

come less than for the rotor without a liquid. Angular speed at which the rotor cannot overcome critical frequency, for low power of the engine is calculated. The ob-

tained results should be taken into account at designing and use of liquid LBDs for clearing fluctuations of unbalanced rotors with a vertical axis of rotation.

Literature

1. Pat. 6782722 USA. Drum washing machine // Yokoi e.a. Sanyo Electric Co., Ltd.; 31.08.2004.
2. Epishev L.V. On dynamic instability of a rotating rotor at incomplete filling of liquids. [in Russian] // Scient. Reports of vyssh. shkoly. Mashinostroyeniye i priborostroyeniye. – 1959. – No 2. – P. 66–74.
3. Derendyaev N.V., Sandalov V.M. On stability of stationary rotation of the cylinder in part filled with a viscous incompressible liquid. [in Russian] // Prikladnaya matematika i mehanika. – 1982. – V. 46, issue. 4. – P. 578–586.
4. Dimentberg F.M. Bending fluctuation of rotating shafts. [in Russian]. – M.: Izd. Akad. nauk SSSR, 1959. – 246 p.
5. Rubanovskij V.N., Samsonov V.A. Stability of stationary movements in examples and problems. [in Russian] – M.: Nauka, 1988. – 304 p.
6. Gusarov A.A. Autobalancing devices of direct action. [in Russian]. – M.: Nauka, 2002. – 119 p.
7. Nesterenko V.P. Automatic balancing of rotors for devices and machines with many degrees of freedom. [in Russian]. – Tomsk: Izd. Tomsk. Gos. Univ., 1985. – 85 p.
8. Dimentberg F.M., Shatalov K.T., Gusarov A.A. Fluctuation of machines. [in Russian]. – M.: Mashinostroyeniye, 1964. – 308 p.

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THE AMPLIFIER OF UNIPOLAR PULSES OF THE SHORT RANGE RADAR SYSTEM

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The amplifier of videopulses intended for work as a source of a pulse feed of the Hannah diodes 3A763A-M of the short range radar system is described. Characteristics of the amplifier are: coefficient of amplification 16 dB; the maximal amplitude of output pulses – 6 V; the maximal current in a pulse – 2,5 A.

At the present velocities of moving objects, for example, automobiles, is measured with wide using of the short range radar systems, based on the Doppler effect. Generators of the SHF oscillations of the named systems are made more often on the Hannah diodes working in the continuous mode. Abilities of such systems of a short range radar location can be expanded by converting the generators in the pulse operating mode. In this case it becomes possible to measure not only the velocity of objects, but and distance to them.

According to the nominal data [2] to excite the Hannah diodes 3A763A-M it is required the generators of videopulses with positive polarity amplitude 5...6 V at the output current 1,5...2 A. The standard generators of videopulse work as a rule for standard loading 50 Ohm and have a output voltage 1 V.

The circuit diagram of the amplifier allowing to raise the output parameters of the standard generator of pulse signals up to required values is shown on Fig. 1.

The amplifier contains the input resistive divider of voltage, two cascades of amplification, the stable current generator, the control output.

The resistive divider of voltage staying on the amplifier input and made on the resistors R1-R3, ensures coordination of the amplifier with output resistance of the generator and stabilization of general negative feedback depth, covering the amplifier.

In both cascades of the amplifier made on transistors VT2 and VT4, it is applied active collector thermostabilization of rest currents [3]. The transistor rest currents themselves were chosen from the undistorted amplification of videopulses with pulse ratio changing from 10 up to ∞ . For transistor VT2 the rest current is equal 70 mA, for VT4 – 300 mA that is found by selection of nominal of the resistors R5 and R12.

During start of the generator on the Hannah diode its resistance changes. To reduce influence of changing loading resistance the amplifier characteristics its output cascade is made by the circuit with the general collector, and the amplifier is covered with the general negative feedback consisting of elements R7, C8. As result the output resistance instant frequency of generation of the amplifier equal 0,4...0,6 Ohm is realized.

It is known, that change temperature of Hannah diode crystal results to change of the instant generation frequency [4]. To reduce the named factor the stable current generator on the transistor VT5, providing heating of the diode during the periods between arrival of start pulses is mounted in the amplifier. The stable current generator has limits of regulation 0,1...0,5 A.

The control output (fig. 1) is foreseen in the amplifier, which allows to register amplitude of pulses given on the Hannah diode. Diode VD1 is mounted for protection of the amplifier transistors against breakdown at

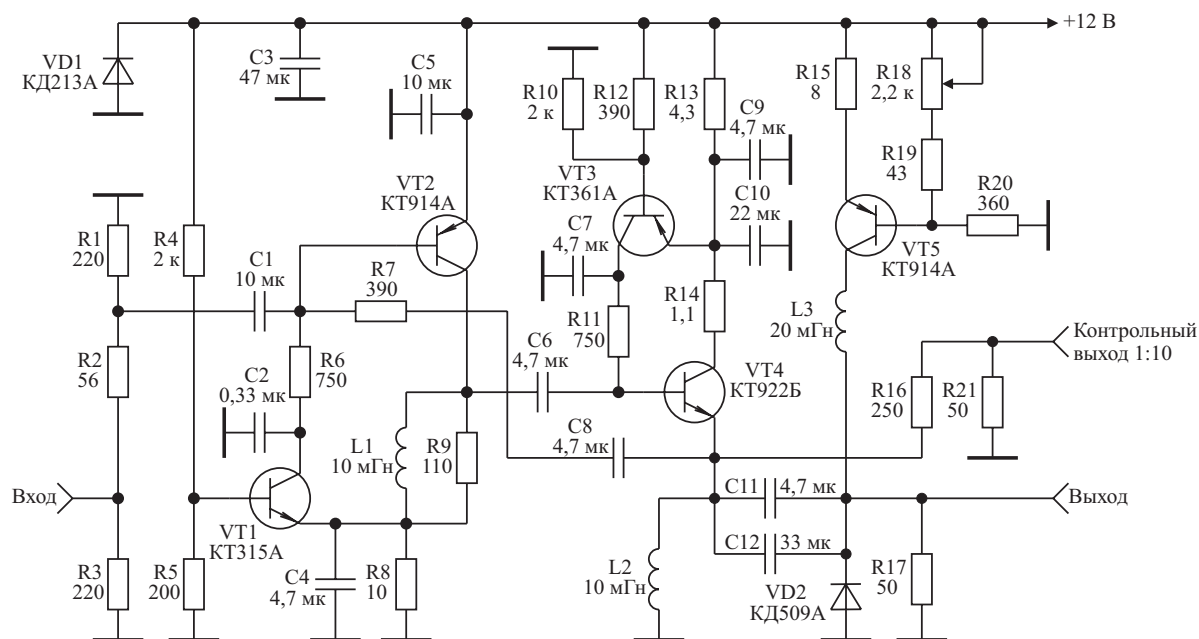


Fig. 1. The circuit diagram of the amplifier

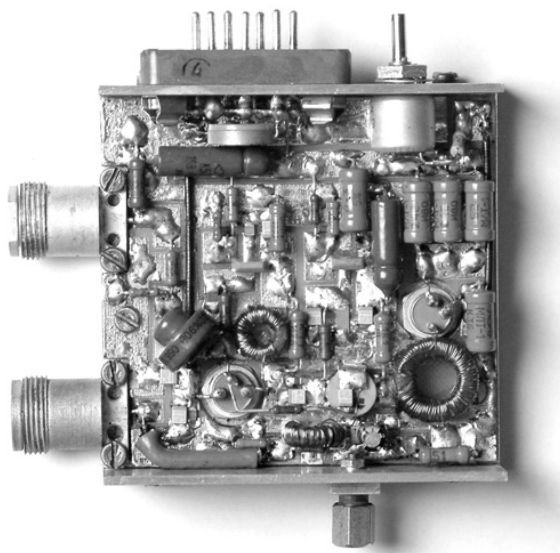


Fig. 2. The photo of the amplifier

a wrong choice of feed voltage polarity. Diode VD2 is necessary for restoration of a constant component on the amplifier output.

The photo of the amplifier explaining to feature of its constructive realization is given on fig. 2.

The amplifier has the following characteristics: amplification factor – 16 dB; input pulses polarity -negative; output pulses polarity – positive; the maximal amplitude of output pulses – 6 V; the maximal pulse current – 2,5 A; output resistance of the amplifier – 0,4...0,6 Ohm; time of establishment of pulse front 5 ns; fall of flat top at pulse duration 500 ns no more than 3 %; a feed voltage 12 V; duration of amplified pulses 10...500 ns; pulses ratio – not less than 10; overall dimensions 80×79×30 mm.

At pulse duration being 10 ns the system of a short range radio-location allows to define distance to objects from 1,5 m and more, at pulse duration being 500 ns speed of object movement is defined on distance up to 75 m.

Literature

1. Bakulev P.A., Stepin V.M. Methods and devices of selection of the moving targets. [in Russian]. – M.: Radio i svyaz, 1986. – 288 p.
2. Semi-conductor devices. Superhigh-frequency diodes. Handbook [in Russian] / B.A. Nalivajko, A.S. Berlin, V.G. Bozhkov etc. Ed. B.A. Nalivajko. – Tomsk: MSE «RASCO», 1992. – 223 p.
3. Titov A.A. Calculation of the active collector thermostabilization circuit and its use in amplifiers with automatic adjustment of consumed current. [in Russian]. // Electronic engineering. Ser. SHF-technique. – 2001. – No 2. – P. 26–30.
4. Tsarapkin D.P. SHF-generators on Gahn diodes. [in Russian]. – M.: Radio i svyaz, 1982. – 112 p.