Oct. 7, 1924. 1,510,799

J. H. ROGERS

LOOP AERIAL

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Fig. 1.

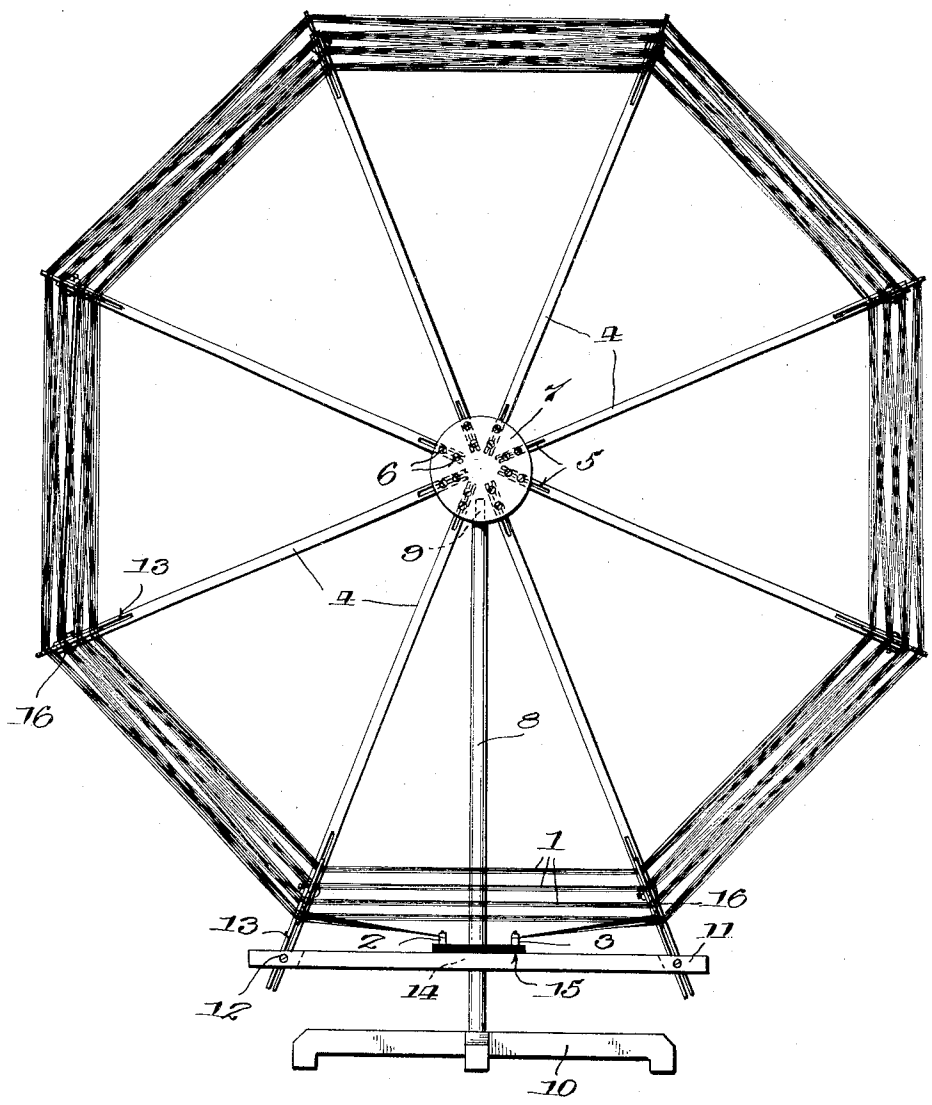

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Fig. 2.

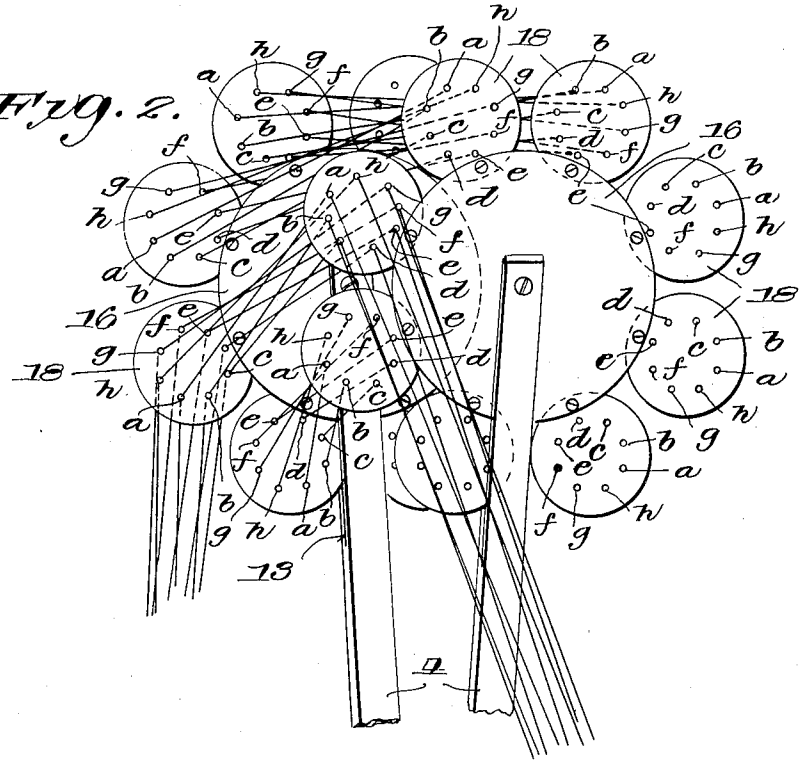

Fig. 3.

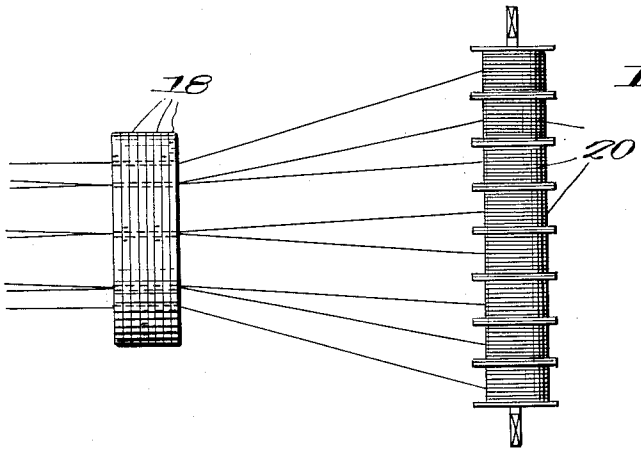

Fig 4.

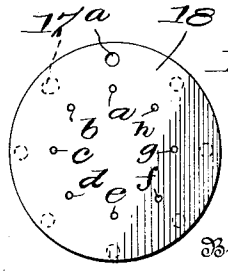

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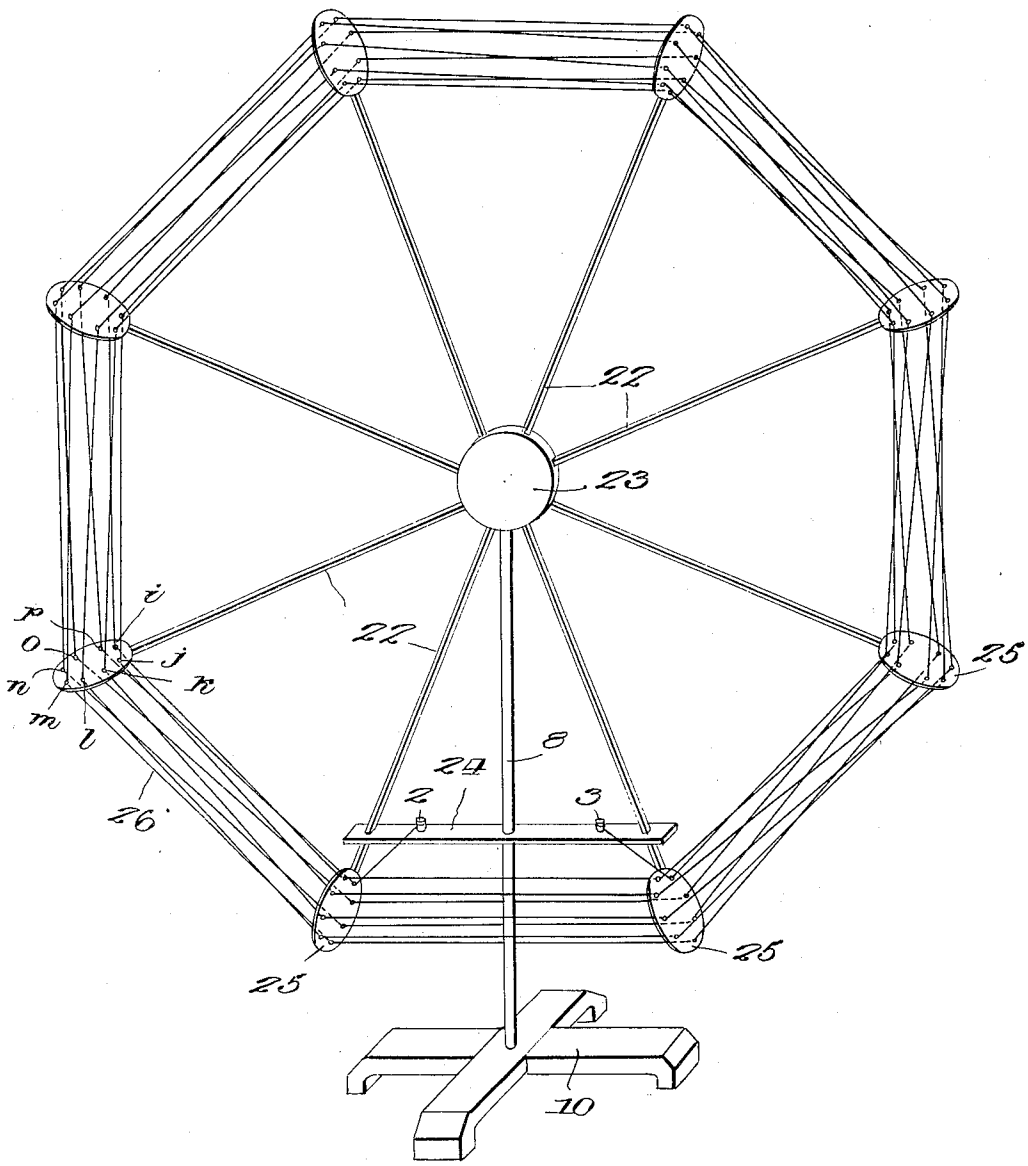
Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES HARRIS ROGERS, OF HYATTSVILLE, MARYLAND.

LOOP AERIAL.

Application filed July 12, 1923. Serial No. 651,080.

To all whom it may concern:

Be it known that I, JAMES HARRIS ROGERS, a citizen of the United States, residing at Hyattsville, in the county of Prince Georges and State of Maryland, have invented certain new and useful Improvements in Loop Aerials, of which the following is a specification.

The present invention is based on a loop antenna structure which possesses great advantages over the ordinary form. The underlying feature of this antenna is that a multiple turn loop is arranged with its conductors substantially in the surface of a tore whereby a very compact form of antenna is produced, which nevertheless has a very low distributed capacity.

In my prior application, Serial No. 607,623, filed December 18, 1922, I have disclosed a loop antenna, the turns of which are arranged in a polygonal helix. While one form of the present device resembles the former in that the loop conductor comprises a plurality of strands connected in parallel but spaced from each other except at their ends, it differs from the prior construction in that the conductor is arranged on a polygonal tore instead of as a helix. This results in a great economy of space and simplicity of construction. An antenna of the present form is also much easier to manipulate and of substantially the same electrical efficiency as the prior type, for the same amount of wire used.

A simpler type of the tore-shaped loop is also embodied in one form of the present invention, wherein a single conductor is substituted for the composite one.

A process of making the tore-shaped loop antenna is another feature of the present invention.

For a fuller understanding of the invention, reference should be made to the following specification descriptive of the preferred forms of the device, in connection with the accompanying drawings, wherein:—

Fig. 1 is an elevation of a loop;

Fig. 2 is a fragmentary diagrammatic detail of part of the loop shown in Fig. 1, showing the type of winding;

Fig. 3 is a diagram of the means used in winding the loop of Fig. 1;

Fig. 4 is a detail view of a stack of the spacing disks as arranged to facilitate the winding operation.

Fig. 5 shows a modified loop similar to that shown in Fig. 1 except that a single conductor is used in place of a composite one.

Referring first to Figs. 1 and 2, there is shown an antenna comprising a composite conductor 1 formed into a multiple turn loop, and having its ends at binding posts 2 and 3. The composite conductor consists of a plurality of strands, eight being illustrated in the present case, and the loop also comprises eight turns. The loop is supported by a plurality of radial arms 4 each of which is slotted at its inner end as shown at 5. Screws 6 passing through the slots 5 serve to secure these arms adjustably to the central hub or disk 7, as shown. A vertical support or rod 8 journaled at 9 in the hub 7, as shown, is itself secured to the base 10. A brace 11 is secured to two of the arms 4, which may be made longer than the rest, by means of screws 12 passing through slots 13. This brace 11 has an aperture 14 fitting the rod 8 loosely, so that the whole structure may rotate about said rod 8. A piece of insulation 15 may be provided as a mounting for the binding posts 2 and 3.

Each arm 4 has a slot 13 at its outer end. Supports 16, best shown in Fig. 2, are held in these slots, by means of screws 17. As illustrated, these supports are circular disks but the shape is subject to modification within wide limits. Each support 16 carries a plurality of conductor holding disks 18, which are secured to the supports 16 by screws 19. These disks 18 are provided with a plurality of holes, *a*, *b*, *c*, *d*, *e*, *f*, *g* and *h*, as shown, to receive the strands of conductor. In the present form, these holes are arranged in circular series. Each disk 18 also has a hole 17^a for the screws 19.

It will be noted that the composite conductor comprises eight strands, each strand being held in one of the holes in each disk 18. A "cage" is thus formed similar to the cage of the prior application hereinabove referred to. This composite conductor passes successively around the supports, and when the whole is wound, it will be seen that the turns of the cage itself form a still larger "cage." The strands are transposed regularly in their courses from disk to disk and the cage is also transposed around supports 16, as best shown in Fig. 2, in a similar manner so that in the finished device all the strands are substantially symmetrically

arranged and of similar electrical properties. The resulting structure will be called a "polygonal tore" for want of any more appropriate geometrical term. The larger the number of arms, the closer will be the approach to a true circular tore. In order to avoid the rod 8, it is preferred to omit transposing the lower sections of the cage, which are adjacent to said rod as shown in Fig. 1.

In winding the loop just described, the preferred way is to provide a plurality of reels of wire, 20, equal in number to the number of strands in a "cage," eight as shown in Fig. 3. The entire number of disks 18 is then assembled as in Fig. 4, with the wire holes in register but with the screw receiving holes 21 successively displaced, as shown, by dotted lines. The eight strands are then threaded through the whole set of disks as in Fig. 3. Then the disks 18 are secured by their screws 17, one at a time, to the appropriate supports 16, whereby the strands in the "cage" become transposed automatically in the mere operation of winding the loop.

Referring now to Fig. 5, there is shown a simpler type of loop wherein a single conductor is provided in place of the "cage." This figure shows diagrammatically a plurality of radial arms 22 supported by a hub 23, journalled on rod 8. Rod 8 is held by base 10, and passes loosely through brace 24 which is secured to two of the arms 22, and holds the binding posts 2 and 3. Each arm supports a disk 25 which is apertured to support the conductor 26. This conductor is threaded through said apertures, as shown at *i*, *j*, *k*, *l*, *m*, *n*, *o*, and *p*, and may be and preferably is, transposed from disk to disk as in the other type.

While I have disclosed a loop wherein the conductors are transposed to secure a high degree of electrical symmetry, and prefer such construction, it will be evident that for certain purposes very satisfactory results may be secured without such transposition and the invention is therefore not to be considered as limited to the actual forms disclosed.

What I claim is:—

1. An antenna comprising a conductor formed into a multiple turn loop, all the turns of the loop lying substantially in the surface of a polygonal tore.

2. An antenna comprising a composite conductor formed into a multiple turn loop, all the turns of the composite conductor as a whole lying substantially in the surface of a polygonal tore.

3. An antenna comprising a conductor formed into a multiple turn loop, said conductor having each turn disposed symmetrically with respect to the others in the surface of a polygonal tore.

4. An antenna comprising a conductor formed into a multiple turn loop, said conductor having each turn disposed substantially in the surface of a polygonal tore, the conductor itself comprising a plurality of parallel strands arranged in a cylindrical surface.

5. An antenna comprising a conductor consisting of a plurality of equidistant parallel strands which are successively transposed, said conductor being formed into a multiple turn loop wherein the turns are disposed substantially in the surface of a polygonal tore and are themselves successively transposed so as to be distributed symmetrically over said surface.

6. A loop antenna comprising a conductor consisting of a plurality of strands electrically connected in parallel but spaced from one another, said conductor as a whole being formed into a multiple turn coil wherein all the turns are substantially symmetrically arranged with respect to one another.

7. A loop antenna comprising a composite hollow conductor, said conductor between its terminals consisting of a plurality of strands each spaced from its neighbors, and each disposed on a path which is substantially helical with respect to the hollow conductor, said conductor itself being formed into a hollow assembly wherein all the turns are spaced symmetrically from their neighbors.

8. A multiple turn loop antenna comprising a support, radial arms carried thereby, a perforated spacer carried by each arm, the perforations in each spacer being substantially uniformly spaced in a closed curve and a conductor traversing the spacers in succession and passing through all the perforations in its complete course about the loop.

9. The process of making a cage-loop antenna having perforated spacers for the conductors constituting the cage, which process comprises threading the requisite number of spacers on the individual conductors before the winding operation is started.

10. The process of making a cage-loop antenna having perforated spacers for the conductors constituting the cage, said spacers having aligning means therein, which process comprises threading the requisite number of spacers on the individual conductors with the aligning means progressively turned whereby the cage when assembled will have the conductors automatically transposed symmetrically.

In testimony whereof I affix my signature.

JAMES HARRIS ROGERS.