April 26, 1966 A. BARTOLINI 3,248,735

BALLOON CARRIED ANTENNA

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Fig. 1.

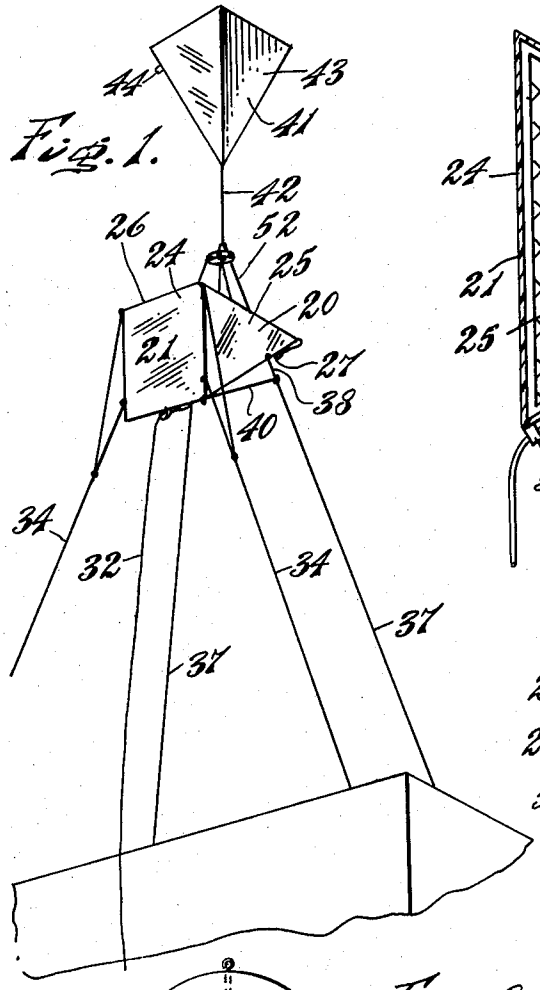


Fig. 6.

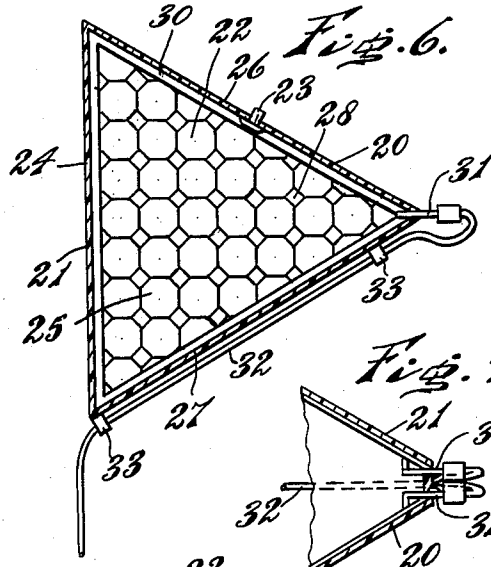


Fig. 7.

Fig. 11.

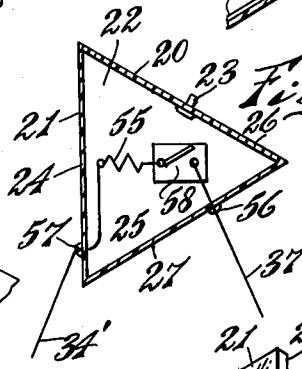


Fig. 10.

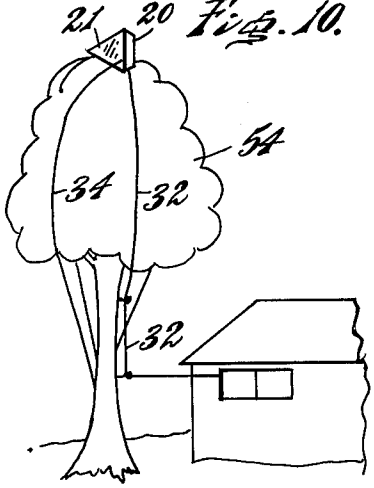


Fig. 8.

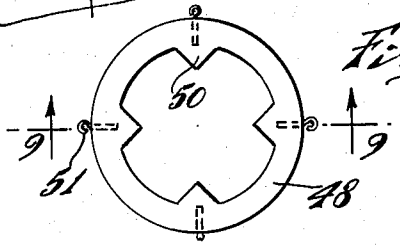
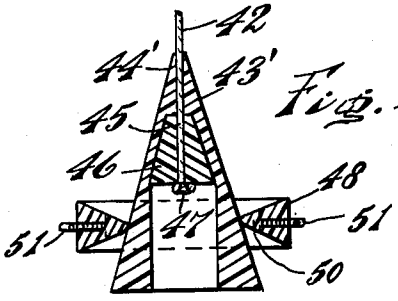


Fig. 9.



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BALLOON CARRIED ANTENNA

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Fig. 2.

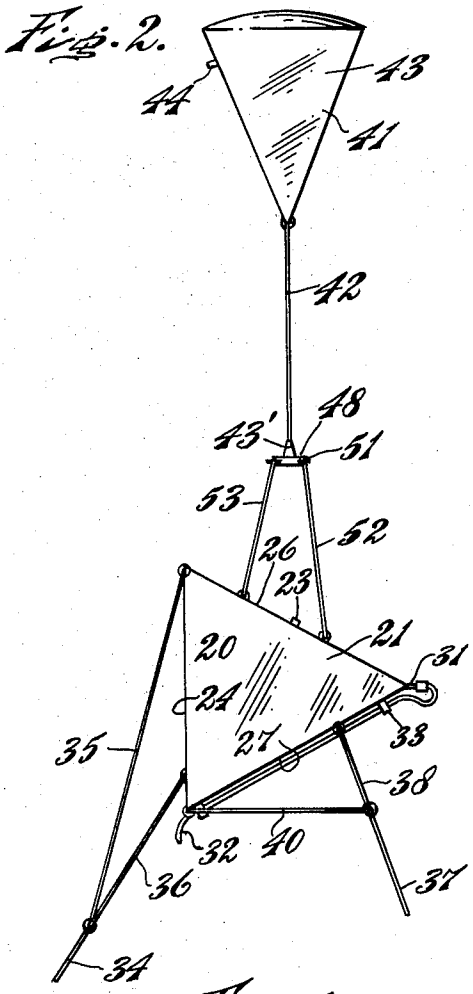


Fig. 3.

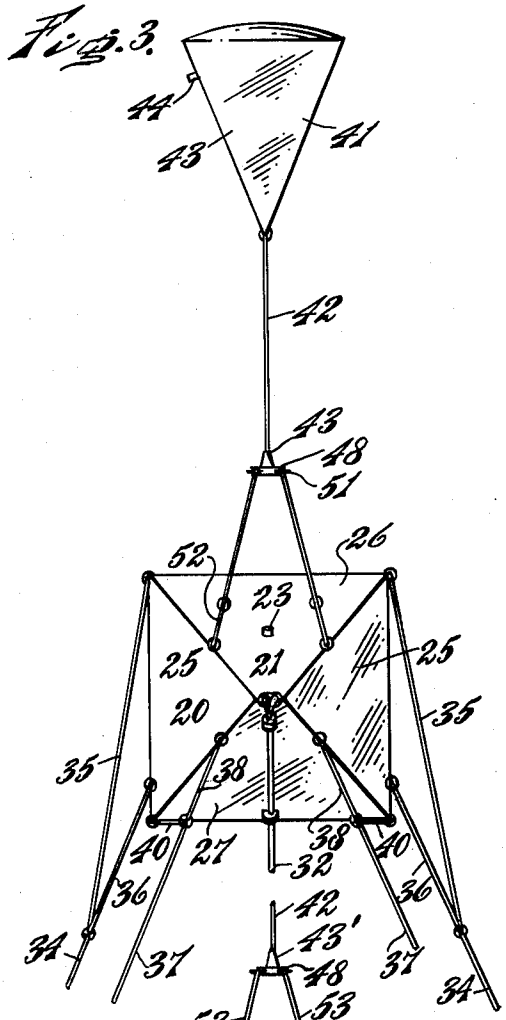


Fig. 5.

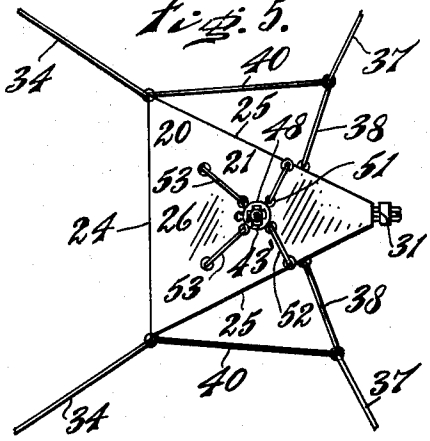
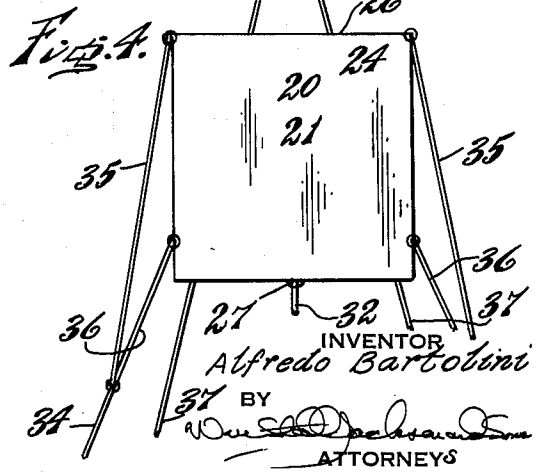


Fig. 4.



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3,248,735

BALLOON CARRIED ANTENNA

Alfredo Bartolini, Rte. 1, Box 422, Furlong, Pa.

Filed Jan. 17, 1962, Ser. No. 166,844
11 Claims. (Cl. 343—704)

The present invention relates to antennas for use in television and the like. The invention is believed to have particular application to homes, although it can be employed in connection with industrial establishments such as gasoline stations, restaurants, or in communication system engineering as a probe antenna for antenna site determination.

The invention also has significant application in the military services during war time. It provides a means of highly directional radio transmission in an enemy-held location where it would be highly desirous to quickly elevate the antenna to any desired height for the transmission and then quickly lower it for concealment or to move to another location.

A purpose of the invention is to provide long range television reception without requiring the use of a mast or a tower to maintain the antenna in an outdoor elevated and correctly oriented position.

A further purpose is to permit easy removal and storage of a television antenna, and transportation to, and reinstallations at a new location.

A further purpose is to minimize the amount of time required to install a long range television antenna.

A further purpose is to render a television antenna more attractive, eliminating unsightly features such as a mast, permitting colorful effects, and even giving the illusion that the television antenna is floating free in space.

A further purpose is to assist in stabilizing a buoyant television antenna against winds.

A further purpose is to avoid breaking off and bending of antenna elements due to the action of winds and weather.

A further purpose is to assist in using a television antenna in advertising.

A further purpose is to avoid difficulty from ice and snow in connection with a television antenna.

A further purpose is to facilitate installing a long range, outdoor type television antenna indoors in a space in the upper portion of a house such as a loft or attic, or high ceiling areas such as an auditorium without the necessity for modifications.

A further purpose is to provide a television antenna by means of metallic layers or surfaces which are carried by or in connection with a balloon, and to connect a transmission line between the metallic surfaces and television or other type receiver.

A further purpose is to make a balloon having flat surfaces such as a pyramid, and to provide an antenna connected to a transmission line and suitably located on the balloon envelope preferably on the interior.

A further purpose is to stabilize the antenna pyramid so that it will remain in position with the base perpendicular to the ground.

A further purpose is to further stabilize the antenna pyramid by a stabilizer balloon, preferably connected to the antenna balloon through a swivel and preferably of inverted pyramid form.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate a few only of the numerous embodiments in which the invention may appear, selecting the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

FIGURE 1 is a perspective showing the antenna balloon and stabilizer balloon in position above a building.

FIGURE 2 is an enlarged fragmentary view of the antenna balloon and stabilizer balloon of FIGURE 1, looking at the side.

FIGURE 3 is an enlarged fragmentary elevation of the antenna balloon and stabilizer balloon of FIGURE 1 looking from the rear.

FIGURE 4 is an enlarged fragmentary elevation of the antenna balloon looking from the front.

FIGURE 5 is an enlarged fragmentary plan view of the antenna balloon, the stabilizer balloon being broken away.

FIGURE 6 is a central longitudinal vertical section through the antenna balloon to enlarged scale.

FIGURE 7 is a fragmentary central longitudinal plan section of the antenna balloon to enlarged scale.

FIGURE 8 is an enlarged top plan view of the bearing of the swivel shown in various figures.

FIGURE 9 is a section on the line 9—9 of FIGURE 8, with the swivel added.

FIGURE 10 is a perspective showing the antenna balloon of the invention anchored to a tree.

FIGURE 11 is a vertical section through the antenna balloon of the invention omitting the antenna surface and the transmission line but showing an electric heating device.

Describing in illustration but not in limitation and referring to the drawings:

In the prior art, the conventional television antenna of the type used on or adjacent to homes and industrial establishments such as restaurants and gasoline stations is usually a permanent structure supported by a mast or by towers, and involving not only considerable expense but considerable time and trouble in erection. There is also danger in some cases of damage to the roof and this is especially so in case of a heavy storm.

Taking down and reerecting such a prior art television antenna is usually troublesome and expensive.

The prior art television antenna is often not a thing of beauty and in fact, in some cases definitely detracts from the appearance of the premises. This is not only true of the antenna but of the mast or tower and the accompanying guy wires.

In accordance with the present invention, the antenna is associated with or made part of an inflatable balloon, which performs several functions. In the preferred embodiment it supports the metallic surface of the antenna without the requirement of any mast or tower. It also positions the antenna surface in a suitable form, preferably more or less flat in which it can function as an antenna. It also supports the transmission line wires from the antenna.

It also performs various related functions, including stabilizing against wind, preferably removing snow and ice, and in some cases adding to the appearance of the location at which it is installed.

Considering the invention more particularly in its preferred form, a long range television reception system is provided which does not require a mast and does not require a tower or a pair of towers, and therefore will not damage the roof or other related structure. The initial cost and periodic maintenance cost is greatly reduced when the antenna must be installed at a considerable height because the mast or other rigid support is not required.

The device of the invention can readily be taken down and packed up into a light, compact package by deflating the balloon. It can then be reinflated by connection to a gas cylinder and reinstalled readily at another location.

The antenna of the invention is so simple that it can be installed to a considerable height by one person without a helper, without need for ladders and special tools, and without hazard to life and limb.

Since the conventional guy wires of the prior art are not required, the unsightly appearance of a prior art long range television antenna is avoided. In fact, the stabilizing lines and the transmission line can be so light and can blend so well with the surroundings that the antenna will appear to be floating freely in space with no visible means of attachment to the house.

Where desired, the antenna can be given a gala or colorful appearance. Thus the antenna can carry special decorations for certain holidays, or can bear some symbol, device or name associated with the owner. It can also provide a space on which advertising can be displayed, or can carry a special message which will be plainly visible at a considerable height above the ground.

The television antenna of the invention is preferably self-stabilizing so that it will recover quickly from a gust of wind and thus will not greatly change its position. The antenna system of the invention has such high gain on most VHF channels that temporary disorientation by a gust of wind will not cause noticeable effect in television reception in most areas.

While the invention in its best embodiment will usually be installed in the air outside a house or building, it may if desired be made to blend with the surroundings, for example by nesting the television antenna in the top of a tree. This has a self-stabilizing effect during storms.

The television antenna of the invention can also be installed indoors, in which case the effect of the gas is to distend the envelope. Thus the antenna of the invention can be placed in a loft or attic or steeple, avoiding the necessity for attachment by nails and screws.

The slight vibration or flexing of the envelope of the balloon itself will tend to cause ice or snow to drop instead of remaining adhering. If desired, however, the antenna may have built-in heating equipment to cause melting of ice and snow, as later explained.

Referring now first to the form of the invention shown in FIGURES 1 to 9, the antenna balloon **20** has an envelope **21** of any suitable light flexible gas-retaining fabric or layer, as well known in the art in balloon manufacture, suitable materials being rubber, polyvinyl chloride, silk, rayon, nylon or the like, with suitable impregnating coatings as well known, to reduce gas transmission through the envelope where required.

A very effective material as used in my experiments is polyvinyl chloride sold under the trademark Mylar, and having a thickness of the order of .0015 inch (1.5 mils).

The envelope is filled with a gas lighter than air occupying the interior space **22**, the preferred gas being helium, but hydrogen or light hydrocarbon gas being permissible. The gas will preferably be noninflammable. Filling of the gas is suitably accomplished through valve **23**, which may be conveniently of the type employed as a tire valve, or balloon valve, although any other suitable type of valve may be used. The valve **23** performs the function of filling and of discharging the gas where desired.

The preferred shape of the antenna balloon is that of a rectangular or preferably a square pyramid, as shown. The pyramid has a base **24** which is preferably positioned at right angles to the ground and is preferably square as shown, has two opposed triangular pyramid sides **25** which are arranged vertically and has two trapezoid sides **26** at the top and **27** at the bottom, as shown.

Thus it will be evident that there are five generally straight sides, although, of course, the inflation may apply some bulging so that the sides will not be entirely plane.

The envelope is used to carry a very thin metallic layer **28** which will preferably be on the inside but permissibly may be on the outside and will preferably extend over each of the sides **25**, with a very thin metallic band **30** around the outer edge. The metallic layer **28** and the band **30** are desirably integral.

The metallic layer **28** and metallic band **30** will preferably be of foil dimension or thinner and flexible, and may conveniently be applied by spraying a metal such as aluminum, gold, silver, copper, tin or other suitable metal in a very thin layer which will not greatly increase the weight. Such very thin layers are well known in the art and have been applied extensively on plastics.

While the layer **28** with band **30** which forms an antenna element proper may be continuous, I have shown it as a network, applied, for example, by spraying through a mask, in order to further decrease the weight.

Thus in effect there are two antenna elements separated from one another and converging, which in a suitable antenna for example may be several feet apart at the base and a few inches apart at the apex.

Each of the antenna layers **28** with their respective bands **30** is electrically connected to a transmission line terminal **31** and each of the transmission line terminals **31** is electrically connected to one of the wires of the two conductor line forming a transmission line **32**, so that both of the transmission line wires can be connected to the television set to form the antenna. The transmission line **32** is suitably held to the bottom of the balloon by clips **33** so that it will descend from the edge of the balloon adjacent the bottom of the base.

The antenna balloon is conveniently moored in a manner to make it self-stabilizing. There are two lines **34**, each of which branches and is connected to one side of the vertical base of the pyramid by means of a line **35** to one top corner of the base and a line **36** to the adjoining edge of the base near the bottom, the lines **35** and **36** being of suitable length with respect to the angle at which the line **34** extends downward so as to tend to hold the antenna balloon with the base **24** vertical.

At opposite positions which tend to divide the 360° angle into four parts, lines **37** are provided which branch and connect to the bottom side **27** of the pyramid by a line **38** connected to the adjoining edge of the bottom side **27** near the apex and a line **40** connected to the adjoining edge of the bottom of the pyramid near its base **24** and therefore near the lowest point of the pyramid. The relative lengths of the lines **38** and **40** are chosen so as to tend again to hold the pyramid in the position shown with the base **24** vertical.

While the device may be used without other stabilization than that which I have already described, it is preferable to employ a balloon stabilizer **41** which floats above the antenna balloon, as best seen in FIGURES 1, 2 and 3.

The balloon stabilizer can be of any suitable shape, but preferably diverges upwardly in the form of an inverted pyramid as shown, or an inverted cone, anchored at the apex to support line **42**. The balloon stabilizer has an envelope **43** and is filled with one of the gases as mentioned through filling valve **44** which may be of the type of valve **23**.

In the preferred embodiment, the balloon stabilizer line **42** connects to cone internal member **43'** of a swivel by passing through opening **44'** and then through opening **45** of anchoring plug **46** and being suitably knotted at **47** at the bottom.

The internal cone **43'** works within swivel bearing **48** which surrounds the cone and has internal projections **50** which prevent the cone from pulling up through the space between the projections.

The projections **50** preferably are sharp pointed in both directions as shown, and in the preferred embodiment both the cone **43'** and the bearing **48** are made of a low friction plastic such as polyfluorohydrocarbon, an example being polytetrafluoroethylene. Other similar hydrocarbons such as poly-fluoro-chloro-hydrocarbons may be employed.

The bearing **48** has outer anchorage eyes **51** which connect respectively to lines **52** extending from opposite edges of the balloon top surface **26** near the apex, and to lines **53** extending from the top surface **26** on opposite sides near the base **24** so that the respective lines **52** and **53** are generally disposed at 90° positions to one another.

Thus the divergence of the lines **52** and **53** from the

bearing **48** assures that orientation of the antenna balloon **20** will be influenced by the position and orientation of the bearing **48**.

The stabilizer balloon **41** exerts a steady upward pull on the antenna balloon through the swivel assembly. The inverted pyramid or other similar shape of the stabilizer balloon will tend to exert even greater upward force with a momentary gust of wind passing across it. The stabilizer balloon **41** will also move in the direction of the wind to a certain extent and that will cause a swivel action which will be unlike that of the usual type swivel.

The internal member cone **43'** will always tend to remain vertical and the swivel external member bearing **48** will pivot with the edge of the bearing which is upwind moving upwards and the opposite edge of the bearing moving downward. This bearing action during a momentary gust of wind assists greatly in maintaining correct horizontal plane orientation at the antenna balloon **20**, even though the antenna position is momentarily influenced by the wind.

The stabilizing lines of the antenna balloon **34** and **37** may be attached to the ground (or a building) in any suitable manner, preferably so that the angles formed by any two lines to the adjoining lines will be approximately at 90° when viewed from above.

To prevent the stabilizing lines from being noticeable, and so that they will be durable and of sufficient strength, they will suitably be of thin braided, prewaxed nylon cord of natural color, while the antenna transmission line will also be of natural color.

The response of the antenna balloon to the wind will be readily understood. A wind coming from the left or from the right (that is, striking against the surface shown in FIGURE 2 or its opposite surface) will tend to pivot the antenna balloon about a vertical axis with one edge of the front moving toward the right and the other edge of the front moving down. This movement will expose more of the bottom surface of the antenna balloon to the wind and the wind on the bottom surface will oppose further downward movement. One of the lines **53** to the swivel will also oppose downward movement of the front edge of the balloon, because the side of the bearing to which the line is attached will be moving in an upward position.

This same wind may instead cause a front edge of the antenna balloon to begin to move in the opposite direction, but this would be opposed by one or more of the stabilizing lines.

If the wind were to come toward the forward edge (that is the surface shown in FIGURE 4), it would tend to cause the antenna balloon upper surface to begin to tilt backward. But the action of such a wind on the stabilizer balloon will make the swivel lines **52** pull up and the swivel lines will tend to hold the antenna balloon in the correct orientation to the ground. More of the antenna balloon movement will be cancelled out by some of the other stabilizer lines, which will oppose a shift in the relationship of the antenna balloon.

If the wind comes from the rear (that is toward the apex), it will tend to move the antenna balloon forward and either up or down. The tie lines **37**, however, tend to prevent any great forward movement and if the antenna balloon tends to pivot, forward with the apex rising, lines **53** to the swivel with lines **37** will oppose this movement. Also, if the antenna balloon forward surface begins to move down the bottom surface is exposed further to the wind and this will tend to correct the difficulty.

Thus the device is effectively stabilized against movement in a direction which would cause it to lose its proper orientation.

While the installation of the antenna balloon as shown in FIGURES 1 to 9 is preferred, in some cases it will be desirable to blend the antenna balloon with the surroundings. This can be done by causing it to nest in a tree **54** as shown in FIGURE 10. The antenna balloon without the stabilizer is allowed to rise in the air and is positioned by the tie lines directly above the selected tree. After the balloon has been correctly oriented, the tie lines are drawn in until the antenna balloon nestles in the treetop. The tie lines are then secured, for example to the tree trunk or to a branch, and transmission line is connected to the television receiver. In this case no stabilizing balloon is desirable.

In some cases and in some climates the elimination of ice and snow by flexing of the antenna balloon in the wind will not be adequate and in such cases I provide in the antenna balloon or the stabilizing balloon or both an electric heater **55** as shown in FIGURE 11. The illustration shows the antenna balloon. Instead of two of the tie lines in this case, I use electric wires **37'** connected to the high side of the electric power source and **34'** connected to the grounded side of the electric power source. The wires are led in through gas tight seals **56** and **57** in the balloon envelope. A thermostatic switch **58** suitably closes the circuit automatically when a low temperature is reached and heats the gas within the balloon, thus counteracting any tendency of snow or ice to adhere.

I have found that a successful television antenna according to the invention can be made with the edges of the pyramid of the antenna balloon each about four feet, and a separation between the two antenna surfaces at the apex of about three inches.

Where the antenna balloon is placed indoors, the inflating gas can for example be air.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claim.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In an antenna system for use in television or the like, an aerodynamically stabilized inflatable flexible envelope in the general shape of a pyramid having a substantially flat surface, a metallic layer distributed along the flat surface of said envelope, said pyramid shaped envelope having its base positioned substantially transverse to the ground and a transmission line connection from said metallic layer to the ground.

2. An antenna of claim **1**, having at least two opposed generally flat surfaces on the pyramid with metallic layers being distributed along both surfaces, each connected to the transmission line.

3. An antenna of claim **1**, in which said metallic layer is on the inside of the substantially flat surface of the envelope.

4. In an antenna, an inflatable balloon in the general form of a pyramid having substantially flat surfaces, a metallic layer on at least one flat surface, a transmission line connected with the metallic layer and the ground and a plurality of diverging lines connected to opposite sides of the pyramid to hold it in an aerodynamically stabilized position with the base of the pyramid being transverse to the ground, said lines being secured at points below the balloon.

5. An antenna of claim **4**, having four such lines, two of which are anchored to the pyramid near the base and two of which are anchored to opposed sloping sides of the pyramid near the bottom thereof.

6. An antenna of claim **5**, in which the lines anchored to the opposed sloping sides near the bottom are also anchored to the pyramid near the bottom of the base.

7. An antenna of claim **4**, having four such lines, two of which are connected at opposite sides to the base of the pyramid nearest the ground and also near the top and in which the other two lines are connected to opposite bottom edges of the sloping sides of the pyramid at a point near the base and also at a point near the apex.

8. In an antenna system according to claim **4**, including in combination a stabilizer balloon above the antenna balloon and connected thereto by a line, with swivel means

interposed in the line between the stabilizer balloon and the antenna balloon.

9. An antenna of claim **8**, in which the stabilizer balloon is of pyramid form.

10. An antenna of claim **8**, in which the stabilizer balloon is of inverted pyramid form.

11. In an antenna system according to claim **1**, including an electric heater in the inflatable envelope and electric circuit means interconnected to the electric heater to melt ice and snow on the inflatable envelope.

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