

June 3, 1941.

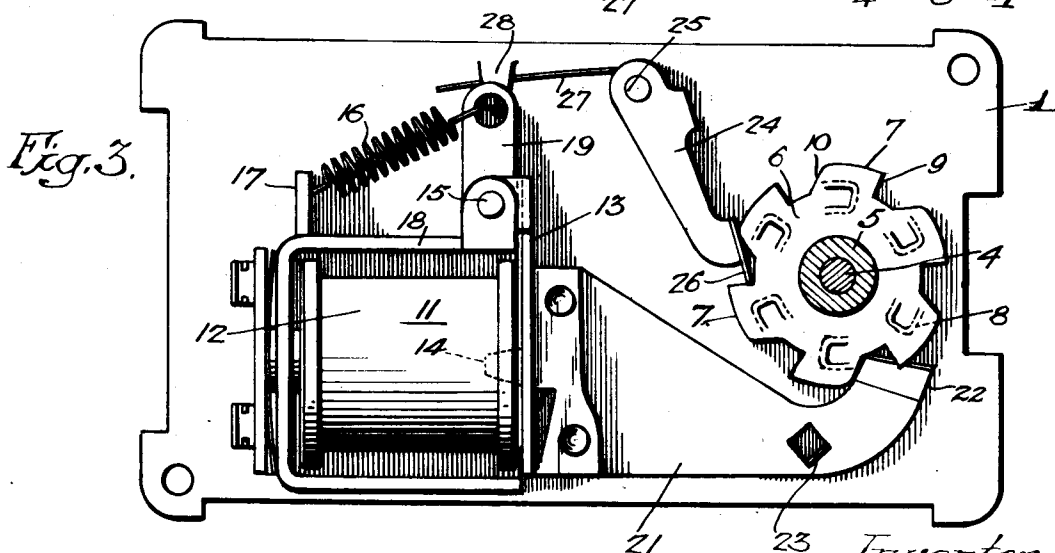
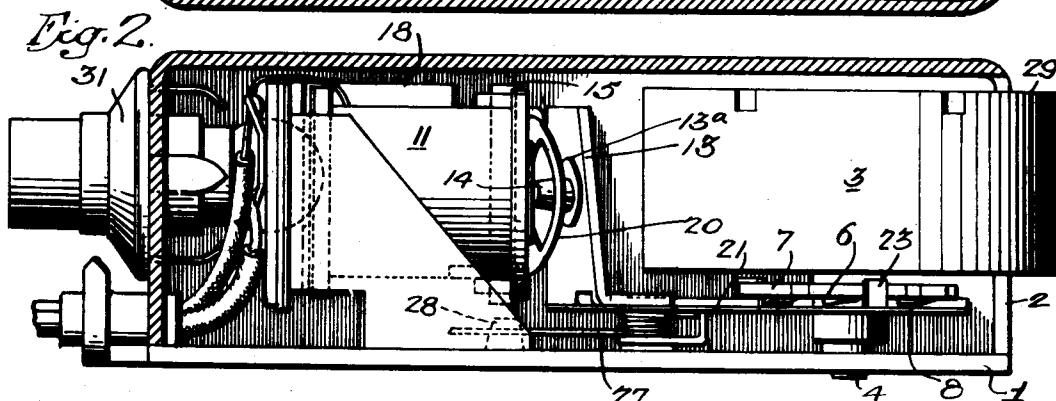
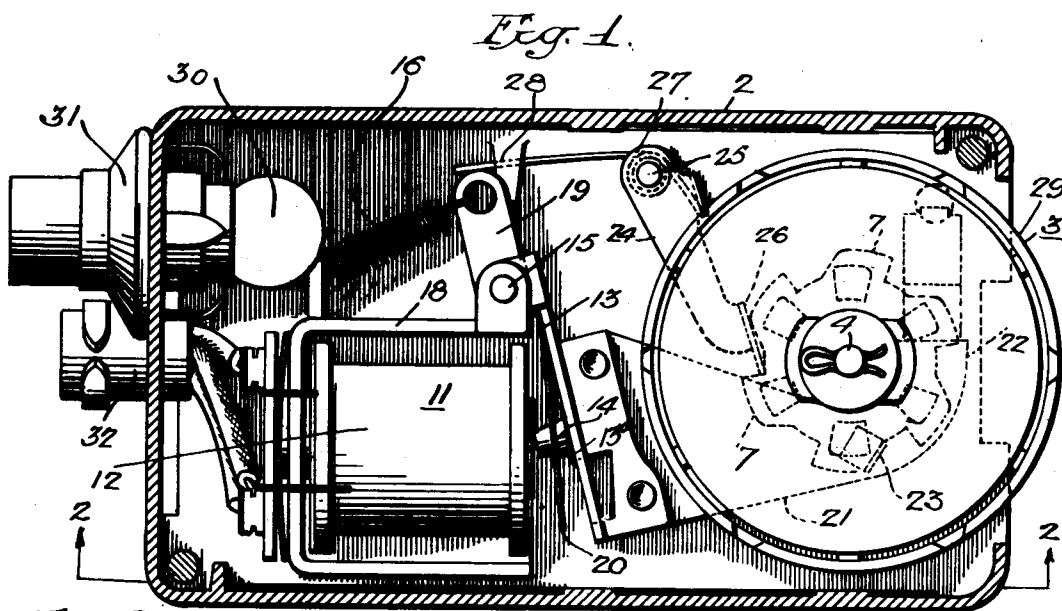
J. E. BARTH

2,244,601

POSITIONING MECHANISM

Filed July 25, 1939

2 Sheets-Sheet 1



23 Inventor
Jay E. Barth
by his Attorneys
Houm & Houm

June 3, 1941.

J. E. BARTH

2,244,601

POSITIONING MECHANISM

Filed July 25, 1939

2 Sheets-Sheet 2

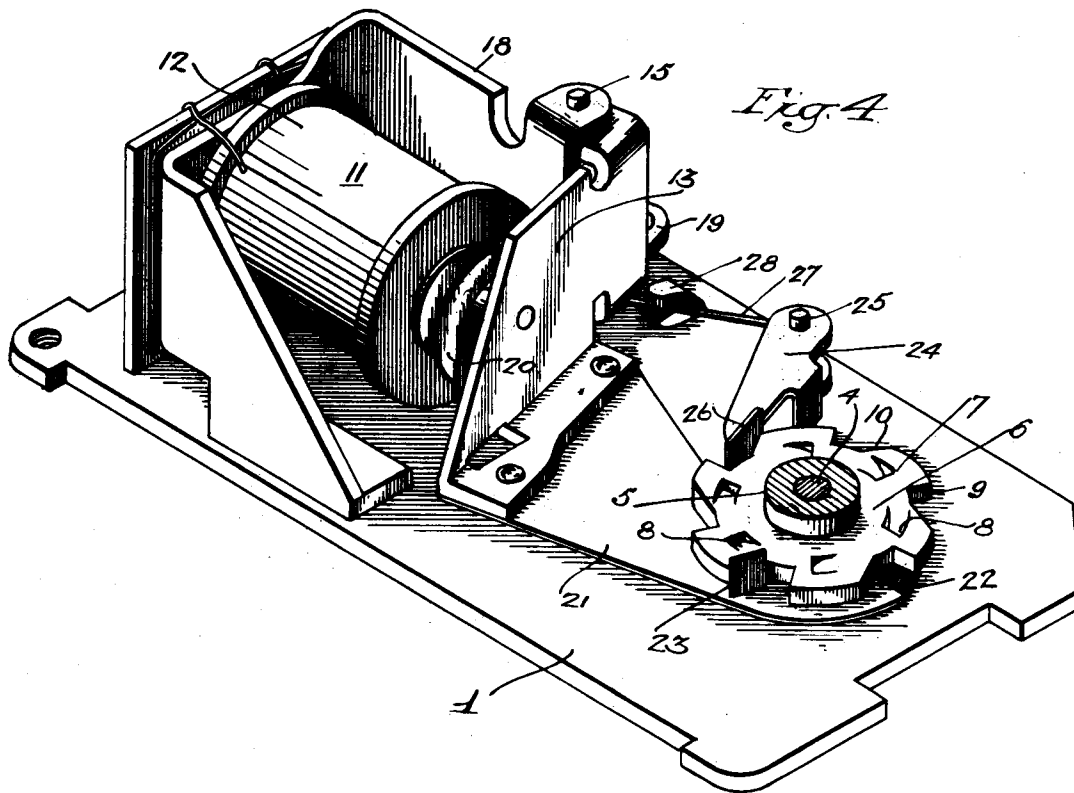


Fig. 4

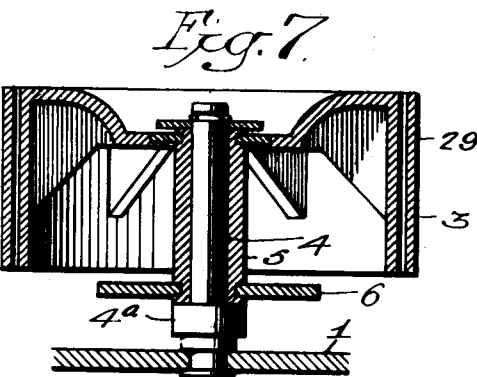
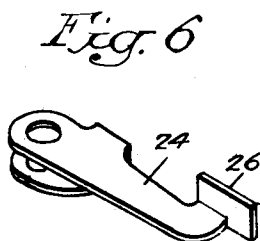


Fig. 7

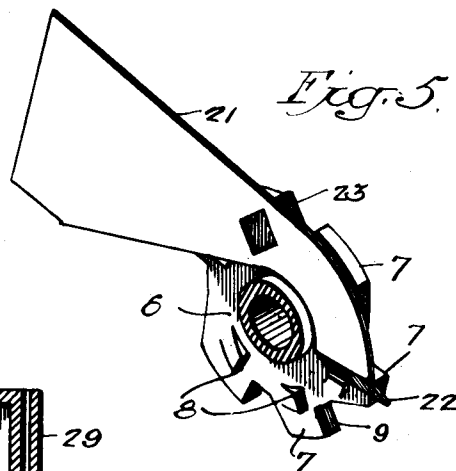


Fig. 5

Inventor
Jag E. Barth
by his Attorneys
Hudson & Hudson

UNITED STATES PATENT OFFICE

2,244,601

POSITIONING MECHANISM

Jay E. Barth, Detroit, Mich., assignor, by mesne assignments, to Philco Radio and Television Corporation, Philadelphia, Pa., a corporation of Delaware

Application July 25, 1939, Serial No. 286,491

8 Claims. (Cl. 74-142)

This invention relates to positioning mechanisms and, more particularly, to a novel mechanism for positioning a rotary device in step-by-step fashion. While the invention is applicable generally to the positioning of any device, it is particularly adapted for positioning a tuning indicator for a radio receiver or the like and, therefore, it will be described with reference to such adaptation.

One object of the invention is to provide a simple and compact mechanism for operating a rotary device in step-by-step fashion.

Another object of the invention is to provide a novel mechanism of the stated character having provision for preventing overrun or "galloping" action of the device being controlled.

A further object of the invention is to provide an electromagnetically operable positioning mechanism which is responsive to successive electrical impulses and which embodies certain novel features pointed out hereinafter.

A still further object of the invention is to provide a mechanism which is particularly adapted for actuating a tuning indicator for a radio receiver, especially a receiver wherein it is desired to have the tuning indicator separate from the receiver proper, as in the case of an automobile radio receiver.

The invention may be more clearly understood by reference to the accompanying drawings, wherein:

Fig. 1 is a sectional view of the mechanism provided by the invention;

Fig. 2 is a sectional view taken along line 2-2 of Fig. 1;

Fig. 3 is a face view of the mechanism removed from its casing and showing the parts in an operative position;

Fig. 4 is a perspective view of the mechanism;

Figs. 5 and 6 are detail perspective views of certain parts; and

Fig. 7 is a detail sectional view of the indicating device.

Referring to the drawings, there is provided a mounting plate 1 upon which the parts of the mechanism are mounted, and a cover or casing 2 adapted to enclose the said parts. A tuning indicator, designated generally by reference character 3, is rotatably mounted on the base plate 1 and constitutes the device to be positioned by the mechanism. As indicated above, this device is representative of any device whose position it is desired to vary by means of the mechanism to be described presently. The device 3 (see Fig. 7) comprises a stationary pin 4

carried by the base plate 1 and on which there is rotatably mounted a hollow shaft or sleeve 5 carrying a toothed wheel 6. The pin 4 has a collar or flange 4a thereon, on which the lower end of sleeve 5 seats. The sleeve 5 also carries an indicator dial or drum of which more will be said later. The wheel 6 has radially-extending detent teeth 7 (see Figs. 3 and 4) whose purpose will be explained presently and ratchet teeth 8 protruding from one side of the wheel and preferably formed by struck-out portions of the wheel. It will be noted that the number of detent teeth 7 corresponds to the number of ratchet teeth 8. It will be noted further that each detent tooth has an abrupt radial edge 9 and a sloping edge 10.

An electromagnetic device, indicated generally at 11, is mounted on the base plate 1 and is arranged to actuate the device 3. This actuating device comprises an electro-magnet or coil 12 and a pivoted armature plate 13 carrying a tapered armature pin 14 (see Figs. 1 to 3) arranged to move into an axial opening in the electromagnet 12. A ring or washer of non-magnetic material, such as brass, is secured to plate 13 and surrounds the pin 14. The purpose of this will be explained presently. The armature plate 13 is pivoted at 15 and is biased to the position shown in Fig. 1 by means of a spring 16 having one end attached to a stationary lug 17 on the magnet frame 18, the other end of the spring being attached to an extending arm 19 carried by plate 13. A leaf spring 20, formed of resilient non-magnetic material, is secured to the plate 13 adjacent its pivot point and is arranged to engage the end of the magnet structure when the armature is attracted by the energized magnet. This spring member is in the form of a ring and is adapted to surround the magnet core when the device is energized.

The purpose of the non-magnetic washer 13a is to prevent sticking of the armature plate by preventing the same from becoming permanently magnetized, and the non-magnetic member 20 serves this purpose also but it functions additionally as a buffer and silencer for the armature, preventing the same from forcibly striking the pole piece or core of the magnet. The elements 13a and 20 increase the reluctance of the magnetic path between the armature plate and the magnet core, which would normally increase the current required to insure positive operation. However, the tapered pin 14 compensates for the said increase in reluctance by decreasing the reluctance at the central part of

the device where it is very effective and causing positive operation by small currents.

The armature plate 13 carries an arm 21, the free end of which is formed to provide a pawl 22 (see Figs. 4 and 5) which is arranged cooperatively with the ratchet teeth 8. There is also provided on member 21 a detent 23 which is adapted to function cooperatively with the detent teeth 7 and is preferably formed by striking out a portion of the arm 21.

An auxiliary arm 24 (see Fig. 6) is pivotally mounted on the base plate 1 at 25 and has its free end formed to provide a detent 26 also adapted to function cooperatively with the detent teeth 7. A fine wire spring 27 is coiled about the pivot 25 and has one end in engagement with the arm 24 while the opposite end of the spring is held by a turned-up lug 28 on the base plate. The spring 27 is thus arranged to urge the arm 24 counter-clockwise, as viewed in Figs. 1 and 3, into cooperative engagement with the wheel 6.

In order to indicate the various stations to which a radio receiver may be tuned by step-by-step action, the tuning indicator 3 has a transparent indicator dial or drum 29 carried by the rotatable sleeve 5 (see Fig. 7). This indicator drum has suitable provision for carrying indicia to indicate the various stations. This device forms the subject of a copending application of Jackson H. Pressley, Serial No. 286,486, filed July 25, 1939. As shown in Figs. 1 and 2, the casing 2 is open at one end and a portion of the indicating dial protrudes therefrom so that the indicia carried on the periphery of the dial may be brought successively into view. To illuminate the dial and the indicia thereon, there is provided within the casing 2 a lamp 30 carried by the socket structure 31 which is removably mounted on an end wall of the casing. The conductors leading to the electromagnet 11 enter the casing through a suitable insulator bushing 32.

Considering now the operation of the device, normally the armature of the electromagnet is in the position illustrated in Figs. 1 and 2 and the detent 23 abuts against the edge 10 of one of the detent teeth 7 (see Fig. 4), while the auxiliary detent 26 abuts against the edge 9 of another one of the said teeth. It will be seen that the detent 23 prevents movement of the wheel 6 in a counter-clockwise direction, as viewed in Figs. 1, 3 and 4, while the detent 26 prevents rotation of the wheel in a clockwise direction. Thus, the wheel is held stationary and is prevented from shifting the position of the indicia in the viewing position. This is particularly important in the case of an automobile radio receiver or the like wherein the mechanism is subject to vibrations and jolts tending to shift the position of the dial.

When a current impulse is supplied to the electromagnet 11, the armature is attracted and the plate 13 moves to the position shown in Fig. 3 against the action of spring 16. This causes the detent 23 to be removed from engagement with the detent teeth 7 and also causes the pawl 22 to be retracted by sliding the same over one of the ratchet teeth. When the energizing impulse ceases, the armature plate 13 is retracted by means of the spring 16 and the arm 21 is moved to its normal position. During this movement, the pawl 22 engages one of the ratchet teeth, as shown in Fig. 5, moving the wheel 6 through one step. During this stepping movement, the detent 23 is moved into the path of the detent teeth 7 and acts as a stop to limit the movement of

wheel 6 to one step. This is an important feature as will now be shown.

In a mechanism of this character, there is a tendency for the device being operated to overrun or "gallop," particularly when it is actuated through several steps by rapidly occurring impulses. This tendency is due to the momentum gained by the rotating device which tends to carry the device beyond the desired position. Moreover, the greater the number of impulses and the greater their rate of occurrence, the greater will be the momentum acquired by the rotating device. By the simple provision of the detent arrangement illustrated, the device is prevented from moving more than one step at a time.

During each stepping movement, the auxiliary detent 26 rides over the sloping edge 10 of each detent tooth, the arm 24 pivoting against the action of spring 27 to permit this. At the end of each stepping movement, however, the detent 26 engages the edge 9 of the detent tooth, thus locking the wheel 6 in its new position against clockwise rotation as viewed in the principal figures.

A device of the character illustrated may be employed in conjunction with a step-by-step tuning mechanism, the two being operated in step-by-step correlation so that the tuning indicator indicates accurately the station to which the tuning device tunes the receiver. To this end, the tuning device may be operated electromagnetically and the two electromagnets may be connected in the same circuit and controlled by a single push-button which may be actuated repeatedly to impart successive impulses to the electromagnets simultaneously. Such an arrangement is disclosed in the copending application of Quinn, Serial No. 286,492, filed July 25, 1939, wherein the step-by-step correlation of two devices is broadly claimed. It will be apparent that the tuning indicator and its operating mechanism may be located remote from the tuning device which may form a part of the receiver proper. Furthermore, the actuating button or switch may be disposed in any desired position remote from either of the said devices. In the case of an automobile receiver, for example, the receiver proper may be located in any convenient position and the tuning indicator unit provided by this invention may be mounted on the instrument panel or in any other desired position where it may be readily operated and observed by the operator. Such an arrangement eliminates the necessity of employing flexible cables to control the tuning of a radio receiver.

While the invention has been illustrated and described with reference to one specific embodiment, it will be understood that various modifications of the structure may be resorted to without departing from the scope of the invention as defined in the appended claims.

I claim:

1. An electromagnetic step-by-step positioning device including in combination, a rotary device to be positioned, a wheel on said device having a plurality of laterally-extending ratchet teeth and a corresponding plurality of radially-extending detent teeth, a pawl arranged to engage said ratchet teeth and thus rotate said device, means for actuating said pawl including an electromagnet and a pivoted armature therefor, said pawl consisting of a flat metal arm secured to said armature and movable therewith, said arm carrying an offset portion arranged to engage said ratchet teeth, and a detent portion arranged

to engage said detent teeth, means normally maintaining said arm portions in engagement with said teeth, said arm being rotatable about the pivot of said armature whereby a small armature movement will actuate said device.

2. An electromagnetic step-by-step positioning device including in combination, a rotary device to be positioned, a wheel on said device having a plurality of laterally-extending ratchet teeth and a corresponding plurality of radially-extending detent teeth, a pawl arranged to engage said ratchet teeth and thus rotate said device, means for actuating said pawl including an electromagnet and a pivoted armature plate therefor, said pawl consisting of a flat metal arm secured to said armature and extending substantially at a right angle thereto, said arm carrying an offset portion arranged to engage said ratchet teeth, and a detent portion arranged to engage said detent teeth, means normally maintaining said arm portions in engagement with said teeth, said arm being rotatable about the pivot of said armature whereby a small armature movement will actuate said device.

3. In a step-by-step positioning device, a ratchet and detent wheel having radial detent teeth on its periphery and ratchet teeth struck out from the body of the wheel at circularly-spaced points and extending laterally from a face thereof, a flat pawl extending parallel to the plane of said wheel and having a laterally-turned end adapted to engage said ratchet teeth, a detent struck-out from said pawl and extending laterally therefrom so as to engage said detent teeth and limit the movement of the wheel by said pawl, and means for actuating said pawl.

4. In a step-by-step positioning device, a ratchet and detent wheel having radial detent teeth on its periphery and ratchet teeth struck out from the body of the wheel at circularly-spaced points and extending laterally from a face thereof, a flat pawl extending parallel to the plane of said wheel and having a laterally-turned end adapted to engage said ratchet teeth, a detent struck-out from said pawl and extending laterally therefrom so as to engage said detent teeth and limit the movement of the wheel by said pawl, means for actuating said pawl, and a second pawl engaging said detent teeth and preventing retrograde movement of said wheel.

5. In a step-by-step positioning device, a ratchet and detent wheel having radial detent teeth on its periphery and having circularly-spaced laterally-extending ratchet teeth, each of said detent teeth having front and rear edges of predetermined configuration, a stepping pawl arranged to engage said ratchet teeth to actuate said wheel, means for reciprocating said pawl, a detent on said pawl constructed and arranged in predetermined relation to the front edges of

the detent teeth and engageable therewith to limit the movement of the wheel to the desired amount, and a holding pawl constructed and arranged in predetermined relation to the rear edges of the detent teeth and engageable therewith to prevent retrograde movement of said wheel.

6. In a step-by-step positioning device, a ratchet and detent wheel having radial detent teeth on its periphery and having circularly-spaced laterally-extending ratchet teeth, each of said detent teeth having a sloping front edge and an abrupt radial rear edge, a stepping pawl arranged to engage said ratchet teeth to actuate said wheel, means for reciprocating said pawl, a detent on said pawl arranged to engage the sloping front edge of a detent tooth during each stepping movement of said wheel, thereby to limit the movement of the wheel to the desired amount, and a holding pawl arranged to engage the radial rear edge of a detent tooth to prevent retrograde movement of said wheel.

7. In a step-by-step positioning device, a ratchet and detent wheel having radial detent teeth on its periphery and having circularly-spaced laterally-extending ratchet teeth, each of said detent teeth having front and rear edges of predetermined configuration, a stepping pawl arranged to engage said ratchet teeth to actuate said wheel, means for reciprocating said pawl, a laterally-extending detent on said pawl having a flat face engageable with the front edges of the successive detent teeth during the successive movements of said wheel, thereby to limit the movement of the wheel to the desired amount, and a holding pawl having an edge portion engageable with the rear edges of the successive detent teeth to prevent retrograde movement of said wheel.

8. In a step-by-step positioning device, a ratchet and detent wheel having radial detent teeth and lateral ratchet teeth, each of said detent teeth having front and rear edges of predetermined configuration, a stepping pawl adapted to engage said ratchet teeth, a detent on said pawl adapted to engage the front edge of a detent tooth, means normally maintaining said pawl in a position such that said detent is effective to prevent rotation of the wheel in a forward direction, a holding pawl adapted to engage the rear edge of a detent tooth, means normally maintaining said holding pawl in operative position so as to prevent rotation of the wheel in a rearward direction, and means for reciprocating said stepping pawl to actuate said wheel, said detent and said holding pawl preventing undesired movement of the wheel during the actuation thereof.

JAY E. BARTH.