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COMPLETE SPECIFICATION

Improvements in Press-button Operated Tuning Devices for Radio Receiving Apparatus

We, FABBRICA ITALIANA MAGNETI MARELLI, an Italian Corporate Body, of 22, Corso Venezia, Milan, Italy, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to tuning devices, for radio receiving apparatus, of the type (hereinafter referred to as the type described) in which the apparatus is pre-tuned to a number of selected stations by sets of coils (varying in number with the type of circuit employed) each having within it a magnetic core, the pre-set tuning being effected by relative adjustment between the coils and cores and the required set of coils for the particular station desired being thrown into circuit by the operation of a push-button or the like.

The principal object of the present invention is to provide an improved arrangement and mounting of the coils and of the cores and also means for the cumulative displacement of each set of cores and for their individual regulation with respect to the control members.

In apparatus of the type described it is known to control the circuits of a set of coils by one press-button, and to arrange each coil on an insulating sleeve in the interior of which the co-operating core is mounted.

It is also known to adjust the position of movable cores of a set by means of a transmission which terminates at the cores, or by the aid of a cross piece connected to the cores and comprising an interiorly screw-threaded rotatable socket which engages a fixed screw-threaded spindle.

According to the present invention, the insulating sleeves which carry the coils and in the interior of which the cores are located, are mounted in a box which contains the entire device and in the front

and back walls of which screws are journaled, each one for the displacement of a set of cores, the cores of each set being connected together by a sliding member which engages and travels along the screw when the latter is rotated.

In this way there is effected an easy mounting and guiding of all the movable members which are mounted in the interior of a box the volume of which is invariable and reduced to a minimum.

The invention also comprises details of construction of the different members of the device and of the supporting box in which these members are held.

In the accompanying drawings, Figure 1 is a diagram of the tuning circuits to which the device according to the invention is applied, Figure 2 shows in its right-hand part a front view of the device, while another part thereof is a section on the line 2—2 of Figure 3 and its lower left-hand corner is a section on the line 2¹—2¹ of Figure 3; Figure 3 is a cross-section on the line 3—3 of Figure 2, Figures 4 and 5 show a support for the coils, in side elevation and in plan respectively, Figure 6 in a view in perspective of another constructional form with a part broken away, Figure 7 is a section along the axis of one of the coil-carrying sleeves, and Figure 8 shows separately one of the coil-carrying sleeves.

In the tuning system to which the present invention relates and which is assumed to be applied to a wireless receiving apparatus of the superheterodyne or frequency-changing type, a coil forming part of the preselector stage and a coil forming part of the oscillator stage are provided for each of the transmitting stations for which the press button tuning is to be effected, and the said coils are adapted to be rendered operative by the displacement of the corresponding press button.

At the instant when, starting from the normal tuning by means of the variable

[Price 1/-]

- condensers of the pre-selecting circuit and of the oscillatory circuit, the apparatus is placed in condition for effecting the tuning by press buttons, the said variable condensers are placed out of circuit and replaced by two fixed condensers, while the two normal coils of the preselector and of the oscillator are replaced by the pair of coils corresponding to the press-button which has been operated, and these coils, with the aforesaid fixed condensers, set up resonance at the frequency suitable for the reception of the transmission from the desired station.
- The arrangement described is illustrated by the diagram of Figure 1, in which the aerial A is connected at Vs to a mixing or converting valve and the different preselecting coils Bps are branched off from the circuit A—Vs, while the corresponding oscillator coils Bo are connected in parallel with an oscillator valve at Vo. The different pairs of coils Bps and Bo may be rendered operative by connecting their windings to earth by means of the corresponding switch I, which is controlled by the press button T. Co designates the fixed condenser of the oscillator circuit, while Cps designates the fixed condenser of the preselecting circuit.
- Each coil Bps and Bo is provided with an iron core N which is adjustable within wide limits. Each of the said cores N must be adjustable independently of the others, while on the other hand the two cores belonging to each pair of coils must be adjustable at the same time in order to tune the circuit corresponding to each press button to one of the stations for which the tuning by means of the press buttons may be effected; it having to be borne in mind that in wireless receiving apparatus of this type press button tuning is provided for a limited number of transmitting stations and that in each wireless receiving apparatus the elements of the tuning device must be provided and adjusted in accordance with the requirements of the locality in which the wireless receiver is installed and at the choice of the user.
- The present invention relates to the mechanical arrangement by which the required conditions for the different pairs of coils Bps and Bo may be provided and comprises a number of advantageous features relating to the construction, arrangement and control of the different elements.
- In the constructional form shown in Figures 2 and 3, the device comprises a box constituted by the lower wall 1, the upper wall 2, the side walls 3, the front wall 4 and the rear wall, the latter wall being constituted by two plates 5 and 6 secured together. Between the walls 4 and 5, 6 are disposed sleeves 7 intended to support the coils 8, 9 and to contain and guide the adjustable cores 10. These sleeves are longer than their respective coils and have, in the part left bare, slots 11 which are situated opposite one another in the sleeves carrying the coils 8, 9, belonging to the pair corresponding to a given press button.
- A screw 12 parallel to the sleeves and adapted to be controlled from the outside by means of its head 12¹ is rotatably fitted in the walls 4 and 5 of the box between the two sleeves 7 having their slots 11 situated opposite one another, the said walls 4 and 5 being suitably connected together. On the screw 12 is screwed a slide comprising a nut 13 and two transverse arms 14, 14¹ which project inside the sleeves 7 through their slots 11, and screws 15 connected to the cores 10 are screwed into these arms.
- A press button 16 actuates by means of a rod 19 a switch 17, 18 intended to control the circuit of the two coils 8, 9 and is subjected to the action of a return spring 26, while the rod 19 comprises a tooth 19¹ adapted to engage with a transverse locking member 20 pivoted at 21 and urged by a spring 22. In a manner known *per se*, the transverse locking member 20 engages in the operative position the press button 16 which has been displaced, while, when a press button is displaced, the said transverse member releases the press button which is in the operative position at this instant and permits it to return under the action of its spring 26.
- The sleeves 7, which are preferably of insulating material, have at their extremities notches 7^o forming tongues 7¹, as well as a longer tongue 7¹¹ projecting at the rear part of the box and carrying the terminal at which the corresponding coil terminates and to which a common conductor which connects all the similar coils is soldered. The walls 4 and 5, 6 of the box have apertures 23, 24 for mounting the sleeves 7, and the apertures 23 in the wall 5 permit the free passage of the sleeves and of the coils fitted thereon. The apertures 24 in the walls 4 and 6 have a diameter which is smaller than the outer diameter of the sleeves and these apertures comprise sector-shaped enlargements 24¹ in which the tongues 7¹ of the sleeves engage. In this way, the sleeves 7 may be locked between the walls 4, 6, while the sleeves remain angularly engaged in the apertures 24, 24¹.
- The apertures 23, 24 in the walls of the

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box are situated in rows and arranged quincuncially for the two coils of the different pairs of cores co-operating with a slide 13, 14, 14¹ and a screw 12 (Figure 2) in order to reduce the dimensions of the assembly. The condensers 25 which, in combination with the coils 8, 9 form the oscillatory circuits of the preselector and of the oscillator, are preferably also arranged in the box 1, 2, 3, 4, 5—6.

By adjusting the screws 12, the positions of the cores 10 in the sleeves 7 belonging to a common pair may be regulated to equal degrees, while the screws 15 permit of regulating the cores 10 of the different sleeves with respect to one another.

In the constructional form shown in Figures 6—8, the device comprises two parallel supporting plates 4, 5 assembled with the aid of lateral plates 3. In the plate 4, 5 are fitted the sliding rods 19 adapted to act on the contacts of the circuits of the different coils, each of these rods being controlled by means of its press button 16 and returned by its spring 26, while a transverse member 20 subjected to the action of springs 22 (Figure 7) is adapted to engage with the fingers 19¹ of the different rods 19 and to maintain one of the rods 19, 19¹ in the operative position at a time.

The sleeves 7 intended to carry the coils 8 and 9 are fitted in apertures 27 in the plate 5, each of these sleeves being supported at one of its extremities so as to project in cantilever fashion into the space between the plates 4, 5. Each sleeve 7 is mounted with the aid of a flange 28 formed in the plate 5 about each aperture 27, the extremity of each sleeve 7 being fitted in the said flange 28, while the mounting is completed by a ring 29 which is forced into the said extremity of the sleeve 7. In order to effect a good mounting of the sleeve 7, its extremity has a slot 30 (Figure 8) which imparts to it an elasticity permitting the expansion of the extremity of the sleeve 7 in the flange 28.

All the sleeves 7 may advantageously be mounted in a single operation by inserting the sleeves 7 in the respective flanges 28, fitting the rings 29 in the interior thereof and then forcing all the rings 29 inside the respective sleeves by a single operation.

On each of the sleeves 7 is disposed a coil 8 or 9, while a core 10 of agglomerated magnetic material slides in the interior thereof. Each core 10 is connected by means of a resilient rod 31 to a screw-threaded socket 32 provided with a head 32¹ for manual adjustment and screwed into a screw-threaded eye 33

formed in a slide 34 fitted on the control screw 12, which may be rotated by means of its head 12¹.

As is shown in Figures 6 and 7, the slide 34 comprises two arms 34¹ each forming at its extremity an eye 33 to which one of the cores 10 of the respective group is connected. The slide 34 likewise comprises the nut 13 which is screwed on the screw 12, and is guided in its displacements by means of a ring 35 having a plain hole which slides over a smooth part 12¹¹ of the screw 12, and also by a flattened rod 36 which projects from the slide and slides in an aperture 37 in the plate 4.

Opposite each socket 32, the plate 4 has a hole 42 affording access to the head 32¹ of the corresponding socket 32 for the purpose of adjustment.

An arcuate spring 41 encircles at its intermediate part the screw 12, while the extremities of the said spring take up a position in notches 45 of the eyes 33 and bear against the screwthreaded sockets 32 screwed into the said eyes for the purpose of exerting on the said sockets 32 a pressure which maintains them in their adjusted position.

The fitting of each screw 12 in the plates 4, 5 is effected at one of its extremities with the aid of its pivot 12⁰ situated in an aperture 38 in the plate 5. The opposite extremity of each screw 12 is supported in a seat 39 extending from a splayed aperture 39¹ in the plate 4. The screw 12 has a peripheral groove 40 adapted to engage with the edge of the seat 39 and to be engaged by a spring 44 extending over the length of the plate 4 opposite the series of screws 12 and is undulated so as to pass alternately below the rods 36 of the different slides and in the upper part of the grooves 40 of the screws 12. The said spring 44 maintains the different elements in position and retains the screws 12 with their grooves 40 in engagement with the seats 39, in order to prevent longitudinal displacement of the screws 12 under normal conditions.

The rod 36 of each slide 34 is provided, in its part adapted to project out of the plate 4, with a calibration scale which may be inspected from outside the device, the edge of the aperture 37 in the plate 4 through which the rod slides being employed as a reference, whereby the pair of cores 10 connected to each slide 34 may be calibrated.

With the arrangement described, the individual calibration of each core 10 is effected by acting on the head 32¹ of the socket 32 through the aperture 42 in the plate 4, while the simultaneous regula-

tion of the two cores of each pair is effected by acting on the screw 12, 12' of the slide 34 to which the two cores 10 are connected.

5 The cores 10 are maintained in the desired position by the springs 41, which hold the sockets 32 in their adjusted position, and by the spring 44 which acts on the screws 12 and on the guide rods 10 of the different slides 34.

10 In the two constructional forms, the different switches 17, 18 may be controlled by the displacement of the different press buttons 16 in order to connect the desired pair of coils 8, 9 in the circuit, while the other pairs are rendered in-operative.

15 The device described permits of combining in one assembly all the elements co-operating to effect the press button tuning, thus reducing to a minimum the space occupied and facilitating the regulating operations and the tuning operation; in addition, the manufacture and assembly are simple and economical.

20 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

30 1. A tuning device of the type described for radio receiving apparatus, in which coils are arranged on insulating sleeves in the interior of which the respective cores are mounted, characterised by the sleeves being mounted in a box which contains the whole device and in the front and back walls of which screws are journaled, each one for the displacement of a set of cores, the cores of each set being connected together by a sliding member which engages and travels along the screw when the latter is rotated.

40 2. A device as claimed in Claim 1, characterised in that the sliding member comprises a guide rod adapted to slide in a slot in a stationary plate.

50 3. A device as claimed in Claim 2, characterised in that the guide rod of the sliding member is provided with a calibration scale which can be inspected from the outside, the plate through which the said rod slides being employed as reference.

55 4. A device as claimed in Claim 1, characterised in that the sliding member comprises transverse arms, the extremities of which have eyes in which are screwed sockets connected to the corresponding cores.

60 5. A device as claimed in Claim 4, characterised in that the sliding member comprises a nut engaged with the screw and a guide ring having a plain hole

adapted to slide on a non-threaded portion of the said screw.

6. A device as claimed in Claim 1, characterised in that a spring of arcuate form, which is disposed on the sliding member, bears against the screw and acts on the screwthreaded sockets in order to hold the said sockets in the desired position and to maintain the sliding member in engagement with the screw.

7. A device as claimed in Claim 1, characterised in that the screw is fitted in the stationary part of the device with the aid of a groove of the said screw, which engages in a seat provided in a plate belonging to the stationary part.

8. A device as claimed in Claim 7, characterised in that a spring is in engagement with the screw and with the guide rod of its sliding member and the said spring maintains the screw and the sliding member in position and eliminates the play relatively to the seats in which the screw and the rod are mounted.

9. A device as claimed in claim 6, characterised in that a single spring extends over the screws and over the guide rods of all the sliding members and maintains all these elements of the device in position.

10. A device as claimed in Claim 1, characterised in that each core is connected to the sliding member which actuates it with the aid of a screw permitting the individual regulation of the said core with respect to its sliding member.

11. A device as claimed in Claim 10, characterised in that one wall of the box has an aperture opposite the screw which connects each core to its control member.

12. A device as claimed in Claim 1, characterised in that each sleeve has at least one of its extremities secured in one wall of the box containing the device.

13. A device as claimed in Claim 1, characterised in that each sleeve has a slot in a part left uncovered by the coil disposed thereon, the said slot permitting the passage of a part of the sliding member which connects this member to the core movable inside the sleeve.

14. A device as claimed in Claim 13, characterised in that the sleeves of the two coils corresponding to one group have their slots disposed opposite one another and the sliding member comprises two arms extending into the slots of the two sleeves and acting at the same time on the cores of these two sleeves.

15. A device as claimed in Claim 1, characterised in that one of the walls of the box is constituted by coupled plates, of which the outer one is utilised for the

fitting of the sleeves, while the inner one which is connected to the opposite wall of the box, is intended for the fitting of other parts and has apertures which permit the passage thereof of the sleeves supporting the coils.

16. A device as claimed in Claim 15, characterised in that each sleeve is fitted in apertures in one wall and in a plate supporting it and comprises at its extremities notches and tongues, while the said apertures have sector-shaped extensions in which the tongues of the sleeve engage, and their edges comprise portions against which the ends of the notches of the sleeve abut.

17. A device as claimed in Claim 16, characterised in that one of the tongues of the sleeve projects beyond the plate co-operating therewith and supports the connection between the conductor forming the coil of the sleeve and an external conductor.

18. A device as claimed in Claim 1, characterised in that each of the sleeves carrying the coils is secured at one of its extremities in a plate belonging to the box of the device.

19. A device as claimed in Claim 18, characterised in that, for the fitting thereof in the supporting plate, each sleeve is fitted in an aperture in the

plate and a ring is forced into the extremity of the said sleeve, thus expanding it and holding it fast in the aperture in the plate. 35

20. A device as claimed in Claim 19, characterised in that the extremity of the sleeve has a slot for the purpose of facilitating the expansion and holding fast thereof. 40

21. A device as claimed in Claim 20, characterised in that the aperture on the plate is surrounded by a flange in which the extremity of the sleeve is fitted. 45

22. A device as claimed in Claim 1, characterised in that the sleeves of the different groups are arranged in two rows in quincunx.

23. A device as claimed in Claim 1, characterised in that the box also contains the tuning condensers co-operating with the coils carried by the sleeves. 50

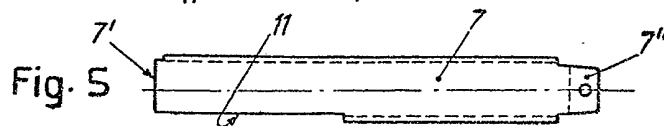
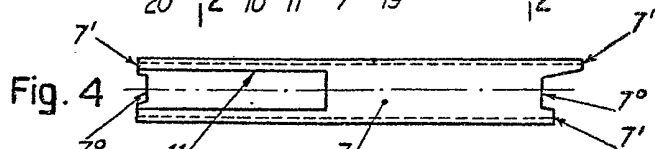
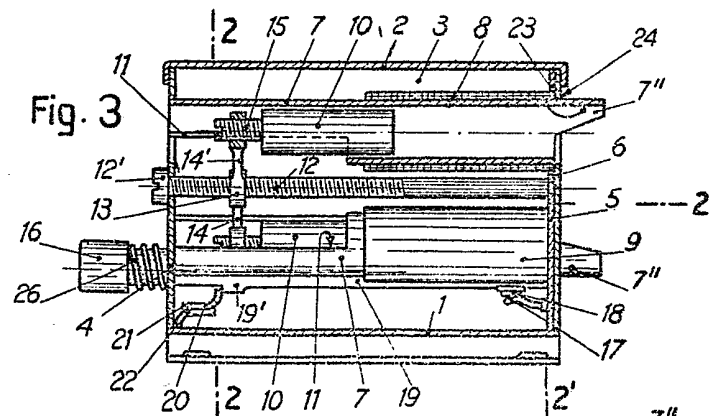
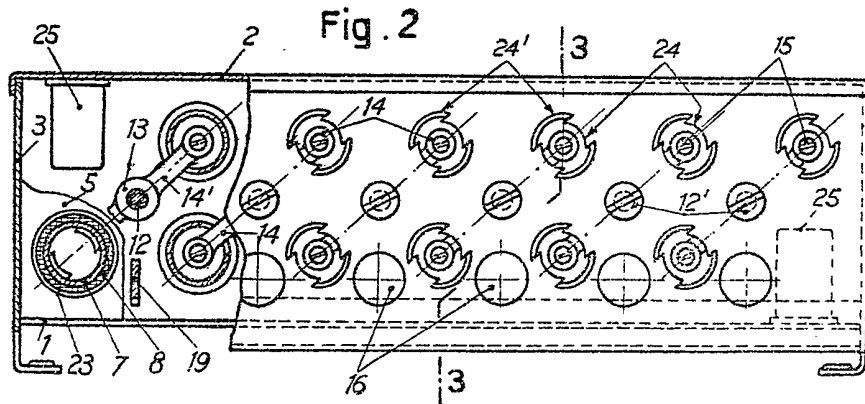
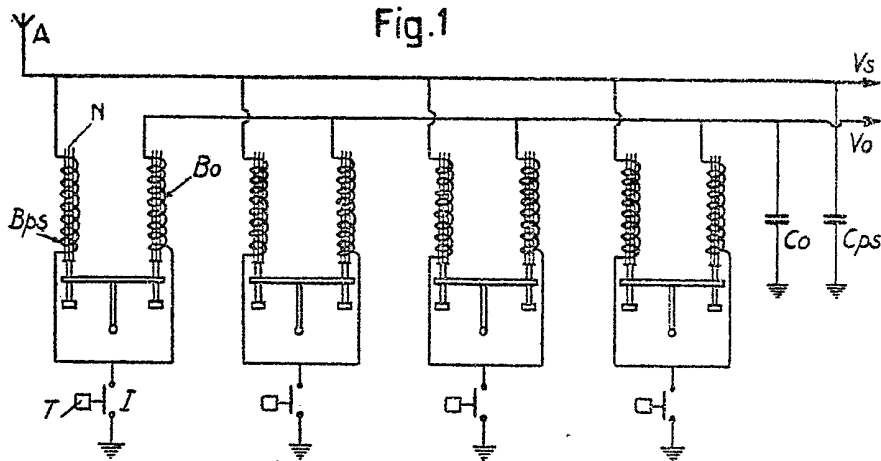
24. A press-button-operated tuning device for wireless receiving apparatus substantially as shown in Figures 1 to 5 or Figures 1, 6, 7 and 8 of the accompanying drawings. 55

Dated this 14th day of September, 1939.

FABBRICA ITALIANA MAGNETI

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[This Drawing is a reproduction of the Original on a reduced scale.]

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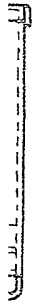


Fig. 6

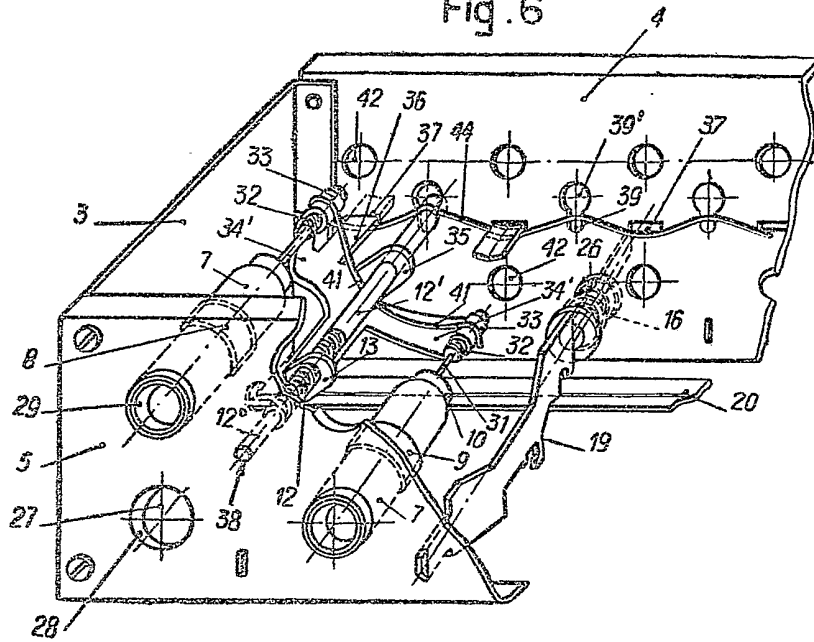


Fig. 7

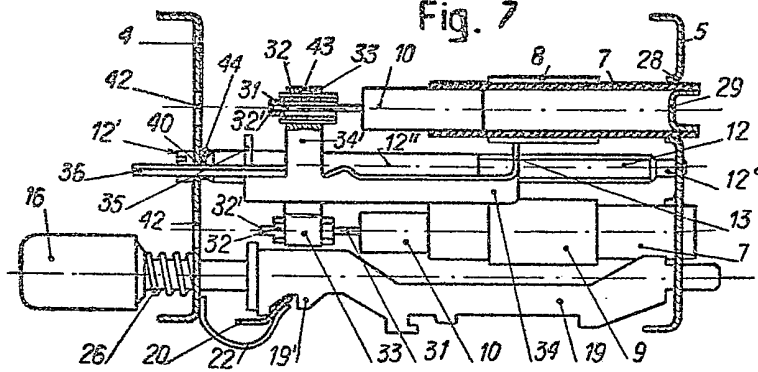


Fig. 8

