May 14, 1968 J. GUTTENBERG 3,383,081

SUPPORT FOR PLANAR ARRAY ANTENNA

Filed July 25, 1966 2 Sheets-Sheet 1

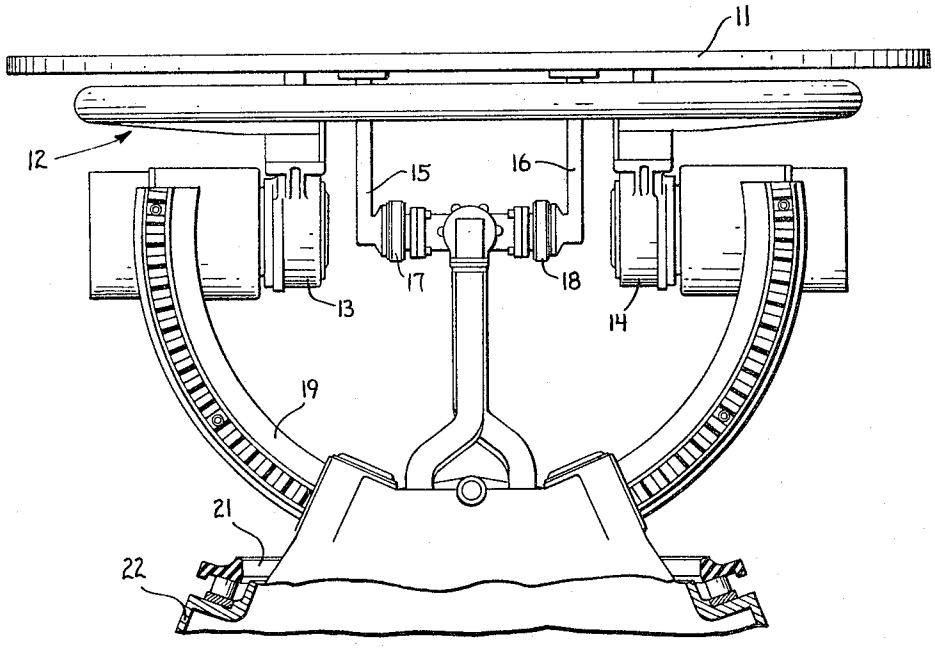


Fig. 1.

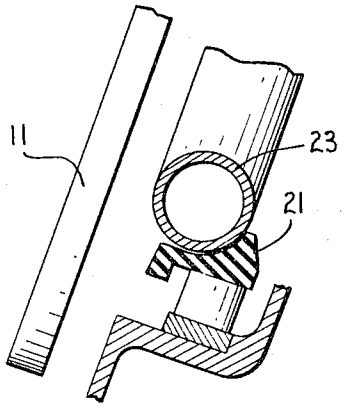


Fig. 2.

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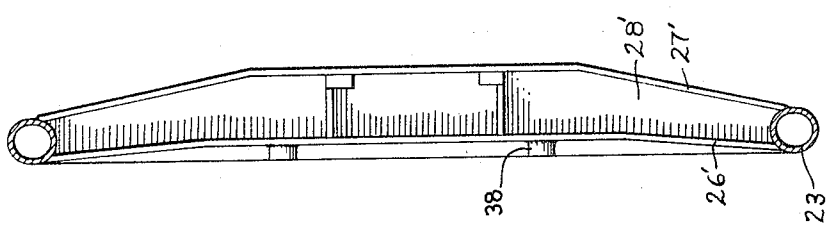


Fig. 4.

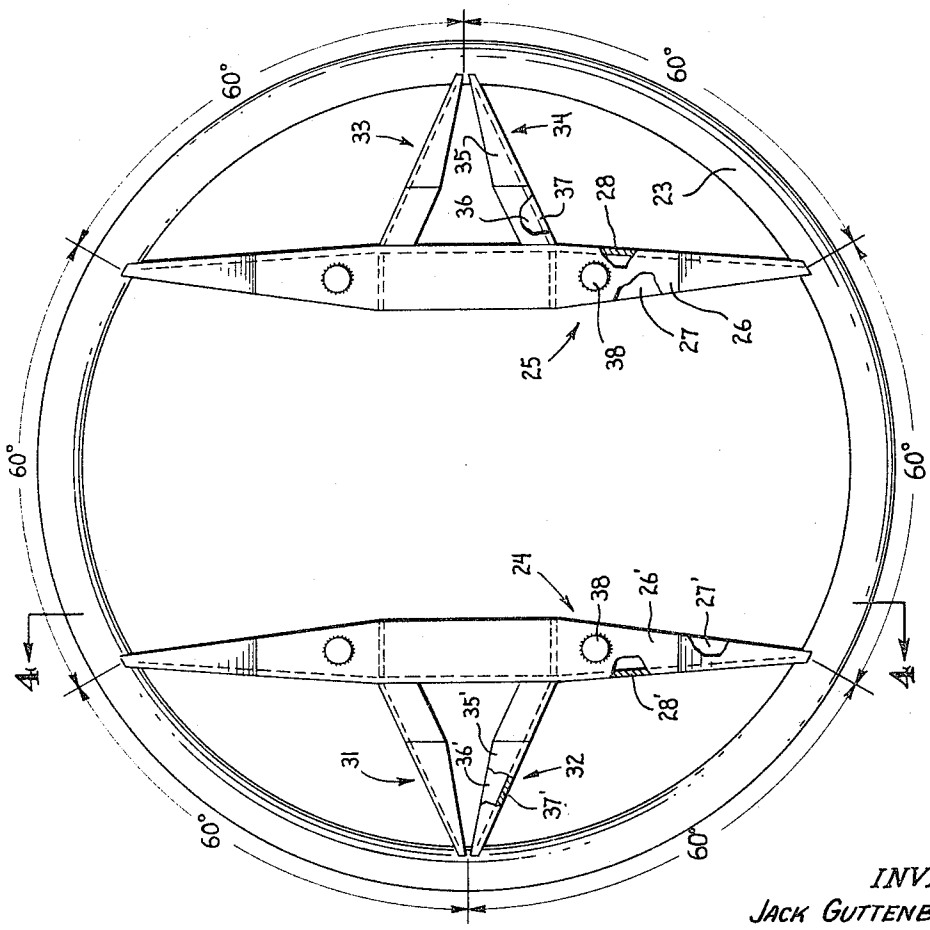


Fig. 3.

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SUPPORT FOR PLANAR ARRAY ANTENNA

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ABSTRACT OF THE DISCLOSURE

A supporting structure for an antenna array plate having an annular tubular ring and a plurality of uniform strength beams attached to said annular tubular ring and having mounting pads on said beams for positioning an antenna array plate whereby said annular tubular ring can deflect without contacting said antenna plate.

The present invention relates to a supporting structure for a planar array antenna and more particularly to a stucture that will both support a planar array antenna and act as a unidirectional spring between the antenna and a limit ring on an antenna.

In the antenna prior art, planar array antennas are frequently attached to a supporting structure which is a casting and when the casting encountered a limit ring, the stopping load or shock is transferred directly to the antenna. As various forms of waveguides are normally attached to the antenna, repeated shocks to the antenna can cause serious and permanent damage to rotary joints, waveguide structure, and the like.

In the present invention, a support is provided which is comprised of a hollow ring which is supported by beams so that there is a uniform deflection rate about the ring. The hollow ring acts as a spring and absorbs the greatest part of the shock when the ring strikes a limit ring. The planar array antenna is spaced apart and attached to the hollow ring so that there can be deflection in the hollow ring without any corresponding deflection in the planar array antenna or any engagement between the planar array antenna and the supporting structure. The hollow ring is attached to conventional antenna structure that permits scanning in both elevational and aximuth planes.

It is therefore a general object of the present invention to provide an improved structure for supporting a planar array antenna.

Another object of the present invention is to provide an improved supporting structure which will reduce or eliminate shock to a planar array antenna.

Other objects and advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIGURE 1 is a partial side view showing a planar array antenna and supporting structure;

FIGURE 2 is a partial sectional view showing engagement of a supporting structure ring with a limit ring;

FIGURE 3 is a top plan view of a supporting ring; and

FIGURE 4 is a sectional view taken on line 4—4 of FIGURE 3.

Referring now to the drawings, in FIGURE 1 there is shown a planar array antenna with related scanning hardware. An array plate **11** is attached to a support assembly **12** which in turn is supported by rotary joints **13** and **14**. By way of example, a pair of waveguides **15** and **16** are shown connected to array plate **11** and rotary joints **17** and **18** are provided to permit the array plate to be scanned in elevation. A C-ring **19** is provided and, with its associated hardware, provides azimuth scanning.

An annular bumper **21** of resilient material is attached

to housing **22** and provides a mechanical stop when the support assembly **12** strikes annular bumper **21**. FIGURE 2 of the drawings shows the position of array plate **11** when annular ring **23** of support assembly **12** is against bumper **21**.

Referring now to FIGURES 3 and 4 of the drawings, it can be seen that annular ring **23** is of tubular material and that a pair of elevation beams **24** and **25** are attached, as by welding, to annular ring **23**. Each elevation beam is comprised of a top plate **26**, a bottom plate **27**, and a side plate **28**. The top, bottom and side plates are welded together to form a U-shaped beam. A pair of azimuth beams **31** and **32** are attached, as by welding, to beam **24** and likewise a pair of azimuth beams **33** and **34** are attached, as by welding, to beam **25**. Each azimuth beam is comprised of a top plate **35**, a bottom plate **36**, and a side plate **37**. The top, bottom, and side plates are welded together to form a U-shaped beam. The beams, which are built-up channels in cross-section, are approximately uniform strength beams and have increased spring rate. Azimuth beams **31** and **32** each have one end welded to elevation beam **24**, and beams **31** and **32** are angled so that their outer ends converge, and at annular ring **23**, the ends of beams **31** and **32** are contiguous. Likewise, azimuth beams **33** and **34** each have one end welded to elevation beam **25**, and beams **33** and **34** are angled so that their outer ends converge, and at annular ring **23**, the ends of beams **33** and **34** are contiguous.

The ends of the beams engage the annular ring **23** such that annular ring **23** is supported at six equally spaced positions and as the beams are designed to have equal stiffness, the ring support points can be treated as planar. Thus, regardless of where annular ring **23** strikes along the three hundred, sixty degrees of the annular bumper **21**, the stopping force and the amount of deflection are independent of the position of the array plate, and are related only to the rotational deceleration of the moving mass of the antenna array and its supporting structure.

A plurality of mounting pads **38** are provided on elevation beams **24** and **25**, there being shown two each on each beam, and the antenna array plate **11** is positioned on these pads. Pads **38** position array plate **11** to allow for structural deflection of support assembly **12** without the annular ring **23** coming into contact with array plate **11** and thus no shock force is transferred to the array plate **11**. The kinetic energy of the moving antenna is absorbed by the bending deflection of the support assembly **12** and by the shear and compression deflection of the annular bumper **21**. Array plate **11** is attached to the top plates **26** and rotary joints **13** and **14** are connected to the support assembly **12** through the bottom plates **27**. Annular ring **23**, which is supported by the beams, can absorb shock loads and is free to deflect and thus provides protection for array plate **11**.

It can thus be seen that the present invention provides an improved supporting structure for a planar array antenna. The supporting structure provides, at minimum weight, a mechanical stop that prevents damaging shock to the antenna and its related hardware. Obviously many modifications and variations of the persent invention are possible in the light of the above teachings. It is therefore to be understood, that within the scope of the appended claim, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A supporting structure for an antenna array plate comprising:

an annular tubular ring,

a plurality of uniform strength beams attached to said annular tubular ring, said plurality of uniform strength beams comprising first and second longitudinal beams extending substantially parallel to one

another, a first pair of traverse beams each having one end attached to said first longitudinal beam and the other end of each first pair of traverse beams being contiguous to each other end and being attached to said annular tubular ring, and a second pair of traverse beams each having one end attached to said second longitudinal beam and the other end of each second pair of traverse beams being contiguous to each other end and being attached to said annular tubular ring, and

means attached to a part of said beams for supporting a planar array antenna plate whereby said annular

tubular ring can deflect without contacting said antenna plate.

References Cited

UNITED STATES PATENTS

905,018	11/1908	Sullivan et al.	248—349 XR
2,479,897	8/1949	Baxter et al.	343—765 XR
2,888,229	5/1959	Lester	248—346

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