Oct. 21, 1969 B. A. BOGGS 3,473,420

JIG FOR SPINNERETTE

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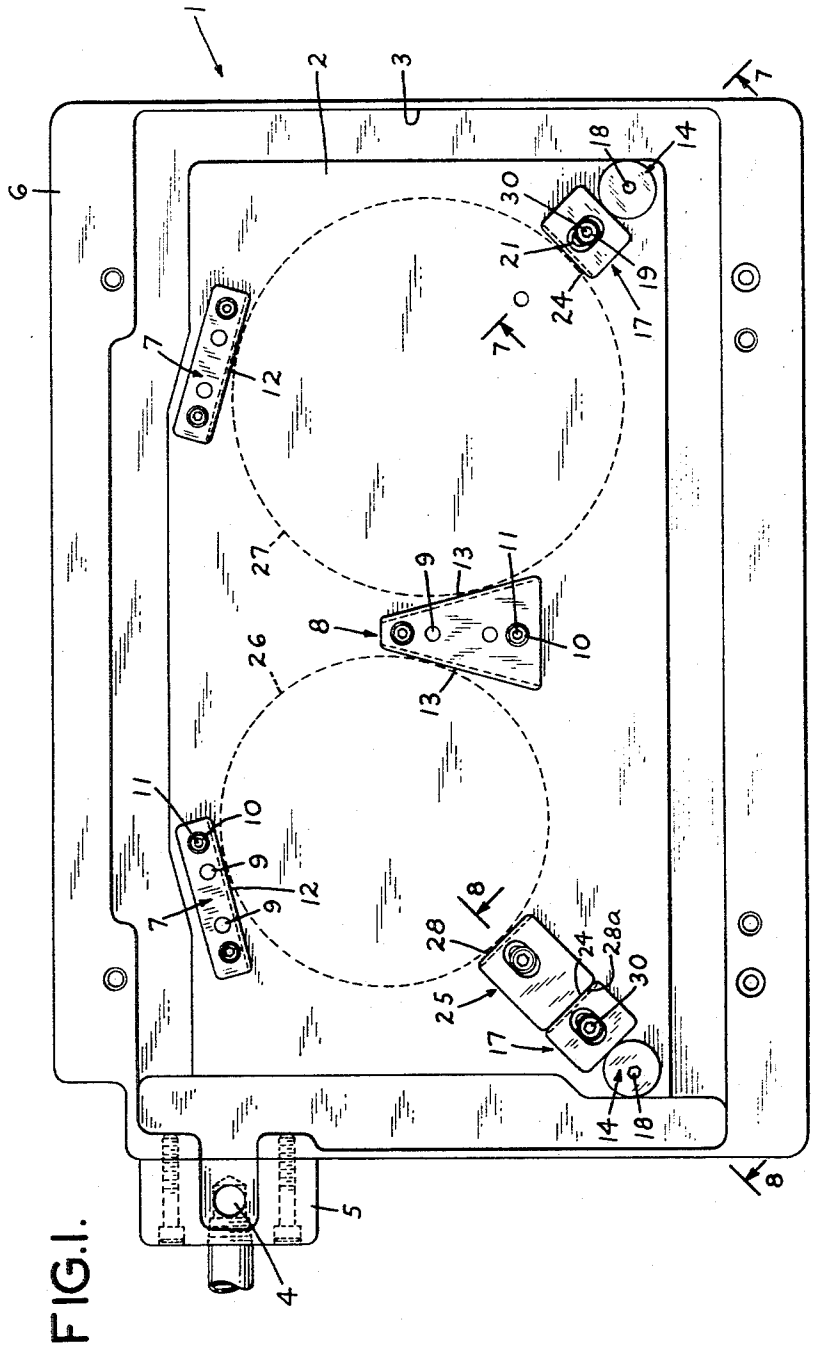


FIG. 1.

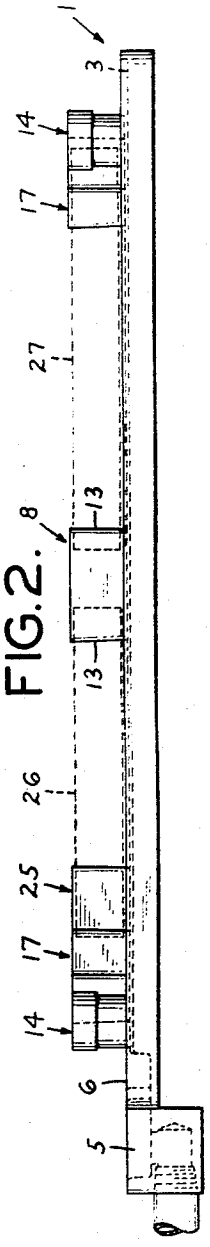


FIG. 2.

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JIG FOR SPINNERETTE

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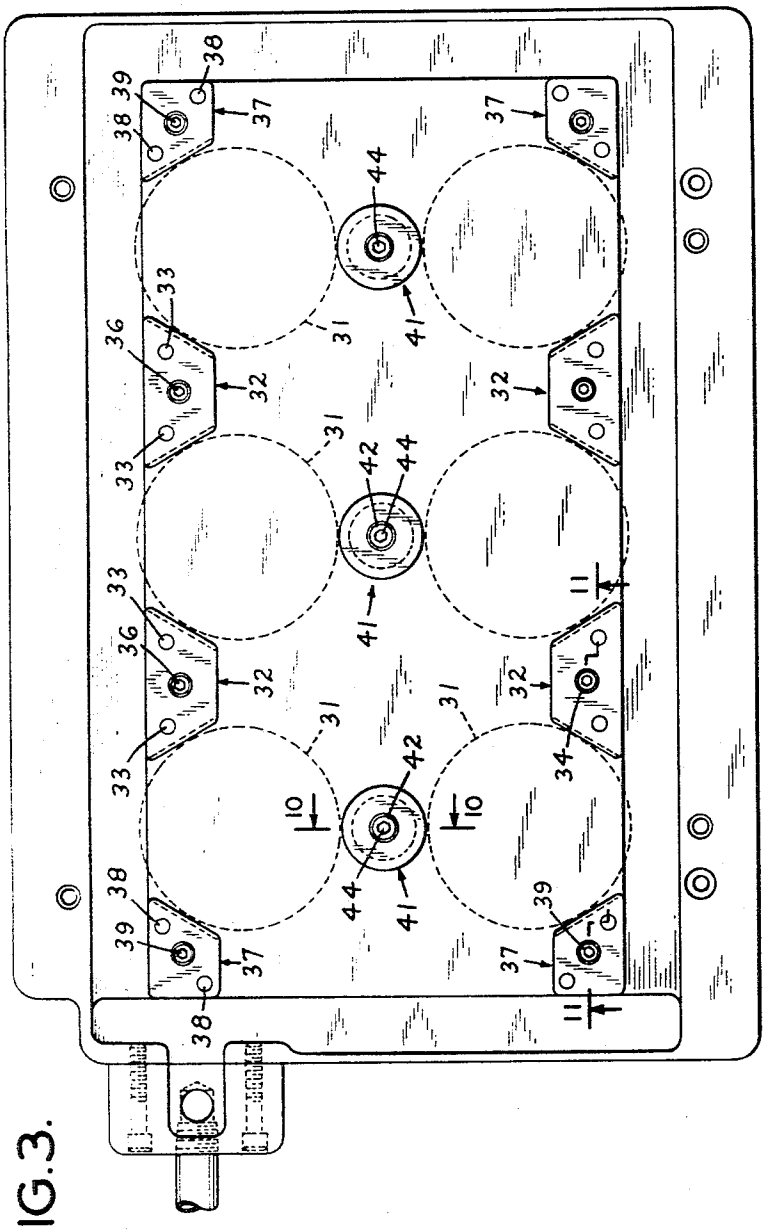


FIG. 3.

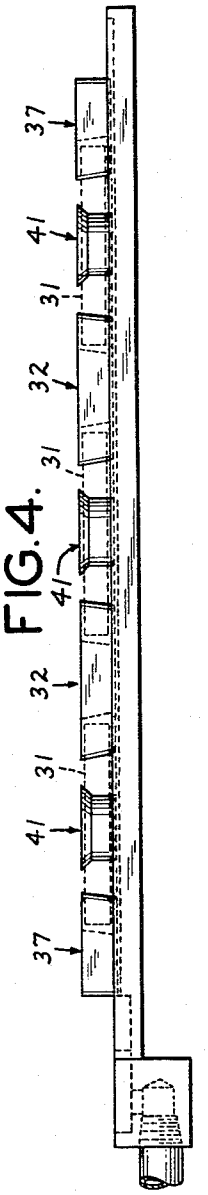


FIG. 4.

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JIG FOR SPINNERETTE

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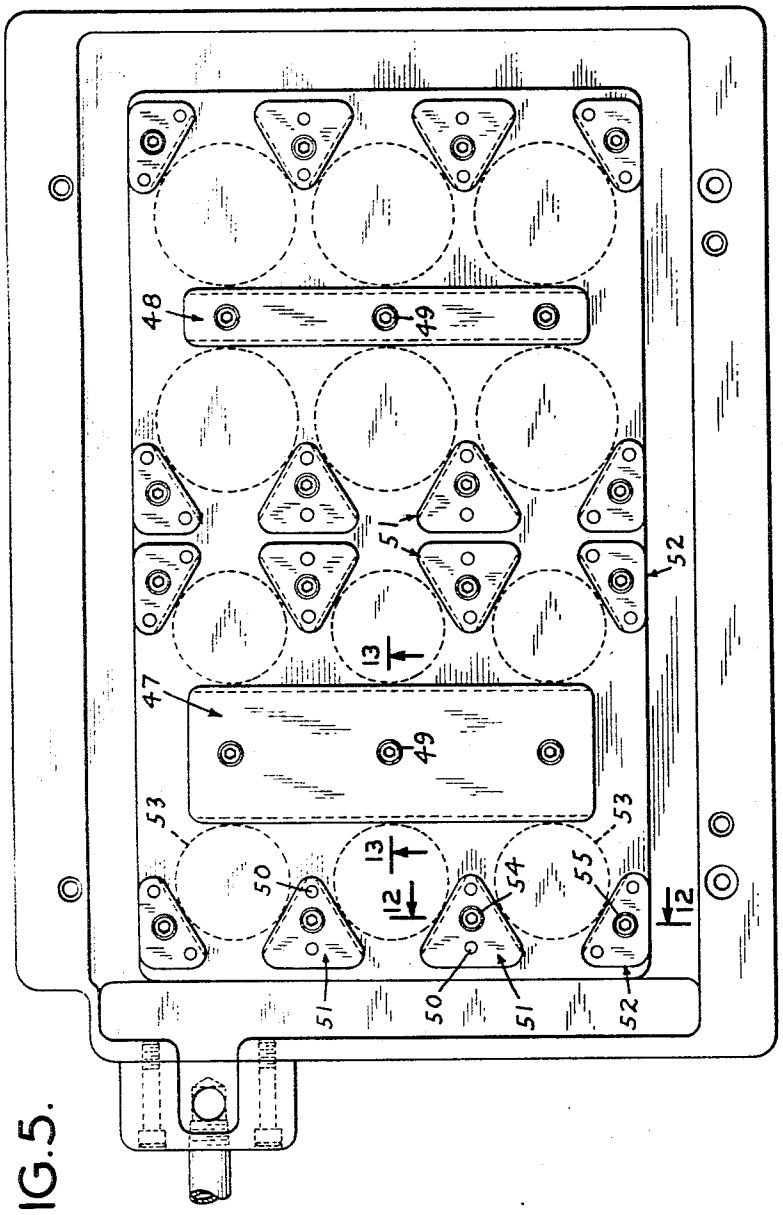


FIG.5.

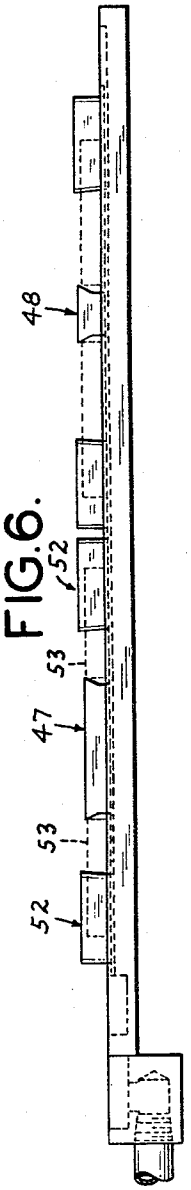


FIG.6.

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JIG FOR SPINNERETTE

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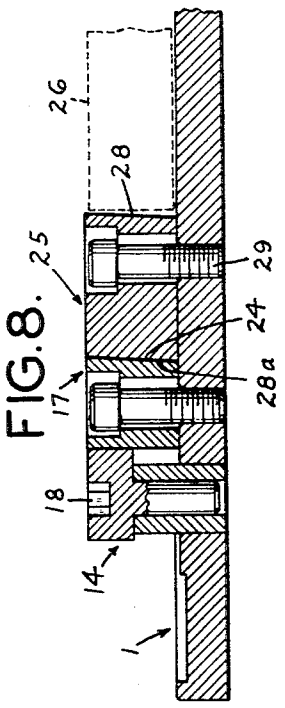


FIG.8.

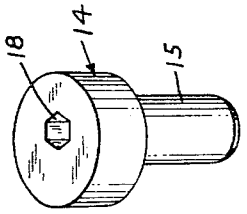


FIG.9.

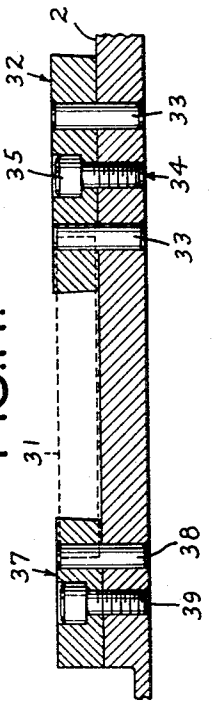


FIG.11.

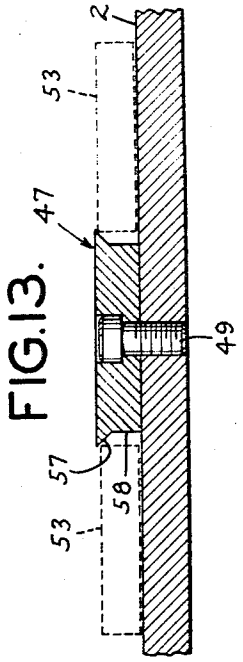


FIG.13.

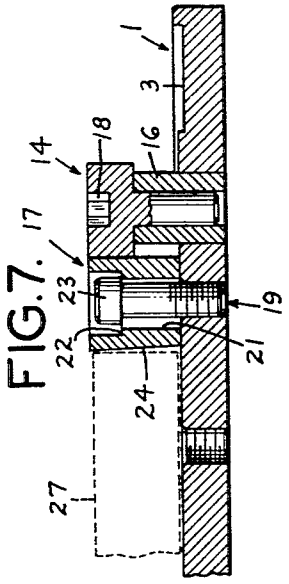


FIG.7.

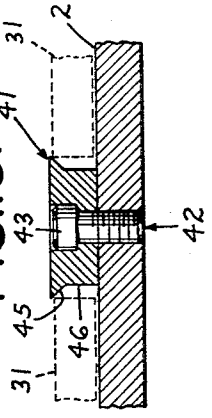


FIG.10.

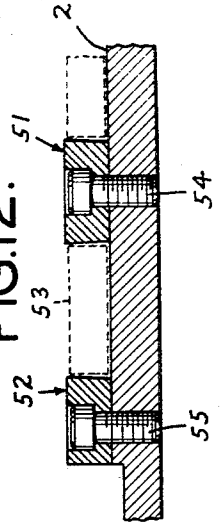


FIG.12.

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United States Patent Office 3,473,420
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3,473,420

JIG FOR SPINNERETTE

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Int. Cl. B23b 47/28; B23q 3/02
U.S. Cl. 77—63 3 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for positioning and clamping one or more spinnerette blanks during the drilling of orifices. Positioning blocks adapted to be secured to a plane supporting surface are used to provide three points of contact per spinnerette blank. The abutting face of a positioning block is inclined downwardly away from the periphery of the spinnerette blank, and extends to a height above the supporting surface which is slightly greater than the corresponding height of the spinnerette blank, thereby wedging the spinnerette blank between the positioning block and the supporting surface.

BACKGROUND OF THE INVENTION

The present invention relates to the positioning and clamping of workpieces. More particularly, it relates to a new and useful means for holding spinnerette blanks in a desired position during the drilling of orifices therein.

In drilling operations where the workpiece is a relatively thin member, it was difficult to provide a clamping means or jig which could hold the work firmly in a predetermined position and which was compact and simple in design.

With the introduction of programmed drilling operations whereby the orifices in a spinnerette blank are drilled automatically, the requirements placed upon the jig became even more stringent.

A jig suitable for programmed drilling must be capable of maintaining correct alignment of the workpiece throughout the operation. It must also be devoid of any substantial protrusions, e.g., nuts, bolts, etc., above the work surface which might interfere with the automatic drilling apparatus. The simultaneous accommodation of a plurality of workpieces on a single supporting surface and the facile replacement of finished workpieces without disturbing the reference or "zero position" are also desirable features of such a jig. U.S. Patent 2,430,613 teaches a work holding device which claims to possess some of the advantages enumerated above. However, the jig disclosed in that patent is limited in its application to single workpieces on T-slotted bench surfaces. The adjustment of the clamping members to accommodate a new workpiece of the same or different size than its predecessor requires laborious manipulation of a number of positioning blocks. Furthermore, the positioning blocks used according to U.S. Patent 2,430,613 are rather complicated in design and therefore difficult to manufacture cheaply.

SUMMARY OF THE INVENTION

Accordingly, it is an object of my invention to provide a jig which will hold one or more spinnerette blanks firmly in position during the drilling of orifices therein.

Another object of my invention is to provide a jig for one or more spinnerette blanks which will maintain correct alignment of the blanks during programmed drilling of orifices without the need for redetermining the zero position of the jig during replacement of workpieces.

Another object of my invention is to provide a jig for one or more spinnerette blanks which has no substantial protrusions above the work surface.

Another object of my invention is to provide a jig for one or more spinnerette blanks which permits the facile replacement of finished workpieces.

A further object of my invention is to provide a jig for one or more spinnerette blanks which is not limited in its application to any particular shape of spinnerette blank.

A still further object of my invention is to provide a drilling jig whose components are compact and simple in design.

Other objects and a fuller understanding of my invention may be had by referring to the following description and appended claims.

In accordance with my invention, spinnerette blanks, i.e., solid, generally circumferential discs which are relatively thin compared to their lateral area, may be effectively positioned and clamped on a supporting surface by means of abutments or positioning blocks each of whose abutting faces is a plane surface inclined downwardly away from the periphery of the spinnerette blank to the supporting surface. Each positioning block extends to a height above the supporting surface slightly greater than the corresponding height of the spinnerette blank. In this way, such a positioning block, when urged against the spinnerette blank, will exert a downward as well as lateral force upon the spinnerette blank, tending thereby to wedge the blank between itself and the supporting surface. The upper surfaces of the positioning blocks are flat and free of any protuberances. Orifices may be drilled in a plurality of spinnerette blanks which are simultaneously secured to a single supporting surface. For such an operation, each positioning block may have a plurality of abutting faces, the number of positioning blocks required being such as to provide three points of contact per spinnerette blank.

It is also a feature of my invention that, for a given spinnerette blank, two positioning blocks may be secured to the supporting surface by means familiar to those skilled in the art. The third positioning block may be slidably mounted on the supporting surface and adapted to be secured thereto. The slidably mounted positioning block is operated upon and actuated by a cam. In this way, a fixed zero position of the jig may be maintained while at the same time permitting rapid insertion and removal of workpieces.

The use of positioning blocks whose points of contact with the spinnerette blank are located on plane abutting surfaces permits the rapid adaptation of the jig to accommodate circumferential spinnerette blanks of various diameters and shapes. The embodiments of my invention illustrated in the drawings and discussed in detail hereinbelow teach the clamping of circular spinnerette blanks. However, I also contemplate using workpieces which are ellipsoidal or otherwise bounded by curved lines as well as workpieces having straight edges.

The set-up for a given drilling operation can be made upon a supporting surface having a predetermined pattern of holes through which dowels and hold-down screws locate and secure the positioning blocks. A number of such patterns may be drilled into a single supporting surface to permit multiple set-ups. In view its compactness of design, the apparatus of my invention comprising supporting surface, positioning blocks, and cams, is easily stored or transported.

The work surface, cams and positioning blocks constituting the apparatus of my invention may be made of any material able to withstand the forces encountered during the drilling operation. Because of the simple design and consequent ease of manufacture of the above components of my invention, numerous materials may be used for their construction. For example, plastics, hard rubber, and various metal alloys may be used. Preferably how-

ever, the work table, cams, and positioning blocks are constructed of metal, and desirably of steel.

Reference is now made to the accompanying drawings of which there are four sheets. They are provided by way of illustration, showing several preferred embodiments of my invention and the principles thereof and what I now consider to be the best modes for applying those principles. Other embodiments employing the same or equivalent principles may be used and changes of size and/or structure may be made by those skilled in the art without departing from the spirit of my invention and purview of the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a preferred embodiment of my invention.

FIG. 2 is a side elevational view of FIG. 1.

FIG. 3 is a top plan view of another preferred embodiment of my invention.

FIG. 4 is a side elevational view of FIG. 3.

FIG. 5 is a top plan view of yet another preferred embodiment of my invention.

FIG. 6 is a side elevational view of FIG. 5.

FIG. 7 is a sectional view taken along line **7—7** of FIG. 1 showing in detail the construction of a slidably mounted positioning block employed in the apparatus together with a positioning cam operating upon the block and means for securing the block to the supporting surface.

FIG. 8 is a sectional view taken along line **8—8** of FIG. 1 showing in detail the construction of a slidably mounted positioning block together with securing means and positioning cam therefor, said positioning block being shown in combination with an extension block to accommodate smaller workpieces.

FIG. 9 is a perspective view illustrating the type of positioning cam used in the apparatus of my invention.

FIG. 10 is a sectional view taken along line **10—10** of FIG. 3 showing in detail the construction of a curved positioning block employed in the apparatus of my invention.

FIG. 11 is a sectional view taken generally along lines **11—11** of FIG. 3 showing in detail the construction of two positioning blocks acting jointly upon a single workpiece.

FIG. 12 is a sectional view taken along line **12—12** of FIG. 5.

FIG. 13 is a sectional view taken along line **13—13** of FIG. 5 showing in detail the construction of a positioning block acting at once upon a plurality of workpieces.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a preferred apparatus embodying the features of my invention includes a work table **1** having supporting surface **2** thereon. Supporting surface **2** is surrounded by channel **3** to entrain lubricating liquid which runs off supporting surface **2** during the drililng operating. Channel **3** may be downwardly sloped toward drain hole **4** located on drainage attachment **5** to facilitate removal of liquid. Channel **3** is bounded by surface **6** which may have a slightly higher elevation than supporting surface **2** in order to prevent liquid in channel **3** from flowing over the edge of work table **1**. Positioning blocks **7** and **8** are located on supporting surface **2** by means of dowels **9** extending through positioning blocks **7** and **8** into supporting surface **2**. Positioning blocks **7** and **8** are secured to supporting surface **2** by means of hold-down screws **10** extending through positioning block **7** and **8** into supporting surface **2**. The head of each screw **10** (and of all hold-down screws hereinafter described) is recessed below the surface of the positioning block and is provided with a wrench socket **11** centered on the axis of screw **10**. Wrench sockets **11**

are adapted to receive the complentary-shaped end of a wrench to facilitate tightening of screws **10**. Abutting faces **12** and **13** of positioning blocks **7** and **8** respectively are plane surfaces which are downwardly and inwardly sloped as shown for positioning block **8** in FIG. 2. The degree of slope abutting faces **12** and **13** and of plane abutting faces on positioning blocks hereinafter described is preferably (but not necessarily) between about 5° and about 10° from the vertical. Circular cam **14** is rotatably mounted on supporting surface **2** by means of shank **15** which extends into supporting surface **2** as shown in FIGS. 7, 8, and 9. Bushing **16** (FIG. 7) serves as a journal bearing for shank **15**. Cam **14** operates upon slidably mounted positioning block **17** by rotation about an eccentric axis which is coincident with the axis of shank **15**. Wrench socket **18** on cam **14** is centered on the axis of shank **15** and is adapted to receive the complementary-shaped end of a wrench to facilitate rotation of cam **14**. Positioning block **17** is slidably mounted upon and may be secured to supporting surface **2** by means of hold-down screw **19** extending through slot **21**. Slot **21** is perpendicular to supporting surface **2** and parallel to the direction of motion of positioning block **17**. The upper portion of slot **21** is enlarged to receive and provide a shoulder **22** engageable with head **23** of hold-down screw **19**. Head **23** of hold-down screw **19** has a wrench socket **30** (not shown in FIGS. 7 and 8) centered on the axis of hold-down screw **19**. Wrench socket **30** is adapted to receive the complementary-shaped end of a wrench to facilitate tightening of hold-down screw **19**. Abutting face **24** of slidably mounted positioning blocks **17** is a plane surface which is downwardly and inwardly sloped as shown in FIGS. 2, 7 and 8. FIG. 1 also shows an extension block **25** being used to accommodate a spinnerette blank **26** of smaller diameter than spinnerette black **27**. The face **28** of extension block **25** which abuts spinnerette blank **26** is identical to abutting face **24** of slidably mounted positioning block **17**. Face **28***a* of extension block **25** mates snugly with abutting face **24** of slidably mounted positioning block **17** as shown in FIGS. 1 and 8. Extension blocks **25** may be further characterized as being slidably mounted upon supporting surface **2** in the same manner as positioning block **17** hereinbefore described, and as shown in FIGS 1 and 8. When the apparatus of my invention is used in conjunction with extension block **25**, positioning block **17** functions as a "push rod" through which cam **14** operates upon extension block **25**. When extension block **25** is secured to supporting surface **2** by tightening hold-down screw **29**, hold-down screw **19** in slidably mounted positioning block **17** may be left in a loosened condition.

Referring to FIG. 2, cam **14**, positioning blocks **8** and **17**, and extension block **25**, are shown in vertical elevation. Positioning blocks **7** (not shown) **8**, and **17** and extension block **25** extend to a height above supporting surface **2** which is slightly greater than the corresponding height of spinnerette blanks **26** and **27**.

By virtue of the inventive features of the novel apparatus of my invention, spinnerette blanks **26** and **27** are positioned and clamped onto work table **1** simply by placing the blanks on supporting surface **2** as shown and rotating cams **14**. Subsequent tightening of hold-down screws **19** (or **29**), clamps the spinnerette blanks in position ready for drilling. Loosening the hold-down screws followed by rotation of the cams in the opposite sense as before releases the workpieces and permits their removal from the work table. From the above-described operation of the apparatus shown in FIG. 1, it can be seen that the location of stationary positioning blocks **7** and **8** determines the zero position of the jig. This feature, together with the ease of manipulation of the apparatus permits the drilling of spinnerette blanks in rapid sequence.

A further advantage of my invention is that the structure of the apparatus gives freedom from any significant

protrusions above the upper surface of spinnerette blanks 26 and 27 as shown in FIG. 2.

Referring to FIG 3, a variant of the preferred apparatus embodying the features of my invention is shown wherein six circular spinnerette blanks 31 of equal diameter may be simultaneously secured to supporting surface 2. Positioning blocks 32 are designed so that each abuts two spinnerette blanks simultantously. Positioning blocks 32 are located on supporting surface 2 by means of dowels 33 extending through positioning blocks 32 into supporting surface 2 as shown in FIG. 11. Positioning blocks 32 are secured to supporting surface 2 by means of screws 34 extending through positioning blocks 32 and into supporting surface 2 as shown in FIG. 11. The head 35 of each screw 34 is provided with a wrench socket 36 (not shown in FIG. 11) centered on the axis of said screw 34. Wrench sockets 36 are adapted to receive the complementary-shaped end of a wrench to facilitate tightening of screws 34.

Positioning blocks 37 are located and secured at the corners of supporting surface 2 by means of dowels 38 and screws 39 respectively, in a manner analogous to that by which positioning blocks 32 are located and secured as shown in FIG. 11. Circular positioning blocks 41 are located and secured to supporting surface 2 by means of screws 42 extending through the center of circular positioning blocks 41 into supporting surface 2 as shown in FIG. 10. The head 43 of each screw 42 is provided with a wrench socket 44 (not shown in FIG. 10) centered on the axis of screw 42. Wrench sockets 44 are adapted to receive the complementary-shaped end of a wrench to facilitate tightening of screws 42. Each circular block 41 is positioned on supporting surface 2 so as to contact two spinnerette blanks 31 simultaneously. The upper circumference of circular positioning block 41 encompasses flange 45 which forms an angle of between about 145° and about 155°, and preferably about 150° with vertical wall 46 of circular positioning block 41 as shown in FIG. 10.

Referring to FIG. 4, positioning blocks 32, 37 and 41 are shown in vertical elevation. The positioning blocks 32, 37 and 41 extend to a height above the top surface of spinnerette blanks 31 only enough so that a "wedging" action is exerted upon spinnerette blanks 31.

In operating the apparatus shown in FIGS. 3 and 4, hold-down screws 42 (FIG. 10) in circular positioning blocks 41 are maintained in a loosened condition, thereby permitting circular positioning blocks 41 to be lifted slightly off supporting surface 2. Spinnerette blanks 31 are slipped into position as shown in FIG. 3 and secured to supporting surface 2 by tightening hold-down screws 42. To remove a workpiece from the work table, the above steps are reversed. Stationary positioning blocks 32 and 37 remain secured to supporting surface 2 during the above operation to maintain a fixed zero position on the jig.

The design of the apparatus shown in FIGS. 3 and 4 permits the replacement of three pairs of spinnerette blanks independently, each pair of blanks being removable simultaneously. FIG. 4 shows the complete absence of any significant protrusions above the tops of spinnerette blanks 31.

Referring to FIG. 5, positioning blocks 47 and 48 are each shown in simultaneous contact with six spinnerette blanks 53. Positioning blocks 47 and 48 are secured to supporting surface 2 by means of screws 49 extending through positioning blocks 47 and 48 into supporting surface 2 as shown for positioning block 47 in FIG. 13. Positioning blocks 51 and 52 are adapted to be located and secured onto supporting surface 2 by means of dowels 50 and hold-down screws 54 and 55 respectively, in a manner hereinbefore described for positioning blocks of other preferred embodiments and as shown in FIG. 12. The abutting faces of positioning blocks 47 and 48, respectively are flanged along their upper edges as shown in FIGS. 6 and 13. By way of illustration, flanged surface 57 and vertical surface 58 of the abutting face of positioning block 57 shown in FIG. 13 form an angle of between about 145° and 155°, and preferably about 150°.

Operation of the apparatus shown in FIG. 5 requires only that position blocks 47 and 48 be loosened from supporting surface 2 in order to replace finished workpieces. Each adjustment of positioning block 47 or 48 permits the simultaneous replacement of six spinnerette blanks.

I claim:

1. Apparatus for positioning and clamping a substantially flat workpiece, such as a spinnerette blank and the like, on a supporting surface which comprises, in combination, a work table having a supporting surface and a plurality of positioning blocks releasably secured to said surface to provide three points of contact between said positioning blocks and said workpiece, two of said positioning blocks being attached to said supporting surface in a stationary position and one of said positioning blocks slidably secured to said supporting surface, said stationary blocks being secured to said supporting surface by a pair of locating dowels and a hold-down screw and said slidable block being provided with an elongated slot having a hold-down screw extending therethrough and into said supporting surface for securing the said slidable block to said surface, and a cam mounted upon said supporting surface in contact with said slidable block for actuating said block into position for holding said workpiece whereby a fixed zero position jig may be maintained to facilitate rapid insertion and removal of workpieces.

2. An apparatus as described in claim 1 wherein one of said positioning blocks abuts two workpieces.

3. An apparatus as described in claim 2 wherein the positioning blocks are provided with an inclined wall which abuts the workpiece, said inclined wall extending downwardly away from said workpiece.

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U.S. Cl. X.R.

269—138; 144—288