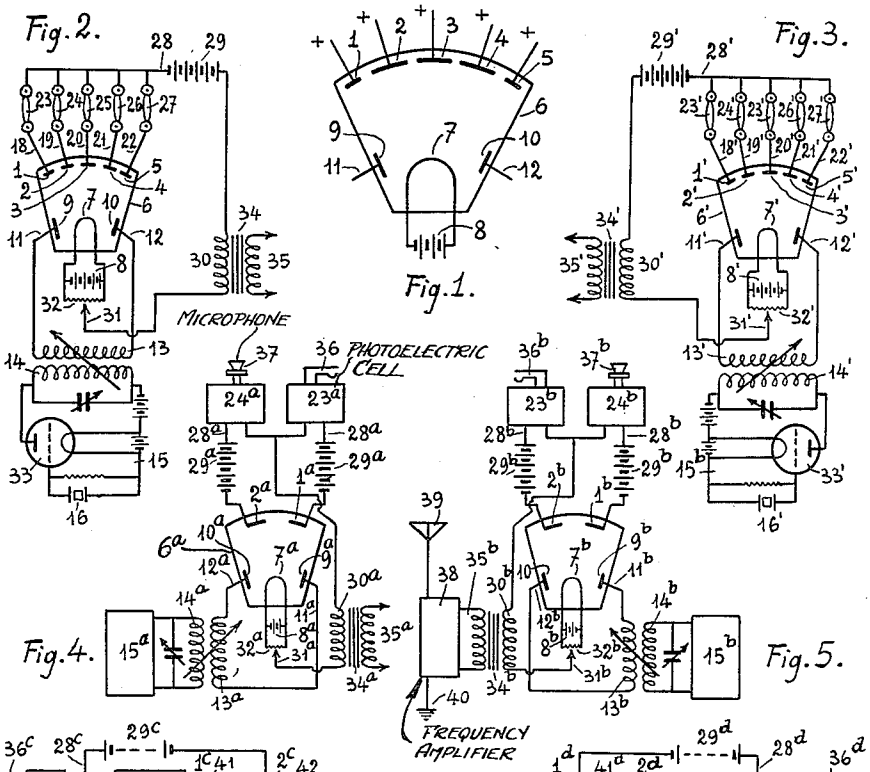
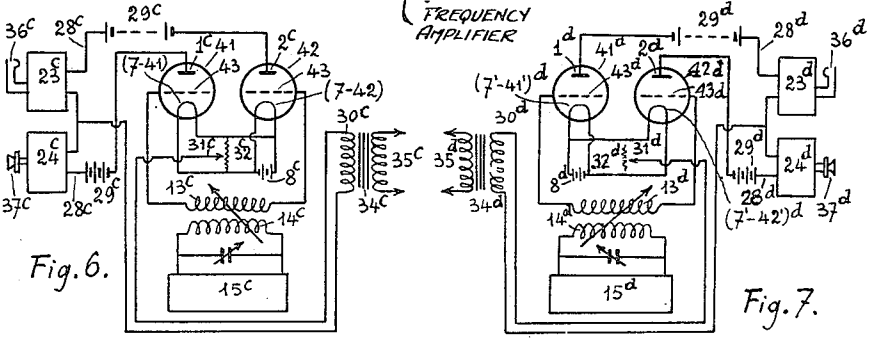
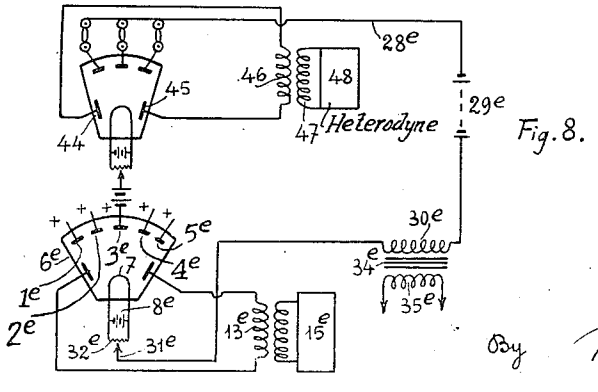
April 7, 1936. A. MONTANI 2,036,350

SYSTEM FOR MULTIPLE TRANSMISSION AND RECEPTION

Filed Feb. 21, 1933







Inventor
A. Montani
By Marks & Clerk
Attorneys.

Patented Apr. 7, 1936 2,036,350

UNITED STATES PATENT OFFICE

2,036,350

SYSTEM FOR MULTIPLE TRANSMISSION AND RECEPTION

Angelo Montani, Genoa, Italy

Application February 21, 1933, Serial No. 657,908
In Italy April 16, 1932

1 Claim. (Cl. 179—15)

The present invention has for its object to utilize in a new manner valves of known types for transmitting and receiving installations, and it has as a result the industrial effect that it is possible to effect various transmissions and receptions simultaneously and distinctly with a single transmitting-receiving station, with a single receiving-transmitting station and with a single transmitting means (which in the wireless transmission plants is constituted by the ether).

The valves that are utilized according to the present invention may be those having more than one plate and in which the stream coming from the filament receives a continuous displacement. In place of one of such valves, it is also possible to employ a pair of common valves the filaments of which emit radiations that strike the plates alternately.

The utilization of these special valves or of these pairs of common valves permits of fitting a station with a certain number of transmitting-receiving means (telephones, microphones, picture apparatus, and the like), of employing a single current conductor, a single emission, radiation conductor, and the like (in this case the transmitting-receiving station is provided with a common aerial and the conductor is constituted by the ether), and of providing the corresponding station with as many receiving-transmitting devices (telephones, microphones, picture apparatus, and the like) as were the aforesaid transmitting-receiving means, which can be utilized simultaneously, while also simultaneously the different transmissions of sounds, pictures, and the like will be received distinctly, separately and without superposition.

The above result is attained:

(1) By providing each transmitting-receiving station with various plates of ionic valves, located either inside a single bulb or inside several bulbs.

(2) By adopting at each station one or various ionic streams (or one or more cathodic streams) which strike such plates one at a time and with a determined sequence.

(3) By adopting devices such that the law on which the phenomenon according to which the stream or streams strikes or strike the plates of one station shall be identical with the law on which the stream or streams strikes or strike the plates of the other station.

(4) By inserting after each plate one of the transmitting and receiving apparatus of the stations thus obtaining that the stream or streams aforesaid may complete the circuits of the said apparatus.

In this manner the movable stream of the transmitting or receiving station will serve to successively close the various circuits passing through the different transmitting or receiving apparatus enabling the latter to function one after the other within a predetermined period of time; as the movable stream will successively close, with the same period of time, a corresponding number of circuits at the receiving or transmitting station, each of which circuits passes by one of the receiving or transmitting apparatus, the receiving apparatus function one after the other, with the same determined law of time, and each of them will receive successive impulses whereby it will be put into action.

From the foregoing it follows that the frequency or period of the phenomenon set up by the stream or streams of the two stations respectively, must be so selected that, in spite of the aforesaid continuous interruption of transmission and reception, the latter may be carried out in a convenient manner, by utilizing the inertia of the receiving apparatus as well as the phenomenon of the persistence of the impressions on the human organs.

In the embodiment illustrated the circuits for operating the oscillations are on their turn operated by oscillating devices which have the same frequency and are independent of one another.

The present invention is illustrated, only by way of example, in the annexed drawing in which:

Fig. 1 is a diagram of a valve provided with various plates as it may be employed, according to the present invention, either at the transmitting or at the receiving station.

Fig. 2 is a diagram of a station equipped for five telephonic apparatus working successively, each of them capable either of transmitting or of receiving,

Fig. 3 shows the corresponding receiving-transmitting station.

Figs. 4 and 5 show respectively the transmitting and the receiving station for the case where it may be necessary to transmit and to receive simultaneously sounds and pictures with radio waves.

Figs. 6 and 7 show how the same general principle of the previous figures, can be realized in practice with a pair of usual ionic valves. As the system can evidently be repeated,

Fig. 8 shows how two of the aforesaid fundamental elements, for instance two valves each provided with a plurality of plates, can be connected in series.

With particular reference to the special valve illustrated in Fig. 1, 1 to 5 denote five plates contained within the bulb 6 in which the filament 7 is located, said filament being connected with the circuit of the battery 8. The bulb also contains two electrodes 9, and 10 a condenser which, by means of a circuit including the conductors 11 and 12, compels the electron stream emitted by the filament 7 to move like a pendulum, so as to connect the filament 7 successively with the plates 1, 2, 3, 4, 5, 4, 3, 2, etc.

The pendular motion of the said electronic stream is so controlled as to cause it to accomplish a complete oscillation within a determined period of time (for instance within 1:20.000 of second). For this purpose the conductors 11 and 12 are connected to an oscillating circuit having a determined frequency which, for the reason specified hereinafter, is adjustable.

To this end, the inductance 13, Fig. 2 is excited by the inductance 14 of the heterodyne 15, in the grid circuit in which a crystal 16 is interposed to maintain the number of oscillations per second invariable; 8 is the battery connected with the filament 7.

An apparatus 23 . . . 27 is connected to each plate 1 . . . 5 by means of a conductor 18 . . . 22, the various apparatus being then connected to a common conductor 28 leading to the positive pole of a high tension battery 29 the negative pole of which is connected, through a winding 30 with the movable contact 31 of a potentiometer having an adjustment resistance 32 set in parallel with the battery 8 of the filament 7. The other parts indicated in Fig. 2 are of common use, such as, for instance, the oscillating valve 33. The winding 30 constitutes the primary of a transformer 34 the secondary 35 of which serves for the transmission, in a suitable manner, of the successive impulses that pass successively through the circuits (18, 23, 28), (19, 24, 28), (20, 25, 28), (21, 26, 28) (22, 27, 28), (21, 26, 28), etc.

Fig. 3 is constituted by the same parts as those of Fig. 2 and like parts are designated by the same reference numerals primed with a (′); the apparatus 23′, 24′, 25′, 26′ and 27′ being, in this case, telephonic apparatus. In order to insure regular working, as aimed at by the invention, the two crystals 16 and 16′ must give and keep the same frequency and the two oscillations must be exactly timed, which can be obtained by known means.

Considering the case illustrated in the figure, i. e. that the bulb 6 of the transmitting station contains five plates and assuming the oscillating circuit piloted by the crystal 16 to secure 20,000 oscillations per second, it may occur that each plate remains under the influence of the stream coming from the filament 7 over a period of time equal to 1:160.000 of a second. Considering one of these periods, for instance, that during which the stream strikes plate 4 at the station illustrated in Fig. 2, the circuit including the telephonic apparatus 26 will remain closed through said stream. If, according to the assumption made, the valve 6′ is identical with the valve 6 and it is so regulated that within the space of time aforesaid the stream from the filament 7′ strikes the plate 4′ for the same space of time, the circuit including the apparatus 26′ will remain closed through said stream, which apparatus 26′ will then coact with the apparatus 26. In the small space of time of 1:160.000 of second immediately following, the apparatus 25 and the corresponding apparatus 25′ will function; in the further small space of time of equal value the apparatus 24 and 24′ will function. In the small space of time following the last mentioned the apparatus 23 and 23′ will function and, in order that this duration may be equal to the previous ones, the plates 1 and 1′ (located at the ends in the arrangement) must have a period corresponding to the half of the others; after which the apparatus 24, 24′, etc. will function again, always with the same space of time. It must be noted that the time of 1:20.000 of second is divided into eight equal portions for the successive functioning of the apparatus connected to the plates 1, 2, 3, 4, 5, 4, 3, 2, 1.

Figures 4 and 5 show, in analogy with what is shown in Figures 2 and 3, a case where an apparatus 23^a, connected to a photoelectric cell 36 and an apparatus 24^a connected to a microphone 37 can function simultaneously and transmit simultaneously sounds and pictures by means of a transformer (and usual related apparatus) the primary of which is indicated by 30^a; for this different transmission the dimensions of the plates 1^a and 2^a of the valve 6^a, Fig. 4, can be different, each of them in relation with the requirements of the apparatus whose circuit they are designed to close. In this view, parts corresponding with those above described are indicated by the same numerals with the exponent "*a*" added.

Figure 5 shows the corresponding receiving set, where 38 is the high and low frequency amplifier, 39 the antenna, 40 the earth, 23^b, Fig. 5, the apparatus for the reception of the images, and 24^b the apparatus for the reception of the sounds. In this figure corresponding parts are identified by the exponent "*b*".

The arrangement illustrated in Figures 4 and 5 and which utilizes a valve with two plates and oscillating stream either at the transmitting or at the receiving station, can also be carried out in the arrangements illustrated in Figs. 6 and 7, where pairs of usual ionic valves are used both at the transmitting and the receiving station; in fact the transmitting station embodies valves 41 and 42 the plates of which are indicated (in analogy with what has been illustrated in the previous figures) by 1^c and 2^c, while their grids are indicated by 43. The filament of the valve 41 is indicated by 7—41, that of the valve 42 by 7—42; the other parts shown in the Figure 6 similar with those indicated in the Figures 2 and 4 are indicated by the same reference numbers with the exponent "*c*". This also applies to the different parts of Fig. 7, where the numbers are also the same but having the exponent "*d*" added. The oscillating circuit (Figures 6 and 7) changes alternately the potential to the grids 43 and permits of closing alternately the circuit of the plate 1^c or 1^d and of the plate 2^c or 2^d, as in the case of Figure 4.

Though for descriptive reasons the present invention has been based on the foregoing and on what is illustrated in the annexed drawing, many modifications and additions can be made, such as, for instance, that illustrated, in principle, in Figure 8; this figure relates to the case of two special valves, as the one illustrated in Fig. 1, and placed in series, particularly the second valve being in series on one of the plates of the first valve. The second valve should have an oscillation period of its stream in convenient relation with the oscillation period of the stream of

the valve 6^e, and for this purpose the oscillating circuit of the armatures 44, 45 will present an inductance 46 conveniently excited by the inductance 47 of the heterodyne 48. In this figure, parts corresponding with those above described are provided with the exponent "e".

It will be understood that a similar arrangement may be arranged at the receiving station.

Such an arrangement in series of two valves can be effected either with the special valves according to Fig. 1 or with the pairs of valves according to Figures 6 and 7.

Having now particularly described and ascertained the nature of the present invention and in what manner the same is to be performed, what is declared to be claimed is:

In a system for distinct multiple transmission and reception, a plurality of electron discharge devices each of said devices including a tube, a filament therein adapted to emit electron streams, and a plurality of plates associated with the filament, circuits connected with said plates, oscillating devices for controlling the emission of electrons from the respective filaments to the respective plates associated therewith, the oscillating device associated with one tube having a lower frequency than the other device, one of the plates of one of the electron discharge devices being connected with the filament of the other electron discharge device.

ANGELO MONTANI.