

Feb. 17, 1942.

L. BATCHELDER
ELECTRICAL COMPENSATOR

2,273,011

Filed Dec. 1, 1937

3 Sheets-Sheet 1

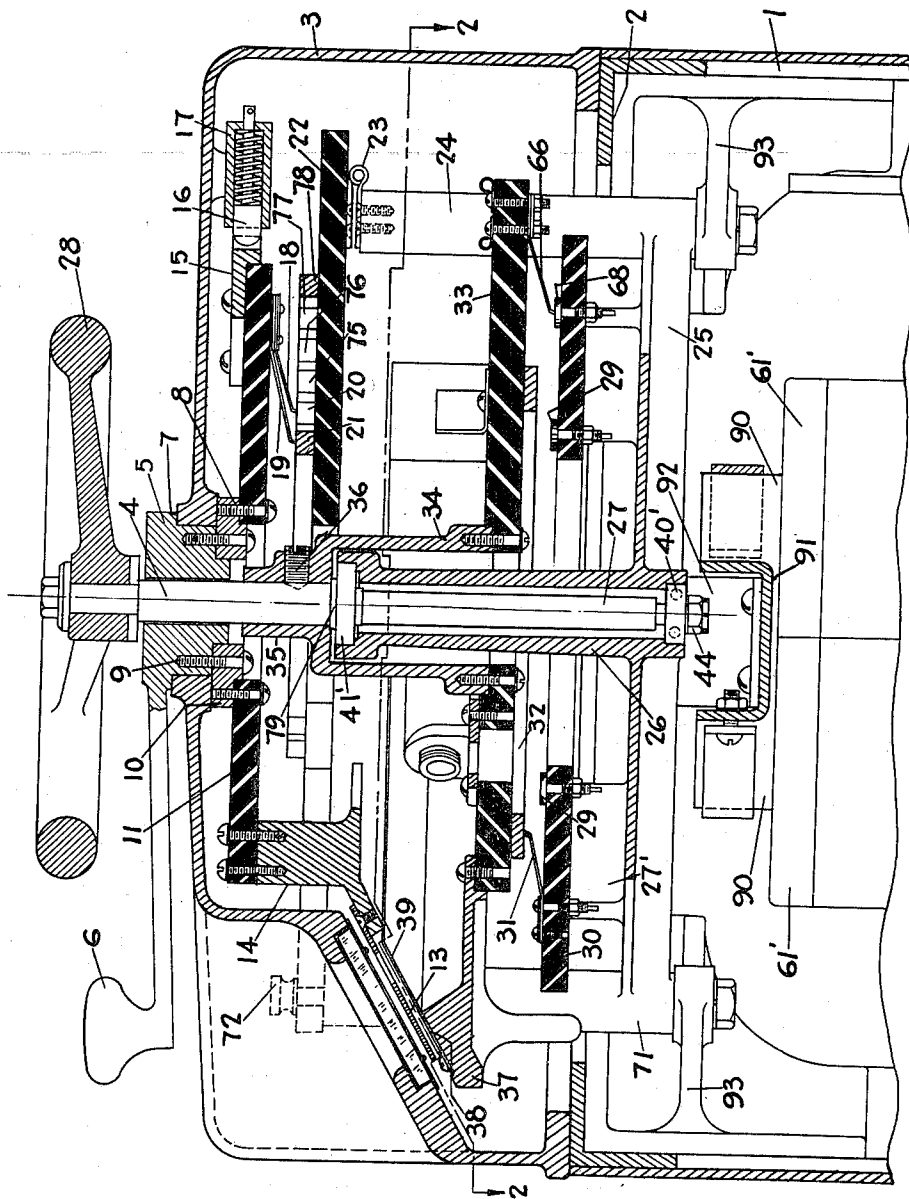


FIG. 1

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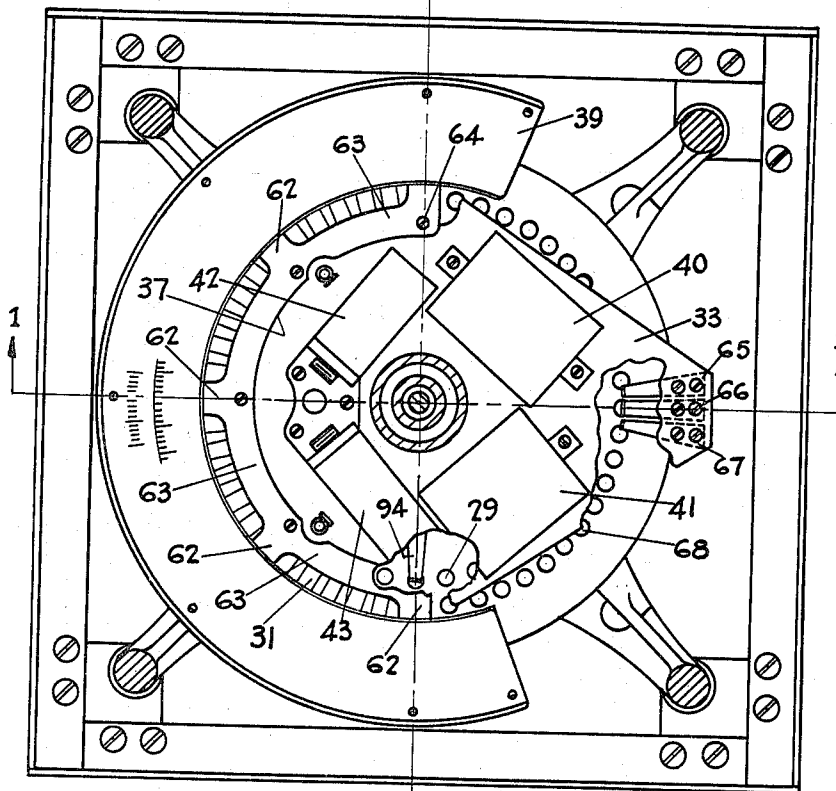


FIG. 2

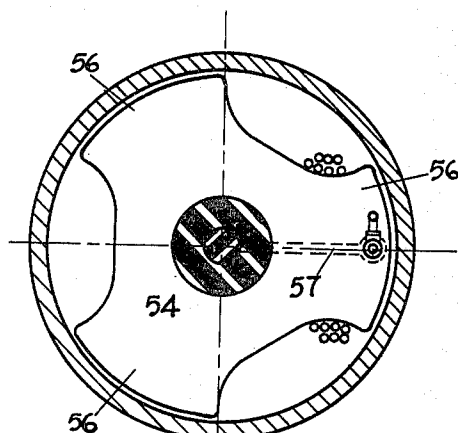


FIG. 5

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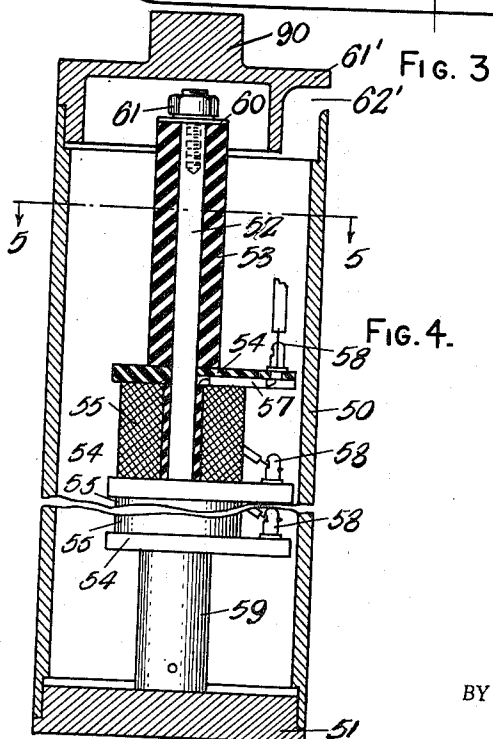
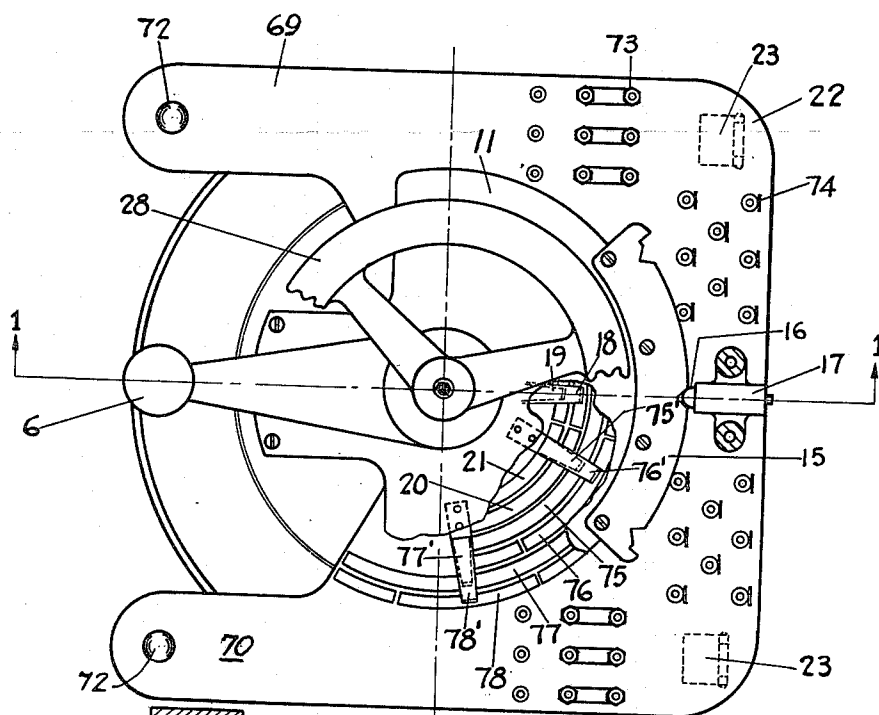
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UNITED STATES PATENT OFFICE

2,273,011

ELECTRICAL COMPENSATOR

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a corporation of Maine

Application December 1, 1937, Serial No. 177,539

5 Claims. (Cl. 200—14)

The present invention relates to electric compensators and in particular to the type described in my United States Patents No. 2,070,570, issued February 16, 1937, and No. 2,088,580, issued August 3, 1937.

In this type of electric compensator there are employed both what are called B-lines, C-lines and F-lines each of these lines being electrical retardation lines. The F-line is fixed in length; the C-line is also fixed in length but has taps at uniform intervals so that the output may be taken off anywhere along the line by means of a suitable switch. The B-line is divided into two parts variable in length by a switch, whereby the line may be opened progressively at any point from one end of the line to the other, with one side of the line connected to one ear or indicating device and the other side of the line connected to the other ear or indicating device.

Compensators of this type, it will be appreciated, have a great many switching contacts which, in order to provide reliable compensation, must operate uniformly well at all times. It is also necessary in this type of apparatus to make provision so that the apparatus can be easily disassembled for cleaning, adjusting or repairs. The present invention provides a construction in which these advantages are obtained and, further, provides a device in which the shifting from various groups of receivers for different combinations of compensation are made readily possible. In addition to this, the electric lines of the compensator are so constructed and arranged that they are substantially unaffected by external electric or magnetic fields.

Other features in the construction and operation of the mechanism will be described in connection with the drawings in which Fig. 1 shows a sectional elevation through the upper portion of the compensator; Fig. 2 shows a section taken on the line 2—2 of Fig. 1 with the cover removed; Fig. 3 shows a top view as viewed in Fig. 1 again with the cover removed; Fig. 4 shows a section through a compensator column; and Fig. 5 shows a section taken on the line 5—5 of Fig. 4.

As shown in Fig. 1 the compensator mechanism is enclosed in a casing having a base frame 1 with an inwardly extending flange 2 upon which the top cover 3 is mounted. Upon arms 93 projecting inwardly from the frame 1 below the flange 2 is mounted a spider 25 having formed integrally therewith at its four extremities supporting posts 24 and 71 and at its center a tube or hub 26. Mounted within the hub 26 is a shaft having a lower extension 27 and upper exten-

sion 4. The shaft is secured within the hub by means of the nut 44 at the lower end and the shoulder 79 at the upper end of the shaft which bear respectively against ball bearings 40' and 41' mounted in the hub. Above the shoulder 79 the shaft 4 carries the cap or support 34 to which a rotor plate 33 is secured by means of the set screw 36 in the hub 35. Above the hub 35 there is rotatably mounted on the cover 3 concentric with but slightly spaced from the shaft 4 a hub 5 which has a portion extending through an aperture in the cover 3 and to which is attached a handle 6 whereby the hub 5 may be rotated. Within the cover the hub 5 has a shoulder to which is secured a ring 8 by means of the screws 9 so that the hub is swivelled in the cover and not free to be removed from it. Secured to a shoulder 10 of the ring 8 is a second rotor plate 11 of insulating material.

At the extremity of the shaft 4 above the hub 5 there is secured a handwheel 28 whereby the shaft 4 and its extension 27 may be rotated. Thus, by rotation of the handwheel 28, the plate 33 may be rotated, while by rotating the handle 6, the plate 11 is rotated.

The rotor plate 11 has two functions; first, to control the switches for shifting from one receiver group to another, and, second, to indicate which group of receivers is connected to the compensator for the several positions of the handle 6. The latter function is performed by a tell-tale indicator 13 mounted at an inclined angle downward from a bracket 14 fastened to the lower side of the rotor plate 11. This tell-tale indicator is usually marked "port-bow-starboard," the port position meaning that receivers on the port side of the vessel are connected to the compensator while the starboard position means that the receivers on the starboard side of the vessel are connected to the compensator and the bow position refers to a combination of port and starboard receivers. The three positions of the indicator 13 and consequently of the rotor 11 are determined by the aid of an arcuate stop guide 15 mounted on the latter, which guide operates against the spring finger 16 mounted in a holder 17 which is secured to the cover 3. The guide 15 is provided with three notches cooperating with the spring finger 16, as more clearly shown in Fig. 3, and thus provides for the three positions of the rotor plate 11.

The face view of the scale 39 is shown in Fig. 2. This figure also shows the shape of the bracket 37 which has radial webs 62 and arcuate webs 63 formed integrally with one another, the arcu-

ate webs being fastened to the plate 33 by means of the screws 64.

The switching functions of the rotor plate 11 are performed by eight sets of two brushes, each mounted on the underside of the plate 11. In Fig. 1 there is shown the set of brushes 19, 18, operating on conductive segments 21 and 20, respectively. In Fig. 3 two other sets of brushes 75', 76' and 77', 78' are also shown bearing upon other segmented rings 75, 76 and 77, 78, respectively. The three sets of conductive segmented rings are concentrically mounted upon a stationary insulating plate 22. The latter is hinged at its right-hand side, as shown in Figs. 1 and 3, by hinges 23 to the upright posts 24, of which there are two. The left side of the plate 22 is formed with two extending arms 69 and 70, as shown in Fig. 3, having apertures through which the plate may be held firmly by means of thumb screws 72 to the posts 71 extending upwardly from the spider 25. It will be noted from the shape of the plate 22, as shown in Fig. 3, that the conducting segments 20, 21, and 75 to 78 do not extend all the way around the plate 22 so that the plate can be raised on its hinges without interfering or coming in contact with the shaft 4. The segmented rings are suitably connected to the various groups of sound receivers so that the proper group of receivers will be connected to the compensator as indicated by the tell-tale 13 for each of the three positions of the handle 6.

The plate 22 also carries the connecting elements 73, 74, etc., whereby connections are made from the receiving units to the selector switch and from the latter to the lag lines.

The lower rotor plate 33 which is rotated by the handwheel 23 carries switching elements for adjusting the compensator lag lines to the proper length to bring into phase the energy received by the particular groups of sound receivers which are in use as determined by the selector switch controlled by the handle 6. The plate 33 also carries an indicating scale 39 for indicating the direction of the sound source when the compensator is balanced.

The indication is accomplished by a bracket 37 mounted on the rotor plate 33 and carrying a scale having an inclined surface 38 visible through apertures in the tell-tale 13 and a glass-covered aperture in the cover 3 as shown in Fig. 1. The compensator switching functions of the rotor plate 33 are carried out in cooperation with a stator plate 30 of insulating material which is mounted upon four arcuate upwardly extending members 27' formed integrally with the spider 25.

The switching mechanism is in the form of two sets of switches; one for the B-line and the other for the C-line. The B-line switch consists of two sets of brushes one of which 31 is mounted on the stationary insulating plate 30 and bears upwardly against the conducting ring 32 mounted on the underside of the rotor plate 33. The second set consists of three brushes 65, 66 and 67 mounted on the rotor plate 33 and engaging the contact buttons 68 arranged in a semi-circle on the upper side of the plate 30 concentric with the shaft 27. On the upper side of the plate 33 there are mounted inductance elements 40 and 41 and condensers 42 and 43 which are connected to the B-line by means of the two sets of brushes. Condensers 42 and 43 are connected in series with appropriate brushes of the group 31 and, as described in my above-mentioned United States Patent No. 2,070,570, assist in giving proper ter-

minations to the halves of the B-line at the break. The inductances 40 and 41 are connected by means of brushes 65, 66 and 67 in parallel with appropriate inductances of the B-line as described in my above-mentioned United States Patent No. 2,088,580. The C-line switch includes two brushes, one of which 94 is shown in Fig. 2 and is mounted on the underside of the rotor plate 33. A similar brush is also mounted on the plate 33 diametrically opposite the brush 94. These brushes engage an inner circle of contact buttons 29 mounted on the stationary plate 30 concentrically to the circle of buttons 68.

From the above it will be evident that rotation of the handwheel 28 operates the entire switching mechanism for the adjustment of the lag lines whereby the desired direction determination is made and operation of the handle 6 effects the necessary switching operations to select the group of receivers which it is desired to use.

It will be noted that the switch construction according to the present invention permits easy cleaning of the contacts. In assembling and disassembling the switch the handwheel 28 is first removed after which the cover 3 may be removed and with the latter the disc 11 and the switch plates mounted thereon. This exposes the contact rings 20, 21 and 75 to 78 which are thereby easily cleaned. Further, by removing the thumb screws 72 and raising the plate 22 on its hinge 23 and loosening the set screw 36 in the collar 35, the disc 33 and the cap 34 can be removed. This not only allows the disc 33 to be thoroughly cleaned but also exposes the plate 30 and the numerous contact members mounted thereon.

Below the switch proper are mounted the columns containing the retardation line coils. These are housed in the lower part of the casing and one of them is shown in detail partly in section in Fig. 4. These columns comprise metallic cylinders 50 having a base element 51 upon which the entire line assembly is mounted. This assembly comprises a center rod 52 which runs all the way down the columns. Upon the rod are mounted insulating spacing plates 54 separating and alternating with the inductance coils 55. A plan view of the insulating plates 54 is shown by Fig. 5. It will be noted that they are formed with three wing elements 56. The under faces of the plates are provided with a groove 57 through which the connection from the lower coil is brought to the upper coil through the terminal connecting element 58. The ends of the inductance columns are separated from the top and bottom of the cylindrical case by means of the insulating collars 55 and 59, respectively, the whole column being held in a unitary assembly by means of the cap 60 and the clamping nut 61. The cylinder 50 is provided with an upper cap or cover 61' having an outlet 62' for the leads to the coils. The cover 61' also has a projecting boss 90 on its upper surface which is secured by suitable means to a channel 91 fastened to a bracket 92 secured to the frame 1 as indicated in Fig. 1. By this construction the lag line columns can not only be housed compactly in a small space and easily assembled during manufacture but also each column is thoroughly shielded and protected against mechanical damage.

Having now described my invention, I claim:

1. An electric compensator switch comprising a plurality of insulating plates mounted in parallel relationship substantially one above the other and carrying contact elements of the

switch, a casing enclosing said switch, said casing having a cover removably mounted thereon, the top plate of said plurality of insulating plates having means mounting it rotatably in the cover, a frame within the casing, means mounting the plate positioned next to said top plate with a hinge element at one end supported from the frame of the casing and means for raising one of said other plates in a direction perpendicular to the plane in which the plate is normally positioned whereby the contact elements on all the plates are accessible.

2. An electric compensator switch having a plurality of parallelly supported insulating plates carrying contact members of said switch, at least two of said plates being rotatable independently of each other, means for supporting said rotatable plates including a casing, a cover for said casing, a frame mounted within the casing, a rotatable shaft journaled in the frame and extending through an aperture in the cover, a hollow rotatable shaft journaled in the cover concentrically with said first shaft but out of contact therewith and means for supporting one of said rotatable plates on each of said shafts, whereby rotation of one shaft does not affect the other shaft.

3. An electric compensator switch including a frame, a plurality of parallelly supported insulating plates carrying contact members of said switch, some of said plates being rotatable and others stationary, the latter being mounted on said frame at least one of said stationary plates having a hinge element in the means mounting it on the frame, whereby said plate can be raised out of its normal position parallel to the other plates to make one or more of the latter accessible for cleaning and adjustment of the contact members thereon.

4. An electric compensator switch including four insulating plates carrying contact elements of the switch, a casing enclosing said switch, said casing having a cover removably mounted thereon, a frame secured to the casing, a rotatable shaft wholly supported by said frame, a second rotatable shaft wholly supported by said cover, means mounting one of said plates on said frame, means removably mounting the second plate on said first shaft, means mounting the third plate on said frame, said means including a hinge element whereby said plate may be moved out of its normal position, and means mounting the fourth plate on said second shaft, all said plates being normally parallel to each other, whereby by removing the cover and therewith the fourth plate, raising the third plate on its hinge element and removing the second plate, all of said plates become accessible for cleaning and adjustment of the contact members thereon.

5. In an electric compensator the combination of a casing, a cover for the casing, a stationary frame secured to the casing, a compensator switching mechanism within said casing having a rotatable shaft projecting through an aperture in said cover, said shaft being wholly journaled in said frame, a second switching mechanism having movable and stationary contact elements, a rotatable hollow shaft being wholly journaled in said cover so as to be locked thereto and arranged concentrically with said first shaft but out of contact therewith, said movable switch elements being secured to said hollow shaft for rotation therewith and for removal from the casing with said hollow shaft and said cover.

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