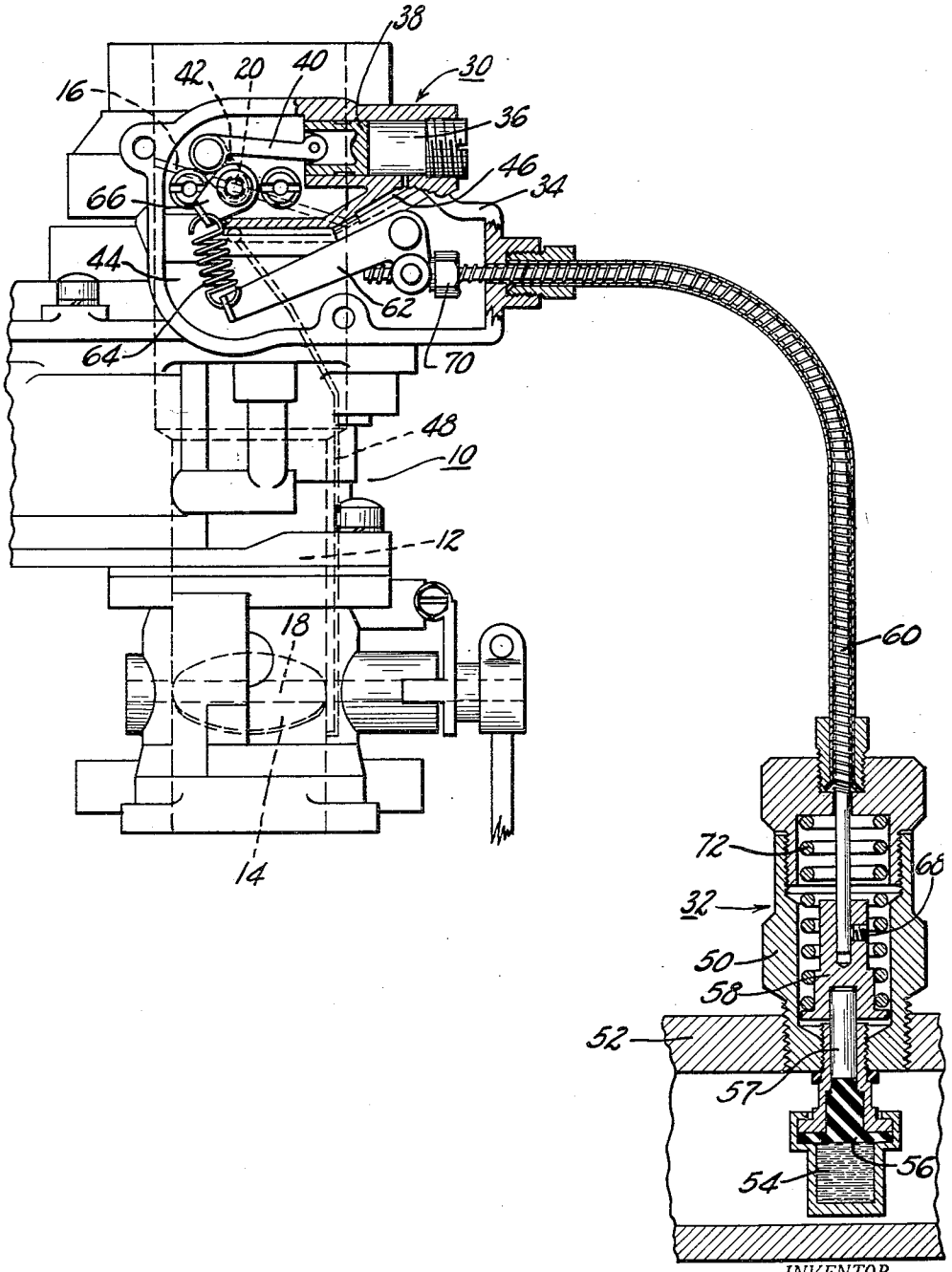
Dec. 18, 1956 D. J. SCHAFFER ET AL 2,774,343

CHOKE CONTROL DEVICE

Filed April 9, 1952



INVENTOR.
DAVID J. SCHAFFER
ROBERT R. DORLAND
BY
M. A. Hobbs
ATTORNEY

United States Patent Office 2,774,343 Patented Dec. 18, 1956

2,774,343

CHOKE CONTROL DEVICE

David J. Schaffer and Robert R. Dorland, Detroit, Mich., assignors to Bendix Aviation Corporation, South Bend, Ind., a corporation of Delaware

Application April 9, 1952, Serial No. 281,422

4 Claims. (Cl. 123—119)

The present invention relates to a fuel mixture control device and more particularly to a choke control device for a carburetor of an internal combustion engine.

One of the principal disadvantages of the conventional hot air automatic choke control device is its tendency to close the carburetor choke valve at a faster rate than the cooling rate of the engine. If an attempt is made to start the engine before it has fully cooled, the automatic choke device often over-chokes the engine and sometimes causes flooding. One of the principal objects of the present invention therefore is to provide an automatic choke control device which will close the carburetor choke valve at substantially the same rate as that at which the engine cools.

Another object is to provide a reliable choke control device for a carburetor of an internal combustion engine, which varies the fuel-air mixture in accordance with engine requirements.

Another object of the 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.

A further object of the invention is to provide a fuel enrichment device for a carburetor which more closely regulates the fuel-air mixture supply required by the engine than the present commercial hot air choke control devices.

Additional objects and advantages of the present invention will become apparent from the following description and accompanying drawing, wherein a carburetor equipped with our automatic choke control device is shown.

Referring more specifically to the drawing, numeral 10 designates a float-type down-draft automotive carburetor which includes the usual induction passage 12 having disposed therein a throttle valve 14 and a choke valve 16 mounted on shafts 18 and 20, respectively. The choke shaft 20 is offset from the center of the induction passage to unbalance the choke valve so that air flow through the induction passage will tend to open the valve. The carburetor contains, in addition to those elements mentioned, a main fuel system, idle system, accelerating pump, fuel bowl and power enrichment jet, usually found in conventional automotive carburetors, and since the construction of these elements is well known a description of them here is unnecessary.

The choke valve is controlled by our automatic choke control device which consists basically of a vacuum reseponsive unit 30 mounted on the carburetor at one end of shaft 20 and a temperature responsive unit 32 mounted on the engine cylinder head, or in the engine coolant lines. Unit 30 is enclosed in a housing 34 and includes a cylinder 36 and a piston 38 in the cylinder connected to the choke shaft 20 by a rod 40 and a lever 42 secured to one end of the shaft. The cylinder which is closed at one end and connected at the other end directly with chamber 44 of the housing is connected near its closed end with the induction passage on the engine side of the throttle valve by passages 46 and 48. Chamber 44 of

the housing is vented to the atmosphere either directly or through the induction passage on the air intake side of the choke valve. Immediately after the engine starts to fire, manifold vacuum is transmitted through passages 48 and 46 to cylinder 36 causing piston 38 to move to the right and open the choke valve to provide the air required for engine operation. The extent to which the piston will open the choke valve will depend upon the position of the upper end of passage 46 along the side wall of the cylinder. If it is in the extreme righthand end of the cylinder, manifold vacuum will cause the piston to move the choke valve to its wide open position. A balanced choke valve could be effectively used in that construction.

The temperature responsive unit 32 includes a base 50 adapted to be secured, for example, to the cylinder head 52 of a water cooled internal combustion engine, preferably threaded into a hole therein, and contains a chamber 54 filled with a thermo-expansible material, such as hydrocarbon and copper. A yieldable diaphragm 56 forms the upper wall of chamber 54 and is operatively connected to the choke valve shaft 20 by a shaft 57, adapter 58, Bowden wire or the like 60, pivoted lever 62, spring 64, and lever 66 mounted on the choke shaft. The Bowden wire is secured to adapter 58 by a set screw 68 and to lever 62 by a pivotally mounted nut 70. A spring 72 urges adapter 58 and Bowden wire 60 in the direction to close the choke valve as the thermo-expansive material contracts when the engine cools. As the engine cooling liquid becomes warm after the engine has been started, the heat causes the material in chamber 54 to expand and urge diaphragm 56 upwardly permitting the choke valve to open under the influence of air flow in the induction passage. Spring 64 is included in the linkage between the temperature responsive unit and the choke valve to permit the vacuum piston to open the valve when the engine begins to fire.

While the starting motor is operating to start a cold engine, the choke valve is held fully closed by the temperature responsive unit, the manifold vacuum transmitted to cylinder 36 and the air flow in the induction passage being insufficient to open the valve. As soon as the engine begins to fire, manifold vacuum readily becomes sufficient to move piston 38 to the right and thereby partially open the choke valve to provide the air required for cold engine operation. When the throttle valve is opened the manifold vacuum decreases substantially and the air flow increases. Under this condition the choke valve is moved to or retained in at least a partially open position by the effect of the air flow on the larger portion of the unbalanced valve. Thereafter, as the engine becomes warm, the thermo-expansible material expands and through the Bowden wire permits the choke valve to gradually open until it reaches fully opened position.

Since the present choke mechanism is responsive to the temperature of the cooling liquid instead of exhaust manifold temperatures, as in conventional hot air chokes, the choke valve is closed at a rate comparable to that at which the engine cools. Therefore the choke valve setting is always correct regardless of whether the engine is being started while partly or fully warm. Although only one embodiment of the invention is shown and described herein, modification may be made without departing from the scope of our invention.

We claim:

1. In a choke control device of a carburetor for an engine having an induction passage with a choke valve mounted on a shaft therein: a vacuum responsive member operatively connected to said shaft for urging said valve toward opened position, a lever on said shaft, a spring connected to said lever, a link connected to said

spring, resilient means having a one-way connection with said link adapted to constantly urge said choke valve toward closed position, a temperature responsive element having a one-way connection with said link adapted to oppose said resilient means.

2. In a control device for a choke valve of a carburetor for an engine: a resilient means for urging the choke valve towards closed position, a linkage connecting said means with said valve, a temperature responsive member for decreasingly opposing said means at substantially the same rate as the engine cools, a one way connection between said member and said linkage, and a vacuum responsive means for urging said choke valve toward open position.

3. In a control device for a choke valve of a carburetor for an engine: a spring for urging the valve toward closed position, a linkage for connecting said spring to said choke valve, an expansible means in said linkage, and a temperature responsive means having a one way connection with said linkage for decreasingly resisting said spring at substantially the same rate as that at which the engine cools.

4. In a choke control device of a carburetor for an engine having an induction passage with a choke valve mounted on a shaft therein: a lever secured to said shaft, a resilient member connected to said lever, a spring for urging said choke valve towards closed position, a linkage connecting said spring with said resilient member, and an element responsive to engine temperature for resisting said spring.

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