

Jan. 26, 1965

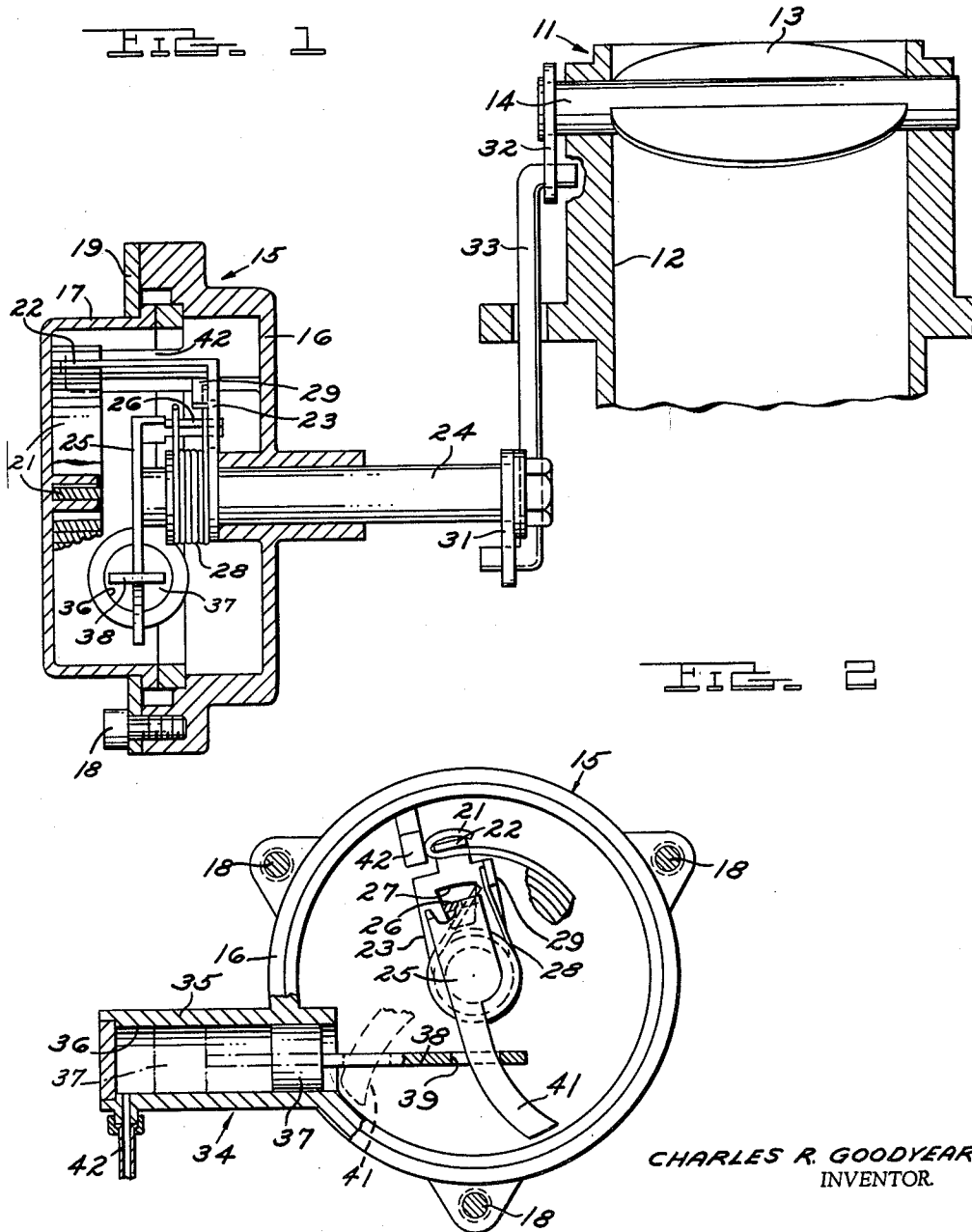
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CHOKE MECHANISM

Filed Aug. 31, 1962

2 Sheets-Sheet 1



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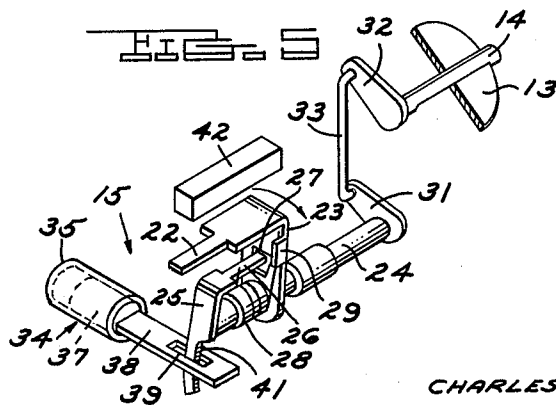
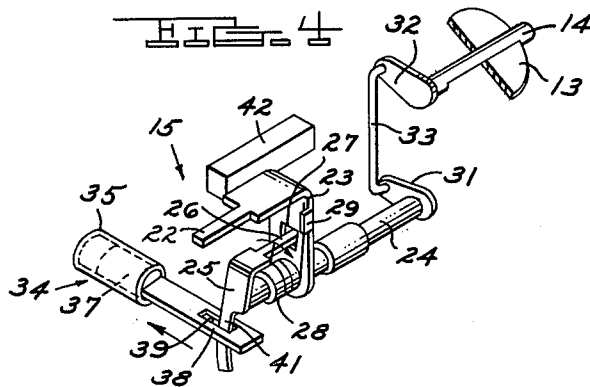
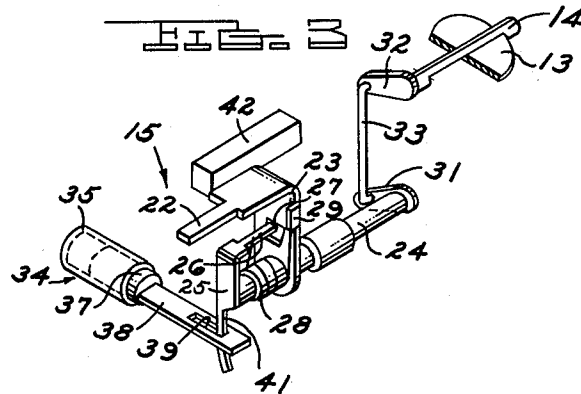
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CHOKE MECHANISM

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Filed Aug. 31, 1962, Ser. No. 220,729

1 Claim. (Cl. 236—92)

This invention relates to a choke mechanism for the charge forming device of an internal combustion engine.

When cranking a cold engine, the choke valve is maintained in a fully or nearly fully closed position either manually or automatically to provide a rich starting mixture. Once the engine fires, however, the choke valve should open slightly to permit sufficient air flow for sustained engine operation. The choke valve is normally opened automatically by engine suction. The engine suction is employed to open the valve either through direct actuation by the provision of an unbalanced choke valve or by having a separate suction motor that opens the choke valve. In many instances a combination of a suction motor and an unbalanced choke valve is utilized.

In previous choke mechanisms of the type having a vacuum motor to pull down or open the choke plate, the vacuum motor was directly coupled to the choke actuating mechanism. If a thermostatic spring positions the choke mechanism, the vacuum motor must overcome the tension in the thermostatic spring before pull down can be effected. This means that the degree of choke valve pull down is dependent upon the temperature induced preload in the thermostatic spring. The amount of pull down required is not dependent upon temperature, however, and insufficient choke valve pull down may result if extremely low temperatures are encountered.

It is, therefore, the principal object of this invention to provide an improved choke mechanism in which the amount of choke valve pull down is independent of the actuating means for the choke valve.

In an internal combustion engine charge forming device embodying this invention a choke valve is supported in the induction passage for movement from an opened to a closed position. Actuating means are operatively connected to the choke valve for moving the choke valve between the opened and closed positions. A suction motor is operatively connected to the choke valve to move the choke valve from a closed to a partially opened position in response to engine suction. The operative connection between the actuating means and the choke valve is constructed and arranged to provide for opening of the choke valve by the suction motor without affecting the actuating means.

Further objects and advantages of this invention will become more apparent as this description proceeds particularly when considered in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a cross sectional view of a side elevation of a portion of an internal combustion engine charge forming device incorporating this invention.

FIGURE 2 is an end view, with portions shown in section, of the automatic choke actuating mechanism shown in FIGURE 1.

FIGURE 3 is a perspective view of the choke valve and actuating mechanism shown in FIGURE 1.

FIGURE 4 is a perspective view, in part similar to FIGURE 3, showing the parts in another position.

FIGURE 5 is a perspective view, in part similar to FIGURES 3 and 4, showing the parts in still another position.

Referring now in detail to the drawings, a portion of the charge forming device of an internal combustion engine is indicated generally at 11. The charge forming

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device 11 has an induction passage 12 and means for supplying fuel to the induction passage 12 (not shown).

A choke valve 13 is pivotally supported within the induction passage 12 by a choke valve shaft 14. The choke valve 13 is unbalanced, that is, it is eccentrically disposed relative to its pivot axis. The unbalance of the choke valve 13 is such that the pressure differential created by a decrease in pressure in the intake manifold of the engine tends to rotate the choke valve 13 into an opened position.

A choke valve actuating mechanism, indicated generally at 15, is provided to rotatably position the choke valve 13 within the induction passage 12. The choke valve actuating mechanism 15 includes a choke housing 16 that is supported in a fixed position upon the charge forming device 11. A cover plate 17 is fixed to the choke housing 16 by bolts 18 and a clamp 19. A thermostatic spring 21 is contained within the choke housing 16 and has one end thereof affixed to the cover plate 17. The other end of the thermostatic spring 21 encircles a projecting end 22 of a lever 23. The lever 23 is rotatably supported upon a choke actuating shaft 24.

The choke actuating shaft 24 is rotatably supported by the choke housing 16 and projects at one end therefrom. Secured to the other end of the choke actuating shaft 24 is a lever 25. The lever 25 has an intumed end 26 that projects through an aperture 27 formed in the lever 23. A torsional spring 28 encircles the choke actuating shaft 24 and has one of its ends in abutment with the end 26 of the lever 25. The other end of the torsional spring 28 contacts a tang 29 formed upon the lever 23. Although the aperture 27 provides a lost motion connection with the end 26 of the lever 25, the torsional spring 28 normally causes the levers 23 and 25 to rotate together.

The projecting end of the choke actuating shaft 24 has secured thereto a lever 31. A lever 32 is affixed to the choke valve shaft 14. A link 33 is pivotally connected to the levers 31 and 32 to transmit motion from the choke actuating shaft 24 to the choke valve shaft 14 and choke valve 13.

A suction motor, indicated generally at 34, is provided to pull down or open the choke valve 13 slightly once the engine has started when the temperature is otherwise low enough for the thermostatic spring 21 to close the choke valve 13. The suction motor 34 comprises a cylindrical housing 35 formed integrally with the choke housing 16. Slidably supported within a bore 36 of the cylindrical housing 35 is a vacuum piston 37. Secured to and extending from the vacuum piston 37 is an actuating rod 38. Received in a longitudinal slot 39 formed in the actuating rod 38 is a downwardly extending projection 41 of the lever 25. A source of vacuum for actuating the vacuum piston 37 is provided by a conduit 42 that interconnects the bore 36 with a point in the induction system below the throttle valve of the charge forming device 11.

Operation

Referring now to FIGURES 3-5, FIGURE 3 illustrates the choke valve 13 and the choke valve actuating mechanism 15 as they appear during cranking of the engine under low ambient temperatures. The thermostatic spring 21 has rotated the lever 23 in a counterclockwise direction. The movement of the lever 23 was transmitted through the torsional spring 28 into counterclockwise rotation of the lever 25. The choke actuating shaft 24 and lever 31 were thus rotated in a counterclockwise direction pulling the link 33 downwardly to rotate the choke valve shaft 14 and choke valve 13 into the closed position. If the temperature of the bimetal were sufficiently low, the lever 23 would be rotated until it

abutted a stop 42 formed integrally with the choke housing 16.

During cranking of the engine a pressure differential is created that exerts a force tending to open the choke valve 13. The tension in the torsion spring 28 and the thermostatic spring 21 resist opening of the choke valve 13, however. Once the engine fires there will be an immediate and substantial decrease in pressure in the induction system below the throttle valve of the charge forming device 11. This decrease in pressure will be transmitted through the conduit 42 to the suction motor 34. The pressure differential across the vacuum piston 37 will cause the vacuum piston 37 to move into the bore 36. This causes the end of the slot 39 in the actuating rod 38 to contact the projection 41 of the lever 25 and rotate the lever 25, the choke actuating shaft 24, and the lever 31 in a clockwise direction. This moves the link 33 upwardly to rotate the choke valve shaft 14 and choke valve 13 in a clockwise direction. The choke valve 13 is thus opened slightly to permit sufficient air flow for smooth engine operation. The offset or unbalance of the choke valve 13 also assists in its opening.

Rotation of the choke actuating shaft 24 by the suction motor 34 is accomplished without affecting the position of the lever 23 as long as the torque exerted by the thermostatic spring 21 exceeds the torque exerted upon the torsion spring 28 by the unbalanced choke valve 13 and the suction motor 34. When this condition prevails, the torsion spring 28 will yield to allow the lever 25 to rotate with respect to the lever 23 (FIGURE 4). The amount of relative rotation is limited by the width of the aperture 27 formed in the lever 23.

The thermostatic spring 21 is heated in response to engine temperature by an exhaust manifold stove or in some other known manner. When heated, the tension in the thermostatic spring 21 decreases to rotate the lever 23 in a clockwise direction (FIGURE 5). Rotation of the lever 23 in the clockwise direction is transmitted through the torsion spring 28 to the choke actuating shaft 24 when the rotational effect exerted by the torsion spring exceeds the rotational effect caused by the suction motor 34. As the temperature of the engine raises further, the position of the choke valve becomes dependent solely upon the temperature of the thermostatic spring 21 in conjunction with the rotational effect exerted upon the choke valve 13 by its unbalance.

It should be readily apparent that if the lever 23 were affixed to the choke actuating shaft 24, as has been heretofore common, the suction motor 34 would have to overcome the tension in the thermostatic spring 21 before choke valve pull down could be effected. This would

mean that the degree of choke valve pull down would be dependent upon the temperature of the thermostatic spring 21. If the suction motor was designed to provide a certain degree of pull down at a given temperature of the thermostatic spring 21, there would be insufficient pull down when the temperature of the thermostatic spring 21 fell below the given temperature. By divorcing the suction motor 34 from the thermostatic spring 21, a uniform degree of pull down may be maintained regardless of temperature. The suction motor 34 and unbalanced choke valve 13 always act against a set force, that of the torsional spring 28, before pull down can take place. These factors contribute to the improved choke action.

It is to be understood that this invention is not to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined by the appended claim.

I claim:

A charge forming device for an internal combustion engine comprising an induction passage, a choke valve positioned in said induction passage for controlling the flow of air therethrough, an automatic choke actuating mechanism comprising a housing, a choke valve actuating shaft journaled within said housing, linkage means operatively connecting said choke valve actuating shaft with said choke valve, a first lever supported within said housing and fixed to said choke valve actuating shaft, a second lever supported within said housing and journaled upon said choke valve actuating shaft, means providing a lost motion connection between said levers, spring means operatively connected to said levers for resisting relative rotation between said levers, a suction motor operatively connected to said first lever, and thermally responsive means having one end thereof operatively connected to said second lever to rotate said second lever in response to temperature variations, said spring means being yieldable upon actuation of said suction motor for relative rotation between said levers to operate said choke valve without affecting the position of said second lever and said thermally responsive means.

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