April 26, 1960 J. H. FRIDEN 2,933,800

PROFILING TOOL

Filed June 19, 1957 3 Sheets-Sheet 1

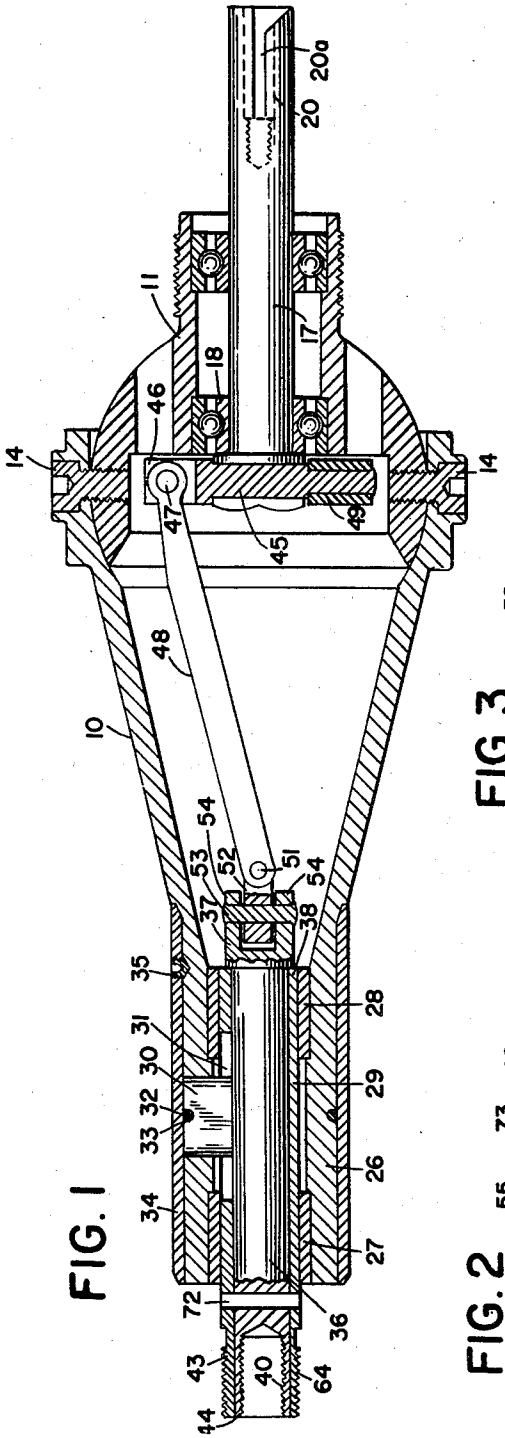


FIG. 1

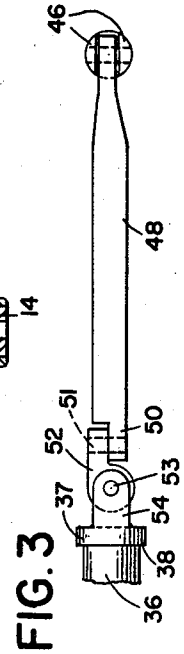


FIG. 3

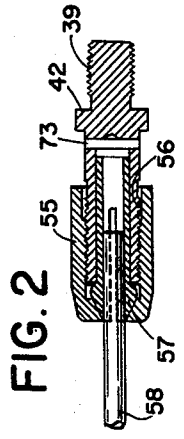


FIG. 2

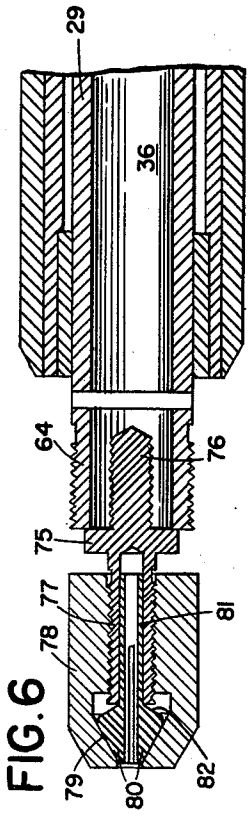


FIG. 6

April 26, 1960 J. H. FRIDEN 2,933,800

PROFILING TOOL

Filed June 19, 1957 3 Sheets-Sheet 2

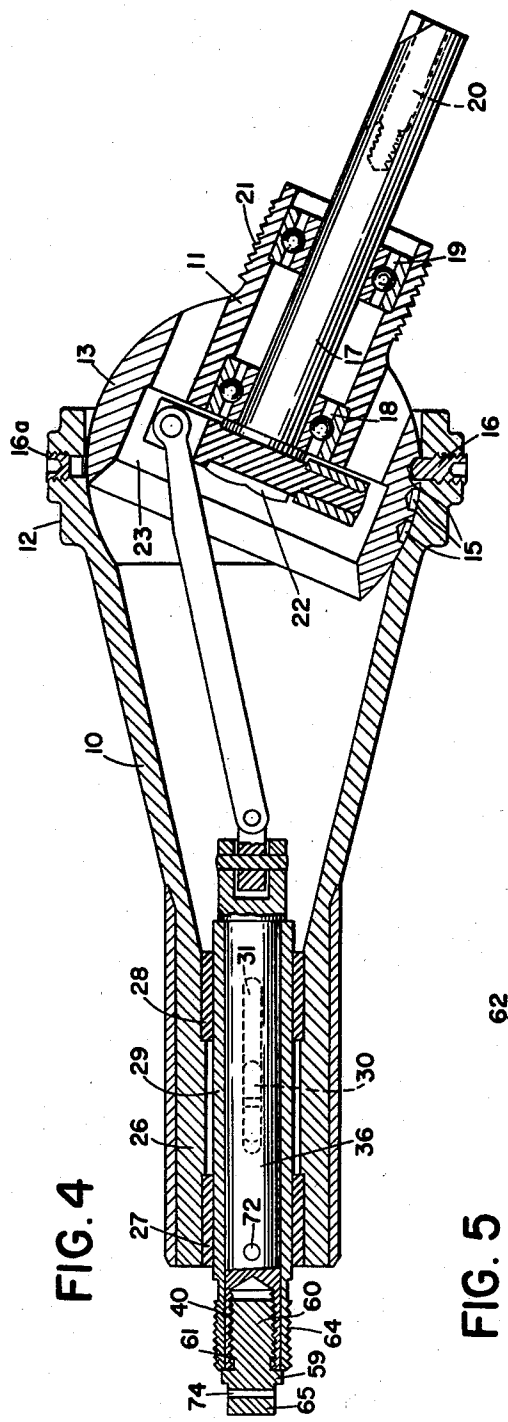


FIG. 4

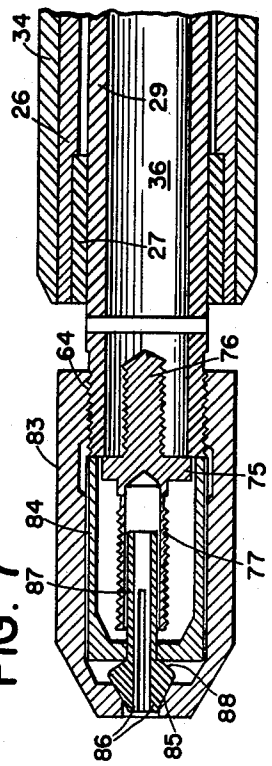


FIG. 7

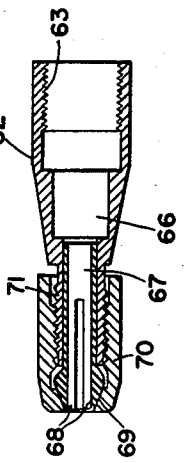


FIG. 5

April 26, 1960 J. H. FRIDEN 2,933,800

PROFILING TOOL

Filed June 19, 1957 3 Sheets-Sheet 3

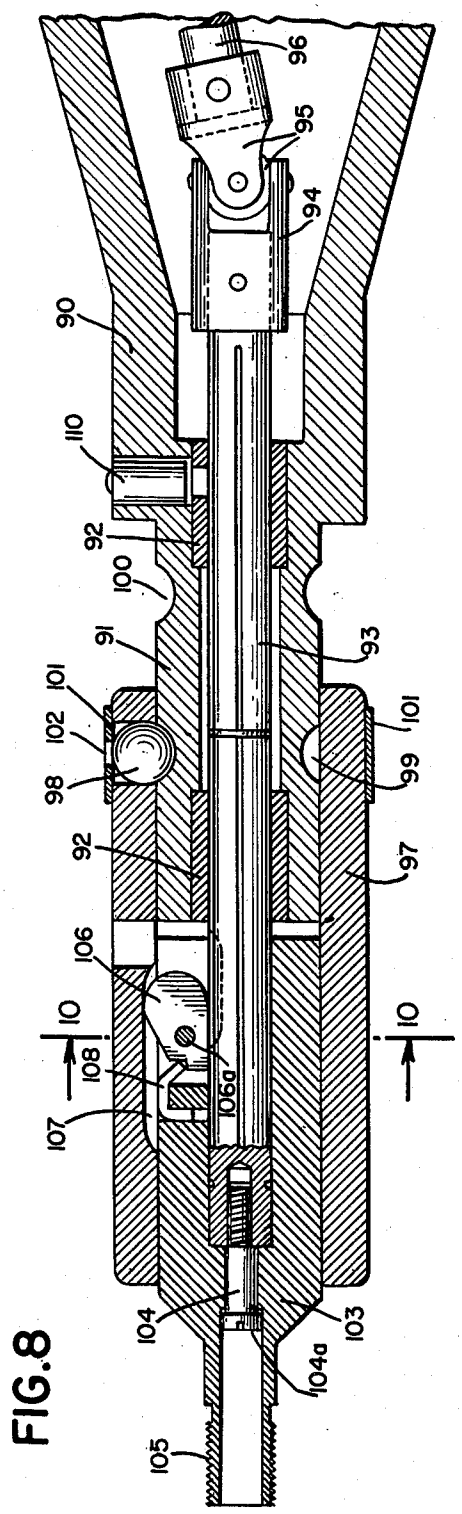


FIG.8

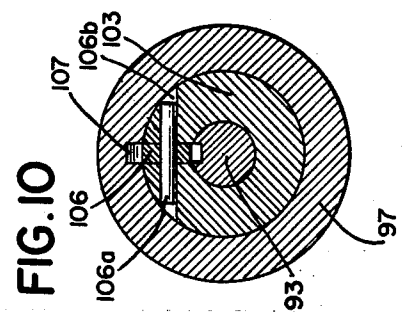


FIG.10

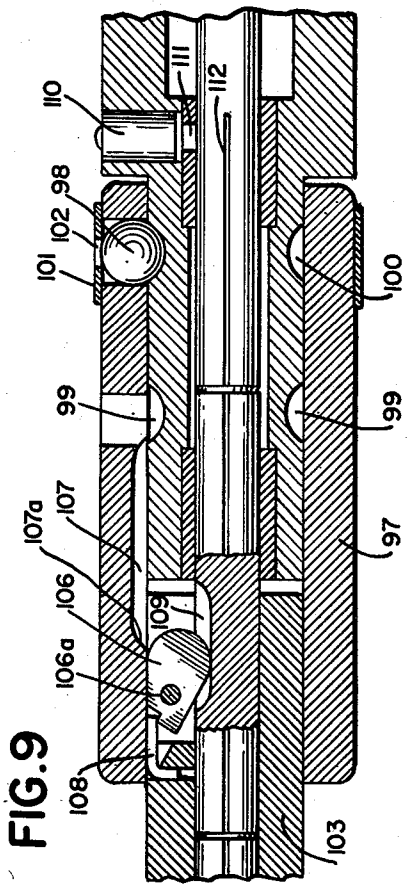


FIG.9

United States Patent Office 2,933,800 Patented Apr. 26, 1960

2,933,800

PROFILING TOOL

John H. Friden, Maplewood, N.J.

Application June 19, 1957, Serial No. 666,562

5 Claims. (Cl. 29—76)

This application is a continuation-in-part of my application Serial No. 595,158 filed on July 2, 1956 now abandoned. The invention relates to profiling tools of the type held by the hand of the operator and adapted to be moved by hand around an irregular surface, such as the contour of a die cavity or the like, to finish the surface. Such tools, as heretofore constructed, have involved a reciprocatory file-like tool or the like adapted to impart to the surface the desired configuration and smooth finish.

The improved tool of the present invention is adapted for similar operation for the same purposes but is of simpler construction and capable of performing a wider variety of operations at high speed and in a reliable manner. In accordance with the present invention, cutting elements of appropriate form may be caused to perform their operation either by a simple reciprocating movement or by a rotary movement or a combined reciprocatory and rotary movement, by simple adjustments and interchange of only a few parts. Thus the new tool is adapted for many uses involving the hand finishing of surfaces of irregular contour and particularly interior surfaces of objects having cavities, the tops of which are open but the bottoms of which are closed. It may also be used as a rotary drill.

It is desirable to provide tools of the character indicated with a cutting element, such as a file, which is reciprocated at high speed through a stroke of readily variable length so as to render the device most efficient for the finishing of contoured surfaces of different depth or other dimension extending in the direction of reciprocation of the tool.

An important object of the invention has been to provide a simple, lightweight and compact tool of the character indicated which is capable of operation at high speed and adapted to be readily adjusted to vary the stroke of the reciprocating cutter element.

A further object has been to provide a tool which is readily adapted for either reciprocatory or rotary action or a combined reciprocatory and rotary cutting action.

A hand tool construction in accordance with the invention comprises a main housing having two pivotally interconnected parts. A rotary drive shaft arranged for connection with a flexible cable or the like extending from a suitable power source is journaled in one part of the housing while a driven, reciprocatory and rotary shaft is mounted in the other part of the housing. This driven shaft is journaled, at least in part, in a sleeve which partakes of the reciprocating movements of the shaft but may or may not be held against rotation with the latter. In one embodiment to be disclosed the sleeve is constantly held against rotation with the shaft, while in another embodiment it may be held against such rotation or may partake of such rotation, depending upon the positions of certain parts. Provision is made in the first embodiment for mounting the cutting element on either the shaft or the sleeve depending upon the type of movement desired to be imparted to the element. In the

second embodiment the cutting element is always attached to the sleeve. Connections are provided between the driving shaft and the driven shaft which are adapted to permit variation of the reciprocating stroke of the tool by simply varying the angle between the axes of the two parts of the housing. Thus with quick and easy interchange of only a few parts the tool is adapted for any of the three modes of operation indicated, i.e. simple reciprocation of the cutting element through a readily variable stroke, or simple rotary operation of a cutting or lapping element at high speed, or a combined rotary and reciprocatory operation of the cutting or lapping element with readily variable length of reciprocatory stroke. In the second embodiment the only part requiring change is the cutting or lapping element itself, depending upon the character of the work to be performed.

Other objects, features and advantages of the invention will appear from a detailed description of several illustrative embodiments of the same which will now be given in conjunction with the accompanying drawings, in which:

Fig. 1 is a horizontal sectional view taken along the axis of a profiling tool embodying the invention;

Fig. 2 is an axial section through a chuck adapted to be applied to the left end of the tool shown in Fig. 1;

Fig. 3 is a detail view of a connecting link embodied in the tool;

Fig. 4 is a view, partly in elevation and partly in vertical section, showing the tool of Fig. 1 adjusted for maximum reciprocation of the cutter and provided with an adaptor for use when the cutter is to be reciprocated only;

Fig. 5 is an axial section through a chuck adapted to be applied to the left end of the tool when provided with the adaptor of Fig. 4;

Fig. 6 is an axial sectional view through a modified form of the tool carrying a chuck for holding a cutter or the like adapted for revolution, with or without reciprocation;

Fig. 7 is a view similar to Fig. 6 showing use of a chuck for holding a cutter or the like adapted for reciprocation only;

Fig. 8 is an axial sectional view through a portion of a modified form of tool embodying the invention, this being adapted to have the cutting or lapping element always carried by the same member;

Fig. 9 is an axial sectional view through a portion of the tool shown in Fig. 8 but with certain parts shifted into a different position; and

Fig. 10 is a transverse sectional view taken along the line 10—10 of Fig. 8.

Referring now to Figs. 1 to 7 of the drawings, the tool is provided with two main housing members 10 and 11 which preferably provide a substantially lubricant tight enclosure for the driven parts of the tool, thus making possible adequate lubrication of such parts. The major portion of member 10 is preferably of frusto-conical form and has an enlarged collar or flange 12 at one end. The innermost portion of the inner surface of the collar 12 is preferably of spherical configuration and arranged to cooperate with the spherical outer surface of an enlarged portion 13 of member 11. To facilitate assembly and yet permit a relatively close fit between the portion 13 and collar 12, the inner surface of the latter has its outermost portion of cylindrical form with a radius equal to that of the spherical portion. The two housing members are pivotally interconnected by means of pivot screws 14 having screw threaded engagement with the enlarged portion 13 of member 11 and having enlarged heads cooperating with radial, diametrically opposed openings in the collar 12 to provide the desired pivotal action between

members 10 and 11. The arrangement is such that the two members may be axially aligned, as shown in Fig. 1, or they may have their axes inclined in relation to each other as shown in Fig. 4. As will be apparent, the extent of inclination of the axes of the members may be varied and the two members may then be locked in any one of a plurality of set positions by the cooperation of a screw stud or pin 16 with one or another of a series of radially extending holes or recesses 15 in the portion 13 of member 11. These recesses are closely spaced and may have one substantially tangent to the next. While only three recesses are shown, a greater number may be provided if desired. Stud 16 has screw threaded engagement with the collar 12 so that the stem of the stud, which cooperates with one or another of the openings 15, may be retracted to permit a change in the angular relation of the axes of the two members 10 and 11. When these have been properly adjusted the screw stud 16 may be turned to lock the parts in set position. Either in addition to or in lieu of the stud 16 there may be provided a set-screw 16*a* (Fig. 4) which is received by screw threads in the collar 12 and adapted to have its inner end forced into frictional engagement with the outer surface of the spherical portion 13 of member 11. This will permit infinite angular adjustment of the members 10 and 11, within the limits of the device, and then locking of said members in set position by the set screw. It will be understood that at such times the stud 16 will be retracted so that its inner end does not project inwardly beyond the inner wall of the collar 12. If desired a suitable scale may be provided to indicate the extent of the angular displacement of the axes of the two housing members or the corresponding extent of movement of the tool which is reciprocated in the manner to be described. Such scale markings may be provided on the surface of the portion 13 of member 11 and cooperate with an index on the collar or flange 12.

Within the member 11 there is journaled a shaft 17. Ball bearing units 18 and 19 are preferably provided between the shaft and the member 11 to enable high speed rotation of the shaft with a minimum of friction. The outer end of shaft 17 is provided with an axial bore 20, the inner end of which is screw threaded and arranged to receive a fitting which permits connection of the shaft with a Bowden cable, or the like, through which the shaft 17 may be driven. As shown in Fig. 1, the shaft 17 is provided with a key slot 20*a* arranged to cooperate with a key at the end of the Bowden cable extending from a suitable driving motor. The means for coupling the Bowden cable or other flexible drive with the shaft 17 may be of any conventional form. If desired a screw threaded cap having a central opening through which the shaft 17 extends may be applied to the free end of the member 11 and retained by screw threads 21 in the latter. This cap may assist in retaining the Bowden cable connected with the shaft 17.

At its inner end the shaft 17 is provided with an enlarged head 22, preferably integral with the shaft. This head is received within a cavity 23 in the inner end of portion 13 of member 11 and is adapted for free rotation within this cavity.

The member 10 of the housing has a sleeve-like extension 26 which carries spaced bushings 27 and 28 providing bearings for a sleeve or hollow shaft 29. The latter is arranged for reciprocation in the bushings but is held against rotation in relation to the housing member 10 by means of a key 30. This key extends through a suitable, slot-like opening in the extension 26 of the member 10 and into an elongated key slot 31 in the sleeve 29. If desired, this key slot may extend only partially through the wall of the sleeve 29 so that the key 30 rides upon the bottom of the groove thus formed. A split ring 32 is preferably provided to retain the key in position. This ring fits in an annular groove provided around the outer surface of the extension 26 adjacent its midpoint. The key 30 has a notch 33 cut in its upper face to receive the ring. The arrangement is such that a sleeve 34 formed of metal or a suitable plastic, such as Bakelite, may be slipped over the extension 26 and secured thereto by means of a screw 35.

Within the reciprocatorily driven hollow shaft or sleeve 29 there is rotatably mounted a shaft 36 which, as will be explained, is arranged for reciprocation axially in unison with the sleeve 29 and, at the same time, rotates within the latter. At its right end (Fig. 1) the shaft 36 is provided with an enlarged head 37 providing a shoulder 38 cooperating with the right end of the sleeve 29. At its left end the sleeve 29 and shaft 36 terminate in the same plane to provide shoulders 43 and 44 respectively.

When the tool is to be used in such a way as to bring about both revolution and reciprocation of the work performing element, for cutting or lapping purposes or the like, and when it is to be used to provide for only revolution of the work performing element, a chuck of the character disclosed in Fig. 2 is employed. This is provided with a screw threaded stem 39 cooperating with internal threads 40 at the end of the shaft 36. When the stem is screwed tightly into the end of the shaft a radially extending shoulder 42 on the stem abuts against the shoulders 43 and 44 hereinabove mentioned. In this way the sleeve 29 and shaft 36 are confined for joint reciprocatory movements by the shoulder 38 at the right end and shoulder 42 at the left end of the shaft.

The connections from the driving shaft 17 to the driven shaft 36 will now be described. Shaft 17, as shown in Fig. 1, has a slightly enlarged head at its left end providing a shoulder which abuts against the right end of the inner raceway of the ball bearing unit 18. A stud 45 is mounted in a diametrically extending opening through the enlarged head of the shaft 17 and is adapted for turning movements within the latter. At its upper end the stud 45 is provided with forked extensions 46 carrying a pivot pin 47 providing a pivotal connection with a link 48. It will be apparent that a universal connection is thus provided between the link 48 and the shaft 17 through the pivotal action about the axis of the pin 47 and the rotation of the stud 45 about an axis perpendicular to that of the pin 47. This connection is spaced an appropriate distance from the axis of shaft 17. Stud 45 is suitably retained within the opening of the head of the shaft 17 by means of a collar 49 appropriately secured, as by a press fit or the like, to the lower end of the stud. At the left end of the link 48 the latter is connected by a universal joint with the end of the shaft 36. Thus, as shown in Fig. 3, the link 48 is provided with an extension 50 which is pivotally connected by means of a pin 51 with a rock member 52 pivotally mounted by means of a pin 53 between spaced extensions 54 of the head 37 of shaft 36. A universal connection is thus provided in substantially axial alignment with the shaft 36.

It will be apparent that through the connections described the revolutions of the shaft 17 will be transmitted to the shaft 36 and when the housing members 10 and 11 are in the position shown in Fig. 1, no other movement will be imparted to the shaft 36. The link 48 in transmitting the motion will swivel about its universal axes at the two ends and thus prevent binding of the parts. When the housing members 10 and 11 are angled in relation to each other, as shown in Fig. 4, the link 48 will not only revolve the shaft 36 but will also reciprocate the latter in an axial direction and, through the connections described, will also reciprocate the sleeve 29.

Returning to Fig. 2, the chuck there illustrated is provided with a rotatable head 55 having screw threaded engagement with threads 56 provided on a hollow extension of the stud 39. Within this hollow extension there is mounted a split sleeve-like clamping element 57 having an axially extending opening arranged to receive the shank of any suitable work performing element 58, such as a circular file, or a lapping element, or the like. Turning

of the head 55 of the chuck in a direction to cause the latter to shift toward the right will, of course, serve to cam the segments of the split sleeve 57 inwardly to grip the shank of the work performing element.

Referring now to Figs. 4 and 5, there is shown the adaptation of the tool for imparting only reciprocatory movements to the work performing element. A different type of chuck is employed for this purpose. Moreover, an additional element is utilized. This is a screw stud 59 having a threaded stem 60 arranged to cooperate with the threads 40 at the end of the shaft 36. It takes the place of the stem 39 of the chuck of Fig. 2. The stud is provided with a radially extending shoulder 61 which cooperates with the left ends of the shaft 36 and sleeve 29 to perform the same function as the shoulder 42 of the chuck in Fig. 2. It insures the simultaneous reciprocatory movement of the sleeve 29 and shaft 36. Sleeve 29 is provided with external screw threads 64 adjacent its left end arranged to cooperate with internal screw threads 63 on the body 62 of the chuck shown in Fig. 5. Screw stud 59 has a reduced portion 65 at its left end which fits within a recess 66 in the body 62 of the chuck. A slight clearance is provided between the head 65 and the wall of the recess 66 to enable free rotation of the screw stud with the shaft 36 and relative to the member 62. A split clamping sleeve 67 is mounted within a reduced extension of member 62 and is arranged, in a conventional manner, to have its segments 68 urged inwardly against the shank of the work performing element inserted in the outer end of the sleeve. For this purpose an inclined shoulder 69 on a knurled head 70 having screw threaded engagement with a thread 71 on the extension of member 62 serves to cam the segments 68 into engagement with the shank of the work performing tool as the head 70 is screwed tightly on to the member 62. At the same time the enlarged head of sleeve 67 is wedged against the outer end of the reduced extension of member 62 to lock the sleeve against turning relative to the extension. It will be apparent that when this arrangement is employed the chuck, and hence the work performing element, will receive movement only from the sleeve 29 and will, therefore, be merely reciprocated to an extent determined by the angling of the axis of shaft 17 in relation to that of shaft 36. The rotational movement of the shaft 36 will simply be idle.

To facilitate the assembly of the chucks and the screw stud 59, suitable openings may be provided for the reception of detaining pins or appropriate tools. Thus the sleeve 29 and the shaft 36 may be provided with a diametrically extending passage 72 for the insertion of a pin to hold these parts against turning when the chuck elements are applied. It will be understood that the shaft 36 should first be turned into the position to align the portion of opening 72 which passes through it with the portions of this opening which extend through the wall of the sleeve 29. A similar diametrically extending opening 73 may be provided in the chuck of Fig. 2 for the insertion of a pin or tool to facilitate turning of this to tighten the screw stud 39 within the threads 40. Also the screw stud 59 may be provided with a diametrically extending opening 74 through the extension 65 for a similar purpose. A similar opening may be provided, if desired, through the body portion 62 of the chuck of Fig. 5, although adequate leverage for the turning of this may be provided by simply knurling the outer surface of this member in an appropriate area. Other means for facilitating the assembly and removal of the various parts may be employed in lieu of those shown and described.

In Figs. 6 and 7 there is illustrated a modified arrangement which eliminates the necessity of the separate screw stud 59 of Fig. 4 and enables conversion of the tool from one involving revolution and reciprocation, or simply revolution, of the work performing element to one involving reciprocation only. The right hand portion of this tool, which is not shown, may be of the

same construction as that illustrated in Figs. 1 and 4. In this embodiment a screw stud 75 is employed, this having a threaded stem 76 arranged to be screwed tightly into the threads 40 in the shaft 36. The radially extending flange portion of the stud 75 provides the desired shoulder for cooperation with the left ends of the sleeve 29 and shaft 36 to insure axial movement of these in unison. Member 75 also has a hollow, externally threaded sleeve 77 extending toward the left arranged to cooperate with internal threads on a chuck member 78. The head of the latter has camming surfaces 79 adjacent its outer end arranged to cam inwardly the segmental portions 80 of the split outer end of a sleeve 81 inserted in the bore of the extension 77. By appropriate tightening of the chuck through turning of the member 78 a shoulder 82 on the segments 80 will provide suitable frictional engagement with the end of the extension 77 to insure rotation of the sleeve 81 with the head 78 and with the shaft 36. With this arrangement the work performing element retained by the chuck will receive both revolving and reciprocating movements, provided the members 10 and 11 of the tool have their axes angled in relation to each other, or simply a revolving movement if the axes of these members are aligned as shown in Fig. 1.

When the device is to be used for merely reciprocation of the work performing element a chuck member 83 is employed in lieu of the member 78. Member 83 has internal screw threads arranged to cooperate with the threads 64 on the end of the sleeve 29 so that the chuck will partake of the movements of the sleeve. Within the member 83 is provided a cup-shaped element 84 having an opening in its bottom or left end for the reception of the usual split clamping sleeve of the chuck which receives the shank of the work performing element. As member 83 is turned to tighten the grip on the work performing element the camming surface 85 will urge the segments 86 of the clamping sleeve against the shank of the work performing element. At the same time the shoulder 88 of the segments 86 will be urged against the outer face of the element 84 and the latter will have its opposite end urged against the outer end of the sleeve 29. Thus element 84 and the chuck will partake only of the movements of the sleeve 29 and will be prevented from rotation. The stem 87 of the clamping sleeve will have a free-running fit within the extension 77 of member 75 thus permitting the latter to rotate freely around the stem 87.

In the several embodiments disclosed the screw threads on the stems 39, 60, 76 and 77 are preferably of such hand that the various parts carried thereby are tightened by any resistance to rotation of the shaft 36 or the work performing element as the shaft 36 is driven. Threads 64 and other threads in the tool may also be of such hand as to cause tightening by any frictional force or the like developed in the operation of the tool.

Turning now to Figs. 8–10, inclusive, there is shown a profiling tool having all of the capabilities of the embodiments described above but which is so constructed that the same chuck may be employed regardless of the type of movement it is desired to impart to the cutting or lapping element. The housing members of this unit are of generally the same form as in the embodiment shown in Fig. 1 and they may be connected for relative pivotal movement in the same manner. Also, the driving shaft and the universal connection from this to the driven shaft may be the same as described in relation to the Fig. 1 embodiment. If desired, however, the link or shaft which connects the driving shaft with the driven shaft may have a simple pivotal connection, rather than a universal connection, with a part carried by the driving shaft, said connection being at a point outwardly of the axis of said shaft.

As shown, the modified unit has a housing member 90 which is generally similar to member 10 of the first

embodiment. This housing member has a substantially cylindrical extension 91 which carries bushings 92 in which is journaled a driven shaft 93. The latter, at its right end, carries a head 94 connected by a universal coupling 95 with a rod or shaft 96 through which power is applied to the shaft 93 from the driving shaft of the unit, corresponding with shaft 17 of Fig. 1. Surrounding the extension 91 and arranged for axial sliding movement thereon is a sleeve 97 adapted to be gripped by the operator of the tool. Sleeve 97 may be shifted into either of the two positions shown in Figs. 8 and 9, respectively. It is retained in one or the other of these positions by a ball 98 cooperating with one or another of a pair of indentations 99 and 100. These indentations may be of annular form and extend completely around the extension 91 or if desired, they may be simply of spherical form arranged to receive the inner portion of the ball 98. In the latter event, a plurality of such spherical indentations may be provided, if desired, around the circumference of the extension 91 in each of the planes indicated at 99 and 100. When the spherical form of indentation is employed the ball not only serves to retain the sleeve 97 against axial movement along extension 91, but also against rotational movement in relation to the latter. This is of assistance to the operator in preventing rotation of the sleeve 97 in the use of the tool. Ball 98 is urged inwardly into the indentation 99 or 100 by a spring clip 101 surrounding the sleeve 97. This provides a yielding inward force. Preferably an opening 102 is provided through the spring clip just above the ball 98 to permit the top of the ball to extend slightly into the spring clip.

A sleeve-like member 103, constituting a hollow driven shaft, is mounted within the sleeve 97 and has a sliding fit in relation to the latter. Member 103 has an axial bore arranged to receive the left end of the shaft 93 and thus provides a further bearing support for the latter. A screw 104 passing freely through an axial opening in the member 103 and having screw threaded engagement with the shaft 93 serves to retain these parts against relative axial movement. Screw 104 has an enlarged head 104*a* for this purpose which is provided with only a slight running clearance in relation to the adjacent shoulder on the member 103 so that, as will appear later, the shaft 93 may rotate within member 103. An axial extension at the left end of member 103 is provided with screw threads 105 adapted to carry a chuck which may, for example, be of the type shown at 78 in Fig. 6. This chuck, it will be understood, serves to retain the desired cutting or lapping element to partake of whatever movements are imparted to the member 103.

Within an axially extending slot provided in the member 103 there is mounted a key or detent member 106 pivoted upon or by means of a pin 106*a* extending through an opening 106*b* disposed transversely of the axis of the member 103 and at an appropriate distance radially outward from the latter. When the sleeve 97 is in the position shown in Fig. 8, the key or detent 106 is rocked into a position in which its outer portion fits into a keyway 107 in the inner surface of the sleeve 97. A spring 108 serves to rock the key or detent 106 into this position. If desired, a plurality of keyways 107 may be provided around the inner circumference of the sleeve 97. It will be seen that when the parts are in the Fig. 8 position, the member 103 will be locked against turning movement in relation to the sleeve 97 but it is free to partake of axial movements in relation to the latter.

When the sleeve 97 is shifted into the Fig. 9 position, the sloped surface 107*a* at the end of the keyway 107 cooperates with the key or detent 106 to rock the same downwardly about its pivot 106*a*. This disengages the key 106 from the keyway 107 and urges its lower portion into engagement with a keyway 109 provided in the outer surface of the shaft 93. If desired, a plurality of keyways 109 may be provided around the circumference of the shaft 93 so as to facilitate alignment of the key 106 with one or another of these keyways. When the key 106 is positioned as shown in Fig. 9 the member 103 will be locked to the shaft 93 for rotation therewith as well as for the reciprocatory movement therewith which is constantly provided.

It will be seen from the foregoing that the chuck carried by the threaded portion 105 of the member 103, in the manner explained, may be given either a rotary movement or a reciprocatory movement or a combined rotary and reciprocatory movement. A simple rotary movement will be imparted to the chuck when the parts are in the position shown in Fig. 9 and when the two members of the housing are axially aligned as shown in Fig. 1. A simple reciprocatory movement will be imparted to the chuck and its retained cutting element when the parts are in the position shown in Fig. 8 and the housing members of the unit are tilted in relation to each other, as shown in Fig. 4. The extent of reciprocation may be varied by varying the angle of inclination of the axes of the two housing members. A combined rotary and reciprocatory movement will be imparted to the chuck and its retained cutting element when the parts are in the position shown in Fig. 9 and the two housing members are tilted in relation to each other as indicated in Fig. 4.

Suitable means are preferably provided for lubricating the various bearing surfaces of the tool. For this purpose an oil cup 110 may be provided in a radial bore through the housing 90 in radial alignment with an opening 111 through the right hand bushing 92. Lubricant thus delivered to the opening 111 is picked up by one or more axially extending grooves or slots 112 in the outer surface of the shaft 93 and may thus be delivered to other bearing surfaces within the extension 91 and within the member 103.

While preferred embodiments of the invention have been described in considerable detail and certain modifications have been suggested, it will be understood that various other changes may be made within the scope of the invention as defined by the appended claims.

What is claimed is:

1. A handtool comprising a pair of pivotally connected housing members, each of said housing members having a shaft journaled therein, one of said shafts being a driving shaft and the other a driven shaft, said shafts being axially aligned when said members are in one position in relation to each other and having their axes inclined with respect to each other when said members are pivoted into another position in relation to each other, means for revolving said driving shaft, means including a link interconnecting said shafts, said interconnecting means including a pair of members one connected for movement with each of said shafts, universal coupling means for connecting said link with each of said members connected with said shafts, one of said universal coupling means comprising a part carried by the member connected with said driving shaft, one end of said link being swivelled upon said part carried by said member connected with said driving shaft at a point removed substantially from the axis of said shaft, the other of said universal coupling means comprising a part carried by said member connected with said driven shaft, the other end of said link being swivelled upon said part carried by said member connected with said driven shaft at a point substantially in alignment with the axis of said driven shaft means for preventing rotation of said driven shaft, and a work performing element connected with said driven shaft for reciprocation only thereby when the axes of said housing members are out of alignment and when said last mentioned means prevents rotation of said driven shaft.

2. A handtool comprising a pair of pivotally connected housing members, a driving shaft journaled in one of said members and adapted for connection with a power source, a driven shaft journaled in the other of said members, said shafts being in axial alignment when said mem-

bers are in one position in relation to each other and having their axes in angled relation when said members are pivoted into other different positions in relation to each other, a universal coupling between said shafts comprising a member secured to said driving shaft and extending outwardly from the axis thereof and a link extending from a portion of said member outwardly of the axis of said driving shaft to a point along the axis of said driven shaft, a sleeve-like member secured to said driven shaft for axial movement therewith, and means shiftable on said housing member which carries said driven shaft arranged to cause said sleeve-like member to be coupled whenever desired with said driven shaft for rotation thereby, said sleeve-like member being constructed and arranged to carry a work performing element.

3. A handtool constructed in accordance with claim 2 in which said means comprises a sleeve manually shiftable axially on said last specified housing member to selectively couple or uncouple said sleeve-like member in relation to said driven shaft for rotation with the latter.

4. A handtool comprising a pair of pivotally connected housing members, a driving shaft journaled in one of said members and adapted for connection with a power source, a driven shaft journaled in the other of said members, said shafts being in axial alignment when said members are in one position in relation to each other and having their axes in angled relation when said members are pivoted into other different positions in relation to each other, a universal coupling between said shafts comprising a member secured to said driving shaft and extending outwardly from the axis thereof and a link extending from a portion of said member outwardly of the axis of said driving shaft to a point along the axis of said driven shaft, a sleeve-like member secured to said driven shaft for axial movement therewith, means shiftable on said housing member which carries said driven shaft arranged to cause said sleeve-like member to be coupled whenever desired with said driven shaft for rotation thereby, and means controlled by said shiftable means for locking said sleeve-like member against rotation when said sleeve-like member is not coupled with said driven shaft, said sleeve-like member being constructed and arranged to carry a work performing element.

5. A handtool comprising a pair of pivotally connected housing members, a driving shaft journaled in one of said members and adapted for connection with a power source, a driven shaft journaled in the other of said members, said shafts being in axial alignment when said members are in one position in relation to each other and having their axes in angled relation when said members are pivoted into other different positions in relation to each other, a universal coupling between said shafts comprising a member secured to said driving shaft and extending outwardly from the axis thereof and a link extending from a portion of said member outwardly of the axis of said driving shaft to a point along the axis of said driven shaft, a member secured to said driven shaft for axial movement therewith, manually operable means comprising a sleeve shiftable axially on said housing member which carries said driven shaft, a key element cooperating with said sleeve and shiftable under control of the latter to lock said member secured to said driven shaft for rotation therewith or to prevent such rotation depending upon the position into which said sleeve is shifted, and means on said last mentioned member enabling the attachment thereto of a work performing element.

References Cited in the file of this patent

UNITED STATES PATENTS

341,664	Krayer	May 11, 1886
636,476	Webster	Nov. 7, 1899
1,172,264	Dorau	Feb. 22, 1916
1,356,556	Payne	Oct. 26, 1920
1,694,834	Sinclair	Dec. 11, 1928
2,442,009	Kline	May 25, 1948
2,711,653	Zero	June 28, 1955