United States Patent

[11] 3,626,919

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[54] FAIL-SAFE THROTTLE CONTROL

14 Claims, 11 Drawing Figs.

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[51] Int. Cl. F02b 77/08, F02d 11/04, B60k 27/08
[50] Field of Search .... 123/198 R, 198 D, 198 DB, 198 DC, 98, 108, 97 B, 103 C, 103 D, 103 E, 142; 180/82, 82.1, 82.7; 192/129; 74/513

[56] **References Cited**

UNITED STATES PATENTS

2,455,573	12/1948	Fant, Jr.	123/198 D
2,678,033	5/1954	Minder	123/198 D
2,793,706	5/1957	Moreland	180/82
2,836,669	5/1958	Rosenberg	200/61.89
3,121,214	2/1964	Frederick	340/53
3,171,917	3/1965	Leichsering	200/86.5
3,202,161	8/1965	Richards	123/198 D X
3,273,552	9/1966	Plath	123/198 D
3,313,897	4/1967	Gorsky	200/61.89
3,435,165	3/1969	Lombard	200/61.89
3,487,183	12/1969	Schulman	200/61.89
1,055,834	3/1913	Tibbetts	123/98
1,097,778	5/1914	Tibbetts	123/98
1,833,908	12/1931	Maybach	123/103
2,067,332	1/1937	Numer	180/82
2,148,729	2/1939	Coffey	123/98
2,188,704	1/1940	Claytor	123/102
2,260,576	10/1941	Maybach	123/198 DB UX
2,313,011	3/1943	Duwe	123/98
2,517,501	8/1950	Mennesson	180/82 (.1) UX
2,897,806	8/1959	Landrum	123/108 X
3,276,439	10/1966	Reichenbach	123/108 X

FOREIGN PATENTS

200,061	11/1955	Australia	123/98
1,052,320	9/1953	France	123/98

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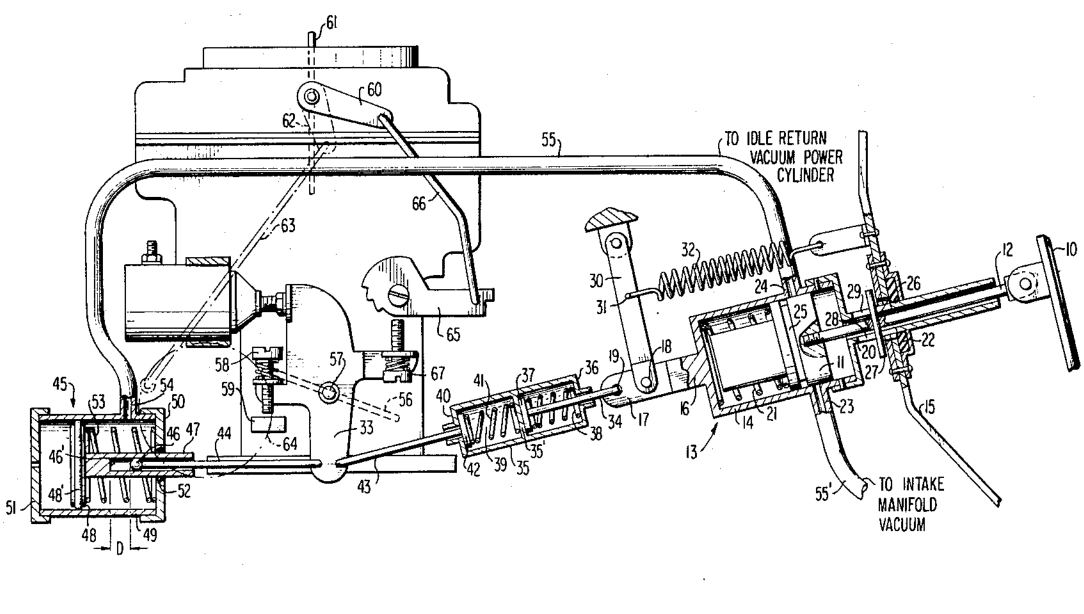
ABSTRACT: A spring-actuated valve or switch means which is interposed into the accelerator linkage of a motor vehicle acted upon by opposing forces of the accelerator pedal foot pressure and the throttle return spring pressure either to return the engine to idle or disconnect the ignition when in cooperation these forces indicate throttle linkage sticking or failure.



PATENTED DEC 14 1971 3,626,919

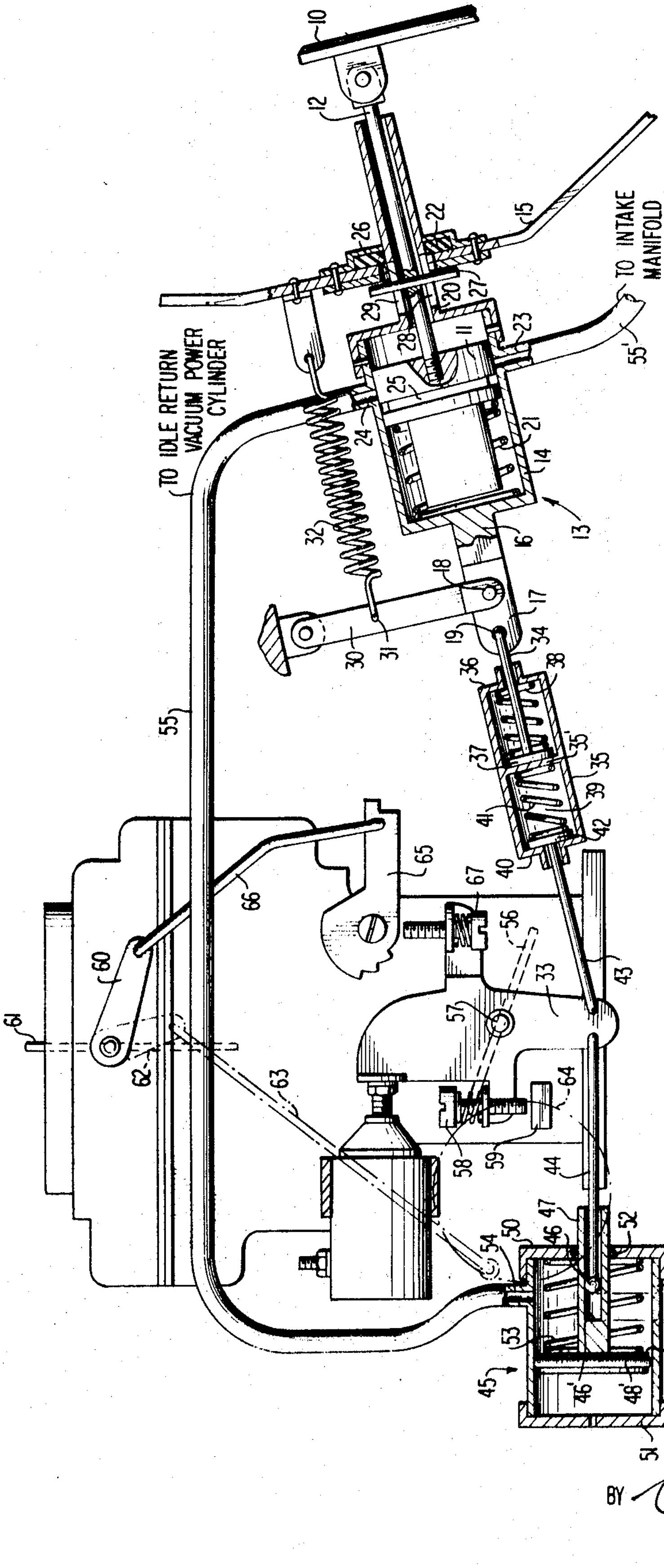


FIG. I

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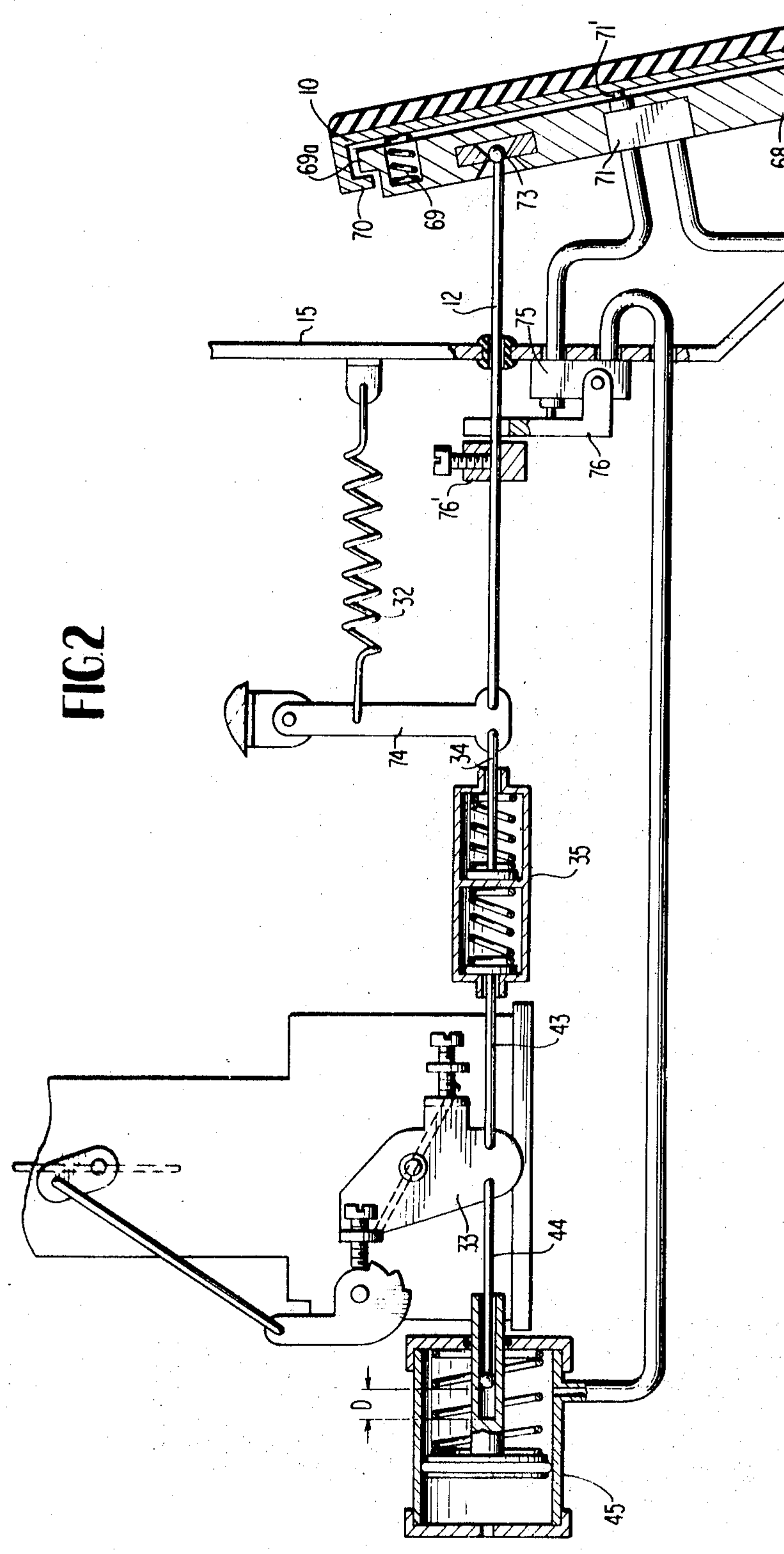
10
71'
69a
69
70
73
71
68
72
12
15
75
76
76'
32
74
34
35
43
33
44
D
45

FIG.2

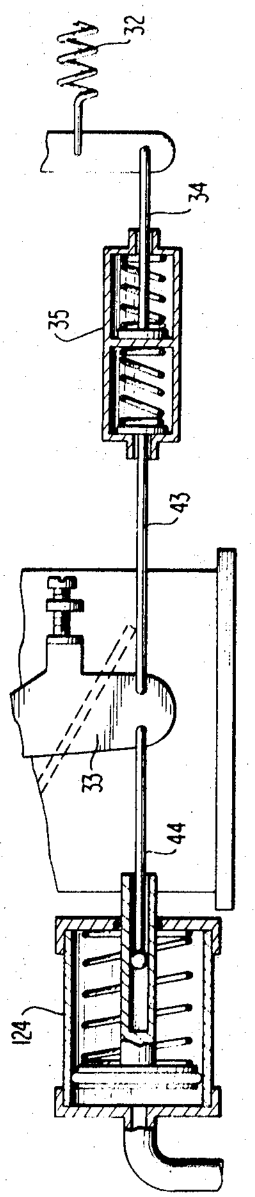
32
34
35
43
33
44
124

FIG.10

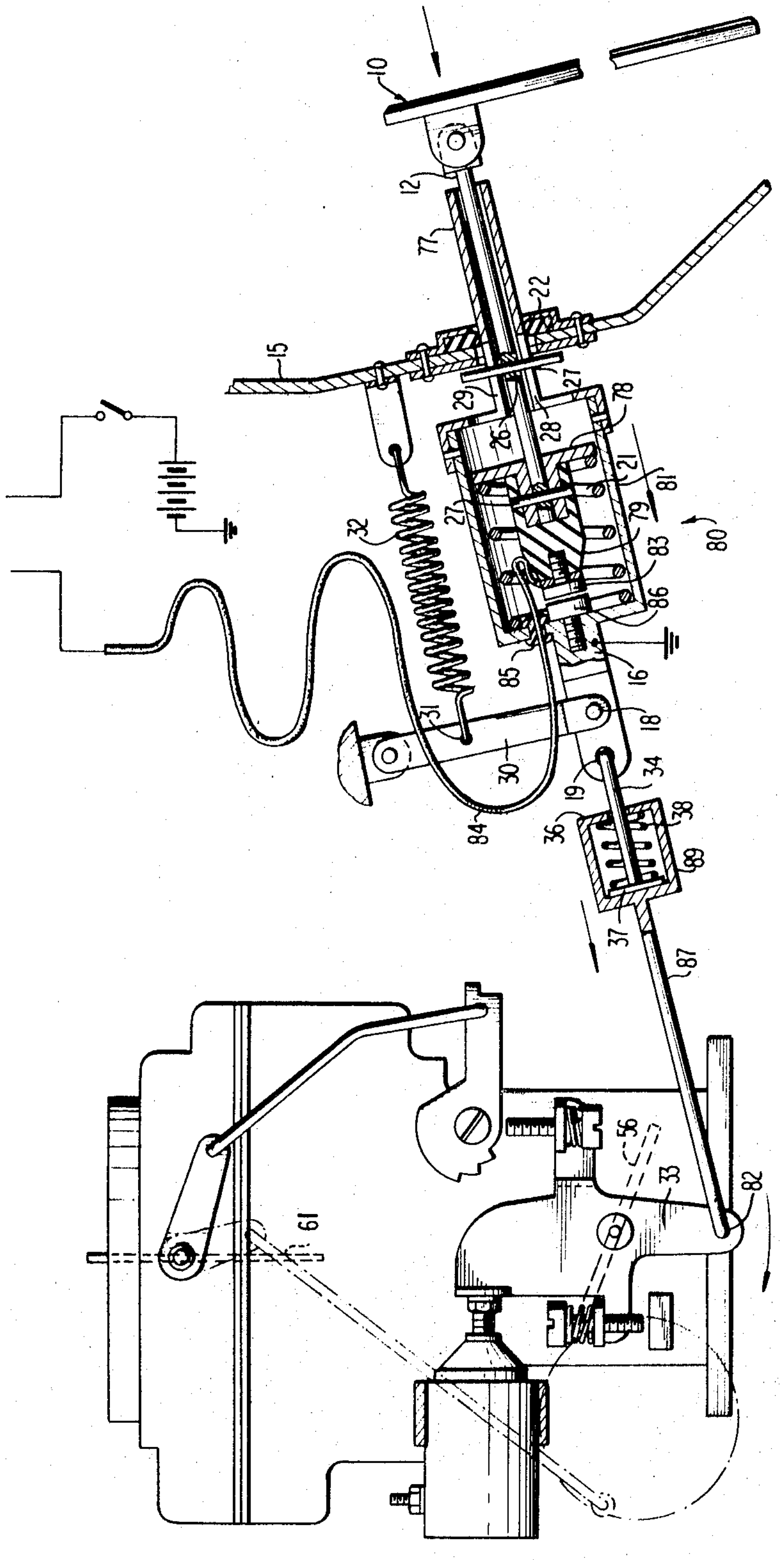

FIG.3

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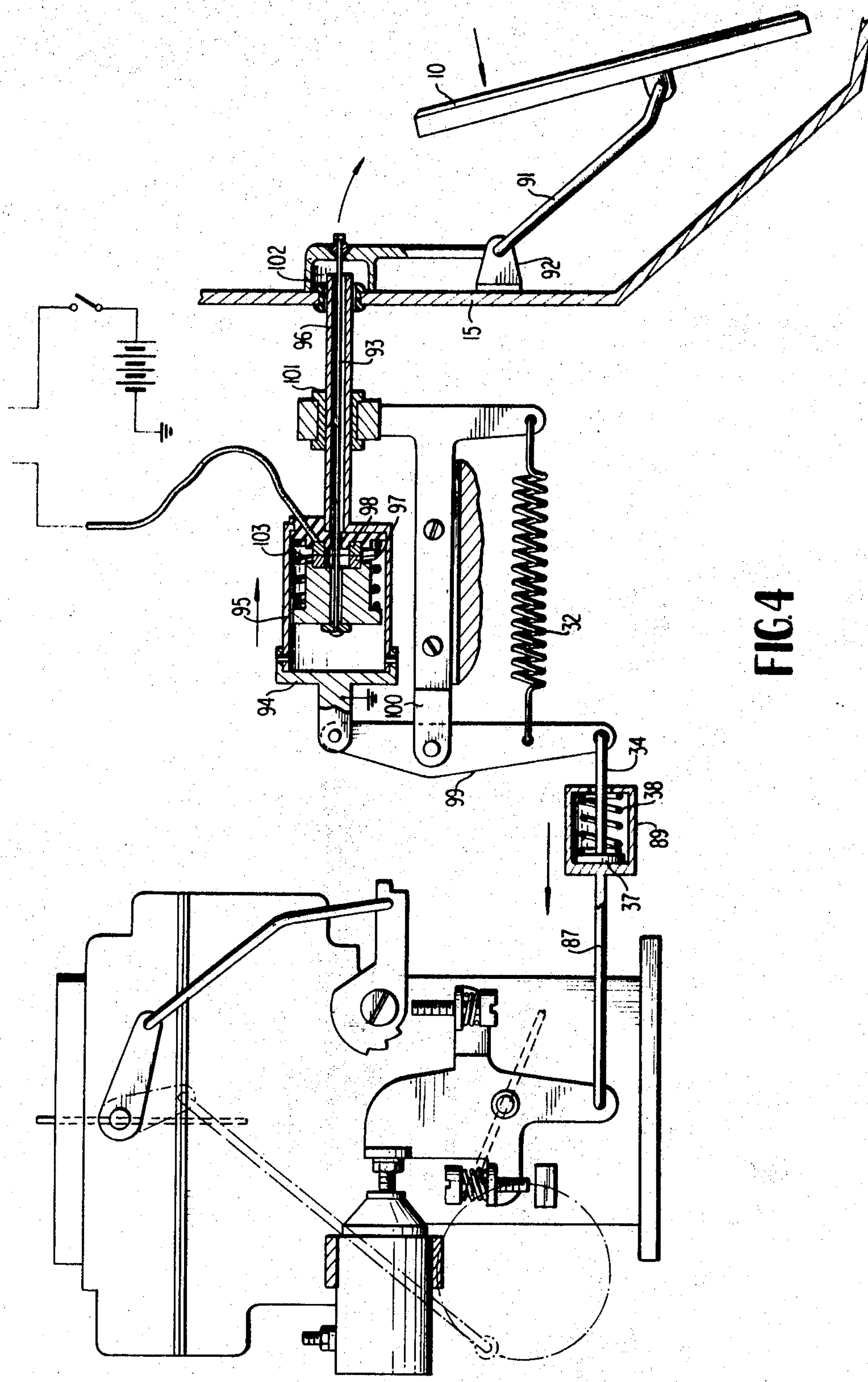

FIG.4

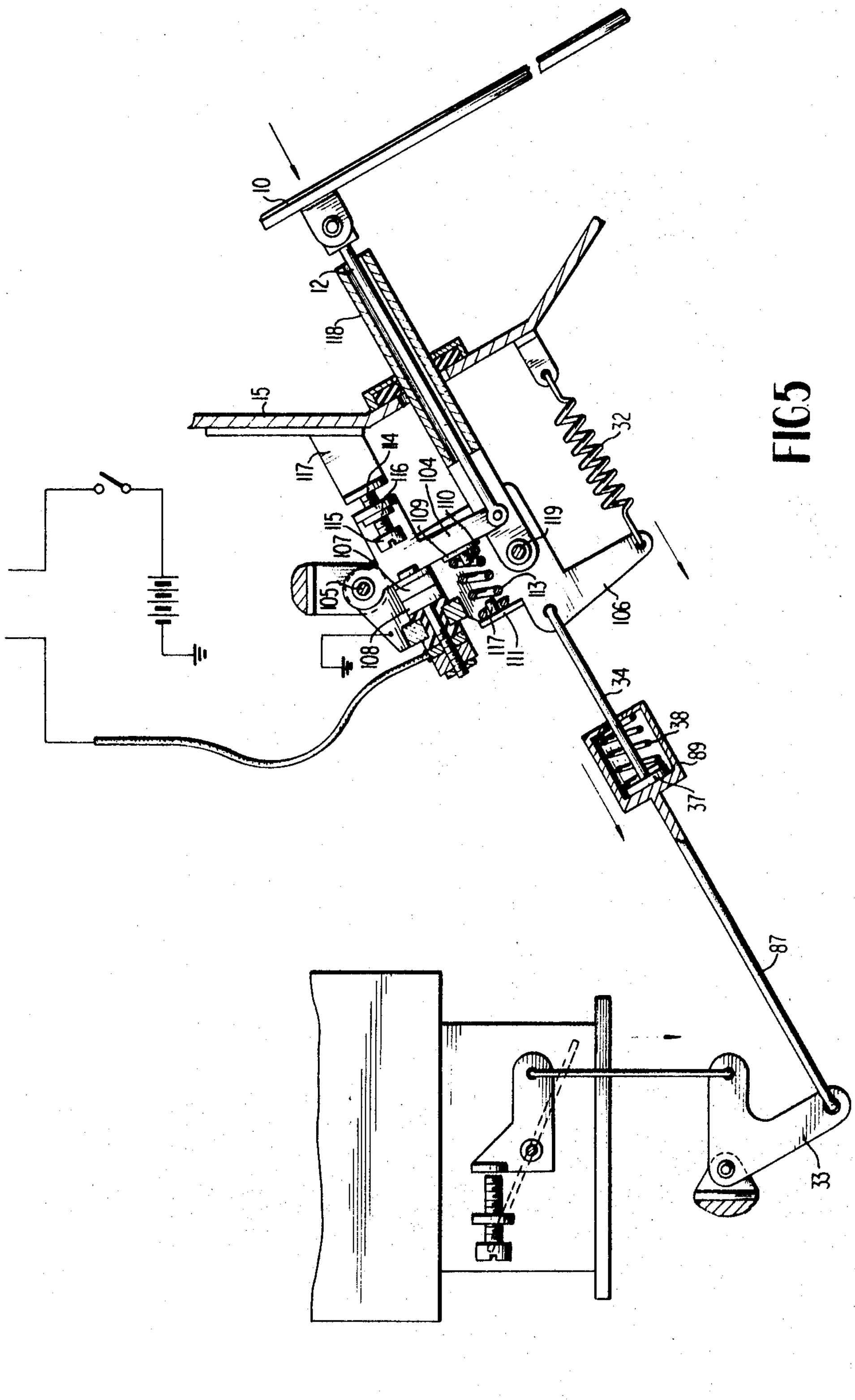
10
12
118
15
117
114
116
104
110
109
115
107
105
108
119
113
117
111
106
32
34
38
89
37
87
33

FIG5

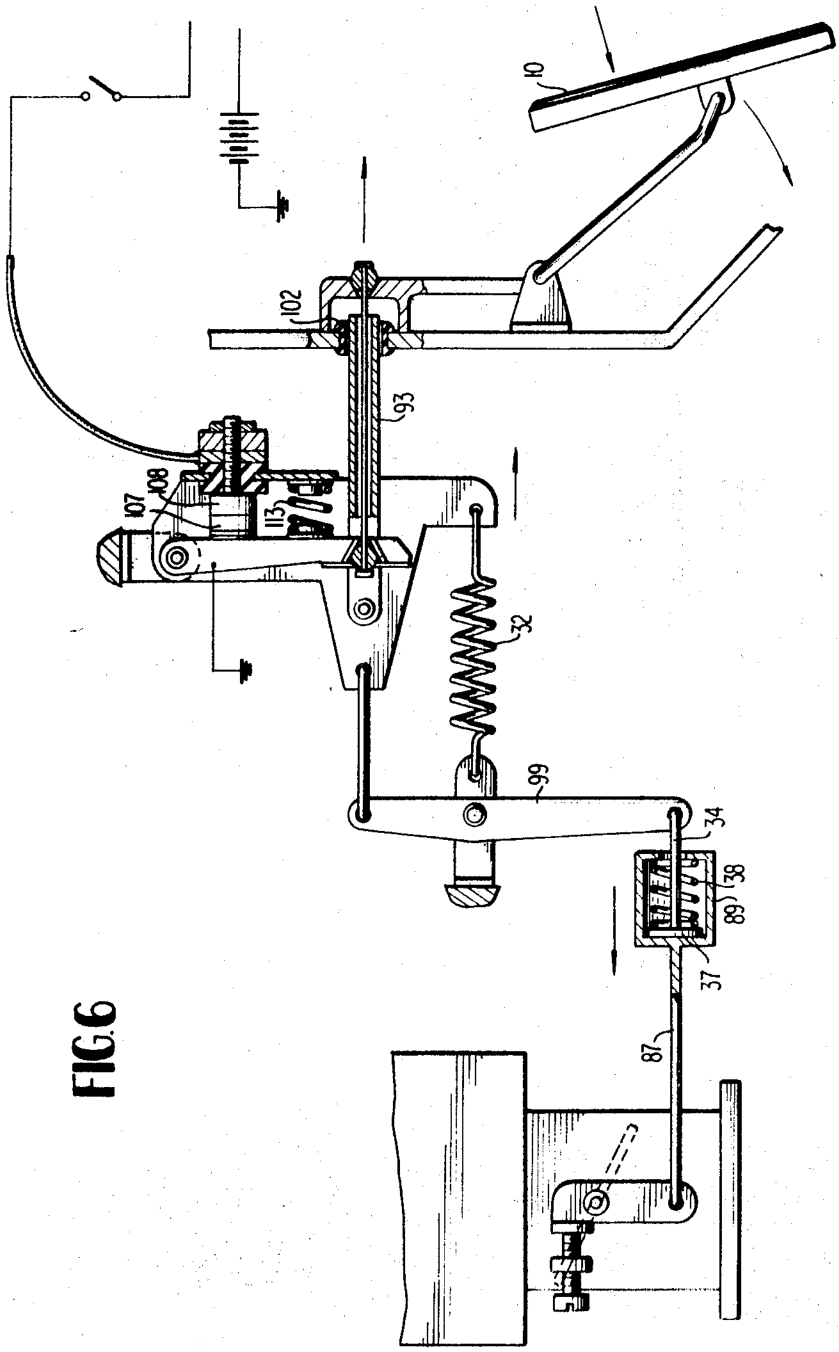

FIG.6

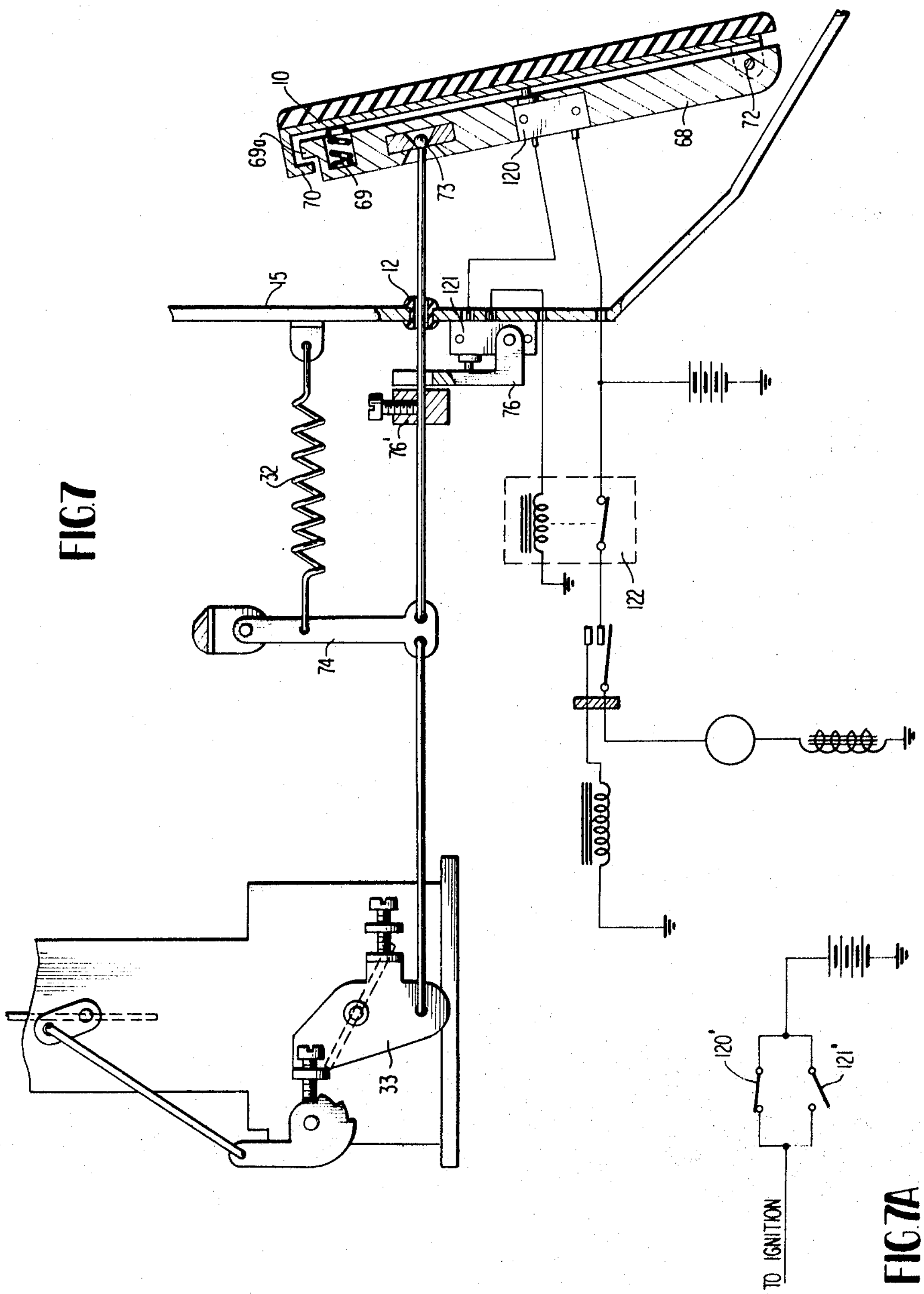
10
69a
70
69
73
120
68
72
15
12
121
76
76'
32
122
74
33
120'
121'
TO IGNITION

FIG.7

FIG.7A

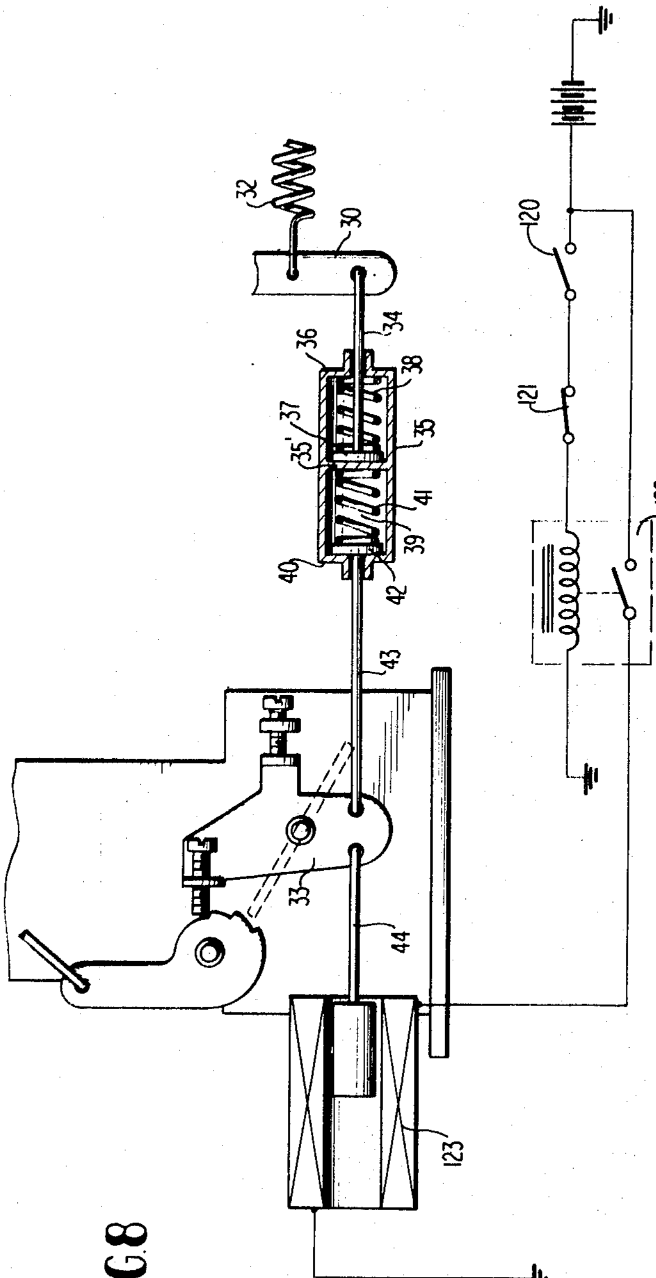
32
30
34
36
38
37
35'
35
41
39
40
42
43
33
44
123
120
121
122

FIG.8

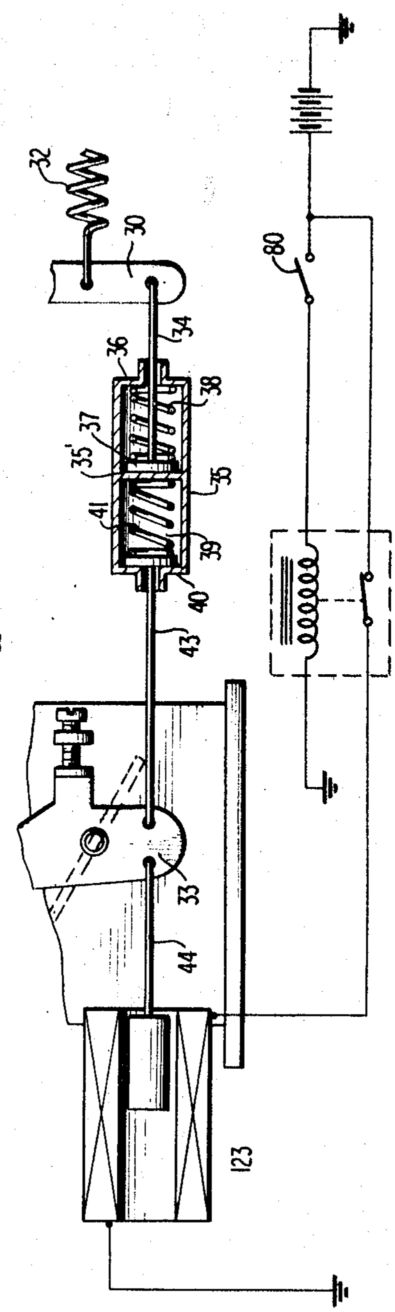
32
30
34
36
38
37
35'
35
41
39
40
43
33
44
123
80

FIG.9

FAIL-SAFE THROTTLE CONTROL

This invention relates to safety controls for motor vehicles and more particularly to a control to deactivate the engine should the accelerator linkage become frozen, broken or disengaged.

Many accidents have been caused by the opening or sticking of the carburetor throttle plate in an open position due to binding or breaking of the linkage, springs or pedals.

Under these conditions the driver could turn off the ignition system and stop the car, but the tendency is for the driver to panic as the car picks up speed and neglect to use the brakes. The brakes of modern cars are totally ineffective in such a situation and the results are usually disastrous.

The most common form of failure has been breakage of the throttle return spring that is the spring that urges the throttle plate into idle position when the accelerator is released. On many carburetors when the spring tension is released, the weight of the accelerator pedal and the geometry of the linkage cause the throttle to open thus speeding up the forward motion of the motor vehicle. U.S. Pat Nos. 3,273,552 to W. L. Plath, as well as 3,487,183 to Schulman and 2,793,706 to Moreland recognize the need for additional safety factors being built to cooperate with motor vehicle carburetors but their attempts to redress failure of the throttle return spring have proven unacceptable since nothing has yet been done in the automotive industry to correct this condition.

Other causes of wide open throttle failure can and do occur when pivot pins break, become loose or fall out, incorrect linkage geometry locks the accelerator open by a toggle action, or the linkage simply binds due to accumulation of dirt or ice from slushy roads, etc.

The present invention not only provides protection against a broken throttle return spring, but in addition senses any deviation from normal operation of the accelerator linkage due to any of the causes heretofore mentioned and provides for suitably disabling the engine.

Further, with certain of the improved constructions which will be hereinafter described, engine speed is maintained at idle which is important when the device is applied to large motor vehicles using power steering and power brakes where stopping the engine would cause dangerously difficult steering and braking.

In view of the foregoing it is the primary object of this invention to provide an apparatus in association with the accelerator linkage of a motor vehicle and the carburetor or ignition circuit whereby improper communication between the throttle and accelerator foot pedal will disable the engine.

It is a further object of this invention to provide a simple, efficient and inexpensive vacuum system for disabling the carburetor of a motor vehicle under conditions of open throttle failure.

It is another object of this invention to provide a simple, efficient and reliable hydraulic system for disabling the carburetor of a motor vehicle under conditions of open throttle failure.

It is a further object of this invention to provide a simple, efficient, reliable and foolproof switch mechanism for disabling the carburetor by the utilization of a solenoid for disabling the ignition system of a motor vehicle under conditions of open throttle failure.

It is still another object of this invention to provide a system for disabling the engine of a motor vehicle under conditions of open throttle failure regardless of whether the failure is due to binding, sticking, locking, a broken throttle return spring, or broken or disconnected accelerator linkage.

For a better understanding of this invention and further objects and advantages, reference will be made to the following description and accompanying drawings and to the appended claims in which the new and novel features of this invention are set forth.

FIG. 1 shows the fail-safe throttle mechanism utilizing a push rod system with a vacuum valve integral with the push rod linkage used to control a vacuum power cylinder to return the carburetor to idle;

FIG. 2 shows the fail-safe throttle mechanism utilizing a push rod system with two valves operating in concert to control the vacuum power cylinder;

FIG. 3 shows schematically the fail-safe throttle system utilizing a push rod system with the disabling electrical point system integral with the push rod linkage;

FIG. 4 shows schematically the system of FIG. 3 which is further adapted to using a pull cable connection to the accelerator pedal linkage;

FIG. 5 shows the fail-safe throttle system utilizing a push rod system with the disabling electrical point system pivotally mounted;

FIG. 6 shows the system adapted to using a pull cable connection to the accelerator pedal linkage with the disabling electrical point system pivotally mounted;

FIG. 7 shows still another embodiment wherein two switches and a relay are substantially substituted for the vacuum valve system of FIG. 2 to render the system fail safe.

FIG. 7A shows the use of two switches wired in parallel in the embodiment shown in FIG. 7 to eliminate the need for a relay;

FIG. 8 shows another embodiment wherein a solenoid is used in conjunction with the two switches of FIG. 7 to return the throttle to idle position in case of failure;

FIG. 9 shows a further embodiment wherein a solenoid is used in conjunction with the single integral switch of FIGS. 3, 4, 5 or 6 to return the throttle to idle position in case of failure; and

FIG. 10 shows a still further embodiment wherein hydraulic pressure is used to return the carburetor to idle.

Referring now to FIG. 1, there is shown a cross-sectional view of floorboard **15** of a vehicle to which an accelerator pedal **10** is pivotally attached at its lower end which is not shown. A push rod **12** is pivotally mounted to the accelerator pedal **10** in any standard manner and as normally used in motor vehicles, and extends slidably through cylindrical housing **20** and is rigidly attached by threading or other means to valve **11**.

The vacuum valve assembly **13** has a generally cylindrical housing **14** open at one end to reveal a cylindrical bore adapted to receive the valve **11** and closed at the other end with a solid wall having an offstanding cylindrical rod **16** extending concentrically along its axis. The rod end **17** may be flattened to form a rectangular cross section link end and is suitably perforated for apertures **18** and **19**. However, other ways of accomplishing this connection will be apparent.

The valve **11** is slidably fitted into the open bore of the housing **14** and thereafter the axially perforated cover **20** is attached to the housing by any convenient means.

The free end of valve **11** is suitably reduced to receive surrounding spring **21** which is disposed between the valve **11** and the bottom of the bore of housing **14** under compression to urge valve **11** upwardly toward the cover **20**.

THe cover **20** includes an axially disposed tubular extension of reduced diameter slotted as at **28** and **29** as shown which extends upwardly through the floorboard **15** and dust seal **22**, the tubular extension being arranged to slidably support rod **12** to which the pedal **10** is attached as hereinbefore described.

The housing is perforated as shown and provided with nipples **23** and **24** and adapted to receive the conduits shown attached thereto, the purpose of which will be understood as the description progresses.

The valve **11** is provided with an annular groove about its major diameter in such a manner that when the valve body is urged to its uppermost position by spring **21**, the conduits connected to nipples **23** and **24** can communicate with the groove **25** as is well known in spool valve construction.

The accelerator push rod **12** is suitably drilled at **26** to allow pin **27** to be press-fitted thereinto, the pin extending through the slots **28** and **29** arranged to act as a stop against the floor **15** when the spring **21** and return spring **32** urge the rod **12** upwardly.

The lower end of the housing **14** is supported by a link **30** which is pivotally attached thereto at **18** by a pin bolt or other suitable means, and at its other end in a similar manner is suitably and pivotally attached to some portion of the vehicle with the link being suitably perforated generally medially of its length at **31** to receive one end of the throttle return spring **32**, and the other end thereof being attached firmly to a fixed anchorage either on the firewall or the engine.

Disposed between the end of the housing **14** and throttle plate lever **33** carried by the carburetor is a push rod construction incorporating a two-way yield device constructed as follows.

As is well shown in FIG. **1** a tubular casing **35** having a suitable partition **35'** for a purpose to be described is positioned between the end of housing **14** and the throttle plate lever **33** by rods **34** and **43**, respectively. Rod **34** which includes a rigid disc **37** affixed to one end and arranged to be positioned in the casing on one side of the partition **35'** has its free end arranged to extend through apertured cover **36** and thereafter be secured to the portion **16** which offstands axially of the housing **14**, as shown. A coil spring **38** is provided between the disc **37** and the cover **36** for a purpose that will become apparent later. Also confined within the casing **35** is the disc bearing end **42** of rod **43**, the free end of the rod passing through the perforated cover **40** and being affixed to the throttle plate lever **33**. In the bore **39** is positioned a spring **41** which abuts the partition **35'** at one side and the disc **42** at the other end.

It is believed to be now evident from a study of FIG. **1**, that the two-way yield device allows rods **34** and **43** to separate if a force greater than the compressive spring force of spring **38** is applied and allows said rods to come together if a force greater than the compressive spring force of spring **41** is applied.

Adjacent to the point on the throttle plate lever **33** where rod **43** is attached there is also pivotally affixed another rod **44**, the free end of which is ball-shaped as at **46** and slidably fitted in the tubular extension **47** of vacuum piston **48**. The vacuum piston **48** which includes an annular recess into which is seated an O-ring **48'** for seating against the inner wall of the housing **49** is arranged to reciprocate therein and as shown, the extension **47** on the piston projects through an apertured cover **50** provided with a seal means **52**. The vacuum housing is closed at its opposite end by a perforated cover **51** which thus vents the chamber formed between the head of the piston and the cover to atmosphere. There is disposed between vacuum piston **48** and cover **52** a spring **53** which is under compression and normally urges said vacuum piston toward the cover **51**.

At this time it will be noted that communication is provided for between the power elements thus far described by having on the one hand the nipple **24** on housing **14** connected to the nipple **54** by means of the flexible conduit **55** and on the other hand the nipple **23** on housing **14** connected by another flexible conduit **55'** to the intake manifold vacuum.

Those skilled in the art will recognize the following construction as that of a modern carburetor and its operation is briefly described here for purposes which will be apparent when describing the operation and novelty aspects of this invention.

The pivotal lever **33** communicates directly with throttle plate **56** through rod **57**. Idle adjusting screw **58** bears against stop **59** which allows positioning of the throttle plate and therefor adjustment of the idle speed. Lever **60** communicates directly with choke valve **61** positioned in the throat of the carburetor and now shown in its open position, this element being controlled to open through lever **62** and push rod **63** by thermostatic coil spring **64** shown here only schematically. The lever **60** communicates with fast idle cam **65** through push rod **66**. Fast idle screw **67** bears against fast idle cam **65** when the throttle valve **56** is closed or partially closed during warm up, thus opening the throttle valve **56** to a greater or lesser degree depending on the choke position, therefore preventing the engine from stalling.

From the foregoing description the method of constructing and using this invention will be readily understood.

At idle, throttle return spring **32** is strong enough to overcome the compressive spring force of spring **21** thus urging vacuum assembly **13** toward the firewall **15** of the vehicle or other positive stop means that is provided therefor. The stop pin **27** being then in contact with firewall **15** or stop means as explained causing push rod **12** to resist the motion of vacuum assembly **13** forcing valve body **11** to its lowermost position and causing the upper land of the valve (as shown in FIG. **1**) to block communication between the flexible tubes **55** and **55'**, respectively. When accelerator pedal **10** is depressed, spring **21** remains compressed due to the restraining force of throttle return spring **32**, thus maintaining valve **11** in its lowermost position, while at the same time, the forward motion is transmitted through housing **14**, push rod **34**, disc **37**, housing **35**, rod **43** to the throttle lever **33**, thus opening the throttle. It will now be apparent to those skilled in the art that as long as throttle spring force and the force exerted on the accelerator pedal oppose each other, the valve **11** will block communication between the vacuum chamber **45** and the intake manifold vacuum and that no vacuum will be applied to the idle return vacuum power cylinder. If however, the driver removes his foot from the accelerator pedal **10** and the throttle does not return to its idle rest position, spring **21** will be released forcing valve **11** upwardly toward cover **20**, at which time the annular groove **25** will provide communication between conduits **55** and **55'**, thus applying vacuum to the idle return vacuum power cylinder **45** and returning the engine to idle.

During idling and under conditions of warming up of the normal motor vehicle provided with an internal combustion engine, the throttle may be required to be adjusted to different openings depending upon the characteristics of a specific carburetor engine, etc. The purpose of the two-way yield device can now be readily seen. As the idle screw **58** or fast idle screw **67** are adjusted, rod **43** moves axially as lever **33** moves. Were it not for the yield device, the vacuum valve assembly would move away from the firewall releasing pressure on spring **21** and applying vacuum to the power cylinder **45**. With the new yield device described herein, as rod **43** moves, it causes spring **38** to be compressed slightly without disturbing the balance of the remainder of the system. It is required in the application of this system that spring **32** be able to overcome the spring force of spring **38** and spring **21**.

It should now be clear also that the purpose of the second spring **41** provided in housing **35** is to allow the vacuum power cylinder **45** to actuate the throttle lever and return it to an idle position should the linkage between housing link **35** and the accelerator pedal become bound or frozen.

During normal operation of the vehicle it is required that the vacuum power cylinder not interfere with the operation of the carburetor. It should be evident that distance D between the base **46'** of the tubular piston extension **47** provided on the vacuum piston **48** and ball end **46** is arranged to allow rod **44** to move unrestricted as throttle lever **33** moves. Should the vacuum power cylinder be actuated, the stroke of piston **48** must be large enough to cause the base **46'** of tubular extension **47** to strike the ball end **46** and force the throttle plate lever **33** back to an idle position through the rod **44**.

It is contemplated that a further embodiment of this invention, which should be readily understood by those skilled in this art, particularly in view of the foregoing description, may be made by utilizing two vacuum valves operating in concert to control the vacuum power cylinder.

Referring at this time to FIG. **2** there is shown an upper accelerator pedal plate **10** pivotally mounted at its lower end to lower accelerator plate **68**. The upper end of pedal plate **10** is suitably hooked at **70** to communicate with a tang **69A** carried by plate **68** such that it allows small angular motion between the two plates. Lower plate **68** is suitably bored to receive spring **69** which is under a compressive force urging plates **10** and **68** apart, these plates, however, being restrained from separation by tang **69A** and hook **70**. Rigidly mounted within a suitable opening in plate **68** is vacuum valve **71**, its actuating pin **71'** being located so as to be actuated when plates **10** and **68** are pressed together. The assembly is pivotally mounted to the floorboard by pivot pin **72** and a bracket, not shown. Push rod **12** is pivotally mounted at one end to lower plate **69** in a suitably formed socket **73** and passes slidably through the firewall. The other end of rod **12** is bent and extends through a suitable perforation at one terminal end of link **74** retained by any suitable means, not shown. The link **74** is pivotally mounted at its other end to a bracket firmly affixed to the frame such that the link is substantially perpendicular to rod **12** and as explained earlier, the link **74** is associated with the firewall by means of a return spring **32**. In proximity to the pivotal attachment between rod **12** and link **74** a second perforation is made to accept the rod **34** that extends to the two-way yield device, the other end of which is attached to the carburetor. The construction and use of the yield device are the same as hereinbefore mentioned.

Mounted on firewall **15** or other fixed and rigid member is a vacuum valve **75** with an actuating arm means **76** that is pivotally or resiliently mounted so as to communicate with the actuating pin of valve **75**. Mounted on rod **12** is an adjustable valve actuating means **76'**, the purpose of which should be apparent without further discourse.

An essential part of this particular embodiment is the vacuum power cylinder **45** which is the same in construction as described in the first embodiment of this invention.

In its at-rest position, spring **32** urges the carburetor throttle plate arm against the idle stop as explained earlier. The adjustable valve actuator **76'** is initially adjusted so that the valve actuating arm **76** may close the valve. It is, of course, understood that there is no foot pressure now being applied to the accelerator pedal upper plate **10** and therefore spring **69** urges plates **10** and **68** apart allowing valve **71** to remain open. However, when foot pressure is applied to the accelerator pedal upper plate **10**, it is forced towards plate **68** against the spring pressure of the throttle return spring **32** and spring **69**. Thus, valve **71** is actuated and now closes. As push rod **12** is urged forward, valve actuator **76'** moves forward allowing valve **75** to open. It is evident then that valves **71** and **75** act in concert to maintain a closed vacuum circuit to vacuum power cylinder **45** as long as communication between the accelerator pedal and carburetor is normal and when there is pressure on the accelerator pedal and the system is in other than an idle condition. Should the linkage bind or the spring **32** break, and the operator removes his foot from pedal **10**, valves **71** and **75** will both be in an open condition applying vacuum to vacuum power cylinder **45**, returning the throttle to an idle condition.

In automobiles which are light in weight and do not have power steering or power brakes, it may be economically advantageous to stop the engine rather than return it to an idle condition. FIG. 3 shows such an embodiment utilizing a set of contact points which are integral with the accelerator push rod to sense throttle linkage failure and stop the engine.

Referring now to FIG. 3, there is shown as before, a cross-sectional view of floorboard **5** of a vehicle to which accelerator pedal **10** is pivotally attached (not shown). Push rod **12** is pivotally mounted to accelerator pedal **10** in any standard manner as normally used in motor vehicles and extends through cylindrical upper housing **77** into spring retainer **78** and insulated contact support **79**, both of which are pinned or otherwise rigidly affixed to rod **12**.

The contact switch assembly, generally indicated as **80**, has a substantially cylindrical housing **81** open at one end with a means **16** extending from its lower end along its axis, the means being arranged to form a rectangular link end and suitably perforated to form apertures **18** and **19** as hereinbefore described in the first embodiment. The cover **20** for the housing includes the support for rod **12**, and the similarity of these elements will be appreciated from a comparison of FIGS. 1 and 3. The end of insulated contact support **79** positioned in the housing is concentrically drilled and/or tapped to receive contact element **83**, and attached thereto by any convenient means is a conductor wire **84** which passes through perforation **85** in the end of housing **81** this being suitably bushed to prevent chafing. Housing **81** is suitably drilled and tapped in its bottom concentric with its inner bore to receive the metal contact element **86** with the housing **81** being grounded to the electrical ground of the vehicle. Spring **21**, as shown, is disposed between the bottom of the housing **81** and the spring retainer **78** while the push rod **12** is suitably drilled to allow the pin **27** to be arranged as a stop and for the purpose explained earlier.

The lower end of the housing **81** is pivotally supported by link **30** and spring **32** which is associated therewith and operates in the same manner as explained in connection with FIG. 1.

It should be now clear to those skilled in the art that the external construction of the switch means described above resembles the external construction of the comparable valve means of the first embodiment hereinbefore described.

There is interposed between the end of housing **81** and throttle plate lever **33** a push rod incorporating a one-way yield device constructed as follows. Rod **34** is secured at one end to housing **81**, as shown at **19**, and its opposite end includes a disc **37** which is positioned in casing **89**, the casing being closed with a perforated cover through which the rod **34** is arranged to extend. A spring **38** is disposed within housing **86** under a compressive force between disc **37** and cover **36** so as to normally hold rods **34** and **87**, the latter being affixed to the throttle plate in fixed alignment, disc **37** being a relatively close sliding fit in the bore of housing **86**, and rod **34** being a substantially close sliding fit in the concentric perforation in cover **36**.

It is believed to be apparent that the one-way yield device is substantially one-half of the two-way yield device described earlier and is required to allow adjustment of the carburetor as explained herein before.

From the foregoing description the method of constructing and using this embodiment will be readily understood. Contact means **83** and **86** form the ground connection for the ignition system. At idle, the throttle return spring **32** has sufficient strength to overcome the compressive spring force of spring **21** and spring **38** thus urging housing **81** toward the firewall **15**, and thus causing push rod **12**, spring retainer **78**, insulated contact support **79** and contact element **83** to resist the motion of housing **81** bringing the contact means **83** and **86**, respectively, together and completing the ignition ground. When the accelerator pedal **10** is depressed, spring **21** remains compressed due to the restraining force of throttle return spring **32**, thus maintaining both contacts **83** and **86** in abutment while the forward motion is transmitted through housing **81**, push rod **34**, disc **37**, housing **89**, and rod **87** to the throttle lever **33**, thus opening the throttle **56**. It will be apparent to those skilled in the art that as long as throttle spring force and the force exerted on the accelerator pedal oppose each other, the contacts **83** and **86** will remain closed and the engine will continue to run. If, however, the driver removes his foot from the accelerator pedal and the throttle does not return to its idle rest position, spring **21** will be released and force spring retainer **78**, insulated contact support **79** and contact **83** away from the bottom of housing **81**, thus separating the contacts and effectively turning off the ignition.

Referring now to FIG. 4, there is shown another embodiment of this invention which utilizes a pull cable to close the fail-safe switch. In this instance the accelerator pedal **10** is pivotally mounted on arm **91** which, in turn, is pivotally mounted on bracket **92** attached, for example, to the firewall. A cable **93** passes through a suitable conical perforation in the upper end of arm **91** and is secured in tension by a standard compression ball. Without a detailed description, it can be seen, that the contact switch assembly consisting of cover **94**, housing **95**, tube extension **96** and its internal parts, performs the same function as hereinbefore described, except that the contacts **94** and **98** are closed when a pull is exerted on cable **93** and the housing is pulled instead of pushed as in the previously described embodiments. In this form of the invention, link **99** is pivotally mounted on a support **100** which is rigidly attached to the frame. The switch housing is pivotally attached to the upper end of link **99** and slidably supported in bushing **101**, tube **96** extending through dust shield **102** and through the firewall. At the lower end of link **99** is attached rod **34** of the one-way yield device constructed and used as hereinbefore described.

Here the throttle return spring **32** is attached to a suitable perforation in link **99** and firmly attached at the other end to a fixed anchorage. The spring force of spring **32** must be adequate to overcome the spring force of spring **103** and spring **38** for the reasons earlier described. It is evident from the discussion of the previous embodiments that under all normal conditions contacts **97** and **98** are in contact maintaining a proper electrical ground for the ignition to operate. If the throttle fails and remains in an open condition when the operator removes his foot from the accelerator pedal, spring **103** opens contacts **97** and **98** and the engine stops.

Referring now to FIG. **5**, there is shown a further embodiment of this invention in which the contacts are pivotally mounted instead of axially mounted.

The grounded contact arm **104** is pivotally mounted so as to rotate about shaft **105** which is rigidly affixed to the frame, and the insulated contact arm **108** is pivotally mounted at the same pivot. Contact means **107** is rigidly attached by riveting to an apertured ear extending at right angle from arm **104** and in a substantially radial direction from pivot **105**. Contact element **108** is mounted by means of insulated washers to an apertured ear extending at right angles to arm **106** so that the pair of contacts are in direct alignment with each other. In a like manner, ear **109** with spring support pin **110** at its center extends from arm **104**, and ear **111** with spring support pin **117** at its center extends from arm **106**. Spring means **113** is disposed between ear **109** and **111** to hold the contact elements **107** and **108** apart. Extending also at right angles from arm **104** is an arm **114** which is suitably threaded to receive a stop screw **115** which is provided with a lock nut **116**. It will be noted in this embodiment that the stop screw **115** bears against a stop **117** which is rigidly attached to the firewall **15**.

Arm **106** is extended downwardly to a perforated terminal end to which one end of the spring **32**, the throttle return spring, is attached, while the other end of the spring is connected to a fixed anchorage.

The sleeve **118** is pivotally connected to arm **106** by pivot bolt means **119** and is arranged to extend through a dust shield in the firewall **15** thereby providing a slidable support for push rod **12** which, as shown, is pivotally affixed to the lower terminal end of arm **104** and extends upwardly so as to be pivotally affixed to the accelerator pedal **10**. Arm **106** is suitably perforated to receive the bent end of rod **34** which connects through the one-way yield device to the throttle plate lever **33** as hereinbefore described.

In this embodiment the functions are the same as those in FIG. **3**, wherein the switch assembly is an integral part of the push rod assembly. It is believed that from the foregoing it will be now appreciated that the throttle return spring **32** is sufficiently adequate to overcome the force of one-way yield spring **38** and spring **113**, thus urging arm **106** and contact **108** against contact **107**, while simultaneously forcing arm **104** and stop screw **115** against stop **117**. The application of pressure on the accelerator pedal **10** transmits the forwardly directed force through arm **104**, contact elements **107** and **108**, arm **106** into rod **34**, rod **87**, to the throttle plate lever **33**, thereby maintaining constant contact to properly ground the ignition system. It is evident that should the throttle stick open or spring **32** break and pedal pressure is removed, spring **113** will urge said contact members apart, causing the ignition system to be disabled.

FIG. **6** shows another embodiment of this invention using a pull cable with pivoted contacts. From the foregoing construction and description in FIGS. **4** and **5**, the construction and operation of this embodiment should be clear to those skilled in the art. The pivotal point assembly has been reversed so that pulling closes the points and a reversing link is used to achieve a pushing motion to operate the carburetor throttle lever. This embodiment combines elements from FIGS. **4** and **5** to perform the same functions as previously described.

From the foregoing description it should become obvious that combinations of various elements may be assembled to provide the same functions as hereinbefore noted and different energy modes may be used. For example, the embodiment now to be described and shown in FIG. **7**, utilizes switches and electrical energy to achieve the same concerted action as the valves shown in FIG. **2**.

Referring TO FIG. **7**, there is shown another embodiment in which switch **120** is affixed to the lower pedal **68**, and a switch **121** which is rigidly attached to the firewall **15**. Switch **120** replaces valve **71** of FIG. **2** and switch **121** replaces valve **75** in that same view. These switches perform substantially the same function to switch electrical energy to relay **122** to stop the engine in case of throttle failure.

FIG. **7** also shows no yield device, the removal of which may be accomplished by arranging switch **121** to have sufficient overtravel to be actuated just before maximum fast idle when the pedal is relaxed and allowing the linkage to return to slowest idle position when fast idle is not required. It should be clear that this principle can be applied to all of the other embodiments shown.

An alternate approach is shown in FIG. 7A in which switches **120'** and **121'** are arranged in parallel with each other, the pair being placed in series with the ignition circuit eliminating the need for relay **122** and opening the ignition circuit to stop the engine in the case of throttle failure.

FIG. **8** is a further embodiment which illustrates how the return to idle operation can be accomplished electrically. The solenoid means **123** replaces the vacuum power unit **45** of FIG. **2**. By combining the concerted switching of FIG. **7** with the solenoid means **123** of FIG. **8**, the precise actions of the embodiment of FIG. **2** are achieved electrically.

FIG. **9** illustrates the same action by combining the single contact switch of the embodiment shown in FIG. **3** with the solenoid means **123** of FIG. **8**.

It should be further obvious to those skilled in the art that hydraulic power is available within motor vehicles which have power steering and therefore high-pressure hydraulic fluid may be used to return the carburetor to idle.

Referring to FIG. **10** it can be seen that a hydraulic power cylinder **124** replaces the vacuum power cylinder **45** of FIG. **2**. By simply replacing the vacuum valves **71** and **75** of FIG. **2** with hydraulic valves (not shown), will provide the same valving action. By replacing the vacuum lines with hydraulic lines and connecting the system to the high-pressure line of the power steering pump, improper communication between the accelerator pedal and the carburetor will allow both valves to open, applying high pressure oil to the hydraulic power cylinder **124**, to thereby return the carburetor to idle.

While numerous embodiments of this invention have been shown, it will be obvious to those skilled in the art that it is not so limited, but may be rearranged in its basic form to include other forms such as actuating the carburetor using a pull cable attached directly to the throttle plate lever arm, appropriately placing the sensing means for delineating proper or improper communication between the accelerator pedal and carburetor.

The term "throttle plate lever means" may represent the throttle control lever in any of its forms including that for the fuel control rack on diesel engines.

Such modifications are considered to be within the spirit of this invention for sensing the lack of proper communication; moreover, it is conceivable to add to the system an additional power cylinder means for actuating the power brakes of the vehicle.

What is claimed is:

1. A fail-safe throttle control mechanism for internal combustion engine carburetors including a carburetor mounted on

a motor vehicle comprising throttle plate lever means associated with the carburetor, means carried by said throttle plate lever means extending to an accelerator pedal, said last-named means further including means for sensing failure of the accelerator pedal to return to a normal condition upon an attempt to decelerate and reacting to such improper communication of operation of the released accelerator pedal to said throttle plate lever means, and said reacting means being so disposed in the mechanism for immediately rendering the engine operation safe by returning the throttle plate lever to an idle position.

2. A fail-safe throttle control mechanism as claimed in claim **1**, wherein the reacting means is hydraulically actuated.

3. A fail-safe throttle control mechanism as claimed in claim **1**, wherein the reacting means is vacuum actuated.

4. A fail-safe throttle control mechanism as claimed in claim **1**, wherein the reacting means includes an electrical system provided on the motor vehicle.

5. A fail-safe throttle control mechanism as claimed in claim **4**, wherein a solenoid is included in the electrical system of the motor vehicle.

6. A fail-safe throttle control mechanism as claimed in claim **1**, wherein the means carried by said throttle plate lever means extending to the accelerator pedal is push operated.

7. A fail-safe throttle control mechanism as claimed in claim **1**, wherein the reacting means comprises a power means.

8. A fail-safe throttle control mechanism as claimed in claim **7**, wherein the power means comprises a cylinder.

9. A fail-safe throttle control mechanism as claimed in claim **1**, wherein the sensing means includes valve means actuated by the accelerator pedal.

10. A fail-safe throttle control mechanism as claimed in claim **1**, wherein the sensing means includes electrical contact means actuated by the accelerator pedal.

11. A fail-safe throttle control mechanism as claimed in claim **1**, wherein the accelerator pedal comprises at least two interconnected plates, one of which carries either a switch means or a valving means.

12. A fail-safe throttle control mechanism as claimed in claim **1**, wherein the carburetor and the throttle plate are replaced by a diesel fuel rack.

13. A fail-safe throttle control mechanism as claimed in claim **1**, wherein the means carried by said throttle plate lever means extending to an accelerator pedal further includes means to permit the adjustment of said carburetor without disturbing the sensing means.

14. A fail-safe throttle control mechanism as claimed in **13**, wherein the means to permit adjustment of said carburetor includes a double resilient means.

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