Oct. 11, 1966 G. L. KOLB 3,278,212

FOLDABLE ANTENNA HINGE BRACKET

Filed Nov. 14, 1962

Fig. 1

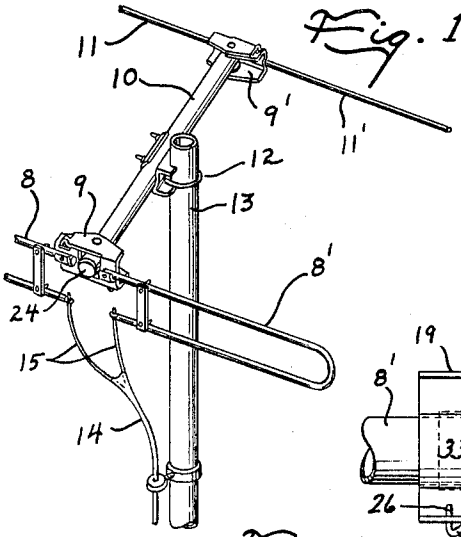


Fig. 6

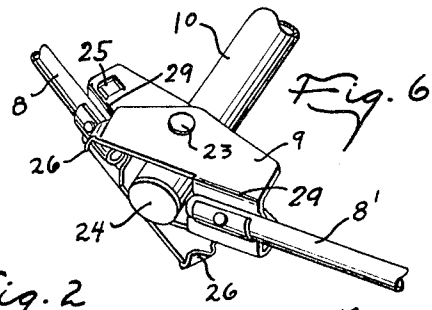


Fig. 2

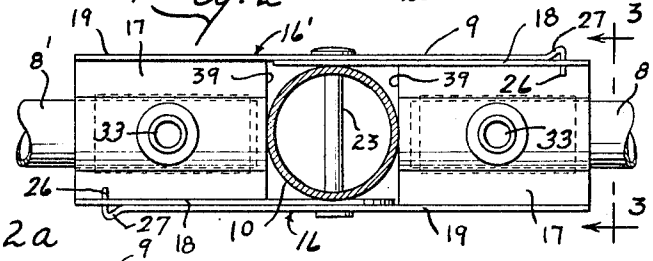


Fig. 2a

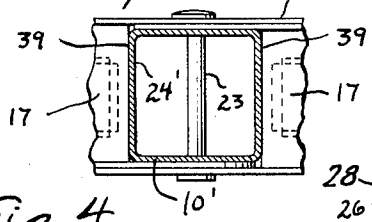


Fig. 5

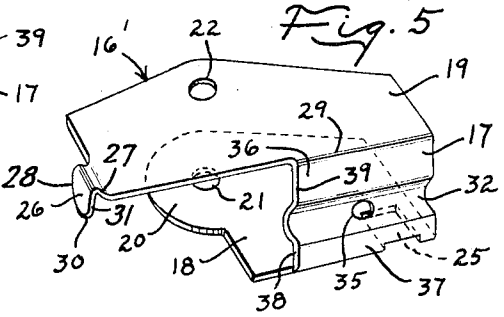


Fig. 4

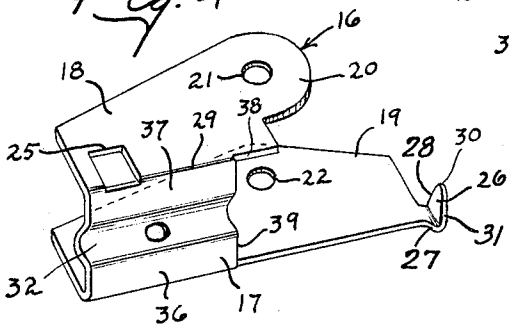


Fig. 7

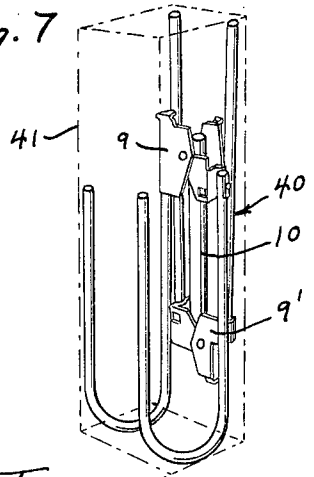
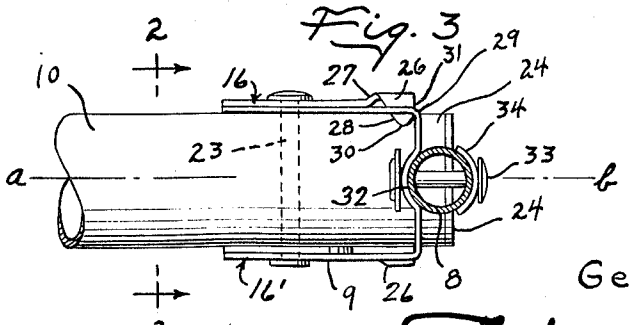


Fig. 3



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FOLDABLE ANTENNA HINGE BRACKET

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13 Claims. (Cl. 287—99)

This invention relates to the art of television antennas and is more particularly concerned with those that it is desired to pack and ship in folded or knocked-down form for savings both in space and transportation charges.

The principal object of my invention is to provide a simple and economical self-latching two-piece hinge bracket construction for hingedly mounting the two halves of any antenna requiring straight element construction, as, for example, high and low band dipole antennas, in which both the dipole and reflector come folded into parallelism with the beam and the elements are adapted to be unfolded into aligned coextensive relationship on opposite sides of and in right angle relationship to the beam and on the center thereof, the novel construction of the two-piece hinges providing for the snapping into holes of latching teeth or tabs on the two pieces when they come into exact alignment and firm abutment against opposite sides of the beam and in exact and rigid right angle relationship thereto, locked so securely that even a heavy bird coming to rest on the outer end of either of the hinged parts cannot cause any unlatching and disarray thereof. Only a single rivet is required for pivotal mounting of the hinged parts on the beam, and the two parts of each hinge assembly are alike and interchangeable, thereby making for economy of production.

The invention is illustrated in the accompanying drawing, in which:

FIG. 1 is a perspective of a single bay dipole television antenna, showing the halves of both the dipole and the reflector hingedly interconnected and securely interlocked in accordance with my invention;

FIG. 2 is a rear view of the dipole hinge joint taken on line 2—2 of FIG. 3;

FIG. 2*a* is a fragmentary view along the lines of FIG. 2, showing a square beam in lieu of the round one shown in FIG. 2;

FIG. 3 is a side view taken on the line 3—3 of FIG. 2;

FIGS. 4 and 5 are perspective views of two interchangeable bracket parts used together in the manner of FIGS. 1, 2 and 3 to form a hinge joint;

FIG. 6 is a perspective view illustrating a hinge joint just prior to interlocking of the parts in firm abutment against opposite sides of the beam, and

FIG. 7 is a perspective view of a folded antenna, indicating in phantom the carton to contain it in storage and shipment.

The same reference numerals are applied to corresponding parts throughout the views.

Referring to the drawing, FIG. 1 shows a single bay high-low band dipole television antenna in which the two elements 8 and 8′ of the dipole are hingedly interconnected and interlocked by an improved hinge bracket made in accordance with my invention and indicated generally by the reference numeral 9 provided on one end of the horizontal beam 10, and in which the two elements 11 and 11′ of the reflector are similarly mounted on the other end of the beam by means of another hinge bracket made in accordance with my invention and indicated generally by the reference numeral 9′. Inasmuch as the hinge brackets 9 and 9′ are alike, a description of one, as given hereinafter, will suffice for both. The horizontal beam 10 is clamped, as indicated at 12, on the vertical mast 13 in the usual way, and the lead-in line 14 has one

lead 15 connected to each of the elements 8 and 8′ of the dipole and where two antennas are used together in a double bay setup, one for the high band and the other for the low band, it is common practice to mount them on the mast 13 with the smaller one at the upper level for the high band and the larger one at the lower level for the low band, turning the two in angular relationship to one another in the direction of the television transmitters, the two antennas being electrically connected in parallel with a single lead-in line 14.

Each hinge bracket 9 (or 9′) is made up of two identical and interchangeable stamped sheet metal bracket parts 16 and 16′, each generally U-shaped in cross-section, with a cross or web portion 17 connecting and integral with opposed parallel side walls 18 and 19, the side wall 18 being of approximately half the length of the hinge bracket like the web 17, and the side wall 19 being of full length, the side wall 18 including an inward ear extension 20 with a circular hole 21 therein in register with a circular hole 22 provided in the middle of the other side wall 19 to accommodate the hinge pin 23 by means of which the two parts 16 and 16′ of each hinge bracket are hingedly mounted on the beam 10 near the outer end 24 thereof. The pin 23 has a head on one end and the other end is upset after entry through the parts assembled on the beam. A rectangular hole 25 is punched in the outer end of each side wall 18 next to the web 17, and a right triangular tooth or tab 26 is provided on the remote end of the other side wall 19, the tooth 26 on part 16 entering the hole 25 in part 16′, and tooth 26 on part 16′ entering the hole 25 in part 16 when the two parts are disposed in assembled co-extensive relationship, these teeth by reason of the springiness of the special aluminum alloy used in the parts 16 and 16′ being arranged to snap into place when the teeth 26 come into register with the holes 25. To make for easier operation the teeth 26, although disposed at right angles to the walls 19 are on the outer ends of short extensions 27 bent outwardly out of the plane of the walls 19 to reduce the extent to which the teeth 26 project inwardly from the plane of the side walls 19, as best illustrated in FIG. 3, and the back edge 28 of each tooth is inclined as the hypotenuse of the right triangle so as to serve as a cam surface as the two parts 16 and 16′ approach co-extensive relationship these cam surfaces 28 then riding up on the rounded corners 29, as should be evident from a study of FIG. 6, to spring the walls 19 outwardly until the rounded tip portion 30 of the teeth 26 can ride down into the holes 25, whereupon the vertical front edges 31 of the teeth engage the inner side of the webs 17 with a wedging fit, the entry of the teeth 26 in the holes 25 being with a snap action that is clearly audible as the parts go together with a click. Once the teeth 26 have snapped into place in the holes 25 with their vertical edges 31 in abutment behind and parallel to the webs 17 there is no danger of the parts 16 and 16′ becoming disarranged regardless of any heavy and sudden wind pressure on the antenna during a storm and regardless of a heavy bird coming to rest on the outer end of either of the antenna or reflector elements supported on the hinge bracket 9 or 9′.

The webs 17 have longitudinally extending arcuate depressions 32 formed therein to accommodate the inner end portions of the dipole or reflector elements and hold the same against turning even though only a single rivet 33 and curved clamp strip 34 are used, the hole 35 at the middle of the depression 32 being provided for the entry of the rivet. The depression 32 is offset from the longitudinal center line of the web 17 slightly toward the wall 18, as indicated by the slightly greater width of the flat portion 36 on one side of said depression in rela-

tion to the width of the flat portion **37** on the other side, this being done in order to compensate for the thickness of the metal of the parts **16** and **16'** in their overlapping interfitting assembled relationship with wall **19** of one part **16'** overlying wall **18** of the other part **16** and wall **19** of part **16** underlying wall **18** of the other part **16'** and thereby insure exact alignment of the depressions **32** lengthwise of the hinge bracket on the center of the beam **10** and accordingly obtain exact endwise alignment of the elements **8** and **8'** of the dipole or the elements **11** and **11'** of the reflector with the center of the beam **10**.

The web **17** is cut away at the inner end, as indicated at **38**, on both parts **16** and **16'** on opposite sides of the hinge pin **23** just enough to accommodate with a close fit the outer end **24** of the round beam **10**, as seen in FIG. 2, or the outer end **24'** of the square beam **10'**, as seen in FIG. 2*a*, thereby insuring exact right angle relationship of the dipole **8–8'** with respect to one end of the beam and the same exact right angle relationship of the reflector **11–11'** with respect to the other end of the beam, and accordingly insuring exact parallelism of the dipole with the reflector for best all around performance of the antenna. In other words, I obtain a three-point lock for the dipole elements **8–8'** by virtue of the single hinge pin **23** at the middle of the hinge bracket and the two snap latching teeth **26** entered in holes **25** at the opposite ends of the hinge bracket to obtain the desired rigidity of the hinge bracket, and in addition I have insured exact right angle relationship of the hinge bracket with respect to the beam **10** or **10'** by virtue of the firm engagement of the parallel inner edges **39** of webs **17** on diametrically opposite sides of the end portion **24** of beam **10** or end portion **24'** of beam **10'**.

In operation, the folded antenna indicated generally by the reference numeral **40** in FIG. 7 can be packed nicely in a small carton, as indicated in phantom at **41**, thus saving space and shipping expense. When the antenna is about to be installed, the operator unfolds the dipole and reflector elements and snaps them into place, being careful in so doing to apply whatever pressure is necessary only on the hinge bracket parts **16** and **16'** so as to avoid bending or damaging the dipole or reflector elements. Once the hinge bracket parts are snapped into place the dipole and reflector are both in right angle relationship to the beam **10** or **10'** and in exact parallelism, and there is exact alignment of the elements **8–8'** of the dipole with one another and with the center line of the beam **10** or **10'**, as indicated at *a–b* in FIG. 3, the same kind of exact alignment being, of course, obtained at the other end of the beam with elements **11–11'** of the reflector. Although the spring latching action described makes the setting up operations easy, it is clear that once the parts have assumed the rigid locked position and right angle relationship with respect to the beam there is no danger whatever of sudden and heavy wind pressure or the alighting of heavy birds on the outer end of either of the elements of the dipole or reflector causing unlocking and consequent disarrangement of the parts.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. In a foldable antenna structure, a beam, a pair of opposed, interfitting, channel-shaped hinge bracket parts receiving one end portion of said beam in the channels thereof and pivotally mounted on said beam by means of a single pin extending diametrically through said beam to swing from opposite sides of the beam toward coextensive relationship to one another and having web portions the inner end of which are arranged to engage the opposite sides of said beam to limit the swinging movement when the bracket parts are in coextensive relationship to one another and in right angle relationship to the beam, means locking said bracket parts in that relationship to one another and to said beam, and a pair of elongated antenna elements having inner end portions rigidly secured to the web portions of said hinge bracket parts, respectively, so that when said bracket parts are disposed in abutment with the opposite sides of said beam and in right angle relationship thereto to form together a supporting bracket the antenna elements are in endwise alignment with one another.

2. An antenna structure as set forth in claim **1** wherein the pair of hinge bracket parts are alike and interchangeable and are interfitted and have pivot holes provided therein which are placed in register to accommodate a single hinge pin for pivotally mounting said bracket parts on said beam.

3. An antenna structure as set forth in claim **2** wherein the locking means comprises holes provided in one portion of the respective bracket parts in spaced relation to said pivot holes and latch projections on another portion of the respective bracket parts in similarly spaced relation to said pivot holes and which when the bracket parts are swung into operative position at right angles to and engaging opposite sides of said beam enter said holes to lock said parts in that position.

4. A latchable hinge structure comprising a pair of interfittable generally U-shaped members each having a web portion interconnecting opposed parallel and relatively springable side walls, one of which side walls is relatively short and approximately the same length as the web portion and the other relatively long and extending beyond the inner end of the first side wall, the two members being disposed in reversed relation to one another end for end so that the web portions can assume aligned relation and with the short side wall of the first member overlapping the long side wall of the second member and with the long side wall of the first member overlapping the short side wall of the second member, the two members being pivotally connected on an axis at right angles to the inner end portions of the short side walls of said members, there being a latch opening provided in the outer end portion of one side wall of each member, and there being a latching projection provided on the other side wall of each member, and arranged to engage detachably in said latch openings when said members are disposed in coextensive relation whereby to secure a double locking action when said members are swung from angular relationship to one another to coextensive relationship.

5. A latchable hinge structure as set forth in claim **4** wherein said U-shaped members are identical and interchangeable.

6. A latchable hinge structure as set forth in claim **4** wherein the latching projections are of right triangular form, the inclined hypotenuse edge of each serving as a cam surface to deflect outwardly the side wall carrying the same in the riding of the projection over the side wall of the other member toward engagement in the latching opening, the other side edge of the projection being substantially in right angle relation to the side wall carrying said projection.

7. A latchable hinge structure as set forth in claim **4** wherein the latching projections are of right triangular form, the inclined hypotenuse edge of each serving as a cam surface to deflect outwardly the side wall carrying the same in the riding of the projection over the side wall of the other member toward engagement in the latching opening, the other side edge of the projection being substantially in right angle relation to the side wall carrying said projection, the inner ends of the web portions of said members being cut away to define an opening therebetween of a predetermined size when the web portions are disposed in aligned relation and the two members are interlocked whereby closely to accommodate a part on which the members are pivoted and to which the members are to be locked in rigid relationship.

8. As an article of manufacture, a stamped sheet material hinge bracket part that is generally U-shaped having a web portion interconnecting opposed parallel side walls, one side wall being short in relation to the other but extending inwardly relative to the inner end of the web and having a pivot opening provided in its inner end remote from the web, the other side wall extending inwardly well beyond the inner end of the first side wall and having a registering pivot opening provided therein, the short side wall having a latch receiving opening provided therein in the diagonally opposite corner thereof from said pivot opening, and the long wall having a latch projection provided thereon remote from said latch receiving opening on the corner diagonally from the pivot opening in that side wall, the latch receiving opening and the latch projection being both approximately at the same radial distance from the pivot opening whereby two identical articles of the kind described can be interfitted in reversed end for end relation and rigidly interlocked in pivoted relationship to one another.

9. An article of manufacture as set forth in claim 8 wherein the web has a longitudinally extending depression defined therein parallel to and approximately midway between said side walls.

10. An article of manufacture as set forth in claim 8 wherein the web has a longitudinally extending depression defined therein parallel to and approximately midway between said side walls, said depression being offset from the longitudinally center line of the web only to the extent of the thickness of the sheet material used in the stamping, whereby when two such identical articles are interfitted in reversed end for end relation and rigidly interlocked in pivoted relationship to one another the depressions are in endwise alignment with one another.

11. A latchable hinge structure comprising a pair of interfittable generally U-shaped members each having a web portion interconnecting opposed parallel and relatively springable side walls, one of which side walls is relatively short and approximately the same length as the web portion and the other relatively long and extending beyond the inner end of the first side wall, the two members being disposed in reversed relation to one another end for end so that the web portions can assume aligned relation and with the short side wall of the first member overlapping the long side wall of the second member and with the long side wall of the first member overlapping the short side wall of the second member, the two members being pivotally connected on an axis at right angles to the inner end portions of the short side walls of said members, there being a latch opening provided in the outer end portion of one side wall of one of said members, and there being a latching projection provided on the overlapping side wall of the other of said members and arranged to engage detachably in said latch opening when said members are disposed in coextensive relation, whereby to secure a locking action when said members are swung from angular relationship to one another to coextensive relationship.

12. A latchable hinge structure as set forth in claim 11, wherein the latching projection is of right triangular form, the inclined hypotenuse edge thereof serving as a cam surface to deflect outwardly the side wall carrying the same in the riding of the projection over the side wall of the other member toward engagement in the latching opening, the other side edge of the projection being substantially in right angles relationship to the side wall carrying said projection.

13. A latchable hinge structure as set forth in claim 11, wherein the latching projection is of right triangular form, the inclined hypotenuse edge thereof serving as a cam surface to deflect outwardly the side wall carrying the same in the riding of the projection over the side wall of the other member toward engagement in the latching opening, the other side edge of the projection being substantially in right angle relationship to the side wall carrying said projection, the inner ends of the web portions of said members being cut away to define an opening therebetween of a predetermined size when the web portions are disposed in aligned relation and the two members are interlocked whereby closely to accommodate a part on which the members are pivoted and to which the members are to be locked in rigid relationship.

References Cited by the Examiner

UNITED STATES PATENTS

2,465,331	3/1949	Resnick	343—818 X
2,926,350	2/1960	Saul	343—915 X
2,932,028	4/1960	Saul	343—915 X
3,083,044	3/1963	Klancnik	287—99

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