March 4, 1952 J. R. DULL 2,588,093

TUNING MECHANISM FOR TELEVISION SETS AND THE LIKE

Filed April 13, 1951 2 SHEETS—SHEET 1

Fig. 1.

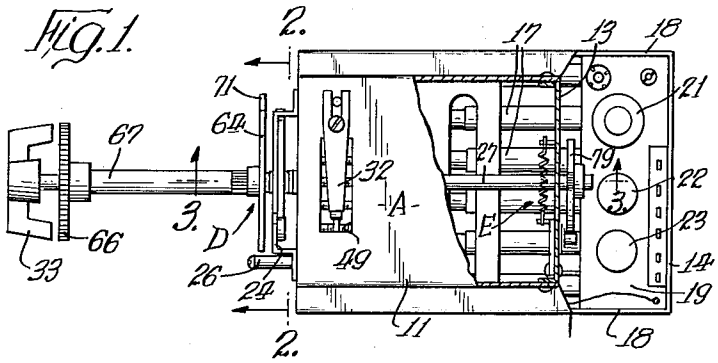


Fig. 2.

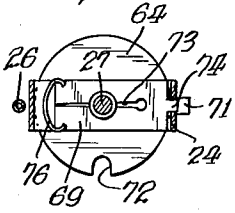
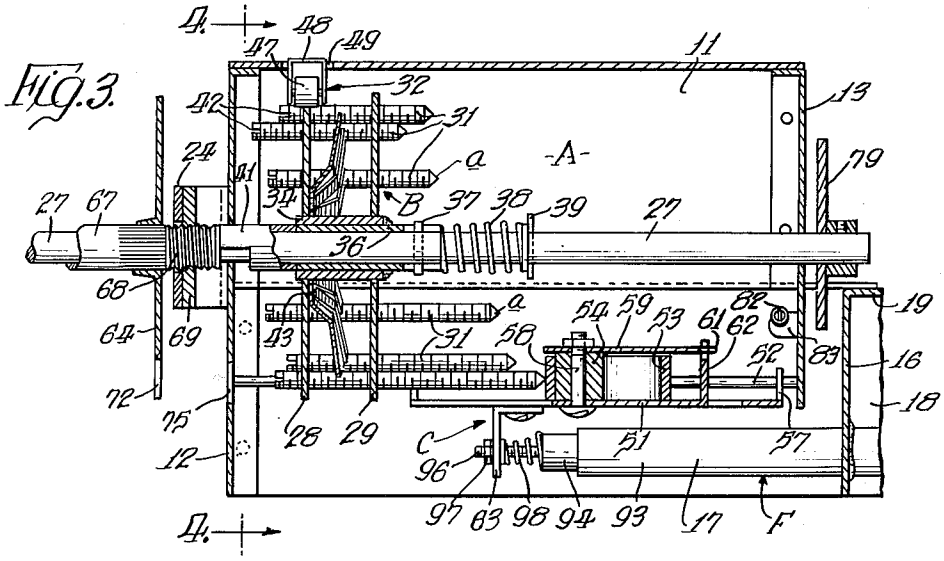


Fig. 3.



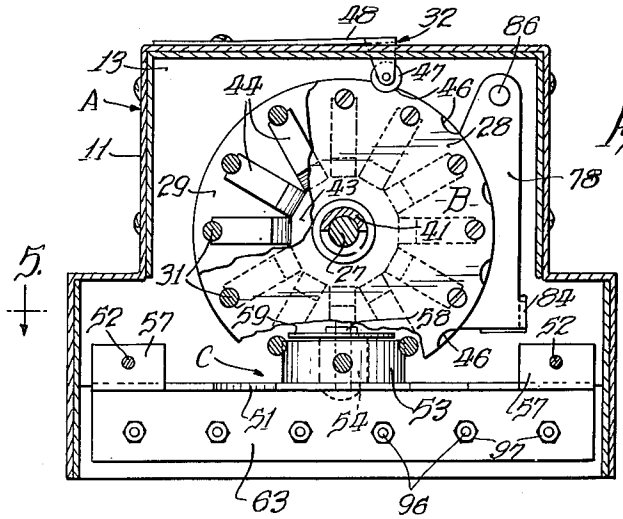


Fig. 4.

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Fig. 5.

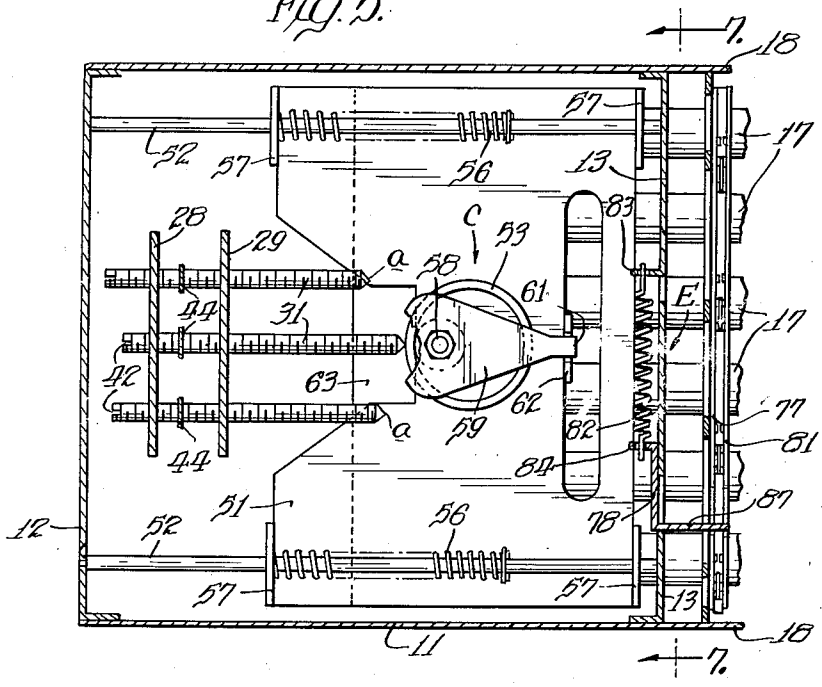


Fig. 6.

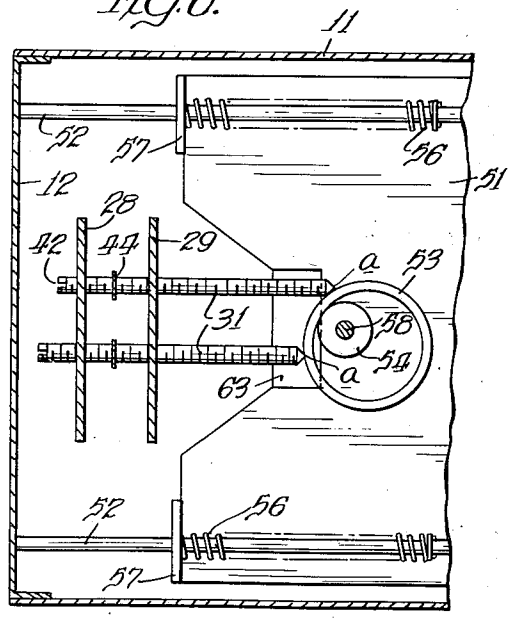
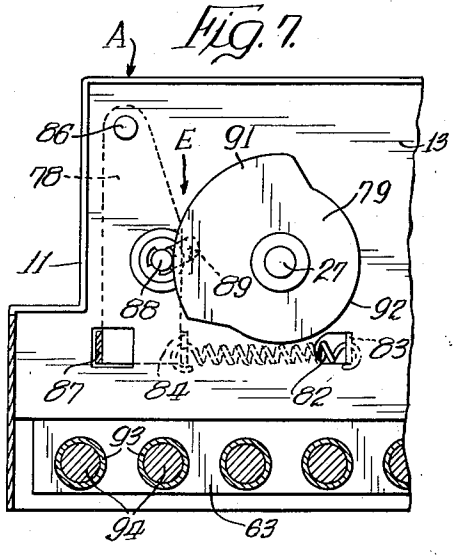


Fig. 7.



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UNITED STATES PATENT OFFICE

2,588,093

TUNING MECHANISM FOR TELEVISION SETS AND THE LIKE

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Application April 13, 1951, Serial No. 220,845

25 Claims. (Cl. 74—10.33)

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This invention relates to a motion translating mechanism particularly adapted for use in television receiving sets whereby the rotation of a channel-selector knob will effect the required longitudinal adjustment of certain channel-selector impedance elements for this purpose.

The main objects of this invention are to provide an improved device for translating circular or rotary motion into longitudinal or reciprocal motion; to provide an improved form and arrangement of the several parts of the device of this kind which results in (1) a smooth and accurate reciprocal movement with a minimum of lost motion, (2) a widely-distributed and minimum wear, and (3) freedom from shocks or impacts which arise from operation of the rotary element; to provide improved means for obtaining a fine vernier adjustment of the positioned reciprocable member; to provide in a device of this kind an improved form and arrangement of the several parts which permits a continuous rotation of the rotatable element in either direction; to provide an improved device of this kind which is particularly adapted for use in securing the relative adjustments of the channel-selector mechanism for wave-receiving sets, more particularly television receiving sets; to provide an improved device of this kind wherein the parts are of such simple construction that they may be economically produced, and be assembled by other than highly-skilled labor and with practically no likelihood of inaccuracies, thereby insuring long life and minimizing the requirements for, and cost of, repairs or replacements.

In the accompanying drawings:

Fig. 1 is a plan view of a television channel-selecting mechanism constructed in accordance with this invention, certain parts of the enclosing housing being broken away to more clearly show the internal arrangement;

Fig. 2 is a sectional detail, taken on line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional elevational view, taken on line 3—3 of Fig. 1;

Fig. 4 is a transverse sectional elevational view, taken on line 4—4 of Fig. 3;

Fig. 5 is a fragmentary horizontal sectional view, taken on line 5—5 of Fig. 4, showing the motion translating parts in the position they occupy when the rotatable element is held in one of its operative positions;

Fig. 6 which is a fragmentary sectional view similar to Fig. 5, shows the position of the floating ring when the rotating element is intermediate of its latched positions; and

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Fig. 7 is a fragmentary sectional elevation, taken on line 7—7 of Fig. 5.

A distinctive feature of this invention involves a rotatable element and a spring biased reciprocating member, the element mounting a concentrically arranged series of axially disposed adjustable pins whose ends are spaced at progressively different distances from the plane of the rotative element and which operate, during rotation of the element, to successively contact the external periphery of a floating ring so as to press it eccentrically against, and cause it to revolve around, a fixed hub on the reciprocating member whereby rotation of the element produces a smooth reciprocation of the member thereby to secure the required adjustment of the channel-selecting mechanism for a television set.

A motion translating device constructed in accordance with this invention comprises a supporting housing A, a rotatable element B, a reciprocal member C, a trimming means D, a switch actuating means E, all compactly assembled for use with suitable electrical equipment, and connections F essential to selectively connecting a television receiving set with the standard frequency channels.

The support A whereon all of these parts are mounted comprises a supporting housing 11 having front and rear end walls 12 and 13, an end plate 14, and an intermediate angle bracket 16.

In cross section the housing 11 appears as an inverted T with the lateral sides of the transverse part having extensions 18 continuing rearwardly beyond the end wall 13 (see Fig. 1). As herein constructed, the end walls 12 and 13 are set within, and substantially flush with, the open ends of the housing 11 and are secured thereto as by screws and/or by welding. The rear end wall 13 does not extend to the bottom of the transverse part of the main housing because of the arrangement of certain channel-selector impedance elements 17 (see Fig. 3). End plate 14 is secured between the rear ends of the lateral extensions 18 (see Fig. 1). The angle bracket 16 is secured across the extensions 18 adjacently rearwardly of the end plate 14 with one leg thereof extending horizontally at the upper edges of the extensions 18 to form a base 19 for sockets which receive certain electronic tubes 21, 22 and 23 (see Figs. 1 and 3). The front end wall 12 mounts a bracket 24 and a stop 26 which coact with the trimming means D to be hereinafter described. The front wall 12 and the rear plate 14 are provided with a series of apertures aligned with the channel-selector mechanism 17.

The rotatable element B comprises a shaft 27 whereon is mounted a pair of disc plates 28 and 29 for supporting a plurality of parallel pins 31 which are arranged concentrically about the axis of the shaft 27. The disc plates are held in predetermined rotative positions by a detent 32. The shaft 27 is journaled on the housing walls 12 and 13 and extends forwardly of the front wall 12 to mount an operating knob 33 (see Fig. 1).

The disc plates 28 and 29 are secured in axially spaced relationship to a collar 34 which is secured to a sleeve 36 slidably mounted on the shaft 27 to which it is keyed by a pin 37 (see Fig. 3). A spring 38 embracing the shaft 27 is interposed between the end of the sleeve 36 and a pin 39 in the shaft 27 so as to press the sleeve 36 forwardly against a bushing 41.

The pins 31 are threaded into one of the discs 28 or 29, and the inner acting end *a* of each pin is conically shaped whereas its outer end is formed with a cross slot 42 to receive a screw driver to permit axial adjustment of the pins so that their conical ends may be positioned at progressively different distances from the planes of the discs 28 and 29. The pin acting ends thus constitute a cam means through which the circular motion of the discs 28 and 29 is translated into a reciprocating motion for the member C as will be presently described.

In order to hold the pins 31 fixedly in their adjusted positions and prevent any subsequent free turning movements, a spring metal auxiliary disc 43 with radially extending angularly offset fingers 44 is arranged concentrically between the discs 28 and 29, and is secured to one of them—the discs 28, for example. The extremities of these fingers 44 are notched to engage the threads of the respective pins 31 and thereby locate them in the respective positions to which they may be relatively adjusted.

The periphery of the disc 28 is formed with a plurality of arcuate depressions 46, spaced apart rotatively to lie one between each two pins 31 (see Fig. 4), so as to coact with a roller 47 that is journaled on a spring 48, thereby to constitute the detent 32 heretofore referred to. The spring arm 48 which is carried on the housing extends over and through a slot 49 to advance its roller 47 into the proximate notch 46 and thereby yieldingly secure the rotatable element B in as many different rotative positions as there are pins 31. By this arrangement any one of the pins 31 may be positioned to hold the reciprocable member C at any one of several predetermined positions within its reciprocable range for television channel selection.

The reciprocable member C, as herein shown, comprises a plate 51 slidably mounted on guide rods 52 and constituting a carriage whereon is mounted a device having a convex face confronting the rotatable element B. As shown, this device comprises a floating ring 53 rested on the carriage and loosely surrounding a fixed hub 54. By compression springs 56 coiled around the guide rods 52, exerting a thrust force against the carriage, the ring 53 is advanced yieldingly toward the acting end *a* of the lowermost pin 31 on the rotatable element B whose rotative position at the time is fixed by the detent 32 in the manner already described.

The carriage plate 51, as herein shown, is of rectangular form having ears 57 struck up, one adjacent each of its four corners and apertured to receive the respective guide rods 52 for slidably supporting the carriage. Approximately at the center of the carriage plate 51 is secured the hub 54, as by a suitable bolt and nut 58.

The inside diameter of the floating ring 53 is considerably greater than is the outside diameter of the hub 54, so as to be maintained always by the springs 56, acting upon the carriage plate 51, in engagement with the acting ends *a* of the two pins 31 that are opposite thereto, i. e., the lowermost pins that are comprised in the rotatable element B. The floating ring thus occupies an eccentric position with respect to the hub 54.

The floating ring 53 may be held against accidental axial displacement on the hub 54 by a hold-down shield 59 secured at one end to the hub bolt 58 and formed at its other end with a tongue 61 that engages a lug 62 (see Fig. 5) struck up from the carriage plate 51. On the underside of the carriage plate, adjacent its forward end, is an angle bracket 63 which is set in opposed relationship to the bracket 16 and coacts therewith in affording support for the channel-selector mechanism 17.

As the discs 28 and 29 are rotated the acting ends *a* of the pins 31 which are adjusted axially to different positions will advance toward or recede from the floating ring 53 to shift its position eccentrically with respect to the line of travel of the axis of the hub 54, and also cause the floating ring to shift its position rotatively with respect to the hub. It is this feature of operation that gives a smooth and accurate reciprocable movement to the carriage 51 and with a minimum of lost motion and practically free of shocks and impulses that might emanate from the rotation of the discs 28 and 29. Moreover, because of this rotative shifting of the floating ring about the hub 54, there is an even and uniform wearing of the ring during a long period of continued operation of the device. To enhance as much as possible the wearing qualities of the ring, it may be heat treated without regard to any circular distortion resulting therefrom, since perfect roundness is not a factor in the accuracy of operation in the device of this invention.

The trimming means D whereby fine vernier adjustments of the carriage plate 51 are obtained comprises a dial 64 and a knob 66 fixed on a sleeve 67 that is rotatably mounted on the shaft 27 intermediate the bushing 41 and the knob 33. The knob 66 is desirably positioned close to the knob 33 for convenience in manipulations. The inner end of the sleeve 67 is threaded at 68 to operate in a threaded block 69 on the bracket 24. In response to rotation of the sleeve 67 on the shaft 27, pressure is exerted against the spring 38 to produce a relative axial movement of the discs 28 and 29 and the mounted pins 31 with respect to the shaft 27. The block 69 may be a piece of a resilient material that is threaded to coact with the sleeve threads 68. It is slit at 73 (see Fig. 2) and held in place on the bracket 24 by a plug 74 protruding through a slot in the end of the bracket and around the sleeve 67 by a C-shaped spring 76 so as to effect an axial movement of the sleeve 67 when it is turned on the shaft 27.

The dial 64 which is mounted adjacent the inner end of the sleeve 67 is formed with a peripheral tooth 71 which abuts the pin 26 to limit the rotation of the dial to a single revolution. Hence, the extent of axial movement of the shaft 27 is determined by the pitch of the threads 68. The dial 64 is also formed peripherally with

a semicircular recess 72 so that when the recess is down it will be in axial alignment with an opening 75 in the housing end wall 12 (see Fig. 3), thereby to permit insertion of a screw driver to effect successive rotative adjustment of the pins 31. The location of the recess 72 is such that when it is opposite the opening 75, the dial 64 will be turned to the position wherein the sleeve 67 is intermediate the extreme limits of its movement. This is the best position for accurate adjusting of the several pins 31.

The switch actuating means E comprises a switch bar 77, a rocker arm 78, and a cam 79 (see Figs. 5 and 7). The switch bar 77 which is a more or less conventional feature in television receiving sets is arranged to coact with a plate 81 so as to synchronize with the adjustment of the impedance elements 17 to effect the required current changes between bands or channels of low and high frequency. A spring 82 extending between a lug 83 on the housing rear wall 13 and a lug 84 on the rocker arm 78 normally biases the bar 77 toward a right-hand position, as viewed from the front of the instrument.

The rocker arm 78 is hinged at 86 on the inside of the housing rear wall 13 (see Figs. 4 and 7) and is provided with a finger 87 extending rearwardly to engage a slot in the switch bar 77 (see Fig. 5). A follower pin 88 on the rocker arm 78 extends through a slot 89 in the wall 13 to contact the cam 79. This cam is secured to the rear end of the shaft 27, outwardly of the end wall 13, and is formed with an outset arcuate riser 91, concentric with the axis of the shaft 27, which, in coaction with the inset arcuate surface 92, effects the required reciprocation of the switch bar 77 in proper coordinated relationship with shifting of the carriage plate 51 through which a selection of television channels is afforded.

The electrical equipment and connections F may be such as are commonly used on television receiving sets. Herein are shown only the channel-selector impedance elements 17 and the electronic tubes 21, 22 and 23. The impedance mechanism comprises six telescoping units 93 and 94 (see Fig. 3). The outer units 93 are anchored adjacent one end of the bracket 16. The inner units 94 are yieldingly attached at their opposite ends to the bracket 63 by threaded rods 96 with nuts 97 on their outer ends, and springs 98 interposed between each unit 94 and the bracket. Thus a reciprocal movement of the carriage plate 51 produces the required relative axial adjustment of these impedance elements to effect the desired channel selection.

The operation of a television channel-selector device embodying this invention is substantially as follows:

After operating the usual current switch (not shown) to closed position, the knob 33 is turned to the appropriate position for the desired channel. The resulting rotation of the discs 28 and 29 and the pins 31 mounted thereon, in coaction with the springs 56, will produce a reciprocal movement of the carriage plate 51 to so adjust the telescopic relationship of the impedance elements 17 as to relate the set to the channel of the frequency desired. Because of the special relationship of the floating ring 53 to the hub 54, the transition from channel to channel is made by rotating the knob 33 in either direction and without shock or impact transmitted from any of the other parts of the instrument.

If trimming is needed to better clarify the features on the screen, the knob 66 is turned so as to secure a fine vernier adjustment of the carriage plate 51 and with it a corresponding fine adjustment of the selector impedance elements 17. When the selection of a channel involves a change between bands of low and high frequency, the coordinated action of the cam 79 will effect the required movement of the switch bar 77.

When it is desired to adjust any of the pins 31 to clarify any particular channel reception, the dial 64 is turned to the position shown in Figs. 2 and 3. Thereupon a screw driver may be inserted through the registering dial recess 72 and the end panel opening 75 to engage the cross slot 42 of the proximate pin. Turning the pin slightly alters the position of the carriage plate 51 relative to the planes of the discs 28 and 29, and consequently effects a controlled very slight adjustment of the impedance elements 17.

I claim:

1. The combination of a support, an element rotatably journaled on the support, axially disposed cam means mounted on the element, a member reciprocatingly mounted on the support for movement parallel to the axis of the rotary element, a hub on the member disposed in the circumference of the cam means, and a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the cam means with the ring whereby the rotation of the element effects a smooth reciprocable movement of the member.

2. The combination of a support, an element rotatably journaled on the support, axially disposed cam means mounted on the element, a member reciprocatingly mounted on the support for movement parallel to the axis of the rotary element, means biasing the movement of the member in one direction, a hub on the member disposed in the circumference of the cam means, and a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the cam means with the ring whereby the rotation of the element effects a smooth reciprocable movement of the member.

3. The combination of a support, an element rotatably journaled on the support, axially disposed cam means mounted on the element, a member reciprocatingly mounted on the support for movement parallel to the axis of the rotary element, a hub on the member disposed in the circumference of the cam means, a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the cam means with the ring whereby the rotation of the element effects a smooth reciprocable movement of the member, and spring-biased detent means for yieldingly holding the rotary element in predetermined rotative positions.

4. The combination of a support, an element rotatably journaled on the support, a plurality of axially disposed pins arranged on the rotary element concentrically about the axis thereof with the ends of the pins located at progressively different positions axially of the rotary element, a member reciprocably mounted on the support for movement parallel to the axis of the element, means biasing the movement of the member in one direction, a hub on the member disposed within the circular confines of the concentrically arranged pins, and a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of

the pin ends with the ring whereby the rotation of the element effects a smooth reciprocable movement of the member.

5. The combination of a support, an element rotatably journaled on the support, a plurality of axially disposed pins adjustably arranged on the rotary element concentrically about the axis thereof with the ends of the pins located at progressively different positions axially of the rotary element, a member reciprocably mounted on the support for movement parallel to the axis of the element, means biasing the movement of the member in one direction, a hub on the member disposed within the circular confines of the concentrically arranged pins, and a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the pin ends with the ring whereby the rotation of the element effects a smooth reciprocable movement of the member.

6. The combination of a support, an element rotatably journaled on the support, a plurality of axially disposed pins adjustably arranged on the rotary element concentrically about the axis thereof with the ends of the pins located at progressively different positions axially of the rotary element, a spring disc concentrically fixed on the element and having radially disposed fingers engaging the respective pins and locking them against free turning movement in the element, a member reciprocably mounted on the support for movement parallel to the axis of the element, means biasing the movement of the member in one direction, a hub on the member disposed within the circular confines of the concentrically arranged pins, and a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the pin ends with the ring whereby the rotation of the element effects a smooth reciprocable movement of the member.

7. The combination of a support, an element rotatably journaled on the support, a plurality of axially disposed pins arranged on the rotary element concentrically about the axis thereof with the ends of the pins located at progressively different positions axially of the rotary element, a member reciprocably mounted on the support for movement parallel to the axis of the element, means biasing the movement of the member in one direction, a hub on the member disposed within the circular confines of the concentrically ararnged pins, a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the pin ends with the ring whereby the rotation of the element effects a smooth reciprocable movement of the member, and spring-biased detent means for holding the element in predetermined rotative positions so as to selectively locate the axis of the pins in radial alignment with the axis of the hub.

8. The combination of a support, a shaft journaled on the support, a pair of axially spaced discs fixed to rotate with the shaft, a plurality of threaded axially disposed pins arranged on the discs concentrically about the axis thereof with the ends of the pins located at progressively different distances from the plane of the discs, a guide on the support disposed parallel to the axis of the shaft, a carriage slidably mounted on the guide, a spring biasing the movement of the carriage in one direction, a hub on the carriage disposed within the circular confines of the concentrically arranged pins, and a ring of greater

inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the pin ends with the ring whereby the rotation of the discs effects a reciprocable movement of the carriage on the guide.

9. The combination of a support, a shaft journaled on the support, a pair of axially spaced disc elements fixed to rotate with the shaft, a plurality of threaded axially disposed pins arranged on the disc elements concentrically about the axis thereof with the ends of the pins located at progressively different distances from the plane of each disc element, an auxiliary disc mounted on the shaft between the disc elements and having radially disposed resilient fingers with its extremities formed and positioned to engage the pins and hold them against free turning movement in the disc elements, a guide on the support disposed parallel to the axis of the shaft, a carriage slidably mounted on the guide, a spring biasing the movement of the carriage in one direction, a hub on the carriage disposed within the circular confines of the concentrically arranged pins, and a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the pin ends with the ring whereby the rotation of the disc elements effects a reciprocable movement of the carriage on the guide.

10. The combination of a support, an element rotatably journaled on the support, axially disposed cam means mounted on the element, a member reciprocatingly mounted on the support for movement parallel to the axis of the rotary element, and a device rotatably carried by the member and mounted to float thereon and disposed in the circumference of the cam means and having a convex face opposite the cam means to be slidingly engaged thereby whereby the rotation of the element effects a smooth reciprocable movement of the member.

11. The combination of a support, an element rotatably journaled on the support, axially disposed cam means mounted on the element, a member reciprocatingly mounted on the support for movement parallel to the axis of the rotary element, means biasing the movement of the member in one direction, and a device rotatably carried by the member and mounted to float thereon and disposed in the circumference of the cam means and having a convex face opposite the cam means to be slidingly engaged thereby whereby the rotation of the element effects a smooth reciprocable movement of the member.

12. The combination of a support, an element rotatably journaled on the support, axially disposed cam means mounted on the element, a member reciprocatingly mounted on the support for movement parallel to the axis of the rotary element, a device rotatably carried by the member and mounted to float thereon and disposed in the circumference of the cam means and having a convex face opposite the cam means to be slidingly engaged thereby whereby the rotation of the element effects a smooth reciprocable movement of the member, and spring-biased detent means for yieldingly holding the rotary element in predetermined rotative positions.

13. The combination of a support, an element rotatably journaled on the support, a plurality of axially disposed pins arranged on the rotary element concentrically about the axis thereof with the acting ends of the pins located at progressively different positions axially of the

rotary element, a member reciprocably mounted on the support for movement parallel to the axis of the element, means biasing the movement of the member in one direction, and a device rotatably carried by the member and mounted to float thereon and having a convex face disposed within the circular confines of the concentrically arranged pins to be successively slidingly engaged by the acting ends thereof whereby the rotation of the element effects a smooth reciprocable movement of the member.

14. The combination of a support, an element rotatably journaled on the support, a plurality of axially disposed pins adjustably arranged on the rotary element concentrically about the axis thereof with the acting ends of the pins located at progressively different positions axially of the rotary element, a member reciprocably mounted on the support for movement parallel to the axis of the element, means biasing the movement of the member in one direction, a device rotatably carried by the member and mounted to float thereon and having a convex face disposed within the circular confines of the concentrically arranged pins to be successively slidingly engaged by the acting ends thereof whereby the rotation of the element effects a smooth reciprocable movement of the member.

15. The combination of a support, an element rotatably journaled on the support, a plurality of axially disposed pins adjustably arranged on the rotary element concentrically about the axis thereof with the acting ends of the pins located at progressively different positions axially of the rotary element, a spring disc concentrically fixed on the element and having radially disposed fingers engaging the respective pins and locking them against free turning movement in the element, a member reciprocably mounted on the support for movement parallel to the axis of the element, means biasing the movement of the member in one direction, a device rotatably carried by the member and mounted to float thereon and having a convex face disposed within the circular confines of the concentrically arranged pins to be successively slidingly engaged by the acting ends thereof whereby the rotation of the element effects a smooth reciprocable movement of the member.

16. The combination of a support, an element rotatably journaled on the support, a plurality of axially disposed pins arranged on the rotary element concentrically about the axis thereof with the acting ends of the pins located at progressively different positions axially of the rotary element, a member reciprocably mounted on the support for movement parallel to the axis of the element, means biasing the movement of the member in one direction, a device rotatably carried by the member and mounted to float thereon and having a convex face disposed within the circular confines of the concentrically arranged pins to be successively slidingly engaged by the acting ends thereof whereby the rotation of the element effects a smooth reciprocable movement of the member, and spring-biased detent means for holding the element in predetermined rotative positions so as to selectively locate the axis of the pins oppositely of the convex face of the device.

17. The combination of a support, a shaft journaled on the support, a pair of axially spaced discs fixed to rotate with the shaft, a plurality of threaded axially disposed pins arranged on the discs concentrically about the axis thereof with the acting ends of the pins located at progressively different distances from the plane of the discs, a guide on the support disposed parallel to the axis of the shaft, a carriage slidably mounted on the guide, a spring biasing the movement of the carriage in one direction, a device rotatably and floatingly mounted on the carriage having a convex face disposed within the circular confines of the concentrically arranged pins to be successively slidingly engaged by the acting ends thereof whereby the rotation of the discs effects a reciprocable movement of the carriage on the guide.

18. The combination of a support, an element rotatably journaled on the support, axially disposed cam means mounted on the element, a member reciprocably mounted on the support for movement parallel to the axis of the rotary element, a device rotatably carried by the member and mounted to float thereon and having a convex face disposed within the confines of the cam means to be slidingly engaged thereby whereby the rotation of the element effects a smooth reciprocable movement of the member, and means associated with the rotary element for shifting it axially on the support for securing fine vernier adjustments of the member.

19. The combination of a support, an element rotatably journaled on the support, a plurality of axially disposed pins arranged on the rotary element concentrically about the axis thereof with the acting ends of the pins located at progressively different positions axially of the rotary element, a member reciprocably mounted on the support for movement parallel to the axis of the element, means biasing the movement of the member in one direction, a device rotatably carried by the member and mounted to float thereon and having a convex face disposed within the confines of the circumferentially arranged pins to be successively slidingly engaged thereby whereby the rotation of the element effects a smooth reciprocable movement of the member, and means associated with the rotary element for shifting it axially on the support for securing fine vernier adjustments of the member.

20. For use with a wave receiving set of the type wherein is a rotatable element carrying a plurality of parallel pins arranged concentrically of the axis of the element with the acting ends of the pins disposed at different positions axially of the element, and wherein is an impedance mechanism-supporting carriage movable through a fixed path toward and from the acting ends of the pins and biased for movement in one of said directions: a selecting device comprising a hub on the carriage disposed within the circular confines of the concentrically arranged pins, and a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the acting ends of the pins with the ring whereby to effect a smooth back and forth movement of the carriage with each rotatable movement of the element.

21. For use with a wave receiving set of the type wherein is a rotatable element carrying a plurality of parallel pins arranged concentrically of the axis of the element with the acting ends of the pins disposed at different positions axially of the element, and wherein is an impedance mechanism-supporting carriage movable through a fixed path toward and from the acting ends of the pins and biased for movement in one of said directions: a selecting device comprising a hub on the carriage disposed within the cir-

cular confines of the concentrically arranged pins, a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the acting ends of the pins with the ring whereby to effect a smooth back and forth movement of the carriage with each rotatable movement of the element, and a spring-biased detent means for disposing the element in predetermined rotative positions to successively locate the axis of each pin in radial alignment with the axis of the hub on the carriage.

22. For use with a wave receiving set of the type wherein is a support for rotatable element mounting a plurality of parallel pins arranged concentrically of the element with the acting ends of the pins disposed at different positions axially of the element, and wherein is an impedance mechanism-supporting carriage mounted on the support for movement through a fixed path toward and from the acting ends of the pins and biased for movement in one of said directions: a selecting device comprising a hub on the carriage disposed within the circular confines of the concentrically arranged pins, a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the acting ends of the pins with the ring whereby to effect a smooth back and forth movement of the carriage with each rotatable movement of the element, and means associated with the rotatable element for shifting it axially on the support for securing fine vernier adjustments of the carriage.

23. For use with a wave receiving set of the type wherein is a shaft journaled on a support, wherein is a disc element carried by the shaft to rotate therewith and to shift axially thereupon, wherein is a plurality of parallel pins arranged concentrically of the axis of the disc element and carried thereby with the acting ends of the pins located at different positions axially of the disc element, and wherein is an impedance mechanism-supporting carriage mounted on the support for movement through a fixed path toward and from the acting ends of the pins and biased for movement in one of said directions: a selecting device comprising a hub on the carriage disposed within the circular confines of the concentrically arranged pins, a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the acting ends of the pins with the ring whereby to effect a smooth back and forth movement of the carriage with each rotatable movement of the disc element, a sleeve rotatable on the shaft threaded into the support and contacting the disc element, and means for rotating the sleeve to effect an axial movement of the disc element on the shaft thereby to secure a fine vernier adjustment of the carriage on the support.

24. For use with a wave receiving set of the type wherein is a shaft journaled on a support, wherein is a disc element carried by the shaft to rotate therewith, wherein is a plurality of parallel pins arranged concentrically of the axis of the disc element and carried thereby with

the acting ends of the pins located at different positions axially of the disc element, and wherein is an impedance mechanism-supporting carriage mounted on the support for movement through a fixed path toward and from the acting ends of the pins and biased for movement in one of said directions: a selecting device comprising a hub on the carriage disposed within the circular confines of the concentrically arranged pins, and a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the acting ends of the pins with the ring whereby to effect a smooth back and forth movement of the carriage with each rotatable movement of the disc element, said support having an opening therein opposite one end of each pin when the disc element is in a predetermined rotative position whereby to permit access to the pin for adjustment thereof.

25. For use with a wave receiving set of the type wherein is a shaft journaled on a support, wherein is a disc element carried by the shaft to rotate therewith, wherein is a plurality of parallel pins arranged concentrically of the axis of the disc element and carried thereby with the acting ends of the pins located at different positions axially of the disc element, and wherein is an impedance mechanism-supporting carriage mounted on the support for movement through a fixed path toward and from the acting ends of the pins and biased for movement in one of said directions: a selecting device comprising a hub on the carriage disposed within the circular confines of the concentrically arranged pins, a ring of greater inside diameter than the hub held in free eccentrically revolving contact therewith by engagement of the acting ends of the pins with the ring whereby to effect a smooth back and forth movement of the carriage with each rotatable movement of the disc element, a sleeve rotatable on the shaft and threaded into the support and contacting the disc element, a dial arranged on the sleeve to rotate therewith adjacent the support, means for rotating the sleeve to effect an axial movement thereof and of the dial for securing a fine vernier adjustment of the carriage on the support, and means for limiting movement of the dial to a single rotation, the support having an opening therein opposite one end of each pin when the disc element is in a predetemined rotative position whereby to permit access to the pin for adjustment thereof, the dial having a slot arranged to register with the support opening when the dial is intermediate the limits of its rotary range.

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