Feb. 20, 1940. A. V. D. WILLGOOS 2,191,333

ENGINE CYLINDER VALVE

Filed Sept. 30, 1938

Fig. 1

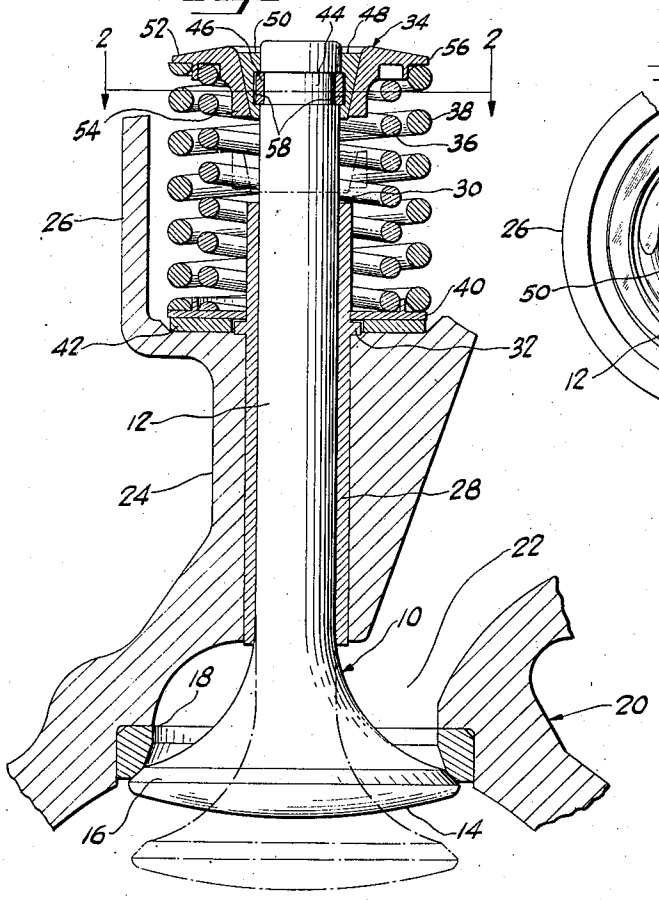
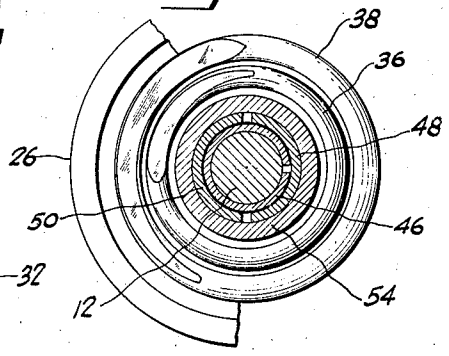


Fig. 2



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ENGINE CYLINDER VALVE

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8 Claims. (Cl. 123—188)

This invention relates to improvements in engine cylinder valves and has particular reference to an improved construction for connecting the valve closing spring to the end of the valve stem and for other purposes.

An object of the invention resides in the provision of an improved cylinder valve arrangement including an improved and simplified construction for connecting the valve closing spring to the end of the valve stem.

A further object resides in the provision of an improved valve construction in which one of the elements utilized to connect the end of the valve closing spring to the valve stem also serves the additional purpose of limiting the inward movements of the valve into the cylinder, particularly in case of breakage of the spring or the spring connecting means.

Other objects and advantages will be more particularly pointed out hereinafter or will become apparent as the description proceeds.

In the accompanying drawing, in which like reference numerals are used to designate similar parts throughout, there is illustrated a suitable mechanical embodiment of an engine cylinder valve construction disclosing the invention. The drawing, however, is for the purpose of illustration only and is not to be taken as in any way limiting or restricting the scope of the invention as set forth in the appended claims.

In the drawing,

Fig. 1 is a side elevational view of an engine cylinder valve with the valve guiding, supporting and closing elements shown in vertical section and,

Fig. 2 is a transverse sectional view on the line 2—2 of Fig. 1.

Referring to the drawing in detail, the numeral 10 generally indicates a poppet valve of the familiar mushroom type having a stem portion 12 and a head 14 provided with a beveled sealing surface 16 which cooperates with a similar surface provided on the annular valve seat 18 secured in the cylinder head 20 surrounding the port 22. Above the port 22 the cylinder head is provided with an extension 24 which terminates in a hollow rocker-arm box 26. A tubular guide 28 extends through the extension 24 and into the interior of the rocker-arm box terminating above the bottom of the rocker-arm box as indicated at 30 and is provided with an annular shoulder 32 which rests upon the bottom of the rocker-arm box and prevents the guide from moving through the extension 24. The valve stem 12 extends through the guide 28 and to a position above the upper end of the guide to receive an abutment structure generally indicated at 34 for the upper or outer end of one or more coiled compression springs, as indicated at 36 and 38, located in the rocker-arm box 26 and surrounding the portions of the valve guide and valve stem projecting into the rocker-arm box. The force of the springs 36 and 38 exerted on the abutment 34 tends to raise the valve 10 and maintain it closed against the seat 18. The valve is opened by a suitable valve operating device, not illustrated, many forms of which are familiar to the art. If desired, a fixed abutment 40 and a spring pad 42 may be disposed between the lower ends of the springs 36 and 38 and the bottom of the rocker-arm box 26 immediately surrounding the valve guide 28 for adjusting the spring tension and to provide a hard bearing surface for the lower ends of the springs, particularly in those constructions in which the cylinder head 20 is made of a relatively soft metal such as an aluminum alloy.

The valve stem 12 is provided near its end opposite the head 14 with a comparatively shallow annular groove 44, preferably having rounded shoulders so that there are no sharp edges on the valve stem to permit localized stress concentration which might result in relatively rapid deterioration of the valve stem in use. The abutment 34 comprises a split snap ring 46 proportioned to be partly received in the annular groove 44, a pair of semi-circular wedges 48 and 50 having axially tapered outer surfaces and a flanged cap generally indicated at 52 including a sleeve portion 54 having an axially tapered inner surface dimensioned and proportioned to cooperate with the outer surfaces of the wedges 48 and 50, and an annular flanged portion 56 arranged to overlie the upper or outer ends of the springs 36 and 38.

In applying the improved valve retaining organization the valve is first inserted through the guide 28 and the snap ring 46 applied to the valve stem. The springs 36 and 38 are placed in position upon the abutment 40 and pad 42 surrounding the upper ends of the valve stem and guide member. The movable abutment member 52 is then placed in position upon the valve springs and the springs are compressed to move the member 52 inwardly to a position past the groove 44. With the movable abutment 52 below the snap ring 46 the wedges 48 and 50 are inserted in position so that they bear at both sides of their internal grooves on the valve stem and their internal grooves, as indicated at 58, receive the outer portion of the snap ring, the inner portion of which is received in the annular groove 44

in the valve stem. The means compressing the springs 36 and 38 may then be released permitting the movable abutment 52 to move outwardly until it wedges upon the wedge members 46 and 48 which bear on and become fixed relative to the valve stem 12 by this wedging action. The outer ends of the springs 26 and 38 will then be securely connected to the outer end of the valve stem so that the force of the springs will urge the valve to seat against the annular seat member 18.

The valve guide 28 is dimensioned above the shoulder 32 so that its upper or outer end, as indicated at 30, is located at a position near the terminal position of the undersurfaces of the members 46, 48 and 52 during the valve opening travel of these members, as is indicated in broken lines in Fig. 1. With this arrangement, if the valve springs 36 and 38 should be broken during operation the contact of the undersurfaces of the members 46 and 48, as illustrated, with the upper end 30 of the valve guide 28 will limit the inward movement of the valve so that the valve will not project into the cylinder materially beyond its normal open position. If the member 52 or the springs 36 and 38 should be broken and the members 48 and 50 released from their operative position, contact of the lower side of the snap ring 46 with the upper end of the valve guide 28 will limit the inward movement of the valve so that the valve still cannot project into the cylinder materially beyond its normal open position and the piston, not illustrated, will therefore not be permitted to pound against the head of the valve if the engine continues to operate after one valve has been disabled in the manner indicated above. With this construction only one groove in the valve stem is necessary and only one ring is used to perform the two functions of retaining the movable spring abutment on the end of the valve stem and limiting the inward travel of the valve in case the springs or abutments fail during operation which construction not only provides a material simplification of the spring retaining and movement limiting arrangement by avoiding the use of additional parts but also results in a much stronger and more durable valve stem by omitting an additional groove between the abutment retaining groove and the valve head.

While a particular mechanical construction and arrangement has been hereinabove described and illustrated in the accompanying drawing for the purpose of disclosing the invention, it is to be understood that the invention is not limited to the construction and arrangement so illustrated and described, but that such changes in the size, shape and arrangement of parts may be resorted to as come within the scope of the sub-joined claims.

Having now described the invention so that other skilled in the art may clearly understand the same, what it is desired to secure by Letters Patent is as follows.

What is claimed is:

1. An engine valve organization including, a valve having a stem provided with an annular groove near its outer end, and a snap ring engageable in said groove and providing a shoulder on said stem to limit the travel of said valve in one direction and provide an anchorage for a valve spring retainer.

2. An engine valve organization including, a valve having a stem provided with a shallow annular groove near its outer end, a valve spring, and an abutment for connecting the outer end of said spring to the outer end of said valve, and a single snap ring engageable in said groove and projecting beyond the cross-sectional area of said stem to limit the travel of said valve in one direction and provide an anchorage for said abutment in operatively connecting the end of said valve spring to said valve stem.

3. An engine valve organization including, a valve having a stem provided with an annular recess near its outer end, a valve spring, an abutment for connecting the outer end of said spring to the outer end of said valve, a tubular guide for said valve stem, and a single snap ring engageable in said recess to provide an anchorage for said abutment and cooperate with the end of said guide to limit the travel of said valve in one direction.

4. A valve spring retainer and valve travel limiting device comprising, a snap ring simulating a short split tube and having end surfaces adapted to be engaged with the sides of an annular groove in the outer portion of the valve, a pair of wedge members engageable with the end surfaces only of said snap ring and bearing on the valve stem, and a flanged abutment engageable with said wedge members and the adjacent end of the valve spring.

5. In combination with a valve having a stem and a head portion and a shallow annular groove in the stem portion at the end thereof opposite said head constituting the only irregularity in the cylindrical surface of said stem, a tubular guide for said valve, and a valve closing spring surrounding a portion of said stem, means for connecting the grooved end of said valve stem to the corresponding end of said spring and for limiting movements of said stem through said guide comprising, a snap ring of thin cross-section in said groove, a pair of substantially semi-circular wedge members engageable with said snap ring but bearing on said stem, and a flanged abutment engageable with said wedge members and overlying the adjacent end of said spring.

6. In combination with a valve having a stem and a head portion and a shallow annular groove having rounded shoulders in the stem portion at the end opposite said head constituting the sole irregularity in the cylindrical surface of said stem, a tubular guide for said valve terminating, when said valve is in closed position, at a distance from said groove substantially equal to the opening travel of said valve, and a valve closing spring surrounding a portion of said stem, means for connecting the grooved end of said valve stem to the corresponding end of said spring and for cooperating with the end of said valve guide to limit movement of said valve through said guide comprising, a snap ring having a relatively thin elongated cross-section in said groove, a pair of substantially semi-circular wedge members engageable with the sides of said snap ring, and a flanged abutment engageable with said wedge members and arranged to overlie the adjacent end of said spring.

7. In combination with a valve having a stem and a head portion and a shallow annular groove in the stem portion at the end thereof opposite said head, a tubular guide for said valve terminating, when said valve is in closed position, at a distance from said groove only slightly greater than the opening travel of said valve, and a valve closing spring surrounding a portion of said stem, means for connecting the grooved end of said valve stem to the corresponding end of said

spring and for cooperating with the end of said valve guide to limit movement of said stem through said guide comprising, a snap ring in said groove, a pair of substantially semi-circular wedge members engaged with said snap ring and bearing on the valve stem on each side of said snap ring, and a flanged abutment engaged with said wedge members and overlying the adjacent ends of said spring.

8. In an engine valve combination, a valve having a head portion and a stem portion provided with an annular groove near its end opposite said head portion, a tubular valve guide provided intermediate its length with an external annular shoulder supported by the engine, a valve seat supported by the engine, a valve closing spring surrounding the portion of said valve guide on the side of said shoulder remote from said seat, a flanged abutment overlying said spring, wedge members engaging said abutment, and a snap ring in said groove and engaging said wedge members to position said abutment with respect to said valve stem and limit the movement of said valve stem through said guide in the event of failure of said spring or said abutment, the distance between said snap ring and the adjacent end of said valve guide when said valve is closed against said seat being substantially equal to the normal opening travel of said valve.

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