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AERIAL FEEDER

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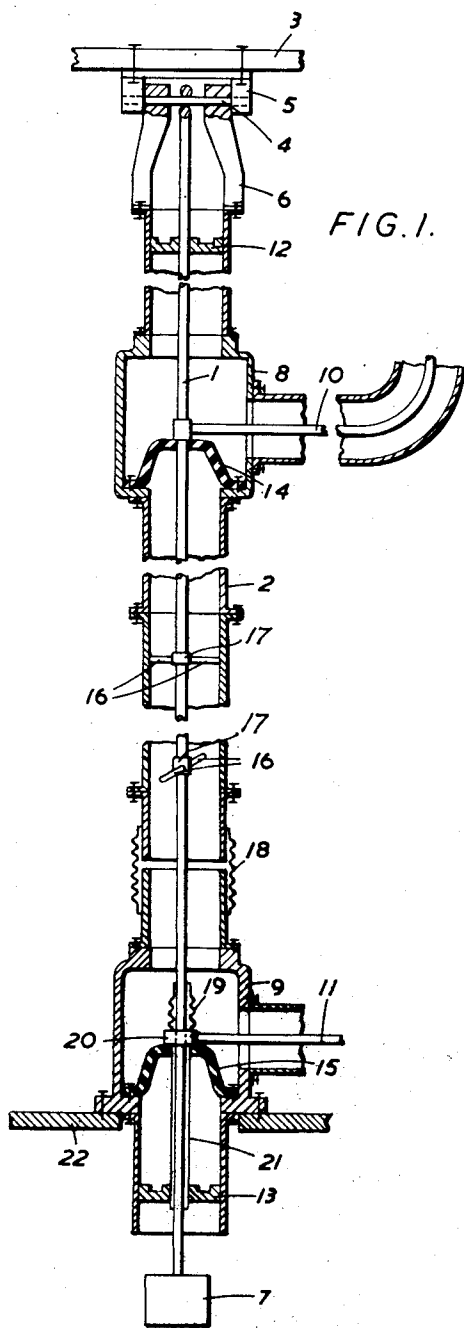


FIG. 1.

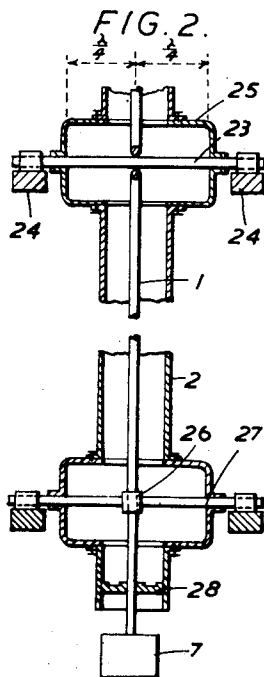


FIG. 2.

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AERIAL FEEDER

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1 Claim. (Cl. 333—96)

This invention relates to vertically arranged concentric line electric feeders.

When an aerial is employed for transmitting, for example, signals having a frequency of the order of television signals, it is customary to feed the aerial from a feeder of the concentric line type. If the aerial is supported from a tower of considerable height, say 800 feet, difficulties are encountered in providing a suitable form of central conductor for the feeder and also in supporting the central and outer conductors of the feeder. In cases where a television aerial has been carried by a tower of considerably smaller height than that referred to above, the central and outer conductors of the feeder have been constructed in sections which are all supported at the lower end of the tower, the sections being assembled from the bottom of the tower upwards. However, if such an arrangement were employed for supporting a feeder having a length of, say 800 feet, then the mechanical loading on the sections at the lower end of the feeder would tend to cause buckling of the outer and central conductors of the feeder introducing electrical irregularity. Furthermore, the assembly of the feeder in the above manner entails considerable labor.

One of the objects of the present invention is to provide an improved construction of feeder with a view to overcoming the above-mentioned difficulty.

According to one feature of the invention, there is provided a vertically arranged concentric line feeder carried by a supporting structure and having a central conductor comprising a wire rope suspended at its upper end.

According to another feature of the invention, there is provided a vertically arranged concentric feeder comprising an outer conductor and a central conductor wherein the central conductor comprises a wire rope which, together with the outer conductor, is suspended at its upper end from a supporting structure, and spacing elements are provided at intervals between said conductors for maintaining said conductors concentric with one another.

Preferably, said central conductor is mechanically loaded at its lower end and the wire rope is of the so-called locked-coil type, all of the strands of the rope being made of a suitable conducting material such as an alloy of cadmium-copper or, alternatively if other considerations allow, only the outer strands of said conductor need be made of such alloy.

The outer conductor of the feeder may be composed of a plurality of tubular sections suitably bolted or otherwise secured together end to end.

In order that the said invention may be clearly understood and readily carried into effect, it will now be more fully described with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of a feeder constructed according to one embodiment of the invention, and

Figure 2 is a diagrammatic view illustrating a feeder constructed according to another embodiment of the invention.

As shown in Figure 1 of the drawings the reference numeral 1 indicates the central conductor of a concentric line aerial feeder and the reference numeral 2 the outer conductor thereof. The central conductor of the feeder is suspended at its upper end from a tower or other supporting structure to which the aerial proper is mounted, a platform, girder or some other suitable sup-

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port for the aerial being indicated at 3. The central conductor is attached at its upper end to a trunnion 4 carried by bearings 5 bolted or otherwise secured to the member 3 and depending from the trunnion 4 is a stirrup 6 to which the outer conductor 2 of the feeder is connected and suspended from its upper end. The central conductor of the feeder may, for example, be about 1" in diameter and the outer conductor may be about 5" in diameter. The central conductor is preferably in the form of a wire rope of the so-called locked-coil type or it may comprise an inner core of wire rope provided with a covering of insulating material such as polythene provided with an outer sheath of copper tape. A locked coil type of rope is one in which strands of the rope have such cross-sectional shape as to interlock with one another so that when the rope is tensioned the interlocking strands serve to prevent any substantial twisting of the rope.

The lower end of the central conductor is preferably mechanically loaded either by the provision of a spring or weight which latter may be located in a dash-pot so as to maintain the central conductor taut. The mechanical loading is indicated by the reference numeral 7.

The outer conductor of the feeder comprises sections of copper tubing provided with annular end flanges as shown by means of which the sections are bolted or otherwise secured together end to end and at convenient positions along the length of the outer conductor junction boxes 8 and 9 are provided housing an aerial lead 10 and a transmitter lead 11 respectively. At the upper end of the feeder a short-circuiting piston 12 is provided whilst a similar short-circuiting piston 13 is also provided at its lower end, these pistons being for tuning and matching purposes.

In assembling the feeder the central conductor is first hauled to the top of the tower or other supporting structure and attached to the trunnion 4 and then the sections of outer conductor and junction boxes are passed successively over the lower end of the suspended central conductor, hauled to appropriate positions and then bolted to one another. The central conductor is spaced in the junction box 8 by an insulating sleeve 14 and the lower end of the central conductor is similarly located in the junction box 9 by an insulating sleeve 15. The spacing of the central conductor along the major length of the outer conductor can be effected by the provision of insulators disposed along the length of said central conductor and suitably spaced apart by a distance of, for example, one-eighth of a wavelength at the operating frequency of the aerial. In the embodiment shown in Figure 1, two of such insulators are shown, such insulators comprising insulating arms 16 projecting radially from the central conductor and carried by conducting supports 17 of any suitable form. The insulating arms 16 may be inserted in apertures in the supports 17 as the sections of the outer conductor are assembled. Preferably, as shown, the pairs of arms 16 are staggered rotationally along the length of the central conductor. If desired, insulators of the bead type may be used.

At the lower end of the outer conductor an expansion joint is provided which is of any suitable construction, and as shown in Figure 1 said joint comprises a metal bellows 18 secured to adjacent sections of the outer conductor. An expansion joint is also provided associated with the central conductor at its lower end, said joint comprising a metal bellows 19 attached at one end to the inner conductor and at its other end to a sleeve 20 to which the transmitter lead 11 is also connected, the sleeve having a tubular extension 21 through which the inner conductor passes in electrical contact therewith. The junction box 9 on the lower end of the outer conductor of the feeder may be carried by a supporting platform or structure 22. The feeder is preferably hermetically closed and may be provided with a filling of a suitable gas such as nitrogen to reduce sparking and to avoid ingress of moisture.

The aerial lead 10 and the transmitter lead 11 may be tapped into the central conductor at suitable points along the length thereof, the points being suitably chosen so as to provide the required impedance matching between the aerial and transmitter leads. The outer conductor of

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the feeder will of course be provided with suitable branches to enclose the aerial and the transmitter leads in known manner, these branches being also suitably hermetically closed.

It will be appreciated that, due to the construction above described buckling of the central conductor is avoided and, furthermore, due to the suspension of the outer conductor from its upper end buckling thereof is also avoided.

Figure 2 of the drawings illustrates diagrammatically a modified construction according to the invention in which the central conductor is suspended at its upper end from a transverse conducting support in the form of a trunnion 23 which is supported at its ends on girders 24, the trunnion 23 being enclosed by sections 25 of outer conductor which enclose the trunnion on each side of the central conductor to an extent effectively equal to one-quarter of the operating wavelength of the aerial so that said trunnion has negligible effect on the electrical characteristics of the feeder. A similar construction is provided at the lower end of the feeder and in this case the central conductor passes through a sleeve 26 provided in the supporting trunnion 27 and is in electrical contact therewith. The central conductor at its lower end is short-circuited to the outer conductor by a piston 28.

What we claim is:

A vertically arranged concentric feeder coupled to an aerial and comprising an outer conductor and a central conductor consisting of a wire rope separated from the outer conductor by a gaseous medium and of such a length that the mass of the feeder if supported at its lower end would introduce electrical irregularities due to buckling,

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the central and outer conductors of the feeder being suspended from a supporting structure to avoid said buckling, spacing elements for maintaining the conductors concentric with one another, and a transverse conducting support for said central conductor to which the latter is connected intermediate the ends of said transverse support, said outer conductor including sections surrounding said transverse support and connected to the latter at distances from the point at which the central conductor is connected thereto effectively equal to a quarter of the operating wavelength of said aerial.

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