

# PATENT SPECIFICATION

763,062



Date of filing Complete Specification: Sept. 22, 1954.

Application Date: June 22, 1953.

No. 17167/53.

Complete Specification Published: Dec. 5, 1956.

Index at acceptance:—Class 39(4), P3X.

## COMPLETE SPECIFICATION

### A New Apparatus for Producing an Electric Current

We, HAROLD VICTOR COLMAN, a British Subject of 45, Southlands Road, Birmingham 13, formerly of 17, Cole Valley Road, Hall Green, Birmingham, in the County of Warwick, and RONALD WILLIAM DAVID SEDDON-GILLESPIE, a Canadian Citizen, of 54, Wolverton Road, Rednal, Birmingham, in the County of Warwick, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a new apparatus for producing electric current such apparatus being in the form of a completely novel secondary battery.

The object of the present invention is to provide apparatus of the above kind which is considerably lighter in weight than and has an infinitely greater life than a known battery or similar electrical characteristics and which can be re-activated as and when required in a minimum of time.

According to the present invention we provide apparatus comprising a generator unit said unit including a magnet adapted to produce a magnetic field, means for suspending a chemical mixture in said field, said mixture being composed of elements whose nuclei becomes unstable as a result of bombardment by short waves so that the elements become radio-active and also release electrical energy, said mixture being mounted between and in electrical contact with a pair of different metals, such as copper and zinc, a condenser mounted between said metals, a terminal electrically connected to each said metal, means for conveying said waves to said mixture and a lead shield surrounding said unit to prevent harmful radiation from said mixture.

The mixture is preferably composed of the elements Cadmium, Phosphorus and Cobalt having Atomic Weights of 112, 31 and 59 respectively.

The mixture which may be of powdered form

is mounted in a tube of non-conducting, high heat resistivity material and is compressed between granulated zinc at one end of the tube and granulated copper at the other end, the ends of the tube being closed by brass caps and the tube being carried in a suitable cradle so that it is located between the poles of the magnet.

The magnet is preferably an electro-magnet and is energized by the current produced by the unit.

The means for conveying the waves to the mixture may comprise a pair of antennae which are exactly similar to the antennae of the transmitter unit for producing the waves, each antenna projecting from and being secured to the brass cap at each end of the tube.

The transmitter unit which is used for activating the generator unit may be of any conventional type operating on ultra short wave and is preferably crystal controlled to the desired frequency.

The invention is illustrated in the accompanying drawing wherein

FIGURE 1 is a side elevation of one form of apparatus

FIGURE 2 is an end elevation thereof and FIGURE 3 is a schematic circuit diagram.

In the form of our invention illustrated the generator unit comprises a base 10 upon which the various components are mounted this base having projecting upwardly therefrom a pair of arms 11 which are adapted to form a cradle or housing 12 for a quartz tube 13 the cradle 12 being preferably made of spring material so that the tube 13 is firmly, yet removably held in position. The arms 11 are so disposed in relation to the poles 14 of an electro-magnet 15 that the tube 13 when in position is disposed immediately between the poles of the magnet so as to be in the strongest magnetic field created thereby. The magnet serves to control the alpha and beta rays emitted by the cartridge when it is in operation.

The ends of the quartz tube 13 are each pro-

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vided with a brass cap 16 and these caps 16 are adapted to engage within the spring cradles 12 and the coils 17 associated with the magnet being so arranged that if the base 10 of the unit is in a horizontal plane the poles 14 of the magnet are in a substantially vertical plane.

Also connected across the cradles is a lead condenser 18 which may conveniently be housed in the base 10 of the unit and connected in parallel with this condenser 18 is a suitable high frequency inductance coil 19.

The unit is provided with a lead shield 20 so as to prevent harmful radiation from the quartz tube as will presently be described.

The quartz tube 13 has mounted therein at one end a quantity of granulated copper this copper being in electrical contact with the brass cap 16 at that end of the tube and mounted within the tube and in contact with the granulated copper is a chemical mixture which is of powdered form and which is capable of releasing electrical energy and which becomes radioactive when subject to bombardment by ultra short wireless waves. Mounted in the other end of the tube and in contact with the other end of the powdered chemical mixture is a quantity of granulated zinc which is itself in contact with the brass cap on this end of the tube the arrangement being that the chemical mixture is compressed between the granulated copper and the granulated zinc.

Projecting outwardly from each brass cap 16 and electrically connected therewith is an antenna 21 each antenna 21 corresponding exactly in dimension, shape and electrical characteristics to the antenna associated with a transmitter unit which is to produce the ultra short waves aforesaid.

The electro-magnet 15 is conveniently carried by a centrally disposed pillar 22 which is secured to the base 10 this pillar 22 carrying at its upper end a cross-bar 23 to one end of which is attached the high frequency coil 19.

The other end of this cross-bar 23 is bent round into arcuate form as shown at 24 and is adapted to bear against an arcuate portion 25 of the base 26 of the electro-magnet 15. Suitable locking means is provided for securing the two arcuate portions 24 and 25 in the desired angular position so that the position of the poles 14 of the electro-magnet can be adjusted about the axis of the quartz tube 13.

The transmitter unit is of any suitable conventional type for producing ultra short waves and may be crystal controlled to ensure that it will operate upon the desired frequency without the necessity for tuning. If the transmitter is only required to operate over a short range it may conveniently be battery operated but if it is to operate over a greater range then it may be operated from a suitable electric supply such as the mains.

If the transmitter is to be tuned the tuning may be operated by a dial provided with a micrometer vernier scale so that the necessary

"fineness" of tuning may be achieved.

The mixture which is contained within the quartz tube is composed of the elements Cadmium, Phosphorus and Cobalt having Atomic Weights 112, 31 and 59 respectively. Conveniently these elements may be present in the following compounds and where the tube is to contain thirty milligrams of the mixture the compounds and their proportions by weight are as follows:—

1 Part of  $\text{Co}(\text{No}_3)_2 \cdot 6\text{H}_2\text{O}$

2 Parts of  $\text{CdCl}_2$

3 Parts of  $3\text{Ca}(\text{Po}_3)_2 + 10\text{C}$ .

The cartridge which consists of the tube 13 with the chemical mixture therein is preferably composed of a number of small cells built up in series. In other words considering the cartridge from one end to the other at the one end, and in contact with the brass cap, there would be a layer of powdered copper, then a layer of the chemical mixture, then a layer of powdered zinc, a layer of powdered copper etc. with a layer of powdered zinc in contact with the brass cap at the other end of the cartridge. With a cartridge some forty-five millimetres long and five millimetres diameter some fourteen individual cells may be included.

The cradles 12 in which the brass caps 16 engage may themselves comprise terminals from which the output of the unit can be taken. Alternatively a pair of terminals 27 may be connected across the cradles 12 these terminals 27 being themselves provided with suitable antennae 28, which correspond exactly in dimensions, shape and electrical characteristics to the antennae associated with the transmitter these antennae 28, if provided, replacing the antennae 21.

In operation with the quartz tube containing the above mixture located between the granulated copper and the granulated zinc and with the tube itself in position between the poles of the magnet the transmitter is switched on and the ultra short waves emanating therefrom are received by the antennae mounted at each end of the tube and in contact with the copper and zinc respectively the waves being thus passed through the copper and zinc and through the mixture so that the mixture is bombarded by the short waves and the Cadmium, Phosphorus and Cobalt associated with the mixture becomes radio active and also releases electrical energy which is transmitted to the granulated copper and granulated zinc causing a current to flow therebetween in a similar manner to the current flow produced by a thermo couple. It has been established that with a mixture having the above composition, the optimum release of energy is obtained when the transmitter is operating at a frequency of 300 megacycles per second.

The provision of a quartz tube is necessary for the mixture evolves a considerable amount of heat whilst it is reacting as a result of the bombardment by the short waves. It is found

that the tube will only last for one hour and that the tube will become discharged after an hour's operation, that is to say the radio activity of the tube will only last for one hour and it is therefore necessary, if the unit is to be run continuously for the transmitter to be operated for a period of some fifteen to thirty seconds duration once every hour.

10 With a quartz tube having an overall length of some forty-five millimetres and an inside diameter of five millimetres and containing thirty milligrammes of the chemical element the estimated energy which will be given off from the tube for a discharge of one hour is 15 between 100 and 110 volts at 10 amps. To enable the tube to give off this discharge it is only necessary to operate the transmitter at the desired frequency for a period of some 15 to 30 seconds duration.

20 The current which is given off by the tube during its discharge is in the form of direct current.

During the discharge from the tube harmful radiations are emitted in the form of gamma and alpha and beta rays and it is therefore necessary to mount the unit within a lead shield so as to prevent the harmful radiations from affecting personnel and objects in the vicinity of the unit. The alpha and beta rays which are emitted from the cartridge when it is in operation are controlled by the magnet.

When the unit is connected up to some apparatus which it to be driven by power obtained from the unit it is necessary to provide suitable fuses to guard against the cartridge being short circuited during discharge thereof, or when it is fully charged, for if such a short circuit should occur the cartridge is liable to explode.

40 The estimated weight of such a unit including the necessary shielding, per kilowatt hour output is approximately twenty-five per cent of any known standard type of accumulator which is in use today and it is estimated that the life of the chemical mixture is probably in the region of seventy to eighty years when under constant use.

It will thus be seen that we have provided a novel form of apparatus for producing an electric current which is considerably lighter than the standard type of accumulator at present known, which has an infinitely greater life than any known type of accumulator and which can be recharged or reactivated as and when desired and from a remote position depending upon the power output of the transmitter.

Such form of battery has many applications, one for example, of which is the use of such batteries in marker and other buoys which are

used in harbours and such like places and which could be reactivated at given intervals from a shore base central transmitting station.

What we claim is:—

1. Apparatus for producing electric current comprising a generator unit, said generator unit including a magnet adapted to produce a magnetic field, means for suspending a chemical mixture in said field, said mixture being composed of elements whose nuclei become unstable as a result of bombardment by short waves so that the elements become radio-active and also release electrical energy, said mixture being mounted between and in electrical contact with a pair of different metals, such as copper and zinc, a condenser mounted between said metals, a terminal electrically connected to each said metal, means for conveying said waves to said mixture and a lead shield surrounding said unit to prevent harmful radiation from said mixture.

2. Apparatus according to Claim 1 wherein the mixture is of powdered form and is mounted in a tube of non-conducting, high heat resistivity material and is compressed between granulated zinc and granulated copper at the other end, the ends of the tube being closed by caps of suitable conducting material.

3. Apparatus according to Claim 2 wherein the caps are of brass and wherein the caps engage in a suitable cradle formed of conducting material said cradle serving to locate the tube between the poles of the magnet.

4. Apparatus according to Claim 3 wherein the magnet is in the form of an electro-magnet and is adapted to be energized by the current produced by the unit.

5. Apparatus according to any of the preceding claims wherein the mixture is composed of the elements Cadmium, Phosphorus and Cobalt having Atomic Weights of 112, 31 and 59 respectively.

6. Apparatus according to any of the preceding claims wherein the means for conveying the short waves to the mixture comprises a pair of antennae which are physically and electrically similar to the antennae of the transmitting unit, each antennae projecting from and being secured to the brass cap at each end of the tube.

7. Apparatus for producing an electric current substantially as hereinbefore described with reference to and as shown in the accompanying drawing.

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## PROVISIONAL SPECIFICATION

## A New Apparatus for Producing an Electric Current

- We, HAROLD VICTOR COLMAN, a British Subject, of 17, Cole Valley Road, Hall Green, Birmingham, in the County of Warwick, and RONALD WILLIAM DAVID SEDDON-GILLESPIE, a Canadian Citizen, of 54, Wolverton Road, Rednal, Birmingham, in the County of Warwick, do hereby declare this invention to be described in the following statement:—
- 10 This invention relates to a new apparatus for producing electric current such apparatus being in the form of a completely novel secondary battery.
- 15 The object of the present invention is to provide apparatus of the above kind which is considerably lighter in weight than and has an infinitely greater life than a known battery of similar electrical characteristics and which can be re-activated as and when required in a minimum of time.
- 20 According to the present invention we provide apparatus comprising a generator unit said unit including a magnet adapted to produce an electric field, means for suspending a chemical mixture in said field, said mixture being composed of elements whose nuclei become unstable as a result of bombardment by short waves so that the elements become radioactive and release energy, said mixture being mounted between and in electrical contact with a pair of different metals, such as copper and zinc, a condenser mounted between said metals, a terminal electrically connected to each said metal, means for conveying said waves to said mixture and a lead shield surrounding said unit to prevent harmful radiation from said mixture.
- 35 The mixture is preferably composed of the elements Cadmium, Phosphorus and Cobalt having Atomic Weights of 112, 31 and 59 respectively.
- 40 The mixture which may be of powdered form is mounted in a tube of non-conducting, high heat resistivity material and is compressed between granulated copper at the other end, the ends of the tube being closed by brass caps and the tube being carried in a suitable cradle so that it is located between the poles of the magnet.
- 45 The magnet is preferably an electro-magnet and is energized by the current produced by the unit.
- 50 The means for conveying the waves to the mixture may comprise a pair of antennae which are exactly similar to the antennae of the transmitter unit for producing the waves, each antenna projecting from and secured to the brass cap at each end of the tube.
- 55 The transmitter unit which is used for activating the generator unit may be of any conventional type operating on ultra short wave and is preferably crystal controlled to the desired frequency.
- 60 In one form of our invention the generator unit comprises a base upon which the various components are mounted this base having projecting upwardly therefrom a pair of generally U-shaped arms which are adapted to form a cradle or housing for a quartz tube the arms being preferably made of spring material so that the tube is firmly, yet removably held in position. These arms are so disposed in relation to the poles of an electro-magnet that the tube when in position is disposed immediately between the poles of the magnet so as to be in the strongest magnetic field created thereby.
- 65 The ends of the quartz tube are each provided with a brass cap and these caps are adapted to engage within the spring cradle arms and the coils associated with the magnet are connected across these cradle arms the magnet being so arranged that if the base of the unit is in a horizontal plane the poles of the magnet are in a substantially vertical plane.
- 70 Also connected across the cradle arms is a lead condenser which may conveniently be housed in the base of the unit and connected in parallel with this condenser is a suitable inductance coil.
- 75 The whole unit is enclosed within a lead shield so as to prevent harmful radiation from the quartz tube as will presently be described.
- 80 The quartz tube has mounted therein at one end a quantity of granulated copper this copper being in electrical contact with the brass cap at that end of the tube and mounted within the tube and in contact with the granulated copper is a chemical mixture which is of powdered form and which is capable of releasing energy when subject to bombardment by ultra short wireless waves. Mounted in the other end of the tube and in contact with the other end of the powdered chemical mixture is a quantity of granulated zinc which is itself in contact with the brass cap on this end of the tube the arrangement being that the chemical mixture is compressed between the granulated copper and the granulated zinc.
- 85 Projecting outwardly from each brass cap and electrically connected therewith is an antenna each antenna corresponding exactly in dimension, shape and electrical characteristics to the antenna associated with a transmitter unit which is to produce the ultra short waves aforesaid.
- 90 The transmitter unit is of conventional type for producing ultra short waves and may be crystal controlled to ensure that it will operate upon the desired frequency without the necessity for tuning. If the transmitter is only required to operate over a short range it may
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conveniently be battery operated but if it is to operate over a greater range then it may be operated from a suitable electric supply such as the mains.

- 5 The mixture which is contained within the quartz tube is composed of the elements Cadmium, Phosphorus and Cobalt having Atomic Weights 112, 31 and 59 respectively the nuclei of these elements becoming unstable as a result of bombardment by ultra short waves so that the elements become radio-active and release energy. Conveniently these elements may be present in the following compounds and where the tube is to contain thirty milligrammes of the mixture the compounds and their proportions by weight are as follows:—

- 1 Part of Co (No.) 2  $6\text{H}_2\text{O}$
- 2 Parts of  $\text{CdCl}_2$
- 3 Parts of  $3\text{Ca (Po.) } 2 + 10\text{C}$ .

- 20 In operation with the quartz tube containing the above mixture located between the granulated copper and the granulated zinc and with the tube itself in position between the poles of the magnet the transmitter is switched on and the ultra short waves emanating therefrom are received by the nuclei mounted at each end of the tube and in contact with the copper and zinc respectively the waves being thus composed through the copper and zinc and through the mixture so that the mixture is bombarded by the short waves and the Cadmium, Phosphorus and Cobalt associated with the mixture becomes radio active and releases energy which is transmitted to the granulated copper and granulated zinc causing a current to flow therebetween in a similar manner to the current flow produced by a thermo couple. It has been established that with a mixture having the above composition the optimum release of energy is obtained when the transmitter is operating at a frequency of 300 megacycles per second.

- 45 The provision of quartz tube is necessary for the mixture evolves a considerable amount of heat whilst it is reacting as a result of the bombardment by the short waves it is found that the tube will become discharged after an hours operation, that is to say the radio activeness of the tube will only last for one hour and it is therefore necessary, if the unit is to be run continuously for the transmitter to be operated for a period of some fifteen to thirty seconds

duration once every hour.

With a quartz tube having an overall length of sixty millimetres and an inside diameter of five millimetres and containing thirty milligrammes of the chemical element the estimated energy which will be given off from the tube for a discharge of one hour which is between 100 and 110 volts at 10 amps. To enable the tube to give off this discharge it is only necessary to operate the transmitter at the desired frequency for a period of some 15 to 30 seconds duration.

The current which is given off by the tube during its discharge is in the form of half waved direct current.

During the discharge from the tube harmful radiations are emitted in the form of gamma and similar rays and it is therefore necessary to mount the unit within a lead shield so as to prevent the harmful radiations from affecting personnel and objects in the vicinity of the unit.

The estimated weight of such a unit, including the necessary shielding, per kilowatt hour output is approximately twenty-five per cent of any known standard type of accumulator which is in use today and it is estimated that the life of the chemical mixture is probably in the region of seventy to eighty years when under constant use.

It will thus be seen that we have provided a novel form of apparatus for producing an electric current which is considerably lighter than the standard type of accumulator at present known, which has an infinitely greater life than any known type of accumulator and which can be recharged or reactivated as and when desired and from a remote position depending upon the power output of the transmitter.

Such form of battery has many applications, one for example, of which is the use of such batteries in marker and other buoys which are used in harbours and such like places and which could be reactivated at given intervals from a shore base central transmitting station.

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