March 8, 1949. W. E. KUENSTLER 2,464,045

FREQUENCY CONTROL DEVICE

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Fig. 1

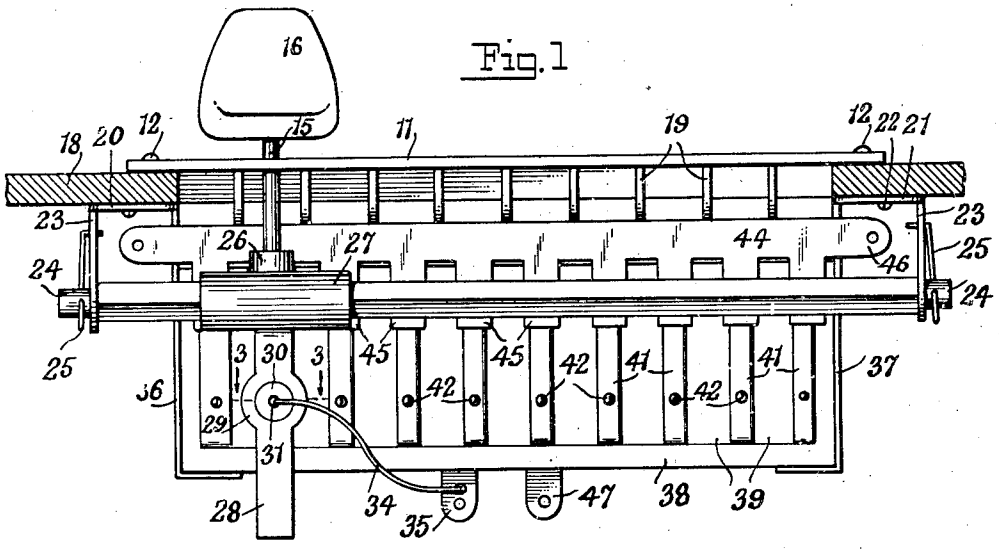



Fig. 2.

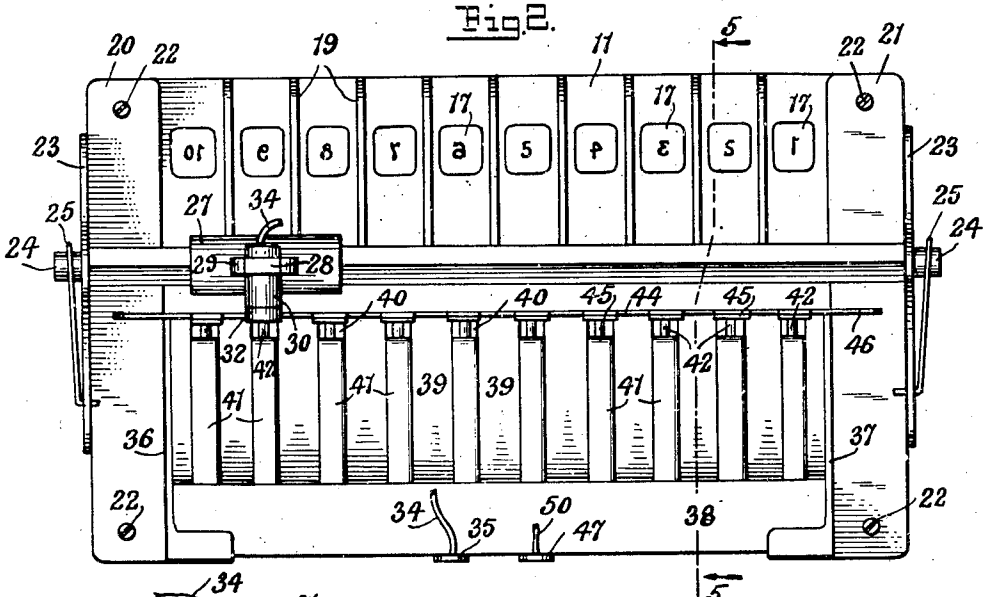
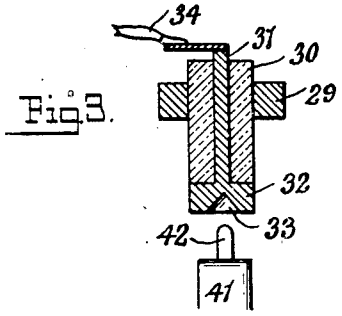



Fig. 3.




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Fig. 4.

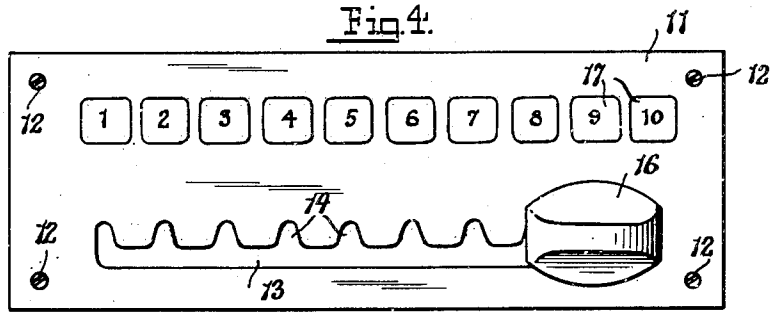



Fig. 5.

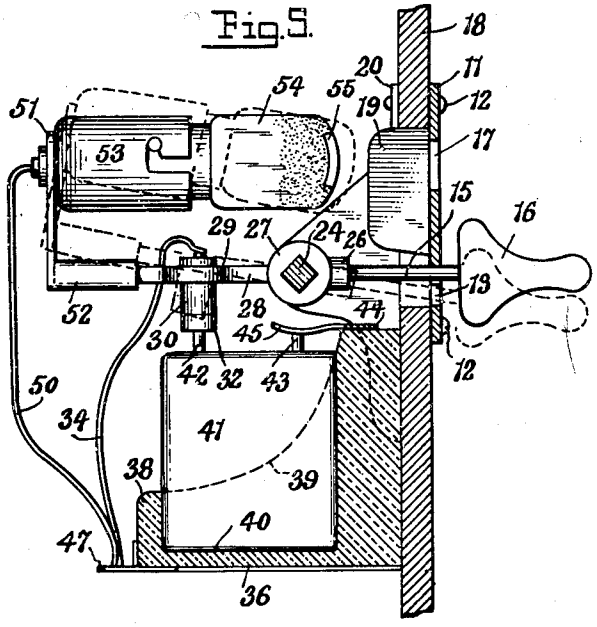
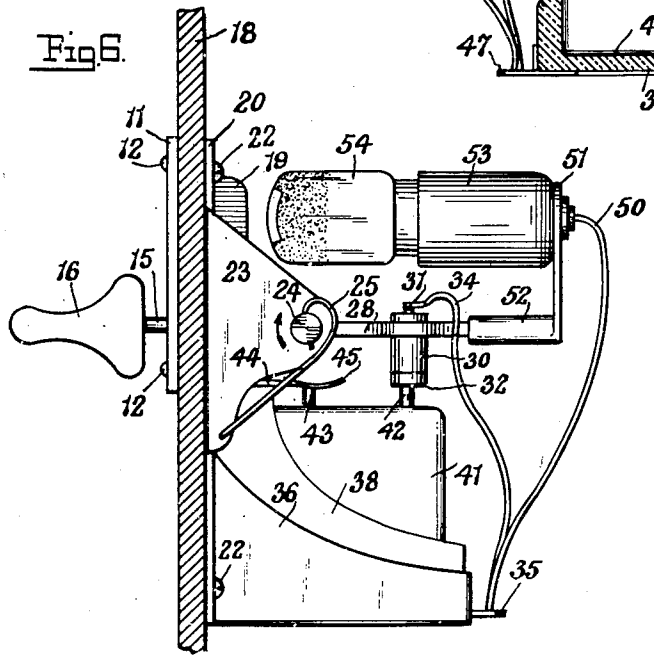



Fig. 6.




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# UNITED STATES PATENT OFFICE

2,464,045

## FREQUENCY CONTROL DEVICE

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10 Claims. (Cl. 171—327)

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This invention relates to frequency control devices, such as are adapted for use in connection with the tuning of radio receiving sets, radio-phonographs, record players and possibly other radio or electronically-controlled devices wherein the selection of frequencies is necessary to permit operation of the device of which the control means of this invention forms a part.

An object of the present invention is to provide an efficient, low-cost selecting or tuning device by means of which a circuit can be readily and easily tuned to desired frequencies with rapidity, ease and accuracy by the simple shift of a manually-operated lever.

More particularly, the invention contemplates the provision of a support upon which a plurality of piezo-electric crystals, condensers, coils or other frequency-determining elements are removably and interchangeably supported, and of means by which any selected one of said frequency-determining elements may be placed in the circuit by the adjustment of a selector, said selector being arranged for manual slidable movement from one of the crystals, condensers or the like to another, while the selector is held spaced-away from the frequency-determining elements.

In the accompanying drawings, wherein an illustrative embodiment of the invention is disclosed, Fig. 1 is a top plan view, with parts in section, and with the illuminating means omitted, of the improved frequency-control or tuning device; Fig. 2 is a rear elevation of the same; Fig. 3 is a sectional view of the same on the line 3—3 of Fig. 1, looking in the direction of the arrows; Fig. 4 is a front elevational view of the face plate of the unit, showing the operating knob; Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2, looking in the direction of the arrows, and Fig. 6 is an end view of the device, looking at the left end of Fig. 1.

With reference to the drawings, 11 indicates the face plate of the tuning unit or frequency selector. The plate 11 is adapted to be secured over an opening in a panel or other supporting surface 18, by suitable fastening means, such as the screws 11. Extending longitudinally of the plate 11 is a guide slot 13 which is provided in its upper edge with a plurality of equally-spaced notches or serrations 14, each of which represents a point at which a selected frequency is obtained. Located above each of the notches or serrations 14 is a window, as shown at 17, which window may be provided with suitable transparent or translucent covering in the conventional manner, and may be marked to indicate the frequency which it represents, the radio station, phonograph record or other means which will be reproduced when the frequency represented by the notch below the window is that at which the selector is then located.

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At 15 is indicated a rod to which is attached a knob 16 by which the selector is manually operated and by which it is caused to be shifted in the slot 13. The rod 15 extends through the slot 13 and through the opening in the panel 8 where it is attached to the selector 28 in a manner to be described.

Secured to the back of the panel 18, as by the screws 22, are two spaced brackets, indicated respectively at 20 and 21. Each bracket is provided with an inwardly bent lug 23, the two lugs 23 constituting bearings for the rotative support of the opposite ends of a rocking shaft 24, which shaft, except for the end portions supported in the brackets 20 and 21, is non-round or square in cross sectional shape.

Mounted for slidable movement along the shaft 24 is a sleeve 27 which has its bore corresponding in shape to the cross-sectional shape of the shaft 24, so that while the sleeve is slidable on the shaft, it cannot turn or rotate thereon but will turn only when the shaft is rotated. Extending radially from the sleeve 27 is a boss 26 which threadably receives one end of the rod 15. Extending radially from the opposite side of the sleeve 27 is a finger 28 provided with a disk portion 29 in which is fitted a sleeve 30 of insulating material. At one end of the insulating sleeve 30 is provided a metallic head or contact member 32 integrally formed with a stem portion 31 extending through the insulating sleeve 30, as clearly seen in Fig. 3. At the upper end of the stem 31 is secured a lug to which is fastened a flexible wire 34 connected to a lug 35 from which a connection into the circuit of the apparatus of which this device forms a part, is made. The lower face of the head 32 is formed with a conical recess or seat 33 which seats against the upper end of a contact pin 42 extending from a frequency-determining element 41, such as a piezo-electric crystal, a coil, a condenser or the like.

Formed on the bracket 20 is a supporting arm 36, and a similar arm 37 is formed on the bracket 21. These two supporting arms act to support a rack or holder 38 in which a plurality of crystals 41, condensers, or other frequency-determining elements are removably mounted. The rack 38 is preferably composed of insulating material and

is shaped substantially as shown, and provided with a plurality of separating partitions 39, thus forming separate recesses 40 into each of which is mounted one of the crystals 41 or other frequency-determining elements, as shown in the drawings. The crystals, condensers, coils or the like 41 are encased in any suitable manner, as known in this art, and fit snugly in the recesses 40 in the rack 38 and in such a manner as to be readily removable and interchangeable if desired. Each crystal, condenser or the like 41, is provided with two contact pins, indicated respectively at 42 and 43. When the crystals, condensers or the like are fitted in the rack in the manner shown and described, they will be so arranged that their upwardly-projecting contact pins will be disposed in two rows, namely, one row composed of all of the contacts 43, and the second row consisting of all the contact pins 42.

The contact pins 43 are electrically connected by a common contact strip indicated at 44, and secured to the top of the rack 38. Provided on the contact strip 44 is a plurality of spring contact fingers 45, each of which rests against and establishes electrical contact with one of the contact pins 43. At each of its ends, the contact strip 44 terminates in a lug portion 46 to which a wire may be soldered or otherwise attached, to place this strip and all the contact pins 42 in the circuit of the apparatus of which the selector forms a part.

The contact pins 42 are those selected by the selector 28 which can be moved along the shaft 24 to any desired point over any one of the crystals, condensers or the like 41, and caused to establish contact with the contact pin 42 thereof.

Illuminating means is provided for the selector by means of an electric bulb 54, the end of which is coated with an opaque material, except for a square or patch 55 which registers with each window 17 to thereby illuminate the same when the bulb is positioned behind it. The bulb 54 is removably received in a socket 53 mounted on the upstanding arm 51 of a supporting bracket which terminates in a sleeve 52 removably fitted on the end of the selector finger 28. To confine the illumination from the bulb 54 to each window 17 behind which the bulb may be positioned, deflector plates 19 are provided at the back of the face plate 11 between the several windows 17. The illuminating means, consisting of the bulb 54 and the supporting means therefor, are omitted from Figs. 1 and 2 of the drawing. A wire 50 leads to the bulb 54, said wire being attached to a lug 47 which is wired to a source of current to illuminate the bulb.

From the foregoing, the operation of the improved frequency selector will be readily understood. Each of the several crystals, other frequency-determining devices, coils, condensers or the like is tuned or otherwise regulated so that the same will respond to a different frequency. The result is that when the contact member 32 on the selector 28 rests upon the contact pin 42 of any selected crystal, condenser, coil or the like 41, the tuning of the radio apparatus, phonograph or other device in circuit with the selector, to that particular frequency, will be established. Hence, it will be apparent that the tuning of the device to any desired frequency merely requires the shifting of the selector 28 from the contact pin 42 of one crystal 41 to that of another crystal of the desired frequency.

It will be noted that at each end of the shaft 24 is provided a wire spring 25, which springs not



only serve as cotter pins to retain the shaft against longitudinal displacement out of the bearings 23, but also tend to apply torsional force to the shaft 24 to tend to turn it in the direction of the arrow in Fig. 6. Since the sleeve 27 conforms in interior shape to the shape of the shaft 24 it will be obvious that as the shaft 24 is turned by the springs as described, the rod 15 will normally be elevated to bring it into one or the other of the notches or serrations 14 in the slot 13. At the same time the finger 28 of the selector will be lowered and the contact head 32 brought to rest against the contact pin 42 over which it may be located at the time. In other words, the springs 25 tend to normally hold the contact head 32 into contact with one of the contact pins 42 and will continue to so hold it until the device is manually operated to shift the selector from one of the contact pins 42 to another of the desired frequency. This is done by depressing the knob 16 so that the rod 15 will be lowered out of the notch 14 within which it was then resting, and by moving the knob in the required direction in the slot 13 until the properly designated notch 14 is reached. Then, when pressure on the knob 16 is released, the springs 25 will elevate the rod 15 into the notch 14 then positioned above it, and the finger 28 will swing downwardly to bring the contact head 32 against the contact pin 42 over which it is then positioned.

Since the rod 15 cannot be moved along in the slot 13 until it is lowered out of the notches 14, and as such lowering movement of the rod 15 will cause the finger 28 to rise and lift the contact head 32 from off the pin 42 over which it was located, it will be apparent that shifting of the finger 28 will only be possible when the head 32 is spaced away from or out of contact with one or the other of the contact pins 42. Thus, no wiping or scraping action of the parts is obtained and a shift from one of the frequency-determining elements to another is easily secured.

While I have herein described the frequency-determining elements as being crystals, condensers, coils or the like, the elements may be other devices or may be merely contacts used for purposes other than changing the frequency of the apparatus.

Thus, while having described one embodiment of the invention, it is obvious that the same is not to be restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims.

What I claim is:

1. In a device of the character described employing a plurality of frequency-determining elements, each having a contact member, and said elements being mounted to thereby dispose the contact members in alignment, the improvement consisting in a frequency selector including a finger adapted to be selectively rested against any one of the contact members, means for urging said finger toward the contact members, said means permitting manual movement of said finger away from the contact members, said finger being mounted for sliding movement from one contact member to the next, and means for permitting said sliding movement of the finger only while the finger is disposed away from the contact members.

2. In a device of the character described, a rack for holding a plurality of piezo-electric crystals of different frequencies, contact members arranged in a line and respectively connected to said crystals, a sliding selector including a piv-

oted finger adapted to be held against any selected contact member, spring means for normally urging the finger toward the contact members, means by which the selector may be manually moved away from the contact members and shifted from one contact to another, and a face plate having a slot through which a part of the selector extends, said slot permitting sliding movement of the selector only while the selector is manually maintained with its finger disposed away from the contact members.

3. In a device of the character described, a plurality of circuit-controlling elements, each of which has a contact member, a selector including a finger adapted to rest against any one of said contact members, the contact members being arranged in a line, means for pivotally and slidably supporting the selector whereby it can be slidably moved from one contact to another but only while pivotally held away from the contact members, and a face plate provided with a slot in which the selector is slidably moved, said slot having serrations in which the selector is positioned when the finger thereof is resting against a contact member.

4. In a device of the character described, a plurality of frequency-determining elements, each having a contact member, said elements being mounted to thereby dispose the contact members in a straight line, a frequency selector including a finger adapted to be selectively and resiliently rested against any one of the contact members, spring means for urging said finger toward the contact members, said spring means permitting manual pivotal movement of said finger away from the contact members, said finger being mounted for manual sliding movement from one contact member to the next, and a slot in which the selector is moved, said slot permitting said sliding movement of the finger only while the finger is disposed away from the contact members.

5. In a device of the character described, a rack for holding a plurality of piezo-electric crystals of different frequencies, contact members arranged in a line and respectively connected to said crystals, a rocking shaft, a sliding selector including a finger pivotal with the shaft and slidable thereon and adapted to be held against any selected contact member, spring means operative on the rocking shaft for normally urging the finger toward the contact members, means by which the selector may be manually and pivotally moved away from the contact members and shifted from one contact to another, and a face plate having a serrated slot through which a part of the selector extends, said slot permitting sliding movement of the selector only while the selector is manually maintained with its finger disposed away from the contact members.

6. In a device of the character described, a support for a plurality of piezo-electric crystals of different frequencies, each of said crystals having a contact member, a shaft adjacent to said contact members, said shaft being of non-round shape, a selector slidably mounted on the shaft, supports in which the shaft is pivotally mounted whereby a pivotal movement of the shaft will cause pivoting of the selector, spring means operative on the shaft to cause the selector



to be held against any one of the contacts adjacent to which it may be situated, a handle portion extending from the selector, a face plate having a notched slot through which the handle portion extends, the spring means tending to normally hold the handle portion in the notches in the slot.

7. In a device of the character described, a support for a plurality of frequency-determining elements, each of said elements being provided with a pair of contact pins, means for electrically connecting together one of the contact pins in each pair, a slidable selector manually movable from the second contact pin on one frequency-determining element to a similar pin on any of the other frequency-determining elements, means for normally urging the selector into contact with a pin adjacent to which it may be located, and manual means by which the selector may be pivotally moved to swing it away from any of the pins and then slidably moved to another of the pins.

8. In a device of the character described, a rack provided with a plurality of recesses to hold piezo-electric crystals, each crystal terminating in a pair of upstanding contact pins, a connection member extending between one of the pins of each crystal, a slidable and pivotal selector finger mounted over the crystals, spring means for urging the finger toward the crystals and into contact with any of the second pins of the crystals over which the finger may be positioned, and a lever connected to said finger by which the finger may be elevated and then shifted from one of the contact pins to another of the same.

9. In a selecting device as provided for in claim 8, wherein the slidable and pivotal selector is mounted on a rocking shaft, and wherein the spring means is operative upon said shaft to urge the finger toward the crystals.

10. In a device of the character described, a rack-like support for a plurality of frequency-determining elements, each of said elements being provided with a pair of vertically-disposed contact pins, means for electrically connecting one of the contact pins in each pair, a slidable selector located over the pins and manually movable from the second contact pin on each frequency-determining element to a similar pin on any of the other frequency-determining elements, springs for normally urging the selector into contact with any pin above which it may be located, and a lever by which the selector is pivotally moved to elevate it away from any one of the pins and then slidably moved while so elevated, to another of the pins.

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## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS


| Number | Name | Date |
|---|---|---|
| 1,609,744 | Trogner | Dec. 7, 1926 |
| 1,697,967 | Wrobley | Jan. 8, 1929 |
| 1,846,289 | Vasselli | Feb. 23, 1932 |
| 1,861,371 | Trogner | May 31, 1932 |
| 1,906,106 | Schaeffer | Apr. 25, 1933 |
| 1,917,995 | Polin | July 11, 1933 |
| 2,240,450 | Wolfakill | Apr. 29, 1941 |