ABSTRACT: A universal clamp having specially formed gripping faces and adapted to hold lapping rods and lapping sticks of various diameters as well as abrasive stones and other abrasive tools in any position of use.
UNIVERSAL CLAMP FOR ABRASIVE TOOL

This invention relates to a clamp or holder for tools. More particularly, the invention pertains to an improved holder for firmly and positively gripping lapping rods and sticks, abrasive stones and similar abrasive and polishing tools. It is a principal feature of the tool holder of the invention that it is readily and simple adjustable to hold abrasive tools of various shapes and diameters and to secure these firmly in any of a plurality of selectable angles. Novel surface contours or configurations of the tool gripping faces of the cooperating clamping blocks of the tool holder render the device useful, without modification, for securing tools of different sizes and cross sections.

Many types of gripping assemblies for lapping rods and other abrasive tool elements are known in the art. Not only have these structures taken numerous and varied physical forms and arrangements, but in addition, many different manufacturing techniques have been used in providing the ultimate product. Many of the known prior art holders have been relatively complicated in form and costly and time consuming in fabrication. Other has lacked the requisite versatility and adaptability. Notwithstanding the considerable attention that has been directed to this subject, no completely satisfactory tool holder for abrasive tools heretofore been produced, each device having one or more objectionable features which have limited and impaired its usefulness and general acceptability. No prior art clamp has been found to provide a completely satisfactory answer to the long recognized need. It is the aim of this invention to provide effective solutions to the existing problems to the end that an improved tool holder of universal application may be realized.

The present invention, therefore, is directed to and has for one of its objects the provision of a tool holder or clamp which is simple in form, has high mechanical strength and which is versatile, and adjustable and lends itself to low cost manufacturing methods.

Another object of the invention is to provide in a single tool holder that degree of mechanical versatility which will permit the use of the tool holder in conjunction with lapping rods and other tools of various physical dimensions and diameters, and shapes.

Yet another object of the invention is to provide a lapping rod tool holder in which gridlike surface configurations of the tool gripping faces of the clamping elements permit the disposition of the tool in any of several selectable angular positions.

A related object of the invention is to provide an adjustable, universal tool holder fabricated of a minimum of mechanical parts and adapted for use with and ready attachment to an actuator such as an oscillator or vibrator.

It is an important feature of the tool holder of the invention that it effects a positive and tight grip on the lapping rods or other tools and prevents creeping, slipping and rotation.

Other and further objects, advantages, and features of the invention will become apparent from a reading of the following specification taken in conjunction with the drawings in which:

FIG. 1 is a perspective view of one embodiment of the universal clamp of the invention showing a lapping rod secured therein to extend axially of the clamp.

FIG. 2 is a perspective view of the clamp of FIG. 1, but showing the lapping rod held to extend transversely of the clamp, in each of two mutually perpendicular positions;

FIG. 3 is a top plan view of the clamp as shown in FIG. 1;

FIG. 4 is a side elevational view of the clamp;

FIG. 5 is an end view of the clamp;

FIG. 6 is a top plan view of the lower jaw element of the clamp of FIG. 1 and showing the configuration of the rod gripping face;

FIG. 7 is a cross-sectional view taken on the line 7-7 of FIG. 6.

FIG. 8 is lines; top plan view of a second embodiment of a clamp according to the present invention, with a rod secured therein, and showing, in broken lines, two alternative positions of securement of the rod, at about 45° and at 90° to the rod shown in solid lines;

FIG. 9 is a side elevational view of the clamp of FIG. 8;

FIG. 10 is an end view of the clamp of FIG. 8;

FIG. 11 is a plan view of the upper rod gripping face of the upper block or jaw element of the clamp of FIG. 8; and

FIG. 12 is a top plan view of the lower jaw element of the clamp of FIG. 8, showing the configuration of the rod gripping face.

In effectuating the aims and purposes of the present invention the opposed tool gripping blocks or jaws of the clamp are formed on their tool gripping faces to define grids or surfaces which act, in concert, to grip and hold the tool against shearing, sliding, and rotation. Adjustable bolts or other clamping means intercouple and connect the opposed clamping blocks of the tool holder and bring the clamping jaws toward each other and into firm engagement with the tool positioned therebetwixt. A firm and stable mechanical structure results.

Referring now to the drawings, and particularly to FIGS. 1—7, for purposes of disclosure, one preferred embodiment is shown as comprising a lower jaw member, block, or holder body 22, and an upper jaw or block 26, the two blocks being adjustably and releasably intercoupled by means of bolts 30 as indicated in FIG. 4. The bolts are generally T-shaped in cross section and comprise a threaded shank or shaft 34 and an enlarged mounting head 38. The bolts pass through bores 42 in the upper block 26 and threadedly engage the lower block 22, the bolt heads 38 seating on shoulders 48 in the upper block. In the preferred embodiment of the invention illustrated, the bolt heads are adapted for use with Allen wrenches or equivalent turning means.

The lower block or clamping jaw 22, as seen most clearly in FIGS. 2, 4 and 6, includes integrally formed shank 52 and jaw portions 54. Extending axially rearwardly of the clamping assembly and integral with or firmly secured within the shank 52 is a shaft 60 by means of which the tool holder is held in a chuck or other gripping component of a vibrator or oscillator, not shown.

In the embodiment of the invention illustrated in FIGS. 1—7, and as depicted in FIGS. 2 and 6, the face of the clamping block 22 is formed with a plurality of parallelly extending trough-shaped grooves or nests 64 extending longitudinally of the lower clamping block 22 and parallelizing the shaft 60. Threaded bolt receiving passages 62 are formed in laterally extending wings or flanges 66 integral with the jaw portion 54 of the clamping block 22.

The upper jaw or block 26 is formed on its face presented to the lower block 22 with plurality of grooves 70 which extend parallel to and align vertically with the trough shaped grooves 64 of the lower block 22. In addition, as best seen in FIGS. 2 and 4, the upper clamping block 26 is formed to include a plurality of parallel grooves 74 which lie in substantially the same plane as the grooves 70 but extend transversely thereof to form a grid. When it is desired to have the lapping rod or pencil 80 extend in a direction parallelling the tool holder shaft 60, the lapping rod 80 is secured and retained between the cooperating clamping jaws within the nests or grooves 70 and 64, as shown in FIG. 1. As clearly illustrated in FIG. 2, the lapping rod may also be secured to extend laterally and generally transversely of the shaft 60 by seating the rod 80 within a groove 74 and bringing the jaws together to force the rod into abutment with ridge edges 86 of the lower clamping block 22. It will be appreciated that the assembly of FIG. 2 may be rotated about the shaft 60 whereupon the lapping rod 80 will extend downwardly, or at any desired angular displacement, one such position being indicated schematically by the broken lines of FIG. 2.

A second embodiment of the tool clamp of the invention is shown in FIGS. 8 through 12. As illustrated, the tool holder 100 corresponds generally, in overall dimensions and structural arrangement, to the first embodiment 20, the differences in the two forms of the invention being only in the surface formations of the tool gripping faces. For the purposes of ease of reference and for simplicity, parts of the second embodiment 100 which are either identical or similar to parts shown in the first embodiment 20 of the invention are marked with the
same numerals but with the suffix “a.” In describing the second embodiment of the invention it will be necessary to refer only to those features of the clamp which differ from those previously described.

Referring first to the lower clamping block 22a, in addition to the longitudinally extending trough-shaped grooves 64a, the tool-engaging face of the block is formed with transversely extending grooves 104 which intersect and are perpendicular to the grooves 64a. In the particular embodiment of the invention illustrated, the gridlike portion which includes the transversely extending grooves is limited to a marginal forward area of the lower clamping block. In all other material respects the block 22a corresponds to the block 22 of the first embodiment.

The configuration of the gripping face of the upper jaw member or clamping block 26a of the second embodiment of the invention is illustrated in FIG. 11. As shown, the block surface is grooved longitudinally 64a, as in the case of the first embodiment of the invention. In addition, the block or plate 26a is formed with transversely extending V-shaped grooves 0r troughs 74a, these grooves extending throughout the entire length of the plate.

The resulting multifaceted or multiridged surface is effective to clamp and hold the lapping rod 80 or any other abrasive stone or tool in selectable angular positions, several such positions being indicated schematically in FIG. 8. As clearly set forth in the foregoing description, the improved tool holder of the invention is highly versatile and is of universal application in its field of use. The V-slots and crossed V-slots of the clamping jaws define toothed grids or gripping surfaces including ridges which are effective to grip and secure not only rods or bars of round, rectangular or triangular cross section but abrasive stones and other tools or irregular cross-sectional configuration as well.

The specific exemplary tools shown in the drawings are for the purposes of illustration only, it being readily apparent that the clamp of the invention functions equally as a holder for tools of all other physical forms. That is, the foregoing description and the drawings are merely to explain and illustrate the invention, and the manner in which it may be performed, and the invention is not to be limited thereto except insofar as the appended claims are so limited since those skilled in the art who have this disclosure before them will be able to make modifications and variations therein without departing from the scope and spirit of the invention.

We claim:

1. A clamping device for impressing a nondeforming gripping force on an abrasive tool and for positive securing of the tool, and including means for attachment of said clamping device to a high frequency manipulator for rapid movement of said device and said tool secured thereby during stressed abutting contact of an abrasive surface of said tool against a workpiece for abrading and polishing thereof, a pair of opposed cooperating clamping plates selectively shiftable radially toward and away from one another and adapted to grip and secure said tool positioned therebetween, securingment of said tool between said plates being in any of a plurality of selectable positions, opposing facing surfaces of said plates being of nonplanar configuration, each said plate having formed therein to extend radially inwardly of respective said surfaces a plurality of parallel, longitudinally extending, open ended, substantially coplanar troughlike channels, at least one of said plates having formed therein a second set of troughlike channels extending transversely of and generally in the same plane as said longitudinally extending channels formed in said plate to provide a gridlike contour on a surface of one of said plates, separate pairs of walls of a first plate defining respective said longitudinally extending channels and said channels extending transversely thereof each converging along corresponding straight lines to form substantially coplanar intersecting tool-engaging ridges, said ridges adapted for cooperation with ridges formed by converging walls defining channels in a facing plate of said device to bear upon and to grip an abrasive tool therebetween, said channels in said one of said plates presenting generally V-shaped slots along the length thereof in substantial correspondence and in radial communication with opposed overlying cooperating slots in the other of said plates to form receiving nests, walls bounding and defining said nest adapted to bear against, grip, and securely embrace an abrasive tool seated in said nest, adjustable coupling and securingment means interconnecting said plates and operable to urge said plates toward each other and to bring said plates into positive clamping and gripping engagement with the periphery of said abrasive tool positioned in said nest, opposed said walls bounding said nest restraining and bearing upon said tool in nondeforming yet stressing and securing contact to preclude rotational, pivotal, and axial shifting thereof, and shaft means carried by said clamping device for attachment of said device to a mechanism for vibrating said device during operative use of said tool held thereby.

2. The device as set forth in claim 1 wherein each of said pair of clamping plates has formed therein a second set of troughlike channels extending transversely of and generally in the same plane as corresponding said longitudinally extending channels to provide a gridlike contour on each said plates.