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STABILIZING CIRCUIT

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Fig. 1.

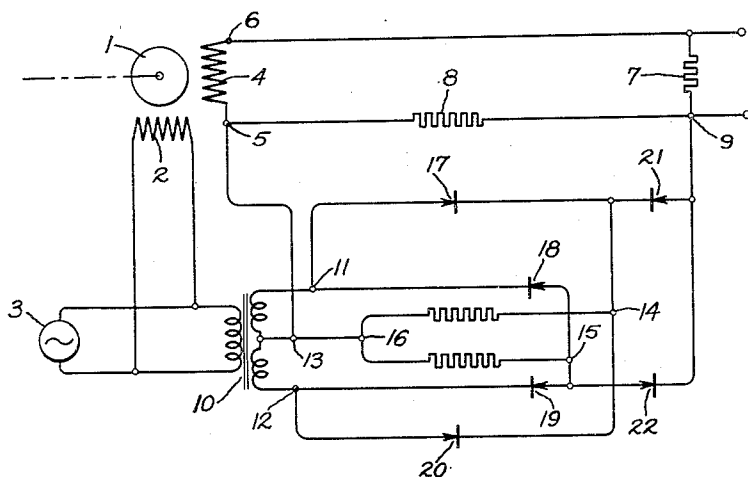
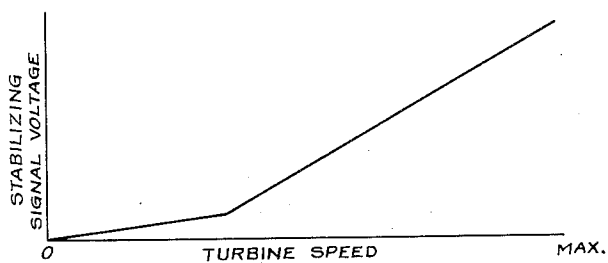


Fig. 2.



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STABILIZING CIRCUIT

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2 Claims. (Cl. 323-66)

1

My invention relates to an electrical circuit and more particularly to a means for producing step changes in the output voltage gradient of stabilizing apparatus.

Control systems for airplane turbosupercharger regulators usually consist of a number of individual control units electrically interconnected to operate as a system. Their purpose is to maintain constant carburetor inlet pressure by automatically regulating a turbosupercharger which is driven by a turbine located in the exhaust stack, the speed of which is dependent on the position of the waste gate in the turbine exhaust.

Because of time delay in effecting a change in carburetor pressure in response to waste gate operation, it is necessary that the system be provided with a means for insuring stability. This has been accomplished in the past by introducing into the regulator control system, a stabilizing signal comprising a component which is a direct function of waste gate position and a component which is a direct function of turbine speed as derived, for example, from a velocity generator. It has been found however, that while operation is stable at high altitudes, the signal from the velocity generator makes the system too sluggish during operation on the ground due to differences in air speed as well as altitude. Therefore, it has become necessary to seek means for producing a stabilizing signal which varies with the exhaust stack turbine speed but which has a low voltage gradient up to approximately one-third speed so as to permit rapid acceleration on the ground and which also provides a greater voltage gradient above this speed to retain stability at the higher altitudes.

Accordingly, it is an object of my invention to provide a means for changing the gradient of a stabilizing signal at an arbitrary value of turbine speed.

According to a preferred embodiment of my invention, I couple the velocity generator to the turbine for rotation therewith and derive an alternating voltage which is applied to a voltage divider comprising two impedances. Across the first of these impedances, I connect a shunting circuit which operates to substantially bypass the impedance upon exceeding a predetermined bias voltage. The alternating voltage output signal is taken from the terminals of the second impedance whose characteristic is automatically modified when the velocity generator reaches a predetermined transition value of voltage.

The invention will be more fully understood by

2

referring now to the accompanying drawing wherein

Fig. 1 is a diagrammatic representation of my stabilizing circuit and

Fig. 2 is a typical curve of output voltage gradient.

Referring now to Fig. 1 there is shown a velocity generator 1 such as a tachometer, which is adapted to be driven by a turbine not shown. The generator input winding 2 is provided with a voltage from an A.-C. source of supply 3. As generator 1 gathers speed, it produces a voltage of constant frequency and magnitude proportional to speed across a winding 4 having terminals 5, 6. An output resistor 7 and a shunt resistor 8 are joined together at one end 9, and their other ends are connected to generator winding 4 at terminals 5 and 6 respectively.

Across resistor 8 there is connected a shunting circuit which comprises basically, a means for establishing a reference voltage which is utilized to bias unidirectional limiting devices. A transformer 10 is connected to A.-C. source 3 and is provided with a secondary winding having terminals 11, 12 and a midtap 13. The alternating voltage which appears at the terminals of the secondary winding is now rectified so as to produce a corresponding voltage across a bias resistor having terminals 14, 15 and a midtap 16 which is connected directly to midtap 13 of the transformer secondary winding. Rectifiers 17, 18, 19 and 20 are so connected to the bias resistor that terminals 14, 15 always maintain a positive and a negative polarity respectively.

A limiting rectifier 21 is connected between positive terminal 14 of the bias resistor and terminal 9 of the output resistor so that no current will flow between these terminals until the voltage at terminal 9 is positive and greater than the reference voltage at terminal 14. I have also connected the secondary midtap 13 with terminal 5 of the velocity generator winding 4 so that when rectifier 21 conducts, a shunt path is established across resistor 8 starting at terminal 9, thru rectifier 21, terminals 14, 16, 13 and back to 5.

A second limiting rectifier 22 is connected between terminal 15 of the bias resistor and output terminal 9 and likewise rectifier 22 does not conduct until the voltage at terminal 9 swings to a lower negative value than that existing at terminal 15. Accordingly, on the negative half of the voltage cycle, resistor 8 is also bypassed when rectifier 22 conducts, and a shunt path is estab-

3

lished starting at terminal 9, thru rectifier 22, terminals 15, 16, 13 and back to 5.

When the signal from the velocity generator is below a certain transition voltage, the limiter action does not exist and the voltage output across resistor 7 will be the fraction $R_7/R_8 + R_7$ of the signal voltage, wherein the subscripts correspond to similar identifying numerals of the drawing.

When the signal from the velocity generator is above a certain transition voltage, limiter action will hold the voltage drop across resistor 8 to a value determined by the bias resistor voltage drop and the output voltage will be substantially equal to the signal voltage.

Fig. 2 shows the variation of stabilizing signal voltage produced with relation to turbine speed. It will be noted that at high turbine speeds, a high voltage gradient exists, whereas at low turbine speeds, the stabilizing signal output is maintained at a low value. Thus, I have provided a means for conveniently changing the voltage gradient of a generated signal so as to provide appropriate system stabilization at any altitude.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim is:

1. A stabilizing circuit comprising an alternating voltage generating means, a first and a second resistor serially connected across said

4

generating means, means for conditionally applying a bias voltage across said second resistor further comprising a source of voltage including a transformer having a primary and a secondary, means for rectifying the voltage from said transformer, a bias resistor having a midtap, means for applying said rectified voltage across said bias resistor, means connecting the midtap of the bias resistor to one end of said second resistor, and limiter means connecting said bias resistor with the other end of said second resistor whereby the gradient of the voltage across said first resistor is altered upon reaching a predetermined voltage.

2. A circuit as defined in claim 1 wherein said secondary winding has a midtap connected to the midtap of said bias resistor and said limiter means further comprises two unidirectional devices, one of said devices being connected between said one end of said second resistor and one end of the bias resistor, the other of said devices being connected between said one end of said second resistor and the other end of the bias resistor.

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