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L. W. JOHNSON

1,905,103

VALVE GUIDE CLEANER

Filed Dec. 9, 1929

Fig. 2.

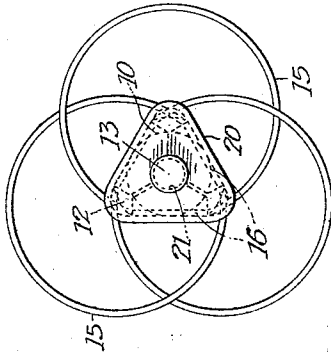


Fig. 5.

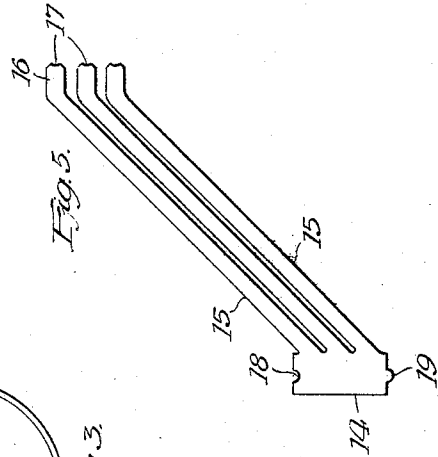


Fig. 3.



Fig. 1.

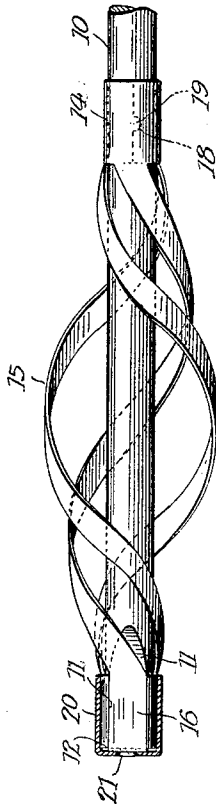


Fig. 4.

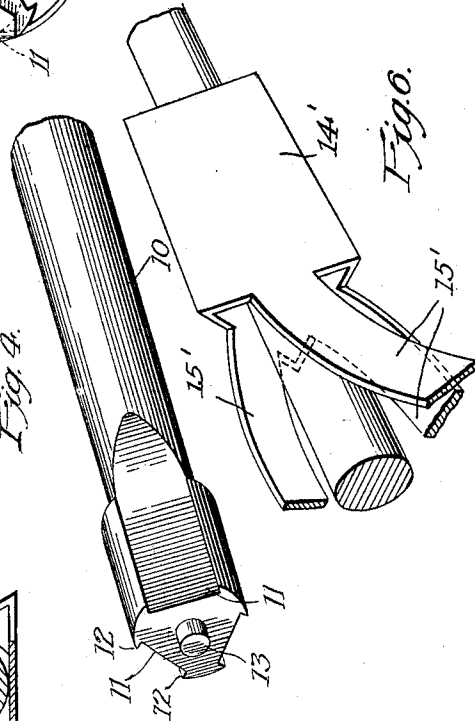
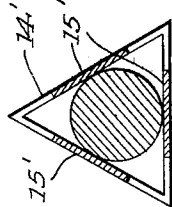


Fig. 6.

Fig. 7.



Witness

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VALVE GUIDE CLEANER

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My invention relates to valve guide cleaners and method of making same, and has particular reference to a cleaner having a head portion thereon which is adapted to remove carbon, dirt and the like from the walls of the guides through which the valve stems pass in the ordinary internal combustion engine.

Another and further object of my invention is the provision of a cleaner comprising a cleaning head which will remove the carbon deposits, dirt and the like, without removing any of the metal from the walls of the valve stem guides.

Another and further object of my invention is the provision of a valve guide cleaner which is composed of few parts, which is easily assembled, and which, when assembled, has the blades formed in such manner that the edges thereof extend upward and outward thus bringing the edges of the blades into contact with the walls of the guide so that dirt, carbon and the like, adhering to these walls, is removed.

It will be understood that the valve guides are small in size, being adapted for openings ranging usually from $\frac{5}{16}$ to $\frac{7}{8}$ of an inch in diameter. Because of the small size of the guides it is extremely difficult to provide fastening means for a cleaner head to the stem, so that the cleaners will work effectively and also will not break in service. In the method which I employ in making the cleaner, the blades forming the cleaner head are placed under tension so that the blades are slightly concave in cross section so that the edges contact with the side walls of the valve guides.

Another and further object of my invention is the provision of a valve guide cleaner and method of making the same which provides a cleaner having the blades so formed that danger of breakage of the blades is reduced to a minimum and the blades will have long life in the cleaner head and the stresses in the metal will be so distributed that flexing of the blades will not result in their fracturing or breaking away at the ends, thus rendering the cleaner inoperative.

These and other objects will be more fully and better understood by reference to the accompanying sheet of drawing, in which—

Figure 1 is a side elevational view of my improved invention;

Figure 2 is an end elevational view of the device shown in Figure 1;

Figure 3 is an end view of one of the blades and the stem upon which the blades are mounted;

Figure 4 is a perspective view of the end of the stem upon which the cleaner head is mounted; and

Figure 5 is an elevational view of the blades before they are shaped to form the cleaner head.

Figure 6 is a detail fragmentary perspective view of the inner end portion of the cleaner head showing a modification of the collar end of the head.

Figure 7 is a detail sectional view of Figure 6.

Referring specifically to the drawing and in which like reference characters refer to like parts throughout, a stem 10 is shown, having a plurality of flat faces 11, 11 formed thereon at its outer end, these faces being cut deeper at the outer end and shallower towards the rear end, so that these faces are inclined to the longitudinal axis of the stem 10 and are flat to form seats for the blades as hereinafter described, with shoulders 12, 12 formed at the sides of the faces against which the edges of the blades are fitted. A projection 13 is formed on the end of the stem and which projects outward therefrom in alignment with the longitudinal axis of the stem 10.

The cutting head of the cleaner is formed from a blank (Fig. 5) having a base portion 14 from which a plurality of blades 15, 15 project, these blades 15 extending away from the portion 14 in an angular direction, preferably from 45 to 60 degrees, depending upon the size of the cleaner. For a cleaner for a $\frac{5}{16}$ bore the preferable angle for these blades is 60 degrees, and for the $\frac{3}{8}$ and $\frac{7}{8}$ sizes the preferable angle is 45 degrees.

The free ends 16 of the blades are angu-

larly disposed with reference to the body of the blades 15, the angularity of these portions of the blades depending upon the angle of the blades 15 with respect to the member 14, but in any event they are turned so that they extend at a right angle to the member 14. The ends 16 of the blades 15 have arcuate shaped recesses 17 formed therein and are inwardly turned to engage over the end of the stem 10 with the end 16 abutting the projection 13 formed on the stem 10 which fits into the recesses 17. The base portion 14 at one of its edges has a recess 18 formed therein adapted to receive a projection 19 formed at the opposite side thereof. The base member 14 is formed into a collar, preferably round so as to conform to the shape of the stem 10 upon which it is slidably mounted. The area of flexure in the blades at their rear ends is so great and the work performed by the blades is so much greater near the forward end of the cleaner head, that I have found it unnecessary to flatten this base member on its sides, although this may be done if desired, thus forming a triangular shaped collar if three blades are used.

After the blank illustrated in Figure 5 is formed, the next step in the making of the device is to bend the base portion 14 into a collar and fitting the projection 19 into the recess 18 with the blades projecting angularly therefrom so that the head assumes somewhat the shape of a tripod. The base member 14, now shaped into a collar, is slipped over the stem 10 and the operator thereupon takes each of the blades 15 and places them under tension by winding them in the spiral form as shown in Figure 1, at the same time slightly twisting the blades until the end portions 16 are in alignment with the axis of the stem 10, whereupon these blades are fitted against the seats 11, 11 formed in the end of the stem 10. A portion of the end 16 of the blades is thereupon bent downward over the end of the stem 10 with the recessed portions 17 being fitted against the stud 13. A cap 20 is provided which is triangular in shape and has an opening 21 in the end thereof through which the projection 13 on the end of the stem 10 is adapted to project. When the cap 20 is fitted into position, the projection 13 is upset on the end by a blow from a hammer so that the cap 20 is held firmly in position with respect to the stem 10.

After the member 14 is fashioned into a collar form and the blades 15, 15 are turned into spiral form as shown in Figure 1, the blades 15, as they are twisted, are forced into an elliptical form in cross section, that is, concave on their outer sides and convex on their inner sides, so that the edges of the blades 15 project outward as shown in Figure 1. The edges of the blades project-

ing outward form the cutting portions when the device is inserted into an opening, this condition of the blades being brought about by the angularity of the blades 15 with respect to the base member 14 and twisting them into position as described, so that the ends 16 are in alignment with the axis of the base collar 14. The blades 15 are also elongated slightly during this operation, that is, they are distorted in a longitudinal direction, thus putting tension on the blades 15 and resulting in the cleaning head being longer than if the blades 15 were merely wrapped or turned in such manner that their angles with respect to the base portion 14 remained the same throughout their length, and also changes slightly the angularity of the blades with respect to the base 14. This tensioning of the blades also causes them to bulge along their middle portions and to assume a barrel-like formation.

In fashioning the cutting head in the manner described, the blades 15 remain flat at their forward ends and are only very slightly curved at their rear ends adjacent the base portion 14. The smallest area of flexure of the blades is at their forward ends where the blades seat upon the flat faces 11 of the stem 10. If the blades were arcuate shaped at their forward ends and seated upon a curved surface, the constant flexing of the blades in a small area of the blade would set up metal fatigue very quickly resulting in the breaking of the blades. The main burden of the work performed by the cutting head is at the forward end, where the blades are fixed against longitudinal movement and therefore to insure long life and service the blades are seated upon the flat surface and are flat at these ends. The collar portion 14 slides upon the stem 10 so that at the rear end of the cutting head the area of flexure of the blades is greater than at their forward ends, and when the head is compressed it slightly elongates thus creating some flexure in the blades in a longitudinal direction as well as a very slight amount in a transverse direction.

After the device is fashioned into the form shown in Figure 1, as herein described, while the cutting head is in a soft flexible condition, the blades are heat treated or tempered so that they are substantially spring steel and very hard, to render them long lived and afford sufficient resistance to elongation so that the pressure on the sides of the guide openings is sufficient to remove the accumulated dirt and carbon therefrom.

The flattened feature of the collar 14, hereinbefore referred to, has been shown in Figures 6 and 7 of the drawing wherein the stem 10 is circular as usual, but the collar 14' has been flattened into triangular shape

to accommodate the three blades 15', one for each flat side of the collar. It will be understood that the triangular collar has a slidable fit upon the stem and may be rotated thereon if necessary, just the same as the cylindrical collar 14, to accommodate the movements of the blades when the blades are accommodating themselves to the size of the opening being cleaned. Each blade is flat where it joins the adjacent flat side of the collar thereby reducing the liability of breakage at the juncture of the blade and the collar.

While I have described more or less precisely the details of construction, I do not wish to be understood as limiting myself thereto, as I contemplate changes in form and the proportion of parts and the substitution of equivalents as circumstances may suggest or render expedient without departing from the spirit or scope of my invention.

I claim:

1. A valve guide cleaner comprising in combination, a cleaner head having a plurality of spirally extending blades integrally formed with a collar portion, the said collar portion having flat faces adjacent the ends of the said blades, a stem having a plurality of flat faces formed thereon, and an end cap fitted over the free ends of the said blades and secured to said stem.

2. A valve guide cleaner comprising in combination, a cleaner head having a connecting portion and a plurality of blades in angular relation to said connecting portion, a stem having a plurality of angularly disposed flat faces thereon, an end collar, and means on said stem for engagement with the said collar.

3. A valve guide cleaner comprising in combination, a cleaner head having a connecting portion and a plurality of blades depending therefrom in an angular direction, each of said blades having end portions formed at right angles to the longitudinal plane of said connecting member, a stem having a plurality of flat angularly positioned seats therein, a collar, and means carried by said stem whereby the said collar is held over the end of the blades of the cleaner head and the end of the said stem.

4. A valve guide cleaner comprising in combination, a cleaner head having a connecting portion and a plurality of blades depending therefrom in an angular direction, each of said blades having end portions formed at right angles to the longitudinal plane of said connecting member and being fashioned into spiral form, a stem having a plurality of flat angularly positioned seats therein, a collar, and means carried by said stem whereby the said collar is held over the end of the blades of the cleaner head and the end of the said stem.

5. A valve guide cleaner comprising in combination, a cleaner head having a connecting portion and a plurality of blades depending therefrom in an angular direction, each of said blades having end portions formed at right angles to the longitudinal plane of said connecting member and being fashioned into spiral form and placed under tension when the head is formed, a stem having a plurality of flat angularly positioned seats therein, a collar, and means carried by said stem whereby the said collar is held over the end of the blades of the cleaner head and the end of the said stem.

6. A valve guide cleaner comprising in combination, a cleaner head having a connecting portion and a plurality of blades depending therefrom in an angular direction, each of said blades having end portions formed at right angles to the longitudinal plane of said connecting member and being fashioned into spiral form and twisted upon themselves, a stem having a plurality of flat angularly positioned seats therein, a collar, and means carried by said stem whereby the said collar is held over the end of the blades of the cleaner head and the end of the said stem.

7. A cleaning head blank, comprising a base portion, and a plurality of blades extending therefrom, the said blades being free at their ends opposite the base portion.

8. A valve guide cleaner comprising a stem having a plurality of faces formed thereon at one of its ends, and a cleaning element formed of a single piece of metal into a plurality of blades, each having one end free, the free ends of the blades being fixedly secured to said stem on the respective faces thereof, the said cleaning element having a collar portion formed at one end thereof freely movable on said stem.

Signed at Chicago, Illinois, this 5th day of December, 1929.

LEONARD W. JOHNSON.