Jan. 24, 1967 J. L. ERVINE 3,300,784

ANTENNA WITH ELEMENTS PIVOTALLY CONNECTED TO BOOM

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FIG. 1

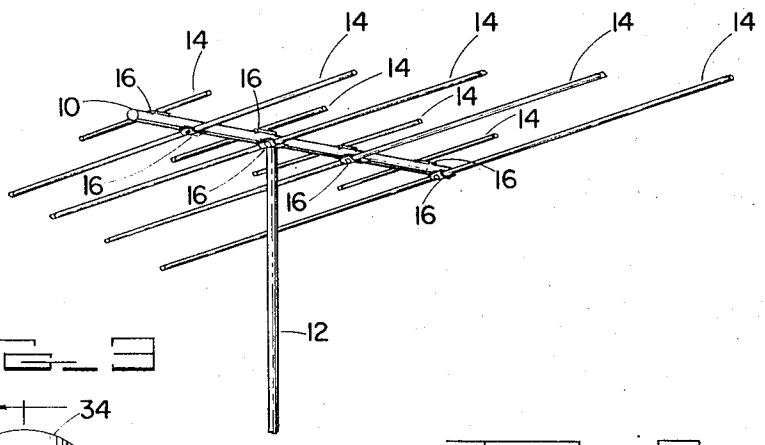


FIG. 3

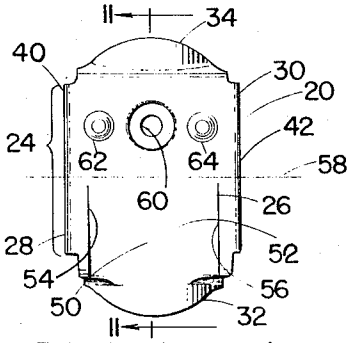


FIG. 2

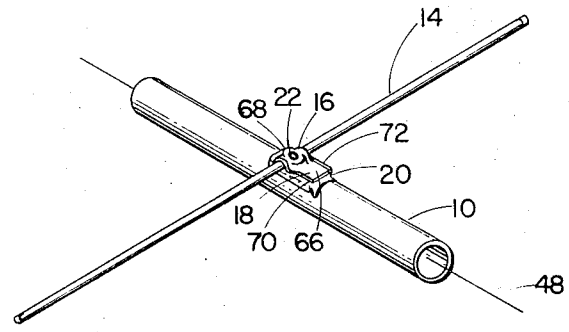


FIG. 4

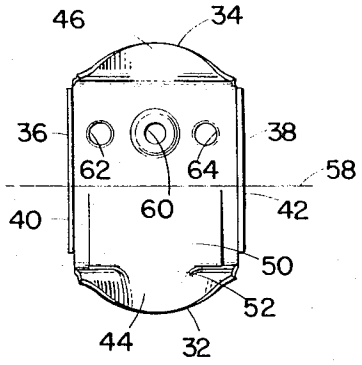


FIG. 5

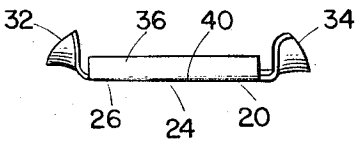


FIG. 6

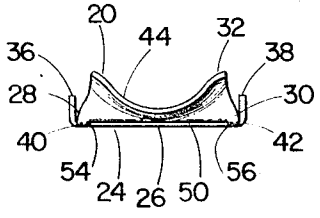
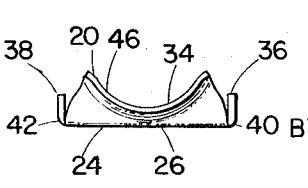


FIG. 7



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FIG. 8

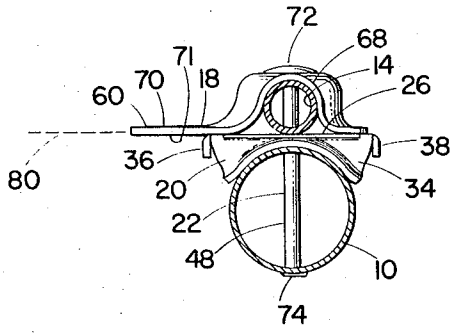


FIG. 9

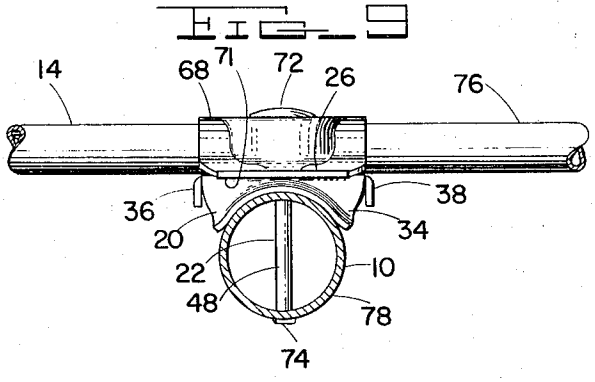


FIG. 10

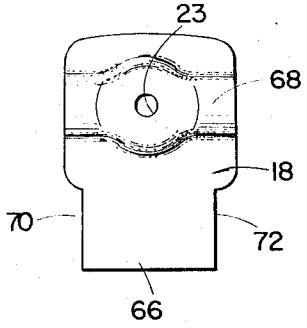
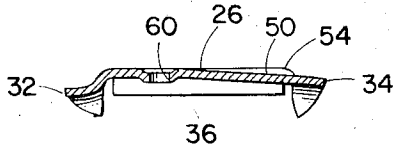


FIG. 11



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ANTENNA WITH ELEMENTS PIVOTALLY CONNECTED TO BOOM

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Filed Sept. 8, 1965, Ser. No. 485,707
6 Claims. (Cl. 343—882)

The present invention relates generally to an antenna structure of the type which comprises a boom and a plurality of elongated elements secured transversely to the boom, and more particularly, to a device for pivotally connecting the elements of the antenna to the boom and for selectively securing each element transversely of the boom and parallel to the other elements.

Heretofore, antennas such as conventional television and F.M. radio antennas have been provided with antenna elements which can be pivoted into a position generally parallel with the boom for shipping in boxes having a relatively small cross-sectional size. However, such antennas, before they are useful, must have the elements thereof positioned transversely of the boom. Further, it is highly desirable to have the elements perpendicular to the boom and parallel to each other. In this position, the elements must be secured to the boom in a manner such that the elements will remain perpendicular to the boom and parallel to each other during the use of the antenna. Storms having high winds tend to move the elements from this desired position, and therefore, it is desirable to provide a device whereby the elements can be pivotally connected to an antenna boom and securely locked into the desired position. Prior devices were designed such that when the element and the boom were connected together with sufficient force to hold them secure in the desired position, the pivoting of the elements and boom was only accomplished with difficulty and many times the elements were bent in trying to position them transversely of the boom. This difficulty in operation of prior devices was due to the fact that many times the device was bent from the forceful connection of the element to the boom in the manufacturing of the antenna or became engaged with an edge of the device which restricted the movement of the element as desired. It is therefore further desirable that a device for pivotally connecting a plurality of elements to the boom of an antenna be capable of clamping forcefully the elements and boom together, but still permit facile pivoting of the elements from a collapsed position to one in which the elements are transverse to the boom.

It is therefore the primary object of this invention to provide an improved device for pivotally connecting an element of an antenna to the boom whereby the element can be positioned generally parallel to the boom and moved when desired to a position generally perpendicular to the boom and secured in this last-mentioned position.

Another object of this invention is to provide an improved device for pivotally connecting an element of an antenna to an antenna boom which will not be deformed during the manufacture of the antenna so as to restrict the movement of the element into the desired position.

Still another object of this invention is to provide an improved device for pivotally connecting an antenna element to a boom which allows the elements to be pivotally rotated into a position transverse to the boom and wherein the element is locked in position and rigidly secured to the boom whereby high winds are incapable of moving the element from the locked position of the element.

A further object of this inventiton is to provide an improved device for pivotally connecting an antenna element to a boom which has a detent which is movable from a position corresponding to the alignment of the element with the boom to a position in which the detent is positioned in a detent-receiving indentation and the element is generally perpendicular to the boom with relative ease whereby the element can be secured to the element boom.

Still further an object of this invention is to provide an improved device for pivotally connecting an element to an antenna boom which is relatively strong such that no deformaiton of the device will occur during the connection of the element to the boom during the manufacturing of the antenna, and which is provided with a detent and a detent-receiving indentation and oppositely facing caming surfaces on both sides of the detent-receiving indentation, respectively, whereby the element can be moved from a position generally aligned with the boom to a position transverse of the boom with the detent positioned in the detent-receiving indentation thereby rigidly securing the element in the last-mentioned position to the boom.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of an antenna comprising an antenna boom, a mast supporting the boom in a generally horizontal position, and a plurality of elements secured to said boom in spaced apart and parallel relationship with each other and generally perpendicularly of the boom;

FIG. 2 is a fragmentary view of the antenna having the improved device of this invention mounted on the boom and securely and rigidly holding an element transversely of the boom;

FIG. 3 is a top view of the base portion of the improved fastening device of this invention;

FIG. 4 is a bottom view of the same base portion;

FIG. 5 is a side view of the same base portion showing the top surface of the base portion facing downwardly;

FIG. 6 is an end view of the same base portion showing the top surface facing downwardly and illustrating the indentation in the top surface;

FIG. 7 is an end view of said base portion opposite to that viewed in FIG. 6 and showing the top surface facing downwardly;

FIG. 8 is a view in cross-section of the boom illustrating the antenna element in its aligned position with the boom;

FIG. 9 is a fragmentary view, partially in cross-section, of the structure illustrated in FIG. 8 showing the antenna element moved into a position generally perpendicular to the antenna boom whereby the antenna element is locked into the position shown and rigidly and securely connected to the antenna boom;

FIG. 10 is a top view of the cap member which cooperates with the base portion in clamping the antenna element and boom together; and

FIG. 11 is a sectional view of the base member taken substantially along section line 11—11 of FIG. 3.

In the broader aspects of this invention, there is provided a device for pivotally connecting an antenna element to a boom comprising a base member having a flat plate portion with an upwardly facing flat surface, opposite and parallel longitudinal edges, and opposite end portions. Two strengthening and reinforcing flange portions are integrally joined to the plate portion adjacent the opposite edges, respectively, and extend between the end portions. The flange portions have oppositely and outwardly facing camming surfaces which join the upwardly facing plate surface at their longitudinal edges, and are rounded and smoothly merged with the plate surface whereby the camming surfaces and the upwardly facing surface of the

base member are continuous. The end portions extend transversely away from the plate portion and are mounted on the boom with the plate portion spaced from the boom. The upwardly facing surface of the plate portion has an indentation therein having oppositely facing and upstanding abutment surfaces which form a detent-receiving indentation.

Referring to the drawings, and more particularly to FIGS. 1 and 2, there is shown a conventional antenna boom **10** which is rigidly secured in a generally horizontal position to a conventional antenna mast **12**. Secured to the boom **10** in spaced apart positions, respectively, are a plurality of antenna elements **14**. Elements **14** are secured to the boom **10** at the midportions thereof and extend generally perpendicular to the boom parallel to each other. Each of the elements **14** are secured to boom **10** by means of the improved fastening device **16** of this invention which comprises a cap member **18** and a base member **20**. The specific embodiment illustrated has a rivet **22** which is used to fasten the element **14** to the boom **10**. Rivet **22** passes through an opening **23** in the cap member **18**, the element **14**, the base member **20** and the boom **10** and forcibly clamps the aforesaid members together between flattened end portions of the rivet **22** as will be hereinafter more specifically described.

Referring now to FIGS. 3 through 7, the improved base member **20** of the device of this invention will now be described. Base member **20** has a flat metal plate portion **24** of substantially rectangular shape with a flat surface **26** facing away from the boom **10** when the base member **20** is mounted thereon. Metal plate portion **24** has opposite and parallel longitudinal edges **28** and **30** and opposite and spaced apart end portions **32** and **34**. Two strengthening and reinforcing flange portions **36** and **38** are joined to plate portion **24** adjacent to the opposite longitudinal edges **28** and **30**, respectively, so as to extend generally perpendicularly away from plate portion **24** and toward boom **10** when the base member **20** is mounted thereon. Flange portions **36** and **38** extend between the opposite end portions **32** and **34** and have oppositely and outwardly facing camming surfaces **40** and **42**, respectively, joining the plate surfaces **26** at the longitudinal edges **28** and **30**. Camming surfaces **40**, **42** are rounded and smoothly merge with the surface **26** of the plate portion **24** thereby forming a continuous base portion surface extending between the respective flange portions **36** and **38**. End portions **32** and **34** generally extend perpendicularly away from the plate portion **24** in the same direction as the flange portions **36** and **38**, respectively, and toward the boom **10** when the base member **20** is mounted thereon. Each of the end portions **32** and **34** has a part cylindrical surface **44** and **46**, respectively, which is coaxially positioned on boom **10** when the base member **20** is mounted thereon. End portions **32** and **34** extend away from plate portion **24** a distance greater than the extension of the flange portions **36** and **38**; and therefore, the end portions **32** and **34** space the plate portion **24** from the boom **10** when the base member **20** is mounted on the boom **10**. Thus mounted on boom **10**, plate surface **26** is substantially parallel to the axis of boom **10**.

Plate surface **26** has an identation **50** therein defined by a flat bottom **52** and two oppositely facing and upstanding abutment surfaces **54** and **56**, respectively. Abutment surfaces **54** and **56** are generally parallel to each other and generally perpendicular to the plate surface **26**. Further, abutment surfaces **54** and **56** extend from the central portion defined by the line **58** of FIGS. 3 and 4 to a position adjacent end portion **32**. Bottom **52** of the indentation **50** slopes gradually downwardly toward the boom **10** when the base member **20** is mounted thereon from the line **58** toward end poriton **32**. This sloping of the bottom **52** provides that the abutment surfaces **54** and **56** gradually increase in height in the direction from the line **58** toward end portion **32** such that the abutment surfaces **54** and **56** have their greatest depth adjacent to the end portion **32**. Positioned adjacent to end portion **34** in plate portion **24** is an opening **60** through which rivet **22** passes to mount base member **20** onto boom **10**, as aforementioned. Positioned on opposite sides of opening **60** are two raised knobs **62** and **64** which are conventionally provided to aid in the securance of the element **14**, as will be hereinafter mentioned .

The reinforcement and stiffening of the member **24** by the flanges **36** and **38** is sufficient to prevent the member **24** from bowing under the clamping force of the rivet **22**. If such bowing did occur, it is obvious that the clamping force would be relieved and thereby reduce the force which otherwise would hold the assembly in a selected position. If the force is too weak, obviously the tongue portion **66** will not be retained in the indentation **50** nor will the element be held securely enough onto the boom **10**.

In a specific embodiment of this invention, the base member **20** is manufactured of aluminum sheet which is one-sixteenth inch thick. Plate portion **24** measures approximately one and one-quarter inches by one and one-quarter inches and has attached, as aforementioned, two flange portions **36** and **38** which depend from the plate portion **24** a distance of three-sixteenths of an inch. End portions **32** and **34**, however, depend from the plate portion **24** a distance of approximately five-sixteenths of an inch. The surfaces **44** and **46** of the end portions **32** and **34**, respectively, at their closest point to the plate portion **24**, extend two-sixteenths of an inch below the plate portion **24**. Thus, when the base member **20** is mounted on the boom **10**, the plate portion **24** is at least two-sixteenths of an inch away from the exterior surface of the boom **10**; however, due to the cylindrical shape of the boom **10**, the flange portions **36** and **38** are spaced farther apart from the boom **10**. Surfaces **44** and **46** are radiused substantially identically with the boom **10**. The indentation **50** of the base member **20** measures approximately one inch transversely of the base member **20** and one half inch measured from the line **58** to the position at which the abutment surfaces **54** and **56** terminate adjacent to end **32**.

As illustrated, base member **20** is integrally formed of material having a constant thickness. In a specific construction, base member **20** has been made of aluminum sheet; however, any sheet metal or other material having suitable strength and other physical properties would be equally satisfactory, keeping in mind that the devices **16** of this invention are exposed to the weather and therefore are preferably corrosion resistant.

In operation, the base member **20** of the device **16** of this invention is mounted on boom **10**, as shown in FIG. 2, with a cap member **18** positioned on surface **26**. Cap member **18** has a resilient tongue portion **66** and a cylindrical portion **68**. The cylindrical portion is dimensioned and shaped so as to fit intimately over element **14**. Tongue portion **66** is resilient and extends away from the cylindrical portion **68** generally perpendicularly, and further, is rectangular in shape and of the same dimensions substantially as the indentation **50** for reasons that will become obvious hereinafter. Tongue portion **66** has oppositely facing edges **70** and **72** and has a flat, downwardly facing surface **71** resting upon surface **26** of the plate portion **24**.

Referring now to FIGS. 2, 8 and 9, there is shown an element **14** secured to the boom **10** by the fastening device **16** of this invention. Intimately fitted into the cylindrical portion **68** of cap member **18** is a tubular element **14**. Cap member **18** is positioned intermediate the ends of element **14** and with the element **14** held between the cap member **18** and the base member **20**. Cap member **18** is also in contact with surface **26** of the base member **20** and is secured thereto by pin or rivet **22** which passes through the cylindrical portion **68** of the cap **18** and the opening **60** of the base member **20**. Pin

22 also passes through the element 14 and the boom 10, and forcibly clamps the cap member 18, the base member 20, the element 14 and the boom 10 between enlarged end portions 72 and 74, shown in FIGS. 8 and 9. Thus secured together, the element 14 and the cap member 18 are incapable of movement with respect to each other and form a first pivotal unit 76; and similarly, the base member 20 and the boom 10 are incapable of movement with respect to each other and form a second pivotal unit 78. Pivotal units 76 and 78 are movable with respect to each other from a first position, illustrated in FIG. 8, in which the tongue portion 66 extends transversely of the boom 10 and the element 14 is generally parallel to the axis 48 of boom 10, to a second position, illustrated in FIGS. 2 and 9, in which the element 14 is substantially perpendicular to the boom 10 and the tongue portion 66 is positioned in the indentation 50 of the base portion 20 with the tongue edges 70 and 72 engaged with the abutment surfaces 54 and 56. Thus, it can be seen that tongue 66 in the indentation 50 forms a detent device for holding the element 14 in the second position above-mentioned.

Since all of the base members 20 are secured to the boom 10 in spaced apart relationship in an identical manner, each element 14 of the antenna will be substantially perpendicular to the boom and parallel to each other when the tongue portions 66 thereof are positioned within the respective indentations 50. Further, since the cylindrical portions 68 of cap members 18 intimately fit the respective elements 14 and the cylindrical surfaces of base members 20 are coaxially positioned on the boom 10, each element 14 is rigidly secured in the aforementioned position by engagement of the tongue member 66 with the respective indentation 50.

In moving the pivotal unit 76 from the position shown in FIG. 8 to the position shown in FIG. 9, the camming surfaces 40 and 42 of flange portions 36 and 38 function to allow the cap member 18 to rotate relative to the base member 20 with relative ease. As can be seen from FIG. 8, when the cap member 18 is positioned in the first position above-mentioned with tongue member 66 extending transversely of the boom 10, a portion of the tongue member 66 depends beneath the plane of the surface 26 of the base member 20 (indicated by the dotted line 80). Thus, the tongue portion 66 of cap member 18 must be lifted onto the surface 26 of the base member 20 when the cap member 18 is rotated from the first position, shown in FIG. 8, to the second position, shown in FIG. 9. This is the function of the camming surfaces 40 and 42 of the flange portions 36 and 38. During the rotation above-mentioned, one of the edges 70, 72 of the tongue portion 66 engages one of the rounded camming surfaces 40 and 42 and is lifted onto surface 26 of the base member 20 and into the indentation 50. Further, with the cap member 18 in the first position above-mentioned, as illustrated in FIG. 8, element 14 is positioned between knobs 62 and 64 formed in the surface 26; and thus, when the element 14 is moved into the second position, illustrated in FIG. 9, the element 14 is lifted from the surface 26 and onto the knobs 62 and 64 thereby urging the cap member 18 and the base member 20 apart and aiding in the securance of the element 14 to the cap member 18 and the base member 20 to the boom 10, respectively.

The improved device for pivotally connecting each of the elements 14 of the antenna to the antenna boom 10 of this invention thus provides that the elements 14 can be positioned in a generally parallel position to the axis of the boom 10 and moved when desired into a position generally perpendicular to the boom. In this latter position, the elements 14 are rigidly secured to the boom and locked into position by the detent device comprising the indentation 50 and the tongue portion 66 above-mentioned. Further, each of the elements 14 are generally parallel to each other in the last-mentioned position since each of the base members 20 and cap members 18 are substantially identical and can only fit boom 10 and the element 14, respectively, in the position illustrated in the drawings. Further, the base 20 is strengthened by flanges 36 and 38 such that the surface 26 does not become bowed when the element 14, the cap 18, the base 20 and the boom 10 are connected together during the manufacture of the antenna or when the element 14 is rotated into operating position during which the clamping force is increased by the action of the knobs 62 and 64, as aforementioned. Thus, the tongue portion 70 fits the indentation 50 as intended and the element 14 is rigidly secured to the boom 10, as intended, and will not become loosened because of the bowing of the base member 20. Still further, the rotation of the element 14 with respect to the boom 10 is made easier by means of the camming surfaces 40 and 42 of the flanges 36 and 38 as aforementioned. This provides that rotation of element 14 into the locked position, in which element 14 is substantially perpendicular to the boom 10, can be achieved relatively easily and without bending of boom 10 or element 14.

While there have been described above the principles of this invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of this invention.

What is claimed is:

1. For use in an antenna comprising an elongated and cylindrical boom and a plurality of elongated antenna elements, a plurality of devices pivotally connecting each of said elements to said boom, respectively, each of said devices including a base member mounted on said boom and a cap member positioned on and pivotally connected to said base member, said base member having a flat metal plate portion of substantially rectangular shape; said plate portion having a flat surface facing away from said boom, opposite and parallel longitudinal edges and opposite end portions, two strengthening and reinforcing flange portions integrally joined to said plate portion adjacent to said opposite edges, respectively, and extending generally perpendicularly away from said plate portion toward said boom; said flange portions extending between said end portions and having oppositely and outwardly facing rounded camming surfaces, respectively joining and smoothly merging into said plate surface at said longitudinal edges, said end portions extending generally perpendicularly away from said plate portion toward said boom and beyond said flange portions, each of said end portions having a part cylindrical surface coaxially positioned on said boom and spaced from said plate portion, thereby spacing said plate portion from said boom, said plate surface being substantially parallel to the axis of said boom and having an indentation therein defined by a flat bottom and oppositely facing and upstanding abutment surfaces, said abutment surfaces being generally perpendicular to said plate surface and extending from the central portion of said plate portion to one of said end portions, said bottom sloping toward said boom and said one end portion, whereby said abutment surfaces gradually increase in depth in the direction from the center of said plate portion to said one end portion, said abutment surfaces having the greatest depth dimension adjacent to said one end portion, said cap member including a part-cylindrical portion which fits intimately over said antenna element and a resilient tongue portion extending in a direction normal to the axis of said part-cylindrical portion, said tongue portion being flat and rectangular in shape, said tongue portion further being of a size and shape as to fit intimately said indentation in said base member, said cap member and said element as a unit being superposed onto the plate surface of said base member, a pivot pin extending through said cap member, said element, said base member and said boom and forcefully clamping the same together, said flanges

on said base member being of such size and strength that said plate portion is not bowed toward said boom by the clamping force of said pivot pin, said cap member and antenna element being rotatable from a first position in which said element is generally parallel to said boom and said tongue portion extends transversely of said boom and one of said camming surfaces to a second position in which said antenna element is substantially perpendicular to said boom and said tongue portion is positioned in said indentation with the tongue edges engaged with said abutment surfaces, respectively, whereby said tongue portion and said indentation form a detent device for holding said cap member and said base member against rotation, said tongue portion being disposed beneath said plate surface when said cap member is in said first position whereby one of said tongue portion edges engages one of said camming surfaces of said base member and lifts said tongue portion onto said plate surface during the rotation of said cap member from said first position to said second position.

2. For use in an antenna, an elongated and cylindrical boom and a plurality of elongated antenna elements, a plurality of devices pivotally connecting each of said elements to said boom, respectively, each of said devices including a base member mounted on said boom and a cap member positioned on and pivotally connected to said base member, said base member having a flat metal plate portion with a flat surface which faces away from said boom, said plate portion having opposite longitudinal edges and opposite end portions, two strengthening and reinforcing flange portions integrally joined to said plate portion adjacent to said opposite edges, respectively, and extending generally perpendicularly away from said plate portion toward said boom, said flange portions having oppositely and outwardly facing caming surfaces, respectively, joining said plate surface at said longitudinal edges, said camming surfaces being rounded and smoothly merging with said flat surface and said flanges whereby said camming surfaces and said plate surface are continuous, said end portions extending generally perpendicularly away from said plate portion toward said boom, each of said end portions having a part-cylindrical surface positioned on said boom and spaced from said plate portion, thereby spacing said plate portion from said boom, said plate portion having an indentation therein defined by oppositely facing and upstanding abutment surfaces, said cap member including a part-cylindrical portion which fits intimately over said antenna element and a resilient tongue portion extending in a direction normal to the axis of said part-cylindrical portion, said tongue portion being flat and rectangular in shape, said tongue portion further being of a size and shape as to fit intimately said indentation in said base member, said cap member and said element as a unit being superposed onto the plate surface of said base member, a pivot pin extending through said cap member, said element, said base member and said boom and forcefully clamping the same together, said flanges on said base member being of such size and strength that said plate portion is not bowed toward said boom by the clamping force of said pivot pin, said cap member and element being movable from a first position in which said element is generally parallel to said boom and said tongue portion of said cap member extends transversely of said boom to a second position in which said element is substantially perpendicular to said boom and said tongue portion is positioned in said indentation with said tongue edges engaged with said abutment surfaces, whereby said tongue and indentation form a detent device for holding said first and second pivotal units against rotation, said tongue portion being disposed beneath said plate surface when said cap member is in said first position whereby one of said tongue portion edges engages one of said camming surfaces of said base member and lifts said tongue portion onto said plate surface during the rotation of said cap member from said first position to said second position.

3. For use in an antenna, a base member having a flat metal plate portion of substantially rectangular shape provided with a flat surface, said plate portion having opposite and parallel longitudinal edges and opposite end portions, two strengthening and reinforcing flange portions integrally joined to said plate portion adjacent to said opposite edges, respectively, and extending generally perpendicularly away from said plate portion in one direction, said flange portions extending between said end portions and having oppositely and outwardly facing camming surfaces, respectively, joining said plate surface at said longitudinal edges, said camming surfaces being rounded and smoothly merging with said flat surface and said flanges whereby said camming surfaces and said plate surface are continuous, said end portions extending generally perpendicularly away from said plate portions in said one direction and beyond said flange portions, each of said end portions having a part-cylindrical surface spaced from said plate portion, said plate surface having an indentation therein defined by a flat bottom and oppositely facing and upstanding abutment surfaces, said abutment surfaces being generally perpendicular to said plate surface and extending from the central portion of said plate portion to one of said end portions, said bottom sloping downwardly toward said one end portion, whereby said abutment surfaces gradually increase in depth in the direction from the center of said plate portion to said one end portion, said abutment surfaces having the greatest depth dimension adjacent to said one end portion.

4. For use in an antenna, a base member having a flat metal plate portion with a flat surface, said plate portion having opposite longitudinal edges and opposite end portions, two strengthening and reinforcing flange portions integrally joined to said plate portion adjacent to said opposite edges, respectively, and extending perpendicularly away from said plate portion in one direction, said flange portions having oppositely and outwardly facing camming surfaces, respectively, joining said plate surface at said longitudinal edges, said camming surfaces being rounded and smoothly merging with said flat surface and said flanges whereby said camming surfaces and said plate surface are continuous, said end portions extending generally perpendicularly away from said plate portions in said one direction, each of said end portions having a part-cylindrical surface spaced from said plate portion, said plate portion having an indentation therein defined by oppositely facing and upstanding abutment surfaces.

5. For use in an antenna, a structure comprising a base member and a cap member positioned on and pivotally connected to said base member, said base member having a flat metal plate portion of substantially rectangular shape with a flat surface, said plate portion having opposite and parallel longitudinal edges and opposite end portions, two strengthening and reinforcing flange portions integrally joined to said plate portion adjacent to said opposite edges, respectively, and extending generally perpendicularly away from said plate portion and said cap member, said flange portions extending between said end portions and having oppositely and outwardly facing camming surfaces, respectively, joining said plate surface at said longitudinal edges, said camming surfaces being rounded and smoothly merging with said flat surface and said flanges whereby said camming surfaces and said plate surface are continuous, said end portions extending generally perpendicularly away from said plate portion in the same direction and beyond said flange portions, each of said end portions having a part-cylindrical surface spaced from said plate portion, said plate surface being substantially parallel to the axis of said part-cylindrical surfaces and having an indentation therein defined by a flat bottom and oppositely facing and upstanding abut-

ment surfaces, said abutment surfaces being generally perpendicular to said plate surface and extending from the central portion of said plate portion to one of said end portions, said bottom sloping away from said cap and toward said one end portion, whereby said abutment surfaces gradually increase in depth in the direction from the center of said plate portion to said one end portion, said abutment surfaces having the greatest depth dimension adjacent to said one end portion, and pin means extending through said cap member and base member for forcefully clamping said cap member and base member together and for pivotally connecting said cap member to said base member, said cap member having a resilient tongue portion, said tongue portion being rectangular in shape and having oppositely facing edges, said cap member being movable from a first position in which said tongue portion extends transversely of said base member to a second position in which said tongue portion is positioned in said indentation with said tongue edges engaged with said abutment surfaces, whereby said tongue portion and indentation form a detent device for holding said cap member and base member against rotation, said tongue portion being disposed beneath said plate surface when said cap member is in said first position whereby one of said tongue portion edges engages one of said camming surfaces of said base member and lifts said tongue portion onto said plate surface during the rotation of said cap member from said first position to said second position.

6. For use in an antenna, a base member and a cap member positioned on and pivotally connected to said base member, said base member having a flat metal plate portion with a flat surface which faces toward said cap member, said plate portion having opposite longitudinal edges and opposite end portions, two strengthening and reinforcing flange portions integrally joined to said plate portion adjacent to said opposite edges, respectively, and extending generally perpendicularly away from said plate portion and said cap member, said flange portions having oppositely and outwardly facing camming surfaces, respectively, joining said plate surface at said longitudinal edges, said camming surfaces being rounded and smoothly merging with said flat surface and said flanges whereby said camming surfaces and said plate surface are continuous, said end portions extending generally perpendicularly away from said plate portion in the same direction and beyond said flange portions, each of said end portions having a part-cylindrical surface spaced from said plate portion, said plate portion having an indentation therein defined by oppositely facing and upstanding abutment surfaces, and pin means extending through said cap member and base member for forcefully clamping said cap member, and said base member together and for pivotally connecting said cap member to said base member, said cap member having a resilient tongue portion, said tongue portion having oppositely facing edges, said cap member being movable from a first position in which said tongue portion of said cap member extends transversely of said base member to a second position in which said tongue portion is positioned in said indentation with said tongue edges engaged with said abutment surfaces, whereby said tongue and indentation form a detent device for holding said first and second pivotal units against rotation, said tongue portion being disposed beneath said plate surface when said cap member is in said first position whereby one of said tongue portion edges engages one of said camming surfaces of said base member and lifts said tongue portion onto said plate surface during the rotation of said cap member from said first position to said second position.

No references cited.

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