Nov. 19, 1957 W. R. GRISWOLD 2,813,431

INTERLOCKED DETENT FOR SHAFT POSITIONING APPARATUS

Filed June 22, 1953 3 Sheets-Sheet 1

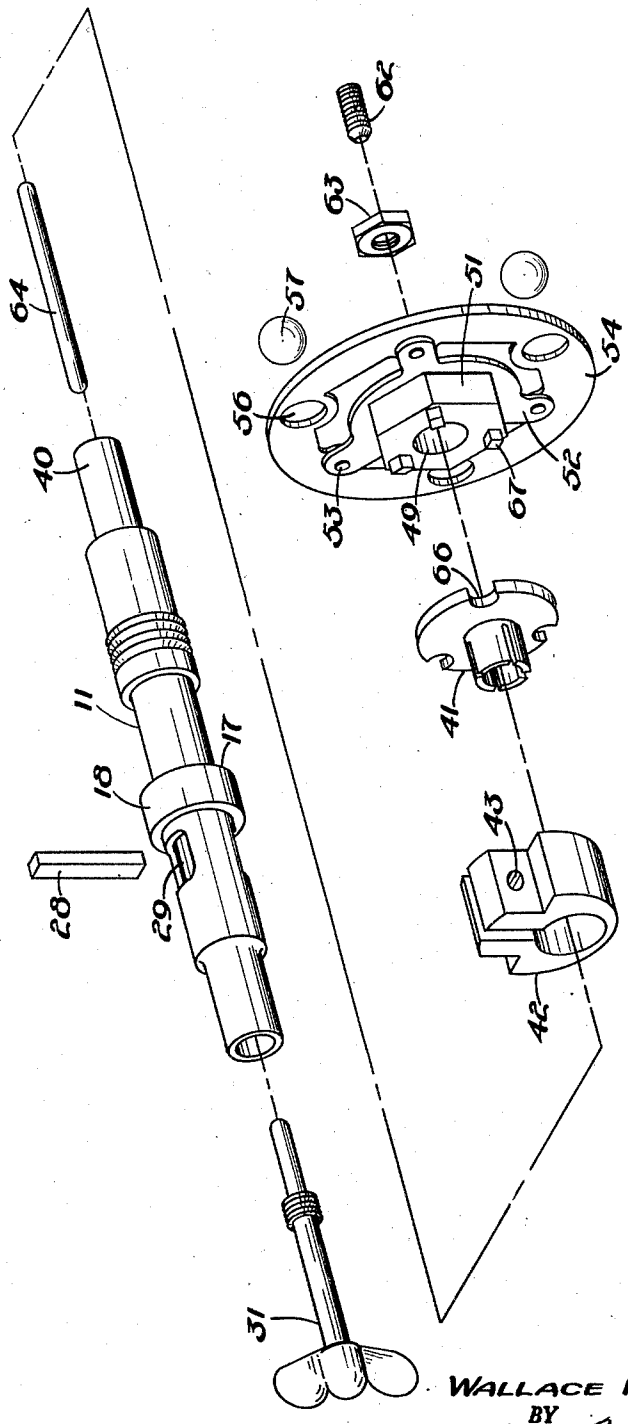


FIG. 1

INVENTOR.
WALLACE R. GRISWOLD
BY
ATTORNEY

Nov. 19, 1957 W. R. GRISWOLD 2,813,431

INTERLOCKED DETENT FOR SHAFT POSITIONING APPARATUS

Filed June 22, 1953 3 Sheets-Sheet 2

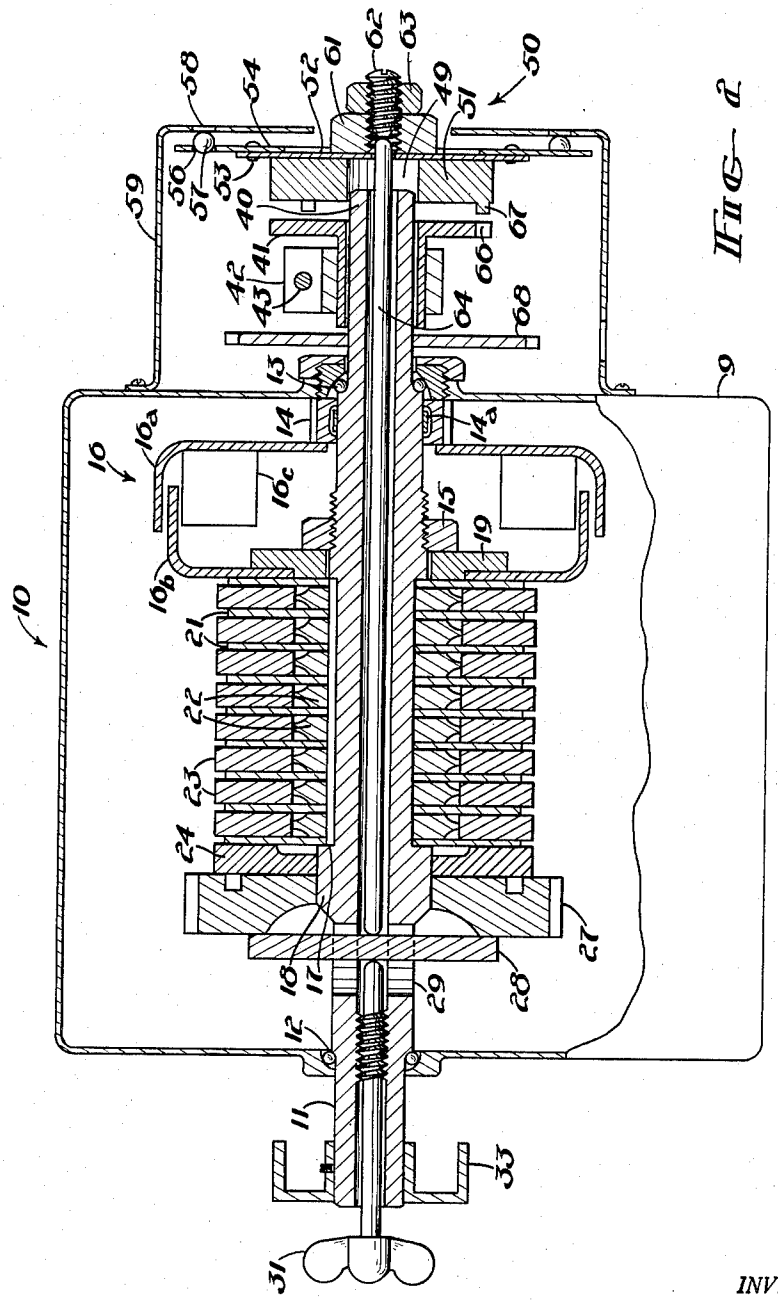


Fig. 2

INVENTOR.
WALLACE R. GRISWOLD
BY
Mann Woody
ATTORNEY

Nov. 19, 1957 W. R. GRISWOLD 2,813,431

INTERLOCKED DETENT FOR SHAFT POSITIONING APPARATUS

Filed June 22, 1953 3 Sheets-Sheet 3

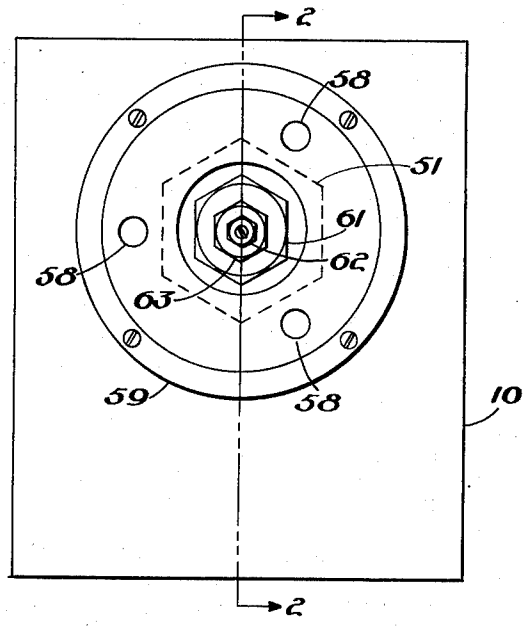


FIG. 3

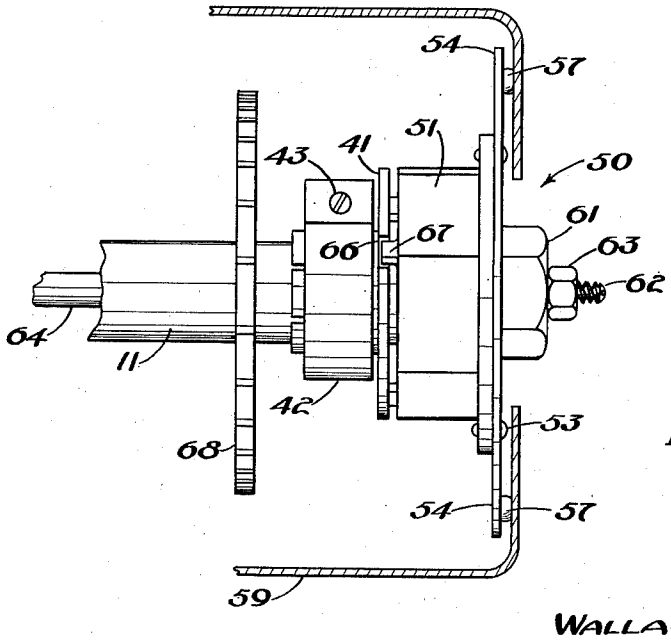


FIG. 4

INVENTOR.
WALLACE R. GRISWOLD
BY
Morris Moody
ATTORNEY

United States Patent Office 2,813,431 Patented Nov. 19, 1957

2,813,431

INTERLOCKED DETENT FOR SHAFT POSITIONING APPARATUS

Wallace R. Griswold, Cedar Rapids, Iowa, assignor to Collins Radio Company, Cedar Rapids, Iowa, a corporation of Iowa

Application June 22, 1953, Serial No. 363,350

5 Claims. (Cl. 74—10.2)

This invention relates generally to improvements in automatic shaft positioning apparatus and relates particularly to interlocked detent means for automatic shaft positioning apparatus.

The shaft positioning apparatus involved herein is generally used in automatic electronic tuning devices and is generally known by the name of "multiturn," which is the subject of a number of patents previously issued to Arthur A. Collins and R. W. May, as for example, Patents 2,285,414, 2,546,980 and 2,504,998. The improvement described herein is a detent for a multiturn tuning shaft with an interlock which engages the detent with the shaft for manual shaft rotation and disengages the detent from the shaft for automatic shaft rotation.

The present specification gives the details of automatic shaft positioning apparatus that are necessary to understand the present improvements. Reference may be made to the above mentioned patents for a more complete description of shaft positioning devices. The novel features are described in detail.

A multiturn shaft positioner operates to automatically obtain a predetermined position of a tuning shaft in response to the setting of a rotary switch. A drive motor then rotates the tuning shaft and a stop ring drum assembly until the shaft is stopped at a terminal position. The drive motor then continues to rotate through a slip clutch until a selector cam drum and a selector switch reach a limit position determined by the selected electric circuit. The drive motor then reverses and the tuning shaft is driven in the other direction until a selected pawl engages the notch of its corresponding stop ring to stop the tuning shaft at the desired pre-selected position. The drive motor and driving connections continue rotation through the slip clutch until the cycle of operation is terminated by another limit switch. The tuning shaft remains stationary at the pre-selected position by engagement of the selected pawl with the selected stop ring until another pre-selected position is desired.

During automatic operation as described above, the stop rings must be rigidly held in predetermined positions on the tuning shaft and locking means must be provided for them. Thus, there is a preset shaft position for each stop ring. Sometimes it is desired to change the preset positions of the stop rings. Then the stop rings must be unlocked from the tuning shaft, and manual rotation of the tuning shaft must be allowed relative to the pawl held stop ring to enable selection of a new position of the tuning shaft relative to that stop ring. A different shaft setting can thus be obtained for each stop ring.

At times it is desirable to manually turn the tuning shaft. If the stop rings are unlocked, a radio receiver, for example, may be controlled by the tuning shaft.

Some radio receivers operate over a large frequency range and require automatic tuning for a plurality of widely spaced frequencies. It may be necessary in such receivers to use two multiturn shaft positioning devices, one for coarse tuning and the other for fine tuning. The coarse tuning multiturn may tune, for example, in one

megacycle increments, and the fine tuning multiturn may tune, for example, in one kilocycle increments.

A numerical indicator may be provided on the panel of the receiver and may consist of a megacycle indicator coupled to the megacycle tuning shaft and a kilocycle indicator coupled to the kilocycle tuning shaft. The indicated frequency of the receiver will be the sum of the indications of the megacycle and kilocycle dials. Any deviation between the indicated megacycle frequency and the actual tuned frequency of the megacycle shaft will be an unknown tuning error. If the reading on the megacycle indicator were alone relied on to indicate megacycle increments, the error would often be large. However, exact megacycle increments are obtained by this invention which has a detent coupled to the tuning shaft that causes it to stop at exact megacycle increments. It is therefore an object of this invention to provide a means for indicating exact incremental shaft positions for a multiturn shaft.

However, a detent will cause a large amount of additional friction against the movement of the multiturn shaft which is undesired during automatic operation. If allowed to remain, the multiturn would require a larger driving motor and a stiffer slip clutch. It is therefore the principal object of this invention to provide an interlock which will detach the detent for automatic operation but will attach it for manual operation.

This invention consists of a detent assembly with longitudinally extending lugs which are rotatably supported at one end of a hollow multiturn tuning shaft. A shaft hub is fixed to the shaft adjacent the detent assembly and has notches capable of mating with the lugs on the detent assembly. The detent assembly may be moved longitudinally relative to the shaft hub by a thumb screw which is threadedly received through the other end of the shaft. The thumb screw presses against a locking bar which pushes a spacer rod that engages and moves the detent assembly longitudinally relative to the shaft hub. The detent lugs then engage and disengage the shaft hub notches to lock and unlock the detent assembly from the tuning shaft. At the same time that the thumb screw locks and unlocks the detent from the tuning shaft, it also unlocks and locks the stop rings from the tuning shaft, respectively, and thereby interlocks the operation of the detent assembly with the operation of the stop rings.

Further objects, features and advantages of this invention will become apparent to one skilled in the art upon further study of the specification and drawings, in which:

Figure 1 is an exploded view of this invention;

Figure 2 is a sectional view of this invention taken along section line 2—2 in Figure 3;

Figure 3 is an end elevational view of this invention; and

Figure 4 is a side elevational view of this invention with the detent bracket shown in section.

The portion of a multiturn shaft positioning unit directly associated with this invention is shown in detail in Figure 2. The multiturn unit, which has one embodiment shown in detail in Patent Number 2,504,998, is designated generally as **10**.

A hollow tuning shaft **11** with a fixed knob **33** at one end is rotatably received through multiturn unit **10**. A frame **9** has a pair of bearings **12** and **13** through which shaft **11** extends. A gear **14** which is rotatably mounted over needle bearings **14***a* on shaft **11** drives shaft **11** through a slip clutch **16**. Slip clutch **16** has a drive portion **16***a* fixed to gear **14** and an outwardly expandable friction disc **16***c* that is fixed to drive portion **16***a*. Disc **16***c* frictionally engages a driven portion **16***b* which is locked to shaft **11** when a series of stop rings **23** are locked to shaft **11**.

A series of spacer rings **21** and drum rings **22** are fixedly held on shaft **11** between a shoulder **17** of a boss **18**

and a clamp washer 19 held tight by a nut 15 threadedly received on shaft 11.

Stop rings 23 are normally loosely held between adjacent pairs of spacer rings 21. Clutch driven portion 16*b* is then also loosely held between an indented portion of clamp washer 19 and a spacer ring 21. Stop rings 23 and clutch driven portion 16*b* are locked to shaft 11 when a thumb screw 31 threadedly received in an end of shaft 11 is tightened. The end of screw 31 engages a locking bar 28 which is transversely received through a transverse slot 29 in shaft 11. Locking bar 28 presses against a clamped gear 27 which pushes a terminal clamp ring 24 that clamps the stop ring assembly and clutch driven portion 16*b* against nut 15 and holds them rigid with respect to shaft 11 for automatic operation.

A shaft hub 41 is fixed by a clamp 42 to shaft 11 near the end 40. The clamp 42 may be tightened by a screw 43. A detent hub 51 forms a part of a detent assembly designated generally as 50. The hub 51 is formed with a central opening 49 into which the end 40 of shaft 11 is rotatably received. A detent support 52 is fixed to detent hub 51 and is riveted to a flexible annular detent spring 54 by rivets 53. A number of holes 56 are symmetrically spaced around detent spring 54. Ball bearings 57 are supported in holes 56 and are biased against a detent bracket 59 which is fastened to the frame 9 of the multiturn unit 10.

A bracket 59 is formed with a number of holes 58. There is a hole for each bearing 57 and in certain angular positions of the detent spring 54 they are aligned. A nut 61 is fixed to the other side of detent support 52 concentric with detent hub 51 and a set screw 62 is threadedly received within nut 61. A lock nut 63 is provided to lock set screw 62 in any desired position. A spacer rod 64 is received within shaft 11 between locking bar 28 and set screw 62.

A number of notches 66 are equi-angularly provided around the periphery of drive hub 41 and a like number of lugs 67 project from detent hub 51 and are receivable within notches 66. A take-off gear 68 is also fixed to shaft 11 and drives a tuning unit not shown.

Figure 2 shows multiturn unit 10 arranged for automatic operation with the stop rings locked and the detent assembly disengaged. Thumb screw 31 is screwed tight so as to push locking bar 28 to the right to rigidly clamp stop rings 23 and clutch portion 16*b* to shaft 11. At the same time that thumb screw 31 engages locking bar 28 and clamps stop rings 23, it likewise moves spacer rod 64 to the right in Figure 2 and moves detent assembly 50 to the right against the biasing force of spring 56. In this manner detent assembly 50 is moved to the right with respect to shaft 11 and lugs 67 are moved out of engagement with notches 66.

Then detent assembly 50 is not fixed relative to shaft 11. Therefore when unlocked from shaft 11, the detent assembly 50 will remain stationary because of engagement of balls 57 with holes 58 and it will not cause frictional drag during automatic shaft operation.

When manual operation is desired, thumb screw 31 is screwed to the left in Figure 2 which releases locking bar 28 and loosens stop rings 23, compressed gear 27 and clutch portion 16*b*. Spacer rod 64 and detent assembly 50 are then moved to the left under the bias of detent spring 54. Lugs 67 on hub 51 then line up and engage notches 66 on hub 41 as is shown in Figure 4. Shaft 11 may then be manually rotated by means of knob 33.

Rotation of shaft 11 is transmitted to detent assembly 50 through lugs 67 and detent assembly 50 then rotates relative to bracket 59. Ball bearings 57 will ride into and out of holes 58 in bracket 59 and form a positive positioning means.

During manual operation, shaft 11 is free of the frictional drag of clutch 16 which is held stationary by gears (not shown) that mate with gear 14. This is because clutch portion 16*b* is not clamped between washer 19 and spacer ring 21. Also shaft 11 may be rotated free of gear 27 which is held stationary by other mating gears not shown.

A radio receiver or other apparatus may be tuned by rotation of shaft 11. A multiturn unit may be accurately preset to automatically tune a desired number of incremental frequencies.

Thus, in summary this invention provides means whereby an automatic shaft positioning mechanism may be changed to a manually controlled device wherein the available manual positions will be controlled by the detent mechanism. Merely by turning thumb screw 31 the apparatus may be changed from manual to automatic or vice versa. It is to be realized that the rod 64 causes engagement and disengagement of the detent mechanism.

While a selected embodiment of this invention has been described, it will be understood that it is capable of many modifications by a man skilled in the art and therefore changes in the construction and arrangement may be made without departing from the spirit and scope of this invention, as disclosed in the appended claims.

What is claimed is:

1. Interlocking means for engagement and disengagement of a detent assembly and a shaft, in shaft positioning apparatus having a stop ring assembly with means for clamping the stop ring assembly comprising, latching means connected between said detent assembly and the shaft of said apparatus, and means for actuating said latching means connected between the latching means and the means for clamping the stop ring assembly, whereby the detent assembly is disengaged when the stop ring assembly is clamped and is engaged when the stop ring assembly is unclamped.

2. Interlocking means for a detent assembly in multiturn apparatus having a frame member rotatably supporting a tuning shaft which has a stop ring assembly mounted on it, a screw threadedly received in one end of the tuning shaft, and the tuning shaft formed with a transverse slot that loosely receives a locking bar to lock and unlock the stop ring assembly, the improvement comprising, a detent bracket attached to said frame member, said detent assembly rotatably and slidably supported on said tuning shaft and having detent engagement with said detent bracket, a shaft hub attached to said tuning shaft adjacent said detent assembly, latching means supported by said hub and detent assembly to lock them together when they are in close proximity, a spacer bar mounted between the locking bar and the detent assembly, whereby said detent assembly is moved away from the shaft hub to disengage said latching means when said screw is tightened.

3. Interlocking apparatus between a detent assembly and a shaft positioning mechanism having a locking member comprising, a shaft hub axially secured to the shaft of said mechanism, a detent hub rotatably and slidably mounted on the shaft immediately adjacent to said shaft hub, latching means formed on said shaft hub and detent hub to latch said hubs together when they are moved together and to unlatch them when moved apart, said detent assembly supported by said detent hub, a frame supporting said apparatus, a bracket supported by the frame and engaged by said detent assembly in detent fashion, spring means biasing together said detent hub and said shaft hub, and means actuated by the locking member of said shaft postioning mechanism to move apart said shaft hub and detent hub to unlocked position when said locking member is in locked position for said apparatus, whereby said detent assembly is latched to the shaft when the locking member is locked and is unlatched with the shaft when the locking member is unlocked.

4. An interlocking system for a detent assembly in shaft positioning apparatus having a stop ring assembly, a tuning shaft, and means for clamping said stop ring

assembly, comprising a spacer rod, said spacer rod actuated by said clamping means, a shaft hub fixed on said tuning shaft and formed with a plurality of notches around its periphery, a detent hub slidably and rotatably mounted on said tuning shaft and engaged by the spacer rod for axial movement, a plurality of lugs formed on said detent hub and engageable with the notches formed in the shaft hub, spring means axially biasing said detent hub toward said shaft hub, and a detent means actuated by said detent hub to sense predetermined positions for said tuning shaft, whereby the lugs engage the notches only when the stop ring assembly is unclamped by the clamping means.

5. Interlocking means for controlling the engagement of a detent assembly with the shaft of a multiturn having stop ring locking means comprising, a frame supporting said multiturn, a spacer rod actuated by said locking means, said shaft formed hollow throughout its length to support the spacer rod, a detent hub rotatably and slidably mounted on said tuning shaft and actuated by said spacer rod, a detent spring supported by said detent hub and formed with a plurality of holes, a detent bracket supported by the frame of said multiturn and formed with a plurality of holes, a plurality of ball bearings receivable between the holes of the detent spring and the

detent bracket to sense predetermined rotational positions of said detent assembly, a shaft hub attached securely to said tuning shaft, lug and notch means formed on said detent hub and shaft hub for engagement when said hubs are close to each other, the detent hub urged toward the shaft hub by said detent spring, and the detent hub and shaft hub maintained apart by the spacer rod when the multiturn locking means is engaged.

References Cited in the file of this patent

UNITED STATES PATENTS

1,855,179	Brownell	Apr. 26, 1932
2,130,219	Allison et al.	Sept. 13, 1938
2,153,865	Gersch	Apr. 11, 1939
2,179,748	Mastney	Nov. 14, 1939
2,249,753	Elliott	July 22, 1941
2,472,979	May	June 14, 1949
2,493,635	McKellip	Jan. 3, 1950
2,504,998	May	Apr. 25, 1950
2,536,070	May	June 2, 1951
2,604,791	Daly	July 29, 1952

FOREIGN PATENTS

980,647	France	Dec. 27, 1950