Aug. 19, 1947. A. B. RIEGEL 2,425,898

VALVE GRINDER

Filed March 25, 1947

FIG_1_

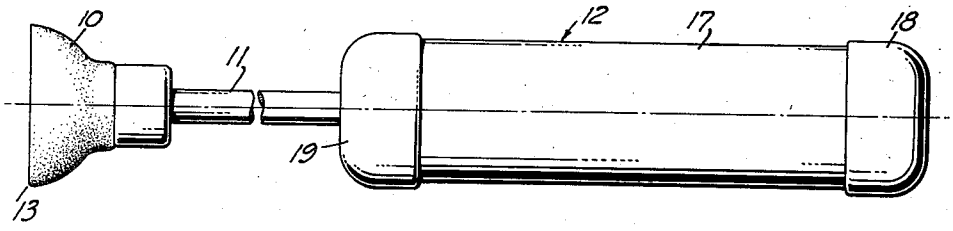


FIG_2_

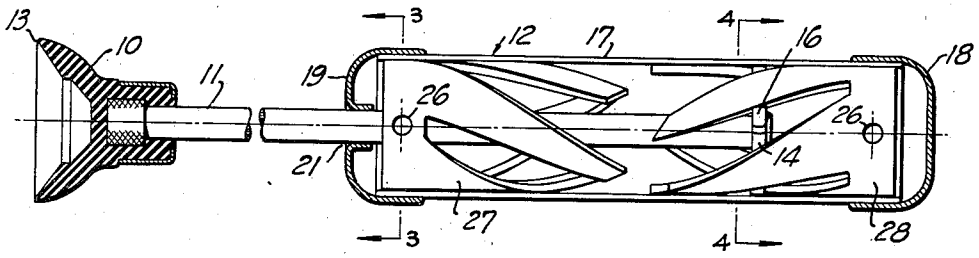


FIG_3

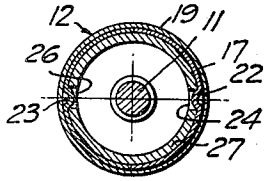


FIG_4_

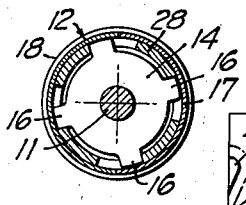


FIG_6_

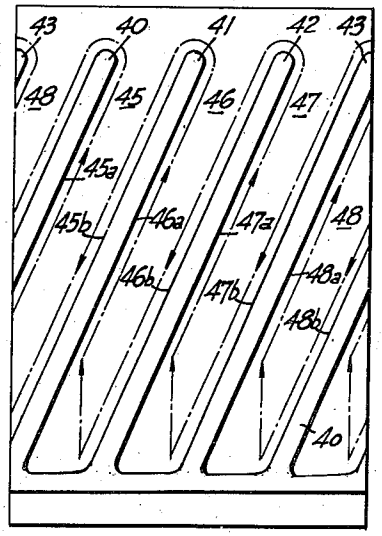


FIG_5_

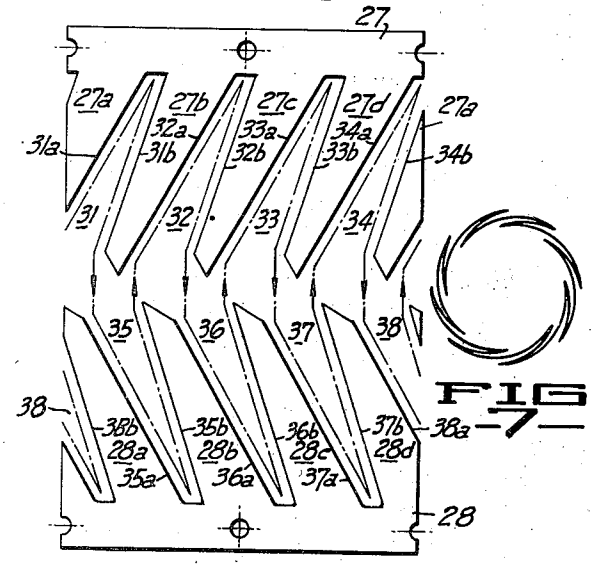


FIG 7

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VALVE GRINDER

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13 Claims. (Cl. 51—29)

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This invention relates generally to valve grinders, and particularly to a small portable device of this character adapted particularly for use by the home mechanic or small shop owner in connection with the grinding and reseating of conventional automobile valves of the poppet type.

It is an object of the present invention to provide a device of this character which is light, compact, and easily portable. Heretofore devices which have been intended to accomplish the results have either been complicated or have been unduly bulky in size.

It is a further object of this invention to provide a device of the character described which is simple to manufacture and which contains a minimum number of wearing parts.

It is a further object of the present invention to provide a valve grinder which will, in addition to providing annular oscillation of the valve being ground, also provide for progressive advance of the valve from one oscillating position to another. As is well known to those skilled in the art two types of motion are desirable and necessary in connection with grinding the average automobile valve. The first type of motion is annular oscillation about the axis of the valve stem whereby the valve reciprocates back and forth within the seat into which it is being seated. In addition to that it has been necessary to change the oscillation or reciprocation position from time to time to secure an even grinding end.

Further objects and advantages of the present invention will appear from the following specification taken in conjunction with the accompanying drawing in which:

Figure 1 is a top plan view of a valve grinding device incorporating my invention.

Figure 2 is a partial cross-sectional view of the device shown in Figure 1.

Figure 3 is a cross-sectional view of the device, taken along the line 3—3 of Figure 2.

Figure 4 is a cross-sectional detail of the device shown in Figures 1 and 2 and taken along the line 4—4 of Figure 2.

Figure 5 is an expanded or unrolled view of the device shown in Figure 2.

Figure 6 is an expanded or unrolled view of a modification of the device shown in the previous figures.

Figure 7 is a diagrammatic view of the path of oscillation and rotation of the device as illustrated in Figure 5.

As shown in Figure 1 my valve grinder consists generally of a gripping member or suction cup 10 which is suitably secured to one end of a shaft 11. The other end of the shaft 11 extends into a housing or handle 12 and is adapted to reciprocate with respect thereto.

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The suction cup 10 or gripping member is preferably made of rubber or some other readily deformable material in order that the lip 13 will readily engage and grip a valve member adapted to be ground. The method of securing the suction cup 10 to the shaft 11 is unimportant, it being necessary only that the same be securely mounted with respect thereto.

On that end of shaft 11 remote from the suction cup end I have provided a spider 14 which is suitably secured to the shaft 11 and adapted to rotate and reciprocate therewith. The spider 14 is provided with a plurality of extending teeth 16 which are adapted to engage selected cam surfaces of selected cam tracks as will more fully hereinafter be explained.

As shown in Figures 1 and 2 the housing or handle 12 consists of a split shell 17 on the ends of which are mounted caps 18 and 19 respectively. Cap 19 is provided with an orifice 21 through which shaft 11 is adapted to extend and with respect to which it is adapted to reciprocate. The shell 17 is provided with two sets of detents 22 and 23 which are adapted to cooperate with corresponding orifices 24 and 26 in a pair of members 27 and 28 which are thereby securely held within the shell 17 against longitudinal or rotational movement with respect thereto.

As shown in Figure 2 and more particularly in Figure 5, the members 27 and 28 present a plurality of similar and identical teeth 27*a*, *b*, *c* and *d* and 28*a*, *b*, *c* and *d* respectively. As is shown in Figures 2 and 5 these teeth extend toward each other and are coaxially aligned with respect to the longitudinal axis of both the handle 12 and the shaft 11. As is apparent from an examination of Figures 2 and 5 the teeth 27*a* and *b* form a cam track 31, teeth 27*b* and 27*c* form a cam track 32, teeth 27*c* and *d* form a cam track 33, and teeth 27*d* and 27*a* form a cam track 34. As will be observed each cam track as above identified provides a pair of cam surfaces 31*a* and 31*b*, for example. It is apparent that tooth-like members 28*a*, *b*, *c*, and *d* likewise form a plurality of cam tracks 35, 36, 37 and 38. Cam track 35 provides a pair of cam surfaces 35*a* and 35*b*. In like manner, cam surfaces 36*a* and *b*, 37*a* and *b* and 38*a* and *b* are provided.

As is shown in Figures 2 and 5 the various cam

tracks 31 to 34 inclusive and 35 to 38 inclusive are staggered with respect to each other. Upon reciprocation of shaft 11 and spider 14 the teeth 16 of spider 14 engage certain of the cam tracks and cam surfaces heretofore described. For example, as shown in Figure 5, upon reciprocation of the spider 14 one tooth 16 of the same will engage cam surface 31*a* upon reciprocation of the handle in one direction. When the handle has reached one extreme of its longitudinal reciprocation and the toothed spider within the same has moved in the opposite direction the spider will engage cam surface 31*b*. From cam surface 31*b* it will next engage cam surface 35*a* and upon change of direction of movement of handle 12 will engage cam surface 35*b*. The path of the tooth 16 within the handle 12 is shown in Figure 5 and is as follows: The tooth 16 will engage first one cam track then another and then will be advanced to another cam track. Under no circumstances will the tooth 16 merely reciprocate within two adjacent cam tracks but, as is obvious, will move progressively from one to another by virtue of the interrupted and staggered relationship of the two sets of cam tracks 31 to 34 inclusive and 35 to 38 inclusive.

Operation of the device may more fully be described as follows. The suction cup 10 is engaged with a valve member which is adapted to be ground. As is well known to those skilled in the art, proper valve grinding and seating depends upon the valve being placed within the seat to which it is to be ground and oscillated about the longitudinal axis of the valve stem. A valve grinding compound is customarily placed within the space between the valve and the valve seat. It is further necessary, from time to time, to change the station of angular oscillation in order to obtain an even seating of the valve around its entire periphery with the periphery of the valve seat. When the suction cup 10 is securely engaged with the valve (not shown) the handle 12 is reciprocated along the longitudinal axis of the shaft 11. Upon reciprocation of the handle 12 and its cooperating cam tracks, all of which have been heretofore described, the tooth 16 of the spider 14 engages the cam tracks generally as shown in Figure 5. Specifically, upon downward movement of the handle 12 the tooth 16 engages cam surface 31*a* until it reaches the uppermost limit thereof. Upon movement of handle 12 in an upward direction, the tooth 16 engages cam surface 31*b* until it reaches the lower limit thereof from which point it follows cam surface 35*a* until it reaches the lower limit thereof. At this point the handle 12 is moved downwardly, or toward the suction cup 10. The tooth 16 then engages cam surface 35*b* until it reaches the uppermost limit thereof from which it follows cam track 32*a*, until it reaches its upper limit. At this time the handle 12 is next moved upwardly or to a position remote from the suction cup 10 whereby the tooth 16 engages cam surface 32*b* until it reaches the lower extension thereof from which point it engages the cam surface 36*a*. The reciprocation of handle 12 and its cooperating parts with respect to the shaft 11 is continued whereby the tooth 16 follows each of the cam tracks 31, 35, 32, 36, 33, 37, 34 and 38 in that order. It will be seen therefore that the tooth 16 will tend to advance generally as shown in the broken lines in Figure 5 and ultimately make a complete circuit with respect to said cam tracks and will, as a matter of course, likewise tend to rotate shaft 11 completely about its longitudinal axis. In addition to completely rotating the shaft 11 about its vertical axis, it will also cause oscillation of shaft 11 about its longitudinal axis at the same time as shown in Figure 7. As is shown in Figure 5, whenever the tooth 16 engages any one of the cam surfaces 31*a*, 32*a*, 33*a*, 34*a*, 35*a*, 36*a*, 37*a*, or 38*a* the tooth 16 is being advanced to the right as shown in Figure 5 or, as shown in Figure 7, in a clockwise direction. On the other hand whenever the tooth 16 engages any one of the cam surfaces 31*b*, 32*b*, 33*b*, 34*b*, 35*b*, 36*b*, 37*b* or 38*b* it is being oscillated in a counterclockwise direction. Upon each complete reciprocation of the handle 12 from, for example, its extreme uppermost position through its extreme down position and returning to its extreme uppermost position, the shaft 11 is rotated a quarter of a turn in a clockwise direction. At the same time, however, it is being operated in a counterclockwise direction when the tooth 16 engages cam surface 35*b*, in a clockwise direction when the tooth 16 engages cam surface 32*a*, in a counterclockwise direction when the tooth 16 engages cam surface 32*b* and again in a clockwise direction when the tooth 16 engages the cam surface 36*a*. While the tooth 16 has changed its direction four times it has ultimately advanced a quarter of a revolution about the longitudinal axis of shaft 11. In this manner rapid annular oscillation of the member 10 is provided upon each reciprocation of handle 12 and, at the same time, progressive rotation of the device about the longitudinal axis of shaft 11 is likewise obtained.

In the modification shown in Figure 6 a plurality of ribs, 40, 41, 42 and 43 are provided and substituted for the members 27 and 28 of the device shown in Figure 2. These ribs form a plurality of cam tracks 45, 46, 47 and 48 which provide cam surfaces 45*a*, 45*b*, 46*a*, 46*b*, 47*a*, 47*b*, 48*a*, 48*b* respectively. When the handle and its cooperating ribs 40, 41, 42 and 43 are moved longitudinally with respect to the shaft 11, as has previously been described, the tooth 16 of spider 14 engages the cam surfaces generally as shown in the broken lines of Figure 6. For example when the handle is moved away from the suction cup 10 the spider 14 engages first cam surface 47*b*. When the handle reaches the most remote position and begins its stroke in the opposite direction the tooth 16 moves straight upwardly from its lowermost position until it strikes cam surface 47*a* which it then follows to its uppermost extreme. It will be obvious that the shaft 11 is then being rotated. The cup 10 is in engagement with a valve which, it will be recalled, is in frictional engagement with the valve seat to which it is being seated. As has previously been pointed out the suction cup 10 is preferably made of rubber or some other readily deformable and resilient material. As the valve is being turned within its seat it tends to lag behind the rotation of the shaft 11 inasmuch as the resiliency of the cup 10 permits a certain amount of lag. Therefore when the tooth 16 approaches the upper limits of cam surface 47*a* it tends to be urged against the same with a certain amount of pressure and, when the tube 16 reaches the upper limit of cam surface 47*a* it tends to go over the top of rib 42 by virtue of the resiliency of the suction cup 10 and the frictional drag of the contact between the valve and the valve seat. When the tooth 16 has passed over the extreme uppermost end of the rib 42 it is then in engagement with cam track 46 and, as has previously been described in connection with its passage through

cam track 47, will engage cam surfaces 46b and 46a in that order. In this manner the tooth 16 will move from cam track to cam track thereby advancing the station of oscillation of the suction cup 10.

It is obvious that when the tooth 16 engages cam surface 47b the cup is oscillated in one direction. On the other hand when the tooth 16 engages cam surface 47a the cup is oscillated in another direction. Therefore with each stroke of the handle the tooth 16 is oscillated forwardly and backwardly and, in addition thereto, is advanced from one cam track to another thereby advancing a full 90° about the periphery of the cup 10.

I claim:

1. In a device of the character described, a valve engaging member, a shaft secured to said valve engaging member, a spider secured to said shaft, a handle adapted to reciprocate with respect to said shaft, a plurality of cam tracks associated with said handle and adapted to engage said spider to cause oscillation of and progressive advance of said valve engaging member.

2. In a device of the character described, a valve engaging member, a spider secured to said valve engaging member, a handle adapted to reciprocate with respect to said valve engaging member, a plurality of cam tracks adapted to engage said spider to cause oscillation of and progressive advance of said valve engaging member.

3. In a device of the character described, a valve engaging member of the suction type, a shaft secured to said valve engaging member, a spider secured to said shaft at the end remote from said valve engaging member, a handle adapted to reciprocate with respect to said shaft, a plurality of staggered cam tracks associated with said handle and adapted to engage said spider to cause oscillation of and progressive advance of said valve engaging member.

4. In a device of the character described, a valve engaging member, a spider secured to said valve engaging member, a handle adapted to reciprocate with respect to said valve engaging member, a plurality of cam tracks associated with said handle and adapted to engage said spider, said cam tracks being staggered.

5. In a device of the character described, a valve engaging member, a shaft secured to said valve engaging member, a spider secured to said shaft at the end remote from said valve engaging member, teeth on said spider, a handle adapted to reciprocate with respect to said shaft, a plurality of cam tracks associated with said handle and adapted to engage the teeth on said spider, said cam tracks being staggered and forming interrupted cam surfaces.

6. In a device of the character described, a valve engaging member, a shaft secured to said valve engaging member, a spider secured to said shaft at the end remote from said valve engaging member, teeth on said spider, a handle adapted to reciprocate with respect to said shaft, two series of helical cam tracks associated with said handle and adapted to engage the teeth on said spider, said series of cam tracks being staggered with respect to each other.

7. In a device of the character described, a valve engaging member, a shaft secured to said valve engaging member, a spider secured to said shaft at the end remote from said valve engaging member, a handle adapted to reciprocate with respect to said shaft and along its longitudinal axis, a plurality of cam tracks associated with said handle and adapted to engage said spider, said cam tracks being staggered and forming a plurality of interrupted cam surfaces to provide annular oscillation of the valve engaging member and progressive advance of the same about its vertical axis.

8. In a device of the character described, a valve engaging member, a shaft secured to said valve engaging member, a spider secured to said shaft at the end remote from said valve engaging member, a handle adapted to reciprocate with respect to said shaft, a plurality of helical cam tracks associated with said handle, said cam tracks being staggered and forming a plurality of interrupted cam surfaces adapted to engage said spider to provide annular oscillation of the valve engaging member and progressive advance of the same about its vertical axis.

9. In a device of the character described, a valve engaging member, a shaft secured thereto, a spider secured to said shaft, a tooth on said spider, a handle coaxially aligned with said shaft and adapted to reciprocate with respect thereto, a plurality of cam tracks generally coxially aligned therewith and helical with respect thereto and adapted to be engaged by the tooth on said spider upon reciprocation of said handle and cam tracks with respect to said shaft, said cam tracks being staggered and formng a plurality of interrupted cam surfaces whereby upon reciprocation of said handle in one direction said tooth engages one cam surface on one of said cam tracks and upon reciprocation in the other direction it engages an opposed surface on said cam track and upon reciprocation again in said first direction engages another of said cam tracks.

10. In a device of the character described, a valve engaging member, a shaft secured to said valve engaging member, a spider secured to said shaft at the end remote from said valve engaging member, a handle adapted to reciprocate with respect to said shaft, a plurality of cam tracks generally adapted to be engaged by said spider upon reciprocation of said handle and cam tracks with respect thereto, said cam tracks being helical and staggered and forming a plurality of interrupted cam surfaces whereby upon reciprocation of said handle said spider engages said helical cam surfaces and oscillates and engages said staggered cam surfaces and advances from cam track to cam track.

11. In a device of the character described, a valve engaging member, a shaft secured to said valve engaging member, a spider secured to said shaft at the end remote from said valve engaging member, a tooth on said spider, a handle adapted to reciprocate with said shaft, a plurality of cam tracks associated with said handle and adapted to engage said tooth, said cam tracks being staggered whereby upon each reciprocation of said handle and said cam tracks with respect to said shaft and said tooth, said tooth will engage the next succeeding cam track.

12. In a device of the character described, a valve engaging member, a shaft secured thereto, a spider secured to said shaft, a handle adapted to reciprocate with said shaft, a plurality of cam tracks associated with said handle and adapted to engage said spider, said cam tracks being staggered whereby upon each reciprocation of said handle and said cam tracks with respect to said shaft, said spider will advance from cam track to cam track.

13. In a device of the character described, a

valve engaging member, a shaft secured to said valve engaging member, a spider secured to said shaft at the end remote from said valve engaging member, a handle adapted to reciprocate with said shaft, a plurality of cam tracks associated with said handle and adapted to engage said spider, said cam tracks being helical with respect to said handle whereby said valve engaging member oscillates upon reciprocation of said handle

and cam tracks with respect to said shaft, and said cam tracks being staggered whereby upon each reciprocation of said handle and said cam tracks with respect to said shaft, said spider will engage the next succeeding cam track and the station of oscillation of said valve engaging member will advance.

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