

May 4, 1965

D. L. BIESECKER

3,182,329

ANTENNA MOUNTING CLIP

Filed June 13, 1963

3 Sheets-Sheet 1

Fig. 1

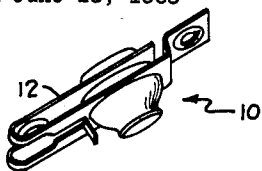


Fig. 3

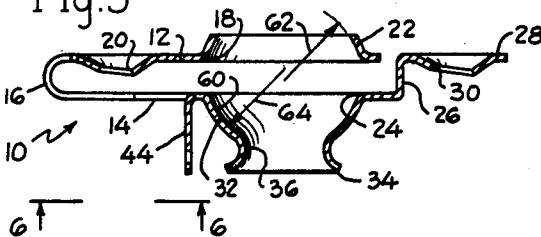


Fig. 2

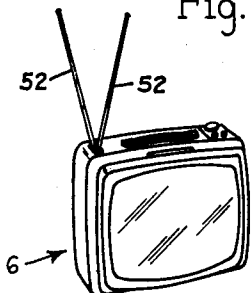


Fig. 4

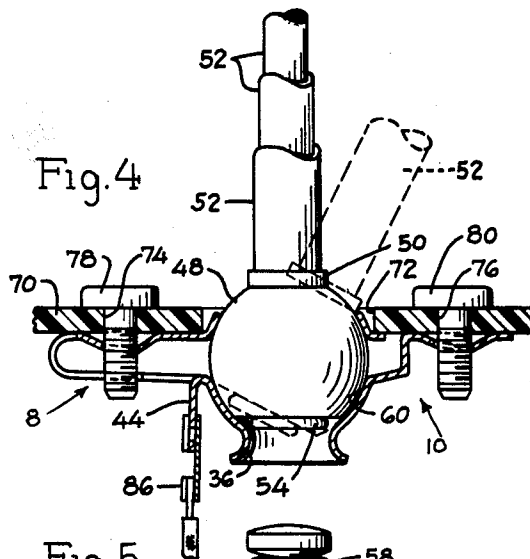


Fig. 6

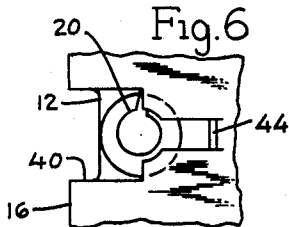


Fig. 5

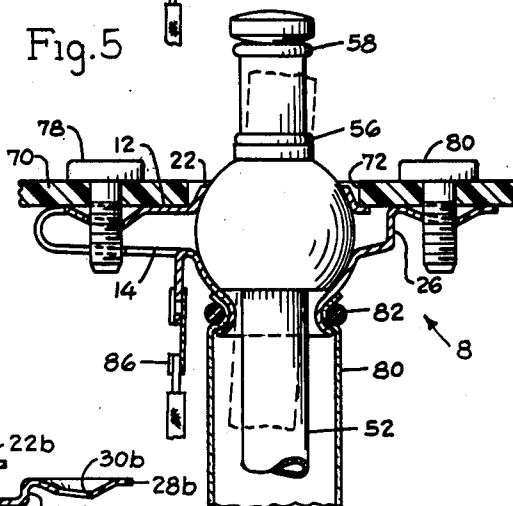


Fig. 7

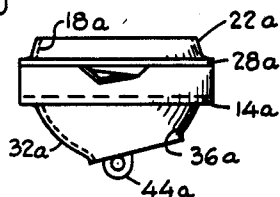


Fig. 8

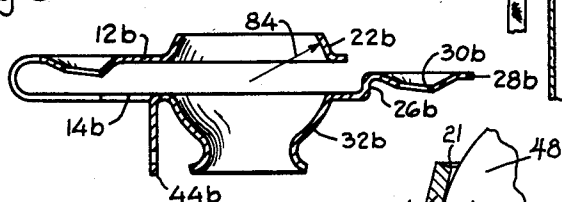
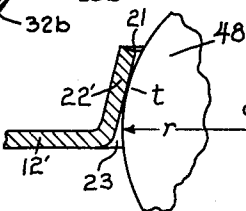


Fig. 8A



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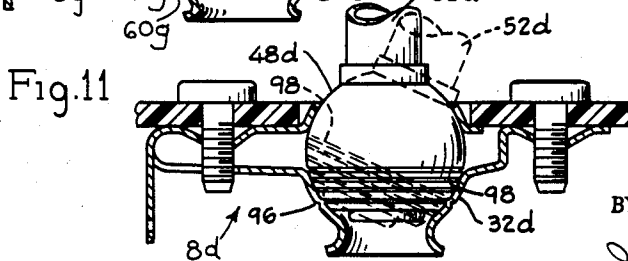
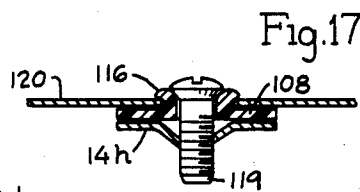
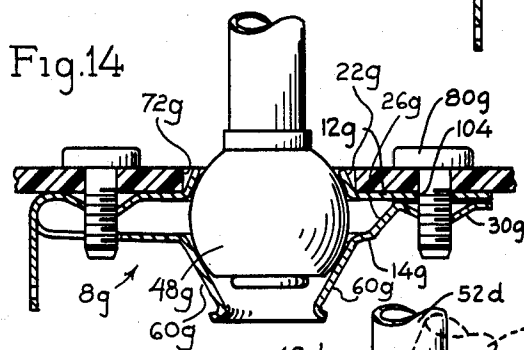
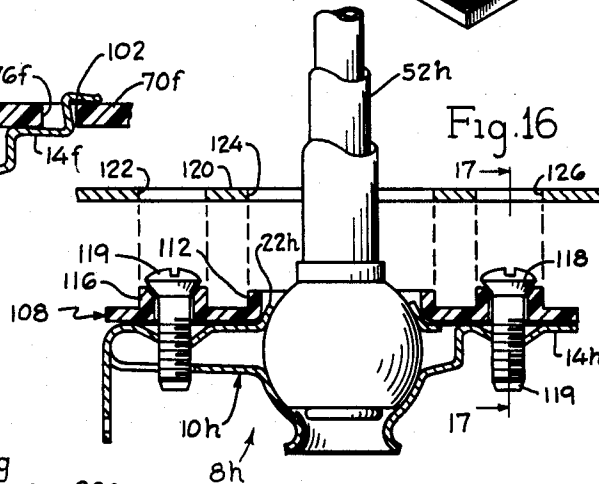
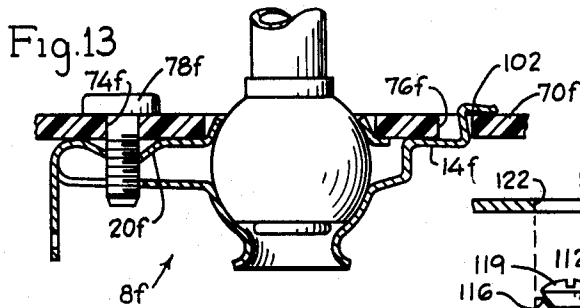
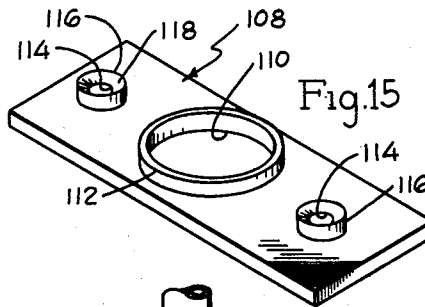
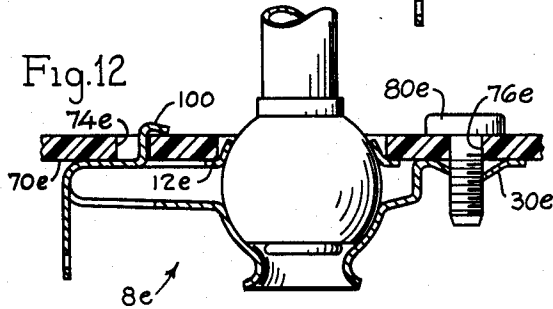
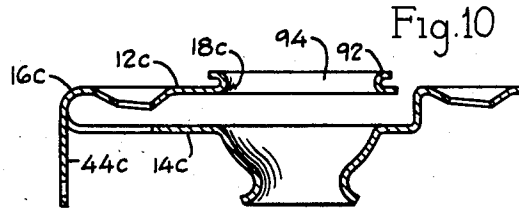
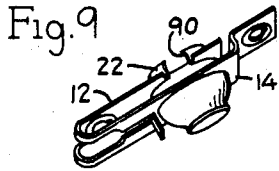
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ANTENNA MOUNTING CLIP

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3 Sheets-Sheet 2



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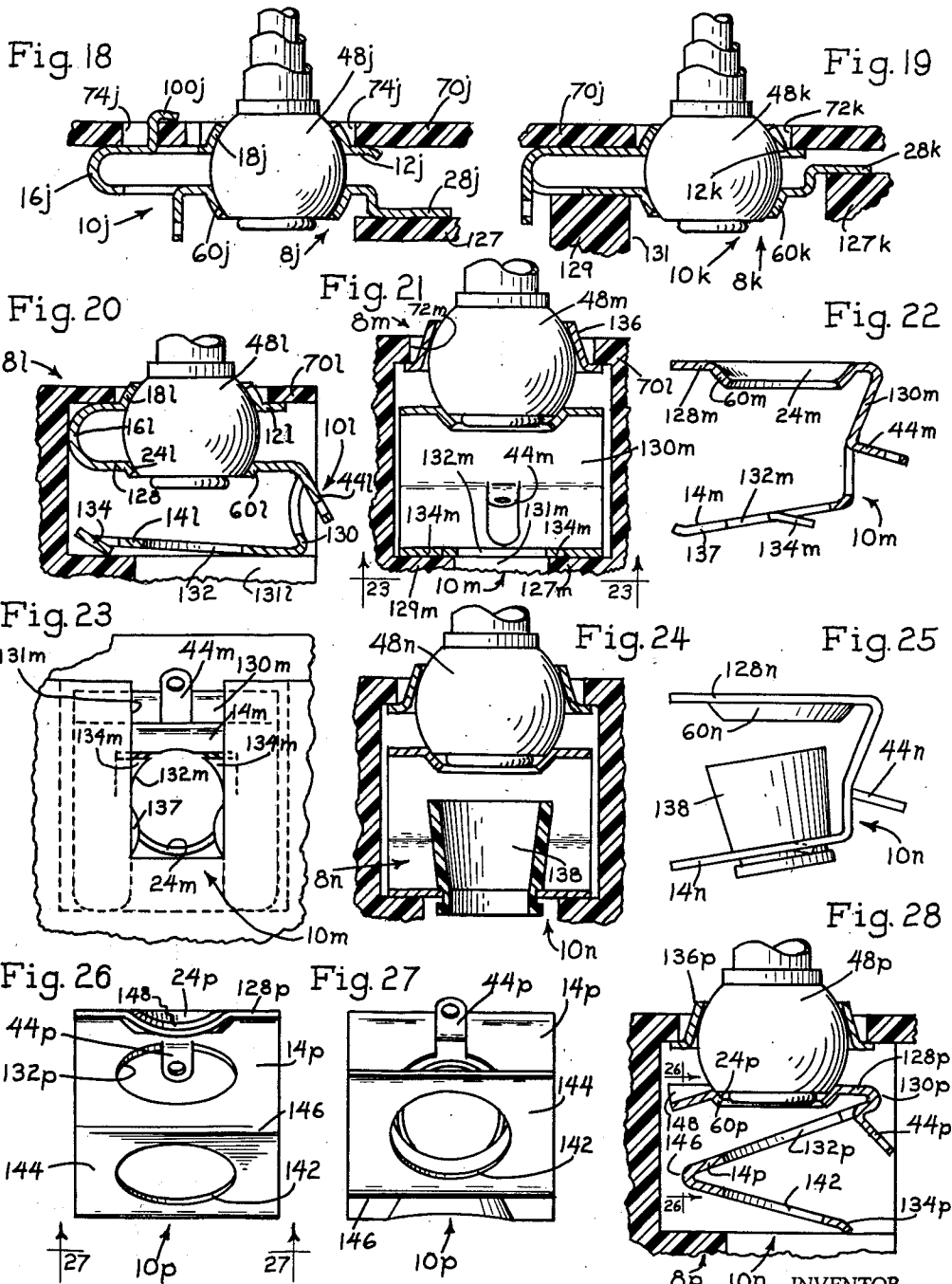
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ANTENNA MOUNTING CLIP

Filed June 13, 1963

3 Sheets-Sheet 3



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3,182,329

ANTENNA MOUNTING CLIP

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14 Claims. (Cl. 343-702)

This is a continuation-in-part of my co-pending application Serial No. 157,655, filed December 7, 1961, which is now abandoned.

This invention relates in general to antenna assemblies for electronic equipment and more particularly relates to means for mounting an antenna assembly in electronic equipment such as television equipment and the like.

In certain types of television equipment, for example, it is desirable to provide integral antenna means. This is particularly desirable among so-called portable television sets and other types of portable electronic equipment such as portable transmitters, portable short-wave radios, portable walkie-talkies and similar types of equipment. Sets of electronic equipment which must be moved from one location to another have need for integral antennas where it is inconvenient to provide a multiplicity of outlets for permanent full size antenna installations. As a compromise from an electronic standpoint, the television industry has, for example, developed the use of a pair of tubular elements commonly known as "rabbit ears" which, when oriented in a directional relationship to the television transmitter, will receive quite effectively the transmitted signals. It is usual, in the art, to provide a ball and socket joint so that the tubular members associated therewith can be swiveled in all directions to assume an attitude and direction most desirable for the reception of the transmitted signal. Heretofore, very complex assemblies have been utilized to assure a bias against the ball and socket joint so that the tubular members are maintained in their desired final position. Further, the assemblies are made even more complex when it is desired to telescope the antenna tubular members within the casing so that they are protected against accidental damage when they are not in use.

It is an object of this invention to provide a simplified assembly of the aforementioned type for use with portable electronic equipment and the like.

More particularly, it is an object of this invention to provide a ball and socket joint which may be readily assembled to the electronic equipment, which will maintain a permanent bias on the ball so as to retain the ball and its associated elements in a variable fixed attitude while affording telescopic movement of the tubular members through the assembly.

Still another object of this invention is to provide a clip means having a pair of substantially parallel leg portions with connection means therebetween, both of the legs being apertured and the margin of the aperture in at least one of the legs directly supporting the ball, the other leg through the connection means imparting a bias to the ball by the mounting thereof to a portion of the electronic equipment.

Still another object of the invention is to provide a clip means of the aforementioned general characteristics which has electrical connection means integral therewith, the clip means being made of resilient metal, for affording a direct electrical connection from the antenna means to the electronic apparatus as suitable and desired.

The novel features which are characteristic of the invention are set forth with particularity in the appended claims. The invention itself, both as to its organization and its method of operation, together with additional objects and advantages thereof will best be understood by

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the following description of specific embodiments when read in connection with the accompanying drawings in which:

FIG. 1 is a perspective view of the one embodiment of a clip means contemplated as a part of the antenna assembly of the present invention;

FIG. 2 is a perspective view of a portable television set of the type adapted to utilize the present invention;

FIG. 3 is an elevational view in section of one type of clip of the present invention which is mounted by screw means;

FIG. 4 is a view of the clip shown in FIG. 3 with the associated other parts of the assembly;

FIG. 5 is a view similar to FIG. 4 showing the tubular parts in retracted position with the addition of another component to the assembly;

FIG. 6 is a fragmentary view taken along line 6-6 of FIG. 3 indicating one manner in which the electrical connection means may be struck from the clip body;

FIG. 7 is a side elevational view of an alternate embodiment of the clip means;

FIG. 8 is an elevational view, partially in section, of still another embodiment of the present invention;

FIG. 8A is a fragmentary sectional view of a modified flange having a conical shape;

FIG. 9 is a perspective view of an embodiment of the clip similar to that shown in FIG. 1 but modified by a slot in the upper leg;

FIG. 10 is a further embodiment of the clip showing a modification of the upper bearing means;

FIG. 11 is a modification to the lower socket element and ball for purposes of ratcheting;

FIGS. 12 and 13 are further embodiments of the invention showing a modification of the attaching means from that used in the previous embodiments;

FIG. 14 is still another embodiment of the invention wherein the legs of the clip are uniform in length;

FIGS. 15 through 17 disclose another embodiment of the invention adapted for use with a metal case;

FIG. 18 is a sectional view of another embodiment of an assembly which is very similar to that shown in FIG. 12 except that the mounting of the clip means to the housing is by a wedging action rather than by the use of a fastening means such as a screw, bolt or the like;

FIG. 19 is a view similar to FIG. 18 showing a clip means mounted to a housing similar to that shown in FIG. 10 except that the clip means is mounted by a wedging action rather than being mounted by screws, bolts and the like;

FIG. 20 is a sectional view through another embodiment of an assembly;

FIG. 21-FIG. 23 are views of another mounting assembly utilizing a two piece clip means;

FIGS. 24 and 25 are views of another embodiment of clip means and its assembly similar to that shown in FIGS. 21-23 with the addition of another part; and

FIGS. 26-28 are views of still another embodiment of clip means and its assembly.

Portable electronic equipment such as, for example, the portable television set shown in FIG. 2 requires the use of an integral antenna means. To prevent accident to the antenna means during transporting of the equipment, it is preferable that the antenna be mounted so as to be located substantially within the outer housing means 6. On the other hand, when the equipment is in use in different locations, it requires that the antenna means be elevated and located at different attitudes relative to the set. Various assemblies shall now be discussed which provide these functions in an economical manner.

All of the clip means assemblies 8, about to be discussed, utilize the housing means to mount fastening means, or

provide the fastening integral therewith by various abutments which allow a wedging of the clip means 10 interiorly of the housing to provide the requisites resilient bias upon the assembly while affording telescopic movement therethrough.

Returning now to FIGS. 1 through 6 of the drawings, the clip means 10 is shown in an assembly 8 in FIGS. 4 and 5 of the drawings. FIGURES 4 and 5 of the drawings represent sectional views through the housing means 6 of a television set shown in FIG. 2 of the drawings. The clip means 10 is generally J-shaped in configuration and has a body defined by an upper plate or leg 12 and a lower leg or plate 14 which are normally substantially parallel to one another and interconnected by a connection means in the form of a bight portion 16 integral therewith. The upper leg 12 is apertured as at 18 and 20 respectively. Surrounding aperture 18 is a flange 22 having, in section, a substantially spherical conformation, for purposes best set forth hereinafter, which extends upwardly away from leg 12. Flange 22 can if desired be frustoconical as shown in FIG. 8A at 22' rather than spherical. Flange 22' has a diameter at 21 less than dimension $2r$ and a diameter at 23 greater than dimension $2r$ so that a point of tangency t is established intermediate the height of flange 22'. The material surrounding aperture 20 is distorted to provide stud engaging means which is a stamped helix for accepting a screw thread.

The lower leg 14 is normally longer in length than leg 12 and is provided intermediate its length with an aperture 24. At a point just beyond aperture 24 and adjacent the terminal end of leg 12, leg 14 may be bent upwardly at substantially right angles thereto to form strut 26 and thence is bent outwardly again to provide a lateral extension 28 to its free end. Intermediate the strut 26 and the free end 28 there is provided an aperture 30 similar to aperture 20 in that it has stud engaging means encircling said aperture. Strut 26 is of such a length as to place the lateral extension 28 in substantially the same plane as leg 12.

Aperture 24 is surrounded by a downwardly and inwardly extending flange 32 having in section a substantially spherical confrontation of a radius similar to flange 22. In this embodiment flange 32 is reversely bent outwardly to provide a funnel-shaped skirt 34 which at its juncture with the flange 32 forms a passageway 36 of a predetermined diameter, for purposes best set forth hereinafter.

As best seen in FIG. 6, leg 14 and bight 16 are slotted as at 40 to provide a clearance hole in leg 14, for acceptance of a screw as later described, and to reduce the amount of material in bight 16 so as to control the resiliency of bight 16.

A tab 44 is struck from the material of leg 14 and bent downwardly in the same direction as flange 32. Tab 44 is designed to be used as an electrical connector. In the present instance, it is of the so-called spade type configuration although other forms of electrical connection can be made to the clip body.

Clip 10 is preferably a heat treatable sheet metal clip made from strip material of a constant width for economy in fabrication. This product has the characteristics of high strength and continued resiliency.

The antenna utilized in portable television sets includes a ball 48, which is technically a segmented sphere of two bases, having a through bore and a collar 50 surrounding said bore at its upper end. Telescopically associated with ball 48 are a plurality of thin wall tubular members 52 which are capable of co-axially interlocking inside one another. The outer tube 52 is provided at its lower end with a flange or bead 54 and at its upper end with a beaded flange 56. The diameter of the beads 54 and 56 is controlled so as to limit the axial movement of the tubular members 52 within ball 48. At the upper end there is preferably a second beaded flange 58 which provides tubular means intermediate beads 56 and 58 for

grasping the outer tube to move same to extended position beyond the case.

The ball and tube subassembly can be preassembled to the clip prior to installation in the case. This is most easily accomplished by springing legs 12 and 14 outwardly in opposite directions, inserting tubes 52 through aperture 18 and snapping ball 48 into the socket 60 formed by opposed flanges 22 and 32. Clip means 10, can for ease of assembly of ball 48, be initially formed with legs 12 and 14 disposed in a spread apart or diverging position, without impairing the function of the clip.

It is also possible to provide a clip means, of the type shown in FIG. 9, wherein the upper leg 12 and flange 18 are slotted from an edge as at 90 to assist in the preassembly of the ball and tubular members with the socket. In this modification the legs 12 and 14 are spread apart so as to accept the ball; the tubular members are then pivoted through slot 90 into assembled position.

Referring back now to clip means 10, the radii of curvature of flanges 22 and 32 are substantially identical to the radius of curvature of ball 48, or preferably are conical as shown in FIG. 8A. In the embodiment shown in FIG. 1, while these radii 62 and 64 as indicated by the arrows are on the common center line or axis of apertures 18 and 24, their centers are axially displaced relatively to one another. The center of radius 62 for flange 22 is positioned below the center of radius 64 for flange 32, for purposes best set forth hereinafter. It should be noted, however, as indicated hereinabove, that while this embodiment of the present invention utilizes spherically disposed flanges to form the socket means, other means can be used and will be discussed hereinafter.

For the application of the clip 10 to the housing means 6 of a television set, the upper wall of the case 70 may be provided with a plurality of apertures suitable for the mounting of two assemblies 8 of clip, ball and tubes, but in the present instance we will only discuss a single application since they are identical. (Also, it will be noted that some sets only use one antenna.) A central aperture 72 is provided in case 70 and on opposite sides thereof a pair of smaller apertures 74 and 76 respectively are also provided. The clip and ball assembly are positioned with leg 12 resting against the inside surface of case 70 and with flange 22 projecting upwardly into aperture 72, serving as a locating means for accurate positioning of the clip. Leg 12 is dimensioned to traverse both sides of aperture 72 and prevent removal of the clip through aperture 72. A pair of screws 78 and 80 are telescoped through apertures 74 and 76 into engagement with thread engaging means 20 and 30, respectively. Screw 78 draws leg 12 into intimate contact with the inner surface of case 70. Screw 80 draws the lateral extension 28 into intimate contact with the inner surface of the housing or case 70. It will be appreciated that when ball 48 is positioned in the socket 60 during preassembly the distended relationship of the radii of curvature 62 and 64 tends to spread the clip apart from the preferred initial substantially parallel relationship of legs 12 and 14. When screw 80 draws lateral extension 28 into engagement with the undersurface of case 70, this bows leg 14 and because of the resilient nature of the material of the clip impresses a spring bias against the surface of ball 48. The amount of this bias, as a result of the bowing, is predetermined by the length of strut 26. This bias continues throughout all angular positions of ball 48 relative to the socket 60. The ball and tube subassembly can be tilted within limits of the contact of collar 50 with the upper surface of flange 22, as shown in phantom in FIG. 4.

Referring now to FIGS. 4 and 5, the diameter of beaded flange 54 and the outer tubular member 52 are controlled relative to passageway 36 so that the interlocked tubes 52 can be axially pressed downwardly in interlocked relation to be enclosed within case 70. The lateral movement of the tubes 52 in this lowered position, is limited by the controlled diameters of the tubes 52 relative to passage-

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way 36, when taken in conjunction with the center of movement of ball 48. This limited lateral motion as best seen in phantom in FIG. 5 prevents contact of the tubular antenna elements with any of the electronic circuitry internally contained within case 70.

The funnel-shaped skirt 34 has a two fold function, first, it provides a pilot or guide means for feeding flange 54 up within socket 60 so that the subassembly of ball and tubes can be fully extended and swiveling thereof permitted. Secondly, it has been found desirable in certain applications to provide a dielectric tube 80 for encapsulating tubes 52 in their lowered or retracted position as an added safety feature. Suitable spring securing means 82 encircles the outside surface of the juncture of flanges 32 and 34 and retains the end of tube 80 in the concavity therebetween.

A modification of the present invention is shown in FIG. 7 wherein similar numerals are utilized to designate similar parts with the addition of the suffix *a*. In certain case designs it is desirable to retract the tubes 52 at an angle other than perpendicular relative to the surface of case 70, hence, in this embodiment the passageway 36a is angularly disposed relative to the axis of flanged aperture 18a. All of the other features of the clip such as the disposition of legs 12a and 14a and flanges 22a and 32a are substantially identical.

The third modification shown in FIG. 8 relates to a similar device wherein similar parts are designated by similar numerals with the addition of the suffix *b*. In the first embodiment the radii of curvature 62 and 64 had centers axially displaced along the common center line. In the present embodiment flanges 22b and 32b have a common radius of curvature 84 on a common center. In this embodiment, strut 26b is made shorter than strut 26 of the other embodiments. When extension 28b and its threaded aperture 30b are drawn into engagement with the under surface of the case, leg 14b will bow and produce the desired spring bias against a ball, not shown, having a radius of curvature complementary to radius 84.

In all of the embodiments suitable connection means 40 86, shown in phantom for purposes of illustration, are attached to terminal 44 for electrically interconnecting the tubular antenna members 52 through the ball 48 and clip 10 to the electronic circuitry of the set.

Referring now to FIGS. 10 and 11 wherein similar parts are designated by similar numerals with the addition of suffixes *c* and *d* respectively, FIG. 10 is basically identical to the first embodiment with the exception that aperture 18c, instead of being surrounded by a spherical or conical flange, is provided with a reversely bent flange portion 92. Flange 92 presents a smooth interior surface 94 and is totally adequate as a bearing surface for a ball of the type previously described. In addition, the terminal 44c in this embodiment has been moved from the central portion to the left extremity as viewed in the drawing and depends from the bight portion 16c. Similar to the first embodiment, it is struck from the material forming leg 14c.

The embodiment set forth in FIG. 11 shows a modification to the lower flange 32d. A plurality of protuberances 96 extend inwardly from the inner surface of flange 32d. Ball 48d is provided with a plurality of annular grooves 98 axially spaced about ball 48d. The grooves 98 cooperate with protuberance means 96 to permit ball 48d and associated tubular elements 52d to be ratcheted in angular increments within the socket member.

FIGS. 12 through 14 disclose various forms of alternate fastening means wherein similar parts shall be designated by similar numerals with the addition of the suffixes *e*, *f* and *g* respectively. In FIG. 12 the fastening means such as screw 78 and thread engaging means 20, of the first embodiment, are replaced by a hook shaped means 100. Hook 100 is struck from the confines of leg 12e. In assembling this clip with the case, hook 100 is telescoped through aperture 74e and the entire clip assembly is then

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slid to the right, as seen in the drawing, to engage the upper surface of case 70e. Screw 80e is then passed through bore 76e into engagement with thread means 30e and drawn upwardly to fasten the assembly to the case.

FIG. 13 discloses an embodiment similar to that shown in FIG. 12 with the exception that a hook means 102 is provided at the extremity of leg 14f with the resultant elimination of the screw 80 and thread locking means 30 of the first embodiment. In this instance hook 102 is fed through bore 76f until it is overriding the upper surface of case 70f. Then screw 78f is telescoped through bore 74f into engagement with nut means 20f. In both of the embodiments shown in FIGS. 12 and 13, the remaining portions of the clip are substantially identical to the first embodiment.

While all of the previous embodiments show the clip as having a substantially J-shaped configuration, it must be appreciated that the choice of this shape is primarily for economy of materials. However, it has been found that certain advantages accrue when the upper leg 12g, as seen in FIG. 14, is made of a length substantially equal to lower leg 14g and provided with a pass-through aperture 104 to accommodate the telescopic assembly of screw 80g with threaded means 30g. This provides an assembly with more positive control over the location of the ball retaining flanges and affords a wider range of tolerances in the casing aperture 72g. It will also be noted that strut 26g is at an angle other than 90° in this embodiment. Also to be noted is the frusto-conical shape of flanges 22g and 60g which accommodate to a wider range of tolerances in the balls 48g.

It should be noted, of course, that it is most desirable that the case 70 used with this sheet metal clip means be fabricated of a dielectric or plastic material. Should the case 70, of necessity, be metallic in nature, then it would be necessary to interpose a dielectric material between the clip and the case to prevent a short circuit or grounding of the antenna.

To facilitate the insulation of the clip means from a metallic case, we refer now to FIGS. 15 through 17 wherein similar parts are designated by similar numerals with the addition of the suffix *h*. FIG. 15 is a perspective view of a plastic or dielectric spacer mounting means 108. Means 108 is a generally planer member having a large central aperture 110 surrounded by an upstanding flange 112. A pair of smaller apertures 114 are provided on opposite sides of aperture 110 and each has an upstanding flange 116 extending in the same direction as flange 112. Each of said flanges 116 are countersunk at their outer extremity as at 118 for purposes best set forth hereinafter.

Spacer means 108 can be preassembled to clip means 10h by telescoped aperture 110 over the extremity of tubular members 52g and the outer flange 22h of the clip. A pair of oval head screws 119 are mated with their respective thread means to assemble a spacer means 108 with the preassembled clip and antenna. The entire assembly is then telescoped into a metallic case 120 having mating apertures 122, 124 and 126. The flange 112 projects internally of aperture 124 while flanges 116 project beyond the limits of apertures 122 and 126 respectively to position the entire assembly relative to the case. By tightening screws 119 their heads will radially deform flange 116 so as to overlie the upper surface of metallic case 120. Thus, in this embodiment applicant has provided means for insulating the clip 10 from the metallic case 120 and also has made provision for an economical mode of assembly.

Another embodiment of the invention is shown in FIG. 18 which is similar in many respects to that shown in FIG. 12 and similar parts will be identified by similar reference numerals with the addition of the suffix *j*. In this embodiment the portion of the upper leg shown to the right of the aperture 18j has a little more stock

and the corresponding portion on the lower leg, instead of being through apertured to receive a screw, is offset downwardly for engagement with an integral molded abutment 127 of the casing. In assembly the clip means 10j, the two free ends of the upper and lower arms are inserted between the upper portion of the housing 70j and the boss 127 and slid to the right as viewed in FIG. 18 so as to afford the positioning of the hook 100j over the margin surrounding the aperture 74j. It will be seen that this embodiment does not require auxiliary fastening means, relying instead upon the boss 127 to provide a reaction member against which the lower leg will impart a bias to the ball 48j through the connection means bight portion 16j.

The assembly 8k shown in FIG. 19 is similar in many respects to that shown in FIG. 18 and similar parts will be identified with similar reference numerals with the addition of the suffix *k*. The assembly 8k utilizes two abutments 127k and 129 which are spaced apart to provide an internal housing aperture 131 for affording the telescopic movement of the antenna 52 therein. This type of mounting arrangement, i.e. with the use of no screws with the clip means 10k as shown, requires that the aperture 72k be located relatively close to an edge surface of the housing.

The assembly 8l shown in FIG. 20 is substantially similar to the foregoing and similar parts will be identified with similar reference numerals with the addition of the suffix *l*. The clip means 10l, rather than being J-shaped or U-shaped, is S-shaped in configuration. It is mounted by a wedging action rather than by auxiliary fastening means. The upper leg 12l is not as long as that shown in the foregoing embodiments and the middle leg 128, intermediate the upper leg and the lower leg 14l provides the flange 68l for ball 48l. Electric terminal tab 44l is struck from bight 130 connecting legs 128 and 14l. It will be noted that apertures 13l and 24l and 132 are coaxial when the clip means 10l is in assembled position. The lower leg 14l of the clip means 10l is formed with downturned tabs 134 adjacent the free end thereof to prevent outward movement of the clip means or the assembly once it has been placed in position as shown in FIG. 20. The leg 14l engaging the margin surrounding the aperture 131l of the casing imparts a bias through the bight portion 130 to the lower portion of the ball and through bight portion 16l to the upper portion of the ball to provide a resilient bias against the ball 14l. The clip is assembled by placing the assembly into the aperture from right to left as viewed in FIG. 20, the electrical terminal tab 44l being positioned for easy access thereto for connection to the circuit as aforescribed.

The assembly shown in FIGS. 21 and 23 utilizes the clip means 10m shown in FIG. 22. Similar parts will be identified with similar reference numerals together with the addition of the suffix *m*. The assembly 8m is quite similar to that shown in FIG. 20 except that it is two piece in that the upper leg is replaced by a collar 136 which is separate from the remainder of the clip means. The collar has a flange which engages the margin of the casing surrounding the aperture 72m in the casing. A ball retaining flange is formed similarly to those formed normally in the upper leg of the clip means heretofore described. As can be seen in FIGURE 22, the lower portion of the clip means 10m has a leg 128m providing the lower ball flange 60m which is connected to the lower leg 14m by a bight portion 130m. The lower leg is bifurcated to the left of the aperture 132m and the tabs 134m are struck out of portion of the margin of the aperture 132m as best shown in FIGS. 22 and 23. The tab for electrical connection means 44m is struck out of the bight portion 130m. The bifurcation of the lower leg 14m affords slightly easier springing of the assembly 8m between the bosses 127m and 129m during initial assembly. The confronting side edges of the

bifurcated lower leg 14m may be formed with tabs 137 for purposes about to be described.

The assembly 8n is substantially identical to the assembly shown in FIGS. 21-23 with the addition of the assembly member 138 and similar parts will be identified with similar reference numerals with the addition of the suffix *n*. The antenna guide means 138 essentially comprises a flared hollow member having a groove means 140 at the lower end which is merely inserted between the bifurcated legs of the lower leg 14n of the clip means. The tabs 137 of the clip means retain the member 138 in a coaxial position with the antenna and member 138 has a height sufficient to guide the lower end of the antenna within the housing. In all other respects the assembly 8n is identical to assembly 8m. It will be noted, as shown in FIG. 25, that the member 138 is initially not coaxially aligned with the aperture flange 60n but it becomes coaxial therewith after assembly as shown in FIG. 24.

The assembly 8p shown in FIG. 28 and the clip means 10p shown in FIGS. 26 and 27 have many similarities to the foregoing embodiments and similar parts will be identified with similar reference numerals with the addition of the suffix *p*. In this embodiment, the clip means 10p is Z-shaped in configuration, the upper leg 128p corresponding to 128n and 128m of the embodiments shown in FIG. 25. The middle leg 14p and the lower leg are shown in stressed position in the assembly 8p shown in FIG. 28, each being apertured at 132p and 142 respectively. In essence the bight portion 130p immediately above the tab 44p is a shortened version of bight 130m and an additional bight portion 146 is provided between the lower leg 144 and middle leg to impart the resilient bias against the ball. To facilitate assembly of the clip in the assembly 8p, the upper leg 128p is provided with a shallow curvilinear groove 148 adjacent the free end thereof as best shown in FIGS. 26 and 28. The free end 134p of the lower leg 144 is turned downwardly to prevent accidental withdrawal of the clip means.

As can be seen from all of the embodiments in the invention, it is contemplated that simple stamping means in the form of various types of clip means are mounted to the casing by fastening means in the form of bolts or screws or a simple wedging action is used in conjunction with utilization of bosses or abutments within the television casing. In all embodiments of the assemblies shown, coaxial bore means are provided in the legs of the clip means to accept a plurality of the tubular extensible members which are telescopic within the housing. Also at least the margin surrounding bore means in one of the leg means of the clip means directly supports the ball for limited swivel movement thereon, the construction being of the type wherein another leg of the clip means is mounted to the housing so as to impart through a connection portion to another portion of the clip means, a resilient bias to supply resilient pressure on the swivel ball without disabling the telescopic movement of the antenna there-through. Also all of the clip means have electrical connection means integral therewith to provide an electrical connection through the clip means to the swivel ball and thus to the antenna members.

The assembly provides a constant predetermined amount of spring bias for effectual operation and use of antenna means, no readjustment being necessary by the purchaser. Fatigue of parts, as experienced in other antenna assemblies, is virtually eliminated.

While various embodiments of the invention have been shown and described, it will be apparent to those skilled in the art that many modifications are possible. The invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

What is claimed as the invention is:

1. An antenna mounting assembly for electronic equipment, comprising apertured housing means for said equipment, a swivel ball having an axially extending bore

adapted to accept a plurality of tubular extensible members telescoped within said ball, integral one piece resilient sheet metal clip means mounted within said housing having first and second leg means and an integral connecting means portion, bore means in each of said first and second leg means for registry with the aperture in said housing to accept said plurality of tubular extensible members telescoped within said ball to place said members within said housing means, at least the margins surrounding said bore means in said first leg means directly supporting said ball for limited swivel movement thereon, said second leg means being mounted to said housing means to impart, through said connecting means portion, a bias on said first leg means to supply resilient pressure on said swivel ball while affording telescopic movement of the tubular extensible members therethrough, said sheet metal clip means further having electrical connection means integral therewith to provide an electrical connection through said clip means to said swivel ball and to said tubular extensible members.

2. An antenna mounting assembly for electronic equipment, comprising housing means for said equipment having a bore communicating the exterior with the interior of the housing means, a swivel ball mounted interiorly of said housing and having an axially extending bore alignable with said bore in said housing adapted to accept a plurality of tubular extensible members telescoped within said ball, integral resilient sheet metal clip means mounted within said housing having first and second leg means and a connecting means portion, first bore means in said first leg means and second bore means in said second leg means adapted to be coaxially aligned when said clip means is mounted in said housing means, said first and second bore means being mounted for registry with the bore in said housing to accept said plurality of tubular extensible members telescoped within said ball to place the major extent of said members within said housing means, at least the margins of said first bore means in said first leg means directly engaging and supporting said ball for limited movement thereon, said second leg means being fixedly mounted to said housing means to impart, through said connecting means portion, a bias on said first leg means to supply resilient pressure on said swivel ball while affording telescopic movement of the tubular extensible members therethrough and to permit relative tilting movement of said extendable members when extended while maintaining said bias on said ball, said sheet metal clip means further having electrical connection means integrally formed therein to provide an electrical connection interiorly of said housing means through said clip to said swivel ball and to said tubular extensible members.

3. The antenna assembly set forth in claim 2 wherein said clip means is mounted to said housing means by threaded fastening means.

4. The antenna assembly set forth in claim 2 wherein said housing means is formed with first and second spaced interior surfaces, said first and second leg means being wedgedly mounted between said first and second surfaces.

5. The assembly set forth in claim 4 wherein means integral with said clip means and offset from the major plane of one of said first and second leg means is operable to resist unauthorized disassembly of said clip means from wedging association with said first and second surfaces.

6. A clip for mounting an antenna assembly for electronic equipment, said antenna assembly including a swivel ball having an axially extending bore adapted to accept a plurality of tubular extensible members telescoped within said ball, comprising integral resilient sheet material having first and second spaced portions and a connecting portion, bore means in each of said first and second spaced portions for registry with each other to accept said plurality of tubular extensible members telescoped within said ball to place said members within said first and second bore means, at least the margins surrounding said bore

means in said first leg means being formed with ball engaging means having portions offset from the major plane of said first portion for directly supporting said ball for limited swivel movement thereon, said second spaced portion being operable when mounted to impart, through said connecting portion, a bias on said first spaced portion to supply resilient pressure on the swivel ball while affording telescopic movement of the tubular extensible members therethrough, said sheet material means further having electrical connection means integral therewith to provide an electrical connection to said swivel ball and to said tubular extensible members.

7. Preassembled portable television antenna and clip including a ball like member having an axially extending bore, a plurality of tubular extensible members telescopically accepted within the bore of said ball, means for restraining removal of said tubular members from assembly with said ball, a U-shaped clip of resilient sheet material having a pair of legs with aperture means in each of said legs in registry with one another, means on at least one leg for resiliently engaging said ball, and said apertures in said legs being so dimensioned as to accept the axial movement of said tubular members when the tubular members are coaxially positioned within said apertures.

8. A television antenna mounting assembly including an apertured case, a swivel ball having an axially extending bore adapted to accept a plurality of tubular extensible members telescoped within said ball and a one piece resilient sheet material clip generally U-shaped in section with one leg of the clip having a reversely bent end adapted to rest adjacent said case when the other leg is positioned against said case, means for fastening said clip to said case, said clip further having a pair of apertures in said legs in registry with one another, flanges around the margins of said apertures and extending in opposite directions adapted to act in concert as a socket for said ball, electrical connection means struck from said clip for connection to said antenna.

9. A device of the type claimed in claim 8 wherein one leg of the clip having a reversely bent end is longer than the other leg of the clip and said means for fastening said clip to said case includes a pair of thread engaging means positioned on opposite sides of the pair of apertures in register, said threaded engaging means adapted to accept a screw threaded member through said apertured case.

10. A device of the type claimed in claim 8 wherein one leg having the reversely bent end is substantially longer than the other leg and further, said means for fastening said clip to said case includes hook shaped means struck from the material of said clip on one side of said spherical flanges and thread engaging means positioned on the opposite side of said spherical flanges, said means being positioned at opposite ends of said two legs respectively.

11. A device of the type claimed in claim 8 wherein one spherical flange positioned around one of said apertures is provided with a slot traversing the flange and the adjacent margin of the clip providing ingress to one of said apertures to assist in preassembly of said ball and tubular extensible members within said clip.

12. A device of the type claimed in claim 8 wherein one of said flanges and said swivel ball are provided with complementary means to permit ratcheting of the ball within the socket.

13. A sheet metal clip for use in the resilient retention of a portable antenna including a pair of substantially parallel leg members of similar length with each leg being provided with aperture means, flange means extending in opposite directions from each of said legs about the margins of said aperture means in each of said legs, said aperture means being substantially in register with one another, screw accepting means in each of said legs each positioned on opposite sides of the center line passing through said flanged aperture means, the lower of said

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legs being bent adjacent its end so that its free end lies substantially adjacent to and in substantially the same plane as the lower surface of the other leg.

14. A television antenna mounting assembly including an insulated apertured case, an antenna having a plurality of coaxially interestered tubular members, a truncated sphere having an axial extending bore adapted to telescopically accept said tubular members, a resilient one piece strip material clip adapted to retain said sphere in biased relation adjacent the inside surface of said apertured case with said tubular members adapted to be telescopically accepted within said aperture and further being capable of swivel or nutating action when projecting beyond the surface of said case opposite to said clip, said clip including a first flat leg having a pair of apertures therein and adapted to lie against the inside surface of said case, flange means extending upwardly from said leg extending around one of said apertures, the internal wall of said flange means being defined axially in section by an area engaging said sphere having a diameter less than the diameter of said sphere, thread engaging means surrounding the second aperture in said leg, a second initially flat leg joined to said first leg by a bight portion, said second leg having a first portion initially extending substantially parallel to said first leg, a second strut portion extending integrally from said first portion towards, but spaced from the free end of said first leg, and a third portion extending substantially parallel with said first leg, said

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first portion being apertured in registry with the flanged aperture in said first leg, flange means extending downwardly and inwardly from the margins of the aperture in said first portion away from said first leg, said last mentioned flange means being adapted to cooperate with said first mentioned flange means to accept and retain said ball as in a socket, thread engaging means surrounding an aperture in said third portion, multiple screw means adapted to traverse said case and to engage each of said thread engaging means to draw said first leg and the third portion of said second leg into intimate contact with the inside surface of said case whereby said first portion is bowed and applies a bias on said movable ball.

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