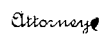


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GRINDING TOOL

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This invention relates to grinding tools, and particularly to those of the portable eccentric valve seat grinding type.

In the use of tools of this character, it is the practice to mount them on pilot stems extending from the cylinder blocks through the respective valve seat openings whereby the rotatable grinding members of the tools are held in proper centered or grinding relation to the seats, and in accomplishing this it has been the practice, so far as I am aware, to mount a rotatable part or sleeve of the tool directly on the pilot stem so that wear was not only occasioned between the coacting side surfaces of such rotating part and stem, but also between the upper end of the pilot stem and the coacting depth gauge stop member. This wear, and particularly that between the coacting side surfaces of the stem and receiving sleeve, soon prevents the perfect fitting of the parts which is necessary for accurate close dimension work, such as now required in engines used in automobiles and airplanes, and particularly the latter, and requires frequent replacement of the pilot stems as well as repair of the tools and replacing of the stem receiving sleeves thereof.

An object of the invention is the provision of a tool of the character described wherein the sleeve or part receiving the pilot stem is stationary relative to the tool housing, and also relative to the pilot stem so far as relative rotation thereof is concerned, when the tool is in use, thereby preventing wear between the stem and receiving part of the tool and obviating the frequent replacement of one or both of such parts, which has heretofore been necessary by reason of such wear.

Another object of the invention is the provision of a tool of this character wherein the depth gauge member and pilot stem are tied together when in use to prevent or resist different relative movements thereof and to provide simple and efficient means therefor and to cause such stems and the receiving sleeve of the tool to combine to constitute a unit which is substantially stationary relative to the tool housing when the tool is in work grinding operation.

Another object of the invention is the provision of an eccentric grinder type tool wherein the eccentric movements of the grinding wheel and its immediate carrying parts are not communicated to the tool housing.

Other objects and advantages of the invention will be apparent from the following detailed de-

scription and from the accompanying drawing, in which—

Figure 1 is a central longitudinal section of a tool embodying the invention mounted in operative grinding relation to a valve seat, with the latter in fragmentary section and with parts in full; Fig. 2 is a side elevation of a tool embodying the invention; Fig. 3 is a cross-section thereof on the line 3—3 in Fig. 1, and Fig. 4 is an elevation of the eccentric sleeve member of the tool.

Referring to the drawing, 1 designates an engine block or head, 2 a valve seat therein, in the present instance of tapered form, and 3 a pilot stem firmly mounted in the associated valve stem guide 4 and projecting a distance up through and above the valve seat opening, as well understood in the art.

The grinding tool A, in which a part at least of the present invention resides, has a hollow housing 10 which is provided, at what may be termed its upper and lower ends, with axially aligned openings 11 and 12, respectively, with the former, in the present instance, smaller than the latter. A bushing 14 is mounted in the opening 11 with its inner end externally flanged and in outward thrust engagement with the marginal inner end wall of the opening. A sleeve 15 is mounted at its upper end in the bushing 14, being threaded therein, and extends downward therefrom through the housing opening 12 in spaced relation to its wall and for some distance below such opening. The lower end of this sleeve is intended to receive the customary pilot stem 3 and its upper end to receive the customary depth gauge stem 16. The sleeve 15 is stationary or non-rotatable with respect to the bushing 14 and housing 10.

An eccentric sleeve 17 is rotatably mounted on the sleeve 15 with its outer end projected through and beyond the housing opening 12 and in end thrust engagement with a flange 18 on the sleeve 15 and with its upper end in end thrust engagement with the bushing 14 through a gas-ket 19. A nut 20 threads on the upper end of the sleeve 15 in jam engagement with the outer end of the bushing 14 and the housing 10. A spiral gear 21 is provided on the upper end portion of the sleeve 17 within the housing.

A hollow high speed spindle 23 is rotatably mounted on the eccentric sleeve 17 in spaced relation thereto and immediately below the gear 21 through the medium of upper and lower sets of ball bearings 24 and 25, with the balls thereof preferably having their inner bearings in recesses

formed in the sleeve and their outer bearings in race rings 26 fitted into the spindle. The spindle projects through and below the housing opening 12, being slightly smaller in diameter than said opening to permit the eccentric movements produced by a turning of the eccentric sleeve 17.

A grinding wheel 30 is carried by the lower end of the spindle 23 for rotation therewith around the lower end of the stationary concentric sleeve 15. For this purpose the hub sleeve 31 of the wheel loosely receives the lower end of the sleeve 15 for rotary and limited lateral eccentric movements relative thereto and has its upper end enlarged and receiving the lower end of the spindle 23 to which it is threaded and in clearance relation to the outer marginal edge wall of the opening 12. It is apparent that when the stationary sleeve 15 of the tool is mounted on a pilot 3, the grinding wheel 30, due to its eccentric mounting relative to the sleeve and pilot, will be disposed eccentric to the valve seat so that it will have engagement with the seat at one side only of its axis, and that such point of engagement will progressively advance around the seat as the eccentric sleeve 17 is rotated.

In the present instance, the drives for the eccentric sleeve 17 and high speed spindle 23 are through a flexible shaft 35 having connection with any suitable power source (not shown). This shaft enters an enlarged side portion 10^a of the housing through a removable part 36 and has driving connection with a shaft 37 mounted in said portion. The shaft 37 has a spur gear 38 in mesh with the spur gear 39 on the inner end of the spindle 23 and has a worm 40 in driving connection with the eccentric sleeve gear 21 through a countershaft 41 (Fig. 3) and worm gears 42 and 43 thereon. The driving connections between the shaft 35 and the spindle 23 and eccentric sleeve 17 are proportioned to cause a high speed driving of the grinding wheel and a low speed driving of the eccentric sleeve 17, which latter imparts a revoluble movement to the axis of the grinding wheel.

The depth gauge stem 16 is threaded into the upper end of the stationary concentric sleeve 15, is provided at its upper end with a knurled head to facilitate turning and has its lower end adapted to rest on the upper end of a pilot stem 3 when the tool is mounted in operating relation thereon. The lower end of the gauge stem is preferably provided with a circumferential recess or groove in which a spring ring 45 of undulating form is mounted to exert a desired frictional pressure against the side wall of the sleeve bore to resist a free turning of the gauge stem in the sleeve.

In use, the pilot stem 3 and gauge stem 16 are tied together in end to end engagement by a rod 46 which is projected axially through one of said stems, being controlled from the outer end thereof, and threads into the other stem. In the present instance, the rod 46 is projected through an opening in the pilot stem 3 and has its lower end projected in accessible position below the lower or outer end of such stem and provided with a head 47 to facilitate turning with a wrench, screwdriver, or other suitable tool. The upper end of this rod threads into a socket in the lower end of the gauge stem 16. In the present instance a locking nut 48 is threaded on the lower end of the pilot stem against the collet 49 and projects a distance from the lower end of the stem to receive a

coiled expansion spring 50 around the rod 46 in thrust engagement at one end with the lower end of the pilot stem and at its other end against a washer 51 which bears outward against the head 47 of the rod and also has engagement with other stop means in the member 48. The rod 46 is intended to be screwed into the guide stem 16 in seating or shouldered engagement therewith, and when so seated the washer 51 is raised to some extent from its seat on the nut 48 by the head 47 of the rod and against the tension of the spring 50. When, during operation of the tool, the guide stem 16 is turned to effect a feeding adjustment of the tool relative to the pilot 3, the rod 46 turns therewith within the pilot stem due to the yielding connection of the rod with the pilot stem through the interposed spring 50. It will thus be apparent that while the guide and pilot stems are tied together by the rod 46 and spring 50, such tying is not so rigid and positive as to prevent a turning of the guide stem for the purpose of feeding adjustment. This tying together of the gauge and pilot stems also causes one to serve more or less as a rigid extension of the other and to thereby cooperate to brace and hold the tool in proper centered relation to the valve seat being ground. The stationary mounting of the concentric pilot stem receiving sleeve 15 in the tool housing not only eliminates wear between the pilot stem and such sleeve, but also makes possible the tying together of the gauge and pilot stems in an efficient and simple manner.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent, is:

1. In a tool of the class described, a sleeve for receiving a pilot to center the tool with respect to the work, a grinding wheel carrying spindle encircling said sleeve in spaced relation thereto, a mount for said spindle which is rotatable around the sleeve and eccentric to its axis, and means for rotating said spindle and mount at different predetermined speeds.

2. In a tool of the class described, a stationary sleeve for receiving a pilot stem to center the tool relative to the work, an eccentric sleeve mounted on the first sleeve for rotation about its axis, a grinding wheel carrying spindle mounted on the eccentric sleeve for rotation about an axis eccentric to the first sleeve axis, and means for rotating said eccentric sleeve and spindle at different predetermined speeds.

3. In a tool of the class described, a housing having openings at opposite ends, a sleeve stationarily mounted in one opening and projecting through the other in spaced relation to its wall and beyond the housing to receive a work centering pilot, a grinding wheel carrying spindle rotatable about said sleeve and projected through said last-mentioned opening in spaced relation to its wall, means around said sleeve forming a rotatable mount for said spindle which is eccentric to the sleeve axis, and means for driving said mounting means and spindle at different predetermined speeds.

4. In a tool of the class described, a housing, a sleeve stationary with respect to the housing and projected therethrough with one end adapted to

receive a work centering pilot and the other end adapted to receive a pilot engaging depth gauge, a grinding wheel carrying spindle rotatable about the pilot receiving end of said sleeve, a mount for said spindle eccentric to the sleeve axis and rotatable therearound, and means for driving said spindle and mount at different predetermined speeds.

5. In combination, a portable valve seat grinding tool having a housing and a sleeve stationarily mounted therein and projecting there-
through, a depth gauge stem adjustably mounted in one end and a work centering pilot stem slid-
ingly fitted into the other end of the sleeve with the inner ends of said stems in stop coaction, and means operable from without one of said
stems and projected lengthwise therethrough for tying the stems together whereby said stems and sleeve combine to constitute a unit which is sub-
stantially rigid relative to the housing when the tool is in work grinding operation.

6. In combination, a portable valve seat grinding tool having a housing, a sleeve stationarily mounted in and projected through said housing, a grinding wheel rotatably mounted around said sleeve with its axis of rotation eccentric to that of the sleeve, together with a work centering pilot stem slidingly fitted into one end of said sleeve, a depth gauge stem threaded into the other end of the sleeve in stop coaction with the inner end of the pilot stem, and means operable from without one of said stems and projected lengthwise therethrough for yieldingly tying the stems together whereby said stems and sleeve combine to constitute a unit which is substan-

tially rigid relative to the tool housing when the tool is in work grinding operation.

7. A combination as called for in claim 5 wherein the tying means is projected through the pilot stem.

8. A combination as called for in claim 5 wherein the tying means is projected through the pilot stem and spring means is interposed between the pilot stem and the tying means to cause a yielding tying engagement of the two stems.

9. In an eccentric tool of the class described, a housing, a sleeve mounted in said housing and open at one end to receive a stationary pilot stem projecting from the work to be ground, a mount on said sleeve within the housing for free rotation thereon with its axis eccentric to that of the sleeve, a spindle mounted for free rotation on said mount and having an end projecting without the housing, a grinding wheel fixedly carried by the projecting end of said spindle, and means for driving said mount and spindle relative to the housing and at different speeds.

10. In a tool of the class described, a housing, a sleeve stationary with respect to the housing with one end open without the housing and adapted to receive a work centering pilot and the other end adapted to receive a pilot engaging depth gauge, a depth gauge adjustably mounted in said other end of the sleeve, and a grinding wheel carrying spindle mounted for rotation about the pilot receiving end of said sleeve with its axis of rotation eccentric to the sleeve axis.

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