United States Patent

Eshelman

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[54] **THROTTLE RETURN SPRING REDUNDANCY SYSTEM**

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[51] **Int. Cl.**.....**G05g 11/00**

[58] **Field of Search**.....123/98, 198 D, 198 DB; 74/479, 74/481, 482; 251/67; 192/129, .084

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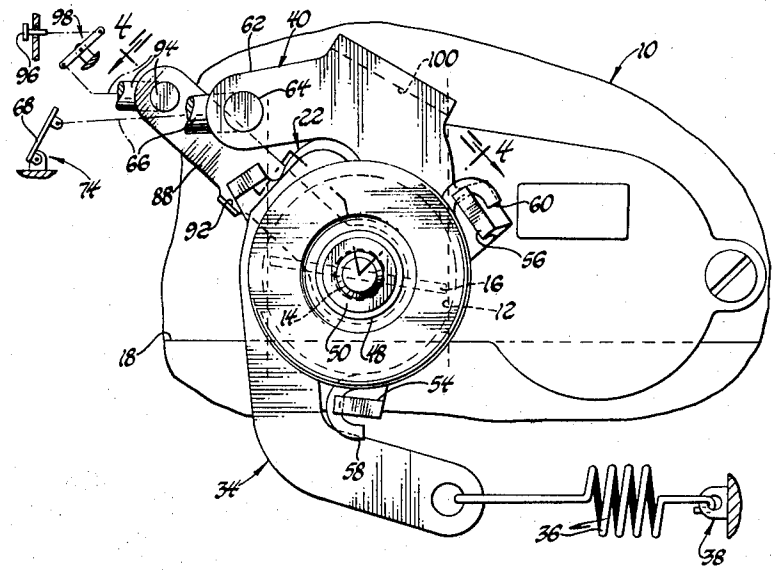
[57] **ABSTRACT**

A throttle valve, situated within the induction passage of a fuel or air induction device, is carried by a throttle shaft for fixed rotation therewith; a lever fixedly connected to the throttle shaft is operatively connected to a remotely situated operator's foot-operated throttle control; a first throttle return spring is operatively connected to the first lever for returning the throttle valve to an idle position whenever the foot-operated throttle control is released; a second safety spring is provided for assuring the movement of the throttle valve to the idle position in the event that, for example, either the first throttle return spring or the associated throttle control linkage should fail while the throttle valve is in either a partly or fully opened position; and manually operated lever means is provided for at times operatively engaging the lever fixedly secured to the throttle shaft in order to thereby rotate the throttle valve toward an open position against the resistance of the safety spring.

8 Claims, 4 Drawing Figures



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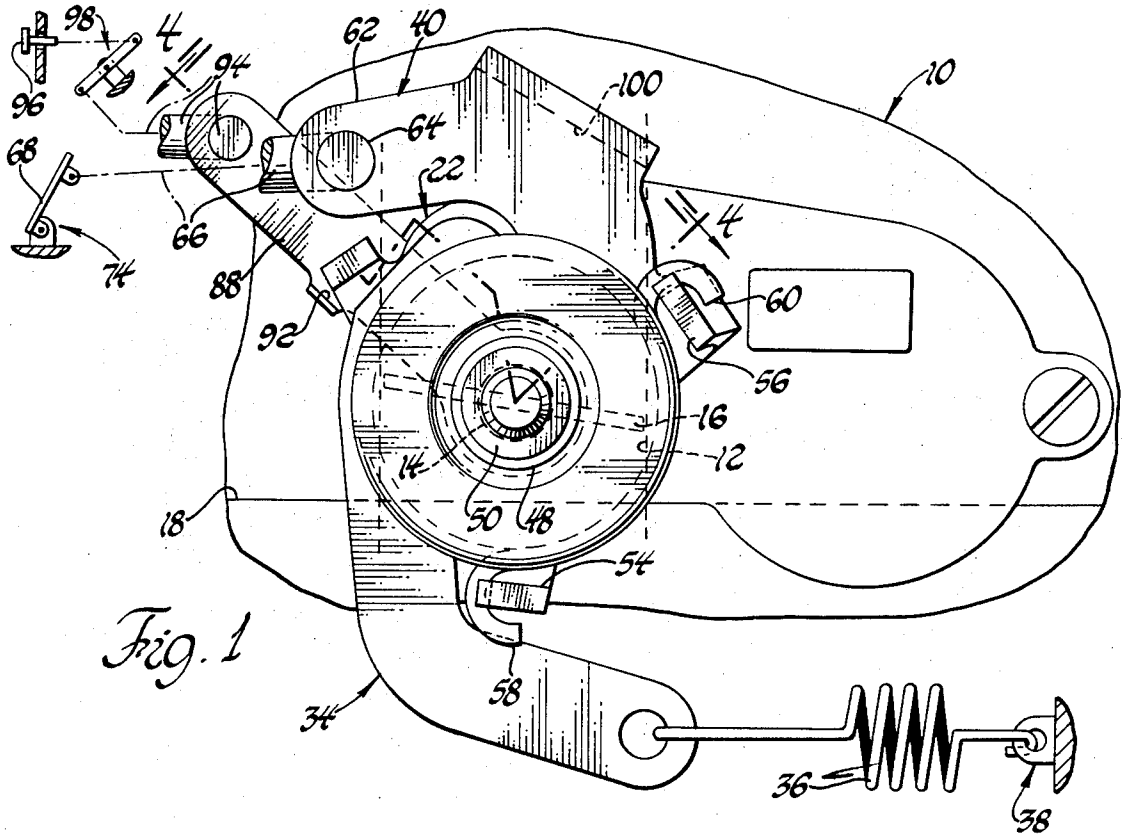

Fig. 1

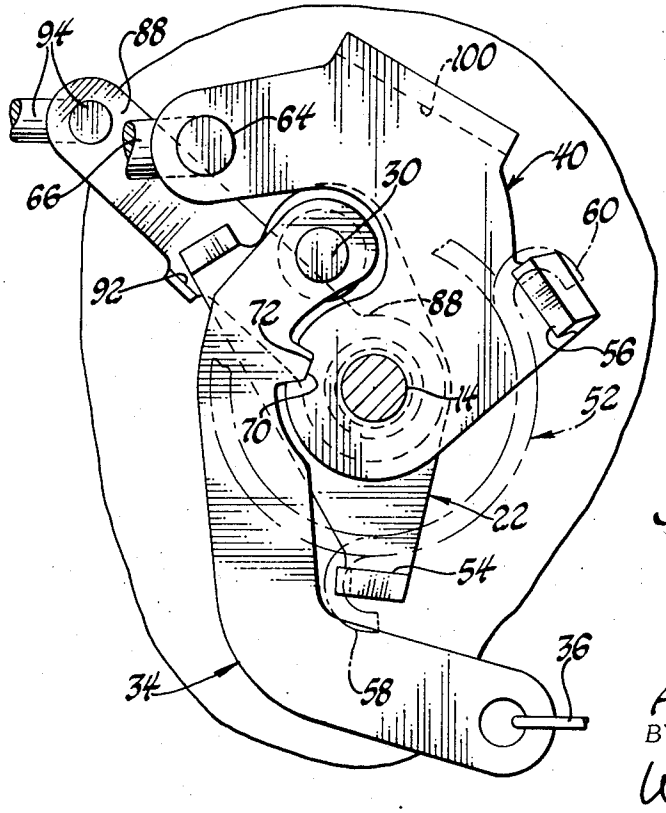

Fig. 2

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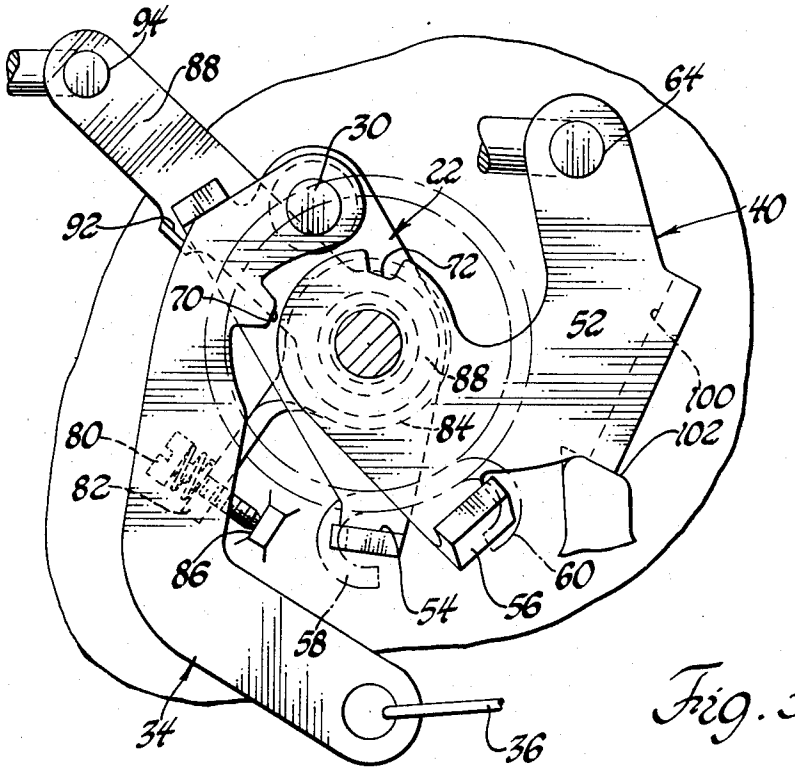

Fig. 3

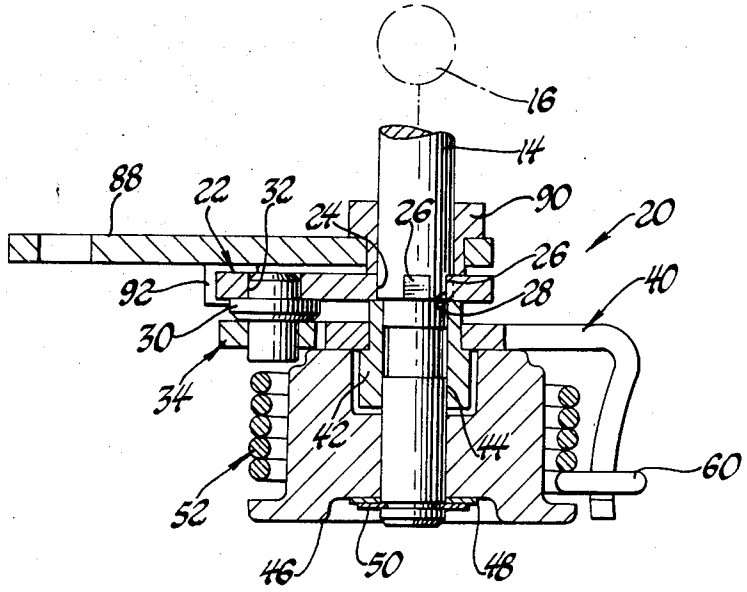

Fig. 4

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THROTTLE RETURN SPRING REDUNDANCY SYSTEM

BACKGROUND OF THE INVENTION

Heretofore, carburetors or other engine induction devices, employing an induction passage with a throttle valve therein, had a lever fixed to the throttle shaft which lever, in turn, was operatively connected to associated throttle control linkage (as the vehicle operator's foot-controlled throttle pedal within the vehicle passenger compartment) and to a return spring for returning the throttle valve to an engine idle position when control over the throttle had been relinquished by the vehicle operator.

Even though such carburetors and induction devices have performed well in the past and have not shown any tendency to experience failure of such a throttle return spring or the associated throttle control linkage, the Federal Government has, nevertheless, recently issued new proposed safety standards in regard to driver-operated throttle or "accelerator" control systems.

Such standards, among other things, require that; (1) in the event the normal or usual throttle return spring should fail, means must be provided for assuring that the throttle valve will return to its idle position; (2) in the event the associated throttle control linkage should fail, means must be provided for assuring that the throttle valve will return to its idle position; and (3) the vehicle operator must still be able to exercise a degree of control over the position of the throttle valve with the occurrence of the events set forth in (1) and (2), above.

Accordingly, the invention as herein disclosed is primarily concerned with the solution of the above as well as other related problems.

SUMMARY OF THE INVENTION

According to the invention, an automatic throttle return device comprises a first lever adapted for connection to an associated throttle shaft and throttle valve for rotation therewith, first spring means for rotating said first lever and throttle valve to an idle position during normal operating conditions, second safety spring means energized upon failure of said first spring means for assuring rotation of said first lever and said throttle valve to said idle position, and manually actuated lever means effective for at times forcibly moving said throttle valve in the opening direction against the resistance of said safety spring means.

Description of the Drawings

In the drawings wherein, for purposes of clarity, certain details and elements may be omitted from one or more views:

FIG. 1 is a fragmentary elevational view of a carburetor or other induction device equipped with a throttle control embodying the invention;

FIG. 2 is a view similar to FIG. 1 with certain elements shown in FIG. 1 removed for purposes of clarity and showing the remaining elements in positions corresponding to normal operation;

FIG. 3 is a view similar to FIG. 2 but illustrating the elements in positions assumed resulting from a failure of, for example, the normal throttle return spring; and

FIG. 4 is a cross-sectional view taken generally on the plane of line 4—4 of FIG. 1 and looking in the direction of the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in greater detail to the drawings, FIG. 1 illustrates a fragmentary portion of a carburetor **10** having an induction passage **12** formed therethrough with a journalled throttle shaft **14** extending transversely through the induction passage or bore **12**. A throttle valve **16**, situated within the induction passage **12**, is suitably fixedly secured to an carried by throttle shaft **14** for rotation therewith within the induction passage for controlling flow therethrough to the related engine **18**.

The throttle return device **20**, referring in particular to FIGS. **1** and **4**, is shown as being comprised of a first lever **22** having a mounting aperture **24** by which it is mounted onto throttle shaft **14** and secured thereto for rotation therewith as by keying flatted portions **26** formed on the shaft **14** and cooperating flatted portions **28** formed in the aperture **24** of lever **22**. A pivot pin **30**, which may be pressed into an aperture **32** of lever **22** as to be secured thereto, pivotally supports a latching lever **34** which, in turn, as shown in FIGS. **1**, **2** and **3**, has its other end operatively connected to a throttle return tension spring **36** having its opposite end suitable anchored as at **38**.

A second latching or throttle control lever **40** is preferably fixedly secured to a bushing **42** which, in turn, is freely received on a necked-down portion **44** of throttle shaft **14** so as to be rotatable with respect thereto. A drum-like member **46** is also freely journalled on the reduced diameter **44** of shaft **14** and axially retained thereon as by a washer or thrust bearing **48** and a C-clip **50**. The drum **46** serves to generally carry and retain a coiled torsion safety spring **52** thereabout.

As shown in FIGS. **1**, **2** and **3**, levers **22** and **40** are respectively provided with generally laterally extending arm portions **54** and **56** to which are operatively connected hooked ends **58** and **60** of torsion spring **52** so as to result in lever **22** being urged counter-clockwise and lever **40** being urged clockwise.

Another arm portion **62** of lever **40** is pivotally connected to one end **64** of a motion transmitting member such as a rod **66** which, in turn, is operatively connected as to the foot-operated throttle control lever or pedal **68** within the vehicle passenger compartment.

As best seen in FIG. **4**, it can be seen that the main body portions of levers **34** and **40** are substantially in the same plane. This is done to enable such levers to coact with each other as by having a tongue-like latching projection **70** formed on lever **34** received within a cooperating recess or slot **72** formed in lever **40**.

For the moment neglecting the latching projection **70** and recess **72**, it can be seen that the only lever which is in any way fixed or secured for driving rotation of the throttle valve **16** is lever **22** because lever **40** is rotatable with respect to throttle shaft **14** and lever **34** is pivotally carried by lever **22**.

OPERATION OF THE INVENTION

For purposes of description, let it be first assumed that the elements are in the respective positions as shown in FIGS. 1 and 2. At this time the throttle valve 16 will be in the nominally closed or idle position within induction passage 12 as generally depicted in, for example, FIG. 1. Also, as illustrated in FIG. 2, the torsion safety spring 52 is attempting or urging the levers 22 and 40 in the directions previously described but is precluded from so moving the levers because of projection 70 being engaged within latching recess 72. This engagement between member 70 and latched recess 72 is maintained by the spring 36 which also serves to provide the force for returning the throttle shaft 14 and throttle valve 16 to the idle position.

During normal operation when opening movement of the throttle pedal 68 is rotated clockwise about its pivot support 74 causing rod or linkage means 66 to move to the right causing clockwise rotation of lever 40. As lever 40 is so rotated, it, through latched recess 72 and projection 70, causes like rotation of latching lever 34 generally translationally about the center or axis of throttle shaft 14. Such rotation of latching lever 34, in turn, imparts rotation to lever 22 through the interconnecting pivot member 30. Of course, since lever 22 is fixedly secured to throttle shaft 14 for rotation therewith, clockwise rotation of lever 22 causes clockwise rotation of throttle shaft 14 and throttle valve 16 in the opening direction.

When throttle control pedal 68 is released, the return spring 36 pulls at the lower end of lever 34 causing counter-clockwise rotation thereof as well as like rotation of levers 40 and 22. This, in turn, results in throttle shaft 14 also being turned counter-clockwise with throttle valve 16 being returned to idle position.

Further, as is generally well known in the art, a suitable throttle stop screw 80 may be provided as generally depicted in FIG. 3. The screw 80 may be threadably carried by an arm portion 82 of a lever-like member 84 suitably fixedly secured to the throttle shaft 14 so as to rotate therewith. The purpose of such a stop screw is, of course, to coact with a suitable abutment 86 and in so doing determine the idle position of the throttle valve 16.

Let it now be assumed that throttle rod or linkage 66 has caused clockwise rotation of levers 40, 34 and 22 to a position where, for example, the throttle valve 16 is approaching a wide open position. Further let it be assumed that at that moment the throttle return spring 36 breaks. If this were to happen, the throttle valve 16 would be returned to a safe engine operating position and not remain in its nearly wide open position at which point the spring 36 broke. This would occur as follows. It should be noted that the sides of the notch or slot 72 are made slightly tapered as are the juxtaposed sides of the latching projection 70. Consequently, the torsional force of torsion spring 52 continually urges the projection 70 out of seated engagement with the slot or recess 72. However, in normal operation return spring 36 provides enough force to prevent disengagement between latching portions 70 and 72. Therefore, if return spring 36 should break, the force of torsion safety spring 52 forces the latch tongue 70 out of engagement with latch slot 72. With the latching means thusly disengaged, the torsion safety spring 52 causes the throttle shaft lever 22 to start to rotate counter-clockwise while at the same time urging the throttle linkage lever 40 in the clockwise direction. The throttle shaft 14 will rotate in the counter-clockwise direction until the related throttle stop screw, such as screw 80, abuts against its cooperating abutment whether it be a related fast idle cam or a fixed stop as 86 which, in either case, determine the idle position of the throttle valve 16.

When the throttle lever 22 has been so rotated resulting in an idle position for the throttle valve 16, the safety torsion spring 52 is able to exert its remaining full force against throttle linkage lever 40 so as to cause it to rotate clockwise to the position shown in FIG. 3 whereat the throttle linkage 66 is moved so far to the right as to cause the clockwise rotation of the foot pedal 68 to a degree rendering the pedal 68 substantially useless for further operation of the throttle valve 16. That is, for practical purposes, all possible motion of the foot pedal 68 in the throttle-opening direction is taken up by the rotation of lever 40.

Of course, the same ultimate results would be obtained as set forth above if, instead of assuming that the throttle return spring 36 broke, the linkage means 66 interconnecting the lever 40 and foot pedal 68 were to break.

In view of the above, it can be seen that the invention thus far described provides means effective for assuring the closure of the throttle valve whenever either the throttle actuating means, such as 68, or the throttle return spring 36 should fail thereby preventing the occurrence of a "run-away" engine with a throttle valve stuck in either a partly or wide open position.

However, as is also evident from the above, whenever the safety spring 52 is permitted to rotate the throttle valve to its idle position, the vehicle operator, for all practical purposes, looses the ability to subsequently further open the throttle valve. This might create additional burdens on the operator if, for example, the safety spring 52 should close the throttle valve 16 to idle position while the vehicle is on some upgrade or in traffic.

Accordingly, in order to overcome such a situation, the invention contemplates the provision of auxiliary manually operated means for overriding the safety spring 52 in order to provide at least some limited degree of control of the throttle valve in order to thereby move the throttle valve in the opening direction.

In the embodiment of the invention shown, this is achieved by the provision of a lever 88 carried by a bushing 90 which, in turn, is freely journalled on the throttle shaft 14. As shown in each of the Figures, lever 88 is provided with a generally laterally extending abutment arm 92 which is so located as to be generally in juxtaposed relationship to lever 22. The swingable end of lever 88 is pivotally connected as to linkage means 94 leading to motion transmitting means 98, in turn, operatively connected to a manually actuated control member 96 located as within the vehicular passenger compartment.

Referring to FIGS. 1 and 3, it can be seen that in the event safety spring 52 moves throttle valve 16 to its idle position with the related levers and linkages assuming positions as depicted in FIG. 3, the vehicle operator

can still open the throttle valve by pulling the control member **96** (FIG. 1) thereby causing clockwise rotation of lever **88**. Such rotation causes abutment arm **92** to engage lever **22** and impart like rotation thereto. As previously described, clockwide rotation of lever **22** results in opening movement of the throttle valve **16**. Such rotation of lever **22** and lever **88** is resiliently resisted by the coiled safety spring **52** and, as best illustrated in FIG. **3**, such resilient resistance is developed as a result of lever **40** not being permitted to rotate in the clockwise direction because of a generally transversely extending abutment arm **100** carried by lever **40** engaging a maximum or wide open throttle abutment **102**. That is, the abutment **102** normally determines the maximum position to which the throttle valve **16** can be rotated in the opening direction.

Although only a selected preferred embodiment of the invention has been disclosed and described it should be apparent that other embodiments and modifications of the invention are possible within the scope of the appended claims.

I claim:

1. Apparatus for assuring the return of a throttle valve from a partly opened or fully opened position to an idle position, comprising a shaft rotatable in accordance with the rotation of said throttle valve, first manually actuated throttle control linkage means operatively connected to said shaft for at times effecting rotation of said shaft and said throttle valve in a throttle opening direction, first spring means operatively connected to said shaft and said throttle valve for applying a resilient force thereagainst in a direction opposite to said throttle opening direction in order to at times rotate said shaft and said throttle valve to said idle position, second resilient means effective upon the occurrence of a failure in said first spring means for automatically causing said shaft and said throttle valve to be rotated to said idle position, and second manually actuated throttle control linkage means, said second manually actuated linkage means being effective for at times causing rotation of said shaft and said throttle valve in said throttle opening direction against the resistance of said second resilient means.

2. Apparatus according to claim **1**, including first lever means carried by said shaft for rotation therewith, wherein said first manually actuated throttle control linkage means is connected to said shaft through said first lever means, and wherein said second resilient means comprises second spring means pre-loaded and operatively connected to said first lever means.

3. Apparatus according to claim **1**, including first lever means carried by said shaft for rotation therewith, wherein said first manually actuated throttle control linkage means is connected to said shaft through said first lever means, wherein said second resilient means comprises second spring means pre-loaded and operatively connected to said first lever means, and latching means for preventing said second spring means from causing rotational motion of said first lever means and said shaft during normal operation, said latching means being disengaged and effective upon failure of said first spring means to permit said second spring means to resiliently urge said first lever means and throttle valve to said idle position.

4. Apparatus according to claim **3**, wherein said said second manually actuated linkage means comprises a second rotatable lever, said second rotatable lever being effective to upon actuation thereof abuttingly engage and rotate said first lever means and said shaft in said throttle opening direction.

5. Apparatus according to claim **3**, wherein said second manually actuated linkage means comprises a second lever freely rotatable about said shaft, said second lever being effective upon actuation thereof to engage and rotate said first lever means and said shaft in said throttle opening direction.

6. Apparatus according to claim **3**, wherein said latching means comprises a second lever member secured directly to said first manually actuated linkage means and freely rotatable about said shaft, a third lever member pivotally connected to said first lever means, a first latching surface formed on said second lever, a second latching surface formed on said third lever and adapted for cooperative engagement with said first latching surface, wherein said first spring means is operatively connected to said third lever for urging and maintaining said first and second latching surfaces in cooperative engagement as long as said first spring means does not experience a failure, and wherein said second spring means operatively engages said first lever means and said second lever in a manner continually urging said first lever means and said second lever to experience relative rotation with respect to each other.

7. Apparatus according to claim **6**, wherein said second manually actuated linkage means comprises a fourth rotatable lever, said fourth rotatable lever being effective upon actuation thereof to abuttingly engage and rotate said first lever means and said shaft in said throttle opening direction.

8. Apparatus according to claim **6**, wherein said second manually actuated linkage means comprises a fourth lever freely rotatable about said shaft, said fourth lever being effective upon actuation thereof to engage and rotate said first lever means and said shaft in said throttle opening direction.

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