Feb. 25, 1936. V. F. ZAHODIAKIN 2,032,162

INTERNAL COMBUSTION ENGINE VALVE

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Fig. 1.

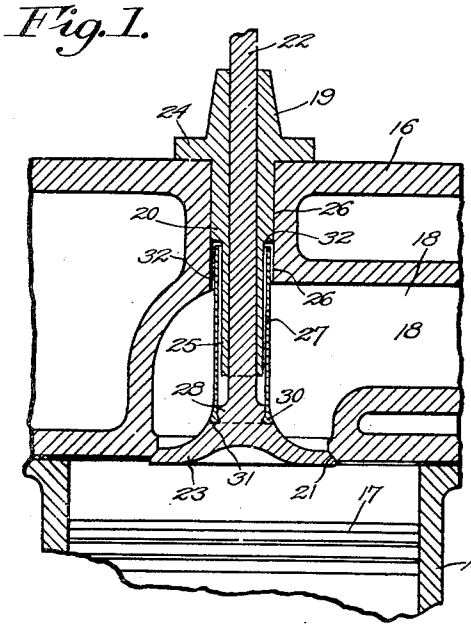


Fig. 2.

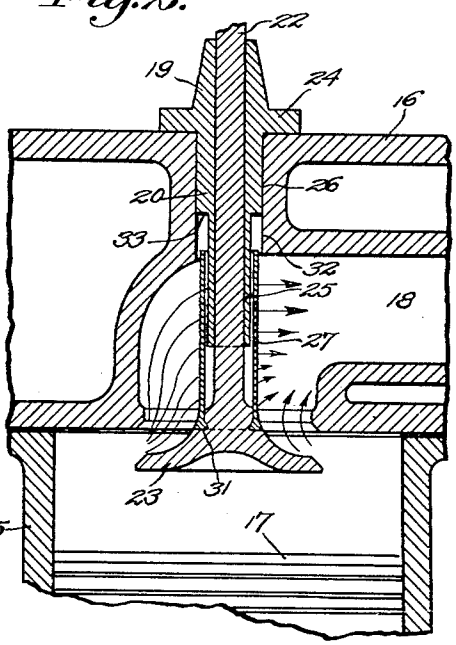


Fig. 3.

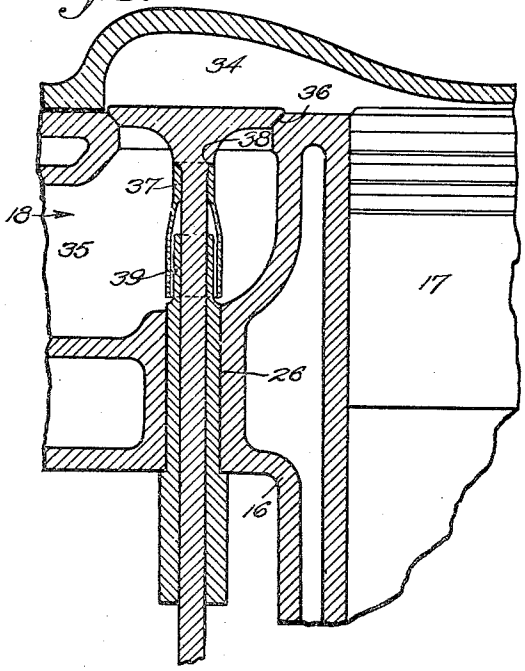
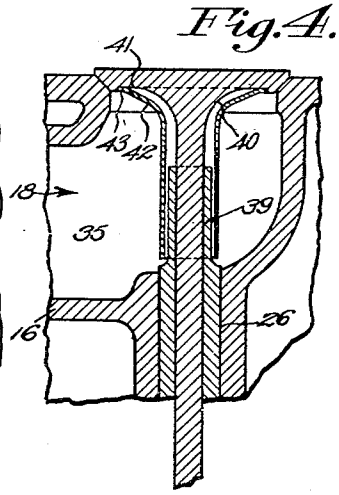


Fig. 4.



INVENTOR
Victor F. Zahodiakin
BY
Wood & Wood
ATTORNEYS

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Fig. 5.

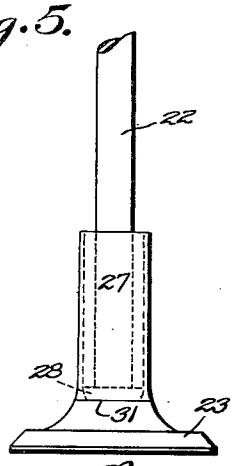


Fig. 6.

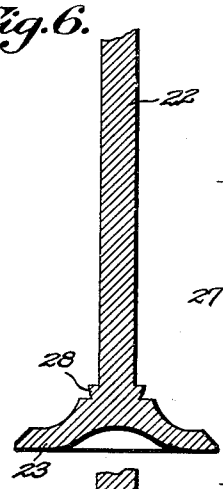


Fig. 8.

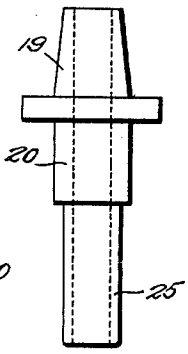


Fig. 7.

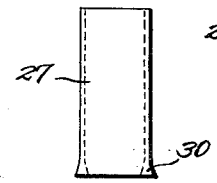


Fig. 9.

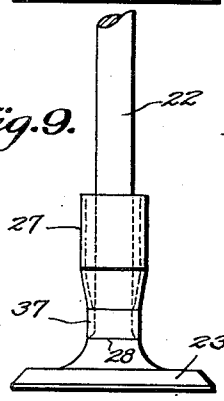


Fig. 10.

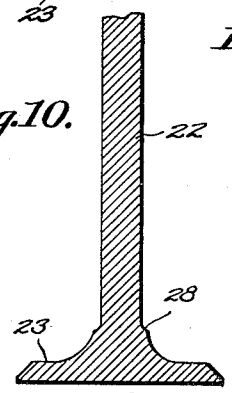


Fig. 11.

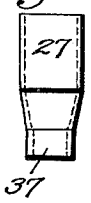


Fig. 15.

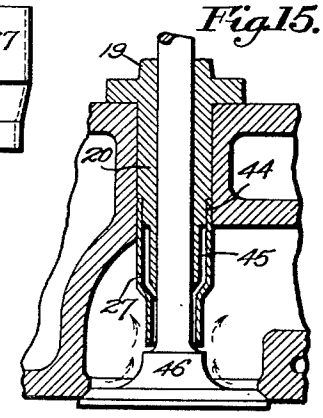


Fig. 12.

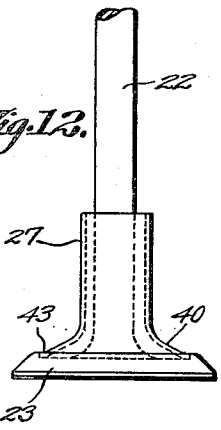


Fig. 13.

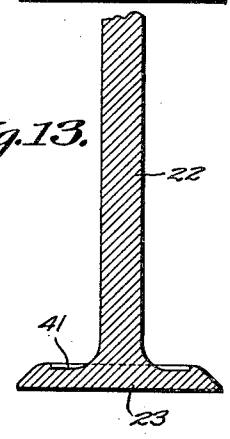
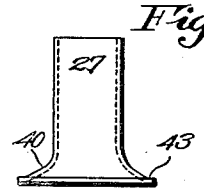


Fig. 14.



INVENTOR
Victor F. Zahodiakin
BY
Wood & Wood
ATTORNEYS

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UNITED STATES PATENT OFFICE

2,032,162

INTERNAL COMBUSTION ENGINE VALVE

Victor F. Zahodiakin, Cincinnati, Ohio, assignor to The Z-Flex Piston Ring Corporation, New York, N. Y., a corporation of New Jersey

Application April 10, 1933, Serial No. 665,369

2 Claims. (Cl. 123—188)

This invention relates to internal combustion engines and is particularly directed to improvements in valves for this type of engine. More specifically, the present improvements are embodied in the exhaust valves and came into being because of the problem created by the destructive action of the hot gases and products of combustion discharged from the cylinders.

It is the object of this invention to provide an improved exhaust valve structure for internal combustion engines in which a shield is associated with the valve head, valve stem and valve guide, and is so disposed in the exhaust passageway as to give maximum protection to the valve, whereby the following advantageous results occur: The entire valve is maintained at lower temperature and local overheating of the combustible mixture and pre-ignition are thereby eliminated, permitting higher compression without detonation; carbon deposits, pitting of the contacting surfaces of the valve seat and head and burning of the valve head and stem are prevented resulting in better compression and maintenance of a constant uniform operating clearance of the valve, consequently accomplishing more accurate valve timing; a lighter valve may be used since the tensile strength of the valve material will be maintained; less working clearance between the valve guide and the valve stem is needed since there is less expansion due to the lower temperature of the valve stem and accordingly the alignment of the valve seats will be improved and sticking of the valve will not occur; furthermore since sticking of the valve stem in the valve guide does not occur due to the elimination of carbon deposits, a lower tension on the springs will be permitted and this will be advantageous to the engine since strong springs are destructive to the valve; warping of the valve is prevented and the use of less expensive materials is possible due to the lower temperature; and finally the performance and efficiency of the engine will be greatly increased since the defects from overheating of the valves will be eliminated as above stated and a noticeable increase in power output will result.

Other objects and further advantages will be more fully apparent from a description of the accompanying drawings, in which:

Figure 1 is a fragmentary sectional view taken through a cylinder and exhaust passageway of an internal combustion engine, showing the improvements applied to the exhaust valve and illustrating the valve in closed position.

Figure 2 is a view taken similar to Figure 1, but showing the valve in open position.

Figure 3 is a fragmentary sectional view taken through a cylinder and exhaust passageway of an internal combustion engine, showing a modified mounting of the valve protecting shield showing the same applied to an exhaust valve incorporated in the engine block.

Figure 4 is a fragmentary sectional view taken through an exhaust valve and passageway showing another modified mounting of the shield.

Figure 5 is a fragmentary exterior view of an exhaust valve showing the shield of this invention in position thereon.

Figure 6 is a longitudinal fragmentary sectional view of the valve with the shield removed.

Figure 7 is an exterior side view of the shield showing it separately.

Figure 8 is a side view of the valve guide showing it separately.

Figure 9 is a fragmentary exterior view of the exhaust valve showing the modified form of shield of Figure 3 attached thereto.

Figure 10 is a longitudinal fragmentary sectional view of the exhaust valve of Figure 9.

Figure 11 is an exterior side view of the shield of Figure 9.

Figure 12 is a fragmentary side view of an exhaust valve showing the modified shield of Figure 4 applied thereto.

Figure 13 is a fragmentary longitudinal sectional view of the exhaust valve of Figure 12.

Figure 14 is an external side view of the latter modified shield.

Figure 15 is a central sectional view of a further modification.

The present improvements are directed in their entirety to the exhaust valve structure and environment thereof. Accordingly, the illustration has been extended only so far as is necessary to illustrate the mounting and relation of an exhaust valve to a motor including for this purpose a showing of the upper end of a cylinder, the adjacent portion of the head including the exhaust passageway and the mounting for the valve and the valve itself.

Referring to Figures 1 and 2 of the drawings, the engine includes the engine body comprising a cylinder block indicated at 15 (of which only the upper end is shown) and a cylinder head at 16, a piston at 17, an exhaust passageway extending from the cylinder at 18, an exhaust valve guide disposed through the cylinder head at 19, an exhaust valve mounted for vertical reciprocation in the guideway at 20, and an ex-

haust valve seat between the exhaust passageway and the cylinder at 21.

The valve illustrated is of the poppet type and its operating means, such as a cam, is not illustrated since it is purely conventional. The valve includes a stem 22 and a head 23. The valve guide is of sleeve form including a flange 24 disposed intermediate of the length of the guide and lying on the top surface of the exhaust valve head. The exhaust valve guide is fixed in position and has the lower extended or depended portion 25 mounted through a vertical bore 26 in the head and entering the exhaust passageway disposing the valve guide in axial alignment with the exhaust valve seat, the exhaust passageway turning at right angles from the initial portion to extend laterally from the head in the conventional manner.

The depending portion 25 of the guide extends across the exhaust passageway a considerable distance for the purpose of providing a longer bearing for the exhaust valve stem. The lower end of the guide is spaced sufficiently from the head of the valve to permit ample working clearance.

The shield 27 of this invention is secured to the rear end or hub 28 of the head portion 23 of the valve and is of cylindrical or tubular form concentrically mounted on the valve surrounding the stem thereof and the exhaust valve guide. This tubular element is secured in position on the valve head having a beaded lower end 30 fitting within an annular groove 31 of the hub 28. The lower end of the shield, as described, is attached or secured in the groove by pressing or rolling the bead into the groove and by shrinkage.

This shield extends upwardly to completely house the portions of the valve stem and exhaust valve guide normally exposed in the exhaust passageway. To accomplish complete coverage the lower end of the valve guide is exteriorly counterturned as at 32, the counterturning extending well up along the guide extended lower end to a point within the bore 26 in which the guide is mounted. The tubular shield extends about this counterturned portion, relatively closely but not in contact therewith, upwardly into the space in the bore cleared by the counterturning, the shield being also clear of contact with the wall of the bore.

When the valve is closed, as shown in Figure 1, the upper edge of the shield is moved to a point not quite in contact with the shoulder 33 formed of the counterturning, whereas when the valve is open and has moved downwardly the normal distance, the upper end of the shield has not moved out of the bore. Accordingly the valve guide and the valve stem are fully protected from the hot gases flowing from the cylinder regardless of the position of the valve and particularly when the valve is open.

By the provision of this protective sleeve or cylindrical shield spaced from and entirely housing or surrounding those portions of the valve and guide traversing the exhaust passageway, an isolated and insulating space has been provided for the reason that the air contained therein has substantially little or no velocity and the space may be aptly referred to as a dead air space. The valve structure, guide structure and the form of shield shown in Figures 1 and 2 have been fully detailed and separately illustrated in Figures 5 to 8 inclusive of the drawings, and the foregoing description relates the application of the invention to a "valve in head" type of motor.

In Figure 3 a modified attachment and arrangement of the shield is disclosed and for the purpose of varied application the invention is shown applied to the "valve in side" type of motor. In this type of motor the exhaust passageway 18 extends from above the cylinder in the form of a passageway 34 in the head to the passageway 35 extended downwardly and laterally within the block. The valve engages on a valve seat 36 located at the upper surface of the block, the valve extending downwardly and being operated from beneath.

In this case the tubular shield is of reduced diameter toward its head end and includes a cylindrical portion 37 lying snugly on the valve stem and against a shoulder 38 between the stem and the head and is attached by shrinkage, spot welding, or any other suitable means. The same telescopical principle used in the preceding form is used in this instance, the shield extending over but clearing the counterturned portion 39 of the valve guide. Although the shield is not extended into the bore 26 of the motor body as in the previous form, it will be understood that this could be conveniently accomplished in this form. The elements of the modification shown in Figure 3 are detailed in Figures 9 to 11 inclusive of the drawings.

In Figure 4 the "valve in side" type of motor is again disclosed and the arrangement is the same as in Figure 3 except as to the attachment and arrangement of the shield relative to the head of the valve. In this instance the stem curves into the head as at 40 and a circular concentric recess 41 is formed in the underside of the head, the stem curving into the groove. The shield has a curved or flared upper end providing a flange 42 which lies over the circular recess and has its edge 43 attached therein by spot welding or any other suitable means.

The groove extends over substantially the entire underside of the valve head and due to the co-related curving of the stem and shield the dead air space or insulating space is carried up to and along the underside of the head of the valve and substantially the entire undersurface of the head is covered by the shield and protected from the heat.

Now it will be apparent that in all instances the shield effectively covers those moving and guiding parts which are disposed in the exhaust passageway and shields the same from the extreme heat of the discharged hot gases or products of combustion, and that due to the spacing a substantial insulation is accomplished. It is considered a decided advantage to provide the shield as a separate element attached in position, for the parts can then be efficiently machined and ground without interference or difficulty because of the presence of the shield. Moreover, not only are the surfaces protected from the heat by the elimination of all the damaging actions of heat, but the temperature of the valve is materially lower in operation. There is no opportunity for the deposit of carbon on the working surface of the valve stem and because of the lower temperature of the valve, pitting of the surfaces does not occur.

Since the relation of the shield to the moving parts is a telescopical one and the parts are so extended, full protection is accomplished at all times regardless of the position of the valve. As shown in the modified view, the insulating space and the protection of the shield may be extended to the rear side of the valve head for protecting

the same. It is constantly recognized in the automotive industry that prevention of excessive heat at the valves is a most desirable accomplishment and is productive of many desirable results in the performance of the motor and increase in power output naturally occurs.

Referring to Figure 15, the protective sleeve or cylindrical shield 27 is shown fixed to the valve guide 19. Accordingly, in this form it will be noted that the valve moves telescopically relative to the shield. Describing the details of this modification, the protective sleeve is fixed on a counterturned portion 44 of the guide within the body of the engine and extends over the projected end of the guide and over the extended portion of the valve stem, terminating adjacent the rear side of the valve head.

The projected end of the guide is counterturned as at 45 and the extended end of the sleeve is formed of a smaller diameter toward its outer end for the purpose of providing a uniform insulating space about the guide and stem substantially throughout the length of the protective sleeve. The end of the sleeve adjacent to the head is positioned to provide proper working clearance for reciprocation of the valve. Therefore, when the valve is closed, this clearance is approximately taken up.

The valve includes a hub 46 at the rear side of its head from which the stem extends, this hub being of equal or slightly greater diameter than the extended end of the sleeve. The sides of the hub are curved to join the rear face of the valve head. The purpose of this structure is to deflect the hot exhaust gases or products of combustion away from the open lower end of the protective sleeve as shown by the arrows of Figure 15.

Having described my invention, I claim:

1. In an internal combustion engine, an engine body comprising a cylinder block and head, said body having an exhaust passageway extending from said cylinder, a valve slidably mounted in said engine body, said exhaust passageway including a concentrically formed seat adapted to be engaged by the head of said valve, and a cylindrical shield fixed to the valve and extending along and spaced from the valve stem across the exhaust passageway, said engine body including a bore portion receiving the end of said cylindrical shield, said cylindrical shield therefore having a telescopical movement in said bore and of a length whereby it is disposed in said bore at both open and closed positions of said valve.

2. In an internal combustion engine including the engine body comprising a cylinder block and head, said body having an exhaust passageway extending from said cylinder, a valve guide fixed in a bore of said body, a valve slidably mounted in said valve guide, said exhaust passageway including a seat adapted to be engaged by the head of said valve, and a sleeve extending along and spaced from the valve stem across the exhaust passageway, said engine body bore and valve guide having an annular space therebetween for receiving the end of said cylindrical shield, said cylindrical shield therefore having a telescopical movement in said annular space and of a length whereby it is disposed in said space at both open and closed positions of said valve.

VICTOR F. ZAHODIAKIN.