March 21, 1961 J. D. GUEST 2,976,532

TELESCOPING GAMMA MATCH ANTENNA CONSTRUCTION

Filed Jan. 15, 1958 3 Sheets-Sheet 1

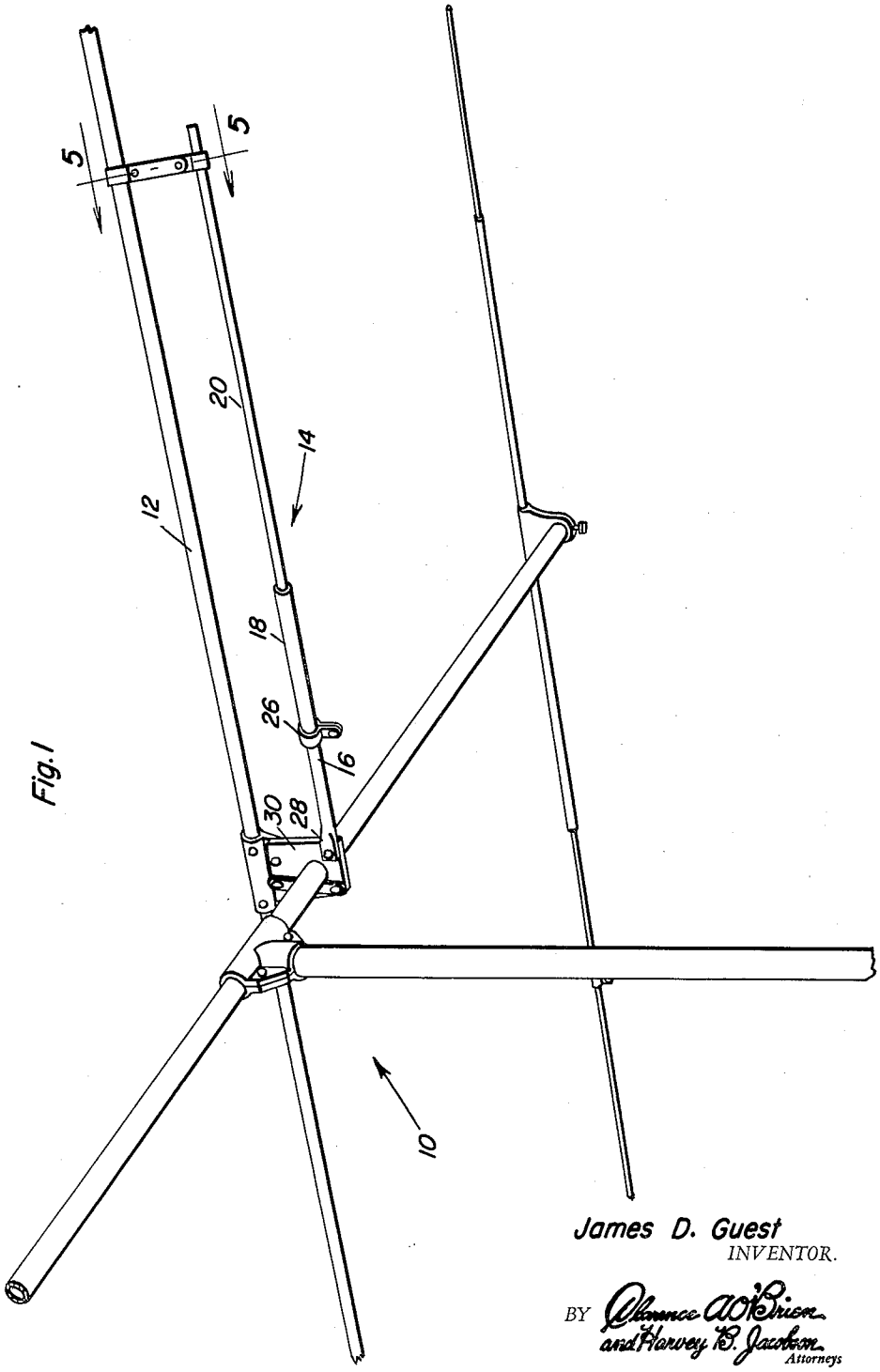


Fig. 1

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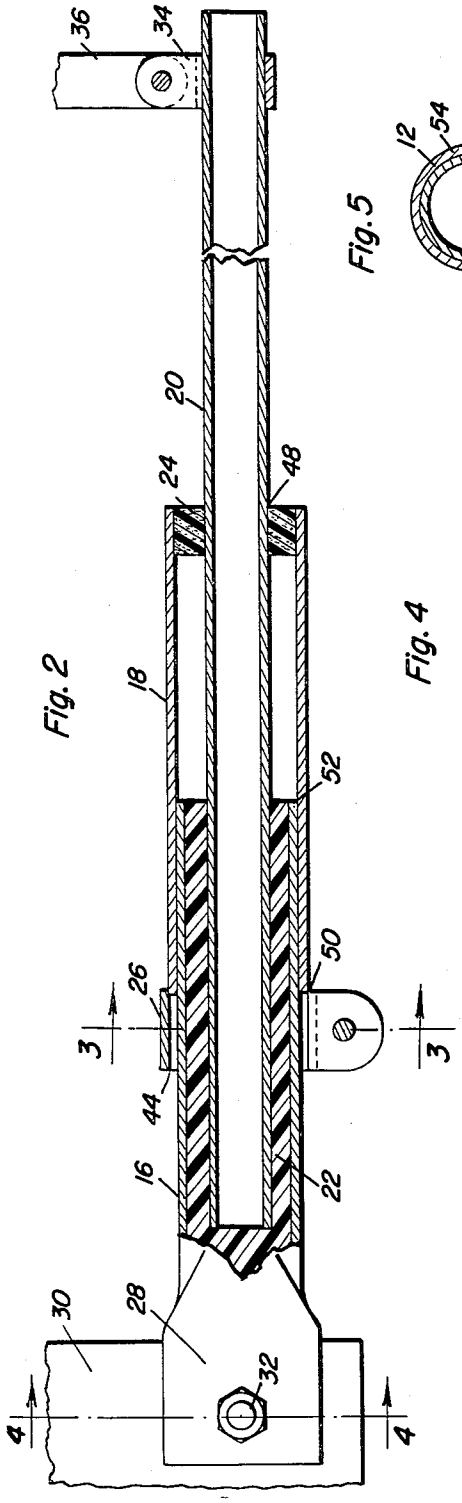


Fig. 2

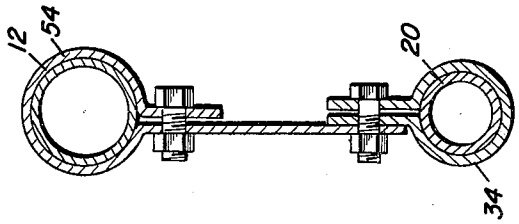


Fig. 5

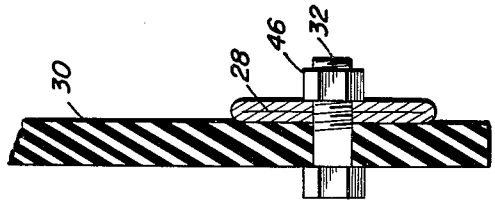


Fig. 4

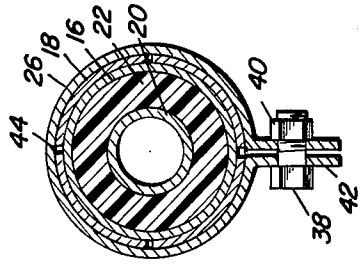


Fig. 3

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TELESCOPING GAMMA MATCH ANTENNA CONSTRUCTION

Filed Jan. 15, 1958 3 Sheets-Sheet 3

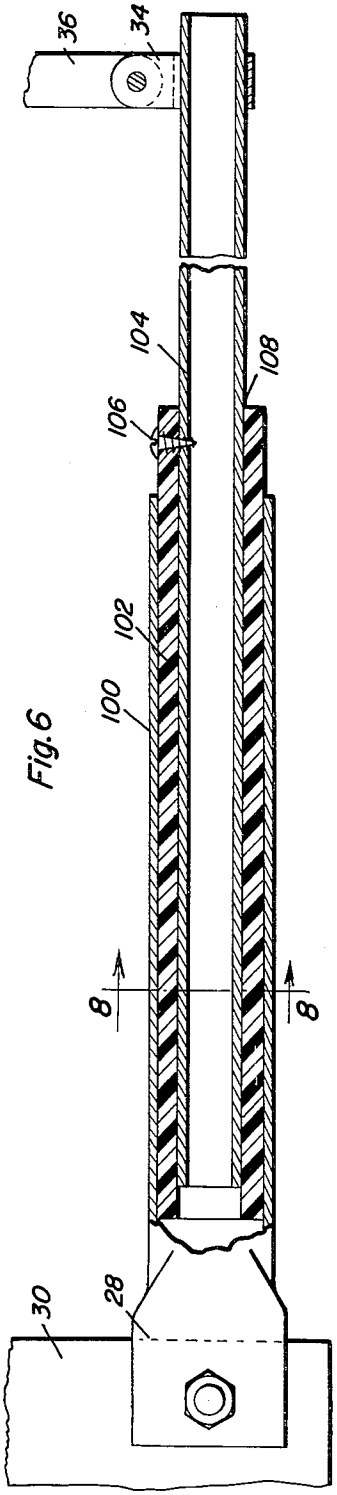


Fig. 6

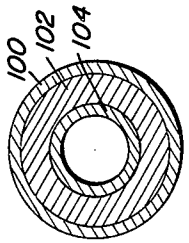


Fig. 8

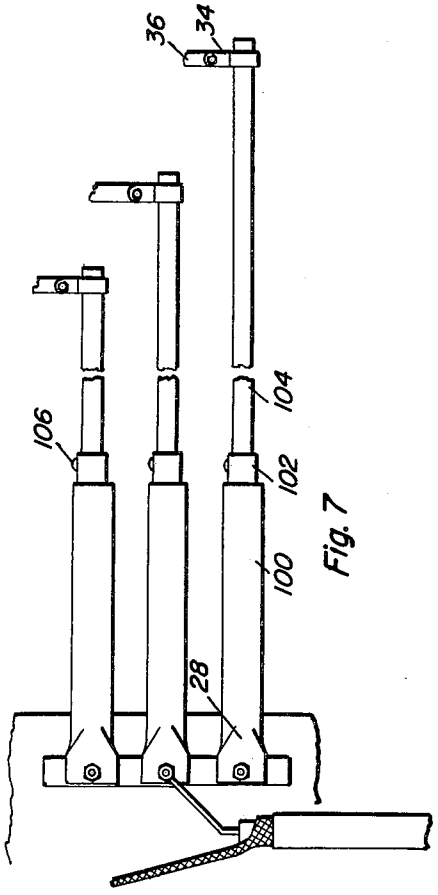


Fig. 7

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TELESCOPING GAMMA MATCH ANTENNA CONSTRUCTION

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5 Claims. (Cl. 343—722)

This invention relates to an antenna construction and more particularly to a beam-type antenna utilizing adjustable tuning means.

In beam-type antennas of the T match type or the "Gamma" match type, it has often been found necessary to include variable capacitors in the circuit arrangement in order to adequately tune the driven element. It has long been a problem to develop variable capacitor arrangements whereby the capacitor may be placed with the antenna array and not be unduly subjected to weather conditions and wind vibration, etc. The invention below relates to a novel type of construction wherein a variable capacitor is included with the antenna array and wherein the capacitance may be easily adjusted along with its characteristic of being impervious to rain and other naturally occurring phenomenon.

It is the principal object of this invention to provide a new type beam antenna incorporating variable capacitor tuning wherein the capacitor is not subject to breakdown due to normally occurring weather conditions.

It is a further object of this invention to provide an antenna which is easier to manufacture and which is superior mechanically to those previously used.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 shows the invention in perspective illustrating the complete antenna construction;

Figure 2 shows the capacitive tuning element of the invention shown in Figure 1 in section;

Figure 3 shows a sectional view substantially through the plane 3—3 of Figure 2;

Figure 4 shows a sectional view substantially through the plane 4—4 of Figure 2;

Figure 5 shows a sectional view substantially through the plane 5—5 of Figure 1;

Figure 6 illustrates another embodiment of the invention illustrating another form of the capacitive tuning of Figure 2;

Figure 7 shows the variable capacitance used in multiple for multi-band beams;

Figure 8 is a sectional view substantially along the plane 8—8 of Figure 6.

Numeral 10 generally designates the beam antenna apparatus wherein is illustrated generally a "Gamma" match type construction where numeral 12 shows the driven element and 14 generally designates the variable capacitor tuning portion. The invention more particularly lies in element 14 which is shown in section in Figure 2 including three concentric electrically conductive portions of tubing members 16, 18 and 20. Tube 20 is located within tube 16 and is held in place by an epoxy resin 22 having good electrical and adhesive characteristics. Of course numerous other adhesives could

be used in lieu of an epoxy resin. Tube 18 is in electrical contact with 16 and slidably surrounds it. A Lucite bushing 24 is secured in one end of tube 18 and surrounds tube 20 in slidable relation thereto. A clamp 26 exists on the outer portion of tube 18 to fixedly hold tube 18 in a particular position in relation to tube 16. Tube 16 has a flat portion on one end thereof generally designated as 28 and is attached to the mounting assembly 30 by a hexagonal screw 32. A clamp 34 and strap 36 attach tube 20 to the driven element 12.

Figure 3 shows a sectional view substantially through the frame 3—3 of Figure 2 wherein a clamp 26 may be seen held together at an extension 42 by a hexagonal bolt 38 and cooperating nut 40. Within the clamp 26 are tubes 18, 16, epoxy resin 22, and inner tube 20. Tube 18 contains slots 44 which allow compression by clamp 26 to hold tube 18 in place with respect to tube 16.

Figure 4 shows a sectional view through plane 4—4 of Figure 2 and illustrates the flat portion 28 of tube 16 held to the mounting assembly 30 by hexagonal bolt 32 and cooperating nut 46.

Figure 5 shows the clamping means through plate 5—5 of Figure 1 wherein the tuning element 14 is attached to the driven element 12.

In operation the tube 18 slides over tube 20 at point 48 and is electrically insulated therefrom by Lucite bushing 24. Tube 18 is electrically connected to tube 16 and slides over it at 50. The variable capacitance of the arrangement consists of a fixed capacitive portion and an adjustable capacitive portion. The entire volume wherein is included the epoxy resin constitutes a fixed capacitive portion due to the constant dimensions between tube 16 and tube 20. The adjustable capacitive portion is located between the end of the epoxy resin 52 and the Lucite bushing 24. This adjustable capacitance is due to the varying dimensions between tube 18 and tube 20 brought about when the tube 18 is slid over tube 16.

The tube 18 is slidably adjusted until a minimum standing wave ratio is obtained on the driven element. When the minimum standing wave ratio is obtained through adjustment of the location of the clamp 34, strap 36 and clamp 54 along with the adjustment of slidable tube 18, all the clamps should then be tightened and the antenna is ready for use.

Figure 6 shows a further embodiment of the invention wherein only two tubes are utilized. Here tube 100 is the outer tube and has a portion 28 connected to a mounting assembly 30 in a manner identical with the embodiment shown in Figure 2. A suitable plastic insulation 102 exists within outer tube 100 and encompasses inner tube 104. Screw means 106 cooperate with insulation 102 and inner tube 104 to hold 104 in fixed relation with respect to insulation 102 and outer tube 100. The insulation 102 is secured to the outer tube 100 but is slidably related to tube 104 as shown at 108.

Figure 8 shows a view substantially along the plane 8—8 of Figure 6 showing members 100, 102 and 104 in concentric relationship.

This embodiment of the invention is similar in operation to the operation of the device of Figure 2. Capacitive adjustment is made by sliding the tube 104 with respect to the insulation 102 whereby the effective dimensions between the tube 100 and 104 are varied, thereby adjusting its capacitance. In order to achieve the minimum standing wave ratio on the driven element clamp 34 along with strap 36 and clamp 54 are moved and tube 104 is slidably adjusted in insulation 102 until a minimum standing wave ratio is obtained on the driven element.

Figure 7 shows the matching device to be used where one is feeding a multi-band beam. Three elements are

shown for tuning at three different frequencies. In this view the coaxial line is shown feeding the elements.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. An antenna construction including the combination of a driven member comprising an elongated conductive rod and a tuning member comprising a variable capacitor including concentrically arranged telescopically related first and second elongated conductive tubes, and a tubular insulator concentrically secured to one of said tubes and slidably associated with the other of said tubes, and conductive strap means connecting one of said tubes to said driven member.

2. An antenna construction including the combination of a driven member comprising an elongated conductive rod and a tuning member comprising a variable capacitor including concentrically arranged telescopically related first and second elongated conductive tubes, and a tubular insulator concentrically secured to one of said tubes and slidably associated with the other of said tubes, said first conductive tube secured and electrically connected to an antenna mounting assembly said second conductive tube extending beyond said first tube remote from said mounting assembly, and conductive strap means connecting said second tube to said driven member, said strap means engaging said second tube remote from said first tube.

3. An antenna construction including the combination of a driven member comprising an elongated conductive rod and a tuning member comprising a variable capacitor including concentrically arranged telescopically related first and second elongated conductive tubes, and a tubular insulator concentrically secured to one of said tubes and slidably associated with the other of said tubes, said first conductive tube secured and electrically connected to an antenna mounting assembly, said second conductive tube extending beyond said first tube remote from said mounting assembly, and conductive strap means connecting said second tube to said driven member, said strap means engaging said second tube remote from said first tube, said strap means including conductive clamps slidably received on said driven member and said second tube.

4. In an antenna construction, a variable capacitance arrangement comprising a plurality of electrically conductive concentrically related tubes, said tubes containing telescopically related portions whereby the capacitance of the arrangement may be varied, one of said conductive tubes containing a second conductive tube within, said second tube being held in place in relation to the first tube by an adhesive filling the volume between the two tubes, said second tube being longer than said first tube and extending beyond the confines therefrom, a third tube disposed around said first tube in electrical contact therewith and in slidable relation thereto and an insulative ring slidably mounted around said second tube and secured to said third tube.

5. In an antenna construction, a variable capacitance arrangement comprising a plurality of electrically conductive concentrically related tubes, said tubes containing telescopically related portions whereby the capacitance of the arrangement may be varied, one of said conductive tubes containing a second conductive tube within, said second tube being held in place in relation to the first tube by an adhesive filling the volume between the two tubes, said second tube being longer than said first tube and extending beyond the confines therefrom, a third tube disposed around said first tube in electrical contact therewith and in slidable relation thereto and an insulative ring slidably mounted around said second tube and secured to said third tube, a driven member, and conductive strap means electrically connecting said second tube to said driven member.

References Cited in the file of this patent

UNITED STATES PATENTS

2,469,168	Loughlin	May 3, 1949
2,714,192	Pan et al.	July 26, 1955
2,837,742	Weiss	June 3, 1958

OTHER REFERENCES

QST, August 1955, pp. 29–31.
QST, July 1957, p. 30.
QST, October 1957, pp. 19 and 20.