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

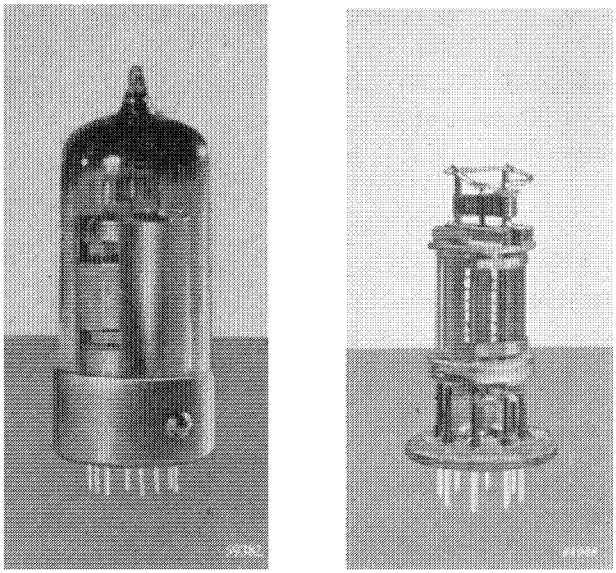


Fig. 1
The UAF 42, showing the electrode system (approximately actual size).

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

UAF 41

Diode section

Anode - cathode	C_d	=	3.8 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

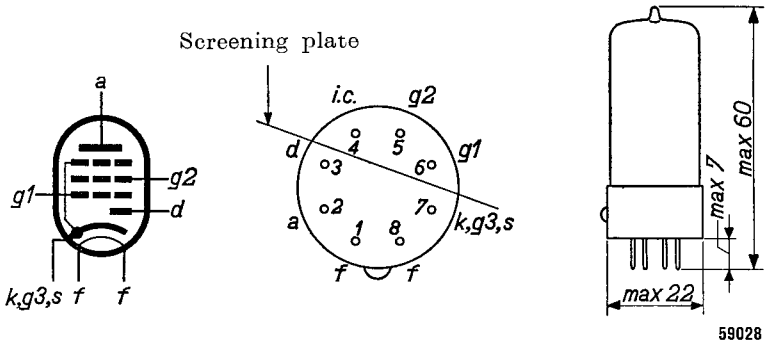


Fig. 2
Electrode arrangement, electrode connections and maximum dimensions in mm of the UAF 41.

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} =	−1.1	−17	−2	−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 . .	μ_{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 MΩ
Bias resistor R_k=2.7 kΩ Screen grid resistor R_{g2}=0.73 MΩ

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 MΩ
Bias resistor R_k=2.7 kΩ Screen grid resistor R_{g2}=0.73 MΩ

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 MΩ
Bias resistor R_k=1.2 kΩ

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

B. Supply voltage V_b=100 V Anode resistor R_a=0.1 MΩ
Bias resistor R_k=2.3 kΩ

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	0.55	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_{g2_o}	= max.	550 V
Screen grid voltage, valve controlled	$V_{g2}(I_a<3$ mA)	= max.	250 V
Screen grid voltage, valve not controlled	$V_{g2}(I_a=6$ mA)	= max.	150 V
Screen grid dissipation	W_{g2}	= max.	0.3 W
Cathode current	I_k	= max.	10 mA
Grid current starting point	$V_{g1}(I_{g1}=+0.3$ μA)	= max.	—1.3 V
External resistance between first grid and cathode	R_{g1}	= max.	3 MΩ
External resistance between heater and cathode	R_{fk}	= max.	20 kΩ
Voltage between heater and cathode	V_{fk}	= max.	150 V

Limiting values of the diode section

Peak anode inverse voltage	$V_{d\,\mathrm{inv}\,p}$	= max.	350 V
Diode current	I_d	= max.	0.8 mA
Peak diode current	I_{dp}	= max.	5 mA
Diode current starting point	$V_d(I_d=+0.3$ μA)	= max.	—1.3 V
External resistance between heater and cathode	R_{fk}	= max.	20 kΩ
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_{g1f}	<	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

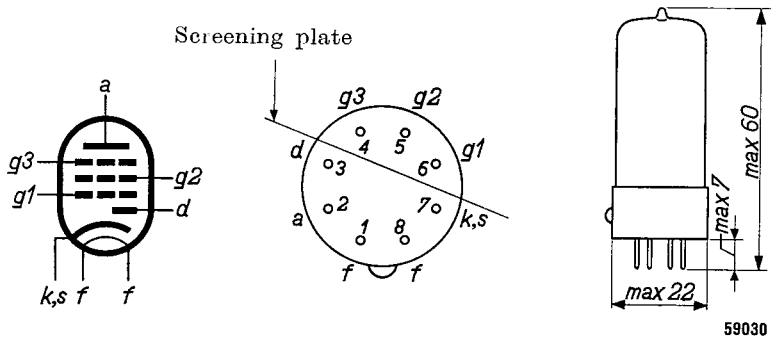


Fig. 3
Electrode arrangement, electrode connections and maximum dimensions in mm of the UAF 42.

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		kΩ
Bias resistor	R_k	=	310		310		Ω
Grid bias	R_{g1}	=	—1.2	—16	—2	—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	17	2000	20	μA/V
Internal resistance	R_i	=	0.85	>10	0.9	>10	MΩ
Equivalent noise resistance	R_{eq}	=	5.8	—	7.5	—	kΩ
Amplification factor, second grid with respect to first grid	μ_{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		kΩ
Bias resistor	R_k	=	310		Ω
Grid bias	V_{g1}	=	—2	—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	20	μA/V
Internal resistance	R_i	=	1.0	>10	MΩ
Equivalent noise resistance	R_{eq}	=	7.5	—	kΩ
Amplification factor, second grid with respect to first grid	μ_{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		kΩ
Resistor between screen grids and chassis	R_2	=	27		27		kΩ
Bias resistor	R_k	=	250		250		Ω
Grid bias	V_{g1}	=	—1.0	—10.5	—1.8	—18	V
Screen grid voltage	V_{g2}	=	53	69	87	117	V
Anode current	I_a	=	3.0	—	5.5	—	mA
Screen grid current	I_{g2}	=	1.0	—	1.7	—	mA
Mutual conductance	S	=	1850	18	2100	21	μA/V
Internal resistance	R_i	=	0.75	>10	0.8	>10	MΩ
Equivalent noise resistance	R_{eq}	=	6	—	8	—	kΩ
Amplification factor, second grid with respect to first grid	μ_{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)

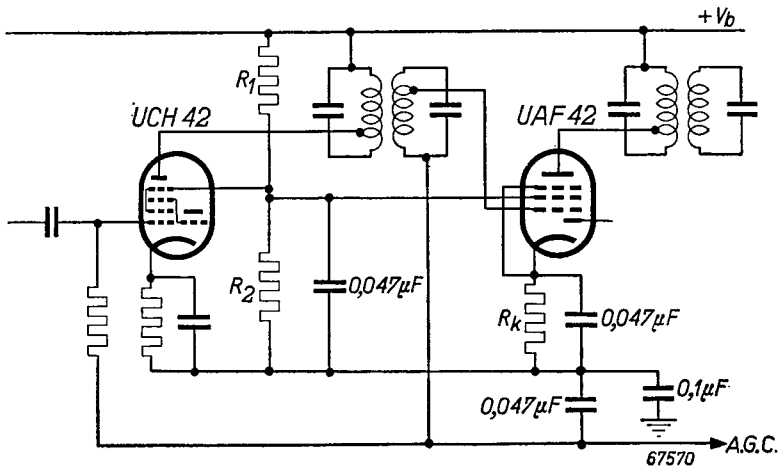
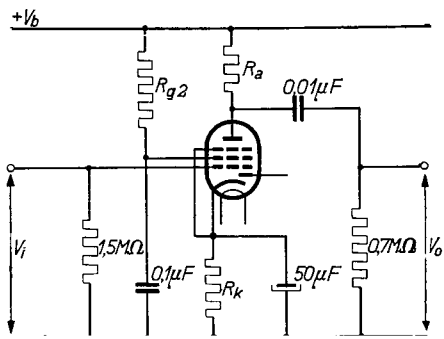


Fig. 4

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 . .	μ_{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)

UAF 42

A. Supply voltage V_b=170 V Anode resistor R_a=0.22 MΩ
Bias resistor R_k=2.7 kΩ Screen grid resistor R_{g2}=0.82 MΩ

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 MΩ
Bias resistor R_k=1.5 kΩ Screen grid resistor R_{g2}=0.33 MΩ

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 MΩ
Bias resistor R_k=2.7 kΩ Screen grid resistor R_{g2}=0.82 MΩ

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 MΩ
Bias resistor R_k=1.5 kΩ Screen grid resistor R_{g2}=0.33 MΩ

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 MΩ
Bias resistor R_k=1.8 kΩ

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 MΩ
Bias resistor R_k=1.2 kΩ

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 MΩ
Bias resistor R_k=1.8 kΩ

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

UAF 42

D. Supply voltage V_b=100 V Anode resistor R_a=0.05 MΩ
Bias resistor R_k=1.2 kΩ

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	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 condition	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 controlled	$V_{g2}(I_a<2.5$ mA)	= max.	250 V
Screen grid voltage uncontrolled valve	$V_{g2}(I_a=5$ mA)	= max.	125 V
Screen grid dissipation	W_{g2}	= max.	0.3 W
Cathode current	I_k	= max.	10 mA
Grid current starting point	$V_{g1}(I_{g1}=+0.3$ μA)	= max.	−1.3 V
External resistance between grid 1 and cathode	R_{g1}	= max.	3 MΩ
External resistance between grid 3 and cathode	R_{g3}	= max.	3 MΩ
External resistance between heater and cathode	R_{fk}	= max.	20 kΩ
Voltage between heater and cathode	V_{fk}	= max.	150 V

Limiting values of the diode section

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

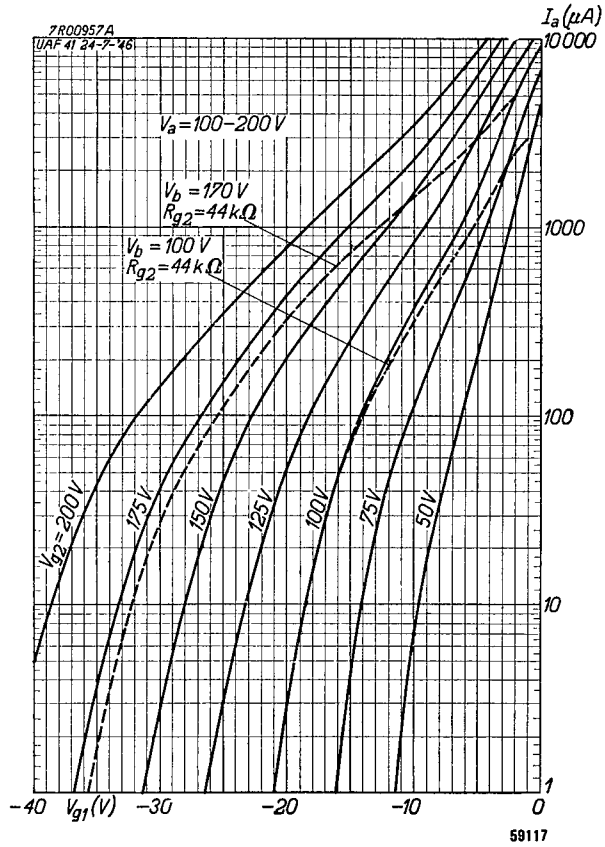


Fig. 6

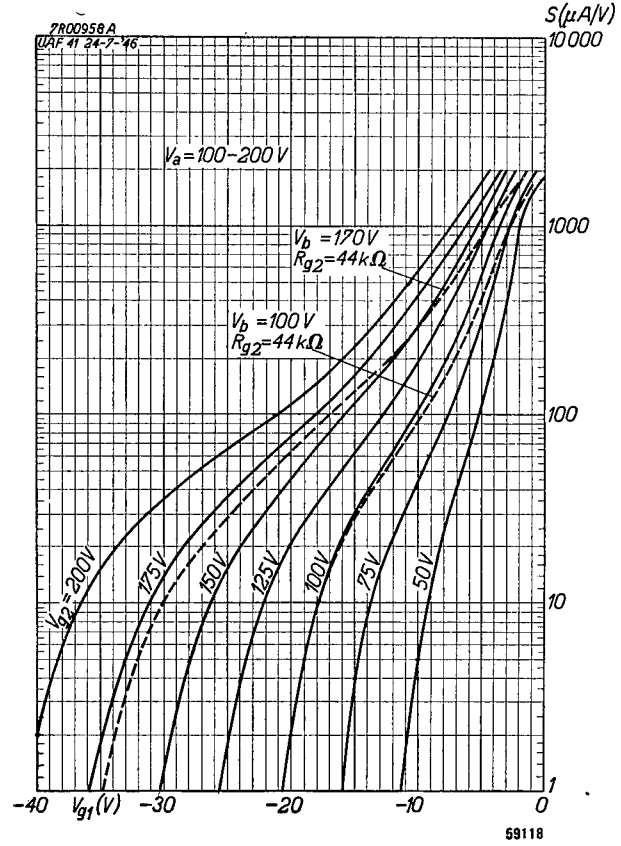


Fig. 7

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.

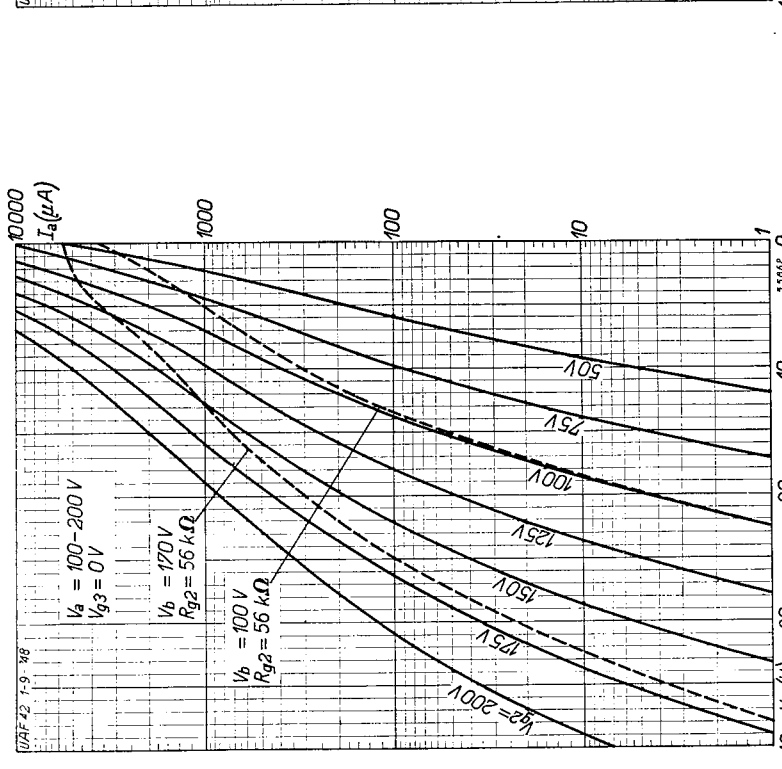


Fig. 8
Anode current (I_a, Fig. 8) and mutual conductance (S, Fig. 9) of the UAF 42 as functions of the grid bias (V_{g1}) for various values of the screen grid voltage (V_{g2}). The dotted lines indicate the variations in anode current and mutual conductance when a series resistor of 56 kΩ is included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

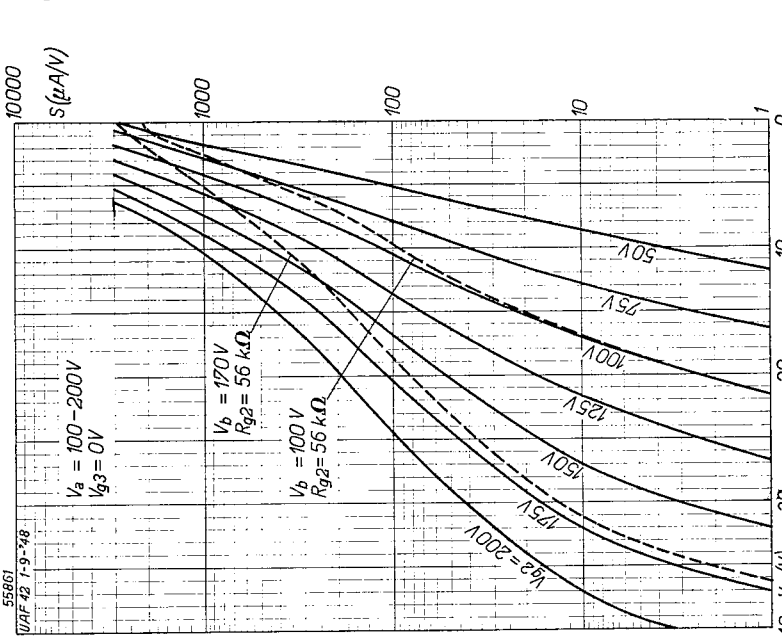


Fig. 9

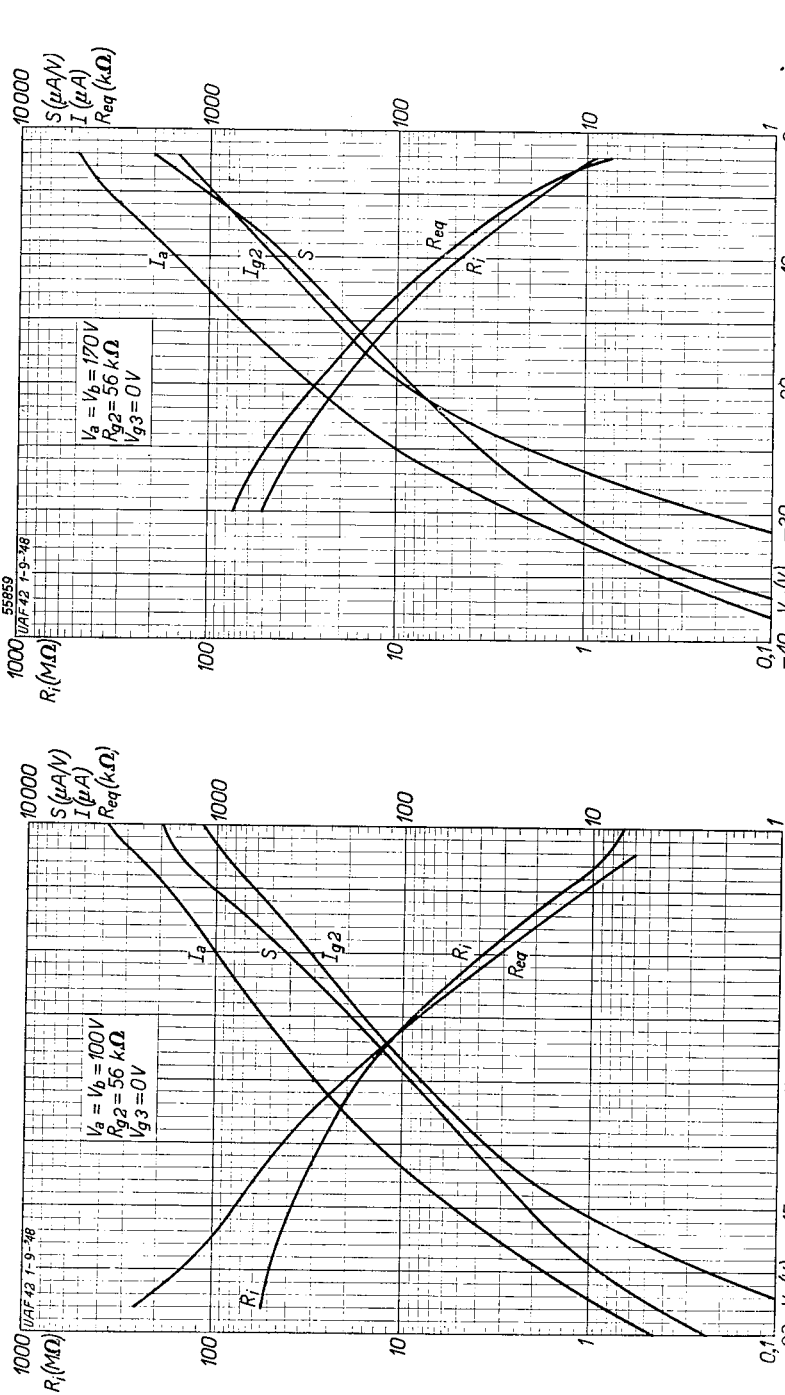


Fig. 10
Anode current (I_a), screen grid current (I_{g2}), mutual conductance (S), internal resistance (R_i) and equivalent noise resistance (R_{eq}) of the pentode section of the UAF 42, as functions of the grid bias (V_{g1}); screen grid resistor $R_{g2} = 56$ kΩ, anode and supply voltage = 100 V (Fig.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

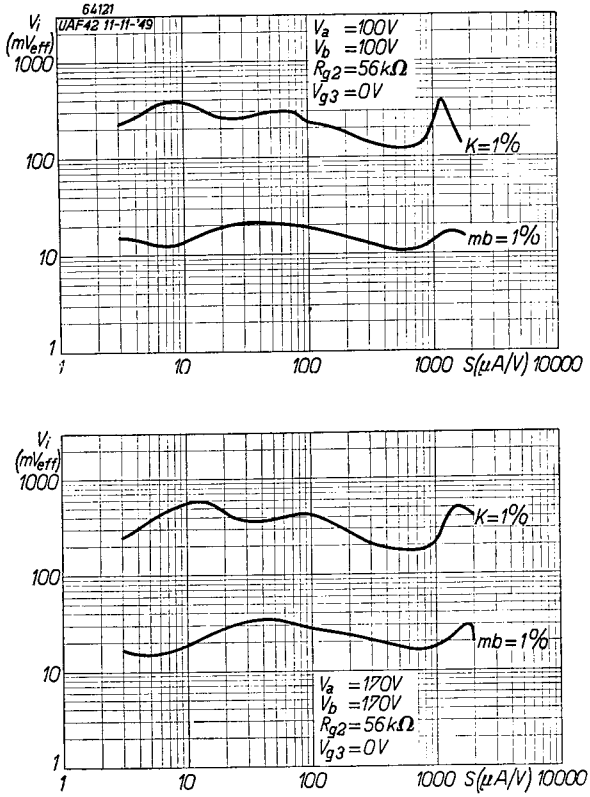


Fig. 12
The effective voltage (V_i) of an interfering R.F. signal on the control grid of the UAF 42, producing 1% cross-modulation; also that of an A.F. signal producing 1% modulation hum (curve m_b=1%), both as a function of the mutual conductance (S). Screen grid series resistor R_{g2}=56 kΩ, anode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

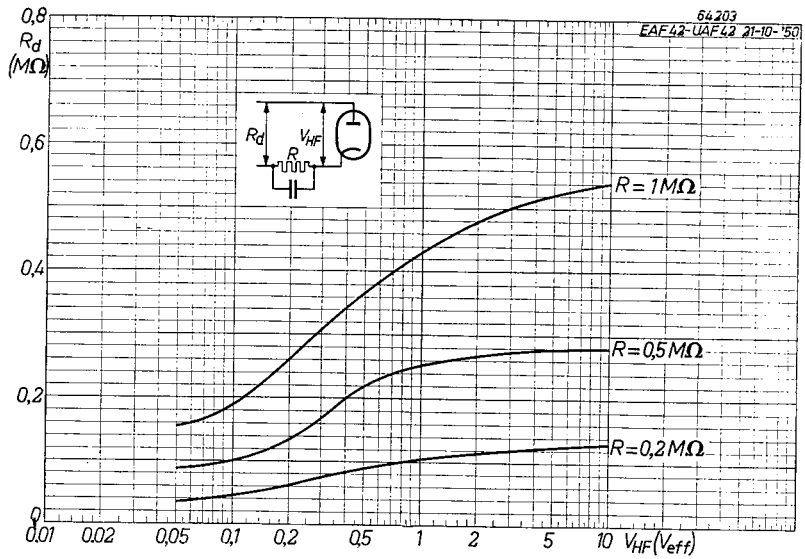


Fig. 13
Damping resistance of the diode of the UAF 42 as a function of the applied R.F. signal, for different values of the series resistor in the detector circuit. For detection characteristic of the diode see Fig. 7 in the description of the EBC 41.

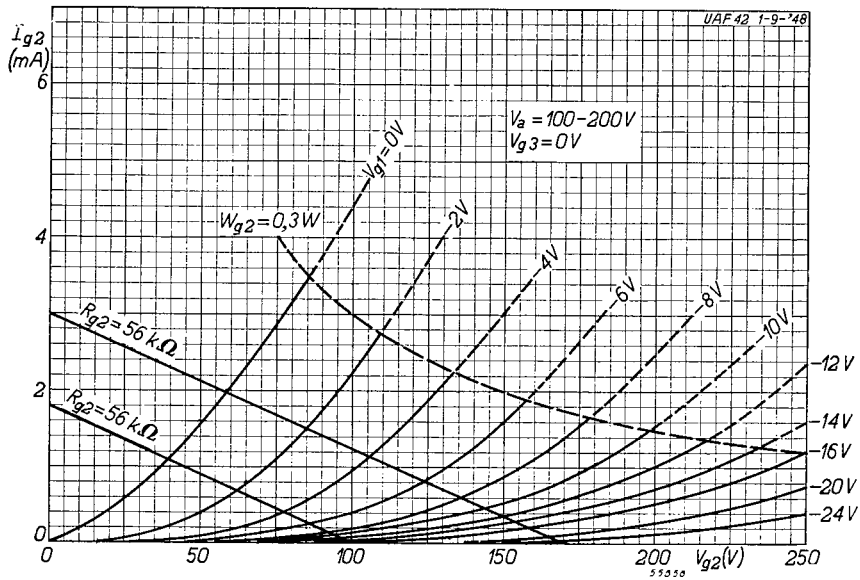


Fig. 14
Screen grid current (I_{g2}) of the pentode section of the UAF 42 as a function of the screen grid voltage (V_{g2}) with grid bias (V_{g1}) as parameter. The maximum permissible screen grid dissipation (0.3 W) is indicated by the dotted line. The straight lines give the working characteristic for a screen grid series resistor of 56 kΩ, at supply voltages of 170 and 100 V.

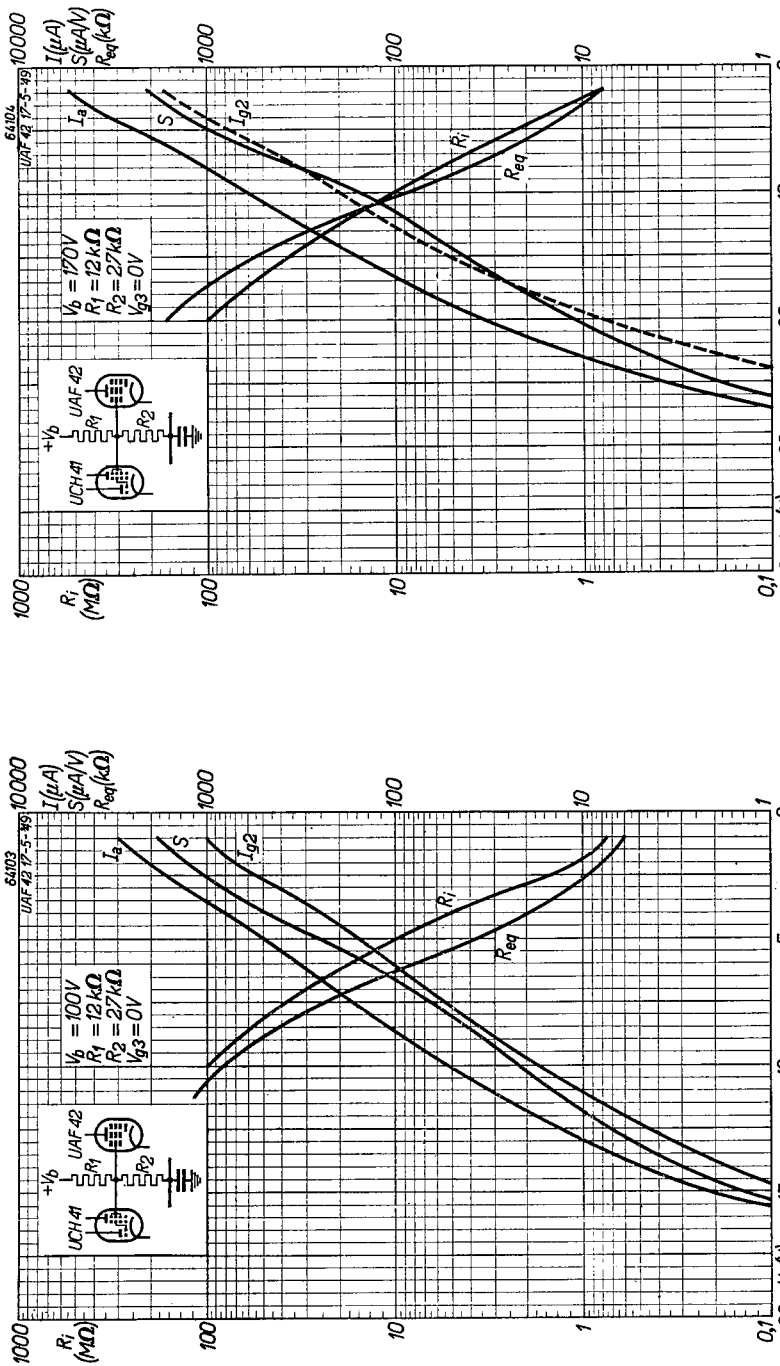
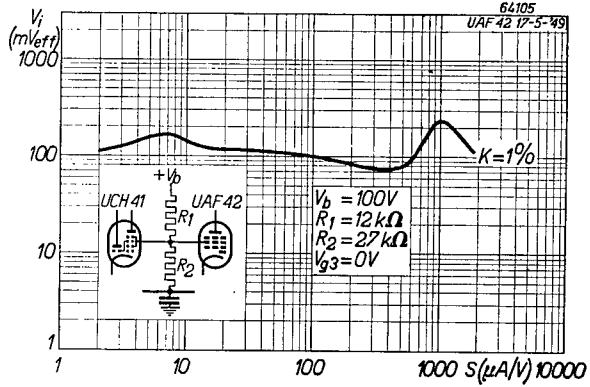


Fig. 15
As Figs. 10 and 11, but with the screen grid voltage of the UAF 42 obtained by means of the same potentiometer as that of the frequency changer UCH 41.

Fig. 16



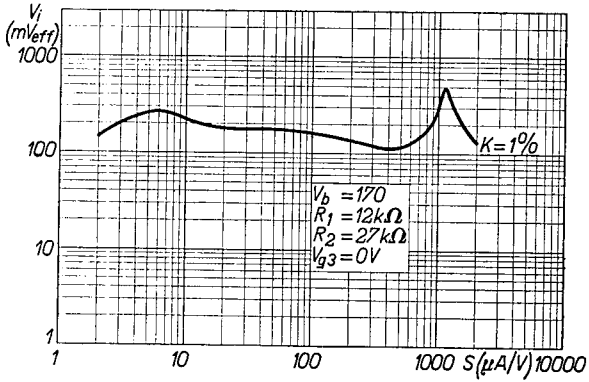
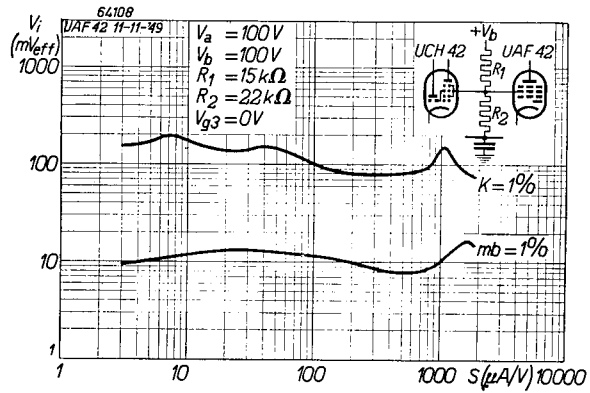


Fig. 17
As Fig. 12, but with the screen grids of the UAF 42 and UCH 41 fed by means of a common potentiometer.



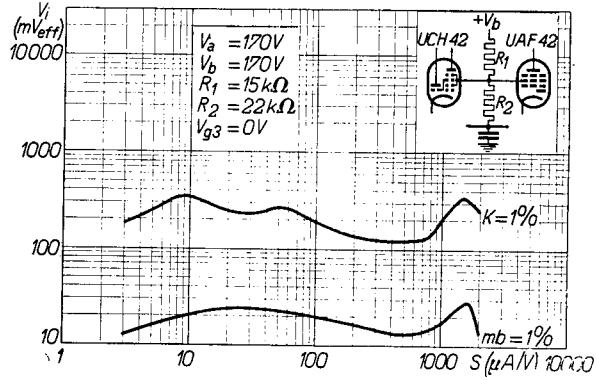


Fig. 18
As Fig. 12, but with the screen grids of the UAF 42 and UCH 42 fed by means of a common potentiometer.

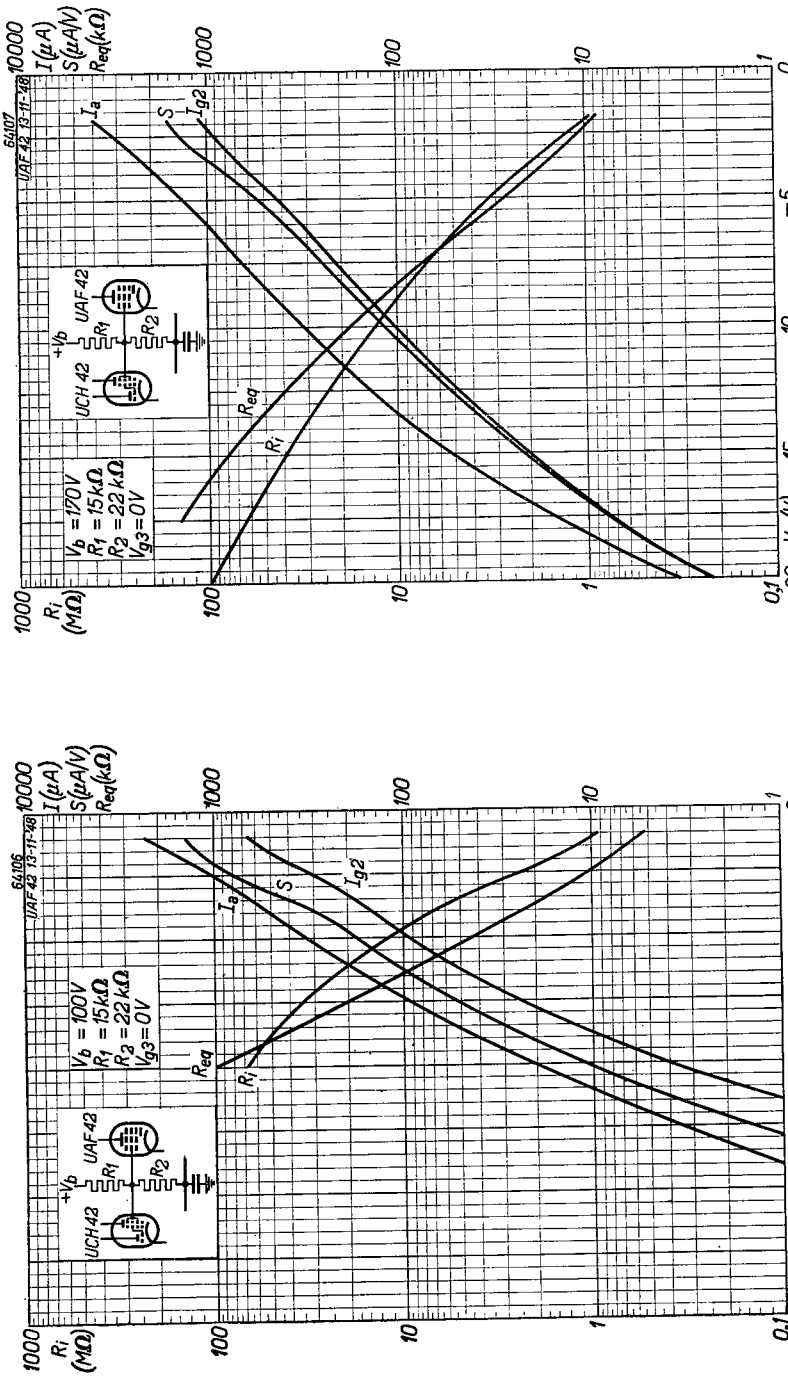


Fig. 19
As Figs. 10 and 11, but with the screen grid feeds of the UAF 42 and UCH 42 taken from a common potentiometer.

Fig. 20