April 26, 1966 T. M. BALL 3,248,094

CHOKE CONTROL FOR CARBURETOR

Original Filed Dec. 21, 1961

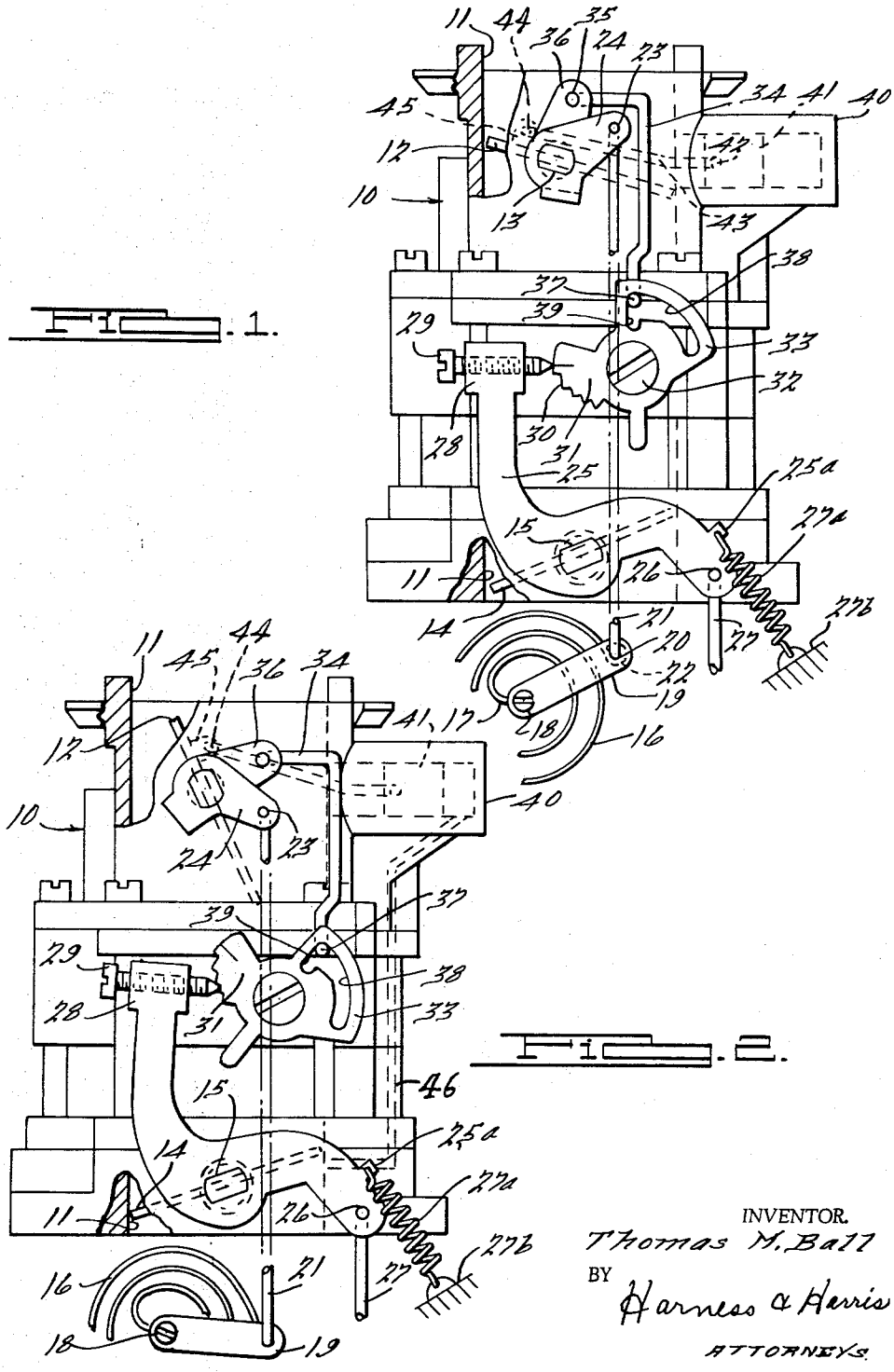


FIG. 1.

FIG. 2.

INVENTOR.
Thomas M. Ball
BY
Harness & Harris
ATTORNEYS

United States Patent Office 3,248,094 Patented Apr. 26, 1966

3,248,094

CHOKE CONTROL FOR CARBURETOR

Thomas M. Ball, Bloomfield Hills, Mich., assignor to Chrysler Corporation, Highland Park, Mich., a corporation of Delaware

Original application Dec. 21, 1961, Ser. No. 161,189. Divided and this application Oct. 3, 1963, Ser. No. 313,538

3 Claims. (Cl. 261—39)

This application is a division of copending application, Serial No. 161,189, filed December 21, 1961.

This invention relates to improvements in the automatic control of a carburetor for an internal combustion engine and has for an important object the provision of improved control means for the conventional unbalanced choke blade effective to prevent stalling of the engine immediately after it has been started.

Occasionally when an automotive engine is initially started, a rush of inlet air blows the choke blade open sufficiently to cause the engine to stall, particularly during unfavorable weather conditions. It is accordingly another object of the invention to provide improved simple and economical means which is highly effective to enable limited opening of the choke during starting only, so as to prevent stalling, and which allows normal choke operation after the engine has been started and the throttle has once been opened beyond the idle operating condition.

It is considered desirable to provide an automatic carburetor which will enable rapid engine starting merely by closing the starting motor circuit and without supplemental manual operation of the throttle. Such operation is often referred to as "cam starting" because the usual fast idle cam and cooperating thermostatic control are employed to maintain the throttle in the proper starting position. During cam starting the throttle will be at an idle position, such that the engine is especially susceptible to stalling in consequence of a surge of cold inlet air immediately after being started.

Another object is therefore to provide improved automatic control means of the above character which is particularly adapted for cam starting, so as to limit the initial choke opening during starting only, without interfering with normal choke operation at other times.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

FIGURE 1 is a fragmentary and generally schematic view of a carburetor embodying the present invention, portions being broken away to illustrate details of construction, the choke blade being shown in the starting position.

FIGURE 2 is a view similar to FIGURE 1, showing the choke blade in an idle operating position.

It is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the drawings, an embodiment of the present invention is illustrated by way of example comprising a carburetor for an automobile engine, the carburetor including a body **10** having the customary air inlet induction conduit **11**. An unbalanced choke blade or valve **12** is secured to a rotatable shaft **13** journalled at opposite ends in the body **10**. The blade **12** is pivotal with shaft

13 and is located in the upper portion of conduit **11** in accordance with conventional practice. A throttle valve **14** secured to a rotatable shaft **15** journalled at opposite ends in the body **10** is provided at a downstream location of the conduit **11**.

Suitably located within a portion of the engine so as to be responsive to an operating temperature thereof is a spiral bi-metallic thermostat spring **16** having a fixed end **17** secured to a fixed spindle **18**. A swinging arm **19** pivotal on spindle **18** has an outer swinging end pivotally connected at **20** to the lower end of an operating link **21**. A free end **22** of thermostat **16** is engaged with arm **19** at the region of the connection **20** so as to urge arm **19** counterclockwise with progressively increasing force as the temperature decreases. The upper end of link **21** is pivotally connected at **23** to the swinging end of a crank arm **24** keyed to the choke shaft **13**.

Keyed to the throttle shaft **15** is a throttle control lever **25** having one swinging end pivotally connected at **26** with a personally actuated throttle link **27**. The other end of lever **25** is provided with a threaded boss **28** having an adustable idle control screw or cam follower **29** screwed therein. The inner end of screw **29** is adapted to engage a stepped cam surface **30** of a fast idle cam **31** when the latter is in a predetermined cold idle operating position as described below. The cam **31** is keyed to a rotatable axial stub **32** journalled on the body **10** and is provided with a counterweight portion **33** effective to urge clockwise rotation of cam **31** by gravity force toward a warm operating position.

Throttle lever **25** is normally urged clockwise toward the closed or idle position illustrated in FIGURES 1 and 2 by a customary throttle return spring **27***a* schematically illustrated under tension between a projection **25***a* of lever **25** and a fixed portion **27***b* of the engine. Foot pedal actuation of shaft **27** is effective to swing lever **25** counterclockwise to open the throttle **14**.

Upon closing movement of choke valve **12**, the fast idle cam **31** is swung counterclockwise to the cold position by means of a link **34** having an upper end pivotally connected at **35** to a crank arm **36** keyed to shaft **13**. The lower end of link **34** terminates in an extension **37** which projects in a direction parallel to the pivot axis of cam **31** through a lost motion slot **38** to complete a lost motion pivotal connection between link **34** and cam **31**. Slot **38** is formed arcuately within the counterweight portion **33** concentrically with the pivot axis of cam **31** to enable opening movement of choke valve **12** independently of movement of cam **31**, as described below, by virtue of extension **37** riding within groove **38**. Extending radially within cam **31** and intersecting slot **38** is a movement limiting notch **39** or detent slot arranged to receive extension **37** when cam **31** is in the cold position shown, FIGURE 1, thereby to limit opening movement of choke valve **12**. As is apparent, the link **34** is provided with a lost motion connection with cam **31** by reason of the extension **37**, slot **38** and notch **39**.

In order to render the position of choke valve **12** responsive to the pressure in conduit **11** downstream of throttle valve **14**, a vacuum cylinder **40** formed integrally with body **10** contains a reciprocable piston **41** therein, pivotally connected at **42** to one end of a dog-leg link **43**. The other end of the latter link is pivotally connected at **44** to the outer end of a projection **45** secured to valve **12** so as to swing the latter in a clockwise opening movement upon rightward movement of piston **41**. The right end of cylinder **40** is connected by means of duct **46** with induction conduit **11** at a location downstream of throttle valve **14**, FIGURE 2, thereby to urge opening of choke **12** against the force of thermostat spring **16** when the pressure downstream of throttle valve **14** is low, i.e. during engine idling.

During operation of the structure described, when screw **29** is in contact with the stepped cam surface **30**, the frictional contact between screw **29** and surface **30** resulting from the tension of spring **27***a* is sufficient to prevent pivotal movement of cam **31** in consequence of the normal forces acting thereon, such as the forces resulting from counterweight **33**, thermostat coil **16**, piston **41**, or the downwardly flowing air in conduit **11** acting on the unbalanced blade **12**. In consequence, when the carburetor parts are in the cold position illustrated in FIGURE 1 and the cold engine is initially started, opening of the unbalanced choke blade **12** by the initial surge of cold inlet air in conduit **11** will be limited to a predetermined extent, as for example approximately 10°, by downward movement of extension **37** into notch **39**.

During this starting operating, the throttle **14** will be maintained in a fast idle position by reason of screw **29** engaging the fast idle step of the cam surface **30**, FIGURE 1. At the fast idle position, throttle **14** is cracked slightly open as illustrated in FIGURE 1, so that the engine will idle effectively in the cold condition. Thereafter, when throttle valve **14** is open from the fast idle position to accelerate the engine, the frictional engagement between screw **29** and cam surface **30** will be released to enable opening of choke valve **12** to the usual operating condition. By this time, the danger of engine stalling will have passed, because the stalling tendency described occurs only in the first two or three seconds of engine operation.

After the throttle **14** has been initially opened from the starting position of FIGURE 1 to enable opening of choke valve **12** to a running position, if the throttle **14** is then returned to a cold idle position so as to engage one of the lesser steps of cam surface **30**, the cam **31** will be locked against swinging movement as aforesaid by virtue of its frictional contact with screw **29**. However in this instance, the cam **31** will now be in position to receive extension **37** within slot **38**. Thus if the engine is allowed to run at idle for sufficient time to relax the closing force of thermostat spring **16** as a result of warming of the engine, throttle valve **12** will be free to open by virtue of movement of extension **37** along slot **38**.

If the engine is operated in the warm condition under load and is then turned off and allowed to cool, choke valve **12** will be locked against return movement to the closed position by contact between fast idle cam **31** and screw **29**. Accordingly, in order to return the carburetor mechanism to the position illustrated in FIGURE 1, throttle **14** must first be opened to release the engagement between cam **31** and screw **29** thereby to enable thermostat spring **16** to return choke valve **12** and cam **31** to the position of FIGURE 1. Thereafter upon closing of throttle **14**, screw **29** will engage the cold starting step of cam surface **30** as illustrated in FIGURE 1.

I claim:

1. In a fuel charging device for an internal combustion engine, air inlet conduit means, unbalanced choke valve means in said conduit means susceptible to being urged to an open position by the force of air flowing in said inlet conduit means, thermostatic means responsive to decreasing temperature for yieldingly closing said choke valve means, fast idle cam means pivotal between cold and warm positions, means yieldingly urging said fast idle cam means toward its warm position, a throttle valve in said conduit means, idle control means movable with said throttle valve and engageable with said cam means at the cold position upon closing movement of said throttle valve to limit said closing movement to a slightly open fast idle position and also to prevent pivoting of said cam means until said throttle valve is opened from said fast idle position, means responsive to the pressure in said conduit means downstream of said throttle valve for yieldingly opening said choke valve means to an intermediate idle position against the tension of said thermostatic means when said throttle valve is opened from said fast idle position, and restricting means to restrict the initial opening of said choke valve means to prevent a sudden flow of inlet air in said conduit means sufficient to stall said engine immediately after the latter has begun to operate under its own power with said cam means at said cold position and said throttle valve at said fast idle position and to enable opening of said choke valve means upon rotation of said cam means for said cold position to said intermediate idle position, said restricting means comprising a link pivotally connected at one end with said choke valve means to move therewith, a lost motion slot extending in said cam means and having the other end of said link movably connected therein to ride therealong and to engage said cam means at one end of said slot and pivot said cam means to said cold position upon closing of said choke valve means, said slot at said one end thereof extending transversely to the direction of force applied through said link to its said other end by force tending to open said choke valve means when said cam means is at said cold position, and a detent slot extending in said cam means in said direction and opening into said lost motion slot at said one end of the latter to receive said other link end and block movement thereof along said lost motion slot to limit opening of said choke valve means sufficiently to prevent said sudden flow when said cam means is at said cold position, said lost motion slot at said one end thereof being aligned with said direction when said cam means is at said intermediate idle position to receive and guide said other link end along said movement limiting slot in the direction from said one slot end upon opening movement of said choke valve means independently of movement of said cam means.

2. In the combination according to claim **1**, said lost motion slot extending in said cam means arcuately from said one end thereof and partially around the pivot axis of said cam means in the direction of rotation of said cam means from its cold to its warm position.

3. In the combination according to claim **2**, said detent slot extending radially inwardly from said lost motion slot at said one end of the latter.

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HARRY B. THORNTON, *Primary Examiner.*

RONALD R. WEAVER, *Examiner.*