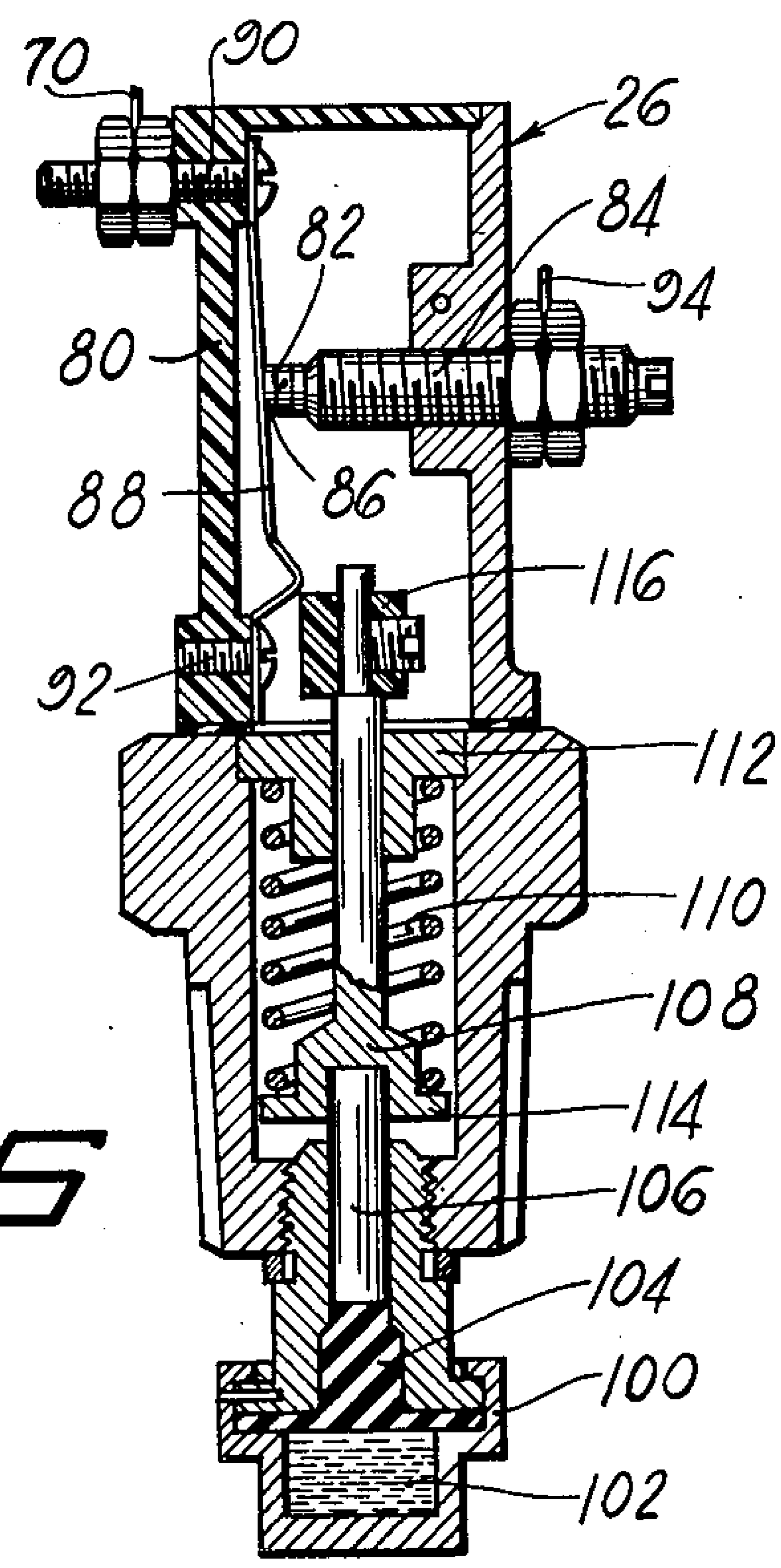

Fig. 6

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CARBURETOR CONTROL MECHANISM

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9 Claims. (Cl. 123—119)

The present invention relates to a control for an engine, and more particularly to an automatic choke control for a carburetor of an internal combustion engine.

One of the principal objects of the present invention is to provide a fuel enrichment device for an internal combustion engine which varies the fuel-air ratio in accordance with variations in the temperature of the cooling fluid of the engine.

Another object of the invention is to provide a control for the choke valve of a carburetor which is responsive to manifold vacuum and to variations in the temperature of the liquid in the cooling system of the engine.

Another object is to provide a choke control device for an engine which is readily responsive to a temperature of some part of the engine remote from said device.

A further object is to provide a choke control device which varies the fuel-air ratio in accordance with the engine requirements.

Additional objects and advantages of the present invention will become apparent from the following description and accompanying drawings, wherein:

Figure 1 is a side elevation of a multiple cylinder internal combustion engine showing schematically certain elements of the present invention;

Figure 2 is a vertical cross-sectional view of our choke control device;

Figure 3 is a sectional view of our control device taken on line 3—3 of Figure 2;

Figure 4 is a sectional view of the control device taken on line 4—4 of Figure 3;

Figure 5 is a sectional view of a modified form of our invention; and

Figure 6 is a sectional view of a temperature responsive switch for our choke control device.

Referring more specifically to the drawings, and to Figure 1 in particular, wherein a multiple-cylinder water cooled internal combustion engine is shown, numeral 10 designates a cylinder block, 12 a cylinder head, 14 an intake manifold, 16 a carburetor, 18 an air cleaner mounted on said carburetor, and 20 our choke control device mounted in operative position on the air horn of the carburetor and connected by an electrical circuit with a battery 22, an ignition switch 24 and a thermostatically controlled switch unit 26 mounted on cylinder head 12. For the purpose of this description, the engine, including the carburetor, may be considered conventional in construction and operation.

The choke control mechanism is encased in a

housing 30 secured to the carburetor air horn 32 adjacent one end of the choke valve shaft 34 on which choke valve 36 is mounted in the carburetor induction passage 38, said choke valve preferably being of the unbalanced pressure responsive type or having a poppet valve adapted to permit an increase in air flow as soon as the engine begins to fire. Shaft 34 extends into the housing and is rotated in the choke opening direction by a vacuum responsive piston 40 connected to said shaft by a rod 42 and a lever 44 rigidly mounted on one end of said shaft. Piston 40 is adapted to reciprocate in a cylinder 46 in response to manifold vacuum transmitted to said cylinder through conduits 48 and 50 and a port 52 from the induction passage on the engine side of the throttle valve. The degree of manifold vacuum required to actuate the choke valve is partially controlled by an air bleed passage 54 extending longitudinally through piston 40 and connecting cylinder 46 with the internal portion of housing 30, which in turn is vented to the atmosphere through port 56 in cover 58.

The choke valve is held closed during engine cranking and is urged towards closed position during the warming-up period by a solenoid 60 acting through a lever 62, a coil spring 64 and lever 44, said spring being mounted on the end of choke shaft 34 and connected at one end to lever 44 and at the other end to lever 62 to form a resilient linkage between the choke valve and solenoid 60. Lever 62 is pivoted at one end on a pin 66 secured in the wall of housing 30 and is preferably constructed of soft steel with a thin plate of copper on the lower side at the point of contact between the lever and the solenoid core 68. Lead 70 connects the solenoid with thermostatic switch 26 and lead 72 connects the solenoid with any suitable ground, such as the main body or the air horn of the carburetor.

The thermostatic switch unit 26, shown in detail in Figure 6, is in series with the ignition switch and is adapted to control the choke unit on carburetor 16 in response to changes in the temperature of the engine cooling liquid. The switch is contained in a cap 80 of plastic or other nonconducting material and consists of a fixed contact 82 mounted on stem 84 which is secured in the side wall of said cap, and a movable contact 86 mounted on a leaf spring element 88 which is secured by screws 90 and 92 to the inside wall of the cap opposite stem 84, contact 82 being connected by a lead 94 with the ignition switch 24 and battery 22, and contact 86 being connected by lead 70 with solenoid 60. The base 100 of the switch unit is adapted to be secured to the cylinder head of the engine, preferably threaded into a hole therein, and contains a chamber 102 filled with a thermo-expansible material, such as hydrocarbon and copper. A yieldable diaphragm 104 forms the upper wall of chamber 102 and is operatively connected to switch element 88 by a shaft 106 abutting against the upper side of said diaphragm and a stem 108 urged in the direction to permit the switch to close by a coil spring 110 reacting between a fixed sleeve 112 and a flange 114 on the lower end of the stem. The upper end of stem 108 is insulated from element 88 by a plastic cap 116. As the engine cooling liquid becomes warm after the engine starts, the heat is transmitted to the thermo-expansible material in chamber 102 which urges diaphragm 104 upwardly, forcing stem 108 to move contact 86 on element 88 away from contact 82, thus interrupting the current from battery 22 to solenoid 60.

In the starting operation of a cold engine, turning on of the ignition switch 24 completes the circuit for the choke unit on the carburetor in that switch unit 26 is always closed when the engine is cold. The solenoid 60, which is then energized, pulls lever 62 to the right, as shown in Figure 3, rotating spring 64 and the choke shaft 34 in the clockwise direction to close the choke valve for starting. As soon as the engine begins to fire, the air flow in the induction passage 38 of the carburetor causes the choke valve (if the valve is of the unbalanced type) to open slightly against the force of spring 64 to provide sufficient air for the operation of the engine before the manifold vacuum has increased sufficiently to operate piston 40. When the throttle valve is moved toward closed position and the manifold vacuum has, as a result, increased substantially, piston 40 moves downward in cylinder 46, urging the choke valve in the opening direction in opposition to the yieldable force applied by solenoid 60 through spring 64. The degree to which the choke valve will be opened by piston 40 depends upon the size of port 52 relative to passage 54, upon the strength of spring 64, and upon the degree of manifold vacuum. The first two factors can be adjusted to suit requirements. If the throttle valve is again opened to the point where the manifold vacuum can no longer hold piston 40 down in opposition to the solenoid, the choke valve moves toward closed position and provides additional fuel enrichment for engine acceleration. As the air flow increases with acceleration, the unbalanced valve partially opens to provide the air required for the higher speed. When the cooling liquid has reached a predetermined temperature, thermostatic switch 26 opens the choke circuit, de-energizing solenoid 60 and permitting the choke valve to move to wide open position for normal engine operation.

In Figure 5, a modification of our choke control device is shown wherein a solenoid 120 and a vacuum piston 122 are on opposite sides of lever 44. The solenoid 120 actuates a metallic piston 124 which is connected to lever 44 by a coil spring 126. Piston 122 is connected to lever 44 by a rod 128. The cylinder 130 in which piston 122 reciprocates is connected to the induction passage through a port 132 and conduits similar to conduits 48 and 50 shown in Figures 1 and 2. The operation of the choke control device employs an electrical circuit and a thermostatic switch similar to that shown in Figures 1 and 6.

Although thermostatic switch 26 is shown mounted on the engine cylinder head, it may be mounted at any other suitable point in the cooling system of the engine or at some other point on the engine apart from the cooling system, as for example the exhaust manifold, which will indicate the operating temperatures of the engine.

The thermostatic switch may be of the design shown in Figure 6 or any other suitable design. Other modifications may be made in our choke control device to suit requirements without departing from the scope of the present invention.

We claim:

1. A control for an engine carburetor having a choke valve and a shaft for said valve, comprising a lever on said shaft, a solenoid for urging said valve toward closed position, a member actuated by said solenoid, a yieldable means connecting said member to said lever, a vacuum responsive means connected to said lever for urging said valve in the opening direction, a circuit for said solenoid, and a means responsive to some engine temperature for controlling the current through said circuit.

2. A control device for the choke valve of an engine carburetor, comprising a solenoid, a yieldable linkage operatively connected to said valve and adapted to be actuated by said solenoid in the direction to close said valve, and a vacuum responsive means connected to said valve for urging said valve in the opening direction on an increase of manifold vacuum.

3. A control device for the choke valve of an engine carburetor, comprising a solenoid, a resilient linkage, operatively connected to said valve and adapted to be actuated by said solenoid in the direction to close said valve, a vacuum responsive means connected to said valve for urging said valve in the opening direction on an increase of manifold vacuum, a circuit for said solenoid, and a switch means responsive to some engine temperature for controlling the current through said circuit.

4. A control device for the choke valve of a carburetor for a liquid cooled engine, comprising a solenoid, a yieldable linkage operatively connected to said valve and adapted to be actuated by said solenoid in the direction to close said valve, a vacuum responsive means connected to said valve for urging said valve in the opening direction on an increase of manifold vacuum, a circuit for said solenoid, and a switch means responsive to the temperature of the cooling liquid for controlling the current through said circuit.

5. A fuel enrichment device for an internal combustion engine having an induction passage and a carburetor with a throttle valve, a choke valve and a shaft therefor, comprising a lever secured to said shaft, a solenoid, a pivoted lever actuated by said solenoid, a yieldable means connecting said first mentioned lever with said second mentioned lever, and a chamber connected to the induction passage on the engine side of the throttle valve and having a movable wall connected to said first mentioned lever.

6. A fuel enrichment device for an internal combustion engine having an induction passage and a carburetor with a throttle valve, a choke valve and a shaft therefor, comprising a lever secured to said shaft, a solenoid, a pivoted lever actuated by said solenoid, a resilient means functionally interposed between said levers, a chamber connected to the induction passage on the engine side of the throttle valve and having a movable wall, a rod connecting said wall with said first mentioned lever, and a circuit for energizing said solenoid.

7. A fuel enrichment device for an internal

combustion engine having an induction passage and a carburetor with a throttle valve, a choke valve and a shaft therefor, comprising a lever secured to said shaft, a solenoid, a pivoted lever actuated by said solenoid, a spring connecting said first mentioned lever with said second mentioned lever, a cylinder connected to the induction passage on the engine side of the throttle valve, a piston in said cylinder connected to said first mentioned lever, a circuit for said solenoid, and a means responsive to some engine temperature for controlling the current through said circuit.

8. A fuel enrichment device for an internal combustion engine having a carburetor with a choke valve and a shaft therefor, comprising a lever secured to said shaft, a solenoid, a pivoted lever actuated by said solenoid, a yieldable means functionally interposed between said levers, a chamber having a movable wall adapted to be subjected to manifold vacuum, a rod connecting said wall with said first mentioned lever, and a thermo-statically controlled switch responsive to an engine temperature for controlling said solenoid.

9. A fuel enrichment device for a liquid cooled internal combustion engine having an induction

passage and a carburetor with a throttle valve, a choke valve, and a shaft therefor, comprising a lever secured to said shaft, a solenoid, a pivoted lever actuated by said solenoid, a spring connecting said first mentioned lever with said second mentioned lever, a cylinder connected to the induction passage on the engine side of the throttle valve, a piston in said cylinder connected to said first mentioned lever, a circuit for energizing said solenoid, and a thermostatically controlled switch in said circuit responsive to the temperature of the cooling liquid of the engine.

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