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LOCKING DEVICE FOR INDICATING AND CONTROL APPARATUS

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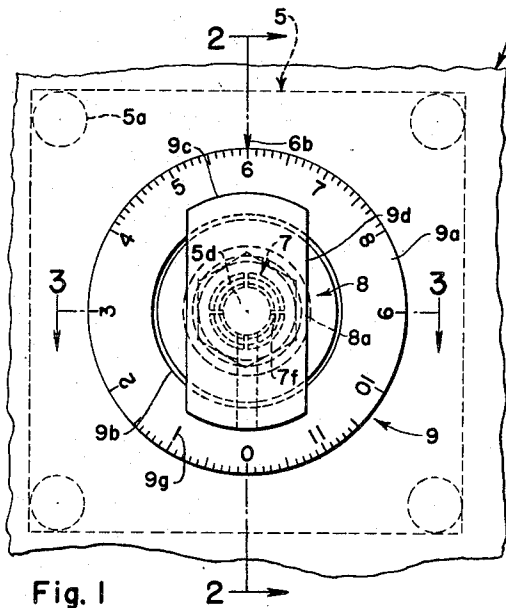


Fig. 1

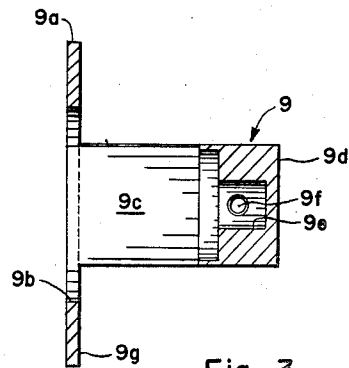


Fig. 3

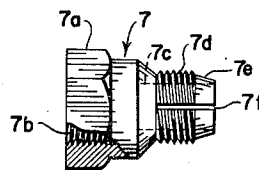


Fig. 4

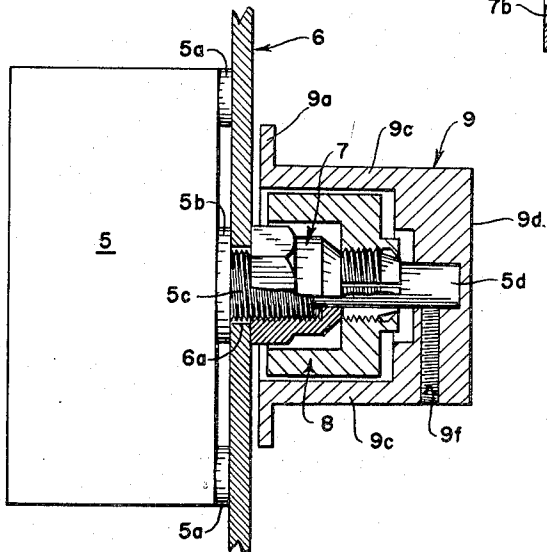


Fig. 2

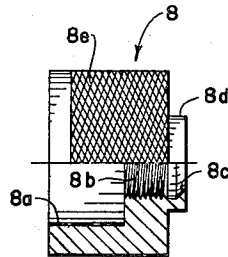


Fig. 4A

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LOCKING DEVICE FOR INDICATING AND
CONTROL APPARATUSTheodore M. Mathison, Seattle, Wash., assignor
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The present invention relates generally to indicating and control apparatus and more particularly to an improved locking device for the dials or indicators of such apparatus.

In the operation of controls of the rotary type it is frequently desirable to lock the control dial or other member in a given position of adjustment at which it is desirable that it not be inadvertently moved or otherwise disturbed. Numerous locks have been proposed for control members such as dials and knobs, but for the most part they have not proven entirely satisfactory due to the locking means frequently distorting or disturbing the desired adjustment which it was intended to preserve and for various other reasons such prior locks have proven objectionable, particularly where vibration service requirements have been rigid.

The present invention is directed to an improved locking device which may preferably take the form of an internally threaded locking member which engages the external threads of a collet-type shaft engaging portion of a mounting nut by which the control instrumentality is mounted upon a wall or panel. The dial or other indicating means, is preferably directly fixed to the shaft of the control device in a surrounding relationship with respect to the internally threaded locking member, with a portion of the dial knob or hub cut away to provide access for the locking member. The improved device has proven extremely satisfactory particularly where critical or fine adjustments of the control apparatus are required to be made and positively retained without the slightest disturbance during the locking procedure, which may be accomplished by a single hand of the operator.

It is accordingly a major object of the present invention to provide an improved locking device for a dial or other indicating means mounted upon a control shaft or pivot. It is a further object to provide such a locking means which will not disturb or distort the adjusted setting of the control. It is a still further object to provide a single mounting member for the attachment of a control device to a wall or panel which member serves also to frictionally grip the control shaft for fixedly locking the same with respect to the control device and the panel. A further object resides in an improved arrangement of the locking member which engages the mounting nut for directly locking the control shaft to the device and to the panel, and separately from the dial or other indicating means. Other objects and advantages of the present in-

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vention, both with respect to its overall arrangement and the details of its respective parts, will become obvious to those skilled in the art after reading the following description, taken in conjunction with the accompanying drawings, forming a part hereof, in which:

Fig. 1 is a front elevational view of a portion of a panel and a control unit upon which the improved device has been mounted;

Fig. 2 is a transverse sectional elevation of the apparatus shown in Fig. 1, as taken along the lines 2—2 thereof;

Fig. 3 is a sectional view of the dial member as taken along the lines 3—3 of Fig. 1;

Fig. 4 is an elevational view, partly broken away showing the mounting nut member; and

Fig. 4A is a similar partly cross-sectioned elevational view of the locking member.

As shown in Figs. 1 and 2, the numeral 5 represents a control device, instrument or similar instrumentality arranged for mounting upon the panel or wall 6 for adjustment by an operator, and to be maintained at any desired setting. The control instrumentality 5 may be an electronic unit or similar equipment which may be subjected to considerable vibration such as in aircraft, ships, or other vehicles, although it will be understood that the present invention is general in character and is equally applicable to other devices which may require adjustment and locking. The control unit 5 is preferably provided with a plurality of mounting lugs or bosses 5a with a central enlarged circular boss 5b coaxially aligned with the mounting thread 5c and the control shaft 5d. It will be understood that the threaded male mounting stud 5c is fixed with respect to the housing of the control unit 5 and is internally bored to provide a guide and bearing for the control shaft 5d which is preferably operatively connected to the moving portions of the unit 5.

The panel or other mounting wall 6 is preferably provided with a central aperture or hole 6a to receive and permit protrusion of the threaded stud 5c therethrough with the bosses 5a and 5b bearing against the back of the panel. A mounting head nut 7 is provided with an external hexagonal nut portion 7a, which may be of other polygonal shape to receive and be turned by a suitable wrench, and is internally threaded at 7b to engage the male thread 5c of the mounting stud of the unit 5. The mounting nut 7 is also provided with a reduced diameter collet or gripping sleeve portion having an internal bore

7c to fit about the shaft 5d. This sleeve portion of the mounting nut 7 is provided with external threads 7d and its externally coned sleeve portion 7e as well as the threads 7d are provided with a plurality of longitudinal slots 7f which permit of the springing, compressing and clamping of this portion of the mounting nut about the shaft 5d.

An annular locking member 8 is provided at one end with an enlarged internal bore 8a of sufficient diameter to be rotated with sufficient clearance about the corners of the nut portion 7a of the mounting nut 7 and is provided at its other end with a reduced diameter portion 8d which is internally threaded as at 8b to engage the threads 7d of the mounting nut 7. This end of the locking member 8 which terminates in the reduced diameter boss portion 8d is provided with an internally coned nose or taper 8c which is formed into a mandrel portion arranged to externally engage the male tapered portion 7e at the outer end of the mounting nut 7, shown in detail in Fig. 4. It will accordingly be understood that as the locking member 8 is threadedly engaged and tightened against the mounting nut 7 which in turn has been locked to the stud 5c, and to the panel 6, the camming effect of the portion 8c constricts the split terminal collet portion of the mounting nut 7 as it is drawn thereon and causes this portion to frictionally grip the control shaft 5d and to lock the same with respect to the mounting nut 7, the panel 6, the stud 5c and all of the other fixed portions of the control unit 5. The locking member 8, as shown in detail in Fig. 4A, is preferably provided with an externally knurled portion 8e by which it may be threadedly gripped between the fingers of the operator and rotated in the desired direction for either locking or unlocking the shaft 5d.

The control shaft 5d is preferably of sufficient length to extend beyond the gripping portions 7e of the mounting nut 7 and through the boss 8d of the locking member 8, and the extending shaft portion has mounted upon it the dial or knob element 9, which is shown in detail in Fig. 3. The dial member 9 is provided with a flanged portion 9a for rotation contiguous to the outer face of the panel 6, which flanged portion is provided with an opening or internal bore 9b to permit rotation about the outside diameter of the locking member 8 with sufficient clearance and without interference. The dial member 9 is provided with a pair of arcuate yokes or arms 9c which may preferably be of the same inside diameter as the opening 9b and extend outwardly from the flange 9a with a uniform thickness to the knob head 9d with which they are also integral and serve to attach to the flange 9a. The knob head 9d is provided with an internal bore 9e of a diameter to receive the projecting portion of the control shaft 5d and a set screw 9f is suitably threaded within the knob head 9d for fixedly attaching the same to the control shaft 5d. The outer face of the flange 9a of the dial 9 may preferably be provided with numerals or other indicia 9g and an index line or arrow 9h may preferably be provided upon the outer face of the panel 6 by which the indicia may be registered or the dial adjusted to a desired setting. Obviously the arrangement may be reversed in that the numerals or other indicia may be engraved or otherwise provided upon the panel 6 and the dial utilized merely as a pointer. It will be noted that the knob head 9d is formed as a yoke connecting diametrically opposed portions

of the flange 9a, the yoke being of a width which is a little more than half of the outside diameter of the locking member 8. The yoke forming the arms 9c and the knob head 9d may accordingly be described as the remaining portion of a closed end cylinder having an internal bore 9b from which the opposite and parallel side segments were removed to expose and provide access to the knurled outside face of the annular locking member 8 which rotates with suitable clearance within the bore 9b of the remaining portion of the original closed end cylinder.

The relatively simple operation of the improved control unit is accomplished by initially backing off and rotating the mandrel type locking member 8 such that the gripping collet portions of the mounting nut 7 release their frictional contact with the control shaft 5d to thereby permit its adjustment with respect to the casing of the unit, the panel 6 and the mounting nut 7. Adequate clearance in the axial direction is provided to permit the locking member 8 to be backed off to a sufficient extent from the threads 7d without its boss portion 8d striking the inner face of the knob head 9d, which is suitably counterbored to provide the adequate clearance. After the locking member 8 has been backed off sufficiently to permit the shaft 5d to be unlocked and released the dial member 9 may then be rotated freely to the desired setting. Then by gripping the knurled portion of the locking member 8 and rotating the same upon the threads 7d back to its locking position at which the control shaft 5d is secured to the fixed unit of the assembly, the dial member 9 is also automatically locked without being touched, thereby precluding the possibility of the distortion of the control setting. It will accordingly be seen that by means of the improved device which has been shown and described a very fine adjustment may be made by the single hand of an operator and then merely by shifting his fingers slightly the adjustment may be secured in the desired setting without disturbance to the control setting. It is likewise possible to unlock the dial without physically touching the dial and without loss of its setting in the event the operator decides after unlocking the dial that he desires to continue the adjusted setting and relocks it in that position. Heretofore in dial locking devices where the lock engages the dial such an operation would disturb the setting and the operator would find it necessary to again adjust the dial which in a fine adjustment might involve considerable time and distraction from his other duties.

Other forms and modifications of the present invention, both with respect to its general arrangement and the details of its respective parts, which may occur to those skilled in the art after reading the foregoing description, are intended to come within the scope and spirit of this invention, as more particularly set forth in the appended claims.

I claim:

1. In a shaft locking arrangement for a panel-mounted instrument including a mounting nut for threadedly attaching the instrument to a panel, an instrument shaft rotatably mounted within said mounting nut, said mounting nut having external threads and a longitudinally slotted gripping portion, a locking member threadedly engaging the external threads of said mounting nut for rotation thereon, coaxing cone surfaces provided on said gripping portion and said locking member adapted as the result of

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rotation of the locking member to cause the gripping portion to engage the said shaft, and a dial element fixedly attached to said shaft.

2. A locking arrangement for a panel-mounted instrument having a threaded mounting stud and a controllable shaft, comprising a mounting nut 5 threadedly engaging said stud for fixing the instrument to the panel and having a gripping portion, said shaft rotatably mounted within said gripping portion of said mounting nut, said gripping portion having external threads and longitudinal slots, a locking member threadedly engaging the threads of said gripping portion for rotation thereon and adapted to cause said gripping portion to clampingly engage said shaft for 10 locking said shaft to said mounting nut, and dial means fixedly attached to said shaft.

3. In a locking arrangement for a panel-mounted instrument including a mounting nut for threadedly attaching the instrument to the panel, an instrument shaft rotatably mounted within said mounting nut, said mounting nut having external threads and a longitudinally slotted externally coned gripping portion, a dial element fixedly attached to said shaft, and a 20 locking member threadedly engaging the external threads of said mounting nut and having an internally coned nose for causing said gripping portion to clampingly engage and lock said shaft to said mounting nut.

4. A mounting arrangement for a control unit mounted upon an apertured panel comprising a threaded stud fixed to said unit and a movable shaft operatively associated with said unit, said stud and said shaft protruding through said apertured panel, mounting means including an internally threaded portion for engagement with said stud for the mounting of said unit upon said panel, said mounting means having an externally threaded clamping portion coaxially disposed about said shaft, an internally threaded locking member engaging the external threads of said mounting means for clampingly engaging said 30

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shaft for locking said shaft to said panel, and dial means fixedly attached to said shaft for rotating said shaft and indicating its position with respect to said panel, said dial means having removed portions providing access for the manual operation of said locking member.

5. Shaft locking means for a panel mounted control unit having a mounting stud through which extends said shaft and including a mounting nut for threadedly engaging said mounting stud for attaching said unit to said panel, said mounting nut additionally having external threads and a flexible portion co-axially disposed about said shaft, and an internally threaded locking member engaging the external threads and the flexible portion of said mounting nut, said flexible portion clampingly engaging said shaft for locking said shaft in fixed relationship to said panel.

6. Means for locking the control shaft of a panel mounted control unit in fixed relationship to said panel comprising a mounting stud fixed to said control unit and through which extends said shaft, a mounting nut threadedly engaging said mounting stud and having external threads and an integral flexible portion co-axially disposed about said shaft, and a locking member engaging the external threads of said mounting nut as well as said flexible portion thereof for causing said flexible portion to clampingly engage said shaft.

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