Feb. 24, 1942. R. E. BOWLEY 2,274,124

BAND-PASS FILTER COUPLING, COMPENSATING, AND DIVIDING NETWORK

Original Filed Feb. 5, 1940

Fig. 1.

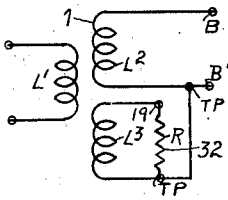


Fig. 2.

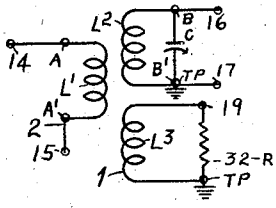


Fig. 3.

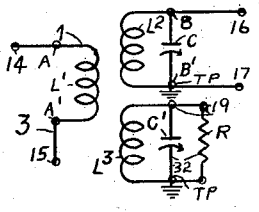


Fig. 4.

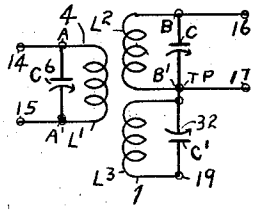


Fig. 5.

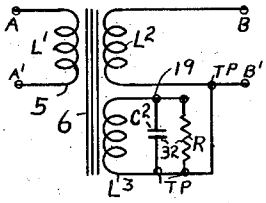


Fig. 6.

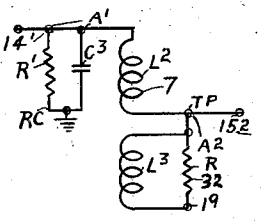


Fig. 7.

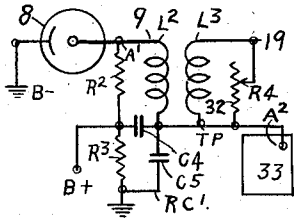


Fig. 8.

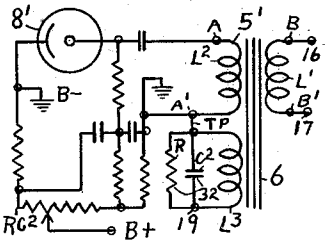


Fig. 9.

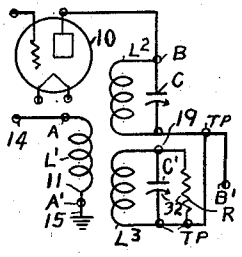


Fig. 10.

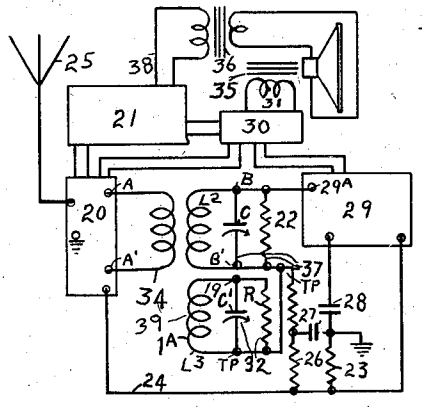
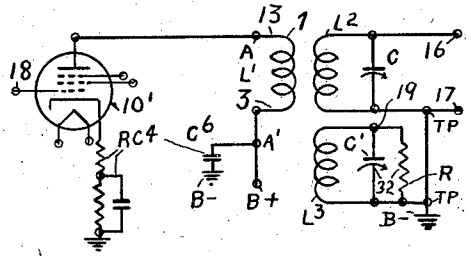


Fig. 11.



INVENTOR

Raymond E. Bowley

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UNITED STATES PATENT OFFICE

2,274,124

BAND-PASS FILTER COUPLING, COMPENSATING, AND DIVIDING NETWORK

Raymond E. Bowley, San Anselmo, Calif.; Eve Mary Bowley administratrix of said Raymond E. Bowley, deceased

Original application February 5, 1940, Serial No. 317,266. Divided and this application April 26, 1940, Serial No. 331,837

4 Claims. (Cl. 178—7.3)

The present invention is a modification of the apparatus described in my U. S. Patent No. 2,189,161, issued February 6, 1940, for Sound reproducing apparatus and a wiring circuit therefor; and is also a modification of the apparatus described in my copending application for Letters Patent in the U. S. Serial No. 317,266, filed February 5, 1940, for Sound reproducing apparatus, and is also a division of said application #317,266.

This application is for carrying forward the basic idea disclosed in said Patent #2,189,161 and in said application #317,266, covering other species of the invention.

The present invention relates to inductance and impedance combinations, and also to wiring circuit network systems embodying the said inductance and impedance combinations, and also to apparatus and devices embodying the said wiring circuit networks and inductance combinations, in the field of electronics, and in wiring circuit network systems in general, such as television circuits, radio frequency and associated circuits of all kinds, photo-electric cell and circuit networks, in reproducing circuits and recording circuits, etc., and in sound systems.

It is an object of the present invention to provide inductance and impedance combinations and arrangements providing an adjustable or variable electrical and electro-magnetic circuit network in a wiring network system, such as hereinafter described.

It is another object of the invention to provide a multiple circuit transformer having windings which are adjustable with relationship to one another whereby the inductive coupling between at least two of the transformer windings may be very accurately adjusted for obtaining maximum efficiency, or for meeting different conditions encountered in service, or for other purposes.

It is an object of this invention to provide, in a wiring circuit network system, an inductance and impedance combination, which may be a transformer, a choke, a coupling coil, or other suitable inductance, including a winding divided at an intermediate tapping point into a plurality of connected inductively coupled winding sections, tapping points provided at the outer ends of the multiple section winding, a suitable impedance, which may be a resistance unit fixed or variable, a condenser fixed or variable, or both a resistance unit and a condenser, one end of the impedance connected in the circuit system of the said multiple section winding at one of the said tapping points, the other end of the impedance connected in the circuit system of the multiple section winding at one of the other said tapping points, two of the said tapping points operatively connected in the said wiring circuit network system at suitable points, whereby at least one adjustable or variable element is included in the said inductance and impedance combination.

It is another object of this invention to provide an improved inductance and impedance combination such as described in the preceding paragraph adapted for tuning or adjustment so as to be effective in association with a band-pass filter system in radio, television, and other wiring circuit network systems in the field of electronics.

The principal feature of the invention is embodied in a complete operative radio-television-audio wiring circuit network system including in combination, an input circuit for receiving radio-television and radio-audio air waves, a radio receiving and amplifying circuit network, a complete audio system including audio detector, amplifier and reproducing apparatus, a complete television wiring circuit network and system, and a transformer and band-pass filter system operatively coupling the television portion of the wiring network system in operative relationship with the radio receiving and amplifying portion of the system in cooperative relationship with the audio portion of the wiring circuit network system, and power supply apparatus for supplying suitable power to the radio receiver and amplifier, to the television network portion of the apparatus, to the audio portion of the apparatus and also to the field coil of the electro-dynamic loudspeaker included in the audio output portion of the system.

Another feature of the invention is embodied in apparatus including a wiring circuit network system and an electron discharge device, wherein an inductance and impedance combination such as hereinafter described and claimed is in combination with a resistance and capacitive coupling network adjacent the electron discharge device, such as a photo-electric cell and film reproducing system, or other system in the field of electronics.

Another feature of the invention is embodied in apparatus including a wiring circuit network system, at least one electron discharge device and an inductance and impedance combination, such as hereinafter described, such as radio apparatus, television apparatus, or other apparatus in the field of electronics.

The invention will be described for illustrative purposes with reference to the accompanying drawing, taken together or separately, the details of mechanical construction being left to the skill of the experienced workman employing the invention and improvements herein described and claimed, within the spirit of the invention and the scope of the claims.

In the drawing

Fig. 1 is a multiple winding transformer wherein at least two of the windings of the transformer are positioned in cooperative relationship whereby the inductive coupling therebetween produces the best desired results, an impedance is in combination with the transformer forming one modification of the invention.

Fig. 2 is a portion of a wiring circuit network including a multiple circuit transformer and a suitable impedance forming another modification of the invention.

Fig. 3 is another wiring circuit portion including a transformer and impedance combination including variable condensers, comprising another modification of the invention.

Fig. 4 is a portion of another wiring circuit network including a multiple circuit transformer, a suitable impedance, and a plurality of variable condensers in combination forming another modification of the invention.

Fig. 5 is a multiple circuit iron core transformer and a suitable impedance in combination embodying another modification of the invention.

Fig. 6 is a portion of an inductance-impedance and capacitive network circuit embodying the invention.

Fig. 7 is another portion of apparatus including a wiring circuit network, an electron discharge device and an inductance and impedance combination in cooperative coupling with a resistance and capacitive coupling network closely located adjacent the electron discharge device, in another modification of the invention.

Fig. 8 is a portion of a reproducing system circuit network embodying another modification of the invention.

Fig. 9 is a portion of apparatus including a wiring circuit network wherein a modification of the invention is connected in an oscillator circuit.

Fig. 10 is a complete operative radio-television-audio receiving system forming an embodiment of my invention, in a modification of the apparatus described in my U. S. Patent #2,189,161; and also in a modification of the apparatus described in my copending application for U. S. Letters Patent #317,266 hereinbefore identified.

Fig. 11 is a portion of electronic apparatus including in a wiring circuit network another modification of the invention.

Wide band width and suitable gain plus circuit simplicity are difficult things to obtain simultaneously, these things are desirable in radio and television, photo-electric reproduction of sound, etc.

The transformers herein described and the inductances described in the combinations shown in the drawing are adapted for providing the desired results. By arranging the coupling between the windings of the transformer and the impedance or capacity, or both, properly the efficiency of the circuit system is greatly enhanced. By using tight coupling between the coils or windings the tuning adjustments are as simple as conventional types. If the coupling between the windings is not sufficient, the frequency response will have several pronounced peaks, with over coupling a broad band width may be obtained, varying the coupling between winding sections of the transformer or other suitable inductance changes the characteristics accordingly, by changing or adjusting the value of the impedance or using different forms of impedance, different results are obtained. The impedance in combination with one portion of the inductance circuit system tends to improve the efficiency of the apparatus.

The inductance-impedance - and - capacitance combinations herein described and claimed are capable of being modified in many different ways and are also adapted for many other uses and purposes within the spirit of the invention without departing from the scope of the claims.

Referring to the drawing:

Fig. 1 represents a three circuit transformer (one) of the air core or other type adapted for use in radio frequency and associated frequency circuit network systems, in radio, television, and other apparatus in the field of electronics. The transformer (one) having a primary winding L^1, and a multiple section secondary winding divided at an intermediate tapping point TP into a plurality of connected inductively coupled winding sections L^2—L^3; tapping points B—B^1 at the outer ends of the winding portion L^2, one of which in this modification is the intermediate tapping point TP, being adapted for connecting the secondary circuit system of transformer (one) to a suitable wiring circuit network. A third tapping point provided at point 19 at the outer end of the winding portion L^3 of the secondary winding, the other end of winding portion L^3 being connected to the intermediate tapping point TP.

A suitable impedance 32, which may be a resistance unit R as shown, or R^4 as shown in Fig. 7, a condenser C^1—C^2 as shown in Figs. 3 and 5, or both a resistance unit and a condenser, has one end thereof connected to the secondary winding of transformer (one) and portion L^3 at tapping point 19, the other end of the impedance 32 is connected to the winding at intermediate tapping point TP. Other arrangements are possible within the spirit of the invention, as shown in my copending application 317,266 hereinbefore mentioned. The method and principle of operation of transformer (one) is described in my U. S. Patent #2,189,161 hereinbefore mentioned, of which this invention is a modification.

In the present invention coil sections L^2—L^3 are adapted for adjustment, or various arrangements as to their relative cooperative inductive coupling relationship, whereby the proper inductive coupling therebetween may be obtained as required under whatever conditions are encountered.

The windings of transformer (one) may be arranged in any suitable cooperative manner within the spirit of the invention and the scope of the claims, they may be close coupled, loose coupled, over coupled or otherwise coupled without departing from the spirit of the invention and the scope of the claims, the windings may be adjustable or they may be temporarily or permanently affixed in operative position.

Fig. 2 represents a portion of apparatus comprising a wiring circuit network (two) including a transformer (one). The intermediate tapping point TP being connected to the negative or grounded side of the circuit network (two). A

variable condenser C is connected across the winding L^2 and the positive and negative leads B—B^1 of the secondary circuit network system of the transformer. Condenser C may be a fixed condenser or a tuning condenser, or a trimming condenser, as required to meet the conditions encountered in different applications of the invention.

The primary winding L^1 of the transformer is connected to the wiring circuit network system (two) at tapping points A—A^1 and circuit leads **14—15**. The secondary winding portion L^2 of the transformer is operatively connected to the wiring circuit network (two) at tapping points B—B^1 or TP to circuit leads **16—17**.

Winding portion L^3 of the secondary winding and impedance **32** connected in combination therewith are described in Fig. 1. Fig. 3 represents apparatus comprising a wiring circuit network system (three) embodying the invention. Transformer (one) and the impedance **32** including resistance unit R and variable condenser C^1 being another modification of the invention. Although shown in this modification as a ground connection TP, the intermediate tapping point TP may be made at any other suitable point in the circuit system as required to meet conditions which may be encountered, as shown in Figures 5, 6, 7, 9, and 10 for example. Referring to Figure 3 in the drawing, the present invention is shown to differ from the invention described in my U. S. Patent, Serial No. 2,189,161, by providing a high frequency transformer (one) having two tuned resonant circuits L^2—L^3 in the secondary system each circuit containing an inductor winding, L^2—L^3, and two variable condensers C—C^1 in cooperative relationship, one of the condensers in circuit L^2 the other condenser in circuit L^3, one end of each of the said inductor windings connected to an intermediate tapping point, TP, each circuit adjustable according to the band width of a desired frequency and in accordance with the resonance and impedance in the inductive coupling between the said windings L^2—L^3, providing means C—C^1 for tuning to a broad band width and at the same time preserving a sufficiently level response over the band width of the desired frequency. Tuning the circuits to different frequencies according to the wave band of the desired frequency tends to effect the desired results. When primary circuit L^1 is untuned the primary circuit will tend to track along with the tuned circuits L^2—L^3 when the transformer is employed in a suitable circuit network.

Fig. 4 represents another portion of apparatus including a wiring circuit network (four) embodying the invention, comprising transformer (one) and capacitive elements or condensers C—C^1—C^6 operatively connected in cooperative relationship with the transformer circuit system. Referring to Figure 4 in the drawing, the present invention differs from the invention described in my U. S. Patent, Serial No. 2,189,161, by providing a transformer (one) suitable for high frequencies, and condensers C—C^1 and C^6 in the inductive network, comprising three coupled tuned resonant inductor windings and circuits L^1—L^2 and L^3, providing a tuned primary input circuit L^1 and two tuned secondary circuits L^2—L^3 separately connected in parallel with the condensers C—C^1 and C^6, each adjustable for tuning to a different frequency according to the band width of a desired frequency.

Figures 3 and 4 show cooperative elements and functions in the present invention that are not present in the original invention, while at the same time employing the compensating principle described in the original invention. In high frequency circuits, adjustment and tuning of the circuits is necessary. The present invention provides the necessary method and apparatus for both compensation and tuning in high frequency circuits for providing a broad band width having a sharp cut-off and at the same time preserving a sufficiently level response over a broad band width. The original invention and the present invention are more or less cooperative inventions, the adjusting and tuning elements providing for the use of the original invention in high frequency circuits.

Fig. 5 represents an iron core transformer **5** having an iron core **6** and also having a primary winding L^1 and a divided secondary winding L^2—L^3 as described for transformer (one). The winding portion L^3 of transformer **5** has an impedance **32** comprising a resistance unit R and a condenser C^2 connected in the circuit system thereof, as described in Fig. 1.

Fig. 6 represents another portion of apparatus including a wiring circuit network system (seven) comprising, in combination, a resistance-capacitance circuit network RC and an inductance and impedance circuit network L^2—L^3—**32**-R in cooperative relationship. Resistance unit R^1 and condenser C^3 provide the resistance-capacitance portion RC of the network, being connected to the circuit system (seven) at points A^1—14^1 and to the negative or ground side of the circuit network. One end of winding portion L^2 is connected to point A^1 the other end of winding portion L^2 being connected to the intermediate tapping point TP and also to end A^2 of winding portion L^3 and to circuit lead 15^2. The winding portion L^3 and the impedance **32** comprising resistance unit R in the modification illustrated are substantially as described in Fig. 1.

The term inductance as used in this specification and in the claims is understood to apply to transformers, chokes, and other inductive devices comprising windings forming an inductance in a wiring circuit.

Fig. 7 represents another portion of apparatus including a wiring circuit network system (nine) embodying the invention. An inductance-impedance-resistance-capacitance circuit network combination (nine) is illustrated closely coupled to electron discharge device **8** which is a photo-electric cell in this modification of the invention. The inductance L^2—L^3 and variable resistance unit R^4 forming the inductance and impedance portion of the circuit network. The resistance units R^2—R^3 and condensers C^4—C^5 providing the resistance capacitance portion RC^1 of the circuit network system (nine). The photo-electric cell electron discharge device **8** is connected to the circuit network at the ground or negative side of the circuit and at point A^1. A power supply means B plus-B neg., is connected to the circuit network system at points B plus and B neg. Point A^2 is connected to the input of a photo-cell amplifier or other device **33**. The coupling circuit network (nine) is located closely adjacent the electron discharge device **8**.

Frequently a photo-electric cell has an output so low that it is coupled, with a "resistance-capacitive coupling" to a special amplifier **33** a few inches away. The current in such cells is so low that it cannot be transferred without great distortion, and possibly complete loss, to a main

amplifier a few feet distant. The size of the connecting wire has little to do with this loss; the losses and distortion are due to capacitance effects and not to straight resistance.

The modification of the invention illustrated and described in Fig. 7 is especially adapted for use in combination with apparatus employing an eelctron discharge device of this type, but it is understood that I am not limited to the modifications shown and described or to the particular apparatus described, within the spirit of the invention.

Other photo-electric cells have enough output, especially when transformer coupled, to feed directly into the main amplifier. Coupling devices and circuits used to couple the photo-electric cell to the output circuit are most important. In many cases the current passing through the cell is very minute. If the leads from such a cell covered any great distance the current would be practically lost by capacitive action.

Take photo-film reproduction of sound, for example, the fluctuations in potential across a photo-electric cell are extra-ordinarily small. But these fluctuations represent the pick-up of the sound recorded on the film, they are all that there is of that sound at that point. Later on, after they have been amplified a hundred million times or thereabout, they will be strong enough to set air in a large theatre vibrating, but at their beginning they will not fill a thimble.

Photo-cell power has to be used right where it is created; there is not enough to go further.

It is one of the objects of this invention to provide coupling means in cooperative relationship with an electron discharge device, adapted for more efficiently and more effectually obtaining desired results, wherein combinations of elements embodying this invention are used for improving the operative efficiency of the apparatus, in the field of electronics.

Fig. 8 is another portion of apparatus including a wiring circuit network system embodying transformer 5^1 in another modification of the invention. 8^1 is a photo-electric cell electron discharge device; RC^2 is a resistance-capacitive circuit network closely adjacent electron discharge device 8^1. B plus and B neg., represent power supply means.

Coupling transformer 5^1 has an iron core 6, the primary winding of transformer 5^1 is divided at intermediate tapping point TP into a plurality of connected inductively coupled winding portions L^2—L^3; the winding L^1 is the secondary winding in this modification of the invention. The impedance 32 includes resistance unit R and condenser C^2. In this modification of the invention an inductance-impedance-resistance-capacitive combination of elements embody the invention in an improved coupling arrangement. Output circuit 16—17 is connected to the amplifier portion of the wiring circuit network system at points 16—17.

Fig. 9 represents another portion of apparatus including a wiring circuit network 11, wherein an electron discharge device 10 is connected in combination with another modification of the invention in an oscillator circuit network (eleven) illustrating that this invention is capable of being modified and used for many useful purposes within the spirit of the invention and the scope of the claims, in the field of electronics.

Figure 10 represents the principal feature of my invention embodied in a complete radio-television-audio wiring circuit network system 34 in a modification of the apparatus described in my U. S. Patent, Serial No. 2,189,161 hereinbefore identified; and in a modification of the apparatus described in my copending application for Letters Patent in the U. S. No. 317,266 hereinbefore identified. An input circuit 25 is adapted for receiving radio-television and radio-audio waves; radio receiver and amplifier 20 is adapted for receiving and amplifying both radio-television and radio-audio currents; audio circuit network 21 is complete with audio detector and audio amplifier 21; step-down audio output transformer 36 inductively couples electro-dynamic loud speaker 35 with the audio output circuit 38; 29 is a complete television circuit network and system; 30 is power supply apparatus adapted for supplying suitable power to the various elements and portions of wiring circuit network system 34, including field power to the field 31 of electro-dynamic loudspeaker 35.

An inductance and impedance-resistance-capacitive combination 39 is a feature of the present invention. The combination 39 includes transformer 1A, condensers C—C^1— 27 and 28, and resistance units 22—23—26—27 and R. Resistance unit R and condenser C^1 provides an impedance 32 connected in the circuit system of winding portion L^3 as hereinbefore described. Condenser C and resistance units 22—27—26 and 23 provide a band-pass filter system, resistance 23 being a bias resistor connecting the A. V. C. bias lead to the ground side of the system. The biasing lead 24 providing automatic control means for both picture and sound signals.

Transformer 1A operatively couples the television portion 29 of wiring circuit network system 34 with the radio receiver and amplifier portion 20 in cooperative relationship with the audio portion 21—35—36 at the primary leads A—A^1. The amplified audio currents being impressed upon the audio detector and circuit network 21 and loudspeaker 35. The amplified television currents being impressed upon the primary winding L^1 of transformer 1A are fed through the secondary winding L^2 of the transformer setting up an inductive reactance current in the secondary winding portion L^3 which reacts upon the currents passing through the transformer windings, effecting improved operating efficiency at the output portion of the television network system 29. The operation of the inductance and impedance combination is described in Figures 3 and 4.

The television currents pass from transformer 1^A through the band-pass filter network 37 to the television circuit network 29. The television input is operatively coupled with the radio receiving and amplifying portion 20 of the network 34 at points A—A^1. Condenser C is variable and is connected across terminals B—B^1 of the transformer secondary circuit system portion L^2. Resistor 22 terminates the band-pass filter chain; 23 is an A. V. C. biasing resistor; 24 is an A. V. C. bias lead; 26 is another filter resistor; 27—28 are condensers; output lead 29A is connected to the input of the television circuit network 29, such as to input 18 of an electron discharge device 10^1 in the wiring circuit network 13 shown in Fig. 11.

Another feature of this invention provides auxiliary manual compensation in the band-pass filter resonant inductive network, in cooperation with variable bias compensation applied to the secondary portion of the transformer coupling network, wherein variable bias, or auto-

matic volume control, is applied to the input grid terminal of the following electron discharge device connected in the network system, tending to compensate for variances in response levels or in brilliance in the subject or background, bringing out more details enabling the observer to sense more accurately the light values upon the subject in the optical representation, accompanied by increased discrimination against undesired signals in nearby and adjacent channels.

When an amplifier electron discharge device has the input grid electrode thereof connected to the television picture circuit channel coupling lead, as at point 29a, and variable bias is applied thereto through bias resistance 23 and through bias-band-pass filter resistances 26—27 in series with intermediate tapping point TP, one end of condensers C and C', one end of resistances 22 and R, and connected to A. V. C. bias lead 24, in series with resistance 23, and having at least a portion thereof by-passed by by-pass condenser 27 connected to the resistance 26—27 and ground in the bias and band-pass filter coupling network, energy of signals passing through the circuit will vary in strength in accordance with the bias.

By adjusting the condenser C' in shunt with auxiliary winding L^3, or by changing the value of resistance R in shunt with winding L^3, or by adjusting condenser C' and the value of R, the response of the system and the character of the signals passed on to the following portions of the system may be semi-automatically, or manually adjusted or controlled to provide compensation in cooperation with said automatic bias volume control compensation for obtaining improved sharpness and clarity in the reproduced image.

This feature of my invention is particularly adapted for use in intermediate frequency amplifier coupling and network circuits, and provides for meeting the objection of obsolescence in the television portion of the apparatus during the experimental period of television. The radio receiving and amplifying portion of the system 34, and the audio portions 21—35 and 36, and the power supply apparatus 30 have been developing for a number of years and are more or less perfected, while the television portion 29 of the system 34 is new and yet in the experimental stage. The coupling arrangement 39 of this invention provides for the television portion 29 of the system 34 to be removed and exchanged at any time for a new and improved television portion 29 designed for use in combination with the original radio-audio and power supply portions 20—21 and 30 of apparatus 34 whereby the user may keep his radio-television-audio apparatus up to date without having to discard perfectly good radio-audio and power supply portions of the system. Similarly the radio receiving and amplifying portion 20 may be exchanged for a new and improved radio receiving and amplifying portion 20 without discarding perfectly good audio-television or power supply apparatus.

Fig. 11 represents another portion of apparatus including a wiring circuit embodying a modification of the invention. Apparatus and circuit network 13 includes an electron discharge device 10^1, an inductance and impedance combination 3, described in Fig. 3, a resistance and capacitive circuit network RC^4 is connected to the electron discharge device 10^1 and to the primary portion L^1 of transformer (one) at points A—A^1. A condenser C_6 being connected to the primary circuit adjacent point A^1, and is also connected to the negative side of the network, at the ground. Point A of the primary circuit system is operatively connected with the output of electron discharge device 10^1 at point A. Power supply means B plus and B neg., is connected to the circuit network system 13 at points B plus and at B negative or the ground.

This modification of the invention illustrates that the invention is adapted for use in radio and in television wiring circuit network systems. Three resonant circuits are more effective than two, as in conventional types and systems.

Wide band width and suitable gain plus circuit simplicity are difficult things to obtain simultaneously. By using this invention desired results may be obtained. Variations in the coupling between windings of transformers and other inductance devices, and various impedance arrangements and combinations produce different results.

The embodiments of the invention illustrated and described herein have been selected for the purpose of setting forth the principles involved. The invention is, however, susceptible to being further modified to meet different conditions encountered in its use without departure from the inventive concept disclosed.

Numerous ideas have been carried out in this invention, with recognition on my part that one or more novel elements or combinations can be employed separately, or the various elements or combinations can be employed collectively. While a certain arrangement of the elements of this invention will produce a certain result, different arrangements or apparatus will produce a different result.

I want it understood that I do not confine myself for the obvious reason that different conditions and applications of the invention require different combinations of elements and different arrangements of the elements in a wiring circuit network.

I realize that other modifications of this invention are possible, therefore I say that my invention is not limited to the particular constructions shown and described, and it is my intention to cover all other modifications that can be made without departing from the spirit of the invention or the scope of the claims. I desire it understood that the claims hereunto appended are to be considered in defining my invention rather than the exact disclosures herein made.

Features of my invention herein shown and described and not claimed are claimed in my U. S. Patent No. 2,189,161 hereinbefore mentioned; or in my copending application for U. S. Letters Patent No. 317,266, hereinbefore identified, of which this application is a division.

I claim:

1. A band-pass filter coupling and compensating network comprising, three resonant circuits inductively coupled in a transformer network forming a primary winding, also forming two secondary windings, each secondary winding having one end thereof connected to a variable biased common transformer secondary intermediate tapping point, one secondary winding being in a signal circuit including a resistance and a variable condenser in parallel connected in shunt with said winding and broadening the band with response of the circuit, the circuit adapted for being tuned to frequencies capable of responding to incoming radio frequency signal frequencies, the other secondary winding being in a cooperative auxiliary resonant circuit in-

cluding a resistance and a variable condenser in parallel connected in shunt with said auxiliary winding, the auxiliary circuit adapted for being tuned for providing compensation in the associated signal circuit substantially in accordance with a broad band width having a sharp cut-off and at the same time preserving a sufficiently level response over a wide band width, accompanied by increased discrimination against undesired signals on nearby and adjacent channels, the band-pass filter being tuned to pass desired frequencies corresponding to radio frequency signals selected from a plurality of signals within a band of frequencies within the range of the filter, a bias resistance connecting the transformer secondary tapping point to ground, an automatic volume control bias coupling lead connected to the resistance, a by-pass condenser in the band-pass filter and bias network connected in shunt with at least a portion of said coupling resistance and ground, the arrangement tending to compensate for variances in response levels at different frequencies.

2. A band-pass filter, in an intermediate-frequency amplifier coupling network comprising, three resonant circuits inductively coupled in a transformer network forming a primary winding, also forming two secondary windings, each secondary winding having one end thereof connected to a variable biased common transformer secondary tapping point and automatic volume control coupling lead, one secondary winding being in a signal circuit including a resistance and a variable condenser in parallel connected in shunt with said winding, the circuit adapted for being tuned to an intermediate frequency capable of responding to desired radio frequency signals, the other secondary winding being in a cooperative auxiliary resonant circuit including a resistance and a variable condenser in parallel connected in shunt with said auxiliary winding and broadening the band width response of the circuit, the circuit adapted for being tuned for providing compensation in the associated signal circuit substantially in accordance with a broad band width having a sharp cut-off and at the same time preserving a sufficiently level response over a wide band width, accompanied by increased discrimination against undesired signals on nearby and adjacent channels, the band-pass filter being tuned to pass intermediate-frequencies of desired radio-frequency signals selected from a plurality of signals within a band of frequencies within the range of the band-pass filter, an A. V. C. bias resistance connecting the bias coupling lead and the transformer secondary tapping point to ground, a by-pass condenser in the band-pass filter and bias network connected in shunt with at least a portion of said coupling resistance and ground, the arrangement tending to compensate for variances in response levels of incoming signals bringing out more details and more finer points with less side band interference, resulting in more clarity and better fidelity in reproduction.

3. A band-pass filter, in a compensating, coupling, and dividing network in a television picture and sound receiver, amplifier and reproducer combination comprising, three resonant circuits inductively coupled in a transformer network forming a primary winding, also forming two secondary windings, each secondary winding having one end thereof connected to a variable biased common secondary intermediate tapping point, one secondary winding being in a television picture signal circuit including a resistance and a variable condenser in parallel connected in shunt with said winding and broadening the band width response of the circuit, the circuit adapted for being tuned to intermediate frequencies capable of responding to selected incoming television picture signals, the other secondary winding being in a cooperative auxiliary resonant circuit including a resistance and a variable condenser in parallel connected in shunt with the said auxiliary winding, the auxiliary circuit adapted for being tuned for providing compensation in the associated signal circuit substantially in accordance with a desirable characteristic curve according to a broad band width having a sharp cut-off and at the same time preserving a sufficiently level response over a wide band width, accompanied by increased discrimination against undesired signals on nearby and adjacent channels, the band-pass filter being tuned to pass intermediate frequencies responsive to desired television picture signals within a band of frequencies within the range of the band-pass filter, a bias resistance connecting the secondary intermediate tapping point to ground, an automatic volume control bias lead connected to the resistance also being resistance coupled to ground, a by-pass condenser in the band-pass filter and bias coupling network connected to the resistance in shunt with at least a portion of the coupling resistance and ground.

4. A band-pass filter coupling network comprising, a transformer having a primary winding, also having two secondary windings forming three resonant circuits, each secondary inductor winding having one end thereof connected to a common variable biased tapping point and automatic volume control coupling lead, a positive television picture signal circuit coupling lead connected to the outer end of one secondary winding of the transformer, a resistance and a variable condenser in parallel connected in shunt with said winding in the picture circuit channel, the circuit being adapted for being tuned to intermediate frequencies responsive to desired incoming television picture signals, the other secondary winding being in a cooperative auxiliary resonant circuit including a resistance and a variable condenser in parallel connected in shunt with said auxiliary winding, the auxiliary circuit adapted for being tuned for providing compensation in the associated signal circuit substantially in accordance with a broad band width having a sharp cut-off and at the same time preserving a sufficiently level response over a wide band width, accompanied by increased discrimination against undesired signals on nearby and adjacent channels, the band-pass filter being tuned to pass desired intermediate frequencies responsive to television picture signal frequencies within the range of the band-pass filter, a bias resistance connecting the transformer secondary tapping point and the A. V. C. bias coupling lead to ground, a by-pass condenser in the band-pass filter and bias network connected in shunt with at least a portion of the bias coupling resistance and ground, the arrangement forming both automatic and manual compensation in the network tending to compensate for variances in response levels at different frequencies, bringing out more details enabling the observer to sense more accurately the light values upon the subject in optical representation.

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