April 9, 1946. W. P. LEAR 2,398,100

MULTIPLE BAND RADIO DIRECTION COMPENSATOR

Original Filed Oct. 17, 1940 4 Sheets-Sheet 1

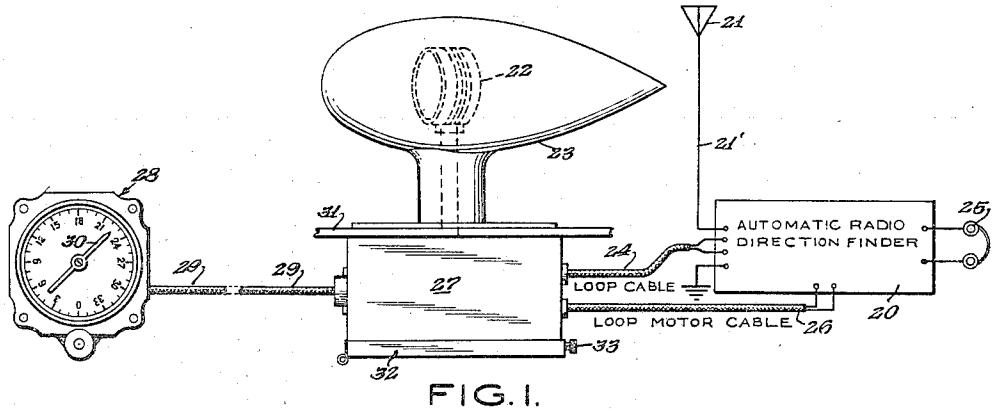


FIG. 1.

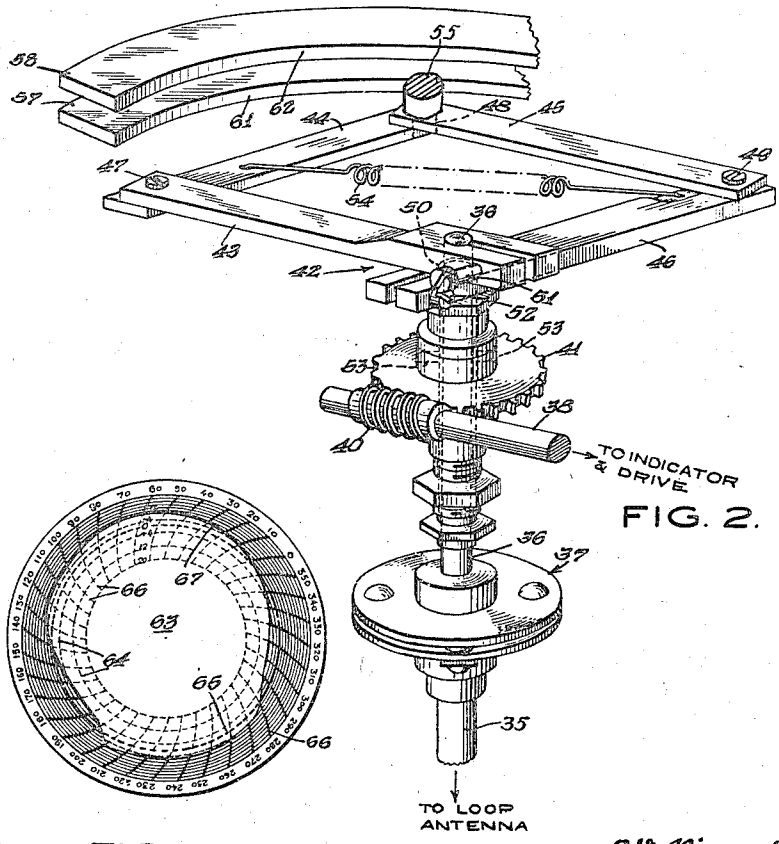


FIG. 2.

FIG. 3.

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MULTIPLE BAND RADIO DIRECTION COMPENSATOR

Original Filed Oct. 17, 1940 4 Sheets-Sheet 2

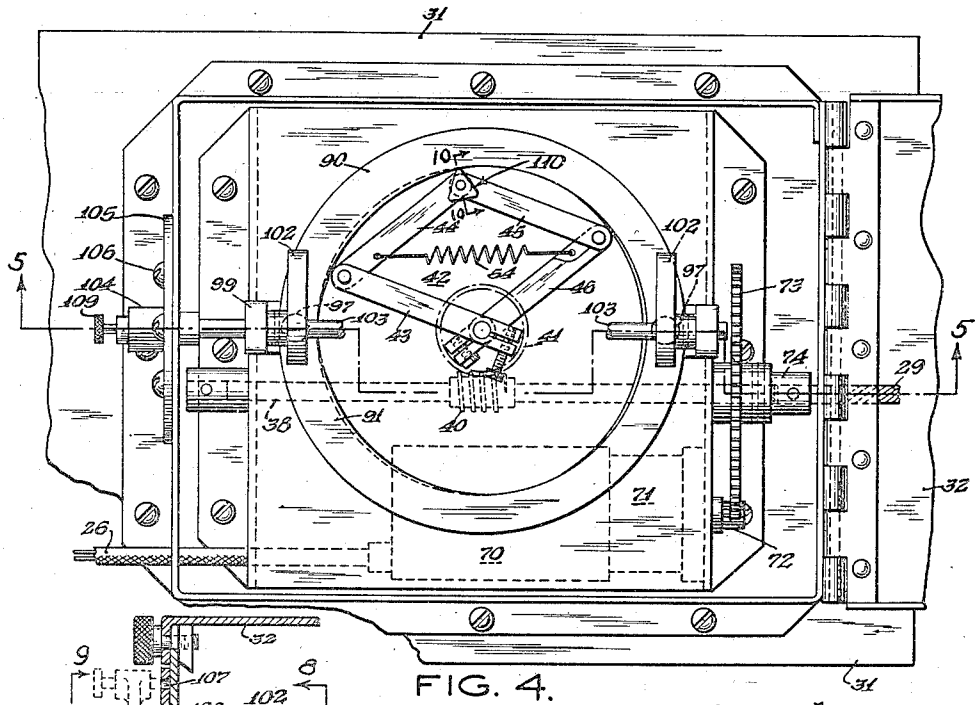


FIG. 4.

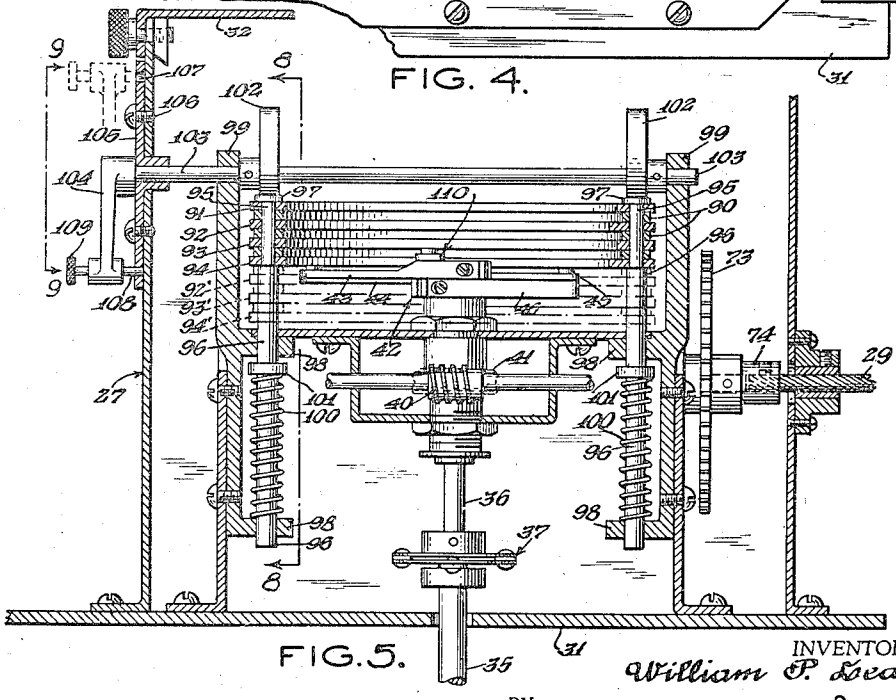


FIG. 5.

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MULTIPLE BAND RADIO DIRECTION COMPENSATOR

Original Filed Oct. 17, 1940 4 Sheets-Sheet 3

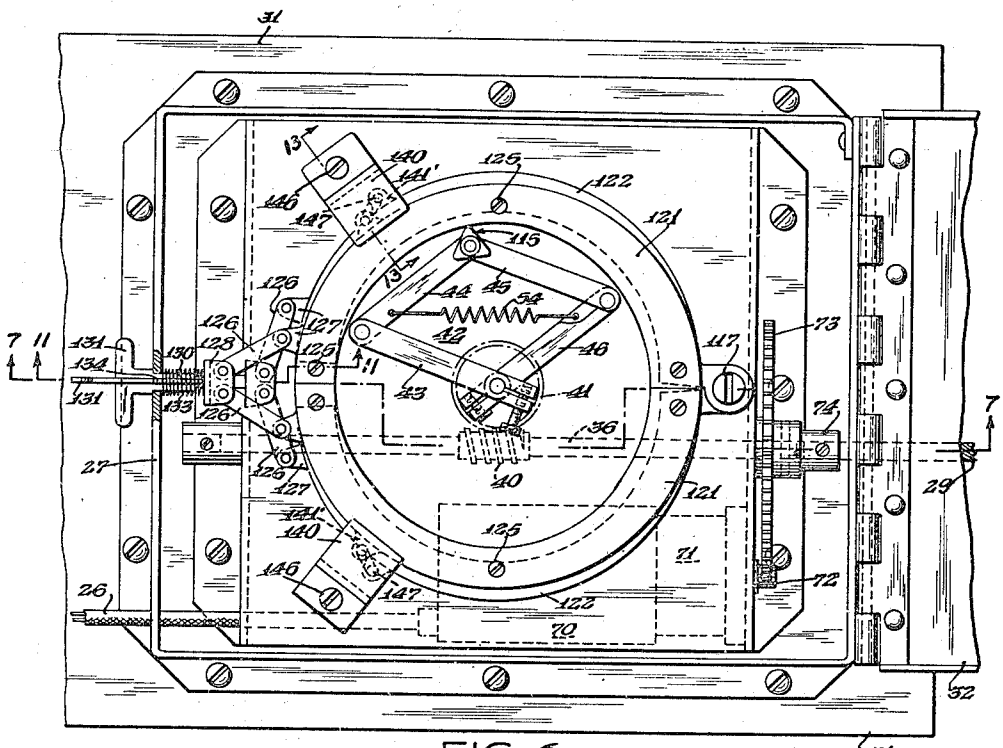


FIG. 6.

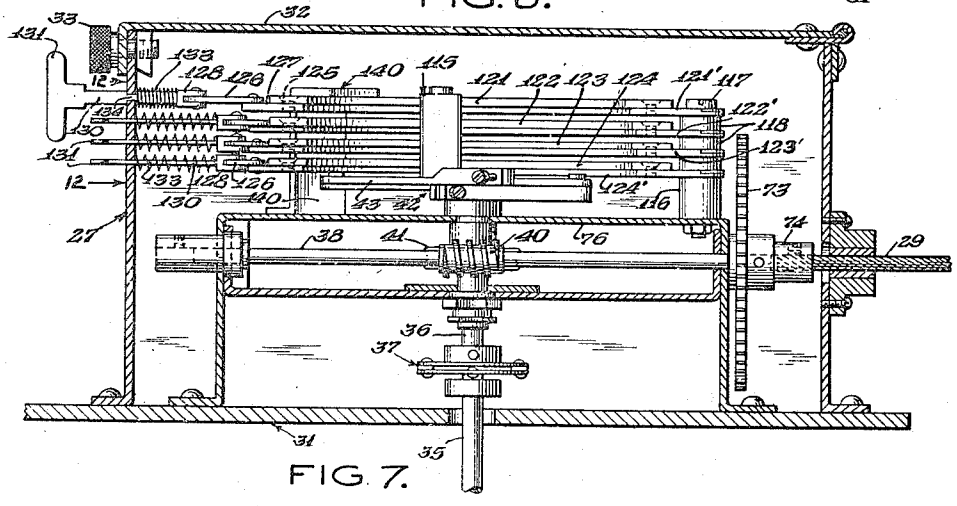


FIG. 7.

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MULTIPLE BAND RADIO DIRECTION COMPENSATOR

Original Filed Oct. 17, 1940 4 Sheets-Sheet 4

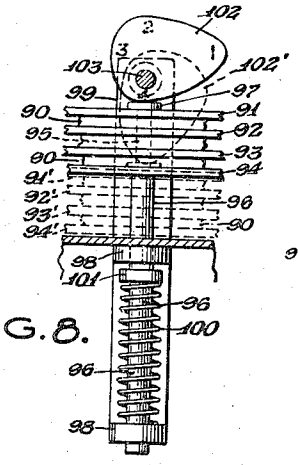


FIG. 8.

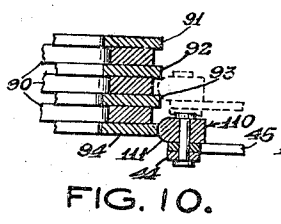


FIG. 10.

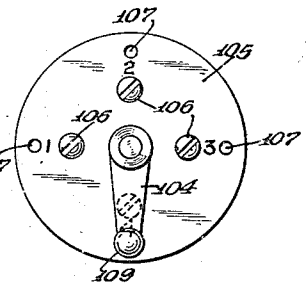


FIG. 9.

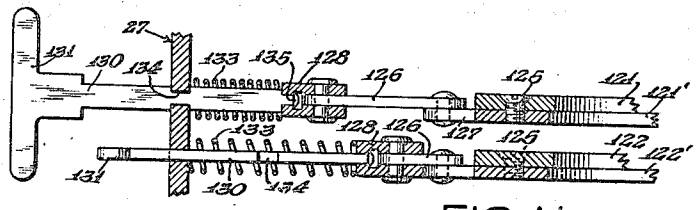


FIG. 11.

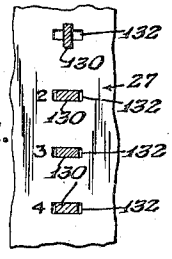


FIG. 12.

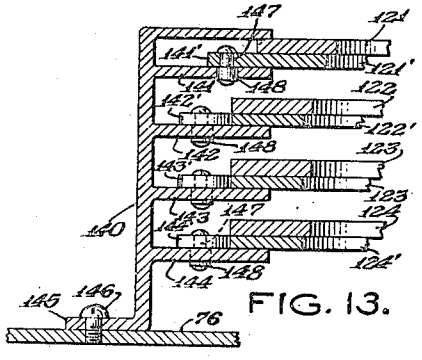


FIG. 13.

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Patented Apr. 9, 1946 2,398,100

UNITED STATES PATENT OFFICE

2,398,100

MULTIPLE BAND RADIO DIRECTION COMPENSATOR

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Original application October 17, 1940, Serial No. 361,544, now Patent No. 2,330,226, dated September 28, 1943. Divided and this application April 1, 1943, Serial No. 481,422

14 Claims. (Cl. 250—11)

The present invention relates to quadrantal error compensating mechanisms which effect bearing corrections for radio direction indicators, and more particularly to novel multiple arrangements for selective compensation in a plurality of ranges of radio frequency reception. This case is a division of my copending application, Serial No. 361,544 filed October 17, 1940, now Patent No. 2,330,226, issued Sept. 28, 1943 entitled "Quadrantal error corrector systems," and assigned to the same assignee as the present application.

To obtain accurate azimuthal bearing indications, radio direction finder systems are generally provided with a so-called quadrantal error compensator to mechanically correct deviation errors of the indicator readings, over 360° of arc. The errors are due to directional distortions of the received radio waves, inherent in the radio installation. The bearing deviations usually are of the order of a few degrees, and in some instances may reach to 10° or even 20°, depending upon the character and closeness of the surrounding metallic objects.

It has been found that the quadrantal errors depend upon the frequency range of radio reception. Thus, when operating on radio frequencies in widely separated reception bands, the corrections were not fully reliable unless the corrector mechanism was correspondingly rearranged or changed in the different ranges. The present invention permits such change to be effected with a minimum of time and attention. This is particularly advantageous aboard an airplane. Quadrantal errors have been found to depend upon the degree of draught of a ship in water. The invention is accordingly also applicable aboard ship for readily accommodating the radio directional error corrections to the degree of draught.

It is the principal object of the present invention to provide quadrantal error corrector arrangements incorporating a plurality of corrector cams calibrated for correspondingly different reception bands, selectively placed into operation by the mere twist of a knob or flip of a lever. The corrector cams are arranged adjacent each other. The associated mechanism selectively engages one cam at a time. The number of cams used depends on the frequency range or bands over which the system is to operate, and may well correspond to one-half or the full number of frequency reception bands of the direction finder receiver. Each cam is individually calibrated to properly quadrantally compensate for the radio bearing indications in the associated band.

Further objects, advantages and capabilities of the invention will become apparent in the following description of specific embodiments thereof illustrated in the accompanying drawings, in which:

Fig. 1 is a schematic diagram of an automatic radio direction finder system incorporating the invention.

Fig. 2 is an enlarged perspective showing of a quadrantal compensator section.

Fig. 3 is a plan view of a calibrated corrector cam.

Fig. 4 is a plan view of one form of the invention.

Fig. 5 is a vertical cross-sectional view taken along the line 5—5 through the mechanism of Fig. 4.

Fig. 6 is a plan view of another embodiment of the present invention.

Fig. 7 is a vertical cross-sectional view through the mechanism of Fig. 6, taken along the line 7—7 thereof.

Fig. 8 is a vertical cross-sectional view taken along the line 8—8 of Fig. 5.

Fig. 9 is an elevational view on the line 9—9 of Fig. 5.

Fig. 10 is an enlarged cross-sectional view taken along the line 10—10 of Fig. 4, showing a detail of the cam selector thereof.

Fig. 11 is an enlarged cross-sectional view taken along the line 11—11 of Fig. 6, showing a detail of the cam selector mechanism thereof.

Fig. 12 is an elevational view taken along the line 12—12 of Fig. 7.

Fig. 13 is an enlarged cross-sectional view taken along the line 13—13 of Fig. 6, showing a detail of the cam selector mechanism thereof.

An automatic radio direction finder system embodying the quadrantal corrector mechanism of the invention is diagrammatically illustrated in Fig. 1. The radio receiver and electronic control section of the system is indicated at 20, and may well embody the system disclosed in my Patent No. 2,308,521, issued January 19, 1943, and assigned to the same assignee. A non-directional antenna 21, and a rotatable directional or loop antenna 22 shown in dotted lines within streamline housing 23, are connected to the radio frequency input of direction finder 20 through lead 21′ and loop cable 24 respectively. Ear phones 25 are for the aural determination of the station tuned-in, or for effecting aural-null directional determinations.

An electric motor, controlled through cable 26 by direction finder circuits 20, is arranged within

housing 27 for directly rotating loop antenna 22 in a manner such as disclosed in my patent referred to, and as will be described in more detail hereinafter. A 360° azimuthal indicator 28 is mechanically connected to loop antenna 22 by a flexible mechanical shaft 29 for indicating the bearing positions of the loop antenna at a remote location therefrom, such as near the pilot. As will be later shown, the quadrantal error corrector mechanism enclosed within housing 27 is mechanically connected between rotatable loop antenna 22 and indicator 28, whereby the indications by indicator needle 30 on the dial of indicator 28 are automatically corrected to correspond to the true geometrical bearing on the radio station tuned-in.

The streamline housing 23 is used where the loop antenna is mounted exterior of the body of the aircraft indicated at 31. The quadrantal error corrector mechanism within housing 27 is, in the illustrated embodiment, mounted adjacent the loop antenna and against the inner surface of the aircraft body 31. The position of the quadrantal error corrector mechanism may, however, be remote from the loop antenna. Also, the loop motor may be positioned apart from the quadrantal error corrector mechanism, such as actually within the chassis of the direction finder receiver. A hinged cover 32 on quadrantal error corrector housing 27 may be opened by means of locking nut 33, to permit access to the corrector mechanism within. Selective changes in the quadrantal error corrector may thus be directly effected. If the loop antenna is in a relatively inaccessible place, the corrector mechanism enclosed in housing 27 is preferably separate from the loop antenna, being placed nearer the operator who may readily effect the selective operation.

Reference is now made to Fig. 2, the perspective illustration of an operating section of the quadrantal error corrector mechanism. The arrangement illustrated corresponds to the basic corrector assembly incorporated in the quadrantal error corrector of my copending application, now Patent No. 2,330,226. It is to be understood, however, that the present invention may be practiced with other equivalent quadrantal error correcting arrangements, insofar as the corrections, per se, are effected; the invention being more broadly concerned with the multiple arrangements and selective control of the compensator. Once a selection is made, the mechanism operates in the usual manner to compensate through calibrated action, as by a cam.

Shaft 35 is connected directly to the loop antenna, and is connected to central shaft 36 of the mechanism through flexible coupling member 37. The indicator 28 is mechanically connected to the mechanism by flexible cable 29 through horizontally mounted shaft 38. A worm 40 is secured to shaft 38 and meshes with worm gear 41. The mechanical engagement between loop shaft 35 and indicator shaft 38 is arranged to be rigid yet relatively angularly displaceable under the control of a cam. A pantograph 42, comprised of linked arms 43, 44, 45 and 46 is incorporated in the illustrated corrector mechanism.

The pantographed arms are respectively linked at pivotal points 47, 48 and 49. The free end of arm 43 is adjustably secured to the upper end of vertical shaft 36; the free end of link 46 being secured adjacent thereto to the upper end of a sleeve 50 concentric about vertical shaft 36. Thumb screws 51 and 52 are used to respectively grip the arms 43 and 46 to the shaft and sleeve ends. The worm gear 41 is mechanically secured to sleeve 50 by suitable set screws indicated at 53, 53. A spring 54 is arranged between links 44 and 46 to mechanically bias the pivotal point 48 between links 44 and 45 radially outwardly.

Rotation of shaft 38 in either direction causes a corresponding angular displacement of the pantograph 42 and loop shaft 35. A cam follower 55 is secured at the pivotal region 48 in the form of an upwardly extending rod and internally cammed members 57, 58 are spaced apart for individual engagement with cam follower 55. The internal cam surface 61 of cam 57 is engaged with cam follower 55, to define the degree of radial extension of the pantograph.

Variation in the radial disposition of internal cam surface 61 determines the amount of angular displacement effective between shaft 36 and sleeve 50. The radial cam variation correspondingly controls the angular difference between the actual positions of the loop antenna as connected to shaft 35, and the bearing indication of indicator 28. By suitable design of the corrector cam, the proper compensation of the readings of indicator 28 may be effected throughout the 360° range in accordance with the determined quadrantal bearing errors of the installation for the radio frequency range corresponding to cam 57. To effect quadrantal error compensation for another frequency reception band, another cam surface such as 62 of cam 58 is engaged with cam follower 55 through suitable actuation, such as relative vertical displacement of member 55. The selective cam control action will be described in more detail hereinafter. As many individual corrector cams may be used as is necessitated by the overall radio reception range of the system, and design refinement.

A typical calibrated corrector cam is illustrated in plan view in Fig. 3. The cam blank 63 has an inscribed 360° graph designed to translate quadrantal error determinations for the respective band into the corrective curve, in a direct, accurate and simple manner. A series of concentric circles 64 correspond to the magnitude of the quadrantal error in degrees. Centrally disposed circle 65 corresponds to zero quadrantal error correction. The concentric circles radially larger than zero circle 65 refer to a negative quadrantal error correction; the smaller ones, to a positive correction. Arcuate radial lines 66 are arranged at 10° separations over 360° of arc, being designed in accordance with the geometrical law of motion and coaction of the cam followers with respect to the internal cammed surface. Internal cammed surface 65 of cam blank 63 is the result of a smooth continuous curve connecting the determined compensation errors plotted on blank 63. Complete and accurate quadrantal error compensation over the 360° azimuth is effected by the mechanism of the invention, being automatically and continuously present for all indications.

In the embodiment of the multiple quadrantal error corrector system illustrated in Figs. 4 and 5, the pantograph 42 and associated mechanical connections to the loop antenna and indicator of this embodiment are similar to that previously described. The loop motor is positioned within the quadrantal housing 27, indicated at 70 in dotted lines. An electromagnetic clutch 71 couples motor 70 to pinion 72. Pinion 72 engages gear 73 which is fastened to horizontal shaft 38 of the

corrector mechanism. Flexible shaft 29 connected to indicator 28 is fastened to the end of shaft 38 by coupling piece 74. Motivation of the loop antenna occurs by suitable energization of motor 70 and electromagnetic clutch 71 in response to radio wave reception, as described in detail in Patent No. 2,308,521. The loop antenna drive occurs through gearing 72, 73, and 40, 41 of the quadrantal corrector mechanism. Indicator 28 coupled to cable 29 follows the angular orientation of the loop antenna with proper compensation through the corrector mechanism.

A plurality of individual cams, 91, 92, 93 and 94 are spaced one above the other by annular spacing rings 90, and are held together by the reduced diameter sections 95, 95 of shafts 96, 96. Flat-heads 97, 97 are on the tops of sections 95, 95. Shafts 96, 96 are slidably supported in elbows 98, 98 projecting from frame 99. A compression spring 100 is concentric about the lower end of each shaft 96, being between the lowermost supporting elbow and an intermediate collar 101 on the shaft.

The cam assembly 91 to 94 accordingly is normally biased upwardly against two normally stationary cams 102, 102. Cams 102, 102 are arranged on rod 103, which is supported in frame 99 across the top of the assembly, and have individual coaction with flat-heads 97, 97. Rod 103 extends through housing 27. A selector handle 104 is secured to the projecting end of cam rod 103. The angular position of cams 102, 102 is altered through the rotation of handle 104. When four cams are used, such as 91 to 94 illustrated, there are four corresponding positions for handle 104.

Fig. 9 is an end elevational view of the selector handle 104 and associated escutcheon plate 105 secured on the adjacent side wall of housing 27 by screws 106. The four positions, Nos. 1, 2, 3 and 4, marked on plate 105 correspond respectively to the operative engagement of respective cams 91, 92, 93 and 94 with cam follower 110 extending from trolley 42. To insure rigid and stable positioning of cams 102, 102 after their being set, holes 107 are provided in escutcheon plate 105 opposite the setting positions, for engaging pin 108 which is spring biased towards plate 105. A knurled knob 109 is at the outer end of pin 108 for proper manipulation.

Fig. 8 is a cross-sectional detail illustrating the coaction of a selector cam 102 with cam assembly 91 to 94. Cams 102 and selector handle 104 of Figs. 5, 8 and 9 are in position No. 4, corresponding to the engagement of corrector cam 94 with cam follower 110. Springs 100, 100 press the cam assembly against cams 102, 102, which, in position No. 4, cause accurate engagement of the cam 94 with cam follower 110. Upon due cam positioning, the selector cams 102, 102 and the cam assembly remain stationary, the operation of the quadrantal error corrector on the bearing indicator of the system then corresponding to the action of a single cam, namely the selected one. The remaining cams stay out of coaction with the cam follower 110 and pantograph 42.

When selector cams 102, 102 are rotated to a new position, they press the cam assembly 91 to 94 against the continuous spring action of compression springs 100, 100, to accurately select another cam for coaction with cam follower 110. The dotted selector cam position 102' of Fig. 8 corresponds to position No. 1, the selection of cam 91 for coaction with the cam follower. The dotted positions of the cam assembly 91', 92', 93', 94', correspond to their lowermost position in the mechanism. The intermediate positions, Nos. 2 and 3, are selected similarly. It is unnecessary to open housing lid 32 to effect the corrector cam selection, since only external handle 104 need be operated to perform this.

To provide for non-interfering action in the selective movement of cam follower 110 between the respective cams 91 to 94, coacting edge 111 of cam follower 110 is designed as shown in Fig. 10. The active surface of follower 110 is curved, and sufficiently wide to slide among the successive adjacent cams without disengaging at any point.

Another embodiment of the multiple quadrantal error corrector mechanism in accordance with the invention is illustrated in Figs. 6 and 7. Four cam sections are shown for selective coaction with cam follower 115 mounted at the joining of pantograph arms 44, 45. The respective cams are in the form of split half sections pivoted upon post 116. Post 116 is bolted onto sub-frame 76 by bolt 117. The cam sections are spaced from each other by washers 118. Corrector cam units 121, 122, 123, 124 constitute the multiple corrector cam assembly for selective engagement with cam follower 115. The individual corrector cam units comprise two 180° sections of the previously described 360° internal cams. The cam units are individually mounted on semi-circular supports 121', 122', 123', 124' by screws 125. Their effective cammed surfaces project radially inwardly from the associated semi-circular support members, insuring proper contact of the cams with cam follower 115.

Toggle links 126 are attached to the free ends of the cam sections, being pivoted on ears 127 thereof. Each pair of links 126, 126 of a cam set is pivoted in a yoke 128 secured to an individual selector bar 130. Selector bars 130 extend through corresponding slots 132 (see Fig. 12) in housing 27, terminating in integral transverse handles 131. A compression spring 133 is arranged about each bar 130, positioned between housing 27 and yoke 128. Yokes 128 and toggle links 126 are thus normally biased inwardly, whereby the cam units are normally in the inoperative position when their selector bar 130 is in the inner position.

To select a cam unit for active coaction with follower 115, the corresponding selector bar 130 is pulled outwardly through its handle 131. Upper selector bar 130 attached to upper cam unit 121 is shown in the extended position, the cam thus being in operative or active relation with follower 115. To hold selector bar 130 in this outer position, against the retracting action of its spring 133, it is twisted 90° into a vertical position. Recessed portion 134 of bar 130 is in this manner permitted to lock transversely against narrow horizontal slot 132 in housing 27.

Figs. 11, 12 and 13 are enlarged detail sectional or elevational views more clearly illustrating the correlation of the respective selector parts of this construction. Selector bars 130 are rotatably joined to their respective yokes 128 by an expanded head 135 within the yokes. With the upper selected bar 130 maintained in the extended position, the corresponding cam unit 121 is engaged, a continuous 360° cam surface thereupon being effective on cam follower 115. The remaining three disengaged cams (122, 123, 124) are pivoted apart to their normally inoperative relation, forming a discontinuous arrangement

wholly outside of contacting relationship with cam follower 115.

To change from one cam engagement to another in this arrangement, it is unnecessary to open housing lid 32. The selected cam (corresponding to position No. 1), is first disengaged by rotating the vertically projecting handle 131 by 90°, then pressing it inwardly or releasing it to permit its spring 133 to force it back to the neutral or inoperative position. The cam thereupon spreads apart to the inoperative position. The selector bar 130 of the next desired cam is then pulled outwardly against its spring, to engage the cam with the cam follower, in the manner previously described in connection with cam unit 121.

A supporting and guiding member 140 is provided for each half of the cam assembly. Members 140 contain horizontal projecting shelves 141, 142, 143, 144 for the respective cam units 121, 122, 123, 124. A mounting flange 145 extends at the bottom of members 140 for their securement to sub-panel 76 by screws 146. The unpivoted or free ends of the semi-circular supports 121', 122', 123', 124', contain lugs 141', 142', 143', 144' which project onto the shelves 141, 142, 143, 144. The lugs engage the shelves through pins 147 passing therethrough and terminating in shoulders or larger heads 148 which ride in corresponding slots in the shelves.

The cam supports 121', 122', 123', 124' are accordingly horizontally supported between pivotal post 116 and the respective members 140, 140. Also, the horizontal pivotal movements of the cam supports are guided by the shelves 141, 142, 143, 144 of member 140. In this manner, the semi-circular cam units 121, 122, 123, 124 need not be very strong structurally, but merely of sufficient strength to coact with cam follower 115. The cam supports 121', 122', 123', 124' in coaction with the supporting and guiding members 140, 140 provide the necessary structural strength for the cam assembly while permitting free selective coaction of the respective cams.

Although preferred embodiments of the invention are herein disclosed using four cams in the multiple cam assembly, different numbers of cams may be used. As will be apparent to those skilled in the art, modifications and variations in the constructional features and arrangements illustrated may well be made, without departing from the broader spirit and scope of the invention as defined in the following claims.

What is claimed is:

1. A quadrantal error corrector comprising, in combination, a plurality of corrector cams with individual pre-shaped cam surfaces, said cams being mounted as a unit in spaced relation to each other; cam follower means engageable with said cams; a housing enclosing said cams and cam follower means; and mechanism operable from outside said housing for moving the mounted cams and said cam follower means relatively to each other to effect selective engagement between said cam follower means and any one of said cams.

2. A quadrantal error corrector for a direction finder including, in combination, a plurality of flat corrector cams with individual cam surfaces pre-shaped in accordance with respective bands of operation, said cams being mounted as a unit in spaced relation to each other; cam follower means engageable with said cams; a housing enclosing said cams and cam follower means; and mechanism for moving the mounted cams into selective engagement with said cam follower means including a member, means pressing said mounted cams toward said member, and an element for operating said member.

3. A quadrantal error corrector for a direction finder having in combination, a plurality of flat corrector cams with individual cam surfaces predetermined in accordance with respective radio frequency bands, said cams being mounted as a unit in spaced relation to each other; spring pressed cam follower means engageable with said cams; and means for selectively engaging one of said cams with said cam follower means including a cam member, spring means pressing the mounted cams against said cam member, and apparatus for operating said cam member to move said cams into selective engagement with said cam follower means.

4. A quadrantal error corrector for a direction finder comprising, in combination, a plurality of flat corrector cams with individual cam surfaces predetermined in accordance with respective radio frequency reception bands, said cams being mounted as a unit in spaced relation to each other; spring pressed cam follower means engageable with said cams; and means for selectively engaging one of said cams with said cam follower means including a pair of cam members, spring means pressing the mounted cams against said cam members, and apparatus for operating said cam members to move said cams into selective engagement with said cam follower means.

5. A quadrantal error corrector for a direction finder comprising, in combination, a plurality of flat corrector cams with individual cam surfaces predetermined in accordance with respective radio frequency reception bands, said cams being mounted as a unit in spaced relation to each other; spring pressed cam follower means engageable with said cams; mechanism for selectively engaging one of said cams with said cam follower means including a pair of cam members, spring means pressing the mounted cams against said cam members, and apparatus for operating said cam members to move said cams into selective engagement with said cam follower means; and means connected to said cam follower means to apply the error correction to said direction finder.

6. A quadrantal error corrector for a direction finder comprising, in combination, a plurality of flat corrector cams with individual cam surfaces predetermined in accordance with respective radio frequency reception bands, said cams being mounted as a unit in spaced relation to each other; a spring pressed cam follower selectively engageable with said cams; a housing enclosing said cams and cam follower; and means for selectively engaging any one of said cams with said cam follower including a pair of cam members spacedly mounted on a shaft extending outside said housing, spring means pressing the mounted cams against said cam members, a cam position indicator mounted on the outside of said housing, and means on the outer end of said shaft selectively engageable with said indicator to operate said shaft and cam members to move said cams into selective engagement with said cam follower means.

7. A quadrantal error corrector for a direction finder including, in combination, a plurality of flat corrector cams with individual cam surfaces predetermined in accordance with respective radio frequency reception bands, said cams being mounted as a unit in spaced relation to each other; a spring pressed cam follower selectively

engageable with said cams; a housing enclosing said cams and cam follower; and means for selectively engaging any one of said cams with said cam follower including a pair of cam members spacedly mounted on a shaft extending outside said housing, spring means pressing the mounted cams against said cam members, an escutcheon plate mounted on the outside of said housing and formed with apertures corresponding to selected positions of said cams, a handle on the outer end of said shaft for operating said shaft and cam members to move said cams into selective engagement with said cam follower, and a spring pressed plunger on said handle selectively engageable with said apertures to retain said cams in such selective engagement.

8. A quadrantal error corrector for a direction finder comprising, in combination, a plurality of flat corrector cams with individual cam surfaces predetermined in accordance with respective radio frequency reception bands, said cams being mounted as a unit in spaced relation to each other; a spring pressed cam follower selectively engageable with said cams; a housing enclosing said cams and cam follower; means for selectively engaging any one of said cams with said cam follower including a pair of cam members spacedly mounted on a shaft extending outside said housing, a spring pressing the mounted cams against said cam members, an escutcheon plate mounted on the outside of said housing and formed with apertures corresponding to selected positions of said cam, a handle on the outer end of said shaft for operating said shaft and cam members to move said cams into selective engagement with said cam follower, and a spring pressed plunger on said handle selectively engageable with said apertures to retain said cams in such selective engagement; and apparatus connected to said cam follower for applying the error correction to said direction finder.

9. A quadrantal error corrector comprising, in combination, a plurality of corrector cams with individual pre-shaped cam surfaces, said cams being mounted as a unit in spaced relation to each other; cam follower means engageable with said cams; and mechanism for moving the mounted cams and said cam follower means radially relatively to each other to effect selective engagement between said cam follower means and any one of said cams.

10. A quadrantal error corrector comprising: a frame; a plurality of split corrector cams; means pivotally mounting said split cams in pairs on said frame; cam follower means engageable with said cams, said cams normally being out of engagement with said cam follower means; and mechanism for moving the pivoted cam pairs into selective engagement with said cam follower means.

11. A quadrantal error corrector comprising: a plurality of split corrector cam pairs with individual pre-shaped cam surfaces; means pivotally mounting said split cams in pairs one next to another; a cam follower engageable with said cams, said cams being normally out of engagement with said cam follower; and mechanism for moving the pivoted cam pairs into selective engagement with said cam follower comprising an arm linked to each of said cam pairs for individually operating the associated cam pair into coaction with said cam follower.

12. A quadrantal error corrector for a direction finder comprising: a plurality of split flat corrector cam pairs with individual cam surfaces pre-shaped in accordance with respective bands of operation; means pivotally mounting the split cams in pairs; one near another; a member with portions slidably supporting the split cams in their pivotal movement; cam follower means engageable with said cams; and mechanism for moving the pivoted split cam pairs into selective engagement with said cam follower means comprising an arm linked to each of the cam pairs for individually operating the associated cam pair into coaction with the cam follower means to present a continuous three hundred and sixty degree cam surface thereto, whereby selective quadrantal error compensation is effected by the corrector.

13. A quadrantal error corrector for a direction finder comprising: a frame; a plurality of split flat corrector cam pairs with individual internal cam surfaces pre-shaped in accordance with respective radio frequency reception bands; means pivotally mounting the split cams in pairs on said frame one next to another; a member with portions slidably supporting the split cams in their pivotal movement; a spring-pressed cam follower engageable with said cams; means normally holding the cam pairs out of engagement with said cam follower; and mechanism for moving the pivoted split cam pairs into selective engagement with said cam follower comprising an arm individually linked to said cam pairs for operating the associated cam pair into coaction with said cam follower to present a continuous three hundred and sixty degree cam surface thereto, and an arrangement for holding the arms in their cam engaging position.

14. A quadrantal error corrector comprising, in combination, a frame; split corrector cam pairs; means pivotally mounting said split cam pairs on said frame; cam follower means engageable with said cam pairs, said cam pairs normally being out of engagement with said cam follower means; a housing enclosing said cam pairs and cam follower means; and mechanism for moving the pivoted cam pairs into selective engagement with said cam follower means including an arm linked to each cam of said cam pairs and a handle connected to said arms and extending through said housing for individually operating the associated cam pair into coaction with said cam follower, said handle being formed to engage said housing to lock the associated cam pair in its operated position.

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