Dec. 24, 1957

R. E. TAYLOR

2,817,326

TAPPET SPACER RETAINER

Filed Feb. 16, 1956

2 Sheets-Sheet 1

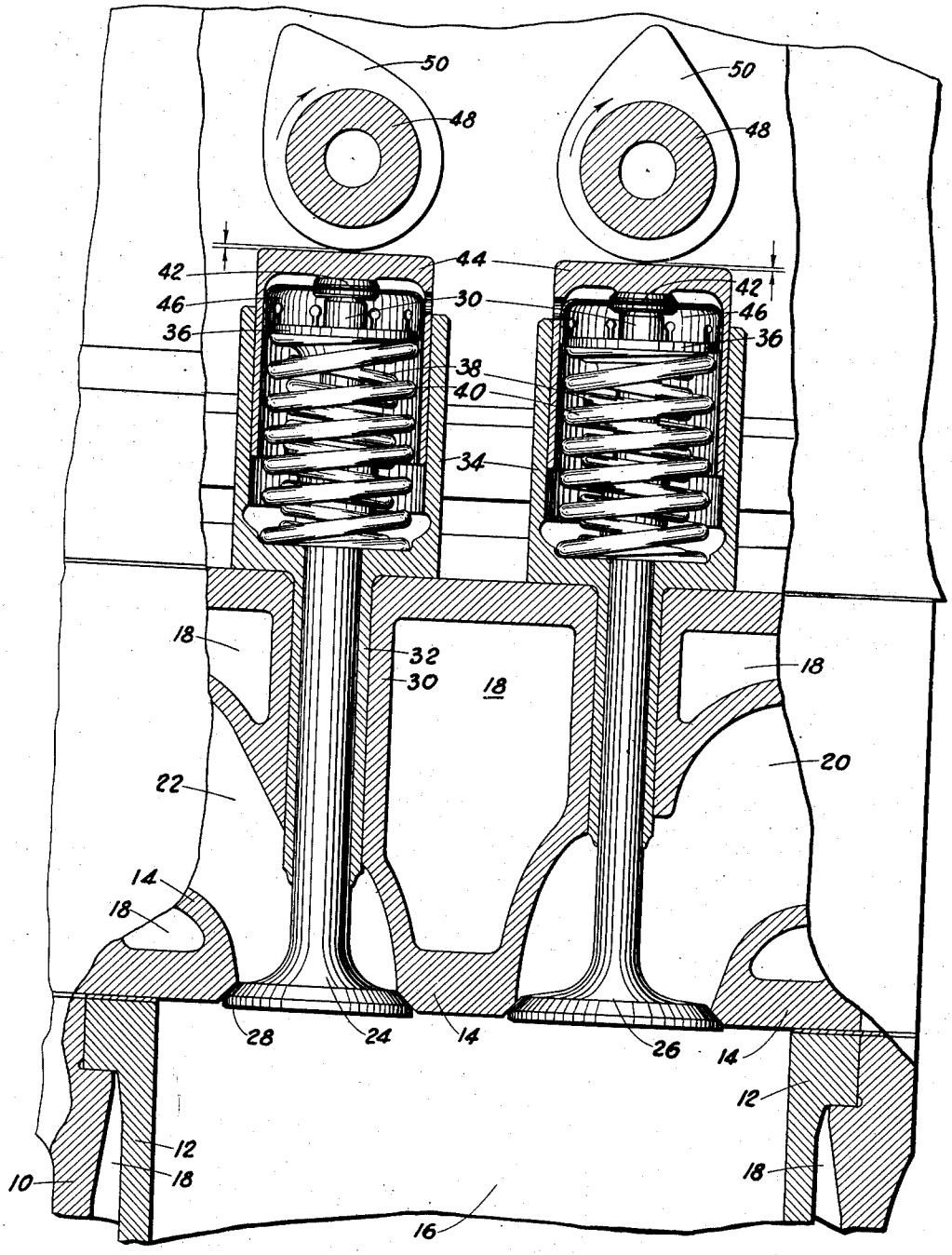


Fig. 1

INVENTOR.
BY Ross E. Taylor
Wilson, Redrow & Sadler
ATTORNEYS

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2 Sheets-Sheet 2

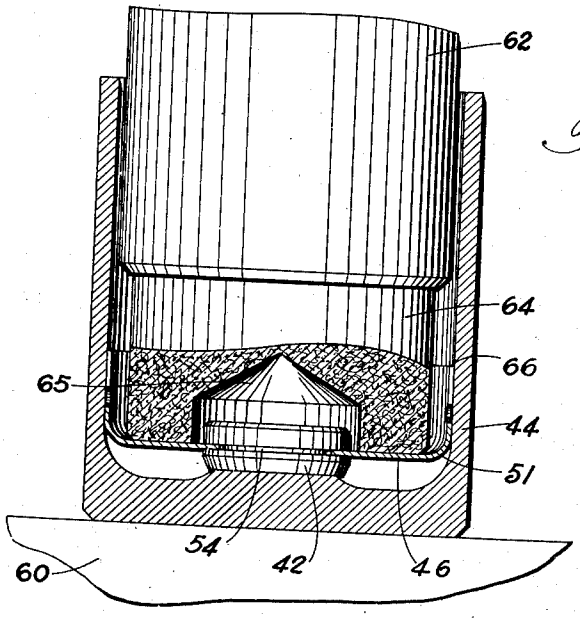


Fig. 2

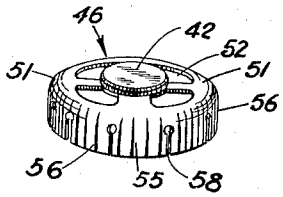


Fig. 4

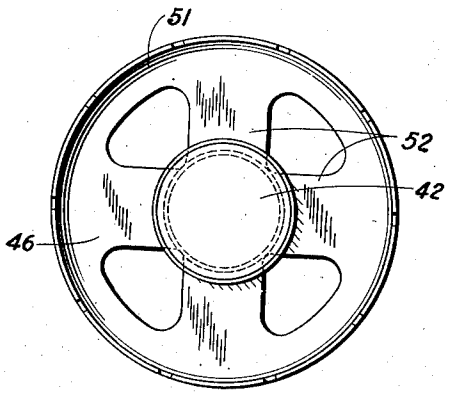


Fig. 3

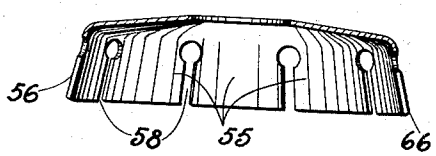


Fig. 5

INVENTOR.
BY Ross E. Taylor
Wilson, Redrow & Sadler
ATTORNEYS

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TAPPET SPACER RETAINER

Ross E. Taylor, Grosse Pointe Farms, Mich., assignor to Studebaker-Packard Corporation, Detroit, Mich., a corporation of Michigan

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8 Claims. (Cl. 123—188)

This invention relates to the valve assembly of an internal combustion engine and more particularly to a valve tappet spacer retainer for said valves.

In internal combustion engines the maintenance of proper clearance between the valve tappet and its actuating cam is vitally important as such clearance must be held to close tolerance for efficient operation of the engine. Various means have been provided in the prior art for shimming up the contact portion of the tappet relative to the ends of the valve stems to maintain the desired clearance between the tappet and the cam. This problem is especially acute if the spacer shim, placed between the ends of the valve stem and valve tappet housing, slips out of position and becomes enmeshed with the springs and other moving parts of the valve tappet assembly whereby not only is the designed clearance lost but the shim may become deposited in such a position as to hold the valve open with an accompanying loss in power and efficiency. This necessitates expense in disassembling the engine and repairing the damaged tappet assembly.

Although several ways have been proposed for holding the shims in position, no device is currently known which is relatively foolproof in use. It is therefore a principal object of this invention to overcome the disadvantages of the prior art and to provide a retaining means for holding a spacer shim between the ends of a valve stem and the contact portion of the valve tappet that is positive in action and not likely to become broken, displaced, or misaligned from its designed position.

It is a further object of this invention to provide a retaining means for holding a spacer shim assembled that is of simple construction and operation, which may not only be economically manufactured, but which will be efficient in use, uniform in operation, easily operated, and be unlikely to get out of repair.

It is also an object of this invention to provide a means for retaining a spacer shim with its tappet assembly so that when the engine is disassembled for repair purposes the preselected shim will not become separated from its corresponding tappet.

While the tappet spacer retainer means of the present invention is shown and described in connection with valving of an internal combustion engine having overhead valves, other applications of this structure are contemplated within the scope of the present application, and further objects will become apparent when the following detailed description and the accompanying drawings are studied wherein:

Figure 1 is a sectional view of a portion of an internal combustion engine showing particularly the overhead valve assembly;

Figure 2 is a sectional view of the valve tappet spacer, spacer retainer and tappet cup being assembled;

Figure 3 is a plan view of the assembled tappet spacer and tappet spacer retainer;

Figure 4 is a perspective view of said assembled tappet spacer and tappet spacer retainer; and

Figure 5 is a sectional view through the central portion of said tappet spacer retainer.

Referring now to the drawings for a detailed description of the present invention, in Figure 1 the valve and valve actuating assembly of an overhead valve internal combustion engine is shown. This view shows an engine block 10 having an associated cylinder liner 12 seated therein and having a cylinder head 14 bolted thereto to form a combustion chamber or cylinder 16. Water passages 18 are provided to cool the engine and maintain it at operating temperature. The engine has both an inlet passage 20 through which combustion supporting air and fuel is drawn into the combustion chamber 16 and an outlet passage 22 through which exhaust gases are expelled from the combustion chamber. The inlet passage 20 and outlet passage 22 are sealed during predetermined periods of the engine cycle from the combustion chamber 16 by poppet valves 24 and 26.

As both valves are identical in construction and operation within the scope of the present invention an explanation of one valve will suffice for both and therefore only exhaust valve 24 will be discussed in detail. Valve 24 comprises a valve head 28 and a valve stem 30, which stem 30 slides in a sleeve 32 seated in the cylinder head 14. Said sleeve 32 has integrally formed on one end portion thereof an upwardly opened cup shaped element 34 which is seated on the upper face of the cylinder head 14 and encases the upper portion of the valve stem 30. A collar 36 is detachably secured near the upper end of the valve stem 30 and is so positioned thereon as to be always enclosed within the cup-shaped element 34. Disposed between the collar 36 and the lower inner side of the cup 34 is a pair of telescoped springs 38 and 40 which are concentrically disposed with respect to each other and with respect to the valve stem 30. With the springs so disposed the valve head 28 of the poppet valve 24 is urged into a closed position whereby the exhaust passage 22 is sealed off. A downwardly opened cup-shaped tappet element 44 is positioned over the end of the valve stem 30 and is slidably nested within the cup-shaped element 34. Positioned between the end of the valve stem 30 and the cup-shaped tappet element 44 is a spacer shim 42 which is held by means of a spacer retainer 46, which forms the principal subject matter of the present invention.

Means are provided for opening the inlet valve 26 to permit the flow of combustion supporting air and fuel to the cylinder and further means are provided to open valve 24 to exhaust the waste gases from the cylinder. The poppet valve 24 is actuated by a cam lobe 50 carried by a cam shaft 48. The cam shaft 48 is rotated by the engine whereby the cam lobe 50 is forced against the upper surface of the tappet cup 44 for depressing the springs 38 and 40 to thereby open the valve 24, unseat the valve head 28 and allow the passage of exhaust gases from the cylinder chamber 16 through the exhaust passage 22.

Clearance is provided between the upper surface of the tappet 44 and the minimum diameter of the cam 50 so that the valve head 28 will seat properly. The clearance is such as to provide for any wear which may take place between the valve head 28 and the valve seat, and also to provide for expansion due to heating of the engine. The clearance between the cam 50 and the tappet cup 44 is critical and must be held within close tolerance for efficient operation so that the cam lobe 50 will strike the upper surface of the tappet 44 at the correct angle and will not cause excessive wear. Depending upon the engine, this clearance will ordinarily be in the order of .005 to .015 of an inch. Due to the commercial tolerances which are encountered in mass production it is necessary that a means be provided for accurately pro-

viding for the clearance in question, both when the engine is new and also when the engine is being repaired after wear has been encountered. The present invention provides for spacer shims 42 to be disposed between the valve stem 30 and the tappet cup 44. The shims 42 are designed in various thicknesses so that the shim of proper dimension may be selected to provide the clearance required. The valve assembly is subjected to continual oscillating motion during the operation of the engine, and therefore it is necessary that proper means be provided for securely holding the selected spacer 42 in position.

The spacer retainer 46 is of generally cup shape design having a base 51 which has a plurality of tangs 52 directed radially inwardly and inclined slightly outwardly from the plane of said base. It is intended that the spacer retainer 46 be formed of spring steel or a similar material so that a spacer shim 42 may be snapped into position relative to the retainer and securely held therein by the resiliency of the tangs 52 which engage in an annular groove 54 that is circumscribed about the perimeter of the spacer 42.

The retainer 46 has a skirt portion 56 depending from the periphery of the base 51 which is provided with a plurality of longitudinally extending slots 58 so that individual portions 55 of the skirt 56 can be flared slightly radially outwardly from the base portion thereof. In assembly the combined spacer shim 42 and spacer retainer 46 are fitted within the tappet cups 44 whereby a coaction between the taper of the skirt portion 56 and the inclined tangs 52 results in a locking force hereinafter described. The device is assembled by inverting the tappet cup 44 on a bench or work surface 60 and forcing the assembled spacer shim 42 and spacer retainer 46 into coacting position within said tappet cup 44. A tool 62 having a head 64, preferably of non-metallic material, is used to ram the spacer 42 and its retainer 46 into position. The head 64 is of such a diameter that part of it strikes the retainer 46 at about the centrl portion of the tangs 52 and an opening 65 in the center is adapted to fit over the spacer shim 42.

When the tool 62 forces the spacer retainer within the cup member 44 to its full depth, the spacer shim 42 strikes the inner surface of the tappet cup 44. With the application of further force on the tool 62 the normally inclined tangs 52 are flexed into a flat attitude so that they are positioned in a common plane. The deflection of the tangs 52 tends to cause the skirt portion 56 of the spacer retainer 46 to flare outwardly to an extent greater than normal. As the skirt 56 of the retainer 46 is held in position by the internal cylindrical wall of the tappet 44, the deflection of the tangs 52 is transmitted as a force through the skirt 56 against the inner wall of the tappet cup 44. This force holds the retainer 46 and consequently the spacer shim 42 in the desired location. Any movement of the tappet 44 during the operation of the engine which might tend to dislodge the retainer 46 from its position would be countered by the force of the skirt 56 against the inner walls of the tappet cup 44 and also by the action of the edge 66 of the skirt 56 which will tend to "dig-in" and thus even more securely hold the retainer 46 and the shim 42 in position.

While a retainer of particular design is shown in the drawings and described in detail, variations are contemplated within the scope of the present invention, the above detailed description being for the purpose of presenting the preferred embodiment of the invention of this application.

I claim:

1. In an internal combustion engine having cam actuated poppet valves, the combination of a cup member disposed over the stem end of said valve and between said valve end and said cam, a spacer shim of preselected thickness positioned between said valve end and said cup member to provide a predetermined clearance between said cup member and said cam, a retainer for holding said shim in position, an annular groove around the girth of said shim, a plurality of inwardly directed radial tangs on said retainer intersecting said annular groove, said tangs being inclined axially to the plane of the base of said retainer, said retainer having a flared skirt portion with longitudinally extending slots, said retainer being positioned within said cup member so as to be elastically deflected and thereby held in position by its own spring action.

2. In an internal combustion engine having a cam actuated poppet valve and a cup member disposed over the stem end of said valve and having its base between said cam and said valve end, the combination of a spacer shim of preselected thickness positioned between said valve end and said cup member to provide a predetermined clearance between said cup member and said cam, a retainer for holding said shim in said position, said retainer being generally cup shaped and having a flared skirt portion, said skirt portion having a plurality of longitudinal slots, the base portion of said retainer being formed of a plurality of radial tangs directed inwardly for gripping said shim.

3. In an internal combustion engine having a cam actuated poppet valve, the combination of a cup member positioned over the stem end of said valve and with the base thereof between said valve and said cam, a shim of preselected thickness between said valve end and said cup member and said cam, a retainer for holding said shim in said position, said retainer having a flared skirt portion, said skirt portion being of such diameter as to create a spring fit when disposed within said cup member.

4. In an internal combustion engine having a cam actuated poppet valve, the combination of a cup member disposed between said valve and said cam, a shim of preselected thickness positioned between said valve and said cup member to provide a predetermined clearance between said cup member and said cam, a shim retainer for holding said shim in position, said shim retainer having a flare skirt portion, said retainer being positioned within said cup member and of such size that the skirt portion thereof will be deflected to hold said retainer within said cup member.

5. A spacer shim and shim retainer, said shim being of selected thickness and generally disk shaped, said shim having an annular groove about its girth, said retainer being generally cup shaped and having a flared skirt portion, said skirt portion having longitudinally extending slots, radial tangs on said retainer for holding said shim, said tangs being inclined to the base of said retainer.

6. In an internal combustion engine having a valve, a cam engaging with said valve, and a tappet member coacting between said cam and said valve for holding said valve seated, the combination of a shim, means for holding said shim positioned between one end of the valve and the tappet member for maintaining a predetermined clearance between said tappet member and said cam, said means comprising a retainer having a circular base, a plurality of tangs projecting radially inward from said base to support said shim, a skirt formed around the periphery of the base, said skirt being divided into a plurality of outwardly flared sections which are adapted to engage with the inner portion of the tappet member for holding the shim in position.

7. A spring retainer having a domed shaped base portion and an axially disposed skirt portion around the edges thereof, said base portion having radially extending slots formed therein to permit axial displacement of the central portion thereof and said skirt portion having longitudinally extending slots formed therein to permit radial displacement of the outer end portions of said skirt.

8. A spring retainer having a base, a plurality of tangs extending radially inwardly and slightly axially from

said base and a skirt divided into a plurality of outwardly flared portions depending from the periphery of said base.

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