April 24, 1951 B. G. VALENTINE 2,549,948

ACCESSORY MOUNTING FOR INTERNAL-COMBUSTION ENGINES

Filed Aug. 9, 1948 4 Sheets-Sheet 1

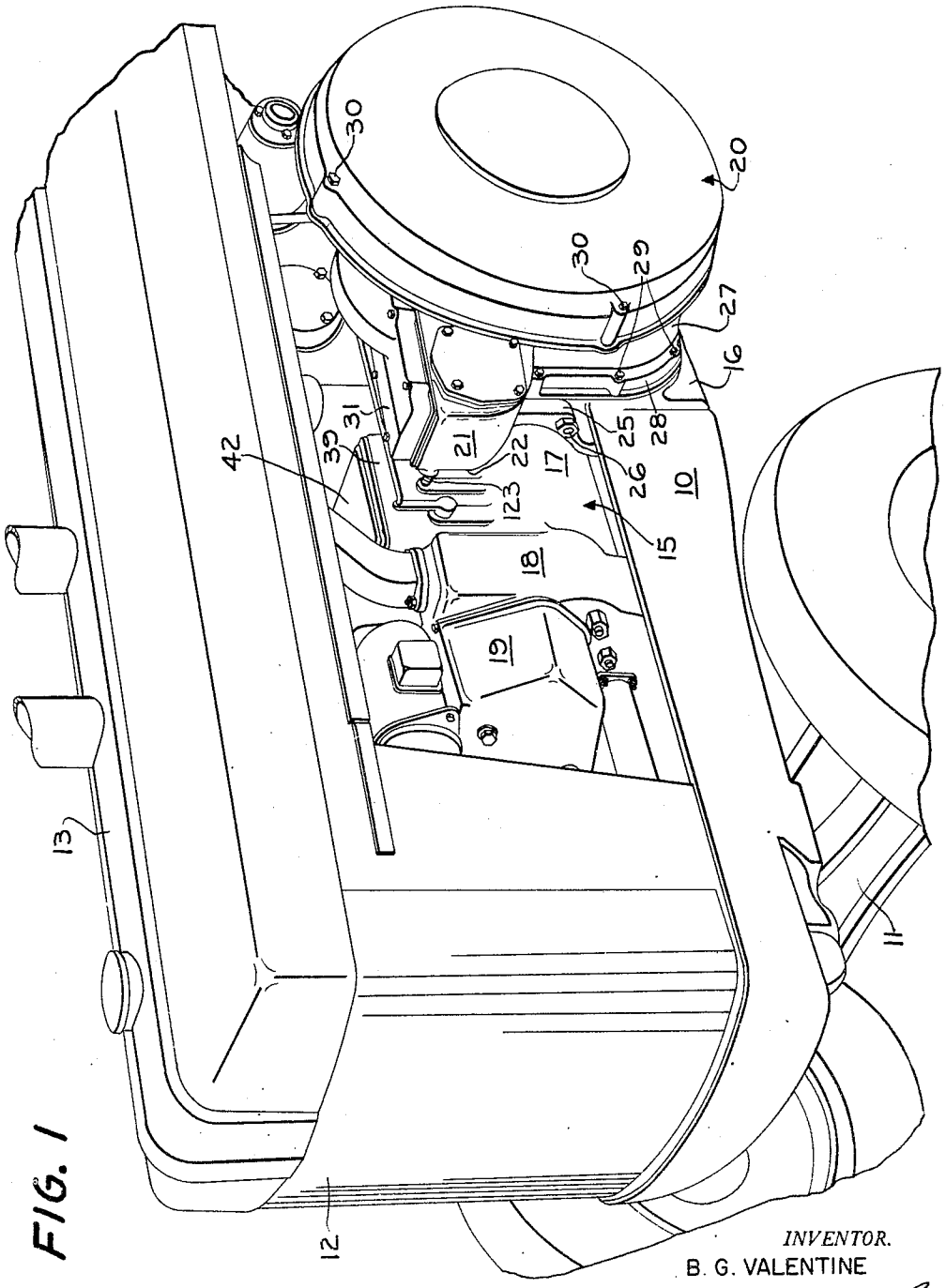


FIG. 1

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ACCESSORY MOUNTING FOR INTERNAL-COMBUSTION ENGINES

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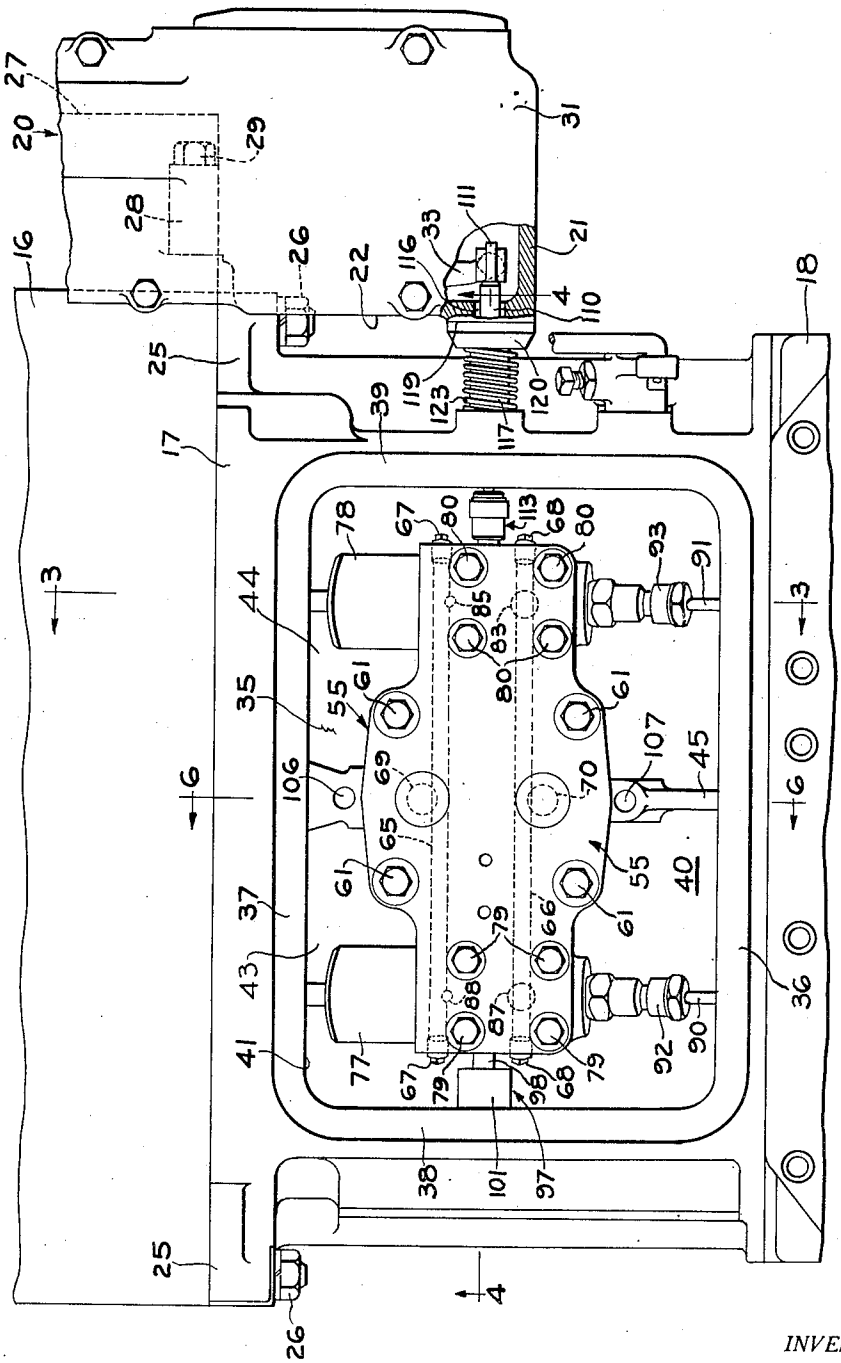


FIG. 2

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ACCESSORY MOUNTING FOR INTERNAL-COMBUSTION ENGINES

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FIG. 3

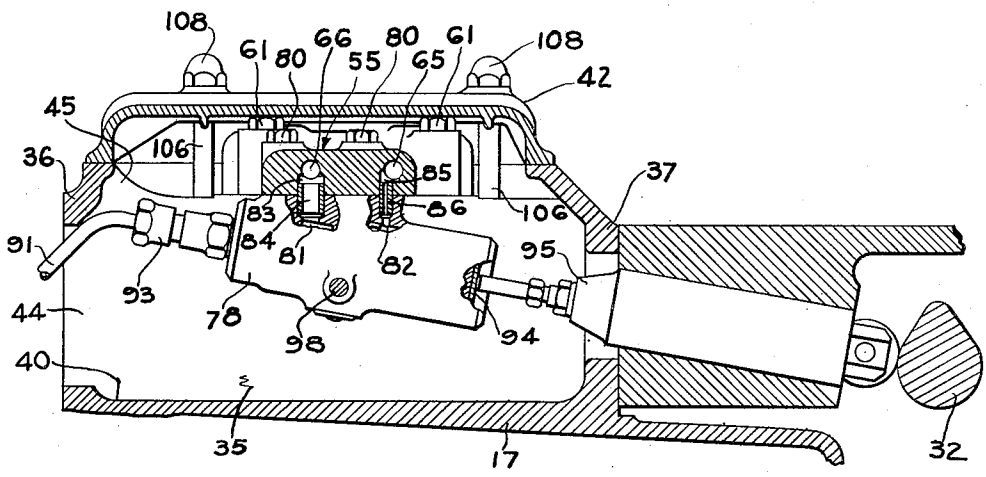


FIG. 4

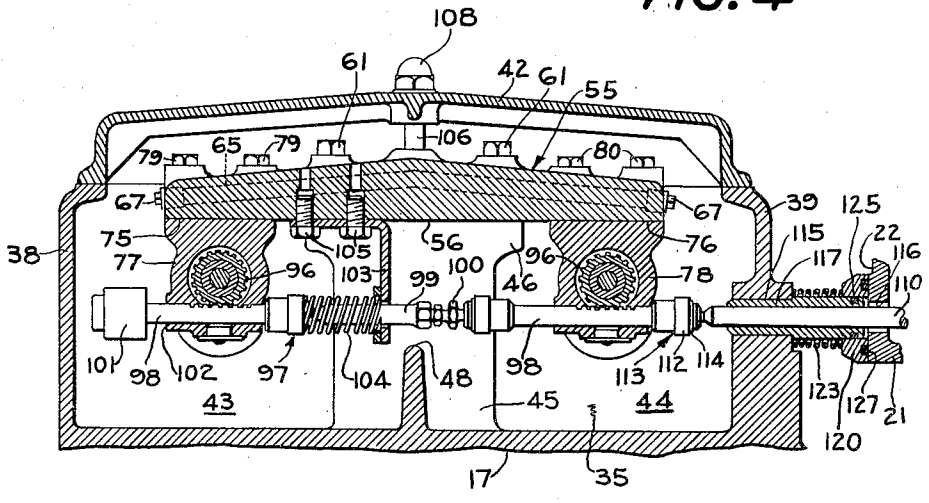
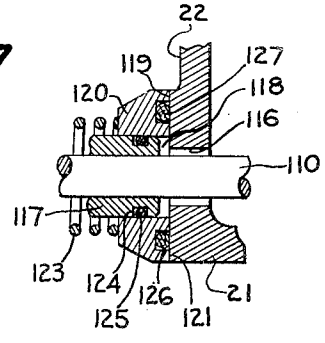


FIG. 7



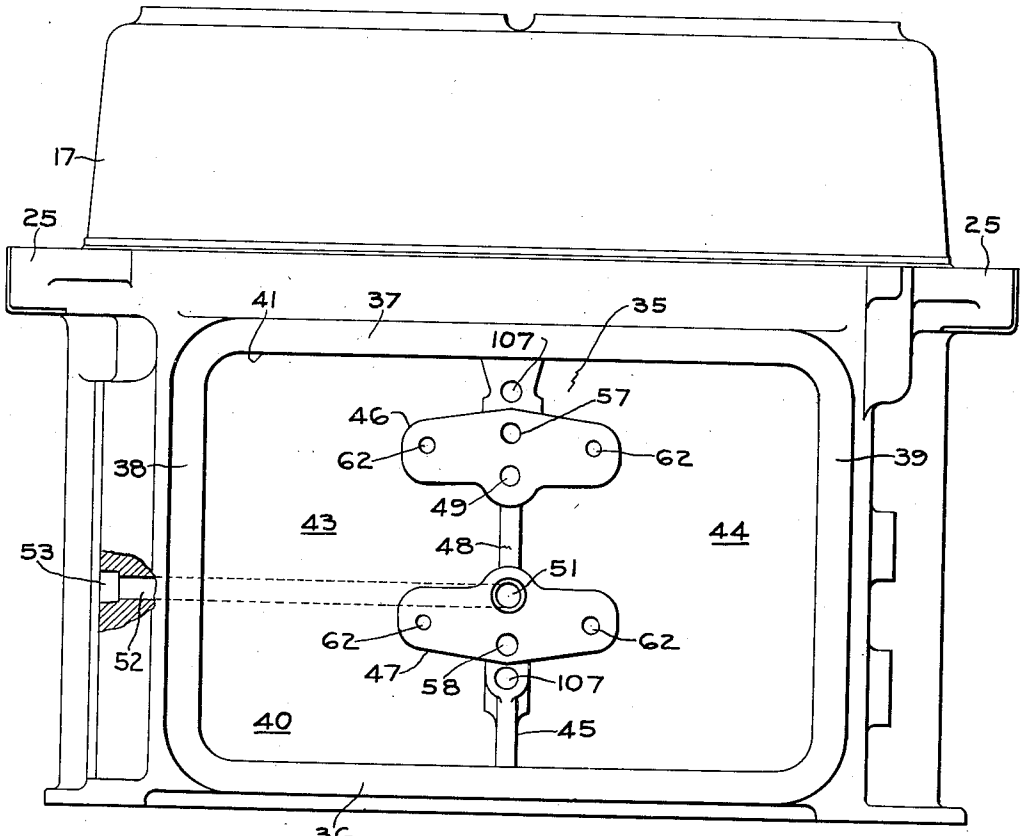
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ACCESSORY MOUNTING FOR INTERNAL-COMBUSTION ENGINES

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FIG. 5



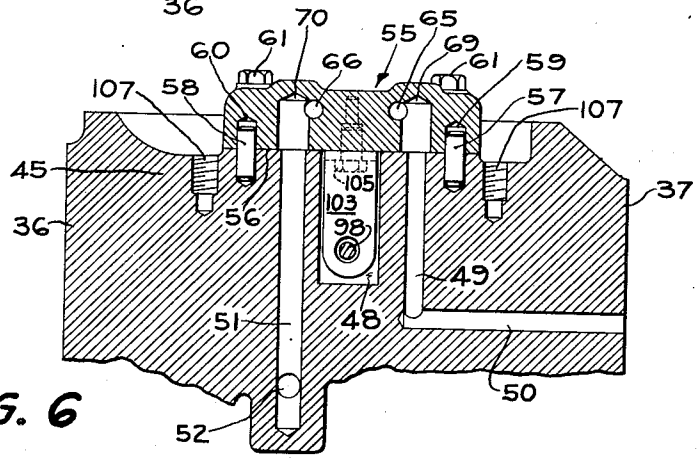


FIG. 6

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Patented Apr. 24, 1951 2,549,948

UNITED STATES PATENT OFFICE

2,549,948

ACCESSORY MOUNTING FOR INTERNAL-COMBUSTION ENGINES

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Application August 9, 1948, Serial No. 43,190

18 Claims. (Cl. 123—195)

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This invention relates to an internal combustion engine; more particularly the invention relates to a solid fuel injection engine and to improved means for mounting the fuel injection pump for such engine. Still further, the invention relates to the mounting and arrangement of engine parts and sealing means for a control element extending between said parts.

The invention is directed primarily toward improving the general structure of an engine of the type shown in the U. S. patent to McCray 1,919,069, wherein there is shown an engine of the two-cylinder type in which the cylinders are horizontal and extend longitudinally in a tractor body of which the engine forms a part. According to the present invention, it is a feature to provide a compartment on top of the main cylinder casting of the engine and to removably mount fuel injection pumps on a support in this compartment. It is an important object of the invention to provide the fuel injection pumps as part of a unit including a carrier member to which the pumps are secured, the arrangement being such that the unit may be tested apart from the engine and then installed in the engine without disturbing the adjustment made during the testing operation. In this respect, another feature of the invention resides in the interconnection of the fuel pump by means of a control element and to arrange the supporting means in the compartment in such manner that the installation of the fuel pump unit can be accomplished without disturbing any adjustment made in the control element, the supporting means in a preferred form of the invention having a notch or opening for receiving the control element.

Other features of the invention reside in the detailed arrangement and combination of parts set forth in the following description and claims and illustrated in the accompanying sheets of drawings, together with other features that will readily occur to those versed in the art.

In the drawings:

Figure 1 is a perspective view of the front and left side portion of a tractor of the general type referred to;

Figure 2 is an enlarged fragmentary plan view of the compartment and related engine structure, shown in connection with the mounting of a fuel pump unit, the cover of the compartment having been removed;

Figure 3 is a transverse sectional view taken substantially on the line 3—3 of Figure 2;

Figure 4 is a longitudinal sectional view taken on the line 4—4 of Figure 2;

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Figure 5 is a detail view of the engine part that includes the unit compartment;

Figure 6 is a transverse sectional view taken substantially on the line 6—6 of Figure 2; and

Figure 7 is an enlarged fragmentary sectional view showing the sealing means.

Although, as stated above, the invention covers structural details designed primarily for an engine of the type in which the cylinders are horizontal, it is not intended that the invention be necessarily limited in all its phases to such engine. Likewise, the structural details need not be arranged in the positions illustrated and described nor need they absolutely follow the general proportions of the parts illustrated, reference in the specification and claims to the parts as extending in certain directions being only illustrative and for convenience.

In the illustration of the forward portion of a tractor in Figure 1, the tractor is shown as including a forward body part 10 carried on a transverse wheeled axle 11. The forward part of the body includes an upstanding radiator grille or enclosure structure 12 from the upper portion of which a hood 13 extends rearwardly. The internal combustion engine is of the solid fuel injection type and is designated generally by the numeral 15, being carried by the tractor main case as illustrated in the patent referred to above. Such main case is represented generally by the numeral 16 here. The engine includes a main casting 17 in which two horizontal cylinders (not shown) are formed. To the forward end of the cylinder casting 17 is secured a cylinder head 18. The particular engine shown is of the type having overhead valves (not shown) and the cover therefor is illustrated at 19.

Since the cylinders of the engine are horizontal and extend parallel to the general longitudinal center line of the tractor, the crankshaft thereof (not shown) extends transverse to the tractor and at one side thereof the engine is provided with a flywheel and timing gear mechanism (not shown) enclosed in a housing designated generally by the numeral 20, this housing providing an engine part rigidly secured to the engine part including the cylinder casting 17. The housing 20 includes in general an auxiliary forwardly extending housing part 21 which has an inner wall 22 (see Figures 2 and 4) spaced laterally outwardly or to the left from an upper wall portion of the engine part or casting 17. The detailed relationship between the engine parts will be described below.

From the description thus far, it will be seen

that the main case 16 serves to carry the engine parts 17 and 20. The cylinder casting or part 17 has a flange 25 which is secured by a plurality of studs and nuts 26 to a forward face of the main case 16. The housing or part 20 has a primary housing part 27 provided generally with a peripheral flange 28 which is secured to the left side of the main case 16 as by a plurality of cap screws 29. The housing parts 20 and 27 are secured together as by a plurality of cap screws 30. The upper part of the housing portion 27 is normally closed by a cover 31. The general driving structure contained within the housing parts 21 and 27 is illustrated in the McCray patent referred to above and has not been shown here. Briefly, this driving mechanism includes gearing driven from the crankshaft (not shown), part of which gearing constitutes timing gear mechanism for driving the engine cam shaft, designated at 32 in Figure 3, and a part of which drives speed-controlling mechanism such as a conventional governor (not shown) contained in the housing part 21. In Figure 2, a portion of the cover 31 has been broken away to expose a control arm 33 in the governor housing, detailed reference to which will be made below.

The upper portion of the cylinder casting 17 is in the form of a support having a plurality of walls defining a compartment. Specifically, the compartment is defined at 35 by front and rear walls 36 and 37, a right side or end wall 38 and a left side or end wall 39. The compartment includes a generally flat horizontal bottom 40; and the walls 36, 37, 38 and 39 delineate a generally rectangular opening 41 at the top of the compartment. The compartment is normally closed by a removable cover 42.

As best shown in Figures 2 and 5, the compartment 35 is separated into right and left hand open areas or pockets 43 and 44 by means of a vertical web 45 that extends across the compartment between the front and rear walls 36 and 37. As will be brought out below, the web comprises main supporting structure for a fuel pump unit. For this purpose, the web includes a pair of mounting portions 46 and 47, each of which has a substantially flat upper mounting surface. The mounting portions or pads are separated by a notch 48 which communicates the two pockets or areas 43 and 44 and which opens or is directed upwardly as best shown in Figures 5 and 6. As best shown in Figure 5, the mounting pad 46 is drilled vertically to provide a passage 49 for lubricating oil. As shown in Figure 6, this passage communicates with a horizontal passage 50 which opens outwardly at the rear of the compartment 35 through the rear wall 37. Lubricating oil, or any other suitable fluid, may be supplied through the passages 49 and 50 by any appropriate means, no representative form of which is shown here, since the details of the source of supply of oil are not important to the present invention.

As shown in Figure 5, the mounting portion or pad 47 is drilled vertically to provide a passage 51 which has its lower end in communication with a horizontal transverse passage 52 formed in an upper portion of the casting 17 between the main cylinder and the compartment 35 (Figure 6). The passages 51 and 52 are for the supply of fuel to the fuel pumps to be hereinafter described. The passage 52 opens to the left hand side wall 38, as at 53, and may be connected to any suitable fuel supply means, such as a fuel transfer pump, the arrangement of which is not shown here, since such pumps are generally conventional.

It will be noted that each mounting portion or pad 46, 47 is lying lengthwise of the compartment to provide a suitable support for a detachable carrier member, indicated generally by the numeral 55. This member is disposed horizontally across the web 45 and has a central or intermediate undersurface providing a mounting portion 56 which is complementary to and rests upon the mounting surfaces of the mounting pads 46 and 47. The mounting pads are provided respectively with dowels 57 and 58 which are respectively received in vertical bores 59 and 60 drilled upwardly in the carrier member 55 (Figures 5 and 6). The carrier member 55 is detachably secured to the web and its associated mounting portions 46 and 47 by a plurality of cap screws 61 which are received by tapped bores 62 in the mounting pads 46 and 47. The number of cap screws is relatively small, preferably four, so that the carrier member will be appropriately secured to the mounting pads 46 and 47 and yet may be readily removed therefrom.

As best shown in Figures 2 and 6, the carrier member 55 is generally of elongated conformation and has a pair of passages 65 and 66 running lengthwise therein. The passage 65, as best shown in Figure 4, is made up of a pair of angularly related bores opening respectively at opposite ends of the carrier member. The open ends of the bores are plugged, as at 67. The passage 66 is similarly formed and its open ends are plugged at 68. The intermediate portion of the carrier member 55 is provided with a vertical passage or port 69 which intersects the passage 65 and which is exposed or open to the under mounting surface 56 of the member 55.

The member 55 is provided with a second passage or port 70 which is vertical and which intersects the passage 66, the passage 70, like the passage 69, being exposed or open to the under mounting surface 56. When the member 55 is mounted on the web 45, the ports or passages 69 and 70 are respectively in communication with the vertical passages 49 and 51 in the web. This relationship is best shown in Figure 6, which also shows that the notch 48 is between the passages 49 and 51.

As best shown in Figures 2 and 4, the carrier member 55 extends respectively at opposite sides of the web to provide a pair of mounting portions 75 and 76, each of which is in the form of a flat undersurface. A pair of fuel injection pumps 77 and 78 is part of the unit including the carrier member 55, the pumps being respectively mounted on the mounting portions 75 and 76 of the carrier member, so that one pump is disposed in each area or pocket 43, 44. These pumps may be of any suitable construction. Those shown are of a well known type and form no part of the present invention in and of themselves. Therefore, the components thereof have been illustrated and will be described only to the extent that they are related to the invention.

As best shown in Figure 4, the pump 77 is removably but rigidly secured to the under mounting portion 75 of the carrier member 55 by a plurality of cap screws 79. The pump 78 is likewise secured to the other mounting portion 76 of the member 55 by means of a plurality of cap screws 80. As best shown in Figure 3, the pump 78 is provided with a fuel chamber 81 and with a lubricating oil chamber 82. At the proximate

end portion 76 of the member 55, the fuel passage 66 intersects a vertical passage 83 from which a tubular connection 84 is made to the fuel chamber 81. At the same end of the member 55, the lubricating oil passage 65 intersects a vertical passage 85 from which a tubular connection 86 is made to the lubricant chamber 82 in the pump 78. The fuel pumps being identical, the pump 77 is provided with fuel and lubricant chambers (not shown) similar to the chambers 81 and 82 described in connection with the pump 78. For this purpose, the opposite end portion 75 of the carrier member 55 is provided with vertical passages or bores 87 and 88 respectively intersecting the longitudinal passages 66 and 65. From the description thus far it will be seen that the pumps are lubricated by means of lubricant supplied thereto by means of the passages and ports 50, 49, 69, 65, 85 and 88. Likewise, the pumps are supplied with fuel through the passages and ports 52, 51, 70, 66, and 83 and 87. The pumps are provided respectively with supply lines 90 and 91 which may be connected in any suitable manner to appropriate injection nozzles (not shown) associated with the cylinders (not shown) in the engine casting. The supply lines 90 and 91 are respectively detachably connected by fittings 92 and 93 to the fuel pumps 77 and 78 so that the lines may be readily removed from the pumps. As best shown in Figure 3, the illustration of the pump 78 represents the structure of each pump as including a pump plunger 94 operated by a push member 95 to which reciprocatory motion is imparted by the cam shaft 32, an arrangement which is largely conventional.

In the present case, the particular type of pump used includes means by which the quantity of fuel supplied to the nozzles in the cylinders may be controlled or metered. Each pump is provided with a conventional adjusting pinion 96, the angular position of which regulates the supply of fuel to the nozzle, as will be understood by those versed in the art. The adjustment of the pinions 96 is accomplished simultaneously by means of a control element, designated generally by the numeral 97 and comprising a plurality of coaxial members connected together in end-to-end relationship. Two of the components of the control element comprise operating racks 98 detachably interconnected by an adjustable part 99, provision for adjustment being made at 100. As will be understood by those versed in the art, the pumps must be balanced in the proper manner to insure the efficient operation of the engine. As will be hereinafter brought out, the adjustment of the racks 98 is difficult to achieve while the fuel pump unit is mounted in place, particularly in the structural relationship illustrated.

The direction of movement of the control rack element 97 is to the right in Figure 4 when it is desired to increase the supply of fuel to the engine. The left hand end of the element 97 is provided with a stop 101 which may abut a shoulder 102 provided at the left side of the left hand fuel injection pump 77, this stop being provided for the purpose of determining the rated full load of the engine.

When the fuel pump unit is mounted in place on the web 45 the fuel control element 97 extends transversely across the web and through the notch 48 therein. Since the notch opens upwardly, removal of the unit from the compartment may be accomplished without interference between the element 97 and any part of the web.

The intermediate member 99 between the rack members 98 extends through an apertured bracket and is surrounded by a light spring 104 for the purpose of eliminating looseness in the control element. The bracket is secured to an under part of the intermediate portion of the carrier member 55 as by means of a pair of cap screws 105. The bracket and spring thus become part of the fuel pump and carrier unit.

As stated above, the compartment 35 is normally closed by the removable cover 42. The removable securing of the cover 42 to the compartment is preferably accomplished by means of a pair of studs 106 which are threaded into tapped bores 107 in the web 45 and which pass upwardly through appropriate openings in the cover 42 and which receive acorn nuts 108.

Adjustment or regulation of the fuel supply by means of the pinions 96 and racks 93 is under control of the governor mechanism (not shown) contained within the housing 31 and having the control arm 33 previously described. The control connection between the arm 33 and the control element 97 is preferably accomplished by means including a short shaft or rod 110 connected at one end as at 111 to the control arm 33 and detachably connected at its other end, as at 112, to the right hand end of the right hand rack 93. The connection 112 preferably includes readily disconnectible means, such as a collar 113 and snap ring 114. The details have not been particularly illustrated, since any other appropriate connection may be utilized. It will be understood that the control arm 33 is movable in response to variations in engine speed to shift the rod or shaft 110, and hence the control element 97, to regulate the pumps 77 and 78 in accordance with the fuel requirements of the engine.

The right hand end wall 39 of the compartment structure is provided with an opening 115 through which the shaft 110 extends. The inner wall 22 of the casing or housing 21 has an opening 116 through which the shaft 110 loosely extends. As previously described, the relationship between the engine parts 17 and 20 is such that the casing or housing portion 21 is spaced from the proximate side (39) of the cylinder casting or part 17. Because of variations in manufacture, particularly with respect to the bolt holes that receive the cap screws 29, it is not always possible to obtain perfect axial alignment between the openings 115 and 116 respectively in the walls 39 and 22. Such variations in manufacture may be compensated to some extent by making the opening 116 slightly larger so that there will be an appreciable amount of looseness between the opening and the shaft 110. On the other hand, however, the increased size of the opening 116 over the outside diameter of the shaft 110 means that this opening must be sealed against the entrance of dirt and the escape of lubricant. The particular sealing means shown here forms the subject matter of assignee's copending application, Serial No. 53,318, filed October 7, 1948, but will be described here briefly as a representative means for sealing the openings in the engine parts 17 and 21. The opening 115 about the shaft 110 is preferably sealed by means of a bushing or member 117 in the form of a sleeve having a portion which tightly fits the opening 115 and which receives the shaft 110 with sufficient tolerance to provide for axial shifting of the shaft 110 therein. The sleeve 117 is cylindrical and extends toward the wall 22 of the casing or housing 21, preferably terminating

short of the wall and allowing a clearance space 118 at this point (Figure 7). This clearance is provided to accommodate variations in manufacture affecting the spacing between the walls 22 and 39.

The wall 22 is provided with a finished face 119 radially disposed as respects the axis of the shaft 110 and facing the outside of the wall 39. A circular one-piece collar 120 surrounds the portion of the sleeve 117 that is proximate to the opening 116, the inner annular periphery of the collar closely but slidably fitting the outer cylindrical surface of the sleeve. The collar has a radial face 121 which contacts or lies against the radial face 119 on the wall 22. In the preferred illustration of the invention, a compression spring 123 provides means acting against the wall 39 and against the collar 120 for urging the collar against the wall 22 so that the radial faces 121 and 119 are in contact. The seal structure thus far described accommodates variations in manufacture that may affect the spacing between the walls 22 and 39, since the collar 120 may slide axially of the sleeve 117. Similarly, this seal structure accommodates variations in manufacture that may affect the alignment of the openings 115 and 116, since the collar 120 and the radial face 119 are relatively displaceable at times in directions normal to the axis of the shaft 110, it being remembered that the opening 116 is quite a bit larger than the outside diameter of the shaft 110.

In order to complete a seal between the interior and exterior of the housing or casing 21, there is provided a first seal which includes an annular groove 124 in the outer periphery of the portion of the sleeve 117 that is proximate to the opening 116. This groove is preferably rectangular in cross section, as illustrated. Within this groove is provided a seal ring 125 composed of resilient material and having a normally circular cross section. Such ring is known in the art as an O ring. As will be readily understood by those skilled in the art, the ring 125 is normally confined in the groove 124 by the inner periphery of the collar 120 so that the ring has a cross section that is slightly oval, the arrangement being such that the ring may roll about a circular axis in the event of relative axial movement between the sleeve 117 and collar 120. A further portion of the seal comprises a second annular groove 126, this one being formed in the collar 120 and opening to the radial face 121 of the collar. This groove, like the groove 124, is generally rectangular in cross section and receives a circular ring 127 identical, except for size, to the ring 125. The installation of the ring 127 in the groove 126 is such that the ring may slide or roll in the event of relative movement between the collar 20 and wall 22 in any direction normal to the axis of the shaft 110. Consequently, not only do the seals 124—125 and 126—127 accommodate variations in manufacture, but these seals also serve to perform a sealing function of the event of relative movement between the engine parts 17 and 20 because of vibrations inherent in the operation of the engine.

The arrangement of the fuel pumps 77 and 78 on the carrier member 55 as a complete unit together with the control element 97 enables the unit to be tested apart from the engine. For this purpose, the entire unit may be mounted on a test support having generally the characteristics of the supporting structure provided by the web 45 and its mounting pads 46 and 47. Such test structure will include passages similar to those formed in the supporting structure in the compartment, so that a complete test may be made on the fuel pump unit apart from the engine. Such test will include the determination of the operating efficiency of the pumps, the balancing thereof by adjustment of the components of the control element 97, the determination that the pumps are properly supplied with fuel and lubricant, and other tests incidental to the operating efficiency of the pumps. It will also be understood that, during the testing operation, the pumps 77 and 78 are connected to test lines in place of the lines 90 and 91. Likewise, the right hand end of the right hand rack 98 is connected to a test control rather than to the control shaft 110, which is obvious.

After the test has been completed, the entire unit may be installed in place on the web 45, the under mounting surface 56 of the member 55 being received by the mounting pads 46 and 47, after which the carrier member may be rigidly secured to the mounting pads by means of the cap screws 61, and the connection may be accomplished at 112 between the right hand rack 98 and the inner end of the shaft 110 within the compartment 35; at the same time, the lines 90 and 91 will be connected to the fuel pumps 77 and 78, respectively, by means of the fittings 92 and 93, respectively. The cover 43 may be installed and secured in place by means of the acorn nuts 108.

It will be seen that in the event that the pumps 77 and 78 require servicing after operation, the entire unit may be just as readily removed from the compartment 35. Since the notched structure of the web 45 readily accommodates both the control element 97 and the supporting structure 103, there will be no interference between these parts and the web during installation and removal of the unit.

As previously stated, the disclosure herein is directed to what is presently considered the most desirable form that the invention may assume in an engine of the type referred to. It will be understood, of course, that the invention is susceptible to many modifications and alterations, all of which may be accomplished without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. In an internal-combustion engine having a main engine casting: means rigidly mounted on said casting and providing a compartment having an open top through which access may be had to the compartment; means within the compartment providing an upstanding support substantially centrally of the compartment and generally separating the compartment into a pair of similar pockets; means in the support providing a generally horizontal opening through the support communicating the compartment pockets; means providing in the support a generally vertical fuel passage at one side of said opening and a generally vertical lubricant passage at the other side of said opening, said support having top mounting surfaces and said passages opening upwardly respectively to said surfaces; a carrier member disposed generally horizontally across the support and having a central undersurface complementary to the mounting surfaces on the support and a pair of end portions respectively overhanging the support and above the compartment pockets; means detachably mounting the carrier member on the support; means in the carrier member including a fuel passage and a lubricant

passage opening at the undersurface of the member and respectively communicating with the passages in the support, said member passages extending into the member end portions; a pair of fuel pumps carried respectively by said member end portions in the compartment pockets, each pump including a fuel chamber, a lubricant chamber, and a controllable part, said fuel and lubricant chambers in the pumps being respectively connected to the fuel and lubricant passages in the carrier member; a control element connected to the controllable parts of the fuel pumps and extending through the opening in the support; and a cover closing said compartment.

2. In an internal-combustion engine having a main engine casting: means rigidly mounted on said casting and providing a compartment having an open top through which access may be had to the compartment; means within the compartment providing an upstanding support substantially centrally of the compartment and generally separating the compartment into a pair of similar pockets; means in the support providing a lubricant passage and a fuel passage; a carrier member disposed generally horizontally across the support and detachably mounted at a central underside portion thereof on the upper portion of the support and having a pair of end portions respectively overhanging at opposite sides of the support and respectively above the aforesaid pockets; a pair of fuel pumps detachably carried by the carrier member, one on and below each end portion of the carrier member so as to be housed in the proximate pocket; means in the carrier member including separate fuel and lubricant passages communicating with the fuel pumps and opening at the under portion of the carrier member by means of which said member is mounted on the support, said passages in the carrier member respectively communicating with the passages in the support; and a cover for closing the compartment.

3. In an internal-combustion engine having a main engine casting: means rigidly mounted on said casting and providing a compartment having an open top through which access may be had to the compartment; means within the compartment providing an upstanding support substantially centrally of the compartment and generally separating the compartment into a pair of similar pockets; means in the support providing a fluid passage; a carrier member disposed generally horizontally across the support and detachably mounted at a central portion thereof on the support and having a pair of end portions respectively overhanging at opposite sides of the support and respectively above the aforesaid pockets; a pair of fluid pumps detachably carried by the carrier member, one on and below each end portion of the carrier member so as to be housed in the proximate pocket; means providing fluid passages in the carrier member communicating the fluid pumps with fluid passage in the support; and a cover for closing the compartment.

4. For use with an internal-combustion engine: a support providing a generally rectangular compartment having substantially vertical end and side walls and a horizontal bottom wall, and including an opening at its top delineated generally by upper portions of the end and side walls; means in the compartment including a generally vertical web extending across the compartment from one side wall to the other and substantially midway between the end walls, said web having a central notch therein opening upwardly; means on the web providing a pair of upper mounting pads separated by the notch, each pad having a generally horizontal mounting surface; a carrier member disposed generally horizontally across the web and having undersurface portions resting on the mounting pad surfaces, and having end portions disposed respectively at each side of the web; means providing an opening in one end wall of the compartment generally aligned with the notch in the web; a pair of fuel pumps mounted respectively on the carrier member end portions, each including a controllable part; a control element interconnecting said parts and passing through said notch; a control member extending through said end wall opening; means detachably interconnecting the control member and element within the compartment; means detachably securing the carrier member to the mounting pads; and a cover for closing said compartment top opening.

5. The invention defined in claim 4, further characterized in that: the web includes a fuel passage and a lubricant passage opening respectively to the mounting pad surfaces; and the carrier member includes fuel and lubricant passages communicating with fuel and lubricant chambers in the pumps and opening to the undersurfaces of said member for communication respectively with the fuel and lubricant passages in the web.

6. For use with an internal-combustion engine: a support having wall portions defining a compartment having an open side closed by a removable cover; a mounting member arranged within the compartment so that there is an open area in the compartment at each side of the mounting member, said member having a notch opening generally toward the open side of the compartment; a carrier member detachably mounted on the mounting member within the oompartment and having an end portion at each side of the mounting member for disposition respectively in said open areas; a pair of fuel pumps carried by the carrier member for disposition respectively in said areas, each pump having a controllable part; and a control element interconnecting said controllable parts and extending through the notch in the mounting member; whereby, upon removal of the cover and detachment of the carrier member from the mounting member, the carrier member, together with the fuel pumps and control element may be removed from the compartment as a unit through the open side of the compartment, said control element being moved outwardly of said notch.

7. For use with an internal-combustion engine: a support having wall portions defining a compartment having an open side closed by a removable cover; a mounting member arranged within the compartment so that there is an open area in the compartment at each side of the mounting member, said member having a notch opening generally toward the open side of the compartment; a carrier member detachably mounted on the mounting member within the compartment and having an end portion at each side of the mounting member for disposition respectively in said open areas; a pair of fuel pumps carried by the carrier member for disposition respectively in said areas, each pump having a controllable part; a control element interconnecting said controllable parts and extending through the notch in the mounting member; means carried by a wall portion for operating the control element; and

detachable means interconnecting the operating means and the control element; whereby, upon removal of the cover, the carrier member may be detached from the mounting member and the control element may be detached from the operating means for removal of the carrier member, fuel pumps and control element as a unit through the open side of the compartment, said control element passing outwardly through said notch.

8. For a vehicle having an internal-combustion engine: a fuel pump and carrier unit therefor, including a carrier member having a pair of spaced apart carrier portions and an intermediate mounting portion, a pair of fuel pumps rigidly secured to the carrier portions and including controllable parts and a control element interconnecting said parts and extending across the mounting portion of the carrier member, each of said fuel pumps including a fluid chamber, and said carrier member including passage portions intercommunicating said chambers and having a fluid port exposed through its mounting portion; a support adjacent the engine for said unit including a mounting portion to receive the mounting portion of the carrier member and a notch to removably receive the control element, said support having a fluid passage exposed to its mounting portion and in communication with the fluid port of the carrier member when the unit is on the support, and means including the mounting portions of the carrier member and support for detachably mounting the unit on the support.

9. For an internal combustion engine; an accessory unit including a carrier member having a pair of accessory carrier portions and an intermediate mounting portion, a pair of accessories carried respectively by said carrier portions, each having a fluid chamber and an adjustable part, and an adjusting element interconnecting said parts and extending across the mounting portion, said carrier member having fluid passage portions intercommunicating the accessory chambers and a communicating fluid port opening to the mounting portion; a support adjacent the engine for mounting said unit, including a mounting portion to receive the mounting portion of the carrier member and a notch that removably receives the control element, said support having a fluid passage exposed to its mounting portion and in communication with the fluid port of the carrier member when the unit is on the support; and means including the mounting portions of the carrier member and support for detachably mounting the unit on the support.

10. In an internal-combustion engine having a main engine casting: means rigidly mounted on said casting and providing a compartment having an open top through which access may be had to the compartment; means within the compartment providing an upstanding support substantially centrally of the compartment and generally separating the compartment into a pair of similar pockets; means providing in the support a generally vertical fuel passage and a generally vertical lubricant passage, said support having a top mounting surface and said passages opening upwardly to said surface; a carrier member disposed generally horizontally across the support and having a central undersurface complementary to the mounting surface on the support and a pair of end portions respectively overhanging the support and above the compartment pockets; means detachably mounting the carrier member on the support; means in the carrier member including a fuel passage and a lubricant passage opening at the undersurface of the member and respectively communicating with the passages in the support, said member passages extending into the member end portions; a plurality of fuel pumps carried by said member end portions in the compartment pockets, each pump including a fuel chamber, a lubricant chamber, and a controllable part, said fuel and lubricant chambers in the pumps being respectively connected to the fuel and lubricant passages in the carrier member; a control element connected to the controllable parts of the fuel pumps; and a cover closing said compartment.

11. In an internal-combustion engine having a main engine part: means carried by said part providing a support having a mounting portion; means in the support providing a fluid passage opening to the mounting portion; a movable control member having a portion in proximity to the support; a carrier member removably mounted on the mounting portion of the support and including a fluid passage having a pair of communicating portions, one of which opens to the fluid passage in the support at the mounting portion of the support; and a fluid pump carried by the carrier member and having a fluid chamber opening to the other fluid passage portion in the carrier member, and a controllable part disconnectibly connected to the aforesaid movable part.

12. In an internal-combustion engine having a main engine part: means carried by said part providing a support having a mounting portion; means in the support providing a fluid passage opening to the mounting portion; a carrier member removably mounted on the mounting portion of the support and including a fluid passage having a pair of communicating portions, one of which opens to the fluid passage in the support at the mounting portion of the support; and a fluid pump carried by the carrier member and having a fluid chamber opening to the other fluid passage portion in the carrier member.

13. In an internal-combustion engine having a main engine part: means carried by said part and providing a compartment having walls including related edge portions defining an access opening; a removable cover for closing said opening; a support within the compartment including a mounting portion facing the opening and within the cover when the cover is in place; a movable control member extending through one of the compartment walls and into the compartment; means providing a fluid passage in the support opening to the mounting portion; a carrier member removably mounted on the mounting portion of the support within the compartment and having a fluid passage therein including a passage portion opening to the fluid passage in the support at said mounting portion, and a second passage portion spaced from the first passage portion; and a fluid pump carried by the carrier member within the compartment and including a control element disconnectibly connected to the aforesaid control member and a fluid chamber opening to the aforesaid second fluid passage portion in the carrier member.

14. In an internal-combustion engine having a main engine part: means carried by said part and providing a compartment having walls including related edge portions defining an access opening; a removable cover for closing said opening; a support within the compartment including a mounting portion facing the opening and with-

in the cover when the cover is in place; means providing a fluid passage in the support opening to the mounting portion; a carrier member removably mounted on the mounting portion of the support within the compartment and having a fluid passage therein including a passage portion opening to the fluid passage in the support at said mounting portion, and a second passage portion spaced from the first passage portion; and a fluid pump carried by the carrier member within the compartment and including a fluid chamber opening to the aforesaid second fluid passage portion in the carrier member.

15. In an internal-combustion engine having an engine part: means carried by said part providing a support having a mounting portion; means providing a fluid conduit having a portion adjacent the support; a carrier member removably mounted on the mounting portion and having fluid passage means including first and second separate passage portions, the first of which is connectibly and disconnectibly associated with the aforesaid conduit portion; and a fluid device mounted on the carrier member and having fluid-receivable means associated with the second passage portion independently of the first passage portion.

16. In an internal-combustion engine having an engine part: means carried by said part providing a compartment having an access opening; a removable cover for the opening; a support within the compartment and having a mounting portion exposed when the cover is removed; means providing a fluid conduit having a portion within the compartment; a carrier member removably mounted on the mounting portion within the compartment and having fluid passage means including first and second separate passage portions, the first of which is connectibly and disconnectibly associated with the aforesaid conduit portion; and a fluid device mounted on the carrier member within the compartment and having fluid-receivable means associated with

the second passage portion independently of the first passage portion.

17. In an internal-combustion engine having a main engine part: means carried by said part providing a support having a mounting portion; a movable control member having a portion spaced to one side of the support; a carrier member removably mounted on the mounting portion of the support and having a portion offset toward and in proximity to the control element; and a fluid pump carried by the carrier member offset portion and having a controllable part disconnectibly connected to the aforesaid movable part.

18. In an internal-combustion engine having a main engine part: means carried by said part and providing a compartment having walls including related edge portions defining an access opening; a removable cover for closing said opening; a support within the compartment including a mounting portion proximate to and facing the opening and within the cover when the cover is in place; a movable control member extending through one of the compartment walls and into the compartment and offset from the mounting portion; a carrier member adapted for insertion through the opening and removably mounted on the mounting portion of the support within the compartment and having a portion offset toward the control element; and a fluid pump carried by the offset portion of the carrier member within the compartment and including a control element disconnectibly connected to the aforesaid control member.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,451,228	Larson	Apr. 10, 1923