Feb. 16, 1954 C. R. WILSON 2,669,027

MICROMETER TANGENT BAR

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Fig. 1

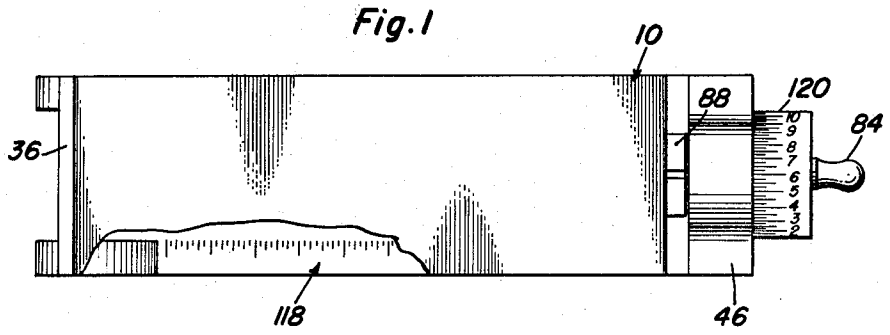


Fig. 2

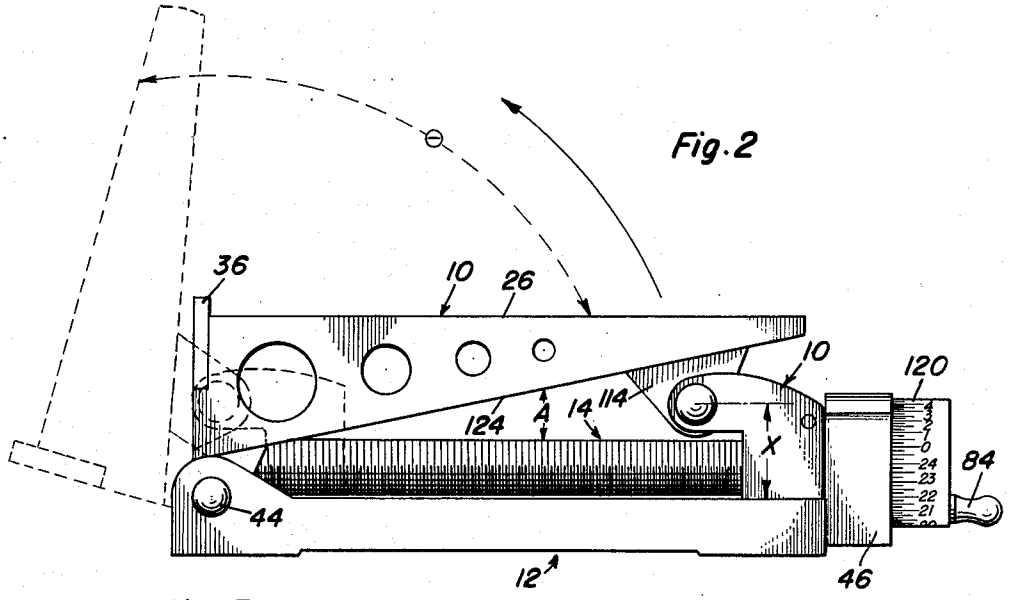
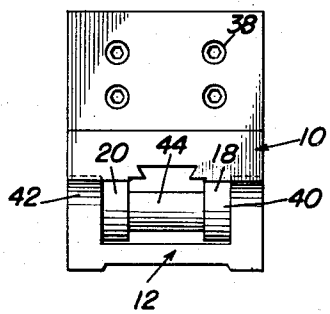


Fig. 3



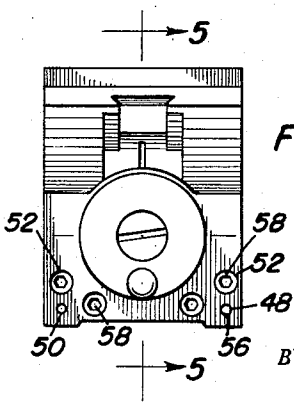


Fig. 4

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Fig. 5

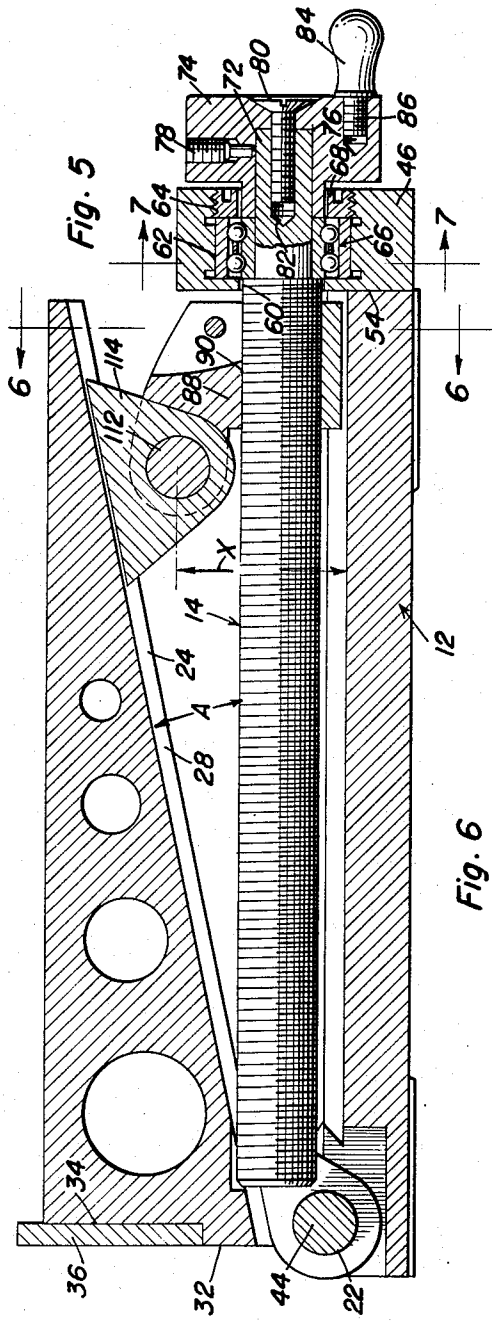


Fig. 7

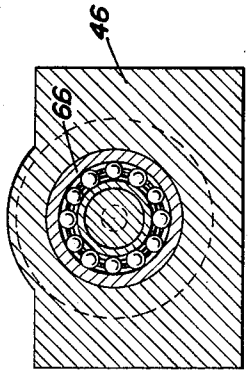
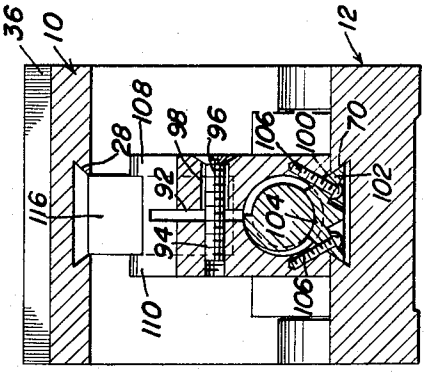


Fig. 6



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MICROMETER TANGENT BAR

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Application July 12, 1950, Serial No. 173,262

5 Claims. (Cl. 33—174)

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The present invention relates to improvements in angle measuring devices, and more particularly to the type of angle measuring device adapted to be set at predetermined micrometer angles.

An object of the present invention is to provide a tool for measuring angles or setting angles for use in die making operations and the like.

A further object of the present invention is to provide an improvement over existing angle setting tools, the present invention being based on the fact that angles may more accurately be measured by their tangent values than by their sine or cosine values.

Still another object of the present invention is to provide an improved angle setting device which may be employed in conjunction with specially prepared tables for micrometer settings whereby preselected angles may be set.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes embodiments of the present invention, which are given by way of illustration or example only.

The best form in which I have contemplated applying my invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a top plan view of the present invention with a portion of the angle plate broken away;

Figure 2 is a side elevational view of the present invention showing the angle plate in dotted lines in a second position;

Figure 3 is an end elevational view of Figure 2 looking from left to right;

Figure 4 is a side elevational view looking from right to left in Figure 2;

Figure 5 is a vertical longitudinal sectional view taken substantially along the plane of line 5—5 of Figure 4;

Figure 6 is a vertical transverse sectional view taken substantially along the plane of line 6—6 of Figure 5; and

Figure 7 is a vertical transverse sectional view taken substantially along the plane of line 7—7 of Figure 5.

Referring more particularly to the drawings, wherein like numerals designate like parts throughout, numeral 10 designates generally the angle plate, numeral 12 designates generally the base supporting means, numeral 14 designates generally the screw actuating means and numeral 16 designates generally the micrometer nut means.

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The angle plate 10 is of substantially triangular cross section being provided with a pair of downwardly extending ears 18 and 20 which are apertured at 22. The lower face 24 of the angle plate 10 forms a predetermined angle with respect to the upper face 26 and is provided with a dovetail slot 28 throughout its length. The base 32 of the angle plate 10 is provided with a recess 34 in which is disposed an end plate 36. The end plate 36 is secured to the wall of the recess 34 by means of a plurality of Allen head screws 38.

The base supporting means 12 is of substantially rectangular form and is provided with a pair of upstanding bearing portions 40 and 42 which are adapted to embrace the ears 18 and 20 and rotatably support the bearing pin 44. The bearing pin 44 is adapted to extend through each of the ears 18 and 20 for pivotally supporting the angle plate 10.

As seen best in Figure 5, the end of the base supporting means 12 opposite to the pivot pin 44 is provided with a bearing mounting housing 46 which is formed with a pair of dowel holes 48 and 50 and a plurality of bores 52. The end face 54 of the base supporting means 12 is provided with longitudinally extending dowel pins 56 which are adapted to be received within the holes 48 and 50 of the bearing housing 46 for positioning thereby. The housing 46 is secured to the base supporting means 12 by means of a plurality of Allen head screws 58.

The bearing housing 46 is provided with a central bore 60, a counterbore 62 and a threaded portion 64. The outer race of the conventional ball bearing unit 66 is press fitted into the counterbore 62 and is rigidly held in position by means of the locking ring 68 which is threadably engaged with the threads 64.

The base supporting means 12 is also provided with a dovetail slot 70, as best seen in Figure 6.

The screw actuating means 14 is rotatably supported by its bearing portion 72 within the conventional bearing 66. A handle supporting element 74 is provided with a counterbore 76 in which is received the end of the bearing portion 72. The set screw 78 secures the elements 74 from rotation with respect to the portion 72, and a screw 80 is threadably engaged in a bore 82 in the end of the bearing portion 72 with its head engaging the outer surface of the elements 74 for retention thereby. The handle 84 of any

desired form is threadably mounted in the elements 74 and 86.

The nut micrometer means 16 includes a screw engaging portion 88 provided with an internally threaded bore 90 and is split at 92. The nut portion 88 is provided with a threaded bore at 94 in which is threadably received the end of a screw 96. The head portion of the screw 96 abuts the side of the nut portion 88 on the opposite side of the split 92 and has the threaded shank portion freely received in a bore 98. With this arrangement, it will readily be seen that the degree of friction between the screw means 14 and the micrometer nut means 16 may be varied.

The lower end of the micrometer nut means 16 is provided with a V-slot 100 which provides communication between the threaded bore 90 and the bottom face of the nut 16. Positioned within the V-slot 100 is a dovetail slot engaging element 102 which is provided with threads 104 for engagement with the screw means 14. A pair of screws 106 are adapted to maintain the member 102 in position and to vary the degree of friction between the member 102 and the screw means 14, and also between the member 102 and the dovetail slot 76. The nut 16 is provided with a pair of ears 108 and 110 which are apertured for receiving the pivot pin 112 upon which the slide element 114 is pivotally mounted.

The slide element 114 is provided with a dovetailed head 116 for sliding engagement with the dovetail slot 28.

As seen in Figure 1, the base supporting means 12 may be provided with indicia markings 118 on its upper surface which may be employed to determine the position of the micrometer nut 16 with respect to the pivot pin 44. Further, the element 74 is provided with externally inscribed indicia 120 which may be calibrated for use in determining the angle of the upper face 26 of the angle plate 10.

The foregoing description, taken in conjunction with the drawings is believed to set forth the operation of the device which will be readily apparent to one skilled in the art. By merely rotating the handle 44, the screw means 14 will be simultaneously rotated within the bearing means 66 and will cause the micrometer nut to be threadably moved longitudinally of the base 12 with the slide member 114 engaged in the dovetail slot 28. The movement of the nut 16 in the slide 114 will cause pivoting movement of the angle plate 10.

It will be noted that the underside of the plate 10 at 24 forms a predetermined angle with respect to the horizontal, and this angle is termed the base angle. The distance x, on Figure 2, is of a fixed amount and is employed for determining the actual angle of the upper surface 26 with respect to the horizontal. Thus, if it is desired that the base 26 be positioned at a predetermined angle theta, the angle theta is added to the base angle, and the cotangent of the result angle is evaluated. The product of the cotangent of that angle and the amount x gives a result in inches which is the base of a triangle. The micrometer screw may then be rotated until the indicia 118 and 120 each give the reading of the above result. It is believed that one skilled in the art will readily understand how angles of greater than 90° may be set.

Inasmuch as the present invention involves the use of tangents and cotangents rather than sines and cosines, it will be seen that the degree of accuracy possible with this device is high.

This will become obvious when it is realized that the tangent and cotangent tables read to a greater number of significant numbers than the sine and cosine tables.

If desired, special tables may be made for use with various sizes of the tangent angle bar and for setting the dial at predetermined degrees, minutes, or seconds based on the above formulae. The use of the tables would eliminate much of the time consumed in figuring out the above formulae.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope without sacrificing any of the advantages thereof.

Having thus described my invention, what I claim to be new is:

1. A tangent bar comprising a supporting base, a pivotable means pivotally mounted on said supporting base, an actuating screw rotatably mounted on said supporting base and being secured against longitudinal movement thereon, means reciprocally engageable with said actuating screw and said pivotable means and being actuated by said actuating screw to effect pivoting of said pivotable means, said pivotable means including a plate having an upper and a lower face angularly disposed relative to said upper face, a longitudinally extending dovetailed slot in the lower face of said plate, said reciprocally engageable means comprising a micrometer nut reciprocably moved by said actuating screw, and a slide element pivotally connected to said nut and slidably engaged in the slot of said plate whereby longitudinal movement of said nut will effect sliding engagement between said slide element and said plate, whereby said plate will be pivoted, said supporting base including a longitudinally extending dovetailed slot, the lower end of said nut having a V-shaped slot therein, a dovetail slot engaging element disposed in said V-shaped slot, and means on said nut adjustably maintaining said slot engaging element within said base slot whereby the friction between the element and the base slot may be varied.

2. An angle measuring device consisting of an elongated base having first and second ends, a standard pivoted to said first end, an operating nut mounted on said base for sliding movement between the ends thereof, a slide pivotally mounted on said nut and slidably secured to said standard, an actuating screw rotatably journaled at said second end of said base and threadedly received in said operating nut whereby rotation of the screw will pivot the standard about the base, said standard having top and bottom faces, the top face being flat and the bottom face being inclined thereto with the pivot being located at the end of the standard away from the apex of the angle, the bottom face of said standard forming an inclined trackway thereon, said slide being slidably and non-rotatably secured in said trackway.

3. An angle measuring device comprising of an elongated base having first and second ends, a standard pivoted to said first end, an operating nut, guide means on said base mounting said operating nut for sliding movement between the ends thereof, a slide pivotally mounted on said nut, means slidably securing said slide to said standard, an actuating screw rotatably journaled

on said second end of said base and threadedly received in said operating nut whereby rotation of the screw will pivot the standard about the base, said slidably securing means including said standard having top and bottom faces, the top face being flat and the bottom face being inclined thereto with the pivot being located at the end of the standard remote from the apex of the angle, said bottom face having a trackway formed thereon, said slide being secured in said trackway.

4. An angle measuring device consisting of an elongated base having first and second ends, a standard pivoted to said first end, an operating nut, guide means on said base mounting said operating nut for sliding movement between the ends thereof, a slide pivotally mounted on said nut, means slidably securing said slide to said standard, an actuating screw rotatably journaled on said second end of said base and threadedly received in said operating nut whereby rotation of the screw will pivot the standard about the base, said slidably securing means including said slide having a dovetail projection thereon, said standard having top and bottom faces, the top face being flat and the bottom face being inclined thereto with the pivot being located at the end of the standard remote from the apex of the angle, said bottom face having a dovetailed groove formed therein, said projection seating in said groove.

5. An angle measuring device comprising of an elongated base having first and second ends, a standard pivoted to said first end, an operating nut, guide means on said base mounting said operating nut for sliding movement between the ends thereof, a slide pivotally mounted on said

nut, means slidably securing said slide to said standard, an actuating screw rotatably journaled on said second end of said base and threadedly received in said operating nut whereby rotation of the screw will pivot the standard about the base, said slidably securing means including said standard top and bottom faces, the top face being flat and the bottom face being inclined thereto with the pivot located at the end of the standard remote from the apex of the angle, said bottom face having a trackway formed thereon, said slide being secured in said trackway, said guide means including said base having a dove-tail groove therein, said nut being slidably disposed in said groove.

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