

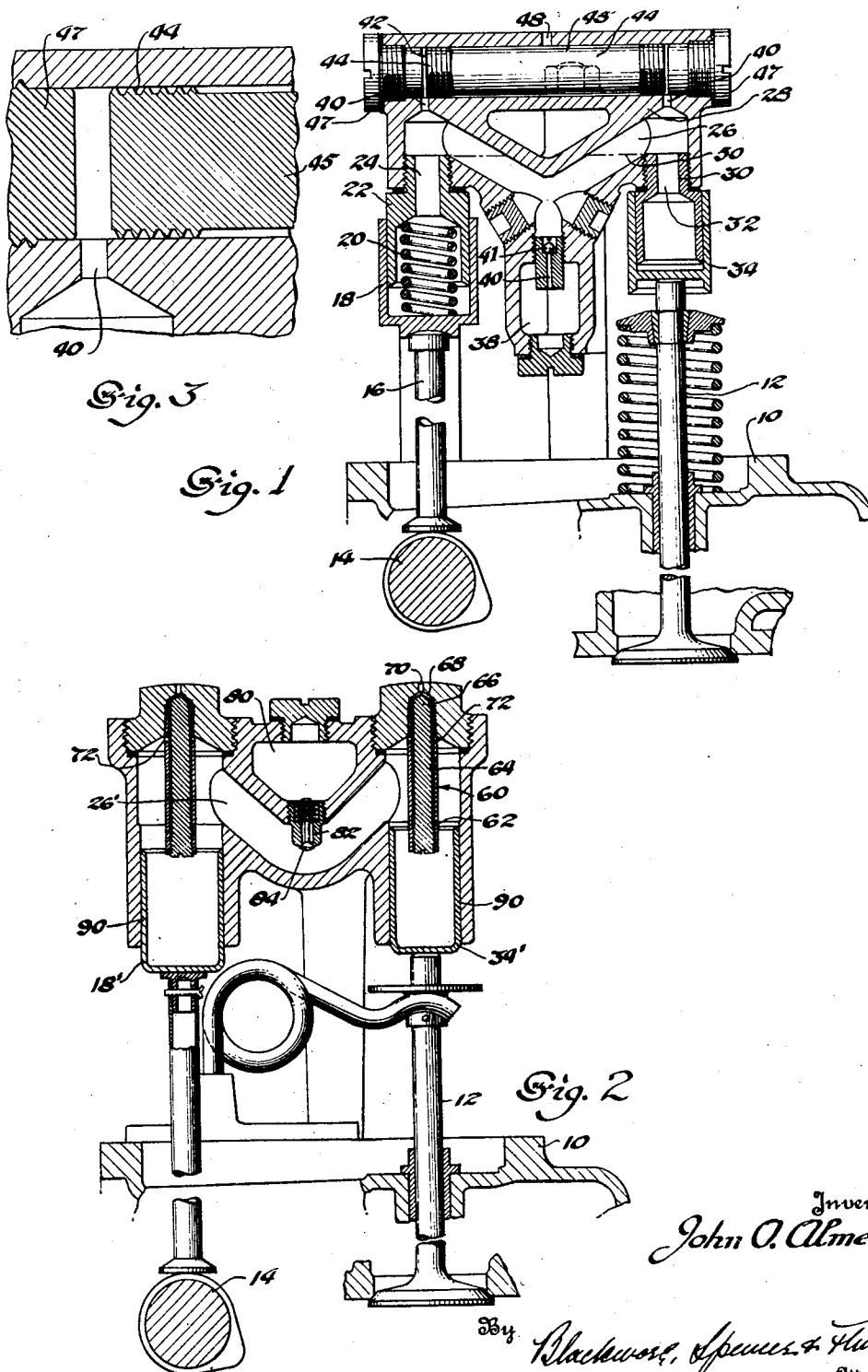
Oct. 10, 1933.

J. O. ALMEN

1,930,260

HYDRAULIC MECHANISM

Filed Jan. 5, 1928



Inventor
John O. Almen

By *Blackwell, Spencer & Finch*
Attorneys

UNITED STATES PATENT OFFICE

1,930,260

HYDRAULIC MECHANISM

John O. Almen, Royal Oak, Mich., assignor to
General Motors Research Corporation, Detroit,
Mich., a corporation of Delaware

Application January 5, 1928. Serial No. 244,762

5 Claims. (Cl. 123—90)

This invention relates to hydraulic operating mechanism of the type used to operate the valves of an internal combustion engine.

In such constructions there is provided an hydraulic chamber having bores for the operating and operated plungers, the latter being operated by displacement of fluid in the chamber produced by movement of the operating plungers, the latter being connected with the valve tappet and the former with the valve. In devices of this kind, in spite of all precautions air will find its way into the system producing noisy operation and, even in some cases, rendering the whole apparatus inoperative for all the energy of the operating plunger is absorbed by alternate compression and expansion of the air cushion. The present invention has to do with means for relieving the chamber of air. Two different embodiments of my invention are disclosed. In one, the chamber is provided with a fixed air vent in the form of a restricted passage and in the other, a similar vent controlled by a thermostatic element is made use of. I prefer the last-named type for the reason that as the parts become heated during continued operation of the engine, the vent is substantially sealed.

Figure 1 is a vertical section through the first form of my apparatus.

Figure 2 is a similar section through my modified and preferred form.

Figure 3 is an enlarged detail of a portion of the vent of Figure 1.

In Figure 1 I have illustrated at 10 a portion of the head of an internal combustion engine in which are mounted the usual valves 12 for controlling the admission of the mixture to the cylinders and the discharge of exhaust gases therefrom. I have shown at 14 the camshaft, usually mounted in the engine base, and operating tappet 16. The upper end of the tappet engages a plunger 18 normally urged downwardly by spring 20 bearing against the fitting 22 having a bore 24 communicating with hydraulic chamber 26. The chamber 26 is formed in a casting 28 in which a plurality of similar chambers are arranged, one for each valve and tappet. The casting is bolted to the top of the head 10 of the engine. At the other side of the chamber there is provided a similar fitting 30 having a bore 32 communicating with the interior of plunger 34 abutting against the end of the stem of the valve 12. Beneath the chamber 26 is oil reservoir 38 communicating with the chamber through passage 40 controlled by valve 41. The chamber 38 is normally supplied

with oil from the circulating lubricating system of the engine.

It will be noted that the highest points in the chamber 26 are above the pistons 18 and 34 and at these points are arranged passages 40 forming part of the air vents. The passages 40 discharge into bore 42 in which is fitted the member 44 having threaded ends and a connecting reduced portion 45. Note that the member 44 is not threaded into the bore 42, but merely has a force fit therewith. The bore 42 is provided with a central vent 48. The ends of the bore 42 are closed by means of plugs 47 of any suitable type equipped with gaskets.

With this construction it will be apparent that any air gaining access to the chamber 26 will pass or be forced upwardly through passages 40 and through the spiral passages constituted by the threads of the member 44 into the annular passage surrounding the reduced portion 45 of the member, from whence it will find its way through port 48 into the atmosphere. I call particular attention to the fact that the passage 44 is quite a long one. In experimenting with this type of construction I have found it important that the cross section of the passage be as large as possible in order that it may not be easily stopped by dirty oil. In order, therefore, to prevent excessive leakage of oil from the chamber, the vent is made as long as possible. By making it in the form of a thread, I obtain the greatest length in the minimum space.

The construction shown in this figure possesses the further advantage that there is a limit to the amount of oil which may leak from the chamber so that there will always be sufficient oil to operate the valves. Thus, the plungers 18 and 34 are in the form of inverted cups and will, at all times, hold a certain volume of oil. The central portion of the chamber 26 is likewise depressed and will at all times be filled at least to the level indicated at 50, whatever be the loss by leakage between the pistons and their fittings. The volume of oil contained in the plungers and in the depressed portion of the hydraulic chamber is sufficient to insure operation of the valves, although the rest of the chamber be filled with air.

The form shown in Figure 2 differs from that in Figure 1 in that in place of a fixed vent a thermostatic vent 60 is employed. This consists of a shell 62 preferably of steel into which is threaded a rod 64 of aluminum or other material having a much higher coefficient of expansion than steel. The rod has a tapered end 66 normally spaced

- from seat 68. At the uppermost portion of the seat 68 is a passage 70 leading to the atmosphere. The rod 64 is of less diameter than the tube 60 forming an annular passage leading to the vent
- 5 70. The shells 62 are provided with ports 72 leading to the annular space between the element 64 and the shell. The operation of this construction is the same as the preceding, the air entering through port 72 passing between the rod and
- 10 shell and upwardly through vent 70 to the atmosphere. Upon the heating of the engine the rod 64 will expand and the gap at 68 will be reduced. Thus, as the oil becomes heated and runs more freely, the vent will be closed reducing
- 15 leakage.
- In this form, also, the reservoir 80 is located above the hydraulic chamber, the oil passing into the chamber through port 82 controlled by valve 84. As, in the preceding case, the leakage of oil
- 20 is limited both by the inverted V shape of the chamber 26' and by the cupshaped construction of the pistons 18' and 34'. These are received in bores 90 instead of surrounding the fittings as in Figure 1.
- 25 I claim:
1. Hydraulic valve operating mechanism for internal combustion engines comprising an hydraulic chamber, an operating member, an operated member, the chamber being provided with
- 30 a capillary vent open to the atmosphere for the discharge of air from the chamber, said vent comprising a tubular passage and a plug extending into the passage and defining with the walls thereof a capillary vent.
- 35 2. In hydraulic valve operating mechanism, a chamber, bores communicating with the chamber, operating and operated plungers fitted in said bores, a portion of said chamber being depressed to serve as a basin for oil and prevent its escape by leakage past said plungers.
3. In hydraulic operating mechanism, the combination of an hydraulic chamber, a plunger cooperating with said chamber, said plunger being of inverted cup-shape to retain oil therein and prevent its leakage past the plunger.
- 35 4. Hydraulic operating mechanism comprising an hydraulic chamber, an operating member, an operated member, the chamber being provided with a vent open to the atmosphere of comparatively large cross section so as to prevent clogging but of great length so as to offer sufficient resistance to flow to reduce the leakage to a minimum, said vent comprising a tubular passage communicating with the hydraulic chamber, and a threaded member fitted in the passage with the
- 40 tops of the threads engaging the walls of the passage defining therewith a spiral vent.
5. A thermally controlled vent comprising a supporting member in the form of a readily removable plug provided with a bore, a cylinder removably secured at one end in the bore, a thermal element secured in the opposite end of the cylinder and having a portion projecting into the cylinder and spaced from the cylinder wall, said element and cylinder having different coefficients
- 45 of expansion, said bore constituting a restricted discharge passage cooperating with the end of the thermal element to define a vent variable in size with temperature, and a port in said cylinder.
- JOHN O. ALMEN.

40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150