Jan. 8, 1952 R. T. DOUGHTY 2,581,471

VALVE ROTATING DEVICE

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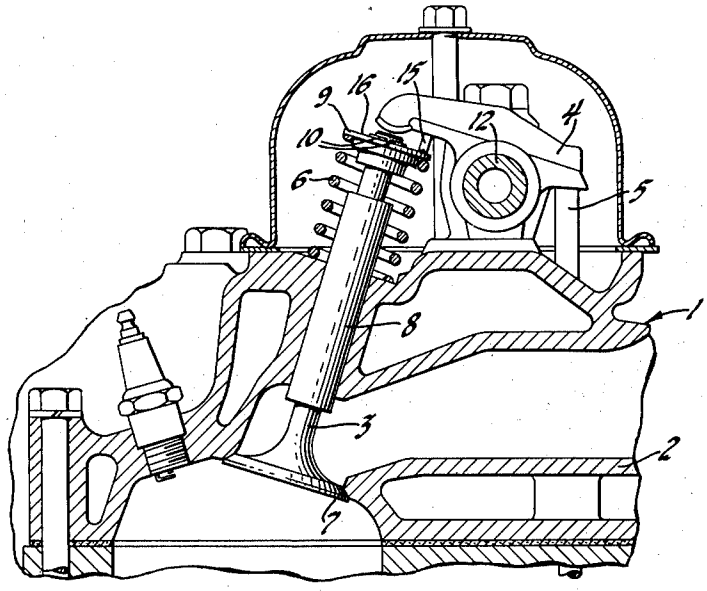


Fig. 1

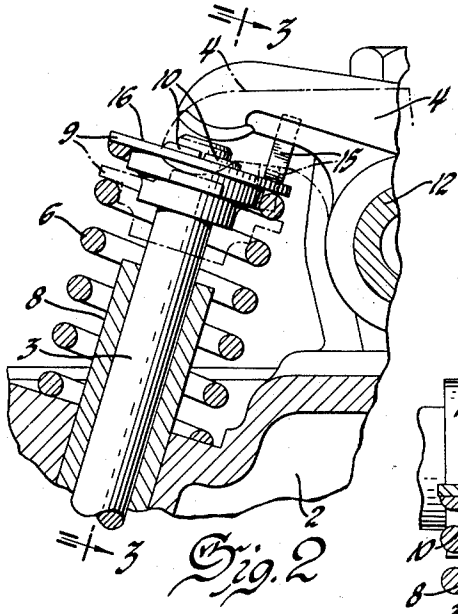


Fig. 2

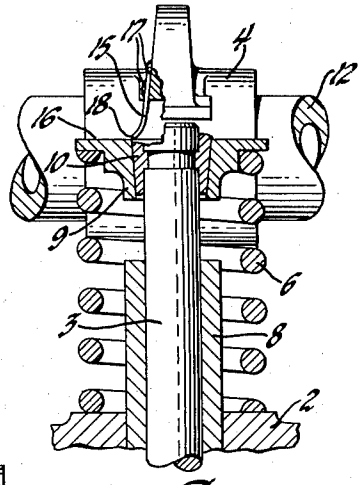


Fig. 3

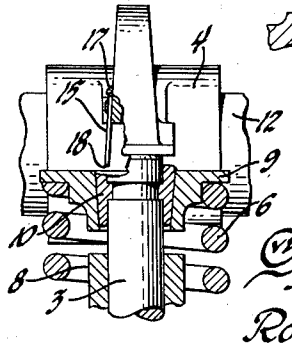


Fig. 4

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VALVE ROTATING DEVICE

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7 Claims. (Cl. 123—90)

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This invention relates to poppet valves for internal combustion engines and the like and more particularly to means for effecting axial rotation of the valves simultaneously with their reciprocation.

The invention is applicable to such engines of the overhead valve type employing the usual rocker which operates against the valve stem to effect opening of the valve against the biasing force of a coil spring concentric with the stem, one end of the spring being in abutment with a retainer fixed to the stem and the opposite end of the spring being in abutment with a stationary portion of the engine frame. During reciprocation of the valve the opposite ends of the spring are caused to rotate relative to each other due to the inherent twisting effect produced in the spring during flexure thereof. Various attempts have heretofore been proposed for utilizing this twisting effect of the spring to rotate the valve progressively in one direction, and it is the principal object of my invention to provide a simple and inexpensive means for accomplishing this result which is thoroughly dependable in operation.

Broadly my invention contemplates attaching a brake to the valve rocker adapted to effect a one-way braking engagement with the retainer during valve reciprocation, thereby accommodating rotation of the valve in one direction by the spring while restraining such rotation in the opposite direction.

In the drawing:

Figure 1 is an elevational sectional view of a portion of an internal combustion engine incorporating the valve rotating device of my invention.

Figure 2 is an enlarged fragmentary view similar to Figure 1, showing the valve-closed positions of the parts in solid lines and their valve-open positions in broken lines.

Figure 3 is a sectional view taken substantially on line 3—3 of Figure 2 with the parts in their valve-closed positions.

Figure 4 is a view similar to Figure 3 but showing the relationship of the parts with the valve in open position.

Referring now to the drawing there is shown an engine frame designated generally by the numeral 1 including a cylinder head 2 incorporating the conventional overhead type valve mechanism including the poppet valve 3, operating rocker 4, push rod 5, and coil return spring 6. Elevation of the push rod 5 by a cam (not shown) rotates the rocker 4 on its shaft 12 to

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drive the valve 3 open, i. e., away from its seat 7 against the biasing force of the spring 6. 8 is a bushing fixed in the cylinder head 2 which guides the valve 3 during its opening and closing movements and accommodates axial rotation of the valve. Contraction and elongation of the coil spring 6 during reciprocation of the valve results in relative rotation between the opposite ends of the spring as a result of the inherent tendency of the spring to twist when flexed. The spring seats on the cylinder head and has its opposite end in abutting and rotative driving relation with the retainer 9 which is fixedly secured to the valve stem by conventional split locks 10. Hence, as the valve reciprocates in operation it also tends to rotate in alternate directions, the direction of rotation during opening depending on whether the spring 6 is wound right-hand or left-hand. In the arrangement shown which employs a right-hand wound spring, the retainer 9 and hence the valve 3 tend to rotate in a counterclockwise direction during valve opening and in a clockwise direction during valve closing.

To accommodate counterclockwise rotation of the valve while restraining its clockwise rotation I provide a one-way brake 15 in the form of an elongated flat strip of spring steel or the like in a plane slightly inclined (Figures 3 and 4) to the plane of movement of the rocker 4. One end of the brake 15 is fixedly attached as by welding at 17 to one side of the rocker and has its other end depending therefrom toward the upper face 16 of the retainer 9. The brake 15 as shown in Figures 1 and 2 is also offset from the valve stem toward the rocker shaft 12 and has sufficient length that its lower end 18 remains in engagement with the retainer surface 16 throughout a substantial portion of the reciprocatory stroke of the valve and moves out of engagement therewith just prior to the valve reaching its fully open position indicated in Figures 2 and 4. By reason of its inclined and offset relation with the valve, the lower end 18 of my brake effects a one-way locking engagement with the surface 16, accommodating counterclockwise rotation of the retainer 10 but restraining clockwise rotation thereof. The flexibility of the brake enables its lower end 18 to remain in engagement with the retainer surface 16 through a substantial portion of the valve stroke despite their relative movement axially of the valve.

I claim:

1. In an internal combustion engine, a poppet valve having a stem, means including a rocker

engageable with the stem for opening the valve, a spring for returning the valve to closed position and acting to rotate the valve as the valve is reciprocated, and a brake carried by the rocker and directly engageable with means associated with said stem to limit valve rotation to one direction.

2. In an internal combustion engine, a poppet valve, reciprocating means therefor including a valve operator and a return spring, said spring having a portion adapted to rotate in alternate directions as the valve is reciprocated, a member drivably connecting said spring portion to the valve, and a brake carried by the operator and engageable with said member to limit rotation of the member to one direction throughout a portion of the reciprocatory stroke of the valve.

3. In an internal combustion engine, a poppet valve guided for rotation and for reciprocation to and from open position, means for opening the valve, a coil spring for closing the valve, said coil spring due to its inherent twisting motion during contraction and elongation providing a rotative force for rotating the valve, a member rotatively and thrustably connecting one end of the spring to the valve, and a one-way rotary brake for said member carried by said valve opening means.

4. In combination with a poppet valve reciprocating means including a rocker operative to open the valve in opposition to a coil spring having one end in abutting and rotary driving relation with a retainer fixed to the valve, a resilient arm projecting from the rocker adapted to engage the retainer in one-way rotative braking relation over a portion of the reciprocatory stroke of the valve.

5. In combination with a poppet valve reciprocating means including a rocker operative to open the valve in opposition to a coil spring having one end in abutting and rotary driving relation with a retainer fixed to the valve, a brake for restraining rotation of the valve in one direction consisting of an arm inclined to the axis of the valve in a direction generally longitudinal to the axis of the rocker, said arm being fixed at one end to the rocker and having its other end disposed to abut the retainer between the valve and the rocker axis during reciprocation of the valve.

6. In an internal combustion engine, a poppet valve having a stem, means including a rocker engageable with the stem for opening the valve, a spring for returning the valve to closed position and acting to rotate the valve as the valve is reciprocated, and a brake arranged to frictionally interconnect the rocker and means associated with said stem to limit valve rotation to one direction during reciprocation.

7. In an internal combustion engine, a poppet valve guided for rotation and for reciprocation to and from open position, a valve opening member, a coil spring for closing the valve, said coil spring due to its inherent twisting motion during contraction and elongation providing a rotative force for rotating the valve, a member rotatively and thrustably connecting one end of the spring to the valve, and a one-way rotary brake carried by one of said members and engageable with the other member during a portion of the reciprocatory stroke of the valve.

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