

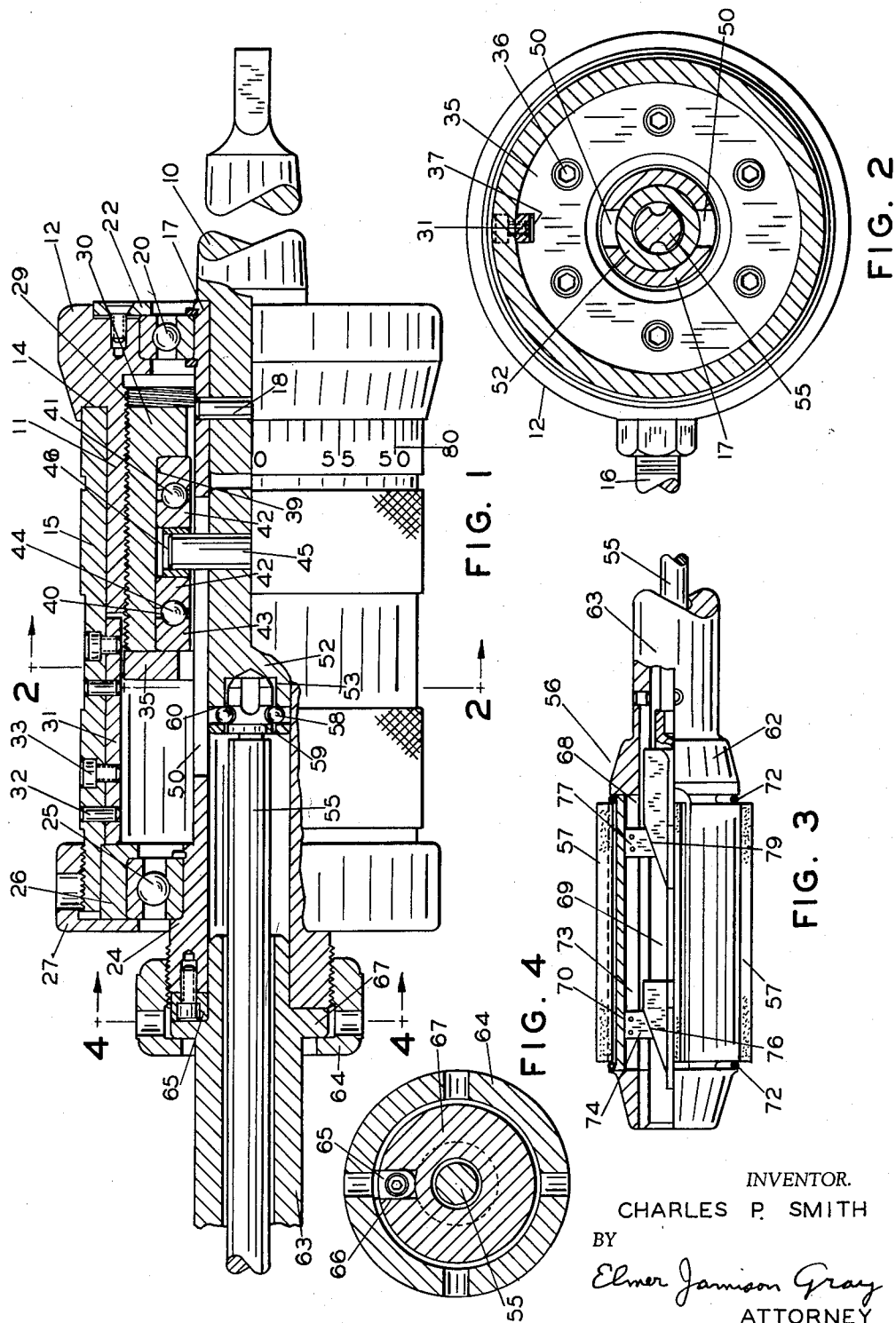
June 27, 1961

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2,989,825

HONING HEAD

Filed April 15, 1957



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2,989,825

HONING HEAD

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Filed Apr. 15, 1957, Ser. No. 653,014

8 Claims. (Cl. 51—184.3)

This invention relates to a universal honing head for use in controlling the position of tools in relation to the bores of work pieces, particularly honing, reaming and boring tools, irrespective of the type of machine by which such tools may be actuated.

An object of the present invention is to provide a honing head having a driven spindle adapted to be coupled at one end to a source of power and through its other end to a honing tool whereby upon manual rotation of the head, either while the tool is at rest or during rotation thereof, the cutting or abrading element of the tool may be readily expanded to maintain said element in contact with the work so as to insure effective, rapid and accurate removal of the stock.

In accordance with the embodiment of the invention herein illustrated, by way of example, the universal head for a tool may be actuated to push or pull the tool forwardly or backwardly relative to the work while the tool is rotating, thus avoiding the necessity for stopping the mechanism for any readjustment or repositioning of the tool to expand it into contact with the work.

A further important feature of the invention is to provide a universal head for controlling the expansion of the abrasive portion of the tool, to move it longitudinally through the bore while the tool is rotating, and in such control of the abrasive the latter can be brought into intimate contact with all portions of the bore to hone the walls of the work to effect the precise honing thereof.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawing forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

FIG. 1 is a fragmentary longitudinal view, partly in section, illustrating a honing head embodying the present invention, the head having a portion of the honing means positioned with respect thereto.

FIG. 2 is a sectional detail view taken substantially on a line 2—2 of FIG. 1.

FIG. 3 is a fragmentary longitudinal view, partly in section, illustrating a honing tool which may be incorporated for use with the honing head of the present invention.

FIG. 4 is a sectional detail view taken substantially on a line 4—4 of FIG. 1.

Before a detailed explanation of the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the present embodiment there is illustrated a honing head or apparatus which is attachable at its driven end to a conventional machine. The honing head, depending upon the type of machine with which it is used, may extend either vertically or at an angle, such as 45°, or horizontally. In the present instance the honing head is shown in a horizontal position, although it is understood that this is merely for illustrative purposes.

Referring to the drawings wherein there is illustrated, by way of example, one embodiment of the present in-

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vention, there is provided a driven shaft or spindle 10 which is adapted to be coupled to a source of power such as provided by a boring or honing machine (not shown). The spindle 10 is rotatable with respect to a sleeve member 11 non-rotatably positioned with respect to the machine with which the control head is used. The sleeve member 11 has an enlarged head portion 12 provided with an inward annular groove 14 adapted to receive one end of a tubular casing or outer adjusting sleeve 15. For securing the sleeve 11 against rotation a holding member is provided, a portion only of which has been shown as including a laterally extending arm or rod 16 secured to the portion 12. The other end of the rod 16 is preferably secured to some fixed part of the machine with which the honing head is used. A tubular spindle extension 17 is secured to the inner end of spindle 10 as by a pin 18. The spindle extension 17 is spaced from and rotatably supported in sleeve head portion 12 by a roller bearing indicated generally at 20 located by a face plate 22 removably secured to the head portion 12.

The outer end of spindle extension 17 is enlarged and threaded at 24, adjacent which enlargement is a roller bearing indicated generally at 25 to anti-frictionally support the outer end of adjusting sleeve 15. A substantial portion of sleeve 15 is supported on the outer bearing surface of sleeve member 11. A bearing retainer 27 is threaded on the outer end of sleeve 15 to locate bearing 25 with respect thereto. Interpositioned between the bearing 25 and the inner surface of sleeve 15 is a bearing cup 26, which is pressed into the outer end of sleeve 15 for rotation therewith.

The interior surface of sleeve 11 is threaded at 29 for engagement with an exteriorly threaded nut or inner adjusting sleeve which, upon manual rotation of outer adjusting sleeve 15, will be rotated therewith and also moved longitudinally thereof either forward or backward therein. An elongated key 31 is longitudinally located within the sleeve 15 by means of pins 32 and secured to the inner surface thereof by means such as screws 33. A retainer ring 35 is secured to the inner end of sleeve 30 by means of screws 36 (FIG. 2). A keyway or slot 37 is provided in retainer ring 35 to receive the key 31. It will be understood that in addition to mounting the sleeve 30 for turning with the adjusting sleeve 15 the key 31 and retainer ring 35 provide means for slidably guiding the nut or sleeve 30 in its longitudinal fore and aft movement.

The nut 30 is provided with a bore 39 for the reception of a pair of thrust bearings 40 and 41 presently to be described. These bearings consist of inner and outer races 42 and 43 respectively, and disposed in each pair of races are the balls 44. Intermediate the inner races 42 is a tool expansion control pin member 45 between which and the inner races 42 is disposed a plain bearing 46. The retainer 35 also serves to positionally retain the above bearings within the nut 30. The purpose of assembling the aforesaid elements interiorly of the nut is to enable the control pin member 45 to be freely rotated therein with a minimum of frictional resistance as hereinafter more particularly described.

Extending midway of the ends of the spindle extension 17 a pair of opposed parallel slots 50 are provided through the walls thereof. Within the bore in the spindle extension 17 is an adapter 52, the outer end of which has a bore 53 for receiving the inner end of a tool control rod 55 that is carried by the tool 56 (see FIGURE 3), the outer end of which tool carries cutting or abrading elements 57. The tool 56 is provided with a hollow connecting shank 63 of convenient length detachably secured to the threaded end 24 of spindle extension 17. The shank 63 and spindle extension 17 are

secured together in end to end relation by means such as threaded connecting collar 64, rotary drive being imparted to the shank 63 by means of a driving key 65 attached to the end of extension 17 receivable in a radial slot 66 in the coupling portion 67 of the shank 63. The rod 55 is secured to the aforesaid adapter 52 by means of a plurality of balls 58 received in a circumferential groove 59 in the control rod and radial apertures 60 in the control member. Thus, when the spindle 10 is rotated, it will rotate therewith the control member 45 within the nut or inner adjusting sleeve 30 as previously referred to above. It will be understood that, although the inner adjusting sleeve 30 is not affected by the rotation of the control member or pin 45 therein, said nut may be freely shifted longitudinally of the spindle extension 17 upon manual rotation of the sleeve 15, and such longitudinal movement may be made while the shaft is rotating.

The honing tool 56 illustrated in FIG. 3 comprises a cylindrical stone holding body portion 62 from which the shank 63 extends. The body portion 63 is provided with equally spaced radial stone holder guide slots 68. These radial cross slots 68 extend entirely through the annular body portion 62 and terminate at the axial bore 69 thereof.

Mounted within each cross slot 68 is a stone holder 70 having a smooth fit within the slot. Fitting within an outer longitudinal slot in each stone holder 70 is a honing stone or abrading element 57, each honing stone being adhesively secured within the slot and having the work portion thereof projecting radially outwardly from the stone holder. As shown, the elongated honing stones 57 terminate short of the ends of the stone holders to provide supports for annular contracting springs 72 which function to retract the stone holders in the usual manner.

Each stone holder 70 is provided with a central inwardly opening longitudinal slot 73 extending the full length thereof. Within the forward end of each slot is fitted a front cam shoe or member 74 secured in position as by rivets. The inner edge of each cam member 74 is tapered rearwardly and upwardly to form a cam edge 76. Within the rear end of each slot 73 is fitted a rear cam shoe or member 77 also secured in position by rivets. These cam shoes are identical to the cam shoes 74 and have similar cam edges 79.

Adjustable axially within the bore 69 is a cam unit having cam means cooperable with the front and rear cam shoes 74 and 77 for imparting outward radial displacement to the stone holders 70. Said unit includes rod 55 disposed axially of the bore 69 and actuated by the adapter member 52 described above.

In the operation of the control head as above described, after the tool 56 is attached to the spindle 10 and the control rod 55 is connected through the adapters 52 and the control pin member 45, the assembly is ready to perform its cutting or honing operation. The tool 56 is inserted into the bore of the work piece and the sleeve 15 is then rotated to bring the cutting tool or abrasive into contact with the work piece to be acted upon. The contact of the cutter or abrasive with the work piece is effected when through the rotation of the sleeve 15, either to the right or left, nut or sleeve 30 is likewise moved thereby either to the right or left. In such movement the control member 45 moves in the same direction with the nut 30 and because member 45 through its connection with adapter 52 and the latter's connection to the control rod 55 as before described, such movement of the control member results in either pulling or pushing said control rod longitudinally of the work piece so that the abrading elements 57 can be extended into honing or cutting relationship with the work. The graduations 80 on sleeve 15 permit the operator to readily determine the precise adjustment necessary to expand the

honing stones to attain the finish required on the work.

I claim:

1. In a honing apparatus having rotary drive spindle means and an endwise shiftable rod in said spindle for controlling the radial adjustment of honing stone holders, a non-rotatable supporting head having an internally threaded cylindrical extension, an inner adjusting sleeve extending within said extension and having threaded engagement therewith, a rotatable outer adjusting sleeve connected at all times to said head and embracing said cylindrical extension in bearing engagement therewith, means for connecting said adjusting sleeves to provide for longitudinal adjustment of the inner sleeve upon manually turning the outer sleeve, and means for connecting said rod to said inner sleeve.

2. In a honing apparatus having rotary drive spindle means and an endwise shiftable rod in said spindle for controlling the radial adjustment of honing stone holders, a non-rotatable supporting head having an internally threaded cylindrical extension, an inner adjusting sleeve extending within said extension and having threaded engagement therewith, a rotatable outer adjusting sleeve connected at all times to said head and embracing said cylindrical extension in bearing engagement therewith, means for connecting said adjusting sleeves to provide for longitudinal adjustment of the inner sleeve upon manually turning the outer sleeve, and longitudinally adjustable means rotatable relatively to said inner sleeve for connecting said rod thereto.

3. In a honing apparatus having rotary drive spindle means and an endwise shiftable rod in said spindle for controlling the radial adjustment of honing stone holders, a non-rotatable supporting head having an internally threaded cylindrical extension, an inner adjusting sleeve extending within said extension and having threaded engagement therewith, a rotatable outer adjusting sleeve connected at all times to said head and embracing said cylindrical extension in bearing engagement therewith, means for connecting said adjusting sleeves to provide for longitudinal adjustment of the inner sleeve upon manually turning the outer sleeve, and means for connecting said rod to said inner sleeve, said connecting means including a pin connected to said rod and shiftable within a guide slot in said spindle means.

4. In a honing apparatus having rotary drive spindle means and an endwise shiftable rod in said spindle for controlling the radial adjustment of honing stone holders, a non-rotatable supporting head having a single internally threaded cylindrical extension, a single inner adjusting sleeve extending within said extension and having screw threaded engagement therewith, a rotatable outer adjusting sleeve permanently connected to said head and embracing said cylindrical extension in permanent bearing engagement therewith, a key and slot connection between said adjusting sleeves to provide for rotatable movement of the inner sleeve with the outer sleeve upon turning the latter together with simultaneous longitudinal adjustment of the inner sleeve, and means for connecting said rod to said inner sleeve.

5. In a honing apparatus having rotary drive spindle means and endwise shiftable hone adjusting means therein, a hollow non-rotatable supporting member having an inner cylindrical surface, an inner rotatable adjusting sleeve telescoped into said supporting member and having a threaded connection with said inner cylindrical surface of said supporting member to provide for longitudinal adjustment of said sleeve upon rotation thereof relative to said supporting member, an outer rotatable adjusting sleeve mounted on said supporting member and within which said inner sleeve is longitudinally movable, means for permanently connecting said adjusting sleeves to provide for rotation of both said sleeves and longitudinal adjustment of the inner sleeve upon turning the outer sleeve, and means including a member rotatable with

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and shiftable longitudinally of the spindle means for connecting said inner sleeve to said hone adjusting means.

6. In a honing apparatus having rotary drive spindle means and endwise shiftable hone adjusting means therein, a hollow non-rotatable supporting member having an inner cylindrical surface, an inner rotatable adjusting sleeve telescoped into said supporting member and having a threaded connection with the inner cylindrical surface of an overlying extension of said supporting member; to provide for longitudinal adjustment of said sleeve upon rotation thereof relative to said supporting member, an outer rotatable adjusting sleeve mounted on said supporting member and within which said inner sleeve is longitudinally movable, means for permanently connecting said adjusting sleeves to provide for rotation of both said sleeves and longitudinal adjustment of the inner sleeve upon turning the outer sleeve, and connecting means disposed within said inner sleeve for connecting the same to said hone adjusting means.

7. In a honing apparatus having rotary drive spindle means and endwise shiftable hone adjusting means therein, a non-rotatable supporting member, an inner rotatable adjusting sleeve having a threaded connection with an overlying extension of said supporting member to provide for longitudinal adjustment of said sleeve upon rotation thereof, an outer rotatable adjusting sleeve mounted on said supporting member, means for permanently connecting said adjusting sleeves to provide for rotation and longitudinal adjustment of the inner sleeve upon turning

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the outer sleeve, and connecting means disposed within said inner sleeve for permanently connecting the same to said hone adjusting means, said connecting means including a control pin member rotatable with and adjustable longitudinally of the spindle means and also rotatable relative to said inner and outer sleeves.

8. In a honing apparatus having rotary drive spindle means and an endwise shiftable rod in said spindle for controlling the radial adjustment of honing stone holders, a non-rotatable supporting head having an internally threaded cylindrical extension, an inner adjusting sleeve extending at all times within said extension and having threaded engagement therewith, an outer rotatable adjusting sleeve mounted on said cylindrical extension, means for connecting said adjusting sleeves to provide for longitudinal adjustment of the inner sleeve upon manually turning the outer sleeve, and means for permanently connecting said rod to said inner sleeve, said connecting means including a control pin member rotatable with and adjustable longitudinally of the spindle means and also rotatable relative to said inner and outer sleeves.

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