Oct. 12, 1971 A. F. HUDSON 3,611,527

MOUNTING FOR TOOL BITS

Original Filed June 8, 1966 4 Sheets-Sheet 1

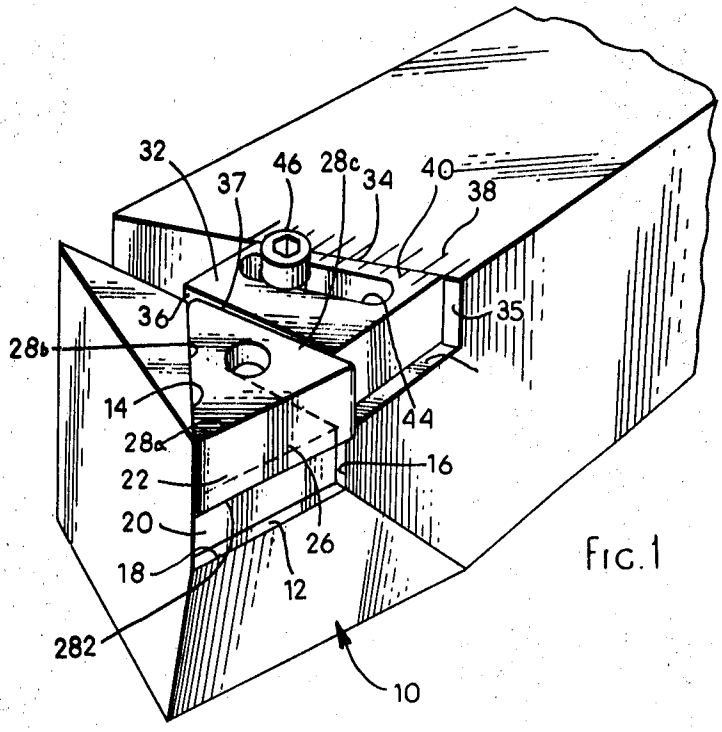


FIG. 1

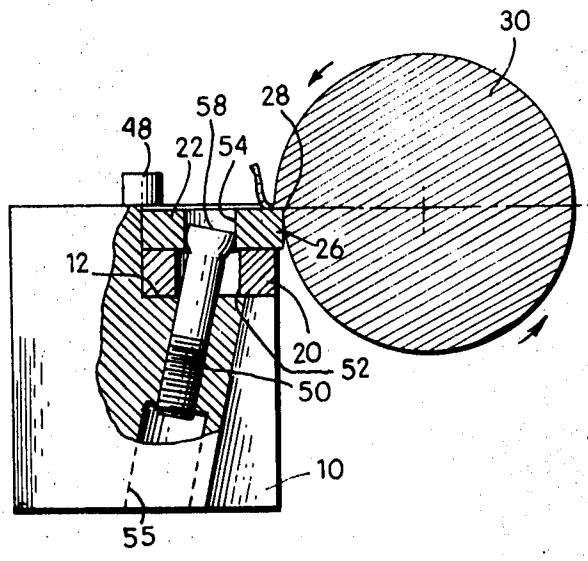


FIG. 2

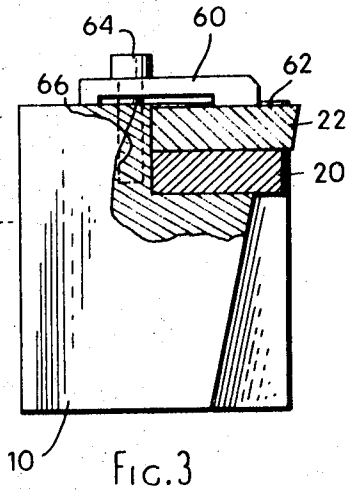


FIG. 3

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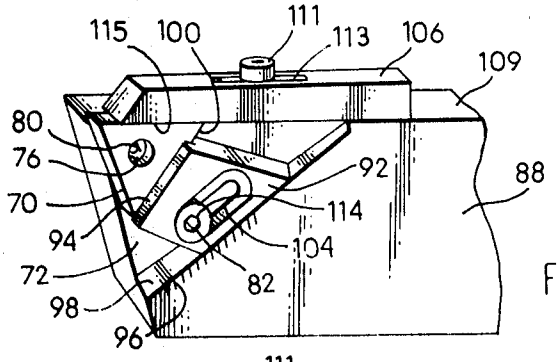


FIG. 4

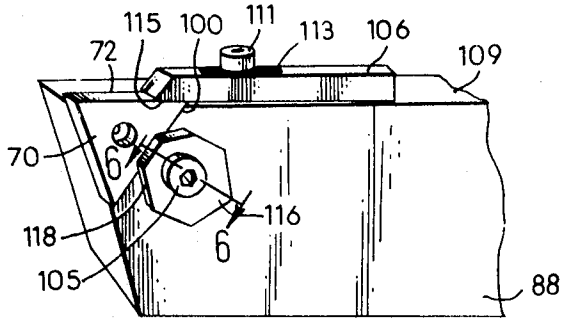


FIG. 5

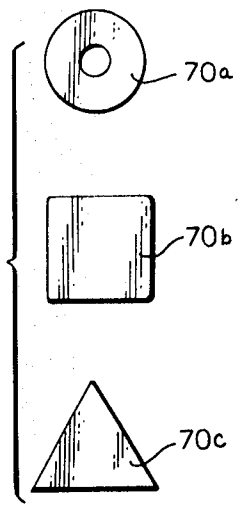


FIG. 7

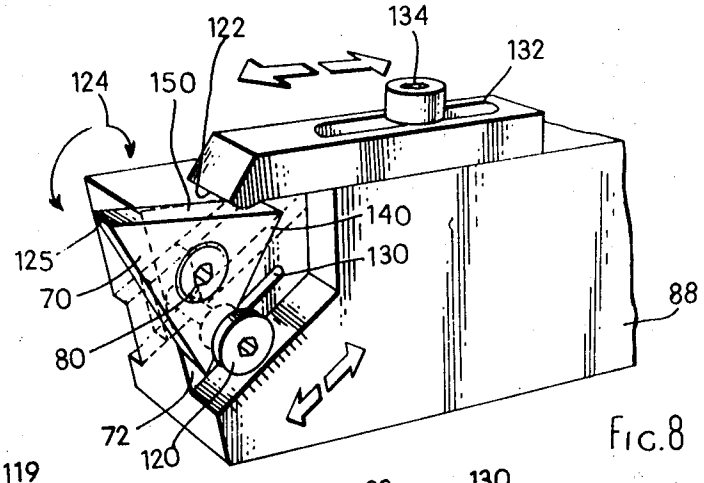


FIG. 8

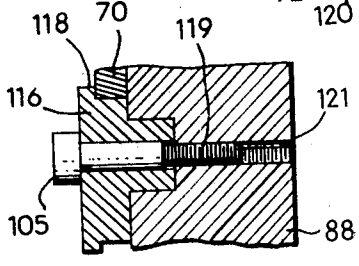


FIG. 6

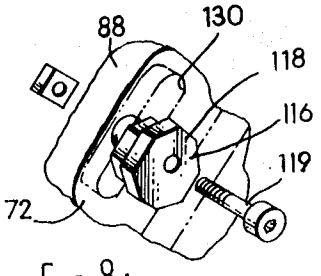


FIG. 8A

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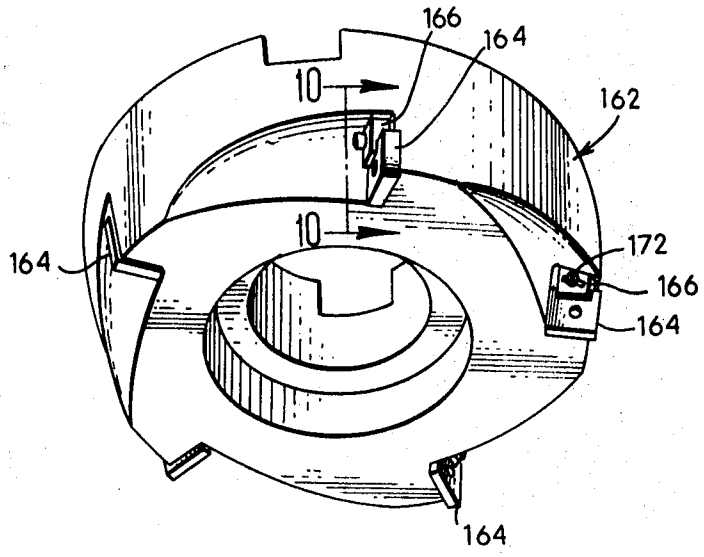


FIG. 9

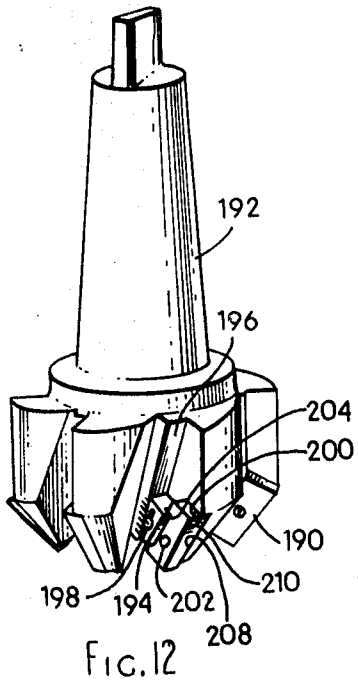


FIG. 12

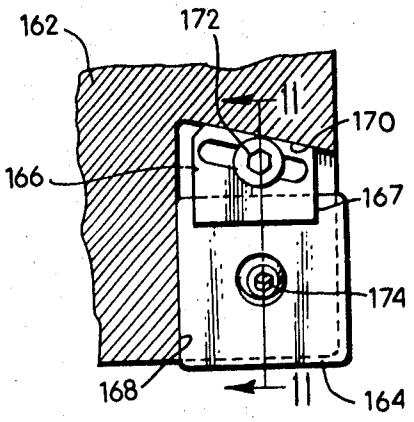


FIG. 10

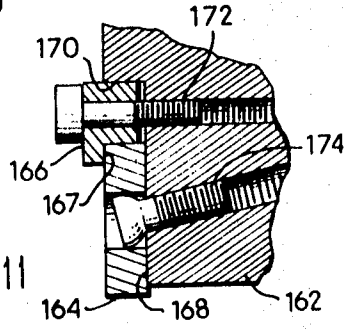


FIG. 11

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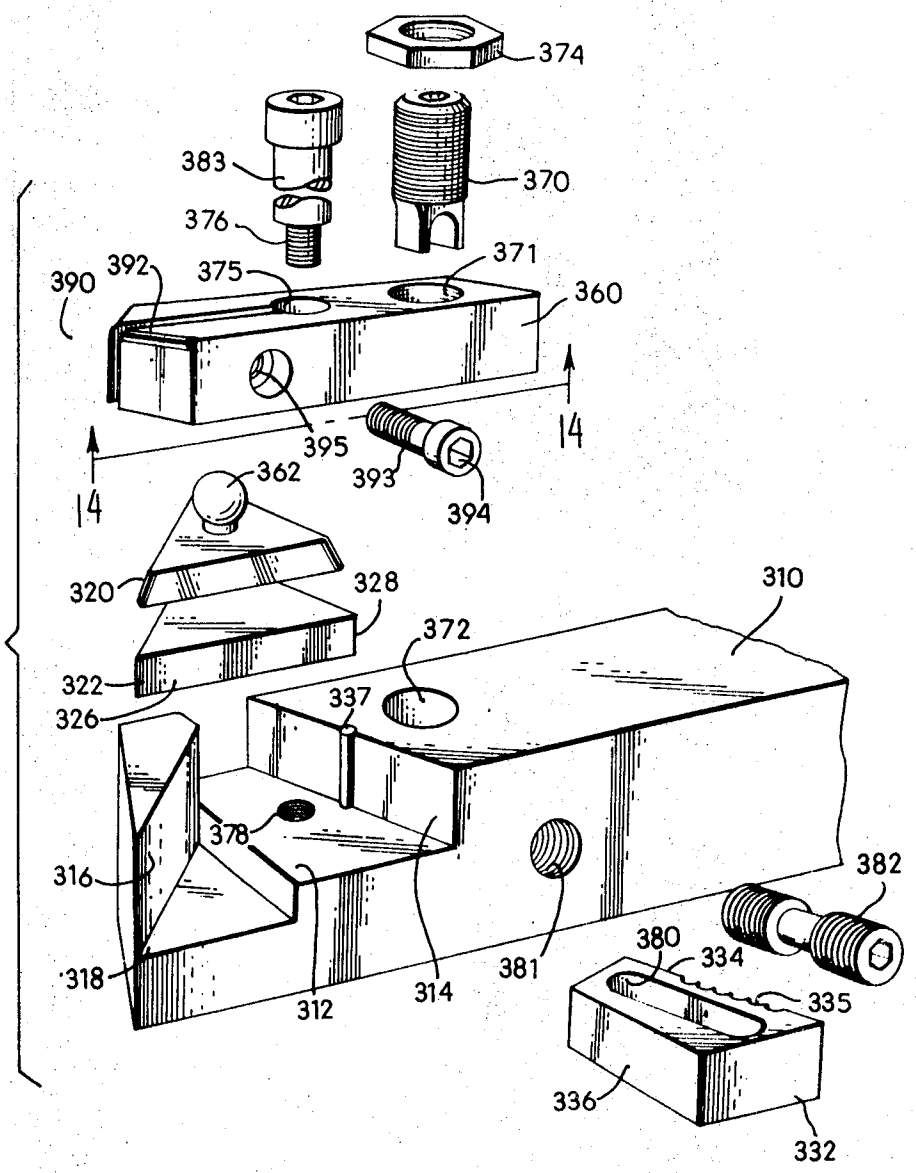


FIG. 13

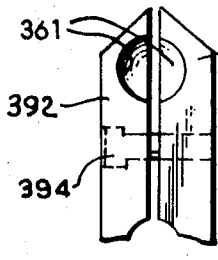


FIG. 14

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United States Patent Office

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MOUNTING FOR TOOL BITS

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Original application June 8, 1966, Ser. No. 575,200, now Patent No. 3,497,934, dated Mar. 3, 1970. Divided and this application Oct. 27, 1969, Ser. No. 869,542

Int. Cl. B26d *1/00, 1/12*

U.S. Cl. 29—98 2 Claims

ABSTRACT OF THE DISCLOSURE

I propose an adjustable mounting for tool bits which includes a pocket of a size which can be adjusted in order to position the tool bit, this being by means of a movable element within the pocket in the form of a wedge which provides one locating surface for the tool bit, and additional locating surfaces for the tool bit which will provide a back-up for the tool bit regardless of its adjusted position whereby the tool bit is held against movement in its adjusted position, and a hold down device which retains the tool bit within the pocket at its desired position.

This is a divisional application of copending application No. 575,200, filed June 8, 1966 and entitled "Mounting for Tool Bits." Application No. 575,200 now issued as U.S. Pat. No. 3,497,934 on Mar. 3, 1970. This invention relates to an improved mounting for tool bits in metal and nonmetal processing tools as cutters, planers, boring devices, reamers, etc., and more particularly this invention relates to a new and improved mounting wherein the tool bit can be positioned easily and precisely at the desired working position.

Both the metal and nonmetal working arts have long been aware of the need for properly positioning wearable tool bits. Some of the advances in this respect are shown in my previously issued Pats. Nos. 2,903,781 and 2,808,637. While the art has successfully met the requirement for positioning the working bit at the proper working angle, it has not been successful in readily positioning the tool bit at the correct advance or retractile position with respect to the workpiece. It is desirable that the tool bit be properly located and this necessitates an adjustment to compensate for wear of the bit. In order therefore, for the tool to be of maximum service, there must be provided means for quickly and accurately positioning a tool bit on a tool holder, taking into account the requisite working angle and, also, the optimum projected position of the work bit. This last consideration requires adjustment from time to time owing to wearability and/or sharpening from inherent abrasion and also from sharpening of the bit when one or the other of its working surfaces are worn.

In a brief review of the metal cutting tool art, tools have been provided which include various alloys of tungsten, vanadium, chromium, cobalt, etc. These high speed tools were to a great extent replaced by tool bits having tungsten carbide which was brazed or silver-soldered onto soft steel shanks.

Eventually such brazed tools were in turn replaced to a considerable extent by pieces of carbide of relatively small size which were clamped in a tool holder. The art then progressed to the usage of a "clamped slug" type of tool and holder and this was later replaced by tool shanks having a recess machined in one end and a relatively thin piece of carbide clamped or otherwise suitably secured within such recessed pocket. It was a common practice to make this carbide tool bit of square, triangular or other regular geometrical shape and having working edges. When one corner of the tool bit was worn the tool bit

was indexed to bring a new working edge into position and thereafter clamped in place for use. After all of the edges were worn, it was the practice then to discard the tool bit and therefore they came to be called "throw-away" tool bits.

There has now developed within the art efficient and accurate grinding equipment which can regrind the working edges of the throw-away tool bits and it is possible to regrind such edges to a new accuracy and such edges can be reused. Since, however, the tool bit is reduced in size it is necessary to adjust the position for the reground tool bit with an accuracy which takes into account the loss of material produced because of the regrinding operation. The regrinding procedure has given rise to a need for a tool holder having the capabilities of accurately disposing the reground tool bit and the present invention intends to fill that need. The present invention proposes to use a reducible size pocket wherein the tool bit can be mounted and to position such bit within the pocket with a substantial degree of accuracy and to hold the tool bit in its adjusted position with a considerable degree of backup strength so that the adjusted position is not changed during use. The present invention further proposes to solve the problem of reusing reground tool bits by utilizing a reducible size pocket which can quickly, easily and accurately vary in pocket size so that a tool bit can be accurately located therein in any one of its multiple cutting edge positions in order that all of the reground cutting edges can be advanced by the same amount. Thus, the problem of accurate reuse of a reground tool is effectively solved by the present invention.

According to the foregoing, it is one of the principal objects of the present invention to utilize a tool holder having a reducible pocket for receiving a tool bit which can be accurately positioned in order to present any one of its working edges into operative position and wherein the reducible size pocket can be adjusted to compensate for reduction in size of the tool bit when the tool bit edges are reground so that following regrinding the pocket can be quickly, accurately and conveniently changed in size by the necessary amount to compensate for the change in size of the reground tool bit edges. Consequently there is a substantial saving in bit manufacture because instead of discarding the worn tool bit such tool bits can be reground and reused without sacrifice in accuracy of operation or speed of operation by reason of the added use of the reground bits.

Accordingly, it is one of the principal objects of the present invention to provide a composite means for adjustably defining the optimum position of the tool bit on the work holder.

It is a further object of the present invention to provide a readily adjustable tool bit positioning means which can readily define both the attitude of the tool bit and, also, the extended or retracted position of the tool bit. The present invention also enables the combination of a gage with such adjustable clamping means to readily provide information concerning the positioning of the tool bit.

It is another important feature of the present invention that the tool bit can be readily located in its working position and adjusted to compensate for wear or other dimensional variances, and once such adjustment is made the tool bit is securely clamped in place at its desired position.

A further important feature of the present invention is that a tool bit incorporating multiple adjustments can be incorporated into a tool holder in combination with a wide variation of metal processing tools including, but not limited to, turning tools, planing tools, threading tools, rotating (angular cutting), rotating side cutting or rotating end cutting. Also, the tools can be at right angle and can either reciprocate or rotate, and be fixed or movable.

Other objects and features of the present invention will

become apparent from a consideration of the following drawings, wherein:

FIG. 1 is an enlarged isometric detail view of a tool holder having the invention incorporated therein;

FIG. 2 illustrates the clamping means for holding the work bit within the seat of the tool holder;

FIG. 3 illustrates a somewhat different arrangement for clamping the work bit in place within the seat of the tool holder;

FIG. 4 is an isomertic view of a further arrangement for adjustably positioning and clamping the work bit within the seat of a tool holder;

FIG. 5 is a further embodiment of the invention in which the positioning means is varied from a wedge to a multiple flat shaped means which serves as a series of fixed gauges defining the extended and retracted positions of the tool bit;

FIG. 6 is a section view taken on line **6—6** of FIG. 5;

FIG. 7 illustrates various typical tool bit shapes including circular, square and triangular;

FIG. 8 is an isometric view of a further positioning means defining the attitude, the extended and retracted position of the tool and the angular position to which the tool is turned at the time it effects its working;

FIG. 8A is an isomertic exploded view showing in detail view the attachment of the tool bit onto the tool holder;

FIG. 9 is an isometric view of a rotatable cutter head having a plurality of tools positionable in accordance with the present invention;

FIG. 10 is a detail view looking in the direction of the arrows **10—10** of FIG. 9;

FIG. 11 is a section view taken on line **11—11** of FIG. 10;

FIG. 12 illustrates how the invention is incorporated into a rotatable angular cutting tool;

FIG. 13 is an exploded view of a still further embodiment of the present invention; and,

FIG. 14 is a view of the undersurface of the clamping member.

Referring now to the drawings, a tool holder designated generally by reference numeral **10** includes a pocket **12** which is milled out of the end of the tool holder and includes a fixed side **14** and a second fixed side **16**, these two faces converging at a preferred angle.

Also, within pocket **12** is a flat, or substantially flat, base **18** whereon is mounted replaceable support plate **20** whose opposite faces can be pitched at a preferred angle defining the attitude of a tool bit **22** which is supported thereon. The purpose of locating the tool bit **22** at a preferred angle is that its working face **26**, including working edge **28**, should engage workpiece **30** at the most desired angle. For the significance of this angle as far as friction, cleanness of cut, etc. is concerned, reference may be made to my previously issued Pat. No. 2,903,781, which discusses in full the need for a preferred angle of the tool in order to obtain optimum wear life and machine operating condition. The opposite faces of the support plate **20** are contoured so that the angle of the tool bit can be selectively obtained according to how the support plate **20** is positioned on the flat surface **18**.

The extended and retracted position of the tool bit is defined by a tapered block adjuster **32** having inclined tapered faces **34** and **36** engaging faces **35** and **37** on the tool holder and tool bit respectively. The tapered block adjuster **32** can be moved back and forth to vary the size of the pocket between face **36** and **35** and thus by changing this pocket size the triangular tool bit **22** is adjusted outwardly or inwardly within the pocket **12**. The size of the pocket is determined by the position of the tapered block adjuster **32** and the configuration of its tapered sides **34** and **36** or faces as previously indicated. These parameters are calibrated in relation to a vernier scale **38** on the tool holder **10** and a vernier scale **40** on the tapered block adjuster **32** so that the position of the tool bit **22** can be read from the position of the tapered block adjuster **32**. The described back and forth movement of the tapered block adjuster **32** is obtainable because an elongated slot **44** permits the tapered block adjuster **32** to move past a cap screw **46** threadedly received within the tool holder **10** and clamped in place by means of a suitable wrench which tightens the cap screw down and holds the tapered block adjuster **32** at a preferred location which from the vernier scale reading will accurately define the position for the tool bit.

The tool bit in turn is clamped at the position defined by tapered block adjuster **32** and the support plate **20** (FIG. 2) by means of a ball cap screw **50** which passes through an opening **52** of support plate **20** and into a socket opening **54** of the tool bit **22**. End **58** forms a half ball, or other suitable configuration, and is received within the opening **54** permitting the ball cap screw **50** to urge the tool bit **22** downwardly against support plate **20** and hold it within seat **12** while at the same time permitting the tool bit to assume whatever attitude is defined by the support plate **20**. Thus, the tool bit is accurately and readily positioned in its numerous different aspects for optimum tool working operation and is thereafter fully and reliably clamped in place.

Referring to FIG. 2, there is a major force from the workpiece **30** which is directed radially against the bit forcing it firmly into pocket **12**.

The cutting edge **28** of the tool is wearable and must be reground and the bit repositioned from time to time to compensate for the loss of dimension from wear and regrinding. This is accomplished by loosening the screw **46** and moving the tapered block adjuster **32** to whatever position is necessary for repositioning the bit **22** outwardly within pocket **12** to its proper working position wherein edge **28** is in proper relation to the workpiece, at which point the tapered block adjuster **32** is again clamped by turning down the screw **46**. The tapered block adjuster cannot accidentally move changing the size of the pocket. The tool bit **22** is removed from the pocket and rotated, bringing one or the other of its working edges **28***a*, **28***b*, or **28***c* (if triangular, as shown) into operative position, first, by loosening screw **50** and indexing the tool bit rotatably and then, if turn over type, turning the tool bit over so that the other of the edges of the opposite face are brought into operation. In other words, the tool bit, if turn over type, is turned over so that the faces which are disposed upwardly in FIG. 1 are brought against support plate **20** and in that position any one of the opposite edges is brought into operative position.

After these edges are worn it has been the previous practice to discard the tool bit; but under the practice of the present invention, the edges are reground and the tool bit is repositioned by making the pocket for the tool bit of a reduced size and thereby compensating for the loss of material which occurs during the regrinding operation. The loss of material effected by the regrinding operation is compensated for by reducing the size of the pocket and correspondingly adjusting the tool bit outwardly so that its reground working edge is at the same operative position indicated in FIG. 2. This is accomplished by loosening the screw **50** and causing the tapered block adjuster **32** to move inwardly by whatever amount is necessary to reduce the size of the pocket offsetting the loss of material from the regrinding operation.

In the present invention, however, greater utility is realized from the tool bit and therefore greater economies are effected in metal processing operation. Previous to the present invention the few adjustable tool bit holders being marketed were not widely accepted because there was lacking a readily operable tool holder which could quickly, easily and accurately reduce the pocket size to compensate for the loss of material inherent in regrinding operation. Owing both to the fact that there exists apparatus for quickly and efficiently regrinding the tool bit and by reason of the present invention which is capable of accurately disposing the reground tool bit in operation, many econ-

omies are possible because of the greater utility from a given tool bit.

When the pocket size for the tool bit is adjusted, the tool bit is held in its operative position not only with accuracy but with a considerable degree of strength as well. Because the tool bit is held with equal strength in the newly adjusted position, the same as in the original position, the machining operation is performed just as accurately and as reliably and without deviation because of accidental change in position. In other words, once an adjustment is made to compensate for the reground tool bit, the tool bit is held firmly and accurately in place and is not accidentally dislodged or changed in position during use. These results are obtainable by reason of the present invention which utilizes a reducible pocket for the tool bit which not only provides a substantial variation for change in size of the reground tool bit but also provides through use of a vernier type scale reading, an accurately defined position for the tool bit as previously described. The tool bit once clamped in place cannot move away from the workpiece **30** (FIG. 2) nor can it move angularly (FIG. 1) within the mounting pocket and is further prevented from moving upwardly out of the pocket. The tool bit is prevented from any movement relatively to the pocket because it is securely held in place by the described clamp arrangement. During repositioning of the tool bit the screw **50** is backed out from holder **10** to release the tool bit and the tool bit's position may be repositioned as desired. In this manner the tool bit is accurately positioned and then clamped in place. If desired, the clamping screw **50** can be replaced by an overlying clamp arm **60** (FIG. 3), which is urged against face **62** of the work bit **22**, which takes its planar position from the support plate **20**. The arm **60** adjusts itself to whatever angular position is assumed by the tool bit **22**, as taught in my previously issued Pat. No. 2,903,781, but accidental movements are prevented by a clamping bolt **64** which passes into a threaded opening **66** in the head **10** to clamp the tool bit **22** at its proper angular position defined by support plate **20**, the same as in the previous embodiment and at a planar position defined by support plate **20**, the same as in the previous embodiment.

Referring next to FIGS. 4 and 5, in this embodiment, the tool bit **70** is received within a pocket **72**. The tool bit has an opening **76** into which is passed a conical head **80** of a threaded clamping screw which is passed into a threaded opening in holder **88** thereby urging the tool bit against pocket **72**. The conical head **80** permits the tool bit **70** to move outwardly or inwardly within the pocket **72**, depending upon the position of tapered block adjuster **92**. The tapered block adjuster **92** has tapered faces **94** and **96** engaging tapered face **98** on the holder **88** and face **100** on the tool bit. By sliding the tapered block adjuster in one direction or the other it is possible to vary the position of the tool bit within the pocket to a desired position and the tool bit is then clamped by means of the threaded screw **82**. The described relative movement of the tapered block adjuster **92** is permitted by the elongated opening **104** through which is passed screw **82** threadely received in holder **88** the same as in the previous embodiment. Once the tool bit is properly placed the screw **82** is screwed down. The tool bit is further retained by a sliding chipbreaker **106** which is secured to edge **109** by a cap screw **111** received through oversize opening **113** and permitting the end **115** to engage the upper surface of the bit **70**.

Referring next to FIG. 5, the polygon adjuster **116** can replace the tapered block adjuster **32**. The polygon adjuster is comprised of an eccentric **116** having polygon faces **118**, one of which is caused to selectively bear against the face **100** of bit **70** which is received within a pocket **72**, the same as in the previous embodiment. The eccentric is rotated on shoulder screw **105** and is then clamped at a preferred position by turning the screw **119** down into threaded opening **121** in holder **88** (FIG. 6).

Referring now to FIG. 7, the tool bit can be circular as indicated by reference numeral **70A** and received in a work pocket, and have linear engagement with surfaces **16** and **36** as indicated in FIG. 1. The tool bit can be square as indicated by reference numeral **70B** or the tool bit can be triangular as indicated by reference numeral **70C**, or other desired shapes in the manner previously described.

Referring now to FIG. 8, the bit **70** can be adjusted in the pocket **72** of the holder **88** by a pair of adjustable stops **120** and **122** which serve in addition to defining the position within the pocket **72**, the further function of defining the angularity of the bit, i.e., it is accurately positioned about axis **124** which determines the angle at which the work bit engages the workpiece. In this embodiment, the tool bit is received within a seat **70** the same as in the embodiment of FIG. 5 and its retracted or advanced position is determined by suitably positioning stop **120** within elongated opening **130** and stop **122** is moved relatively to the holder **88** by slipping the elongated opening **132** past screw **134**. The bit **70** is advanced or extended by moving the two stops closer together or by moving the two stops farther apart. The angular position of the bit **70** is obtained by advancing or retracting one or the other of the stops, to vary the point of contact between stop **120** and surface **140** of the bit **70** or by varying engagement of stop **122** with side **150** of the bit **70**. Once the extended or retracted position of the bit is determined, as well as its angular position, the stops **120** and **122** are clamped in place and the bit **70** is then secured within the seat by means of a screw **80**, received through a socket opening **160** which permits the described adjustable movements and then holds the bit in place.

Referring next to the embodiment in FIG. 9, a cutter head designated generally by reference numeral **162**, has spaced around its periphery a number of tool bits **164** which are positioned relatively to the rotatable cutter head, each by means of an associated tapered block adjuster **166**. The tool bits are adjusted within pockets **168** by means of the tapered block adjuster **166** (FIG. 10) movable along coacting inclined surface **170** and then secured by a screw **172**, the same as in the previous embodiment. Once the bit **164** is located, it is held in place within the pocket by means of a screw **174** (FIG. 11) the same as in the previous embodiments.

The bit **164**, referring to FIG. 10, is adjusted angularly and held by an overlapping lip **167** (FIG. 11) which presses the bit **164** against pocket **168**. Clamping screw **174** holds the assembly together against pocket **168** as described. The cutter head **162** is thus operated after the plurality of bits **70** are suitably positioned.

Referring to FIG. 12, a plurality of tool bits **190** are suitably disposed around the periphery of a counterboring tool **192**, these tool bits **190** being positioned by tapered block adjusters **194** which are movable along the surface **196** and are then clamped in place by screw **198**. In this way the tool bit is adjusted within pocket **200** and is then held in its adjusted position by a screw **202**. The tapered block adjuster **194** may include an overhanging lip **204** to assist in holding the tool bit in place. The tool bit is "backed up" within the pocket by resting against surfaces **208** and **210** as well as engaging the confronting surface of tapered block adjuster **194**.

Referring next to the embodiment of FIGS. 13 and 14, there is provided a tool holder designated generally by reference numeral **310** having a pocket **312** which is milled out of the end of the tool holder and includes two relatively fixed sides **314** and **316** which converge at a preferred angle. A substantially flat base **320** may also be provided at a preferred pitch or angle to control the working position for the tool bit **322** so that its working face **326** and working edge **328** can be disposed at a proper working angle.

The position for the tool bit **322** is defined in part by a tapered block adjuster **332** which also lies against base

320 and has tapered faces 334 and 336 which engage fixed side 314 and a confronting side of tool bit 322 to define its operative position. Along the tapered face 334 are a plurality of semi-circular cross section notches 335 which coact with a pin 337 to determine the position of the adjuster 332 and thereby determine the operative position of the tool bit 322 within pocket 312.

The operative position for the tool bit is maintained in part by a clamping member 360 having hemispherical recess portions 361 which engage with a ball 362 on an anvil 320 which bears against and clamps the tool bit 322 in place. The anvil 320 can adjust to any angular position required in accordance with the pitch of the confronting face 321 on the tool bit 322.

A clamping plate 360 overlies both the anvil 320 and the wedge adjuster 332 and is clamped in place by a bolt 370 which is passed through a threaded opening 371 of the clamp 360 and then into threaded opening 372. A nut 374 is then used to hold the clamping bolt in place.

A stem 383 is passed through an opening 375 and the threaded end 376 is received within a threaded opening 378 to urge the clamping member downwardly against the adjuster block while at the same time permitting necessary adjustable movement of the adjuster block by reason of the elongated opening 380 which permits the adjuster block to move in and out of the pocket 312 and thereby define the position for the tool bit 322. The position for the wedge adjuster once established, assists in holding the tool bit in place together with a combination of the bolt 370 and stem 383, the bolt 370 being locked by a locking member 382 which passes through a threaded opening 381 of the tool holder to hold it in place.

Further adjustable swiveling movement of the anvil 320 once it has accommodated itself to the tilt of the tool bit and is thereafter prevented from further movement by means of drawing the two split ends 390 and 392 together with a threaded lock member 393 having an interior irregularly shaped side opening 394 for facilitating turning by a tool provided for that purpose. The locking member 393 is received through threaded openings 395 in the split ends 390, 392 thus pulling the ends together and thereby drawing complementary spherical seats 361 against the ball 362 and preventing further swiveling movement. Once an adjusted position is obtained for the tool bit 322 further movement within the pocket and angular movement on its seat is effectively prevented.

Likewise when it is time to adjust the tool bit either by moving it into or out of the pocket or varying its pitch or presenting a new working edge, all that is required is to loosen bolt 370, stem 383, locking member 382, and effect whatever adjustment is required for the tool bit and thereafter turn down bolt 370, stem 383, locking member 382 to hold the adjuster block 332 and tool bit 321 at its new position.

For example, if it is desired to move the tool bit outwardly, then the adjuster block 332 is moved farther into the pocket with the semi-circular notches 335 ratcheting

over the pin 337 and once the proper position for the wedge block is obtained, determining the position for the tool bit, the wedge block position is fixed by being confined against the face 314, with the pin 337 entering into one of the recessess 335. The adjuster wedge block 332 is effectively prevented from accidental movement by means of clamp 360. The tool bit is therefore held fixedly in its designated position.

Although the present invention has been illustrated and described in connection with a plurality of example embodiments, it will be understood that these are illustrative of the invention and are by no means restrictive thereof. It is reasonably to be expected that those skilled in this art can make numerous revisions and adaptations of the invention and it is intended that such revisions and adaptations which incorporate the herein disclosed principles will be included within the scope of the following claims as equivalents of the invention.

I claim:

1. A tool holder comprising: a tool head having a pocket formed therein; a tool bit mounted in said pocket and disposed at an angle defined by the pitch of the base surface forming a part of said pocket; wedge means for selectively adjusting the position of said bit whereby the bit is spatially disposed both at its working position and its working angle, movable wedge clamping means within said pocket also providing a bit defining surface and movable therein to define the working position of said bit, and at least one support plate disposed within said pocket providing surfaces selectively disposed within said seat, and on which said tool bit is mounted to assume an angle defined by the pitch of said support plate surfaces arranged by selectively locating said support plate within the pocket.

2. A tool holder in accordance with claim 1 wherein said clamping means includes a backup plate and said wedge clamping means is received within said seat and adapted to press against and thereby support said tool bit in an adjusted operative position.

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