United States Patent [19]

Petrant

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[54] **MULTI-PURPOSE WORK HOLDING MEANS**

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[52] **U.S. Cl.** ..... **51/217 A,** 269/258, 33/174 S, 33/174 TC, 269/321 N

[51] **Int. Cl.** **B24b 41/06,** B23q 17/18

[58] **Field of Search** ..... 269/9, 321 N, 258, 268, 269/269; 51/216 R, 216 A, 216 H, 217 A, 220, 221 R; 33/90, 174 S, 174 TA, 174 TB, 174 TC, 174 TD

[56] **References Cited**

UNITED STATES PATENTS

1,148,196	7/1915	Simmons	33/90
1,705,629	3/1929	Wildbore	269/269 X
2,205,964	6/1940	Taylor	51/221 R
2,369,425	2/1945	Becker	33/174 TC
2,371,831	3/1945	Leming	269/269 X
2,409,936	10/1946	Hunt	269/268
2,422,773	6/1947	Colwill	269/269 X
2,756,508	7/1956	O'Grady et al.	33/174 S
2,995,962	8/1961	Dietz	51/216 R
3,423,885	1/1969	Crandall	33/174 S
3,553,908	1/1971	Boehm	51/216 R
3,736,666	6/1973	Sutter	33/174 TC

OTHER PUBLICATIONS

"Combination V-Blocks, Parallels, & Angle-Plates" Baker in American Machinist, 4-15-15, page 655.

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Assistant Examiner—K. J. Ramsey
Attorney, Agent, or Firm—Edward F. Jaros

[57] **ABSTRACT**

A work holder device providing precise multipositioning of a work piece with respect to three dimensional and angular relationships for the machining, grinding and the like of surfaces on the work piece. A work holder body member of right angle type constructed and arranged to provide holding and securing of a work piece in a multitude of desired positions with a reduced set up time and providing for elimination of some set up steps normally employed in the positioning of a work piece for a working operation.

6 Claims, 16 Drawing Figures

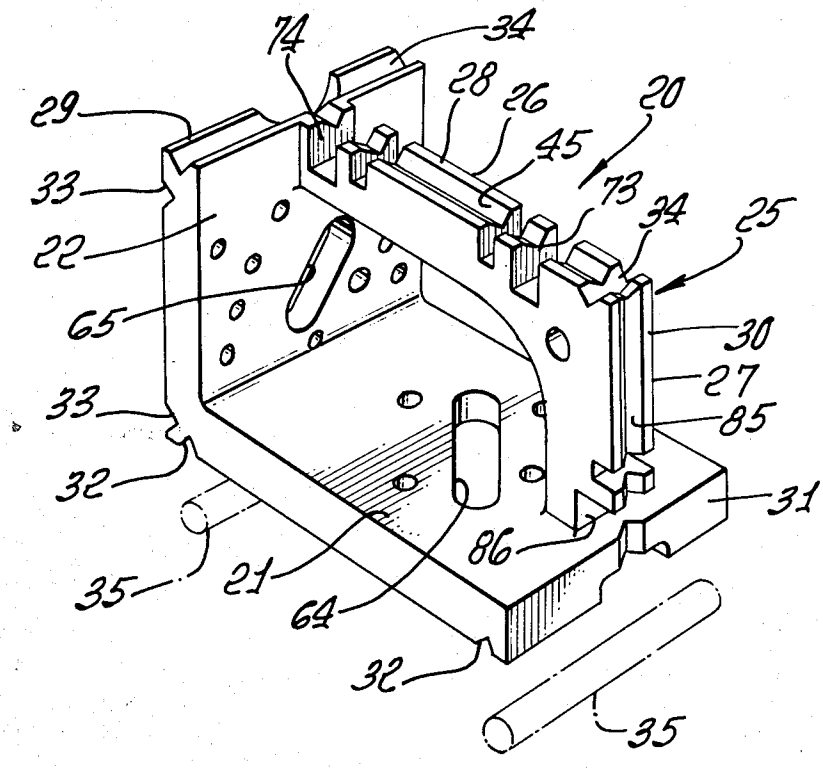


FIG. 1.

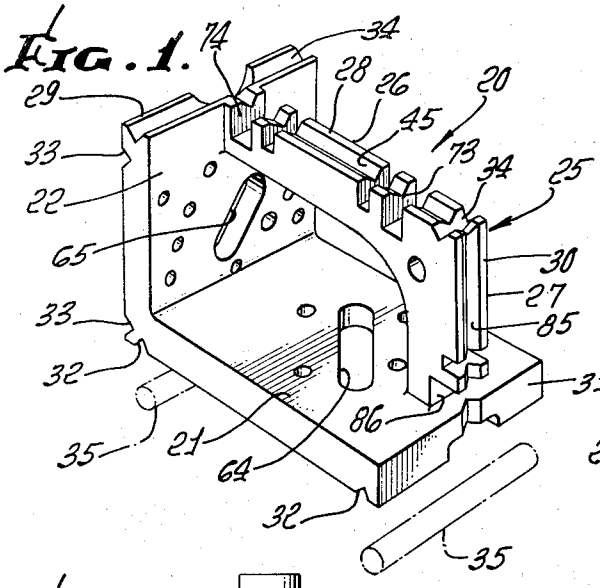


FIG. 10.

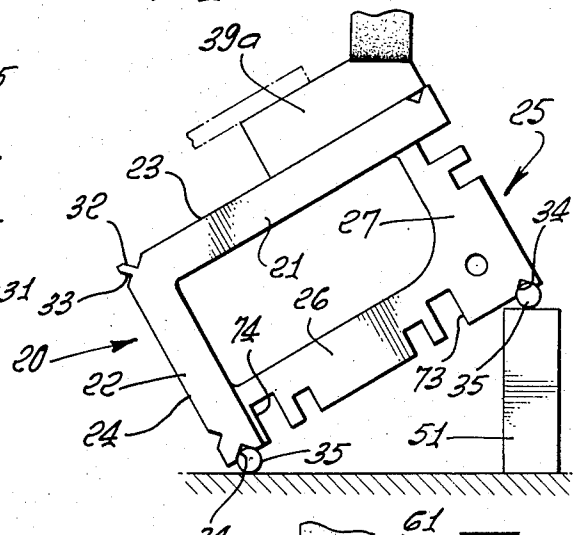


FIG. 9.

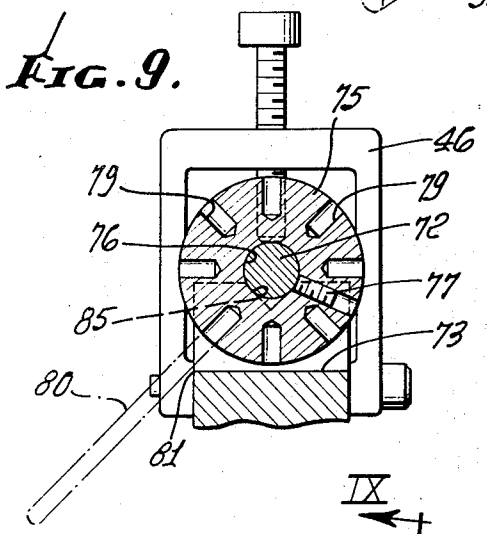
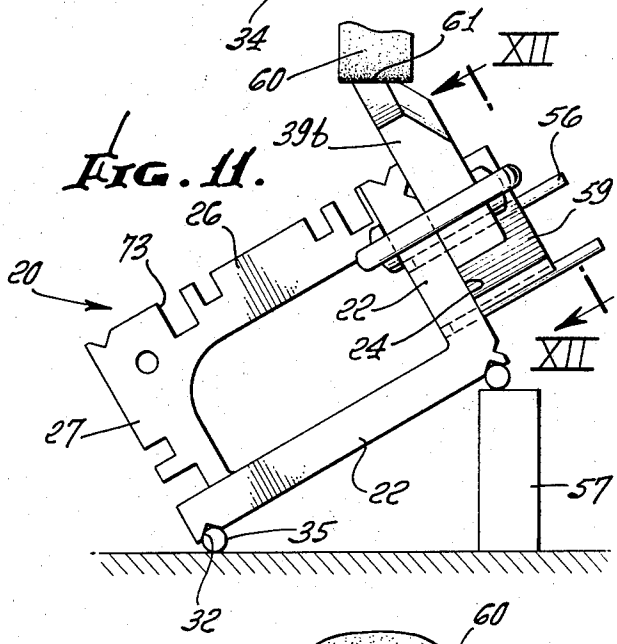


FIG. 11.



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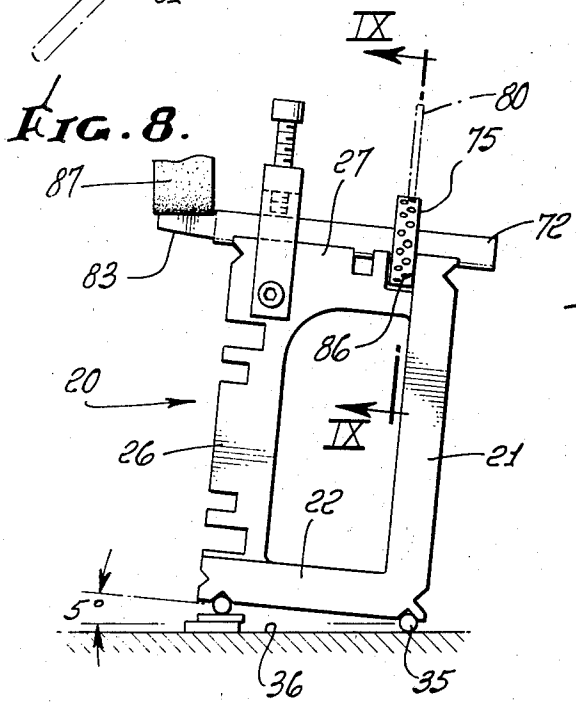


FIG. 12.

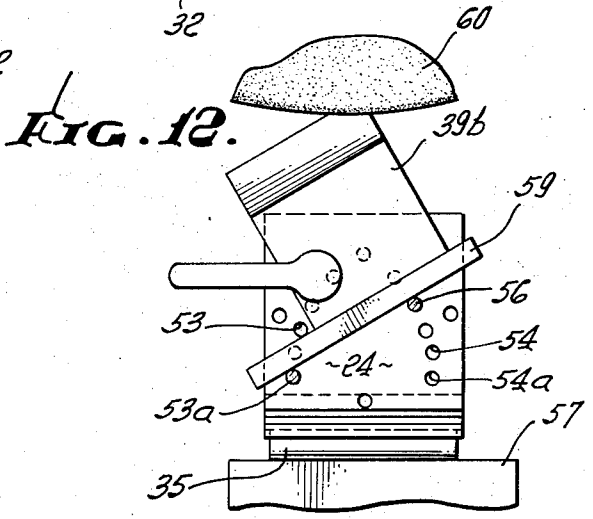


FIG. 1.

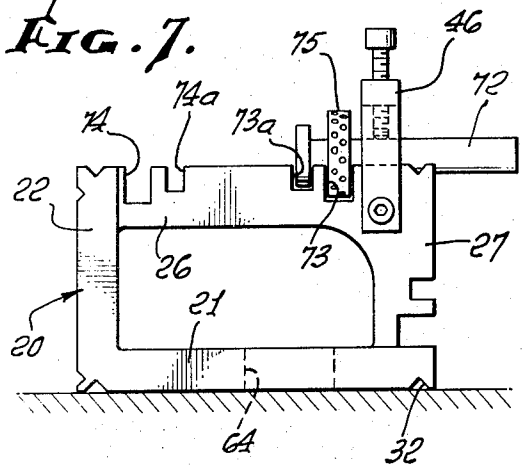


FIG. 2.

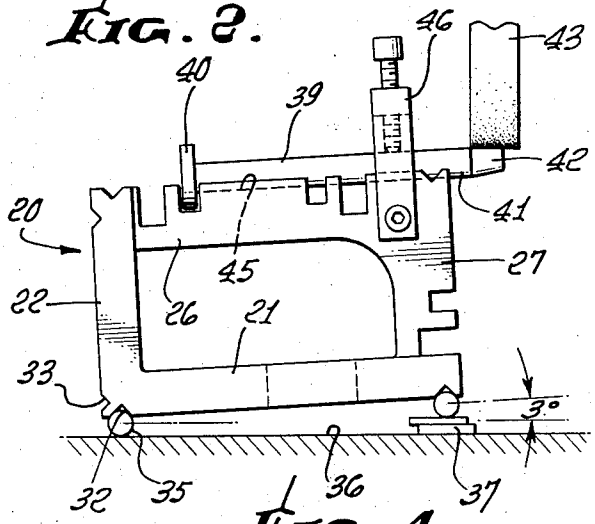
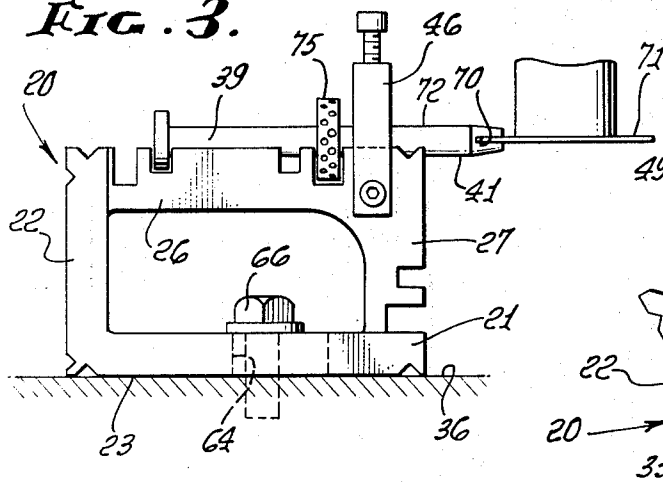


FIG. 3.



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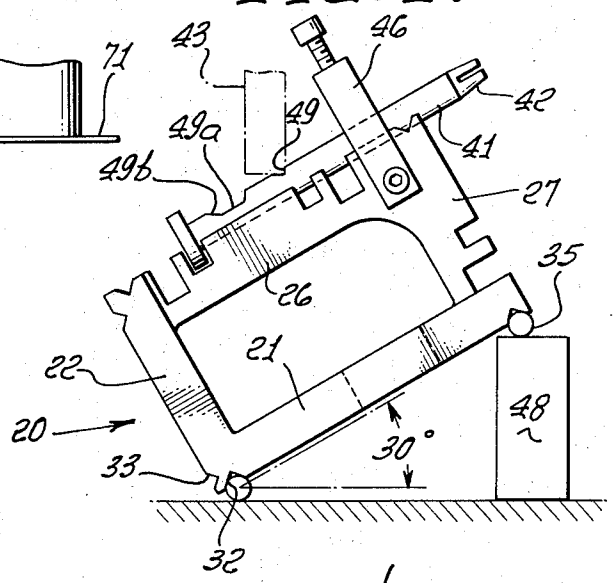


FIG. 5.

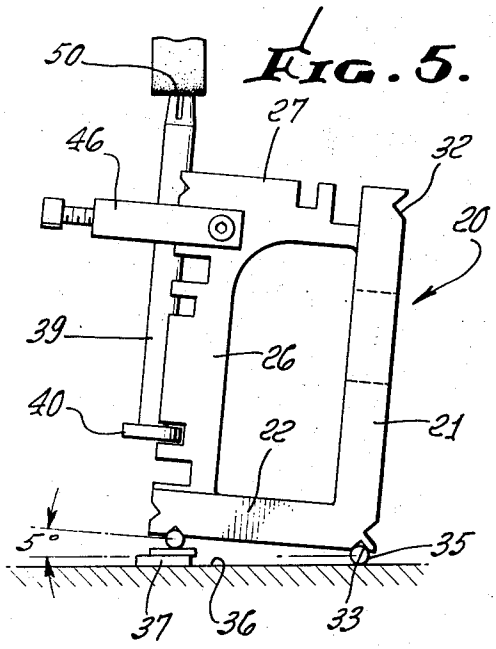


FIG. 6.

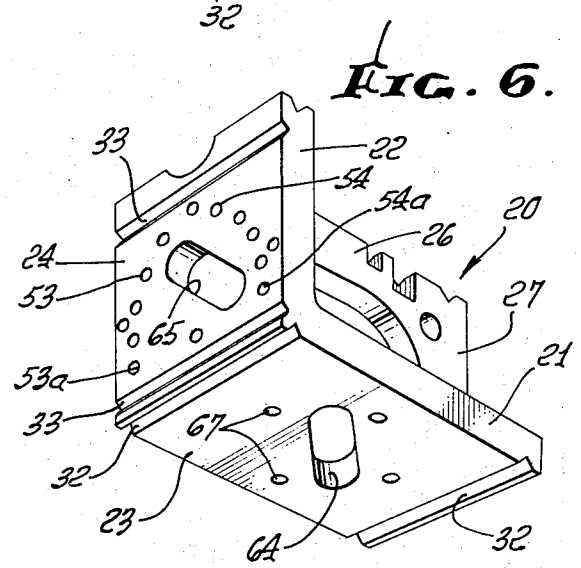


FIG. 13.

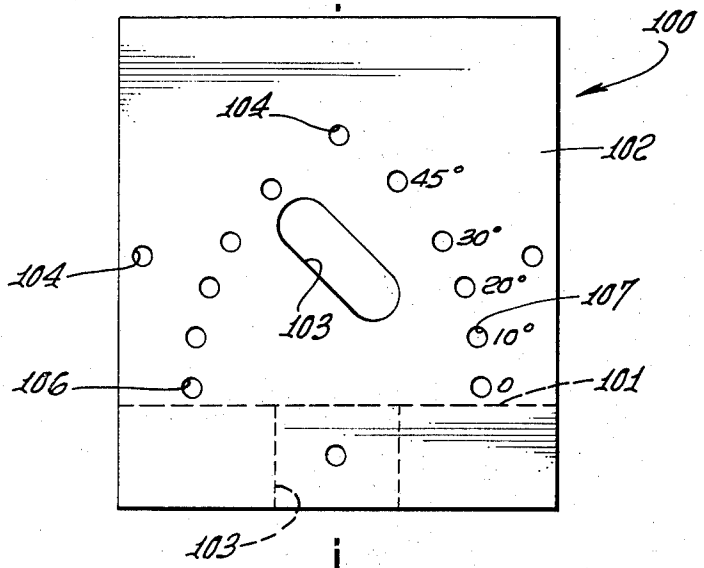


FIG. 14.

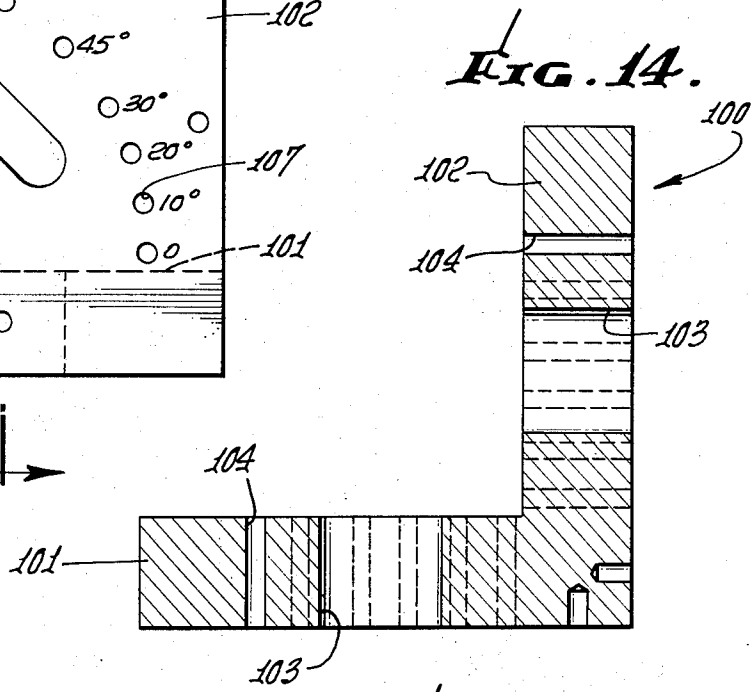
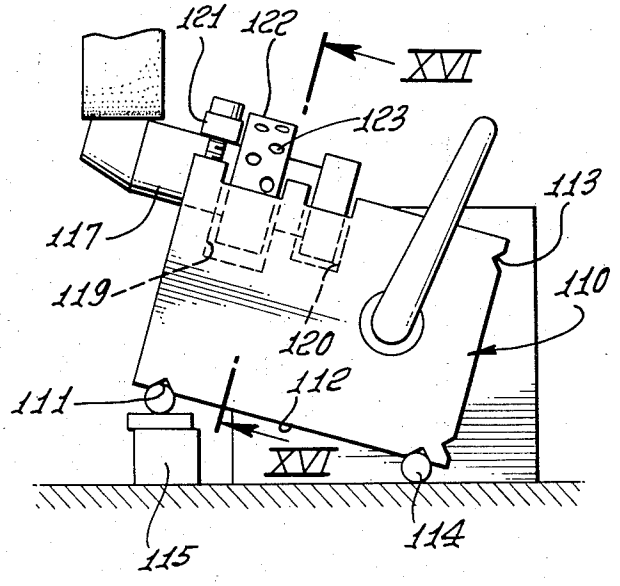


FIG. 15.



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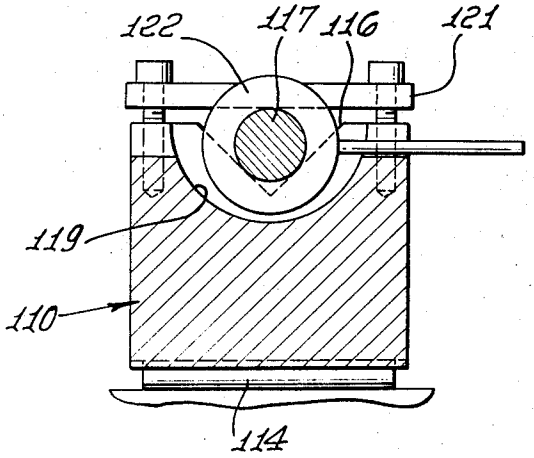

MULTI-PURPOSE WORK HOLDING MEANS

BACKGROUND OF THE INVENTION

Various devices are used in the tooling industry for precisely positioning a work piece for a tooling operation. Among such devices are angle irons of different types such as a right angle iron, measuring irons, slotted angle irons, pallet irons, box angle irons, sine blocks, sine bars, V blocks, many of which are disclosed in catalogue number 511 of Taft-Peirce Manufacturing Co. of Woonsocket, R.I. Such devices are precision made and are employed in tool making by clamping a work piece thereto so that the work piece may be supported and precisely positioned with respect to a machining tool, grinder, or some other tool member for precise working of a surface on the work piece. Such prior proposed work holding devices were useful for specific tooling operations. In the event a different tooling operation was required the work piece was often transferred to a different type of work holder. Such transfer of a work piece to a different work holding device was time consuming because of the care and accuracy with which the work piece was required to be secured to the work holder device and precisely positioned with respect to the tool.

SUMMARY OF INVENTION

The present invention relates to a novel work holding means so constructed and arranged as to readily position a work piece with respect to a tool for precise, accurate working or machining of the work piece.

An object of the present invention is to disclose and provide a work holding means wherein a work piece is capable of being positioned in a multitude of different positions for a working operation while maintaining the desired rigid standards of preciseness and accuracy for such work.

Another object of the present invention is to disclose and provide a work holding device which can be utilized for positioning a work piece and performs the functions of several prior proposed tool holding devices such as sine blocks, V blocks, angle blocks, whirly-gigs, indexing, and other functions without providing so-called secondary set-ups.

Still another object of the present invention is to disclose and provide a multi-purpose work holding device having rigidity, rapid adjustment and a rugged construction whereby work pieces of various type may be readily positioned, secured and worked upon.

Generally speaking, the present invention contemplates a work holding device provided with a body member similar to a right angle iron. The body member is provided with a plurality of sets of V grooves so arranged and spaced to permit its use as a sine bar or block. The body member is also provided with selectively arranged holes adapted to receive pins for positioning a work piece for grinding at normal angles or grinding at compound angles. The body member is provided with means for registering its relationship with respect to a work table in such a manner that the work holding means is capable of positioning a work piece in a desired relation to the tool with the set-up time minimized. The right angle body member is further provided with V grooves and index recesses adapted to receive an indexing device cooperable with the body member whereby angular rotational adjustment of a cylindrical work piece may be readily achieved with respect to a tool.

Many other objects and advantages of the present invention will be readily apparent from the following description of the drawings in which exemplary embodiments of this invention are shown.

In the drawings:

FIG. 1 is a perspective view of a work holding device embodying this invention.

FIG. 2 is a side elevational view of the device shown in FIG. 1 illustrating a work piece held at an angle to horizontal for grinding at an angle to the axis of the work piece.

FIG. 3 is a side elevational view showing the device of FIG. 1 with the work piece of FIG. 2 positioned for cutting a slot at the now angularly ground end of the work piece.

FIG. 4 is a side elevational view of the device of FIG. 1 showing positioning of the work piece at a selected angle to the horizontal, said angular position being provided by use of V-grooves on one of the body portions of the device.

FIG. 5 is a side elevational view of the device of FIG. 1 illustrating positioning of the work piece of FIGS. 2, 3 and 4 at a different angle by utilizing V-grooves on another body portion of the device.

FIG. 6 is a perspective view of the device shown in FIG. 1, the view being taken from below and in front of the main body portions of the device.

FIG. 7 is a side elevational view of the device shown in FIG. 1 illustrating the use of an index means for angular positioning of the work piece.

FIG. 8 is a side elevational view of the device and index means shown in FIG. 7 with the work piece positioned for grinding an angular flat on one end of the work piece.

FIG. 9 is a transverse sectional view taken in the plane indicated by line IX—IX of FIG. 8.

FIG. 10 is a side elevational view showing a different work piece held against one of the external surface means of device, the device being positioned at a selected angle by V-grooves provided on one of the second surface means of the device.

FIG. 11 is an elevational view of the device shown in FIG. 10 wherein a work piece is positioned for composite angular grinding of a surface on the work piece by positioning the work piece at a selected angle with pins inserted in sine holes on one of the first surface means on the device.

FIG. 12 is a view taken from the plane indicated by line XII—XII of FIG. 11.

FIG. 13 is an elevational view of an angle plate provided with certain of the features embodied in the device shown in FIG. 1.

FIG. 14 is a sectional view taken in the vertical plane indicated by line XIV—XIV of FIG. 13.

FIG. 15 is an elevational view of a V-block provided with certain of the features embodied in the device shown in FIG. 1.

FIG. 16 is a sectional view taken in the inclined plane indicated by line XVI—XVI of FIG. 15.

Referring first to FIGS. 1 and 2, a work holding means embodying this invention may comprise an integral body member generally indicated at 20 having generally the shape and configuration of a right angle iron. Body member 20 may comprise a first body portion 21 and a second body portion 22 disposed at right angles

to body portion **21**. Body portions **21** and **22** may be of the same cross-sectional thickness and of the same width. Body portions **21** and **22** provide first rectangular flat finished surface means **23** and **24** in contiguous relation and of a uniform width.

Work holder means **20** also includes a web member **25** of angular configuration and comprising a web leg **26** parallel to body portion **21** and a web leg **27** parallel to body portion **22**. Web member **25** bridges the included angle of **90** degrees between the body portions **21** and **22**. Web leg **26** is provided with a surface means **28** lying in a plane common to the plane formed by the top edge face **29** of body portion **22**. Web leg **27** provides a surface means **30** lying in a plane coplanar with the plane of edge face **31** of body portion **21**, said second surface means **28** and **30** being at right angles to each other and in contiguous relation. The second surface means **28** and **30** are of reduced width as compared to the width of the first surface means provided by body portions **21** and **22**.

The structure briefly defined above is essentially that of a right angle iron. The first and second surface means are finished in precise **90** degree relationship and surfaces are in precise parallelism. Preferably second surface means **28** and **30** on web member **25** are wider than the surfaces provided on prior right angle blocks for purposes later described.

Means are provided for positioning the body member **20** for performing angular work, that is grinding, machining or cutting a surface on a work piece at an angle to an axis of the work piece. Such means include a set of V grooves **32** on surface means **23** of body portion **21**, another set of V grooves **33** on surface means **24** of body portion **22**, and still another set of V grooves **34**, provided on the second surface means specifically the surface **28** and the edge face **29** of the leg member **26** and body portion **22** respectively. The spacing of the grooves in each set of grooves is a sine related distance apart, such spacing being precise. Each set of V grooves **32, 33** and **34** is adapted to receive a roll or dowel **35** of the same diameter. When dowels **35** are associated with a set of V grooves, the body member **20** is readily adapted to perform the function of a sine bar or sine block from any one of three different surfaces. Such use of body member is illustrated in FIG. **2** where dowels **35** are positioned in the set of V grooves **32**, one dowel **35** being positioned upon a finished reference surface **36** and the other dowel **35** being positioned at a selected distance above reference surface **36** by one or more shim elements **37** for precisely positioning the exemplary work piece at a selected angle, for example three degrees, with respect to a plane parallel to reference surface **36**. In FIG. **2** the work piece is illustrated as a core pin **39** having a head **40** and a free end **41** on which an angular surface **42** is to be formed by a suitable tool **43**. Work piece **39** is securely and precisely positioned in a longitudinally extending V groove **45** provided in the second surface means **28** of the web leg **26**. A suitable clamp **46** may hold work piece **39** in V groove **45**.

FIG. **4** illustrates the body member **20** carrying the work piece **39** as illustrated in FIG. **2** but positioned at a much greater angle such as 30° by a shim block **48** to permit forming or cutting of tapered surface **42** of the work piece **39**. In addition, while work piece **39** is held on device **20** as shown in FIG. **4**, notch **49**, flat **49*a***, and slope **49*b*** may be cut therein without changing the set up of the work piece on device **20**. Thus a plurality of complex cutting operations may be performed with accuracy, such capability being enhanced by the freedom to measure with respect to the work piece. In collet set ups, the work piece must be removed, marked and repositioned.

Dowels **35** are normally removable from their associated transverse grooves and are not fixed therein. In the event of a specific work set up where dowels **35** are desired to remain fixed in a V groove, a suitable set screw means may be provided in each dowel for cooperation with a tapped hole in the bottom of a V groove. However, removability of dowels **35** is preferred because dowels are not needed for non-angular set ups, may be obstructive in other set ups, and provide the advantage of selective placing of dowels **35** in one of the other sets of V grooves on the body member as shown, for example in FIG. **5**.

In FIG. **5** dowels **35** are shown positioned in V grooves **33** provided on the body portion **22**. One dowel **35** is in contact with reference surface **36** and the other dowel **35** is seated upon suitable shims **37** to provide a selected angle such as **5** degrees for grinding an angular end face **50** on the free end of work piece **39**.

Use of the V grooves in sine relation is further shown in FIG. **10** wherein dowels **35** are positioned in the set of V grooves **34** provided in the end face **29** of body portion **22** and in the distal end of leg member **26** of the web member **25**. In FIG. **10** a different form of work piece **39a** is shown clamped to surface **23** of body portion **21** to permit grinding of an angular face on work piece **39*a***. The body member **20** is positioned at a selected angle by a shim block **51**.

The work holding means of this invention is also readily adapted to the forming or cutting of surfaces at compound angles on a work piece. FIGS. **6, 11** and **12** show positioning of a work piece on the body member **20** to permit such forming of a compound angle. In FIG. **6** body portion **22** is provided with a plurality of arcuately arranged holes **53** and **54** which converge toward the upper section of body portion **22** and which include reference bottom holes **53*a*, 54*a*** parallel to surface means **23** and a preselected distance apart hereafter referred to as S-distance. S-distance is the distance between centers of sine rolls, buttons, or the equivalent, for example 5 inches, 10 inches, and is a preselected distance to correlate with reference tables commonly used in the machine tool industry for sine plates, sine bars, and other sine equipment to permit rapid accurate positioning of work (Taft-Pierce Catalog No. 511, pages 6 – 10 inclusive). In this example S-distance is used for the distance between centers of a reference hole **53*a*** and any one of holes **54** *a*, **54**, or a reference hole **54*a*** and any one of holes **53*a*, 53**. Holes **54** are arcuately spaced apart an S-distance from bottom reference hole **53*a*** so that insertion of dowel pins **56** in selected holes will generate angles with respect to a plane parallel to the plane of surface means **23** of from 0° to 10°, 20°, 30° and 45°. Holes **53** are similarly related to bottom reference hole **54*a***. Other angles can be readily achieved by using well known gauge blocks since the spacing between the pins **56** in respective holes **53*a*, 54** and **54*a*, 53** are always the preselected S-distance apart.

As best shown in FIGS. **11** and **12**, a work piece such as **39*b*** may be clamped by suitable means, not shown,

against the surface means **24** of the leg portion **22.** Body member **20** may be positioned at a selected first angle by using dowels **35** in V grooves **32** and a shim block **57.** Pins **56** may be inserted in the selected pin holes **53** and **54** to provide a suitable angle upon which a mounting bar **59** is supported to position work piece **39***b* at the desired compound angle with respect to the tool **60.** From a consideration of FIGS. **11** and **12** it will be readily apparent that the angular surface at **61** being formed by the tool **60** lies at a compound angle with respect to the normal axis of the work piece **39***b*.

Means for further adjustably positioning the work holder device of this invention in order to selectively position a work piece with respect to a tool includes elongated angle slots **64** and **65** provided in body portions **21** and **22** respectively. Each slot **64** and **65** extends through said body portions and is disposed at an angle of 45° to the longitudinal and lateral axis of the body portions. Each slot **64** and **65** is adapted to receive therethrough a bolt means **66** which serves to securely clamp the work holder device to a work bed or table provided with reference surface **36.** Body member **20** may thus be readily angularly positioned with respect to the axes of the work table. To facilitate precise alignment with respect to the axis of the machine, alignment holes **67** are provided on the longitudinal and transverse axes of the body portions and spaced apart a preselected S-distance. Alignment holes **67** receive pins which may extend into the T-slot in the machine bed and bear against one or the other edges thereof for precise reference and alignment purposes. Adjustment of body member **20** with respect to a tool is thus further facilitated and the body member may be precisely mounted on the machine table in proper relationship to a tool with set-up time minimized.

In FIG. **3** body member **20** is positioned with its table face or surface means **23** against a reference surface **36** of a work table and held thereagainst by the bolt means **66.** In FIG. **3** a work piece **39** is positioned with its axis parallel to reference plane **36** for the purpose of providing an axially extending slot **70** in the free end **41** of the work piece by means of a disc cutter cutting tool **71.**

Means for indexing a work piece such as a headed ejector or core cylindrical rod **72,** FIG. **7,** into a selected rotational position is another advantage provided by the construction of body member **20.** In FIG. **7** work piece **72** is seated in longitudinally extending V groove **45** provided in the web leg **26.** Along the length of web leg **26** and adjacent to opposite ends thereof are provided recesses **73** and **74** adapted to receive an index bushing **75.** Index bushing **75** includes a through bore **75** of a selected diameter to readily slidably accommodate cylindrical work piece **72.** Index bushing **75** is secured against relative rotational movement with respect to work piece **72** by a set screw **77,** FIG. **9.** Index bushing **75** is thus in fixed relation to the work piece and is loosely accommodated in recess **73** so that the work piece **72** may firmly rest in the V groove **45.** Head notches **73***a*, **74***a* are formed at a selected distance from working surfaces **24** and **27** to receive heads **40** of standard core or ejector rods.

Index bushing **75** is provided with a plurality of selectively angularly spaced radial bores **79** adapted to receive one end of an index pin **80.** Bores **79** may be provided in selected angular spaced relation such as 90°, 45°, 30° and 15° apart. To facilitate location of a plurality of such bores in a relatively small metal body, two or more axially spaced rows of such bores may be provided as indicated in the drawings. The angular relation of the bores are further referenced with respect to edge **81** of the bushing recess **73.** When an index pin **80** is seated in contact with edge **81** as shown in FIG. **9** edge **81** (which may have a small stop flat therein) serves as a positive precise top for rotationally positioning work piece **72.** Thus to determine the precise diameter upon which the slot **70** is to be cut, FIG. **3,** the index bushing **75** will be turned to a selected position before the work piece **72** is held and clamped in the V groove **45.** In the event a cross slot was desired at 90°, the index pin would be placed in an index bore spaced 90° from the initial pin position and after the pin had been placed in the index bore and positioned against edge **81,** the cross slot could be cut in precisely 90° relations with the original slot.

Likewise, as shown in FIG. **8** index **75** may be selectively rotationally positioned to turn work piece **72** through successive 90° angles to provide flats **83** on the end of work piece **72.** In FIG. **8,** work piece **72** is illustrated as mounted in a V groove **85** extending longitudinally in surface **30** of the web portion **27.** Leg portion **27** is provided with index receiving recesses **86** in a manner similar to the recesses **73** and **74** of web portion **26.**

It is important to note that longitudinal V grooves **45** and **85** provided in respective surface means **28** and **30** are symmetrical with respect to the body member and in this example, the apices of the V's lie in a vertical plane longitudinally bisecting the body member. A work piece secured in one of the longitudinal V's **45** and **85** is thus precisely related to other reference or working surfaces to thereby permit additional work on the work piece without removing the piece from the V groove. Since the surface means **28** and **30** are wider than those in a right angle iron, the V grooves **45** and **85** may be larger and may accommodate work pieces of greater diameter. In addition, one of the working V grooves **45, 85** may be made wider than the other so that the diameters of work pieces accommodated by the V grooves **45, 85** may range up to two or three inches. The body member thus is useful as a V block.

In FIG. **8** it will be noted that the body member **20** is being utilized in another position to angularly position work piece **72** with respect to a tool **87.** Index bushing **75** and the extra width of web means **25** and the selected size of the V grooves **45** and **85** therein provide for accommodation of cylindrical work pieces of varying diameter as for example from ⅛ inch to 2 inches or more. This arrangement also provides for hand spin grinding of a work piece by loosening the clamp means and so returning the work piece by hand.

Some of the features mentioned above which have been applied to a right angle iron may also be applied to other work holding devices as illustrated in FIGS. **13–16** inclusive. In FIGS. **13** and **14** an angle plate **100** is provided with a base or table portion **101** and an upstanding work portion **102** at right angles to portion **101.** Each of the portions **101** and **102** may be provided with a slot **103** disposed at a 45° angle to the right angle axes of the leg portion for reception of a work table hold-down bolt means as previously described. The center of slot **103** is at the intersection of the right

angle axes of the leg portion. Centers of alignment holes 104 on each of said axes are located a S-distance apart. The coincidence of the intersection of the axes in the center of the diagonal slot 103 facilitates immediate set-up and alignment of the angle of the work on a work table. Each of the portions 101 and 102 may also be provided with the arcuately arranged holes 106 and 107 in which the bottom holes are spaced apart a sine distance and the remaining holes are spaced apart a selected angular relationship with respect to the bottom hole of the other arcuate set of holes. Thus the angle plate 100 may support through the use of pins received in holes 106 and 107 a work piece for presenting the work piece to a machine tool for grinding a surface thereon at a selected angle.

In FIGS. 15 and 16 a V block 110 is illustrated. V block 110 includes a set of V grooves 111 on table surface 112 of the block and also a set of V grooves 113 on a contiguous surface. Sets of grooves 111 and 113 include V grooves of selected width and depth and the grooves of each set are spaced apart a preselected S-distance and are adapted to removably receive rollers or dowels 114 to position the V block at a selected angle by means of shims or guage blocks 115 as shown in FIG. 15.

A V block such as 110 is normally provided along one surface with a relatively wide and deep V groove 116 adapted to hold a cylindrical work piece such as work piece 117. In spaced relation along V groove 116, V block 110 may be provided with an index bushing recess 119 and a work piece head recess 120. A suitable strap type clamp means 121 may be provided for securely holding work piece 117 in the V groove. Index bushing 122 may be provided with angularly spaced, radially extending sets of holes 123 as in the prior embodiment of an index bushing, said holes receiving an index pin 124 for rotationally positioning work piece 117.

It will thus be apparent that V block 110 is now capable of providing the function of a sine plate in combination with a means for rotationally positioning a work piece with respect to its axis for angular and rotational working thereof.

The advantages of the right angle iron will be readily apparent to those skilled in tool making. The work holding body member 20 not only may be used for the purposes which it previously served but also is capable of use as follows: first as a reversible sine plate or block employing one of three different surfaces on the block and thereby eliminating a secondary set up in a machining or inspection operation, second, a compound sine block utilizing one of two different surfaces to readily locate and position a work piece for the working thereon of a compound angle; third, as a V block by utilizing the 45° angle hold-down slot on each of two leg portions of the angle iron together with precise alignment of the body member by the alignment holes in the leg portions of the block for fast and accurate set-ups; fourth, rotationally or angularly positioning of a cylindrical member with respect to its axis by means of the index bushing.

The modified right angle iron as described above is thus adapted to perform a sequence of complex operations with high interrelated preciseness and accuracy, without loss of time caused by the necessity previously of secondary set-ups. The work piece is capable of being positioned with respect to a tool in virtually any attitude so that straight and angular multisided cuts, angular flats, tapers, squares, and chamfers may be readily machined or ground. Those skilled in the tool-making art will recognize the versatility and usefullness of the several adaptations of the above-described work holding means which embodies this invention.

It will also be understood that costs of set-ups are minimized because of the several features of construction of the device 20, that inspection of the work is facilitated, and that measurements along the work can be readily made. The angularly disposed slot in each of the body portions enhances set up time because no indicating is required; that is the step of precisely locating a surface of a work piece upon which work is to be performed (Taft Pierce Catalog No. 511 page 2). The work holding device 20 constructed with the features above described is thus capable of holding a work piece in many different positions for work thereon by a tool.

The several features of this invention have been exemplary shown with respect to a right angle iron, angle block, and V block. They may also be applied to a tool makers vise which has precision finished surfaces on an elongated generally rectangular body having an upstanding fixed jaw portion at one end and a slidable jaw member movable by a feed screw threadedly carried in an upstanding body portion at the other end of the body. Sets of transverse V grooves spaced a preselected S-distance apart may be cut in the bottom and side surfaces of the vise body to receive sine rolls for positioning the vise body at a selected angle of gauge blocks. In addition the upstanding fixed jaw portion may be provided with arcuately arranged holes a preselected S-distance apart such as holes 53 & 54 described above. Thus the modified vise permits positioning a work piece for angular and compound angular working in addition to its normal use as a vise.

It is understood that various other modifications and changes may be made in the work holding means described above which come within the spirit of this invention and all such changes and modifications come within the scope of the appended claims are embraced thereby.

I claim:

1. A device for precise multi-positioning of work three dimensionally and angularly about an axis thereof for machining, grinding and the like, comprising in combination:

an integral body member having a plurality of surface means arranged in right angle relationship in rectangular form;

a first two of said surface means being in contiguous relation and having uniform width,

each of said first two surface means being provided with a pair of parallel transversely extending V-grooves spaced apart a preselected distance and adapted to removably hold positioning rods of selected diameter;

a second two of said surface means in contiguous relation having uniform width less than the width of said first two of said surface means and in symmetrical relation with the first surface means, and second two of said surface means having longitudinally extending V-grooves adapted to axially position a work piece;

one of said second two of said surface means being provided with spaced transverse recesses between

ends thereof adapted to receive an index means to selectively angularly position a work piece about its axis;

one of said second two of said surface means including

a transverse V-groove adjacent one of said body portions having a first surface means, and

a transverse V-groove on said one of said second surface means adjacent to the other of said second surface means.

2. In a device as stated in claim **1** wherein at least one of said first surface means is provided on a body portion having a slot therethrough extending diagonally with respect to one of the surface means of each of the first and second surface means for securing said body member at an angle on a work table.

3. In a device as stated in claim **1** wherein

a body portion providing one of said first surface means is provided with holes arcuately spaced a preselected distance from a reference hole, the holes being adapted to receive pins for supporting a work on said pins at a selected angle.

4. In a device as stated in claim **1** wherein

at least one of said first surface means includes alignment holes located a selected distance apart and at 45° to a diagonally extending slot through said one of said first surface means.

5. In a device as stated in claim **1** including index means having radial holes angularly spaced and adapted to receive a pin,

said index means being carried in a transverse recess in a longitudinal V-groove and adapted to hold a work piece;

said radial holes being so arranged with respect to a stop face on said body member to provide precise angular positioning of said work piece.

6. In a multi-purpose work holding means, the combination of:

an integral body member having two plate-like body portions provided with external planar surfaces lying at right angles to each other;

a web member bridging the included angle between said body portions and having web legs each provided with an external face normal to said planar surface contiguous thereto;

means provided in at least one of said body portions of said body member to precisely locate said body member and work associated therewith on a work table;

said locating means including a pair of alignment holes spaced a selected distance apart on each longitudinal and lateral axis of said body portion,

and a through slot in said body portion at 45° to each of said axes and having a slot axis intersecting said longitudinal and lateral axes at a common point of intersection;

pairs of parallel transverse V-groove means spaced apart a selected distance on said planar surfaces and on at least one of said external web member faces;

and longitudinally extending V-groove means on at least one of said external faces of said web member for supporting a cylindrical work piece.

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