March 10, 1931. J. B. FLEMING 1,795,333

MOTOR VALVE TESTER CHECK VALVE

Filed March 29, 1927

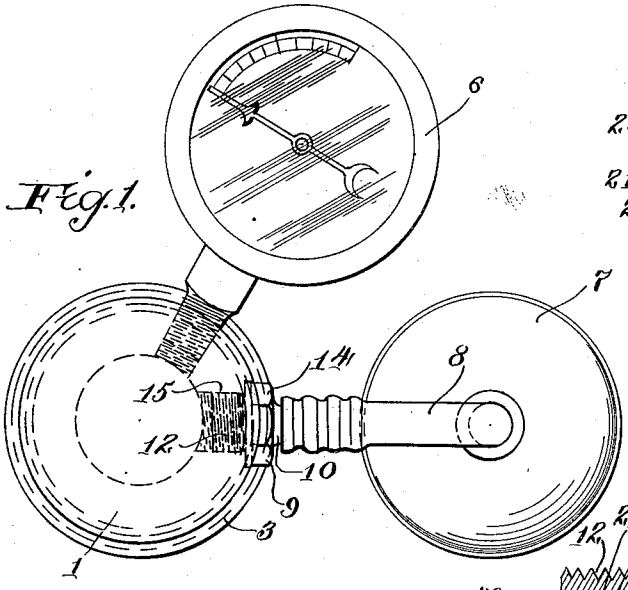


Fig. 1.

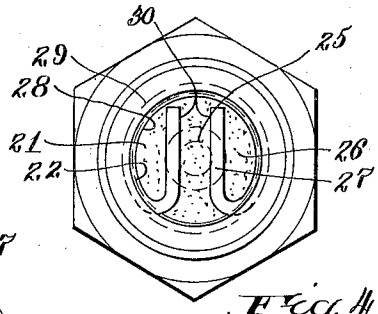


Fig. 4

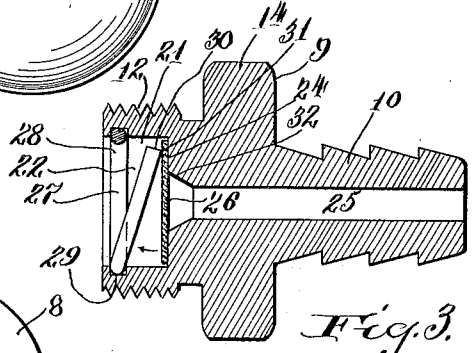


Fig. 3.

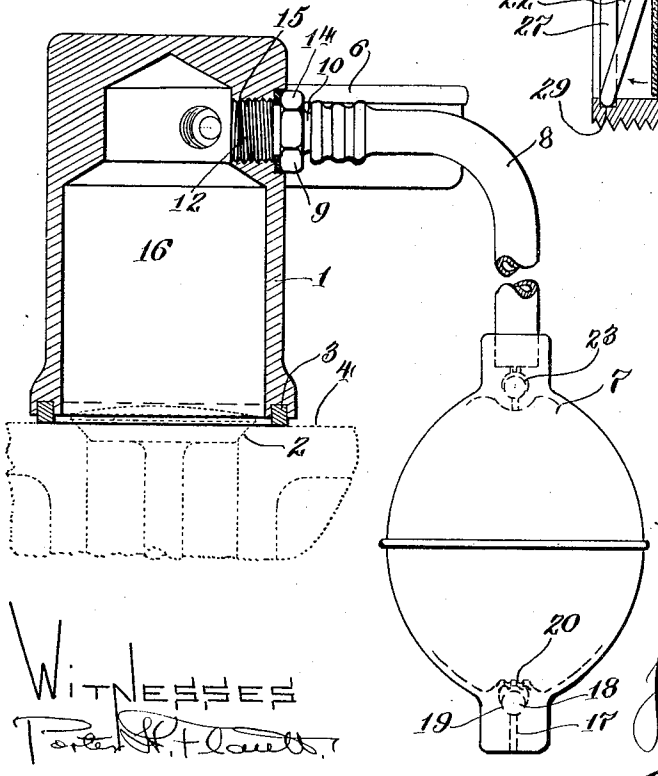


Fig. 2.

Witnesses

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UNITED STATES PATENT OFFICE

JARED BARTON FLEMING, OF BALTIMORE COUNTY, MARYLAND, ASSIGNOR TO THE BLACK & DECKER MANUFACTURING COMPANY, OF TOWSON, MARYLAND, A CORPORATION OF MARYLAND

MOTOR-VALVE-TESTER CHECK VALVE

Application filed March 29, 1927. Serial No. 179,222.

The invention relates to a check valve for use with low pressures and particularly adapted for use in connection with apparatus for testing the intake and exhaust valves of internal combustion motors. This type of apparatus is used to test or indicate the degree of perfection of the contact of motor valves with the seats in connection with the grinding operation, principally for the purpose of showing when a satisfactory closure of the valves is achieved. For this purpose fluid pressure, most conveniently air pressure, is built up in a cup or other cap or closure which contacts with the cylinder surface surrounding the valve seat forming a chamber around the valve seat which is practically air tight and from which air can only escape around the valve due to imperfection of the fit.

The low pressure valves previously used in this connection have been expensive on account of the necessity for accurate machining and in order to attain the degree of sensitiveness required they were made adjustable as to the pressure at which they operated and were consequently subject to maladjustment in the hands of the average garage mechanic.

The improved form of valve may be completely assembled within a single fitting or connection which may be referred to as a nipple, the entire assembly being then screwed into the body of the apparatus which, in the present instance, is a valve testing cup.

In the preferred construction of the improved valve the moving member which closes the valve seat, termed the valve proper, is in the form of a disk which may be of an area considerably greater than the cross sectional area of the passage to be closed and it is retained on its seat by a spring member or check valve retainer, which is provided with a flexible lateral projection holding the retainer in position in the valve chamber. This bears on the valve disk at a point near one side, but slightly spaced inwardly from the extreme edge. The disk may be of flexible material which conforms to the seat and yields in opening.

In the accompanying drawings I have illustrated a valve testing apparatus for the intake and exhaust valves of internal combustion motors, the same being equipped with a check valve embodying the features of the invention in the preferred form.

In the drawings:

Figure 1 is a top plan view of the valve testing apparatus.

Figure 2 is a vertical central section taken through the axis of the same, the valve testing apparatus being shown in connection with a fragment of motor cylinder including a valve, valve seat and passage.

Figure 3 is a longitudinal section taken through the tester valve and valve chamber and fitting on the line of the axis.

Figure 4 is an elevation looking at the same in the direction of the axis and particularly from the left in Figure 3.

Referring to the drawings by numerals, each of which is used to indicate the same or similar parts in the different figures, the apparatus, as shown, comprises a testing cup or chamber 1 adapted to encircle the valve seat 2 of an internal combustion motor or pump, or the like, having a poppet valve the cup being provided with a projecting packing ring or gasket 3 around the opening or mouth, which packing, the cylinder head being removed, contacts the top surface 4 of the cylinder.

In the preferred form an air pressure gauge 6 for indicating low pressures is connected to the inside of the cup, the same being preferably turned upward so as to be convenient for reading by the workman. Air pressure is built up within the cup in operation by means of a low pressure air pump, the most easily and conveniently operable type of pump being the bulb pump shown at 7, which can be controlled and operated by one hand, the other hand being used to hold the testing cup in position.

The bulb pump is provided with a flexible connection 8 to a fitting 9 which may have a barbed nipple 10 at one end for connection to the tube, a hollow threaded projection 12 at the other end and an intermediate angular portion or nut 14. The threaded projection

12 enters and engages a suitable threaded opening 15 leading through the wall of the cup 1 into the chamber 16 within the cup.

The bulb pump 7 is provided at the end remote from the tube 8 with an air admission or intake pasage 17 controlled by the non-return valve shown in the form of a ball valve 18 confined to its seat 19 by a cage 20 of any suitable type. The bulb also preferably has at its delivery end a check valve 23 opening in the same direction.

The pumping apparatus includes a check valve indicated in a general way by reference character 21, which serves to hold the pressure in the cup while the bulb is expanding, taking in a new charge of air through the intake passage 17. This check valve is located in the check valve chamber 22 formed in the enlarged threaded end 12 of the fitting 9. This chamber 22 is provided at the inner side with a valve seat 24 surrounding the end of the air passage 25 which extends through the fitting 9 in the direction of the axis thereof. Cooperating with this seat is a disk 26 of a diameter a little less than the inside diameter of the chamber 22.

This disk is held in contact with the seat 24 by a spring wire valve retainer 27, the same comprising a loop 28 which is sprung into an annular groove 29 in the chamber 22 near the mouth or large opening thereof. In addition to the loop the valve retainer comprises a presser or contact member 30 which, in the preferred form shown, consists of the two ends of the wire loop, the same projecting on an incline backward from the plane of the loop for a distance somewhat less than the diameter of the loop, whereby in the assembled position of the retainer they are brought in contact with the valve disk 26 on the seat 24 at a point 31 spaced slightly inward from the edge of the disk. The disk being preferably rubber, neither of the fully vulcanized hard rigid quality nor of extreme flexibility, but of the material known as rubber dam, possesses resiliency just to a sufficient degree to permit it to swing inwardly, with or without a slight yielding of the spring, admitting air at pressures easily generated by the bulb pump at each stroke or contraction of the same. The valve then returns to its seat closing the passage when the pressure on the bulb pump is released, permitting it to expand and perform the intake stroke. The tendency of the air in the cup to escape and return through the passage to the bulb pump on each intake or expansion stroke may assist in the return of the valve to the seat. It will be further noted that the passage 25 is enlarged at 32 adjacent the valve seat increasing the cross sectional area of the passage and hence the total thrust applied to the valve by the air pressure generated by the pump.

The low pressure valve thus described is not only extremely sensitive, but it does not require accurate machining and it is held and actuated by a spring clip or retainer which is easily sprung into the annular groove so that there need be no fitting of the clip. Further, the rubber disk requires no accurate fitting either to the diameter of the chamber 22 or to the valve seat, which latter it engages closely due to the back pressure of the air without necessity for accurate finishing of the valve seat, the valve being of soft material dispenses with the necessity for finishing both members, which is a feature of all metallic valves. Also, the valve is easily assembled within the fitting 9 separately from the apparatus, and is assembled with the apparatus by merely screwing the threaded portion 12 into threaded opening 15, the tubular hose 8 being then attached by forcing it over the barbed nipple 10. The advantages in disassembling for replacements and reassembling are easily appreciated.

The valve thus constructed not only admits of cheap production, but it is extremely efficient in its operation at low pressures.

I have thus described specifically and in detail an apparatus embodying the features of my invention in the preferred form in order that the nature and operation of the same may be clearly understood, however, the specific terms herein are used descriptively rather than in a limiting sense, the scope of the invention being defined in the claims.

What I claim as new and desire to secure by Letters Patent is:

1. A low pressure check valve construction particularly adapted for use with a bulb or other pump comprising a valve retainer in the form of a spring loop, a valve chamber, in the walls of which the loop is seated so as to encircle the chamber, a valve seat, a valve disk cooperating with the seat, the spring having resilient portions integral with the loop projecting from the loop bearing against the disk near one edge, pressing it against the seat, the other edge being free.

2. A low pressure check valve construction particularly adapted for use with a bulb or other pump comprising a valve retainer in the form of a loop having integral therewith, a pressure applying arm, an annularly grooved valve chamber having a valve seat, a valve disk cooperating with the seat, the loop fitting in the groove and the aforesaid pressure applying arm bearing against the disk near one edge and holding said edge in contact with the seat.

3. A low pressure check valve construction particularly adapted for use with a bulb or other pump comprising a valve retainer in the form of a loop having pressure applying arms integral with the loop and projecting across the same, an annularly grooved valve chamber having a valve seat, a valve disk cooperating with the seat, the loop fitting in

the groove and the aforesaid pressure applying arm bearing against the disk near one edge, the other edge being free, the disk being of flexible material.

4. A low pressure check valve construction particularly adapted for use with a bulb or other pump comprising a valve retainer in the form of a loop having pressure applying arms integral with the loop projecting across the loop, an annularly grooved valve chamber having a valve seat, a valve disk cooperating with the seat, the loop fitting in the groove and the pressure applying arms bearing against the disk near one edge, the other edge being free and the disk being flexible and the arms serving to limit the opening of the valve.

5. A low pressure check valve particularly adapted for use with a bulb pump comprising a valve retainer in the form of a wire loop having a deflected pressure applying end, a chamber having a valve seat, a valve disk cooperating with the seat, the wire loop fitting in the chamber and the pressure member bearing against the disk near the edge, a tubular fitting, the chamber being formed and the valve mechanism assembled in the fitting which has a threaded portion which surrounds the chamber and is adapted to cooperate with a threaded opening, the fitting also having a nut-like portion to be engaged by a wrench and a tube engaging nipple.

6. In a low pressure check valve construction having a valve chamber with a valve seat therein, a flexible valve cooperating with the seat and a valve spring comprising a wire loop of a diameter slightly greater than the chamber, adapted to be held therein by the tension of the spring, the chamber having suitable abutments to position the loop, the loop having an opening at one side with inwardly projecting resilient arms at each side of the opening, said arms projecting across the loop and being deflected from the plane of the loop so that they bear on the valve at one edge pressing it against the seat, the other edge being free to swing upward in opening the arms serving as a stop to limit the opening of the valve.

Signed by me at Towson, Maryland, this 18 day of March, 1927.

JARED BARTON FLEMING.