United States Patent

[11] 3,577,969

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[21] Appl. No. **835,413**
[22] Filed **June 23, 1969**
[45] Patented **May 11, 1971**

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[54] **VARIABLE GOVERNOR LIMITING MECHANISM**
3 Claims, 2 Drawing Figs.

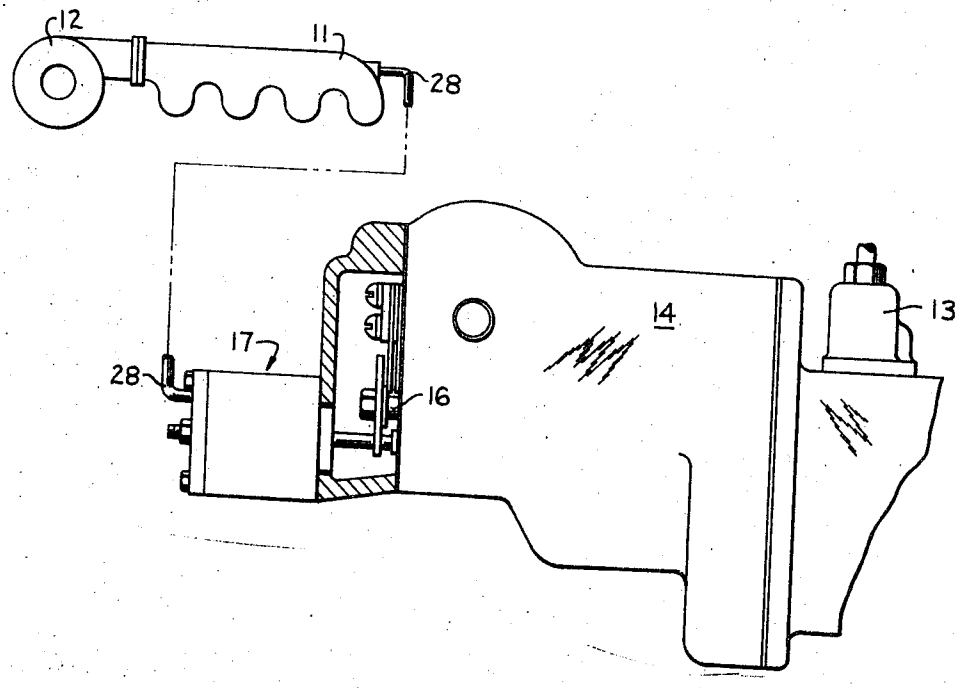
[52] **U.S. Cl.** **123/140,** 123/139
[51] **Int. Cl.** **F02d 1/04,** F02d 1/06, F02b 41/10
[50] **Field of Search** ..... 123/140.2; 92/35—39

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ABSTRACT: A variable limiting mechanism in combination with an engine governor having a movable control rod for establishing an optimum rate of fuel flow, the limiting mechanism being effective to vary the optimum governor setting according to the amount of pressure available within the air inlet manifold for the engine. The limiting mechanism includes a diaphragm member arranged for movement within a housing and defining a first chamber in communication with the air inlet manifold and a second hermetically sealed chamber. A link is secured for movement with the diaphragm member and includes means for limiting motion of the control rod in one direction.



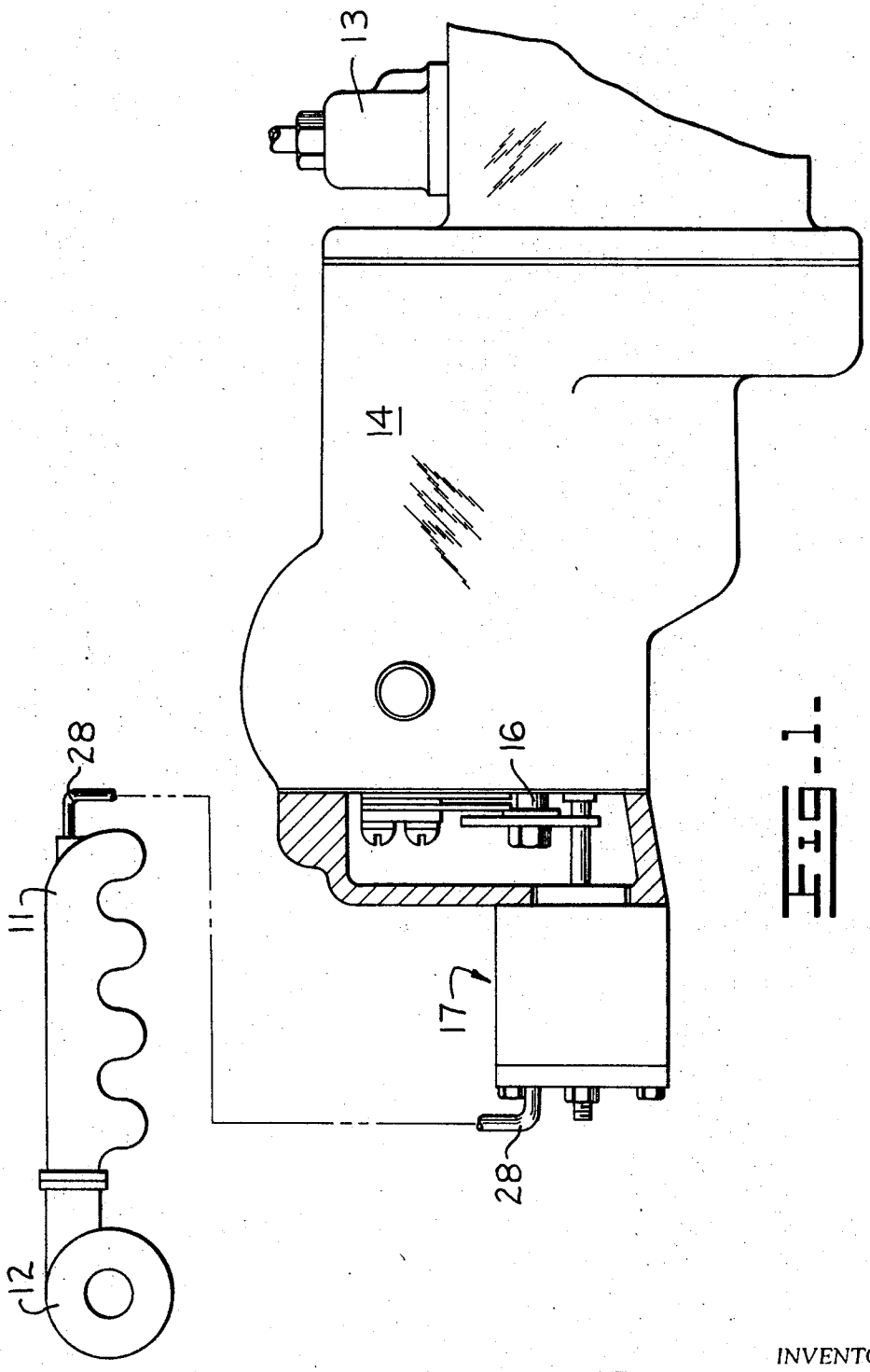


Fig. 1

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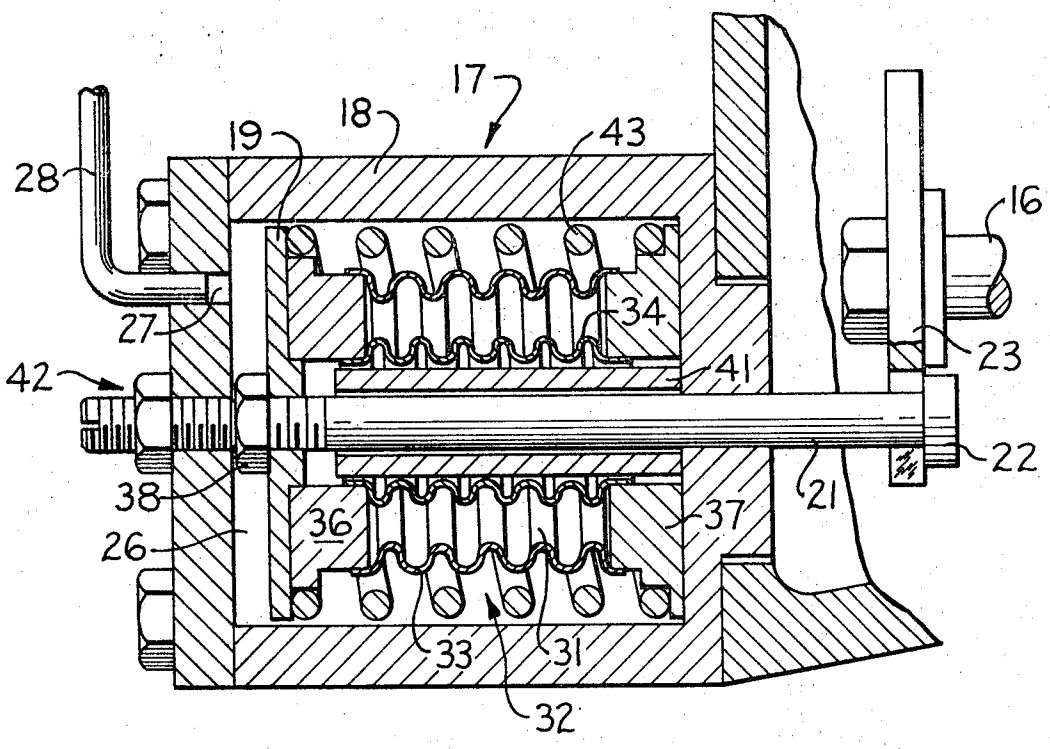


Fig. 2.

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VARIABLE GOVERNOR LIMITING MECHANISM

In various types of engines and particularly in turbocharged engines, governors are employed to establish a rate of fuel delivery to the engine according to the instant operating speed of the engine. Governors of this type are intended to balance the amount of fuel delivered to the engine with the air supply available within the engine inlet manifold to provide for complete combustion of the fuel.

The present invention relates in particular to limiting mechanism for adjusting the governor setting according to ambient air pressure which may vary the amount of air delivered to the inlet manifold for example by a turbocharger. For example, if the governor is adjusted to provide fuel to the engine at a rate permitting its complete combustion at sea level, incomplete combustion tends to result at higher elevations since reduced atmospheric pressure would reduce the amount of air delivered to the inlet manifold. Incomplete combustion of the fuel is generally inefficient and is further undesirable since it tends to cause the emission of excess smoke from the engine.

Accordingly, it is an object of the present invention to provide a mechanically simple limiting mechanism for overcoming problems of the type discussed above.

It is a more particular object of the invention to provide such a limiting mechanism including a single diaphragm member which is simultaneously responsive to pressure from the inlet manifold and to pressure from a hermetically sealed chamber with the diaphragm being associated with the governor to vary its optimum operating setting.

The present invention accomplishes this object by arranging the diaphragm for motion within a housing wherein the diaphragm member divides the housing into two chambers. One of the chambers is hermetically sealed while the other chamber is in communication with the inlet manifold. A link is coupled with the diaphragm member and includes means for limiting motion of a control rod within the governor so that the rate of fuel flow established by the governor corresponds with the amount of air available within the inlet manifold.

Other objects and advantages of the present invention are made apparent in the following description having reference to the accompanying drawings.

In the drawings:

FIG. 1 is a partially sectioned view of the present limiting mechanism and portions of a governor controlled, turbocharger engine with which the limiting mechanism is associated; and

FIG. 2 is an enlarged, fragmentary view of the limiting mechanism with parts shown in secton to illustrate its construction.

In a turbocharged engine system of the type referred to above and partially illustrated in FIG. 1, its operating components include an air inlet manifold 11 and a turbocharger 12 which is driven by the engine (not otherwise shown) to provide air under pressure within the inlet manifold for delivery to the engine. Fuel is delivered to the engine through pumps such as the one indicated at 13.

As is conventional for such turbocharged engine systems, the operating rate of the pump 13 and the rate of fuel delivery to the engine is established by a governor indicated at 14. The governor includes an axially movable control rod, partly illustrated at 16. The control rod is associated with the fuel pump 13 for example by rack and pinion means (not shown), so that the rate of fuel flow provided by the pump 13 is dependent upon the axial position of the control rod 16. The governor 14 is further contemplated as being of a conventional type wherein pivotal flyweights (not shown) are driven in rotation by the engine and tend to position the control rod according to instantaneous operating conditions of the engine. As is further contemplated by the present invention, the fuel pump 13 is adjusted to provide an increased rate of fuel flow when the control rod 16 is positioned rightwardly as viewed in FIG. 1 and to provide a reduced rate of fuel flow as the control rod 16 is shifted in a leftwardly direction as viewed in FIG. 1.

The present invention relates particularly to a limiting mechanism indicated at 17 for use in combination with the governor 14 to provide a variable control over the rate of fuel flow to the engine according to the amount of air available to the inlet manifold 11.

Referring also to FIG. 2, the limiting mechanism 17 includes a closed, cylindrical housing 18 with a diaphragm member 19 arranged for axial movement within the housing 18. The diaphragm member 19 is associated with the control rod 16 by means of a link 21 which includes stop means 22 for limiting movement of the control rod 16 in one direction. As best illustrated in FIG. 2, the link 21 is slidably associated with a bracket 23 secured to one end of the control rod 16. The link 21 penetrates the bracket 23 with the stop means 22 being formed as a flange so that the position of the diaphragm member 19 within the housing 18 provides a variable limit for rightward movement of the control rod 16. Thus, the limiting mechanism 17 tends to vary the maximum rate of fuel flow established by the governor 14 and its control rod 16.

To make the limiting mechanism 17 responsive to the amount of air available to the inlet manifold 11, the diaphragm member 19 forms a first chamber 26 within the housing 18 which is in communication with the manifold 11 by means of a port 27 defined in the housing 18 and a conduit 28 which is also in communication with the inlet manifold 11.

The diaphragm member 19 also forms another chamber 31 within the housing 18. The chamber 31 is hermetically sealed so that its effect upon the diaphragm member 19 tends to be independent of atmospheric or ambient pressures available to the inlet manifold 11. The chamber 31 is is preferably formed by a bellows assembly 32 including bellows 33 and 34 which are coaxially arranged between adapters 36 and 37 secured respectively to the diaphragm member 19 and the housing 18.

The limiting mechanism 17 constructed in this manner is arranged at one end of the governor 14 and control rod 16. The link 21 is secured to the diaphragm member or plate 19 by a locking nut 38 and extends coaxially through the bellows 33, 34 and the housing 18 for association with the control rod 16. Accordingly, the link 21 is permitted to slide axially within the housing 18 while not interfering with the hermetic sealing of the chamber 31.

Overall travel of the diaphragm member 19 in a rightwardly direction within the housing 18 is limited by its interaction with a cylindrical spacer 41 which surrounds the link 21 and is secured to the housing 18. Overall travel of the diaphragm member 19 in a leftwardly direction is limited by interaction of the locking nut 38 with an adjustable stop 42 which threadably penetrates the housing 18.

The diaphragm member or plate 19 also tends to be urged in a leftwardly direction by a spring 43 arranged for interaction between the diaphragm plate 19 and the housing 18. The strength of the spring 43 is selected to offset a preselected amount of air pressure from the inlet manifold 11 existing within the chamber 26. For example, if the governor is initially adjusted for operation at sea level, the spring 43 may be selected to cooperate with pressure in the chamber 31 and balance pressure within the chamber 26 under those conditions.

During operation of the engine system at sea level, a generally maximum amount of air is available to the inlet manifold 11. Thus, in accordance with construction of the limiting mechanism 17 as described above, it permits the control rod 16 of the governor 14 to be shifted fully to the right to provide a relatively maximum amount of fuel flow through the pump 13.

As the engine system moves to higher altitudes wherein the ambient atmospheric pressure tends to be reduced, the amount of air available to the inlet manifold 11 is also reduced resulting in a reduced pressure within the chamber 26. Since the spring 43 and pressure within the chamber 31 are independent of atmospheric pressure, the diaphragm member 19 is shifted leftwardly generally in proportion to the increased altitude at which the engine system is operating. Accordingly,

the link **21** and stop **22** are also shifted leftwardly so that they limit leftward movement of the control rod **16** and effectively reduce the rate of fuel flow which may be delivered by the pump **13**. Accordingly, the optimum fuel flow rate for the pump **13** as regulated by the governor **14** tends to be further adjusted by the limiting mechanism **17** so that fuel is delivered at a rate permitting its complete combustion by the amount of air available through the inlet manifold **11**.

We claim:

1. A variable limiting mechanism in combination with a governor of an engine having an air inlet manifold, the governor including an axially movable control rod for adjusting at least one fuel pump and establishing a desired rate of fuel flow from the pump, the limiting mechanism including a housing arranged at one end of the control rod, a diaphragm member disposed for movement within the housing, a diaphragm member dividing the housing into first and second variable volume chambers, the first chamber being hermetically sealed and the second chamber being in communication with the air inlet manifold a link forming a slidable extension of the control rod, the link being secured for movement with the diaphragm member, the link including means for limiting motion of the control rod in one direction, said first chamber being formed by a pair of coaxially arranged bellows assemblies hermetically associated with the diaphragm member and housing, the link being coaxially arranged within an inner one of the bellows assemblies, and a spring arranged for interaction between the member and the housing, the spring tending to urge the member toward the other chamber, the spring having a strength suitable for establishing preselected positioning of the link and control rod limiting means relative to inlet manifold pressure in the other chamber.

2. The invention of claim **1** further comprising stop means for limiting motion of the diaphragm member within the housing.

3. The invention of claim **1** wherein the secondary chamber is formed by the housing, the diaphragm member and an outer one of the bellows assemblies.