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2,448,718

METHOD OF AND DEVICE FOR PRODUCING PULSES AT THE
MAXIMUM OR MINIMUM OF AN ELECTRIC IMPULSE

Filed Dec. 21, 1943

2 Sheets-Sheet 1

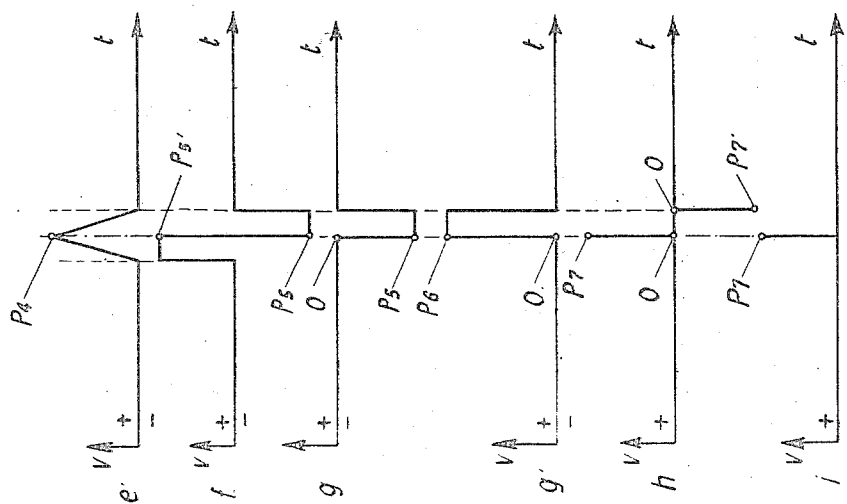
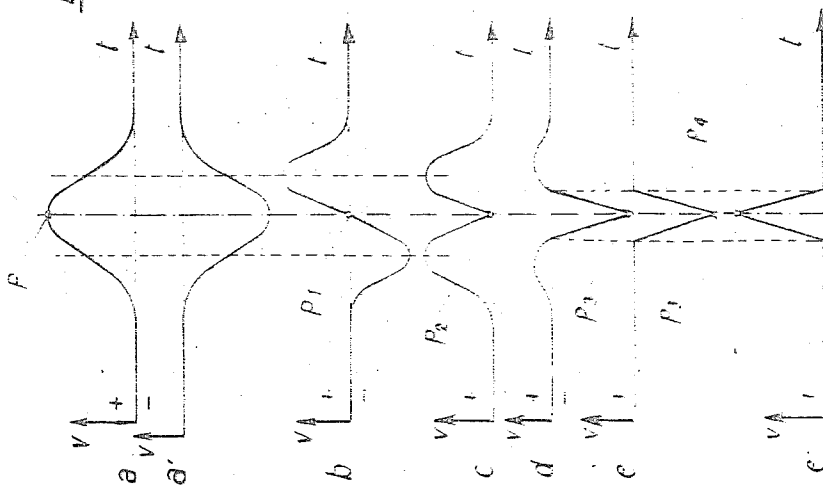


Fig. 1



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2 Sheets-Sheet 2

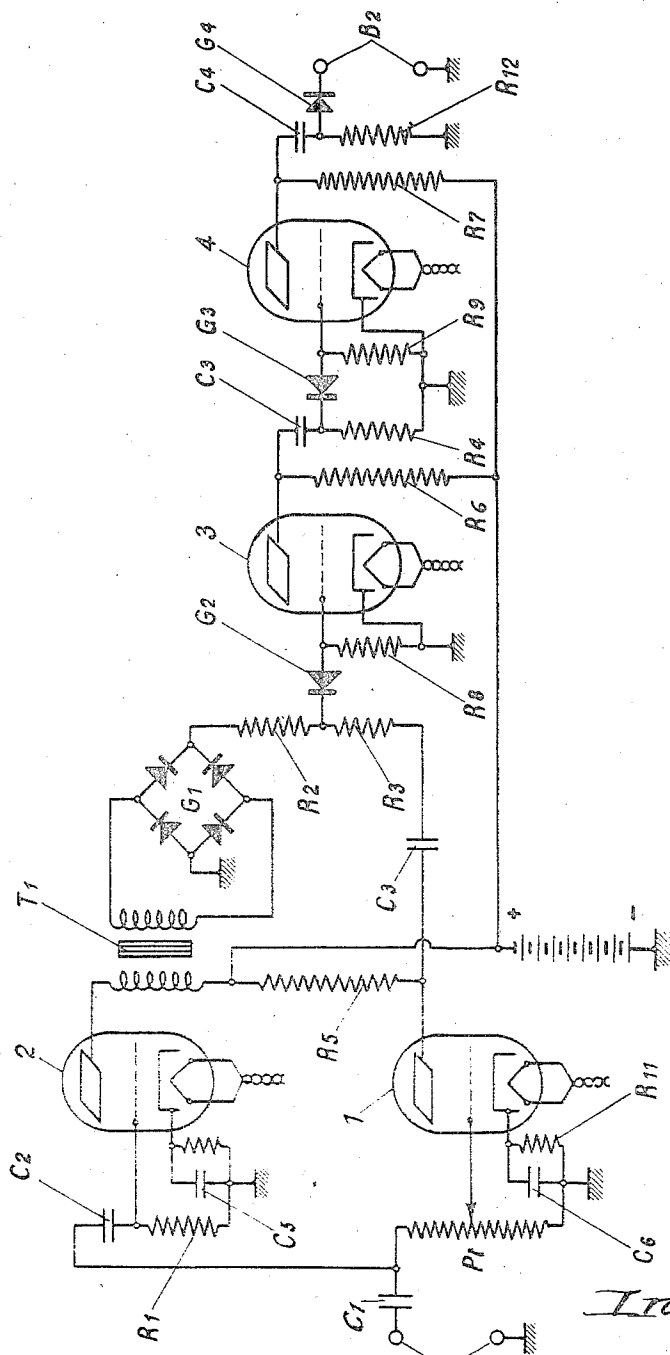


Fig. 2

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METHOD OF AND DEVICE FOR PRODUCING
PULSES AT THE MAXIMUM OR MINIMUM
OF AN ELECTRIC IMPULSEMaurice Koulicovitch, Geneva, Switzerland, as-
signor to Societe Genevoise D'Instruments De
Physique, Geneva, SwitzerlandApplication December 21, 1943, Serial No. 515,178
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3 Claims. (Cl. 178-44)

1

The purpose of the present invention is to transform an electric impulse, whose tension progressively reaches to a maximum or a minimum and then progressively comes back to its initial value, into a final impulse, whose voltage curve varies instantaneously in the very same instant as the tension of the original progressive impulse passes through its maximum or minimum.

According to an important feature of this invention, the original impulse is first transformed into an intermediate impulse whose voltage curve presents a cusp, the derivative of the curve at this cusp having two values, one or both of which are distinct from zero; this intermediate impulse is then transformed into an instantaneous impulse which takes place in the very same instant as the initial impulse passes through its maximum or minimum.

This invention provides a device comprising capacitive or inductive reactances adapted to transform the initial progressive impulse into its derivative in proportion to the time. This derived impulse will also have a progressive course, but it will present two opposite maxima and pass through zero in the very same instant as the initial impulse reaches to its maximum or minimum.

According to another important feature of the invention, the device also comprises rectifiers and resistances adapted to produce, by suppression of a portion of the derived impulse, a transformed impulse having a cusp. The device may further comprise reactive circuits adapted to transform this modified impulse into a final impulse having an instantaneous tension variation.

The device permits further, during the successive transformations of the initial impulse, to entirely suppress some useless portions of the transformed impulses; for this purpose it may comprise one or more auxiliary rectifiers. It also permits to amplify other portions of the impulse and/or to change the polarity thereof by means of auxiliary amplifying circuits.

Other objects and advantages of this invention will be apparent from the following description and claims when read in connection with the accompanying drawings, wherein:

Figure 1 illustrates diagrammatically the successive transformations of the initial impulse a up to its final form i , in the specific case of the embodiment of the device shown in Fig. 2.

Referring concomitantly to the Figs. 1 and 2, the tension a of the initial impulse having a maximum P is supplied through the leading-in

2

terminals B_1 and the de-coupling condenser C_1 concomitantly to the tubes 1 and 2. Tube 1 which is fed through a potentiometer P_t , delivers through the de-coupling condenser C_3 a tension a' having the same form as a , but opposite. Tube 2 is fed through a system comprising the condenser C_2 and the resistance R_1 , which both are rated so as to transform the curve a into its derivative in proportion to the time; tube 2 then delivers this derivative amplified and with reverse polarity, under the form of the tension b which passes through zero at a point P_1 corresponding in the time to the point P . The tension b is then transformed into a tension c by a transformer T_1 and a two-ways rectifier G_1 , the negative portion of the curve b becoming positive, whereby a cusp P_2 is created at zero.

The tension c is then added to the tension a' by the resistances R_2 and R_3 . The sum of these tensions has the form d , whereby a cusp P_3 distinct from zero is created. Owing to the single-way rectifier G_2 , the whole positive portion of the curve d is then suppressed, remaining only the negative portion thereof, which has the form e and which, after amplification through the tube 3 becomes e' , reciprocal of the curve e , with cusp P_4 of tension distinct from zero.

The tension curve e' has at the cusp P_4 two derivatives in proportion to the time, both of equal value but opposite. The condenser C_3 and the resistance R_4 are rated so as to derivate the curve e' in proportion to the time; this derivative f presents, concomitantly, two levels P_5 and P_5' having equal but opposite tensions; the rectifier G_3 suppresses the positive portion of the curve f and feeds the tube 4 with a tension g . Tube 4 amplifies and reverses the tension g and delivers a tension g' which passes abruptly from zero to a definite positive value P_6 at the very same instant as the initial tension a reaches to its maximum P .

The condenser C_4 and the resistance R_{12} are both rated so as to transform the curve g' into its derivative in proportion to the time. This derivative will be the function h which should theoretically reach to an infinite value, but will practically be limited to the definite values P_7 and P_7' . The single-way rectifier G_4 removes the value P_7' so that the tension fed by the leading-out terminals B_2 will have the form i . A sole impulse is thus obtained whose duration is practically null and whose tension reaches abruptly to the value P_7 at the very same instant as the initial tension a reaches to its maximum P .

The resistances R_5 , R_6 and R_7 are the plate

3

resistances of the amplifying tubes and R_3 and R_4 are the grid resistances thereof. They fulfill the customary functions of permitting the tubes to operate and have not any other part to play in the successive transformations of the function a into the function z .

The tubes 1 and 2 are further provided with a self-acting polarising device constituted by the resistances R_{10} and R_{11} shunted by the condensers C_5 and C_6 . As these tubes receive a positive impulse, they must necessarily be provided with polarized grids. As the tubes 3 and 4 receive a negative impulse, they have no further need for grid polarisation.

It is to be understood that other connections may be realized by which a progressive impulse may be transformed into an instantaneous one without additional operation as in the above described example. The method may also be applied to the transformation of an initial impulse passing through a maximum and a minimum such as b into an instantaneous impulse taking place at the same instant as the initial impulse passes through zero.

While I have described only one typical embodiment of my invention, it is obvious that many changes and modifications may be adopted without departing from the spirit thereof. It is desired, therefore, that only such limitation shall be imposed upon my invention as are indicated in the prior art or set forth in the appended claims.

What I claim is:

1. The method of transforming an electric impulse whose tension progressively reaches to a maximum or minimum then progressively recedes from this value, into an impulse whose tension passes abruptly from zero to a definite value, which consists in transforming the initial impulse into an intermediate impulse whose voltage curve presents a cusp coinciding with the maximum or minimum value of the original impulse, the derivative of the curve at this cusp having two values, at least one of which is distinct from zero, and in further transforming the said intermediate impulse into an instantaneous impulse taking place at the very same instant as the initial impulse passes through its maximum or minimum.

2. The method of transforming an electric impulse whose tension recedes progressively from

4

a maximum to a minimum or the contrary and passes through an instantaneous zero value, into an impulse whose tension passes abruptly from zero to a definite value, which consists in transforming the initial impulse into an intermediate impulse whose voltage curve presents a cusp coinciding with the passage through zero of the original impulse, the derivative of the curve at this cusp having two values, at least one of which is distinct from zero, and in further transforming the said intermediate impulse into an instantaneous impulse taking place at the very same instant as the initial impulse passes through zero.

3. The method of transforming an electric impulse whose tension progressively reaches to a maximum or minimum then progressively recedes from this value, into an impulse whose tension passes abruptly from zero to a definite value, which consists in transforming the initial impulse into its derivative in proportion to the time, reversing the polarity of a portion of the derived tension, whereby a cusp is created at zero, adding the tension thus obtained to the initial tension, whereby a cusp of one polarity distinct from zero is created, suppressing the portion of opposite polarity of the tension thus obtained, transforming this new tension into its derivative in proportion to the time, whereby two levels having equal but opposite tensions are created, suppressing the positive or negative portion of the derived tension curve, amplifying, reversing and transforming the new tension into its derivative in proportion to the time and finally suppressing the positive or negative definite value of said derivative whereby a sole instantaneous impulse is obtained whose tension passes abruptly from zero to a definite value at the very same instant as the initial tension reaches to its maximum or minimum.

MAURICE KOULICOVITCH.

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