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Davis

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[54] **TRIGGER MECHANISM FOR FUEL INJECTION PUMP ANEROID CONTROL**

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[52] **U.S. Cl.**... **123/139 ST**, 123/139 AZ, 123/179 L

[51] **Int. Cl.**..... **F02m 63/00**, F02n 17/00

[58] **Field of Search**.... 123/179 L, 139 AZ, 139 ST, 123/139 T, 140 MC, 198 DB

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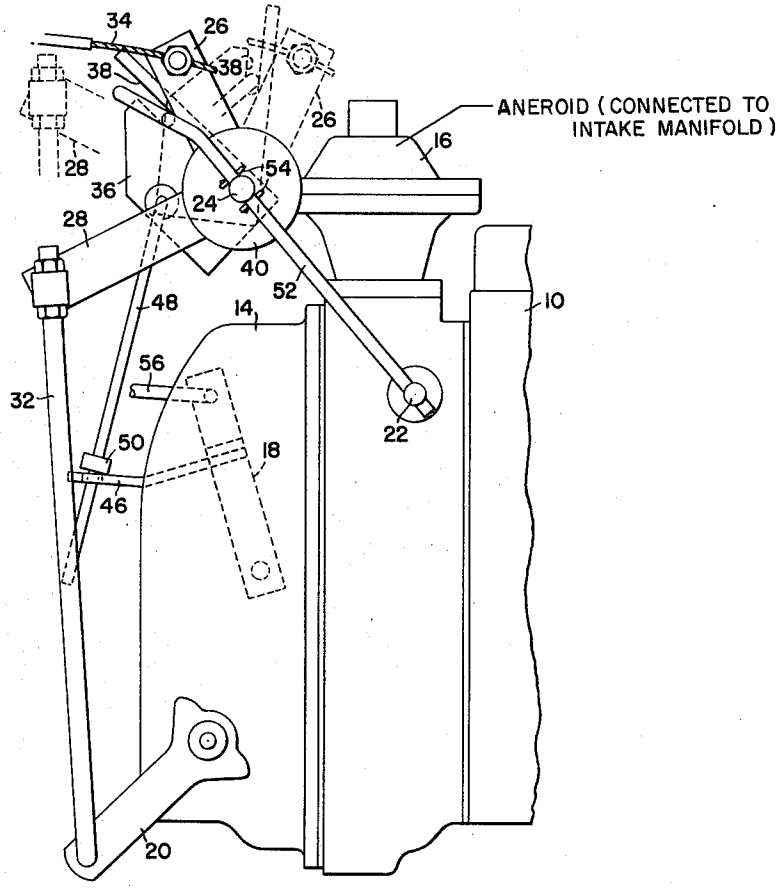
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Assistant Examiner—W. H. Rutledge, Jr.

[57] **ABSTRACT**

A trigger mechanism for the control member of an aneroid on a fuel injection pump assembly includes pivot lever means linked to the fuel shut-off lever of the pump assembly to move the fuel shut-off lever between its off and on positions, pivoted trigger means operatively connected to the control member and extending across the path of movement of the lever means to be engaged and moved by the lever means in a direction to move the control member in a direction to deactivate the aneroid as the lever means is moved in a direction to move the fuel shut-off lever to its off position, and a one-way connection between the speed control lever of the pump assembly and the trigger means to move the trigger means in a direction to move the control member in a direction to activate the aneroid as the speed control lever is moved towards its high-speed position. With this arrangement, the aneroid is automatically deactivated when the engine is shut down so that the engine can be overfuelled for starting and as soon as the speed control lever is advanced to accelerate the engine, the aneroid is again activated.

6 Claims, 3 Drawing Figures



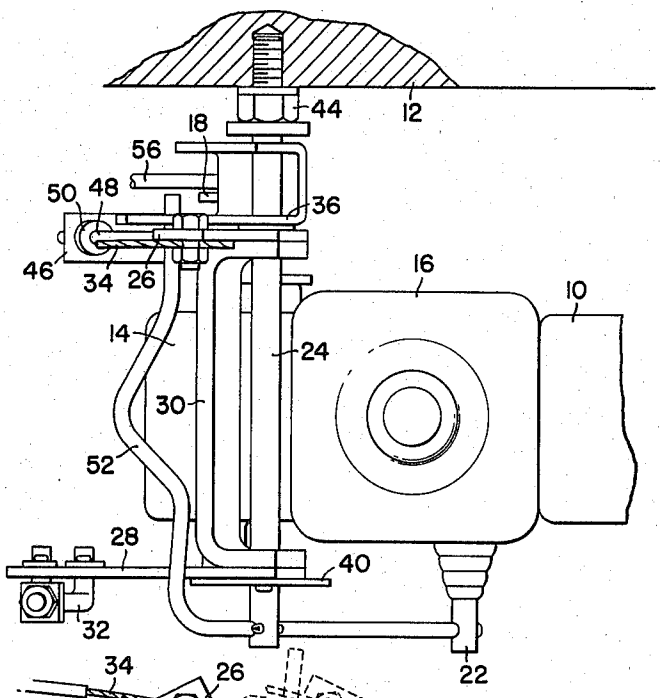

44
12
18
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FIG. 1

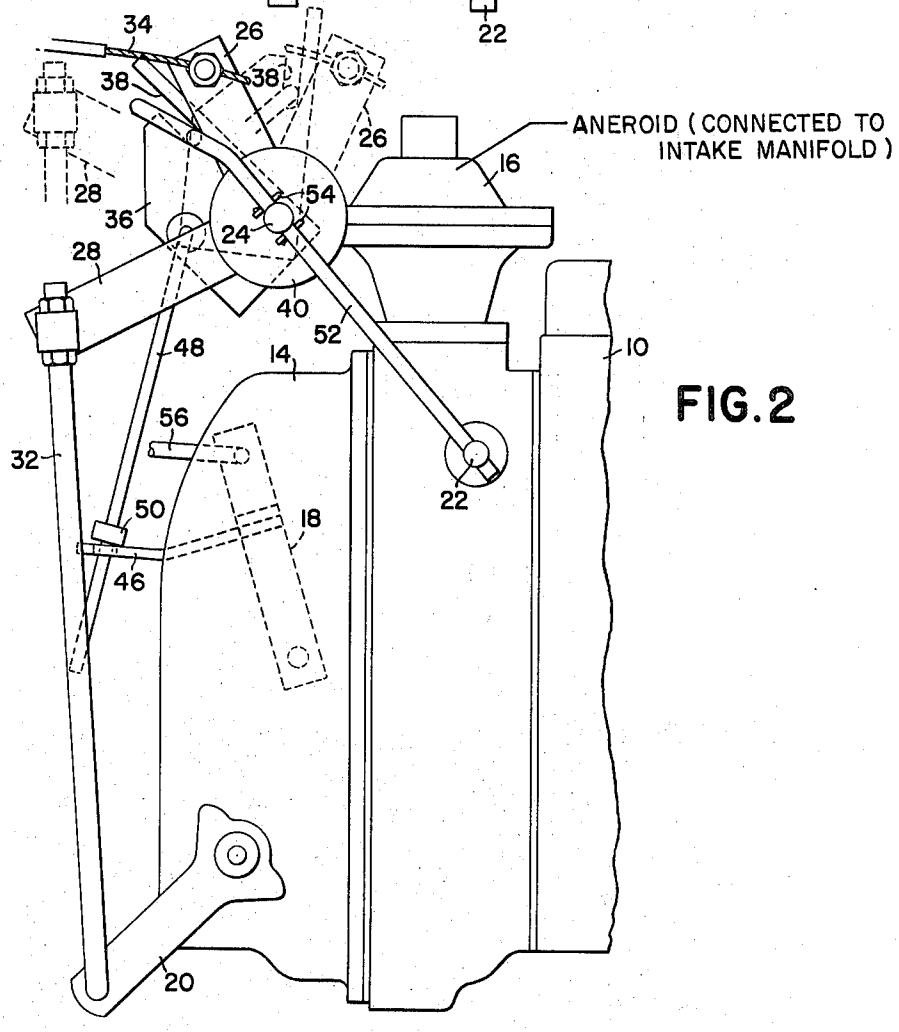
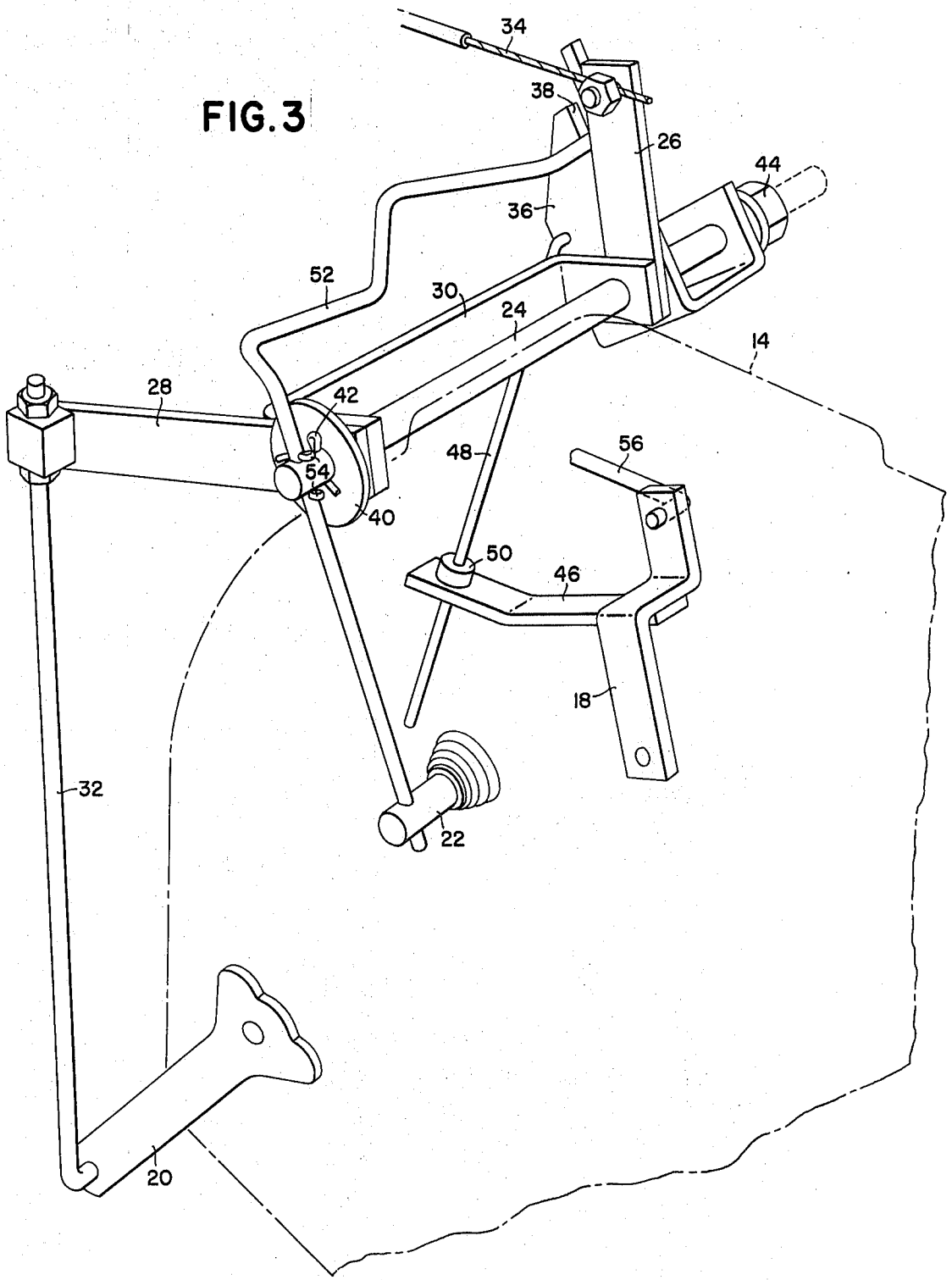

34
26
38
38
ANEROID (CONNECTED TO INTAKE MANIFOLD)
26
16
28
54
36
24
28
40
52
10
48
14
56
32
22
50
18
46
20

FIG. 2

FIG. 3



TRIGGER MECHANISM FOR FUEL INJECTION PUMP ANEROID CONTROL

BACKGROUND OF THE INVENTION

Many fuel injection pump assemblies are equipped with a diaphragm-type control unit known as an aneroid which is responsive to intake manifold pressure to limit the movement of the control rack of the injection pump assembly. Under certain speed and load conditions, adequate air is not available in a turbocharged engine to correspond to the amount of fuel injected into each cylinder. Such an overfluelling condition creates unnecessary black smoke, particularly during acceleration. The aneroid prevents such an overfuelling condition by limiting the movement of the control rack until sufficient manifold pressure is reached to overcome aneroid operation. However, many times, particularly in cold weather, overfuelling is required for starting the engine. Therefore, the aneroid is generally provided with a starting fuel control shaft which can be manipulated to deactivate the aneroid so that overfuelling will be permittted for starting.

SUMMARY OF THE INVENTION

The principal object of the present invention is to provide a trigger mechanism for the control member of a fuel injection pump assembly aneroid which will automatically move the control member to deactivate the aneroid when the fuel shut-off lever of the injection pump assembly is moved to its fuel-off position and will permit the return of the control member to its original position to activate the aneroid when the speed control lever of the fuel injection pump assembly is advanced towards its high-speed position.

A more specific object of the present invention is to provide a trigger mechanism for the control member of a fuel injection pump assembly which includes a trigger member formed as a pair of integral legs extending generally at a right angle to each other, the trigger member being mounted on a support for pivotal and rotational movement, having the free end of one leg connected to the control member for moving the control member between aneroid-activated and aneroid-deactivated positions and a second leg extending across the path of movement of pivoted lever means linked to the fuel shut-off lever of the fuel injection pump assembly so that as the fuel shut-off lever is moved to its off position, the lever means contacts the trigger member and rotates the same, a cam lever cooperating with the second leg of the trigger member to pivot the trigger member as it rotates, and a one-way connection between the speed control lever of the fuel injection pump assembly and the cam lever to return the trigger member to its original position as the speed control lever is advanced towards its high-speed position.

The above objects and additional objects and advantages of the present invention will become apparent to those skilled in the art from a reading of the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a top plan view of a trigger mechanism according to the present invention associated with a fuel injection pump;

FIG. 2 is a side elevational view of the structure illustrated in FIG. 1; and

FIG. 3 is a perspective view of the trigger mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The trigger mechanism illustrated in the drawings is associated with a conventional fuel injection pump assembly which includes a pump housing **10** mounted on an engine **12**, a governor housing **14** and an aneroid **16**. As is conventional, a speed control lever **18** and a fuel shut-off lever **20** are mounted exteriorly of the governor housing **14**. An aneroid control member or starting fuel control shaft **22** is reciprocally mounted in the governor housing, projects therefrom, and is biased outwardly. The aneroid **16** is subjected to inlet manifold pressure through suitable tubing (not illustrated) and is normally linked to the fuel injection pump assembly control rack by the control shaft **22** to limit the movement of the control rack towards the maximum position in accordance with inlet manifold pressure. By pushing in on the control shaft **22** a very small amount, the aneroid is disconnected from the control rack so that the control rack can move to the extreme maximum fuel position. When the aneroid is connected to the control rack, it is considered as being activated and when disconnected from the control rack, it is considered to be deactivated.

The trigger mechanism includes a trigger support in the form of an elongated rod **24** which is threaded into the engine block and extends outwardly in a direction generally normal to the pivotal planes of the speed control lever **18** and fuel shut-off lever **20**. Lever means in the form of a bell crank is pivotally mounted on the rod **24** and includes a pair of spaced crank arms **26** and **28** which are rigidly interconnected by a web member **30**. The lever arm **28** is interconnected with the fuel shut-off lever **20** by a rigid link **32** so that on pivotal movement of the bell crank, the fuel shut-off lever will be moved between its fuel-off and fuel-on positions. Movement of the bell crank is controlled in any suitable manner such as through the use of a push-pull cable **34** secured to the free end of the crank arm **26**.

A cam lever **36** is pivotally mounted on the support rod **24** between the crank arm **26** and the engine block and is provided with an outwardly open elongated slot or recess **38**. The bell crank and cam lever are retained in position on the support rod by a washer **40** and cotter key **42** at the outer end of the rod **24** and engagement with a lock nut **44** at the inner end of the rod **24**. The cam lever **36** has a one-way connection with the speed control lever **18** through an abutment member **46**, a rigid link **48** and a stop collar **50**. The abutment member takes the form of an elongated strap which has one end rigidly secured to the speed control lever in any suitable manner and extends rearwardly therefrom. The rear end of the abutment member is provided with an aperture which receives the flower end of the link **48**, the upper end of the link **48** being pivotally connected to the cam lever **36**. The stop collar **50** is adjustably secured on the link **48** and, as explained hereinafter, is adapted to engage the abutment member so that as the speed control lever is moved towards its high-speed position, engagement between the abutment member and stop collar causes the cam lever **36** to pivot about the rod **24**.

The outer end of the support rod **24** and the starting fuel control shaft **22** are provided with aligned apertures, and a trigger member **52** which is formed of a pair of integral legs extending generally at right angles to each other having one leg extending loosely through the aperture in the support rod **24** and its free end extending through the aperture in the starting fuel control shaft **22.** The trigger member is retained in position in the apertures by a pair of cotter keys **54** which engage opposite sides of the support rod **24.** The other leg of the trigger member is spaced from and extends generally back along the length of the support rod **24** so that its free end extends through the recess **38** and engages the inner end thereof. The trigger member extends across the path of movement of the crank arm **26** so that as the crank arm **26** is moved rearwardly to move the fuel shut-off lever to its fuel-off position, it contacts the upper leg of the trigger member and causes the trigger member to rotate within the apertures in the support rod **24** and control rod **22.** The upper leg of the trigger member **52** would normally swing in a plane as the trigger member rotates in the apertures, but since the free end of the upper leg of the trigger member extends through the recess **38,** the cam lever **36** must move with the trigger member and, since it moves in an arc, it has a camming action on the upper leg of the trigger member and causes the outer end of the upper leg of the trigger member to move in an arc. This arcuate movement of the upper leg of the trigger member pivots the trigger member within the aperture provided in the control rod **24** so that the free end of the lower leg of the trigger member moves inwardly moving the starting fuel control shaft inwardly to disconnect the aneroid from the control rack of the fuel injection pump assembly. Since the trigger member and cam lever must cooperate to move the starting fuel control shaft **22** to deactivate the aneroid, they can be collectively referred to as trigger means.

To shut down the engine equipped with the fuel injection pump assembly and trigger mechanism illustrated in the drawings, the speed control lever **18** is pulled rearwardly by any suitable control rod **56** to a slow idle position illustrated in the drawings. The fuel shut-off lever **20** is then moved to its fuel-off position illustrated in the drawing by moving the crank arm **26** rearwardly from the dotted line position illustrated in FIG. **2** to the solid line position. The rearward movement of the crank arm **26** moves the trigger member and cam lever from the dotted line position illustrated in FIG. **2** to the solid line position in the manner previously explained to push the starting fuel control shaft **22** inwardly. The rearward movement of the cam lever and hence the movement of the trigger member is limited by engagement between the abutment member **46** and stop collar **50** so that the upper leg of the trigger member and the cam lever do not reach the point on the arc which permits the starting fuel control shaft to move outwardly. It should also be noted that the trigger member, being in the form of a rod, is resiliently yieldable so that the movement of the upper leg of the trigger member can be greater than the movement of the lower leg thereof without damaging the various parts.

Once the engine has stopped running due to lack of fuel, the fuel shut-off lever is returned to its fuel-on position by forward movement of the crank arm **26** to the dotted line position illustrated in FIG. **2.** When the engine is again being started, the excess fuel for starting is provided since the aneroid is deactivated, but as soon as the speed control lever is moved towards its high-speed position, engagement between the abutment member **46** and stop **50** will act through the link **48** to move the cam lever **36** and trigger member **52** to the dotted line position illustrated in FIG. **2.** This movement permits the starting fuel control shaft to move outwardly to again activate the aneroid so that overfuelling with the resulting black smoke during acceleration is prevented.

It should be noted that although the upper leg of the trigger member **52** is provided a number of bends, this is not critical to the operation of the trigger mechanism. The bends in the embodiment shown were provided only for the purpose of clearing the undisclosed tubing between the engine intake manifold and the aneroid **16.** It clearance of such tubing is not necessary, the upper leg can be straight.

Having thus described and illustrated the preferred embodiment of the invention, various modifications within the spirit and scope of the invention will become apparent to those skilled in the art and can be made without departing from the underlying principles of the invention. Therefore, the invention should not be limited by the specific illustration and description, but only by the scope of the following claims.

I claim:

1. For use with a fuel injection pump assembly including a speed control lever pivotal between opposite extreme positions corresponding to high-speed and idle positions, a fuel shut-off lever pivotal between opposite extreme positions corresponding to fuel-off and fuel-on positions, an aneroid normally preventing overfuelling, and a control member for the aneroid movable between extreme aneroid-activated and aneroid-deactivated positions, a trigger mechanism for the control member comprising: a trigger support; trigger means pivotally mounted on the support and operatively connected to the control member to move the same between its two extreme positions upon pivotal movement; lever means pivotally mounted on the support in a position to engage and pivot the trigger means in a direction to move the control member to its aneroid-deactivated position as the lever means is moved in a first direction; means interlinking the lever means and the fuel shut-off lever to move the fuel shut-off lever toward its extreme fuel-off and fuel-on positions when the lever means is moved in the first direction and an opposite direction, respectively; and means providing a one-way connection between the trigger means and the speed control lever to move the trigger means in a direction to cause movement of the control member to its aneroid-activated position upon movement of the speed control lever toward its high-speed position.

2. The combination as set forth in claim **1** wherein the speed control lever, the fuel shut-off lever and the lever means all pivot in substantially parallel planes, the control member is movable in a direction generally perpendicular to the planes, and the trigger means includes a trigger member formed as a pair of integral legs extending generally at right angles to each other, with a first leg extending generally perpendicular to the planes and across the paths of movement of the lever means and a second leg extending generally perpendicular to the direction of movement of the control member and having its free end operatively connected to the control member.

3. The combination as set forth in claim 2 wherein the trigger support includes an elongated rod extending generally perpendicular to the planes, the second leg is pivotally connected near it inner end to the elongated rod adjacent one end thereof, the second leg is spaced from and extends generally along the elongated rod, and the lever means is pivotal on the elongated rod near the outer end of the second leg.

4. The combination as set forth in claim 3 wherein the one end of the elongated rod and the control member are provided with aligned apertures; the second leg extends loosely through the aperture in the elongated rod and through the aperture in the control member, the trigger means further includes a cam lever pivotal on the elongated rod and having an outerwardly open recess which receives and engages the free end of the first leg so that as the lever means contacts and moves the first leg it rotates the trigger member in the apertures and as the trigger member rotates the cam lever causes the outer end of the first leg to move in an arc which in turn causes the second leg to pivot in the aperture in the elongated rod so that the free end of the second leg moves the control member.

5. A combination as set forth in claim 4 wherein the means providing a one-way connection between the trigger means and speed control lever includes an abutment member secured to the speed control lever for movement toward and away from the cam lever as the speed control lever moves to its high-speed and idle positions respectively, and aperture provided in the abutment member, a rigid link pivotally connected to the cam lever and extending through the aperture, and a stop member on the link between the abutment member and the cam lever.

6. A combination as set forth in claim 5 wherein the trigger member is resilient and the cam lever moves the free end of the first leg through an arc greater than is required to move the control member between its extreme positions.

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