June 21, 1949. H. BENIOFF 2,473,780

SPARK TRANSMITTER

Filed Oct. 5, 1945 2 Sheets-Sheet 1

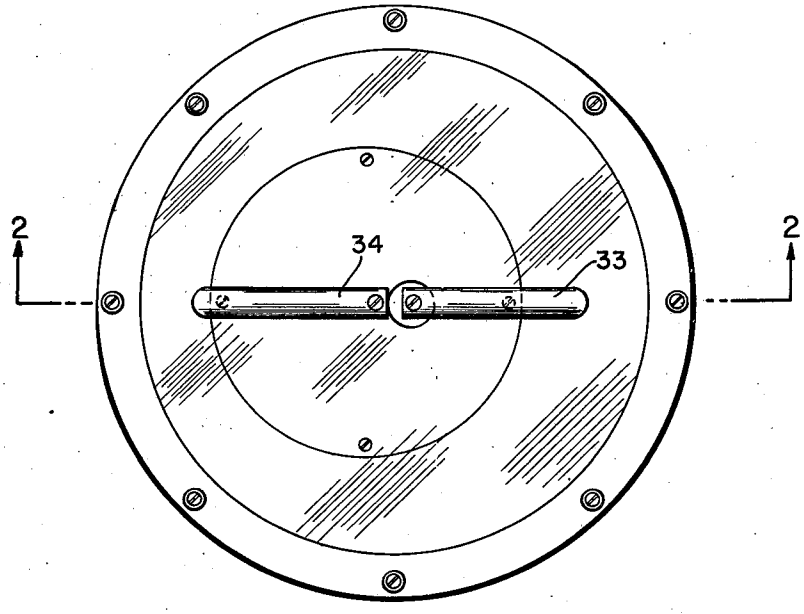


FIG. 1

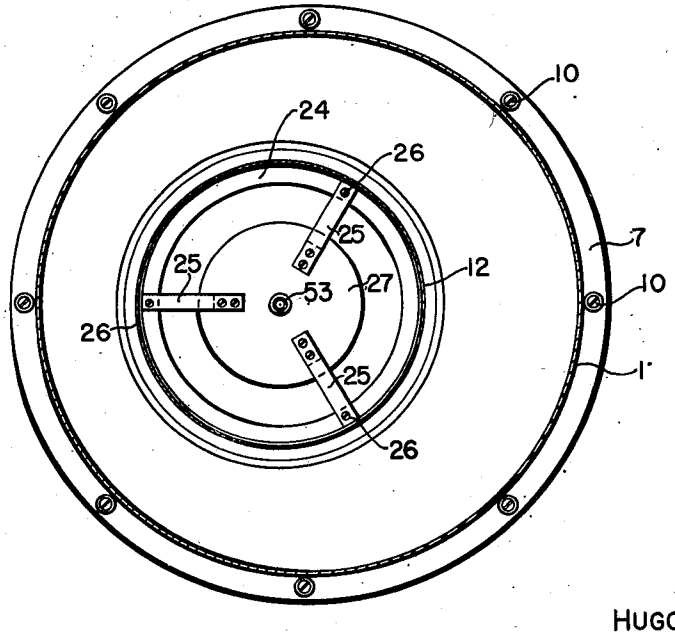


FIG. 3

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SPARK TRANSMITTER

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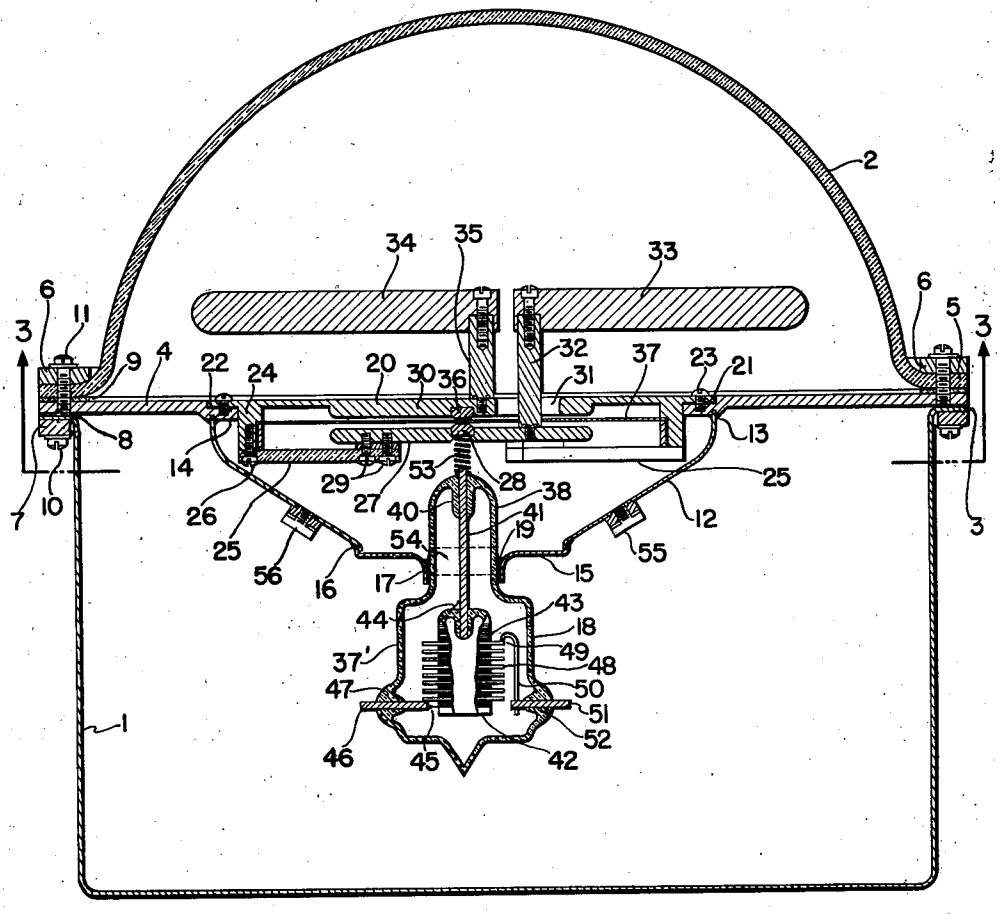


FIG. 2

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2,473,780

SPARK TRANSMITTER

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Application October 5, 1945, Serial No. 620,562

11 Claims. (Cl. 250—17)

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The present invention relates to an ultra high frequency electromagnetic transmitting device of the spark type and has for its purpose means for more effectively and efficiently radiating electromagnetic energy by means of a spark circuit.

The present invention may apply both to directive and non-directive transmission and includes in its arrangement a transformer in an evacuated container positioned in the same assembly with the rest of the equipment. In this way it is possible to make all of the leads short and provide a compact small light-weight device in a single unit.

The arrangement will be more fully described in connection with the drawings illustrating an embodiment of the invention in which Fig. 1 shows a plan view of the device; Fig. 2 shows a sectional view on the line 2—2 of Fig. 1 but slightly enlarged; and Fig. 3 shows a section on the line 3—3 of Fig. 2.

In the arrangement indicated in the figures the unit may be enclosed in a metallic housing or box 1 which may be of spun aluminum, if desired, which is closed by a cover 2 preferably transparent for the radiation of electromagnetic energy. Any suitable material may be used for this purpose as, for instance, a transparent plastic known as "Plexiglas." Between the cover and a flange 3 of the housing 1 there is supported a mounting plate 4 of conductive material as, for instance, brass, copper or the like. The mounting plate 4 is held between the flange 3 of the housing 1 and a corresponding flange 5 formed as the rim of the cover 2.

Suitable clamping rings 6 and 7, 6 fitting over the cover 2 and 7 fitting over the flange 3 with appropriate mounting gaskets 8 and 9 on both sides of the brass plate, may be used to hold the assembly firmly in place when screws 10 and 11 positioned around the periphery of the housing and cover respectively are put in place.

The mounting plate 4 supports the entire structure within the casing. Extending into the housing 1 is a large bowl-like member 12 which may be a copper spinning or other thin metallic structure. This is preferably permanently attached by welding, silver solder or otherwise, indicated by the numeral 13, around the edge of the member 12 to an offset section 14 at the inner edge of the plate 4 which is annular in shape. The copper-spun bowl may, if desired, be made in two parts with a lower plate-like member 15 attached to the member 12 in a soft solder ring joint 16 if desired. Supported at the center of the plate 15 by means of a downwardly extending flange 17 of the plate is the vacuum impulse transformer 18 which will be described in detail later. This also is mounted to the flange 17 by means of a soft-solder joint 19 of some comparatively lower temperature melting solder.

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Mounted within the opening in the plate 4 is the antenna and spark electrode assembly. This comprises a plate 20 with an extending flange 21 which fits in a shoulder 22 formed on the opposite face of the offset 14 around the opening to the plate 4. A group of small screws 23 is used to hold the plate 20 securely in place. The plate 20 has also a downwardly extending flange 24 adjacent the flange 22.

At the end of this flange there are supported a group of insulating bars or fingers 25 extending inwardly which are fastened to the flange 24 by means of screws 26. The elements 25 may be made of any suitable insulating material as, for instance, Mycalex. Supported by the fingers 25 is the lower disk 27 in which, at the center, the sparking electrode 28 is mounted. The disk 27 may be held to the Mycalex bars or brackets by means of the screws 29. The upper plate or disk opposite to the disk 27 is indicated at 30. This is formed as a part of the plate 20 by extending the lower surface of the plate outward, thus making the plate thicker at the central region. The plate 20 and its extending boss 30 may be of the same material as the plate 27 as, for instance, stainless steel or other non-corrodible metal. The plate 30 is provided with a hole 31 through which the rod 32 extends, the end of which is fixed in the plate 27. This rod forms the lead to the antenna arm 33 which is attached at the end of the rod 32. All of these materials may be of stainless steel or some conductive metal. The other antenna arm 34 is supported by the feeder 35 rigidly mounted in the plate 30. The antenna, as indicated, is a doublet in which the length from the antenna tips to the sparking points is substantially the same, thus accounting for one arm 34 being slightly longer than the arm 33. An electrode 36 is mounted in the plate 30 opposite the electrode 28. These two electrodes extend beyond the adjacent surfaces of the plates 30 and 27, respectively, and are somewhat narrowed at their ends. Between the ends of the electrodes there is positioned a mica separator 37 which is supported in the flange 24.

The impulse transformer 18 is encased in a shell 37' preferably of glass. The glass shell is formed with a cylindrical end 38 closed in a rounded end in which a thick section 40 is formed carrying a central support 41 on which a form

42 is supported carrying a secondary winding 43. The supporting rod 41 may be of conductive material and one end 44 of the winding 43 may be attached to the rod while the other end 45 of the winding may be connected to the terminal electrode 46 passing through the glass shell of the tube and sealed in the side boss 47. This terminal 46 may also provide an electrical connection and support for the primary winding 48, the other end 49 of which is connected by means of conductive rod 50 to the terminal 51 sealed to the tube in the boss 52. The primary winding 48 surrounds and is concentric with the secondary winding 43.

Connection is made between the terminal at the external end of the rod 41 and the electrode 28 by means of a spring conducting element 53. The transformer windings 43 and 48 are supported in position in the evacuated shell 37'. The shell itself is provided with a metallized band 54 which is joined to the flange 17 in the plate 15 by means of the soft-solder joint 19.

In the assembly of the device the impulse transformer and its mounting support, including the member 12, are supported by means of the annular plate 4. The spark electrode system and the antennae may then be mounted in place as a unit on the annular plate 4, the spring 53 furnishing the contact pressure with the electrode 28. The insulating separator which provides a hole between the sparking electrodes 28 and 36 insures a discharge in that enclosed area. The antenna is such that it is resonant because of its dimensions at the desired frequency. The ratio of turns in the impulse transformer makes it possible to use externally a lower voltage for connection to the device since the voltage is stepped up within the unit itself.

It will also be noted that the chamber formed within the cover 2 and the plate 4 and well 12 is entirely sealed from the external atmosphere so that this space may be either partially evacuated or filled with gas as may be desired. Suitable vent plugs 55 and 56 are provided for this purpose.

Having now described my invention, I claim:

1. An ultra high frequency spark transmitter comprising a doublet antenna, a pair of opposed capacitive plates having central electrodes, means supporting the arms of the doublet from said opposed capacitive plates, a vacuum-enclosed impulse transformer having primary and secondary windings and means directly connecting the terminal of one end of the secondary to one of said electrodes.

2. An ultra high frequency spark transmitting system including a doublet antenna, an oscillatory spark circuit having opposed capacitive plates with centrally opposed electrodes and a vacuum enclosed impulse transformer, means supporting the impulse transformer in close position to said plates, means providing a direct electrical connection from one of said electrodes to the secondary of said impulse transformer, and means supporting the arms of the doublet from said opposed plates.

3. An ultra high frequency spark transmitting system including a doublet antenna, an oscillatory spark system having opposed capacitive plates with centrally opposed electrodes, a vacuum impulse transformer enclosed in an evacuated vessel having an electrical connection through the wall of the vessel to one of said electrodes, conductive means sealed in the wall of said vessel providing support and electrical connecting

means for elements of said vacuum impulse transformer, and means supporting the arms of the doublet from said opposed plates.

4. An ultra high frequency spark transmitting system including an annular plate member, an oscillatory spark circuit having opposed capacitive plates, one of said capacitive plates having an outwardly extending ring with a transversely extending flange, means attached to said flange for supporting the other capacitive plate, antennae elements and means supporting said antennae elements directly to said capacitive plates, and means for mounting the spark circuit to said annular plate member, whereby said spark circuit may be mounted as a unitary structure on said annular plate.

5. An ultra high frequency spark transmitting system including an annular plate member, an oscillatory spark circuit having opposed capacitive plates, one of said capacitive plates having an outwardly extending ring with a transversely extending flange, means attached to said flange for supporting the other capacitive plate, antennae elements and means supporting said antennae elements directly to said capacitive plates, and means for mounting the spark circuit to said annular plate member, whereby said spark circuit may be mounted as a unitary structure on said annular plate, and a vacuum enclosed impulse transformer having a connecting member aligned with one of said electrodes, means supporting said impulse transformer from said annular plate and spring means making contact between said connecting members and said one electrode.

6. An ultra high frequency spark transmitting system including an oscillatory spark circuit comprising an annular mounting member, a pair of capacitive plates positioned in opposed relation and supported by said mounting member, a pair of antenna arms, a pair of conductive supports, one for each antenna arm supporting said arms to said plates, said plates having centrally positioned electrodes and one of said supports passing through a hole in the capacitive plate to which it is not supported.

7. An ultra high frequency spark transmitting system including an oscillatory spark circuit comprising an annular mounting member, a pair of capacitive plates positioned in opposed relation and supported by said mounting member, a pair of antenna arms, a pair of conductive supports, one for each antenna arm supporting said arms to said plates, said plates having centrally positioned electrodes and one of said supports passing through a hole in the capacitive plate to which it is not supported, the electrical length from the antenna tips to the electrodes being substantially the same.

8. An ultra high frequency spark transmitter comprising a doublet antenna, an oscillatory spark circuit having opposed capacitive plates with opposed electrodes and an impulse transformer connected at its secondary winding to at least one of said plates, and means supporting the arms of the doublet from said opposed plates, the electrical length from the tip of each arm to the electrode on the supporting plate being substantially the same.

9. An ultra high frequency spark transmitting system comprising an annular mounting plate having a bowl peripherally mounted at one side thereof around the opening therein, said bowl having at its base another opening concentric with the mounting plate opening, an oscillatory

circuit having opposed capacitive plates, means for mounting said plates on said mounting plate in the opening therein, antenna elements, means for supporting said antenna elements directly to said plates while maintaining said elements disposed on the other side of said mounting plate from said bowl, an impulse transformer, means mounting said transformer in said other opening in said bowl, a direct connector within the bowl from the secondary winding of said transformer to one of said capacitive plates, and means disposed outside said bowl for making connection to the primary winding of said transformer.

10. An ultra high frequency spark transmitting system comprising an annular mounting plate having a bowl peripherally mounted at one side thereof around the opening therein, said bowl having at its base another opening concentric with the mounting plate opening, an oscillatory circuit having opposed capacitive plates, means for mounting said plates on said mounting plate in the opening therein, antenna elements, means for supporting said antenna elements directly to said plates while maintaining said elements disposed on the other side of said mounting plate from said bowl, an impulse transformer, means mounting said transformer in said other opening in said bowl, a direct connector within the bowl from the secondary winding of said transformer to one of said capacitive plates, means disposed outside the bowl for making connection to the primary winding of said transformer, and means mounted on the outer periphery of said mounting plate for hermetically enclosing the entire structure, the enclosure on the antenna side of the mounting plate being transparent to radiation of said antenna elements.

11. An ultra high frequency spark transmitting device comprising an annular mounting

base, a bowl peripherally mounted on one side of said base around the opening therein, said bowl having an aperture at its bottom, an oscillatory circuit including opposed capacitive plates, confronting spark electrodes on said plates, means for mounting said plates in said opening, an impulse transformer, means mounting said transformer in said aperture, a direct connection within the bowl from the secondary winding of said transformer to one of said plates, and means disposed outside of said bowl for making connection to the primary winding of said transformer.

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Certificate of Correction

Patent No. 2,473,780. June 21, 1949.

HUGO BENIOFF

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 34, claim 5, for the word "members" read *member*;

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of November, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.

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