United States Patent [19]

Marsh

[11] **3,760,786**

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[54] **REDUNDANT THROTTLE RETURN SYSTEM**

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[73] Assignee: **Colt Industries Operating Corp.**, New York, N.Y.

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[52] **U.S. Cl.** ..... **123/198 DB**, 123/98, 180/82, 74/482, 74/513

[51] **Int. Cl.**.. **F02b 77/08**, F02d 11/04, B60k 22/08

[58] **Field of Search** ..... 123/198 D, 198 DB, 123/198 R, 98, 108, 142; 180/82; 74/482, 513

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Attorney—Walter Potoroka, Sr.

[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.

7 Claims, 5 Drawing Figures

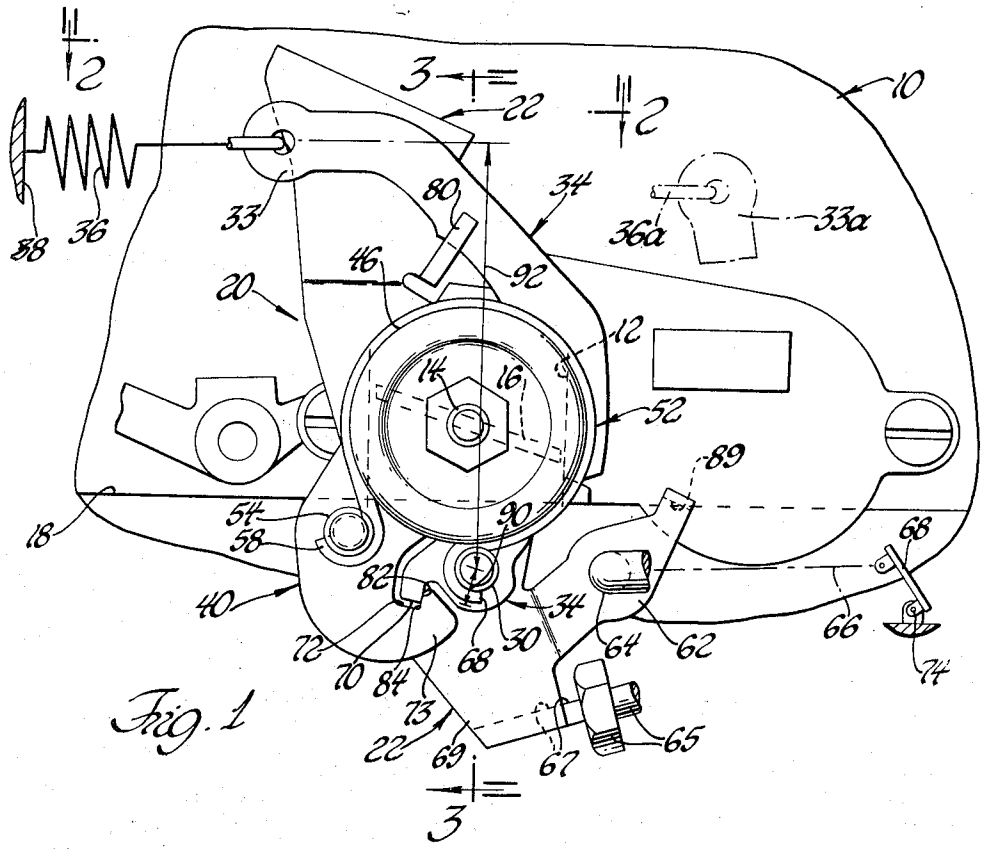

Fig. 1

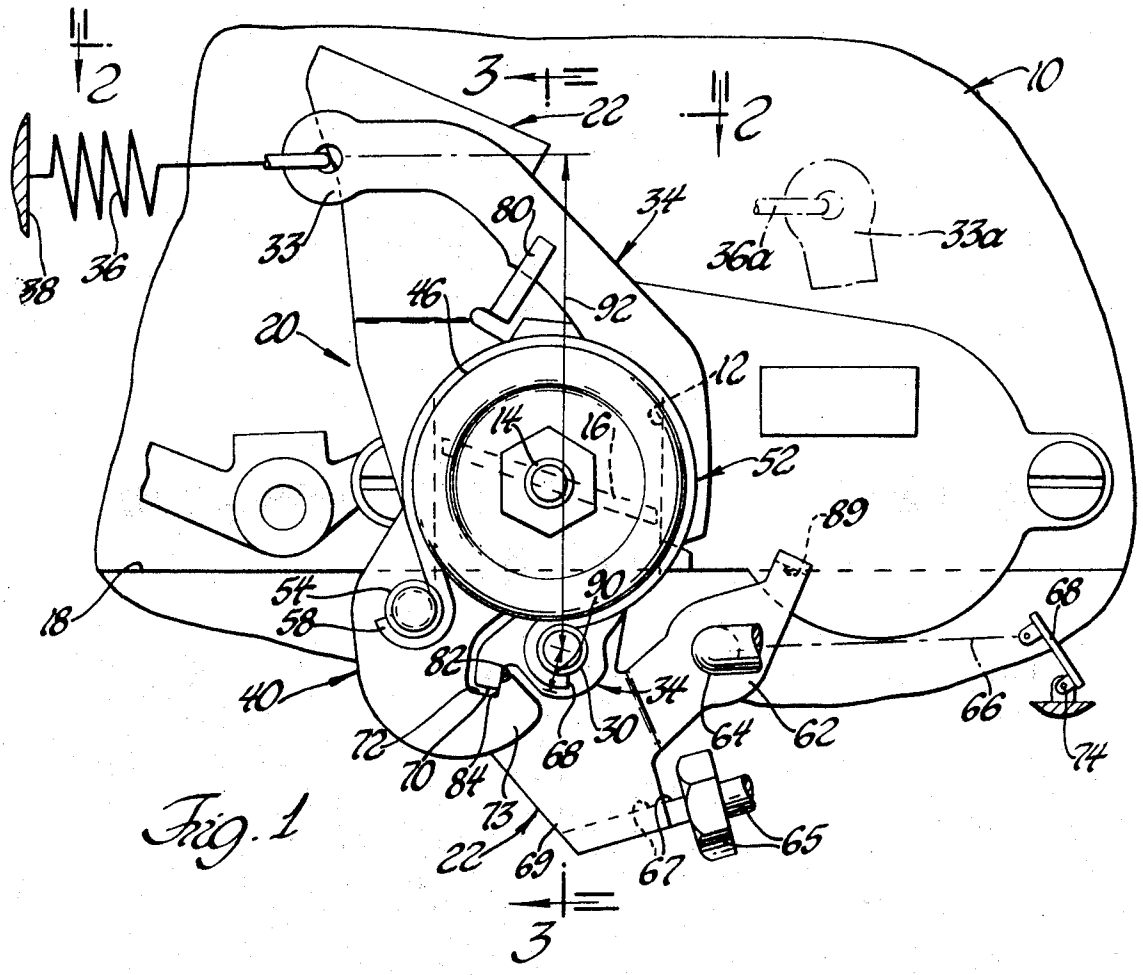
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Fig. 1

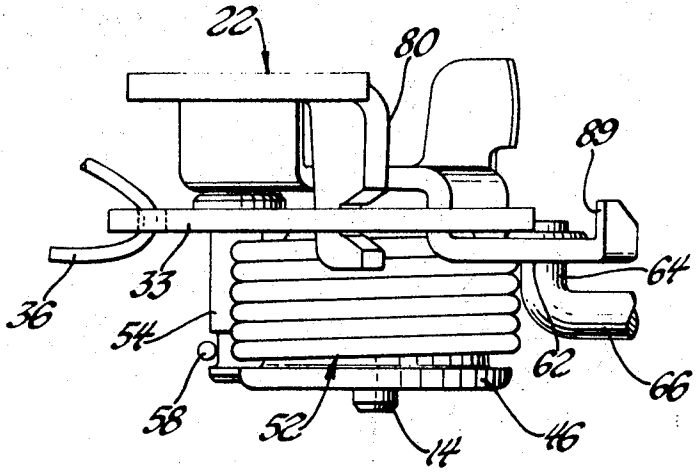
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Fig. 2

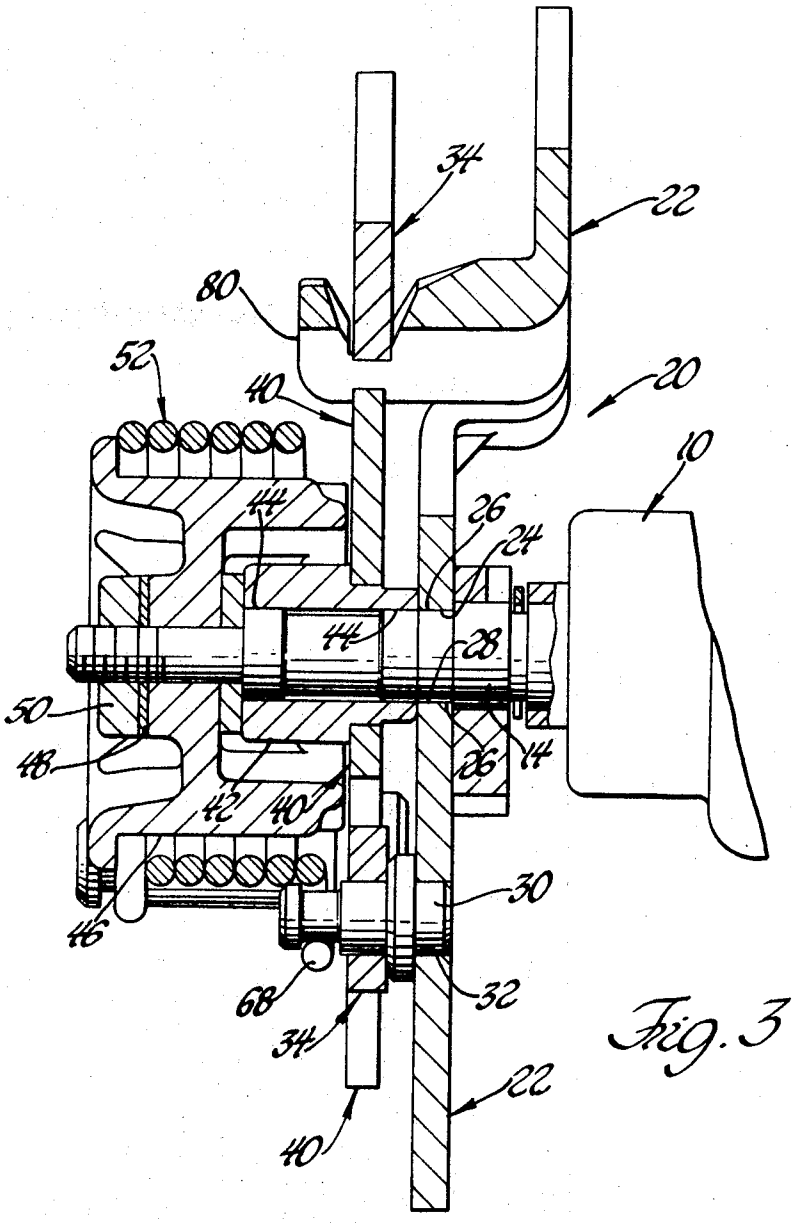
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Fig. 3

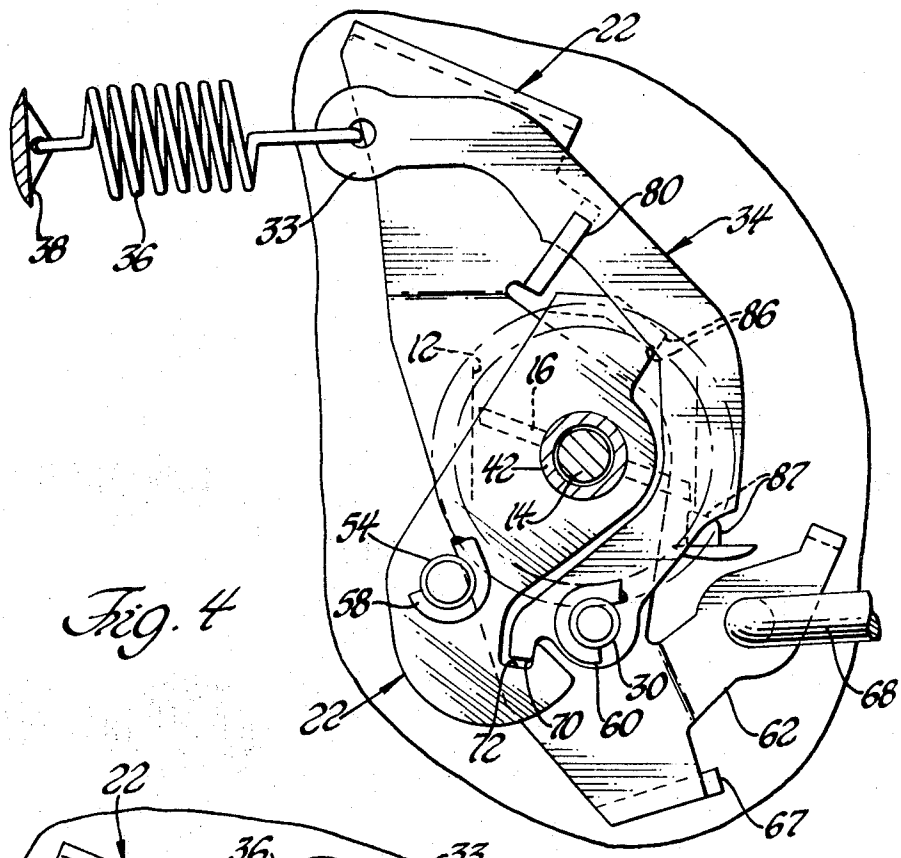
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Fig. 4

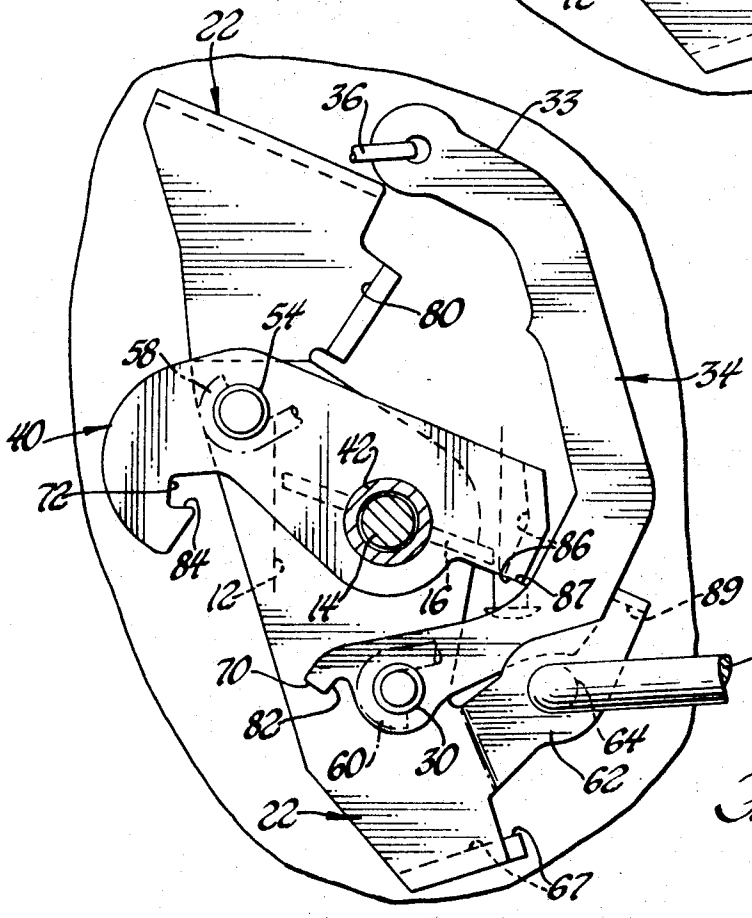
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Fig. 5

REDUNDANT THROTTLE RETURN SYSTEM

BACKGROUND OF THE INVENTION

Heretofore, carburetors or other engine induction devices, employing an induction passage with a throttle valve therein, has 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, latching means effective when unlatched to permit said second safety spring means to be effective for rotating said throttle valve toward 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 fragmentary elevational view taken generally on the plane of line 2—2 of FIg. 1 and looking in the direction of the arrows;

FIG. 3 is an enlarged cross-sectional view taken generally on the plane of line 3—3 of FIG. 1 and looking in the direction of the arrows;

FIG. 4 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; and

FIG. 5 is a view similar to FIG. 4 but illustrating the elements in positions assumed resulting from a failure of, for example, the normal throttle return spring.

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 and 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 **3,** 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 throttle return tension spring **36** having its opposite end suitably 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 necked-down portions **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 of shaft **14** and axially retained thereon as by a washer or thrust bearing **48** and a nut **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,** lever **40** is provided with a generally laterally extending pin or post **54** which is operatively connected to one hooked end **58** of torsion spring **52** while pin **30** carried by lever **22** is operatively connected to the opposite hooked end **60** of 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 **22** is pivotally connected to one end **64** of a motion transmitting member such as a rod **66** which, in turn, is operatively connected to the foot-operated throttle control lever or pedal **68** within the vehicle passenger compartment.

As best seen in FIG. **3,** 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 latching projection or arm portion **70** formed on lever **34** received within a cooperating recess or slot **72** formed in arm portion **73** of 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 4. 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 esample, FIG. 1. Also, as illustrated in FIGS. 2 and 4, 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, which may be determined as by an adjustable abutment 65 engaging a laterally extending flange portion 67 integrally formed at the lower arm portion 69 of lever member 22.

During normal operation when opening movement of the throttle pedal 68 is rotated counter-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 17 in the opening direction.

When throttle control pedal 68 is released, the return spring 36 pulls at the upper end 33 of lever 34, which is normally abutably received in an abutment arm portion 80 of lever member 22, 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.

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 as fragmentarily dispicted in phantom line at 36*a* and 33*a*. 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. That is abutment surfaces 82 and 84 of projection 70 and recess 72 are normally tightly abuted against each other because of safety spring 52. That is, the only thing that is restraining clockwise rotation of lever member 40 is the engagement of surfaces 82 and 84. Consequently, the torsional force of torsion spring 52 continually urges the projection 70 out of abutting engagement with surface 84 of 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 and causes clockwise rotation of lever 40 which rotation continues until a laterally extending arm portion 86 of lever member 40 engages an abutment 87 stopping further clockwise roation of lever 40 as shown in FIG. 5. As a consequence of the stopping of clockwise rotation of lever 70, the remaining spring force of safety spring 62 is partly expended in the counter-clockwise rotation of lever 22 resulting in throttle shaft 14 and throttle valve 16 ultimately attaining the idle position as illustrated in FIG. 5. A laterally extending arm portion 89 carried by lever member 22 is provided as a rest against which lever 34 may abut when spring 52 fails.

It should be noted that when safety spring 52 has thusly rotated the throttle valve 16 to its idle position, lever 22 is again at a position corresponding to that as illustrated in FIG. 1. Consequently, the operator may continue to employ the foot pedal 68 to control the position of the throttle valve 16 enabling driveability of the vehicle. However, in the preferred form, the spring force experienced by the operator after failure of spring 36 would, by comparison, be so sufficiently increased as to indicate to the operator that the vehicle needed corrective servicing.

In the preferred embodiment of the invention shown, it should be noted that, if the center of pin 30 is considered as an axis, the effective force existing at, for example, the mid-portion of the abutting surfaces 82 and 84, has a relatively short effective lever arm distance depicted at 90, whereas the force exerted by the primary or normal return spring 36 has a relatively long effective lever arm distance depicted at 92. Further, it can be seen that the pivot point, or axis about which such force lever arms operate, is generally between the opposing forces (forces developed by springs 36 and 52) thereby defining a class-1 lever. Moreover, the effective lever arm 90 of the force generated by spring 52 is relatively short as compared to the effective lever arm 92 of the force generated by spring 36. In the preferred embodiment of the invention, such effective lever arms 90 and 92 may be in a ratio in the range in the order of 1 : 10 to 1 : 12 respectively.

As a consequence of having such a relatively long effective lever arm for spring force 36, accidental release of the preloaded safety spring 52 is positively prevented due to such factors as, for example, vibrations induced into the throttle return system by associated structure. Further, by employing such a relatively long effective lever arm 92 it becomes possible to use a return spring 36 of a force which is comfortable to the vehicle operator while effectively providing a relatively large resisting force by the projection 70.

Although only one preferred embodiment of the invention has been disclosed and described, it is 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 rotatably 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 ro-

tate said shaft and said throttle valve to said idle position, second preloaded 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 thereby resiliently rotated to said idle position, and latching means for preventing said second spring means from causing rotational motion of said first linkage means and said shaft during normal operation, said latching means comprising a class-1 lever system with latching portions situated on one side of the pivot of said class-1 lever and a resisting force generated by said first spring means applied to the other side of said pivot of said class-1 lever.

2. Apparatus according to claim 1, including first lever means carried by said shaft for rotation therewith, wherein said first manufally 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 operatively connected to said first lever means and said shaft during normal operation, and wherein said latching portions are 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 latching means comprises a second lever member freely rotatable about said shaft, a third lever member pivotally connected by first pivot means to said first lever means, a first latching surface formed on said second lever, a second latching surface formed on said third lever generally at one end thereof and adapted for cooperative engagement with said first latching surface, wherein said first spring means is operatively connected to said third lever at an end thereof opposite to said one end 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.

5. Apparatus according to claim 4, wherein the effective lever arm of the force applied by said first spring means to said third lever is in the order of 10 units, and wherein the effective lever arm of the force applied by said second spring means against said second latching surface on said third lever is in the order of 1.0 unit.

6. Apparatus according to claim 4, wherein said second spring means comprises a torsion spring, and wherein said torsion spring has one end engaged with said first pivot means.

7. Apparatus according to claim 6, wherein another end of said torsion spring is connected to said second lever at a point which is of a radial distance from the axis of said shaft less than the radial distance from the axis of said shaft at which said first latching surface is situated.

* * * * *