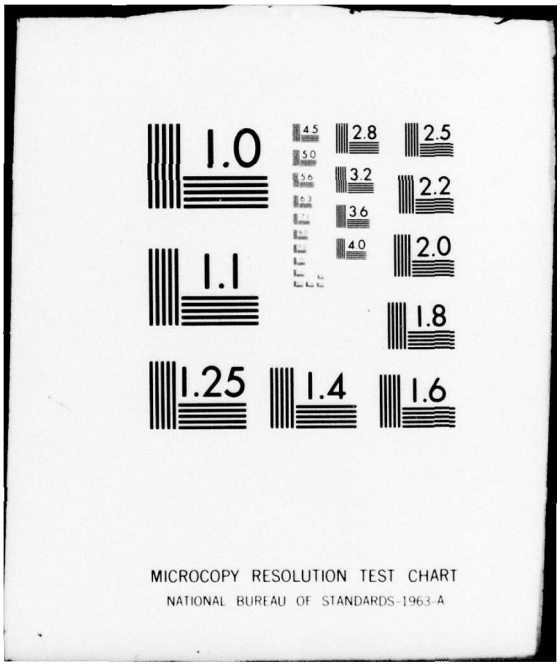
AD-A065 843 FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO F/G
ELECTRODYNAMIC PULSE GENERATOR,(U)
DEC 77 A I BERTINOV, D A BUT
UNCLASSIFIED FTD-ID(RS)T-2092-77 NL

| OF |
AD
A065843

END
DATE
FILMED
5-79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

FTD-ID(RS)T-2092-77

FOREIGN TECHNOLOGY DIVISION

ELECTRODYNAMIC PULSE GENERATOR

by

A. I. Bertinov, D. A. But

EDITED TRANSLATION

FTD-ID(RS)T-2092-77 8 December 1977

MICROFICHE NR: FTD-77-C-001566

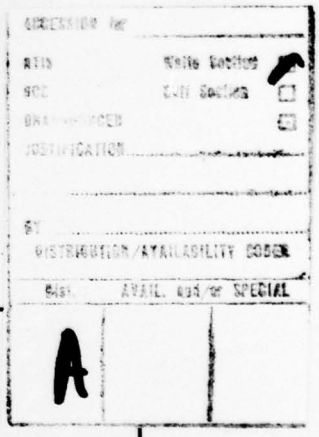
ELECTRODYNAMIC PULSE GENERATOR

By: A. I. Bertinov, D. A. But

English pages: 7

Source: USSR Patent No. 337895, 5 May 1972, pp. 1-3.

Country of origin: USSR
Translated by: Carol S. Nack
Requester: FTD/ETDP



PREPARED BY:

TRANSLATION DIVISION
FOREIGN TECHNOLOGY DIVISION
WP-AFB, OHIO.

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

ELECTRODYNAMIC PULSE GENERATOR

A. I. Bertinov and D. A. But

Moscow Order of Lenin Aviation Institute imeni Sergo Ordzhonikidze

This invention is in the area of obtaining electric power with electrodynamic pulse generators and concerns the improvement of generators.

We already have an electrodynamic pulse generator in which the potential energy of compressed gas is transformed into the kinetic energy of a moving metal piston, and then into electric power liberated on a load by magnetic field deformation. The generator consists of an acceleration shaft, a winding in the form of a

multiturn spring, and switching devices.

The purpose of this invention is tc create an electrodynamic pulse generator with improved energy conversion efficiency.

This is achieved by having the single-row winding attached to the wall of the shaft at one end, and tc a mobile flange which can move along the axis under the effect of the excess gas pressure - at the other end. The gas flows through pipes from the channel of the shaft into the cavities formed by the flange and the shaft, which widens in the vicinity of the winding. The faces of the winding turns are not covered with insulation.

The figure shows an overall view of the electrodynamic pulse generator.

The generator consists of high-pressure or combustion chamber 1, acceleration shaft 2, working body 3, spring winding 4, pneumatic brake shaft 5, load 6, switch 7, nonpower commutator 8, capacitor bank 9, flange 10, insulating bushing 11, spark plug 12, bypass pipes 13 and 14, compartments 15 and 16, control chokes 17 and 18, safety valve 19, main blower line 20, and damping spring 21. The generator is positioned in space so that the bottom of shaft 2 and chamber 1 are lower than the coil.

Winding 4 is a spring with close spacing made from a highly-conductive light elastic alloy (e.g., Aldrey). The uninsulated faces of the winding turns are machined to a high finish. When the spring is compressed, they come close together, providing good electrical contact between the turns.

The faces of the turns are coated with commercial silver in order to decrease their contact resistance. The front of the winding 4 is attached to flange 10, while the rear rests against the inner face of the insulating bushing 11. The metal working body 3, which is a piston, has open holes on its periphery (not shown in the figure).

Load 6 is directly connected to the clips of winding 4 through auxiliary switch 7, which switches the circuits and has a characteristic operating time of within 10^{-6} s. This switch can be an ignitron, for example. Besides load 6, capacitor bank 9 is connected to the clips of winding 4 through the auxiliary commutator 8, which similar to switch 7. Any current collector which requires short, high-current, high-voltage electric power pulses can be used as the load.

The generator operates as follows.

A portion of the compressed gas or fuel mixture is introduced into chamber 1 from a special container, then ignited by spark plug 12. The compressed gases accelerate working body 3 in guide column 2 to the necessary velocity, on the order of 300 m/s. At a certain point in time, the precharged capacitor bank 9 is connected to the winding 4, so that the maximum possible excitation current flows into the winding when body 3 flies up to it, creating a solenoidal axial magnetic field is created.

At a certain point in time during the movement of the working body, bypass pipes 13 and then 14 are connected to the high-pressure cavity of shaft 2 and compression waves are propagated in them. The point of connection of pipe 13 to the shaft 2 is selected with consideration of the velocity of the compression wave, the velocity of the body 3, and the mass of the winding 4, so that when the body flies up to the winding - when the excitation current in the winding is the maximum - the forces of pressure in compartment 15 press up on flange 10. This completely compresses and shorts the winding. When flange 10 is lifted up, the compressed gases escape from compartment 15 through the slit which forms between the flange and the projection of bushing 11, which thus limits the action of the force of the gases on the flange and the winding. The increased induction in the gap

between body 3 and the short-circuited winding 4 is accompanied by a considerable increase in the current in the latter.

The value of the total current in the winding is the maximum when body 3 approaches the lead from winding 4. At this time, the compression wave propagated in pipe 14 increases the pressure in the compartment 16 until flange 10 is released, and spring winding 4 is also released. This coordination of the mechanical processes is achieved by the appropriate selection of the points of connection of pipes 13 and 14 to shaft 2, the ratio of their cross sections, and also the control chokes 17 and 18. The release and opening of winding 4 with a high current leads to a marked increase in the voltage on its clips and switches load 6 into the working mode. Switch 7 is closed at this time, while commutator 8 is open. The energy of the compressed magnetic field is transformed into electric power which is liberated on the load. Thus, winding 4 is a combination of an excitation winding, an armature winding, an inductive accumulator, and a power commutator. Here power commutation is not concentrated on the contacts of any one device, but is uniformly distributed over the coils of the winding. This greatly facilitates its realization.

There should be enough turns in winding 4 to make the voltage on the load divided by the number of turns smaller than the sum of the anode and cathode voltage drop for the winding material in the

corresponding gaseous medium. When this condition is not satisfied, networks of interturn discharges can originate directly on the winding. The time constant of current attenuation in the winding 4-load 6 circuit must be of the same order of magnitude (or lower) as the time taken for body 3 to leave the winding. The body must somewhat longer than the winding in order to satisfy this condition.

After leaving winding 4, body 3 enters the shaft of pneumatic brake 5 and slows down to a complete stop due to the compression of the gas in the shaft. After the body stops, it returns to its original position, and the entire cycle is repeated.

Subject of Invention

This invention is an electrodynamic pulse generator consisting of a shaft in which a piston moves freely, a chamber which accelerates the piston, a chamber which brakes the piston, and a single-row winding arranged coaxially and flush-mounted on the inner wall of the shaft between the chambers. It differs in that in order to raise the energy conversion efficiency, one end of the single-row winding is attached to the wall of the shaft, and the other - to a mobile flange which can move along the axis under the effect of the excess pressure of the gas which enters through pipes from the

channel of the shaft into the cavity formed by the flange and that portion of the shaft which widens near the winding. Here at least the faces of the turns of the winding are not covered with insulation.

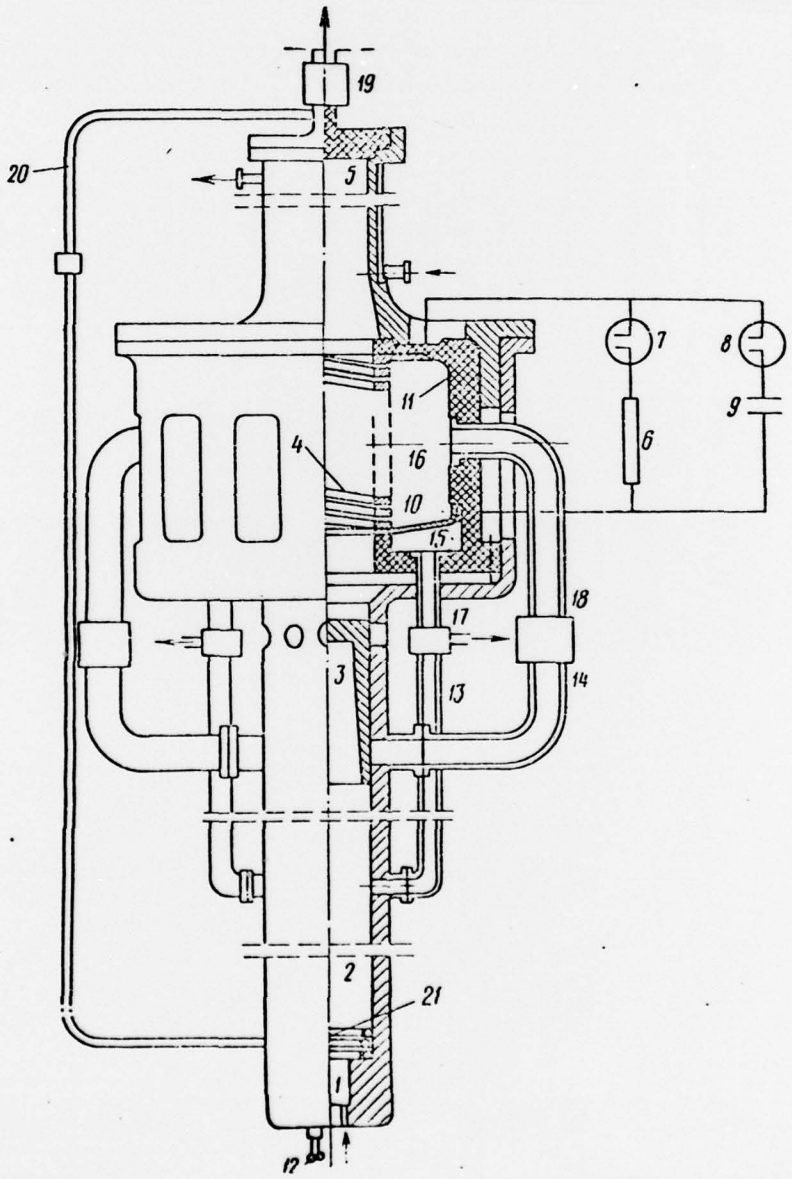


Figure.

DISTRIBUTION LIST

DISTRIBUTION DIRECT TO RECIPIENT

ORGANIZATION		MICROFICHE
A205	DMATC	1
A210	DMAAC	2
B344	DIA/RDS-3C	8
C043	USAMIIA	1
C509	BALLISTIC RES LABS	1
C510	AIR MOBILITY R&D LAB/FIO	1
C513	PICATINNY ARSENAL	1
C535	AVIATION SYS COMD	1
C591	FSTC	5
C619	MIA REDSTONE	1
D008	NISC	1
H300	USAICE (USAREUR)	1
P005	ERDA	1
P055	CIA/CRS/ADD/SD	1
NAVORDSTA (50L)		1
NASA/KSI		1
AFIT/LD		1

ORGANIZATION		MICROFICHE
E053	AF/INAKA	1
E017	AF/ RDXTR-W	1
E404	AEDC	1
E408	AFWL	1
E410	ADTC	1
E413	ESD	2
	FTD	
	CCN	1
	ETID	3
	NIA/PHS	1
	NICD	5