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(71) Applicant: Motta, Tino Giuseppe
Via A. Grandi 143/A
I-20043 Arcore (Milano)(IT)

(71) Applicant: Motta, Natale
Via A. Grandi 143/A
I-20043 Arcore (Milano)(IT)

(71) Applicant: Zappa, Emilia
Via A. Grandi 143/A
I-20043 Arcore (Milano)(IT)

(72) Inventor: Motta, Tino Giuseppe
Via A. Grandi 143/A
I-20043 Arcore (Milano)(IT)

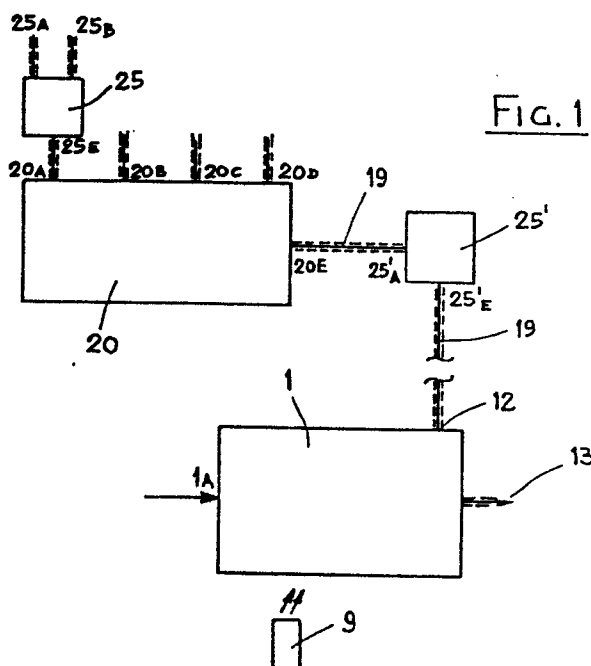
(72) Inventor: Motta, Natale
Via A. Grandi 143/A
I-20043 Arcore (Milano)(IT)

(72) Inventor: Zappa, Emilia
Via A. Grandi 143/A
I-20043 Arcore (Milano)(IT)

(74) Representative: Lecce, Giovanni
Dott. Giovanni Lecce & C. S.r.l. Via G. Negri 10
I-20123 Milano(IT)

(54) Radio frequency switching, regulation, amplification and/or attenuation system.

(57) Switching, regulation, amplification and/or attenuation system which may be adapted to switches with several R.F. inlets, R.F. amplifiers and R.F. convertor selectors, suitable to be employed for the realization of radio and television reception systems or the like, whether fixed or mobile which comprises a power supply and control box (1) containing a radio-frequency filter or injector; a block (20) consisting of a standard unit for the selection, conversion and processing of the R.F. signals and/or an R.F. switch with several R.F. inlets and identification, switching and regulation circuits capable of identifying both the polarity and the particular value of the voltages received, coming from control and power supply box (1) and consequently to control the coupled control circuits of the R.F. switch and/or R.F. conversion and processing unit; one or more blocks or modules (25) or (25'), whether inserted or not in the same block (20), consisting of amplification, attenuation or tuning circuits of the R.F. signals, combined with power supply and regulation circuits able to power, at constant voltage, the above mentioned R.F. amplification, attenuation or tuning circuits, and to carry out the regulation by utilizing the same voltages at different polarities, transmitted, in turn, by control box (1).



"A SWITCHING, REGULATION, AMPLIFICATION, AND/OR ATTENUATION
SYSTEM, WHICH MAY BE APPLIED TO R.F. SWITCHES, AMPLIFIERS
AND R.F. CONVERTORS"

The present invention refers to a switching, regulation, am-
5 plification and/or attenuation system, which may be adapted
to R.F. switches, amplifiers and convertors.

To be more precise, the present invention refers to a
switching, regulation, amplification and/or attenuation
system, which may be applied to switches, amplifiers and
10 R.F. convertors, particularly suitable to be employed for
the realization of radio and television systems or the like,
whether fixed or mobile.

The switching system of the present invention, combined with
a radio frequency selector or switch, whether amplified or
15 not, permits one to carry out remote control switching and
possibly the regulation of the radio frequency signals com-
ing from one or more reception and/or distribution systems
and/or from two or more television aerials separately con-
nected to the inlets of an R.F. switch.

20 Said switching system, combined with a unit for the R.F.
signal conversion and processing, permits one to select
and convert, in turn, into a particular frequency or channel
specific frequencies or channels presented simultaneously at
the unique inlet of the same conversion unit.

25 In addition, this switching and/or regulation system permits
one to carry out, rapidly and safely, one or more switches

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and/or regulations either continuous or sequenced by remote control, even if the connection between the control box and the switching equipment, consisting of coaxial cable or ordinary type and/or a bipolar conductor, results as being in the range of 50 + 100 metres or over.

5 The electronic remote control switching of two or more R.F. inlets of a switch for radio television frequencies, situated at a certain distance from the power supply and control box, is at present accomplished by means of systems
10 which, due to their performance and high sensitivity to inevitable variations of the control or power supply voltage(s), caused by technical connection reasons, do not allow safe switching over long distances or rapid switching from one to the other R.F. inlet of a selector, unless the other
15 intermediate inlets are switched, thus putting the operator into difficulty.

Additional inconveniences lie in the fact that it is impossible, by means of the known systems, to carry out directly from the control boxes or relative remote control,
20 the continuous or sequenced regulation of the attenuation, tuning or amplification of the R.F. signals passing through the R.F. switch or any connected amplifiers, always transmitting the controls for these functions to the aerial-receiver inter-connection cable.

25 The purpose of the present invention is to eliminate the

above inconveniences using a switching system, the working of which is based on the principle of sending to the inter-connection cable, connecting the receiver to the various reception systems (aerials or the like), different voltage
5 levels, and/or different polarities in a continuative manner; in particular, the switching regulation, amplification and/or attenuation system, which is the object of the present invention.

Another purpose is that of being able to include in a reception
10 tion installation an adjustable amplification, tuning or attenuation system of the R.F. signals in question, operating separately or in junction, both externally, upstream or downstream of the various R.F. inlets and outlets of the R.F. switch and/or R.F. conversion unit, and directly in a block
15 of components comprising all together, a R.F. switch or converter: also of being able to carry out, besides the normal switching of the R.F. switch and/or conversion unit, also the continuous or sequenced regulation of the attenuation, amplification or tuning of the system, either directly
20 from the control and/or power supply box or by means of the relative remote control.

These and other purposes are achieved by a switching, regulation, amplification and/or attenuation system including an identification, switching and/or regulation circuit,
25 which, combined with an R.F. switch, is able to cause the

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reaction of, thereby selecting, one of the various inlets of the above mentioned R.F. switch and, furthermore, in some construction versions, is able to adjust the tuning or amplification or attenuation of the radio-frequency signals passing through the various R.F. components of the system, by means of direct current of different voltage and/or polarity sent by the operator even from a great distance along the same cable used for connecting the receiver to the various reception elements. The same identification, switching and/or regulation circuit can be combined with a unit for the conversion and processing of the R.F. signals, thus permitting the realization of a conversion and processing unit able to vary the frequency generated by the local oscillator of the convertor circuit and, possibly, the tuning or resonance frequency of the various R.F. circuits so as to obtain the conversion of a given frequency or input channel, selected among the various ones present at the R.F. inlet of the conversion and processing unit, into a fixed frequency or outlet channel, by means of controls sent through the same connection cable carrying the radio frequency to the receiver itself such as in the case of the R.F. selector.

Another aim of this invention is to be able to fit, both upstream and downstream of an R.F. switching module or R.F. convertor and processor module, combined with the

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relative switching and regulation circuits, some adjustable and tunable amplifiers or attenuators, which operate under the same voltages as the system and may be controlled at a distance by means of the power supply and control box.

- 5 The switching and/or regulation system of this invention is particularly suitable for the realization of functional equipment operating as R.F. selectors/switches at two or more R.F. inlets, R.F. conversion units with commutable frequency and R.F. amplification or attenuation systems
- 10 destined to be employed for simplifying the realization and development of the installations for the reception and/or distribution of radio-television signals or the like.

The power supply, control for the switching of the various

15 inlets and/or of the frequency to be converted and/or the regulation of the amplification, attenuation or tuning of this apparatus is conducted at a distance by means of direct current at different polarities and/or voltages supplied by a power supply and/or control box, which, by

20 means of a low-pass filter, transmits the control voltage onto the same cable which acts as a conveyor for the R.F. signals selected and/or processed by the various apparatus to the receiving system.

The control, in order to obtain the various voltages to

25 be sent to the R.F. apparatus, may be carried out, de-

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pending on the construction versions, on the same power supply or control box and/or by means of a remote control of common or coded type.

The different functions obtainable from the various devices may be achieved in one swoop by a single R.F. apparatus containing all the functions, or by several R.F. units, each having one or more combined functions.

For better understanding of the present invention, the same will be hereunder described in detail, making reference to the figures of the appended drawings which represent some preferred, illustrative but not limitative embodiments of the present invention, wherein :

Figure 1 represents the block diagram of an example of a possible interconnection of the various parts comprising the system;

Figure 2 represents the block diagram of the control and/or power supply box of the system;

Figure 3 represents the wiring diagram of the R.F. filters employed in the system;

Figure 4 represents the block diagram of an illustrative embodiment of the electronic part destined to be applied to an R.F. switch;

Figures 5 and 6 represent diagrams of two possible operation modes of the block shown in figure 4.

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Figure 7 represents the block diagram of a second illustrative embodiment of the electronic part intended for application to a twin inlet R.F. switching block, with possibility of adjusting the tuning, attenuation or amplification of the radio frequency passing through the inlet selected by the R.F. switching block;

Figures 8 and 9 represent diagrams of two possible operation modes of the block shown in figure 7.

Figure 10 represents the block diagram of a third embodiment example of the electronic part intended to be applied to a block containing a commutable unit for the conversion and processing of the R.F. signal, which may be used, for example, for TV reception via satellite;

Figure 11 represents the block diagram of a fourth embodiment example of the electronic part intended to be coupled to a block containing an R.F. signals conversion and processing unit and a block containing an R.F. switch.

Figure 12 represents the block diagram of the special connection, power supply and control system permitting the realization of particular R.F. attenuators or R.F. amplifiers which may be employed either combined with the switching system described in this invention or separately, using

normal known amplification, conversion and/or regulation circuits;

Figure 13 represents a preferred version of the wiring diagram of a possible embodiment of the block shown in figures 12 and 14;

Figure 14 represents a construction variant of the internal circuits connection to the block shown in figure 12;

Figures 15, 16, 17, 18, 19 and 20 represent some construction diagrams of single and centralized television reception installations, using the switching and regulation system described in the present invention.

In figures 1 and 2 are indicated :

- with 1 the power supply and control boxes which provide the various power supply and control voltages, through the 1B outlet to the other components of the system;
- with 1A the inlet of the power supply and control boxes connected to the mains;
- with 9 a transmitter able to remote control the functions of power supply box 1 through which the voltages are transmitted from connector 12 and coaxial cable 19 to the other parts of the system, preventing these voltages from passing on connector 13 linked to the receiver. The same function may be accomplished using separate components, such as those illustrated and described in patent application N° 86114837.7 filed on 24.10.1986 by the same applicants of the present application.

At the same time said box 1 allows the radio-frequency signals to pass between connectors 12 and 13 preventing them from passing through inlet 17.

- 5 - with 20 the block containing an ordinary R.F. signals conversion and processing unit and/or an R.F. switch with any other R.F. circuits coupled to the electronic part, which controls the R.F. switch and the relative circuits and/or the conversion and processing unit, reacting to the voltages sent by 1 through R.F. outlet 20E to coaxial
10 cable 19;
- with 20A, 20B, 20C and 20D, the various R.F. inlets connected to the switch;
- with 25 and 25' are represented some devices suitable for the possible R.F. signals amplification, attenuation or
15 tuning which work in accordance with the constructing techniques represented in figures 12, 13 and 14;
- with 25A, 25B and 25'A are represented the R.F. inlets of the above mentioned devices;
- with 25E and 25E' the R.F. outlets of the relative
20 25 and 25' circuits.
- With reference to figure 2, showing a preferred but not limitative block diagram of power supply and control box 1 embodiment, are indicated :
 - 25 - with 2 a block containing an on-switch and some protection devices (fuses, for example). This block which is powered by the mains on inlet 2A, transmits it to inlet 3A of block 3;

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- with 3, a power supply unit, line voltage potential divider which reduces and insulates the line voltage supplied on inlet 3A and transmits it to inlet 4A of block 4;
- with 4, an AC-DC converter circuit and voltage stabilizer circuits, controlled by means of inlet 4D and possibly 4E so as to be able to obtain two or more voltage levels on outlet 4B;
- with 4C, the inlet for the polarity reversal control realized by block 4 on outlet 4B;
- 10 - with 5, a display which shows the switching and/or regulation carried out and may be controlled:
 - A. by block 4, through inlet 5A
 - B. by block 7, through 5B. In practice it can be realized, for example, with a plurality of ordinary single LED
- 15 diodes or known multiple displays;
- with 6, one or more luminous indicators signalling the operating condition of the apparatus and its possible overload or short circuit conditions caused either on outlet 1B or 12 or by the other apparatus connected to the system;
- 20 - with 7, a block able to control
 - A. the polarity reversal on outlet 4B by means of a direct control to inlet 4C of block 4.
 - B. the various voltage levels always leaving outlet 4B by means of direct controls to inlets 4D and/or 4E.
- 25 In the manual version block 7 may consist, for example, of:

- a switch panel or selector of the various R.F. inlets of block 20, one or two multiple-position switches or one or two potentiometers to carry out the adjustment of the tuning, amplification or attenuation of blocks 20 and/or 25 and 25'.
- 5 In the version equipped with the remote control, block 7 consists of a decoder and actuator power-supplied by module 4 through inlet 7A possibly combined with one or two potentiometers or switches to enable the manual control of the adjustment. The decoder receives impulses or signals on
- 10 inlet 7B and, once processed, it transforms them into controls to be sent to inlets 4C, 4D or 4E;
- with 8, a circuit powered by block 4 through inlet 8A, able to receive through inlet 8B and preamplify the signals received by transmitter 9 and to transmit them to inlet 7B
- 15 of decoder 7;
- with 9, a transmitter, able to send signals or impulses to module 8, for example, of the type employed to control ordinary television sets, or with a separate coding;
 - with 10, a low pass radio frequency filter;
- 20 - with 12, the coaxial connection intended for the coaxial cable deriving from R.F. selector or R.F. conversion unit and relative electronic part 20, or from module 25' (figures 1, 15, 18 and 20);
- with 13 the male coaxial connection to the inlet of receiver 33;
- 25
- with 17 the inlet to the control and power supply voltages deriving from outlet 1B of same box 1.

Said inlet is connected to box 1 by means of a common twin or bipolar wire of small dimensions (for example, in section 2 X 0.5 mmq), one end of which is connected to the box or ground of injector 10 in the version comprising separate
5 parts.

Figure 3 shows the wiring diagram of filter or injector 10 or the various R.F. filters (11A, B, C, D, E, X and Y) indicated in figures 4, 7, 10, 11, 12 and 14 .

Referring to figure 5, showing the operating diagram, on
10 different voltages and two polarities of block 20 represented in figure 4, are indicated :

- on the ordinates the various switchable R.F. inlets 20A, 20B, 20C, 20D, 20M and 20N;
- on the x-coordinates the various voltage ranges and the
15 various voltages enabling, by means of block 22 and selector 21, the various radio frequency inlets to be switched,
- with A, the positive voltage within voltage levels A_1 and B_1 , allowing R.F. inlet 20A to be switched;
- 20 - with B, the positive voltage within B_1 and N_1 voltage levels, allowing R.F. inlet 20B to be switched;
- with N, the possible positive voltage, which, within voltage levels N_1 and N_2 , allows a possible additional 20N inlet to be switched (short-dash line); or with N_1
25 and N_2 the limits of the possible positive voltage range utilizable to perform the regulation of the signals ampli-

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- fication, tuning or attenuation (long-dash line) within a fixed minimum and maximum;
- with C the negative voltage within voltage levels C_1 and D_1 , enabling inlet 20C to be switched;
 - 5 - with D the negative voltage within voltage levels D_1 and M_1 , enabling R.F. inlet 20D to be switched.
 - with M the possible negative voltage within voltage levels M_1 and M_2 enabling an additional 20M inlet to be possibly switched (short-dash line); or with M_1 and M_2 the limits
 - 10 of the possible negative voltage range used to perform the regulation of the R.F. signals tuning, amplification or attenuation (long-dash line) within a minimum and a maximum.
- Figure 6 shows a diagram quite similar to that of figure 6A, representing a functioning under positive voltage. Likewise,
- 15 a system on entirely negative voltages may be devised.
- With reference to figure 8, showing the operating diagram of block 20 represented in figure 7 are indicated :
- on the ordinates the various R.F. inlets 20A and 20B;
 - 20 - on the x-coordinates the various voltages and various positive and negative voltage ranges, which contribute, by means of block 22 and R.F. selector 21, to switch the R.F. inlets and to regulate the R.F. signals amplification and/or attenuation;
 - 25 - with A, the positive voltage within the voltage range A_1 and A_2 enabling R.F. inlet 20A to be switched.

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- from A_2 to A_3 the positive voltage range enabling the regulation of the amplification, attenuation or tuning of the R.F. signals switched by inlet 20A within a minimum and maximum;
 - 5 - with B, the negative voltage within the voltage range B_1 and B_2 , enabling R.F. inlet 20B to be switched;
 - from B_2 to B_3 the negative voltage range enabling the regulation of the amplification, tuning or attenuation of the R.F. signals switched by inlet 20B within a minimum and maximum.
- 10

As already said with regard to the diagram of figure 6, figure 9 shows the operating diagram, on different and only positive voltages, of block 20 represented in figure 7. Should one choose the operation on all negative vol-

15 tages, that stated to this regard when describing figure 6, applies.

It should be noted that these are just some examples of operating diagrams of blocks 20 represented in figures 4 to 7, in as much as the operation may be varied merely by

20 using in a different way the various voltage ranges (or voltage steps) so as to perform first the switching and then the regulation or vice versa, or to increase or decrease these ranges thereby realizing blocks 20 with more or less R.F. inlets or switchings.

25 With reference to figures 4, 7, 10 and 11 showing wirings of embodiment examples of block 20, are indicated :

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- 11A, 11B, 11C, 11D, 11E, 11X and 11Y, filters able to separate the radio-frequency signals from the power supply and control voltages devices which may be realized, for example, according to the wiring diagram of figure 3;
- 5 - with 12A, 12B, 12C, 12D, 12E, 12X and 12Y, are indicated the various connections of the respective filters on which both the radio-frequency signals and the control and/or power supply voltages may be present;
- with 13A, 13B, 13C, 13D, 13E, 13X and 13Y are indicated
10 the various connections of the respective filters on which only the radio frequency signals appear to be present;
- with 17A, 17B, 17C, 17D, 17E, 17X and 17Y are indicated the connections of the respective filters which only voltages or power supply and/or control signals may pass
15 through;
- with 20A, 20B, 20C, 20D, 20X and 20Y the various R.F. inlets of block 20 designed so as to be able to permit the input also of the voltages or control and/or power supply signals;
- 20 - with 20E the R.F. outlet of block 20, permitting also the voltages and/or power supply and/or control signals to be supplied to the various circuits contained in block 20;
- with 21, a block including an electronic or electro-mechanical switch, suitable for the radio-frequency switch-
25 ing, possibly coupled to R.F. tuning, amplification or attenuation stages;

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- with 21A, 21B, 21C and 21D, the R.F. inlets of the R.F. switching block or R.F. switching control 21;
- with 21E, the R.F. outlet of block 21;
- with 21G, the inlet for a possible main power supply of R.F. switch (21) or relative circuits;
- with 21M, 21N, 21O and 21P, the inlets of R.F. switching block 21 on which the control and/or power supply voltages, necessary for obtaining the switching of the various R.F. inlets, 21A, B, C, D of the R.F. switch contained in block 21, are applied;
- with 21R and 21S, the inlets of block 21 to which the voltages or signals for the amplification, tuning or attenuation of the R.F. signals coming from switched inlet 11A or 11B (figure 7), are applied;
- with 22 an identification, switching, actuation and regulation circuitable to identify and process the various levels and polarity of the voltage received on inlet 22E and to transmit it, in turn or simultaneously, whether processed or not, to inlets 21R, 21S or/and 21M, 21N, 21O and 21P, or 42M, 42N, 42O and 42P. The way this voltage is transmitted to the various control inlets, is dependent on the R.F. selector and/or R.F. conversion and processing unit 42 employed;
- with 22A, 22B, 22C and 22D, the outlets of switching circuits 22, possibly intended for the respective inlets

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- 17A, 17B, 17C and 17D, by means of connection with jumpers or switches, not represented. On each of these outlets only the voltage permitting switching of the corresponding R.F. inlet of R.F. switching module 21 is present and this only occurs when said inlet has been switched. For example, when applying a particular voltage to circuits 22 through inlet 22E, module 22 identifies this voltage and causes the reaction of R.F. switching module 21, which switches R.F. inlet 21A through the controls sent on inlets 21M, N, O, P and, at the same time, transmits approximately the same voltage to outlet 22A, and opens the circuits connected to the remaining outlets 22B, 22C and 22D, thereby preventing any current from passing through them;
- 15 - with 22X and 22Y the outlets of the identification and actuation circuits 22 possibly intended for the respective inlets, 17X and 17Y, by means of connections with switches and jumpers, not represented. Voltage will be present on each of these outlets only when the respective inlet 22X or 20Y in figure 11 has been enabled for working, or on a permanent basis as in figure 10.
- with figure 23, luminous indicators, for example, led diodes, able to display the R.F. inlet switched by switching block R.F. 21 or/and the regulation, attenuation, amplification or tuning function, or the channel tuned and converted

by block 42. Filters 11 have been represented in block 20, externally to block 21, for clearer understanding of the drawings. In practice, they may be either suitably built into the same R.F. selector block 21 or into block 42, 43, or
5 realized separately and, if necessary, fitted to the R.F. inlets.

- with 42, a module containing some circuits for the switching and processing of the R.F. signals received through inlet 20Y;
- with 42M, 42N, 42O and 42P, the inlets of module 42 to which
10 are referred some analogical or digital circuits, intended for controlling the choice of the oscillation F_0 frequency of the local oscillator of the convertor circuit and/or the tuning frequency of the selective circuits;

- with 42E, the R.F. outlet of module 42 on which one of the
15 various channels, having different frequency and/or standard, present on R.F. inlet 42Y, results as being present, processed and converted into a given frequency and/or standard.

This channel turns out to have been switched through the transmission of a certain voltage to R.F. outlet 20E (figures
20 10 and 11);

- with 43, an R.F. mixing circuit permitting the various channels present on R.F. inlet 43X, coming from R.F. inlet 20X, to be mixed with the channel presented to R.F. inlet 43Y, coming from outlet 42E of module 42, and to be simultaneous-
25 ly transmitted to R.F. outlet 43E.

With reference to figures 12 and 14 are indicated :

- with 11A, 11B and 11E filters having the same features and connections as those shown in figures 4, 7, 10 and 11;
- with 24 the main grounding of device.25;
- 5 - with 25, a device deriving from the combination of known amplification, tuning or attenuation stages 32 and the special power supply and control system 31 and 26;
- with 25A and 25B, the R.F. inlets of device 25 with the possibility of input of the power supply and/or control
10 voltages;
- with 25E, the R.F. outlet of the device also intended to receive power supply and/or control voltages;
- with 26, a distributed capacitance, achieved for example with one or more capacitors;
- 15 - with 27A, 27B, 29A, 29B and 30, mobile switches or jumpers;
- with 28A and 28B, some diodes;
- with 31, a circuit able to supply, between outlets 31V and 31Z a voltage characterized by the fact that it maintains an invariable polarity and an almost constant level,
20 regardless of polarity and level of the voltage applied to inlets 31E and 31H and, furthermore, to supply on outlet 31X a voltage, with respect to outlets 31V or 31Z, at an always constant polarity (same sign), but with different level, dependent on the voltage value applied between
25 inlets 31E and 31H.

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- with 32, a module containing one or more amplification, tuning or attenuation devices, even of known type;
- with 32A and 32B, the radiofrequency inlets of device 32;
- with 32E, the radiofrequency outlet of device 32;
- 5 - with 32H, the grounding plan or main grounding of the circuits of the device contained in block 32;
- with 32V and 32Z the inlets for the power supply, at constant voltage and polarity, of module 32;
- with 32X, the inlet of the voltage for the control of at-
- 10 - tenuation, tuning or amplification of the circuits contained in block 32.

With reference to figure 13 are indicated :

- with A, a rectifier jumper able to supply, between outlets A1 and A2 a voltage always at constant polarity regardless
- 15 of the polarity of the voltage applied between inlets 31E and 31H;
- with B, an ordinary fixed voltage-regulator circuit;
- with C, some capacitors, the capacitance of which is suitable for the current required on the outlets of device B;
- 20 - with R, a trimmer for regulating the entity of the variation of the output voltage from 31X. . Outlets 31V and 31Z may appear to have been interchanged, being mainly dependent on the type of regulator B employed (positive or negative voltage regulator). With reference to figures 15,
- 25 16, 17, 18, 19 and 20 are indicated :

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- with 33, a receiver such as a television;
 - with 34, the socket or radio-television connector situated in the user's dwelling;
 - with 35, an aerial and an external unit for the reception, amplification and first conversion of TV via satellite;
 - 5 - with 35', an inside unit for the subsequent amplification, processing and conversion of the frequencies and/or standard employed for TV transmission via satellite;
 - with 36, a source of radio-frequency signals such as, for example, a telecamera or the like;
 - 10 - with 37, the aerials;
 - with 38, the ordinary TV central units;
 - with 39 and 39A, B, C, O, some ordinary distribution boxes usually employed in TV installations;
 - 15 - with 40, a possible connection wire between outlet 17E of block 20 and 17E of module 25', in the case that the voltage input in the coaxial cables and distribution box is not desirable;
 - with 41 and 41', two coaxial cable 19 separate down-feeds.
- The operation of the system, object of this invention,
- 20 is based on the principle of transmitting on the normal cable 19 and 18, connecting the radio television receiver 33 to the various accessories necessary for switching 20 and reception (aerials, amplifiers, etc), even if situated far from the receiver itself, a direct power supply and/or
- 25 control current, which, suitably varied in polarity and/or voltage, is able to cause the reaction of the switching

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and/or regulation circuits 20 and to power and regulate any modules 25 represented in figure 12. This voltage is transmitted to cable 19 connecting the R.F. inlet of receiver 33 to the various reception units or R.F. sources, by means of
5 a simple object called injector 10, of small overall dimensions and weight.

Said injector, which will be hereinafter mentioned again, is widely described, illustrated and claimed in patent application N° 86114837.7 filed on 24.10.1986 by the same ap-
10 plicants.

The choice of a control system at different direct current levels derives from the fact that this system, besides avoiding any interferences, is also able to operate using any electrical wire for the connection of power supply
15 and control box 1 to switching system 20, even though this wire shows obvious capacitive and inductive characteristics. Using a control system based on impulses, having a rather high recurrence frequency, one could come across distortion phenomenaⁿ of the impulses themselves, due to possible
20 strong inductive^{l.} or capacitive characteristics of the connection wires, with consequent possibility of failure or poor operation of the system, unless sophisticated decoding circuits are adopted. These circuits are not absolutely necessary, using the system at several fixed voltage
25 levels.

The switching system at several fixed voltage levels, moreover, permits one to change from one voltage to another and consequently to carry out the various controls even randomly. In addition, the system has been adopted
5 which sends alternatively on connection cable 19 voltages, that, besides being different in voltage levels, also vary in polarity (positive and negative), due to the following reasons:

A) to permit some rather high voltage steps, such as to guarantee the actuation of the controls sent, to be utilized even
10 in the presence of undesirable voltage drops along connection cables 18 and 19 over long distances. These drops allow safe switching even in the presence of the unavoidable tolerances of the characteristics of the electronic
15 components utilized for the realization of all the electronics of switching system 1, 20 and 25. In such a way, low cost products without any calibration or balancing circuits, and using ordinary components available on the market, may be realized.

20 B) to avoid an excessive power dissipation in the power supply components and various devices.

For a better understanding of this concept, the following example should be considered :

having to accomplish six controls by means of different voltages, but using same polarity voltages and utilizing a
25 large voltage step aimed at ensuring the actuation of the

control sent (for example 5 volts), one is compelled to utilize a voltage, which, starting from a minimum of 16 volts, for example, necessary for powering possible amplifiers or accessories, is increased by 5 volts for each control; in such a way, to obtain 6 controls, a final voltage of 41 volts ($16+5+5+5+5+5$) is achieved. Such a voltage, besides being of rather high and thus comparatively safe electrical potential, causes also a great power dissipation in the various regulation circuits of the power supply, amplification voltage, etc.

By realizing, instead, the system capable of operating with different polarity (positive and negative), the same controls, 6 for example, may be made by utilizing half voltage levels, (as compared to the previous example), since three controls are activated by the three positive voltages and the other three controls are activated by the remaining three negative voltages.

In such a way, by reducing the number of voltage steps, the power dissipation in the various circuits and also the final voltage are reduced. In fact, by maintaining a voltage step of 5 volts for each control and starting from 16 volts as in the previous example, a final voltage of just 26 volts is achieved ($16+5+5$) in as much as the control voltages are the following : +16V, +21V, +26V, -16V, -21V and -26V.

Some examples on how to realize this switching and regulation

system, utilizing the various voltage levels and/or the two polarities, follow :

- A) known remote-controlled switching of two R.F. inlets by means of manually operated controls on control and power supply box 1. This version may be realized in two ways :
5 either by means of voltage polarity reversal on connection cable 19, or by varying the power supply voltage level, for example, from 16V to 24V or vice versa; it may be generated either by means of a special remote-control equipped with
10 the system or an ordinary remote control.
- B) Version (shown in figure 7) for obtaining switching of two R.F. inlets 20A and 20B with possibility of adjusting amplification, attenuation or tuning of the R.F. signals passing through them and directed to received 33 by means of
15 manually operated controls on control box 1. It may be realized in the following manners :
1. using the polarity reversal system for obtaining the switching of the two inlets 20A and 20B in combination with a gradual voltage variation from low to high level,
20 i.e. from 16V to 24V, aimed at obtaining the regulation or variation either in the amplification and attenuation or tuning of the R.F. circuits;
 2. using the polarity reversal system for obtaining the switching of the two R.F. inlets 20A and 20B in combination with a gradual voltage variation from high to
25 low level, for example, from 24V to 16V, aimed at obtaining the regulation of amplification, attenuation

or tuning.

3. using voltages having same polarity but different voltage levels,
i.e. a voltage step to carry out the switching of the two
R.F. inlets and an additional increase in the same voltage within
5 two fixed values to obtain regulation.

C) Version represented in figure 4 for obtaining the switch-
ing of four R.F. inlets 20A, 20B, 20C and 20D by means of
manually operated control on the power supply or control
box 1, which may be realized, for example :

- 10 1. By using two different levels of voltages in combination
with polarity reversal ;
2. By using four different levels of voltages, having
same polarity.

D) Version to obtain the switching of four R.F. inlets with
15 possibility of regulating either amplification, attenua-
tion or tuning of the R.F. signals passing through them
and directed to receiver 33, by means of manually operated
control on power supply and control box 1, which may be
realized, for example, in the following manners:

- 20 1. Switching of the various R.F. inlets by means of po-
larity reversal and a voltage step (5 volts, for example)
and continuous or sequenced regulation of either ampli-
fication, tuning or attenuation by means of an additio-
nal, gradual, increasing voltage variation, for example,
25 from 21 to 26 Volts;

2. Switching by means of polarity reversal and a large voltage step (for example, from 16V to 26V), and gradual regulation of either amplification, attenuation or tuning of the R.F. signals, by means of a gradual decrease in the maximum voltage to an intermediate voltage, for example, from 26V to 21V;
3. Switching by means of polarity reversal and a voltage step, for example, from 21 V to 26V, and gradual regulation by gradually decreasing the initial voltage, for example, from 21V to 16V.
- E) Version shown in figure 10, utilizing the various levels and/or the two voltage polarities in order to obtain the switching or regulation of a frequency convertor circuit, so as to obtain, in turn, the conversion of an outlet frequency or fixed channel, of a frequency or channel chosen amongst the various ones simultaneously presented to the inlet of a frequency convertor circuit.
- F) Version represented in figure 11, as previous version E) with the combined possibility of carrying out the selecting or switching of the R.F. signals deriving from the outlet of the conversion circuits or of the R.F. signals deriving from other R.F. sources such as aerials or other reception systems.
- G) Versions like the previous ones, the switching and/or regulation of which may be accomplished by means of a special remote control 9, equipped with the various parts of the system, having one or more push buttons enabling the various controls.

H) Versions like some previous ones; the only difference lies in the fact that the switching and/or regulation is feasible by means of a remote control 9 of any type (already equipped with receivers 33), provided that it uses a signals transmission system similar to the reception one of the receiving circuit of block 8 of box 1 such as, for example, the infrared rays. In these versions the switching and/or regulation are feasible in a sequential manner in as much as there is no possibility, by power supply box 1, of decoding the various signals received by the various remote controls 9 equipped with the receivers 33 available on the market, and their functioning is based on the reception or non-reception of the impulse signals transmitted by remote control 9, received during a given lapse of time, for example, from 2 to 5 seconds, after which the power supply box performs the various control operations sequentially.

With reference to the appended figures, control or power supply box 1 is powered on 1A by the line voltage (for example, 220 V), and supplies a direct current on outlet 1B. This voltage may be varied in voltage and/or polarity either by means of controls sent by remote control 9 or by means of a switch panel and/or one or two multiple positions potentiometers or switches. The switch panel, one or two potentiometers and/or switches are available in the versions

29.

with hybrid or manual control only, i.e. without remote control 9 on box 1 and are included in block 7 utilizing the preferable solution with control box 1 separated from injector 10, (figures 15 - 18 - 20).

- 5 The output voltage of outlet 1B is sent, by means of any twin or bipolar wire 18, to injector 10. Injector 10, receiving the voltage switched by box 1 on inlet 17, transmits it, through connection 12, onto interconnection cable 19 normally used for normal radiofrequency transmission to radio
- 10 television receivers.

Cable 19 appears as being connected to outlet 20E of switching unit or block 20 by possibly inserting an amplification, attenuation or tuning module 25. Block 20, containing

- 15 electronic circuits 22 able to recognize the various voltage levels and/or the polarity of the voltage sent, permits one to control switching of the various R.F. inlets of a suitable electronic or electromechanical radio-frequency switch and/or to perform switching of the
- 20 frequency of an oscillator and of the tuned circuits of an R.F. conversion unit. The circuits contained in block 22 permit, furthermore, the control of the amplification, attenuation or tuning circuits, which are either built-in or coupled to the R.F. switch.

- 25 The operation of the single parts comprising the system,

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object of this invention is hereunder described in detail and with specific reference.

Figure 2 shows the block diagram of a preferred but not limitative embodiment of the system control and power supply box 1.

5 It works in the following manner :

The power supply and control box 1 is powered by the normal line voltage (220V, for example) through inlet 1A, and inlet 3A of block 3 is powered by means of block 2 containing the on-switch and protection devices.

10 Block 3 insulates the remaining electronic part of the system from the line voltage and supplies to inlet 4A of block 4 a low level voltage.

Block 4 converts from alternate into direct (A.C. - D.C.) the voltage received from 4A and then, by means of stabilizing circuits (known type) supplies a voltage on outlet 4B and then 1B. This voltage presents different level characteristics depending on the controls received on inlets 4D or 4E through module 7.

Module 4, moreover, by receiving a control on inlet 4C, permits the polarity of the output voltage of 1B to be inverted. In addition, the convertor and stabilizer module 4 supplies to inlets 7A and 8A of the respective modules 7 and 8 a basic voltage for the operation of the respective electronic circuits.

25 Block 4 or block 7, depending on the various constructive

characteristics, supplies to inlet 5A or 5B of block 5 containing a common display, the operating voltage(s) so as to make the display indicate what R.F. inlet of block 20 has been controlled and switched or what channel converted by module 42, and/or the level of the regulation carried out (from a minimum to a maximum). At the same time, module 4 provides also to inlet 6A of module 6, containing some luminous indicators, the data relative to the normal operation, overload, or short circuit conditions, of power supply and control box 1, so as to enable the operator to identify immediately a possible situation of apparatus in working, but in overload or short-circuit conditions, independently of what is displayed by the indicators or displays intended for displaying the other functions.

15 The display of the R.F. inlet selected or channel converted is provided on the front side of power supply box 1 by means of either a first section of an alphanumeric or numeric display, or at a lower cost, by means of luminous indicators, such as, for example, led diodes or bulbs, in one of the

20 following manners :

A) by means of a series of luminous indicators "ON", corresponding to the number of the inlet selected, for example : first inlet selected, one indicator on, second inlet selected, two indicators on, third inlet, three indicators on and so on.

25 B) by means of one or two indicators of a certain colour ON,

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to indicate, respectively, the selection of the first and second R.F. inlet, and subsequent OFF condition of the previous luminous indicators and ON condition of one or two luminous indicators of different colour from the former, to indicate respectively the selection of the third and fourth R.F. inlet. The latter two functions may be, for example, accomplished by means of just two bi-colour leds (red-green).

C) by means of separate switching on of luminous indicators of different colours, more specifically, by means of switching on of a luminous indicator of a certain colour to indicate the selection of the first inlet, the switching off of the previous indicator and switching on of another indicator of different colour, to indicate the selection of the second inlet and so on.

In the same way, the display on the control or power supply box 1, of the variation from minimum to maximum of amplification, tuning or attenuation is provided by means of a second section of the numeric or alphanumeric display, for example, by using symbols varying from 0 to 9, or, at a lower cost, by varying the degree of luminosity of a luminous indicator or by the numerical and proportional ON and Off condition of a given number of indicators, or, more simply, in the manually operated or hybrid versions, by means of inner or outer grading on the knob of the two potentiometers or switches intended for controlling the variation. The

33.

normal, overload or short-circuit operating conditions are signalled by the ON or OFF conditions of a luminous indicator on box 1.

The activation of the smoothing and/or inverter circuits in module 4 of power supply and control box 1 is accomplished, depending on the various constructive versions of box 1, in one of the following manners :

1. by transmitting to module 8 the coded signals from a certain type of remote control 9;
- 10 2. by controlling one or more switches or electromechanical controls, situated on power supply and control box 1, in combination with the remote-control system as per point 1 in the hybrid constructive versions.
3. by transmitting to module 8 any type of signals belonging to the same group, for example, infrared, deriving from
15 any remote control 9.
4. by controlling one or more switches or electromechanical controls situated on power supply and control box 1, in combination with the remote control system as per point 3
20 in the hybrid constructive versions.
5. by manually controlling or activating one or more electromechanical contacts situated on the power supply and control box 1.

In the versions with coded remote control 9 equipped with
25 the system, as indicated under previous point 1, by sending

34.

coded impulses or controls pressing the switches on remote control 9, said impulses or controls are received by inlet 8B and, by means of known circuits contained in block 8, are transmitted to inlet 7B of module 7. Module 7, containing
5 decoding and activation circuits, processes the signals received and, depending on the signal type or code, controls inlets 4C, 4D and/or 4E, thereby obtaining on outlet 1B of power supply or control box 1, voltages at different polarity (positive or negative) depending on the control sent to inlet
10 4C, or voltages at different levels, according to the controls sent to inlets 4D and/or 4E. These controls may be digital (ON-OFF) or analogical and proportional to the output voltage. In the construction versions operating with any type of remote control 9, usually provided with receivers 33, compatible
15 with the reception system of block 8 of power supply and control box 1, an infrared remote control, for example, block 7 is realized by means of an impulse or control detector circuit, coupled to a timed integrating circuit. The operation of control and power supply box 1 consists in
20 sending impulses or signals, by means of a common remote-control 9, to inlet 8B of block 8; these signals or impulses, once pre-amplified by block 8, reach inlet 7A of block 7. Block 7, containing detection, integration and timing circuits, analyzes the time it takes to receive the impulses
25 or signals in a continuous manner and thus, if the signals

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have been received for a comparatively long period of time, for example, two to five seconds, module 7 starts controlling the various inlets - 4C, 4D and/or 4E - of module 4, sequentially and at a prefixed recurrence rate, so as to obtain
5 on outlet 1B of power supply and control box 1, voltages at different polarity and level, such as in the other construction versions.

The sequential switching of the various output voltages of 1B is therefore obtainable by means of constant transmission
10 of impulses through remote control 9, after a set period of time, for example, two to five seconds, during which said impulses are constantly sent.

In such a way, control 1 is obtainable by pressing and keeping pressed any switch or remote control 9 provided
15 with receivers 33; after the set time (2 to 5 seconds), the circuits contained in the control box will start the switching and/or regulation sequence ; this sequence will be stopped by releasing the switch which has been kept constantly pressed.

20 In a second construction version similar to the former, the remote control of box 1 is obtainable by constantly pressing any switch of remote-control 9 for a set period of time, for example, two to five seconds, in order to obtain a first switching or regulation ; then, to continue in the
25 sequence, it is just necessary to release for a moment the

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pressed switch, then repressing it, in order to obtain a subsequent switching or regulation and so on.

The initial time necessary to cause the reaction of the circuits of module 7, during which impluses by means of remote control 9 are to be continually sent, is adjustable, for example, by means of an accessible trimmer, fitted into the control box 1, so as to permit the intervention of the circuits contained in module 7 after a shorter or longer time, as compared to the example given, in order to adapt the sensitivity or response of the circuits of module 7 to the various wave and/or frequency forms provided by the various types of remote-control devices available on the market, and to adjust operation of box 1 so as to avoid its reaction during normal use of the same remote control 9, to accomplish the normal control functions of receiver 33, such as, for example, the change in channels.

These normal function usually require a much shorter control time and consequently transmission of the signals by the remote control lasts for a very short time.

For example, by briefly pressing a certain switch on remote control 9, designed to perform the change of channel or tuned frequency, receiver 33 will be normally switched to the desired channel or frequency and the power supply and control box 1, designed for these construction versions, will not react, whereas, by pressing for a longer period

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and for the set time the same switch, receiver 33 will remain tuned onto the same frequency or channel, but the same control and power supply box 1 will start its switching and regulation functions, as previously described.

- 5 In the versions providing for the manually operated control directly from power supply and control box 1, blocks 9 and 8 are eliminated and block 7 consists of mechanically operated electric controls, for example, of a switch panel or the like, which, once activated, send controls to inlets 4C and/or 4D
- 10 and furthermore by one or two switches or potentiometers, which, if activated, control inlet 4E. By adopting a switch or potentiometer to control inlet 4E, it is possible to obtain the variation of the 1B output voltage gradually within two values, for example, from 21 volts to 26 volts.
- 15 By adopting two potentiometers or two switches to control inlet 4E, it is possible to set two regulation levels, one for the positive voltages and one for the negative voltages, in as much as each potentiometer is activated in a circuit automatically and only in function of a given polarity.
- 20 This enables, for example, the differentiated set-out of amplification, attenuation or tuning of the R.F. signals, depending on the R.F. inlets of R.F. switch 21, enabled by different polarity voltages and using a single R.F. circuit (for example, module 25) having variable characteristics,
- 25 as hereinafter described.

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In any case, the voltage variation obtained in one of the two manners, may be utilized to remote-control the regulation of amplification, attenuation or tuning of the system, described in this invention, as provided for by the realizations with remote control 9. Using a switch panel or the like, to control inlets 4C and/or 4D, a high pulse variation (5 to 8 volts) of the 1B output voltage, combined with the possibility of reversing the polarity of the same voltage, are obtained. In such a way the various obtainable voltages may be utilized to carry out the various switchings. In the hybrid versions, i.e., in all those construction versions where box 1 may be controlled by means of a coded or common type remote control 9 or even directly by one or more electro mechanical controls on box 1, its operation is obtainable by combining the operation criteria of the manual versions.

In some hybrid construction versions, the controls or electromechanical components (switch panel, etc), present on power supply and control box 1 will directly activate the same decoding and actuation circuits, or the detection, integration, timing and actuation circuits present in block 7 in the respective versions with coded or common type remote-control 9, by-passing module 8 and thereby realizing a power supply and control box 1 which may be fully controlled by both remote control 9 or by one or more electromechanical contacts situated on box 1 itself.

In other hybrid versions, some functions of control and power supply box 1 may be accomplished by means of one or more switches on remote control 9 or, alternatively, by means of one or more electromechanical contacts or components situated on

5 box 1 qualified to obtain the same functions ; whereas, one or more functions of box 1, different from the former, may only be activated by means of one or more electromechanical contacts or components especially dedicated to this purpose and placed exclusively on power supply and control box 1.

10 In these construction versions, therefore, it will be possible to make power supply and control box 1 carry out one or more functions, by means of either remote control 9 or by one or more electromechanical contacts or components situated on box 1 itself, and to accomplish other functions
15 by means of just the electromechanical contacts or components situated on control and power supply box 1.

This proves to be useful in those cases providing for certain functions to be carried out frequently by means of either remote control or electrochemical contacts or components situated on box 1, combined to another or other
20 special functions which must be carried out infrequently and only by means of the respective electromechanical contacts or components on box 1.

The functions carried out infrequently may be, for example,
25 the amplification, attenuation or tuning regulation, etc.

It should be specified that by electromechanical contact or component one means any known device, suitable for generating a certain electrical contact by means of manual operation or pressure, such as : a push button or push-button panel, a key or keyboard, a switch, a potentiometer and so on.

With reference, in general, to the various construction versions of control and power supply box 1, the 1B output voltage may thus be varied by : large steps in voltage levels, for example, by some volts such as : +12V, +16V, +26V, -16V, -21V, -26V, or with random sequence +16V, -21V, +26V, -16V, etc. and be utilized to obtain the various switchings or regulations, or may be sent with large steps in voltage levels and be used for the various switchings and also varied gradually or with small steps in voltage level and be utilized to carry out the regulation of the amplification, attenuation or tuning of the system. Figure 4 shows the block diagram of a preferred but not limitative realization of a complete switching block 20, having four R.F. inlets, 20A, 20B, 20C and 20D switchable by means of an R.F. switch.

With reference to the diagrams of figures 5 and 6, the operation of what is represented in figure 4 is as follows: by supplying outlet 20E with a direct current, with voltage A included within the A_1 and B_1 voltage, the same, once

passed through filter 11E, appears as being present on outlet 17E of the same filter connected to inlet 22E of block 22, containing the identification and switching circuits.

The voltage may also be possibly sent, through the same outlet 11E, to inlet 21G of R.F. switch 21, should, for example, an R.F. switch requiring a main power supply or polarization, be employed.

Block 22 identifies voltage A included within voltage limits A_1 and B_1 , and, through the outlet(s) connected to inlets 21M, 21N, 21O, 21P of switching block R.F. 21, makes the same R.F. 21 switch react, permitting only the R.F. signals present on R.F. inlet 21A to pass through outlet 21E, thus to reach outlet 20E, after meeting filter 11E.

Block 22, furthermore, permits voltage A within A_1 and B_1 to reach only outlet 22A.

Block 22, causes the luminous indicators present in block 23 to react simultaneously, so as to display that inlet 20A of block 20 has been selected.

By connecting, as previously seen, through a switch or jumper, inlet 22B of filter 11B to outlet 22B, it is possible to transmit voltage B, included within the respective voltage limits, to inlet 20B, so as to power supply a possible accessory device fitted to inlet 20B only when inlet 20B has been selected.

Likewise, by transmitting a voltage C included within C_1 and

D_1 of figures 5 and 6, the R.F. signals present on inlet 20C will be enabled to pass through outlet 20E and it will be possible to power a possible accessory or amplifier 25 fitted to inlet 20C, by connecting inlet 17C to outlet 22C by means of a jumper or switch (not indicated in the figure); the luminous indicators contained in module 23 will visually show that R.F. inlet 20C has been selected. Obviously, by sending a voltage D included within D_1 and M_1 of figures 5 and 6, the same operation, with regard to inlet 20D, will be obtained.

It should be noted that, for example, connecting inlet 17A of filter 11A to outlet 17E, it is possible to control block 20 by sending voltages A, B, C and D included in the respective limits, through R.F. inlet 20A. This applies also with regard to the other R.F. inlets, by utilizing the respective inlets 17 of filters 11.

By powering always through outlet 20E with the various voltages, it is also possible to send said voltages to inlets 20A, 20B, 20C and 20D permanently, thus independently of the R.F. inlet selected and this may be accomplished by simply connecting one or more inlets 17A, 17B, 17C and 17D of the respective filters to outlet 17E by means of the already mentioned jumper or switch.

Figure 4 represents a four RF inlet version of module 20, in any case, by increasing or decreasing the different voltages to be sent for the control, it is possible to realize

modules 20 with more or fewer switchable R.F. inlets, having the same characteristics. In particular, by using the polarity reversal system, it is possible to increase or decrease by two R.F. inlets module 20 for each voltage of
5 different level added or removed.

Figure 7 shows the block diagram of a preferred but not limitative realization of a switching block 20 having two R.F. inlets 20A and 20B, switchable by means of an R.F. switch 21 and with the regulation possibility of either
10 attenuation, tuning or amplification of the R.F. signals selected by the two R.F. inlets 20A and 20B.

The operation, by using several voltages at different polarities, may be the following : with reference to the diagram in figure 8, by sending from outlet 20E of block 20
15 a positive direct current A included within A_1 and A_2 limits, voltage A, once passed through filter 11E and after possibly powering R.F. switch 21 through inlet 21G, appears as being applied to inlet 22E of block 22 containing the identification, switching and regulation circuits.

20 Block 22 identifies voltage A as being positive and included within the respective voltage range A_1 and A_2 of figure 8 and, through the outlets connected to inlets 21M and/or 21N of R.F. switch 21, makes the same R.F. switch 21 react, permitting only the R.F. signals present on inlet 20A to pass
25 through outlet 20E.

Block 22, furthermore, permits voltage A, included within the respective limits, to reach only outlet 22A. Same block 22 makes simultaneously the luminous indicators in block 23 react, thus visually showing that R.F. inlet 20A of block 20 has been switched.

By connecting with a jumper or switch (not indicated in figure) the voltage input 17A to output 22A or 17E, there is the possibility of powering and operating a possible accessory fitted to R.F. inlet 20A or accomplishing selection and regulation controls by sending the same voltages through same inlet 20A, as described in greater detail with regard to operation of block 20 represented in figure 4.

By sending an always positive voltage to 20E, but exceeding the A_2 limit of figure 8, module 22 maintains R.F. inlet 20A switched and starts sending signals or voltages, through outlets 22R and/or 22S, to R.F. switch 21.

R.F. switching block 21, through the connected tuning, amplification or attenuation circuits, based on the signals or voltages received on inlets 21R and/or 21S, performs the regulation of the tuning, amplification or attenuation of the R.F. signals passing through inlet 20A to outlet 20E and vice versa. The minimum (0 dB for example) and maximum (30 dB for example) value of either amplification or attenuation of the R.F. signals is determined by the characteristics of the R.F. circuits employed to obtain such a regulation

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and by the voltage variation included within A2 and A3, sent to module 22. It stands to reason that in such a way it is possible to regulate either tuning, amplification or attenuation of the R.F. signals within a minimum and a maximum, by simply varying the level of switching voltage A, for example, from level A2 to level A3 or vice versa (figure 8).

Visually, the regulation is shown by the luminous indicators contained in block 23, which appear as being controlled by module 22.

Likewise, by sending a negative voltage B, included within B1 and B2 levels (figure 8) to inlet 22E of module 22, the R.F. signals present on R.F. inlet 20B are enabled to pass and, by sending a still negative, but higher than B voltage, included within B2 and B3 range, one obtains the regulation of either tuning, amplification or attenuation of the R.F. signals passing through inlet 20B, as more expressly indicated with regard to operation of inlet 20A. The luminous indicators contained in block 23 visually show the functions carried out.

The operation of same block 20, as per figure 7 but with a series of voltages with same polarity, is similar to the operation with voltages having different polarities. In fact, with reference to the diagram of figure 9, block 20 containing identification, switching, R.F. selection and

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display circuits, operates in the following manner :

- by sending a positive A voltage, included within A1 and B1 range, block 20 enables R.F. signals to pass through inlet 20A;
 - 5 - by sending a positive B voltage, with voltage level higher than A, and included within B1 and B2 voltage range, block 20 enables the R.F. signals to pass through inlet 20B.
 - by sending a voltage higher than B and included within B2 and B3 voltage range, the regulation of tuning, amplification, or attenuation of the R.F. signals is obtained.
- 10

Figure 10 and 11 represent the block diagrams of two preferred but not limited embodiments of a complete switching block 20 which may only be used for the reception of radio-television transmissions via satellite or otherwise combined with the reception of normal radiotelevision earth transmissions.

15

The main difference between the two represented figures lies in the fact that in figure 10, the group of signals or frequencies coming from the normal systems for the reception of earth signals, applied to inlet 20X, is mixed by means of a mixing circuit 43 with the channel deriving from block 42, selected and processed by same block 42 amongst the various channels or frequencies received by the aerial of the external unit 35 and applied to inlet 20Y and consequently to 42Y of block 42, whereas in figure 11 the group

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of frequencies or channels coming from the normal systems for the reception of earth signals and applied to inlet 20X, is selected by an R.F. switching circuit 21, unless the various channels or frequencies are selected by the operator
5 from the satellite by means of control (s) operated on power supply and control box 1, or by adopting the relative remote control 9, depending on the construction model chosen.

By eliminating circuits 21 and 43 in the respective versions and inlet 20X, components permitting the mixed or switched
10 earth channels to be inserted on the same R.F. down-cable 19, the two versions are equivalent and operate in the same manner. Possible groups of channels or earth channels may be inserted by means of additional external mixers, applied to outlet 20E.

15 The general operation of the two versions of block 20 represented in figure 10 and 11 is similar to that described regarding figures 4 and 7. In detail, with reference to figures 10 and 20, operation is as follows :

By sending a voltage at a certain voltage level and/or polarity
20 ty , to R.F. outlet 20E, the same, having reached inlet 22E of block 22, is identified by the circuits contained in block 22.

Therefore, block 22 transmits to one or more inlets 42M, 42N, 42O and 42P of block 42 a control which makes block 42
25 react. Block 42 comprises the amplification, conversion and

48.

processing circuits of the frequencies and/or standard of the channels transmitted via satellite and received on R.F. inlet 42Y, through R.F. inlet 22Y, already amplified and converted into an intermediate band, for example, from 850 MHz to 1750 MHz, by external unit 35.

Block 42, following the control(s) received on one or more inlets 42M, 42N, 42O and 42P, tunes in a certain channel amongst those sent, as above mentioned, by external unit 35 on inlet 42Y and converts it into a prefixed channel having the same frequencies and transmission standards as one of the several channels comprised in the normal transmission frequencies band of the earth channels, sending it to outlet 42E. The channel thus obtained, having the same transmission standard as that currently used for earth transmissions, and frequencies included in one of the free channels for the radio-television signals reception, for example, from 40 MHz to 860 MHz, is mixed by means of block 43 with the signals or channels deriving from a normal system for the reception of signals transmitted from the earth and applied to inlet 20X.

The signals thus mixed are sent to outlet 20E of module 20 and then, along connection cable 19 and injector 10, to receiver 33. By sending a voltage having a different voltage level, not included within the limits assigned to the previous voltage and/or different polarity, through same outlet 20E, the circuits contained in block 22 identify such a vol-

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tage and send to one or more inlets 42M, 42N, 42O and 42P a different analogical or digital control.

The circuits which inlets 42M, 42N, 42O and 42P refer to, such as, for example, frequency synthesizers of "PHASE LOCKED

5 LOOP" type and some circuits suitable to control the tuning of the various R.F. selective circuits, vary respectively the F_0 oscillation frequency of the frequency converter circuit and the tuning frequency of the tuned circuits contained in block 42, thereby obtaining the conversion of another channel

10 transmitted via satellite into the same outlet channel and standard as used for the reception of the previous channel via satellite. Likewise, by sending to block 20 other voltages having different polarity and/or voltage level, the selective circuits and the local oscillator of the conver-
15 sion circuits, by means of the relative control circuits, will be tuned, in turn, for the reception of the various channels present on inlet 20Y.

It stands to reason that the number of the via satellite channels which may be received using this system, is con-
20 sequently dependent on the number of voltages sent to outlet 20E, which may be identified by the circuits included in block 22.

As far as the version represented in figure 11 is concerned, the functioning, with regard to the reception and selection
25 of the channels via satellite is the same as described for

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figure 10. The only difference lies in the presence of a R.F. switching circuit 21 in place of the mixing circuit 43. This version permits one to select and send to outlet 20E, and consequently to receiver 33, only the channel(s) received by 5 conventional earth reception systems, present on R.F. inlet 20X, or just one of the channels present on R.F. inlet 20Y, received by the satellite and processed by the circuits included in block 42.

In this way, it is possible to avoid any mutual interference 10 between the channel selected and received via satellite and the group of channels applied to inlet 20X, should any technical reception incompatibility exist for receiver 33, such as, for example : adjacent channel with high intensity or channel on the same frequencies or with known 15 frequencies such as "image" frequencies.

The switching of R.F. switch 21 or R.F. circuits of the switch is accomplished by applying a control or power supply to inlet 21M or 21N, supplied by the identification and ac- 20 tuation circuits contained in block 22 whenever a particular voltage, included within a specific voltage range, is applied to or removed from power supply or control box 1.

In figure 11 is represented, to simplify matters, a block 20 with just one inlet 20X for earth channels; however, nothing prevents one from increasing these inlets using a 25 suitable selector 21. With reference to both versions re-

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presented in figure 10 and 11, the number of inlets 42M, N, O, P of block 42 receiving the controls supplied by module 22, is dependent on the number of channels or programs which are intended to be selected or converted by the R.F. conversion and processing module 42 and also on the type of system, whether decimal or binary adopted as interface between module 42 and module 22. Furthermore, on outlet 22X or 22Y, as previously mentioned regarding symbols of figure 10 and 11, voltage is only present when module 22 enables the corresponding inlet 20X and 20Y. Therefore, by connecting to inlet 17X, outlet 22X and/or to inlet 17Y outlet 22Y, it is possible to power the accessories placed upstream of the respective inlets 20X and 20Y only when the inlet in question is enabled. The same outlets 22X and 22Y may also be utilized to power module 21 and module 22 respectively, should one wish, for example, that during selection of inlet 20X and consequently functioning of the circuits coupled to inlet 20X, module 42 is not powered and that during selection of inlet 20Y and consequent functioning of the circuits coupled to same, the circuits contained in block 21 are not powered. Obviously, by connecting the two outlets 22X and 22Y, thereby obtaining a single outlet 22X-Y, a voltage will always be present on the same outlet 22X-Y, regardless of the inlet enabled. Under this condition, too, by connecting outlet 17E to an inlet 17X or 17Y, it is possible to power and control block 20 from the corresponding inlet 20X or 20Y.

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In this version, the luminous indicators contained in block 23 indicate which channel via satellite is selected and processed by block 42 and, in the version of figure 11, which inlet is also selected.

5 The possible power supply circuits of the various blocks 21, 22, 23, 42 and 43 contained in block 20 have not been represented in the various figures 4, 7, 10 and 11, since they essentially depend on the various active components utilized ; in particular, when utilizing active
10 ordinary components which require, in order to work properly, a voltage at fixed polarity and/or voltage levels, the power supply and control criteria in one of the two embodiment versions, as represented and described with ref. to figures 12 and 14 may be adopted.

15 The various functions or various circuits contained in the respective blocks and represented in the various figures as inside block 20, may also be realized either in separate containers connected to each other by means of cables, plugs, jumpers and so on, or may be inte-
20 grated in one or more adjacent blocks ; for example, filters 11 may also be realized in separate containers and linked to the remainder by means of pipes or plugs, otherwise they may be realized inside the various blocks 21, 42 or 43.

25 Therefore, block 20 may be considered as the box or

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casing containing the various circuits represented by the various blocks, some of which intended for carrying out the selection, switching and/or regulation of the various R.F. signals applied thereto, whereas others are meant to carry out powering, switching and/or regulation of possible accessories coupled externally to one or more R.F. inlets whereas others are used for the visual indication of the various functions accomplished.

All the above mentioned circuits accomplish their functions by transmitting direct currents or different voltage and/or polarity to the same block 20 by means of the same connection cable 19 usually used for carrying the R.F. signals to receivers or users 33. Said module 20 may therefore be considered as a casing or box when all functions and/or circuits enabling them to be obtained are realized within it ; whereas it may be considered as an ideal situation for various modules or circuits, should one or more functions and consequently circuits be realized in a series of separate modules which may be combined together.

Inside block 20, regarded as a separate part, which, combined with the other essential parts, constitutes the system referred to in the present invention, consisting of a box 1, an injector 10, a block 20 and one or more modules 25, it is also possible to incorporate

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any circuits with amplification, tuning or attenuation functions, having one or more functions like those described with regard to module 25, thereby realizing a single device with the characteristics of both modules
5 20 and 25.

The above explanations cover only some of the possible examples of operation, in as much as the various voltage levels, polarity and voltage ranges may be employed in various manners to control the switchings or regula-
10 tions. To do this, it is sufficient that module 22 be realized in such a way as to be able to identify and utilize differently these voltages and/or voltage ranges with the result that its functioning varies according to the various voltage steps and/or ranges.
15 In any case, block 22 will be realized on the basis of the specific requirements of the type of R.F. switch or R.F. convertor employed.

Figure 12 represents the block diagram of a special module 25 comprising power supply and control circuits
20 31 combined with radio-frequency signal processing circuits 32, such as, for example, R.F. amplifier, convertor or attenuator circuits, of wide-band or channel, at fixed or variable amplification or attenuation, possibly combined to variable R.F. tuning electronic cir-
25 circuits.

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Power supply and control circuits 31, combined with the distributed capacitance 26, which may be realized, for example, either by means of one or more discrete or printed components such as the BY-PASS capacitors, or
5 utilizing the capacitive effect of a printed circuit, enable any common known R.F. amplification, attenuation or tuning circuits, operating under certain power supply and included in block 32, to function regularly and to maintain unvaried their characteristics of amplifica-
10 tion, attenuation or tuning, powering module 25 with voltages at different levels and/or polarities.

If one chooses, the same circuits 31 and the distributed capacitance 26 enable the R.F. circuits contained in block 32 to be operated and, at the same time, the
15 amplification, attenuation or tuning parameters of the respective circuits, which may be realized in block 32, to be varied. This may be obtained as a result of the variation, within a certain range, of the voltage sent by box 1, regardless of the polarity assumed by the vol-
20 tage and without producing any evidence of reduction of the maximum output voltage of the R.F. signals passing through the R.F. circuits contained in block 32, which may be received undistorted from R.F. outlet 32E. To achieve this result the normal power supply voltage re-
25 quired by the R.F. amplification circuits is not re-

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duced, but the regulation of the radio-frequency is accomplished by appropriate circuits enabled for this function, contained in block 32.

Said maximum R.F. output level, characterizing the various active components utilized to realize the circuits contained in block 32, appears as being practically constant both under operating conditions of circuits 32 as R.F. circuits and fixed processing (switch or jumper 30 open or R of figure 30 set to a minimum voltage within 31X and 31Z) or under operating conditions of R.F. circuits 32 with parameters of amplification, tuning or attenuation, which may vary from a minimum to a maximum (switch or jumper 30 closed and R of figure 13 set to a maximum voltage within 31X and 31Z).

This characteristic is of essential importance, should one have to deal with many R.F. signals at high and different intensity, or presenting frequent fading, depending on ambient conditions.

Module 25 thus realized presents the characteristic of being capable of operating and maintaining practically constant the amplification or attenuation parameters desired, under a very wide power supply voltage range, with both positive and negative polarity, with respect to main ground 24 of device 25, referring to the wiring diagram of figure 12, or with respect to shield S of the

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R.F. inlet or outlet, referring to the wiring diagram of device 25 of figure 14. Moreover, it is possible to obtain the regulation of the attenuation, amplification or tuning of module 25 by means of the variation in level of the power supply voltage applied, by connecting outlet 31X to inlet 32X by means of a switch or a jumper 30, or if this connection is permanent, by adjusting the TRIMMER R represented in figure 13.

Module 25 may be realized by means of known amplification and/or conversion, attenuation or tuning circuits 32, in various versions at one or more R.F. inlets 25A and 25B. Such modules 25 may be realized so as to accomplish various operative functions, by simply changing or modifying the R.F. circuits contained in block 32, or may also be realized in the adjustable and/or non-adjustable versions.

This module 25 may be fitted and powered and if necessary controlled :

- a. on the R.F. inlets of the switching units 20;
- 20 b. between outlet 20E of switching unit 20 and injector 10;
- c. in other points of an installation for the distribution of the R.F. signals, under the same power supply as for the system, figure 18.
- 25 d. in series to other modules 25, having same or different functions, to obtain, for example, greater

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- amplification, tuning or attenuation, whether fixed or adjustable. Using more than one module 25 in series, it is possible to power simultaneously all modules 25 connected and control the variation of the amplification, attenuation or tuning characteristics of one or all modules 25 connected, by simply connecting outlet 31X to inlet 32X of the respective modules concerned, or, by suitably adjusting TRIMMER R, the remaining ones will operate at fixed characteristics;
- 10 e. in combination with other known systems or central units as amplifiers operating on various power supplies, with positive or negative polarity without undergoing any modification.

It is possible, by adopting this particular module 25, to solve many cases requiring either a fixed or adjustable amplification, or an adjustable attenuation or tuning of the R.F. signals present in a certain point of the reception and/or distribution installation, by using, to power and/or remote control module 25, the same voltages as for the switching system, whether these voltages are positive or negative with respect to main grounding 24 - adopting the circuit of figure 12 - or whether these voltages are positive or negative with respect to the shield S of the R..F. coaxial inlet or outlet utilized to power module 25 - adopting

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the circuit of figure 14 ; in particular, it permits one to regulate directly from box 1, by means of either one or two potentiometers or switches situated on box 1 or remote control 9, the degree of amplification, attenuation or tuning desired.

This considerably simplifies the adjustment operation of the installation ; in fact, considering that the adjustment may be accomplished directly from box 1, situated in the vicinity of the radio-television apparatus 33, the adjustment operation of the installation proves to be extremely easy since it does not involve any manual operation on the amplification, attenuation or tuning devices placed near the receiving aerials, and consequently in awkward places.

Furthermore, the regulation may be simply reset at any time and the result obtained immediately verified by means of the radio-television apparatus 33 placed nearby.

With reference to the diagram of figure 8, the general operation of module 25, realized in the variable amplification version, may be the following :

by powering module 25 with a voltage included in A1 to A2 or B12 to B2 voltage ranges, R.F. circuits 32 present in module 25 allow the maximum R.F. amplification to be obtained.

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By exceeding the limit voltage level A2 or B2 and gradually raising the voltage level to A3 or B3 the gradual reduction of amplification, for example, from +20dB to -10 dB, may be obtained without, however, noticeably reducing the maximum R.F. voltage which may be obtained on the R.F. outlet of amplifier circuits 32.

It is of course possible to realize a module 25 which acts on the contrary to the previous example, and precisely - to maintain the maximum amplification with the voltage range A2 and A3 and/or B2 and B3 and carry out the gradual reduction of amplification, for example, from + 20 dB to -10 dB within voltage range A1 to A2 and/or B1 to B2 with the same performances.

Obviously, for compatibility purposes an operation similar to that adopted for the regulation of switching unit 20, will be chosen. The principle of operation as electronic variable attenuator module or variable tuning module is identical to that of the variable amplification module. The only difference lies in the presence of R.F. circuits 32, suitable for the relative purposes. In greater detail, in module 25 of figure 12, by applying any positive or negative voltage, for example, included within the 16V to 35V range, through, for example, the main contact of R.F. outlet 25E and the

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external contact of the same outlet 25E, the voltage, after reaching filter 11E, is sent, through outlet 17E of the same filter, to inlet 31E and 31H of block 31. Block 31, by means of its internal circuits, (figure 13) after modifying the polarity, takes care of regulating the voltage received from inlets 31E and 31H to a pre fixed value and transmits this voltage to outlets 31V and 31Z at constant polarity and fixed voltage level, regardless of the voltage level and polarity of the voltage received on inlets 31E and 31H.

Outlets 31V and 31Z are respectively connected to inlets 32V and 32Z utilized for the power supply of R.F. circuits 32.

Module 32 is thereby powered on a constant basis by means of a voltage of suitable value and single polarity, regardless of the voltages sent to outlet 25E. This permits one to employ ordinary R.F. circuits and to obtain from the same R.F. circuits 32 an amplification, attenuation or tuning of constant value, regardless of the power supply voltages sent.

However, it is possible to vary the total amplification, attenuation or tuning of R.F. circuits 32 by means of a trimmer (not represented in the figure), when installing module 25 permanently.

Since the main grounding of the R.F. signals amplifica-

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tion, tuning or attenuation circuits, with unbalanced or coaxial input and output, is generally connected also to one pole of power supply inputs 32V or 32Z, and since it is necessary to connect grounding plan 32H of

5 circuits 32 to main grounding 24 of device 25 so as to obtain a single radio frequency grounding plan thereby avoiding humming and oscillations, it is necessary to connect grounding plan 32H to main grounding 24 of device 25 by means of a distributed capacitance 26 of

10 suitable capacitive value.

In fact, distributed capacitance 26 permits radio frequency to pass and therefore to consider the R.F. circuits 32 grounding plan as connected to main grounding 24 whereas, at the same time it permits the possible

15 direct current on grounding 32H to be insulated, with respect to main grounding 24.

Said power supply may result as being present between grounding 32H and main grounding 24 due to the fact that, by means of the circuits of block 31, a polarity

20 reversal takes place, when the polarity of the voltage sent on inlets 31E and 31H of block 31 differs from that required by block 32 for proper functioning.

By connecting connection 17E of filter 11E to connection 17A of filter 11A by means of a jumper or switch 29A,

25 it proves to be possible to transmit all voltages applied to outlet 25E to inlet 25A.

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The same applies, with regard to inlet 25B, by connecting, through 29B, filter 11E to filter 11B by means of the respective connections 17. It is obvious that it is possible to power or control module 25 by sending the power supply or control voltages also from inlets 25A or 25B, provided that the above mentioned connection is accomplished.

It should be noted that it is possible, by utilizing the voltage supplied to inlets 25A and/or 25B to power also any normal electronic circuits operating on fixed voltage and polarity, for example, any normal preamplifiers, convertors or the like in current use, simply by linking connections 17A or 17B of the respective filters, by means of diodes 28A or 28B, and following the dashed line of figure 12, to outlet 31V or 31Z of module 32.

Obviously, in these particular cases, either just the positive or negative voltage will be present on inlets 25A or 25B only when the voltages at different voltage levels applied through R.F. outlet 25E are of the same polarity, with respect to grounding 24, as the voltage required on inlets 25A or 25B.

Should one desire module 25 to operate as an amplifier of attenuator at a variable amplification, attenuation of tuning, controlled by the user, it is sufficient to

connect outlet 31X of module 31 to inlet 32X of module 32, or, in the version providing for the fixed connection of the outlet (31X) to the inlet (32X), to rotate the trimmer (R) represented in figure 13 so as to obtain the maximum potential difference between the outlet (31X) and (31Z).

The operation as amplifier at variable amplification is the following :

by sending to inlets 31E and 31H of block 31 a voltage at any polarity included within a certain voltage range, for example, from x value to y value, the amplifier circuit(s) contained in module 32 enable the R.F. signals applied to the respective R.F. inlets 32/A and/or 32/B to reach, amplified with the maximum gain, + 20 dB, for example, R.F. outlet 32E. By sending to the same inlets 31E and 31H of block 31 a voltage at any polarity, but not included in the voltage range X to Y (for example Z) the minimum amplification of the R.F. signals, 0 dB for example, or even an attenuation by -10 dB will be obtained.

By suitably and gradually varying the level of the voltage sent through 31E and 31H within a range included within X to Z or Y to Z values, it is possible to obtain a gradual variation of the amplification of block 32, for example, from +20 dB to 10 dB.

By including in block 32 the electronic attenuator circuits, instead of the amplifier ones, with the same operation, variable attenuators may be obtained with an attenuation, for example, from zero to a value of $20 + 30$ dB. By comprising
5 in module 32 tuning circuits, to which varicap diodes, for example, or the like refer,, and using the same control system, it is possible to perform the tuning and consequently the selective switching or selective amplification of a certain channel or group of channels chosen amongst all the
10 channels present on R.F. inlet of module 25. This channel or group of channels may be tuned or changed at will directly by the user, by means of a control sent by control box 1 or relative remote control 9.

In the embodiment variant of the particular power supply
15 system of module 25 and/or block 20, illustrated in figure 14, the grounding plan 32H of the circuits contained in block 32 is directly connected to main grounding 24 or chassis of device 25 and/or 20.

Said main grounding or chassis is, however, connected to
20 the shielding or grounding S of the input and/or output connector used for the power supply, control and input of the radio-frequency, by means of distributed capacitance 26.

The operation appears as being practically identical to that described with regard to figure 12 ; the only difference
25 lies in the fact that, depending on the polarity of

the voltage transmitted to module 25 and/or 20, the main grounding or chassis 24 may result as differing in potential from shielding or grounding S of the R.F. output and/or input connectors.

5 The remaining circuits have been intentionally omitted in as much as they may be realized in the same way as represented in figure 12. The shieldings or groundings S of the R.F. inlets may be also connected directly to the chassis or main grounding 24 of the device, as in figure 12, if it is not intended to make the control or power
10 supply voltages pass through these inlets, or if it is intended to make only the voltages at a fixed polarity pass through them. On the other hand, if it is intended to make the voltages at different polarities pass through the R.F. inlets or to power and control module 25 and/or
15 20 through the same R.F. inlets, groundings 8 of the same inlets must be connected to main grounding 24 by means of a distribution capacitance 26, as represented in figure 14, for the R.F. outlet.

Figure 15 represents a simple diagram of a standard radio-
20 television reception installation, using the switching and regulation system presented. The dashed line shows the possible fitting of injector 10 directly onto the R.F. inlet plug of receiver 33.

Figure 16 shows a four R.F. inlet switching block 20,
25 connected to various radio frequency sources, such as :

with 36 a telecamera, an ordinary receiving aerial or reception system of the normal TV earth channels and two parabolic aeri~~als~~als 35, complete with an external unit for the first conversion of the frequencies of the radio-
5 television channels transmitted via satellite in the first intermediate band included, for example, within 850 MHz and 1750 MHz. By means of the power supply and control box 1, it is thus possible to select the various sources of R.F. signal to be sent to receiver 33, not represented in the
10 figure.

Figure 17 represents a complex radio-television reception-installation in which each system of aeri~~als~~als 37 and 35 is provided with its own amplification central unit 38. The outlets of central units 38 are connected to the respective distribution boxes, 39A, 39B, 39C and 39D, which distribute the
15 signals received by the respective central units to the respective R.F. inlets of each switching block 20. In the example being considered, switching blocks 20 are four and each of them is connected, by means of cable 19, plugs or connectors 34 and injector 10,
20 not represented, to receiver 33. Each terminal, by means of its switching block 20 results, therefore, as being connected to the signals coming from all central units and consequently may select, in turn, the various groups of R.F. signals or channels desired.

25 Figure 18 represents a centralized multiple installation combined with a single terminal equipped with the switch-

ing system. Considering that the number of the channels distributed in a centralized TV installation is limited by various technical aspects, such as, for example, incompatibility within the various channels received, due to

5 several known technical reasons, it is possible to improve the reception system by providing one or more terminals 34 with a switching system capable of selecting a series of technically compatible channels, thereby enabling proper reception of a greater number of signals or channels.

10 Since the installation represented in the example is a multiple one, having just one owner, an R.F. power amplifier 25' has been suitably utilized, instead of central unit 38, which is constantly powered by the same switching system by means of an electric wire 40 (see dashed line) or the

15 coaxial cable connected to an R.F.inlet of switching block 20.

It is possible to replace module 25 with a self-powered central unit 38, in the case that the various terminals do not belong to the same owner using the switching system.

20 Figure 19 represents an example of how the switching system may be applied to a radio-television reception system, by utilizing switching blocks 20 at two R.F. inlets, 20 and 20B. The signals of the various aerials 37, through two separate central units 38, are sent to terminals 34 on two separate

25 lines, 41 and 41' to which are fitted distribution boxes 39.

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Certain channels are present on down-feed 41, whereas different ones are present on the other down-feed 41. Switching blocks 20, directly connected to distribution boxes 39 of each down-feed 41 and 41' may select the two
5 groups of channels arriving, by means of control sent along the same coaxial cable of the single terminals 34. Figure 20 represents an example of how the switching system may be applied to an installation for the reception of radio-television signals via satellite, by employing blocks 20 comprising circuits for the elaboration
10 and conversion of the frequencies and/or standard of the channels received via satellite, combined, for example, in figure 10 and 11.

In this installation embodiment the user, by means of controls on power supply and control box 1 and/or remote
15 control 9 (depending on the construction version) may select out of the programs or channels received by the external receiving unit 35 and applied to inlet 20Y of block 20, which channel received via satellite has to
20 be processed and sent to receiver 33, by using the same transmission standard as the normal earth programs or channels.

This channel may be mixed with the normal earth channels received in a conventional manner and applied to R.F.
25 inlet 20X by using a block 20 of the type represented

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in figure 10, containing a mixing circuit 43.

Alternatively, the selected and processed channel, coming from the satellite, may be sent to outlet 20E on down-feed 19 and thus to receiver 33 singly, by utilizing a block 20 of the type represented in figure 11 comprising also a switching circuit 21 enabling one to select the R.F. inlet, 20X or 20Y, from which the channels to be received are to be drawn.

To conclude, it should be noted that the identification, switching and regulation circuits 22, contained in block 20 are able to identify the various voltages received, based on both polarity and voltage ; in particular, they are able to identify if the voltage received belongs to a given range of voltages destined either to the switching of an R.F. inlet of an R.F. switch or to the switching of the R.F. circuits of a frequency and/or standard convertor block 42 and consequently to control respectively, the switch contained in block 21 so as to switch it for the selection of the corresponding R.F. inlet, or to control the switching of the circuits of an R.F. frequency convertor, so as to perform the selection and conversion of a given channel out of those present on the R.F. inlet of the convertor itself.

They are also able to identify the voltage received as belonging to the voltage range destined for the regula-

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tion of attenuation, amplification or tuning and, in this case, to control, through outlets 22S and/or 22R, the relative R.F. circuits intended for this purpose so as to accomplish said regulation based on the level of
5 the voltage received as compared to the lowest and/or highest limit of the voltage range assigned. For example, the voltage limits assigned are 19V to 25V; if the voltage received is close to 19V, a maximum amplification, attenuation or tuning may be obtained,
10 whereas, if the voltage received is close to 25V a minimum attenuation, amplification or tuning may be obtained; all the intermediate voltages allow regulation from a minimum to a maximum.

The maximum and minimum, obviously, may also prove to
15 be reversed, with respect to the voltage limits, depending on the construction versions.

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CLAIMS

1. Switching, reg., amplif. and/or attenuation system
which may be adapted to R.F. switches with multiple R.F.
inlets, R.F. amplifiers and R.F. selector convertors
5 and suitable for being employed to realize radio and
television reception systems or the like, whether fixed
or mobile, characterized by the fact that it includes :
a power supply and control box (1); a radio frequency
filter or injector (10); a block (20) consisting of a
10 standard unit for selection, conversion and processing
of the R.F. signals and/or an R.F. switch with multiple
R.F. inlets and identification, switching and regulation
circuits (22) capable of identifying both polarity and
the particular value of the voltage received, deriving
15 from power supply and control boxes 1, and consequent-
ly to control the coupled control circuits of the R.F.
switch and/or conversion and processing unit, and of one
or more blocks or modules (25) or (25'), possibly con-
tained in the same block (20), consisting of amplifica-
20 tion, attenuation or tuning circuits of the R.F.
signals, coupled to power supply and regulation circuits
(31) and (26) able to power at a constant voltage the
above mentioned R.F. amplification, attenuation or tun-
ing circuits and to carry out the regulation utilizing
25 same varying voltages and polarities sent, in turn,

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by control and power supply box (1).

2. Switching, regulation, amplification and/or attenuation system, according to claim 1, characterized by the fact that power supply box (1) is powered by the line voltage and, depending on the controls received through a remote control (9) and /or through the electromechanical contacts situated on the same box (1), supplies, in turn, on its output (1B) different direct currents at positive or negative polarities, with sudden or gradual variations.
3. Switching, regulation, amplification and/or attenuation system according to claims 1 to 2, characterized by the fact that control box (1) is realized with either manual control, or special remote-control, or common remote-control or even with hybrid control.
4. Switching, regulation, amplification and/or attenuation system, according to claims 1 to 3, characterized by the fact that the R.F. inlets selected by R.F. switch (21) and/or the channel selected or converted by module (42) are displayed by means of a numerical or alphanumerical luminous display, or by switching on a number of luminous indicators corresponding to the number of channel selected or converted by block (42) and/or to the number of R.F. inlet selected by R.F. switch (21), or by means of

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switching on, in turn, of an indicator of different colour, depending on the R.F. inlet chosen by R.F. switch (21) and/or on the channel selected or converted by block (42), or by a combination of the
5 above mentioned display methods; these devices are fitted to control box (1).

5. Switching, regulation, amplification and/or attenuation system, according to claims 1 to 4, characterized by the fact that the variation from minimum to
10 maximum of the amplification, tuning or attenuation is displayed by means of luminous indicator, either numerical or alphanumerical or by the switching on or off in equal proportions of a given number of indicators or by varying the degree of luminosity of a
15 luminous indicator or, alternatively, in the versions having a manually operated control box(1) this variation is displayed by means of a graduation around or on the knobs of the potentiometers(s) or switch(es) employed. These devices are fitted to control box(1).
- 20 6. Switching, regulation and amplification and/or attenuation system according to claims 1 to 5, characterized by the fact that the signalling of regular, overload or short-circuit operating conditions on the outlet of power supply and control box (1) and/
25 or on the remaining components of the system, is

provided by means of switching on and switching off of a luminous indicator and by the fact that such a signalling is independent of any other display.

- 5 7. Switching, regulation, amplification and/or attenuation system, according to claims 1 to 6, characterized by the fact that the control and power supply voltages are sent to terminals (20) or (25) by means of a bipolar electric wire of appropriate section or coaxial cable.
- 10 8. Switching, regulation, amplification and/or attenuation system, according to claim 1, characterized by the fact that it includes blocks (20) comprising R.F. switching and/or R.F. convertors and modules (25), inserted in series, simultaneously powered and controlled by the same or different voltages.
- 15 9. Switching, regulation, amplification and/or attenuation system, according to claims 1 to 8, characterized by the fact that it includes modules (25) acting as R.F. attenuators, or R.F. amplifiers at fixed or variable amplification, attenuation or tuning, having one or more inlets and characterized by the fact that these modules (25) may be applied in
- 20 various points of the system and may be powered and/or regulated by means of the same power supply and control voltages as block (20), and they may be uti-
- 25

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lized and powered separately by means of voltages of positive or negative polarity and/or different voltage levels.

10. Switching, regulation, amplification and/or attenuation system, according to claims 8 and 9, characterized by the fact that they comprise modules (25) and/or block (20) using common R.F. circuits operating at fixed polarity and voltage, which are powered through the R.F. outlet or the R.F. inlets, or through the point (17E) and grounding (24) or (S) by means of voltages at different polarity & levels.
11. Switching, regulation, amplification and/or attenuation system, according to claims 8 to 10, characterized by the fact that the R.F. amplifier, attenuator or tuning circuits contained in block (20) or in modules (25), by interrupting the connection between (31X) and (32X) or rotating the trimmer (R) may operate at fixed amplification, attenuation or tuning and also powering the respective blocks (20) or (25), from the RF outlet/inlets or from 31E and 31H or (17E) and grounding (24) or (S) by means of positive or negative voltages of varying voltage levels; alternatively, by connecting (31X) and (32X) or rotating the trimmer (R) in the opposite direction, should points (31X) and (32X) be permanently connected, they

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may be powered by the same points indifferently by means of voltages at positive or negative polarity and permit the regulation of amplification, attenuation or tuning of the R.F. signals passing through them by means of the variations in the power supply voltage included within a certain voltage range, without reducing the max. R.F. voltage which may be obtained in output on the same R.F. circuits.

12. Switching, regulation, amplification and/or attenuation system, according to claims 1 to 11, characterized by the fact that the regulation of the R.F. signals passing through block (20) or modules (25) may be obtained by means of voltages sent by power supply box (1) within voltage ranges having higher or lower voltage levels, as compared to those intended for the switching of the R.F. inlets and/or for the switching of the channel to be selected or converted by block (20).

13. Switching, regulation, amplification and/or attenuation system according to claim 1, characterized by the fact that module (25) and/or block (20) comprise, in combination with power supply box (1), provided with regulation, a fixed amplification, attenuation or tuning device, or constitute a variable amplification, attenuation or tuning device, which may be

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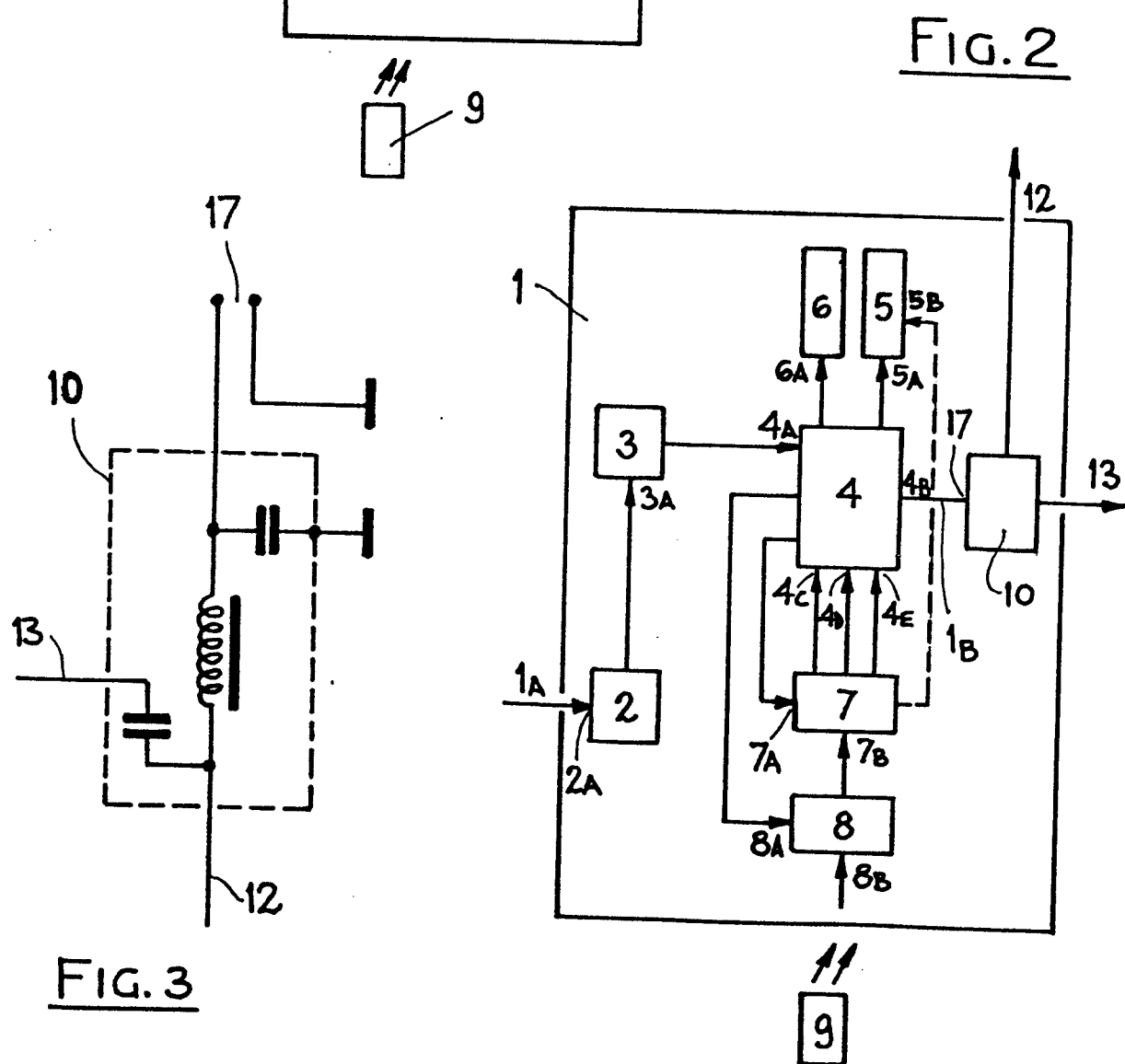
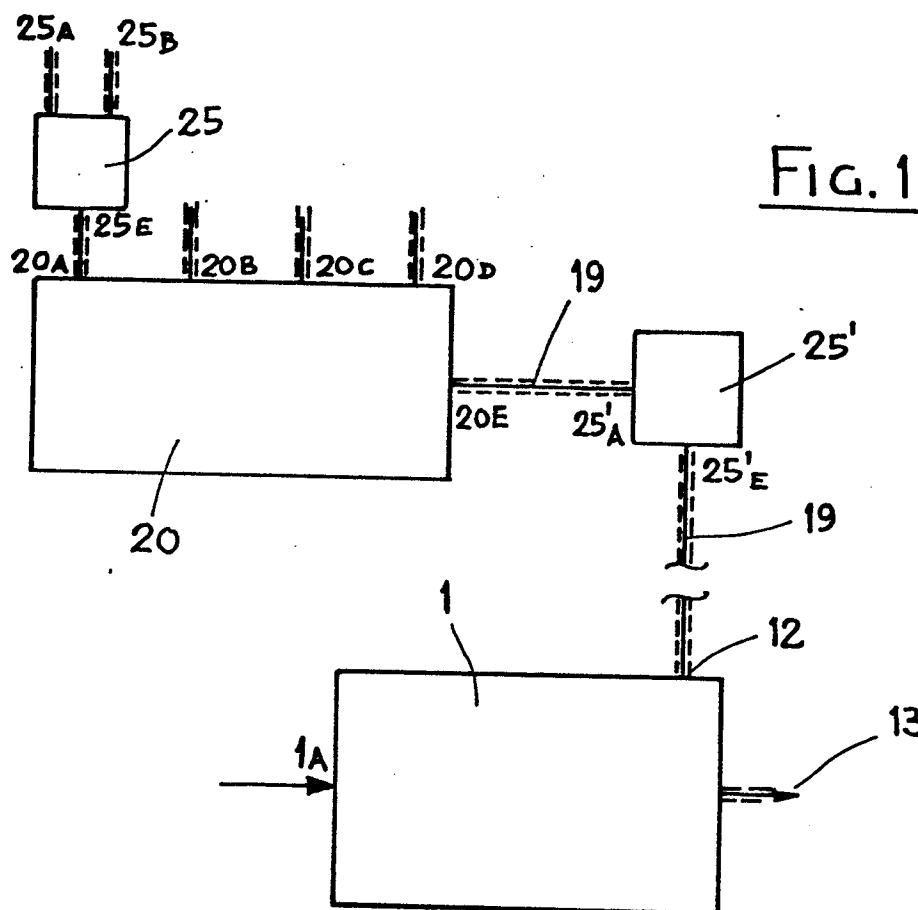
powered and controlled through the same cable (19), where radio-frequency is present.

14. Switching, regulation, amplification and/or attenuation system according to claim 1 characterized by the fact that module (25) and/or block (20) used in combination with power supply box (1), provided with regulation, constitute a device for the remote-control of amplification, attenuation or tuning of the R.F. signals.
- 10 15. Switching, regulation, amplification and/or attenuation system, according to claim 1, characterized by the fact that block (20) and/or module (25) constitute a fixed and/or variable amplification, attenuation and/or tuning device, powered by means of voltages having positive and/or negative polarity.
- 15 16. Switching, regulation, amplification and/or attenuation device according to claims 1 to 15, characterized by the fact that modules (25) are powered and controlled through the R.F. outlet, or, by activating jumpers or switches, are powered and controlled through the R.F. inlets and that, by means of these devices, from the outlet to the selected R.F.inlet, all or a part of the power supply and control voltages pass.
- 20 17. Switching, regulation, amplification and/or attenuation
- 25

- tion system according to claims 1 to 16, characterized by the fact that the identification, switching and regulation circuits (22) contained in block (20) identify the various voltages received based on both voltage polarities and voltage levels.
- 5
18. Switching, regulation, amplification and/or attenuation system, according to claims 1 to 17, characterized by the fact that block (20), realized separately, or in several modules in series and modules (25) are either realized or incorporated inside a system
- 10
- of mobile receiving aerials or for fixed installations.
19. Switching, regulation, amplification and/or attenuation system, according to claims 1 to 18, characterized by the fact that it includes a power supply and control box (1) provided with one or two potentiometers or switches to enable the manual control of the regulation, amplification, attenuation or
- 15
- tuning and by the fact that in the version providing for two potentiometers or switches, the activation, in turn, of these devices in the electrical circuit
- 20
- of box (1) takes place automatically on the basis of the polarity of the output voltage of (1B), thereby enabling a differentiated setout of the regulation of amplification, attenuation or tuning of the R.F.
- 25

80.

signals passing through the R.F. inlets of R.F.
switch (21), activated by voltages at different
polarities.



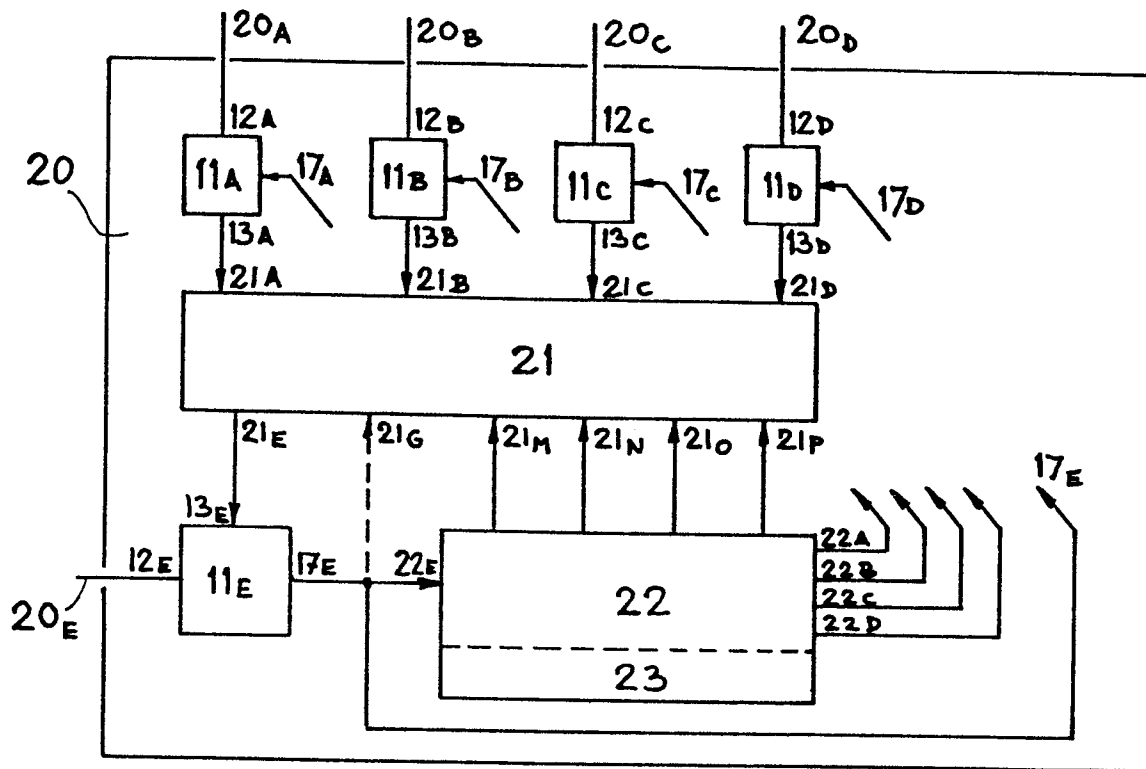


FIG. 4

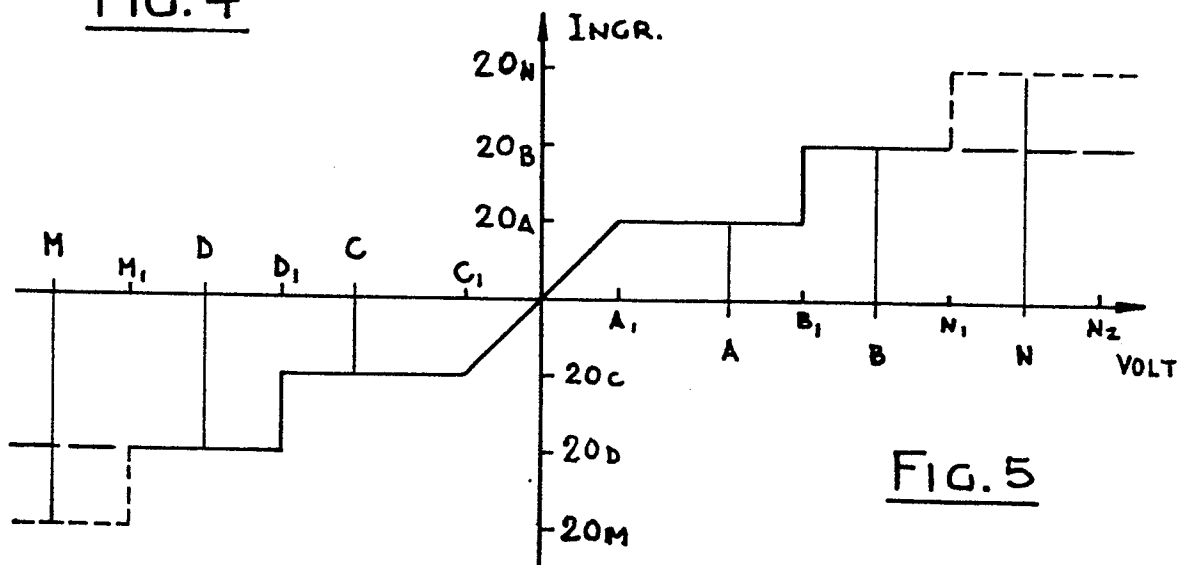


FIG. 5

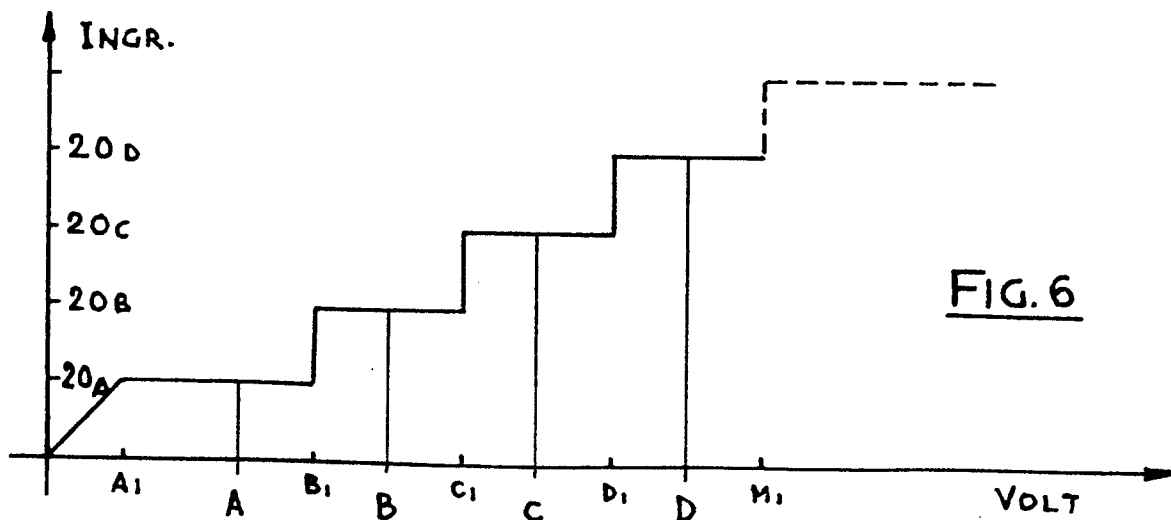


FIG. 6

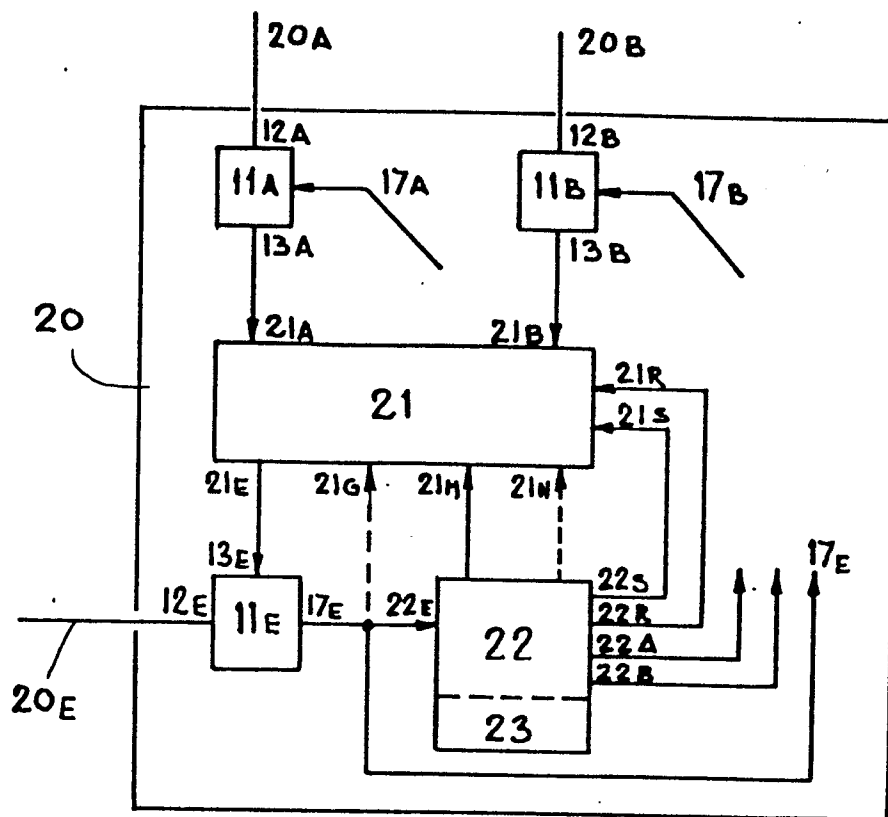


FIG. 7

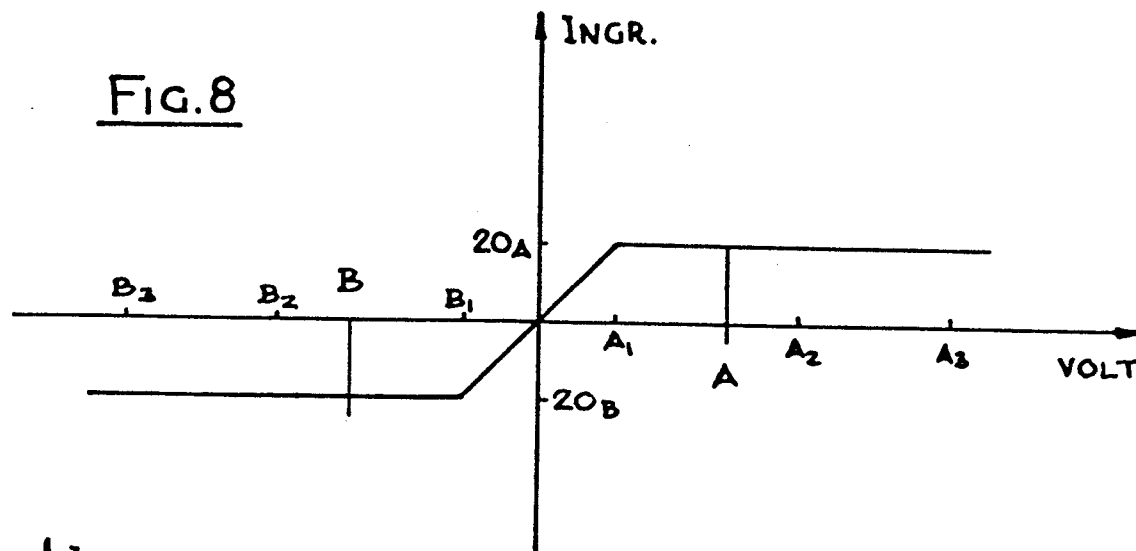


FIG. 8

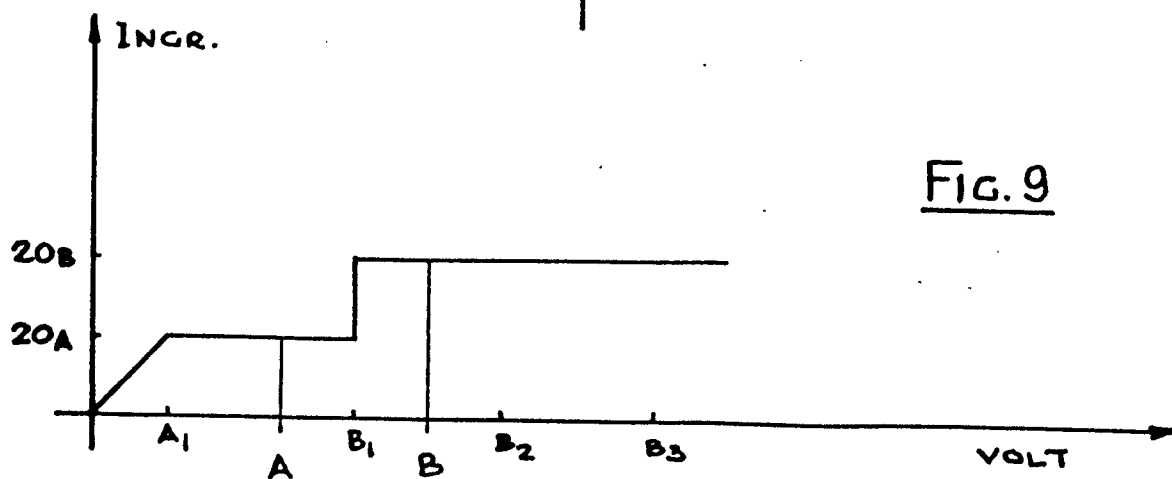


FIG. 9

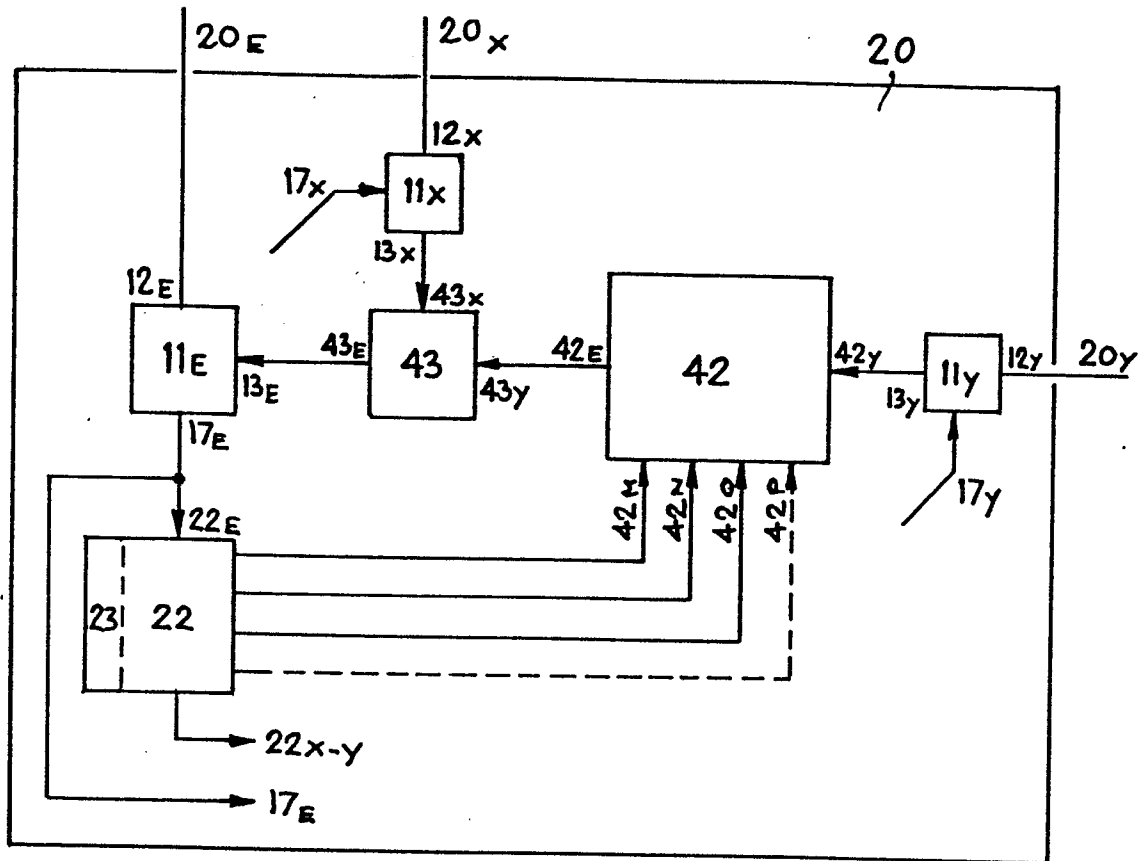
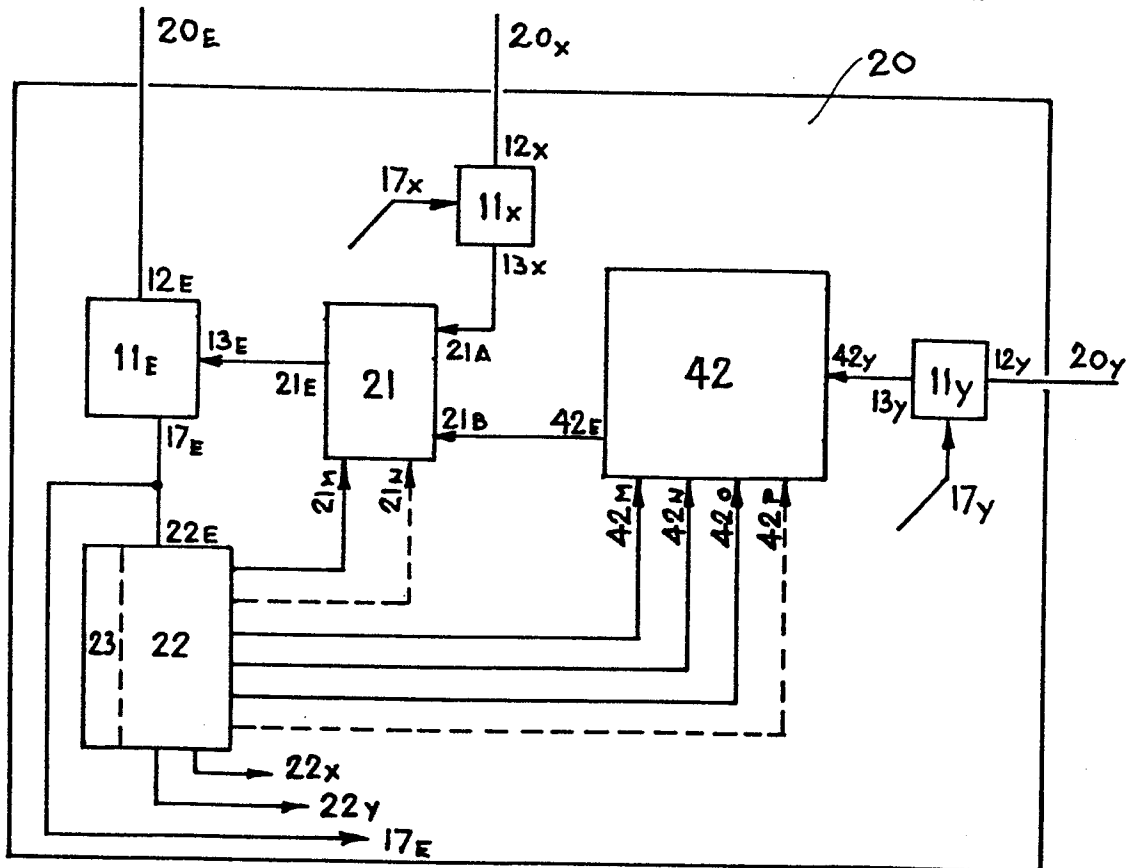


FIG. 10

FIG. 11



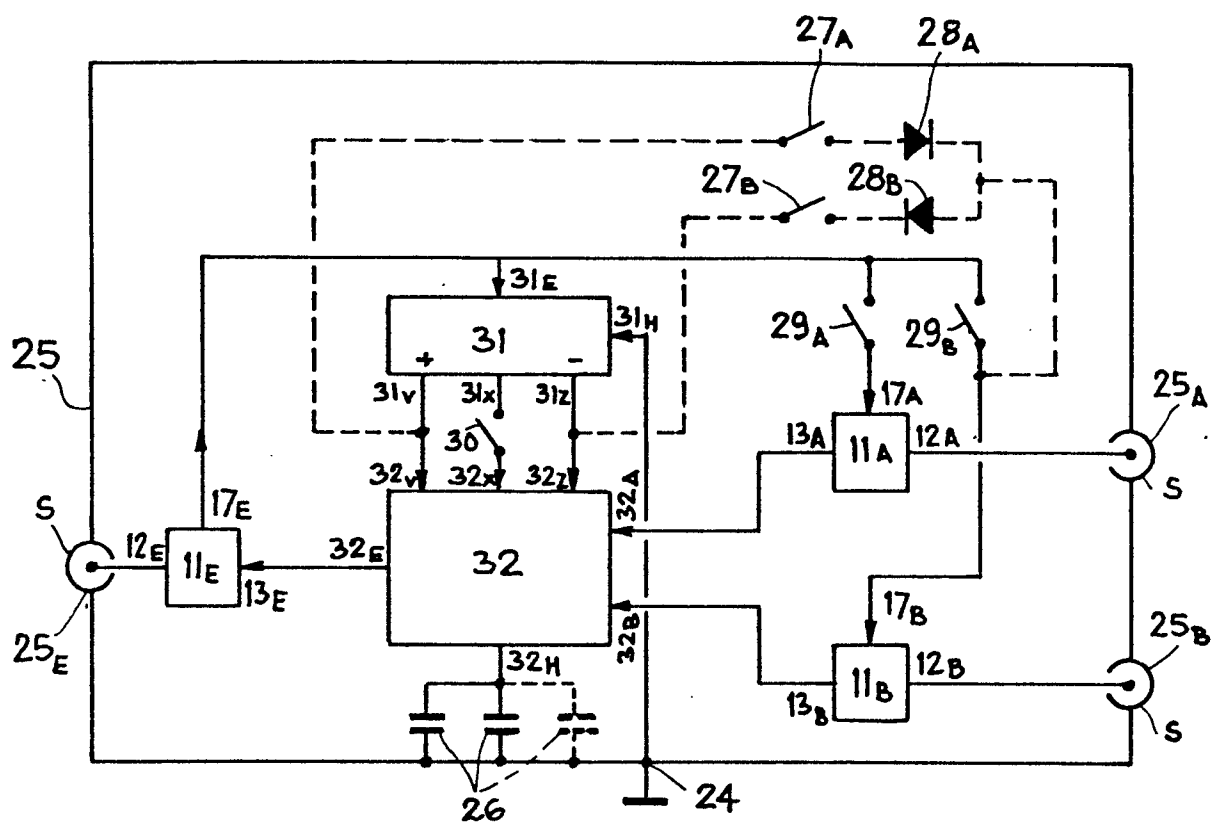


FIG. 12

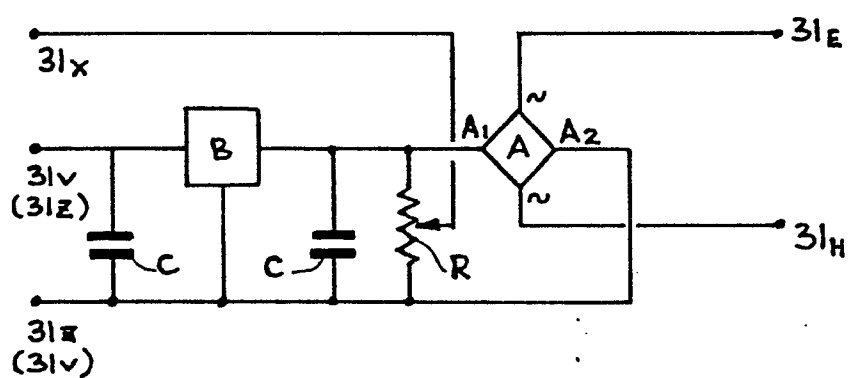


FIG. 13

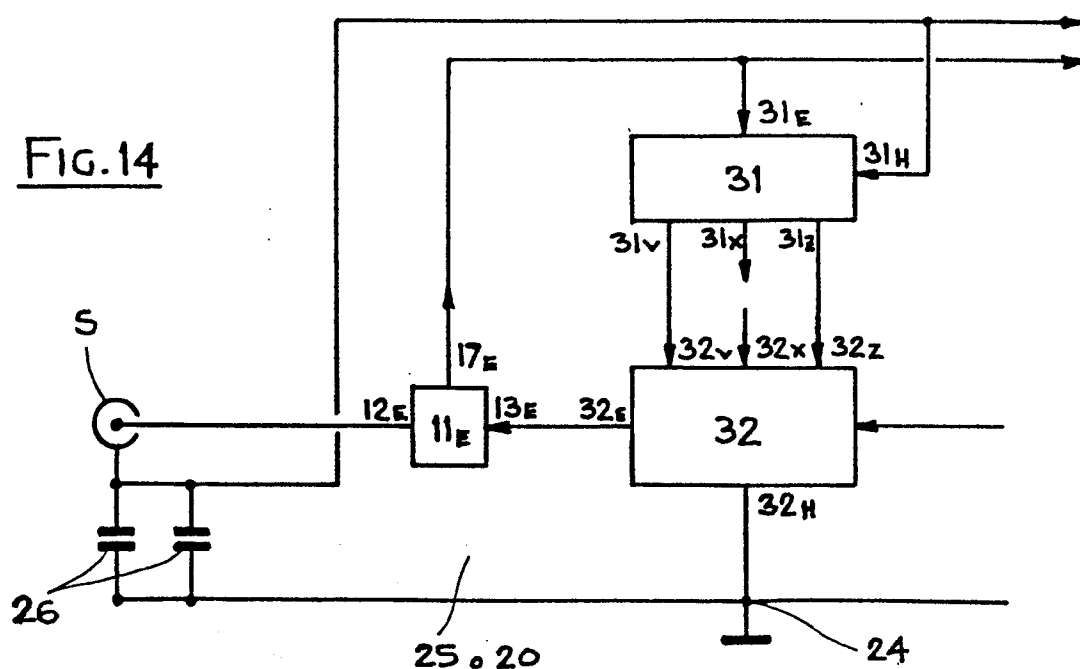
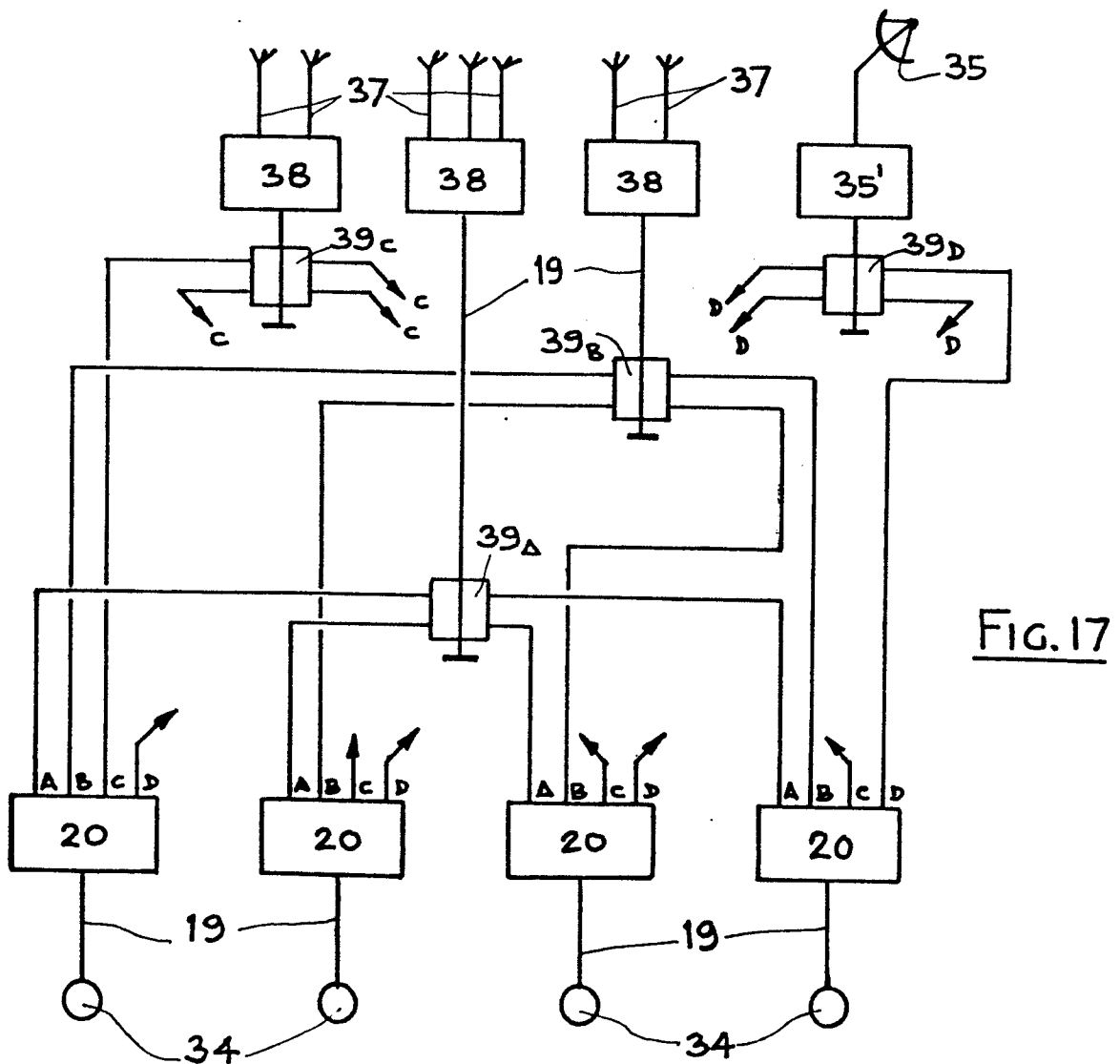
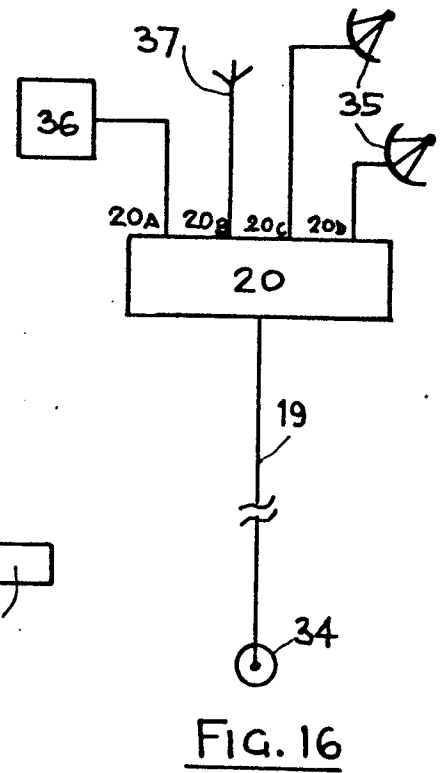
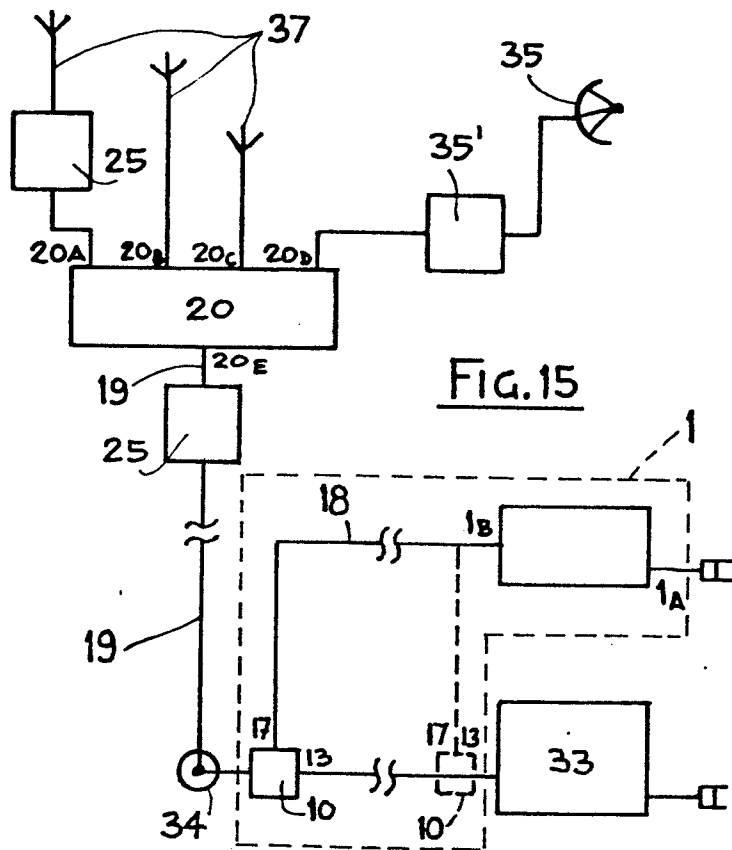


FIG. 14



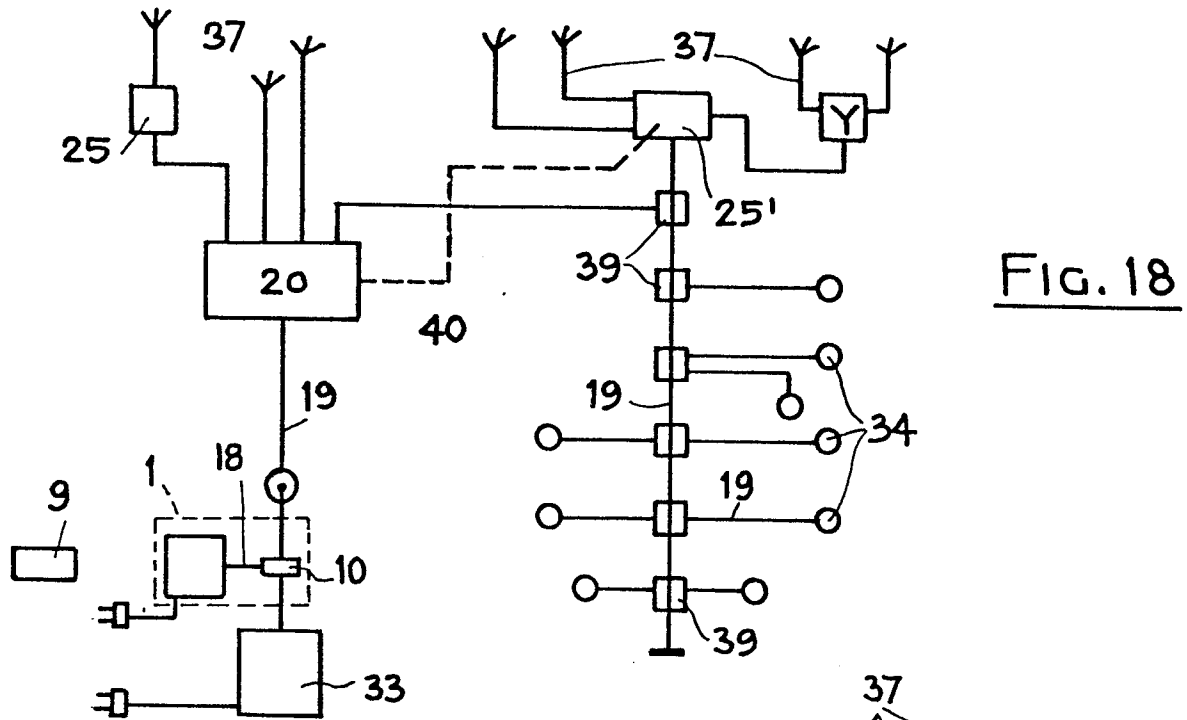


FIG. 18

FIG. 19

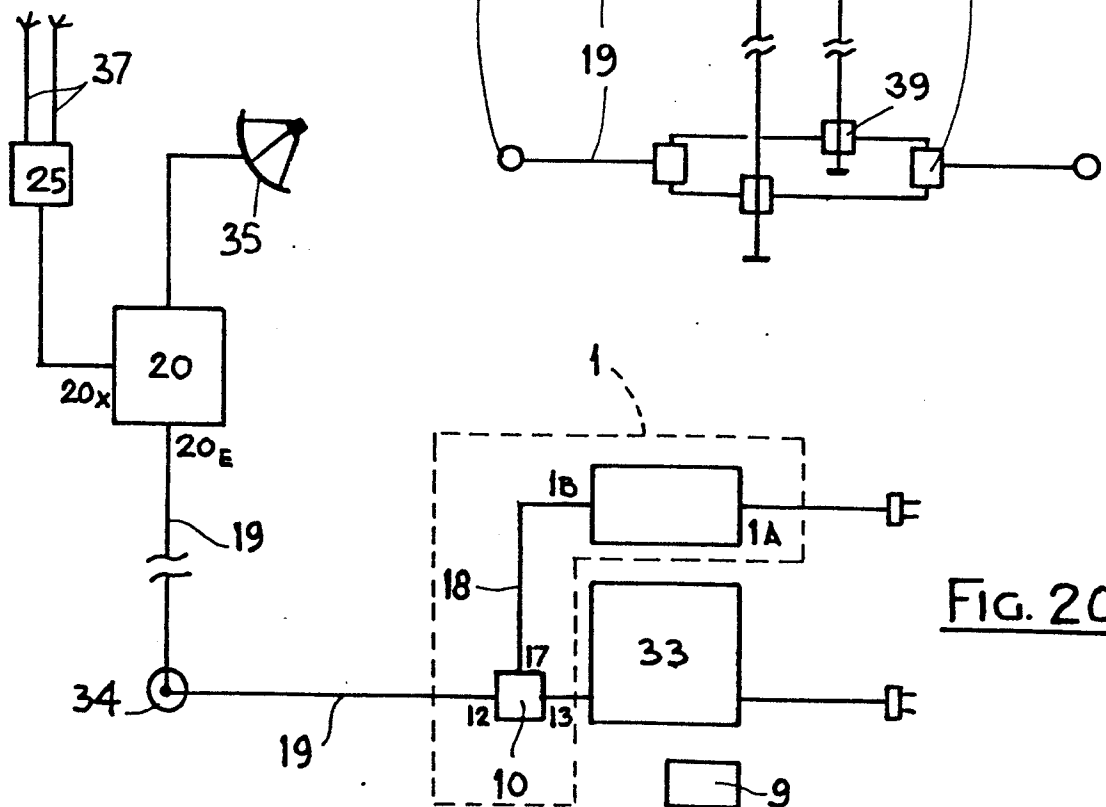


FIG. 20