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VOLTAGE DIVIDER

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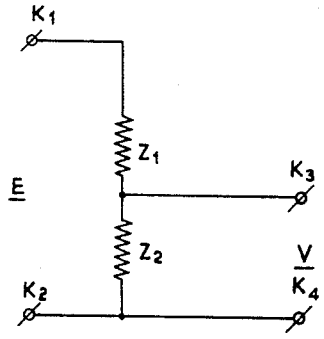


Fig. 1a

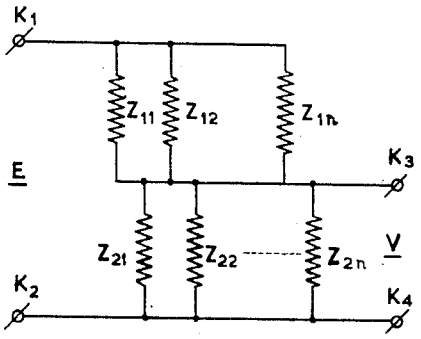


Fig. 1b

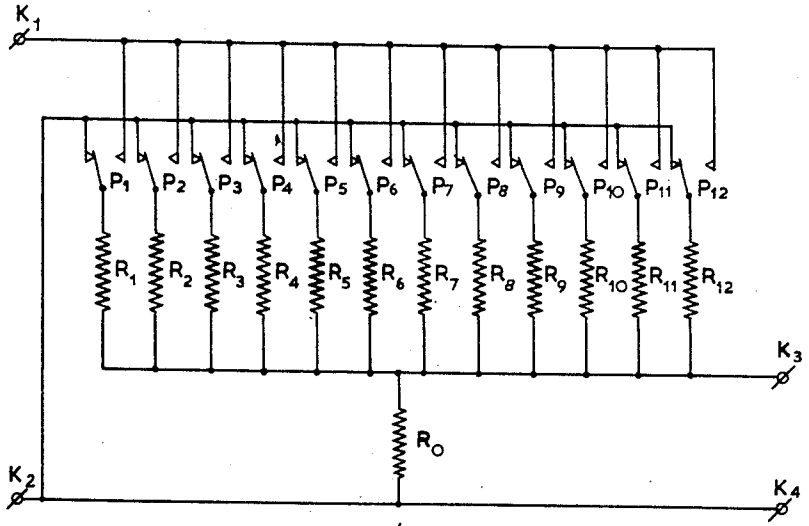


Fig. 2

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VOLTAGE DIVIDER

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This invention relates to voltage divider circuits.

In known circuits of this kind an output terminal is connected to an input terminal and the voltage divider ratio may be varied by switching on and off impedances between the output terminals. Known circuits have the disadvantage that, when an impedance is switched on or off, the variation in voltage division ratio is dependent upon the other impedances which happen to be switched on, that is to say dependent upon the level.

The present invention mitigates the said disadvantage. In the circuit according to the invention an input terminal is connected to an output terminal and one extremity of each of a plurality of impedances is permanently connected to the other output terminal whereas the other extremity thereof may be switched between the input terminals by means of a change-over contact. In this circuit the division ratio is proportional to the sum of the reciprocal values of the impedances switched between the first input terminal and the other output terminal, so that the divison ratio may be adjusted at will in a simple manner due to the contribution of each individual impedance to the division ratio being independent of the position of the other changeover contacts. It is thus possible for the different decimals of a division ratio to be adjusted independently of one another. The circuit is more particularly suited for control purposes, e. g. for controlling the temperature of an oven in accordance with a predetermined program, it being possible for the different temperatures to be determined in a decimal code with the use of a punching tape.

In order that the invention may be readily carried into effect, it will now be described, by way of example, with reference to the accompanying drawing, wherein:

Fig. 1*a* is a schematic diagram of an embodiment of a voltage divider circuit;

Fig. 1*b* is a schematic diagram of a modification of the embodiment of the voltage divider circuit of Fig. 1*a*; and

Fig. 2 is a schematic diagram of an embodiment of the voltage divider circuit of the present invention.

In the voltage-divider circuit of Fig. 1*a*, the voltage division ratio, as is well-known, is equal to

$$\frac{V}{E}=\frac{Z_2}{Z_1+Z_2}=\frac{Y_1}{Y_1+Y_2}$$

wherein V and E indicate the voltage between the output terminals K_3, K_4 and the voltage between the input terminals K_1, K_2 respectively, and Y_1 and Y_2 indicate the reciprocal values, that is, the admittances, of the impedances Z_1, Z_2 respectively. In Fig. 1*b*, the impedances Z_1 and Z_2 are constituted by the parallel combination of a plurality of impedances Z_{11}, Z_{12} . . . Z_{1n} and Z_{21}, Z_{22} . . . Z_{2n}, and the division ratio is equal to:

$$\frac{V}{E}=\frac{EY_{1n}}{EY_{1n}+EY_{2n}}=\frac{EY_{1n}}{EY_n}$$

The division ratio is thus equal to the sum of the admittances of the impedances connected between the terminals K_1, K_3, divided by the sum of the admittances of all

the impedances. The denominator of the fraction does not vary if one or more impedances between the terminals K_1, K_3 are removed to be switched between the terminals K_3, K_4, or conversely.

Fig. 2 is a voltage divider circuit according to the present invention. The output terminal K_4 is connected to the input terminal K_2. One extremity of each of the resistors R_1 to R_{12} is connected to the output terminal K_3, whereas the other extremity of each of the resistors R_1 to R_{12} is connected to an arm of a plurality of change-over contacts P_1 to P_{12}. By means of the change-over contacts P_1 to P_{12} the said other extremity of each of the resistors R_1 to R_{12} may be connected at will either to the input terminal K_1 or to the input terminal K_2. The voltage division ratio may be made adjustable, for example in 1000 equal steps, the resistors R_1 to R_{12} then being such that their conductances are in the proportion of

0.1:0.2:0.3:0.4:0.01:0.02:0.03:
0.04:0.001:0.002:0.003:0.004

As may be clear from the foregoing, the division ratio is proportional to the sum of the admittances of the impedances switched between the terminals K_1, K_3. In order to obtain a relative division ratio of, for example, 0.528, the change-over contacts P_1, P_4, P_6, P_9, P_{11}, P_{12} are switched into their operative positions. In this case the sum of the admittances of the impedances switched between the terminals K_1, K_3 is equal to

$$0.1+0.4+0.02+0.001+0.003+0.004=0.528$$

Thus, the first decimal may be adjusted by means of the change-over contacts P_1 to P_4, the second decimal by the change-over contacts P_5 to P_8, and the third decimal by the change-over contacts P_9 to P_{12}, independently of one another. The division ratio may be adjusted in the absolute sense to any desired value by suitable choice of the value of the resistor R_0. The resistor R_0 then contributes to the denominator of the abovementioned fraction, but does not contribute to the numerator of said fraction.

As previously mentioned, the circuit is more particularly suited for control purposes according to a predetermined program, for example for controlling the temperature of an oven. In this case, the temperature of the oven may be controlled in known manner by comparison of the voltage of a thermal contact with the output voltage of the voltage divider circuit. The different temperatures which the oven is desired to acquire successively may be determined with the use of a punching tape into which holes are punched in decimal code according to the desired temperature. The holes may be scanned by scanning pins controlling the change-over contacts P_1 to P_{12}. The punching tape may be provided with, for example, three groups each of four holes at the most, which are scanned by three groups each of four pins, which groups correspond to the change-over contacts P_1 to P_4, P_5 to P_8, P_9 to P_{12}; that is, to the first decimal, the second decimal and the third decimal, respectively.

While the invention has been described by means of a specific example and in a specific embodiment, we do not wish to be limited thereto, for obvious modifications will occur to those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A voltage divider circuit comprising first and second input terminals for a source of voltage, a first output terminal connected to said first input terminal, a second output terminal, a plurality of impedances in parallel circuit arrangement each having one terminal connected to said second output terminal, and switching means connected between the other terminal of each of said impedances and said first and second input termi-

nals for connecting said other terminal of each of said impedances to either of said first and second input terminals whereby the ratio of the voltage across said output terminals to the voltage of said source is varied.

2. A voltage divider circuit as claimed in claim 1, wherein said plurality of impedances comprises at least two groups, the impedance value of each of said plurality of impedances being so determined that the admittance values of each of the impedances of said groups are in the proportion of whole numbers and the admittance values of said groups are in the proportion of multiples of ten.

3. A voltage divider circuit comprising first and second input terminals for a source of voltage, a first output terminal connected to said first input terminal, a second output terminal, a plurality of impedances in parallel circuit arrangement each having one terminal connected to said second output terminal, and a plurality of switching means each connected between the other terminal of each of said impedances and said first and second input terminals for connecting said other terminal of each of said impedances to either of said first and second input terminals whereby the ratio of the voltage across said output terminals to the voltage of said source is varied.

4. A voltage divider circuit comprising first and second input terminals for a source of voltage, a first output terminal connected to said first input terminal, a second output terminal, a plurality of impedances in parallel circuit arrangement each having one terminal connected to said second output terminal, and a plurality of switches, each of said switches comprising a switching arm electrically connected to the other terminal of each of said impedances, a first switching contact connected to the first of said input terminals and a second switching contact connected to the second of said input terminals, said switching arm being adapted to contact either of said first and second switching contacts whereby the ratio of the voltage across said output terminals to the voltage of said source is varied.

5. A voltage divider circuit as claimed in claim 4, wherein said plurality of impedances comprises at least two groups, the impedance value of each of said plurality of impedances being so determined that the admittance values of each of the impedances of said groups are in the proportion of whole numbers and the admittance values of said groups are in the proportion of multiples of ten.

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