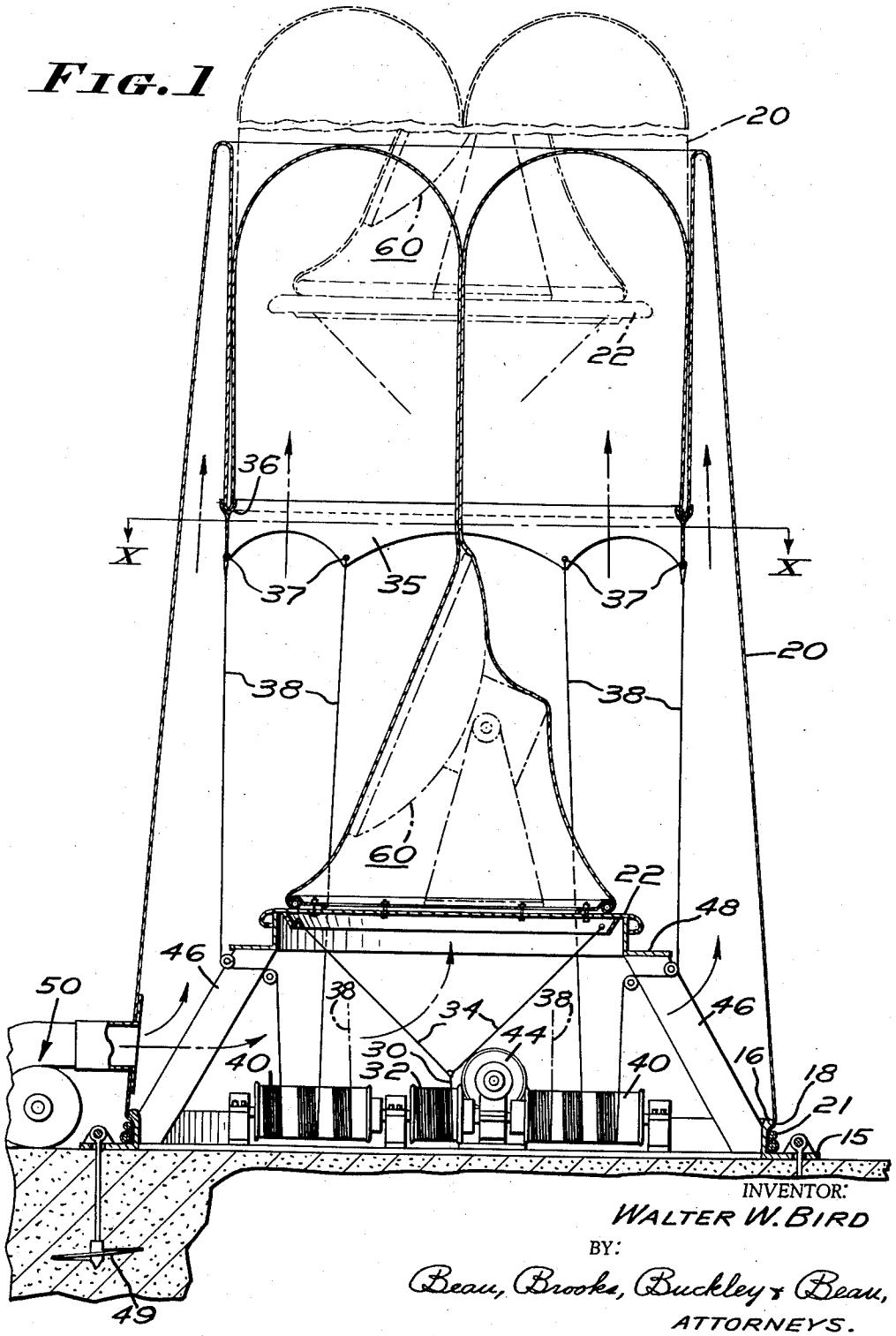
Aug. 26, 1958 W. W. BIRD 2,849,011

AIR INFLATED TOWER OR THE LIKE

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FIG. 1



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FIG. 2

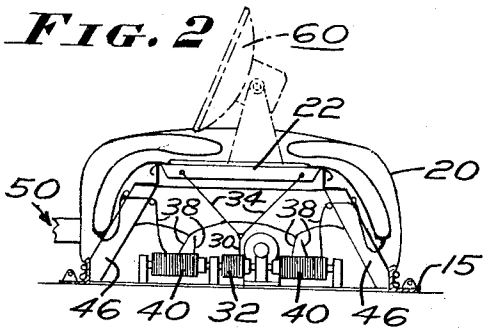


FIG. 3

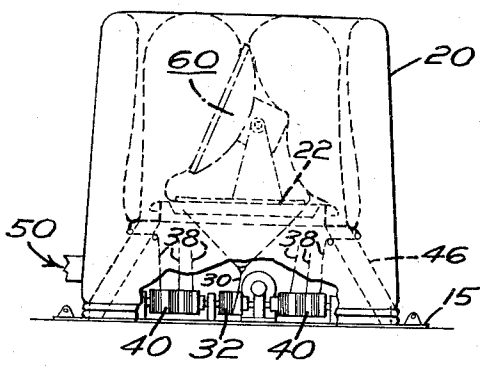


FIG. 4

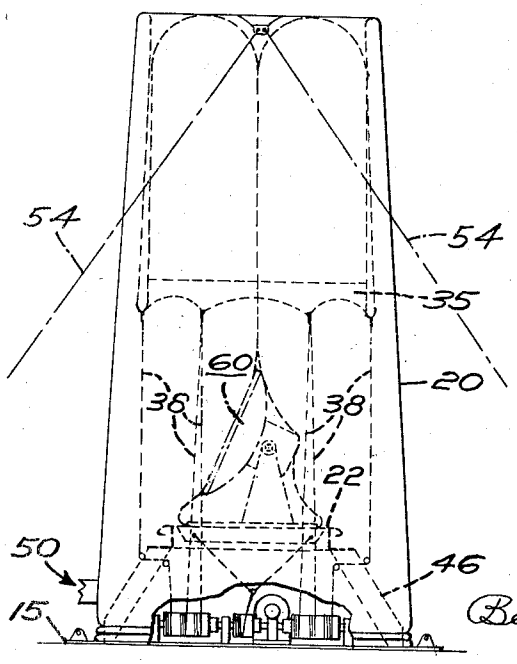
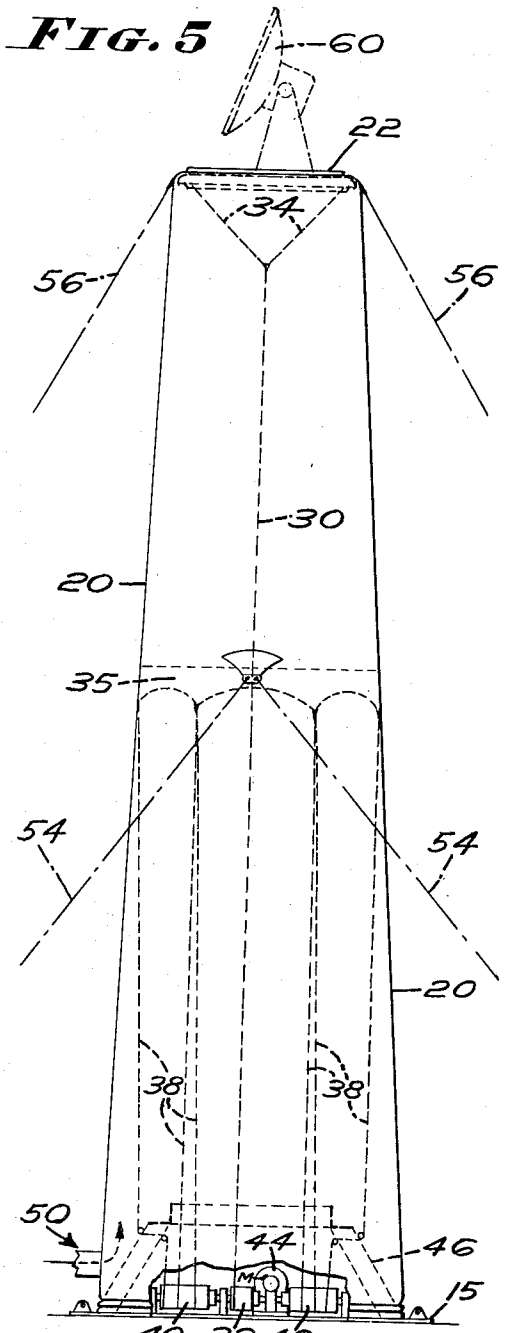


FIG. 5



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AIR INFLATED TOWER OR THE LIKE

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FIG. 6

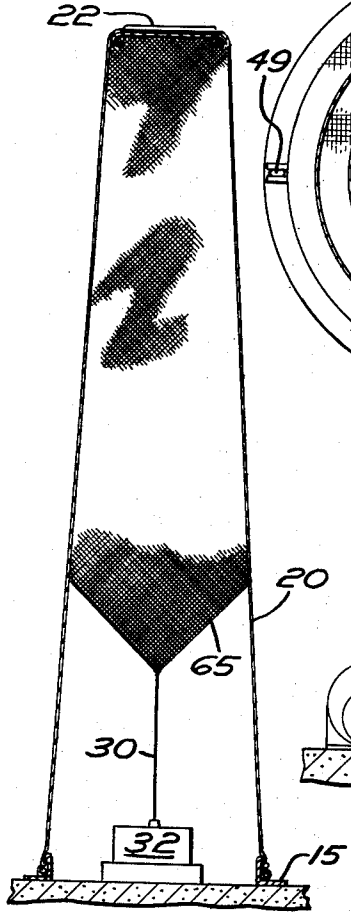


FIG. 10

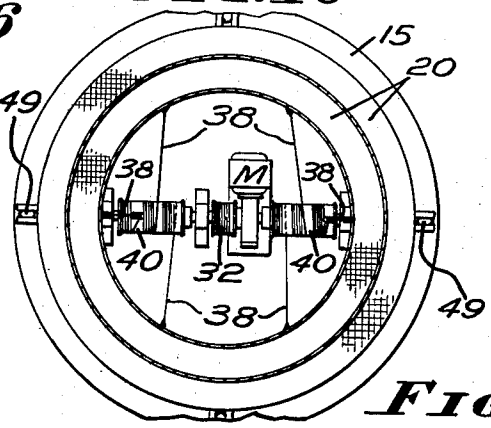


FIG. 11

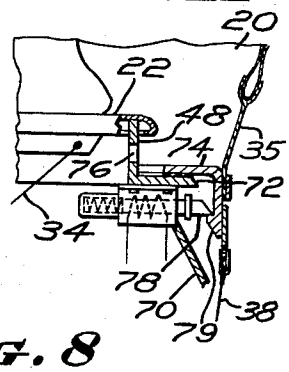


FIG. 8

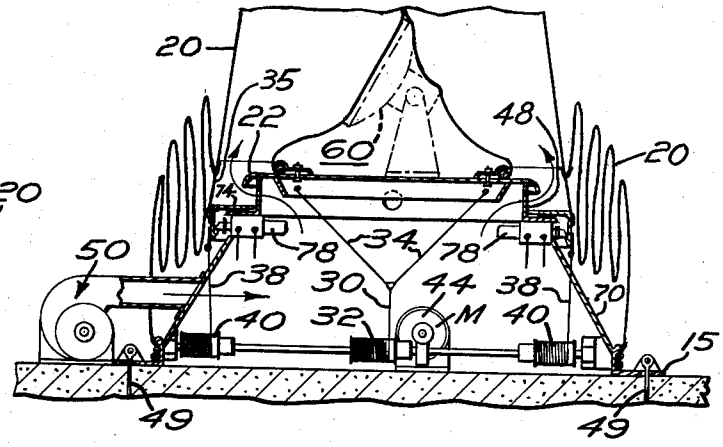


FIG. 9

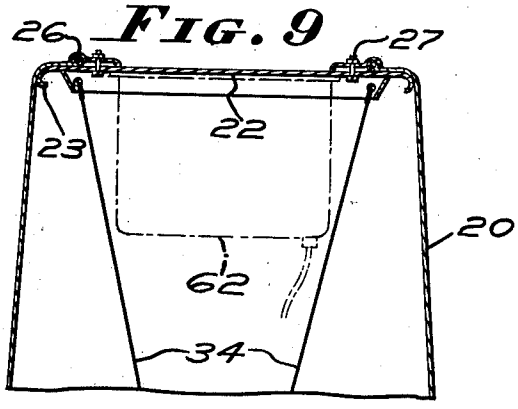
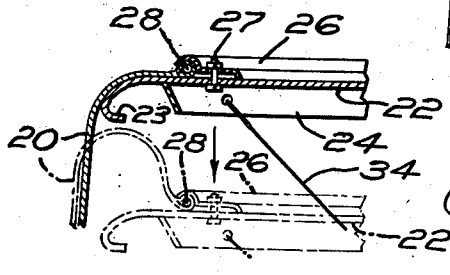


FIG. 7



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United States Patent Office 2,849,011 Patented Aug. 26, 1958

2,849,011

AIR INFLATED TOWER OR THE LIKE

Walter W. Bird, Williamsville, N. Y., assignor to Birdair Structures, Inc., Buffalo, N. Y.

Application September 26, 1957, Serial No. 686,462

5 Claims. (Cl. 135—1)

This invention relates to air supported structures and more particularly to self-erecting air-inflated towers or the like.

A primary object of the invention is to provide an improved self-erecting air-supported tower construction which is adapted to fold into minimum space when deflated and to be so tensioned throughout the erection process as to be self-stabilizing during the erection process and subsequent thereto, even under windy conditions. Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawing:

Fig. 1 is a vertical sectional view through an apparatus of the invention, illustrating the device at an initial stage of erection thereof;

Fig. 2 is a vertical sectional view through a device of the invention showing it in fully retracted or "stow-away" condition;

Fig. 3 is an elevational view showing a first stage of inflation and erection of the apparatus of Fig. 2;

Fig. 4 is a view corresponding to Fig. 3 but showing the apparatus at an intermediate stage of erection;

Fig. 5 is a view corresponding to Fig. 4 but showing the apparatus in fully erect condition;

Fig. 6 is a vertical sectional view through an erect tower of the invention embodying a novel antenna device;

Fig. 7 is a fragmentary sectional view showing details and construction of the tower top plate and side wall fabric components, and showing schematically the device at different initial stages of a retraction operation;

Fig. 8 is a fragmentary sectional view corresponding to portions of Figs. 1 and 2 but showing a modified form of tower height control mechanism;

Fig. 9 is a fragmentary sectional view through the upper end of the tower when inflated, and illustrating a modified form of support for accessories;

Fig. 10 is a horizonal section, on reduced scale, taken along line X—X of Fig. 1; and

Fig. 11 is an enlarged scale fragmentary sectional view of a detail of the mechanism of Fig. 8.

Generally stated, the invention contemplates an improved tower of the type adapted to be erected simply by inflation by means of moderate air or gas pressure, such as by a centrifugal blower.

As shown in Figs. 1–5, 7, 10 the tower of the invention is constructed to comprise generally a base plate or ring **15** having a vertical flange **16** about which is secured the lower end portion of a cone or cylindrically shaped sleeve of fabric **20** comprising the wall structure of the tower when inflated. The bottom end of the wall structure **20** is conveniently fixed to the base flange **16** by means of an encircling cable as indicated at **21** (Fig. 1) or by any other suitable means. The sleeve **20** is closed at its top end either by fabric or by a cap or platform member as illustrated for example at **22**. As shown in better detail in Fig. 7, the platform **22** may comprise a shaped metal plate to include a downwardly curled edge flange **23** and a stiffening flange **24**. The sleeve material is conveniently

affixed to the plate **22** by means of a ring clamp **26** held in place by bolts **27** and embracing the edge of the sleeve which is rolled over a cable **28**. The outside diameter of the plate **22** is kept less than the diameter of the adjacent portion of the sleeve **20**, for reasons to be explained hereinafter.

A tensioning device is attached to the top plate **22** and as shown herein may conveniently comprise a cable **30** fixed at its lower end to a winch or the like as indicated at **32** and is preferably connected at its upper end to the three or more divergent strands **34** which tie at their outer ends to the top plate **22** so that tension forces through the cable **30** will not tend to tilt the top plate **22**. As shown in the drawing, intermediately of its vertical extent the sleeve **20** may be provided with a girdle **35** comprising a reinforcing girth panel sewn or otherwise permanently fixed to the sleeve **20** as indicated at **36** (Fig. 1) and provided with grommets **37** at intervals therearound to which are attached tension cables **38** which wrap upon and are fixedly connected at their lower ends to winches **40—40**. Whereas, the drawing herewith illustrates the device of the invention to include a single intermediate girth panel as indicated at **35** and corresponding tension cables **38**, it is to be understood that any preferred number girth panel and tension control devices may be employed, if any, according to the height of the tower and the indicated need.

As illustrated in better detail in Fig. 1, the winches **30, 40, 40** are arranged to be selectively operated, as by means of any suitable clutch devices and a driving mechanism and motor, as indicated at **44**. The motor and winch unit is conveniently carried upon the base plate device **15**, and upwardly inclined legs **46** are conveniently arranged to provide vertical support for a support ring **48** arranged to receive the top cover plate **22** when the latter is pulled down by winch **32** as to the full line position thereof shown in Fig. 1. The base plate **15** is conveniently anchored to the erection site, as by means of screws **49** or the like as illustrated in Fig. 1; and a low pressure air blower as indicated at **50** or other air supply device such as a pump, gas cylinder or generator is arranged to deliver air or gas under pressure to the interior of the sleeve **20** for purposes to be explained hereinafter.

Thus, it will be appreciated that the tower fabrication as hereinabove described is adapted for storage and transport purposes to be collapsed and/or folded in its fully deflated form upon the supporting frame comprising the legs **46** and the support ring **48**; as in the manner illustrated in Fig. 2 of the drawing herewith. The device of the invention is designed for many purposes under a large variety of installation conditions, and may for example be carried on a transport vehicle with the base ring **15** permanently mounted thereon. Or, the unit may be designed for field erection purposes, and thus upon unloading of the unit at the erection site, the base ring **15** is first anchored to the ground and the air supply device **50** is then activated to commence inflation of the structure. As air moves into the structure the winches **40** controlling the cables **38** are initially braked to permit the air to first inflate the sleeve only into the condition shown in Fig. 3. Then, the winches **40** are permitted to unwind in response to further tower inflating tensions transmitted to the cables **38**, as by selective slipping of the clutches controlling the winches **40—40**. At the same time the winch **32** controlling the tension cable **30** is held braked, whereby the structure next assumes the condition shown in its solid line positions of Figs. 1 and 4. Thus, the inflating air initially causes the lower portion of the tower structure to rise as to the positions shown in Figs. 1, 4, while being constantly under restraint of the tension cables **38**.

This mode of operation maintains the partially erected tower in stable condition and invulnerable to wind gusts or the like throughout the erection process. Upon complete release of the lengths of the tension cables **38** (at which point the girth panel **35** will have attained its ultimate elevated position) further erection of the tower structure is then obtained by restrained relief of the windlass **32** controlling the tension cable **30**. The air input is thereupon permitted to cause the centrally folded top portion of the tower structure to rise upwardly within the annular wall formed by the previously erected lower portion of the structure, and to exfoliate upwardly and into the condition illustrated by Fig. 5 of the drawing herewith. Throughout the entire erection process the different portions of the tower structure are maintained under the centralizing tension effects of the cables **38** and **30**, as explained hereinabove; although if desired external guy wire devices such as are indicated at **54, 56** (Figs. 4, 5) may of course be additionally employed. Subsequent deflation and controlled collapse and nesting of the structure into the transport or storage configuration thereof shown in Fig. 2, is attained by simply permitting escape of the inflating air and reverse operation of the winches **32—40** by the motor **44**.

The tower of the invention may be employed for a variety of purposes, such as for support of military field equipment or the like. In the drawing herewith, for example, a searchlight or radar reflector device is illustrated at **60** as being carried by the top plate **22**. However, it will of course be understood that the tower may be used for any other purpose, and that the top plate **22** may for example mount an interiorly supported functional component as indicated at **62** (Fig. 9) in lieu of the exteriorly mounted apparatus as shown in Figs. 1–5. Also, as shown in Fig. 6, the tower of the invention may be readily constructed to include an antenna device which may be in the form of a metallic screen or metal coated fabric or the like as indicated at **65** applied to the interior or to the exterior of the tower sleeve material, and comprising any desired vertical portion thereof, as may be preferred.

It is a particular feature of the construction of the invention that when the tower is in fully erected condition the upper end of the sleeve **20** rolls over the rounded edge portion of the top plate **22**, as shown in Fig. 7. Then, during the initial stage of deflation of the tower, when the air pressure is relaxed and the cable **30** is first pulled upon, the top plate moves downwardly inside of the sleeve structure **20** without interferences therewith. The freed portion of the sleeve structure **20** thereupon folds outwardly and upwardly above the top plate **22** into progressively larger annular folds as shown by the broken line illustration in Fig. 7. Thus, as the top plate continues to be drawn downwardly inside of the infolding material of the sleeve member **20**, there is thereby provided a natural infolding and nesting of the tower parts as the sleeve **20** is deflated and retracted into its compactly folded condition as shown in Fig. 2.

As shown in Figs. 8, 11, the base support structure of the device may be modified to provide another form of progressive control of the inflating operation. For example, in lieu of the open leg supports **46** referred to hereinabove, the support ring **48** may be carried by an airtight frusto-conical shell **70** welded or otherwise fixed at its lower end to the base ring **15**. The horizontal flange portion **72** (Fig. 11) of the ring **48** is dimensioned to receive in vertical support an annular ring **74** carried by the girth panel **35** hereinabove mentioned.

A resilient gasket or the like is preferably provided between the mating surfaces of the rings **48, 74**, so as to render the juncture therebetween to be substantially airtight. Air passageways as indicated at **76** are provided in the wall of the ring **48**; and as shown in Fig. 8 in this form of the arrangement the air supply device **50** is connected to deliver into the interior of the shell **70**. Releasable latch devices as indicated at **78—78** are carried by the shell **70** and are so arranged that their latch portions extend into holding connection with registering lugs **79** formed on the girth ring **74**. The ring **74** initially seats downwardly upon the support ring **48** and is latched thereto by means of the spring urged latch devices **78**.

When air is first discharged into the interior of the device it enters the shell **70** and then flows upwardly and out through the apertures **76** and thence into only the upper portion of the sleeve **20**, thereby causing it to inflate and exfoliate upwardly as illustrated by way of example in Fig. 8, if the tension cables **30, 38** are initially held down. Then, upon release of the winch controlling the cable **30** the top plate **22** will be permitted to rise upwardly through the center of the previously inflated upper portion of the sleeve; until the entire upper portion of the tower above the girth panel **35** is inflated into upstanding form. Thus, at this position of the apparatus it is fully usable in "half-mast" form, wherever such erection of the tower to intermediate elevation is sufficient for its intended purpose.

If, however, it is required to erect the tower to its full height, the inflation operation is commenced as explained hereinabove but the latches **78—78** are released prior to release of cable **30**. This permits air to flow into the lower component of the sleeve **20**. As soon as this lower section is inflated the cables **38—38** are permitted to play out in response to the pull of the inflation pressures until the lower section of the sleeve is fully extended. The cable **30** is then permitted to play out whereby the plate **22** rises from the support ring **48** and the upper section of the tower exfoliates until the apparatus is in its fully extended form. To retract this tower the internal inflation pressure is reduced and cable **30** is pulled down by winch **32** until the platform **22** seats upon the support ring **48**. The cables **38—38** are then pulled down by their winches to the condition illustrated in Fig. 8 whereupon total release of the internal air pressure permits the entire assembly to collapse into folded form. As explained hereinabove, throughout the entire erection process the cables **30, 38** are maintained under tension so as to stabilize the structure against deflections laterally, such as in response to wind gusts or the like.

It is of course to be understood that although only a few forms of the invention have been illustrated and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A self erecting air inflated tower comprising a rigid base member, an elongated sleeve formed of flexible substantially airtight material fixed at its bottom end to said base member and having a reduced diameter closure member at its upper end sealing the latter, girth panel means encircling said sleeve member intermediately of its ends, tension cables extending separately from said closure member and from said girth panel interiorly of said sleeves, winch means selectively controlling release and tensioning of said cables, whereby said tower may be progressively inflated and deflated by alternate input and release of air from the interior of said sleeve coincident with selective actuation of said winch means.

2. A self erecting air inflated tower comprising a base member, an elongate sleeve formed of flexible substantially airtight material fixed at its bottom end to said base member and having a closure member at its upper end sealing the latter, girth panel means encircling said sleeve member intermediately of its ends, tension cables extending separately from said closure member and from said girth panel, winch means selectively controlling release and tensioning of said cables, whereby said tower may be erected by inflation and deflated by controlled escape of air from the interior thereof coincident with selective

actuation of said winch means thereby stabilizing said tower laterally throughout the erection and deflation operations.

3. A self erecting air inflated tower comprising an elongate sleeve formed of flexible substantially airtight material adapted to be fixed at its bottom end to a base, said sleeve having a reduced diameter closure member at its upper end sealing the latter, tension cable means extending from said closure member, winch means selectively controlling release and tensioning of said cable means, whereby said tower may be progressively inflated and deflated by alternate input and release of air from the interior of said sleeve coincident with selective actuation of said winch means.

4. A self erecting air inflated tower comprising a base member, a cone-shaped sleeve formed of flexible substantially airtight material fixed at its bottom end to said base member and having a closure member at its upper end sealing the latter, girth panel means encircling said sleeve member intermediately of its ends, tension cables extending separately from said closure member and from said girth panel, lateral guying means extending from said sleeve, winch means selectively controlling release and tensioning of said cables, whereby said tower may be

erected by inflation and deflated by controlled escape of air from the interior thereof coincident with selective actuation of said winch means thereby stabilizing said tower laterally throughout the erection and deflation operations.

5. A self erecting air inflated tower comprising a base member including an air chamber having an air outlet, an elongate sleeve formed of flexible substantially airtight material fixed at its bottom end to said base member and having a reduced diameter closure member at its upper end sealing the latter, girth panel means encircling said sleeve member intermediately of its ends, tension cables extending separately from said closure member and from said girth panel interiorly of said sleeve, winch means selectively controlling release and tensioning of said cables, valve means carried by said girth panel and adapted upon descent of said panel to its downwardly retracted position to close said air outlet, whereby said tower may be progressively inflated and deflated by alternate input and release of air from the interior of said sleeve coincident with selective actuation of said winch means.

No references cited.