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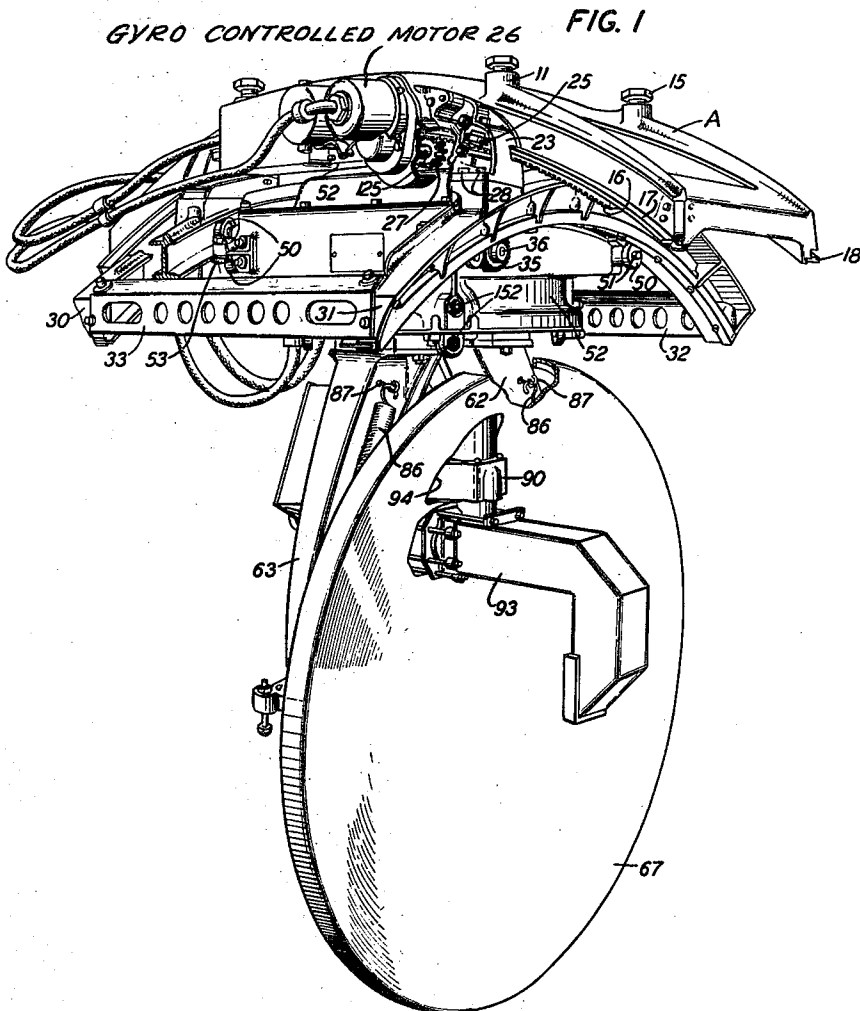
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MECHANICAL STABILIZER FOR SUPPORTING RADAR ANTENNA

Filed Oct. 4, 1947

4 Sheets-Sheet 1



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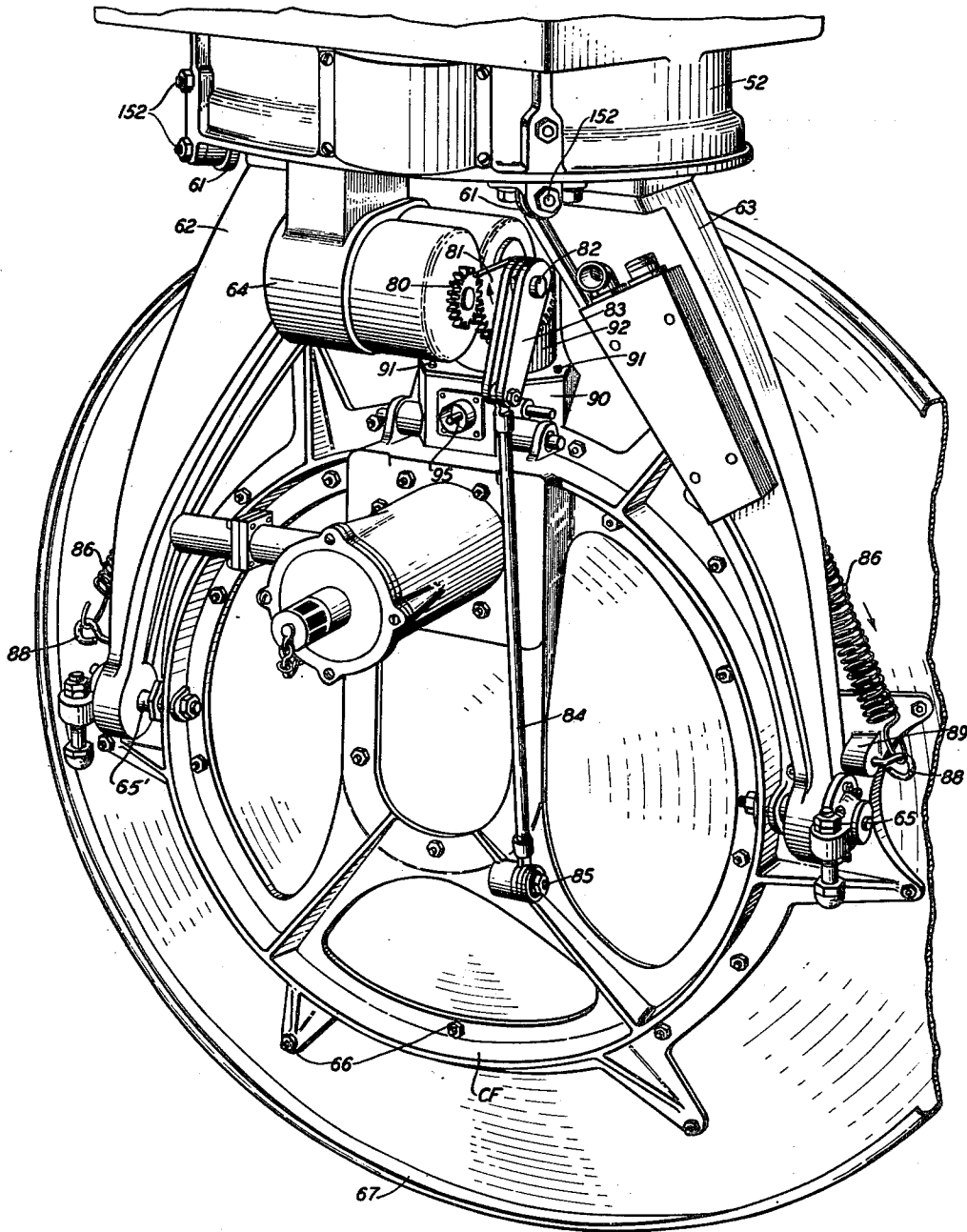
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FIG. 2



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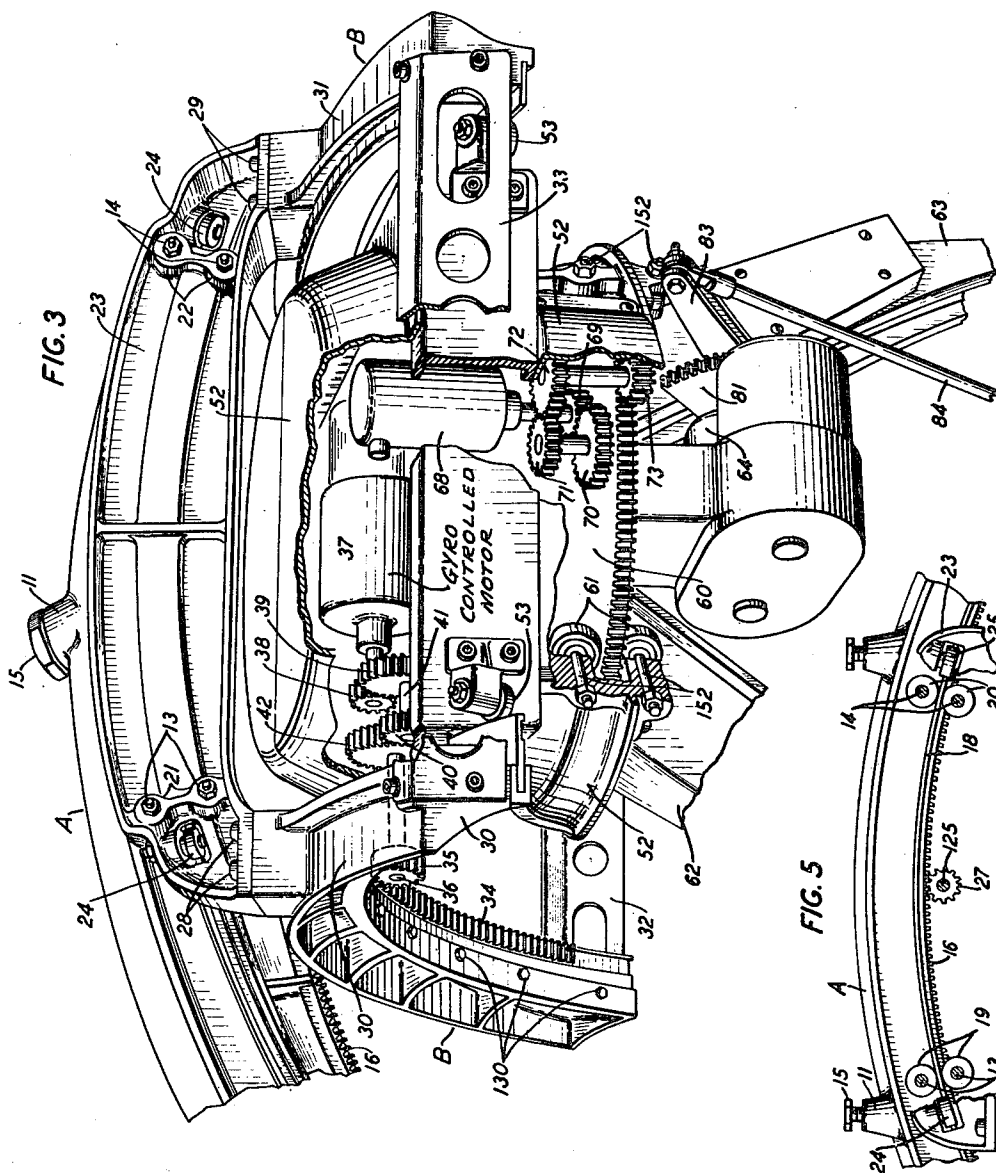
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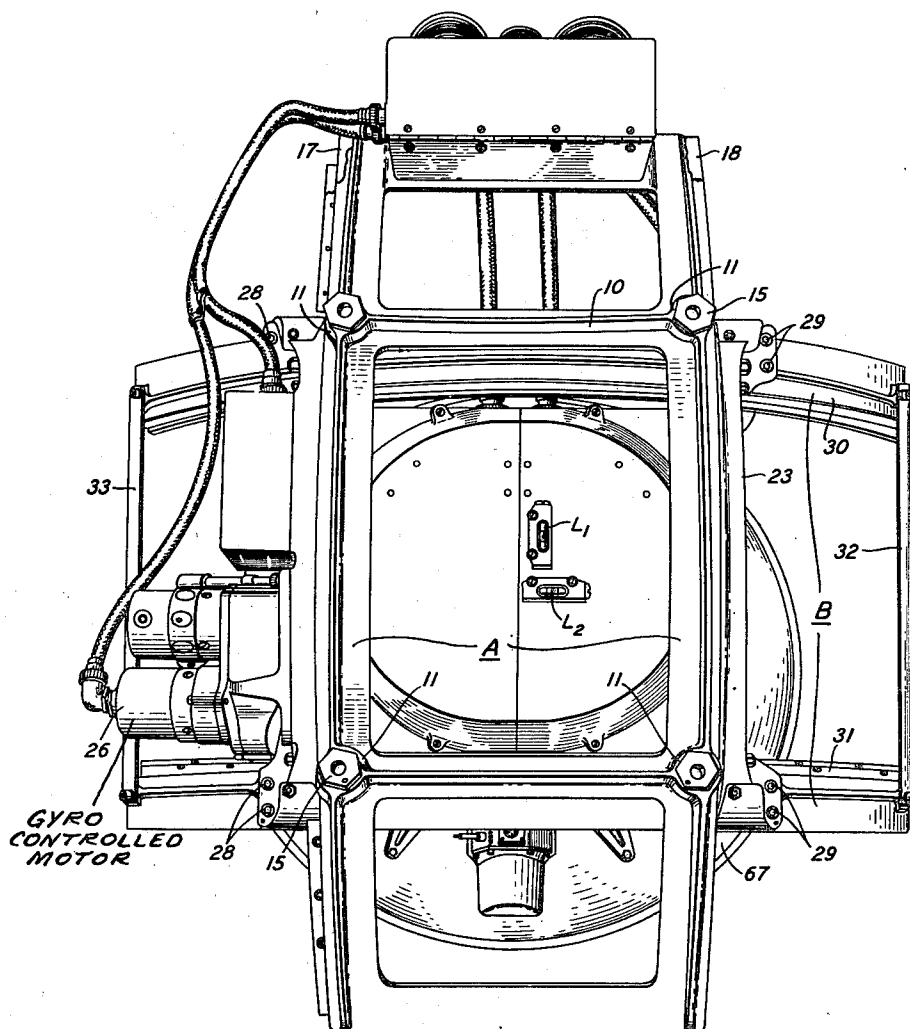
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MECHANICAL STABILIZER FOR SUPPORTING RADAR ANTENNA

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4 Sheets-Sheet 4

FIG. 4



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MECHANICAL STABILIZER FOR SUPPORTING
RADAR ANTENNA

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2 Claims. (Cl. 250—33.65)

This invention relates to scanning mechanisms of the type adapted for use in radio signaling devices such as those mounted on board airplanes, submarines, and like vessels.

The object of the present invention is the provision of a scanning mechanism of the type above referred which will be simple in construction and positive in operation.

In the drawing,

Fig. 1 is an assembly view shown in perspective, a casing for housing a gear actuating mechanism being shown with portions broken away;

Fig. 2 is a partial assembly view enlarged shown in perspective substantially 45 degrees from Fig. 1, a number of operating parts being shown with portions broken away;

Fig. 3 is a partial assembly view shown with a number of operating parts broken away;

Fig. 4 is a top assembly view; and

Fig. 5 is a fragmentary view of the main mounting frame.

According to the construction of the scanning mechanism of this invention a casting in the form of an arcuate rectangularly-shaped frame A, Figs. 1, 3 and 4, is formed with four similarly-shaped boss portions 11 each fitted with a plug 15. These plugs are each provided with a screw-threaded opening for receiving a screw not shown serving for securely fastening the frame A to the ceiling of an airplane cabin or that of a submarine vessel, the plugs 15 in addition serving for adjusting the frame A to a horizontal position through their threaded engagement with the boss portions 11 of the frame as indicated by the level gauges L1 and L2 shown in Fig. 4.

The frame A, Figs. 1, 3 and 5, is provided with an arcuate gear rack 16 and two parallelly disposed arcuate rim portions 17 and 18 forming race tracks for respective pairs of rollers as 19 and 20 best seen in Fig. 5 mounted on a corresponding number of spindles 13 and 14 extending laterally from reinforced portions 21 and 22 formed integrally with a carriage 23. Two pairs of rollers 24 and 25 also mounted on the carriage 23 engage the parallel sides of the arcuate rim portions 17 and 18 for guiding the carriage 23 in its reciprocating movements along the rims as effected by the rotation of a pinion 27 best seen in Figs. 1 and 5 engaging the gear rack 16, the pinion 27 being keyed at one end of a shaft 125 and actuated through a gear reduction mechanism not shown operatively connected to a motor 26 mounted on carriage 23 and under control of a gyroscope not shown.

To the underside of carriage 23 as best seen in Figs. 1, 3 and 4 is secured as by a plurality of screws 28 and 29 a mounting frame B consisting of two parallelly disposed arcuate rail elements 30 and 31 of U or channel-shaped cross-section held in parallel relation to each other at their ends by spacer bars 32 and 33 in cooperation with the carriage 23 to which they are secured at their middle length portions by screws 28 and 29 as above mentioned.

On the rail element 30, as shown in Fig. 3, is secured as by a plurality of screws 130, an arcuate gear toothed rack 34 engaged by a pinion 35 best seen in Figs. 1 and 3 keyed on a shaft 36 rotated by a motor 37 under control of a gyroscope not shown through a gear reduction mechanism including a pinion 38 keyed on the armature shaft of motor 37, a gear 39 mounted for rotation as a unit with a pinion 40 on shaft 41, and a gear 42 mounted for rotation as a unit with pinion 35 on shaft 36. The parallelly disposed rails 30 and 31 are of U-shaped cross-

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section as best indicated by rail 30 in Fig. 1, one of the parallel sides in each rail forming a guide for rollers as 50 mounted on spindles as 51 laterally extending from a second carriage in the form of a two-section cylindrical casing 52, while a number of rollers as 53, Figs. 1 and 3, engage the edges of the arcuate rails 30 and 31 for guiding the cylindrical casing in its movement along the frame formed by the rails 30 and 31 upon the operation of the motor 37, mounted into the two-part casing 52.

The cylindrical casing 52 serves for housing a turntable in the form of a gear 60 best seen in Fig. 3, this gear being supported by a plurality of pairs of rollers as 61 disposed at equal spaced angular distance around the casing 52, and mounted on spindles as 152, while to the underside of gear 60 are mounted for rotation therewith the arms 62 and 63 and a motor 64 provided for a purpose which will be hereinafter described in detail. To the free end of arms 62 and 63 is mounted as on pivots 65 and 65' a circular frame CF to which is secured as by a number of bolts 66 a parabolic-shaped energy reflector 67 which may be orientated in an azimuth direction by the operation of motor 68, securely mounted on the cylindrical casing 52 and operatively connected to the turntable gear 60 by a gearing mechanism comprising a pinion 69 keyed on the armature shaft of motor 68, a gear 70 engaging with the pinion 69 and mounted for rotation as a unit with a pinion 71, a gear 72 engaging the pinion 71 and mounted for rotation as a unit with pinion 73 the latter engaging the gear turntable 60.

The reflector 67 as best seen in Figs. 2 and 3 may be moved on its pivots 65 and 65' for vertical scanning operation by a mechanism comprising a motor 64, a pinion 80 keyed on the armature shaft of this motor, a gear sector 81 pivoted on a spindle 82, an arm 83 connected for movement as a unit with the sector 81 and a rod 84 operatively connecting the free end of arm 83 and the reflector 67 through a stud 85 carried by the frame CF to which the reflector 67 is secured as above described. A pair of springs 86, best seen in Figs. 1 and 2, are hooked at one of their ends to respective studs 87 carried by the arms 62 and 63 and their opposite ends to similar hook members 88 carried by projections 89 formed with the frame CF to which the reflector 67 is secured, the function of springs 86 being to counterbalance the weight of gear sector 81, the arm 83, the rod 84 and its connection 85 so as to distribute the load on the motor 64 uniformly during the vertical scanning movement of the energy reflector.

A casing 90, Figs. 1 and 2, is secured as by a number of screws 91 to a casing section 92 in turn secured to the under-side of turntable gear 60. Casing section 90 serves for mounting a wave guide element 93 extending through an opening 94 in the energy reflector 67 with the horn portion of the wave guide disposed at the focus of the reflector, the wave guide as shown in Fig. 2 connecting with a coaxial cable terminal 95 disposed at the rear of the reflector.

In the operation of the scanning mechanism of this invention the vertical scanning movement of the energy reflector 67 is effected by the operation of motor 64 through the rotation of pinion 80, the gear sector 81, the arm 83 movable as a unit with the gear sector 81 and the rod 84 connecting the free end of arm 83 with the spindle 85 carried by the frame CF to which the reflector 67 is secured.

The azimuth scanning movement of reflector 67 is effected by the operation of motor 68 (see Fig. 3) through the train of gears 69, 70—71, 72—73 and the turntable gear 60 to which the supporting arms 62 and 63 for the reflector are secured, the simultaneous operation of motors 64 and 68 at different speeds relative to each other being effective to operate the reflector to generate any geometrical figure desired. The scanning movements of the reflector 67 as effected either by the individual operation of motors 64 and 68 or by the collective operation of these motors, are not affected by the movement of the vessel in which the scanning mechanism is mounted for the reason that any movement of the vessel which would change the direction of the desired scanning field of the reflector is compensated by the opera-

tion of motors 26 and 37 and the consequent operation of carriage 23 along the rails 17 and 18 of arcuate frame A and the operation of the second carriage in the form of casing 52 housing the turntable gear 60 along the rails 30 and 31 of arcuate frame B disposed at right angles to frame A, motors 26 and 37 as above mentioned being under control of a gyroscope not shown and which forms no part of the present invention.

What is claimed is:

1. A scanning mechanism for use in a radio signaling apparatus on board an aircraft, said mechanism comprising a mounting frame having means for attachment to the aircraft and a pair of parallelly disposed arcuate rim elements, a carriage mounted for movement on said rim elements, an arcuate gear rack mounted on said frame in parallel relation to one of said rim elements, a gyroscope controlled motor mounted on said carriage having a pinion engaging said rack to cause the reciprocating movement of said carriage upon the operation of said motor, another frame mounted on said carriage having arcuate rail elements and an arcuate gear rack disposed in lines parallel to one of said arcuate rails, another carriage mounted for movement along said rail, a gear mechanism having a pinion engaging the last-mentioned gear rack for effecting the reciprocating movement of the last-mentioned carriage, the last-mentioned carriage having a circular casing, a gyroscope controlled motor mounted in said casing for operating said gear mechanism, a turntable mounted for rotation in said casing, said turntable forming a gear, a second motor mounted in said casing, a gearing mechanism driven by said motor for actuating said turntable, a reflector, supporting means suspended from said turntable for pivotally mounting said reflector, a motor carried by said turntable having a pinion, a gear sector engaged by said pinion, an arm movable as a unit with said gear sector, and a rod operatively connecting said arm to said reflector, the operation of said turntable cooperating with the pivotal movement of said reflector to cause the latter to generate a plurality of geometrical figures defined by the speed relation of the third and fourth mentioned motors.

2. A support for an antenna comprising a first arcuate

frame having means for attachment to a mount, a pair of parallelly disposed arcuate rim elements and an arcuate gear rack mounted in parallel relation to said rim elements, a first carriage mounted for movement on said rim elements, a motor mounted on said first carriage and having a pinion engaging the rack, a second arcuate frame mounted on said carriage having a pair of parallelly disposed arcuate rim elements and an arcuate gear rack mounted in parallel relation to said rim elements, a second carriage mounted for movement on said second rim elements, said carriage comprising a circular casing, a motor mounted in said casing, a gear mechanism controlled by said motor and having a pinion engaging the rack of said second arcuate frame, and a turntable gear mounted for rotation in said casing, a reflector, supporting means suspended from said turntable for pivotally mounting said reflector, first motor means carried by said turntable for actuating said reflector to generate oscillatory scanning movement upon operation of said motor, and second motor means for rotating said turntable to cause said reflector to generate scanning movements at right angles to said oscillatory scanning movement.

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