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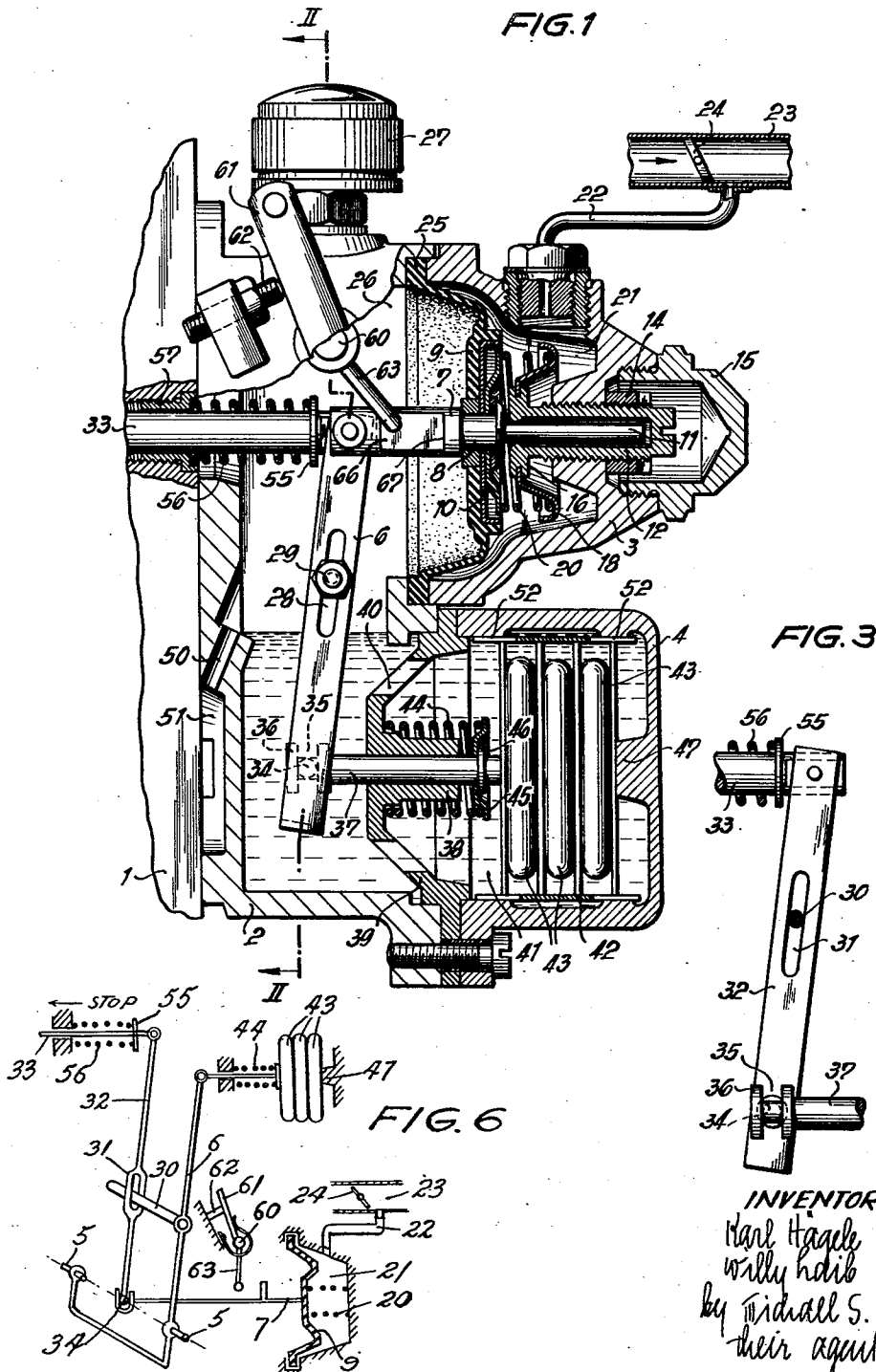
K. HÄGELE ET AL

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INJECTION PUMP CONTROLLING DEVICE

Filed April 19, 1955

2 Sheets-Sheet 1



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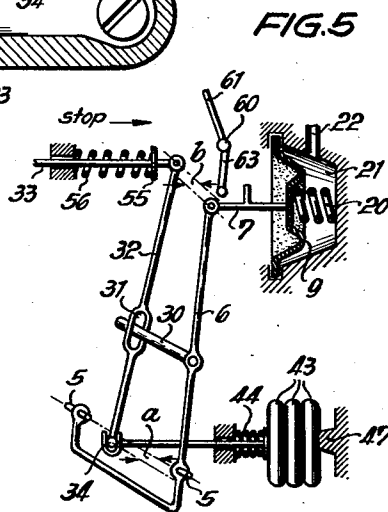
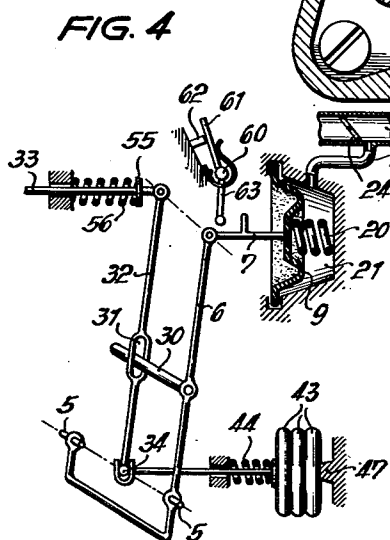
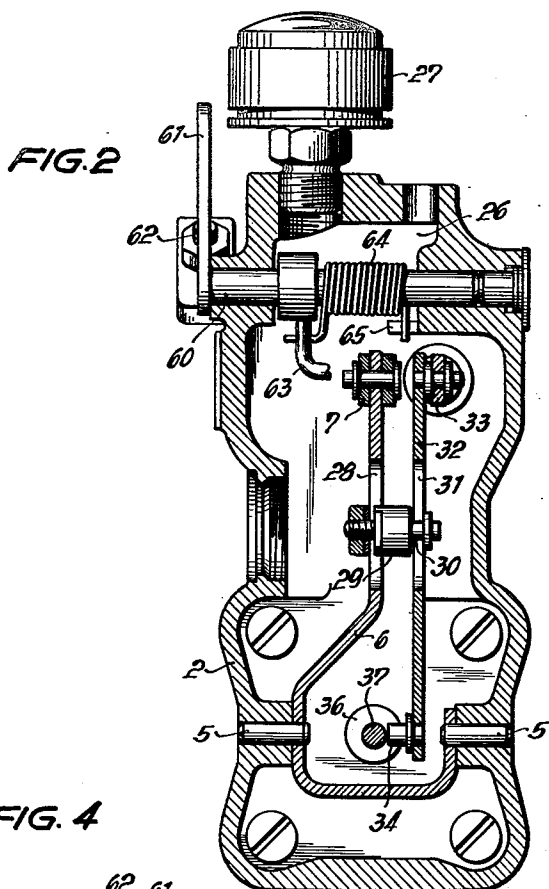
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2 Sheets-Sheet 2



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2,808,819

INJECTION PUMP CONTROLLING DEVICE

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8 Claims. (Cl. 123—140)

The present invention relates to injection pumps and more particularly to a device for controlling an injection pump.

As is well known, it is necessary to control an injection pump connected to an internal combustion engine in accordance with variations in atmospheric pressure as well as variations in the pressure within the intake manifold of the engine. Such control is particularly required when the altitude at which the engine operates is subject to great change, as when the engine is mounted on a vehicle required to travel in mountains as well as at sea level.

One of the objects of the present invention is to provide a control device capable of automatically controlling an injection pump in accordance with variations in the pressure of the atmosphere and in the pressure within the intake manifold.

A further object of the present invention is to provide a device of this type which may be easily accommodated to remaining conventional parts.

Another object of the present invention is to provide a control device which requires a minimum of adjustments and which enables all moving parts to operate in a precise, efficient manner with a minimum of friction.

An additional object of the present invention is to provide a device capable of accomplishing the above objects and at the same time made up of simple, rugged parts which are inexpensive to manufacture and assemble and which will operate reliably for a long period of time.

With the above objects in view, the present invention mainly consists of a device for automatically controlling an injection pump of an internal combustion engine, this device including a support means which movably carries a fuel supply control member and which carries a pair of pressure-sensitive means for respectively sensing the pressure of the atmosphere and the pressure in the intake manifold of the engine, each of these pressure-sensitive means including a movable portion which moves in response to a change in pressure. A first lever is carried by the support means for turning movement in a first plane about a first axis normal to the first plane, this first lever having a free end portion turnable about this first axis and operatively engaging the movable portion of one of the pressure-sensitive means to be moved thereby about the first axis. A pivot means extends along a second axis parallel to the first axis and is carried by the first lever between its free end portion and the first axis. A second lever is guided intermediate its ends by the pivot means for turning movement about this second axis in a second plane parallel to the first plane, this second lever operatively engaging the movable portion of the other of the pressure-sensitive means to be turned thereby about the second axis and also operatively engaging the fuel supply control member to move the same in response to pressure changes sensed by either of the pair of pressure-sensitive means.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both

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as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a fragmentary, sectional, elevational view showing the details of an injection pump control device constructed in accordance with the present invention;

Fig. 2 is a sectional elevational view taken along line II—II of Fig. 1 in the direction of the arrows;

Fig. 3 shows a detail of the structure which is hidden by parts shown in Fig. 1;

Fig. 4 is a schematic illustration of the structure of Figs. 1-3 in one operating position thereof;

Fig. 5 is a schematic illustration of the structure of Figs. 1-3 in a position different from that of Fig. 4; and

Fig. 6 is a schematic illustration of another embodiment of the structure of the invention.

Referring now to the drawings, and to Figs. 1-3 in particular, it will be seen that the fragmentarily illustrated housing 1 of a conventional injection pump has connected thereto a housing portion 2 to which further housing portions 3 and 4 are connected. As is apparent from Fig. 2, the side walls of the housing portion 2 carry a pair of aligned pivot pins 5 which turnably carry a one-armed lever 6 having distant from the axis of pivot pins 5 a free end portion pivotally connected to a rod 7. Thus, the housing 2 and pivot pins 5 form a support means for turnably supporting the lever 6 for turning movement adjacent one end thereof in a vertical plane as viewed in the drawings, about the axis of pins 5, this axis being normal to this vertical plane.

The rod 7 forms a movable portion of a pressure-sensitive means which senses the pressure in the intake manifold 23 fragmentarily illustrated in Fig. 1, and when this pressure changes the rod 7 will shift horizontally to the right or left, as viewed in Fig. 1, to turn the lever 6 about the axis of the pins 5 as a result of the operative engagement between elements 6 and 7. The rod 7 extends to the right from the top end portion of lever 6, as viewed in Fig. 1, and this rod 7 is stepped so as to be provided with elongated end portions of maximum and minimum diameter and an intermediate portion of an intermediate diameter. On this intermediate portion 8 of the rod 7 a diaphragm 9 and a plate 10 are fastened in any suitable fluid-tight manner, as is indicated in Fig. 1. The end portion 11 of the rod 7, which is of minimum diameter, extends into a tube 12 which has an outer thread serving to threadedly mount the tube 12 in a position extending through a threaded bore of the housing portion 3. The tube 12 is maintained in position by a nut 14 which threadedly engages the tube 12 and abuts against the housing portion 3. A cap 15 is threadedly connected to the housing portion 3 in the manner indicated in Fig. 1 in order to cover the end of the tube 12 and the nut 14. The inner diameter of the tube 12 is reduced at its left end portion, as viewed in Fig. 1, and the portion 11 of rod 7 extends slidably through this end portion of reduced diameter of the tube 12 so that the latter serves in this way to guide the rod 7 slidably for movement to the right and left, as viewed in Fig. 1. The end portion of tube 12 which slidably guides the rod 7 extends into the interior of the housing portion 3 and the annular part of the tube 12 which engages portion 11 of rod 7 is of a semispherical cross-section so that the rod 7 may tilt slightly during turning of the lever 6 about the axis of pivot pins 5. Furthermore, this end portion of the tube 12 includes an outwardly extending annular flange 16 formed with an annular groove into which an annular channel member 18 extends, so that this latter member is in this way carried by the tube 12. A coil spring 20 extends about the axis of rod 7 and has its ends in engagement with elements 10 and 18, respectively, as illus-

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trated in Fig. 1, so that in this way the spring 20 urges the diaphragm 9 together with rod 7 to the left, as viewed in Fig. 1.

The interior 21 of housing portion 3, which is sealed from the interior of housing portion 2 by the diaphragm 9, communicates in a fluid-tight manner through the conduit 22 with the intake manifold 23 of the internal combustion engine whose further parts are purely conventional and not illustrated. This intake manifold 23 is provided in a known way with a butterfly valve 24 which is controllable at the will of the operator. The diaphragm 9 and spring 20 form the essential control elements which are sensitive to the pressure prevailing in the manifold 23 downstream of the valve 24, as illustrated in Fig. 1. The outer thickened periphery 25 of the diaphragm 9 is clamped between housing parts 2 and 3 and seals the connection between these parts. The interior 26 of the housing portion 2 communicates with the outer atmosphere through an air filter 27.

The one-armed lever 6 is formed with a slot 28 through which a pivot means 29 extends. This pivot means 29 extends along an axis parallel to that of the pivot pins 5 and the pivot means 29 is clamped to the lever 6 by a nut, for example, in the manner shown most clearly in Fig. 2. By loosening this nut it is possible to shift the pivot means 29 to a desired position along lever 6 between the turning axis formed by the pivot pins 5 and the top free end portion of the lever 6. The pivot means 29 includes a free end portion 30 which extends through an elongated slot 31 formed in a two-armed lever 32 so that the pivot means 29 guides lever 32 for turning movement in a second plane parallel to that in which lever 6 turns about the axis of the pivot means 29 which is normal to both of these planes. As is apparent from Fig. 2, the lever 32 may extend into an annular space formed between a collar fixed to the portion 30 of pivot means 29 and the remainder of the latter.

One arm of the lever 32 is pivotally connected at its free end portion to a fuel supply control member 33 which is movably carried by the support means formed by the housing 1. The fuel supply control member 33 controls the amount of fuel which is supplied by the injection pump in a purely conventional manner forming no part of the present invention and well-known to those skilled in the art, so that in the interest of conciseness the further details of the fuel supply control are not illustrated. At its opposite free end portion the lever 32 carries a pin 34 which extends into an annular groove 35 formed in a collar 36 fixed to a rod 37 of a second pressure-sensitive means, this latter means being sensitive to the pressure of the outer atmosphere and the rod 37 forming a movable portion of this pressure-sensitive means which shifts to the right or left, as viewed in Fig. 1, when the atmospheric pressure changes. The rod 37 extends slidably through the tubular hub 38 of an annular member 39 which is clamped between the housing portions 2 and 4. This annular member 39 is formed with openings 40 so that the interior 41 of housing portion 4 communicates through the interior 26 of housing portion 2 and through the filter 27 with the outer atmosphere. The housing portion 4 is formed of a cast light metal, such as aluminum, aluminum alloy, or the like, and a steel tube 42 is carried within the housing 4 in order to guide a unit similar to a bellows formed by three gas-filled pockets 43 made of a flexible resilient material which is capable of stretching and contracting in response to changes in the pressure of the gas within the pockets. As is evident from Fig. 1, the pockets 43 are located between and carried by plates which do not extend completely across the tube 42 and which are slidable along the axis thereof. A spring 44 is coiled about the hub 38 and abuts against the annular member 39 as well as against the plate 45 which engages a collar 46 fixed to the rod 37, the right end of this rod 37, as viewed in Fig. 3, abutting against the leftmost plate between which the pockets 43 are located. The rightmost one of these

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plates, as viewed in Fig. 1, abuts against a projection 47 which extends inwardly from the right wall of the housing portion 4, as viewed in Fig. 1. The pockets 43 together with the spring 44 form the essential control elements of the pressure-sensitive means which responds to changes in atmospheric pressure.

The wall of the housing portion 2 which engages the housing 1 of the injection pump is formed with an inclined bore 50 communicating with the interior 26 of housing portion 2 and with a cutout 51 which communicates in an unillustrated manner with the chamber of the injection pump in which the cam shaft thereof is located. The interior 26 of housing portion 2 as well as the interior 41 of housing portion 4 are filled with oil up to the elevation of the top end of bore 50. Thus, the bore 50 serves as an overflow which delivers oil to the cutout 51 and the cam shaft chamber when too much oil is supplied to the interior of the housing portion 2 through any suitable opening. In order that the oil may completely surround the pockets 43, the tube 42 is formed with notches 52, and furthermore, the inner surface of housing 4 is formed with an annular groove which overlaps these notches, as is evident from Fig. 1. The oil serves to reduce the friction between the tube 42 and the plates which carry the pockets 43, and furthermore this oil serves to dampen any vibrations.

At its end portion which extends into the interior 26 of housing portion 2 the fuel supply control member 33, which is pivotally connected to the lever 32 in the manner illustrated in Fig. 3 as well as Fig. 2, is provided with a collar 55 which is fixed to the control member 33. A weak spring 56 is coiled about control member 33 and abuts against the collar 55 as well as against a tube 57 threaded into the housing 1 and slidably supporting the fuel supply control member 33. The spring 56 serves the purpose of eliminating play from the above described linkage.

The housing portion 2 turnably supports a shaft 60 in the manner shown most clearly in Fig. 2, and at an end which extends to the exterior of housing 2 the shaft 60 fixedly carries a lever 61 which in the position illustrated in Figs. 1 and 2 bears against a stop screw 62 fixedly mounted on a rigid lug located at the exterior of the housing portion 2. The stop screw 62 is threadedly carried by this lug and is fixed with respect to the lug in an adjustable manner by the nut shown in Fig. 1. In the interior of the housing portion 2 the shaft 60 fixedly carries a lever 63 against which one end of a spring 64 bears, this spring 64 being coiled about the shaft 60 and having its opposite end located within a cutout formed in a lug 65 rigid with the housing portion 2. As is apparent from Figs. 1 and 2, the spring 64 urges the shaft 60 together with levers 61 and 63 in a counterclockwise direction, as viewed in Fig. 1, so that the spring 64 urges the lever 61 against the stop 62. The free end of lever 63 is bent substantially at a right angle to the remainder of lever 63 and extends into a cutout 66 formed in and extending axially along the side surface of the rod 7. The right end face 67 of cutout 66, shown in Fig. 1, engages lever 63 to limit the full load position of rod 7 and diaphragm 9 so as to also limit the extent to which levers 6 and 32 and control member 33 may be moved. Thus, the stop screw 62 may be set to limit the full load position of the control device.

The parts of the above-described structure are shown in Figs. 1-3 in the position which they assume at a high vacuum in the interior 21 of housing portion 3 and at sea level. Such a high vacuum is provided in the interior 21 of housing portion 3 when, for example, the butterfly valve 24 is turned to the position shown in Fig. 1 in order to stop the engine. The fuel supply control member 33 is then in its stop position which is limited by an unillustrated stop within the injection pump.

The parts of the above described structure are arranged in such a way that the path of movement of the fuel supply control member 33 and the path of movement of

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the rod 7 are located substantially in a single plane which is horizontal, as viewed in Figs. 1 and 2, while the path of movement of rod 37 and the axis of pivot pins 5 are located substantially in a single plane which is also horizontal and parallel to the plane which includes the paths of movement of elements 33 and 7. These horizontal planes are perpendicular to the vertical planes in which levers 6 and 32 are respectively movable. In this way the movement of the fuel supply control member 33 corresponds almost exactly to the movement of the diaphragm 9.

The schematic illustration of Fig. 4 shows the parts in that position which they take at partial load at sea level. The valve 24 in the intake manifold 23 is partially opened. The diaphragm 9 becomes located in the illustrated position as a result of the action of spring 20 and the extent of the vacuum prevailing within the interior 21 of housing portion 3, and this position of the diaphragm 9 determines the position of lever 6 and pivot means 29 which forms the turning axis for the two-armed lever 32. The pockets 43 assume at sea level a position at which the annular groove 35 locates the pin 34 of lever 32 along the axis of pivot pins 5.

At low atmospheric pressure, as, for example, when the engine is operating in mountainous areas, the pockets 43 expand and shift rod 37 to the left, as viewed in Fig. 1, so as to move the pin 34 of lever 32 through the distance *a*, for example, indicated in Fig. 5. This movement of pin 34 to the left through distance *a*, as viewed in Fig. 5, results in clockwise turning of lever 32, as viewed in Fig. 5, about the axis of part 30 of the pivot means 29, and as a result the fuel supply control member 33 is shifted in the stop direction indicated in Fig. 5 through the distance *b*. In this way the amount of fuel supplied by the injection pump is automatically reduced in correspondence to the smaller weight of air which the engine sucks in at each stroke at lower atmospheric pressure. The ratio of distance *a* to distance *b* is determined by the ratio between the lengths of the arms of the two-armed lever 32, and this latter ratio may be regulated by adjusting the position at which the pivot means 29 is located along the slot 28 of the lever 6.

In order to facilitate the starting of the internal combustion engine, by providing an enriched fuel-air mixture, it is possible to turn the lever 61 against the influence of spring 64 in a clockwise direction, as viewed in Fig. 1, away from the stop 62. In this way, the lever 63 engages the left face of cutout 66 of rod 7, as viewed in Fig. 1, to shift this rod 7 to the left, as viewed in Fig. 1, and this shifting of rod 7 causes the lever 6 to turn in a counterclockwise direction, as viewed in Fig. 1, so as to shift the pivot means 29 to the left, as viewed in Fig. 1, which results in turning of lever 32 in a counterclockwise direction, as viewed in Fig. 3, so as to shift the fuel supply control member 33 to the left, as viewed in Figs. 1 and 3, and this shifting of member 33 enables the injection pump to supply a greater amount of fuel. It is not essential that the means sensitive to the manifold pressure be connected to the lever 6 and that the means sensitive to atmospheric pressure be connected to the lever 32. It is possible for this arrangement to be reversed with the means sensitive to the manifold pressure connected to the lever 32 and the means sensitive to atmospheric pressure connected to the lever 6, and Fig. 6 shows such an arrangement.

Referring to Fig. 6, the fuel control rod 33 which carries the collar 55 and is acted on by the spring 56 is pivotally connected to the top end of the lever 32 in the same way as the above-described structure, but the bottom end of the lever 32 is pivotally connected at 34 with the rod 7 which cooperates with the diaphragm 9 the right side of which, as viewed in Fig. 6, communicates with the manifold 23 in the above-described manner.

The lever 6 is supported for turning movement in the same way as described above and cooperates with the

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lever 32 in the same way. However, in the embodiment of Fig. 6 the top end of the lever 6 is in pivotal engagement with the rod 37 which passes through the spring 44 and cooperates with the pressure-sensitive pockets 43, in the manner described above. Thus, with the embodiment of Fig. 6 the lever 6 will turn in response to expansion and contraction of the pockets 43, while the lever 32 will turn in response to movement of the diaphragm 9, but the results produced by the structure of Fig. 6 will be the same as that produced by the structure of Figs. 1-5.

With the embodiment of Fig. 6 the adjustable stop means 60-63 still cooperates with the rod 7 in the manner described above, as is shown schematically in Fig. 6.

Thus, in order to effect the reversal of the cooperation of the levers 6 and 32 respectively with the pair of pressure-sensitive means, the latter pair of means need only have their positions interchanged so that they are located as shown in Fig. 6, and the stop means 60-63 is repositioned so as to cooperate with the rod 7.

It will be noted that with the arrangement of Fig. 6 the stop direction of the rod 33 is the reverse of that of Fig. 5 and is directed to the left, as viewed in Fig. 6, rather than to the right, as viewed in Fig. 5.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of injection pump control device differing from the types described above.

While the invention has been illustrated and described as embodied in automatic control device for an injection pump, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A device for automatically controlling an injection pump of an internal combustion engine, comprising, in combination, support means; a fuel supply control member movably carried by said support means; a pair of pressure-sensitive means carried by said support means for respectively sensing the pressure of the atmosphere and the pressure in the intake manifold of the engine, each of said pressure-sensitive means including a movable portion which moves in response to a change in pressure; a first lever carried by said support means for turning movement in a first plane about a first axis normal to said first plane, said first lever having a free end portion turnable about said first axis and operatively engaging said movable portion of one of said pressure-sensitive means to be moved thereby about said first axis; pivot means extending along a second axis parallel to said first axis and carried by said first lever between said free end portion thereof and said first axis; and a second lever guided intermediate its ends by said pivot means for turning movement about said second axis in a second plane parallel to said first plane, said second lever operatively engaging said movable portion of the other of said pressure-sensitive means to be turned thereby about said second axis and also operatively engaging said fuel supply control member to move the same in response to pressure changes sensed by either of said pair of pressure-sensitive means.

2. A device for automatically controlling an injection pump of an internal combustion engine comprising, in combination, support means; a first lever carried by said support means for turning movement in a first plane about

a first axis normal to said first plane, said first lever having a free end portion turnable about said first axis; first pressure-sensitive means responsive to the pressure in the intake manifold of the engine operatively engaging said free end portion of said first lever for turning the latter about said first axis; pivot means extending along a second axis parallel to said first axis and carried by said first lever between said free end portion thereof and said first axis; a second lever guided intermediate its ends by said pivot means for turning movement about said second axis in a second plane parallel to said first plane; second pressure-sensitive means responsive to atmospheric pressure operatively engaging one end portion of said second lever for turning the latter about said second axis in response to a change in atmospheric pressure; and a fuel supply control member movably carried by said support means and operatively engaged by the other end portion of said second lever to be moved thereby.

3. A device for automatically controlling an injection pump of an internal combustion engine, comprising, in combination, support means; a fuel supply control member movably carried by said support means for movement along a path located in a first plane; a pair of pressure-sensitive means carried by said support means for respectively sensing the pressure of the atmosphere and the pressure in the intake manifold of the engine, each of said pressure-sensitive means including a movable portion which moves in response to a change in pressure, said movable portion of said pressure-sensitive means responsive to pressure in the intake manifold being movable along a path located substantially in said first plane; a first lever carried by said support means for turning movement in a second plane normal to said first plane about a first axis normal to said second plane, said first lever having a free end portion turnable about said first axis and operatively engaging said movable portion of one of said pressure-sensitive means to be moved thereby about said first axis; pivot means extending along a second axis parallel to said first axis and carried by said first lever between said free end portion thereof and said first axis; and a second lever guided intermediate its ends by said pivot means for turning movement about said second axis in a third plane parallel to said second plane, said second lever operatively engaging said movable portion of the other of said pressure-sensitive means to be turned thereby about said second axis and also operatively engaging said fuel supply control member to move the same in response to pressure changes sensed by either of said pair of pressure-sensitive means.

4. A device for automatically controlling an injection pump of an internal combustion engine, comprising, in combination, support means; a fuel supply control member movably carried by said support means; a pair of pressure-sensitive means carried by said support means for respectively sensing the pressure of the atmosphere and the pressure in the intake manifold of the engine, each of said pressure-sensitive means including a movable portion which moves in response to a change in pressure, said movable portion of said pressure-sensitive means sensing the pressure of the atmosphere being movable along a path located in a first plane; a first lever carried by said support means for turning movement in a second plane normal to said first plane about a first axis normal to said second plane and located in said first plane, said first lever having a free end portion turnable about said first axis and operatively engaging said movable portion of one of said pressure-sensitive means to be moved thereby about said first axis; pivot means extending along a second axis parallel to said first axis and carried by said first lever between said free end portion thereof and said first axis; and a second lever guided intermediate its ends by said pivot means for turning movement about said second axis in a third plane parallel to said second plane, said second lever operatively engaging said movable portion of the other of said pressure-sensitive means to be

turned thereby about said second axis and also operatively engaging said fuel supply control member to move the same in response to pressure changes sensed by either of said pair of pressure-sensitive means.

5. A device for automatically controlling an injection pump of an internal combustion engine, comprising, in combination, support means; a fuel supply control member movably carried by said support means for movement along a path located in a first plane; a pair of pressure-sensitive means carried by said support means for respectively sensing the pressure of the atmosphere and the pressure in the intake manifold of the engine, each of said pressure-sensitive means including a movable portion which moves in response to a change in pressure, said movable portion of said pressure-sensitive means responsive to pressure in the intake manifold being movable along a path located substantially in said first plane and the other movable portion being movable along a path located in a second plane parallel to said first plane; a first lever carried by said support means for turning movement in a third plane normal to said first and second planes about a first axis normal to said third plane and located in said second plane, said first lever having a free end portion turnable about said first axis and operatively engaging said movable portion of one of said pressure-sensitive means to be moved thereby about said first axis; pivot means extending along a second axis parallel to said first axis and carried by said first lever between said free end portion thereof and said first axis; and a second lever guided intermediate its ends by said pivot means for turning movement about said second axis in a fourth plane parallel to said third plane, said second lever operatively engaging said movable portion of the other of said pressure-sensitive means to be turned thereby about said second axis and also operatively engaging said fuel supply control member to move the same in response to pressure changes sensed by either of said pair of pressure-sensitive means.

6. A device for automatically controlling an injection pump of an internal combustion engine, comprising, in combination, support means; a fuel supply control member movably carried by said support means; a pair of pressure-sensitive means carried by said support means for respectively sensing the pressure of the atmosphere and the pressure in the intake manifold of the engine, each of said pressure-sensitive means including a movable portion which moves in response to a change in pressure; a first lever carried by said support means for turning movement in a first plane about a first axis normal to said first plane, said first lever having a free end portion turnable about said first axis and operatively engaging said movable portion of one of said pressure-sensitive means to be moved thereby about said first axis; pivot means extending along a second axis parallel to said first axis and carried by said first lever between said free end portion thereof and said first axis; means for adjustably locating said pivot pins at a predetermined position along said first lever; and a second lever formed intermediate its ends with an elongated slot through which said pivot means extends to be guided by said pivot means for turning movement about said second axis in a second plane parallel to said first plane, said second lever operatively engaging said movable portion of the other of said pressure-sensitive means to be turned thereby about said second axis and also operatively engaging said fuel supply control member to move the same in response to pressure changes sensed by either of said pair of pressure-sensitive means.

7. In a device for automatically controlling an injection pump of an internal combustion engine, in combination, support means; a first lever turnably carried adjacent an end thereof by said support means for turning movement in a first plane about a first axis normal to said first plane, said first lever having a free end portion distant from said first axis; pivot means carried by said first lever between said first axis and free end portion and

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extending along a second axis parallel to said first axis; and a third lever turnably guided intermediate its ends by said pivot means for turning movement about said second axis in a second plane parallel to said first plane, whereby when said free end portion of said first lever and one end portion of said second lever are respectively in operative engagement with a pair of pressure-sensitive means respectively responsive to changes in the pressure of the atmosphere and in the intake manifold of the engine and the other end portion of said second lever operatively engages a fuel supply control member, the latter will be moved by said levers in response to changes in either of said pressures.

8. A device for automatically controlling an injection pump of an internal combustion engine comprising, in combination, support means; a first lever carried adjacent one end by said support means for turning movement in a first plane about a first axis normal to said first plane, said first lever having a free end portion distant from said first axis; first pressure-sensitive means responsive to the pressure in the intake manifold of the engine and having a portion movable in a second plane normal to said first plane operatively engaging said free end por-

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tion of said first lever for turning the latter about said first axis; pivot means extending along a second axis parallel to said first axis and carried by said first lever between said first axis and said free end portion; a fuel supply control member movably carried by said support means for movement along a path located substantially in said second plane; a second lever turnably carried by said control member for turning movement in a third plane parallel to said first plane, said second lever being formed intermediate its ends with a cutout into which said pivot means extends; and a second pressure-sensitive means responsive to atmospheric pressure and having a portion, movable in a fourth plane parallel to said first plane and including said first axis, operatively engaging a free end portion of said second lever distant from said fuel supply control member.

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