

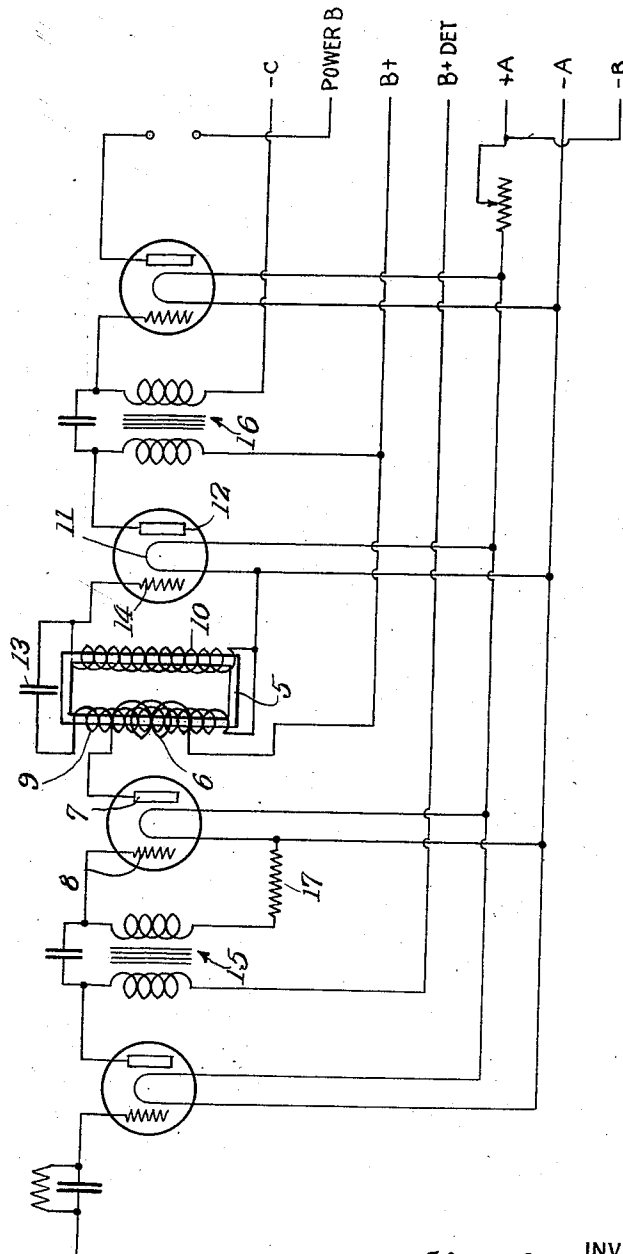
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H. P. DONLE

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AMPLIFIER COUPLING

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INVENTOR  
Harold P. Donle  
BY  
[Signature]  
ATTORNEY

## UNITED STATES PATENT OFFICE

HAROLD P. DONLE, OF MERIDEN, CONNECTICUT, ASSIGNOR, BY MESNE ASSIGNMENTS,  
TO RADIO INVENTIONS, INC., A CORPORATION OF NEW YORK

## AMPLIFIER COUPLING

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The main object of my invention is to produce a coupling for audio frequency amplifiers which will give a high quality of reproduction.

5 Another object is to produce a coupling device with which substantially uniform amplification may be attained over the entire musical scale.

10 Another object is to produce a coupling device of high efficiency.

In the drawing, I have shown a three stage amplifier employing my novel coupling device. The closed iron core 5 carries a primary winding 6 which is connected between the 15 anode 7 of the vacuum tube 8 and the positive terminal of the B battery. The core 5 also carries on opposite legs the two similar secondary windings 9 and 10. The lower ends of these two windings are connected to the 20 cathode 11 of the vacuum tube 12 and the upper ends are connected together by the condenser 13. The upper end of the winding 10 which is on the leg opposite that carrying primary winding 6 is connected to the grid 25 or control electrode 14 of the tube 12.

The coupling devices 15 and 16 used in the first and third stages are those more fully described and claimed in my copending application #98,451 and consist of combined 30 inductive and capacitative means for energy transfer.

The damping resistance 17 serves to prevent internal oscillation without appreciable loss of signal strength as described and 35 claimed in my co-pending application #141,998.

The turn ratio between the primary winding and the two secondary windings may be of the order 4 to 1, but this ratio may be 40 varied considerably to meet the requirements of amplification or of the associated tubes. The condenser 13 preferably has a value greater than 0.025 mf., but may be varied to suit the transformer ratio.

45 I have found that with the coupling device described above the high overall amplification usually present in a properly designed transformer of fairly high ratio is attained and at the same time the high quality of 50 reproduction generally associated with low

ratio transformers and impedance coupling is maintained.

I believe this to be due in a measure to the large number of natural periods present in the various closed circuits. For instance the 55 circuit consisting of the inductances 9 and 10 and the condenser 13 has a very low period near the bottom of the musical scale. The circuit formed by the inductance 10 and the capacity between the grid 14 and the filament 60 11 has a higher period. The primary inductance 6 and the anode-cathode capacity of the tube 8 forms a circuit having a still higher period.

A system consisting of several closely-coupled 65 circuits of differing periods possesses as a whole a very large number of periods. I believe that this large number of periods is present in my coupling device and accounts for the high and uniform amplification 70 obtained throughout the entire musical scale.

I claim:

1. An audio frequency interstage coupling device comprising a rectangular iron core, 75 said core carrying three windings, one of said windings being connected between the anode and the anode supply source of a vacuum tube, said circuit having a high natural oscillatory period, the other two of said windings having common connections to the cathode of another vacuum tube and common 80 connections to the control electrode of said latter vacuum tube, one of said latter connections being made through a capacitance, said circuits having medium and lower natural oscillatory periods and having materially different degrees of electromagnetic coupling with respect to the first mentioned circuit, whereby the distribution of energy 90 transfer can be apportioned in the two latter circuits according to a desired ratio.

2. In combination an audio frequency coupling device and a triodic amplifier tube, 95 said coupling device having a winding for the energy input to the same and having two windings receiving energy electromagnetically from the first mentioned winding with substantially different degrees of coupling 100 thereunto, said latter two windings trans-

ferring their energy to the input circuit of said triodic amplifier tube, the one winding transferring through a direct conductive connection and the other through an interposed  
5 condenser, said latter two windings and their connections constituting two electrical circuits of different oscillatory periods and in different energy absorbing relationship to said first winding.

- 10 3. A vacuum tube coupling device comprising a primary winding for the energy input of the device, two secondary windings electromagnetically coupled with substantially different degrees of coupling to the primary winding, a conductor making connection  
15 to one end of each secondary winding and constituting one terminal of the output circuit of the device, a condenser with one terminal connecting to the opposite end of the first secondary winding and a conductor  
20 making connection to the other terminal of the condenser and the other end of the second secondary winding and constituting the other terminal of the output circuit of the  
25 device.

HAROLD P. DONLE.

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