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Boemer

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[54] **AUTOMATIC LOCKING OF HIGH-LEVEL LUMINAIRES**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **254/148,** 240/64, 248/320

[51] **Int. Cl.** **F21v 21/38**

[58] **Field of Search** 240/64, 67; 254/148; 248/320, 321, 328

[56] **References Cited**

UNITED STATES PATENTS

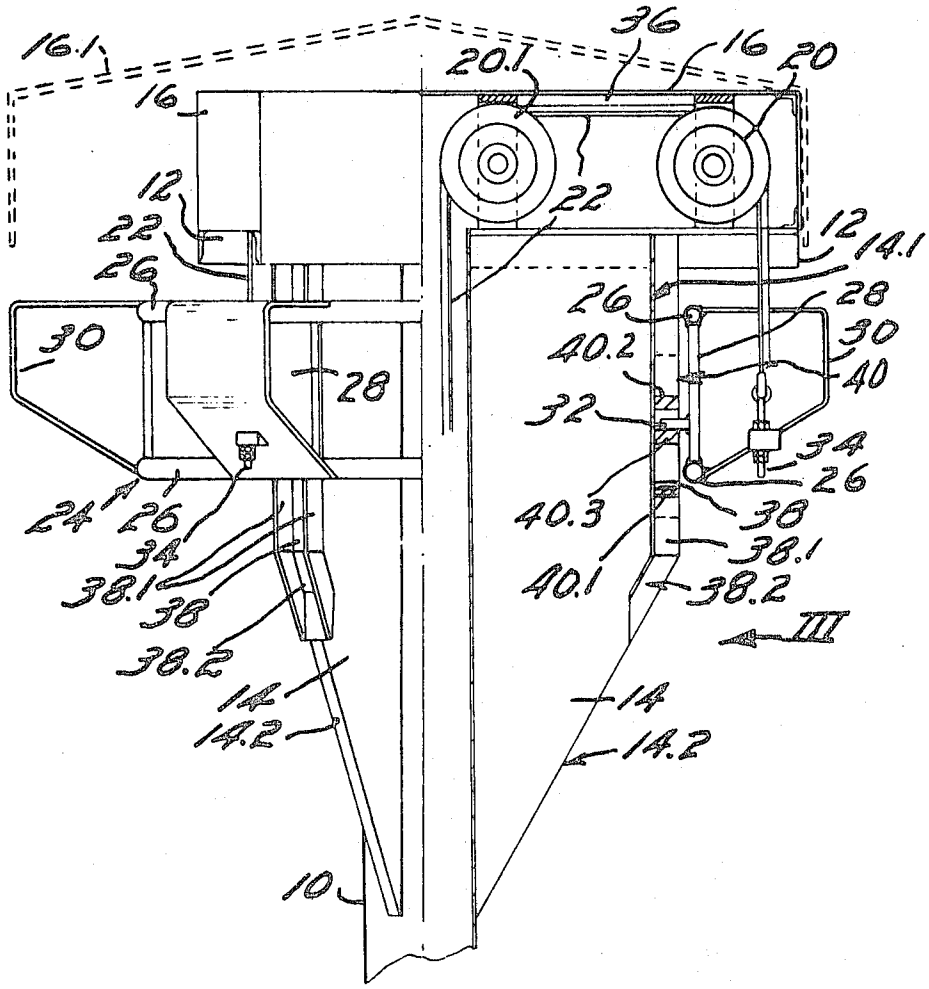
504,082	8/1893	Hebendahl	248/320
3,670,159	6/1972	Millerbernd	248/320
3,721,816	3/1973	Zeller	240/90

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Assistant Examiner—Victor N. Sakran
Attorney, Agent, or Firm—Karl W. Flocks

[57] **ABSTRACT**

Means for the positive support and automatic engagement and disengagement of an annular frame, mounting luminaires and suspended from three hoisting ropes, around the top of a high mast, having cantilever-like parts engaging support recesses and which parts are directed into the recesses and therefrom by rotational deflection of the frame by camming actions against a gravitational bias.

2 Claims, 6 Drawing Figures



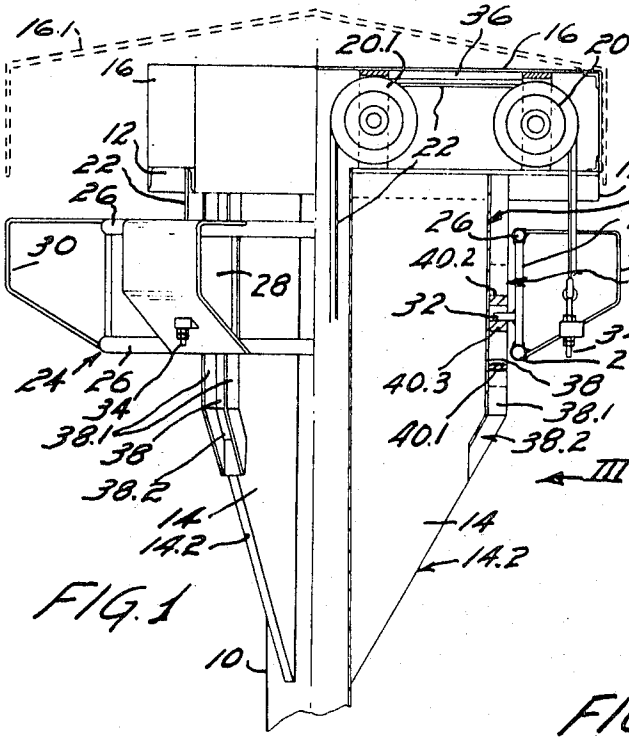


FIG. 1

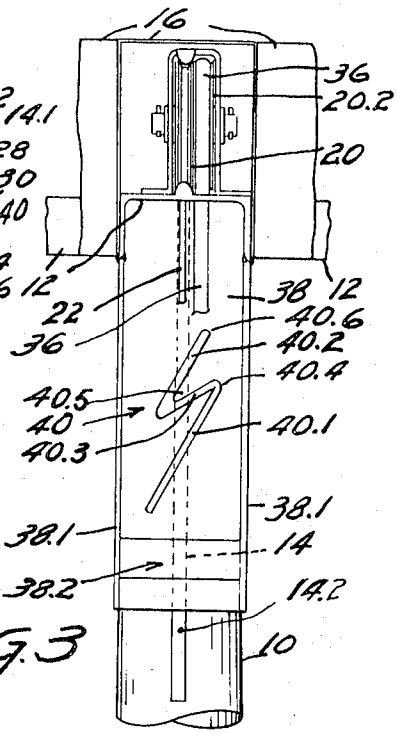


FIG 3

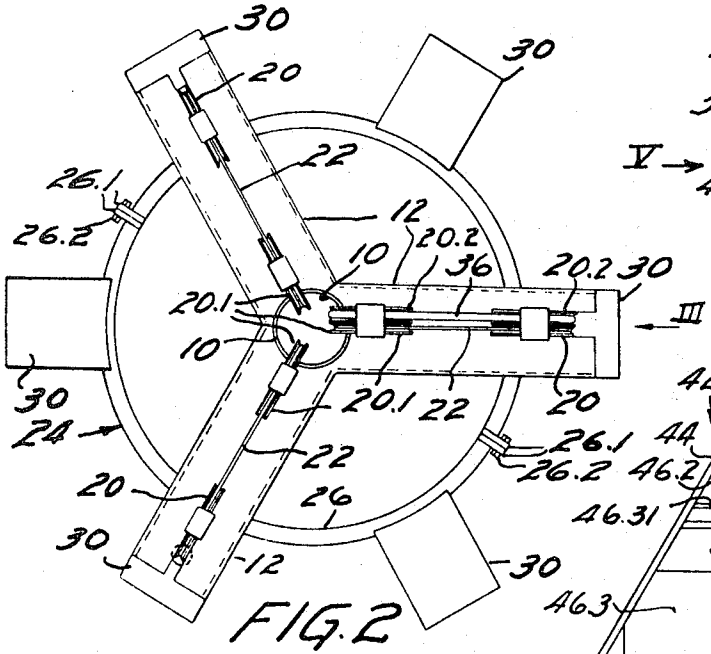


FIG. 2

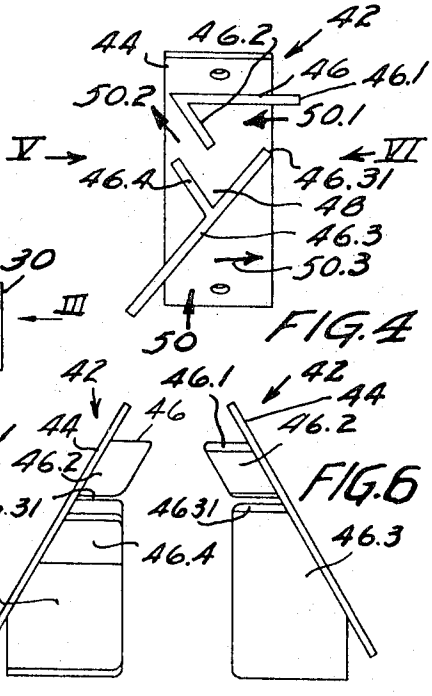


FIG. 4

FIG. 5

FIG. 6

AUTOMATIC LOCKING OF HIGH-LEVEL LUMINAIRES

BACKGROUND TO THE INVENTION

Field of the Invention

The invention relates to positively supporting and automatic engagement on and disengagement from supports of a substantially annular member at the top of a high mast.

Description of the Prior Art

The Applicant is aware of prior U.S. Pat. Nos. 455,547, 504,082, 1,480,121, 1,640,624 and 3,721,816 in which are disclosed luminaires or lamps which are raised and lowered by hoisting ropes and positively supported at elevated positions. In every one of the prior disclosures the luminaires or lamps are raised and lowered by a single hoisting cable and are not arranged around the mast.

SUMMARY OF THE INVENTION

The invention provides positive and safe support and location of an elevatable and lowerable structural member or like means around and at the top portion of a high mast or pole and to which position it is raised and from which it is lowered by hoist gear having hoisting ropes extending upwardly within the mast and passing over spaced pulleys arranged tandem fashion in at least three radial positions at the top of the mast or pole while engagement and disengagement of the member on support means is substantially automatically effected without the aid of remote control devices. The invention is particularly intended for use on high level luminaires having lamps fitted to a substantially annular frame while the power is supplied by flexible insulated conductors also passing through the mast or pole and over spaced pulleys at the top of the mast or pole.

According to the invention a method of positively supporting a member having a centre opening and suspended from hoisting ropes at an elevated position around a mast is provided which includes elevation of the member by the hoisting ropes to the said elevated position, application of rotational movement to the member about its axis and deflection of the hoisting ropes from gravitationally biassed vertical positions in the direction of rotational movement of the member by a camming action of parts on the member with fixed co-acting parts on the mast, return swinging of the ropes and return rotational movement of the member by gravitational bias at the end of the camming action, slight lowering of the member, and direction of the parts on the member during the slight lowering onto co-acting rigid support devices on the mast.

The method also extends to the lowering of the positively supported member and includes lifting of the member from the supported position and disengagement of the parts of the member off the support devices on the mast by the hoisting ropes, application of rotational movement of the member and deflection of the hoisting ropes in the same direction of rotational movement of the member during said lifting and by a further camming action against gravitational bias, reversal of the rotational movement of the member and restoration of the ropes to substantially vertical locations by the gravitational bias at the termination of the further camming action, and finally lowering of the member with the support means engageable parts of the member moving downwardly along faces across and clear of the supporting devices on the mast.

Alternatively the method of lowering of the member includes slightly lifting of the member from the supported position and of the parts of the member off the support devices of the mast by the hoisting ropes, further rotational movement of the member by continuation of the return movement of the member and the ropes to vertical positions of the ropes by the gravitational bias and to a position with the parts of the member clear of the co-acting support devices on the mast, and finally lowering of the members by the ropes.

Also according to the invention means for positively supporting a member, having a centre opening and suspended from hoisting ropes at an elevated position around a mast, is provided and which includes a similar number of co-acting first and second parts rigid with the mast and the member at corresponding arcuate spaced positions, the first parts each having at least one pair of spaced radially disposed and sloping faces at different heights and a recess between the sloping faces whereas the second co-acting parts comprise protruding elements, the sloping faces being adapted to apply and control rotational movement of the member and deflection of the hoisting ropes against gravitational bias on engagement of the sloping faces and the elements during a final stage of elevation of the member by a camming action and reverse movement of the member and the ropes on disengagement of the elements and the faces for direction of the elements and recesses into supporting engagement on slight lowering and by gravitational bias, and direction of the elements clear of the recesses on subsequent lifting of the member before lowering of the member.

The first parts are preferably fixed to the mast near the top end on mountings whereas the co-acting second parts extend radially inwardly across the centre opening of the member. Advantageously three of the first parts are provided at regular arcuately spaced intervals on the mast while a similar number of the second parts, also similarly spaced, are provided on the member.

Each first part, according to one form of the invention, comprises a mountable base plate having on one face a protruding sloping rigid first fin, a second fin extending divergingly from and intermediately of the ends of the upper face of the sloping first fin, a support recess for a second co-acting part between the second fin and the upper portion of the first fin, and a third sloping fin substantially parallel across the second fin and having a lower end in spaced relationship above the recess and an upper end above the upper end of the second fin. The said fins may be secured by the base plate to the outwardly directed face of an inverted conical, pyrimidal or like shaped encasement co-axially secured to the top end of the mast.

According to a preferred form of the invention each second part comprises a substantially vertical mounting plate having a pair of protruding substantially parallel but slopingly disposed upper and lower rigid fins and a fin of smaller inclination connecting the upper end of the lower and the lower end of the upper fins, and a support recess for the co-acting second part at the connection of the upper fin and the connecting lesser sloping fin. Such rigid fin device is of slopingly disposed Z-shape in elevation. The Z-shaped connected fins are disposed in spaced relationship between a pair of transversely spaced vertical and outwardly projecting guide

ribs on the mounting plate. The mounting plate and the guide ribs have an inwardly and downwardly sloping guide portion for the co-acting part when the latter approaches said support means.

Each co-acting second part preferably comprises an inwardly directed cantilever-like pin secured to the member and extending partly across the centre opening of the member.

The said member, which is preferably of annular shape and which may comprise a frame structure, may provide mountings for luminaires, lamps or the like and which mountings preferably also present connecting regions for the hoisting ropes.

An embodiment of the invention will now be described, by way of example, with reference to the drawings, in which:

FIG. 1 is a half sectional elevation of the top part of a tubular mast with associated guiding and support means for an annular member also shown in sectional elevation;

FIG. 2 is a plan of FIG. 1;

FIG. 3 is a fragmentary side elevation of FIG. 1 and FIG. 2 in the direction of arrows III, drawn to a larger scale, and showing only parts attached and mounted to the mast;

FIG. 4 is a front elevation of a modified support device for mounting on a mast;

FIG. 5 is a side elevation in direction V of FIG. 4; and

FIG. 6 is a side elevation in direction VI of FIG. 4.

Reference numeral **10** denotes a tubular mast from the top end portion of which frame arms extend in rigid outwardly protruding fashion at equal arcuate spaced intervals. The mounting of each frame arm **12** is strengthened by a radial fin-like plate or gusset **14.** Each gusset **14** presents a vertical and outwardly directed edge face 14.1 and a lower downwardly and inwardly sloping edge face portion 14.2. Over the top of the frame a cap **16** is preferably secured and providing a protective space over the frame arms **12.** On each frame arm **12** a pair of tandem arranged groove pulleys **20** and **20.1** are mounted over which hoisting ropes **22** are passed which in turn extend downwardly within the mast **10** to hoisting gear, not shown, and also downwardly from the outermost pulley **20** for connection to an elevatable annular frame **24.** The annular frame **24** comprises two vertically spaced rings **26** connected by vertical brace bars or plates **28** and mounting radially outwardly projecting brackets **30** for mounting of lamps or the like, which are not shown. The connected rings comprise two half parts having radial connecting flanges **26.1** which, on placement of the frame half parts around the mast, are connected by bolts **26.2.** At similar positions at three equally spaced arcuate intervals each brace bar or plate **28** provides a rigid inwardly directed substantially horizontally disposed cantilever-like bar, fingers or pin **32.**

The downwardly extending outer ends of the hoisting ropes **22** are adjustably connected by eye bolts **34** to three of the brackets **30** located below the outer ends of the frame arms **12.** On one pair of the pulleys **20, 20.1** an additional circumferentially grooved portion **20.2** is provided for engagement by a flexible insulated electric conductor or cable **36** which extends upwardly through the mast **10** and is connected to electric current distribution means mounted on the annular frame **24.** Said means is not shown.

On the edge faces **14.1** of the gussets **14** vertical channel profile parts are rigidly secured with the flanges **38.1** directed outwardly. The parts **38** are provided with downwardly and inwardly sloping portions **38.2** secured to the sloping edge faces **14.2** of the gussets **14.** At an intermediate position within each channel part **38** a protruding device **40,** in the form of a slopingly disposed Z-shaped plate, is secured and in spaced relationship to the inner faces of the flanges **38.1.** The parallel lower and upper limbs **40.1, 40.2** of each device **40** are slopingly disposed while the connecting limb or web **40.3** is at a lesser inclination. The said devices **40** extend in an outward direction to substantially the same extent as the flanges **38.1** and are adapted to be engaged by the pins **32** of the annular frame **24** when the latter is elevated by the hoisting ropes **22** and more particularly when the frame **24** approaches the required elevated position for supported mounting at the top of the mast **10.**

When the annular frame **24** approaches the elevated position the pins **32** are guided into the channel parts **38** by the sloping portions **38.2.** With the portions of the ropes **22,** between the pulleys **20** and the brackets **30** vertically suspended, the pins **32** engage the undersfaces of the lower sloping limbs **40.1** of the Z-shaped devices **40.** On slow hoisting of the frame **24** the pins **32** slide upwardly along the undersfaces of limbs **40.1** and are laterally displaced thereby and which displacement is transferred to the annular frame **24** which performs a partial rotational motion and in addition causes the vertically suspended portions of the ropes **22** to be deflected; this action is against a gravitational bias. When the pins **32** pass over the top edges **40.4** of the limbs **40.1** the gravitational bias causes the ropes to assume their vertical positions while the frame is rotated in a reverse direction. The pins thus engage the undersfaces of the upper sloping limbs **40.2** of the devices **40** and on easing the tension on the hoisting ropes **22** the frame **24** is lowered and the pins **32** nest in the angular notches **40.5** between the limbs **40.2** and the webs **40.3** of the devices **40** in a positively supported fashion. The frame **24** and the lamps or other devices mounted thereon, thus also become positively supported.

For lowering of the frame **24** it is again raised by the ropes **22** causing the pins **32** to slide upwardly along the undersfaces of the upper limbs **40.2** until they pass over the top ends **40.6** of said limbs. The pins are then free to swing to a position above the sloping upper faces of the limbs **40.2** and which action is due to the gravitational bias on the frame **24** and the ropes **22.** With the pins **32** substantially stationary above central regions of the upper flanges **40.2** the frame **24** is lowered and is caused to be slightly rotated in the direction opposite to that when raised while the deflection of the ropes is also in the opposite direction when the pins **32** slide downwardly along the lower portions of the limbs **40.2** and subsequently limbs **40.1.** Such downward movement of the pins is clear of the entrances to the notches **40.5.** After passing the devices **40** the frame may be subjected to rapid lowering.

According to a modified form an inverted conical casing (which is not shown) is concentrically fixed around the upper portion of the mast **10** and is provided on the outer face at three equally spaced positions with brackets **42** and with each one of which a pin **32** of the frame is co-actingly engageable. Each bracket **42** comprises a base plate **44** fixable to the inverted

cone. Adjacent the upper end of the base plate **44** a horizontal rigid fin **46** is permanently secured across the outer face thereof and of which one end portion **46.1** extends outwardly whereas on the opposite end a fin **46.2** is provided and arranged at an acute downward angle. Across the lower part of each base plate **44** a steeply sloping fin **46.3** is rigidly secured and having its upper end **46.31** in spaced relationship below an intermediate portion of the horizontal fin **46.** From an intermediate portion of the upper sloping face of fin **46.3** another fin **46.4** extends slopingly and divergingly upwardly with its top portion in outward spaced relationship to the lower portion of the fin **46.2.** The fins **46.3** and **46.4** form between them a notch **48** which forms a recess for nesting and positive support of the co-acting pin **32.**

In operation of this form of construction the pins **32** approach the brackets **30** in the direction of arrow **50** and engage the underfaces of the fins **46.3.** On further raising of the frame **24** by the ropes **22** the pins **32** slide upwardly along said underfaces and cause portions of the ropes between the pulleys **20** and the frame **24** to be moved to a sloping position while a part rotational movement is applied to the frame **24.** When the pins pass over the upper edges **46.31** of the fins **46.3,** while the frame is still being elevated, the pins move transversely in the direction of arrow **50.1** to engage the fin **46.2.** The hoisting action is stopped when the pins move the said edges **46.31.** By slowly lowering of the frame the pins **32** become lodged in the notches **48** whereby the frame becomes positively supported in all the notches of all the brackets by all the pins **32.**

For release of the frame **24** the hoisting action is agains applied while each pin is moved in the direction of arrow **50.2** out of the notches and over the upper edge of fin **46.4.** The movement in the transverse direction after passing the edge **46.31** is by a gravitational bias against which deflection in the direction of arrow **50.3** was effected. Once free of the fins **46.4** the frame **24** may be lowered although at the initial stage of lowering a slight reverse rotational motion may again be applied when the pins **32** engage the protruding lower portions of the fins **46.3.**

If desired springs or other resilient buffers may be incorporated such as at the connections of the ropes to the frames for shock absorbing purposes.

On the frame **24** spring biassed pivoted arms may be provided and having rollers on inwardly directed ends for engaging the exterior faces of the mast **10.** With this arrangement rocking of the frame **24** by wind action during raising or lowering is restrained.

The cap **16** is of substantially Y-shape for encasing the frame arms **12,** the pulleys **20, 20.1** rotatably supported on the arms **12,** and the top of the post. If desired the cap may be of the shape shown by broken lines **16.1** in FIG. **1.** The gussets **14** may be replaced by bars or struts extending radially from the mast **10.**

What I claim is:

1. Means for positively supporting a member, having a centre opening and suspended from hoisting ropes at an elevated position around a mast, which includes

a similar number of co-acting first and second parts rigid with the mast and the member;

each first part comprising a substantially vertically disposed mounting plate having a pair of transversely spaced and outwardly projecting guide ribs, a sloping guide-in portion at the lower end of the mounting plate, and a bracket of connected rigid fins arranged according to a sloping Z which is secured by one face to the mounting plate in spaced relationship between the spaced ribs and presenting a pair of connected spaced and sloping radially disposed faces at different heights and a recess between said pair of faces; whereas

each co-acting second part comprising a robust cantilever pin;

the arrangement being such that during the final stage of hoisting of the member the pins are received with clearance between the guide ribs and are drawn onto sloping underfaces of the lower fins of the brackets whereby rotational movement is applied to the member and deflection of the hoisting ropes against gravitational bias by a camming action which is followed by a reverse movement of the member and the ropes by the gravitational bias on disengagement of the pins from the sloping faces and, on lowering of the member, the pins are received in the recesses for support of the member while, for lowering of the member, the member is lifted by the hoisting ropes and by camming with the underfaces of the upper fins of the brackets rotational movement is applied to the member and deflection of the ropes against gravitational bias and on movement of the pins across the upper ends of the said fins a reverse rotational movement is applied to the member by gravitational bias whereafter the member is lowerable.

2. Means for positively supporting a substantially annular member suspended from hoisting ropes at an elevated position around a mast having a similar number of co-acting first and second parts rigid with the mast and the member at corresponding arcuate spaced positions and of which the first parts have spaced sloping fins presenting radially disposed faces and recesses and the second co-acting parts comprise cantilever pins adapted to cammingly engage a first group of sloping faces of the fins for controlled rotational movement of the member and deflection of the hoisting ropes against gravitational bias during the final stage of lifting of the member, and reverse movement of the member and the ropes by the gravitational bias on disengagement of the pins from the said faces for direction of the pins into supporting engagement in the recesses during slight lowering of the member, whereas, for complete lowering of the member, a slight lifting action is applied for reverse movement of the member by the gravitational bias to clear the pins from the recesses before lowering of the member; including

an inverted cone co-axially on the top end of the mast and whereon the radially disposed sloping fins are mounted, the member in turn being adapted to be guidingly received by its centre opening on the inverted cone.

* * * * *