July 5, 1960 P. F. WHITE 2,943,756

HINGE STRUCTURE

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FIG. 1

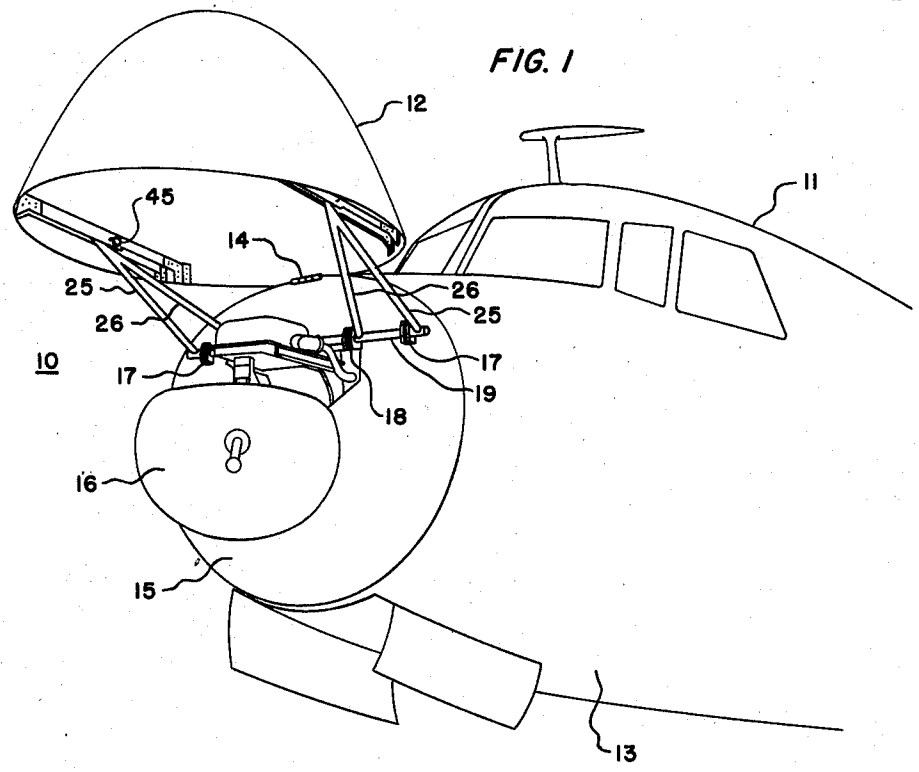

FIG. 2

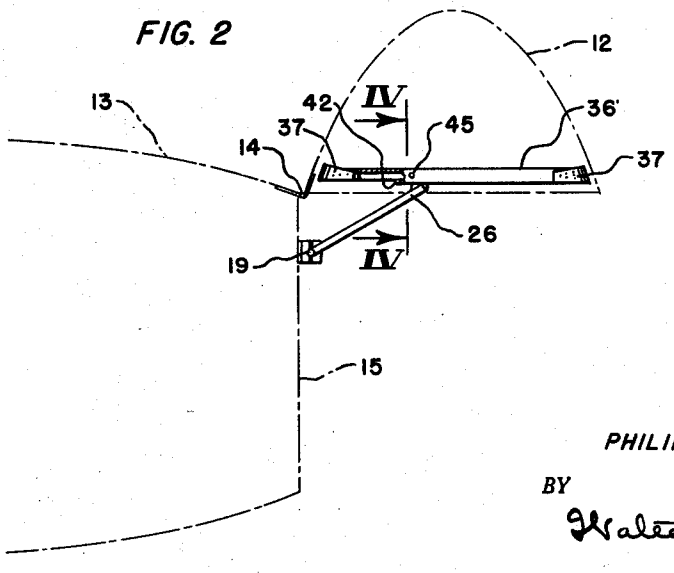

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FIG. 3

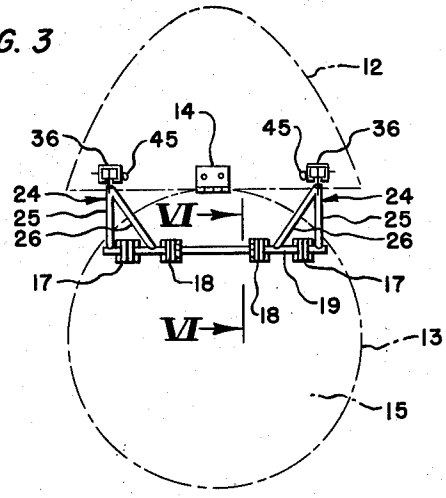


FIG. 4

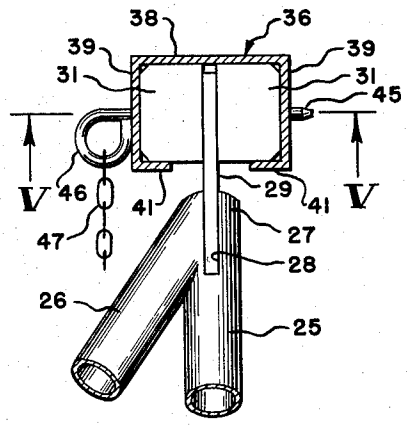


FIG. 5

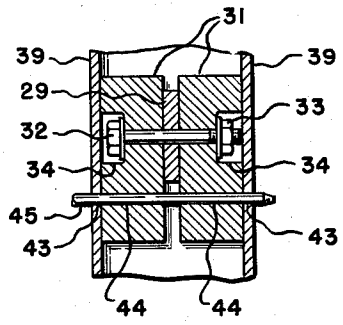
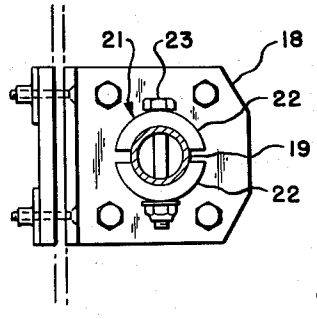


FIG. 6



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HINGE STRUCTURE

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6 Claims. (Cl. 217—60)

The present invention relates generally to hinge constructions for elements adapted to be moved between closed and open positions and intended to be held in open position. More particularly this invention relates to a stabilizer device for use with a conventional hinge and adapted to relieve loads on the hinge.

The present hinge structure is designed primarily for use with hinged cover or housing members for an airplane, but it is understood that it is not limited exclusively to use with airplanes.

As is well-known, many present day passenger, cargo, and other types of airplanes are equipped with radar equipment which provides the pilot with advance warning of flight weather conditions. The radar antenna is normally housed within a radome of non-metallic material positioned on the nose of the airplane body to provide for optimum operating efficiency. For aerodynamic purposes, the radome is of generally hemispherical configuration blending with the contour of the airplane body. In order that convenient accessibility be afforded for maintenance and servicing of the antenna, it is desirable to attach the radome to the airplane body through a single point hinge suspension in preference to a detachable mounting arrangement which latter alternative involves additional time and handling to accomplish the same end.

However, hinging of a hemispherical shape to the airplane body presents a problem since the hinge must carry the weight of the radome and further resist torque loads transmitted through the hinge from the radome into the airplane body. Single point hinge suspension, in and of itself, in connection with large diameter radomes is not sufficiently adequate in view of the length of the moment arm as determined by the diameter of the radome. Further, when in open position, external forces such as strong winds blowing against the radome impose a severe strain on the hinge as well as to the structure to which the hinge is attached.

From the foregoing it will be readily apparent that a single hinge adapted to pivotally secure a radome to an airplane body requires force accepting means to satisfactorily relieve strain which may be imposed on the hinge.

It is, therefore, an object of the present invention to provide novel structure for use in connection with a hinged member which serves to minimize strain exerted upon the hinge.

Another object of this invention is to provide a stabilizer device for a hinged member through which device torque strains are transmitted for distribution over a relatively large bearing area.

Another object of this invention is to provide in connection with a device of the character above prop means adapted to support a hinged member in open position relative to its supporting structure.

Another object of this invention is to provide a torque distributing stabilizer device for a hinged member which is simple in construction, efficient in operation, durable,

and which satisfactorily serves the purpose for which it is intended.

Other objects and features of the present invention will be readily apparent to those skilled in the art from the following specification and appended drawings wherein is illustrated a preferred form of the invention, and in which:

Figure 1 is a perspective view showing the present invention embodied in an airplane, with the radome of the airplane being shown in open position and associated radar mechanism exposed;

Figure 2 is a side elevational view of the hinge stabilizer assembly of the present invention located on the nose portion of an airplane which is shown in dot and dash lines;

Figure 3 is a front elevational view of the assembly shown in Figure 2;

Figure 4 is an enlarged transverse sectional view taken on the line IV—IV of Figure 2;

Figure 5 is a sectional view taken on the line V—V of Figure 4, and

Figure 6 is a sectional view taken along the line VI—VI of Figure 3.

Referring now to the drawings and particularly to Figure 1 a hinge stabilizer assembly **10**, constructed in accordance with the present invention, is shown in operative association with an airplane indicated generally in the drawings by the numeral **11**. Assembly **10** is located at the nose section of the airplane, which nose section includes a radome **12**, made of a material which permits the ready passage of microwave energy. Radome **12** is of generally hemispherical configuration and is pivotally mounted on the body **13** of the airplane at its upper marginal edge by a usual double-leaf hinge **14** having one of its leaves secured to the radome **12** and the other to the body **13** as by nuts and bolts or in any other conventional fashion. Positioned on a bulkhead **15** of body **13** and adapted to be enclosed by radome **12** are a usual radar antenna and its associated equipment indicated generally by the numeral **16**.

Rigidly affixed to airplane bulkhead **15**, generally midway between the location of hinge **14** and the center of the bulkhead **15**, are two bearing blocks **17** and two bearing blocks **18** arranged in alignment in a plane parallel to the plane of the longitudinal axis of the airplane. As shown in Figure 3, the two bearing blocks **18** are located inwardly of the bearing blocks **17**. Bearing blocks **17** and **18** serve to journal a torque shaft **19** which is secured against longitudinal displacement relative to the bearing blocks by a pair of stop means **21** carried by torque shaft **19** adjacent opposed faces of the bearing blocks **18**. As shown in Figure 6, stop means **21** comprises a pair of generally semi-circular elements **22** fitted at opposite sides of torque shaft **19** and secured to the torque shaft **19** by a bolt and nut assembly **23**.

Carried by shaft **19** are two triangular truss assemblies **24**, each assembly **24** formed of a pair of braces **25** and **26** which extend from connections with torque shaft **19** at their inner ends to join at an apex as at **27**. The braces **25** and **26** are secured to each other at the V-shaped juncture of their outer extremities as by welding and are secured to the torque shaft **19** as by welding, for common movement therewith. As shown, in their connection to torque shaft **19**, brace **25** will be located on one side of a bearing block **17** and brace **26** on the opposite side.

At the V-shaped juncture **27** of each of the truss assemblies **24** there is formed a slot **28** within which is secured, as by welding, a plate **29**. Each of the pair of plates **29** extends beyond the outer end of its truss **24** and projects into a space provided between a pair of track-engaging or slide members **31**, and each is pivotally connected to its associated pair of members **31** by a bolt

32 and nut 33 as shown in Figure 5, suitable recesses 34 being provided in members 31 to accommodate the head of bolt 32 and the nut 33. Bolt 32 and nut 33, thus serve to hold a pair of slide members 31 in assembly and to pivotally connect a plate 29 to such assembly.

Carried on radome 12 transverse to torque shaft 19 are a pair of laterally spaced-apart, parallel, elongated tracks 36, which tracks are secured in chord-wise disposition to radome 12 by suitable brackets 37. Tracks 36, as shown in Figure 4, are of generally C-shape configuration in cross section and include a top wall 38, side walls 39 and a pair of inwardly directed flanges 41 with a space between the opposed ends of the latter through which space plate 29 extends. Contained within the area-way defined by the walls of each of the tracks 36 are the interconnected slide members 31 which rest upon and are adapted to ride along an extended trackway formed by the inwardly directed flanges 41. Flanges 41 are not continuous along the lengths of tracks 36 but terminate short of the inner ends thereof as at 42 (Figure 2) to permit the ready insertion of assembled slide members 31 into the passageway of such tracks. Each of the tracks 36 is provided with opposed openings 43 in side walls 39 thereof, which openings are adapted to register with aligned openings 44 in slide members 31 when radome 12 is moved to its desired open position. With openings 43 and 44 in registry a pin 45 may be inserted therethrough to lock the slide members 31 to the track. With slide members 31 locked in position trusses 24 are secured against further movement and serve as props to hold radome 12 in open position. As shown in Figure 4, one end of pin 45 is formed into a loop as at 46 to which one end of a chain 47 is attached, the other end being fastened to convenient structure to prevent loss or misplacement thereof.

In the closed position of radome 12 it will be secured against inadvertent opening by usual quick disconnect fasteners (not shown). When it is desired to gain access to the radar equipment 16 covered by radome 12, the disconnect fasteners are actuated to release the connection of radome 12 to aircraft bulkhead 15, whereupon the radome 12 may be manually lifted and pivoted about the axis of its hinge 14 to the position illustrated in the drawings. It is apparent in this operation that the space relationship of the axis of hinge 14 and the axis of torque shaft 19 carrying the braces 25 and 26 causes the track engaging members 31 to slide within tracks 36 in the direction of hinge 14. When radome 12 is lifted to a position substantially ninety degrees from its closed position, openings 44 in slide members 31 align with openings 43 in track walls 39 whereupon pin 45 may be inserted to lock trusses 24 to radome 12 to hold the latter propped in open position.

With the use of the arrangement hereinabove described hinge 14 will be laternally stabilized and be relieved of torque loads which might tend to tear it loose while the radome 12 is being moved between its open and closed positions or in the event that but one pair of slide members 31 is locked to its track and a pin 45, inadvertently or otherwise, not inserted into the other pair of slide members 31. Such loads, as they occur, will be accepted by the various brace members 25 and 26 and will be equalized by the torque shaft 19 transmitting loads from the braces 25 and 26 at one side of the radome to the braces 25 and 26 at the opposite side of the radome. By relieving hinge 14 of the stresses of torque loads, a hinge is employed which is relatively light and simple in construction, there being no necessity for a heavy construction to assure structural integrity.

Radome 12 may be readily removed from the airplane, when it becomes necessary, without diassembly of the various components of the hinge stabilizer assembly 10, simply by continuing movement of radome 12 beyond its horizontal position to carry slide members 31 beyond the inner ends of flanges 41, which as has been stated, terminate inwardly of the end of the tracks 36. When the slide members 31 are moved beyond the inner ends of flanges 41 they are free to be withdrawn from within tracks 36. Thereafter, hinge 14 may be removed or disassembled to disconnect radome 12 from the airplane.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What I claim is:

1. In combination, a supporting structure, a member hingedly mounted at one point on said structure, and means for maintaining said hinged member in adjusted position relative to said structure, said means comprising a torque member, journal means for rotatively mounting said torque member on said supporting structure, a plurality of brace means carried by said torque member and movable therewith, stop means on said torque member in engagement with said journal means for restraining longitudinal displacement of said torque member along its axis of rotation, and a plurality of slidably mounted means carried by said hinged member, each having a pivotal connection with a brace means and each adapted to be restrained against movement relative to said hinged member to hold said hinged member in adjusted position.

2. In combination, a supporting structure, a cover member hingedly mounted at one point on said structure and swingably movable between opened and closed positions, and means for maintaining said cover member in opened position, said means comprising a torque member, means mounting said torque member on said supporting structure for rotative movement, a plurality of brace means carried at one of their ends by said torque member and movable therewith, means on said torque member for engaging said mounting means to restrain movement of said torque member along its axis of rotative movement, a plurality of slidable members, support members on said cover member for mounting said slidable members, means pivotally connecting the opposite ends of said brace means to said slidable members, and means for locking said slidable members to their support members to retain said cover member in opened position.

3. In combination, a supporting structure, a cover member pivotally mounted at one point on said structure for movement between opened and closed positions, and means adapted to accommodate torque loads which are applied to said cover member when in opened position and for maintaining said cover member in its opened position, said means comprising a torque member, journal means for mounting said torque member on said supporting structure for rotative movement, a plurality of brace means carried at one of their ends by said torque member and movable in common therewith, means carried by said torque member for engaging said journal means to restrain movement of said torque member along its axis of rotative movement, a plurality of track means mounted on said cover member, slidable means mounted for reciprocal movement on said track means, said slidable means being arranged for ready removal from said track means, means for pivotally connecting the opposite ends of said brace means to said slidable means, and means for locking said slidable means to its associated track to retain said cover member in opened position.

4. In combination, a supporting structure, a cover member pivotally mounted at one point on said structure for movement between opened and closed positions, means adapted to accommodate torque loads which are applied to said cover member when in opened position and for maintaining said cover member in its opened position, said means comprising a plurality of elongated track members mounted on said cover member in spaced side-by-side relation, a torque shaft, journal means for rotatively

mounting said torque shaft on said supporting structure, a plurality of brace members affixed at one of their ends to said torque shaft spaced therealong and projecting outwardly from said torque shaft, means carried by said torque shaft for engaging said journal means to restrain movement of said torque shaft along its axis of rotation, a track engaging member slidably positioned on each of said track members and having a pivotal connection with a projecting end of a brace member, and locking means for fixedly securing said track engaging members ot their associated track members to hold said cover member in opened position.

5. Stabilizing means for a cover member which is pivotally connected by a hinge member at one point to a supporting structure for movement between opened and closed positions, said stabilizing means comprising a pair of elongated track members chordally mounted on said cover member in laterally spaced relationship, one on each side of said hinge member, a torque shaft extending transverse to said track members and journalled on said supporting structure for rotative movement, a pair of spaced-apart brace means rigidly affixed at one of their ends to said torque shaft for common movement therewith and projecting outwardly therefrom, means for restraining movement of said torque shaft relative to said supporting structure along its axis of rotative movement, a track engaging member on each of said track members mounted for reciprocal movement thereon, means pivotally connecting each of said brace means at its projecting end to one of said track engaging members, and means for locking said track engaging member to its associated track member to hold said cover member in its opened position.

6. In combination, a cover member, hinge means for pivotally connecting said cover member at one point to

supporting structure for movement between opened and closed positions, stabilizing means for said cover member in its opened position comprising a torque member journalled on said supporting structure for rotative movement, a pair of generally V-shaped brace means having the ends of their leg portions fixedly secured to said torque member for common movement therewith, means for restraining movement of said torque member relative to said supporting structure along its axis of rotative movement, a pair of elongated track members mounted on said cover member in laterally spaced relationship, one on each side of said hinge member, a track engaging member slidably positioned on each of said track members for reciprocal movement thereon, means pivotally connecting each of said V-shaped brace members at its apex to one of the track engaging members, and means for locking said track engaging members against movement on said track members to hold said cover member in its opened position.

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