

UAF 42 (UAF 41) Variable-mu diode-pentode

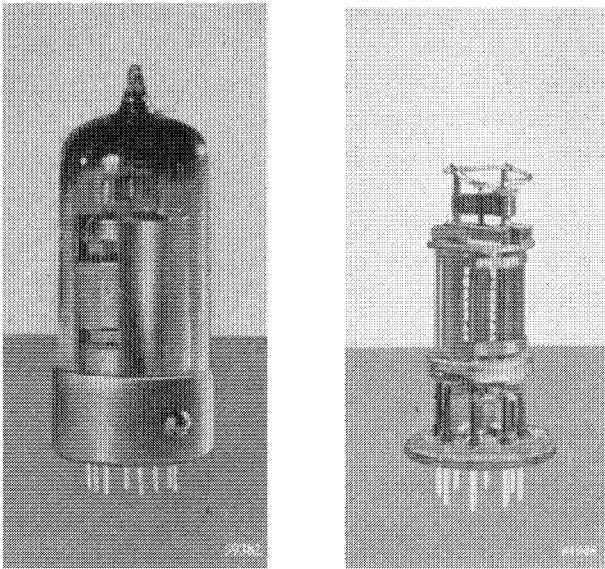


Fig. 1

The UAF 42, showing the electrode system (approximately actual size).

The UAF 42 is a variable-mu diode-pentode for A.C./D.C. receivers having a heater circuit carrying 100 mA. The pentode section is intended for use as R.F., I.F. or A.F. amplifier, the diode section being suitable for detection and A.G.C.

Since the UAF 42 — apart from the heater — is identical with the EAF 42, further particulars will be found in the description of the latter valve.

TECHNICAL DATA OF THE DIODE-PENTODE UAF 41

Heater data

Heating: A.C. or D.C., indirect, series feed

Heater current	I_f	=	100 mA
Heater voltage	V_f	=	12.6 V

Capacitances (cold valve)

Pentode section

Input capacitance	C_{g1}	=	4.0 pF
Output capacitance	C_a	=	6.5 pF
Anode - control grid	C_{ag1}	<	0.002 pF
Heater - control grid	C_{g1f}	<	0.05 pF

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Diode section

Anode - cathode	C_a	=	3.8 pF
Anode - heater	C_{af}	<	0.02 pF

Between diode and pentode sections

Diode anode - pentode control grid	C_{dg1}	<	0.0015 pF
Diode anode - pentode anode	C_{da}	<	0.15 pF

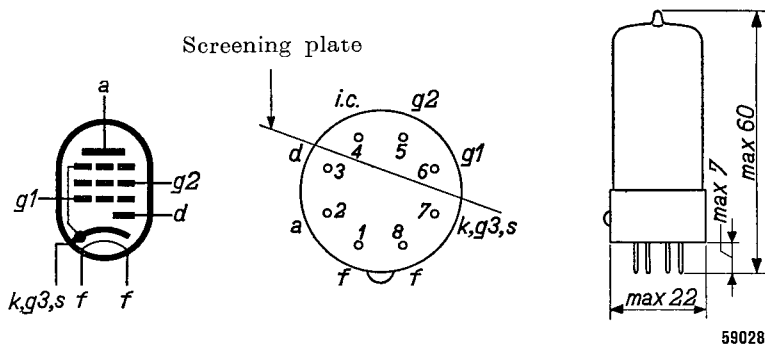


Fig. 2
Electrode arrangement, electrode connections and maximum dimensions in mm of the UAF 41.

Operating characteristics of the pentode section used as R.F. or I.F. amplifier (see Figs. 6 and 7)

Anode and supply voltage . .	$V_a = V_b =$	100	170	V
Screen grid resistor	$R_{g2} =$	44	44	kΩ
Bias resistor	$R_k =$	300	300	Ω
Grid bias	$V_{g1} =$	$\overline{-1.1} \quad \overline{-17}$	$\overline{-2} \quad \overline{-28}$	V
Anode current	$I_a =$	2.8 —	5 —	mA
Screen grid current	$I_{g2} =$	0.9 —	1.6 —	mA
Mutual conductance	$S =$	1650 16.5	1800 18	μA/V
Internal resistance	$R_i =$	1.0 >10	1.2 >10	MΩ
Equivalent noise resistance . .	$R_{eq} =$	7 —	9 —	kΩ
Amplification factor, second grid with respect to first grid . .	$\mu_{g2g1} =$	19 —	19 —	—

Operating characteristics of the pentode section used as resistance-coupled A.F. amplifier (for circuit see Fig. 5; for microphonic properties of this circuit see description of the EAF 42)

- A. Supply voltage $V_b=170$ V Anode resistor $R_a=0.2$ M Ω
 Bias resistor $R_k=2.7$ k Ω Screen grid resistor $R_{g2}=0.73$ M Ω

Control voltage — V_R (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
				3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	0.58	0.18	78	0.8	1.1	1.6
5	0.46	0.13	25	1.2	2.1	4.0
10	0.36	0.08	15	2.0	3.2	4.8
15	0.26	0.05	10	2.6	3.7	5.8
20	0.18	0.03	7	3.0	4.4	7.3
25	0.12	0.01	5	5.1	8.0	13.0

- B. Supply voltage $V_b=100$ V Anode resistor $R_a=0.2$ M Ω
 Bias resistor $R_k=2.7$ k Ω Screen grid resistor $R_{g2}=0.73$ M Ω

Control voltage — V_R (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of:		
				3 V_{RMS}	5 V_{RMS}	
0	0.34	0.10	73	0.8	1.0	
2.5	0.26	0.07	27	3.0	4.0	
5.0	0.20	0.05	15	3.5	5.0	
7.5	0.16	0.04	10	3.8	5.7	
10.0	0.12	0.02	7	4.4	7.5	
12.5	0.08	0.01	5.5	5.7	9.0	

Operating characteristics of the pentode section used as resistance-coupled A.F. triode (screen grid connected to anode)

- A. Supply voltage $V_b=170$ V Anode resistor $R_a=0.1$ M Ω
 Bias resistor $R_k=1.2$ k Ω

Control voltage — V_R (V)	Anode current I_a (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
			3 V_{RMS}	5 V_{RMS}	8 V_{RMS}
0	1.3	15	1.2	1.8	3.4
5	0.9	7.3	1.5	2.4	3.8
10	0.6	5.0	1.3	2.1	3.0
15	0.4	3.7	1.9	3.7	6.0
20	0.2	2.6	4.0	6.8	9.5

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B. Supply voltage $V_b=100\text{ V}$ Anode resistor $R_a=0.1\text{ M}\Omega$
Bias resistor $R_k=2.3\text{ k}\Omega$

Control voltage — V_R (V)	Anode current I_a (mA)	Ampli- fication V_o/V_i	Distortion (%) at an output voltage of		
			3 V_{RMS}	5 V_{RMS}	
0	0.55	12	1.9	2.8	
2.5	0.45	7.2	2.6	5.6	
5.0	0.30	4.9	2.3	4.9	
7.5	0.20	3.8	3.0	6.0	
10	0.15	2.8	6.0	10.0	

Limiting values of the pentode section

Anode voltage, valve biased to cut-off	V_{a_o}	= max.	550 V
Anode voltage	V_a	= max.	250 V
Anode dissipation	W_a	= max.	2 W
Screen grid voltage, valve biased to cut-off	$V_{g^2_o}$	= max.	550 V
Screen grid voltage, valve controlled	$V_{g^2}(I_a<3\text{ mA})$	= max.	250 V
Screen grid voltage, valve not controlled	$V_{g^2}(I_a=6\text{ mA})$	= max.	150 V
Screen grid dissipation	W_{g^2}	= max.	0.3 W
Cathode current	I_k	= max.	10 mA
Grid current starting point	$V_{g1}(I_{g1}=+0.3\text{ }\mu\text{A})$	= max.	—1.3 V
External resistance between first grid and cathode	R_{g1}	= max.	3 M Ω
External resistance between heater and cathode	R_{fk}	= max.	20 k Ω
Voltage between heater and cathode	V_{fk}	= max.	150 V

Limiting values of the diode section

Peak anode inverse voltage	$V_{d\text{ inv } p}$	= max.	350 V
Diode current	I_d	= max.	0.8 mA
Peak diode current	I_{dp}	= max.	5 mA
Diode current starting point	$V_d(I_d=+0.3\text{ }\mu\text{A})$	= max.	—1.3 V
External resistance between heater and cathode	R_{fk}	= max.	20 k Ω
Voltage between heater and cathode	V_{fk}	= max.	150 V

TECHNICAL DATA OF THE DIODE-PENTODE UAF 42

Heater data

Heating: indirect, A.C. or D.C., series feed

Heater current I_f = 100 mA

Heater voltage V_f = 12.6 V

Capacitances (cold valve)

Pentode section

Input capacitance C_{g1} = 4.1 pF

Output capacitance C_a = 5.2 pF

Anode - control grid C_{ag1} < 0.002 pF

Heater - control grid C_{gf} < 0.05 pF

Diode section

Anode - cathode C_d = 3.3 pF

Anode - heater C_{df} < 0.02 pF

Between diode and pentode sections

Diode anode - pentode control grid C_{dg1} < 0.0015 pF

Diode anode - pentode anode C_{da} < 0.15 pF

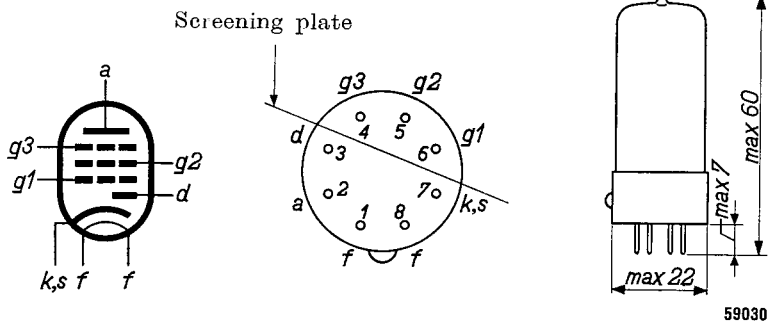


Fig. 3

Electrode arrangement, electrode connections and maximum dimensions in mm of the UAF 42.

UAF 42

Operating characteristics of the pentode section used as R.F. or I.F. amplifier (see Figs. 8 to 11 incl.)

Anode and supply voltage	$V_a = V_b =$	100	170	V
Voltage on third grid	$V_{g3} =$	0	0	V
Screen grid resistor	$R_{g2} =$	56	56	k Ω
Bias resistor	$R_k =$	310	310	Ω
Grid bias	$R_{g1} =$	$\overline{-1.2 \quad -16}$	$\overline{-2 \quad -28}$	V
Screen grid voltage	$V_{g2} =$	50	85	V
Anode current	$I_a =$	2.8	5	mA
Screen grid current	$I_{g2} =$	0.9	1.5	mA
Mutual conductance	$S =$	1700	2000	$\mu A/V$
Internal resistance	$R_i =$	0.85 > 10	0.9 > 10	M Ω
Equivalent noise resistance	$R_{eq} =$	5.8	7.5	k Ω
Amplification factor, second grid with respect to first grid	$\mu_{g2g1} =$	16	16	—

Anode and supply voltage	$V_a = V_b =$	200	V
Voltage on third grid	$V_{g3} =$	0	V
Screen grid resistor	$R_{g2} =$	76	k Ω
Bias resistor	$R_k =$	310	Ω
Grid bias	$V_{g1} =$	$\overline{-2 \quad -34}$	V
Screen grid voltage	$V_{g2} =$	85	V
Anode current	$I_a =$	5	mA
Screen grid current	$I_{g2} =$	1.5	mA
Mutual conductance	$S =$	2000	$\mu A/V$
Internal resistance	$R_i =$	1.0 > 10	M Ω
Equivalent noise resistance	$R_{eq} =$	7.5	k Ω
Amplification factor, second grid with respect to first grid	$\mu_{g2g1} =$	16	—

Operating characteristics of the pentode section used as R.F. or I.F. amplifier (Screen grid voltage obtained by means of the same potentiometer as that of the UCH 41, for circuit diagram see Fig. 4 ; see also Figs. 15, 16 and 17)

Anode and supply voltage	$V_a = V_b =$	100	170	V
Voltage on third grid	$V_{g3} =$	0	0	V
Resistor between supply voltage and screen grids	$R_1 =$	12	12	k Ω
Resistor between screen grids and chassis	$R_2 =$	27	27	k Ω
Bias resistor	$R_k =$	250	250	Ω
Grid bias	$V_{g1} =$	$\overline{-1.0 \quad -10.5}$	$\overline{-1.8 \quad -18}$	V
Screen grid voltage	$V_{g2} =$	53	87	V
Anode current	$I_a =$	3.0	5.5	mA
Screen grid current	$I_{g2} =$	1.0	1.7	mA
Mutual conductance	$S =$	1850	2100	$\mu A/V$
Internal resistance	$R_i =$	0.75 > 10	0.8 > 10	M Ω
Equivalent noise resistance	$R_{eq} =$	6	8	k Ω
Amplification factor, second grid with respect to first grid	$\mu_{g2g1} =$	16	16	—

Operating characteristics of the pentode section used as R.F. or I.F. amplifier;
screen grid voltages of UAF 42 and UCH 42 obtained by means of a common potentiometer (see Figs. 18, 19 and 20)

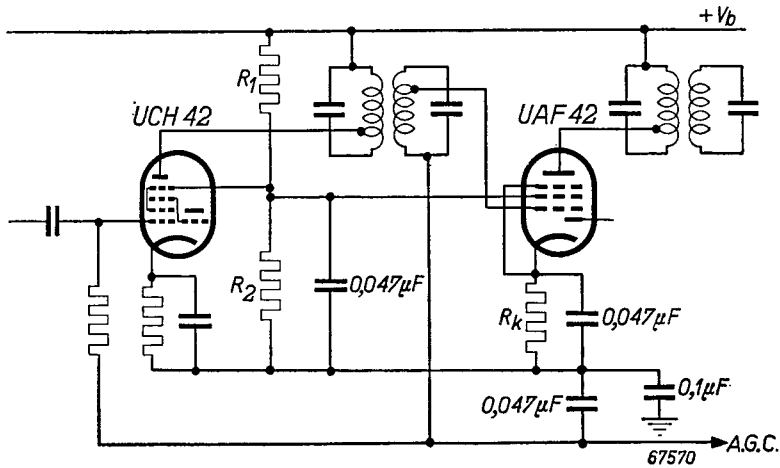
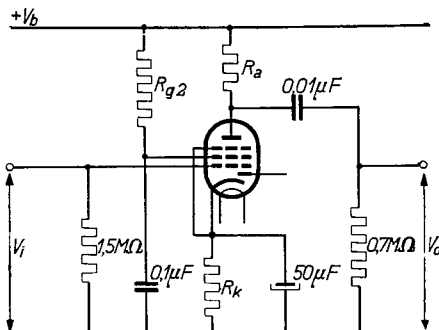


Fig. 4

Anode and supply voltage	$V_a = V_b =$	100	170	V
Voltage on third grid	$V_{g3} =$	0	0	V
Resistor between supply voltage and screen grids	$R_1 =$	15	15	kΩ
Resistor between screen grids and chassis	$R_2 =$	22	22	kΩ
Bias resistor	$R_k =$	330	330	Ω
Grid bias	$V_{g1} =$	-1.0 — -9.5	-1.8 — -15.5	V
Screen grid voltage	$V_{g2} =$	43 58	70 99	V
Anode current	$I_a =$	2.3 —	4.0 —	mA
Screen grid current	$I_{g2} =$	0.65 —	1.1 —	mA
Mutual conductance	$S =$	1500 15	1750 17.5	μA/V
Internal resistance	$R_i =$	0.95 > 10	0.95 > 10	MΩ
Equivalent noise resistance	$R_{eq} =$	6.1 —	7.8 —	kΩ
Amplification factor, second grid with respect to first grid	$\mu_{g2g1} =$	16 —	16 —	



Operating characteristics of the pentode section used as resistance-coupled A.F. amplifier (for particulars concerning microphony, see description of the EAF 42)

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A. Supply voltage $V_b=170$ V Anode resistor $R_a=0.22$ M Ω
 Bias resistor $R_k=2.7$ k Ω Screen grid resistor $R_{g2}=0.82$ M Ω

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
				3V _{RMS}	5V _{RMS}	8V _{RMS}
0	0.50	0.17	80	0.8	1.0	1.2
5	0.38	0.12	23	1.5	2.5	4.0
10	0.28	0.09	14	1.9	3.2	5.0
15	0.20	0.06	9	2.6	4.2	6.5
20	0.14	0.04	6	3.6	6.0	9.0

B. Supply voltage $V_b=170$ V Anode resistor $R_a=0.1$ M Ω
 Bias resistor $R_k=1.5$ k Ω Screen grid resistor $R_{g2}=0.33$ M Ω

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
				3 V _{RMS}	5 V _{RMS}	8 V _{RMS}
0	1.05	0.37	68	0.75	0.8	1.1
5	0.71	0.25	20	2.2	3.2	5.0
10	0.48	0.17	10	2.4	3.7	5.5
15	0.30	0.11	6	3.0	4.5	7.0
20	0.16	0.07	3.5	5.2	8.0	12

C. Supply voltage $V_b=100$ V Anode resistor $R_a=0.22$ M Ω
 Bias resistor $R_k=2.7$ k Ω Screen grid resistor $R_{g2}=0.82$ M Ω

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of	
				3 V _{RMS}	5 V _{RMS}
0	0.29	0.09	75	0.9	1.1
2.5	0.22	0.07	27	2.6	4.4
5.0	0.17	0.05	15	3.2	5.0
7.5	0.13	0.04	10	4.0	6.5
10	0.10	0.03	7	5.2	8.0

D. Supply voltage $V_b=100$ V Anode resistor $R_a=0.1$ M Ω
 Bias resistor $R_k=1.5$ k Ω Screen grid resistor $R_{g2}=0.33$ M Ω

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Screen grid current I_{g2} (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of	
				3 V _{RMS}	5 V _{RMS}
0	0.58	0.21	60	0.9	1.0
2.5	0.43	0.14	25	2.3	4.5
5.0	0.31	0.10	12	3.5	6.0
7.5	0.21	0.07	7.5	4.7	8.0
10	0.14	0.05	5	7.0	11

Operating characteristics of the pentode section used as resistance-coupled A.F. triode (screen grid connected to anode)

- A. Supply voltage $V_b=170$ V Anode resistor $R_a=0.1$ M Ω
Bias resistor $R_k=1.8$ k Ω

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
			3 V _{RMS}	5 V _{RMS}	8 V _{RMS}
0	1.20	12	1.4	2.2	3.2
5	0.84	6.5	1.4	2.2	3.7
10	0.58	5.0	1.4	2.3	3.8
15	0.37	3.5	1.7	2.7	4.6
20	0.22	2.5	3.2	5.0	8.0

- B. Supply voltage $V_b=170$ V Anode resistor $R_a=0.05$ M Ω
Bias resistor $R_k=1.2$ k Ω

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of		
			3 V _{RMS}	5 V _{RMS}	8 V _{RMS}
0	2.05	12	1.3	2.0	2.9
5	1.37	6.5	1.6	2.8	4.6
10	0.92	4.5	1.7	2.9	4.8
15	0.60	3.5	2.6	4.0	6.6
20	0.32	2.2	4.5	7.5	11

- C. Supply voltage $V_b=100$ V Anode resistor $R_a=0.1$ M Ω
Bias resistor $R_k=1.8$ k Ω

Control voltage $-V_R$ (V)	Anode current I_a (mA)	Amplification V_o/V_i	Distortion (%) at an output voltage of	
			3 V _{RMS}	5 V _{RMS}
0	0.70	12	2.0	2.2
2.5	0.50	7	2.4	4.5
5.0	0.36	5	2.4	4.5
7.5	0.25	4	2.7	4.7
10	0.17	3	4.2	6.6

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D. Supply voltage $V_b=100\text{ V}$ Anode resistor $R_a=0.05\text{ M}\Omega$
Bias resistor $R_k=1.2\text{ k}\Omega$

Control voltage — V_R (V)	Anode current I_a (mA)	Ampli- fication V_o/V_i	Distortion (%) at an output voltage of	
			3 V_{RMS}	5 V_{RMS}
0	1.18	12	1.7	2.6
2.5	0.80	7	3.0	5.1
5.0	0.56	5	3.6	5.7
7.5	0.38	3.5	4.2	6.8
10	0.24	2.5	6.5	10

Limiting values of the pentode section

Anode voltage, cut-off condi- tion	V_{a_o}	= max.	550 V
Anode voltage	V_a	= max.	250 V
Anode dissipation	W_a	= max.	2 W
Screen grid voltage, cut-off condition	V_{g2_o}	= max.	550 V
Screen grid voltage, valve con- trolled	$V_{g2}(I_a<2.5\text{ mA})$	= max.	250 V
Screen grid voltage uncontrolled valve	$V_{g2}(I_a=5\text{ mA})$	= max.	125 V
Screen grid dissipation	W_{g2}	= max.	0.3 W
Cathode current	I_k	= max.	10 mA
Grid current starting point . .	$V_{g1}(I_{g1}=+0.3\text{ }\mu\text{A})$	= max.	—1.3 V
External resistance between grid 1 and cathode	R_{g1}	= max.	3 M Ω
External resistance between grid 3 and cathode	R_{g3}	= max.	3 M Ω
External resistance between heater and cathode	R_{fk}	= max.	20 k Ω
Voltage between heater and cathode	V_{fk}	= max.	150 V

Limiting values of the diode section

Peak anode inverse voltage . .	$V_{d\text{ inv } p}$	= max.	350 V
Diode current	I_d	= max.	0.8 mA
Peak diode current	I_{dp}	= max.	5 mA

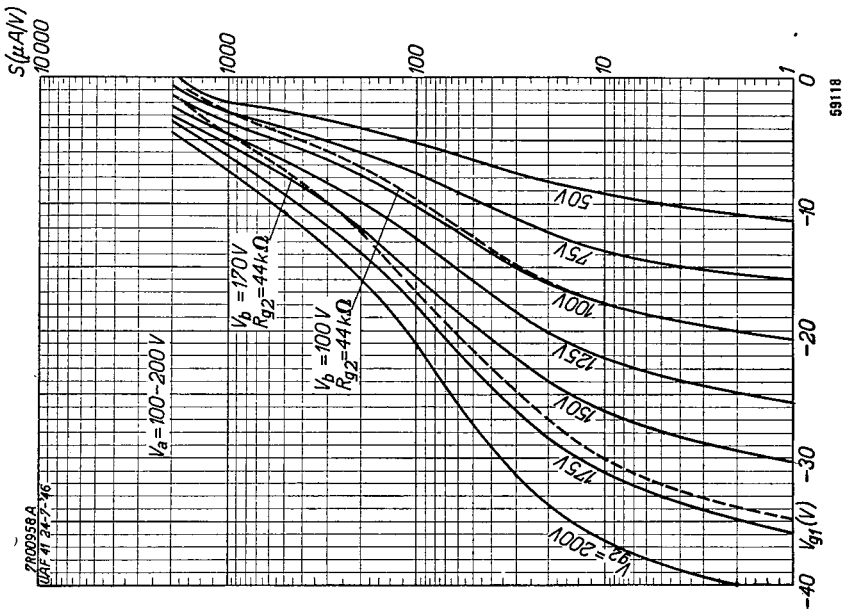


Fig. 7

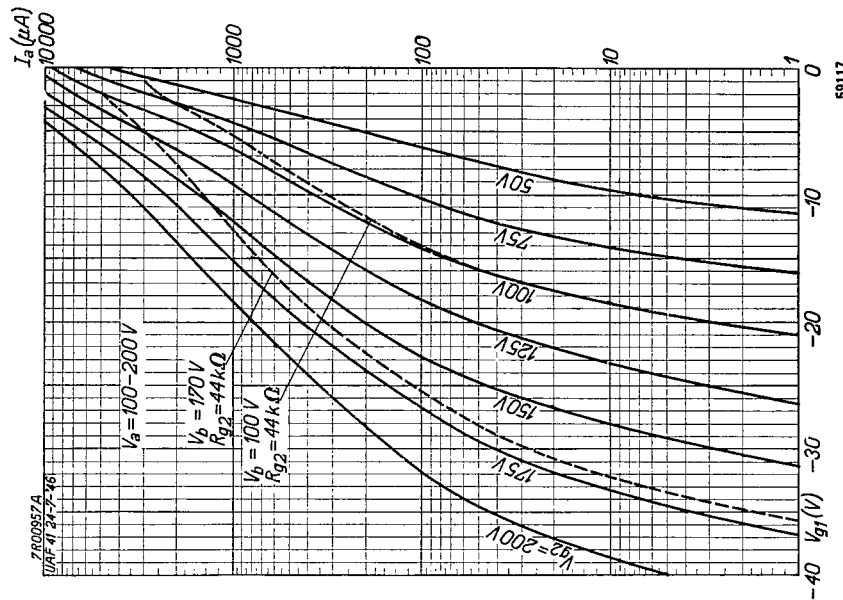


Fig. 6

Anode current (I_a , Fig. 6) and mutual conductance (S , Fig. 7) of the UAF 41 as functions of the grid bias V_{g1} for different values of the screen grid voltage (V_{g2}). The dotted lines indicate the variations in anode current and mutual conductance when a series resistor R_{g2} of 44 kΩ is included in the screen grid circuit.

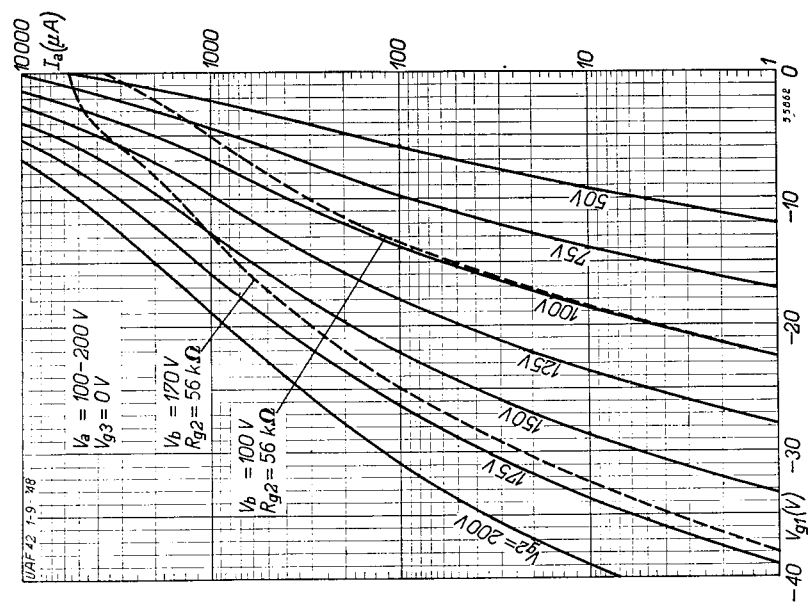


Fig. 8

Anode current (I_a , Fig. 8) and mutual conductance (S , Fig. 9) of the UAF 42 as functions of the grid bias (V_{g1}) for various values of the screen grid voltage (V_{g2}). The dotted lines indicate the variations in anode current and mutual conductance when a series resistor of $56 k\Omega$ is included in the screen grid circuit.

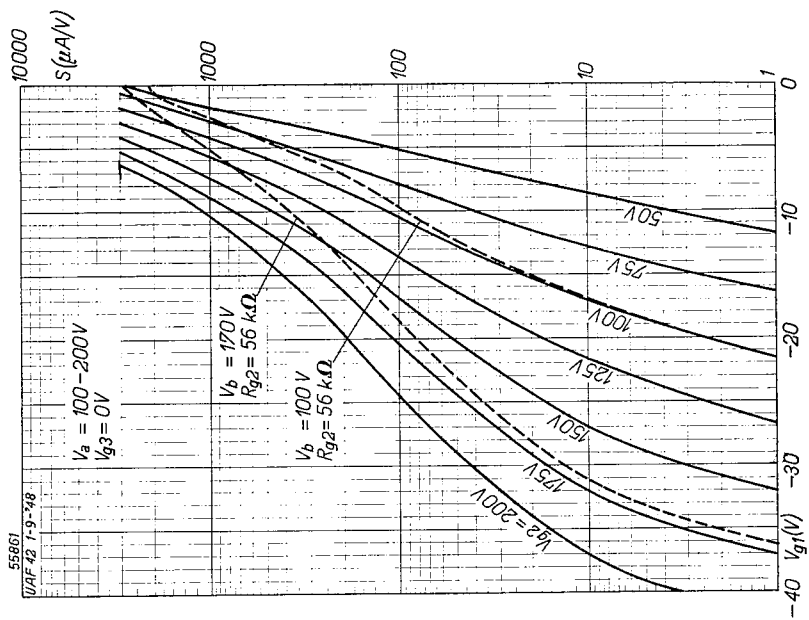


Fig. 9

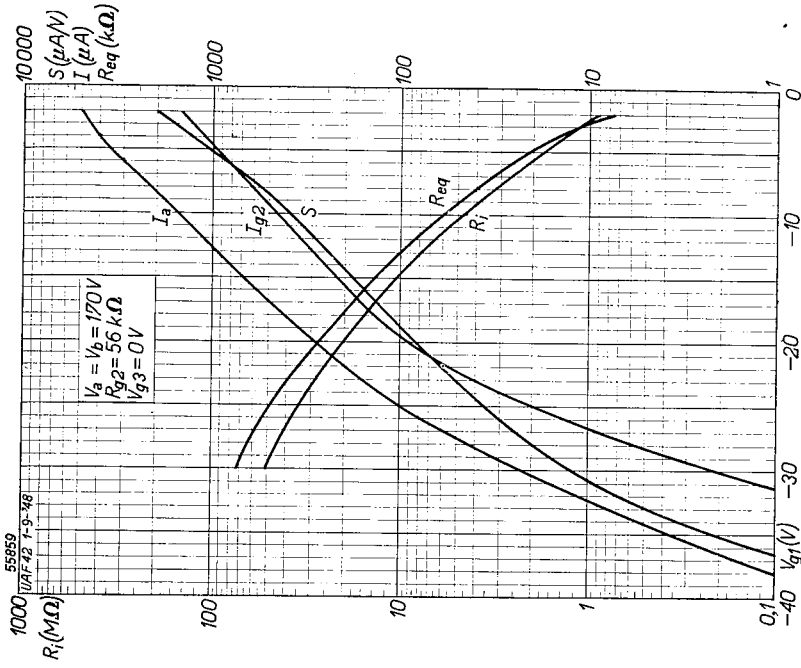


Fig. 11

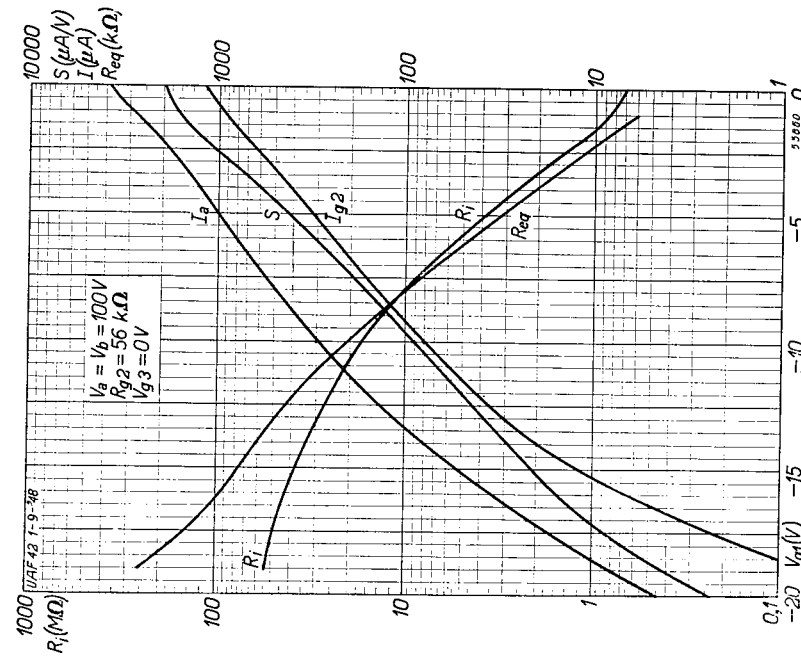


Fig. 10

Anode current (I_a), screen grid current (I_{g2}), mutual conductance (S), internal resistance (R_i) and equivalent noise resistance (R_{eq}) of the pentode section of the UAF 42, as functions of the grid bias (V_{g1}); screen grid resistor $R_{g2} = 56 k\Omega$, anode and supply voltage = 100 V (Fig. 10) and 170 V (Fig. 11).

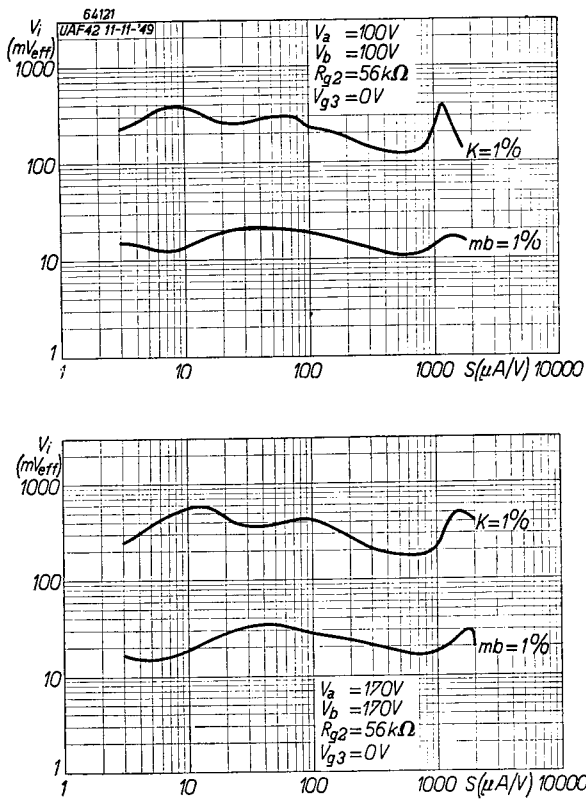


Fig. 12
The effective voltage (V_i) of an interfering R.F. signal on the control grid of the UAF 42, producing 1% cross-modulation; also that of an A.F. signal producing 1% modulation hum (curve $m_b = 1\%$), both as a function of the mutual conductance (S). Screen grid series resistor $R_{g2} = 56 k\Omega$, anode and supply voltage = 100 V (upper figure) and 170 V (lower figure).

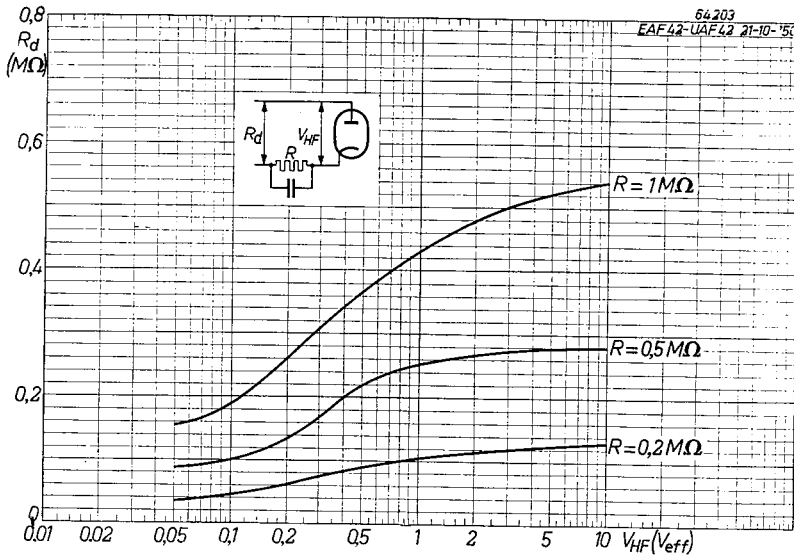


Fig. 13

Damping resistance of the diode of the UAF 42 as a function of the applied R.F. signal, for different values of the series resistor in the detector circuit. For detection characteristic of the diode see Fig. 7 in the description of the EBC 41.

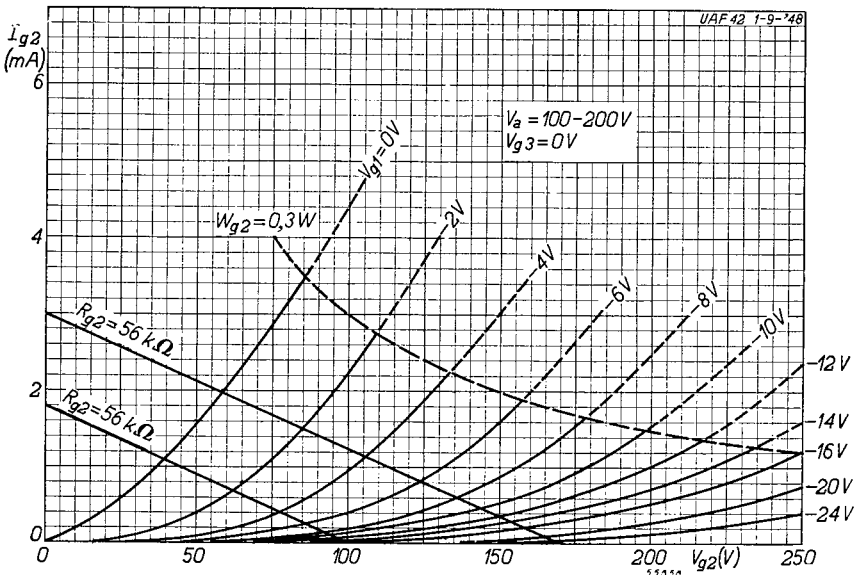


Fig. 14

Screen grid current (I_{g2}) of the pentode section of the UAF 42 as a function of the screen grid voltage (V_{g2}) with grid bias (V_{g1}) as parameter. The maximum permissible screen grid dissipation (0.3 W) is indicated by the dotted line. The straight lines give the working characteristic for a screen grid series resistor of $56 k\Omega$, at supply voltages of 170 and 100 V.

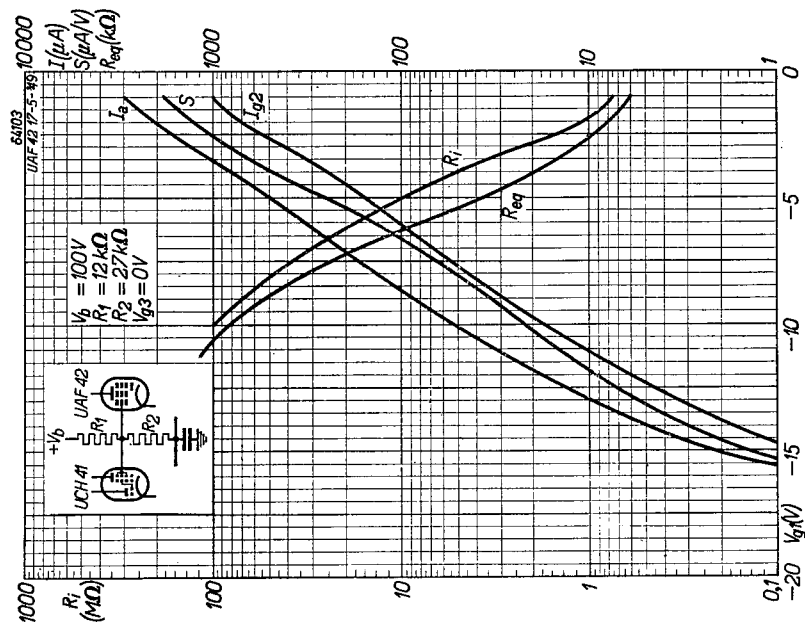


Fig. 15

As Figs. 10 and 11, but with the screen grid voltage of the UAF 42 obtained by means of the same potentiometer as that of the frequency changer UCH 41.

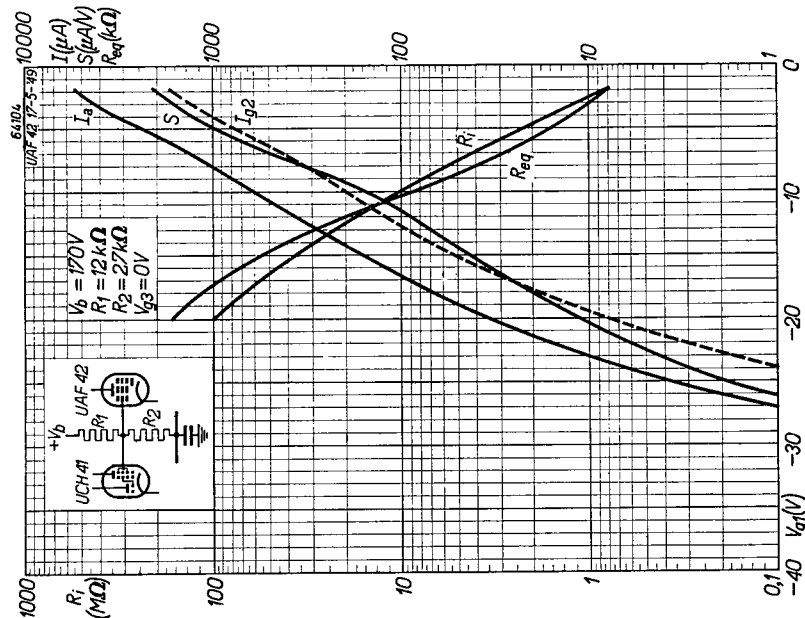


Fig. 16

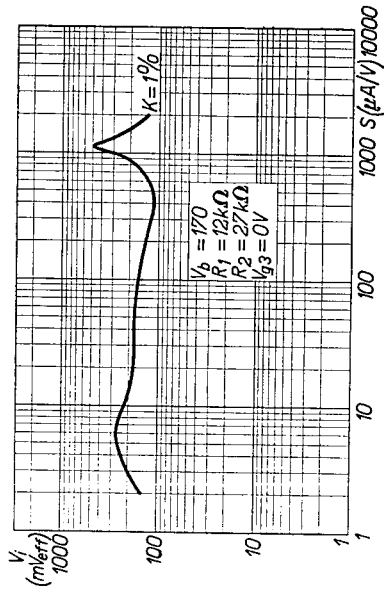
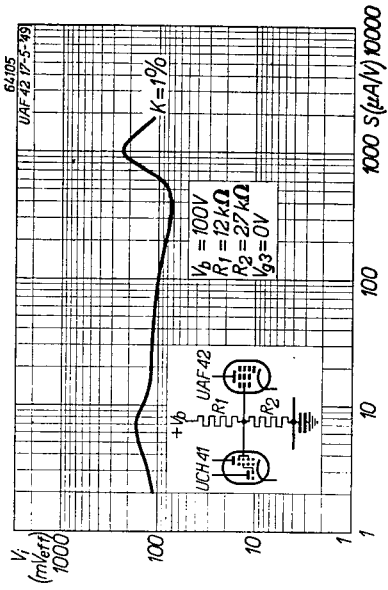


Fig. 17

As Fig. 12, but with the screen grids of the UAF 42 and UCH 41 fed by means of a common potentiometer.

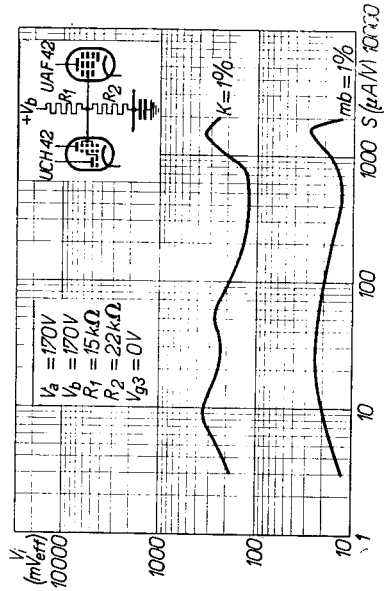
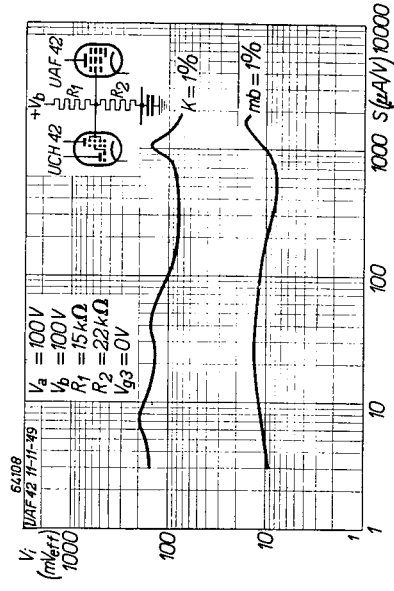


Fig. 18

As Fig. 12, but with the screen grids of the UAF 42 and UCH 42 fed by means of a common potentiometer.

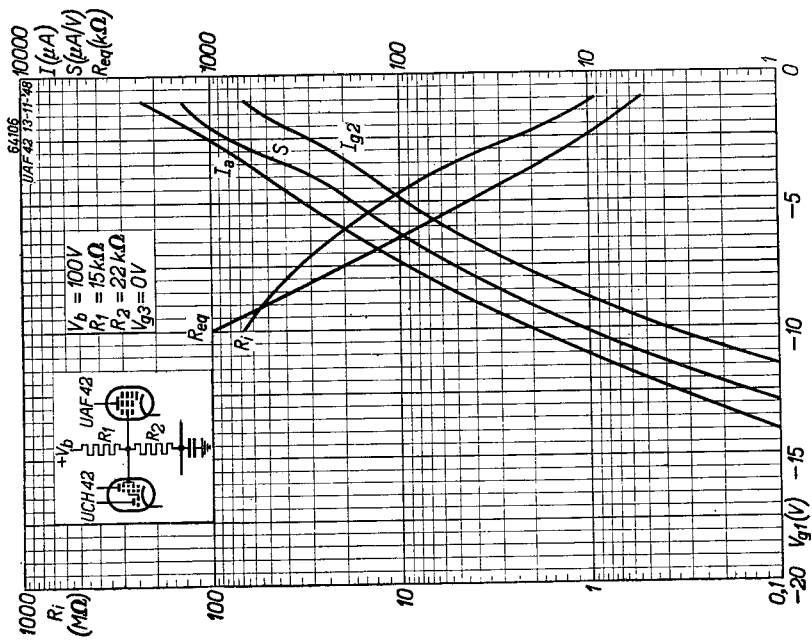


Fig. 19

As Figs. 10 and 11, but with the screen grid feeds of the UAF 42 and UCH 42 taken from a common potentiometer.

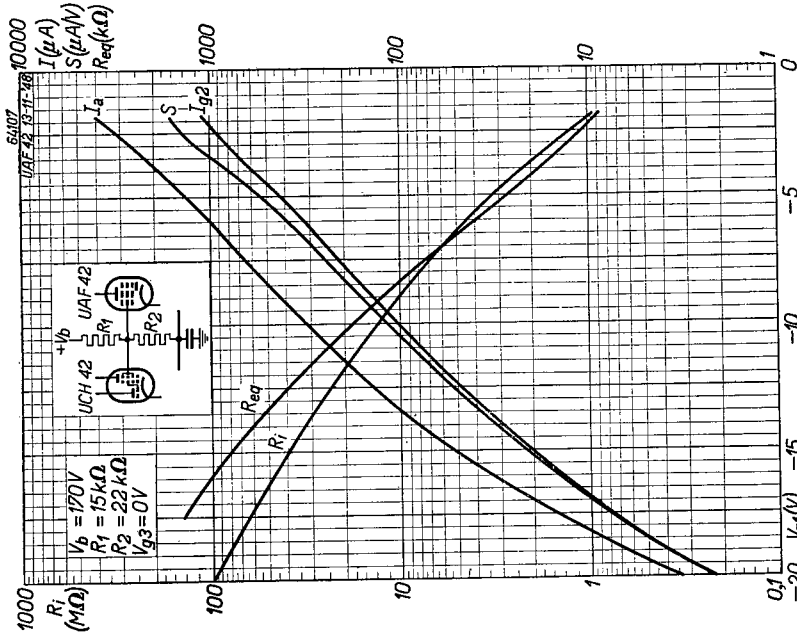


Fig. 20