Oct. 9, 1928. 1,686,802

J. EDGAR

DRESSING ATTACHMENT FOR HOB GRINDING MACHINES AND METHOD OF DRESSING GRINDING WHEELS

Original Filed June 28, 1916

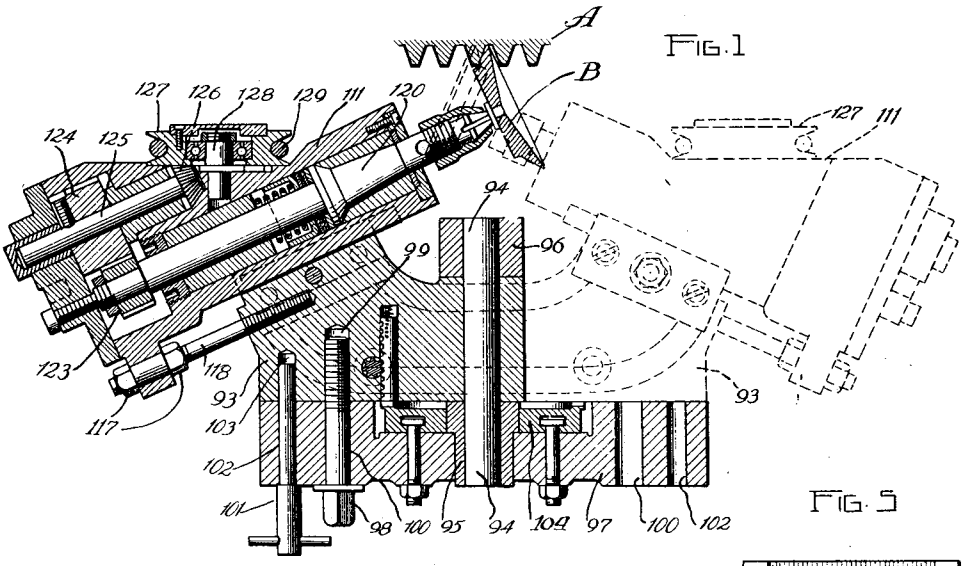


FIG. 1

FIG. 5

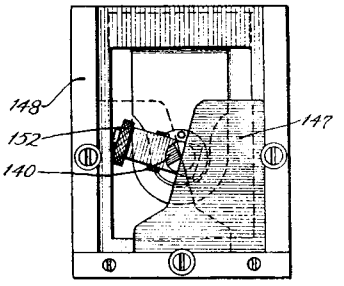


FIG. 3

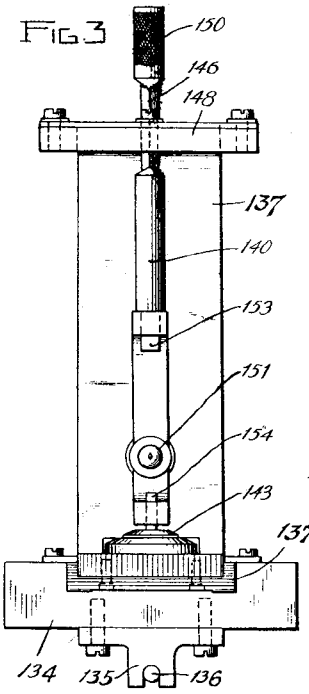


FIG. 2

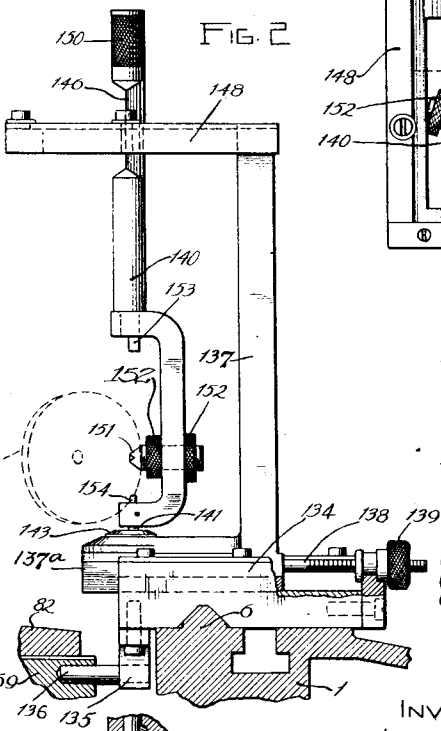


FIG. 6

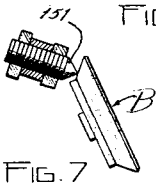


FIG. 7

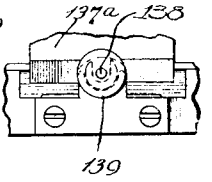
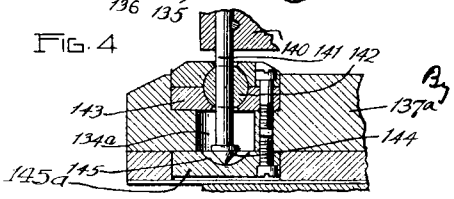


FIG. 4



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Patented Oct. 9, 1928. 1,686,802

UNITED STATES PATENT OFFICE.

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DRESSING ATTACHMENT FOR HOB-GRINDING MACHINES AND METHOD OF DRESSING GRINDING WHEELS.

Original application filed June 28, 1916, Serial No. 106,339. Divided and this application filed March 19, 1923. Serial No. 625,939

The invention pertains to the art of grinding machines such, for example, as those employed in grinding the form of hobs; and the invention has particular reference to a means for dressing the grinding wheels employed in such machines.

The object of the invention is to provide a dressing attachment of a thoroughly practical character which is capable of producing a peripheral grinding face for the wheel of a contour corresponding to the contour to be imparted to the hob teeth.

A more specific object of the invention is to provide a supporting means for a dressing tool by which the latter may be moved in a plane passing through the axis of the grinding wheel, in combination with means for guiding the tool to move so as to impart the desired form to the grinding surface.

The objects of the invention thus generally stated, together with other and ancillary advantages, are attained by the construction and arrangement illustrated in the accompanying drawings forming part hereof. While only one form of the invention is illustrated, it is contemplated that various changes in the form, construction and arrangement of the parts may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims.

In the drawings, Fig. 1 is a horizontal sectional view illustrating the means for rotatably supporting the grinding wheel with respect to a hob being ground. Fig. 2 is a fragmentary side elevational view of my improved dressing attachment and illustrating the manner in which it is supported in the grinding machine. Fig. 3 is a front view of the same. Fig. 4 is a fragmentary vertical sectional view through the lower end of the supporting means for the dressing tool, the view being taken on an enlarged scale to illustrate details of construction. Fig. 5 is a plan view of the templet and its supporting frame for guiding the dressing tool carrier, the latter being shown in section. Fig. 6 is a detail view illustrating the dressing operation. Fig. 7 is a fragmentary elevational view showing a detail of construction.

In my copending application Serial No. 106,339, filed June 28, 1916—of which this application is a division—I have shown a grinding machine of the type to which this invention is capable of application. Said machine comprises a bed (not herein shown) upon which is mounted a slide 1 (Fig. 2) carrying the head stock and the tailstock (not shown) between which is rotatably supported in horizontal position the hob A to be ground. The tail stock is removably mounted on a guide 6 on the slide 1. B indicates a grinding wheel which is rotated at a high speed in a direction opposite to the direction of rotation of the hob A.

The grinding wheel B is fast upon a spindle 120, and the latter is carried by a frame 93 which is mounted for swinging movement in the grinding wheel carriage. A small portion of the grinding wheel carriage is shown in Fig. 2 at 82. The arrangement is such that the frame 93 is capable of reversal so as to place the grinding wheel in position to grind first one side of the teeth and then the other side thereof, as shown in full and broken lines in Fig. 1. The axis of the frame 93 intersects the axis of the hob at a right angle, and when grinding the hob, the point of intersection of the pitch line and the line of contact of the hob and the grinding wheel is in the axis of the frame 93.

The frame 93 is pivoted upon the carriage 82 by means of a shaft 94 mounted at opposite ends in spaced bearings 95 and 96. The latter is rigid with the carriage, and the former is carried by a vertical elongated member 97 rising from the carriage. The frame 93 is arranged to be held against swinging movement by means of a screw 98 mounted in a threaded opening 99 in the frame and adapted to extend through either of two diametrically opposite curved slots 100 in the member 97.

The frame 93 occupies a horizontal position when the grinding wheel which is being dressed is to be used in grinding the teeth of a spirally gashed hob; and occupies an inclined position when the grinding wheel being dressed is to be used for grinding a straight gashed hob. In the latter instance the frame is inclined to the same degree as when grinding.

For the purpose of securing the frame in either of its horizontal positions, I provide a positioning pin 101 adapted to be inserted into either of two openings 102 provided at diametrically opposite points in the upstanding member 97. The pin 101 is adapted to enter a hole 103 in the frame 93, but is used only in setting the frame preparatory to dressing the grinding wheel and at other times is withdrawn from the opening 103.

For facilitating the setting of the frame 93 at an angle corresponding to the angle of the thread of the hob, I provide a protractor ring 104 mounted for rotation with the frame and having at its peripheral edge graduations cooperating with a mark upon the stationary member 97 to permit the setting of the frame at any desired angle.

The grinding wheel spindle 120 is mounted in a head 111 which is suitably mounted on the frame 93 for adjustment relative thereto as by means of nuts 117 on a screw stud 118 fixed to the frame 93. The spindle is connected by a gear train 123—124 to a countershaft 125 which is driven by a bevel pinion 126 and crown gear teeth formed upon a pulley 127. The latter is rotatably mounted upon a stud 128 and receives a belt 129 connected with a suitable source of power.

The dressing means is in the nature of an attachment which in practice is mounted upon the slide 1 after the hob has been removed. The attachment comprises a base 134 adapted to be seated upon the guide 6 and having a notched depending lug 135 adapted to engage a positioning pin 136 (Figs. 2 and 3) fixed to the slide 69 upon which the grinding wheel carriage is mounted. By the aid of this lug and pin, the dressing attachment may be properly located opposite the grinding wheel.

The dressing attachment further comprises a bracket 137 having a base 137^a which is adjustable upon the base 134 toward and away from the grinding wheel by means of a screw-threaded rod 138 secured to said bracket and having a nut 139 thereon. Said nut rests in a recess formed in an upstanding projection on the base 134 and is grooved to form opposed shoulders engaging the opposite sides of said projection so as to hold the nut against longitudinal movement.

The dressing tool is carried by an arm 140 the lower end of which is offset or U-shaped and carries a pin or rod 141 which depends slidably through a ball 142 rotatably mounted in a sectional bearing member 143 mounted in the base 137^a of the bracket 137. Said bearing member is suitably secured within the upper enlarged portion of an aperture 134^a through which the pin 141 projects. At its lower end the pin is provided with a point 144 that rests in a concave recess 145 formed in a plate 145^a secured to the base 137^a.

The upper end of the arm 140 is arranged to be guided by a templet 147 mounted upon a frame 148. To coact with this templet the upper portion of the arm is shaped to form a knife edge 146 and the outline of the working portion of the templet is such that it corresponds to the outline to be imparted to the sides of the teeth of the hob. The frame 148 is rigid with and constitutes a part of the bracket 137, and is so constructed as to permit the ready removal and replacement of the templet. As indicated by the broken lines in Fig. 5 the templet may be secured in the frame in either of two positions corresponding to the two horizontal positions of the frame 93.

At the upper end of the arm 140 is a handle 150 by means of which the dressing tool may be readily manipulated to carry it across the peripheral surface of the grinding wheel.

The dressing tool 151 is provided with a point of sufficiently hard material and is secured by means of nuts 152, upon the U-shaped portion of the arm 140. By this arrangement, the point of the dressing tool may be made to lie in a vertical line passing through the center of the ball 142 and the knife edge 146. To assist in locating the point of the tool in this median line I provide flattened pins 153 and 154 above and below the dressing tool against which pins a straight edge may be placed to serve as a guide in positioning the tool.

The curvature of the socket 145 is such that as the arm is oscillated and moved along the edge of the templet 147, the arm will be moved up and down sufficiently to cause the dressing tool to move in a horizontal plane while tracing the contour of the surface to be ground upon the teeth of the hobs.

In dressing a grinding wheel the aim is to form the grinding face in such a way that when the wheel axis is adjusted to correspond to the thread angle of the hob teeth, rack-tooth-shaped cutting faces will be produced on the hob. To obtain this result in dressing a wheel which is to be used for grinding hobs having straight flutes or gashes, that is to say, gashes parallel to the axis of the hob, the frame 93 carrying the grinding wheel to be dressed is secured in a position inclined to the same degree as when grinding such a hob, the axis 120 of the wheel being then in a plane normal to the hob helix. On the other hand, when dressing a wheel that is to be used for grinding the teeth of a spirally gashed hob, the frame 93 is secured in a horizontal position, the axis 120 of the wheel being then in the same plane as the axis of the hob when in position to be ground. In both cases, the same template is employed. When the wheel is being dressed it is in grinding position, save that the frame 93 is horizontal when the wheel is being dressed for use in grinding a spirally gashed hob. The

point of intersection of the pitch line of the hob and the contour of the wheel is in the axis of the frame 93, as when grinding.

I claim as my invention:

1. The combination with means for rotatably supporting a grinding tool, of an attachment for dressing the tool, said attachment comprising a base, a base mounted upon the first base for longitudinal adjustment thereon, a templet carried by the second base, and a dressing tool carrier comprising an arm having a dressing tool thereon, the lower end of said arm being mounted on the second base to turn on an axis substantially coincident with the point of the dressing tool, said arm being adapted to slide along said templet to guide the dressing tool carried thereby in a predetermined path with respect to the peripheral surface of the grinding wheel.

2. In a grinding machine, the combination of means for rotatably supporting a grinding wheel, a dressing attachment comprising a carrier having a dressing point and a depending supporting pin, a ball slidably engaging said pin, a bearing in which said ball is mounted, a bearing plate having a concave upper surface in which said pin is adapted to engage, and means for guiding the carrier in its swinging movements, the curvature of said concave surface being such that the dressing point always moves in the same plane.

3. The combination of means for supporting and rotating a grinding wheel, a carrier pivoted at one end and also free to turn on an axis extending longitudinally of the carrier, a dressing tool on the carrier having its point located approximately in said axis, and means for modifying the swinging movements of the carrier and thereby of the dressing tool to cause the latter to travel in a plane.

4. The combination of a pivoted frame, a grinding wheel carried by the frame, the active portion of said wheel being in the axis of the frame, a dressing tool, and means for moving said tool in the plane of the active portion of said wheel.

5. The combination with means for rotatably supporting a grinding wheel, of a dressing attachment comprising an arm having a dressing tool thereon and having a universal pivotal support, a support with which said arm slidably engages shaped to cause said tool to travel in a horizontal plane in the swinging movements of the arm, and a templet for guiding said tool in its movements.

6. The combination of a pivoted frame, a grinding wheel rotatably supported in said frame, said frame being adjustable through an arc of approximately 180 degrees, and means for dressing the grinding wheel comprising a tool carrier and a stationary frame having a templet with which said carrier is arranged to coact in guiding the movements of the tool, said templet being reversible to conform to the positions of said frame and hence of the grinding wheel.

7. The method of dressing a grinding wheel which is to be used for grinding spirally-gashed hobs to produce correct tooth outlines, comprising positioning a grinding wheel with its axis in the same plane as the axis of a hob when in position to be ground, the line of contact of the wheel with a hob so positioned intersecting the pitch line of the hob in an axis on which the grinding wheel may be adjusted into grinding position, and moving a dressing point through the correct tooth outline in contact with the grinding wheel to dress the same.

8. The method of dressing a grinding wheel which is to be used for grinding straight-gashed hobs to produce correct tooth outlines, comprising placing a grinding wheel in grinding position with its axis in a plane normal to the helix of a hob when supported in position to be ground, the line of contact of the wheel with a hob so positioned intersecting the pitch line of the hob in an axis on which the grinding wheel may be bodily swung through 180° into position to grind the other side of the teeth, and moving a dressing point through the correct tooth outline in contact with the grinding wheel to dress the same.

In testimony whereof, I have hereunto affixed my signature.

JOHN EDGAR.