RIAA CORRECTOR

crystal light

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After completing work on the basic version of the proofreader, listening, collecting and analyzing reviews, my interest in this issue subsided - the possibilities of such a structure were clear. I was prompted to return to this issue by communication with site visitors. Chasing the sound and some tendency to perfectionism, on the one hand, - still allowed to get excellent parameters, but on the other hand, it made the corrector very laborious to manufacture and very expensive.

Theoretically, the device can be repeated in amateur conditions, but in practice - this is not realistic. A sports interest arose: without losing the quality of the sound, if possible, to make a corrector, I will not say simpler, but easier to manufacture and less expensive.

Corrector circuit

The circuit of the corrector itself has undergone minimal changes (Figure 1). Were all additional circuits for forming frequency characteristics with switching relay, the circuit of the input and output stages is slightly changed. In the input stage, the battery bias has been changed to automatic (R3, C1, C3). it more convenient from an operational point of view and simplifies the selection of lamps in pairs. Now there is an opportunity slightly adjust the mode of operation of the lamp in fact. Acquisition of high-quality shunt capacitance is not particularly difficult. The second cascade remained unchanged. In the output follower, the cathode choke was replaced by a cascode current source (VT3, VT4). It had virtually no effect on the sound quality.

stage, but led to a slight decrease in the maximum output voltage, which is now determined by the voltage of the negative power supply. Theoretically, one could simplify the circuit a little more and along the way get rid of the separating capacitance C14. But I wanted everything the possibility of implementing an infrasonic filter (due to a decrease in C14) and the possibility (with a slight change in the circuit) to use the output stage independently are retained. it allows you to implement a full-fledged preamplifier based on the corrector.

The objective parameters of the corrector are given below.

Gain (1kHz) Recommended input level
Input impedance Input capacitance (adjustable) THD
(1kHz, Uout=0.5Vrms) Noise level (not weighted)
Background level Crosstalk level (20Hz - 20 kHz)
Overload capacity Maximum output voltage Factor distortion (1kHz,
Uout=33Vrms) Output impedance Minimum load impedance Built-in correction
characteristics Deviation from standard (20Hz - 50 kHz) Supply voltage Power
consumption Time to ready for operation Operating temperature Unit size
Weight

ÿ 100
2÷5mV
47kÿ±0.1%
90÷370pF
0.02% -65dB
-63dB -80dB
+38dB 33Vrms
1% ÿ 50ÿ

10kÿ
eRIAA
±0.07dB
220VAC±10%
100VA 100s
+10÷+30ÿ°
320x250x120mm

7.2kg

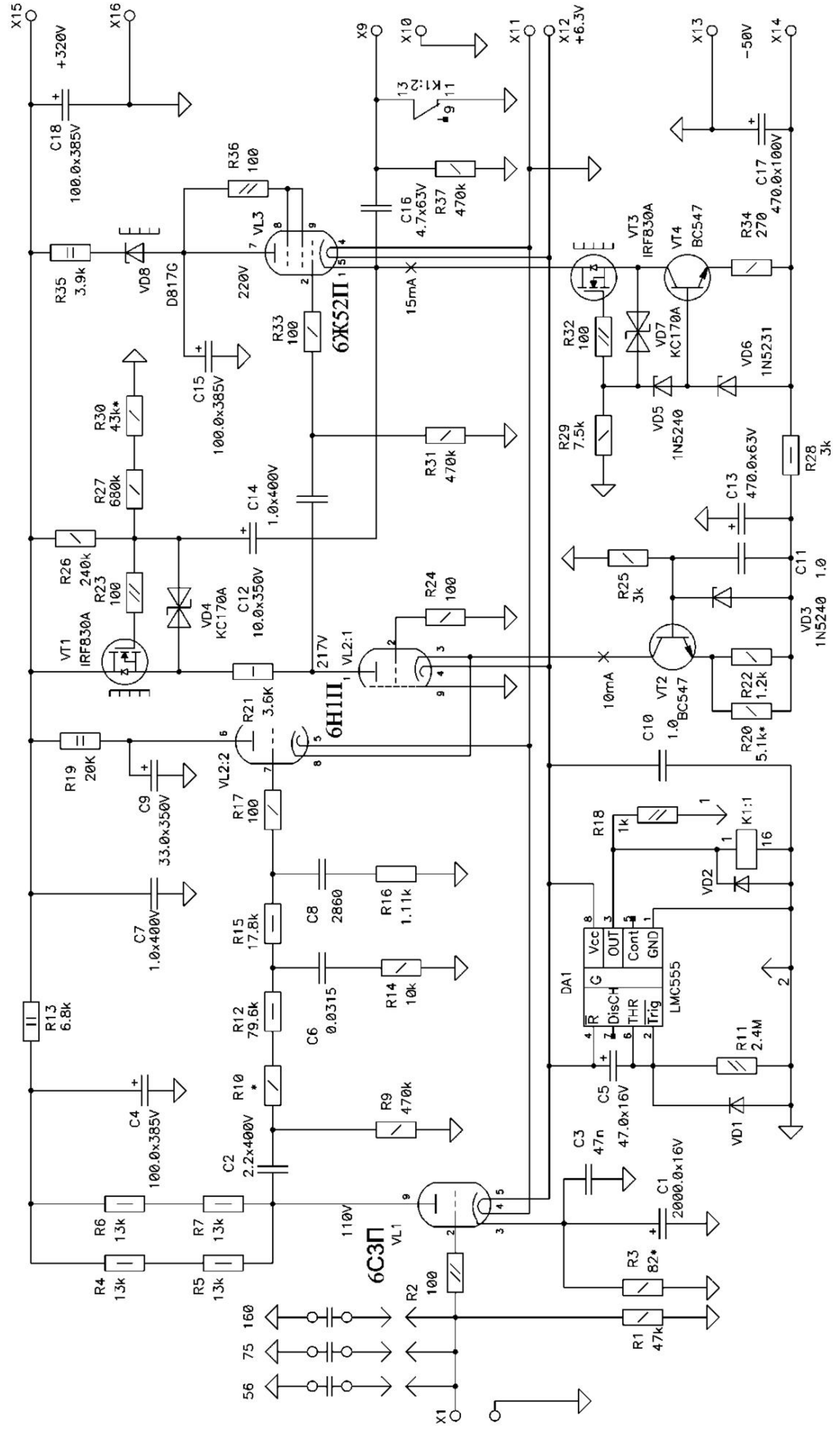
X15
X16
+320V
C18
100.0x385V
X9
X10
X11
X12
+6.3V
X13
-50V
X14
K1:2
R36
100
VL3
6Ж52П
R35
3.9k
VD8
D817G
220V
R33
100
C15
100.0x385V
C16
4.7x63V
R37
470k
15mA
VT3
IRF830A
VT4
BC547
R34
270
C17
470.0x100V
R32
100
VD7
KC170A
VD6
1N5231
VD5
1N5240
R29
7.5k
R28
3k
C13
470.0x63V
R30
43k*
R27
680k
C14
1.0x400V
R31
470k
R26
240k
R23
100
VD4
KC170A
C12
10.0x350V
VT1
IRF830A
217V
VL2:1
R24
100
R25
3k
C11
1.0
VD3
1N5240
10mA
VT2
BC547
R22
1.2k
R20
5.1k*
R21
3.6K
6Н1П
R19
20K
C9
33.0x350V
VL2:2
C10
1.0
R17
100
R18
1k
K1:1
VD2
C8
2860
R16
1.11k
R15
17.8k
C7
1.0x400V
DA1
LMC555
R
DisCH
THR
Trig
G
Vcc
OUT
Cont
GND
R13
6.8k
R12
79.6k
C6
0.0315
R14
10k
R11
2.4M
R10
*
C5
47.0x16V
VD1
C4
100.0x385V
R9
470k
C3
47n
C2
2.2x400V
C1
2000.0x16V
110V
VL1
6С3П
R6
13k
R7
13k
R3
82*
R4
13k
R5
13k
R2
100
R1
47k
160
75
56
X1

Рисунок 1

Source of power

The main changes affected the power supply. The corrector uses a group stabilizer. Since the average current consumed by the corrector in all channels is constant, the voltage is stabilized directly on the primary winding of the power transformer. This, of course, greatly simplifies the source circuit, but makes the device more sensitive to network instability. In its properties, the power supply system occupies an intermediate position between
classic and fully stabilized source. Slow network changes are fully compensated, short-term instability is partially suppressed. Screen between primary
and the secondary winding of the power transformer effectively suppresses high-frequency noise and reduces parasitic capacitive coupling through the network. In most cases (of course, if a powerful thyristor drive does not work behind the wall), this is quite enough to minimize the influence of the mains voltage parameters on the sound.

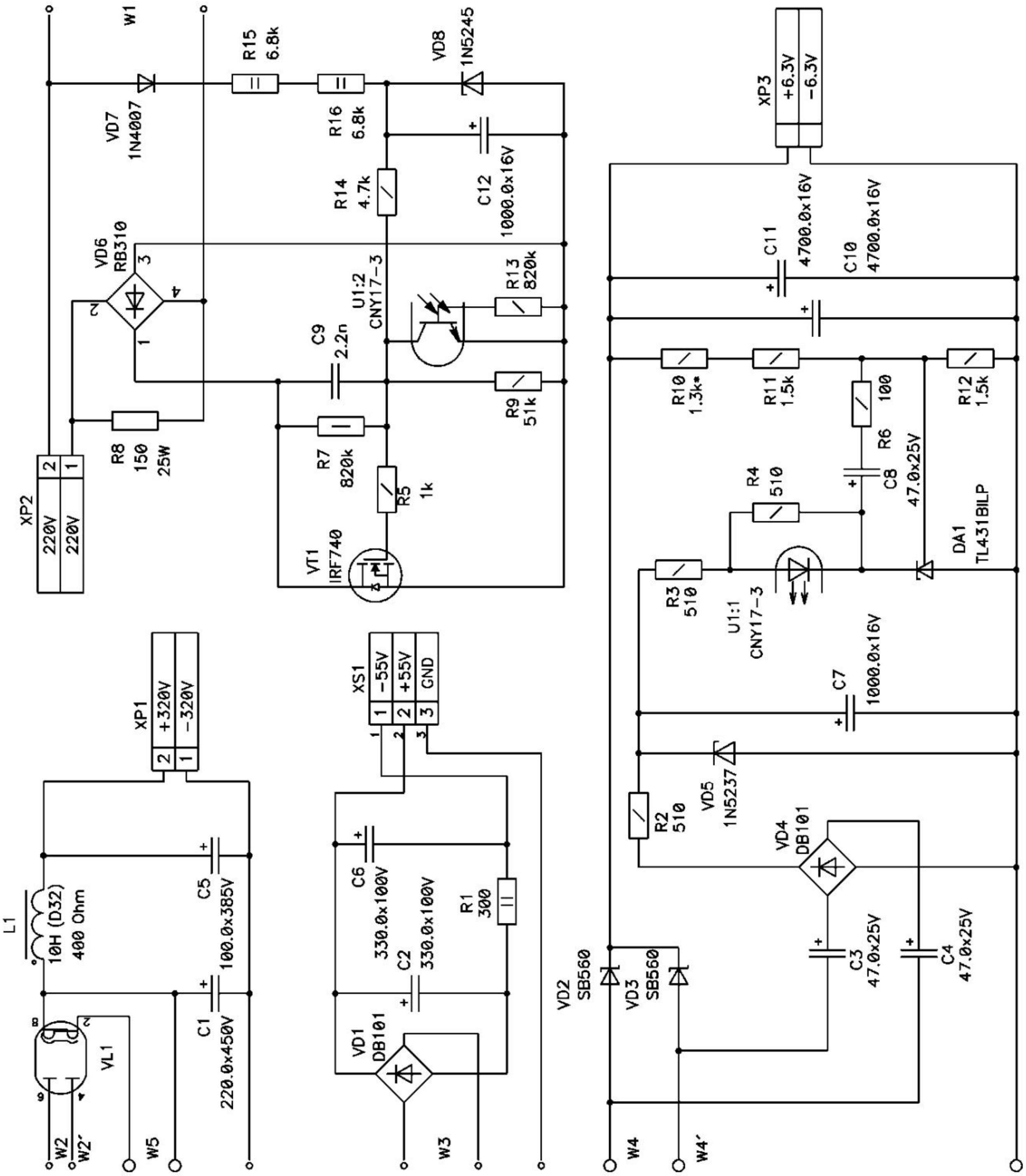

Figure 2

The main channels of the rectifiers are made with a midpoint and do not have any special features. The stabilizer itself consists of two parts. Control element (VT1) located on the primary side transformer and controlled via optical isolation (U1). The control system is located with secondary side and is implemented on the DA1 chip, the leading channel is the filament voltage. For increasing the stability of the control system with significant fluctuations in the mains voltage, the microcircuit is powered by an increased voltage from a rectifier with voltage doubling (VD4, C3, C4).

The power transformer is wound on a ÿ36ÿ30 core made of steel 3410. The winding data are given in the table, the windings are wound in the same order as they are listed. The winding is ordinary, the screen is made of a copper tape 0.3 mm thick, after assembly and testing, the transformer is impregnated varnish ML-92 and baked at a high temperature.

Winding	Number of turns	The wire
W1	700	PET-150, Ø 0.47mm
Screen		
W2	1260	PETLV-2, Ø 0.22mm
W2'	1260	PETLV-2, Ø 0.22mm
W3	260	PETLV-2, Ø 0.22mm
W4	25 25	PET-150, Ø 0.83mm
W4'	21	PET-150, Ø 0.83mm
W5		PET-150, Ø 0.9mm

It should be borne in mind that the parameters of the power supply and the current consumption of the corrector (for all channels) are strictly coordinated.

Construction and details

The device is assembled in one case, which is divided into two parts by a shielding partition made of thick steel (Fig. 3).

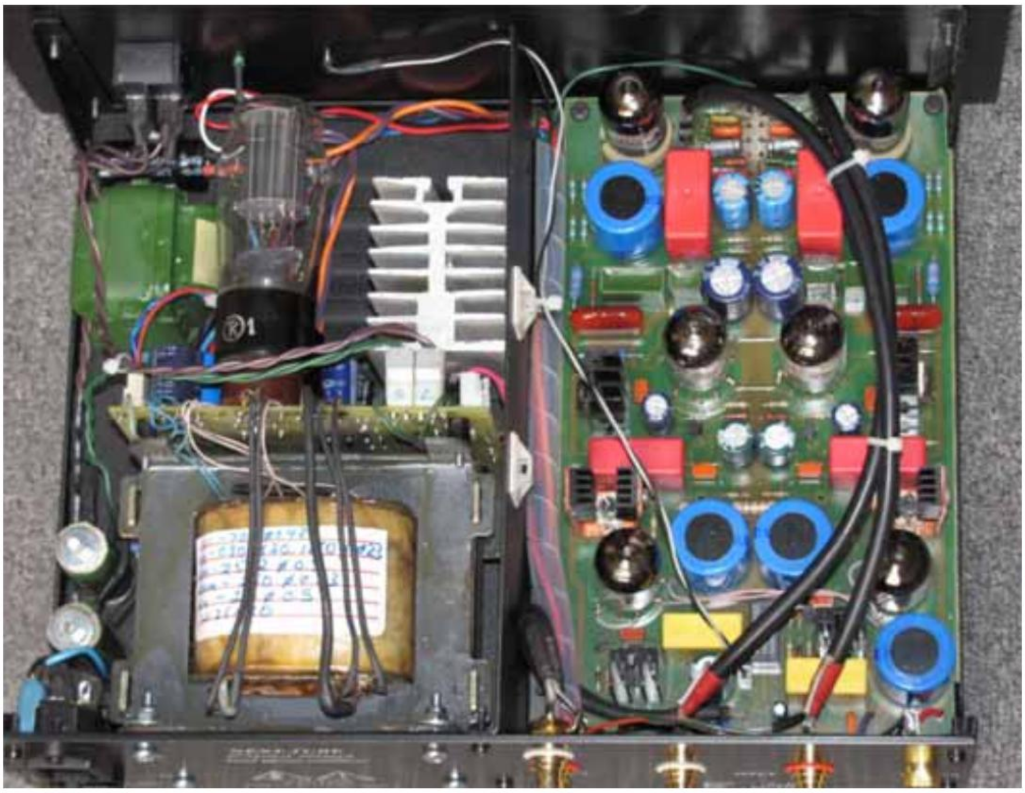

Figure 3

The corrector board is located in one compartment, and the power supply is in the second. In the body should be provided with sufficient louvres for cooling. It is only desirable not make blinds neither from above nor from below directly above the first stage and correction circuits.

All source electronics are assembled on a single printed circuit board, which is attached to the transformer. Larger components are fixed directly on the base plate of the housing. The transformer is mounted on the housing through vibration-isolating rubber bushings and has no hard contact with the housing. The controller transistor is installed on a cooler with an area of 400÷500 cm2 (if there are shutters above and below it). Since the transistor is at the potential of the network, double insulation is used - the transistor is isolated from the radiator, and the radiator itself isolated from the body by bushings. Any special requirements for source details not presented.

The corrector circuit is also completely assembled on a single printed circuit board. The use of a printed circuit board is optional, but desirable, as the circuit is sensitive to layout and layout. The board itself is mounted on anti-vibration stands and does not have a rigid connection with the case. Transistors VT1, VT3 are installed on radiators with an area of 20÷30 cm2 , for the VD11 zener diode, a cooler with an area of at least 50 cm2 is required . The requirements for components that directly carry signal currents are quite stringent. The input stage uses resistors of the CFR, MF (Royal Ohm) type with a low level of intrinsic noise, in the remaining stages MGR, MOR, C2-23 (groups A). In the frequency setting circuit - MF, C2-36, C2-29, C2-14 (group A) with accuracy is better than 0.5%. Capacitors that set the input capacitance of the corrector, mica with an accuracy of no worse than 5% and selected in pairs, separating capacitances - MKP10, MKP4, MPB (Vima). AT frequency-setting circuit, you can use the capacities K71-7, K31-10, SGM-A with an error no worse than 1%, in principle, you can use the capacity of lower accuracy. In this case, you will have to select capacitors at face value. Capacitors in the cathode circuit of the first lamp and power filters - Philips (LL series). Such a selection of components is close to optimal in terms of price-quality ratio. Here you can move in both directions - as to the use of more expensive elements, which will not give anything fundamental, except for moral satisfaction. So in the direction of cheaper, but here it is important

do not bend the stick. If the types of resistors are not so important, then separating capacitances should be film and selected based on the minimum value of the loss tangent. In general, 99% of the answers to the questions: “How suitable is this component?” - lies in the reference books, and I I highly recommend you look there. Figure 4 shows what the corrector looks like and preamplifier based on it.

Figure 4

Adjustment

Adjustment begins with the power supply. A mandatory requirement is the availability of load equivalents connected to all channels. Having removed the kenotron and disconnected the channel winding from the negative voltage, the filament voltage stabilizer is adjusted. By selecting resistors R10, a voltage of 6.3 volts is set at the channel output. Having restored the connection and installed the kenotron, turn on the source and check the voltage at the outputs of the remaining channels. Output voltages may differ from those specified by 5÷7%.

During installation, the resistor R10 is not installed, and the free terminal R12 is grounded. For a fee supply a negative supply voltage (40 ÷ 50 volts) from a laboratory source and install

the current of the current source on the transistor VT2 (selection of R20) and the current source on the transistors VT3, VT4 (selection of R34) are calculated. To control the current, the output of the current source is simply connected through a milliamm permeter to a common wire. After setting the currents, the corrector is powered from a standard source and, if necessary, the voltages at the anode VL1 (R3) and anode VL2:1 (R20) are adjusted. After that, measure
the output resistance of the first stage and solder the resistor R10 with a rating that complements the output resistance of the lamp up to 3 kOhm (the jumper on the common wire is removed). The final stage is the removal of its objective characteristics in full
me.

Conclusion

In general, I am pleased with the result. Determining by ear which corrector works is quite problematic. Rather, it resembles the process of guessing, rather than confidently determining
devices. The corrector practically does not introduce distortion and does not color the sound, it is insensitive to the quality of the interconnect cable. This gives an interesting result: in good systems with a balanced path, the advantages of the system are only emphasized if there are some
problems, they become more pronounced.

In conclusion, I would like to say that the described corrector is a prototype of a mass-produced device with improved parameters. The corrector is produced by Ankor under the trade name Crystal Prima.

Literature

1. Evgeny Karpov, High-quality RIAA Crystal corrector, online edition - 2010. 2. Evgeny Karpov, Stabilized power supply for a tube amplifier, online from
Denmark - 2006.