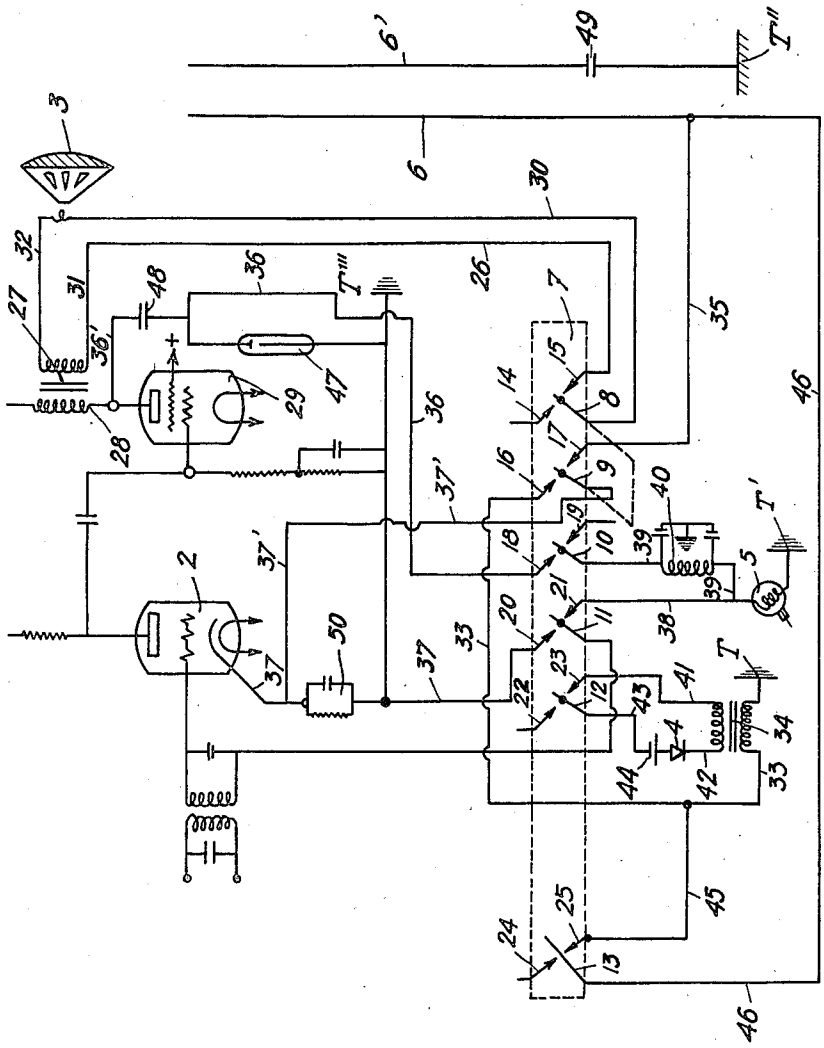
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RADIO-PHONO-TELEPHONIC SYSTEM

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RADIO-PHONO-TELEPHONIC SYSTEM

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This invention relates to an apparatus for receiving wireless transmissions, transmitting and receiving line telephony, and recording and reproducing sound, and its object is to obtain a simple arrangement which will perform the various functions without interference by extraneous, low frequency oscillation due to unwanted couplings between the various switch contacts and other causes.

With this object in view the invention consists in the combination with a rectifying and amplifying tube having control grid and cathode, of a telephone line, a loud speaker, a microphone, a pick-up, a radio receiver, and means for selectively forming circuits for said elements operative to lead the input to the grid of said tube in the case of high-frequency currents in radio reception and in pick-up operations without the microphone, and to the cathode of the tube in telephonic and microphonic operations.

The invention is illustrated in the accompanying drawing which represents a diagram of the electric connections in an apparatus constructed according to the invention.

In said drawing 1 represents the transformer of the intermediate or high frequency circuit of a radio receiver; 2 is a tube for rectifying the waves transmitted to the secondary of transformer 1; 3 is a loud speaker; 4 is a microphone; 5 is a pick-up; and 6 is a telephonic line belonging to any existing telephone. The tube 2 is provided with a cathode as well as with a control grid.

These elements and the various circuits by means of which the apparatus performs all the functions for which it is intended, are selectively brought into action by means of a switching device to which switch blades 8, 9, 10, 11, 12, and 13, belonging to different switches, are coupled in known manner, said switches and the control therefor being mounted on a panel 7.

Blade 8 co-operates with two stationary contacts 14 and 15. Blade 9 which is mechanically coupled to blade 8 as shown in dotted lines cooperates with contacts 16 and 17. Blade 10 cooperates with contacts 18 and 19. Blade 11 cooperates with contacts 20 and 21. Blade 12 cooperates with contacts 22 and 23. Blade 13 cooperates with contacts 24 and 25.

Contact 15 is connected through a wire 26 with one of the ends of the secondary of a transformer 27 the primary of which is connected through a wire 28 with the plate of a second amplifying tube 29.

The blade 8 is connected through a wire 30 with one of the ends of the winding 31 of a loud speaker 3. The other end of winding 31 is connected through a wire 32 with the free end of the secondary of transformer 27.

Contact 14 is disconnected.

Contact 16 is connected through a wire 33 with one of the ends of the secondary of a microphonic transformer 34 the other end of which is connected to the earth at T.

Contact 17 is connected, through a wire 35, to the wire 6 of the telephonic line.

Contact 18 is connected through a wire 36, 36' to the wire 28 that connects the plate of tube 29 with the primary of transformer 27. A condenser 48, acting as coupling condenser, is inserted in wire 26, 26'. Contact 19 is disconnected.

Contact 20 is connected through a wire 37 with the cathode of tube 2, said wire 37 being itself connected through a wire 37' to the blade 9 of switch 7.

A biasing resistance 50 is inserted in this wire 37.

Contact 21 is connected, through a wire 38, with pick-up 5 which, on the other hand, is connected to the earth at T'. Wire 38 is further connected, through a wire 39, with blade 10, a filtering cell 40 being, for a purpose described later, interposed therebetween.

Contact 23 is connected through a wire 41 with one of the ends of the primary of the microphonic transformer 34 the other end of which is connected through a wire 42 with one of the terminals of microphone 4. The other terminal of this microphone is connected through a wire 43 with blade 12, with a battery 44 inserted therebetween.

Contact 22 is disconnected.

Finally, contact 25 is connected through a wire 45 with wire 33 and blade 13 is connected through wire 46 with the wire 6 of the telephonic line; the other wire 6' of this telephonic line is connected to the earth at T''.

The apparatus above described may further include an indicator 47 of known type, for instance a luminous tube filled with neon gas, which will react to the current and show, by variations in the intensity of the flow, for instance on transmitting speech, whether or not the voice is sufficiently strong.

The operation of the apparatus above described takes place as follows:

(a) Radio reception

In this case, the following contacts are made: Blade 12 with contact 22, blade 11 with contact

20; blade 10 with contact 19; blade 9 with contact 16 and blade 8 with contact 15.

The radiophonic waves transmitted to the secondary of transformer 1 are rectified by tube 2. This tube 2 is acted upon at the grid. The cathode is connected to earth at T'.

On the other hand, the circuit of the loud speaker 3 is closed and the radiophonic waves operate this loud speaker.

(b) Recording of the radio reception

The switches are in the same position as for (a) except blade 10 which is changed over to contact 18.

In this way, a portion of the high frequency current issuing from the plate of an additional, low frequency amplifier 29 is fed to pick-up 5, passing through wire 36', coupling condenser 48, wire 36, filtering cell 40 and wire 39. From pick-up 5 the current passes on to the earth at T'.

It follows that the current fed from the radio portion of the apparatus causes the needle of the pick-up to vibrate and thus to record the sounds on a disc, band, or film, etc.

(c) Reproduction of the sounds thus recorded

For this operation, the setting is again as at (a), but blade 11 is connected to contact stud 21.

The low frequency current issuing from pick-up 5 is fed, on the one hand, to the earth at T' and, on the other hand, through wire 38, contact 21 and blade 11, to the grid of tube 2.

The sounds that have been recorded are thus reproduced and the apparatus works as an electric phonograph.

(d) Recording of local sounds

The switching device 7 is operated in such manner that the following contacts are made:

Blade 12 with contact 23; blade 11 with contact 20; blade 10 with contact 18; blade 9 with contact 16; and blade 8 with contact 14.

The microphone 4, under the effect of the sound waves acting thereon, produces variations of current which: issuing from one terminal of battery 44, flow through wire 43, blade 12, contact 23, wire 41, the primary of microphonic transformer 34, wire 42, microphone 4 and finally, the other terminal of the battery 44.

By induction there is produced a current in the secondary of transformer 34 and this current is fed, through wire 33, contact 16, blade 9, and wire 37' to the cathode of tube 2.

The microphonic currents are amplified by tubes 2 and 29 and when issuing from the plate of tube 29 through wire 36' and coupling condenser 48, they are divided into two portions, one of which passes through device 47 and therefrom to the earth at T''', while the other one passes, through wire 36, contact 18, blade 10, wire 39, filtering cell 40, and pick-up 5, to the earth at T'.

The recording takes place substantially in the same manner as explained in (b).

It should be noted that, as blade 8 is applied against contact 14, loud speaker 3 is not inserted in the circuit. Consequently, any resonance effect between microphone 4 and loud speaker 3 is avoided.

(e) Reproduction of any recorded sound

This is obtained in exactly the same manner as stated under (c).

(f) Telephonic conversations

The apparatus above described may also be utilized as a telephone. For this purpose, switching device is operated in such manner as to bring blade 13 against contact 25, blade 9 against contact 17, blade 8 against contact 15, blade 11 against contact 20, and blade 12 against contact 23.

For receiving telephonic communications, the low frequency current from the telephonic line flows, on the one hand, to the earth at T'' through wire 6' and condenser 49. On the other hand, this current flows through wire 6, wire 35, contact 17, blade 9 and wire 37, to the cathode of tube 2. After amplification, there is obtained an induced current in the secondary of transformer 27 and the contact 8—15 being closed, loud speaker 3 reproduces the conversation.

For transmitting, the sound waves are caused to strike microphone 4. The currents induced, as above stated in (d), in the secondary of transformer 34 shall flow, on the one hand to the earth, with which the wire 6' of the telephonic line is connected, and, on the other hand, through wires 33, 45, contact 25, blade 13, and wire 46, to the wire 6 of said telephonic line.

(g) Recording of the telephonic conversations

The switches remain as in (f) except blade 10 which is changed over to contact 18.

The current from the telephonic line flows, on the one hand, to the earth at T'' through wire 6' and condenser 49, and on the other hand to the cathode of tube 2 through wire 6, wire 35, contact 17, blade 9 and wire 37'. This current, flowing through the biasing resistance 50, produces variations of tension of the grid of tube 2, which variations are exactly equal to those of the modulated current from the telephonic line.

After the amplification performed by tubes 2 and 29, the current supplied by said tubes flows to the recording pick-up 5, as explained in (b).

Oviously, the connections just above stated may be established together with those stated under (f) in such manner that the apparatus records all the conversations when it is used as telephone.

(h) Reproduction of the recorded telephonic conversations

This is obtained in the same manner as stated in (c).

It should be noted that although the elements such as the microphone, the transformer, the pick-up, the telephonic line, etc., are connected with the same switching device, there is no risk of low frequency oscillations, due to unwanted coupling between the various switch contacts, being set up since tube 2 is attached both at the grid and at the cathode. With this arrangement, the efficiency or the working of the apparatus is not impaired.

It will also be noted that it is possible to alter in the known manner, the electric characteristics of pick-up 5 by connecting filtering cell 40 to the circuit when sounds are recorded and by disconnecting it when the sounds are being reproduced.

Owing to the arrangement that has just been disclosed, it is possible to obtain a perfect working of the apparatus as a telephone in which the sounds are amplified and reproduced by the loud speaker. For this purpose, it suffices to connect microphone 4 directly to the telephonic line 6, 6', and to connect the loud speaker circuit. Any effect of acoustic reaction between the loud speaker 3 and the microphone 4 which would produce a continuous whistling sound (Larsen effect) is

wholly eliminated due to the fact that the resistance of the telephonic line is much lower than that of the coupling elements of the amplifier, so that the microphonic currents flow practically wholly through the telephonic line and do not reach the loud speaker. This result is due to the fact that there is thus produced a kind of damping through the absorption, by the telephonic line, of these microphonic currents, this absorption being quite sufficient for eliminating the oscillations due to the reaction of the loud speaker on the microphone.

What I claim is:

1. A radio-phono-telephonic system for use in connection with a telephonic line which comprises, in combination, a loud speaker, a microphone, a pick-up, a radio receiver, an amplifying tube, having a control grid and a cathode, and means for selectively forming circuits for said elements operative to lead the input to the grid of said tube in the case of high frequency currents in radio operations and in pick-up operations without the microphone, and to the cathode of the tube in telephonic operations.

2. A radio-phono-telephonic system for use in connection with a telephonic line, which comprises, in combination, a loud speaker, a microphone, a pick-up, a radio receiver, an amplifying tube having a control grid and a cathode, at least one electric circuit for each of these elements, two stationary contacts in each of these circuits, and a switch including a plurality of movable blades each adapted to cooperate with a pair of these stationary contacts, for connecting at will any of these circuits or the telephonic line with said tube, said circuits being operated to lead the input to the grid of said tube in the case of high frequency currents in radio operations, and in pick-up operations without the microphone, and to the cathode of the tube in telephonic operations.

3. A system according to claim 2 including two circuits adapted to cooperate with the pick-up, according as the latter is used for recording sounds or for reproducing them, so as to modify the working characteristics of said pick-up, according as it is connected with one or the other of these two last mentioned circuits.

4. A system according to claim 2 in which said switch is so devised as to permit of branching the telephonic line simultaneously with two circuits, for recording the telephonic conversations.

5. A system according to claim 2 further including a biasing resistance connected to the cathode of the amplifying tube so as to produce variations of the grid tension of said tube equal to the modulated currents from the telephonic line when telephonic conversations are recorded.

6. A system according to claim 2 including coupling means for the amplifier having a resistance higher than that of the telephonic line, so that the oscillations that might be produced by the reaction of the loud speaker on the microphone when the system works as a telephone are eliminated.

7. A system according to claim 2 including two distinct circuits adapted to cooperate with the pick-up and a supplementary switch for coupling said pick-up with either of said circuits, one of said circuits being so made as to correspond to the working of the pick-up according to its normal characteristics and the other one including means for artificially correcting the internal impedance resistance of said pick-up according to requirements.

8. A system according to claim 3 including two distinct circuits adapted to co-operate with the pick-up, and a supplementary switch for coupling said pick-up with either of said circuits, the pick-up having an internal resistance high enough for the reproduction of sounds, and means in one of said circuits for artificially correcting the internal impedance resistance of the pick-up as required for the recording of sound.

9. A system according to claim 2 including two distinct circuits adapted to co-operate with the pick-up, and a supplementary switch for coupling said pick-up with either of said circuits, one of said circuits being so made as to correspond to the working of the pick-up according to its normal characteristics and the other one including means for artificially correcting the internal impedance resistance of said pick-up according to requirements, and means including a filtering condenser and reactance coil for connecting the pick-up to the output circuit of the amplifier.

10. A system according to claim 2 including two separate circuits for the telephonic utilization of the apparatus, one of said circuits being that of the loud speaker, and a combined telephonic receiver in the other of these two circuits.

11. A system according to claim 2 including two separate circuits for the telephonic utilization of the apparatus, one of said circuits being that of the loud speaker, a combined telephonic receiver in the other of these two circuits, and means for simultaneously controlling both of the two last-mentioned circuits.

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