United States Patent

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Rottweil, Germany
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[33] **Germany**
[31] **P 17 66 860.9**

[54] **TUNER FOR COMMUNICATION CARRIERS**
13 Claims, 5 Drawing Figs.

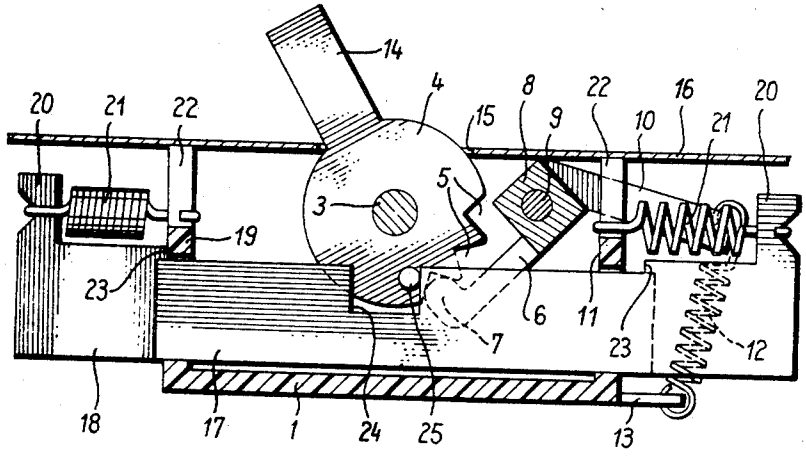
[52] **U.S. Cl.** ..... **74/10.27,** 200/166 SD, 334/7
[51] **Int. Cl.** **F16h 35/18**
[50] **Field of Search** ..... 74/10.27, 10.29, 10.31, 10.33, 10.35, 10.37; 334/7; 200/5 G, 166 SD, 50.3

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ABSTRACT: Turners for communication carriers, especially for radio and television sets, having a number of switches which can be shifted from the off-position to the on-position against the action of a spring. The switches are retained in the on-position by stop members interconnected in such a manner that, when one switch is shifted to its on-position, all of the other switches are released for return into their off-position. The switches take the form of toggle switches comprising switch buttons rocking about a common axle and having a circular notched section provided concentrically with their axle of rotation.



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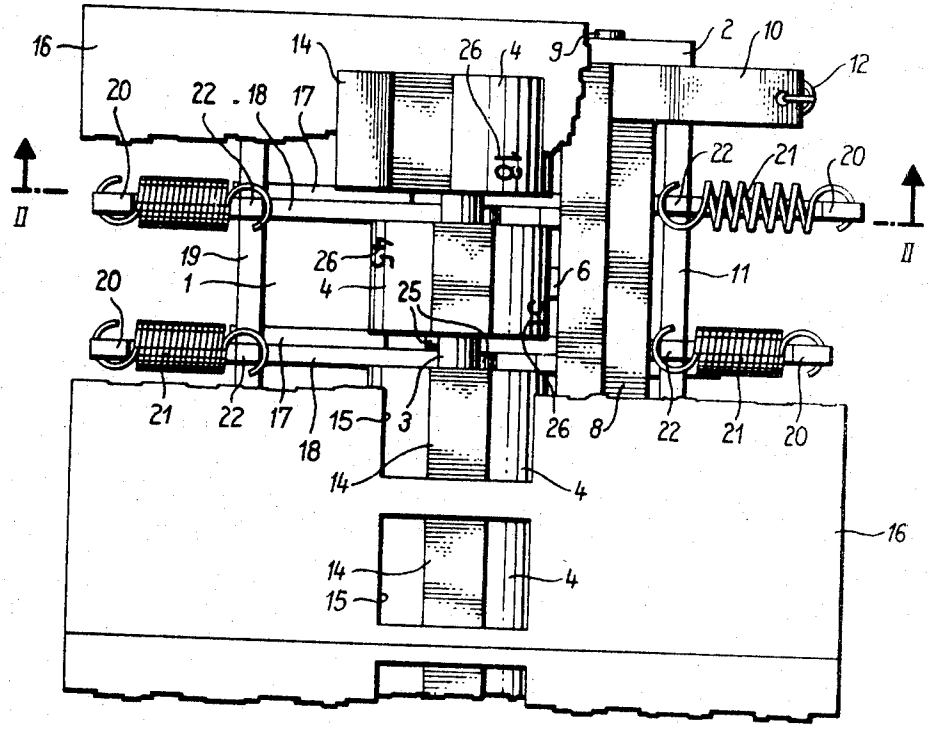


Fig. 1

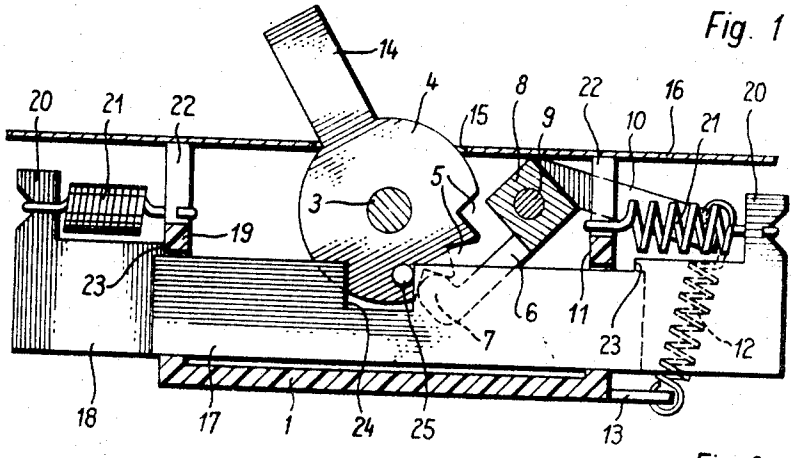


Fig. 2

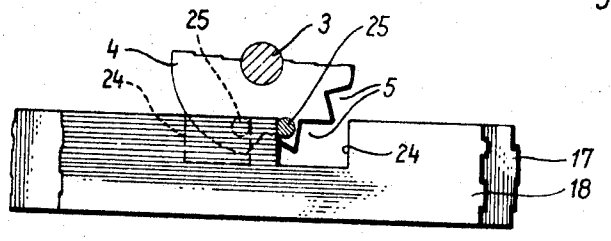


Fig. 3

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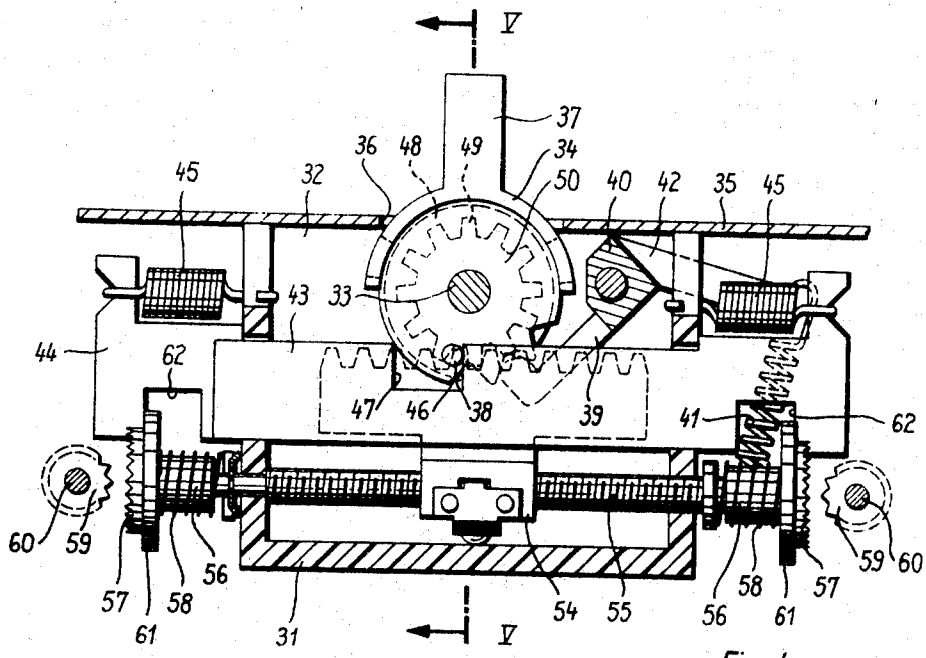


Fig. 4

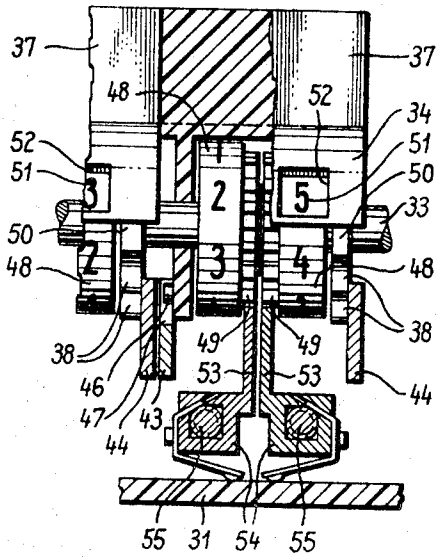


Fig. 5

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TUNER FOR COMMUNICATION CARRIERS

The present invention relates to tuners for communication carriers, in particular for radio and television sets, comprising a number of switches which may be shifted from their off-position to their on-position against the action of a spring and which are retained in the on-position by stop members, the latter being interconnected in such manner that when one switch is shifted to its on-position, all of the other switches are released for return into their off-position.

In some of the known tuners, the switches take the form of pushbuttons. But these pushbuttons require much space, and their construction is rather complex. Often, they take the form of longitudinally slidable rods carrying at their ends the buttons. In this case, the stop members take the form of rockers capable of engaging projections provided at such rods. An additional disadvantage of this known arrangement lies in the fact that it is not always possible to see clearly which of the pushbuttons is in on-position and that special scales must be provided to indicate the setting selected by means of such a pushbutton.

There have also been suggestions in which the pushbuttons have been provided in two parallel lines and in which each pair of opposing pushbuttons has been interconnected by a rocker. Although this arrangement provides increased compactness and although in this case the position of the rocker indicates clearly which of the pushbuttons has been pressed, this arrangement still has the disadvantage of requiring a considerable depth.

It is the objective of the present invention to eliminate the disadvantages of the known tuner arrangement and to provide a tuner characterized by great simplicity and small space requirements.

According to the invention, this objective is achieved by an arrangement in which the switches take the form of toggle switches comprising switch buttons rocking about a common axle and having a circular notched section provided concentrically with their axle of rotation, each of the said notches being engaged by the nose of a stop pawl, and in which all of the stop pawls are mounted on a common rod arranged in parallel to the axle of rotation and rotating about its longitudinal axis, and in which a spring tending to retain the pawls in engagement with the notches acts upon such rod.

It is apparent that the switch buttons require much less space and, in particular, much less depth than the known pushbuttons so that as a result thereof such switch arrangements require only little space behind the front panel of a set. Further, the support of the switch buttons on a common axle is simple, and the rod with the stop pawls can also be easily produced and assembled and requires only little space. An additional advantage of the arrangement of the invention resides in the fact that the position of the switch buttons may be clearly recognized at the very first glance, since the switch buttons which are in off-position form a line, while the engaged switch stands out very clearly. Finally, the switches may either be directly provided with marks or release marks which indicate the setting that has been achieved with the aid of the engaged switch, so that separate scales, which would require additional space, may be dispensed with.

In a preferred embodiment of the invention, the switch buttons are operatively connected through pins and slots with a contact slide which is movable in vertical relation to their axis of rotation. In this embodiment of the invention, the return springs act against the contact slides. The said contact slides allow the switches to perform a large variety of switching functions. In addition, they may be arranged in parallel to the front panel of the tuner, so that their use will not considerably increase the depth of such a unit.

In a preferred embodiment of the invention, each switch button has assigned to it two contact slides which may be moved from a neutral position in opposite directions and which, when in neutral position, keep the switch button in a central off-position. This arrangement makes it possible for each switch button to select two different settings, and as a result the number of switch buttons may be reduced to half the required number. Nevertheless, this arrangement does not impair the clarity of indication, the direction in which the switch button has been moved away from its center position being clearly visible.

In this embodiment of the invention, the contact slides assigned to each of the switch buttons are conveniently arranged on both sides of the switch button. Further, the contact slides arranged between two neighboring switch buttons may be in direct contact with another and be provided with slots for the drive pins provided at the switch buttons. In this case, the slots must be sufficiently spaced to ensure that they will never considerably overlap, independent of the position of the contact slides. Although this arrangement provides an extremely compact design, it safely prevents the neighboring contact slides from jamming and the drive pins provided at the switch buttons from engaging contact slides assigned to neighboring switch buttons.

In one embodiment of the invention, the switch buttons are constituted by a drum seated on a pivot axle and comprising a radially projecting wiper which projects through an opening in the case cover, the said case cover comprising openings exposing certain sections of the drum indicating the switch functions.

When according to the embodiment described above each switch button has an additional indexed position on either side of the center position, a certain section of the drum whose sector must correspond to the angle of traverse of the switch button, may conveniently project into the opening for the wiper provided in the flat cover. In this manner, the slot does not only permit the wiper to be pivoted, but it also forms openings through which may be seen the marks indicating the switch functions provided on the drum or made visible through the drum. In its central off-position, in contrast, the cover hides the corresponding drum sections.

In a preferred embodiment of the invention, the drum is hollow and comprises in its interior a concentrically supported dial cylinder, the marks of such dial cylinder being visible through a window provided in the drum jacket and the said cylinder being in engagement with a drive member projecting through an opening in the drum jacket opposite to the wiper. While this arrangement does not require any additional space, it makes it possible to indicate the setting achieved by the operation of a switch. For adjusting purposes, the dial cylinder may be provided on one end with a gear rim engaging a slidable toothed rack. This toothed rack does not require any additional space and does not appreciably complicate the switch arrangement of the invention. In contrast, this embodiment permits to arrange underneath the drum a potentiometer with a loop guided on a threaded spindle and to connect the drive member of the dial cylinder, in particular the toothed rack, with the slider. Such potentiometers may be used, for instance, to influence voltage-variable capacitors of tuned circuits. In this case, the voltage tapped at the associated potentiometer is then applied by means of the toggle switches of the tuner in accordance with the invention to the tuned circuits. It will be seen that this arrangement provides a complete tuner requiring a minimum of space and offering an extremely simple design. In arrangements in which the switch button may be shifted from its off-position into two different on-positions, the drum may also comprise in its interior two dial cylinders arranged side-by-side and coupled each to a potentiometer slider so that either of the two potentiometers may be selectively excited when the switch button is shifted out of its center position. In this case, the drum of the switch button will be provided with two openings, each provided on one side of the wiper above one of the two dial cylinders, and when the switch button is in its central position, these openings are covered by the case cover.

For the adjustment of the potentiometer and, as a result thereof, the selection of a desired tuning, the threaded spindles may be designed to permit connection to a central tuner.

To this end, one embodiment of the invention provides clutch members arranged on the spindle ends which may be displaced in longitudinal direction and which are kept out of engagement with the matching clutch member of the central tuner through the associated contact slide when the switch button is in its off-position and which are released for engagement when the contact slide assumes another position.

In this connection, it should be mentioned that the preferred embodiment of the invention in which the switch buttons may be shifted from a central position into two on-positions, may most usefully be employed in such a manner that the two sides are assigned to different operating modes or bands. In radio sets, for instance, the on-position on the one side of the off-position may be assigned to AM operation, while the on-position on the other side of the off-position may be assigned to FM operation. In television sets, in contrast, one on-position might be assigned to the VHF range and the other on-position to the UHF range. In both cases, the selected mode of operation or band or range will be clearly distinguishable.

Further details and embodiments of the invention will become apparent from the following specification, in which the invention is described and explained in detail, reference being made to the embodiments shown by way of example in the accompanying drawing. In other embodiments of the invention, the features apparent from the specification and the drawing may be applied either individually or in any desired combination of a plurality of such features. In the accompanying drawing

FIG. 1 is a top plan view of a tuner section according to the invention, with partially removed case cover,

FIG. 2 is a section through the arrangement according to FIG. 1, taken along the line II–II,

FIG. 3 is a view of the center sections of two neighboring contact slides in connection with a section of a switch button of the arrangement according to FIG. 1,

FIG. 4 is a section similar to that shown in FIG. 2 through another embodiment of the invention and

FIG. 5 is a section through the tuner shown in FIG. 4, taken along the line V–V.

The tuner shown in FIGS. 1 to 3 features a housing 1 constituted by an open-top plastic box supporting in its sidewalls 2 a pivot axle 3 on which a number of switch buttons 4 are seated in an axially extending line. The switch buttons 4 consist essentially of circular discs provided over a certain distance of their circular contour with stop notches 5. As appears from FIG. 2, the said stop notches are operatively connected with pawls 6 whose noses 7 engage in either of the stop notches 5 of the switch button assigned to them, depending on the position of the switch button 4. The pawls 6 are mounted on a rod 8 which rotates about an axle 9 supported in parallel to the pivot axle 3 of the switch buttons 4 in the sidewalls 2 of the case 1. The rod 8 carries on its one end an arm 10 which projects beyond the neighboring longitudinal case wall 11. Upon the end of the said arm acts a spiral tension spring 12 which is nested in a tongue 13 projecting from the bottom of case 1. The spring 12 tends to rotate the rod 8 about its axle 9 in clockwise direction, seen in the direction of view of FIG. 2, and to retain thereby the noses 7 of the pawls 6 in engagement with stop notches 5 of the switch buttons 4. As appears from the drawings, three stop notches 5 are disposed along the circular peripheral area of the switch buttons 4 so that the latter are able to assume three different positions. The switch buttons are shifted by means of a wiper disposed on the periphery of the switch buttons and projecting through an opening 15 provided in a cover 16 closing the top of the case 1. The disposition of the stop notches 5 on the switch button 4 is such that the switch button may be shifted to the right and to the left from a central position in which the wiper 14 occupies a position perpendicular to the cover 16. In FIG. 1, all switch buttons 4, except for the uppermost button, occupy their central position, while the uppermost button which is also shown in FIG. 2, has been shifted to the left.

Assigned to each pushbutton 4 are two contact slides 17 and 18 arranged on both sides of each switch button 4. The said contact slides are guided in slots disposed in the longitudinal walls 11 and 19 of the case 1. One end each of the said contact slides is provided with an upright lug 20, in which one end of a tension spring 21 is nested, while its other end embraces a journal 22 which extends from the case wall 11 or 19 to the cover 16. The springs 21 tend to retain the slides 18 and 19 in a position in which a shoulder 23 disposed at their upper edge bears against the outside of the corresponding longitudinal case wall 11 or 19 (see FIG. 2). It appears that the slides 17 and 18 assigned to each switch button 4 extend from the opposing longitudinal case walls 11 and 19 into the case 1 so that they may be moved from their neutral position in the opposite direction, against the action of the spring 21. Within their center zone, the contact slides 17 and 18 are provided with slots 24 engaging pins 25 arranged on the outer surfaces of the switch buttons 4 in a manner that they are in uninterrupted contact with that side of the slot 24 which is assigned to that end of the contact slide 17 or 18 which is loaded by the spring 21. As appears from FIG. 3, the slots 24 are disposed in a manner to ensure that the slots of the slides 17 and 18 assigned to neighboring switch buttons 4 will not overlap which in turn ensures that the pins 25 of the neighboring switch buttons which face each other will not engage the contact slide assigned to the neighboring switch button. This arrangement warrants perfect function without requiring the observation of close manufacturing tolerances.

As mentioned before, the springs 21 tend to retain the contact slides 17 and 18 in a neutral position in which the shoulders 23 of the contact slides bear against the outer surfaces of the case walls 11 and 19. From this neutral position, the contact slides 17, which have their spring-loaded ends neighboring the right-hand longitudinal case wall 11 of the drawing, may be shifted to the right by pivoting the switch button 4 in counterclockwise direction, as shown in FIG. 2. Analogously, the contact slides 18, which have their spring-loaded ends neighboring the left-hand case wall 19, may be shifted to the left by pivoting the switch buttons 4 in clockwise direction. When the switch button 4 occupies its central position, both slides are in their neutral position as demonstrated by the second button from the top of FIG. 1. On the other hand, the neutral positions of the contact slides defined by the contact of the shoulders 23 with the case walls, also define the central position of the switch button 4, and the springs 21 do not only tend to bring the contact slides 17 and 18 into their neutral positions, but they also serve to return the switch button 4 to its central off-position when it is released by the associated stop notch 6. The teeth disposed between the recesses 5 at the periphery of the switch button 4 act to commonly disengage all of the pawls 6 mounted on the rod 8 from the stop notches 5 when any of the switch buttons is shifted. The noses 7 of pawls 6 are rounded to prevent any automatic locking between the teeth disposed between the stop notches 5 and the nose 7 of the pawls 6 when disengagement of pawl 6 from its neutral position has been started. As a result, the tension springs 21 are in a position to return an engaged switch button 4 from any of its on-positions into its central off-position as soon as any of the other switch buttons is actuated, causing the pawl assigned to this actuated switch button and all the other pawls along with it to be disengaged.

From the above explanations it appears that in an arrangement according to FIGS. 1 to 3 any of the switch buttons 4 may be selectively shifted from a central off-position to the left or to the right by means of its wiper 14 and that such shifting causes either of the two contact slides assigned to the said switch to be displaced from a neutral position. The said contact slide may be employed in a manner not specifically shown to operate switch contacts of any desired arrangement, the latter being engaged, for instance, by its end projecting through the case. Another possible arrangement could provide for suitable contacts to be arranged within the case between the contact slides. Further, it appears that each

switch will return to its off-position as soon as any other switch is operated. And the inclined wipers of the switches clearly show which switch has been operated in which direction. In order to indicate the function performed by the actuated switch, the arrangement shown in the drawing has not only the wiper 14 but also a section of the disc or drum-shaped switch button 4 projecting through the opening 15 of the case cover 16, the projecting sector of the said switch button corresponding to the angle of traverse of the switch button. As a result thereof, a shifted switch button makes visible a sector of the drum surface which is normally covered by case cover 16 and which may be provided with marks providing information as to the function of the switch, for example with the numerals 26 shown in FIG. 1.

The embodiment shown in FIG. 4 and 5 corresponds essentially to the details of the embodiment shown in FIG. 1 to 3. It also features a plastic case 31 supporting in its sidewalls 32 a pivot axle 33 for switch buttons 34 which project partially through an opening 35 in a case cover 36 and which carry at their exposed portion a wiper 37. Again, the pushbuttons 34 may assume three different positions, i.e. a central off-position and two on-positions arranged at the left and right thereof and defined by stop notches 38 disposed along a circular section of the switch button 34, said notches being operatively connected with a pawl 39. The pawls 39 are mounted on a rotatably supported rod 40 extending in parallel to the pivot axle 33 and being provided with an arm 42 loaded by a spiral tension spring 41. Further, this arrangement also has each switch button 34 associated with two slide contacts 43 and 44 extending from opposite sides into the case 31 and loaded by tension springs 45, which springs tend to retain the contact slides 43 and 44 in a neutral position and which act simultaneously as return springs for the switch button 34, the said switch button 34 being coupled by means of slots and pins 46, 47 to the said contact slides 43 and 44.

The difference between the embodiments according to FIGS. 1 to 3 and the embodiment according to FIGS. 4 and 5 lies in the switch buttons 34, which in this arrangement do not take the form of discs, but that of hollow drums comprising within them in coaxial arrangement to the drum jacket two dial cylinders 48 supported on the pivot axle 33, each of which dial cylinders is provided on one of its ends with a toothed rim 49. Accordingly, the teeth 49 are provided only in one face 50 of the drum. In order to make the marks 51 of the dial cylinders 48 visible, the drum jacket is provided with two windows 52, each facing one cylinder, the said windows being arranged on both sides of the wiper 37 in a manner that they are hidden by the case cover 35 when the wiper occupies its central position, as shown in FIG. 4. When the switch button is shifted, one or the other of the two windows will appear in the opening 36 of the cover 35 and will render visible that mark 51 of the underlying dial cylinder which faces the window.

The dial cylinders 48 are driven through toothed racks 53 being in engagement with gears 49 disposed at the side faces of the dial cylinders 48. The said toothed racks 53 are disposed in slidable arrangement and in parallel to the contact slides between the contact slides 43 and 44 assigned to each switch button 34. They are directly connected to potentiometer sliders 54 which run on threaded spindles 55, the latter being likewise disposed within the zone between the contact slides 43 and 44 and in parallel to the latter and supported in the longitudinal walls of the case 31. It appears that the potentiometer setting will be transmitted to the dial cylinders 48 by means of the toothed rack 53 so that the dial cylinder will indicate the potentiometer setting. With the aid of switch button 34 it is then possible to selectively throw into circuit any of the two potentiometers, and in particular to apply the voltage tapped from the potentiometer to the variable-voltage capacitors of tuned circuits. Accordingly, the dial cylinders 48 may provide information on the selected channel, the selected frequency or the like.

In the embodiment shown in the drawings, the threaded spindles are operated by means of a central tuning arrangement to which the individual threaded spindles may be selectively coupled. To this end, each of the threaded spindles 55 carries on that end which neighbors the spring-loaded end of the associated contact slide 43 or 44, a clutch member 56 movable in the longitudinal direction of the threaded spindle but rotating with the threaded spindle and carrying on its outer face a rim 57. The clutch member is loaded by a spiral pressure spring 58 arranged concentrically to the threaded spindle 55 and tending to push the clutch member 56 outwardly and to bring its spur rim into engagement with a pinion 59, the latter being mounted on a tuning shaft 60 extending along the outside of the case and in vertical relation to the threaded spindles 55 with which it forms a plane. The clutch member 56 engages, however, with a collar 61 in a recess 62 disposed at the lower edge of the associated contact slide 43 or 44 and is kept by the outer side of the said recess out of engagement with the pinion 59, when the contact slide occupies its neutral position. If, however, any of the contact slides is displaced outwardly in its on-position by actuation of the switch button 34, the clutch member 56 is released and the spur rim 57 will engage the pinion 59, and as a result thereof it will be possible with the aid of a tuning knob not shown in detail which is coupled to the tuning shaft 60, to rotate the threaded spindle 55 associated with the actuated switch button 34 and, thus, to regulate the potentiometer setting 54 and, thus, the tuning.

It shall be understood that the present invention is not restricted to the shown embodiments and, in particular, that the switch arrangements according to the invention may be coupled or combined also with any other tuners or other devices.

Having thus fully described our invention, what we claim as new and wish to secure by Letters Patent is:

1. A tuner for communication carriers, in particular for radio and television sets, comprising a number of switches which may be shifted from their off-position to their on-position, first spring means operatively associated with the switches for returning the latter to their off-position, which switches are retained in the on-position by stop means engageable therewith, whereby, when one switch is shifted to its on-position, all of the other switches are released for return into their off-position, characterized in that the switches are toggle switches having switch buttons pivoting about a common axle and provided with stop notches along a circular section extending concentrically to said common axle, said stop notches being engageable by said stop means, each including a pawl having a nose, all of the pawls being mounted on a common rod extending in parallel to the common axle, said rod being rotatable about its longitudinal axis, and the rod being operatively connected with and loaded by a second spring means for pivotally moving the rod to retain the pawls in engagement with the stop notches.

2. A tuner in accordance with claim 1, characterized in that the switches include the switch buttons operatively connected with the first spring means by pins and slots with contact slides which can be displaced relatively to the common axle of said switch buttons, and the first spring means includes return springs which act upon the contact slides.

3. A tuner in accordance with claim 1, characterized in that each switch includes a switch button operatively associated with at least one contact slide on the side thereof which can be displaced from a neutral position in opposite directions and which, while in a neutral position, keeps the switch button in a central off-position.

4. A tuner in accordance with claim 3, characterized in that two contact slides are assigned to each switch button and are arranged on both sides of the switch button.

5. A tuner in accordance with claim 4, characterized in that the contact slides are arranged between two neighboring switch buttons and are directly adjacent to each other and that they are provided with slots for drive pins disposed on the switch buttons, said slots being sufficiently spaced to ensure that they will not considerably overlap in any position of the contact slides.

6. A tuner in accordance with claim 1, characterized in that each of the switch buttons comprises a drum seated on the common axle and carrying a radially projecting wiper which extends through an opening in a case cover, and said cover having said openings through which certain sections of the drum, which may indicate the switch functions, are visible.

7. A tuner in accordance with claim 6, characterized in that a drum sector of the switch buttons corresponding to the angle of traverse of the switch button extends into the opening for the wiper provided in the cover.

8. A tuner in accordance with claim 6, characterized in that each drum is a hollow body comprising in its interior at least one concentrically supported dial cylinder carrying marks which are visible through a window disposed in the drum jacket, and being in engagement with a drive member which extends through an opening in the drum jacket opposite the wiper.

9. A tuner in accordance with claim 8, characterized in that the dial cylinder carries on its one end a toothed rim which is engaged by a slidable toothed rack.

10. A tuner in accordance with claim 8, characterized in that a potentiometer with a slider running on a threaded spindle means is arranged below the drum, and the drive member for the dial cylinder, in particular the toothed rack is connected with said slider.

11. A tuner in accordance with claim 10, characterized in that two dial cylinders each coupled to one potentiometer slider are arranged side-by-side within the drum, and the drum of the switch button comprises two openings which are arranged on both sides of the wiper and which are hidden by the case cover when the switch button occupies its central position, whereby each of said potentiometers may be selectively thrown into a circuit from their neutral position by actuating the switch button.

12. A tuner in accordance with claim 10, characterized in that the threaded spindle means may be coupled with a central tuning device and that their ends carry clutch members which may be displaced in the longitudinal direction of the spindles and which are retained out of engagement with a matching clutch member of the central tuning device by means of an associated contact slide, when the switch button is in its off-position, while being released for engagement when the contact slide occupies any other position.

13. A tuner in accordance with claim 10, wherein the drive member connected with said slider is the toothed rack.