Oct. 29, 1935. V. W. KLIESRATH ET AL 2,019,138

INTERNAL COMBUSTION ENGINE

Filed June 17, 1933 2 Sheets-Sheet 1

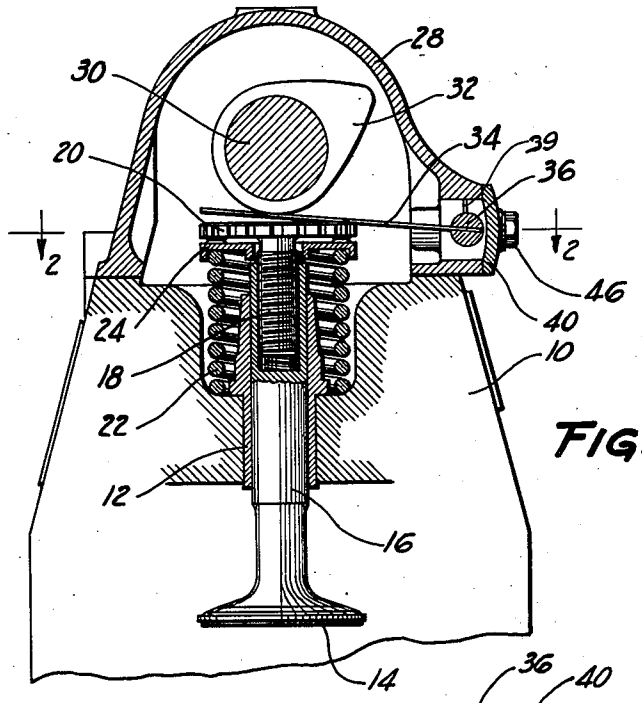


FIG. 1

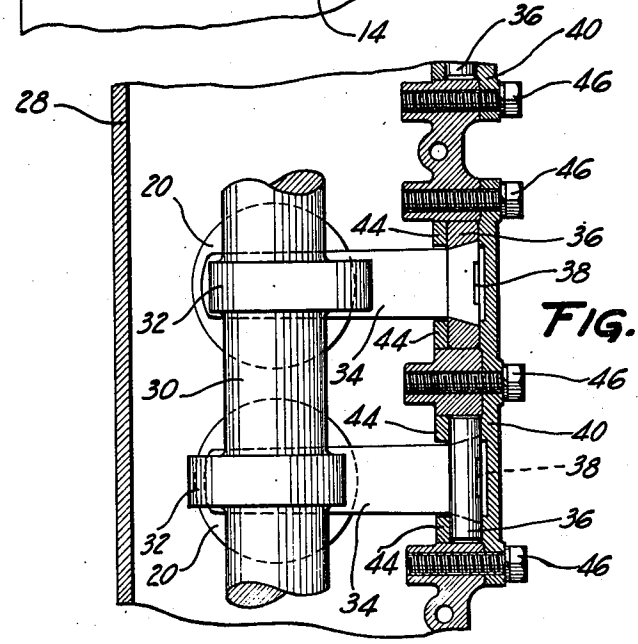


FIG. 2

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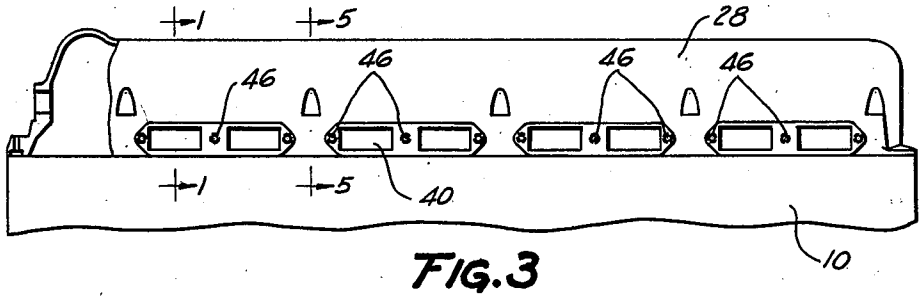


FIG. 3

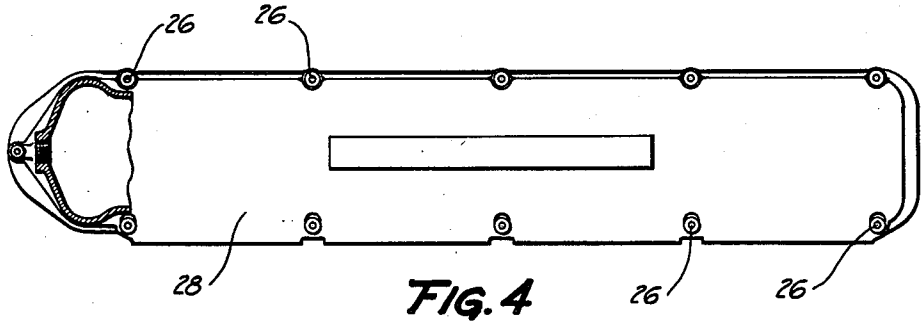


FIG. 4

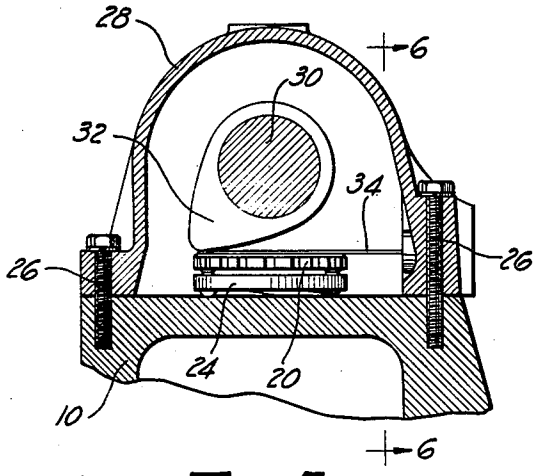


FIG. 5

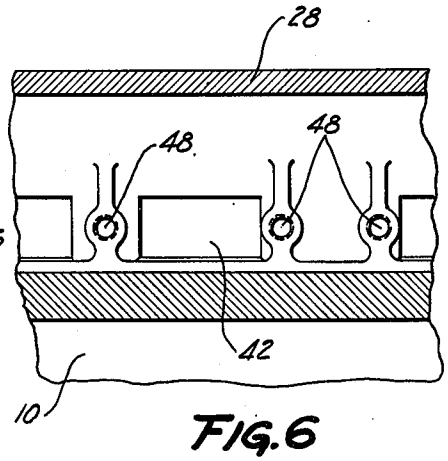


FIG. 6

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2,019,138

INTERNAL COMBUSTION ENGINE

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Application June 17, 1933, Serial No. 676,226

8 Claims. (Cl. 123—90)

This invention relates to internal combustion engines, and especially to their valve gears, and is illustrated as embodied in a novel valve-in-head engine with an overhead camshaft and having novel means for gradually taking up the valve clearance as the cam turns and preferably also taking the side thrust of the cam.

In one desirable arrangement, a member such as a leaf spring extends transversely between each cam and its valve tappet or equivalent part, and remains resiliently in engagement with both the cam and the tappet throughout the engine cycle. As the cam turns to take up the valve clearance, the spring flexes, forming a sort of shock absorber which gradually transmits the cam thrust to the valve, building up the valve-opening force until the clearance is taken up and the cam bears directly on the valve tappet through the spring.

Preferably the leaf spring, or its equivalent, is engaged by means taking the side thrust of the cam, and which is illustrated as a pivot in which the end of the spring is mounted in a novel manner. We prefer to arrange these pivots in a series along the side of a cover in which the camshaft is rotatably mounted, and which is bolted or otherwise secured over the top of the cylinder head in which the valves are reciprocatably arranged. For convenience of assembly and repair, each pair of pivots may be mounted in a removable plate secured to the side of this cover.

The above and other objects and features of the invention, including various novel combinations of parts and desirable particular constructions, will be apparent from the following description of the illustrative embodiment shown in the accompanying drawings, in which:

Figure 1 is a vertical transverse section through the upper part of an engine, showing one valve and its operating means;

Figure 2 is a partial section on the line 2—2 of Figure 1, showing in top plan two of the leaf springs for the valve of one cylinder of the engine;

Figure 3 is a side elevation (broken away at one end) of the top of the engine;

Figure 4 is a top plan view (partly broken away at one end) of the cover in which the camshaft is mounted;

Figure 5 is a transverse vertical section on the line 5—5 of Figure 3, showing how the cover is mounted; and

Figure 6 is a partial section through the cover, on the line 6—6 of Figure 5.

The engine selected for illustration includes the usual cylinder block (not separately shown) on which is bolted or otherwise mounted a cylinder head 10 having guide portions with vertical openings provided with valve-stem guides 12 in which reciprocate suitable valves having mushroom heads 14 and stems 16 which slide in the guides 12. The ends of the stems 16 may be tapped, adjustably to receive tappet members 18 threaded therein and which have enlarged adjusting collars or heads 20.

The valves are urged upwardly toward closed or seated position by springs 22 which coaxially surround the valve stems and tappets, and which are confined at their lower ends by the guide portions of the cylinder head and at their upper ends by retainers such as stamped washers 24 engaging the lower faces of heads 20, and if desired formed yieldingly to lock the heads 20 against displacement.

Secured by bolts 26, or other fastening means, over the top of the cylinder head 10 is a novel substantially closed cover 28 in which is rotatably mounted in any usual and desired manner a camshaft 30. The camshaft 30 is driven from the engine crankshaft in any desired manner, and is provided (and usually integrally formed) with a series of cams 32, one for each of the valves.

According to an important feature of the present invention, novel means is provided to cushion the shock of the operative engagement of each cam with its valve as its clearance is taken up, and preferably also to take the side thrust of the cam without transmitting it to its valve. In the illustrated embodiment, this means includes transversely-arranged members such as a series of steel leaf springs 34, one for each cam and valve. Each of these springs extends at one end transversely between the corresponding cam 32 and tappet head 20 and, even when these parts are spaced apart as in Figure 1 by the amount of the valve clearance, the spring resiliently engages both the cam and the valve. Accordingly, these springs are resiliently in engagement with the cams and the valves throughout the engine cycle.

The outer ends of the springs, as shown in Figure 2, preferably taper to form somewhat wider flat wedges, which are driven into corresponding wedge-shaped seats or slots in holding members such as pivots or pins 36. The ends of the leaf springs may be formed with notches 38, into which the metal of the pivots 36 is peened or otherwise displaced to hold the springs in their seats. Each of the bosses 44 is formed with a slot 39 through its upper wall (Figure 1), through pairs of which slots the corresponding springs 34

may be passed while being inserted into the slots in the pins 36, the slots in the pins being turned vertically into alinement with the slots 38 for that purpose. Afterwards the pins and springs are turned to the position of Figure 2, when the springs are held interlocked in the pins. As shown in Figure 2, the widened end of each spring 34 is wider than the space between bosses 44, this being permitted by the described method of assembly.

For convenience of assembly and removal, we prefer to mount the pivots 36 in pairs, one pair for each engine cylinder, in caps or cover plates 40 over openings 42 (Figure 6) into which project bearings or pairs of bosses 44 formed integrally in the caps 40 and in which bearings 44 the pivots 36 are mounted. Endwise movement of the pivots 36 is prevented by the walls of the openings 42, as well as by the springs 34 extending between the bosses 44 of the respective pairs. The caps or cover plates are fastened in place by bolts or cap screws 46, or other suitable means, passing through tapped openings 48 in bosses formed in the wall of the cover 28.

It will be seen that each spring 34 serves as a cushioning means for the valve thrust, as the valve turns from the position of Figure 1 to the position of Figure 5 to take up the valve clearance, preventing noise and shock as the clearance is taken up. Also since the ends of the springs are held, even though by pivots which can turn freely on their own axes, the springs take all of the side thrusts of the cams due to their wiping action as the camshaft turns. Moreover, oil collects between springs 34 and head 20 in the position of Figure 1, and is forced out gradually as the cam 32 turns, cushioning the taking up of the valve clearance in the manner of a liquid dash-pot.

Since their pivots 36 can turn freely, there is no great flexing of the springs 34, especially when considered relatively to their lengths, and they are consequently of long life. As the interior of cover 28 is, during the running of the engine, full of oil vapor introduced in the usual manner to oil the valve gear, the engaging surfaces of the cams 32 and tappet heads 20 and the upper and lower surfaces of springs 36 as well as the bearing surfaces of pivots 36 are at all times covered with films of oil.

While one illustrative embodiment has been described in detail, it is not our intention to limit the scope of the invention to that particular embodiment, or otherwise than by the terms of the appended claims.

We claim:

1. A force-transmitting means for an engine valve gear comprising a leaf spring, and a pivot having a wedge slot holding one end of said spring.

2. A force-transmitting means for an engine valve gear comprising a leaf spring, and a pivot having a wedge slot holding one end of said spring and peened over across the end of said spring.

3. An engine having a cylinder head provided with reciprocating valves, a removable cover for said head having rotatably mounted therein a shaft having a cam for each valve, a leaf spring extending laterally between each cam and its valve and resiliently engaging both of them throughout the engine cycle, and a series of pivots along the side of the cover for mounting said springs in the cover at their ends, each spring being mounted at its end on one of the pivots.

4. An engine having a cylinder head provided with reciprocating valves, a removable cover for said head having rotatably mounted therein a shaft having a cam for each valve, a leaf spring extending laterally between each cam and its valve and resiliently engaging both of them throughout the engine cycle, a series of pivots along the side of the cover for mounting said springs in the cover at their ends, each spring being mounted at its end on one of the pivots, and a series of removable plates mounted on the side of the cover and each oscillatably carrying a pair of said pivots.

5. An engine having a device forming part of a valve mechanism and comprising a pivot having a slot therethrough, a leaf spring having one end seated in said slot, and a bearing for the pivot having at one side a space for the passage in normal use of the spring and having a slot adapted to be brought into alinement with the first slot by turning the spring to an abnormal position, to facilitate removal and replacement of said spring without removing the pivot from said bearing.

6. An engine having a device forming part of a valve mechanism and comprising a pivot having a wedge-shaped slot therethrough, a leaf spring having one end correspondingly wedge-shaped and seated in said slot and having the wedge-shaped end at its narrower portion merging into a spring of the same width projecting at one side of the pivot, and a bearing for the pivot having at one side a space for the passage of the projecting part of the spring but narrower than the broader portion of the wedge-shaped end of the spring and having a slot wide enough to permit the passage of the widest part of the spring and adapted to be brought into alinement with the first slot by turning the spring to an abnormal position, to facilitate removal and replacement of said spring without removing the pivot from said bearing.

7. An engine having a cam and a valve tappet substantially in line with the cam, and a leaf spring held at one end and having one part engaging a part of said tappet at all times and having another part constantly in engagement with the cam and which is brought, by movement of the cam taking up the clearance of the valve tappet, against the end of the tappet, whereby the said other part forms a solid thrust connection between the cam and the tappet after the clearance is taken up.

8. An engine having a cam and a valve tappet substantially in line with the cam, a leaf spring having one part engaging a part of said tappet at all times and having another part constantly in engagement with the cam and which is brought, by movement of the cam taking up the clearance of the valve tappet, against the end of the tappet, whereby the said other part forms a solid thrust connection between the cam and the tappet after the clearance is taken up, and a pivot in which one end of the leaf spring is mounted.

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