and corresponding to the value W(T) code

$$N_T = \sum_{i=1}^{n} T_i \cdot f_i$$

Which is written in the register **8** and compared by the digital comparitor **9** with the content of the counter **4**. Coincidence of these two codes which is confirmed by triggering of the digital comparitor **9** indicates that the speed reached the value V(T).

Now the above described operations can be repeated for the subsequent cycle. The duration of the cycle $\Delta t_k = t_k - t_{k-1}$ is limited from below only by a needed time of calculations.

Knowing the value of speed N_{k+1} N V_k with a high accuracy in neighboring cycles, it is possible to find a cycle average value of acceleration or input signal.

$$X_k = \frac{V_{k+1} - V_k}{\Delta t_{k+1}}$$

Thus, with the use of the proposed method, it is possible to use as input not only acceleration but also the input signals of other physical nature (mechanical, radiant, magnetic, electrical, thermal, chemical, vibrational, etc).

It should be emphasized that in the algorithm

$$\sum_{i=1}^{n} T_i \cdot X_i^m = T \cdot M_m[x]$$

the values of reference signals can be arbitrary. Therefore it is possible to select those values of the reference signals which are available. For example, for measurement of acceleration more than 1 g it is possible to select the reference signals whose values do not exceed 1 g.

1. A characteristic of the input-output of convertor is presented as a row as Macloren row β_1 β_2

$$f = f_o + B_1 X + B_2 X^2 + \ldots$$

The output parameter f is brought to the input parameter, or in other words it is expressed in units of the input parameter, by dividing

$$\frac{f - f_o}{B_1} = X + \frac{B_2}{B_1} X^2 + \ldots$$

or

$$y = x + \frac{B_2}{B_1} x^2 + \ldots$$

The value y is an reading x, which is different from it only by the inaccuracy value. In the same way the speed is determined

$$v(t) = \int_o^t x(t) \cdot dt$$

and the speed reading

$$w(t) = \int_o^t y(t) \cdot dt.$$

2. Since to the input of the convertor "n" reference signals are supplied, it is possible to determine "n" coefficients of the above presented row, while practically only one coefficient -β_1 is needed. There is the following system of equations:

$$f_1 = f_o + \beta_1 x_1 + \beta_2 x^2 + \ldots$$

$$f_2 = f_o + \beta_1 x_1 + \beta_2 x_1^2 + \ldots$$

From this system of equations the above mentioned determinators are found, and the value of β_1 is found.

3. The input signal acts in the (t) can be judged only by the output signal, or in other words by the value y. It is possible to directly compute initial moments of the output signal M_i[y].

The output signal is caused by the input signal x[t], but mathematically it is possible to present a reverse function, or in other words the input signal as a function of the output signal. This function can be disintegrated in the Macloren row with the disintegration coefficient d_i. This disintegration formula is $x = d_1 \cdot y + d_2 y^2 + \ldots$

When "n" reference signals are available, the following can be written

$$X_1 = d_1 Y_1 + d_2 Y_1^2 + \ldots$$

$$X_2 = d_1 Y_2 + d_2 Y_2^2 + \ldots$$

$$X_n = d_1 Y_n + d_2 Y_n^2 + \ldots$$

Since X_i and Y_i are known, the value di can be found. The system of equation is linear and it is determined by the above mentioned determinators. The value d_i is found in accordance with the previously presented equation. Since Y is a value of X, d_1 is close to I but not always equal to Y.

4. Knowing the initial moments of the value y, it is possible to find initial moments of the value x. The following formulas are utilized for this purpose. The initial order of the moment of the power "m" is

$$M_m[x] = \frac{1}{T} \int_o^T p(x) \cdot x^m \cdot dx$$

Where p(x) is a density of probability of x or

$$M_m[x] = \frac{1}{T} \int_o^t x^m(t) \cdot dt.$$

Then the first initial moment or the mathematical expectation is

$$M_1[x] = \frac{1}{T} \int_o^T (d_1 y + d_2 y^2 + d_3 y^3 +) dt =$$

$$\frac{1}{T}\left[d_1 \int y \cdot dt + d_2 \int y^2 dt + d_3 \int y^3 dt + \ldots\right] M_1[x] =$$

$$d_1 M_1[y] + d_2 M_2[y] + d_3 M_3[y] + \ldots M_2[x] =$$

$$\frac{1}{T} \int_O^T (d_1 y + d_2 y^2 + y_3 y^3 +)^2 dt =$$

$$\frac{1}{T} \int_o^T (d_1^2 y^2 + 2d_1 d_2 y^3 + d_2^2 y^4 + 2d_1 d_3 y^4 + 2d_2 d_3 y^5 + d_3^2 y^6) dt =$$

$$M_2[y] = d_1^2 M_2[y] +$$

$$(2d_1 d_2 M_3[y] + (2d_1 d_3 + d_2^2) M_4[y] + 2d_2 d_3 M_5[y] + d_3^2 M_6[y])$$

where $d_1 \approx 1 \cdot d_2$, d_3, . . . characterized non linearity, and its product is a value of the upper order of the smallness which is neglectable. Then, finally the following is received

$$M_2[x] = d_1^2 M_2[y] + \mathbf{2} d_1 d_2 M_3[y] + \mathbf{2} d_1 d_3 M_4[y] \ldots$$

Analogously, it is possible to obtain

$$M_3[x]=d_1^3M_3[y]+3d_1^2d_2M_4[y]+3d_1^2d_3M_5[y]+ \ldots$$

and in a common case

$$M_n[x]=d_1^nM_n[y]+nd_1^{n-1}d_2M_{n+1f(y)}+nd^{n-1}d_3M_{n+2}[y]$$

The system of equations

$$\sum_{i=1}^{n} T_i X_i^m = T \cdot M_m[x]$$

is obtained from the previous system of equations, (USSR Inventor's Certificates 1,453,418; 1,547,635) but the maximum value "m" is not equal to 2n−1, but instead is equal to n−1, or in other words it is necessary to have twice the number of the previous signals. For the simple case of three reference signals the following can be written.

$$T_1+T_2+T_3=T$$

$$T_1X_1+T_2x_2+T_3x_3=T \cdot M_1[x]$$

$$T_1X_1^2+T_2x_2^2+T_3x_3^2=T \cdot M_2[y]$$

While the invention has been illustrated and described as embodied in method and device of determination of an input signal which changes in time, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

What is claimed is:

1. A device for determination an input signal which changes in time and at its integral value containing n reference signals, comprising a multi-position switch through which the reference signals and the input signal are supplied to a convertor analog-frequency, a key, a counter; a unit of registration of reference signals; a memory unit; an

arithmetic-logical unit; a register of expected integral value of the input signal; a digital comparator; arranged so that outputs of the counter are connected to inputs of the memory unit and unit of registration of the reference signals, outputs of the memory unit and the unit of registration of reference signals are connected to inputs of the arithmetic logical unit, digital outputs of the arithmetic logical units are connected with input of the memory block and the register of expected integral value of input signal, control outputs of the arithmetic logical unit are connected with control inputs of the key and multi-position switch, inputs of the digital comparator are connected to outputs of the counter and the register of the expected integral value of input signal, in which the arithmetic logical unit write a code equal to a sum of products of every time interval and frequency of the convertor analog-frequency, corresponding to the reference signal wherein the every time interval are obtained from an n equation system in accordance with power m in which a left part of each equation in a sum of products of the time interval T_1 by the corresponding reference signal in the power m and a right side of each equation is a product of time of determination of the input signal by its initial moment of the power m, when, wherein m changes from one equation to another equation in a sequence 0, 1, . . . n−1 and the digital comparator fixes reaching by an integral value or the input signal of a value which is equal to a sum of the products of the time interval by the corresponding value of the reference signal.

2. A method of determination an input signal changed in time and its integrated value, comprising the steps of integrating to the given magnitude n reference signals which have a same nature as the input signal, the times interval of the reference signals are determined from conditions of equality the product time of determination of an input signal by its initial moment power m=0,1 . . . n−1 and the sum of products the time interval of a every reference signal by its value in a power m; integrating an actual input signal over time; and determining the reaching of a given magnitude by an integrated value of the input signal by coincidence of a result of the integrating of n reference signals and a result of the integrating of the actual input signal.

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