



# UNITED STATES PATENT OFFICE

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## DETENT MECHANISM

George C. Webster, United States Navy

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This invention relates to detent mechanisms, and more particularly to a multiple range detent mechanism.

In some types of apparatus, it is the practice to employ a control shaft having a peripherally notched indicator dial associated therewith and to provide a spring detent mechanism which is associated with the dial so that as the shaft is rotated the detent will sequentially enter the several notches on the periphery of the dial and thereby aid in mechanically locating the shaft at a number of points, as established by the positions of the notches. Such control shafts are of particular value where it is impractical to ascertain the position of the control shaft by visual means, as for example, where the shaft is to be operated in darkness or by the blind. The detent mechanisms may be so constructed as to provide a clicking sound as the detent enters a notch and thereby produce an audible indication of the position of the shaft. However, it may be desirable that stops be located on the periphery of the dial to limit the extent of rotation of the shaft. It may also be desirable that more than one range of rotation be available and at the same time that the detent mechanism be available to indicate the position of the shaft in the second range.

An object of the present invention is to provide an efficient and effective multiple range detent mechanism.

In accordance with one embodiment of this invention, a multiple range detent mechanism may be provided comprising a rotatable control shaft having a disc keyed thereto and provided with a plurality of spaced, peripherally disposed notches. A number of stop members are located at selected points about the periphery of the disc and a spring-actuated detent mechanism is mounted adjacent the disc and is engageable, in one position, with the notches on the periphery of the disc. In that position, the stop members serve as positive limits of the range of rotation. In a second detent position, only the stop members are engaged by the detent, which then moves outside of the notches, while in a third detent position the detent resiliently engages the stops, thus permitting the shaft to be rotated past a stop by the application of additional force. In a fourth position the shaft moves freely and is not affected by the detent.

Other objects and advantages of the present invention will be apparent from the following detailed description taken in conjunction with the drawing, wherein:

Fig. 1 is a plan view, partly in section, of a

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detent mechanism constructed in accordance with one embodiment of this invention, and

Fig. 2 is a side elevation, partly in section, of the device shown in Fig. 1, a portion of the panel being cut away.

Referring now to the drawing, it will be seen that a portion of an apparatus housing is there illustrated comprising a front panel 5 and a side panel 6 mounted at right angles thereto. An aperture 7 is formed in the front panel 5 and is suitably spaced from the side panel 6. A bushing 8 extends transversely through the aperture 7 and is retained therein by an integrally formed flange 9 which bears against the outer side of the panel 5 and a lock nut 10 which is threaded on to the bushing and bears against the inner side of the panel 5, as shown in Fig. 1. A rotatable control shaft 11 extends through the bushing 8 and supports on its outer end a knob 12 by which the shaft may be rotated and which is suitably keyed thereto. A large disc 15 is mounted on the shaft 11 adjacent to the lock nut 10 and is fixed to the shaft by a set screw 16 which extends through a hub portion 17 of the disc 15.

As may be seen in Fig. 2, the disc 15 is provided with a plurality of V-shaped notches 18, which may be spaced about the periphery of the disc 15 as required. The sides of these notches are engageable by the forward end of a spring-pressed or actuated detent plunger 19, the plunger being provided with a small lug 20 having a rounded end integrally formed with the central portion of the forward end of the plunger and the size of the lug 20 is selected so that it is receivable in the notches. The detent plunger 19 is slidably journaled in the left portion of a cylindrical recess 22 suitably formed in a plunger housing 23, which is mounted securely on the side wall 6. A helical spring 24 is positioned in the recess and one end thereof bears against the right end of the plunger, while the opposite end of the spring bears against the inner end of the cylindrical recess, thus urging the plunger to the left.

The mechanism so far described is substantially conventional, and it will be understood that as the shaft 11 is rotated by the knob 12, the lug 20 will sequentially enter the several notches 18 formed in the periphery of the disc 15. As the lug snaps into a notch, being urged forward by the spring 24, it will make a clicking sound, thereby providing an audible indication, and at the same time it will serve to position the control shaft at a particular point determined by the position or location of a given notch. If desired, the forward face of the disc 15 may be provided with

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numbers, as shown in Fig. 2, and a small, rectangular window 25 is formed in the front plate 5 of the housing to permit viewing the numbers. By locating the notches 18 adjacent the numbers, it will be apparent that the lug 20 upon entering a notch will thereby locate the control shaft so that a particular number indicating that position may be viewed. However, when it is desired to move the control shaft to a new position, it is necessary only to apply a slight additional rotational force to the shaft, and the plunger, being held against the disc only by the force of the spring 24, will be moved to the right by the camming action of the rounded lug 20 against a side of a notch, permitting the disc to be rotated in either direction.

It may, in some cases, be desirable to provide a stop to limit the extent of rotation of the control shaft. In accordance with this invention a suitable stop member may comprise a small arcuate block 26 having rounded ends and which is mounted on the periphery of the disc 15 by an associated screw 27 which extends transversely through the block and is threaded into the periphery of the disc 15. A number of such stops may be mounted about the periphery of the disc 15 to provide a plurality of ranges. It will be apparent then that when the side of the detent plunger engages a stop, the control shaft will be prevented from rotating further in that direction.

By moving the lug 20 on the end of the plunger 19 slightly away from the periphery of the disc 15, the shaft 11 may be permitted to rotate freely between the stops 26. In order to move the plunger 19 away from the disc 15, the left end of a rod 30, which extends axially through the recess 22 formed in the plunger housing block 23, is threaded into the right end of the plunger, the right end of the plunger being suitably apertured, while the right end of the rod 30 extends through an aperture 31 formed in the block 23 and connected to the recess 22. A knurled knob 32 may be fixed to the outer end of the rod to facilitate handling thereof. It will be apparent from the foregoing description that by moving the rod 30 to the right, the plunger 19 may be moved to any desired position in the recess 22. In order to retain the plunger in an alternate position, a pin 33 is mounted in and extends at right angles from the right end portion of the plunger 19 through a slot 34 which extends longitudinally along the upper side of the plunger housing and is of sufficient width to permit the outer portion of the pin to extend therethrough.

In order to locate the end of the plunger so that the lug 20 will no longer engage the notches 18 formed in the periphery of the disc 15, but so that the sides of the plunger will be engageable with the stop members 26 mounted on the periphery of the disc, as described, a small slot 35 may be formed in the upper portion of the plunger housing 23 and connected to the slot 34 at an angle thereto so that by moving the pin in the slot 34 to the entrance to the slot 35, and then rotating the rod 30 slightly, the pin may be caused to enter the slot 35. The slot 35 is, of course, suitably located so that when the pin is positioned therein, the plunger is in the desired position.

In accordance with the present invention, in addition to employing the blocks 26 as stops, they may be utilized to provide an additional range for the detent mechanism. A notch 29 may be formed in the outer surface of each block and may be so located therein that when the lug 20

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at the left end of the plunger is received therein, the shaft 11 will be in the same position as the shaft would be in were the lug received in the notch covered by the block 26. On the other hand, it would be feasible to locate the notch 29 in a different position or to provide several notches in each block. In using the blocks 26 in this manner, the plunger 19 is moved somewhat further to the right to cause the lug 20 alone to engage the sides of the blocks or the notch, or notches formed in each block. A slot 36 similar to the slot 35 is formed in the upper portion of the housing 23 to the right of the slot 35 and connects to the longitudinally extending slot 34. The slot 36 is so located that when the outer end of the pin 33 is disposed therein, the lug 20 is engageable with the rounded side edges of the blocks 26. It is necessary that the slot 36 extend at such an angle from the slot 34 that when the plunger is moved to the right by the camming action of the lug 20 passing over the edge of a block 26, the pin will rotate about the axis of the rod 30 and correspondingly move to the right. The slot 36 must, of course, be made sufficiently long so that the pin will not move entirely out of the slot during this camming action.

Since the side edges of the blocks 26 are rounded, as hereinbefore stated, and the end of the lug 20 is also rounded, it will be understood that as the shaft 11 is rotated, the blocks 26 will operate very similarly to the notches 18, and that the lug 20 will first engage a side of a block and then if more rotational force is applied, the plunger 19 will be cammed to the right, permitting the lug 20 to ride over the outer surface of the block and if a notch is formed in the block to enter that notch.

In the event that it is desired to permit the shaft 11 to rotate freely and without interference from the detent mechanism described, the plunger 19 is then moved to the right until the pin 33 may be moved into a slot 37, which connects to the longitudinal slot 34 similarly to the slots 35 and 36, hereinbefore described, and which is so located on the housing 23 that when the pin 33 is positioned in this slot, the forward end of the plunger is sufficiently spaced from the disc 15 so that neither the sides of the plunger nor the lug 20 engages either the disc 15 or such stop members 26 as may be mounted thereon.

Where herein the various parts of the invention have been referred to as being located in a right or left position, it will be understood that this is done solely for the purpose of facilitating description and the references relate only to the relative positions of the parts as shown in the accompanying drawing.

While but one embodiment of this invention has been shown and described, it will be understood that many changes and modifications may be made therein without departing from the spirit or scope of the present invention.

The invention shown and described herein may be manufactured or used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. A detent mechanism including a peripherally notched disc, a shaft for rotatably supporting said disc, a stop member mounted on said disc, and a plunger engageable in one position with a notch and said stop member, in a second position with said stop member alone, and in a

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third position engageable with neither said stop member nor said notch.

2. A detent mechanism including a peripherally notched disc, a shaft for rotatably supporting said disc, a stop member mounted on said disc, a plunger mounted adjacent said disc and movable toward or away from the periphery of said disc, and a lug mounted at the end of said plunger adjacent said disc, said lug being engageable with a notch in one plunger position while said plunger is engageable with said stop member, in a second position said plunger alone being engageable with said stop member, in a third position said lug alone being engageable with said stop member, and in a fourth position neither said lug nor said plunger being engageable with said stop member or said notches.

3. In a detent mechanism, a peripherally notched disc, a shaft for rotatably supporting said disc, a stop member mounted on the periphery of said disc, a plunger mounted adjacent said disc and longitudinally movable with respect thereto, and a lug at the end of said plunger adjacent said disc, said lug being receivable in a notch in one position of said plunger while in the same position the plunger is engageable with a side of said stop member, in a second plunger position said plunger only being engageable with said stop member, in a third plunger position said lug only being engageable with a side of said stop member, while in a fourth plunger position neither said lug nor said plunger is engageable with either said stop member or a notch.

4. A detent mechanism including a reciprocable plunger, means rotatably mounted adjacent said plunger and engageable by said plunger, resilient means associated with said plunger for urging said plunger into engagement with said rotatably mounted means, means associated with said rotatably mounted means and engageable by said plunger to limit rotation of said rotatably mounted means, and means resiliently engageable by said plunger and associated with said rotatably mounted means to resist rotation of said rotatably mounted means.

5. A detent mechanism including a reciprocable plunger, a rotatable shaft mounted at right angles to the plane of reciprocation of said plunger, a disc mounted on and rotatable with said shaft, the periphery of said disc having formed therein a plurality of spaced notches, resilient means associated with said plunger for urging said plunger into engagement with the periphery of said disc, the forward portion of said plunger being receivable in said notches, and means mounted on the periphery of said disc and engageable by a side of said plunger to limit rotation of said disc.

6. A detent mechanism including a reciprocable plunger, a rotatable shaft mounted at right angles to the plane of reciprocation of said plunger, a disc mounted on and rotatable with said shaft, the periphery of said disc having formed therein a plurality of spaced notches, resilient means associated with said plunger for urging said plunger into engagement with the periphery of said disc; the forward portion of said

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plunger being receivable in said notches, and an arcuate block mounted on the periphery of said disc and engageable with a side of said plunger to limit rotation of said disc.

7. A multiple range detent mechanism including a reciprocable plunger, a shaft rotatably mounted adjacent said plunger, a disc mounted on said shaft and rotatable therewith, said disc having at least one notch formed in the periphery thereof, resilient means associated with said plunger for urging said plunger into engagement with said disc, the end of said plunger being receivable in said notch, an arcuate block mounted on the periphery of said disc and engageable by a side of said plunger to limit rotation of said disc, said block having at least one notch formed in the outer portion thereof, and means associated with said plunger for spacing the forward end of said plunger sufficiently from the periphery of said disc to permit a side of said plunger to engage a side of said block but to prevent the forward end of said plunger from being received in a notch on the periphery of said disc, said last means being adjustable to cause the forward end of said plunger only to engage a side of said block and to be receivable in a notch formed in said block.

8. A multiple range detent mechanism including a reciprocable plunger, a shaft rotatably mounted adjacent said plunger, a disc mounted on said shaft and rotatable therewith, the plane of rotation thereof lying in the same plane as the plane of reciprocation of said plunger, said disc having at least one notch formed in the periphery thereof, resilient means associated with said plunger for urging said plunger into engagement with said disc, means mounted on the end of said plunger engageable with said disc and receivable in said notch, an arcuate block mounted on the periphery of said disc and engageable by a side of said plunger to limit rotation of said disc, said block having at least one notch formed in the outer portion thereof, and means associated with said plunger for spacing the forward end of said plunger sufficiently from the periphery of said disc to permit a side of said plunger to engage a side of said block but to prevent the means mounted on the forward end of said plunger from being received in a notch on the periphery of said disc, said plunger spacing means being adjustable to cause the means mounted on the end of said plunger only to engage a side of said block to permit said disc being rotated past said point of engagement to cause said means mounted on the end of said plunger to be received in a notch formed in said block.

9. A detent mechanism including a peripherally notched disc, a shaft for rotatably supporting said disc, a stop member mounted on said disc, and a plunger engageable in one position with either a notch or said stop member, or both, in a second position with said stop member alone, and in a third position engageable with neither said stop member nor a notch.

GEORGE C. WEBSTER.