

Dec. 14, 1965

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3,224,007

WIRE MESH COLLAPSIBLE DISK REFLECTOR

Filed Jan. 31, 1961

4 Sheets-Sheet 1

Fig. 1.

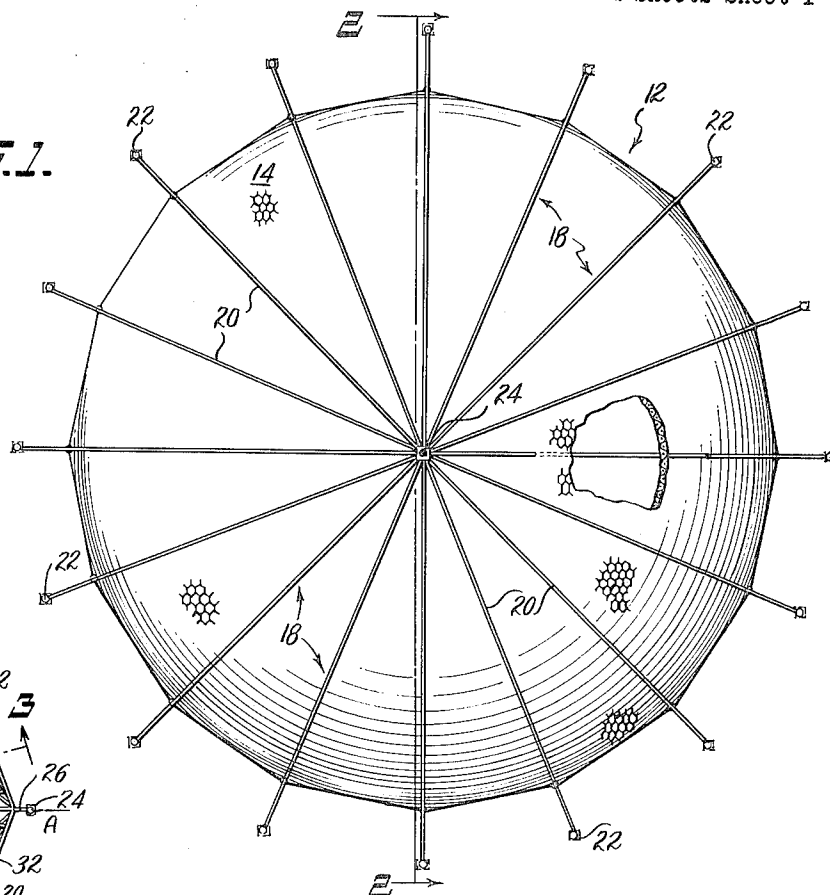


Fig. 2.

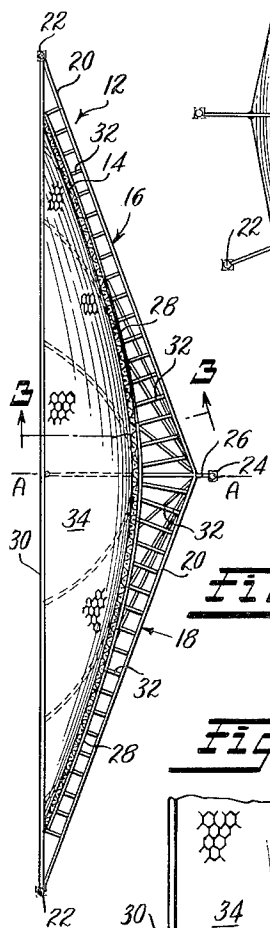


Fig. 3.

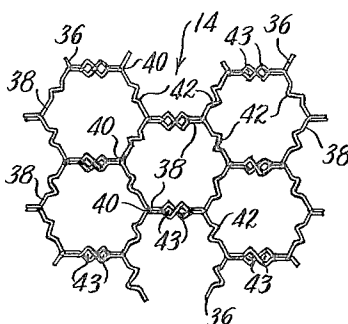
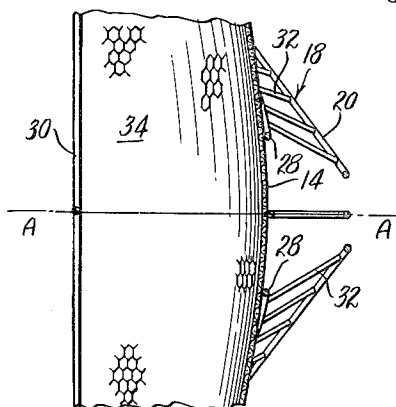


Fig. 4.

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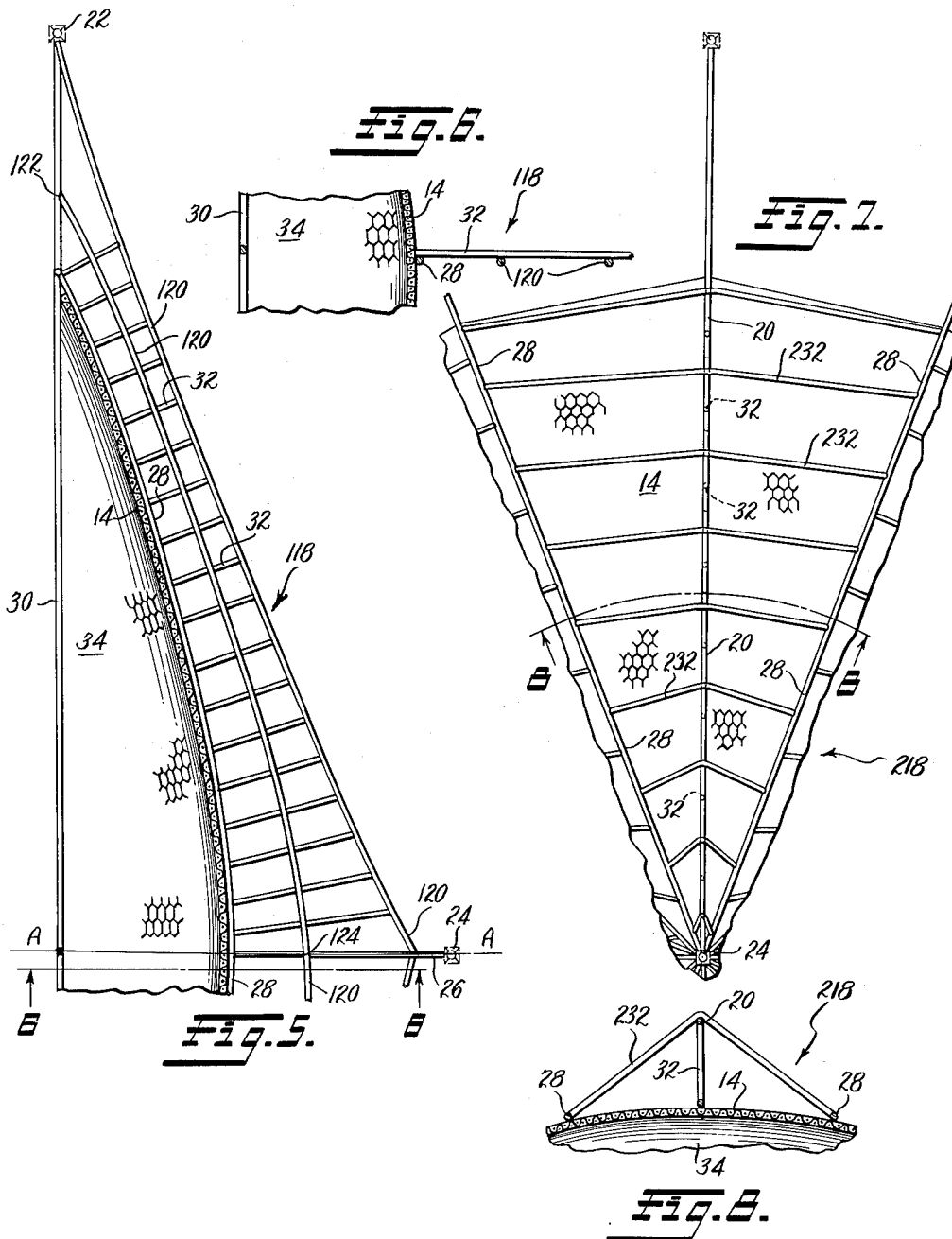
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WIRE MESH COLLAPSIBLE DISK REFLECTOR

Filed Jan. 31, 1961

4 Sheets-Sheet 2



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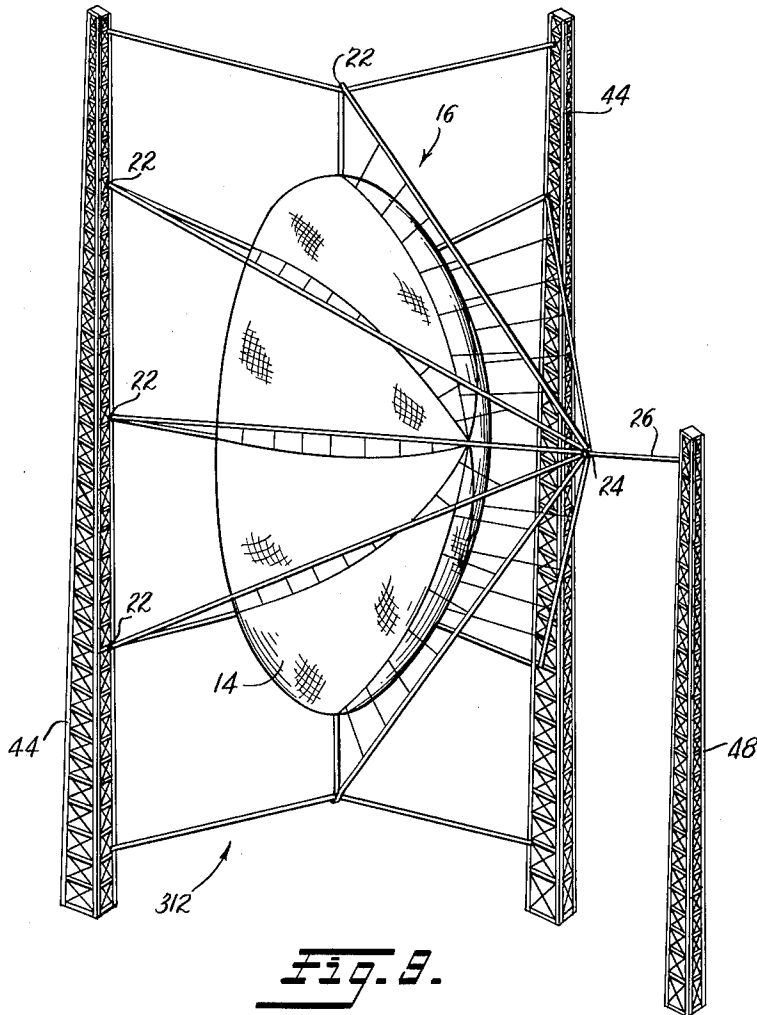
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WIRE MESH COLLAPSIBLE DISK REFLECTOR

Filed Jan. 31, 1961

4 Sheets-Sheet 3



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WIRE MESH COLLAPSIBLE DISK REFLECTOR

Filed Jan. 31, 1961

4 Sheets-Sheet 4

Fig. 10.

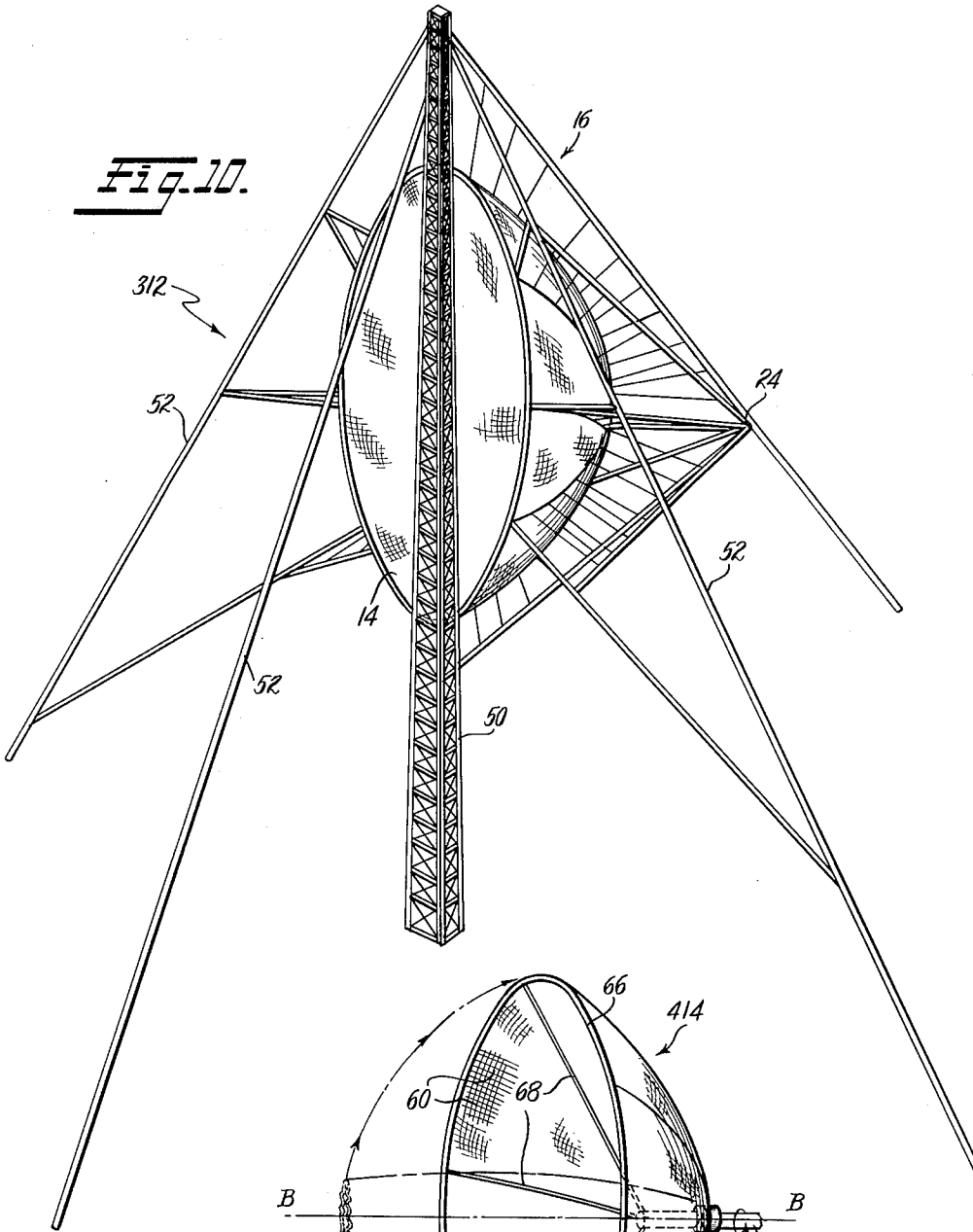
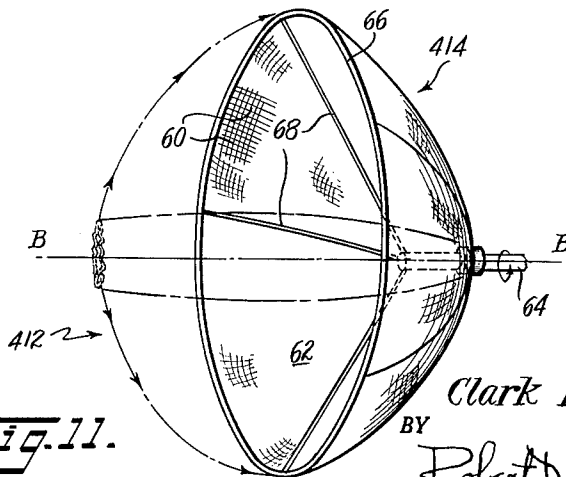


Fig. 11.



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WIRE MESH COLLAPSIBLE DISK REFLECTOR

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Filed Jan. 31, 1961, Ser. No. 86,091

4 Claims. (Cl. 343-915)

This invention relates to reflectors and supporting structures therefor, and more particularly to antenna reflectors and the supporting structure therefor which is defined by a network or system of interconnected bodily flexible web or strand-like tensionable members.

This application is a continuation-in-part of my co-pending application Serial Number 92,430, filed December 20, 1960, for Antenna Reflector and Supporting Structure Therefor, now abandoned.

It has long been desired to be able to manufacture, install, operate and maintain an antenna reflector, having a very large reflecting surface, 600 feet in diameter not being unusual, for receiving and transmitting electromagnetic wave energy, such as radar signals, or other high frequency forms of wave energy, which is economical and inexpensive in manufacture, installation, operation and maintenance; lightweight and portable but durable in construction, substantially indestructable, particularly in regard to concussion and in situations such as use in space with regard to micro-meteorites and other particles; resistant to high wind velocities which enables the antenna reflector to be operable at wind velocities approaching hurricane velocities and greater; prefabricated as a mass produced item and easily varied to manufacturing specifications and packaged in a collapsed condition which enables the reflector to be quickly installed to a desired operational installation shape; a low space factor and semi-invisible with a high strength ratio on comparison to the overall weight of the antenna reflector; resilient and elastic so that on impact or concussion by objects the reflector will quickly return to the original desired contour or figure; substantially weatherproof and relatively less responsive to contraction or expansion due to temperature changes, little or no icing effect and if icing effect does occur, the antenna reflector may be de-iced through a minimum current flow or introduced controlled vibrations; easily transferable from one given installation to another desired installation, and readily and accurately adjustable at any given installation in regard to direction, pattern and character so that after the antenna reflector has been installed at a given location and tested the direction, pattern and character of the main lobe and side lobes may be adjusted to correspond with the calculated or designed desired direction, pattern and character thereof.

Known existing reflectors presently being employed are generally of two types: one type being a rigid reflecting surface supported in fixed immobile relationship to a relatively rigid framework or trestle structure and this type of rigid reflecting surface, framework and trestle structure obviously fails to provide few, if any, of the desires or advantages as stated above, with the other type employing a flexible reflector surface which is normally balloon supported with the reflecting surface being in the nature of a metalized coating on at least a portion of the balloon's surface or a metalized partition located within the confines of the balloon and supported

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along the periphery thereof by a part of the inner surface of the balloon. This second type of reflector not only fails to provide all of the desired advantages as stated above, but also has numerous disadvantages which in the case of a ground supported installation are primarily, limited adjustability as to pattern and contour or figure; requirement of shelter from adverse weather conditions; susceptible to puncture and collapse; maintenance of a constant pressure, etc., and if in space, a very short period of operation, highly susceptible to puncture by micro-meteorites or the like, only to name a few.

Accordingly, it is the primary object of this invention to provide a reflector and support structure therefor which is economical to manufacture; inexpensive to install, maintain and operate; lightweight and easily installed either as a portable or permanent installation; durable, substantially indestructable, relatively invisible, resilient and elastic to impact or concussion; not subject to deformation through expansion or contraction; accurately adjustable as to surface contour or figure, and reliable, practical, effective and efficient in operation.

It is also an object of this invention to provide an antenna reflector having the desires and advantages as stated supra.

A further object of this invention is to provide support structure for supporting a reflector which primarily includes a network of interconnected, bodily flexible, adjustably tensionable strand-like members.

A still further object of this invention is to provide a system for supporting a reflector between a plurality of relatively fixed locations.

An additional object of this invention is to provide a method of supporting a reflector between a plurality of spaced apart locations.

Another object of this invention is to provide a reflector and support structure therefor wherein the reflector is supported in the operational condition through centrifugal force.

Still another object of this invention is to provide a reflector and support structure therefor which may be projected into outer space in a collapsed inoperative condition, rotated to expand and maintain the reflector in a desired operating condition.

Yet it is also an object of this invention to provide a screen for an antenna reflector with means which eliminates the possibility of an arc being formed by reason of a break, parting or some other type of damage which may occur to the screen during operation of the antenna reflector.

It is also a principal object of this invention to provide a method of fabricating support structure which is formed from a network of interconnected, bodily flexible, tensionable elongated strand-like members in a manner which enables the strand-like members to be tensioned to a desired predetermined amount.

In order to accomplish the above stated advantages, desires and objects and overcome the known disadvantages of existing antenna reflectors and the support structures therefor, as also stated above, this invention provides a supporting structure for supporting a reflector, of any desired configuration, wherein the supporting structure includes, in the preferred embodiment, a network or system of interconnected, bodily flexible, adjustably ten-

sionable web or strand-like members. Certain ones of the strand-like members each extend from a fixed location generally inwardly relative to an axis which is substantially common to the axis of the main lobe of the reflector surface and terminate at a common fixed location which is adjacent to the central portion of the reflector surface and disposed generally rearwardly therefrom. Others of the strand-like members are disposed intermediate the reflector surface and the certain strand-like members and extend between diametrically opposed ones of the fixed locations and support the reflector surface. Additional ones of the strand-like members are secured to and extend between the certain and the other ones of the strand-like members at longitudinal space intervals therealong.

Another embodiment or modification of this invention which also accomplishes certain of the objects, possesses certain of the stated desires and advantages and overcomes the corresponding known disadvantages of the existing types of similar structures, as stated above, provides a collapsible reflector which is rotated about an axis that is substantially common with its main lobe and supported in its operative condition by centrifugal force.

With regard to the objects, desires and advantages relating to the antenna reflector screen, as stated above, the screen comprises a plurality of tensioned metallic filaments which are interconnected to define generally polygonal configurations having leg portions which are kinked or bent so that on a break in a leg portion thereof the free end portions will be spaced apart a substantial distance and define a gap which will prevent an arc being formed therebetween.

In performing the method of fabricating the supporting units for the support structure a disposable material is employed whereon there is secured some of the strand-like members which are positioned in contact with other of the strand-like members at spaced locations therealong and all of the strand-like members are tensioned in accordance with the requirements as previously determined for the particular installation and the strand-like members are then secured together at the locations of contact and the disposable material is removed from the some of the strand-like members.

Other objects and important features of the invention will be apparent from a study of the following specification which when taken with the drawing together show, illustrate, describe and disclose a preferred embodiment of the invention together with certain modifications thereof, and what is now considered to be the best mode of practicing the principles of the invention. Still other or additional embodiments or modifications of the invention may be suggested to those having the benefit of the teachings, and such other and additional embodiments or modifications are intended to be reserved especially as they fall within the scope and spirit of the subjoined claims.

In the drawing:

FIGURE 1 is an elevational view, from the rear, with parts thereof broken away, showing a preferred embodiment or modification of a reflector provided with the principles of this invention;

FIGURE 2 is a sectional view, taken along the line 2—2 of FIGURE 1, looking in the direction of the arrows, of the reflector illustrated therein;

FIGURE 3 is an enlarged partial sectional view, taken along the line 3—3 of FIGURE 2, looking in the direction of the arrows;

FIGURE 4 is an enlarged partial view illustrating in more detail a reflector screen element of the reflector of FIGURES 1—3;

FIGURE 5 is a partial view, similar to FIGURE 2, of another embodiment or modification of a supporting unit for the reflector;

FIGURE 6 is a sectional view, taken along the line 6—6 of FIGURE 5 looking in the direction of the arrows,

of the another embodiment or modification of the supporting unit as illustrated therein;

FIGURE 7 is a partial view, similar to FIGURE 1, of a further embodiment or modification of a supporting unit for the reflector;

FIGURE 8 is a sectional view taken along the line 8—8 of FIGURE 7 looking in the direction of the arrows of the further embodiment or modification of the supporting unit as illustrated therein;

FIGURE 9 is an isometric view from the rear of a typical installation of an antenna reflector;

FIGURE 10 is an isometric view, from the front of another typical installation of an antenna reflector, and

FIGURE 11 is an isometric view of another embodiment or modification of an antenna reflector showing the antenna reflector in a collapsed inoperative position by dot-dash lines and in an expanded operative position by solid lines.

Attention is now directed to FIGURES 1 and 2 of the drawing wherein there is illustrated a reflector 12 which may be in the form of an antenna reflector 312 as illustrated in FIGURES 9 and 10 of the drawing normally employed for receiving and transmitting electromagnetic wave energy such as radar signals, or other high frequency forms of wave energy.

The reflectors 12 and 312 both include a metallic mesh reflector screen element 14 and an assembly or structure 16 for supporting, shaping and maintaining the reflector screen element 14 in any desired geometrical contour or figure, such as parabolic, as illustrated.

In the preferred modification or embodiment of the invention, as illustrated in FIGURES 1—3 of the drawing, the assembly 16 includes a plurality of bodily flexible web or strand-like tensionable members which are interconnected to define a network or system of supporting units 18 for the reflector screen element 14.

The supporting units 18 include certain 20 of the strand-like members, which may be more descriptively described as tie back members, which are each secured to and extend generally radially inwardly relative to the main lobe of the reflector 12 or 312 from respective relatively fixed locations 22. The locations 22 are disposed about the periphery of the reflector screen element 14 and are radially outwardly and circumferentially spaced apart relative to an axis A—A which is substantially common with the main lobe of the reflector 12 or 312 and which passes through the central portion of the reflector screen element 14. The tie back members 20 terminate and may be secured to a common relatively fixed location 24 by a suitable resilient stretchable member 26, such as a nylon strand, with the location 24 being along the axis A—A and to the rear of the reflector screen element 14 in longitudinally spaced relationship thereto.

Other 28 of the strand-like members, which may be more descriptively described as reflector screen element backing members, are provided, each of which extend between diametrically opposed ones of the locations 22 with the backing members 28 being disposed intermediate the reflector screen element 14 and the tie back members 20 with the backing members 28 in direct supporting contact with the reflector screen element 14 and longitudinally spaced, relative to the axis A—A, from the tie back members 20. As illustrated in FIGURE 1 of the drawing, it is to be noted that in each of the supporting units 18, the tie back members 20 and the backing members 28 are disposed one each in a common plane which passes through the axis A—A and that the tie back members 20 together with the corresponding backing member 28 may be secured to each other closely adjacent to the respective fixed location 22 or may be secured independently to auxiliary strand-like members 30, as illustrated.

Additional 32 of the strand-like members, which may be more descriptively described as spacer or spanner mem-

bers, extend between and are secured to the corresponding ones of the tie back members 20 and the backing members 28 at longitudinal space intervals therealong in each of the supporting units 18 with the spanner members 32 spanning the space therebetween and disposed in coplanar relationship thereto.

The auxiliary 30 of the tensionable members, which may be more descriptively described as stabilizing members, extend forwardly of and in spaced relationship to the reflector screen element 14 between diametrically opposed ones of the locations 22, as illustrated, but if desirable, other diametrically opposed locations may be employed in securing the stabilizing members 30 in the desired position.

From the above description and disclosure, it is believed to be evident that by placing and controlling the tension of the back members 20 of the supporting units 18 and the stabilizing members 30 between the locations 22 and 24 that the assembly 16 may be effective to support the reflector screen element 14 and that by controlling the tension on the backing members 28 and the spanner members 32 of the supporting units 18 that there may be imparted and maintained on the reflector 12 or the antenna reflector 312 a reflector surface 34 of any desired contour or figure.

In order that the strand-like members may be properly adjustably tensioned in accordance with a given design, installation requirements or a manufacturing specification, any conventional type of automatic servo-adjustment mechanism, not illustrated, may be employed with the strand-like members in order to compensate for any changes in the figure or contour of the reflector and to facilitate in changing the reflector from one type of figure or contour to another type.

The locations 22 and the common location 24 may be, as illustrated in FIGURES 9 and 10 of the drawing, defined by generally upwardly projecting substantially vertically disposed relatively rigid tower structures and it is to be further understood that other suitable relatively rigid structures, such as buildings, guy wires supported slender poles or towers, trees or the like, including special structures which are constructed for installations whereat it is desired that the reflector 12 or the antenna reflector 312 be movable through angles of elevation and azimuth.

The reflector screen element 14 of the reflector 12 and the antenna reflector 312 may be formed from any well known material which is suitable for the purposes desired, such as beryllium-copper alloy, stainless steel, brass or the like, and as illustrated in FIGURE 4 of the drawing, the reflector screen element 14 comprises a plurality of filaments 36 which are interconnected to define annular endless metallic mesh resilient links of polygonal configuration, each of which has leg portions 38 and corner portions 40. Intermediate the corner portions 40 of the links there is provided a bend or kink 42, which may be in wave-like form or S-like configuration with the leg portions 38 which are in contact with each other being secured together by means 43 such as solder or the like. The kinks or bends 42 increase the flexibility and deformability of the links and enable the reflector surface 34 of the reflector screen element 14 to be urged and deformed into the desired contour or figure.

Due to the resiliency of the filaments 36 which will generally have a diameter of approximately .010 inch or less, they will be held in tension even though they may be stretched considerably from their normal shape, in this manner, i.e., the tensioning of the filaments 36, any break or parting in the filaments 36 will enable the free end portions thereof to be spaced a substantial distance apart by reason of the broken filament generally rolling up on itself and define a gap between the free end portions which will prevent an arc being formed therebetween. While the links defined by the intercon-

nected filaments 36 of the reflector screen 14 are shown in the form of a hexagon in FIGURE 4 of the drawing, it is to be understood that they may be of any well known polygonal configuration, such as a triangle, a square, a rectangle or, when the number of leg portions 38 approaches an upper limit, a circle.

There is shown in FIGURES 5 and 6 of the drawing another modification or embodiment 118 of the supporting unit 18 for supporting, shaping and maintaining the reflecting surface 34 of the reflector screen element 14 in a desired contour or figure. In this embodiment, a pair or set of tie back members 120—120 replace each of the tie back members 20 of the embodiment as illustrated in FIGURES 1—3 of the drawing, with the tie back members 120—120 being connected to the spanner members 32 and disposed coplanar with backing members 28 and the corresponding spanner members 32. In each pair of the tie back members 120—120, one of the back members is curved backwardly away from the reflector screen element 14 and extends between the respective locations 22 and the common location 24 whereas the other back member of the pair is curved in an opposed direction generally inwardly and toward the reflector screen element 14 and substantially follows the configuration of the reflector surface 34 of the reflector screen element 14 between other respective locations 122 on the stabilizing member 30 and another common location 124. As illustrated in FIGURE 6, the corresponding members, i.e., the tie back members 120—120, the backing member 28 and the spanner members 32, for each of the supporting units 118 are disposed in a substantially common plane. This construction of the supporting units 118 of the assembly 16 increases the strength and rigidity of the tensioned network system.

There is also shown in FIGURES 7 and 8 of the drawing, a further embodiment 218 of the supporting unit 18 wherein supplementary spacer or spanner members 232 are provided which connect the adjacent backing members 28 to the intermediate corresponding tie back member 20 in a manner which enables alternate tie back members 20 to be eliminated while the intermediate backing member 28 is secured to the tie back member 20 by the spanner members 32. By this construction, the number of tie back members 20 used in the assembly 16 relative to the backing members 28 may be decreased. In each of supporting units 218, the supplementary spanner members 232 are connected to the intermediate corresponding tie back member 20 and extend therefrom outwardly away from the corresponding common plane and are connected at their extremities to the adjacent backing members 28. A section through a single supporting unit 218 of the assembly 16 of this embodiment will be similar to a bilateral triangle having a concave base, as shown in FIGURE 8 of the drawing. The construction of the supporting units 218 of the assembly 16 enables the number of the tie back members 20 to be decreased relative to the number of backing members 28, while yet effectively supporting and maintaining the reflector surface 34 of the reflector screen element 14 in the desired contour or figure.

In FIGURES 9 and 10 of the drawing, there illustrated typical fixed ground installations for supporting and maintaining the antenna reflector 312 in the desired contour or figure, wherein the locations 22 and the common location 24 are defined by substantially vertically disposed generally upwardly projecting relatively rigid tower structures. While tower structures are illustrated, it should be understood that buildings, poles, trees, as well as flexible members and special structures such as mobile frames and frame structures which are designed to enable the antenna reflector 312 to be movable through angles of elevation and azimuth may be employed to establish and maintain the locations 24 and 26.

Also, while the antenna reflector 312 is illustrated as being supported in a generally vertical position, with the main lobe thereof being directed in a manner so that the pattern will be substantially horizontal, it is to be understood that the antenna reflector 312 may be supported by each of the modifications of the assembly 16 so that the pattern may be directed more vertical than horizontal, more horizontal than vertical, vertical, horizontal or any desired direction in between.

In the modification or embodiment of the invention as illustrated in FIGURE 9, there is shown a tri-base type support which includes a pair of tower structures 44 which are disposed and extend along opposite sides of the reflector screen element 14 and suitable means such as strands, cables or the like may be provided, as required, to define the locations 24 and a tower structure 43 is provided which is positioned rearwardly of the reflector screen element 14 to define the common fixed support 24. Of course, it is to be understood that it may be necessary to provide conventional type guy members for supporting the tower structures 44 and 43.

In FIGURE 10 of the drawing, there is illustrated a mono-base type support which requires only one tower structure 50 constructed of non-conductive material having guy members 52 as required.

While the modifications and embodiments of the invention, as illustrated in FIGURES 9 and 10 of the drawing, provide a base support for the assembly 16 having the supporting units 18 thereof shown as the embodiment or modification as illustrated in FIGURES 1 and 2 of the drawing, it is to be understood that the modification and embodiment of the supporting units 118 and 218 of the assembly 16 which are illustrated in FIGURES 5 and 6 and FIGURES 7 and 8, respectively may also be supported by either of the base supports, as illustrated in FIGURES 9 and 10 of the drawing.

Further, for the sole purpose of brevity, the number of supporting units 18, 118 and 218 and the number of locations 22 have been illustrated by definite relatively small numbers, and it is to be understood that in actual practice, the number of the supporting units 18, 118 and 218 and the number of locations 22 will be substantially greater than those illustrated in the drawing, depending upon the requirements of the particular installation with the numbers varying from one installation to another like installation depending upon the requirements and the conditions which are present at the respective installations, such as the required resolution of the contour or figure of the reflector screen element 14 which is primarily determined by the wave length of the emitted energy and the radiation pattern.

Also, if desired, a continuous, annular endless strand member may connect the locations 22 together and be secured to the reflector screen element 14 along the peripheral edge thereof to further facilitate in the stabilization of the reflector surface 34 of the reflector 12 or the antenna reflector 312.

It has been found most desirable and it is preferable that the bodily flexible, tensionable, strand-like members 20, 120, 28, 32, 232, be formed with a conductive core material which possesses high tensile, low stretch characteristics and properties, such as metallic wire or the like, which may be coated with a plastic substance, for a reason to be explained in more detail hereinafter, such as nylon or polyethylene or some near eutectic alloy, such as common solder having approximately 40 percent tin and 60 percent lead. However, in the event that the stabilizer members 30 are employed it is most important that these members be formed of a non-conductive material, such as fiber glass, "Fortisan," or the like, which also possess the desired high tensile, low stretch characteristics and properties but which are non-conductors.

It is to be understood that other web or strand-like materials, than those described and disclosed above, may

be employed provided that the strand-like members 20, 120, 28, 30, 32, 232, all possess the required high tensile, low stretch characteristics and properties and that the stabilizer members 30 are formed of a non-conductive material. The specific examples of the materials which may be preferable and desirable for the strand-like members 20, 120, 28, 32, 232, relates to certain advantages and desired results which are acquired in the fabrication or manufacture of the various modifications and embodiments of the support assembly 16, now to be described and disclosed in more detail.

In order to fabricate and manufacture the supporting units 18, 118 and 218 of the various modifications and embodiments of the support assembly or structure 16, it has been found most preferable and desirable to provide a disposable fabric, such as a highly soluble or meltable material, for example water or alkali soluble or heat meltable substances like soluble carboxymethylated cotton or calcium alginate fibers and heat meltable vinyon, or the like, having some of the strand-like elements, preferably the spacer or spanner members 32, 232, as the case may be, woven therein with the spanner members 32, 232 being disposed at space intervals throughout the extent of the fabric with the space intervals between the adjacently disposed spanner members 32, 232 being controlled according to the technical specifications which have been prepared relating to the requirements and conditions of the particular installation.

The fabric, having the spaced apart metallic or conductive core filament spanner members 32, 232 interwoven therethrough is placed on a jig and maintained in a desired position by metallic clamping bars each of which is provided with voltage terminals, for a reason which will be more fully described and disclosed hereinafter.

The jig is provided with guide means, preferably in the form of pins, which are positioned on the jig in a manner that corresponds to the shape or configuration which is desired for the remaining or other strand-like members, preferably the tie back members 20, 120, as the case may be, and the corresponding backing members 28 for the particular supporting unit 18, 118, 218. The metallic or conductive core filament material of the tie back members 20, 120 and the backing members 28 are then positioned along the guide means and maintained on the jig in direct metal-to-metal, metal to plastic or plastic to plastic contact, as the case may be, with the spanner members 32, 232 being supported by the soluble fabric. Each of the conductive core filament members is then placed under the desired tension according to the requirements as specified in the prepared technical specification and the clamping bars are secured to maintain the strand-like members as positioned and to ensure that there is a direct contact maintained between the positioned strand-like members. Sufficient current is passed through the so positioned strand-like members which will cause the strand-like members to be fused together at the points of contact therebetween. As described and disclosed above, the strand-like members 20, 120, 28, 32, 232, are each formed with a conductive core which is preferably coated with a material which will enable the strand-like members to be fused together and securely joined at points thereon which are in contact with other of the strand-like members when a current is passed through the strand-like members. It is to be understood that all of the strand-like members may be so coated, only part of the strand-like members may be so coated and in certain instances it is only necessary that the strand-like members be formed of a conductive material having the necessary requirements relating to high tensile, low stretch characteristics and properties but which are not coated.

After the strand-like members have been secured together at the points of contact, the fabric is then removed and in the case of a heat meltable fabric the current passing through the spanner members 32, 232 will have al-

ready separated the spanner members therefrom and in the case of the soluble fabrics it is only necessary to dissolve the fabric in a proper solvent.

A still further modification or embodiment of the invention is illustrated in FIGURE 11 of the drawing, wherein an antenna reflector 412 is shown which includes a reflector screen element 414 formed, as illustrated, of preshaped generally radially and substantially circumferentially extending reinforcing members 60 interwoven with a metallic screen mesh-like material 62 or of only a preformed or preshaped flexible sheet material, such as a plastic, not illustrated.

The modification or embodiment of the reflector 412 differs from the various modifications or embodiments thereof as illustrated in FIGURES 1-3, 5-6, 7-8, 9 and 10 in that the reflector 412 does not require the network or system of tensionable members which define the assembly 16 to support and maintain the reflector surface of the reflector in the desired contour or figure.

In place of the assembly 16, the antenna reflector 412 is provided with an elongated hub portion 64 that has the longitudinal axis B-B thereof disposed substantially common with the main lobe of the reflector 412 and a suitable source of power, not illustrated, rotates the reflector screen element 414 in the direction of the arrow, as shown in FIGURE 11 of the drawing, about the axis B-B of the hub which passes substantially through the center portion of the reflector screen element 414.

As illustrated by the dot-dash lines in FIGURE 11 of the drawing, during a non-rotating period, the antenna reflector screen element 414 will be in a normally collapsed inoperative condition or position and on rotation thereof through the source of power the reflector screen element 414 will be urged into and maintained in the expanded operative condition or position, as shown by the solid lines in FIGURE 11 of the drawing, by reason of centrifugal force created by the rotation of the reflector hub portion 64 of the reflector 412.

In order to prevent undue and undesirable wobbling of the antenna reflector screen element 414 during the rotation thereof about the axis B-B and in order to assure that the screen element 414 will be maintained in a desired contour or figure in the expanded operative condition or position, an annular endless flexible strand-like member 66 extends about the outer periphery of the screen element 414 and there may be provided a plurality of strand-like members 68, similar to the strand-like members 66 and which are also preferably non-conductive, which extend between the strand-like member 66 and the hub portion 64 of the reflector 412.

The antenna reflector 412 is preferably for use in outer space where rocket or propulsion means may be employed to instigate the rotation thereof. It is also within the contemplation of this invention that a missile or airship, not illustrated, may be employed as a carrier for the antenna reflector 412 with the missile or airship being provided with an opening having riffling therein with the antenna reflector 412 being provided with means that register with the riffling of the opening so that on ejection of the antenna reflector 412 from within the riffling opening, the antenna reflector 412 will be automatically rotated to create the necessary centrifugal force to urge the reflector screen element 414 of the antenna reflector 412 from the collapsed inoperative condition or position to the expanded operative condition or position.

However, it is also believed to be evident that the antenna reflector 412 may be ground supported and rotated in a manner which will create the necessary centrifugal force to expand and maintain the reflector screen element 414 in the operative condition.

While the invention has been described in terms of the preferred embodiments and certain modifications thereof which it has assumed in practice, the scope of the invention should not be deemed to be limited by the precise embodi-

ments and certain modifications herein shown, illustrated, disclosed and described, such other and additional embodiments and modifications being intended to be reserved especially as they fall within the scope of the claims here appended.

I claim as my invention:

1. An antenna reflector comprising, in combination, a reflector and supporting structure for supporting the reflector, said reflector comprising a screen defined by a plurality of tensionable metallic filaments, said filaments being interconnected to define a plurality of polygonal configurations, each of said polygonal configurations having the side portions thereof kinked intermediate the corner portions thereof, said supporting structure comprising a network of interconnected strand-like members, certain of the strand-like members each extending from a first location to a common second location disposed adjacent the central portion of the screen, other strand-like members disposed intermediate the screen and the certain strand-like members, said other strand-like members each extending between opposed locations that are spaced about the periphery of the screen, and additional strand-like members secured to and extending between the certain strand-like members and the other strand-like members at longitudinal space intervals therealong.

2. An antenna reflector comprising, in combination, a reflector and structure for supporting the reflector, said structure comprising a network of interconnected strand-like members, certain of the strand-like members each extending from a first location to a common second location disposed adjacent the central portion of the reflector, other strand-like members disposed intermediate the reflector and the certain strand-like members, said other strand-like members each extending between opposed locations that are spaced about the periphery of the reflector, and additional strand-like members secured to and extending between the certain strand-like members and the other strand-like members at longitudinal space intervals therealong.

3. An antenna reflector comprising, in combination, a reflector screen and a system for supporting the reflector screen between a plurality of fixed locations, said system comprising a network of interconnected adjustably tensionable bodily flexible strand-like members, certain of the strand-like members extending from a respective one of the fixed locations and terminating at a common one of the fixed locations which is disposed adjacent the central portion of the reflector screen, other strand-like members disposed intermediate the reflector screen and the certain strand-like members, said other strand-like members extending between opposed ones of the respective fixed locations which are spaced about the periphery of the reflector screen, additional strand-like members fixed to and extending between the certain and the other strand-like members at longitudinal space intervals therealong, and auxiliary strand-like members disposed to the side of the reflector screen which is opposed to the side thereof whereat the certain and the other strand-like members are disposed, said auxiliary strand-like members extending between the opposed ones of the respective fixed locations.

4. Structure for supporting an antenna reflector between a plurality of fixed locations, said structure comprising a network of interconnected adjustably tensionable bodily flexible strand-like members, certain of the strand-like members extending from a respective one of the fixed locations and terminating at a common one of the fixed locations which is disposed adjacent the central portion of the reflector, other strand-like members disposed intermediate the reflector and the certain strand-like members, said other strand-like members extending between opposed ones of the respective fixed locations which are spaced about the periphery of the reflector, additional strand-like members fixed to and extending between

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the certain and the other strand-like members at longitudinal space intervals therealong.

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