

July 4, 1939.

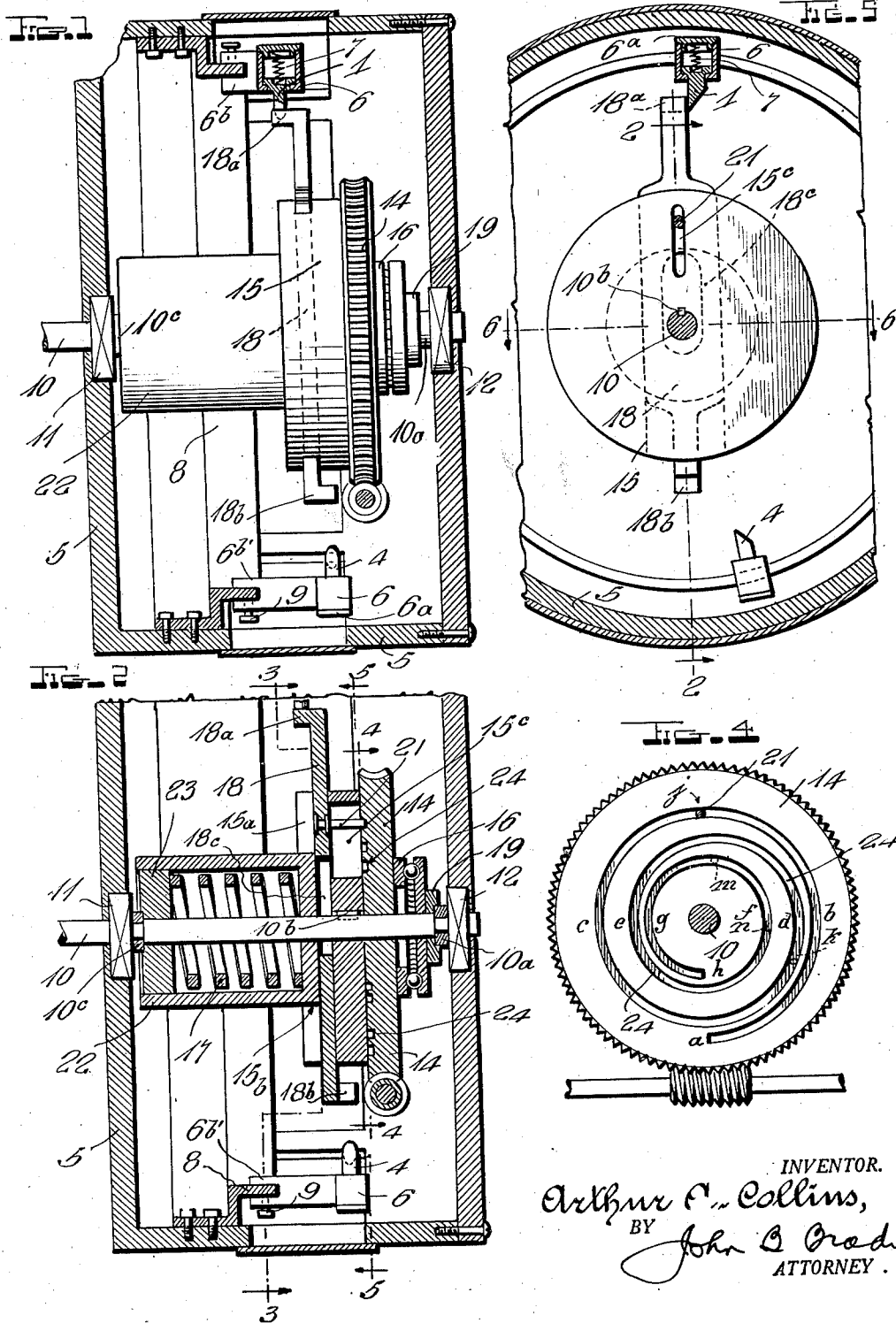
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2,164,309

SHAFT-POSITIONING DEVICE

Filed Dec. 18, 1937

3 Sheets-Sheet 1

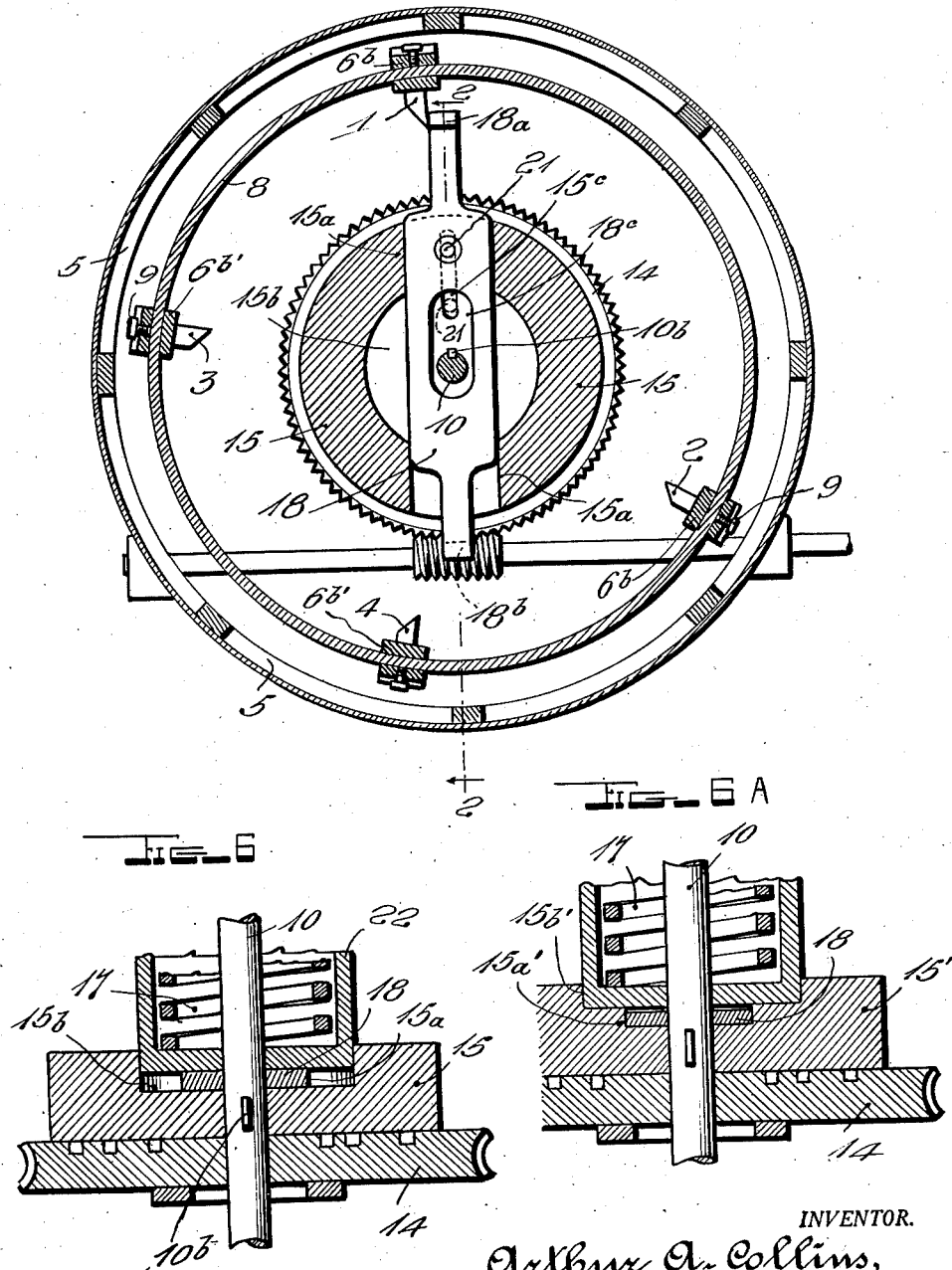


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3 Sheets-Sheet 2



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SHAFT-POSITIONING DEVICE

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3 Sheets-Sheet 3

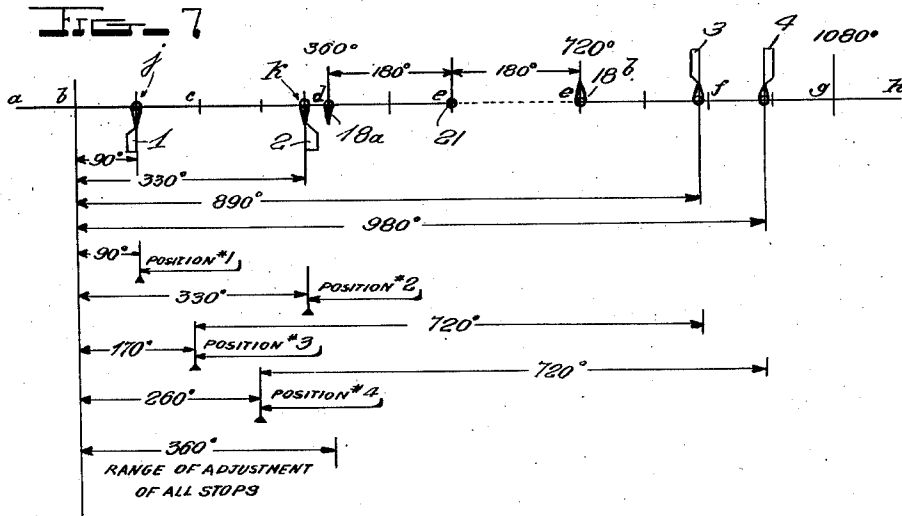


FIG. 8

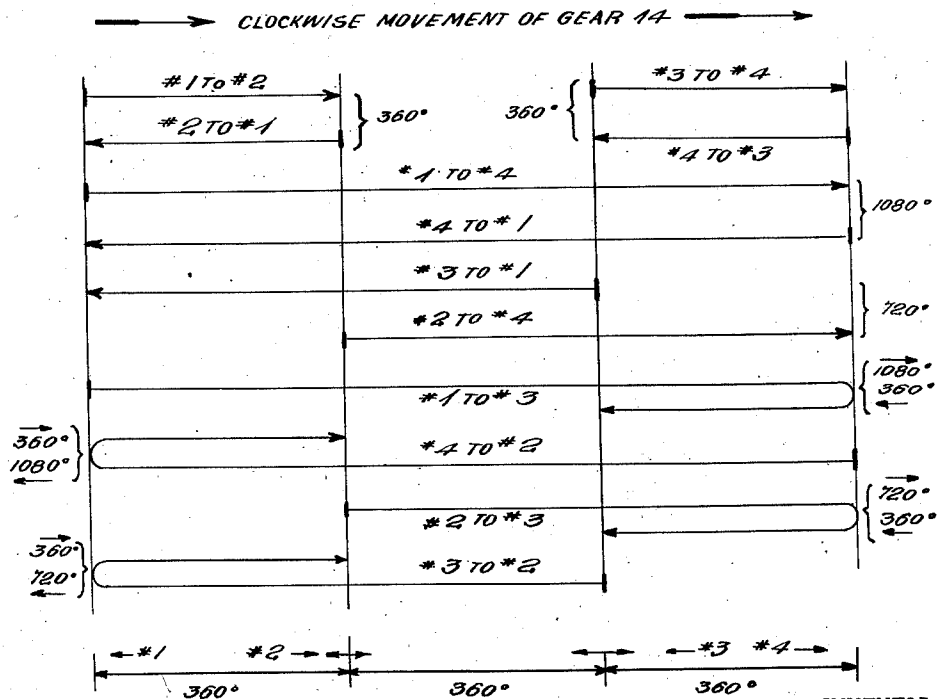


FIG. 9 A

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UNITED STATES PATENT OFFICE

2,164,309

SHAFT-POSITIONING DEVICE

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Application December 18, 1937, Serial No. 180,658

14 Claims. (Cl. 192—139)

My invention relates broadly to apparatus for establishing a rotatable shaft in a plurality of predetermined angular positions and more particularly to a device mounted on a rotatable shaft for coaction with preset relatively fixed abutments.

One application of shaft positioning devices of the type of my invention is in automatic tuning systems for radio apparatus wherein numerous frequency changes over brief periods of time are often required. Arrangements adapted to ten or more different settings form the subject matter of my copending applications, Serial Number 123,453, filed February 1, 1937, for Automatic tuning system and apparatus; Serial Number 172,837, a division thereof filed November 4, 1937, for Control circuits for signal transmission and receiving apparatus; and Serial Number 166,661, filed September 30, 1937, for Automatic tuning system and apparatus. My present invention is a departure from the basic principle of the systems shown in these applications, which employ a movable selector stop, and is adapted more particularly to a limited number of settings for more economical and compact installations.

The device of my invention is suitable for manual or automatic operation, and a control system for automatically operating the device of my invention is disclosed in a copending application in the name of Robert E. Samuelson, filed of even date herewith, for Control circuit for shaft positioning system.

One of the objects of my invention is to provide a shaft positioning device having a rotatable stop arm engageable with a plurality of fixed stops in its path.

Another object is to provide a rotatable stop arm cooperative with a plurality of fixed stops, together with means for determining the particular stop effective to establish the stop arm in set position.

Still another object of my invention is to provide a rotatable stop arm having oppositely extending abutments each cooperative with a plurality of fixed stops in an individual plane, together with means for determining which abutment and which particular stop are effective to establish the stop arm in a set position.

A further object of my invention is to provide a rotatable stop arm cooperative with a plurality of fixed stops, and means controlled by the direction and the degree of rotation of the stop arm for determining which of the fixed stops will be effective to establish the stop arm in set position.

A still further object of my invention is to provide a spring coupled friction clutch device for driving a rotatable stop arm, and means operative by relative movement of the elements of the clutch for determining the operative relation of the stop arm with respect to a multiplicity of fixed stops.

Still another object of my invention is to provide a friction clutch device for driving a rotatable stop arm, and a differential spiral groove in one of the clutch elements engaged by a pin on the stop arm for radially displacing the stop arm upon relative movement of the elements of the clutch device so that the stop arm is selectively operative with respect to a multiplicity of fixed stops.

Other and further objects of my invention reside in the structure of the device herein disclosed as a preferred form of my invention, as set forth in the following specification with reference to the accompanying drawings, in which:

Figure 1 is a side elevational view, with parts broken away and shown in section, of the general arrangement of my invention; Fig. 2 is a vertical longitudinal sectional view of the apparatus shown in Fig. 1, taken substantially on line 2—2 in Figs. 3 and 5; Fig. 3 is a vertical cross sectional view taken substantially on line 3—3 in Fig. 2; Fig. 4 is a similar view on line 4—4 in Fig. 2, looking in the direction indicated; Fig. 5 is a similar view on the same line as Fig. 4 but looking in the opposite direction, as indicated; Fig. 6 is a horizontal sectional view taken substantially on the line 6—6 shown on Fig. 5; Fig. 6A is a view similar to Fig. 6 and showing a modified detail of the structure disclosed; Fig. 7 is a theoretical diagram in linear development of the angular displacements of the stop arm, and showing the relative locations of the various stops; Fig. 8 comprises a series of diagrams indicating, relative to Fig. 7, the extent and the direction of the various angular displacements required to establish the various settings from any other setting; and Fig. 8A is a composite diagram of the several individual diagrams shown in Fig. 8.

The fundamental principle of my invention is to rotate each shaft controlling, say, a tuning element of a radio transmitter, until the shaft is restrained from further rotation by some fixed interference which is preset so that the shaft will stop at the desired position independently of any other shafts simultaneously controlled in a similar manner. In the Autotune systems of my copending applications above noted, several

adjustable single toothed stop rings are mounted concentric with the shaft and fixed to it, and one adjustable stop selectively engages any one of these stop rings and determines the limit of rotation and final position of the shaft. An equally effective arrangement may be provided by a single projection attached to the shaft and selectively engageable with certain fixed stops to limit the rotation of the shaft. In the drawings I have illustrated one arrangement embodying my invention for operation in this manner. Referring to Figs. 1-6, the general construction is as follows:

A driven shaft 10 is connected with a condenser, variable inductance, switch or other element capable of 360 degrees rotation. The controlled device may be so constructed that two positions in opposite halves of the rotation will give the same effect. For instance, in a variable condenser rotation from a reference zero through 180 degrees increases the capacity from a minimum to a maximum and further rotation through 180 degrees will decrease the capacity through the same values from maximum to minimum. Shaft 10 rotates in bearings 11 and 12, and mounted concentrically on the shaft is a worm gear 14 which is rotatable with respect to the shaft 10 but held tightly clamped between clutch plate 15 and thrust bearing 16 by the action of a coil spring 17. The thrust bearing 16 is retained by a collar 19 which bears on a clip 10a secured on the shaft 10. Clutch plate 15 may slide axially on shaft 10 under action of spring 17, but will not rotate with respect to it, being keyed thereto as at 10b, or otherwise suitably connected with the shaft. Thus, rotation of worm gear 14 will cause shaft 10 to rotate, through frictional engagement between worm gear 14 and clutch plate 15, unless shaft 10 is forcibly restrained from rotating, in which case worm gear 14 may continue to rotate, the clutch surfaces slipping.

Parallel to the face of gear 14 is a stop arm 18 mounted in a wide groove 15a cut in the back of clutch plate 15, as shown particularly in Figs. 3 and 6. The stop arm 18 is free to slide in a direction at right angles to the shaft to the extent indicated by full lines and dotted lines in Fig. 3, and the length of slot 18c accommodates the shaft 10. The stop arm is not, however, free to rotate with respect to the shaft, being continuous with the sides of groove 15a of the clutch plate 15. The ends of stop arm 18 are formed into oppositely disposed stop lugs 18a and 18b (Fig. 2). A pin 121 fixed to stop arm 18 extends through a slot 15c in clutch plate 15 and into a spirally cut groove 24 in gear 14, in which it may slide for radially moving the stop arm 18 as will be hereinafter more fully described.

Referring to Figs. 2 and 6, the spring 17 is housed in a cylindrical cup 22 closed by a collar 23 which bears on a retaining clip 10c secured on the shaft 10. The base of the cup 22 enters a circular recess 15b connected with the groove 15a, and bears on stop arm 18 to press the arm, the clutch plate 15 and driving gear 14 into frictional engagement under the action of spring 17, so that all parts are maintained in operable relation. If high spring clutch pressures are required it may be found desirable to relieve stop arm 18 of axial pressure, as shown in Fig. 6A, by extending the circular recess 15b' only partially of the depth of the groove 15a' so that the

cup 22 bears directly on a portion of the clutch plate 15'.

Referring now to Figs. 2 and 4, when gear 14 and clutch plate 15 are rotating together, there will be no relative movement between them and consequently no relative movement of pin 21 with respect to the groove 24 in gear 14. If, however, clutch plate 15 is restrained from rotating, as by a force at right angles to one end of stop arm 18, and if gear 14 continues to rotate, pin 21 will be constrained to move radially inward or outward in groove 24, depending in direction on the direction of rotation of gear 14, and in distance on the radial advance of groove 24.

As indicated in Fig. 1, bearings 11 and 12 are mounted in a fixed framework 5, (which may be a part of the transmitter framework), which forms a solid support for the bearings and all of the movable elements. The shape or construction is not important to a description of the principle of this device, except insofar as it provides a mounting for the bearings 11 and 12 and the adjusted fixed stops now to be described.

As shaft 10 rotates with the arm 18 in the position as shown in Fig. 3, lug 18a describes an arc around the shaft 10. Two stops, designated 1 and 2, are placed across the arc described by lug 18a, and in the same plane, so that the motion of lug 18a will be constrained between these two stops. Then, by making stops 1 and 2 adjustable, over 360 degrees, the arc described by lug 18a can be predetermined, and shaft 10 can be established in either of two predetermined positions by driving worm gear 14 forward or backward through 360 degrees, during which travel projection 18a will stop against adjustable stop 1 when driven counterclockwise and against stop 2 when driven clockwise, as viewed in Fig. 3.

The system of my invention is adapted to determine any of four positions, provision being made to shift arm 18 so that projection 18b rotates at the same radius that lug 18a did previously. At the same time, projection 18a is drawn toward shaft 10 sufficiently to clear stops 1 and 2. Two additional stops, designated 3 and 4, are provided on the arc described by lug 18b and in the same plane as lug 18b, which is offset with respect to the plane of lug 18a. The shaft may be rotated through an arc determined by stops 3 and 4, which also are adjustable, thus giving two additional set positions of shaft 10. Lug 18b meets stop 3 in counterclockwise rotation and stop 4 in clockwise rotation as viewed in Fig. 3. To alternate between the first set of stops 1 and 2, and the second set 3 and 4, stop arm 18 is shifted radially by the arrangement best shown in Figs. 2 and 4.

As shown in Fig. 4, a spiral groove 24 is cut in the face of gear 14 and, during relative rotation between shaft 10 and gear 14, pin 21 which rotates with the shaft slides in this groove. The radial position of stop arm 18 is thus determined by the configuration of the groove 24 and the relative position therein of pin 21, which determines the distance of the pin from the center of shaft 10. Various points on the spiral groove are designated with letters a, b, c, etc., which are likewise employed on the linear development of the groove shown in Fig. 7. Through 360 degrees from b to d the groove does not vary greatly with respect to its distance from the center of shaft 10, and lug 18a will remain in coaction with stop 1 or 2. In 180 degrees from d to e the groove spirals toward the center sufficiently to

bring projection 18a out of the line of stops 1 and 2 and to extend projection 18b into the line of stops 3 and 4. Through 360 degrees from e to g, the groove again remains at effectively constant radius from the center, and lug 18b may engage stops 3 and 4 with pin 21 anywhere between e and g. The portions of the groove a—b and g—h are 90 degree extensions for the pin 21 in case mechanical inertia of moving parts causes additional rotation of gear 14 beyond the desired limits, and the extensions may also serve to collect such foreign matter as may be found between the clutch plate 15 and gear 14, or such as may enter through slots 18c and 15c. The groove from a to d, and from e to h, is necessarily slightly spiral as it must overlap due to its more than 360 degree length, intersecting portions of the groove being undesirable.

It will be noted in Figs. 3 and 4, as in Fig. 7 that the 180° portion d—e of the groove has no bearing on the positioning of the stops relative to the groove; for as the pin 21 moves in this portion of the groove, a 180° spacial relation in stops 18a and 18b offsets the movement of the pin and the effective stop lug appears in the same circumferential position as before. In other words, 180 degrees of the intermediate 360 degrees rotation is employed to move the pin 21 between d and e, projecting the opposite stop lug, while the remaining 180 degrees is employed to bring the projected lug around to the position of the retracted lug, but in an offset plane.

For purposes of illustration consider that for engaging stop 1 or 2, arm 18 will have pin 21 somewhere between points b and d in groove 24; and for engaging stop 3 or 4, between points e and g; and more particularly, stops 1 and 4 are limiting stops and the pin 21 will be closest to the limits b and g in the groove 24 when in engagement therewith. The respective ranges of rotation of gear 14 wherein pin 21 is thus situated, with a reference zero opposite point b, are 0°–360°, and 720°–1080°, the range 360°–720° being employed as above explained. Taking four desired positions of the stops to be 90°, 170°, 260° and 330°, and referring to the reference zero opposite b, the stops may be positioned as follows, counterclockwise from b: stop 1 at 90°; stop 2 at any higher degree position, say 330°; stop 3 at the lesser of the remaining degree positions, 170°; and stop 4 at the limiting position beyond stop 3, or 260°. It will be correspondingly noted that stop 1 lies clockwise from stop 2 at the position indicated, and is therefore rightly in the opposite limiting position. That is to say, stop 2 could not be positioned at 90° and stop 1 at 330°, counterclockwise from b. The stops are shown in Fig. 3 substantially in the positions given, and it will be noted that stops 1 and 2 are engageable within the initial 360° rotation of gear 14, whereas a basic 720° rotation of gear 14 is required before stop 3 or 4 may be encountered.

It might be noted that another arrangement for the stops for the above positions might be: stop 1 at 90°, stop 2 at 170°, stop 3 at 260°, and stop 4 at 330°, which would be the usual orderly arrangement; or the set-up might be: stop 1 at 90°, stop 2 at 260°, stop 3 at 170°, and stop 4 at 330°, the limiting requirements being maintained in every such instance.

As examples of the operation of the device, the changes between several possible positions will be considered, attention being directed to Figs. 3, 4, 7 and 8, in particular. In the position corresponding to a position #1, arm 18 is in the po-

sition shown in Fig. 3, lug 18a abuts stop 1 and pin 21 is in the groove between b and c, at j, Fig. 4. If it is desired to shift to a position #2, determined by the abutment of projection 18a against stop 2, worm gear 14 is rotated in a clockwise direction through 360 degrees, pin 21 possibly moving from b to d, b constituting a reference zero as indicated in Fig. 7. During the first part of the rotation, clutch plate 15 will not move with respect to gear 14 and projection 18a will move around toward stop 2. When stop 2 is met by projection 18a, pin 21 will follow the groove 24 during the remainder of the 360 degrees rotation, moving radially inward slightly due to the small radial displacement of the groove in the remaining degrees of rotation. Pin 21 will come to rest in the arc between c and d, at k, Fig. 4.

When, instead of shifting to position #2, it is desired to shift to a position #4, the sequence is as follows. Gear 14 is rotated in a clockwise direction, as before, but through a total of 1080 degrees instead of 360 degrees. During the first 360 degrees rotation, lug 18a meets and is stopped by stop 2, as above described; however, during the next 360 degrees of rotation pin 21 is drawn toward the center of the shaft by the accentuated spiral shape of groove 24 between d and e. Arm 18 is thus moved so as to draw lug 18a toward the center and remove it from engagement with stop 2, at the same time extending lug 18b away from the center and into the line of stops 3 and 4. When lug 18a has been removed from engagement with stop 2, and during the final 360 degrees of rotation of gear 14, arm 18 and shaft 10 rotate again with gear 14 until lug 18b comes in contact with and is stopped by stop 4, with pin 21 at m, Fig. 4, whereupon shaft 10 will be in its position #4.

In order to shift from the position #4 (established by 1080° clockwise rotation of gear 14 from previous position #1) to position #3, reverse or counterclockwise rotation of gear 14 through 360° is required, during which time stop lug 18b is stopped by stop 3 in the same manner as where a shift is made between positions #1 and #2 with stop lug 18a extended. Pin 21 is then at n, Fig. 4. To return to position #1 from position #3, gear 14 is rotated 720 degrees in a counterclockwise direction with lug 18b against stop 3 until action of pin 21 in groove 24 during the first 360 degrees of rotation withdraws lug 18b from engagement with stop 3, and again extends lug 18a so that it may on further rotation engage stop 1.

The transfers in position in the cycle above described are represented linearly in Figs. 8 and 8A, together with similar diagrams of the further transfers possible. Thus, transfer between positions #1 and #2, or between positions #3 and #4, is accomplished by 360 degree rotation of gear 14, in the proper direction during which period shaft 10 rotates between the positions determined by the extended lug, 18a or 18b, operating between the two stops in its plane. Shift from position #2 to position #4, as from position #3 to position #1, is accomplished by 720 degree rotation of gear 14, but in clockwise direction, during which arm 18 is moved at right angles to shaft 10 to project the opposite stop lug before moving to the new position. In shafting between position #2 and position #3 it is necessary to shift to the farthest position, #1 or #4, and then return to the desired stop, involving successive rotation in two directions, firstly, 720 degrees to reach the limiting position, and secondly, 360 degrees in reverse. The same considerations are involved in shifting

from position #1 to position #3, or position #4 to position #2; that is, shift must be made to the opposite limiting position followed by return to the desired position. To effect the last operations noted, gear 14 is rotated 1080 degrees in the required direction and reversed for 360 degrees further rotation, as indicated on the respective diagrams in Fig. 8.

Stops 1-4 are so constructed that a direct endwise force from lug 18a or b, or the force of 18a or b revolving in an opposite direction to that which would bring it in contact with the stop face, will displace the stop so that the movement of arm 18 is not hindered. This allows radial displacement of arm 18 regardless of the relative positions of the stops. For example, after stop 18b has been extended by rotation of gear 14 with lugs 18a against stop 2, it might be in such a position as to have to pass stop 3 before reaching stop 4, the above provision taking care of this. Similarly if stop 3 or 4 is directly opposite stop 2, projection of lug 18b radially outward against the stop results in displacement of the stop. The arrangement shown in the drawings, particularly Figs. 2 and 3, is intended to be illustrative, merely, of one type of structure having the functions noted. As shown, the stop 1, for example, is supported in a housing 6 enclosing a spring 7 mounted between the stop 1 and the back cover 6a of the housing. The stop and housing assembly is mounted on a circumferential angle support 8 fixed to the framework 5, as shown. The housing 6 has a bifurcated portion 6b extending therefrom for engaging the ring member 3, and a clamping screw 9 for holding the stop in adjusted position. Recalling that stops 3 and 4 are disposed in an offset plane with respect to stops 1 and 2, this is provided for in the extended bifurcated portion 6b' of the mounting means for stops 3 and 4, as illustrated in Fig. 2 at stop 4.

I have illustrated my invention in certain preferred embodiments of the various features thereof, but I do not intend to be limited thereto as I am aware that modifications may be made in the form and arrangement of the elements disclosed without departing from the subject matter of my invention. I desire it understood therefore that no limitations upon my invention are intended except as are imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A shaft positioning device comprising a shaft, a driving clutch member rotatably mounted on the shaft, a driven clutch member slidably and non-rotatably mounted on the shaft in frictional engagement with the aforesaid member, a stop arm mounted for rotation with and radial displacement with respect to said driven clutch member, fixed stops cooperable with said stop arm, and means for interconnecting said stop arm and said driving clutch member for radially displacing said stop arm from engagement with one of said stops upon relative movement of said stop arm and said driving clutch member, said stop arm being held against rotary movement by engagement thereof with the said one of said stops, the aforesaid means including means for maintaining said stop arm in radially displaced position.

2. A shaft positioning device comprising a shaft, a driving clutch member rotatably mounted on the shaft, a stop arm non-rotatable and radially displaceable with respect to the shaft, a plurality of fixed stops cooperable with said

stop arm, and means for interconnecting said stop arm and said driving clutch member for radially displacing said stop arm from engagement with one of said stops upon relative movement of said stop arm and said driving clutch member, said stop arm being held against rotary movement by engagement thereof with the said one of said stops, the aforesaid means including means for maintaining said stop arm in radially displaced position.

3. A shaft positioning device comprising a shaft, a driving clutch member rotatably mounted on the shaft, a stop arm non-rotatable and radially displaceable with respect to the shaft and having oppositely disposed stop lugs thereon extending axially from the arm on opposite sides thereof and movable in separate planes offset from each other, a pair of fixed stops cooperable with each of said stop lugs in the respective plane of movement, one or the other of said lugs being engageable with the respective cooperable stops depending upon the radial position of said stop arm, and means for interconnecting said stop arm and said driving clutch member for radially displacing said stop arm upon relative movement of said stop arm and said driving clutch member, said stop arm being held against rotary movement by engagement of one of the lugs with a cooperable fixed stop, said radial displacement of said stop arm being effective to retract the said lug from engagement with the said cooperable stop and to project the opposite lug for engagement thereof with one of the fixed stops individually cooperable therewith.

4. A shaft positioning device comprising a shaft, a driving clutch member rotatably mounted on the shaft, a driven clutch member slidably and non-rotatably mounted on the shaft in frictional engagement with the aforesaid member, a stop arm mounted in a radial slot in said driven clutch member and radially displaceable with respect thereto, stop lugs carried by said stop arm on opposite faces thereof and movable in separate planes offset from each other, a pair of fixed stops cooperable with each of said stop lugs in the respective plane of movement, said stop lugs being adapted for individual operation with respect to fixed stops for positioning said shaft, and means for interconnecting said stop arm and said driving clutch member for radially displacing said stop arm upon relative movement of said driven and said driving clutch members whereby one or the other of said stop lugs is shifted to effective position for engagement with its respective fixed stops.

5. A shaft positioning device comprising a shaft, a stop arm non-rotatably mounted on said shaft, a pair of fixed stops engageable by said arm in opposite directions of rotation, means for displacing said arm radially with said arm in engagement with one of said stops, and means for maintaining said arm in radially displaced position.

6. A shaft positioning device comprising a shaft, a stop arm non-rotatably mounted on said shaft and having a pair of selectively projectible stop lugs, fixed stops cooperable with each of said stop lugs, and means for projecting the one and simultaneously retracting the other of said stop lugs for engagement by the projected lug of one of the fixed stops cooperable therewith for establishing the shaft in desired position.

7. A shaft positioning device comprising a shaft, friction clutch means for rotating said shaft including a driving and a driven member,

and means, including a stop element operably connected with said driving member and controllable thereby upon relative movement of said driving and said driven members, for establishing said shaft in either of two positions in accordance with a selected predetermined period of operation of said driving member in a given direction.

8. A shaft positioning device comprising a shaft, friction clutch means for rotating said shaft including a driving and a driven member, and means, including a stop element operably connected with said driving member and controllable thereby upon relative movement of said driving and said driven members, for establishing said shaft in a desired position by selected predetermined periods of operation of said driving member in reverse directions.

9. A shaft positioning device comprising a shaft, friction clutch means for rotating said shaft including a driving and a driven member, a radially displaceable stop arm carried by said driven member and having a pin extending axially therefrom, said driving member having a spiral groove in one face thereof for receiving said pin, said groove having an eccentric spiral portion adapted to displace said stop arm abruptly in radial position upon relative movement of said pin in the said portion of said groove, and means including said stop arm for establishing said shaft in selected positions in accordance with predetermined degrees and directions of rotation of said driving member.

10. A shaft positioning device comprising a shaft, friction clutch means for rotating said shaft including a driving and a driven member, said driving member having a spiral groove in one face thereof comprising a 360° portion of small radial displacement connected with a 180° portion of substantial radial displacement connected with a second 360° portion of small radial displacement, a radially shiftable stop arm carried by said driven member and having a pin extending axially therefrom into said groove, said stop arm having a pair of stop lugs displaced 180° circumferentially, a pair of fixed stops individually cooperable with each of said lugs, one of said lugs being projected and engageable with the respective fixed stops with said pin in the first said 360° portion of said groove and the other of said lugs being similarly operative with said pin in the said second 360° portion of said groove, said arm being radially shifted upon relative movement of said pin in the said 180° portion of said groove, and means including said stop arm for establishing said shaft in selected

positions in accordance with predetermined degrees and directions of rotation of said driving member.

11. A shaft positioning device as set forth in claim 10 wherein said driving member has extensions of said groove at either end thereof connected with said 360° portions to provide overrun paths for said pin.

12. In a shaft positioning device, a shaft, friction clutch means for rotating said shaft including a driving and a driven member, said driven member being slidably and non-rotatably mounted on said shaft and having a radial groove therein adapted to receive a stop arm rotatable with said driven member and radially displaceable with respect thereto, and means for mounting said members in frictional engagement comprising a thrust bearing for supporting said driving member secured to said shaft, spring pressure means bearing on said arm, and retaining means on said shaft for engaging said spring pressure means, said driven member having a circular coaxial cut-out portion coextensive in depth with the radial groove therein for guiding said spring pressure means.

13. In a shaft positioning device, a shaft, friction clutch means for rotating said shaft including a driving and a driven member, said driven member being slidably and non-rotatably mounted on said shaft and having a radial groove therein adapted to receive a stop arm rotatable with said driven member and radially displaceable with respect thereto, and means for mounting said members in frictional engagement comprising a thrust bearing for supporting said driving member secured to said shaft, said driven member having a circular coaxial cut-out portion forming a shoulder of said radial groove above the face of said stop arm in said groove, spring pressure means seated on said shoulder, and retaining means on said shaft for engaging said spring pressure means, said stop arm being freely displaceable radially in said groove.

14. In a shaft positioning device, a shaft, friction clutch means for rotating said shaft including a driving member and a driven member, and spring pressed means for maintaining said members in engagement comprising a coaxial thrust bearing for supporting said driving member and a coaxial coil spring mounted in a cylindrical casing in engagement with said driven member, closure means for said casing and retaining means on said shaft for maintaining said coil spring under pressure.

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