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PULSE REPETITION FREQUENCY DIVIDER,(U)
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FOREIGN TECHNOLOGY DIVISION

PULSE REPETITION FREQUENCY DIVIDER

by

L.A. Dubitskiy and Ye.M. Sheremet

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PULSE REPETITION FREQUENCY DIVIDER

By: L.A. Dubitskiy and Ye.M. Sheremet

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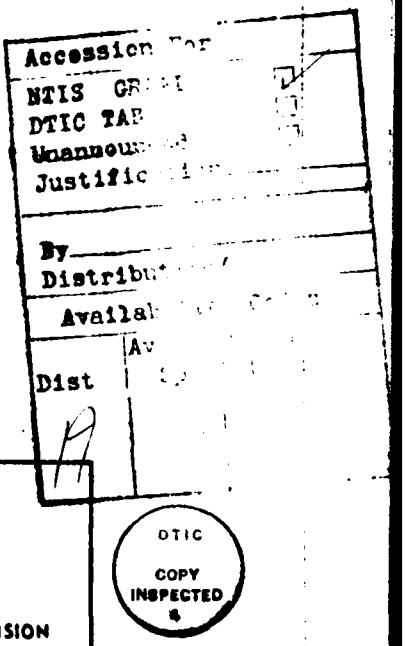

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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

PULSE REPETITION FREQUENCY DIVIDER

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L'vov Design Bureau.

Known pulse repetition frequency dividers contain a driven multivibrator with collector-base connections and an emitter follower in the charging circuit of the time-setting capacitor.

A shortcoming of these devices is the reduced maximum frequency of the input pulses and the low limits of change of the duration and the on-off time ratio of the output pulses.

The suggested device differs from the known devices in that a stabilitron is connected in series with the discharge resistor of the time-setting capacitor. Its cathode is connected between the base of the normally open transistor and the plate of the capacitor and a voltage divider is connected between the anode of the stabilitron and

the base of the normally closed transistor.

This makes it possible to raise the maximum frequency of the input pulses and to expand the limits of change of the duration and the on-off time ratio of the output pulses.

The drawing shows the schematic of the divider.

It is a circuit of a single-capacitor multivibrator with collector-base connections, made up of transistors 1-3. Transistor 2, and also resistor 4, which assigns the displacement in the base of the transistor, and resistor 5 which limits the collector current of the indicated transistor make up the emitter follower which is connected in the charging circuit of the time-setting capacitor 6.

The time-setting circuit consists of resistor 7 and the time-setting capacitor 6. In this circuit stabilitron 8 is connected in series with resistor 7. Resistors 9 and 10 form the voltage divider.

To the input of the frequency divider, through the dividing capacitor 11 a signal is fed in the form of sequential rectangular pulses of negative polarity with an assigned repetition frequency. In its absence the circuit is in the "initial" state: transistor 1 is

closed, transistor 3 is open, capacitor 6 is charged. The arrival of a triggering pulse is characterized by the triggering of transistor 1. At this time the voltage to which capacitor 6 has been charged turns out to be applied to the base of transistor 3. The latter closes. The time constant of the discharge of capacitor 6 determines the length of the pause between pulses and depends basically on the value of capacitor 6 and resistor 7. Connected in series with resistor 7, is stabilitron 8, the stabilization voltage of which is selected close to the collector supply voltage.

In the absence of trigger pulses the voltage on the stabilitron decreases until it approaches the collector supply voltage. The resistance of the stabilitron in this case rises sharply and subsequent discharge of capacitor 6 is realized with a greater time constant as a result of which the pause between pulses increases considerably.

In the presence of triggering pulses the indicated state is absent inasmuch as the reversal of the circuit occurs with a voltage on the stabilitron which converts the stabilization voltage. The discharge current of capacitor 6, and consequently the collector current of transistor 1, in this case is rather large. It should be noted that in the described device the value of the discharge resistor 7 is selected to be smaller than in known devices, as a

result of which capacitor 6 discharges with a large discharge current. This, and also the circumstance noted above, give evidence of the low degree of saturation of transistor 1 which accelerates the reversal of the circuit and raises the maximum frequency of division. Reversal of the circuit is accomplished by triggering pulses arriving at the base of transistor 3 in two different ways.

The first way is a circuit consisting of capacitor 11, resistor 10 and stabilitron 8. With a voltage on capacitor 6 which exceeds the amplitude of pulses which have passed to the cathode of the stabilitron 8, transistor 3 is reliably closed, and capacitor 6 discharges. The discharge continues until the moment at which equality of the indicated voltages is reached and the circuit reverses. On the collector of transistor 6 a leading pulse front is formed. It should be noted that in the given case the leading pulse front, as a rule, is preceded by characteristic surges the cause of which is the brief closing of transistor T6 by the triggering pulses. Upon termination of the action of the triggering pulse the voltage stored on capacitor 4 closes transistor T6, the circuit returns to the previous state, and capacitor 4 continues to discharge until the arrival of the next triggering pulse.

The second way is a circuit consisting of capacitor 11, diode 12, resistor 4, and capacitor 6. The triggering pulses, arriving at

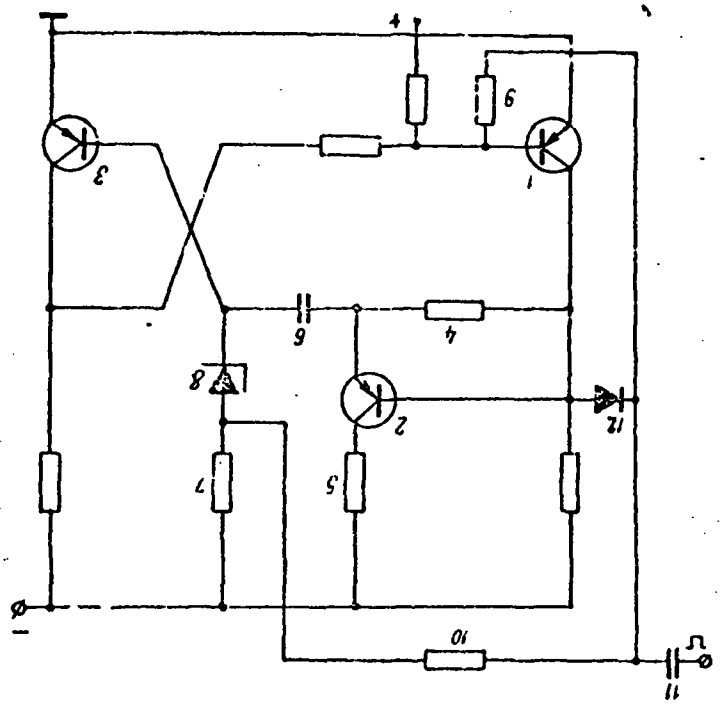
the input of the present circuit, are differentiated, in which case the time constant of the differentiating circuit has various values during formation of the negative- and positive half waves. Formation of the negative half wave is accomplished by a circuit, the time constant of which is determined by the value of capacitor 11, by the resistance of diode 12 and the output resistance of the open transistor 1. The negative half wave is removed from the collector of transistor 1 and through resistor 4 and capacitor 6 is transmitted to the base of transistor 3. With a voltage on capacitor 6 which exceeds the amplitude of the negative half wave, transistor 3 is reliably closed and capacitor 6 discharges. The discharge continues until the moment at which equality of the indicated voltages is realized and the circuit reverses. On the collector of transistor 3 a leading pulse front is formed.

The positive half wave is transmitted to the base of transistor 3 through stabilitron 8 but does not have a significant effect on the operation of the circuit. Reversal of the circuit is accomplished by the joint action of two pulses: the trigger pulse transmitted by the circuit of elements 11, 10, 8 to the base of transistor 3 and the negative half wave of the differentiated trigger pulse. The combined action of the indicated pulses and also the regulation of their amplitude by changing resistance 10 makes it possible to completely eliminate the surges preceding the leading front of the output pulse.

As a result of the use of the indicated pulses for reversing the circuit the reversal time is reduced and the maximum frequency of division is increased.

OBJECT OF INVENTION

Divider of pulse repetition frequency, containing a driven multivibrator with collector-base connections and an emitter follower in the discharge circuit of the time-setting capacitor is distinguished by the fact that for the purpose of raising the maximum frequency of input pulses and expanding the limits of change of the duration and on-off time ratio of the output pulses, in series with the discharge resistor of the time-setting capacitor a stabilitron is connected, the cathode of which is connected with a plate of the mentioned capacitor and the base of the normally open transistor and between the anode of the stabilitron and the base of the normally closed transistor a voltage divider is connected which is made up of two resistors, to the common point of which is connected the cathode of the diode, the anode of which is connected with the collector of the normally closed transistor.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