Jan. 5, 1954 A. R. CLYNE 2,664,768

MOTION LIMITING DEVICE

Filed June 1, 1950 2 Sheets-Sheet 1

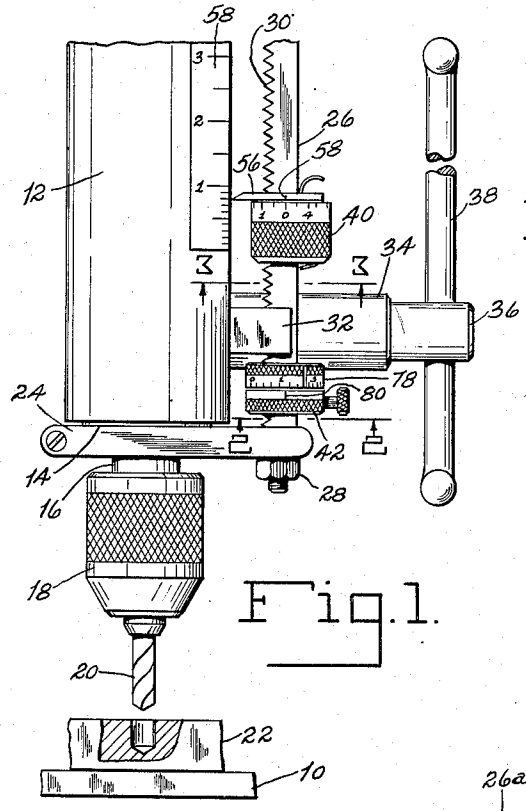

Fig. 1.

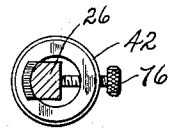

Fig. 2.

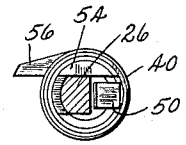

Fig. 3.

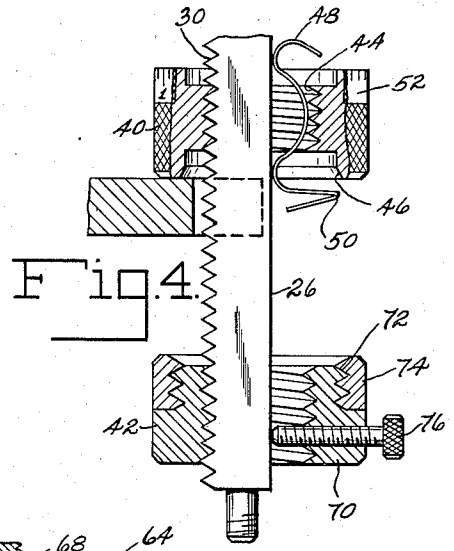

Fig. 4.

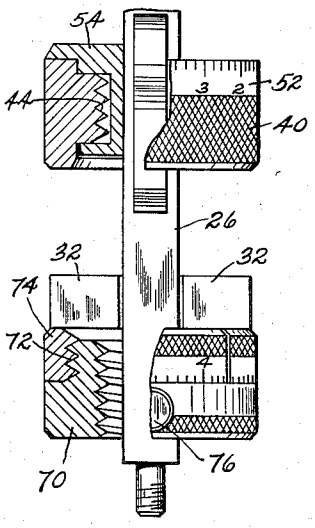

Fig. 5.

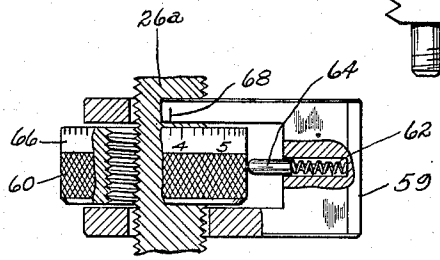

Fig. 6.

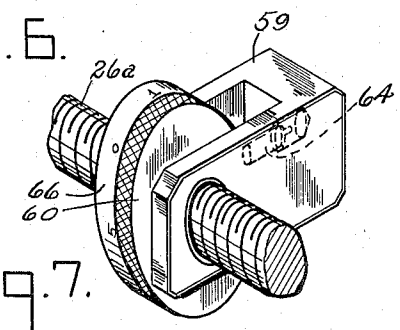

Fig. 7.

INVENTOR.
ALOYSIUS R. CLYNE
BY
J. Donald MacKnight
ATTORNEY

Jan. 5, 1954 A. R. CLYNE 2,664,768

MOTION LIMITING DEVICE

Filed June 1, 1950 2 Sheets-Sheet 2

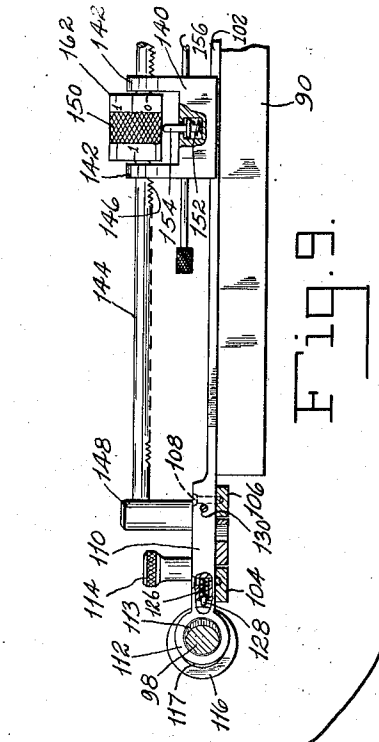

Fig. 9.

Fig. 8.

INVENTOR.
ALOYSIUS R. CLYNE
BY
J Donald MacKnight
ATTORNEY

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UNITED STATES PATENT OFFICE

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MOTION LIMITING DEVICE

Aloysius R. Clyne, New Dorp, N. Y.

Application June 1, 1950, Serial No. 165,569

1 Claim. (Cl. 77—34.5)

1

This invention relates to a quick-setting or stop device adapted to be used where it is desired to position one element accurately with respect to another element or to limit the relative movement between two elements. The invention has many applications such as in machine tools operation, hand tools having relatively movable parts, drafting apparatus where it is desired to position a straight-edge, angle or the like on the drafting board, etc.

The principal object of the invention is the provision of a small compact setting or stop element adapted to be manipulated by one hand quickly and easily along a longitudinal element and to be locked thereupon at a predetermined exact point.

Although, as stated above, the invention has many different applications, it will be described at first as a quick-setting stop device for controlling or limiting the relative movement between the vertically moving quill and the fixed or head portion of a drill press. Other applications of the invention will also be described.

A conventional drill press usually comprises a base or table, a spindle or post attached to the base and extending upwardly and a drill press head mounted on the post. Within the head and vertically movable therein is a sleeve or quill which serves as a bearing support for the drill shaft which carries a drill chuck at its lower end. Means are provided for raising and lowering the quill, and thus drill shaft, with respect to the head. The conventional depth gauge and stop for indicating the vertical position and limiting the movement of the quill with respect to the head usually comprises a bracket attached to the quill and extending laterally therefrom and a short, threaded rod extending upwardly from the end of the bracket parallel to the side of the drill press head. A lug affixed to the side of the head projects laterally close to the threaded rod and cooperates with a nut having threaded engagement with the rod. By turning the nut, it can be moved upwardly or downwardly along the threaded rod to a desired position and then, when the quill is moved downwardly with respect to the head, the nut will engage the projecting lug so as to limit or stop further downward movement. The nut usually cooperates with a scale on the head to indicate the permissible vertical movement of the quill and drill shaft with respect to the head.

A very important disadvantage of the conventional drill press construction described above is that whenever it is necessary to change the depth

2

gauge or stop one must screw the stop nut along the threaded rod to the desired position. This of course takes time and some effort, particularly when it is necessary to move the nut along the rod more than a small fraction of an inch. Another disadvantage is that unless a lock nut is also provided on the threaded rod, vibration of the drill press may cause the nut to rotate on the rod, thus changing the desired setting. Where a duplicate nut, i. e. a lock nut, is provided, then the operator must thread both nuts along the rod to the desired position and then lock them together.

In accordance with this invention means are provided whereby the depth stop can be moved very quickly from one position to another where it will remain without movement, even when considerable vibration is present. A micrometer adjustment is also provided so that the depth stop can be positioned with extreme accuracy, and this of course is very important where accuracy is required in the drilling operation. Very simply described, the device is similar to a nut and bolt, the exception being that the "nut" can be slid quickly to the desired position without being turned on the bolt or rod, after which the nut can be turned to the exact position desired.

For a better understanding of the invention, reference may be had to the accompanying drawings in which:

Fig. 1 is a front elevation showing the essential parts of a drill press;

Fig. 2 is a bottom view of the device taken on the line 2—2 of Fig. 1;

Fig. 3 is a bottom view of another part of the device taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged vertical sectional elevation through the adjusting ring members;

Fig. 5 is a vertical sectional elevation through the parts shown in Fig. 4, but taken from the right;

Fig. 6 is a sectional view of a modified form of adjusting ring or stop;

Fig. 7 is an isometric view of the modified form of Fig. 6;

Fig. 8 is a plan view showing the stop device as applied to a drafting board, and

Fig. 9 is a vertical sectional elevation taken on the line 9—9 of Fig. 8.

Referring to the drawing, Fig. 1 is a front view of a portion of a drill press comprising a drill press table 10, a head 12, a quill 14 vertically slidable within the head, a drill shaft 16 mounted for rotation within the quill, a drill chuck 18 secured to the lower end of the drill shaft, and a drill bit

20 secured in the chuck. A piece of material 22 is shown resting upon the table 10. Secured to the vertically slidable quill 14 is a clamp bracket 24 projecting toward the right and adapted to support a rod 26 threaded into the bracket at its lower end and secured thereto by means of the nut 28. As shown more clearly in Figures 2 and 3, the rod 26 is flat on three sides and threaded at 30 on the side disposed toward the drill press head. Secured to and projecting laterally from the drill press head 12 is a forked lug or bracket 32 disposed, as shown in the Fig. 5, so that the open or forked portion partly surrounds the vertical rod 26. Conventional means are shown for moving the quill and its drill shaft vertically within the head, these means comprising a laterally projecting sleeve 34, a shaft 36 rotatably mounted within the sleeve and a bar 38 passing through the outer end of the shaft. The left hand end of the shaft 36 is provided with teeth not shown, adapted to cooperate with teeth on the back side of the quill 14 in a manner well known so that when the operator grasps the bar 38 and turns the shaft 36, the quill will move up or down. During this movement the rod 26 will, of course, move correspondingly up or down within the forked lug 32.

Mounted for vertical rotational adjustment on the depth rod 26 are two stop members or rings 40 and 42, the member 40 being positioned above the lug 32, and the member 42 being positioned below the lug 32 and above the quill bracket 24. As shown more clearly in Figures 4 and 5, the hole through the ring member 40 is larger in diameter than the width of the rod 26 and the member is provided with internal threads 44 of the same type as the threads 30 on the rod 26. The upper and lower faces of the ring 40 are recessed and the lower inside edge is tapered as at 46. A spring which may be of the general shape shown at 48, fits within and between the right hand surface of the rod 26 and the ring 40. It will be observed that with the construction shown, pressure applied to the outer right hand side of the ring 40 will cause the spring 48 to be compressed while at the same time the threads 44 will be released from the threads 30. While the threads are thus released or disengaged, the ring 40 can be moved easily up or down along the rod 26, and upon the release of the pressure, the spring 48 will again force the ring to the right so that the threads 30 and 44 will again be engaged. The lower end of the spring 48 is provided with a projection 50 adapted to engage the tapered edge 46 of the ring 40 so that when the spring is moved upwardly by pressure of the fingers, the projection 50 will wedge into the tapered ring portion 46, thus holding the ring 40 tightly in engagement with the rod 26. The upper outer periphery of the ring 40 is slightly recessed, and an indicia or zeroing ring 52 is frictionally engaged with the recessed portion of the ring so that it can be turned around the ring as will be described hereinafter.

As shown more clearly in the other side view of Figure 5, a guide member 54 is fitted within the ring 40 and between the front side of the ring and the front of the rod 26. The guide 54 is recessed to accommodate the threads 44 of the ring and thus does not interfere with the turning of the ring about its vertical axis. The inner surface of the guide 54 slides along the front flat surface of the rod 26 when the ring is being moved up or down. As shown in Fig. 1, the guide 54 is provided with a pointed extension 56 adapted to

cooperate with a scale 58 secured to the side of the drill press head 12. The guide 54 is also provided with an index or reference mark 58 cooperating with the indicia ring 52.

In the operation of the device so far described, and in using the device as a depth controlling stop, the point of the drill bit 20 is brought into contact with the upper surface of the material 22, and with the drill in this position, the ring 40 is pressed toward the head 12 and slid down the rod 26 until its lower face comes in contact with the upper surface of the forked lug 32. If, when the pressure is released, the threads do not permit the ring to engage the lug, the ring will be turned slightly while the threads are engaged. The indicia ring 52 is then turned about the outer surface of the main ring 40 until the zero marking on the ring coincides with the reference mark 58 on the guide member 54. The depth of the desired hole is selected and the ring 40 is again pressed toward the drill press head and slid upwardly until the pointer 56 is opposite the desired depth reading on the scale 58. Again, it may be necessary to turn the ring 40 after the pressure is released so that the pointer will coincide exactly with the desired reading on the scale. As an example, let us assume that we desire to drill a hole .500 inch deep in the material 22 and also assume that the scale 58 is inscribed in inches with as many marks per inch as there are threads per inch on the rod 26. The bar 38 is manipulated to bring the point of the drill 20 into contact with the surface of the material 22 at the desired point, and the ring 40 is set so that the pointer 56 is opposite the .500 mark on the scale 58, the peripheral markings or indicia on the ring 52 having been "zeroed." The stop is now set and by turning the bar 38 to perform the drilling operation, the bit will advance into the material and the ring 40 will descend until it strikes the forked lug 32. This will stop the descent of the ring 40 and thus the drill bit. The point 56 will now read zero on the scale 58, and hence the movement of all the parts involved and the depth of the hole will be exactly .500 inch.

If a hole is desired, the depth of which is not shown exactly on the scale 58, it can be obtained by positioning the drill and zeroing the ring 40 as described above. With the drill bit in contact with the upper surface of the material 22, the pointer 56 is set to the nearest division on the scale 58 and the ring 40 is then rotated for the fraction of the division desired. This is accomplished by turning the ring 40 until the index mark 58 is opposite the proper mark or division on the ring 52.

In Figures 6 and 7 is shown a modification of the depth stop. In this case a U-shaped housing or support 59 is placed around the rod 26*a* and the legs of the support member embrace a ring 60 which, like the ring 40, is provided with an internally threaded hole larger in diameter than the rod 26*a*. The center portion of the support member is provided with a recess adapted to house a compression spring 62 and a small plunger 64 biased by the spring into engagement with the knurled outer surface of the ring 60. The spring 62 and the plunger 64 normally force the ring 60 to the left so as to engage the threads on the rod 26*a* which in this case may be threaded around its entire surface. Pressure applied to the left hand surface (as viewed in Fig. 6) of the ring 60, compresses the spring 62 and releases the threaded ring from the rod 26*a* so that the ring and the support member 59 can be moved longi-

tudinally of the rod to the desired point. When the pressure is released, the threads will again engage, thus holding the ring against the rod. The ring 60 is preferably provided with an indicia ring 66 similar to the ring 52 of Fig. 4 which may be turned in friction engagement with the ring 60 and adapted to cooperate with an index mark 68 on the support member. The operation of this embodiment is substantially the same as that previously described with reference to the ring 40, except that in this case the lower surface of the support member 59, rather than the ring, is adapted to engage the lug 32 on the drill press head.

In order to limit the return or upward movement of the quill and drill shaft, a return stop device is disclosed, which in some ways is similar to the depth stop ring 40. As is shown more clearly in Figures 4 and 5, the return stop member 42 comprises an internally threaded annular portion 70 having a hole larger in diameter than the rod 26. The upper portion of the member 70 is reduced in diameter and provided with external threads 72, adapted to engage an internally threaded ring 74. A set screw 76 is threaded through the ring member 70 and is adapted to engage the right hand side of the rod 26 so that the internal threads of the member 70 will tightly engage the threads 30 on the rod 26. As is shown more clearly in Figure 1, the lower outer periphery of the ring 74 is preferably provided with a friction indicia or zeroing ring 78 adapted to be turned about the ring 74 and to cooperate with a reference mark 80 on the annular member 70. The return stop ring 42 is placed between the forked lug 32 and the quill bracket 24 around the rod 26. When the set screw 76 is unscrewed or loosened by an amount such that the internal threads of the member 70 can be disengaged from the threads 30, the ring assembly may be moved along the rod 26 to approximately the desired location and when the set screw 76 is tightened, the assembly will be rigidly locked in position. If the ring 74 is now turned it will move laterally out of the member 70 until the upper surface of the ring 74 engages the lower surface of the lug 32.

The return stop 42 is useful when it is desired to use the drill press as a micrometer for measuring the thickness of a member such as the member 22. When used as a micrometer, the drill bit 20 becomes the equivalent of a micrometer "spindle" and the table 10 becomes the micrometer "anvil." The member 22 to be measured is placed on the table 10 and the drill bit is lowered until it contacts the upper surface of that member. While in this position, the return stop ring 42 is moved upwardly as close as possible to the under side of the lug 32 and the set screw 76 is turned, temporarily securing the ring member 70 to the rod 26. The return stop adjusting ring 74 is now turned until it comes into contact with the lower surface of the lug 32. The depth stop ring 40 is "zeroed" on the upper face of the lug 32 as has been previously described. The member 22 is now removed from the table 10 and after the depth stop ring 40 is moved upwardly, the drill bit is lowered until it strikes the table 10. While the bit is in this position, the depth stop ring 40 is slid along the rod 26 and turned if necessary until it engages the top of the lug 32. The drill bit is then raised until the ring 42 again engages the under side of the lug 32 and the thickness of the member 22 can be read on the scale 58 opposite the pointer 56 in conjunction with the peripheral markings or indicia 22 with reference to the index mark 58. By using the described method along with "known standards" (rods or plates having exactly measured thicknesses or lengths), the drill press may be used as a micrometer for its full capacity. The return stop ring 42 may also be used to advantage in multiple operations to prevent the quill from returning upwardly as far as it would otherwise travel.

Another application of the device is shown in Figures 8 and 9 wherein the invention is illustrated as applied to drafting, i. e. drawing board equipment. With the apparatus illustrated, which will now be described, it is possible to make drawings with greater ease and much greater accuracy than hitherto possible:

A rectangular drawing board 90 is provided at its upper and lower left-hand edges with brackets 92 which may be attached to the under side of the board by suitable screws 94. Secured to and between the brackets 92 is a guide bar 96 preferably rectangular in cross section, disposed parallel to the left-hand edge of the drawing board. Also secured to and between the brackets 92 and to the left of the guide bar 96 is a rod 98 which is also parallel to the left-hand edge of the board and consequently to the guide bar 96. The bar or rod 98 is preferably threaded as at 100 along its inner or right-hand side, although if desired, the rod can be threaded around its entire surface. A straight-edge bar 102 fairly thin in cross section, is adapted to be moved up and down along the board 90 and to remain at all times parallel to the upper or lower edge of the board. A pair of gibs 104 and 106 are attached at right angles to the under side of the bar 102 as by suitable screws 108 and are disposed so as to have sliding engagement with the opposite sides of the guide bar 96. The gibs 104 and 106 therefore maintain the straight-edge bar 102 at all times at right angles to the guide bar 96. The left end portion of the bar 102 is preferably thickened as at 110 and is bifurcated to provide projections 112, having holes 113 encircling and larger in diameter than the rod 98, thus enabling the bar 102 to slide along the rod. A finger support 114 is attached to and projects upwardly from the bar 102 near the bifurcated end portion thereof.

Disposed within the opening between the ends 112 of the bar 102 is a quick setting ring member 116 similar to the member 60 previously described and shown in Fig. 6. As is the case with the ring 60, the member 116 is provided with a center hole 117 larger in diameter than the rod 98, the inner surface of the hole being threaded with the same type threads as those at 100 on the rod 98. The ring 116 is preferably provided with a friction zeroing ring 118 similar to the ring 66 on member 60 and adapted to be turned about the outer periphery of the ring 116 and provided with indicia adapted to cooperate with a reference mark 120 on one of the ends 112. If desired, the lower edge of the ring 116 may also be provided with indicia 122 adapted to cooperate with a second reference mark 124. Within the enlarged portion 110 of the bar 102 is a recess containing a compression spring 126 adapted to press a small plunger 128 against the outer knurled surface of the ring 116. A rod-like pointer 130 is mounted laterally in and has friction engagement with the enlarged portion 110 of the bar 102, this pointer being provided with a knurled head 132. By grasping the head 132 the pointer rod 130 can be moved forward or backwardly

along the upper surface of the guide bar 96 for cooperation with suitable indicia 134 thereon. The scale 134 should contain one mark for each of the threads 100, although for purposes of simplicity all of the marks are not shown in the drawing. The gib 106 is preferably cut out as at 136 to provide a space in which a spring 138 is disposed, this spring bearing against the gib 106 and the right-hand edge of the bar 96 and serving to maintain the left-hand gib 104 in snug engagement with the left-hand edge of the guide bar 96.

With the apparatus so far described, the ring 116 will be biased to the left by the spring 126 and plunger 128 so that its internal threads will be in engagement with the threads 100 on the rod 98. This engagement of the threads will lock the straight-edge bar 102 in any predetermined position on the upper surface of the drawing board 90. When it is desired to move the bar forward or backward on the drawing board, the ring 116 is pressed toward the right, the fingers being assisted by placing the thumb on the right side of the support 114 and the straight-edge bar is then slid along the surface of the board until it is in approximately the desired position. Pressure on the ring 116 is then released and the internal threads of the ring engage the threads 100 on the rod 98 so that the bar 102 will be locked to the rod. If the bar 102 is not exactly in the position desired, the ring 116 may be turned and due to the engagement of the threads the bar 102 will move slightly in one direction or the other, until the exact position is attained. If it is desired to know how far the bar 102 was moved, the pointer 130 may be set opposite one of the marks on the scale 134 before moving the bar and then, after the bar has been placed at the desired position, the distance moved can be read directly from the scale 134. As an example, let us assume that the bar 102 is to be moved $2\frac{1}{32}$ inches toward the lower edge of the board 90 and, we will assume that the scale 134 is marked in divisions of $\frac{1}{16}$ inch. First, the pointer 130 will be set to the nearest full inch which we will consider as 7 inches on the scale. The zeroing ring 118 will now be turned around the main ring 116 until zero coincides with the reference mark 120. The threads will now be released by pressing ring 116 to the right as described above and the assembly will be slid along the upper surface of the board 90 until the pointer 130 lines up with the 5-inch mark on the scale 134. The pressure will then be released so that the threads will again engage, after which the ring 116 will be rotated one-half turn which will move the assembly $\frac{1}{32}$ inch toward the lower edge of the board. The total movement will therefore be 2 inches plus $\frac{1}{32}$ inch or $2\frac{1}{32}$ inches. With the apparatus so far described, the straight-edge bar 102 can be moved quickly clear across the board, i. e., from front to back, or back to front, if desired, or it can be moved in very slight increments as in the case where it is desired to draw a plurality of parallel lines very close together. The pencil is, of course, guided by the edge of the bar 102 in the same manner as when using a conventional T-square. A line or lines can also be drawn at right angles to the bar 102 with the same accuracy. To this end, a sliding block 140 is provided, having a recessed lower surface so that it will rest upon the bar 102 so as to be capable of sliding longitudinally thereupon. The block is provided with two upstanding projections 142, each having a hole adapted to encircle a rod 144 having threads 146 along its lower surface. The rod 144 is supported above and parallel to the bar 102 by means of suitable posts 148. In the space between the two projections 142 is a quick setting or locking ring 150 similar to the ring 116 of Fig. 8 and the ring 60 of Fig. 6. As is the case with the rings 60 and 116, the ring 150 is provided with a hole larger in diameter than and adapted to encircle the rod 144. The inner surface of the hole is provided with threads of the same type as those at 146 on the rod 144. Within the body of the block 140 is a recess housing a compression spring 152 and a plunger 154 adapted to press against the knurled surface of the ring 150. The block 140 is also provided with a pointer 156 slidable therein and having a knurled head 158, the pointer cooperating with a scale 160 inscribed on the upper surface of the bar 102. The ring 150 is preferably also provided with a snug-fitting zeroing ring 162 having indicia adapted to cooperate with a reference mark 164 on one of the projections or legs 142 of the block 140.

The operation of the assembly comprising the block 140, ring 150, etc., is similar to that which has been described with reference to the rings 116 and 60. Thus, by pressing downwardly on the ring 150, the threads are released and the block can be quickly moved along the bar 102 to approximately any desired position. When the pressure on the ring is released and the ring rotated, the block 140 will move slightly to one direction or the other to the exact position desired. A pencil can be placed on the upper edge of the bar 102 against the side of the block 140 and by manipulating the ring 116, the entire assembly can be moved forward or backward over the drawing board so that a line will be drawn which will be exactly at right angles to the bar 102. It will be understood that other drafting implements, such as protractors, angles and the like, may be placed against the edge of the bar 102 and the block 140 so that lines may be drawn at any desired angle with respect to the bar 102.

Although the invention has been described in two rather different embodiments or rather, applications, it is to be understood that the invention comprises essentially an internally threaded ring encircling and having a larger inner diameter than a threaded rod, and means for biasing the ring so that its threads will normally engage those of the rod to lock one member in position with respect to the other; further, that the ring can be rotated while the threads are still in engagement so as to move one of the members slightly with respect to the other for purposes of accuracy. It should also be understood that either of the members, i. e. the rod passing through the ring or the member supporting the ring, may be fixed while the other is movable.

Obviously many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof and, therefore, only such limitations should be imposed as are indicated in the appended claim.

I claim:

A setting device adapted to be positioned at any location on a threaded rod comprising an annular internally threaded ring encircling said rod, the internal diameter of said ring being greater than the external diameter of said rod, and resilient means between a portion of the inner surface of the ring and said rod for forcing said portion of the ring away from said rod

to pull the opposite portion of the ring into cooperative threaded engagement with said rod, the resilient means comprising a strip of spring metal disposed longitudinally of said rod between the outer surface of the rod and the threads on said portion of the inner surface of the ring, and said spring strip being curved so as normally to engage in compression both the rod and threads on the ring, said ring having an annular internal beveled portion and said spring having a bent end portion adapted, when the spring is pressed longitudinally of said rod, to wedge between the outer surface of the rod and the beveled portion of said ring to lock the ring tightly to the rod, the arrangement being such that pressure applied to the outside of said ring portion will release said threaded engagement so that the ring can be slid along the rod until the pressure is released, whereupon the ring will be held, by the

re-engagement of the threads, at approximately the position desired, after which, rotation of the ring will cause it to advance or recede slightly to the exact position desired.

ALOYSIUS R. CLYNE.

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