

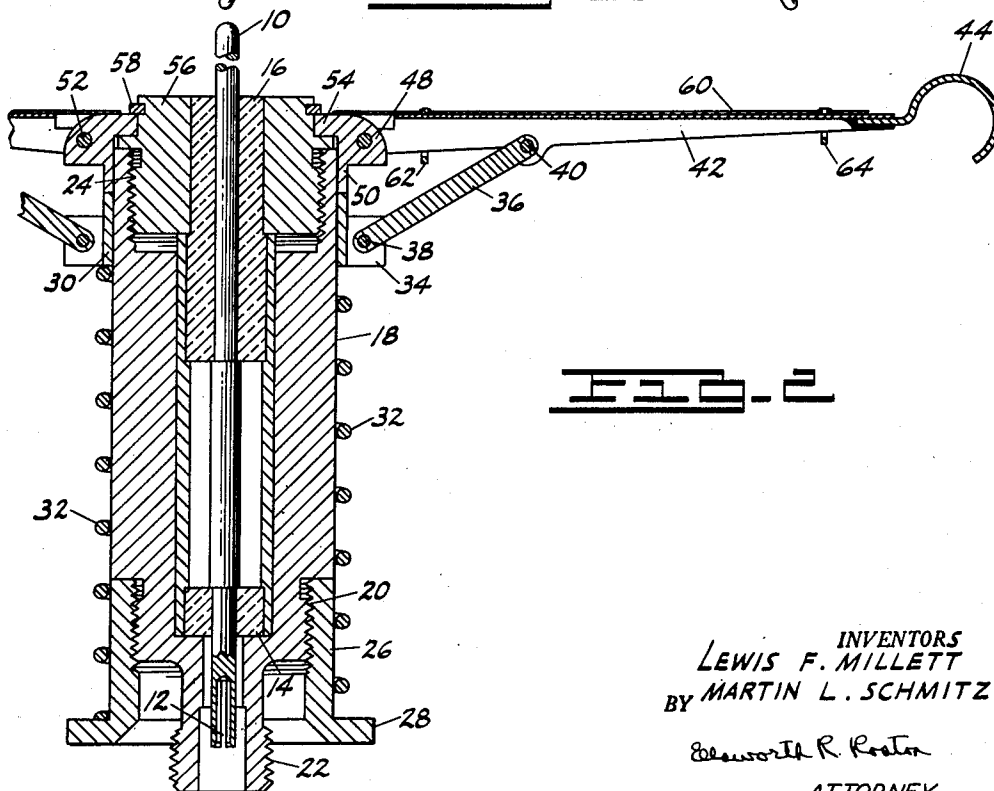
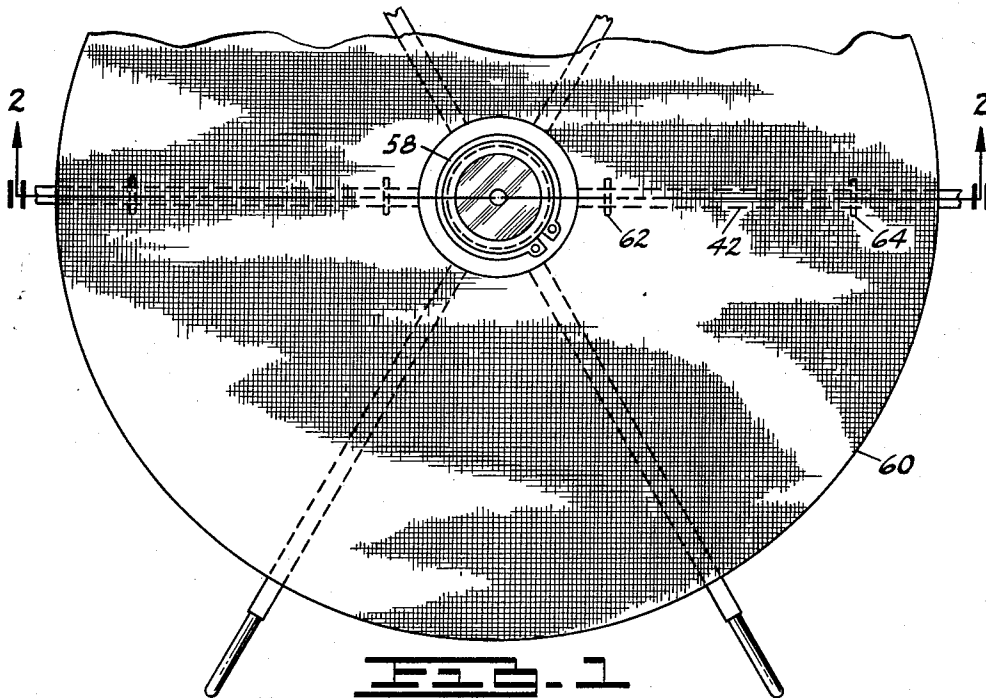
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L. F. MILLETT ET AL
COLLAPSIBLE ANTENNA

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2 Sheets-Sheet 1



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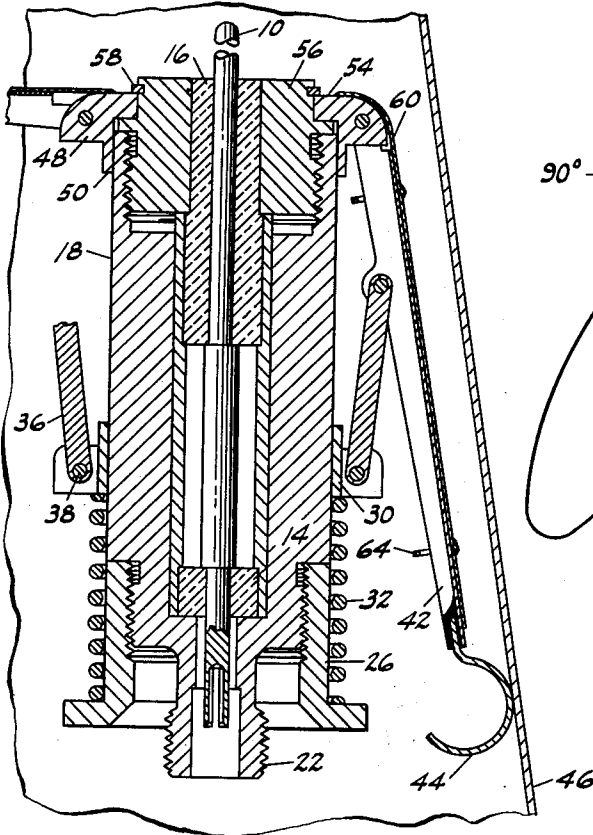


FIG. 3

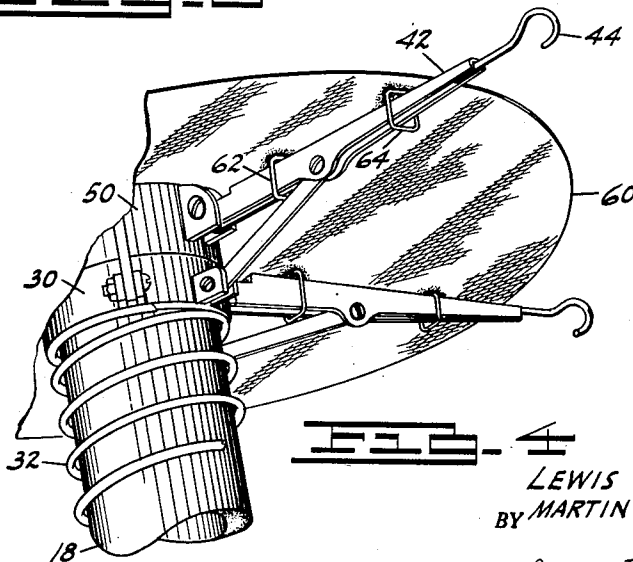
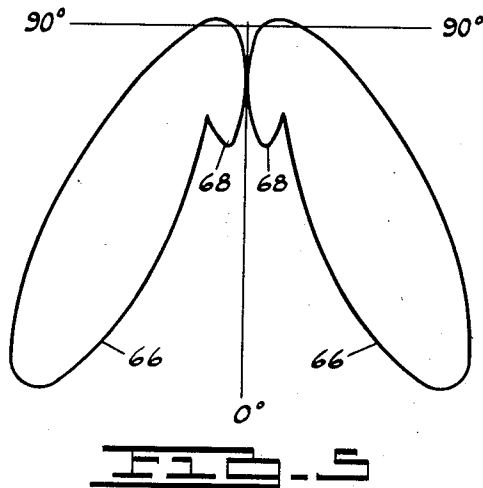


FIG. 5

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COLLAPSIBLE ANTENNA

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3 Claims. (Cl. 250—33.65)

1

2

This invention relates to a collapsible antenna and more particularly to an antenna adapted to provide a desirable radiation pattern during use and to collapse into a relatively small space when not in use.

In many electronic applications, an antenna is employed to transmit energy intermittently towards a distant position or to receive energy intermittently from a distant position. The antenna generally has a radiator which transmits the energy and a reflector which serves as a ground plane to direct the energy into a desirable pattern. The reflector is usually considerably larger than the radiator or any other component in the antenna.

Because of the size of the reflector, it has been considered desirable for many years to provide an antenna whose reflector can operate with the radiator to provide a desirable pattern while in use and can collapse into a relatively small space when not in use. Until now, a satisfactory antenna meeting such requirements has not been obtained.

This invention provides an antenna which employs as its reflector a material made from a wire mesh and which provides means in combination with the reflector to fold the reflector when it is not in use. By using a wire mesh as the reflector, the shape of the pattern produced by the antenna remains appreciably the same as if a solid conductive material is used and the strength of the pattern approaches that produced by an antenna having conventional components.

An object of this invention is to provide an antenna which has a strong and desirable pattern.

Another object is to provide an antenna having a reflector made from a pliable material so that it can fold into a relatively small space when the antenna is not in use.

A further object is to provide an antenna incorporating means for collapsing the reflector of the antenna into a small space when the antenna is not being used.

Still another object is to provide an antenna which is simply and inexpensively constructed and which is reliable in operation.

Other objects and advantages will be apparent from a detailed description of the invention and from the appended drawings and claims.

In the drawings:

Figure 1 is a fragmentary top plan view of the antenna;

Figure 2 is an enlarged, fragmentary sectional

view of the antenna substantially on the line 2—2 of Figure 1, illustrating the appearance of the antenna when the reflector is expanded for the transmission or reception of energy;

Figure 3 is an enlarged, fragmentary sectional view of the antenna similar to Figure 2, but showing the reflector when it is folded during its periods of non-use;

Figure 4 is an enlarged, fragmentary perspective view of the reflector and the means for collapsing the reflector during periods that the antenna is being used; and

Figure 5 is a curve illustrating the pattern of the antenna shown in the previous figures.

In one embodiment of the invention, a cylindrical radiator 10 is provided having a pair of shoulders formed by an intermediate portion which is thicker than the two end portions. A bore 12 is axially provided at the inner end of the radiator 10 so that the radiator may engage a conductive wire (not shown) which forms part of a coaxial cable extending from a transmitter or receiver (not shown). A bushing 14 made from a suitable insulating material such as polystyrene fits on the inner end of the radiator 10 and rests against one shoulder. In like manner, an insulating bushing 16 fits on the outer end of the radiator 10 and rests against the other shoulder.

A cylindrical support member 18 is mounted on the bushings 14 and 16. At its lower end, the support member 18 has two externally threaded portions 20 and 22 separated from each other by a shoulder portion, and at its upper end the member 18 has a threaded bore 24. The coaxial cable (not shown) from the transmitter or receiver fits on the portion 22 and a collar 26 flanged as at 28 fits on the threaded portion 20. A sleeve 30 is slidably mounted on the opposite end of the support member 18 from the collar 26, and a spring 32 is retained on the support member in compressed relationship between the sleeve and the flange 28.

A plurality of brackets 34 extend integrally from the sleeve 30 in pairs, each pair of brackets being uniformly spaced around the periphery of the sleeve relative to the other pairs of brackets. One end of a pivotable linkage 36 is suitably secured between each pair of brackets 34 as by nut-and-bolt combinations 38 and the other end is secured as by nut-and-bolt combinations 40 between the downwardly turned lips of a rib 42 at an intermediate position in the rib.

The outer ends of the ribs 42 are downwardly hooked as at 44 so that the ribs will not catch

against the sides of a restraining member 46 (Figure 3) as the ribs slide along the restraining member from the collapsed position shown in Figure 3 to the expanded position shown in Figure 2. At the inner end, each pair of downwardly turned lips forming a rib 42 straddles a bracket 48 which extends outwardly from a sleeve 50, and a nut-and-bolt combination 52 pivotally secures each pair of lips to the bracket 48. The top portion of the sleeve 50 is bent inwardly to form a rim 54 which presses downwardly upon a plug 56 screwed into the threaded bore 24 to maintain the plug in fixed position in the bore. A clamp 58 (Figures 1, 2 and 3) open at one end snaps into position on a neck portion in the plug 56 and retains the sleeve 50 in fixed position on the support member 18.

The rim 54 is coated with silver to receive as by solder the inner end of a reflector 60 (Figures 1 and 2) made from a suitable wire mesh. For example, the reflector may be made from 100-mesh copper wire. Rings 62 are mounted on the ribs 42 between the sleeve 50 and the nut-and-bolt combination 40 and are secured to the reflector 60 as by solder to maintain the inner end of the reflector in a fixed position relative to the ribs. Similarly, rings 64 carried on the ribs 42 between the nut-and-bolt combination 40 and the hooks 44 are soldered to the reflector 60 to prevent the outer end of the reflector from materially shifting in position relative to the ribs.

The antenna disclosed above is adapted to be used in electronic applications where energy is intermittently transmitted or received or where the antenna remains idle for a predetermined period of time and then operates continuously thereafter. For example, the antenna may be housed in the nose of a rocket, illustrated by the restraining member 46 in Figure 3, and the rocket may be propelled upwardly to an altitude of approximately 100,000 feet. During the ascent of the rocket, the reflector 60 is maintained in a collapsed position as a result of the action of the restraining member 46 on the ribs 42. The reflector 60 is initially collapsed when the spring 32 is compressed, since the wire mesh constituting the reflector acts as a result of its own tension to fold the ribs 42 towards the support member 18 and to slide the sleeve 30 along the support member.

At substantially the maximum height of the rocket, the rocket head becomes detached from the rocket body and then falls away from the equipment housed within it. Upon the release of the rocket head, the spring 32 forces the sleeve 30 upwardly in Figure 3 and expands the reflector 60 into a plane substantially perpendicular to the radiator 10. The electronic equipment associated with the antenna then operates to measure atmospheric temperature and atmospheric pressure at the different altitudes as the equipment floats slowly by parachute to the ground, and the equipment transmits its measurements in coded form to a ground station for decoding, recording and analysis. The airborne equipment associated with the antenna is disclosed in detail in co-pending application 183,717, filed September 8, 1950, by Charles A. Piper.

The antenna disclosed above has several important advantages. Even though a wire mesh is used as the reflector 60, the antenna provides a pattern which does not differ materially in shape or strength from that produced by a conventional antenna. For example, if the exposed portion of the radiator 10 has a length of ap-

proximately a quarter of a wave length at a frequency exceeding 1,000 megacycles and if the reflector 60 has a circular shape with a radius exceeding one wave length, a pattern having a shape similar to that shown in Figure 5 is produced. This pattern has a pair of main lobes 66 as well as a pair of side lobes 68 which are provided to obtain a fairly complete coverage directly ahead of the radiator.

By using a wire mesh as the reflector in combination with means for folding the reflector, the antenna can be maintained in a minimum space when not in use. Furthermore, the sleeve 30, linkages 36 and ribs 42 operate to fold the reflector in a predetermined manner during the periods of antenna non-use and to expand the reflector into its operative shape when the antenna is being used. This insures that the reflector will adapt substantially the same position every time signals are transmitted and that the pattern will be desirable and uniform at all times. It also insures that no damage will be inflicted upon the reflector as a result of its expansive or contractive movements.

Although this invention has been disclosed and illustrated with reference to particular applications, the principles involved are susceptible of numerous other applications which will be apparent to persons skilled in the art. The invention is, therefore, to be limited only as indicated by the scope of the appended claims.

What is claimed:

1. A collapsible antenna, including, a radiator, a support member mounted on the radiator in insulated and coaxial relationship to the radiator, a sleeve slidable on the support member, a plurality of ribs extending from the sleeve, a plurality of linkages pivotable at one end on the sleeve and at the other end on the ribs, a reflector made from a conductive screen-like material, the reflector being secured at its inner end to the support member and at its outer end to the ribs, and means including a spring operative on the sleeve to maintain the reflector in an extended position in a particular plane relative to the radiator during the operation of the antenna and for releasing the reflector for collapse during the periods of antenna non-use.

2. A collapsible antenna, including, a radiator, an insulating bushing on the radiator, a support member on the bushing in coaxial relationship to the radiator, a plurality of ribs pivotably extending at spaced angular intervals from one extremity of the support member, a sleeve on the support member, a plurality of linkages each extending pivotably from the sleeve to an intermediate position on an associated rib so as to provide for the positioning of the ribs in an outstretched or folded position, a spring held under constraint between the support member and the sleeve to maintain the ribs in outstretched position during the operation of the antenna, and a reflector formed from a conductive wire mesh and mounted on the ribs to follow the movement of the ribs for positioning in its extended relationship in a plan substantially perpendicular to the radiator.

3. A collapsible antenna, including, a radiator, an insulating bushing mounted on the radiator to provide an exposed portion on the radiator of predetermined length, a support member mounted on the bushing in coaxial relationship with respect to the radiator, means for clamping the support member in position relative to the radiator, a sleeve mounted on the support mem-

5

ber at an intermediate position on the member, a plurality of pivotable linkages carried at spaced intervals on the sleeve, a plurality of ribs pivotably carried on the support member at one extremity of the member and secured to the linkages to move between an outstretched position and a folded position, a reflector made from a conductive wire mesh and secured to the ribs in insulated relationship to the radiator to follow the movements of the ribs, and a spring held under constraint between the support member and the sleeve to maintain the ribs and the re-

6

flector in outstretched relationship and in a plane substantially perpendicular to the radiator during the operation of the antenna.

5 References Cited in the file of this patent
UNITED STATES PATENTS

Number	Name	Date
1,683,270	Taylor et al.	Sept. 4, 1928
2,072,262	Herzog et al.	Mar. 2, 1937
2,239,909	Buschbeck et al.	Apr. 29, 1941
2,534,710	Golian et al.	Dec. 19, 1950

10