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(54) A TUNER KEYBOARD FOR A BROADCAST RECEIVER

(71) We, AUTOVOX S.P.A. an Italian joint stock company, of 981 Via Salaria, Rome, Italy, declare the invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to the field of tuner keyboards for broadcast receivers such as television or radio receivers, and especially car radios, such keyboard permitting pre-setting of the receiver for the reception of a number of desired alternative transmitting stations.

Such keyboards for radio and television sets are *per se* known. They comprise keys of variable lengths fitted in cams, which can be locked in position, each position corresponding to the tuning of the receiver to a given frequency, and control means, which, upon the actuation of one of the keys, transmit this position to the tuning circuit of the receiver. However, the known keyboards of this type occupy considerable space, which can be a disadvantage in the confines of a car fascia for example.

This disadvantage becomes particularly onerous when, in addition to the receiver and its keyboard, a cassette recorder or player is also installed.

An object of the invention is to provide an improved tuner keyboard, especially for a car radio.

According to the present invention, a tuner keyboard for a broadcast receiver for pre-setting the receiver to the alternative reception from a number of transmitters corresponding to the number of keys provided on the keyboard comprises a respective key cam fulcrumed on each key and adapted to be locked in alternative camming positions with respect to the associated key axis, means coacting with the tuning system of the receiver and said key cams so as to actuate the tuning system in response to the camming position of the cam, said means including further cams each coacting with a respective one of the

keys, each further cam being pivotably mounted at one of its ends on a plate and having an ear disposed at either side of the pivot location, said ears being coplanar with the associated key cam which is capable of being moved into engagement with the ears, each of the other ends of said further cams being linked by respective pins to an elongate member also forming part of said means, one end of said member being releasably linked to the tuning system.

To eliminate any slack or play between the component parts of the keyboard and to obtain the necessary accuracy in the positioning of all cams, said further cams and the keys are preferably spring biased against their guide surfaces. Thus the further cams may conveniently be provided with bores presenting two convergent sides, which are resiliently biased against the pivots on which the further cams are fulcrumed. Similarly said pins of those further cams adjacent the ends of said member are resiliently urged against two convergent sides of corresponding through holes of the member.

The invention will now be described, by way of example, with reference to the accompanying drawings in which:—

Figure 1 is a top view of a first embodiment of the invention, wherein, for the sake of clarity, the slider for the uncoupling of the keyboard from the gear for the manual tuning and three of the five keys are not shown;

Figure 2 is a view of the device of Figure 1, from which the bolt and keys are removed to better show the coaction between the spring loaded eared cams;

Figure 3 is a view from below of a plate serving to guide the keys of said first embodiment;

Figure 4 is a top view of one key of the device of Figure 1;

Figure 5 is a bottom view of the bolt of Figure 1 and of the manual turning gear connected with it;

Figure 6 is an underneath view of a

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second embodiment of the keyboard;

Figure 7 is a cross section through figure 6;

Figure 8 is an underneath view of the base plate of the second embodiment and of its slider, with all keys but one removed for the sake of clarity;

Figure 9 shows on a larger scale how the pins of the eared cams are spring biased against the two convergent sides of the bolt;

Figure 10 shows, also on an enlarged scale, the biasing of said pins against one vertical side of a rectangular hole in the bolt; and

Figure 11 shows, also on an enlarged scale, how the two downwardly convergent sides of the bores in the eared cams are pressed resiliently against their pivots.

With reference to figures 1-5, a base plate 1 is provided with a flange 2 on one of its long sides, and a flange 3 on one of its short sides, both flanges being perpendicular to said plate. Into the other long side of plate 1 is cut a number of slots 4, which open towards the exterior. On plate 1 a plurality of relatively short pivot pins 5 of a relatively small diameter are arranged in a row. A cam 6 is oscillatable on each pivot pin (five cams being shown in the figures). Each cam generally indicated at 6, is provided with two ears 6' which are coplanar with the main cam body 7, and with a lobe 6'' disposed between the two ears, said lobe, as it is clearly shown in Figure 7, being raised relatively to said main body. The lobe 6'' of each cam presents a through opening which receives the pivot 5, around which said cam 6 is oscillated. The ears 6' are given a length such that an ideal line connecting their ends passes through the centers of rotation of cam 6'', i.e. through the centers of pivots 5. From the main body 7 of each cam 6 a pin 8 projects in the same direction as lobe 6''. The pins 8 of two adjacent cams 6 are interconnected by a flat curved leaf spring 9, whose ends are provided with flared notches 9' (figures 9 and 10). Each notch 9' can be in the shape of a segment of a circle of diameter larger than the diameter of pin 8. Pins 8 penetrate either into the triangular holes 25 or the rectangular holes 25' of an elongate member or bolt 24, so that a pin 8 penetrating into a rectangular hole 25' is biased by one end of spring 9 against one vertical surface of said hole, whereby it is rendered capable of sliding up and down on this surface. Obviously hole 25' may have an alternative shape, such as polygonal, it being merely essential that it presents a flat surface, which is perpendicular to the longitudinal axis of said bolt 24 (figure 10).

In order to prevent any play between the cams 6 and the plate 1, also the lobes 6'' are provided with triangular through apertures

51 (figures 11) with a downwardly directed vertex, while a leaf spring 10, whose ends are anchored to studs 11 of plate 1, biases the two sides of said vertex against pivots 5. The leaf spring 10 is supported, intermediate its ends, by a row of additional studs 11', to ensure a uniform pressure of spring 10 on lobes 6''. Obviously the relatively long leaf spring 10 may be replaced by a plurality of separate springs, one for each lobe, and while it would be sufficient to provide merely two cams 6 with through apertures 51, from the point of view of reducing production costs it is more convenient to render all cams alike, that is to provide each cam with the same triangular aperture 51.

Figure 3 shows an essentially rectangular second plate 12 with merely two of its five keys 14 assembled on it. A vertical flange 13, running along its longest side, presents openings through which the keys are inserted and within which they are slidable. This longest side of plate 12 is provided with a row of slots 15. The key, better shown in figure 4, consists of a generally rectangular stem 16, whose one end terminates in a narrower portion 17, while its other end serves to guide a key button 18 of a generally parallelepipedal shape. Stem 16 is provided with two lateral projections 19 and at a point along its centerline there is pivoted a sector-shaped cam 20 pressed against said stem by a resilient tongue 21. A rod-shaped member 22, provided with a projecting part 23 (figure 3) passing through the stem 16, is linked by an opening at one of its ends to a (not shown) member provided in the interior of the key button 18, while its other end overlaps the tongue 21. The key button 18 is slidable along the key stem 16 between a fore end position and a rear end position. In the rear end or completely extracted position of key 14, the end of member 22 is lifted away from tongue 21, to render cam 20 freely oscillatable on stem 16. In its forward end position, i.e. in the inserted position of the key, said end of member 22 is pressed against tongue 22, thus locking cam 20 in a desired inclination relatively to the key axis.

Figure 5 shows the exact shape of the bolt 24 with its row of holes, one for each cam. The terminal holes are triangular, the intermediate ones 25' being here square. As already stated, each hole coacts with a pin 8 of a cam 6. Since the pins 8 are biased by the springs 9 against two converging sides of the triangular holes 25 or respectively against one side of the square holes 25', while the two downwardly converging sides of the through apertures 51 in lobes 6'' of each cam 6 are pressed against pivots 5' by the spring 10, as already explained with reference to figure 11, the bolts are perfectly guided and an exact coordination of all parts

is obtained in any position assumed by the bolt.

One end of bolt 24 is releasably connected to the tuning mechanism of the receiver by means which include a pin 26 connecting the bolt to one end of a link 27, the other end of which is connected by a pin 28 to a platelet 29, which is in turn connected with a rotatably mounted shaft of the *per se* known gear mechanism for the manual tuning of the receiver, which here is fastened to a plate 30. An arcuate spring 31 interconnects pins 26 and 28 to eliminate any play between bolt 24 and platelet 29, without hindering the movement of the parts. It is advisable to confer a triangular or rectangular shape also to the holes through which pass the pins 26 and 28, although this is not shown in the figures.

In order to assemble the keyboard, the cams 6 are fitted upon the pivots 5 of plate 1 and the pins 8 of pairs of adjacent cams are connected together by the arcuate leaf springs 9. If, as in the present case, the number of cams is uneven, the pin of one terminal cam is connected by an arcuate spring 9 with a pin 50 which is rigid with the bolt 24.

The keys 14 are inserted through the slots in flange 13 of plate 12 from the inside. For this purpose, their buttons 18 must be detached from their stems 16. This is done by exerting a pressure upon the rod-shaped member 22, so that its end, which in the assembled state of the keyboard is connected with the (not shown) member provided in the interior of the keyboard button 18, is disconnected therefrom. Thus button 18 may be removed and the stem 16 may be inserted from inside into the corresponding slot of flange 13. Successively the button 18 is reinserted upon stem 16 from the outside of flange 13. The stroke of the stem within said slot is limited between the rear face of the parallelepipedal button 18 and the lateral projections 19 of the stem 16, which projections cannot pass through the slots in the flange 13. The bolt 24 is connected with the gear for manual tuning over the link 27 and a platelet 29, as already described in connection with figure 5. plate 12 is fastened above plate 1 in such a manner that the slots 4 of the latter register with the slots 15 of the former to form upper and lower guide channels for the rod-shaped key members 22. The narrower portions 17 of the stems 16 are introduced into corresponding slots provided in flange 2 of plate 1. In this manner, each key is accurately guided in the keyboard. Plate 12 is applied laterally upon plate 30, which carries the manual tuning mechanism, whereby the holes 25 and 25' of the bolt 24 are connected with the cams 6 by the pins 8. Plates 1, 12 and 30 are assembled together by screws or other fasteners. The

knob of the manual tuning gear is indicated at 32. The thus assembled keyboard appears as represented in figure 1, from which three keys have been removed for the sake of better clarity.

In the second embodiment of the keyboard, the longer sides of an essentially rectangular base plate 33 are provided with flanges 34 and 35 forming right angles with it. Flange 34 carries openings 35 for the insertions therethrough and the guiding of the keys 37. Also in this embodiment a row of spaced apart pivots 5 projects from the baseplate 33. Each pivot penetrates through a triangular hole 51 provided in the lobe 6' of a cam 38. Cams 38 are similar to cams 6, with their main body raised relatively to lobe 6' (figure 7) and provided with two ears 6', whose ends lie on an ideal line passing through the centers of pivots 5. Similarly to the first embodiment, cams 38 are pressed against their pivots 5 either by a long leaf spring 10 or by a number of individual leaf springs, and the pins 8 of said cams 38 are connected two by two by arcuate springs 9. To better show these connections, the upper portions of three cams are broken away in figure 6.

A bolt 39 is pivoted by a pin 40 to a cam 41 fastened to the rotatable shaft 42 of a known gear for manual tuning. Similarly to the bolt 24 of the first embodiment, also bolt 39 is fitted with an array of holes, each hole engaging a pin 8 of a cam 38.

In lieu of the narrower portion 17, the stem 16 of each key 37 has at its end opposite to button 18 a stud 43, which guides said end within a slot 44 of a plate 45, which is fastened to plate 33 in a parallel relationship. As shown in figure 8, a slider 47 is guided on plate 45 by pins 46, 46' or similar means.

The slider consists of an elongate flat metal member, of which one of the longer sides coacts with one of the longer sides of plate 45, while its opposite side is fitted with sawtooth like serrations 49, whose slopes may also have various inclinations, for instance two on each sloped side.

The slider is biased by a spring in such a manner that the sloped sides of its teeth keep the studs 43 pressed against the right side (as seen in figure 8) of slots 44, thereby eliminating any play between the key stems 16 and the plate 45. The slider also serves to disconnect the mechanism for manual tuning from the bolt 39.

The operation of both embodiments of the keyboard for memorizing a set of transmitting stations is the following: the key buttons 18 are completely pulled back, until the end of the rod-shaped members 22 are lifted from the resilient tongue 21 and thereby the cams 20 are released. By turning knob 32 of the mechanism for manual tuning,

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the receiver is tuned to a desired transmitting station. This operation also causes a corresponding lateral displacement of bolt 24 (or of bolt 39 respectively). This displacement swings all cams 6 around their pivot 5 until they assume a given inclination, this inclination corresponding to the tuned-in station. Thereafter the key is pressed inward, until the key cam 20 engages the ears 6' of cams 6 (or of cams 38 respectively) and is forced to assume their inclination. By pressing button 18 further inward, the key cam 20 is locked in position by the depressed end of member 22. By retracting the key, until the projections 19 of its stem 16 abut against the interior surface of flange 13 of plate 1 (or against flange 34 of plate 33 respectively), but without drawing further back the key button 18 (since this latter movement would release the key cam 20), a third key position is obtained, in which the key is inoperative, since the key cam 20 is completely disengaged from the eared cam 6. This position of one key permits to perform the same storage operations on the other keys or to use the manual tuning of the receiver. When one of the keys 14 (or of the keys 37 respectively) is again pressed in, the key cam 20 is forced between the ears of cam 6, and the ensuing displacement of bolt 24 (or bolt 39 respectively) switches the tuning circuit of the receiver to the precedently stored station.

WHAT WE CLAIM IS:—

1. A tuner keyboard for a broadcast receiver for pre-setting the receiver to the alternative reception from a number of transmitters corresponding to the number of keys provided on the keyboard, comprising a respective key cam fulcrumed on each key and adapted to be locked in alternative camming positions with respect to the associated key axis, means coacting with the tuning system of the receiver and said key cams so as to actuate the tuning system in response to the camming position of the cam, said means including further cams each coacting with a respective one of the keys, each further cam being pivotably mounted at one of its ends on a plate and having an ear disposed at either side of the pivot location, said ears being coplanar with the associated key cam which is capable of being moved into engagement with the ears, each of the other ends of said further cams being linked by respective pins to an elongate member also forming part of said means, one end of said member being releasably linked to the tuning system.

2. A keyboard according to Claim 1 wherein said pins of at least those further cams adjacent the ends of said member are resiliently urged against two converging sides of corresponding through holes of the member, the pins of the intermediate further cams being spring biased against one side of respective polygonal holes in said member while said end of each further cam is provided with a hole having two converging sides, the further cams being spring biased so as to urge said converging sides against stationary pivots.

3. A keyboard according to Claim 2 wherein springs biasing the pins of said further cams against said one sides of said polygonal holes are arcuate leaf springs.

4. A keyboard according to Claim 3 wherein the ends of said arcuate leaf springs are notched, and converging surfaces of said notches engage the pins of said further cams.

5. A keyboard according to Claim 3 wherein the ends of said arcuate springs have notches each in the shape of a segment of a circle of a diameter larger than the diameter of the cam pin engaging in it.

6. A keyboard according to Claim 2 wherein the spring biasing said further cams to urge the two converging sides of the holes against said stationary pivots is a flat spring supported, intermediate its ends, by a row of studs to ensure a uniform pressure of said spring upon said further cams.

7. A keyboard according to Claim 1 wherein said elongate member is pivoted to a cam of the tuning system in such a manner that a pin of said tuning system cam is pressed against one side of a polygonal through hole in the elongate member by one of the notched ends of an arcuate leaf spring, the other notched end of which presses against a pin of one of the further cams.

8. A keyboard according to Claim 1 wherein an end portion of each further cam is apertured to permit the pivotal mounting of the further cam on a baseplate of the keyboard, said end portion forming a lobe which is spaced from the ears and the remaining portions of the same further cam.

9. A keyboard according to Claim 1 wherein one end of each key is guided in the interior of said keyboard by a guide stud fast with said key end sliding within a respective slot in a fixed part of the keyboard, a serrated slider being provided having teeth inclined flanks, the slider being resiliently biased in such a manner that said flanks maintain said guide studs constantly against one side of said slots.

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the receiver is tuned to a desired transmitting station. This operation also causes a corresponding lateral displacement of bolt 24 (or of bolt 39 respectively). This displacement swings all cams 6 around their pivot 5 until they assume a given inclination, this inclination corresponding to the tuned-in station. Thereafter the key is pressed inward, until the key cam 20 engages the ears 6' of cams 6 (or of cams 38 respectively) and is forced to assume their inclination. By pressing button 18 further inward, the key cam 20 is locked in position by the depressed end of member 22. By retracting the key, until the projections 19 of its stem 16 abut against the interior surface of flange 13 of plate 1 (or against flange 34 of plate 33 respectively), but without drawing further back the key button 18 (since this latter movement would release the key cam 20), a third key position is obtained, in which the key is inoperative, since the key cam 20 is completely disengaged from the eared cam 6. This position of one key permits to perform the same storage operations on the other keys or to use the manual tuning of the receiver. When one of the keys 14 (or of the keys 37 respectively) is again pressed in, the key cam 20 is forced between the ears of cam 6, and the ensuing displacement of bolt 24 (or bolt 39 respectively) switches the tuning circuit of the receiver to the precedently stored station.

WHAT WE CLAIM IS:—

1. A tuner keyboard for a broadcast receiver for pre-setting the receiver to the alternative reception from a number of transmitters corresponding to the number of keys provided on the keyboard, comprising a respective key cam fulcrumed on each key and adapted to be locked in alternative camming positions with respect to the associated key axis, means coacting with the tuning system of the receiver and said key cams so as to actuate the tuning system in response to the camming position of the cam, said means including further cams each coacting with a respective one of the keys, each further cam being pivotably mounted at one of its ends on a plate and having an ear disposed at either side of the pivot location, said ears being coplanar with the associated key cam which is capable of being moved into engagement with the ears, each of the other ends of said further cams being linked by respective pins to an elongate member also forming part of said means, one end of said member being releasably linked to the tuning system.

2. A keyboard according to Claim 1 wherein said pins of at least those further cams adjacent the ends of said member are resiliently urged against two converging sides of corresponding through holes of the member, the pins of the intermediate further cams being spring biased against one side of respective polygonal holes in said member while said end of each further cam is provided with a hole having two converging sides, the further cams being spring biased so as to urge said converging sides against stationary pivots.

3. A keyboard according to Claim 2 wherein springs biasing the pins of said further cams against said one sides of said polygonal holes are arcuate leaf springs.

4. A keyboard according to Claim 3 wherein the ends of said arcuate leaf springs are notched, and converging surfaces of said notches engage the pins of said further cams.

5. A keyboard according to Claim 3 wherein the ends of said arcuate springs have notches each in the shape of a segment of a circle of a diameter larger than the diameter of the cam pin engaging in it.

6. A keyboard according to Claim 2 wherein the spring biasing said further cams to urge the two converging sides of the holes against said stationary pivots is a flat spring supported, intermediate its ends, by a row of studs to ensure a uniform pressure of said spring upon said further cams.

7. A keyboard according to Claim 1 wherein said elongate member is pivoted to a cam of the tuning system in such a manner that a pin of said tuning system cam is pressed against one side of a polygonal through hole in the elongate member by one of the notched ends of an arcuate leaf spring, the other notched end of which presses against a pin of one of the further cams.

8. A keyboard according to Claim 1 wherein an end portion of each further cam is apertured to permit the pivotal mounting of the further cam on a baseplate of the keyboard, said end portion forming a lobe which is spaced from the ears and the remaining portions of the same further cam.

9. A keyboard according to Claim 1 wherein one end of each key is guided in the interior of said keyboard by a guide stud fast with said key end sliding within a respective slot in a fixed part of the keyboard, a serrated slider being provided having teeth inclined flanks, the slider being resiliently biased in such a manner that said flanks maintain said guide studs constantly against one side of said slots.



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10. A keyboard for a broadcast receiver substantially as hereinbefore, described with reference to Figures 1 to 5, 10 and 11 or Figures 1 to 5 and 9, 10 and 11 as modified by Figures 6 to 8 of the accompanying drawings.

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