May 14, 1935. E. F. LAWHORN ET AL 2,001,497

GRINDING DEVICE

Filed June 15, 1934

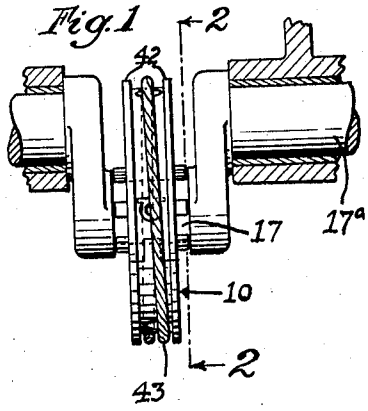


Fig. 1

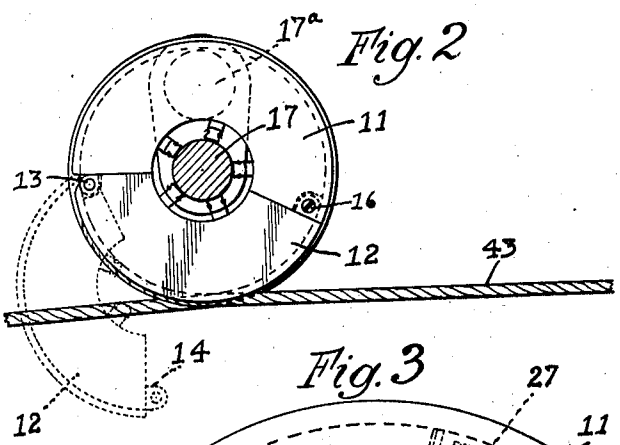


Fig. 2

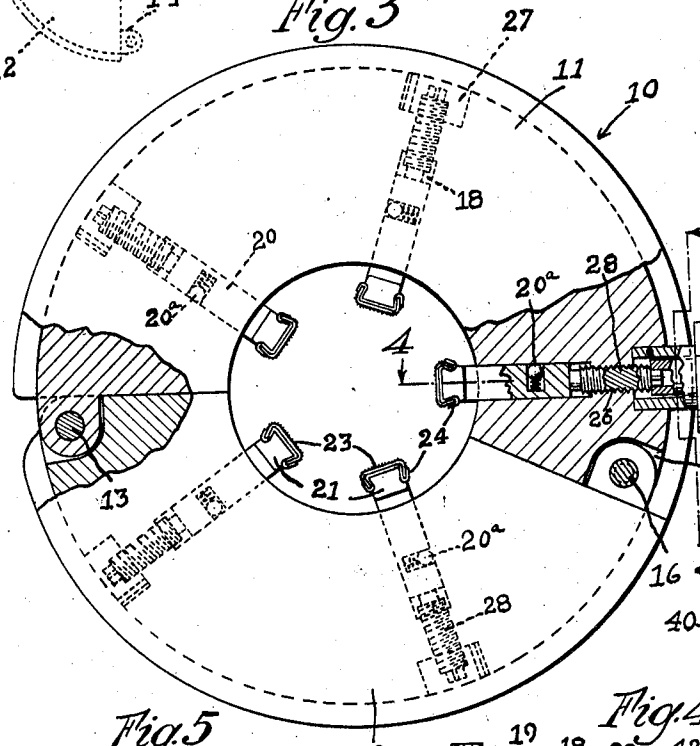


Fig. 3

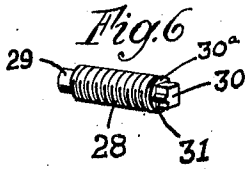


Fig. 6

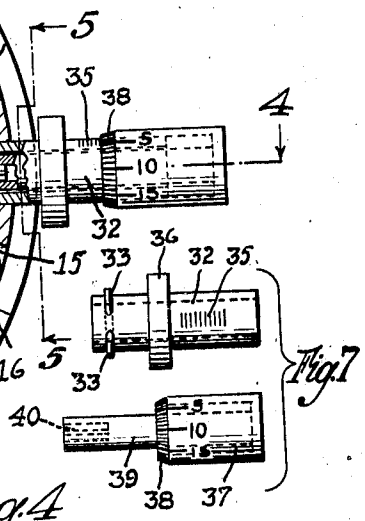


Fig. 7

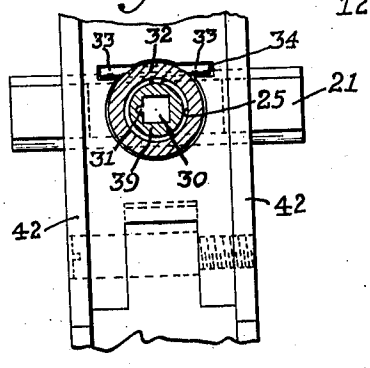


Fig. 5

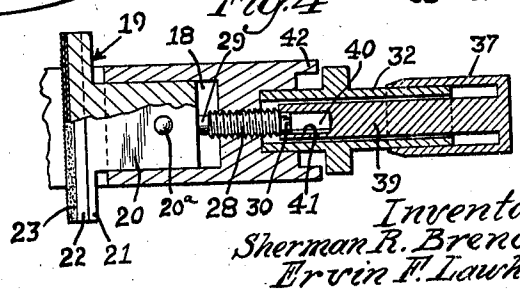


Fig. 4

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GRINDING DEVICE

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4 Claims. (Cl. 51—73)

This invention relates to improvements in grinding devices.

One object of the invention is to provide an accurate grinding device for truing up a shaft without removing the same from a machine of which it is a part. The device is particularly useful in truing up the crank pins of internal combustion engine crank shafts which have become slightly flattened or scored in use. To grind the surface of a crank pin or other shaft in similarly inconveniently accessible positions, without first removing the shaft, the improved device is provided with a ring-like holder formed in two or more arcuate sections which preferably are pivotally connected together to enable the holder to be opened up like a split ring and then placed around the shaft and the ends secured together. This construction of the holder enables the device to be used where it is not possible to slide the device over the end of the shaft to the place where the grinding is to be done.

Another object of the invention, therefore, is to provide a grinding device comprising a holder which can be directly positioned around the portion of the shaft to be ground.

A further object of the invention is to provide a sectional ring-like holder for adjustable grinding members having detachable grinding shoes whereby shoes of different degrees of coarseness can be slipped in place without disturbing the radial adjustment of the grinding member with respect to the holder.

Other objects relate to various features of construction and arrangement of parts which will be apparent from the consideration of the following specification and accompanying drawing, wherein:

Figure 1 is an elevation of a device embodying the present improvements shown positioned on a crank pin of a crank shaft of an internal combustion engine.

Figure 2 is a side elevation of the grinding device, the open position of one of the sections being indicated by dotted lines.

Figure 3 is an enlarged side elevation of the device showing the gauging or actuating device in position for effecting the accurate adjustment of one of the guiding members, parts of the holders being shown in section.

Figure 4 is a sectional view taken on line 4—4 of Figure 3.

Figure 5 is a view taken on line 5—5 of Figure 3.

Figure 6 is a perspective view of one of the threaded adjusting members, and

Figure 7 illustrates the two parts of the micrometric gauging or actuating device in detached relation.

In the drawing, 10 indicates generally the holder for the grinding members and as shown the holder comprises two sections 11 and 12 pivotally connected at adjacent ends by a pin 13. The opposite end of the member 12 is provided with an ear 14 which is moved into a socket 15 of section 11 whereby the sections can be held in rigid ring-like form by a screw 16 after being placed around the shaft to be ground.

In Figure 2 of the drawing, section 12 is shown in open position by dotted lines and when in such position it will be seen that the device may be placed around the crank pin 17 of the crank shaft 17a. It will be obvious that the device may likewise be placed around intermediate parts of other shafts where it is not possible to slide the device longitudinally of the shaft to the place where the grinding is to be done.

In placing the device on the crank pin of an automobile shaft, for example, the oil pan will first be removed, and the connecting rod disconnected from the crank pin. The improved grinder can then be positioned around the crank pin for truing the surface of the same. It will be seen that it is thus unnecessary to remove the crank shaft from the engine.

The sections 11 and 12 of the holder are provided with a plurality of radial slots 18, preferably rectangular in cross section. In each of the slots 18 a grinding member 19 is carried, each member comprising a rectangular shank 20, preferably provided with a friction device 20a which bears against one wall of a slot 18 to prevent the member from dropping out during the handling of the device.

At the outer end of each shank 20 is provided an axially extending portion 21 of dovetail shape upon which a grinding or abrasive element is positioned. Each abrasive element may comprise a sheet metal shoe 22 as illustrated in Figure 3, provided on its outer surface with "carborundum" cloth 23, which is held in position by the turned-over ends 24 of the shoe. The shoe may be slid lengthwise of the member 21 in removing the same for the purpose of replacing with an unused shoe or with a shoe provided with finer or coarser abrasive material.

Extending in alignment with each slot 18 is a passage 25 which is threaded at 26 and is enlarged at its outer end to form a socket 27. Disposed in the passage 25 is a threaded adjusting member 28, the inner end 29 of which is adapted

to contact with the end of a grinding member 20, as illustrated in Figures 3 and 4.

By turning the adjusting member 28 inwardly, the respective grinding member will likewise be moved inwardly and may be forced into grinding relation with the shaft to be ground. In order to grind a shaft accurately it is necessary that the various grinding shoes 22 be positioned radially at uniform distances from the center of the shaft. To facilitate the accurate adjustment of the various grinding members the outer end 30 of each member 28 is of rectangular shape, on one side of which is a rib 31 hereinafter referred to.

The micrometric setting or actuating device, as shown in Figure 7, comprises a tube 32 provided with studs 33 which are arranged to seat in the slots 34 which intersect the sockets 27. This arrangement insures that the tube 32 will always be positioned in the sockets in a given relation, and will be held against rotation. As noted, the tube 32 is provided with graduations 35 and if desired may have a circumferential ring 36 for assistance in placing the tube in the sockets 27.

The other portion of the gauging or actuating device comprises a sleeve 37 having graduations 38 along the edge thereof. The sleeve carries a spindle 39 having a socket 40 adapted to receive the rectangular ends 30 of the adjusting members 28.

One wall of the socket 40, as shown in Figure 5, is provided with a channel or groove 41 for receiving the rib 31, which permits engagement of the socket with the tang or head 30 in one relative position only and thereby avoids errors in the readings of the micrometer graduations.

Thus to adjust the various grinding members to predetermined position, the tubular member 32 is first positioned in a socket 27, and the spindle 39 slid centrally of the tube until the socket 40 engages the rectangular head 30 of the member 28 with the end of the spindle seating on the shoulder 30a.

The sleeve 37 will then be rotated to turn the screw 28 inwardly to the desired position, the graduations 35 and 38 indicating the distance from the center of the shaft to the grinding shoe. When all the grinding members have been similarly adjusted upon a shaft of known size, the holder 10 may be rotated upon the shaft to grind down the surface thereof.

It will be seen, of course, that it may be necessary to make several adjustments of the grinding members in truing up a damaged shaft.

By removing the screw 16 the device may be removed from the shaft, without disturbing the adjustment of the members 28, for the substitution of new grinding shoes or shoes having a finer abrasive for giving the shaft a smooth finished surface.

The device may be rotated or oscillated upon the shaft by any suitable means. In Figures 1 and 2 I have shown the holder as being provided with flanges 42 for retaining on the outer periphery of the holder a cord or belt 43 which may be wrapped around the holder and held taut and the ends alternately pulled to effect the rotation or oscillation of the holder about the shaft being ground. It will be seen that while the grinding members extend inwardly of the inner periphery of the arcuate sections of the holder, they are adjustable from the outer periphery by means of the attachment above described.

The shoe holding members 21 of the grinding elements are shown in Figures 1, 4 and 5, as being of greater width than the thickness of the holder. By providing grinding members, the shoe holding elements 21 of which are of different lengths but having shanks 20 of a size to fit the slots 18, different size areas of a shaft may be ground.

We have shown the holder as comprising two arcuate sections but in some instances it may be desirable to provide a larger number of sections to render the device capable of use in otherwise inaccessible locations. While we prefer to use not less than five grinding members, as shown in the drawing, to provide sufficient points of bearing on the surface of the shaft to prevent the shoes from successively following low or flat areas of the shaft and thus accentuating the deformities sought to be remedied, any suitable number of grinding members may be employed.

While we have shown and described an embodiment of our improvements for the purpose of illustration, we do not wish to be restricted specifically thereto except as so limited by the appended claims.

We claim:

1. A rotatable grinding device for shafts comprising arcuate holder sections arranged to be placed around the shaft to be ground, means for securing said sections in ring form about the shaft, a plurality of radially disposed slots opening in the inner periphery of said holder, a slidable member disposed in each of said slots and retained thereby against relative rotation therein and having grinding means at the inner ends thereof, threaded means for adjusting said slidable members axially and into contact with the surface of the shaft and a gauging-actuating device for actuating said threaded means to effect the adjustment of said grinding means to predetermined and indicated radial positions.

2. A rotatable grinding device for shafts comprising a ring-like holder formed in pivotally connected arcuate sections having means for securing the same in ring-form when placed around the shaft to be ground, a plurality of radial slots opening in the inner periphery of said holder, grinding members having shanks slidably disposed in said slots and retained thereby against relative rotation, said members having axially directed grinding surfaces disposed inwardly of the inner periphery of said holder, threaded radial passages in said holder aligned with said slots and extending to the outer periphery of said holder, and threaded adjusting members in said passages each arranged to engage and adjust one of said grinding members.

3. A device of the class described comprising an annular holder adapted to be placed around a shaft to be ground, said holder having radial slots therein opening in the inner periphery thereof, grinding members having shanks slidably and non-rotatably disposed in said slots, a threaded passage aligned with each of said slots and extending to the outer periphery of said holder, a threaded adjusting member in each passage for effecting the radial adjustment of said grinding members as said adjusting members are turned, and a detachable gauging-actuating device for said adjusting members having means for attachment to said holder in a given position adjacent the outer end of each of said adjusting members and having means for operative attachment to said adjusting members in a given position of rotation thereof.

4. A rotatable grinding device for shafts com-

prising an annular holder formed in pivotally connected arcuate sections having means for securing the same in ring form when placed around a shaft to be ground, said holder having a plurality of radial slots opening in the inner periphery thereof, grinding members each having shanks slidably disposed in one of said slots and having axially directed grinding surfaces disposed inwardly of the inner periphery of said holder, threaded radial passages in said holder extending to the inner periphery of said slots, a threaded adjusting member in each of said passages, said members having inner ends arranged to engage and adjust said grinding members radially, and outer ends shaped for engagement by an actuating-gauging device, said holder having recesses in the outer periphery thereof concentric with the outer ends of said passages each for accommodating an actuating-gauging member in a given position therein, and an actuating-gauging device having means complementary to said recesses for engagement therein in said given positions, said device also having means for engaging the outer ends of said adjusting members for actuating the same to effect the predetermined radial adjustment of said grinding members.

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