

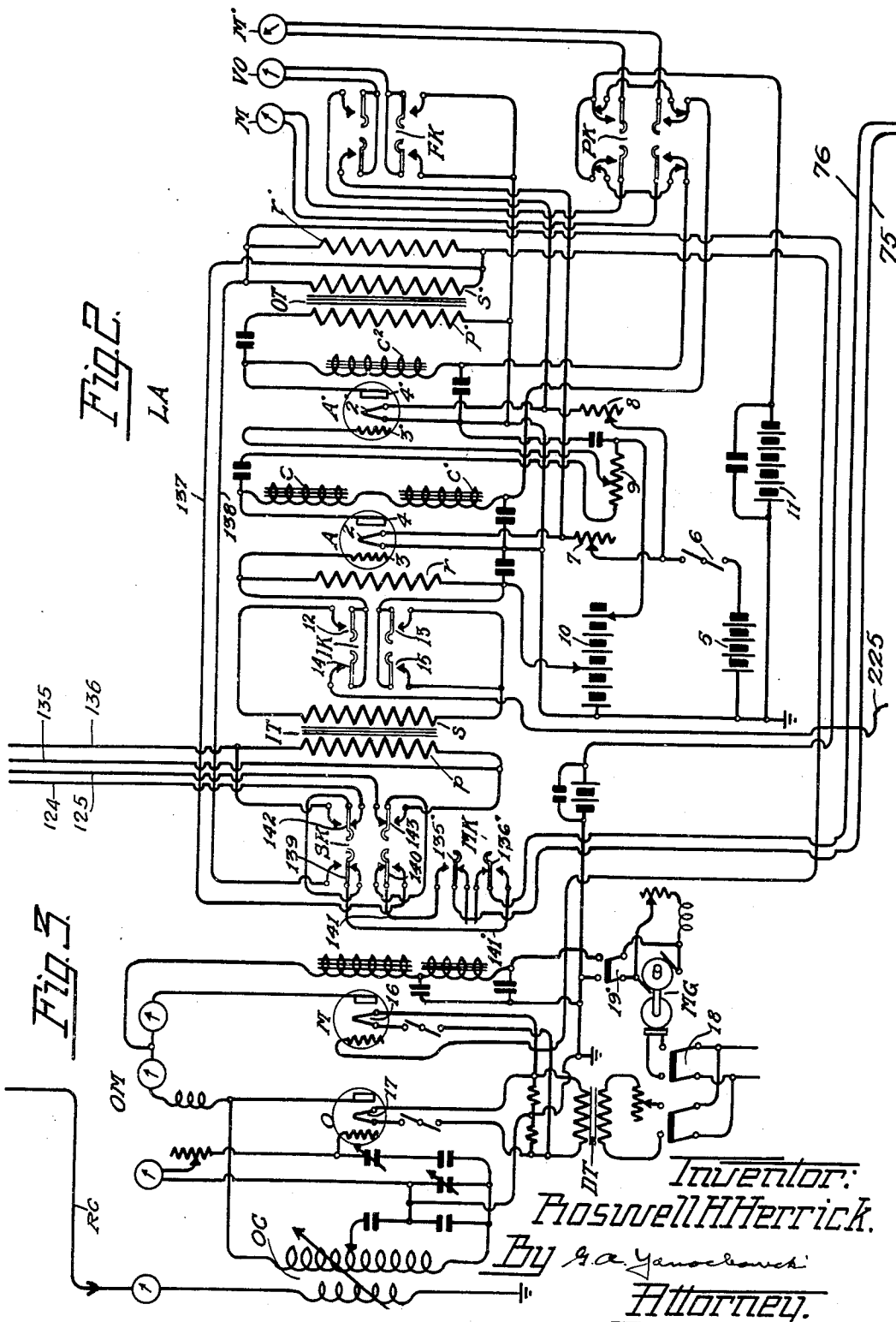
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R. H. HERRICK
PROGRAM SERVICE SYSTEM

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4 Sheets-Sheet 2



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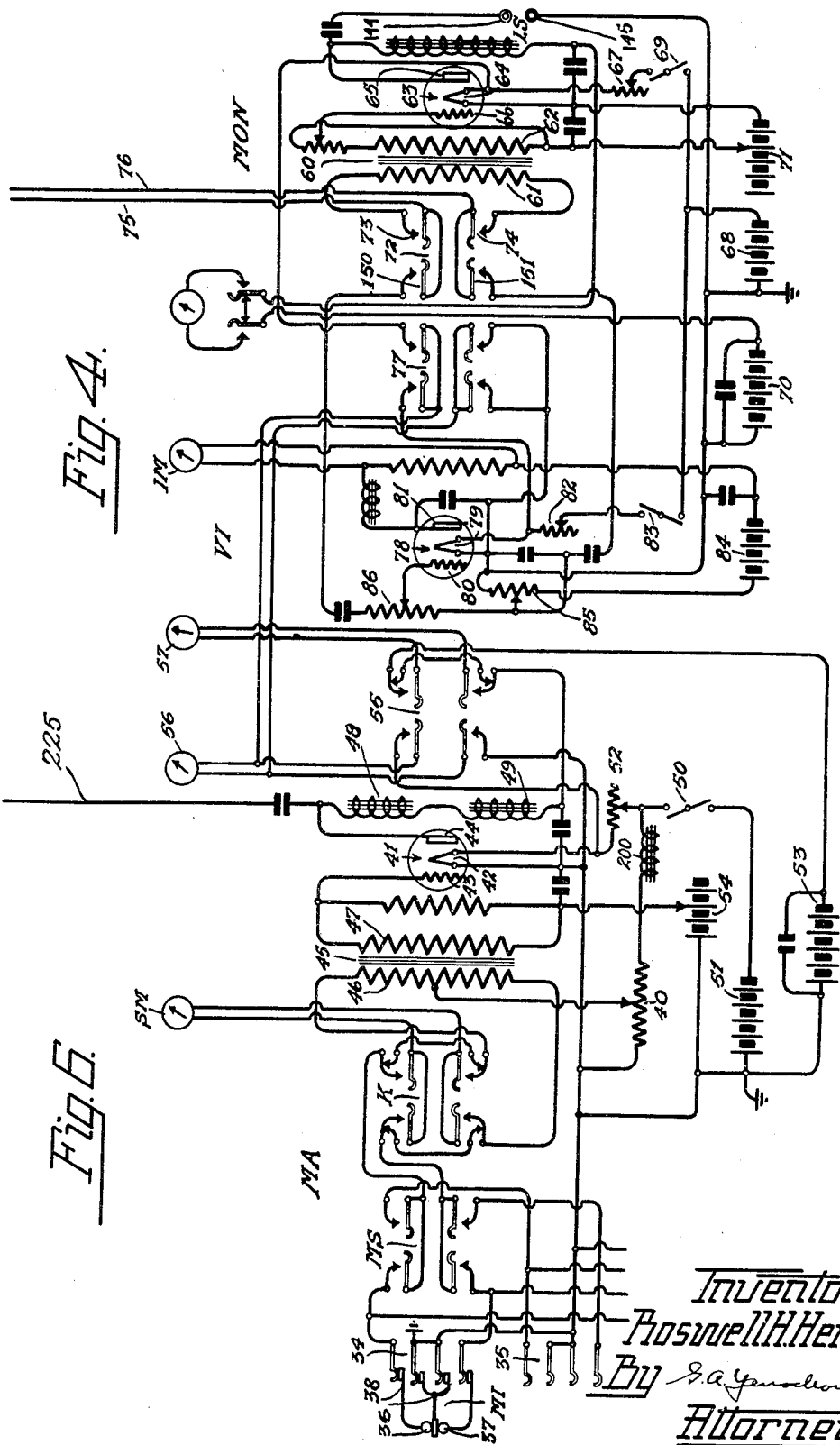
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PROGRAM SERVICE SYSTEM

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4 Sheets-Sheet 3



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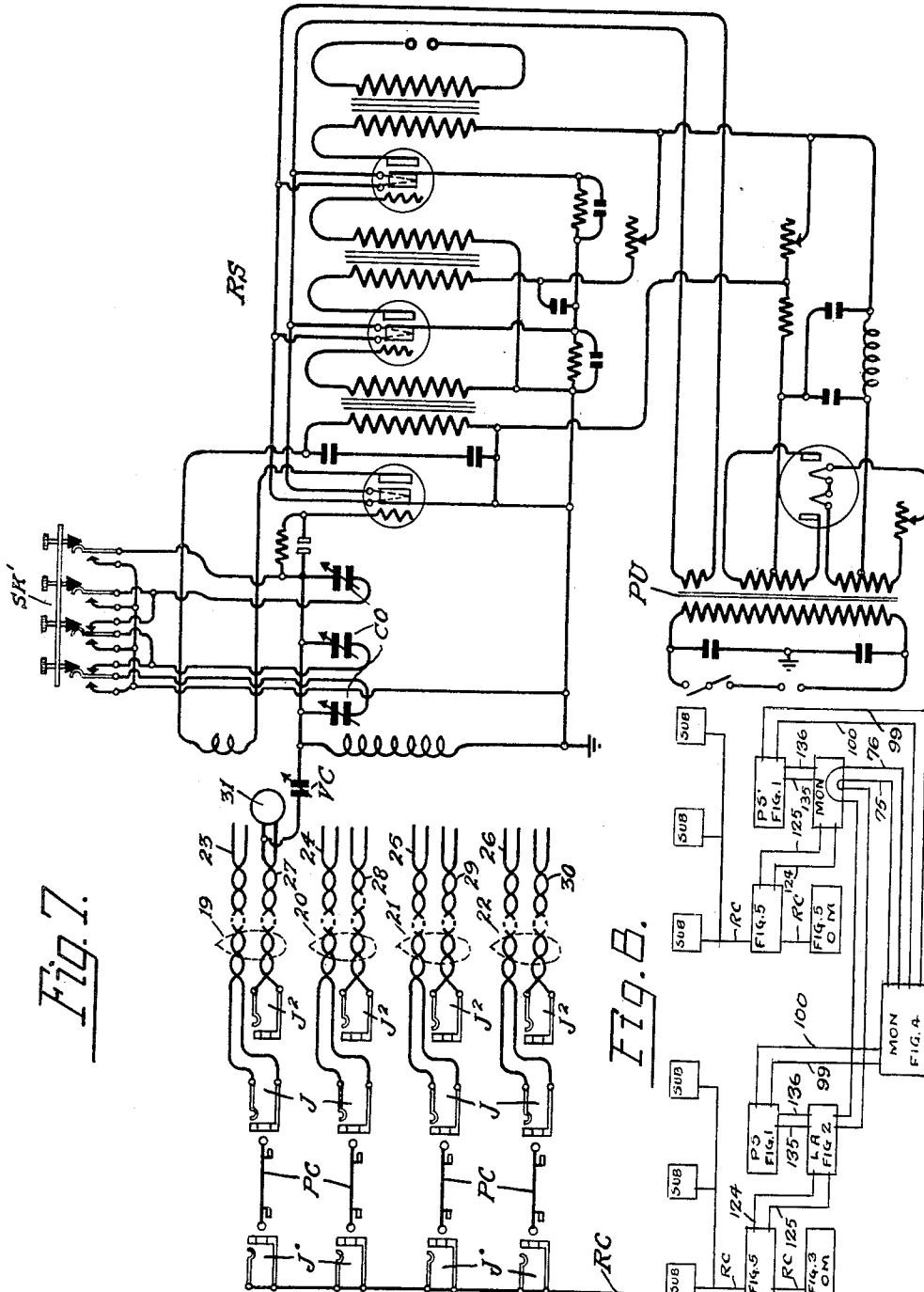
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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PROGRAM SERVICE SYSTEM

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9 Claims. (Cl. 179—2.5)

My invention relates in general to program distributing systems and has to do more particularly with the distribution of programs over telephone lines of a central telephone exchange system to various subscribers of the system who are equipped with auxiliary apparatus located at the substation adapted to receive such program service.

The program service distributing system of my invention comprises means at the central telephone exchange whereby programs either received by suitable pick-up means in the form of radio broadcast receiving sets or originating at a central studio may be transmitted to the subscribers' lines through specially designed line amplifier apparatus or equipment located at the central telephone exchange. Means are also provided at the central telephone exchange, in the form of oscillator modulator apparatus which changes the programs that are of audio frequency and amplified by the amplifier apparatus into radio frequency and modulates the same on a carrier current. The cabling system of the telephone exchange provides means whereby one or more pairs of wires in each cable of the system are used as antenna pairs which are connected to the radio frequency common at the output end of the oscillator modulator at the central office and this energy from the radio frequency common conductor is distributed into these antenna pairs and is thus received in all of the other pairs in the cables so that any subscriber in the exchange who is authorized to receive such program service and whose station is equipped with the proper receiving apparatus may receive the programs.

An object of my invention is the monitoring arrangement, common to the units comprising the amplifier and modulator apparatus, to provide means for monitoring the circuits of the units at different points so that the attendant may, at all times, check the quality of the program at either the input or output end of the units.

Another object of my invention is the provision of a suitable receiving station at which are located a plurality of program services such as broadcast receiving sets and switching means whereby any of the programs being delivered by the program sources may be connected to a monitoring arrangement for monitoring the programs being thus delivered.

For a more complete understanding of my invention reference may be had to the accompanying drawings in which,

Fig. 1 illustrates diagrammatically a group of program sources and switching means associated therewith for monitoring purposes;

Fig. 2 illustrates diagrammatically a line amplifier for amplifying the programs received from various program sources;

Fig. 3 illustrates diagrammatically a suitable type of oscillator modulator for changing the amplified program into modulated radio frequency for the purpose of distribution to the antenna pairs;

Fig. 4 illustrates diagrammatically a monitor amplifier for monitoring the programs of the program sources at different points of the circuits and a volume indicator for measuring the modulator input voltage and also for measuring the degree of radio frequency modulation;

Fig. 5 illustrates diagrammatically a radio monitoring arrangement provided with switching means which is coupled to the radio frequency common conductor and which rectifies, and puts through the monitor amplifier or volume indicator of Fig. 4, a small amount of the RF energy thus picked up from any of the oscillator modulators, for monitoring purposes;

Fig. 6 illustrates diagrammatically a microphone amplifier for sending programs through amplifier apparatus from a central studio and its association with the line amplifier illustrated in Fig. 2, and

Fig. 7 illustrates diagrammatically the operative relation and connection between the different subscribers substations equipped for receiving program service, and the central exchange system and its connections with the radio frequency common conductor.

Fig. 8 schematically shows applicant's entire system and the relation of the various parts to each other.

Figs. 1 to 7 inclusive taken as a whole illustrate diagrammatically a complete system for giving program service over a telephone exchange system.

The line amplifier LA includes two stages of impedance coupled amplification and comprises an input transformer IT having a primary winding p and a secondary winding s associated with the audion tube A provided with the usual filament 2, grid 3 and plate 4. The audion tube A' comprising the usual filament 2', grid 3', and plate 4' is associated with the output transformer OT of the line amplifier LA and includes the usual primary winding p' and secondary winding s' . The choke coils c , c' , and c^2 and resistances r and r' are associated with the line amplifier LA and are for the usual purposes.

A two position key FK is provided which, when moved to close its left alternate contacts, connects the voltmeter VO across the filament terminals of the audion tube A and when moved to close its right alternate contacts, the voltmeter VO is connected across the filament terminals of the audion tube A' to provide means whereby the filament voltage delivered to the audion tubes A and A' from the filament battery 5 may be measured to permit the selection of the proper voltages. A

single throw switch 6 provides means for connecting or disconnecting the filament battery 5 from the audion tubes A and A'.

A two position plate current measuring key PK is also provided, which, when moved to operate its left hand contacts, associates a meter M with the plate of the audion tube A' to measure the amount of current thereon. Key PK when moved to close its right hand contacts associates a meter M' with the plate of the audion tube A to measure the current on the said plate. Thus the key PK in association with the meters M and M' provides means whereby the plate current delivered to the audion tubes A and A' may be measured and checked and rheostats 7 and 8 associated respectively with the filaments 2 and 2' of the audion tubes A and A' provide means for regulating the voltage of the same from the filament battery source 5 so that the filament current of the respective tubes A and A' may be kept constant at all times. A potentiometer 9 and a suitable biasing battery 10 are associated with the grids 3 and 3' of the respective tubes A and A' and provide means for controlling the volume output and for biasing the said grids 3 and 3'. The battery 11 provides the necessary plate voltage for the plates 4 and 4' of the respective tubes A and A'.

A two position input key IK, associated with the line amplifier LA, when moved to the right closes its alternate contacts 12 and 13 to connect the secondary windings of the input transformer IT to the line amplifier LA to amplify the incoming oscillations from the program source for purposes which will presently be described. The input key IK when moved to the left closes its alternate contacts 14 and 15 to connect a program source such as the microphone amplifier MA illustrated diagrammatically in Fig. 6 to the input resistance of audion A for purposes which will presently be described. A monitor selecting key SK in association with a master monitoring key MK permits monitoring the input of a program source at the input point of the line amplifier LA or permits the monitoring of the output of the program of the line amplifier LA which is secured from a suitable program source. The keys SK and MK may also be used for monitoring the modulated radio frequency output of the oscillator modulator OM shown in Fig. 3.

The oscillator modulator OM, illustrated diagrammatically in Fig. 3 comprises the usual modulator and oscillator tubes M and O of a Heising system of modulation, and through the medium of suitable supply means, such as a 110 volt lighting current supply and a stepdown transformer DT, a predetermined filament voltage is supplied to the filaments 16 and 17 of the tubes M and O. A motor generator MG, connected to the current supply by means of a single throw switch 18, operates to deliver the required current to the oscillator modulator OM through a suitable switch 19. The usual oscillator coil OC is also associated with the oscillator modulator OM and the modulated radio frequency output therefrom is fed to a radio frequency common conductor RC for purposes which will be presently described.

The distribution of the subscribers' lines from the central exchange is accomplished by a cabling system which consists of a plurality of cables, each of which comprises a plurality of pairs of wires which serve to connect the subscribers' substations of the system to the exchange switchboard as is well understood. For the purpose of illustration, four cables 19, 20, 21, and 22 are

shown diagrammatically in Fig. 7. In each of the cables 19, 20, 21 and 22 a pair of wires is selected as an antenna pair which are identified in the drawings by the reference characters 23, 24, 25 and 26 respectively. One end of each of the antenna pairs terminates in a jack J secured in a suitable patch box conveniently located near the main distributing frame in the central office telephone exchange. A plurality of jacks J' are also positioned in the patch box, there being as many of these jacks J' as there are antenna pairs provided in the different cables and these jacks J' are bridged to the radio frequency common conductor RC which is associated with the output of the oscillator modulator OM. Patch cords PC are provided to connect the jacks J' with the jacks J associated with the antenna pairs to excite the same through the medium of the modulated radio frequency output of the oscillator modulator OM. The pairs of conductors 27, 28, 29 and 30 of the cables 19, 20, 21 and 22, shown associated with the antenna pairs 23, 24, 25 and 26, represent lines extending between the main exchange and the subscribers substations. These lines terminate at the telephone exchange switchboard in jacks J² and at their remote ends in the usual subscribers substations one of which is indicated in the drawings by reference character 31. These cable pairs 27, 28, 29 and 30, as well as the others not used as antenna pairs, are used for the usual telephone connections between the central exchange and subscribers' substations as is well understood in the art.

Each telephone subscriber authorized to receive programs over the substation equipment is provided with a self contained receiving unit RS which may be connected to either side of the telephone line extending from the central exchange depending upon conditions. Each receiving unit RS is provided with two stages of amplification and is equipped with audion tubes of the alternating current type. A suitable power unit PU is provided for furnishing the necessary current for heating the heater elements of the tubes and for furnishing the necessary plate and biasing voltages for the plates and grids of the said tubes. Each receiving unit RS is provided with a suitable variable condenser VC for controlling the volume and a standard four party ringing key SK' such as is well known in the art is used to select the programs of the various units, the condensers CO being used for adjustment purposes.

Referring now to Fig. 6 there is shown a microphone amplifier unit MA which will be mounted upon a suitable panel at the receiving station. The microphone amplifier unit MA is associated with a pair of microphone jacks 34 and 35 and through the medium of a multiple plug arrangement, a microphone MI as illustrated in Fig. 6, may be connected to either of the microphone jacks 34 or 35. The microphone MI is of an approved two button type comprising buttons 36 and 37 and a multiple contact plug 38 associated therewith may be inserted in either of the jacks 34 or 35. A plug 38 may also be inserted in the jack 35 and a microphone selecting key MS associated with the microphone amplifier MA, when its left contacts are closed, associates the microphone connected to the jack 34 with the microphone amplifier MA and, when its right contacts are closed, associates the microphone connected to the jack 35 with the microphone amplifier MA. A two position microphone testing key K is provided which when moved to 150

close the contacts to the left connects a suitable meter SM in circuit with the button 37 of the microphone MI to measure the current flow therethrough and when the said key K, is moved to close its contacts to the right the other button 36 of the microphone MI is cut in circuit with the meter SM to measure the current flow through it. The two position key K in association with the meter SM permits the current flow through the two buttons 36 and 37 of the microphone MI to be checked and the current flow of the microphone is regulated by means of a suitable variable resistance 40. The microphone amplifier MA consists of one stage of impedance coupled amplification and comprises an audion tube 41 with the usual filament 42, grid 43 and plate 44, and audio transformer 45 having primary and secondary windings 46 and 47. The resistance and choke coils 48 and 49 in the amplifier circuit are for the usual purposes. A battery switch 50 in association with the battery 51 supplies current to the filament 42 of the audion tube 41, and a rheostat 52 in circuit therewith regulates the current flow to the filament 42, the battery 51 also furnishing current through a choke 200 to the microphone MI. The batteries 53 and 54 supply respectively the plate current and grid bias for the plate 44 and grid 43 of the tube 41. A two position key 55, when moved to close its left alternate contacts, cuts a suitable meter 56 in circuit with the battery 51 which supplies current to the filament 42, to measure the voltage current across the same. The key 55 when moved to close its right alternate contacts cuts a suitable meter 57 in circuit with the plate 44 of the tube 41 and provides means for checking the current flow from the battery 53 to the plate 44 of the tube 41.

Fig. 4 illustrates diagrammatically a monitor amplifier MON and a volume indicator VI which may be mounted on a suitable panel. The monitor amplifier MON shown at the right in Fig. 4 comprises one stage of impedance coupled amplification which terminates in a suitable loudspeaker LS. A transformer 60 having a primary winding 61 and a secondary winding 62 is associated with the usual audion tube 63 having a filament 64, plate 65 and grid 66. A rheostat 67 in circuit with the filament battery 68 regulates the flow of current to the filament 64 from the battery 68, a battery switch 69 is provided for cutting the battery 68 in or out of circuit with the filament 64 of the tube 63. A battery 70 is provided for supplying the plate 65 of the tube 63 with the necessary plate voltage and battery 71 serves as a biasing battery for the grid 66 of the audion tube 63. A key 72 when moved to close its alternate contacts 73 and 74 connects the conductors 75 and 76 which terminate at the line amplifier LA, with the terminals of the primary winding 61 of the transformer 60 associated with the monitor amplifier MON. With the key 72 thus positioned the line amplifier input from the program source, or the output of the microphone amplifier MA, at the output end of the line amplifier LA, or the output of the line amplifier LA of the program source may be monitored. The output of the oscillator modulator OM may also be monitored but the monitoring of the different portions of the circuit as just described will of course depend upon the positions of the keys SK and MK associated with the line amplifier LA as will be more fully hereinafter described. A two position key 77 is provided which, when moved to close its right

alternate contacts, places the meter 56 in circuit with the filament battery 68 and in parallel with the filament 64 of the audion tube 63 to indicate the voltage across the same.

Referring now to the volume indicator VI illustrated at the left of Fig. 4 it comprises an audion tube 78 having the usual filament 79, grid 80 and plate 81. A rheostat 82 in association with the battery 68 controls the filament voltage of the audion tube 78 and a battery switch 83 cuts the battery 68 in or out of circuit with the filament 79 of the audion tube 78. The two position key 77 when moved to close its left alternate contacts places the meter 56 in circuit with the filament battery 68 and in parallel with filament 79 of the audion tube 78 to indicate the voltage across the same. A battery 84 supplies the usual plate voltage for the plate 81 of the audion tube 78 and in association with a potentiometer 85 provides the necessary grid bias for the grid 80 of the audion tube 78. A potentiometer 86 for regulating the amount of impressed voltage on the grid 80 from the amplifier units and a volume indicator meter IM also associated therewith are for purposes which will presently be described.

In the system so far disclosed I have illustrated and described one unit which comprises a line amplifier LA, an oscillator modulator OM and a microphone amplifier MA. It is to be understood, however, that the system of broadcast distribution of my invention is so devised that more than one unit may be installed, each unit being a duplicate of the one illustrated in Figs. 2, 3 and 6 and comprising a line amplifier LA, an oscillator modulator OM and a microphone amplifier MA. Each unit is connected to the radio frequency common conductor RC to which the antenna pairs are bridged for purposes already described.

The number of oscillator modulators and hence the programs which may be distributed simultaneously is limited by the width of the frequency band over which satisfactory distribution may be accomplished and by experiment I have found that the programs may be satisfactorily distributed at different frequencies which lie between the frequency band.

Referring now to Fig. 1 the program sources PS, PS', PS² and PS³, represented diagrammatically in the drawings, may be suitable pickup devices such as radio broadcast receiving sets. The pickup devices PS, PS', etc. may be located at a receiving station which is situated at a point distant from the main exchange at which the amplifier units and monitoring units previously described are located. The program sources PS, PS', PS² and PS³ are connected respectively by pairs of conductors 90, 91, 92 and 93, to artificial lines 94, 95, 96 and 97 which terminate respectively in jacks J³ secured to a suitable panel conveniently located at the receiving station. A plurality of jacks J⁴ also are positioned on the panel, there being as many of these jacks J⁴ as there are amplifying units at the main telephone exchange. Patch cords PC² are provided for interconnecting the jacks J³ and J⁴ for purposes which will be more fully hereinafter described. A two position key 98 associated with the program pickup devices PS and PS', when moved to close its left alternate contacts connects PS to conductors 99 and 100, and when moved to close its right alternate contacts the program pickup device PS' is connected to the conductors 99 and 100. A two position key 101

associated with the program pickup devices PS² and PS³ when moved to close its right alternate contacts connects the program pickup device PS³ to conductors 99 and 100 and when moved to

5 close its left alternate contacts the program pickup device PS² is connected to the conductors 99 and 100. The program pickup devices PS, PS', PS² and PS³ by the manipulation of the keys 98 and 101 are connected to the conductors
10 99 and 100 which terminate in a monitor amplifier and volume indicator similar to that illustrated in Fig. 4 for purposes as will be more fully hereinafter described. As the monitor amplifier in which conductors 99 and 100 terminate is similar to that shown in Fig. 4 it is not illustrated. The jacks J⁴ at the receiving station are connected by lines 102, 103, 104 and 105 to jacks J⁵ on a panel at the main telephone exchange and by means of jacks J⁶ also on the
20 panel and patch cords PC' any of the program pickup devices PS, PS' etc. may be connected with the amplifying units located at the main telephone exchange as will be more fully hereinafter described.

25 Referring now to Fig. 5, I illustrate a radio monitor RM and a wave meter WM which are common to the several units located at the main telephone exchange. The radio monitor RM and wave meter WM are associated with a tuning coil
30 TC comprising a stationary or pickup winding 106 and a pair of windings 107 and 108 which may be moved relative to the pickup winding 106. The pickup winding 106 is connected serially with the radio frequency common conductor RC to which the oscillator modulators OM of the different units of the system are bridged. A two position key 109 associated with the radio
35 monitor RM permits the frequencies of the oscillator modulators of the different frequencies to be monitored. The frequencies impressed on the radio frequency common conductor RC induced in the winding 107 of the coil TC is detected by an audion tube 110 of the alternating current type having a grid 111, a plate 112, a
40 cathode 113 and heater filament 114 which is connected by the conductors 115 and 116 to a source of alternating current of the proper voltage and an audion transformer 118 comprising the usual primary and secondary windings 119
45 and 120. The key 109, when actuated to monitor the different units, also connects certain of the condensers 121, 122 and 123 in circuit. The connected frequency passes over the conductors 124 and 125, 126 and 127 or 128 and 129 depending
50 on the position of the key 109 to the contacts of the key SK of the line amplifier associated with the frequency being monitored. By the actuation of the keys SK and MK of the associated line amplifier LA the frequency to be monitored is
55 cut through to the monitor amplifier MA and volume indicator VI all of which will be more fully hereinafter described.

The impressed frequencies of the radio frequency common conductor RC passing through the pickup winding 106 of the coil TC are also
60 induced in the winding 108. By means of a selector key 130, which is of the party line ringing type well known in the art, certain ones of the condensers 131, 132 and 133 are cut in circuit
65 and through the agency of visible means such as a lamp 134 of the miniature type the attendant may check the frequencies that are being delivered by the oscillator modulators of different units to see that they are currents of predetermined set wave lengths. The key to be actuated

and therefore the condensers selected is determined by the frequency to be checked.

Having described in general the apparatus comprising the system for giving program service and the apparatus for monitoring the circuits at different points, I will now describe in detail the method employed to transmit a program from any of the program sources PS, PS' etc. located at some convenient point, or from a microphone located at a suitable studio. I will
8 also describe in detail the operation of the monitoring apparatus previously referred to in general and how the circuits of the different units are monitored at different points as to volume, clarity and wave length.

Assuming that the program to be distributed to the subscribers substations of the exchange system that are equipped to receive the same is from the program source PS which as before described is a suitable pickup device such as a
9 broadcast receiving set, the program pickup extends over conductors 90 through the artificial line 94 to the jack J³ terminating at the receiving station at which the pickup receiving set is also located and by means of a patch cord PC²
10 and the jack J³ the program is extended to the outgoing jack J⁴ at the receiving station. The incoming jack J⁵ at the main exchange is connected by the line 102 with the jack J⁴ at the receiving station and by means of a patch cord
10 PC' the jack J⁵ is connected to the jack J⁶. Conductors 125 and 136 extend from jacks J⁶ and terminate at the respective terminals of the primary winding p of the input transformer IT associated with the line amplifier LA illustrated
11 in Fig. 2. In order to impress the incoming program which is at audio frequency into the line amplifier LA at the main telephone exchange, the input key IK is moved to close its contacts 12 and 13 and the audio frequency
11 oscillations from the program source are amplified by the two stage impedance coupled amplification apparatus shown. As the line amplifier LA is of standard construction and its operation is familiar to those skilled in the art, a detailed
12 description thereof will not be given.

As before described there are as many jacks J⁶ as there are amplifier units and through the medium of the patch cords PC' any one of the program sources PS, PS', PS² or PS³ may be
12 connected to the jack J⁶ which is connected to the line amplifier LA of Fig. 2 as is readily apparent from the drawings without going into detail. The program source PS³ may be called an auxiliary or emergency set and through the medium of the
13 patch cord PC' this emergency program source may be connected to any of the jacks J⁴.

The output from the line amplifier LA is transmitted to the oscillator modulator OM which changes this amplified audio frequency into
13 radio frequency and modulates it on a carrier. This modulated radio frequency output of the oscillator coil OC then is impressed upon the radio frequency common conductor RC. As the operation of the oscillator modulator OM is well
14 understood a detailed description of the same will not be given.

The monitor amplifier MA and volume indicator VI illustrated in Figs. 6 and 4 are common to the different units of the system so that each
14 unit may be monitored to the exclusion of the others and this is accomplished by means of the monitor master key MK and the selecting monitoring key SK with which each line amplifier LA is equipped. I will assume that the key SK
15

of the line amplifier LA illustrated in Fig. 2 is moved to close its left alternate contacts to monitor the output of the line amplifier LA. To connect the output end of the same in circuit with the monitor amplifier MA of Fig. 4 the master monitoring key MK is also moved to its operative position to close its contacts 135' and 136'. The output of the line amplifier LA now extends from the terminals of the secondary winding *s'* of the output transformer OT over conductors 137 and 138 through contacts 139 and 140 of the monitor selecting key SK, conductors 141 and 141', alternate contacts 135' and 136' of the master monitoring key MK, and conductors 75 and 76 to the two position key 72 associated with the monitor amplifier MON and volume indicator VI. The master monitoring key MK when moved to its operative position brings about the closing of its alternate contacts 135' and 136' and as the master monitor keys of the various units are connected serially, should a master monitoring key MK of any of the other units be moved to its operative position for monitoring purposes, the unit associated with this actuated key MK will not be cut through to the monitoring apparatus of Fig. 4 because the normal contacts of the key MK associated with the line amplifier LA are open thus preventing this other unit from being cut through so as to join this unit to the monitor amplifier MON and volume indicator VI. If, however, the actuated key MK is associated with a line amplifier LA closer in the series connection to the monitoring amplifier MON, this line amplifier will be connected to the monitoring means to the exclusion of the previously connected line amplifier. From the above description it is readily apparent that while any one particular unit is being monitored, no other unit, more remote in the series connection, can be cut in to extend the same to the monitoring apparatus. The key SK when moved to close its alternate contacts 142 and 143 connects the terminals of the primary winding *p* of the input transformer IT to the monitor amplifier MON through the normal left contacts 139 and 140 of the key SK, over conductors 141' and 141 through alternate contacts 135' and 136' of the master monitoring key MK and over conductors 75 and 76 to the key 72 of the monitor amplifier MON. When monitoring the output of the line amplifier LA the keys SK and MK are positioned as before described and the key 72 of the monitor amplifier MON is moved to close its contacts 73 and 74 to connect the output of the line amplifier LA over conductors 75 and 76 to the terminals of the primary winding 61 of the transformer 60. The output of the line amplifier LA which may be either a program received by a suitable pickup device or from a microphone located at a studio, passes through the one stage of impedance coupled amplification, with which the monitor amplifier MON is equipped, and is received by a suitable loud speaker LS connected to the terminals 144 and 145 of the output end of the monitor amplifier MON. To monitor the input of a program from a program source such as PS, the key SK is moved to close its alternate contacts 142 and 143 and the program from the program source PS is extended to the loud speaker LS connected to the terminals 144 and 145 associated with the monitor amplifier MON over the circuit arrangement described in connection with the monitoring of the line amplifier LA output. The conductors 99 and 100 extending from the two position key 98 illustrated in Fig. 1 terminate

at the terminals of the primary winding of an audio transformer of a monitor amplifier and volume indicator similar to that illustrated in Fig. 4 and to monitor the program source PS the key 98 is moved to close its left alternate contacts to connect the program source PS to the conductors 99 and 100 which terminate in a monitor amplifier. To monitor the program source PS' the key 98 is moved to close its right alternate contacts to connect the program source to the conductors 99 and 100. Likewise the key 101 when moved to close its left contacts connects the program source PS² and when moved to close its right contacts the program source PS³ is connected. From the above description it may be seen that the input of the program sources may be monitored at the receiving station or at the main exchange.

Programs from a conveniently located studio may also be extended to the subscribers equipped to receive the same. For this type of program distribution a microphone amplifier MA is associated with each unit. The microphone MI which is located in a suitable studio, receives the speech or music which is then amplified by the one stage of impedance coupled amplification with which the microphone amplifier MA is equipped. With the input key IK of the line amplifier LA of Fig. 2 moved to close its contacts 14 and 15, the output of the microphone amplifier MA is connected to the input of the line amplifier LA and through the medium of the two stages of impedance coupled amplification of the line amplifier LA, the amplified voice currents from the microphone MI are delivered to the oscillator modulator OM by which the amplified audio frequency is changed to radio frequency, modulated on a carrier and the output of the oscillator modulator OM is transmitted to a radio frequency common conductor RC to which the other units of the system are also bridged.

The method of monitoring the output of the line amplifier LA as to its audible quality through the medium of the loud speaker LS associated with the monitor amplifier MON having been described, the method of monitoring the output of the same as to its volume output will now be described. The monitoring keys SK and MK associated with the line amplifier LA are moved to the positions before described but the key 72 associated with the volume indicator VI is moved to close its contacts 150 and 151 to connect the conductors 75 and 76 extending from the line amplifier LA to the volume indicator VI. The voltage variation from the amplified output of the line amplifier affects the grid 80 of the audion tube 78 and this voltage variation of the grid 80 in turn causes a variation in the plate circuit of the tube 78 and this in turn affects the meter IM. The volume output of the line amplifier LA is indicated on the meter IM and it is essential that this output be kept within certain limits for best tone quality. When monitoring the program output of the line amplifier LA, should the deflection of the meter be beyond the predetermined limits, adjustments may be instantly made by the operator in charge to compensate for this increased volume to hold the output between the predetermined limits. The output of the line amplifier LA may also be monitored when a program from a studio is being broadcast through the microphone amplifier MA in the same way and a further description is not necessary.

The volume output of the oscillator modulator OM may also be monitored by placing the key SK

of the line amplifier LA in the position shown in Fig. 2 and by operating the key MK of the line amplifier LA to close its alternate contacts 135' and 136'. The modulated radio frequency output of the oscillator coil OC is impressed upon the radio frequency common conductor RC and this energy which is impressed upon the common conductor RC passes through the pickup winding 106 of the coil TC associated with the radio monitor RM illustrated in Fig. 5. As before pointed out there are three oscillator modulators distributing programs at different frequencies namely low, medium and high and assuming that the oscillator modulator OM illustrated in Fig. 3 delivers the high frequency it passes through winding 106 and is induced into the winding 107 of the coil TC. Condensers 121, 122 and 123 are associated with the different frequencies in different combinations depending upon the position of the key 109 and the frequency being monitored. Assuming that the high frequency is being delivered by the oscillator modulator OM, the energy passing over the radio frequency common conductor RC is induced into the winding 107 and is rectified by a suitable type of detector with which the radio monitor RM is equipped and which comprises an audion tube 110 and transformer 118. The key 109 associated with the radio monitor RM is moved to close its alternate contacts 160 and 161 and this detected radio frequency current extends through alternate contacts 160 and 161 of the key 109, over conductors 124 and 125, normal contacts 142, 143 and 139, 140 of the key SK, conductors 141 and 141', alternate contacts 135' and 136' of the key MK, conductors 75 and 76, closed contacts 150 and 151 of the key 72 of the volume indicator to the grid 80 of the tube 78. The variation of voltage of the amplified current causes deflection of the meter IM and when the meter variation or deflection is beyond certain predetermined limits necessary adjustments may be made.

To monitor the output of the oscillator delivering the medium frequency the key 109 is placed in the position shown in Fig. 5 and the current received from the radio frequency common conductor RC is amplified and passes through normal contacts 160, 161 and 162, 163 of the key 109 to the conductors 128 and 129 which extend to the line amplifier associated with the medium frequency unit. The condensers 121 and 122 are connected across the terminals of the winding 107 when this frequency is being monitored for the usual purposes. The output of the oscillator modulator delivering the low frequency may be monitored by moving the key 109 to close its alternate contacts 162 and 163 and the amplified current passes through normal contacts 160, 161, alternate contacts 162, 163 of the key 109 to the conductors 126 and 127 which extend to the line amplifier associated with the low frequency. The condensers 121 and 123 are bridged across the terminals of the winding 107 when this frequency is being monitored for the usual purposes. The condensers 121, 122 and 123 may be adjusted for the different frequencies and once adjusted may be left in their adjusted positions.

The frequency currents delivered by the low, medium and high frequency oscillators are also delivered into the winding 108 of the coil TC and by the manipulation of the individual keys of the key set 130, depending upon the frequency being tested, different combinations of the condensers 131, 132 and 133 are connected and through the medium of visible means in the form of a lamp

134 the attendant may receive an indication that the different frequencies are within prescribed limits.

The modulated radio frequency output of the oscillator modulator OM is connected to the radio frequency common conductor RC as before described and as the antenna pairs 23, 24, 25 and 26 of the cables 19, 20, 21 and 22 are bridged to the radio frequency common conductor RC this energy is distributed to these antenna pairs and by means of induction the remaining pairs in the cable are excited and any subscriber equipped with a receiving set of a special type may receive the program. Several programs may be sent simultaneously on different frequencies within a predetermined range and by means of a party line key SK' any one of the plurality of programs may be selected by the subscriber to the exclusion of the others. The condensers CO one of which is associated with each of the individual keys of the party line key SK' makes this selection possible as is well understood. The condensers CO once adjusted may be left in their adjusted positions.

While the drawings and the above description disclose but a single form of the invention, it is to be understood that certain modifications are contemplated. The invention, therefore is to be limited only by the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a system of program distribution, a plurality of units each including an amplifier device, a plurality of program sources, means for operatively connecting said program sources to said amplifiers of said units, a cable comprising a plurality of conductors, a common conductor electrically connected to one of said conductors, means for impressing the oscillations of a plurality of said program sources on said common conductor, an inductive connection between said one of said conductors and the other conductors in the cable whereby said oscillations are impressed on said other conductors, said inductive connection being the sole connection between said one of said conductors and the other conductors in the cable, monitoring means common to said amplifier devices and means individual to each amplifier device for individually connecting said monitoring means to different points of each of said amplifier devices.

2. In a system of program distribution, a plurality of units each including an amplifier device, a plurality of program sources, means for operatively connecting said program sources to said amplifiers of said units, a cable comprising a plurality of conductors, a common conductor electrically connected to one of said conductors and extending to each of said units, means for impressing the oscillations of a plurality of said program sources on said common conductor whereby said oscillations are impressed on all of said conductors of said cable, monitoring means common to said amplifier devices, switching means individual to each of said amplifier devices for selecting different points of said amplifier device and a second switching means for connecting the selected point of said amplifier device to said monitoring means to the exclusion of said other amplifier devices.

3. In a system of program distribution, a plurality of units each including an amplifier device, a plurality of program sources, means for op-

eratively connecting said program sources to said amplifier devices, a cable comprising a plurality of conductors, a common conductor electrically connected to one of said conductors, means for
 5 impressing the oscillations of a plurality of said program sources on said common conductor, an inductive connection between said one of said conductors and all the other conductors in the
 10 cable whereby said oscillations are impressed on said other conductors, said inductive connection being the sole connection between said one of said conductors and the other conductors in the cable,
 15 monitoring means common to said amplifier devices and means individual to each of said amplifier devices for connecting an amplifier device to said monitoring means to the exclusion of said other amplifier devices.

4. In a system of program distribution, a plurality of units each including an amplifier device,
 20 a plurality of program sources, means for operatively connecting said program sources to said amplifier devices, a cable comprising a plurality of conductors, a common conductor electrically connected to one of said conductors, means for
 25 impressing the oscillations of a plurality of said program sources on said common conductor, an inductive connection between said one of said conductors and all the other conductors in the cable whereby said oscillations are impressed on
 30 said other conductors, said inductive connection being the sole connection between said one of said conductors and the other conductors in the cable, input and output terminals for each of said amplifier devices, monitoring means common to
 35 said amplifier devices and switching means individual to each of said amplifier devices for connecting the said input or output terminals to said monitoring means to the exclusion of said other amplifier devices.

5. In a system of program distribution, a plurality of units each including an amplifier device,
 40 a plurality of program sources, means for operatively connecting said program sources to said amplifier devices, a cable comprising a plurality of conductors, a common conductor electrically connected to one of said conductors, means for impressing the oscillations of a plurality of said
 45 program sources on said common conductor whereby said oscillations are impressed on the other conductors in said cable, input and output terminals for each of said amplifier devices, monitoring means common to said amplifier devices,
 50 a switch key individual to each of said amplifiers for selecting either the input or output terminals of said amplifier devices, and switching means
 55 individual to each of said amplifier devices for extending the input or output of said amplifier devices to be monitored to said monitoring means to the exclusion of said other amplifier devices.

6. In a system of program distribution, a plurality of units each including an amplifier device,
 60 a plurality of program sources, means for operatively connecting said program sources to said amplifier devices, a cable comprising a plurality of conductors, a common conductor electrically connected to one of said conductors, means for
 65 impressing the oscillations of a plurality of said program sources on said common conductor whereby said oscillations are impressed on the other conductors in said cable, input and output
 70 terminals for each of said amplifier devices, monitoring means common to said amplifier devices, a switching key individual to each of said amplifiers for selecting either the input or output ter-

minals of its associated amplifier and a second switching key individual to each of said amplifiers for extending either the said input or output terminals of its associated amplifier to said monitoring means to the exclusion of said other amplifier devices. 80

7. In a system of program distribution, a plurality of program sources, amplifier devices for amplifying the oscillations from each of said program sources, a common conductor, a plurality
 85 of sources of carrier frequency oscillations operatively associated with said conductor, means for simultaneously impressing the amplified oscillations from a plurality of said program sources on respective carrier frequency oscillations and
 90 on said common conductor and monitoring means in series connection with said amplifier devices and common to said sources of carrier frequency oscillations for monitoring the circuits of said
 95 devices and sources at different points, and a key individual to each of said amplifiers for extending one of said different points of its associated amplifier to said monitoring means to the exclusion of the other amplifier devices more remote
 100 in said series connection from said monitoring means.

8. In a system of program distribution, a plurality of program sources, amplifier devices for amplifying the oscillations from said program sources, sources of different carrier frequencies,
 105 a conductor common to said carrier frequency sources, a cable comprising a plurality of conductors, said common conductor electrically connected to one of said conductors, means for simultaneously impressing the amplified oscillations from a plurality of said program sources on
 110 said different carrier frequencies respectively, an inductive connection between said one of said conductors and the other conductors in the cable whereby said oscillations are impressed on
 115 said other conductors, said inductive connection being the sole connection between said one of said conductors and the other conductors in said cable, monitor selecting means common to said
 120 different carrier frequency sources and operatively associated with said common conductor for individually selecting the different carrier frequencies for monitoring purposes.

9. In a system of program distribution, a plurality of program sources, amplifier devices for
 125 amplifying the oscillations from said program sources, sources of different carrier frequencies, a conductor common to said carrier frequency sources, a cable comprising a plurality of conductors, said common conductor electrically connected to one of said conductors, means for simultaneously impressing the amplified oscillations from a plurality of said program sources on
 130 said different carrier frequencies respectively, an inductive connection between said one of said conductors and the other conductors in the cable whereby said oscillations are impressed on said
 135 other conductors, said inductive connection being the sole connection between said one of said conductors and the other conductors in said cable, monitor selecting means common to said different
 140 carrier frequency sources and operatively associated with said common conductor for individually selecting the different carrier frequencies and monitoring means common to said carrier frequencies for monitoring said carrier frequencies. 145

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