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ENGINE POPPET VALVE LIFTER

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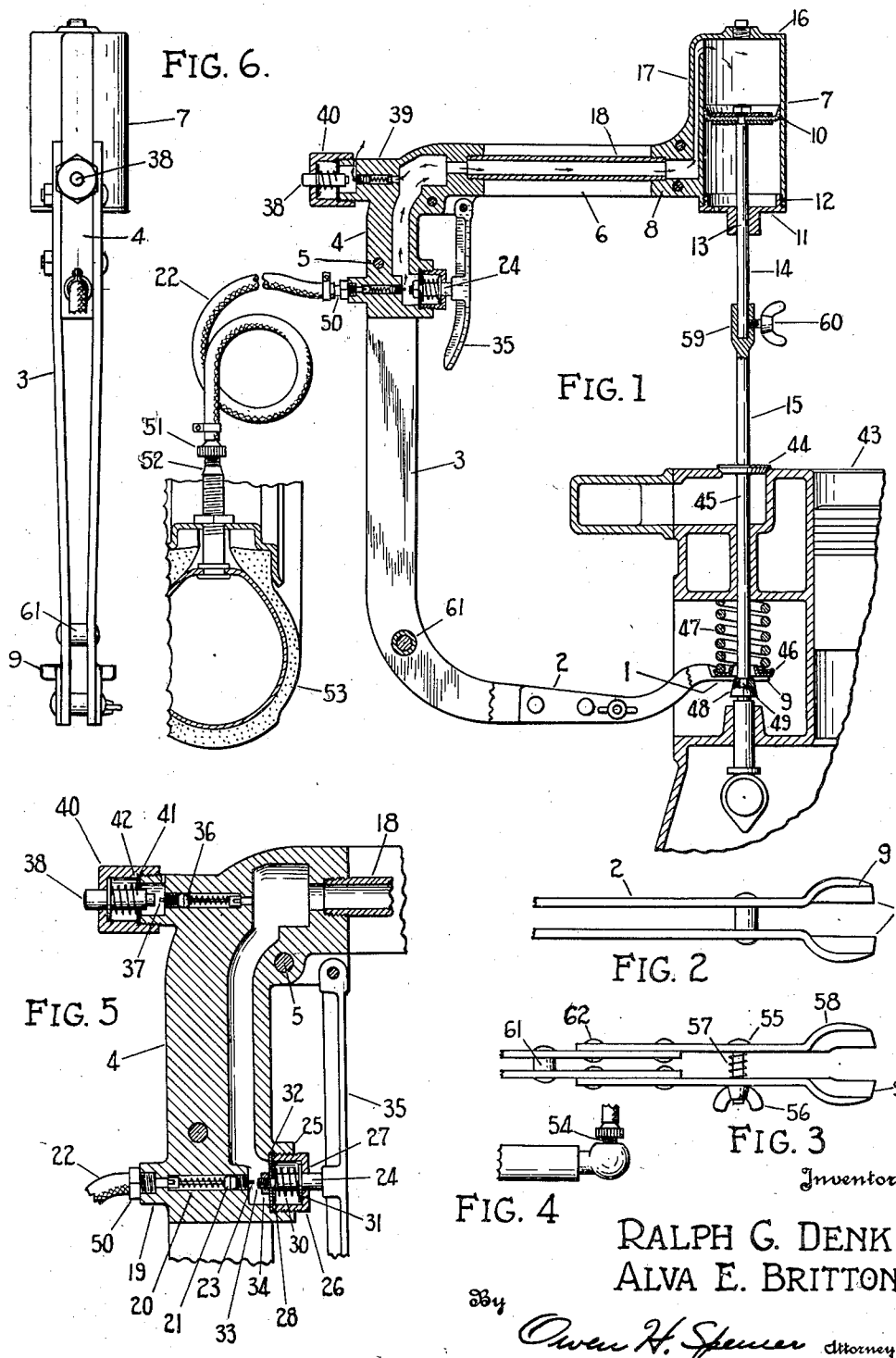


FIG. 4

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ENGINE POPPET VALVE LIFTER

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3 Claims. (Cl. 29—86.3)

The invention is a pneumatically operated tool for removing poppet type valves of a conventional automobile engine and the like, and is used to compress the valve closing springs by compressing and maintaining same in compressed position while the spring seat and keeper are degaged from the valve stem, and the tool is especially useful in conjunction with engine driven vehicles embodying pneumatic tires from which compressed air is obtained as required under certain conditions to operate the tool; and the invention consists substantially in the construction, combination and arrangement of elements hereinafter pointed out and recited more particularly in the claims.

It is a primary object of the invention to provide a tool in the class of "valve lifters" in which the valve closing spring is compressed by applying compressed air to the device.

It is an important object of the invention to provide an air operated "valve lifter" of portable character with a flexible air conduit through which the air for operating same may be directed from a stationary source of supply, while the tool is manually applied in different operating positions.

It is also an important object to provide a pneumatically operated tool of this class with means for flexibly communicating the air operated part of the tool with a tire valve of the vehicle upon which the tool is used, or of a nearby vehicle; and to also provide a means for connecting same with compressed air storages such as standard air hose connections at "filling stations."

It is a further object to provide an air admitting valve trigger and air releasing valve in conjunction with the hand grasp by which the device is handled, by which the same may be moved about, engaged and released by one hand of the operator, the other hand being free to remove the valve spring seat, keeper, valve spring and valve.

It is a further object to provide a power operated tool of this class, of light weight, by which feature it is easily and rapidly handled by the user.

The above and other objects are attained by the structure illustrated in the accompanying drawing in which:

Figure 1 is a partly sectional diagrammatic representation of the device, including fragmentary portions of a standard automobile on which the use of the tool is thus illustrated;

Fig. 2 is a plan view of the spring seat engaging part of the tool;

Fig. 3 illustrates a modified form of the spring seat engaging part of the tool;

Fig. 4 shows a connection for attaching the device to a tire inflating hose connection;

Fig. 5 is a fragmentary sectional showing of the hand grasp and valve mechanism, to a somewhat enlarged scale; and,

Fig. 6 is an elevational view showing the device as seen from a point rearward thereof.

Referring to Fig. 1, the numeral 1 designates a spring seat engaging fork, the dually arranged shanks 2, of which extend normally in a substantially horizontal plane for a distance, and thence curve upwardly to integral continuation with the dually arranged and upwardly extending frame portions 3, the upper extremities of which together straddle the normally vertical hand grasp 4, to which it is secured by rivets, 5. The horizontal arm members 6, continue from the frame portions 3, substantially parallel to the shanks 2, and the air cylinder 7 is secured to said arms by the cylinder lug 8, which is straddled by the overhanging ends of said arm members, the axial line of said cylinder passing between the free ends 9 of the shanks, 2.

Within said cylinder the piston 10 is disposed in working relation therewith, and is adapted to slide vertically therein. The lower head 11 of said cylinder is conveniently secured in place by threads 12, and serves as a removable wall through which the piston 10 is assembled in the cylinder. The piston guide hole 13 is formed through the head 11, concentrically with said cylinder, and the piston rod 14 of said piston extends slidably therethrough. The exposed end of said rod is provided with a removable valve engaging bit, 15, said bit extending substantially as a continuation of said piston rod, concentrically with said cylinder.

The upper end of said cylinder is closed by the normally horizontal head wall 16, and through the cylindrical wall of said cylinder is formed the air channel 17, which communicates with the interior of said cylinder above the piston 10. The other end of said channel communicates with one end of the substantially horizontal pipe 18, which is threaded into the lug 8, between the arm members 6. The hand grasp 4, is partially hollow and the interior of same communicates with said pipe, the other end of which is threaded therein.

The wall structure of said hand grasp forms a boss 19 through which the bore 20 extends from

the interior of the hollow portion of said hand grasp to exteriorly thereof. The air valve 21 is embodied with said boss within said bore and is adapted to normally serve as a check valve and resist entrance of air into said hand grasp. The outer end of said bore is connected to the compressed air supplying hose 22 and the valve trip 23, being embodied with said valve, extends beyond the bore 20 within said hand grasp. In end to end relation with said valve trip, the valve trip ram 24 extends slidably through the internally threaded boss 25, which is also formed on the hollow wall structure of said hand grasp. The ram retainer 26 is of bushing type, the outer or head wall 27 thereof forming a concentric hole through which said ram is exposed. Said ram retainer is threaded in place in the outer end of the boss 25, and the preferably metallic washer 28, is confined between the end of said boss and the inner end of said retainer. The expansion coil spring 30, is tensioned between said washer and the shoulder 31 of said ram, and serves to thus hold the same against the head wall 27 of said retainer, and thus normally maintain said ram in outward position. Between the washer 28 and boss 25, the flexible washer type diaphragm 32 is also confined. Said gasket closely encircles the inwardly extending neck 33 of the ram 24, and is confined against the ram proper by the nut 34, which is threaded over the extreme end of said ram. From the above it will be obvious that the flexibility of said diaphragm permits sufficient longitudinal movement of said ram to operate the valve trip 23, said diaphragm serving as a seal against casual leakage of air around said ram.

The lever 35 is pivoted at one end thereof, to said hand grasp, at a distance from said ram and is positioned to rest transversely across the exposed end of the ram, substantially parallel to said grasp and forward thereof. From the foregoing it will be understood that by holding the hand grasp in the palm of the hand and extending the fingers over the lever 35, the operator may admit air as desired through said hand grasp, by closing the hand against said lever to trip the valve 21, by operation of the ram 24, the air being directed to the cylinder 7, from the air hose 22, the bore 20, the hollow portion of the hand grasp 4, the pipe 18, and channel 17, in order as stated.

The normally upper portion of the hand grasp is provided with an air release valve 36, having a valve trip 37. A trip operating arm 38 is disposed in end to end relation to said trip, the trip end of said ram extending in the sleeve 39, which is formed on the hand grasp concentrically with the trip 38. A cap 40 is threaded over said sleeve and the head wall of said cap forms a hole, through which the corresponding end of said ram is guided and exposed. At a distance from the head wall of said cap, the washer type ram guide 41 is positioned between the interior shoulder 42 of said cap and the end of the sleeve 39, and the ram 38 fits slidably therethrough. Said ram is thus positioned so that the operator's thumb may be readily pressed thereagainst while still holding the device with the same hand, by which arrangement it will be understood that only one of the operator's hands is used to hold the hand grasp, the air admitting lever 35 being conveniently operated by the fingers of the same hand and the air releasing ram 38 being likewise operated by the thumb of the same hand. Air is thus introduced into and released from the cylinder 7 as required by one hand during the

continued use of the device, the other hand being free to remove the engine valve spring seat retainer, seat, spring and valve.

This example of the invention is illustrated as used upon the standard automobile engine 43. The bit 15 is forced against the back of the poppet valve 44, by means of the piston 10, through the piston rod 14, by air under pressure supplied by manipulation of the lever 35.

The fork ends 9 straddle the remote end of the valve stem 45 of the valve 44, under the valve spring seat 46 and upon the admittance of sufficient air in the cylinder 7, said cylinder is forced upwardly carrying the arm members 6, the hand grasp 4, the frame portions 3, the shanks 1, and the fork 2, correspondingly upwardly, and simultaneously compressing the valve spring 47 and raising the spring seat 46, free of the spring seat retainer 48. Said retainer is then removed from its recess 49 in the valve stem 45. The air in the cylinder 7 is then released by the operator through the valve 36, allowing the fork ends 9 to drop. The device is then moved to one side and the valve 44 and valve spring 47, are readily removed from the engine.

The flexible conduit 22, is provided at its outlet end with a metallic union 50, which in this example of the invention is threaded into the inlet end of the valve bore 20, of the hand grasp 4. The other end of said conduit is also provided with a metallic union 51, which in this instance serves to engage the exposed threads of a standard valve stem 52, of the vehicle tire 53, by which feature the device is operated by air from the vehicle upon which the device is being used. The intake end of said conduit is in other instances provided with a hose connection, 54, such as shown in Figure 4, for communicating same to the tire filling air storages (not shown) or other sources of compressed air supply, any type of unions being used as the requirements and convenience of the user may require.

In the modification indicated in Fig. 3, the fork prongs 2, between the valve engaging end 9 of said prongs and the shanks 2, form elongated, preferably flat spring members, the planes thereof being parallel to the longitudinal center line of the cylinder 7. The bolt 55 engages both of said spring members at right angles thereto, said members, together, being confined between the head of said bolt and wing nut 56 of said bolt, it being understood that any type nut may be thus used. The coil expansion spring 57 encircles said bolt between said shanks between which it is tensioned, and it is obvious that said members may be sprung closer together by advancing said nut on said bolt in opposition to the exertion of the spring 57, and that said spring serves to spring said members apart upon withdrawal of said nut, by which action the spacing of the prong ends 9, is varied as desired to adjust same to valve stems of different diameters. Said prongs are provided with normally vertical and upwardly extending walls 58, which partially surround the spring seat of the particular valve, and the spacing of said walls are likewise adjusted correspondingly to the diameter of such seat.

The working length of the cylinder 7, provides for a wide range of movement of the piston 10 therein, by which feature the working distance between the normally downward end of the bit 15, and the prong ends, is readily varied in adapting the tool to engines of different dimensions, although it is understood that different length bits may be engaged with the piston 14 as re-

quired to increase the work engaging range of the device as a whole.

The upper end of the bit 15 forms a sleeve 59, which telescopes over the exposed end of the piston rod 14, and a screw 60, which is threaded transversely through the wall structure of said sleeve against said piston rod, prevents said bit from casually falling from same.

The spacing studs 61 secure the frame portions 3, together in their lower regions, and any suitable number of such studs may be thus provided as required. It is also understood that the shanks 2 and frame members constructed as required from different pieces, secured together as by rivets 62.

While the description and drawing illustrate in a general way certain instrumentalities which may be employed in carrying the invention into effect, it is obvious that many modifications may be made in the various details without departing from the scope of the appended claims, it being understood that the invention is not restricted to the particular examples herein described.

The invention claimed is:

1. For engines embodying poppet valves with valve seating springs and degageable means to retain such springs in closed position, a valve removing tool comprising a frame forming a throat to clear the other engine parts, a spring retainer engaging portion on one end of said frame, a cylinder on the other end of said frame, a piston slidably disposed in said cylinder, a piston rod means extending from said piston toward said retainer engaging portion and serving to bear against the engine valve when the valve spring is compressed by said retainer engaging portion, a hand grasp formed by the throat forming part of said frame, and an inlet valve means serving to admit air from a source of compressed air supply into said piston to force said cylinder retrogradingly from said valve, a part of said inlet valve means forming a part of said hand grasp at will, and an outlet valve means to release the air pressure within said cylinder at will, said outlet valve means being in position to be operated by the same hand and instantly after said inlet valve, while the same hand is used to handle the device by said hand grasp.

2. For engines embodying poppet valves with valve seating springs and degageable means to retain such springs in closed position, a valve

removing tool comprising a frame forming a throat to clear the other engine parts, a spring retainer engaging portion on one end of said frame, a cylinder on the other end of said frame, a piston slidably disposed in said cylinder, a piston rod means extending from said piston toward said retainer engaging portion and serving to bear against the engine valve when the valve spring is compressed by said retainer engaging portion, a hand grasp formed by the throat forming part of said frame, an inlet valve means serving to admit air from a source of compressed air supply into said piston to force said cylinder retrogradingly from said valve, said inlet valve means being embodied with and adapted to cooperate with said hand grasp at will, an outlet valve means serving to release the air pressure within said cylinder at will, said outlet valve means being embodied with and operated coordinately with said hand grasp and inlet valve means, and means to communicate said valve means with a source of compressed air supply.

3. For engines embodying poppet valves with valve seating springs and degageable means to retain such springs in closed position, a valve removing tool comprising a frame forming a throat to clear the other engine parts, a spring retainer engaging portion on one end of said frame, a hand grasp embodied with said frame, a cylinder on the other end of said frame, a piston slidably disposed in said cylinder, a piston rod means extending from said piston toward said retainer engaging portion and serving to bear against the engine valve when the valve spring is compressed by said retainer engaging portion, and an inlet valve means serving to admit air from a source of compressed air supply to said piston to force said cylinder retrogradingly from said valve, at will, said inlet valve means embodying a lever which forms a wall of said hand grasp against which the hand may be tightened to open said inlet valve, and an outlet valve embodied with said frame, serving to release the air pressure within said cylinder, at will, said outlet valve embodying an operating button within manipulating range of the thumb of the hand clasping said hand grasp, and serving to be operated instantly after said inlet valve means while handling said frame by said hand grasp.

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