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2,417,810

NEEDLE GRINDER FOR FINE DIE DRILLING MACHINES

Filed Jan. 31, 1944

2 Sheets-Sheet 1

FIG. 1

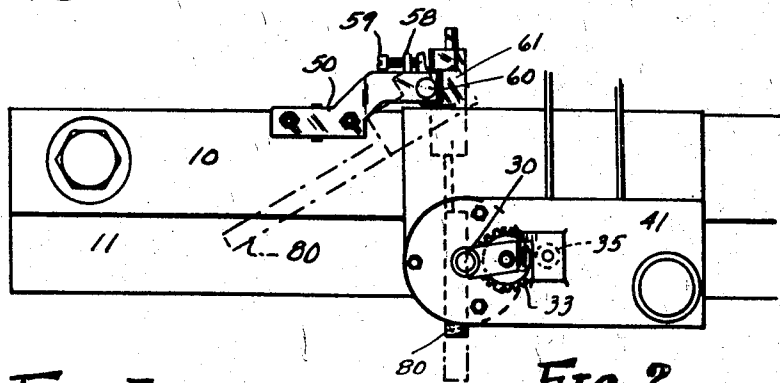
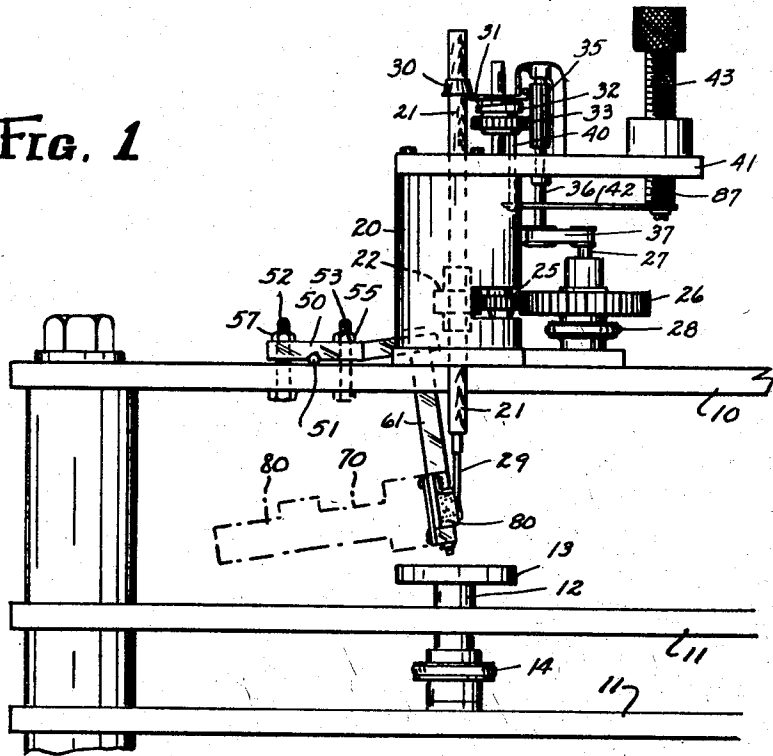


FIG. 3

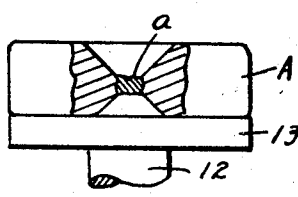


FIG. 2

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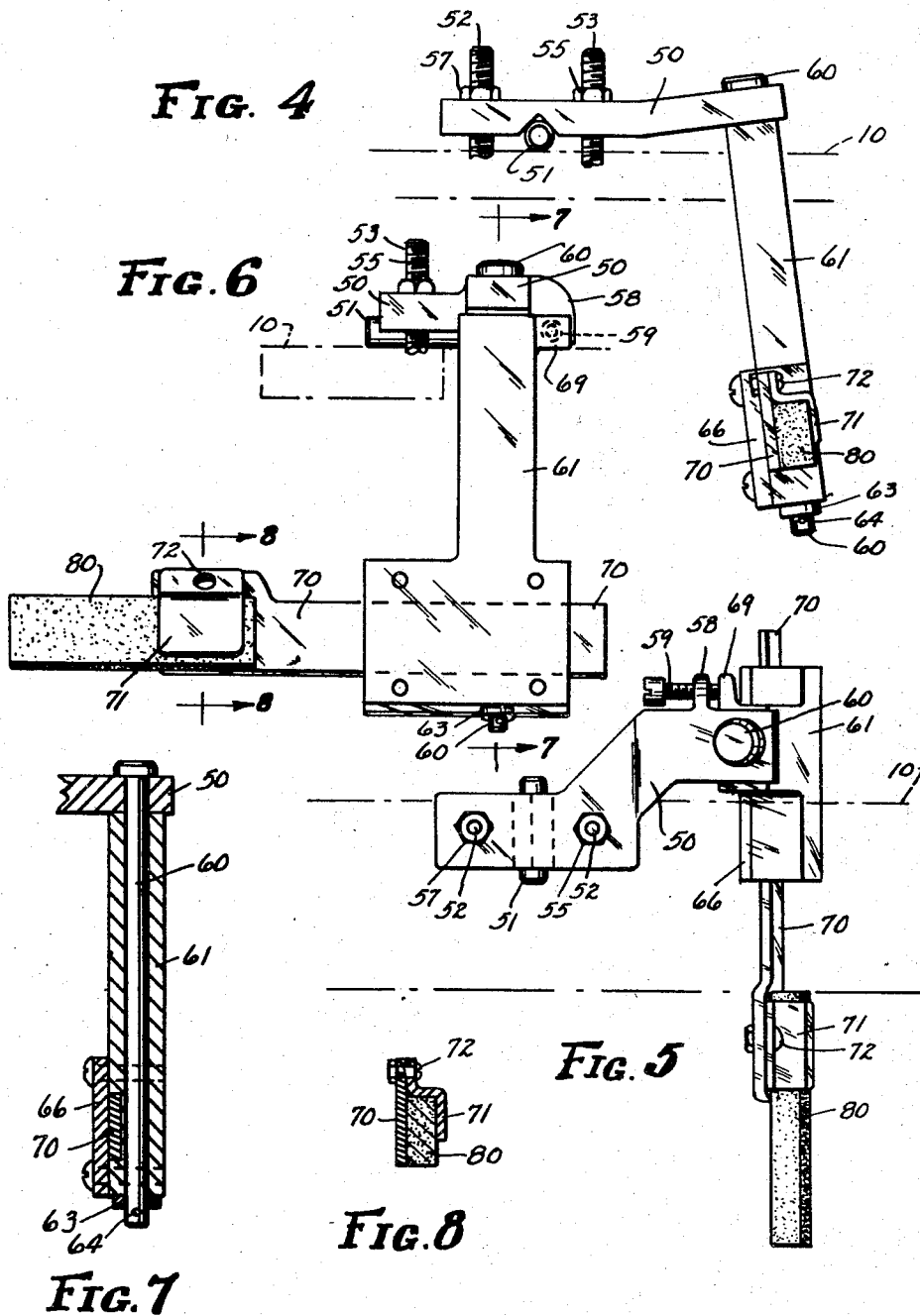
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# UNITED STATES PATENT OFFICE

2,417,810

## NEEDLE GRINDER FOR FINE DIE DRILLING MACHINES

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6 Claims. (Cl. 125—30)

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In the drilling of relatively small holes in diamonds or other material to form dies such as are used in the processing of wire, it is important to grind or hone the drilling point frequently.

The primary object of the present invention is to provide an effective honing device mounted on the frame of such fine die drilling machine and out of the region of drilling action but movable for action whenever desired to dress the point of the drill without requiring its removal from the drill spindle.

A further object is to enable the ready adjustment of the angle of the hone with reference to the drill axis and to limit the approach of the hone to such axis, so that the drill may be properly dressed.

Another object is to enable the ready manual manipulation of the positioned hone transversely of the drill point as the same is rotated.

The above outlined objects and the means for accomplishing the same will be more apparent from the following detailed description of a preferred embodiment of the invention illustrated in the drawings.

In the drawings, Fig 1 is a front elevation of a fine die drilling machine equipped with our honing device; Fig. 2 is a plan of the machine; Fig. 3 is a sectional side elevation on a larger scale of a work holder and a diamond supported thereby for drilling; Figs. 4 and 5 are views similar to Figs. 1 and 2, respectively, but illustrating the honing device detached from the drilling apparatus, the scale being larger than that of Figs. 1 and 2; Fig. 6 is a view on the same scale as Figs. 3 and 4 looking at the right hand side of the honing device; Figs. 7 and 8 are cross sections, as indicated by the correspondingly numbered lines on Fig. 6.

To set out a proper background for our invention, we will first describe briefly the drilling machine shown in Figs. 1 and 2. We have there shown a suitable frame having a horizontal top plate 10 and two horizontal lower plates 11. Rotatably carried by these lower plates is a vertical spindle 12 carrying a table 13 which carries a suitable work fixing for the die, such fixture being indicated at A in Fig. 3.

Mounted on the top frame plate 10 we have shown a housing 20 in which is journaled a vertically movable spindle 21. We have indicated at 22 a pinion splined on this spindle and meshing with an idler gear 25 which meshes with a driving gear 26 on a spindle 27, shown as driven by a belt 28. 29 indicates the drill, held suitably chucked in the spindle and thus constantly ro-

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tated by the belt 28. The table 13 is rotated in the opposite direction to the drill and at a slower speed, as by a suitable driving belt, indicated at 14.

A suitable form of work holder A, adapted to be mounted on the table 13, is illustrated in Fig. 3, and is shown as carrying a diamond *a* to be drilled.

The drill spindle with its drill is reciprocated during its rotation by mechanism indicated in Fig. 1. Thus, we have shown a collar 30 on the drill spindle resting on a lever 31 which has a boss on its underside resting on a crown cam 12 mounted on the hub of a gear 33 which meshes with an elongated driving pinion 35 on an arbor 36. This arbor is connected by a driving belt 38 to the shaft 27 heretofore mentioned.

It results from the mechanism indicated that the rotating shaft 27 rotates the cam 32 and this reciprocates the spindle, the lever moving it upwardly and gravity downwardly.

The downward movement of the drill may be controlled by a suitable micrometer adjustment. As shown, this movement is limited by the hub of the gear 33 abutting a vertically slidable pin 40 mounted in a frame plate 41. The lower end of this pin is carried by a bar 42 in which is journaled the lower end of a micrometer screw 43 which may thus move the pin up and down and set it to give the desired approach of the die to the work.

The honing device of the present invention, when utilized for such a drill and spindle as above described, has a supporting bracket 50 adjustably mounted on the top frame plate 10. This bracket rests on a cylindrical fulcrum 51, which may readily be a short piece of tube, and is locked in position by bolts 52 and 53 mounted in the top frame plate 10 of the machine and carrying nuts 54 and 55. By loosening one nut and tightening the other the bracket is rocked in one direction or the other and held firmly in position.

The bracket 50 has a portion 56 at an oblique angle to the drill spindle, and mounted in the portion is a rod 60 extending through a block 61 which is thus swiveled to the bracket. As shown the rod extends through the bracket and has a head at its upper end, while below the block it has a suitable stop, as, for instance, a washer 63 engaging the underside of the block and the pin 64 positioning the washer. The block is thus held snugly against the underside of the bracket and is swiveled thereto.

The block 61 has a shallow groove formed in one face thereof in which is slidably mounted a

flat bar 70 which forms the hone holder. This bar is held in place by a plate 66 secured to the block. Mounted on the hone holder 70 is a clip 71 secured to the holder by a screw 72, the clip and bar being adapted to have the hone 80 clamped between them, the hone thus projecting forwardly from the holder.

The supporting bracket 50 has a downwardly projecting ear 58, in which is mounted a set screw 59 bearing against an ear 69 on the block 61. This ear and the set screw it abuts, being on the opposite side of the pivot from the hone 80, form an adjustable stop limiting the movement of the hone toward the drill. The adjustment of the bracket 50 controls the angle of the hone to the drill and thus these two adjustments enable the hone to be presented to the drill with the desired limit of approach and at the desired angle.

In normal operation of the drill, the hone and the hone carrier are swung out of the way to a position indicated by broken lines in Figs. 1 and 2. Whenever it is desired, however, to hone the drill, the carrier and hone are simply swung into the position indicated in full lines in Figs. 1 and 4 and hone is then manually manipulated back and forth by sliding its carrier in the positioned block 61 as the drill is rotated. This enables the ready dressing of the drill in a very accurate manner without requiring its removal from the machine.

It will be seen that the hone may be removed from the carrier whenever desired by merely loosening the clamping screw. This enables the hone to be dressed from time to time so that it will present an absolute true surface to the drill.

The device of the present invention contributes greatly to the accuracy of the drilling operation over the old method of removing the drill and honing it by hand. In precision operations to ten thousandths of an inch, or even thousandths, it is very desirable not to disturb the drill in its spindle, or the spindle in the machine, as a replacement of the parts may bring them into slightly different position. Moreover, hand honing of the removed drill is very likely to cause greater treatment on one portion of the drill point than on the other. Accordingly, by holding the drill with a hone at a definite angle and a definite limited approach to the axis, we are able to do the necessary honing with an accuracy far greater than formerly.

In addition to the accuracy of honing provided by our device, there is the great advantage of saving in the time required for the removal of the drill and its subsequent honing. Moreover by having the honing device ready at hand for instant operation the operator will naturally hone the drill with greater frequency than heretofore and thus maintain it sharper, than if it was necessary to remove it each time, resulting in the drilling of a more accurate hole in the die.

We claim:

1. The combination with a support of a bracket mounted on a fulcrum of the support, a pair of threaded members engaging the bracket on opposite sides of the fulcrum to position the bracket, a block pivoted to the bracket, a bar slidably mounted in the block, and a hone mounted on the bar.

2. The combination with a support, a bracket mounted on a fulcrum on the support, threaded

members engaging the bracket on opposite sides of the fulcrum whereby the bracket may be rocked, a block swiveled to the bracket, a bar slidably mounted on the block extending transversely of the block, a hone, and a clamp for holding the hone to the bar.

3. The combination with a frame of a drilling machine, a rotary spindle carried thereby and carrying a drill, a work holder opposite the drill, a bracket adjustably secured to the frame of the machine and having a portion projecting at an oblique angle to the axis of the drill, a block swiveled to such oblique portion of the bracket, a slide mounted in the block extending transversely thereof, means for clamping a hone on the slide with the face of the hone at an oblique angle to the axis of the drill, means for swinging the bracket on the frame to change the angle of the hone to the drill, and means for limiting the swinging of the block on the bracket to limit the presentation of the hone to the drill.

4. In a fine die drilling machine, the combination of a frame, a rotary spindle carried thereby, a needle drill carried by the spindle, a grinding device mounted on the frame of the machine, the mounting comprising an adjustable bracket carrying a guideway lying parallel to a tangent to the drill and a reciprocable slide in said guideway carrying a hone having its face in engagement with the drill during the reciprocation of the slide, and means for adjusting the guideway with reference to the bracket to limit the approach of said hone to the drill.

5. The combination of a work table, a spindle normal thereto adapted to carry a drill in axial alignment with the spindle, a hone, a slidable carrier therefor shiftable bodily into and out of the region between the table and spindle and reciprocable in said region in a path substantially tangent to the periphery of the drill, and means for tipping the carrier to change the angle of presentation of the hone to the drill.

6. The combination of a frame carrying a rotary drill, a bracket mounted on the frame, a block pivotally connected to the bracket, a hone holder slidably mounted in the block and adapted to be swung to and from active position and reciprocated when in active position with the hone in engagement with the drill, means for adjusting the position of the bracket to change the angle of the hone to the drill, and means for adjustably limiting the position of the block on the bracket.

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