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Antenna mount with fine adjustment cam
Antennenbefestigung mit Stelllexzenter zur Feinjustage
Monture d'antenne avec came d'ajustement fin

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Description

BACKGROUND

[0001] For optimal performance, a directional antenna such as a reflector antenna must be closely aligned with a target signal source. Alignment of a reflector antenna is typically performed via an adjustable antenna mount that, with respect to a fixed mounting point, is adjustable in azimuth and elevation to orient the antenna towards the target.

[0002] Antenna mount coarse adjustment may be cost effectively incorporated into an antenna mount via a movable connection coupled to a fixed point, for example via one or more slot(s) and or a pivot point and a slot along which the pivot angle of the movable connection may be fixed by tightening one or more bolt(s) or the like. Fine adjustments are difficult to make in these arrangements because the targeting resolution along the slot(s) is very low due to the free movement of the movable connection until the bolt(s) are tightened. Further, the selected rough adjustment tends to move slightly as the bolt(s) are finally tightened.

[0003] JP 58-170 102 discloses a reflector antenna mount with separate fixed and vertically adjustable connections to a mounting pole. The selected distance between the fixed and vertically adjustable connections sets the elevation angle of the antenna. Because the direct connection of the vertically adjustable connection to the mounting pole, coarse elevation alignment is subject to significant free movement until and during final tightening. A limited range of higher resolution elevation adjustment is available via an eccentrically mounted cam positioned in a slot of a connecting arm of the vertically adjustable connection. Azimuth alignment requires loosening both connections to the mounting pole.

[0004] Where multiple feeds are applied to a single reflector to simultaneously receive closely spaced beams from different satellites, precision alignment is critical to achieve acceptable signal performance with respect to each of the satellites. High resolution adjustment capability may also be used for a single feed reflector and or terrestrial applications where precision alignment is desired.

[0005] The adjustable antenna mount must be designed to support the entire antenna mass and also withstand any expected environmental factors such as wind shear and or ice loading. However, adjustable antenna mounts that are both sufficiently strong and easily adjustable with precision significantly increase the cost of the resulting antenna.

[0006] The increasing competition for reflector antennas adapted for high volume consumer applications such as data, VSAT, satellite tv and or internet communications has focused attention on cost reductions resulting from increased materials, manufacturing and service efficiencies. Further, reductions in required assembly operations and the total number of discrete parts are desired.

[0007] Therefore, it is an object of the invention to provide an apparatus that overcomes deficiencies in the prior art. This is achieved by an adjustable antenna mount as defined in claim 1.

[0008] BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the general and detailed descriptions of the invention appearing herein, serve to explain the principles of the invention.

[0010] Figure 1 is a schematic side view of an exemplary embodiment of the invention, arranged with respect to a main reflector to demonstrate elevation rough and fine adjustment ranges. The boom arm and LNB typically associated with the main reflector have been omitted for clarity.

[0011] Figure 2 is a schematic top view of figure 1, the main reflector shown in section, demonstrating fine azimuth adjustment range.

[0012] Figure 3 is a schematic back view of figure 1, main reflector omitted and hidden lines along a section at the first horizontal axis shown for clarity.

[0013] Figure 4 is a schematic top view of figure 3, fastener(s) omitted, portions of the movable bracket and base bracket transparent for clarity.

[0014] Figure 5a is a schematic top view of the clamp bracket of figure 1.

[0015] Figure 5b is a schematic back view of the clamp bracket of figure 1.

[0016] Figure 5c is a schematic side view of the clamp bracket of figure 1.

[0017] Figure 6a is a schematic top view of the base bracket of figure 1.

[0018] Figure 6b is a schematic back view of the base bracket of figure 1.

[0019] Figure 6c is a schematic side view of the base bracket of figure 1.

[0020] Figure 7a is a schematic top view of the movable bracket of figure 1.

[0021] Figure 7b is a schematic front view of the movable bracket of figure 1.

[0022] Figure 7c is a schematic side view of the movable bracket of figure 1.

[0023] Figure 8a is a schematic front view of a cam.

[0024] Figure 8b is a schematic end section view of the cam of figure 8a.

[0025] Figure 8c is a schematic front view of a cam with a tang.

[0026] DETAILED DESCRIPTION

[0027] The invention will be described with reference to an exemplary embodiment of an antenna mount 2 according to the invention, as shown in figures 1-8c. A primary bracket, for example, a clamp bracket 4 and a movable bracket 6 are coupled to a base bracket 8.

[0028] As shown in figures 5a-c, the clamp bracket 4 is adapted to encircle a cylindrical mount point such as
a mounting pole, not shown, securely clamping the pole via a fastener 10 such as one or more nut and bolt connection(s). A mounting surface 12 at the top of the clamp bracket 4 has a raised first cam mount 14, a pivot connection hole 16 and a pair of adjustable connection hole(s) 18 adapted to receive the base bracket 8.

[0029] The base bracket 8, as shown in figures 6a-c has a base portion 20 with a plurality of bolt hole(s) 22 arranged to align with the pivot connection hole 16 and adjustable connection hole(s) 18 and a first cam slot 24 adapted to receive the first cam mount 14. A pair of first cam guide(s) 26 are positioned proximate the first cam slot 24. First and second end portion(s) 28, 30 are formed on either side of the base portion 20, oriented at 90 degrees to the base portion 20. A second cam mount 32 is formed in the first end portion 28. A corresponding first mount bolt hole 34 coaxial along a first horizontal axis normal to the first end portion 28 at the second cam mount 32 is formed in the second end portion 30. A pair of pivot hole(s) 36 also coaxial along a second horizontal axis normal to the first end portion 28 are formed in the first and second end portions 28, 30, spaced away from the first horizontal axis.

[0030] The movable bracket 6, as shown in figures 7a-c, has a central portion 38, and third and fourth end portions 40, 42, oriented at 90 degrees to the central portion 38. The movable bracket 6 and the fixed bracket 8 are adapted to couple via interconnections between the first and third end portions 28, 40 and the second and forth end portions 30, 42, respectively. A second cam slot 44 in the third end portion and a second mount bolt hole 45 in the forth end portion are coaxial with the first horizontal axis of the fixed bracket 8. A second cam guide(s) 46 are positioned proximate the second cam slot 44. Angular slot(s) 48 having a radius of curvature generally normal to and centered upon the first horizontal axis are also formed in the third and fourth portions 40, 42 positioned to align with the second horizontal axis as the movable bracket 6 is pivoted about the first horizontal axis. Mounting flange(s) 50 with bolt holes formed at corresponding edges of the third and fourth portions may be used to secure the main reflector 52 or other connection point of the reflector antenna to the movable bracket 6.

[0031] A first cam 54 with a mounting hole 56 eccentric to a contact edge 58 of the first cam 54, as shown for example in figures 8a-c, is placed over the first cam mount 14 against the base portion 20, the contact edge 58 of the first cam 54 abutting the first cam guide(s) 26. A fastener 10 such as a nut and bolt or the like may be applied through the first cam mount 14 to retain the first cam 54 upon the first cam mount 14 and also retain the base bracket 8 upon the mounting surface 12. Similarly, a second cam 60 with a mounting hole 56 eccentric to a contact edge 58 of the second cam 58 is placed over the second cam mount 32 against the third end portion 40, between the second cam guide(s) 46. A fastener 10 such as a nut and bolt or the like may be applied through the second cam mount 32 to retain the second cam 58 upon the second cam mount 32 and also retain the movable bracket 6 upon the first end portion 28.

[0032] Rough azimuth alignment of the antenna mount 2 is performed by rotation of the clamp bracket 4 about the mounting pole, prior to final tightening of the related fastener(s) 10. With a fastener 10 such as a nut and bolt or the like applied to the pivot connection hole 16 and corresponding base bracket mounting hole 22, rotation of the first cam 54 between the first cam guide(s) 26 operates to pivot the base bracket 8 about the pivot connection hole 16 to apply a range of fine azimuth adjustment to the orientation of the main reflector.

[0033] Rough elevation alignment of the antenna mount 2 is performed by pivoting the movable bracket 6 with respect to the fixed bracket 8, about the first horizontal axis. With a rough elevation alignment selected, the angular slot 48 fastener 10 connections between the movable bracket 6 and the fixed bracket 8 along the second horizontal axis. Fine elevation adjustment may then be applied by rotation of the second cam 60 between the second cam guide(s) 46, pivoting the movable bracket 6 with respect to the base bracket 8 about the second horizontal axis.

[0034] To facilitate easy operator adjustment of the first and or second cam 54, 60, the cams may be adapted to include c-spanner hole(s) 62 and or an wrench tang 64 dimensioned for a desired wrench size, as shown in figures 8b and 8c, respectively. When finally adjusted, the associated fastener 10 interconnections may be tightened to secure the selected antenna alignment.

[0035] The range and resolution of fine adjustment resulting from rotation of the first and second cams 54, 58 is a function of four factors: the selected cam diameter; the displacement of the mounting hole from the center of the cam; and the distance between the cam mount and the pivot point, i.e. between the first horizontal axis and the second horizontal axis with respect to the second cam. Associated adjustment connection holes and cam slots are dimensioned to allow for the desired range of adjustment. Response to cam adjustment and or change of direction slop in the mechanism is dependent upon the tolerances applied to the fit of the cam upon the respective cam mount and or the cam between the cam guides.

[0036] One skilled in the art will appreciate that the main components of the invention may be cost effectively fabricated by metal stamping. Alternatively, die casting or injection molding may be applied. The specific exemplary embodiment of the invention described herein in detail is demonstrated with respect to a vertical pole mounting but may alternatively be readily adapted to a particular desired mounting surface and or mounting surface orientation. While the present invention has been demonstrated with mating u-brackets, equivalent pivot structures may be formed by mating angle or T-brackets having sufficient materials strength to withstand the
expected weight and environmental stresses upon the antenna mount. Further, the reflector antenna interconnection with the movable bracket may be adapted as desired, including incorporation of the movable bracket into the structure of the main reflector.

[0037] The present invention provides an antenna mount with precision adjustment capability having significantly reduced complexity and manufacturing precision requirements, resulting in a significant reduction in overall cost. Also, the time required for installation and configuration of a reflector antenna incorporating an antenna mount according to the invention is similarly reduced.

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<td>58</td>
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</table>

[0038] Where in the foregoing description reference has been made to ratios, integers, components or modules having known equivalents then such equivalents are herein incorporated as if individually set forth.

[0039] While the present invention has been illustrated by the description of the embodiments thereof, and while the embodiments have been described in considerable detail, it is not the intention of the applicant to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, representative apparatus, methods, and illustrative examples shown and described.

Claims

1. An antenna mount (2), comprising:
   a base bracket (8) having a base portion (20) and at least a first end portion (28); and
   a movable bracket (6) having a central portion (38) and at least a third end portion (40), characterized in that
   the first end portion (28) having a projecting second cam mount (32) and a pivot hole (36);
   the third end portion (40) having a second cam slot (44) and an angular slot (48) having a radius of curvature generally centered upon the second cam slot (44);
   the first end portion (28) and the third end portion (40) adapted to mate whereby the second cam mount (32) projects through the second cam slot (44) and an angular slot fastener (10) couples the first end portion (28) and the third end portion (40) together via the pivot hole (36) and the angular slot (48); and
   a second cam (60) with a second eccentric mounting hole (56) mounted upon the second cam mount (32); the second cam (60) rotatable about the second cam mount (32) pivoting the third end portion (40) about the pivot hole (36) as a contact edge (58) of the second cam (60) abuts at least one second cam guide (s) (46) of the third end portion (40).

2. The antenna mount (2) of claim 1, wherein the first end portion (28) is normal to the base portion (20) between the first end portion (28) and a second end portion (30) is also normal to the base portion (20);
the third end portion (40) is normal to the central portion (38) between the third end portion (40) and a fourth end portion (42) also normal to the central portion (38);

the second end portion (30) and the fourth end portion (42) coupled along a first horizontal axis passing through the second cam mount (32);

the second end portion (30) and the fourth end portion (42) also coupled along a second horizontal axis passing through the pivot hole (36); the first horizontal axis and the second horizontal axis both normal to the first end portion (28).

3. The antenna mount (2) of claim 1, further including a mounting flange (50) projecting from and normal to the third end portion (40).

4. The antenna mount of claim 1, wherein one of the third end portion (40) and the first end portion (28) is coupled to a reflector antenna.

5. The antenna mount (2) of claim 2, wherein the base portion (20) has a first cam slot (24) and a pivot hole (36) adapted to align with a mounting surface (12) of a primary bracket having a projecting first cam (54) mount (14) and a pivot connection hole (16) adapted to align with the first cam slot (24) and the pivot hole (36), respectively;

a first fastener (10) coupling the base bracket (8) to the primary bracket between the pivot connection hole (16) and the pivot hole (16), the first cam (54) mount (14) projecting through the first cam (54) slot; and

a first cam (54) with a first eccentric mounting bolt hole (34) mounted upon the first cam mount (14); the first cam (54) rotatable about the first cam mount (14) pivoting the base bracket (8) about the pivot connection hole (16) as a contact edge (58) of the first cam (54) abuts at least one first cam guide(s) (26) of the base bracket (8).

6. The antenna mount (2) of claim 5, further including a second fastener (10) passing through the first cam (54) mount (14) to couple the primary bracket, base bracket (8) and first cam (54) together.

7. The antenna mount (2) of claim 5, wherein the primary bracket is a clamp bracket (4) adapted to clamp around a cylindrical mount point.

8. The antenna mount of claim 5, wherein the base bracket (8) and the movable bracket (6) are u-shaped.

9. The antenna mount (2) of claim 5, further including a mounting flange (50) projecting from and normal to the third end portion (40).

10. The antenna mount (2) of claim 5, wherein the first cam (54) has a pair of c-spanner holes (62).

11. The antenna mount (2) of claim 5, wherein the first cam (54) has a wrench tang (64) adapted for a wrench.

12. The antenna mount (2) of claim 5, further including at least one adjustable connection hole (18) in the mounting surface (12) aligned with a bolt hole (22) of the base portion (20); the adjustable connection hole (18) and the bolt hole (22) coupled by a third fastener (10).

13. The antenna mount (2) of claim 1, wherein the base bracket (8) pivots with respect to an antenna elevation alignment and the movable bracket (6) pivots with respect to an antenna azimuth alignment.

14. The antenna mount (2) of claim 1, wherein the base bracket (8) and the movable bracket (6) are u-shaped.

15. The antenna mount of claim 1, wherein the movable bracket (6) is coupled to a reflector antenna.

Patentsprüche

1. Antennenträger (2), umfassend:

eine Basishalterung (8) mit einem Basisabschnitt (20) und mindestens einem ersten Endabschnitt (28); und eine bewegliche Halterung (6) mit einem Mittelabschnitt (38) und mindestens einem dritten Endabschnitt (40), dadurch gekennzeichnet, dass der erste Endabschnitt (28) einen vorstehenden zweiten Nockenträger (32) und ein Drehzapfenloch (36) aufweist; der dritte Endabschnitt (40) einen zweiten Nockenschlitz (44) und einen Winkelschlitz (48) mit einem Krümmungsradius, der im Allgemeinen auf dem zweiten Nuckenschlitz (44) zentriert ist, aufweist; der erste Endabschnitt (28) und der dritte Endabschnitt (40) angepasst sind, ineinander zu greifen, wobei der zweite Nockenträger (32) durch den zweiten Nuckenschlitz (44) hindurch vorsteht und ein Winkelschlitzverbinder (10) den ersten Endabschnitt (28) und den dritten Endabschnitt (40) über das Drehzapfenloch (36) und den Winkelschlitz (48) mit einander koppelt, und ein zweiter Nocken (60) mit einem zweiten exzentrischen Befestigungslöch (56) am zweiten Nockenträger (32) angebracht ist; wobei der zweite Nocken (60) um den zweiten Nockenträger (32) drehbar ist und den dritten End-
Abschnitt (40) um das Drehzapfenloch (36) schwenkt, wenn ein Kontakttrand (58) des zweiten Nockens (60) an mindestens einer zweiten Nockenführung (46) des dritten Endabschnitts (40) anstösst.

2. Antennenträger (2) nach Anspruch 1, wobei der erste Endabschnitt (28) senkrecht zum Basisabschnitt (20) zwischen dem ersten Endabschnitt (28) und einem zweiten Endabschnitt (30), der ebenfalls senkrecht zum Basisabschnitt (20) ist, ist; wobei der dritte Endabschnitt (40) zu einem Mittelabschnitt (38) zwischen dem dritten Endabschnitt (40) und einem vierten Endabschnitt (42), der ebenfalls senkrecht zum Mittelabschnitt (38) ist, ist; wobei der zweite Endabschnitt (30) und der vierte Endabschnitt (42) entlang einer ersten horizontalen Achse, die durch den zweiten Nockenträger (32) verläuft, gekoppelt sind; wobei der zweite Endabschnitt (30) und der vierte Endabschnitt (42) ferner entlang einer zweiten horizontalen Achse, die durch das Drehzapfenloch (36) verläuft, gekoppelt sind; wobei die erste horizontale Achse und die zweite horizontale Achse jeweils zum ersten Endabschnitt (28) senkrecht sind.

3. Antennenträger (2) nach Anspruch 1, ferner umfassend einen Befestigungsflansch (50), der vom dritten Endabschnitt (40) vorsteht und zu diesem senkrecht ist.

4. Antennenträger nach Anspruch 1, wobei der dritte Endabschnitt (40) und der erste Endabschnitt (28) mit einer Spiegelantenne gekoppelt sind.

5. Antennenträger (2) nach Anspruch 2, wobei der Basisabschnitt (20) einen ersten Nockenschlitz (24) und ein Drehzapfenloch (36) aufweist, die dazu geeignet sind, sich mit einer Befestigungsfläche (12) einer Primärhalterung fluchtend auszurichten, die einen vorstehenden ersten Nocken-(54-)Träger (14) und ein Drehzapfenverbindungsloch (16) aufweist, die dazu geeignet sind, sich mit dem ersten Nockenschlitz (24) bzw. dem Drehzapfenloch (36) fluchtend auszurichten; wobei ein erster Verbinde (10) die Basishalterung (8) der Primärhalterung zwischen dem Drehzapfenverbindungsloch (16) und dem Drehzapfenloch (36) koppelt, wobei der erste Nocken-(54-)Träger (14) durch den ersten Nocken-(54-)Schlitz vorsteht; und wobei eine erster Nocken (54) mit einem ersten exzentrischen Befestigungsbolzenloch (34) am ersten Nockenträger (14) angebracht ist; wobei der erste Nocken (54) um den ersten Nockenträger (14) drehbar ist und die Basishalterung (8) um das Drehzapfenverbindungsloch (16) schwenkt, wenn der Kontakttrand (58) des ersten Nockens (54) an zumindest einer ersten Nockenführung (26) der Basishalterung (8) anstösst.

6. Antennenträger (2) nach Anspruch 5, ferner umfassend einen zweiten Verbinde (10), der durch den ersten Nocken-(54-)Träger (14) hindurch tritt, um die Primärhalterung, die Basishalterung (8) und den ersten Nocken (54) miteinander zu koppeln.

7. Antennenträger (2) nach Anspruch 5, wobei die Primärhalterung eine Klemmschellenhalterung (4) ist, die dazu geeignet ist, einen zylindrischen Befestigungs punkt zu umklammern.

8. Antennenträger nach Anspruch 5, wobei die Basishalterung (8) und die bewegliche Halterung (6) U-förmig sind.

9. Antennenträger (2) nach Anspruch 5, ferner umfassend einen Befestigungsflansch (50), der vom dritten Endabschnitt (40) vorsteht und zu diesem senkrecht ist.

10. Antennenträger (2) nach Anspruch 5, wobei der erste Nocken (54) ein Paar aus Hakenschlüsselöchern (62) aufweist.

11. Antennenträger (2) nach Anspruch 5, wobei der erste Nocken (54) eine Schraubenschlüsselangel (64) aufweist, die für einen Schraubenschlüssel geeignet ist.

12. Antennenträger (2) nach Anspruch 5, ferner umfassend zumindest ein einstellbares Verbindungsloch (18) in der Befestigungsfäche (12), das mit einem Bolzenloch (22) des Basisabschnitts (20) fluchten ausgerichtet ist; wobei das einstellbare Verbindungsloch (18) und das Bolzenloch (22) durch einen dritten Verbinde (10) gekoppelt sind.

13. Antennenträger (2) nach Anspruch 5, wobei die Basishalterung (8) in Bezug auf eine Antennen-Elevationsausrichtung schwenkt, während die bewegliche Halterung (6) in Bezug auf eine Antennen-Azimuthausrichtung schwenkt.

14. Antennenträger (2) nach Anspruch 5, wobei die Basishalterung (8) und die bewegliche Halterung (6) U-förmig sind.

15. Antennenträger (2) nach Anspruch 5, wobei die bewegliche Halterung (6) mit einer Spiegelantenne gekoppelt ist.

Revendications

1. Monture d’antenne (2) comprenant:
Monture d’antenne (2) selon la revendication 1, dans laquelle l’une parmi la troisième portion terminale (40) et la première portion terminale (28) est accouplée à une antenne à réflecteur.

Monture d’antenne (2) selon la revendication 2, dans laquelle la portion de base (20) possède une fente de première came (24) et un orifice de pivot (36), adaptés pour s’aligner avec une surface de montage (12) d’un support primaire possédant un support (14) de première came (54), ainsi qu’un orifice de connexion de pivot (16) adapté pour s’aligner respectivement avec la fente de première came (24) et l’orifice de pivot (36) ; un premier élément de fixation (10) couplant le support de base (8) avec le support primaire entre l’orifice de connexion de pivot (16) et l’orifice de pivot (36), le support (14) de première came (54) faisant saillie à travers la fente de la première came (54) ; et une première came (54) avec un premier orifice de boulon de montage excentrique (34) est montée sur le support (14) de première came (14) ; la première came (54) étant rotative autour du support (14) de première came, faisant pivoter le support de base (8) autour de l’orifice de connexion de pivot (16) lorsqu’un bord de contact (58) de la première came (54) bute contre au moins un guide de première came (26) du support de base (8).

Monture d’antenne (2) selon la revendication 5, comprenant en outre un deuxième élément de fixation (10) passant à travers le support (14) de première came (54) pour coupler le support primaire, le support de base (8) et la première came (54) entre eux.

Monture d’antenne (2) selon la revendication 5, dans laquelle le support de base est un support d’élément de blocage (4) adapté pour se bloquer autour d’un point de support cylindrique.

Monture d’antenne selon la revendication 5, dans laquelle le support de base (8) et le support mobile (6) ont une forme en U.

Monture d’antenne (2) selon la revendication 5, comprenant en outre une bride de montage (50) faisant saillie sur la troisième portion terminale (40) et étant normale par rapport à celle-ci.

Monture d’antenne (2) selon la revendication 5, dans laquelle la première came (54) possède une paire d’orifices de clé en c (62).

Monture d’antenne (2) selon la revendication 5, dans laquelle la première came (54) possède un tenon de
clé (64) adapté pour une clé.

12. Monture d’antenne (2) selon la revendication 5, comprenant en outre au moins un orifice de connexion ajustable (18) dans la surface de montage (12), aligné avec un orifice de boulon (22) de la portion de base (20) ; l’orifice de connexion ajustable (18) et l’orifice de boulon (22) étant couplés par une troisième fixation (10).

13. Monture d’antenne (2) selon la revendication 1, dans laquelle le support de base (8) pivote par rapport à un alignement d’élévation d’antenne, et le support mobile (6) pivote par rapport à un alignement azimutal d’antenne.

14. Monture d’antenne (2) selon la revendication 1, dans laquelle le support de base (8) et le support mobile (6) sont conçus en forme de U.

15. Monture d’antenne selon la revendication 1, dans laquelle le support mobile (6) est accouplé à une antenne à réflecteur.
REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description