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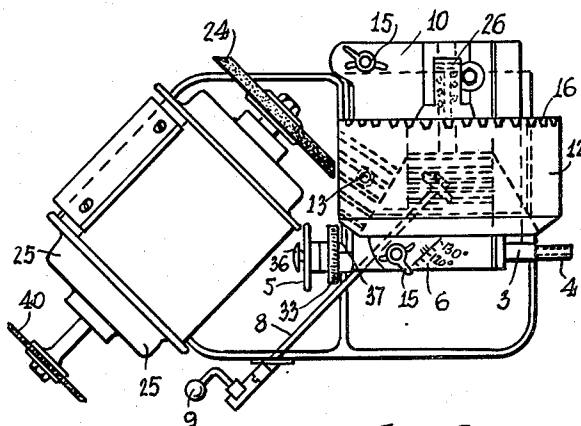
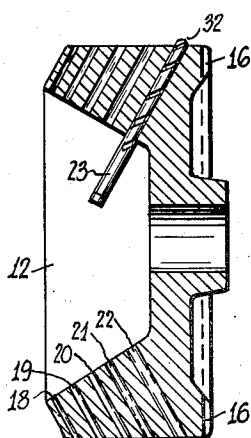
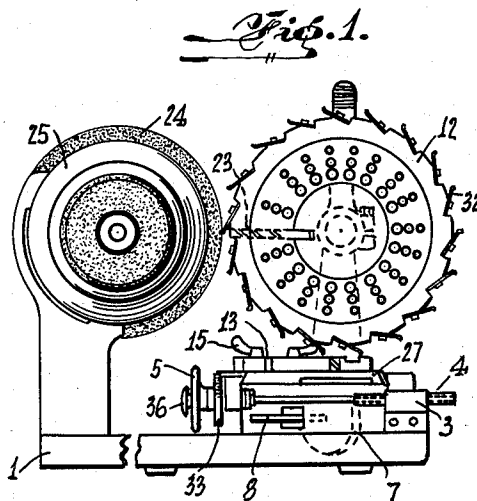
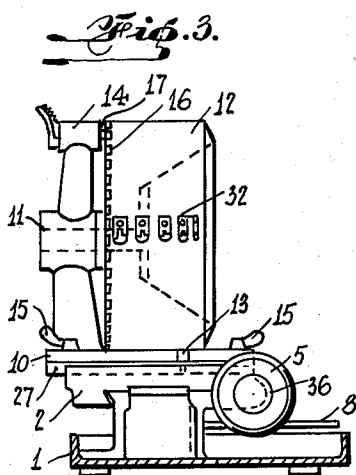
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2,591,893

MACHINE FOR GRINDING TWIST DRILLS

Filed May 24, 1947

2 SHEETS—SHEET 1



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2 SHEETS—SHEET 2

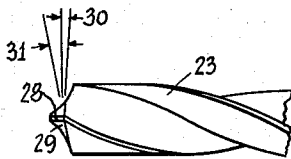


Fig. 5.

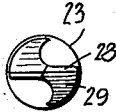


Fig. 5a.

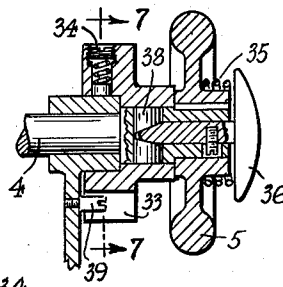


Fig. 6.

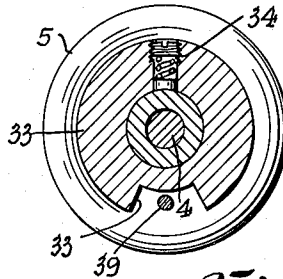


Fig. 7.

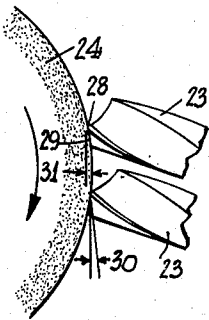


Fig. 8.

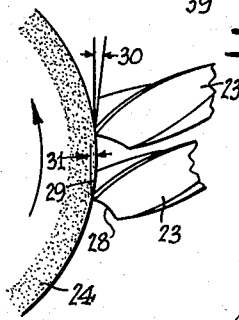
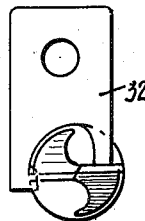


Fig. 10.

Fig. 9.

Fig. 9a.



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UNITED STATES PATENT OFFICE

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MACHINE FOR GRINDING TWIST DRILLS

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5 Claims. (Cl. 51—219)

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This invention relates to machines for grinding twist drills.

Twist drills play an important part in finishing processes, and as these drills are still frequently sharpened by hand grinding, which is not a very accurate or economical method, the accuracy of the grinding suffers and the grinding process remains uneconomical.

The commonest twist drills are those with a conical relief grinding. However, there are also drills the ridges or cutting faces of which are usually composed of two surfaces, the individual surfaces being concavely curved or flat. Hitherto, such drills have been ground singly, or rows of sockets for receiving the drills have been provided in a straight or circular arrangement; in the latter case, however, only a limited number of sockets could be provided without exchanging sockets, especially on account of the rocking movement that has to be effected during the grinding.

The problem underlying the invention is to be able to grind a large number of different sizes of drill on an apparatus that is as simple as possible. For this purpose, it is of fundamental importance to make a selection of a definite drill grinding which not only fulfills the requirements of practice but even affords advantages for the solution of the problem with regard to the set of tools required for the grinding. For this purpose, the ridge faces of the drill are composed, in the fundamentally known manner, of two surfaces which, when being fed, can be brushed by the grinding wheel along the cutting edges.

The invention consists in that the machine for grinding twist drills, the ridge faces of which have, along the edge, a narrow hollow chamfer and then, adjoining at the rear, a hollow ground part, has, for receiving the drills, a drum which is fixable with the aid of peripheral grooves and has a cylindrical outer shell and a conical inner surface. For guiding the drills in succession, this drum contains bores which are obliquely arranged in the radial planes and are perpendicular to the conical inner surface. In addition, it is provided on the outer shell with stops for the inserted drill. The receiving drum, which carries the particular drill, that is to be ground in an approximately horizontal plane and the axis of which lies at about the level of the axis of the grinding wheel, is moved past the periphery of the grinding wheel in the straight-line direction of the shell. This machine has also an especially simple and advantageous receiving device for drills in the case of which it is possible to effect

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with the same means the grinding of a large number of drills of different sizes, the number of different sizes being considerably greater than has been possible to grind hitherto.

Further features of the invention are that the grinding bores for thicker drills are arranged near the hub of the drum and the guiding bores for the thinner drills are arranged near the free edge of the drum. The drill stops are in this case made plate-shaped. Finally, the axis of the drum that receives the drills can be swivelled horizontally in order to be able to obtain different point angles.

An example of embodiment of the subject-matter of the invention is represented in the accompanying drawings, of which—

Figure 1 is a front elevation of the machine;

Figure 2 is a plan;

Figure 3 is a side elevation sectioned on the line I—I of Figure 2;

Figure 4 is a section of the receiving drum with an example of five-hole rows;

Figure 5 shows a drill with ground surfaces;

Figure 5a is an end view of a drill;

Figure 6 is a section through the adjusting device;

Figure 7 is a section through the adjusting device on the line III—III of Figure 6;

Figure 8 is a side elevation of the position of the drills in grinding the chamfer in the case of relief grinding for right-hand drills;

Figure 9 shows a drill stop;

Figure 9a is a plan view of a drill and a drill stop;

Figure 10 is a side elevation like Figure 8 but for left-hand drills.

On the base plate 1, the grinding device is arranged in front of the grinding wheel 24. The grinding wheel can be rotated by means of a belt drive or directly by a motor. The use of a belt drive considerably reduces the cost of a machine. It is also possible to arrange grinding wheels on the two sides of the drive, it then being possible for one wheel to serve for general grinding work or for pointing twist drills. A carriage 2 is moved in a dovetailed guide on the base plate 1 by a spindle 4 and a nut 3 by means of a handwheel 5 near the grinding wheel. A guide plate 27 runs at right angles to the dovetailed guide in the carriage 2 and this guide plate 27 has, at the bottom, a rack in which a screw wheel 1 engages, so that the plate 27 can be moved by means of a handle 9, to and fro parallel to the section plane of the grinding wheel 24. In this

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way, a faultless grinding of the lips of a drill or of a narrow hollow chamfer is obtained, whilst the operating surface of the grinding wheel remains smooth and furrows or unevennesses are avoided. Since the rotating grinding wheel does not have to carry out any reciprocatory movement, the greatest accuracy of the grinding of the lips of a drill or of the narrow hollow chamfer is ensured. The shaft 8 of the screw wheel is rotatably mounted in the base plate 1.

A pivot 13 is mounted on the guide plate 27. This pivot serves for receiving the swivel bearing 10. On this guiding plate there is located in front a degree scale 6 which renders possible the adjustment of the desired point angle and the fixing of the selected position on the guiding plate 27 by tightening a lever nut 15. The funnel-shaped receiving drum 12 is mounted without play on an axle 11 which is tight in the swivel bearing 10. This axle can be swivelled horizontally. Consequently, the cleaning of the machine is very simple, since the axle 11 is only loosened in the swivel bearing 10 and the fixable drum 12 is then taken off. The drum 12 has a cylindrical outer shell and a conical inner surface and, in addition, on its edge, peripheral grooves 16 into which a locking pin 17 drops and is secured by means of springs 26. The locking pin 17 and the springs 26 are arranged in an eye 14 belonging to the swivel bearing. The guiding hole bores 18, 19, 20, 21 and 22 for guiding the drills are arranged in the drum 12 in such a manner that the large diameters lie more towards the axle 11, whilst the smaller diameters are arranged further away from the axle 11 (Figure 4). The diameter of each bore is indicated on the periphery of the drum. The position of the drill introduced, e. g., of the drill 23, in front of the grinding wheel is fixed in such a manner that the desired grinding results. The stops 32 serve also for this purpose both in the longitudinal direction and in the direction of rotation. If drills of different pitch or spirals are used and if, on the other hand, the position of the drill lip to be ground is always to remain horizontal, it is important that the stop for the direction of rotation should be placed near the drill lip to be ground. This is rendered possible by uniting the two stops to form a plate-shaped stop 32 which is fixed on the drum in front of the point of the drill (Figures 4 and 9).

For the purpose of obtaining symmetrically ground drill lips or a narrow hollow chamfer, it is necessary to know the grinding depth to which the apparatus is set in order to be able again to adjust, by resetting, the last drill lip at the end of the sharpening. For this purpose, a counting disc 33 arranged next to the handwheel 5, is employed in the known manner, which counting disc is kept by a spring 34 with a brake screw in the position of rest on the fixed hub located on the carriage 2. On the outer shell of the counting disc 33 there is located a scale graduated in hundredths of a millimetre, on which scale the advance of the spindle can be read off by means of a pointer 37. Fitted next to the handwheel 5 is a knob 36 by means of which the counting disc 33 is rotated through the spindle 4. This is effected by the conical axle of the knob 36 pressing two clamping bolts 38 apart so that the latter press against the inner wall of the counting disc 33 and drive the counting wheel when the handwheel 5 is rotated. Immediately after the pressure on the knob 36 is released, the spring 35 releases the two clamping bolts and again releases

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the counting disc 33. The reading range on the counting disc amounts to about $10/100$ mm. for the group of small drills. The corresponding stroke of the counting disc is limited by a pin 39 which is mounted on the base plate 1 and which projects into a recess in the counting disc 33. In this way, the adjustment to too great a grinding depth and, consequently, the burning of the drill, are avoided. If the grinding depth is to be adjusted, the hand resting on the handwheel 5, by pressing on the knob 36, couples the counting disc 33 with the spindle 4 and then rotates the spindle 4 through about, for example, 4 graduation marks, i. e., $4/100$ mm. The counting disc 33, which is thereupon again released, now remains at rest on the graduation mark concerned until the grinding is finished. Onesidedness of the ground part is then removed by pressing on the knob 36 and rotating the counting disc 33 to the zero position.

The reason for the oblique position of the grinding wheel is that, with a belt drive, by pressing off the grinding motor or the grinding support, complete freedom of movement results for the handwheel 5, the operative lever 9 and the pointing disc 40. Owing to the oblique position of the grinding wheel, the radius of grinding on the work piece is now greater and the ground surface and relief-ground surface are correspondingly flatter. The diameter of the grinding wheel and the width and, consequently, the thickness of the motor can, for this reason, be made somewhat smaller. The turning of the grinding wheel is effected by sticking the diamond holder, in the normal position of 116 to 120° , into a bore in the drum 12 and moving it to and fro in front of the grinding wheel by means of the lever 9.

The surface of the base plate 1 has trough-shaped depressions which are intended for receiving the twist drills to be ground.

The sharpening of a twist drill is carried out in the following manner:

The locking pin 17 is disengaged, the drum 12 is adjusted to the desired diameter of drill and the locking pin is engaged. The drill is now inserted up to the stop 32 and the lever 9 and the handwheel 5 are operated until sparks are produced by the drill and the grinding wheel. The setting of the grinding depth then takes place by pressing the knob 36 on to the handwheel 5 and rotating the handwheel to the desired graduation mark. The knob 36 is then released. Thereupon, the first drill lip is ground by moving the lever 9, the drill is then withdrawn and a rotation through 180° is effected. Thereupon, the drill is again pushed forward up to the stop and further grinding is carried out until the two lips are sharp.

The locking pin 17 is now pushed out, the drum is rotated one groove downwards and the locking pin is then again pressed in. Thereupon, the application of the drill to the grinding wheel is effected by means of the handwheel 5 and the setting of the grinding depth, with the result that a hollow chamfer is produced. The onesidedness of the drill lips is removed by pressing the knob 36 to the handwheel and by, at the same time, rotating the spindle back to the zero position. The drill is then rotated through 180° until the last lip is ground. The grinding of the two lips is then at the same amount. The grinding of the chamfer may be dispensed with in the case of smaller drills.

If another point angle is ground on the drill

instead of the ordinary point angle, the lever nuts 15 are loosened, the guiding drum 12 is adjusted to the desired number of degrees and the lever nuts 15 are then again tightened whereupon the grinding of the drill lips can take place.

Machines for sharpening left-hand drills have a guiding drum with correspondingly oppositely directed guiding holes (Figure 10), as indicated by the angle 31.

On the other end of the shaft of the motor or, in the case of a belt drive, on the shaft of the grinding wheel, there is provided a second grinding wheel 40 which, after the sharpening may be employed for the pointing.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A machine for grinding twist drills having cutting faces formed with a narrow hollow chamfer along their edges, and with a hollow ground part adjoining such edges at the rear; said machine comprising a base, a grinding wheel rotatably supported on said base with the axis thereof disposed in a horizontal plane, a support slidable on said base in a path of travel related angularly to the axis of said wheel, a drum having a cylindrical outer surface and a conical inner surface rotatably mounted on said support with the axis of rotation of said drum disposed in said horizontal plane of the grinding wheel axis, angularly spaced grooves formed in the outer surface of said drum, a locking pin carried by said support and engaging in a selected one of said grooves for retaining said drum in a selected one of a plurality of angularly adjusted positions, a plurality of sets of bores formed in said drum in angularly spaced radial planes of said drum, each of said bores being perpendicular to said conical inner surface of said drum and adapted to receive a drill to be ground, and stops carried by the outer surface of said drum adjacent the outer end of each bore for retaining a drill in the associated bore whereby said drum is adapted to support a drill for grinding in a substantially horizontal plane at the level of the axis of the grinding wheel for movement past the periphery of the wheel in a direction parallel to the path of travel of said support.

2. A machine according to claim 1, wherein said drum is rotatably supported at one end, and wherein the bores of each of said sets are of successively increasing diameter toward said one end of the drum whereby said bores are adapted to receive drills of varied diameters.

3. A machine according to claim 1, wherein

each of said stops includes a plate pivoted at one end on the outer surface of said drum and formed with a notch in the swinging end thereof within which a turn of a drill in the associated bore may engage.

4. A machine according to claim 1, wherein said support includes a plate slidable on said base and a standard pivoted on said plate for swinging about a vertical axis whereby said drum is adapted to be swivelled in a horizontal plane.

5. A machine for grinding twist drills comprising a base, a dovetail guide formed in said base, a carriage slidable on said guide, a guide formed in said carriage at right angles to the direction of movement of said carriage relative to said base, a plate slidably mounted upon said guide formed on said carriage, a vertical pivot on said plate, a standard rotatable on said pivot for swinging about a vertical axis, a grinding wheel, means rotatably mounting said wheel on said base with the axis of rotation of said wheel disposed in a horizontal plane, a drum having a cylindrical outer surface and a hub on one end thereof, means extending through said hub rotatably mounting said drum on said standard with the axis of rotation of said drum lying in the horizontal plane passing through the axis of rotation of said wheel, means maintaining said drum in a selected rotated position, said drum being formed with a conical inner surface opening at the other end thereof, a plurality of sets of bores formed in said drum in angularly spaced radial planes, each of said bores being perpendicular to said inner surface of said drum and adapted to receive a drill to be ground, and stop means carried by said drum at the outer surface thereof adjacent each of said bores for engagement with a drill in the associated bore to hold the drill in position to be ground whereby said drum is adapted to support a drill for grinding in a substantially horizontal plane at the level of the axis of rotation of the grinding wheel for movement in right angularly related directions.

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