March 7, 1950 L. B. READ 2,499,607

AUTOMATIC CHOKE CONTROL

Filed Oct. 11, 1945 2 Sheets-Sheet 1

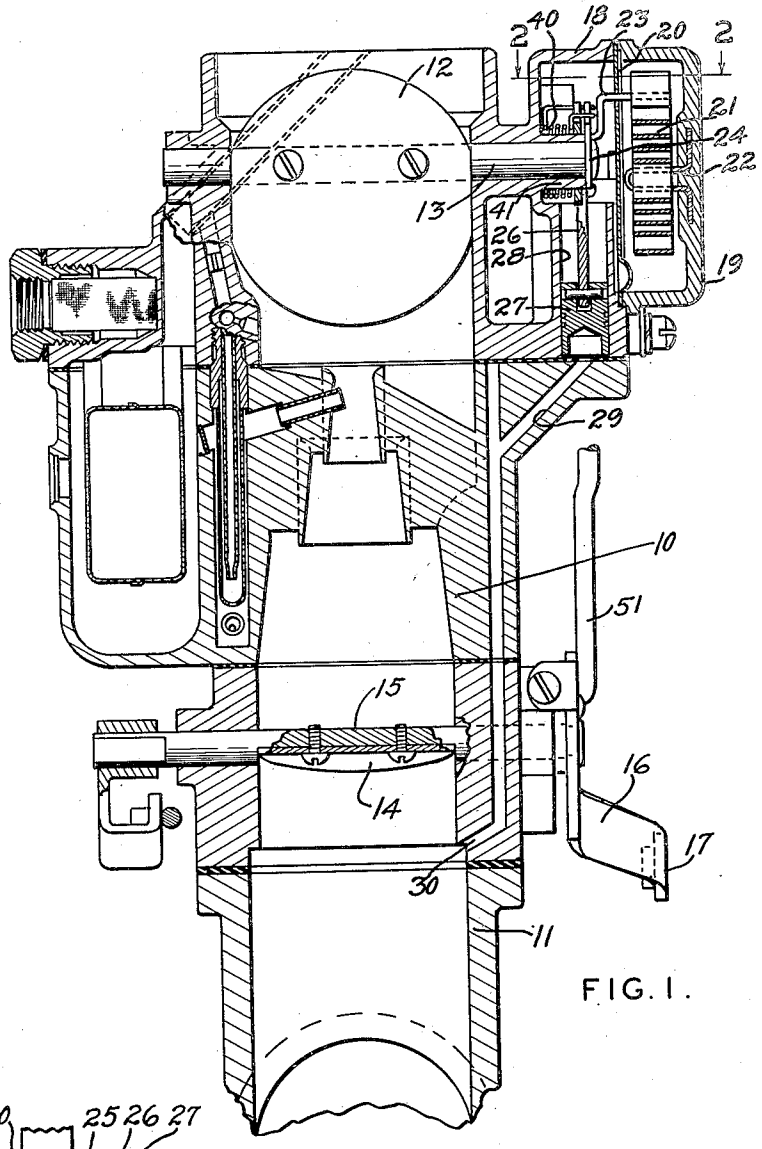


FIG. 1.

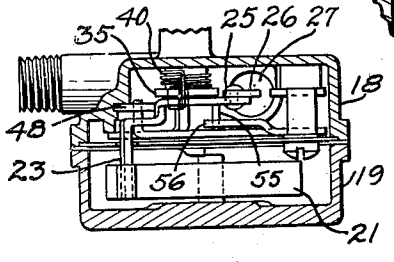


FIG. 2.

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AUTOMATIC CHOKE CONTROL

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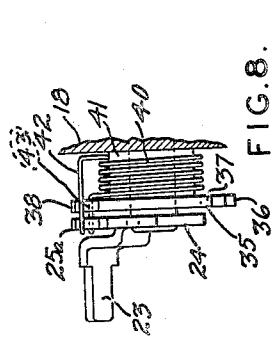


FIG. 8.

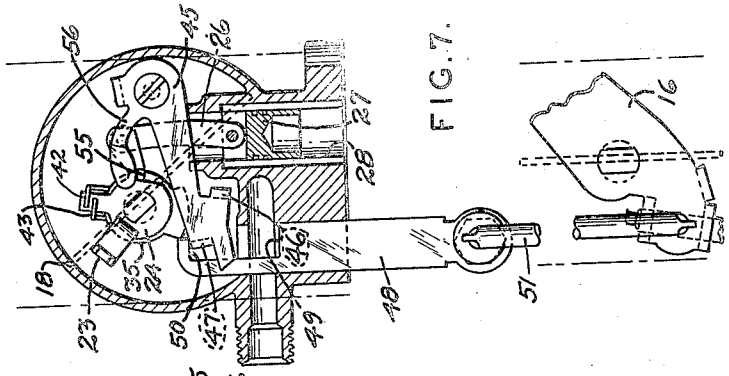


FIG. 7.

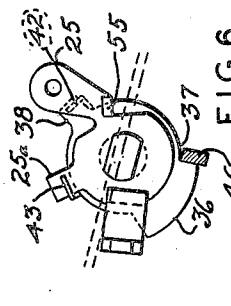


FIG. 6.

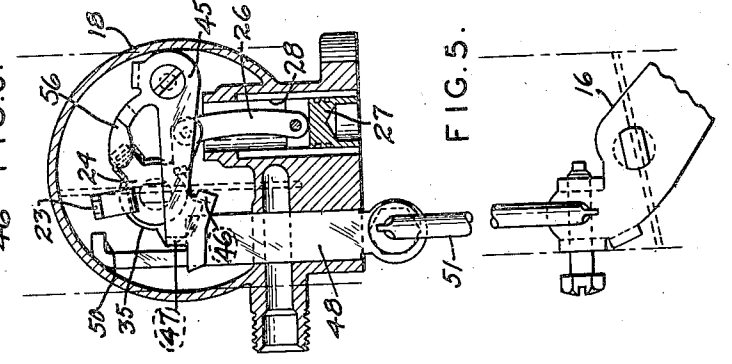


FIG. 5.

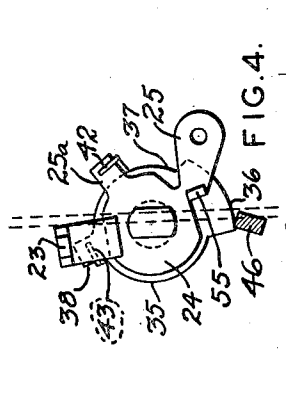


FIG. 4.

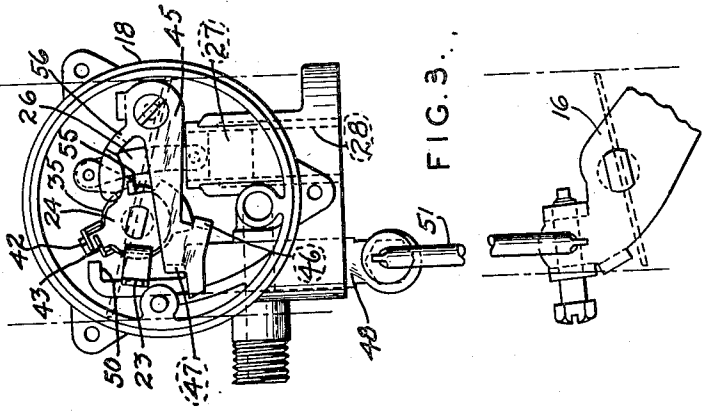


FIG. 3.

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UNITED STATES PATENT OFFICE

2,499,607

AUTOMATIC CHOKE CONTROL

Leland B. Read, St. Louis, Mo., assignor to Carter Carburetor Corporation, St. Louis, Mo., a corporation of Delaware

Application October 11, 1945, Serial No. 621,727

9 Claims. (Cl. 261—39)

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This invention relates to internal combustion engines and consists particularly in novel means for interconnecting and controlling the choke and throttle valves thereof.

With the presently used types of fast idle interconnections between the choke and throttle valves, the choke valve is connected to the fast idle member through a one way connection such that when the choke valve is closed, the cam is positively moved to its fast idle position. However, if the throttle valve is closed with the choke valve in its wide open position, the cam interferes with closing of the choke valve thereafter so that it is necessary to partially open the throttle valve to release the cam before the choke can be closed for cold starting. Where the choke is controlled by a thermostat, this results in the thermostat being maintained, perhaps for long periods, under greater tension than necessary after the vehicle is stopped and the thermostat allowed to cool.

It is an object of the present invention to operatively connect the choke valve and the fast idle member in such a way that the choke valve can close even though the movement of the fast idle member is restricted by the throttle screw.

Another object is to operatively connect the choke valve and fast idle member so that the choke can move fully in either direction irrespective of the position of the fast idle member and throttle valve.

Still another object is to operatively connect the choke valve and the fast idle member by means of a light spring which will hold the fast idle member properly when released by the throttle screw, and which may be stressed to permit full movement of the choke valve in either direction irrespective of the position of the fast idle member or throttle screw.

These objects and other more detailed objects hereafter appearing are attained by the device illustrated in the accompanying drawings in which

Fig. 1 is a vertical transverse section illustrating a portion of an engine induction conduit embodying the invention.

Fig. 2 is a horizontal section of a detail taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a side view showing the interconnection mechanism with the parts in the fast idle position, the outer portion of the housing being removed.

Fig. 4 shows a part of the structure in Fig. 3, but with the choke valve fully opened.

Fig. 5 is a view similar to Fig. 3, but showing the housing in section and the parts in the normal idling position.

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Fig. 6 shows a portion of the structure in Fig. 5, but with the choke valve fully closed.

Fig. 7 is a view similar to Fig. 5, but showing the parts in the "unloading" position.

Fig. 8 is a side view of the structure in Fig. 4.

Fig. 1 shows a portion of an internal combustion engine induction conduit including a downdraft mixture conduit 10 mounted on the intake manifold 11. The entry of air to the upper end of the conduit is controlled by a choke valve 12 mounted off center on a shaft 13. The supply of mixture to the engine is controlled by a throttle valve 14 attached to a shaft 15, shafts 13 and 15 being journalled in the walls of the conduit. The right hand end of the throttle shaft projects beyond the conduit and is provided with an arm 16 rigidly attached thereto and having an aperture in its extremity 17 for attachment of throttle control mechanism extending to the driver's compartment.

Choke shaft 13 extends rightwardly into the automatic choke housing including an inner part 18 and an outer or cover part 19, separated by a plate 20. A coiled bi-metal thermostat 21 has its inner end anchored to a clip 22 projecting inwardly from portion 19 of the casing. The outer end of the thermostat is hooked about an L-shaped finger 23 projecting from a disk 24 rigidly attached to choke shaft 13. This disk has additional radial extensions 25 and 25a. Extension 25 is connected by a link 26 to a piston 27 working in a cylinder 28. The lower end of the cylinder is connected by a passage 29 to a port 30 opening into the induction conduit posterior to the throttle valve. Thermostat 21 and piston 27 cooperate to control the choke valve for cold starting and warm-up of the engine in the manner described in Coffey Patent No. 2,085,351 assigned to the assignee of the present invention.

Loosely received on the right hand end of choke shaft 13 (Fig. 1) and best shown in Figs. 3–8, is a cam 35 having a high point 36 and a low point 37. The cam has a radial extension 38 which normally lies directly behind extension 25a on the disk 24. A spiral spring 40 (Fig. 8) is coiled about a boss 41 which journals the end of the choke shaft, the spring being inside cam 35. The ends 42 and 43 of the spring are bent around and embrace disk and cam extensions 25a and 38. Spring 40 is relatively light, being just strong enough to normally hold the disk and cam in the relative positions as in Figs. 3, 5, and 7 and to enforce movement of the cam with disk 24 and

the choke valve when the movement of the cam is not interfered with.

A lever 45 is pivoted at one side of inner housing part 18 and has a pair of inwardly projecting fingers 46 and 47, inner finger 46 underlying cam 35 for engaging high point 36 or low point 37, according to the position of the cam. The other finger 47 extends across a vertical link 48 which is slidable in a closely fitting recess in the bottom of housing portion 18. Link 48 has spaced shoulders 49 and 50, respectively, below and above finger 47 for cooperation therewith. At its lower extremity, link 48 is pivotally connected to a second link 51 which, in turn, is connected at its lower end to throttle arm 16. The lost motion interconnection is such that opening and closing of the throttle valve causes longitudinal movement of link 48 to bring shoulders 49 and 50 selectively into engagement with finger 47 on lever 45 and, correspondingly, rotate this lever about its pivot.

When the choke valve is closed, as in Fig. 3, high point 36 on the cam is in position to be engaged by finger 46 when the throttle valve is moved towards closed position to limit this movement to the fast idle position, as shown in Fig. 3. On the other hand, when the choke valve has been fully opened, as in Fig. 4, low point 37 of the cam is abreast finger 46 and permits further closing of the throttle valve to its normal idling position. Disk 24 has a small outstanding finger 55 which is engaged by a curved arm 56 on lever 45 when the throttle valve is fully opened, as shown in Fig. 7, to urge disk 24 clockwise and partially open the choke valve against the thermostat for "unloading" excess fuel which may be trapped in the manifold. Various features of the above described interconnection structure are shown and claimed in a co-pending application Serial No. 464,643 filed November 5, 1942, now Patent No. 2,402,361, in the name of George M. Bicknell and assigned to the assignee of the present application.

When the cam is held in the fast idle position by throttle controlled finger 46, as in Fig. 3, opening forces applied to the choke by the direct action of suction thereon and also by the action of suction on piston 27 cause disk finger 25*a* to rotate clockwise relative to the cam, carrying spring extremity 42 with it and stressing the spring (Fig. 4). On the other hand, when the throttle is closed after the choke has been fully opened, as in Fig. 5, throttle control finger 46 holds the cam in its normal idle position. Then, as the thermostat becomes cool urging the choke valve closed, disk finger 25*a* is rotated counterclockwise relative to the cam, carrying the opposite spring extremity 43 with it and partially stressing the spring (Fig. 6). Spring 40 is just strong enough to carry cam 35 with disk 24 when finger 46 does not interfere with the cam movement. Consequently, the added resistance of spring 40 to choke movement, when the cam is locked, is relatively light. The resilient connection formed by spring 40 is such that the choke can move fully from its closed to its open position, as in Figs. 3 and 4, or from its open to its closed position, as in Figs. 5 and 6, irrespective of the position of the cam and throttle valve. In the first case, the unbalanced choke valve is permitted to "breathe" or yield as far as necessary under the effect of air flow and suction thereon. In the latter case, the choke valve is permitted to fully close as the thermostat cools so that the tension on and straining of the thermostat caused when the engine becomes cool while the cam is locked is substantially reduced over the case where a positive one-way connection is provided between the choke and fast idle cam.

A further advantage is that in case the fast idle cam is locked by the throttle screw with the choke partially open and the engine running, the choke is permitted to close as far as necessary under the influence of the thermostat if the mixture should be too lean for continued running. This results because such a lean mixture would cause slowing down of the engine to consequent reduction in manifold vacuum and air flow which tend to hold the choke open.

A further advantage results in case the fast idle cam is locked with the choke partially open. This frequently causes the carburetor to supply a too lean mixture for continued running where the choke is also locked. By the use of the present invention, the slowing down of the engine and loss of manifold suction caused by leanness of the mixture are accompanied by additional closing of the choke under the influence of the thermostat to correct for the excessive leanness.

Various features of the invention may be modified as will occur to those skilled in the art and the exclusive use of all modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In combination with an internal combustion engine induction conduit having choke and throttle valves therein, first and second elements movable, respectively, with said choke valve and said throttle valve, and a member having a two-way yielding connection to said first element and engageable by said second element to variably limit the closing movement of said throttle valve in accordance with the position of said choke valve, said connection permitting full movement of said choke in either direction irrespective of the position of said second element and said member.

2. In combination with an internal combustion engine induction conduit having choke and throttle valves therein, first and second elements movable, respectively, with said choke valve and said throttle valve and a fast idle member having a two-way, resilient connection to said first element and engageable by said second element to restrict the closing movement of said throttle when the choke valve is closed, said resilient connection permitting full movement of said choke valve in either direction irrespective of the position of said throttle valve or said fast idle member.

3. In combination with an internal combustion engine induction conduit having choke and throttle valves therein, an arm rigidly connected to and movable with said choke valve, a second arm connected to and movable with said throttle valve, a fast idle abutment on said second arm, and a fast idle member having a two-way, resilient connection to said first arm and engageable by said second arm to variably restrict the closing movement of said throttle valve in accordance with the position of said choke valve, said resilient connection permitting full movement of said choke valve in either direction irrespective of the position of said throttle valve or said fast idle member.

4. In combination with an internal combustion engine induction conduit having choke and throttle valves therein, first and second arms rigidly connected to and movable, respectively, with

said choke valve and said throttle valve, a pivoted member engageable by said second arm when said choke valve is closed to restrict the closing movement of said throttle valve, and a two-way, resilient connection between said pivoted member and said choke valve adapted to permit full movement of said choke in either direction irrespective of the positions of said pivoted member and said second arm.

5. In combination with an internal combustion engine induction conduit having choke and throttle valves therein, first and second arms movable, respectively, with said choke valve and said throttle valve, a fast idle cam mounted adjacent said second arm and engageable thereby to limit the closing movement of said throttle to a fast idle position when said choke valve is closed, and a two-way, resilient connection between said cam and said first arm adapted to permit full movement of said choke valve in either direction irrespective of the position of said cam and said throttle arm.

6. In combination with an internal combustion engine induction conduit having choke and throttle valves therein, first and second arms movable, respectively, with said choke valve and said throttle valve, a fast idle cam mounted adjacent said choke arm, and having a two way resilient connection to said choke arm, a device extending from said throttle arm for engaging said cam when said choke valve is in closed position to limit the closing movement of said throttle valve to its fast idle position, and structure on said choke arm engageable by said device when said throttle valve is fully opened to open said choke valve.

7. In combination with an internal combustion engine induction conduit having choke and throttle valves therein, means to resiliently close said choke valve for cold starting, members movable respectively with said choke valve and said throttle valve, a fast idle device mounted adjacent said throttle member and engageable thereby when said choke valve is closed to restrict the closing movement of said throttle valve, said device having a full two way resilient connection to said choke member, and structure on said device engageable by said choke member when said throttle valve is fully opened to partially open said choke valve against said resilient closing means.

8. A fast idle device for an internal combustion engine having an induction conduit with choke and throttle valves comprising elements movable, respectively, with said valves, a fast idle member movably mounted adjacent said choke valve element, said member and said choke valve element having extensions normally in close juxtaposition, and a spring having portions hooked about and embracing opposite sides of said extensions whereby said choke valve element may yield in opposite directions relative to said member by selective displacement of said spring portions and stressing of said spring.

9. A fast idle mecchanism for an internal combustion engine induction conduit having choke and throttle valves comprising an element rotatable with said choke valve, a second element movable with said throttle valve, and a fast idle cam pivotally mounted co-axially with said choke element, said cam being engageable by said throttle element to variably restrict the closing movement of said throttle, said choke element and said cam having radial extensions one normally overlying the other, and a spring having extremities hooked about and embracing opposite sides of said extensions whereby said choke element and choke valve may yield in either direction relative to said cam, when said cam is locked by said throttle element, by displacement of said spring extremities and stressing of said spring.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
2,143,153	Hunt	Jan. 10, 1939
2,402,361	Bicknell	June 18, 1946