

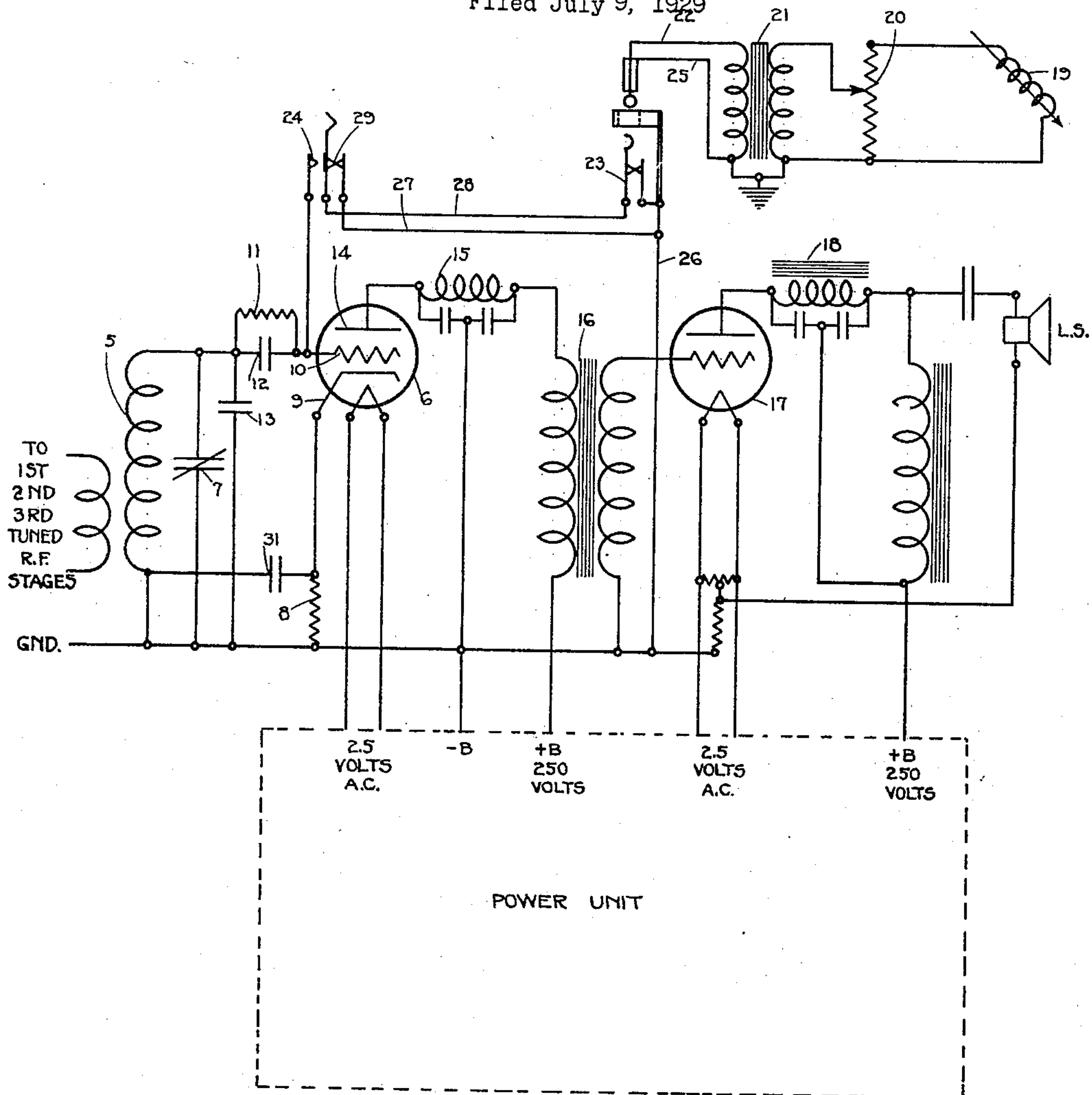
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COMBINED RADIORECEIVER AND ELECTRICAL PHONOGRAPH

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## UNITED STATES PATENT OFFICE

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## COMBINED RADIORECEIVER AND ELECTRICAL PHONOGRAPH

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This invention relates to electrical phonograph reproducing systems and more particularly to combine electrical phonographs and radio receivers.

5 It has been customary in the past where an electrical phonograph and a radio receiver were combined, to introduce the electrical signals from the phonograph pick-up into the input circuit of the audio system of the radio receiver while disabling the detector and the radio frequency amplifying portion thereof.

10 In accordance with the present invention it is proposed to utilize the detector together with the audio frequency amplifying stage or stages of such a combination as an amplifier of phonograph signals. A further feature of the invention includes introducing a scratch filter into the input circuit of such a dual purpose detector which is effective to eliminate the high frequency phonograph needle or stylus scratch on the record when the detector is used as an audio amplifier of phonograph signals and yet permits the proper potential to be applied to the grid of the detector when it is used as a rectifier of radio signals.

15 The drawing diagrammatically represents a portion of a radio receiver in which the radio frequency amplifier is merely indicated but in which the detector and the audio amplifier are shown in detail while in the upper right hand portion of the drawing there is shown a phonograph pick-up unit connectible to the detector by means of a plug and jack connection; the portion of the diagram within the broken lines represents a suitable source of electrical energy for heating the cathodes of the several vacuum tubes and for supplying the grid and anode potentials.

20 In this drawing, 5 designates a transformer by which the radio frequency portion of a radio receiver is connected to the input of a detector tube generally designated 6. It will be understood that the mentioned radio frequency portion of the radio receiver may include two or more stages of tuned radio frequency amplification although the present detector can be linked to the well-known in-

intermediate frequency amplifier of a radio receiver of the superheterodyne type. The input of the detector 6 includes the secondary winding of the transformer 5 and the tuning condenser 7 connected in multiple therewith 55 of which the lower common terminal of these elements is connected through a resistor 8 to the cathode 9 of the detector and the other common terminal thereof is connected to the grid 10 of the detector through a resistor 11 60 and a fixed condenser 12 in parallel. The resistor 11 applies the drop in potential across the resistor 8, to the grid 10 so that this grid is properly biased with respect to the cathode 9. The condenser 12 in addition to applying 65 radio signal energy to the detector grid 10 serves as a low impedance path to ground for certain undesired high frequency currents when the detector is used as an audio amplifier of phonograph signals. The condenser 70 connected in multiple with the tuning condenser 7 is a "padding" condenser 13 so that this tuning condenser may be adjusted to have like characteristics with other similar condensers in the stages of the radio amplifier (not shown). A fixed condenser 31 75 serves as a by-pass condenser in accordance with the well-known practice.

The output of the detector 6 including the anode 14 and the filter network generally 80 designated 15, is coupled by means of an audio frequency transformer 16 to the input of an audio amplifier stage including the vacuum tube 17. The output of this audio stage provided with a filter 18 is connected to a loud 85 speaker generally designated LS. The portions of the circuit arrangement thus far described are utilized for the reception of radio signals when the contacts 24 are open as shown. It should be particularly pointed 90 out that the grid lead to the grid 10 of the detector has no make-break contacts therein for connecting the detector to or for disconnecting it from the phonograph unit. This is especially desirable since contacts of this 95 kind give rise to undesirable capacity effects unless they are very carefully designed and manufactured, and in addition have the disadvantage that they introduce resistance and capacity into the detector circuit which is 100



particularly undesirable when feeble radio frequency currents are being rectified.

The electrical phonograph equipment shown in the upper right hand portion of the diagram includes the well-known pick-up device 19 provided with a stylus or needle which device is connected by means of a potentiometer 20, serving as a phonograph volume control, to the primary winding of a grounded audio frequency transformer 21. The secondary winding of this transformer is normally connected by the plug P and the jack J to the radio receiver since the open contacts 24 and closed contacts 29 actuated by the volume control device, as more fully described in Patent No. 1,766,381, patented June 24, 1930, of Paul Haas, serve to effect the connection and disconnection of the phonograph device into and out of electrical relation with respect to the audio portion of the radio receiver. When the mentioned volume control device is moved to its "off" position, the normally open contacts 24 are closed so that the secondary winding of the transformer 21 is connected through conductor 22, tip contacts of the plug P, tip contact 23 of the jack J, conductor 28, contacts 24, now closed, to the grid 10. The other terminal of the secondary winding of transformer 21 is connected through the conductor 25, sleeve contacts of plug P and jack J, conductor 26, resistor 8 and thence to the cathode 9 of the detector.

It will be understood that phonograph signals generated by the pick-up device 19 are applied over the circuits just described to the detector 6 where they are amplified and then reproduced by the loud speaker LS. It is well known to those familiar with this art that the friction of the needle or stylus with the record groove generates foreign noises commonly described as needle scratch which noises, in the main, are due to high frequency currents above 5000 cycles. In order to eliminate these foreign noises it is customary to introduce a scratch filter in some portion of the phonograph pick-up unit. However, in the present arrangement the condenser 12 in the input of the detector which condenser is connected in multiple of the secondary winding of the transformer 21 serves as means to eliminate these undesirable noises.

The condenser 12 together with the resistor 11 connected in multiple therewith has the appearance of the grid-leak arrangement so commonly used in the grid-leak detectors of the prior art but aside from this superficial appearance, these elements function in an entirely different manner from the grid-leak arrangement, in fact the detector 6 since it is a power detector made effective by a grid bias, operates just as well for the rectification of radio signals when these elements are omitted as when they are present and they are only needed when the detector is used as an audio amplifier of phonograph signals.

In addition to serving as a noise eliminator, the condenser 12 prevents the secondary winding of the transformer 5 from being a direct short circuit across the phonograph unit, while the resistor 11 is essential in supplying the bias to the grid 10 from the drop in potential across the resistor 8. It is unnecessary to describe the power unit or the circuits for applying heating current to the cathodes or the grid and anode potential.

While the present arrangement has been disclosed in connection with a so-called power detector it is useful with other types of detectors and the invention is to be limited only by the scope of the appended claims.

What I claim is:

1. In a combined radio receiver and electrical reproducing phonograph, a source of radio frequency signals, a source of electrical phonograph signals at audio frequency, a vacuum tube, means for connecting said source of radio signals to the input of said vacuum tube whereby it functions as a detector or rectifier, means serving to render ineffective said source of radio frequency signals and to connect said phonograph signals to the input of said vacuum tube whereby it functions as an audio frequency amplifier, and means including a device in the input of said vacuum tube for eliminating certain of the high frequencies of said electric phonograph signals.

2. In a radio receiver, multistage radio frequency, amplifying means for amplifying signals at radio frequency, a detector coupled to said amplifying means, said detector including a vacuum tube provided with a grid and a cathode, an input circuit for said vacuum tube comprising an inductance element and variable capacitance element connected in parallel, one common terminal of said elements being connected to said grid through a condenser and a resistor connected in multiple, and the other common terminals of said elements being grounded and being connected through a resistor to said cathode, an electrical phonograph device, switching means and circuits for connecting said device to said grid and to said grounded terminal, and a loud speaker connected to the output of said detector.

In witness whereof, I hereunto subscribe my name this 8th day of July A. D. 1929.

VIRGIL M. GRAHAM.