

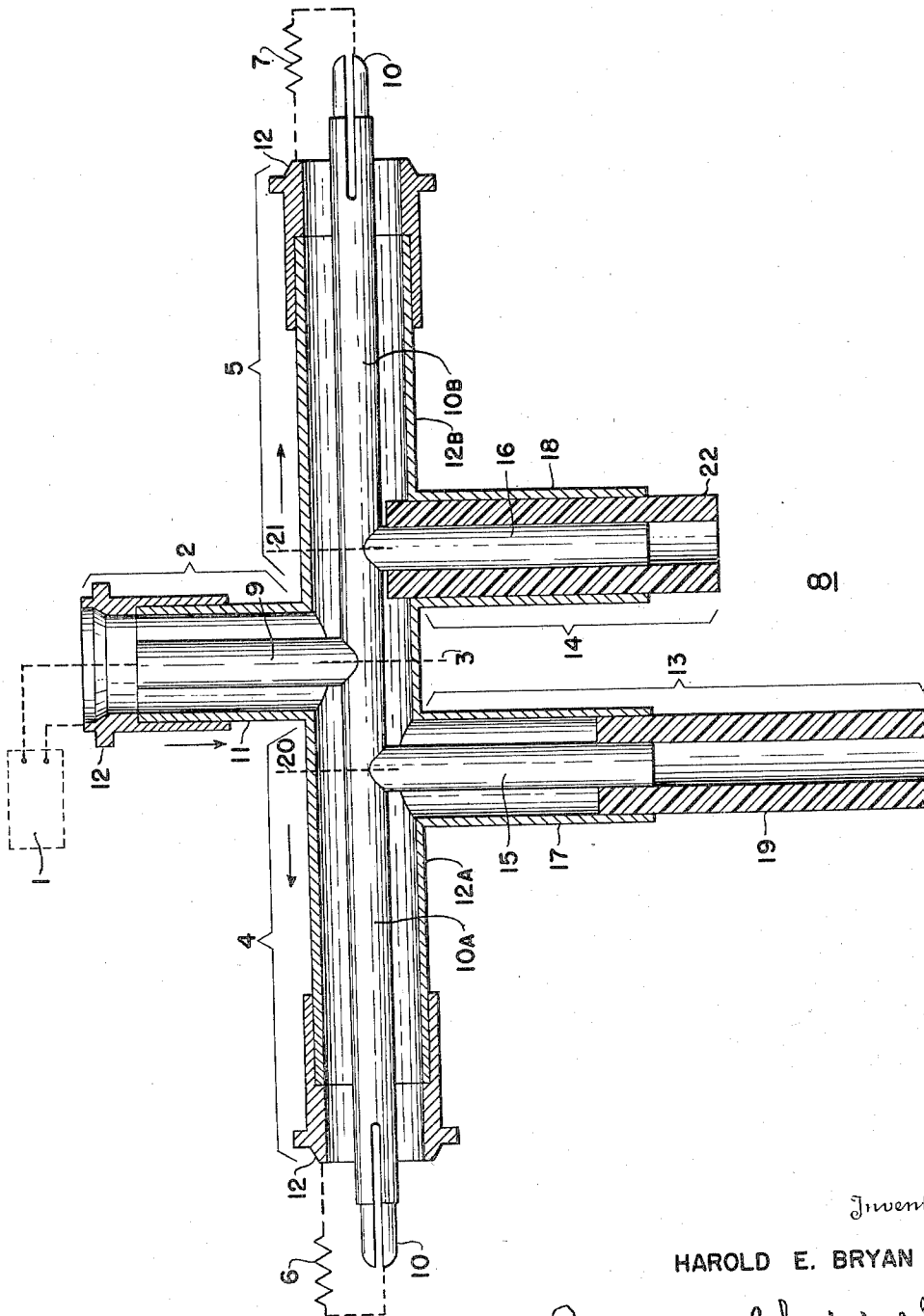
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RADIO-FREQUENCY TRANSMISSION SYSTEM

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RADIO-FREQUENCY TRANSMISSION
SYSTEM

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2 Claims. (Cl. 178-44)

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My invention relates to systems for transmission of power at high-frequencies and in particular concerns arrangements for predetermining the distribution of power from an input line to output lines.

In accordance with my invention, the switching of power from one to another of the output lines or the division of power among the output lines is controlled by variation of the electrical length of stub lines which extend respectively from the output lines, preferably each at a point which is an integral number of quarter-wavelengths from the input-line junction and whose electrical lengths are variable through a range preferably corresponding to at least one quarter-wavelength.

More specifically in accordance with my invention, the stub lines are open-ended concentric lines and their effective electrical length is varied, without use of sliding contacts, by adjustment of slugs or sleeves or insulating material slidable over the inner conductors of the lines.

My invention further resides in the features of construction and arrangement hereinafter described and claimed.

For an understanding of my invention and for illustration of a preferred embodiment thereof, reference is made to the accompanying drawing, principally in section, of a radio-frequency switch or power-divider.

In the system shown, radio-frequency power from source 1 is transmitted by a concentric transmission line 2 to a junction point 3 at which it connects with two concentric output lines 4 and 5 extending to loads or coupling devices generically represented by resistors 6 and 7.

In the connector assembly 8 shown, the inner conductor 9 of the input line 2 is suitably joined to the inner conductors 10A, 10B of the output lines 4 and 5 respectively. Physically, the inner conductors 10A, 10B are a single continuous rod or tube provided at each of its opposite ends with a terminal 10 to be received by the usual transmission line coupling. The outer conductor 11 of the input line 2 is suitably joined, as by silver brazing, to the outer conductors 12A, 12B of the output lines. Each of the lines is provided with a metallic sleeve 12 for engaging the outer conductor or sheath of the extension of the lines to the source of power and loads.

The concentric stub line 13 is attached to the output line 4 at a point which is an integral number of quarter-wavelengths, for example, one

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quarter-wavelength from the input line junction 3.

Similarly, the concentric stub line 14 is connected to the output line 5 at a point which is also an integral number, for example one, of quarter-wavelengths from the junction of lines 2 and 5.

The inner conductors 15 and 16 of the concentric stub lines are suitably connected to the inner conductors 10A and 10B of the output lines 4 and 5 and the outer conductors 17, 18 of the stub lines are suitably attached to the outer conductors 12A, 12B of the output lines.

Each of the stub lines 13, 14 is open-ended and of such physical length that its electrical length may be varied at least one-quarter wavelength by adjustment of the slugs 19, 22 preferably of suitable dielectric material, such as polystyrene, or if of conductive material suitably coated with or encased in insulating material in avoidance of electrically conductive contact with the conductors of the stub lines.

In use of the device 8 as an antenna switch, the length of each of the lines 13 and 14 is such that when its polystyrene sleeve, or equivalent, is inserted a certain distance the effective electrical length of the line is for example a full wavelength, or other even number of quarter wavelengths, so that since the line is open-ended it appears as an open circuit at the junction point 20 (or 21) and so produces no loading. At another position of each of the sleeves, the effective electrical length of the associated stub line is for example three quarter-wavelengths so that it presents a short-circuit at the junction 20 (or 21) and an open circuit at junction 3 by reflection. For use as a switch, the sleeves 19, 22 are located in opposite positions as shown in the drawing and to shift power from one to the other of the output lines the positions of the sleeves are interchanged, preferably by a ganged control.

Although for clarity, line 2 has been designated as the input line and lines 4 and 5 as output lines, it shall be understood any of the lines may be used as the input line and any of the others as output lines; for example, a radio-receiver may be connected to line 2 and, by operation of sleeves 19, 22, may selectively receive radio-frequency energy from one or the other of two antennae, or other sources, generically represented by resistors 6 and 7.

In use of the assembly 8 as a power divider, the lengths of the stub lines 13, 14 are so adjusted that as the sleeves 19, 22 are moved simultaneously, outwardly for example, the electrical length

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of one of lines 13, 14 changes gradually from an even number of quarter-wavelengths to an odd number of quarter-wavelengths while the electrical length of the other stub line gradually changes from an odd number of quarter-wavelengths to an even number of quarter-wavelengths. Accordingly, the ratio of the impedances of the output lines as seen from the junction 3 is progressively varied to change the distribution of power from the input line to the output lines. By proper choice of the impedances of the stub lines, the load on the generator remains substantially constant for the different positions of the sleeves 19, 22.

If desired, a gang control may be provided to effect concurrent movement of the sleeves and a suitably calibrated scale provided to assist in setting them to obtain any desired ratio of power division.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What I claim is:

1. A high-frequency transmission system comprising a concentric input line, a pair of concentric output lines joined thereto, and means for determining the distribution of power from the input line among the output lines comprising open-ended concentric lines extending from the

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output lines each at a point which is a quarter-wavelength from the input line, and separate plungers of dielectric material gradually slidable within said last-named lines to vary their electrical length.

2. A high-frequency transmission system comprising a concentric input line, at least two concentric output lines joined thereto at a common junction, and means for determining the distribution of power from the input line among the output lines comprising open-ended concentric lines extending from the output lines respectively at points which are an equal number of quarter-wavelengths from said junction, and separate plungers of dielectric material gradually slidable along said last-named lines to vary their electrical length through a range of at least about one quarter-wavelength.

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