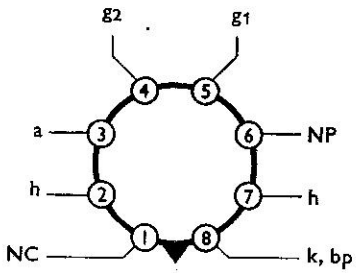
G.E.C. VALVES

# BEAM TETRODE
## 6.3V INDIRECTLY HEATED

# KT77
ISSUE 2

A beam tetrode with an absolute maximum anode dissipation rating of 32 watts. The KT77 is designed for use in the output stage of an a.f. amplifier. Two valves in Class AB1 give a continuous output of over 70W. The KT77 is also suitable for use as a series valve in a stabilised power supply.

## BASE CONNECTIONS AND VALVE DIMENSIONS




View from underside of base.

Base: International Octal (B8-0)
Bulb: Tubular

| | |
|---|---|
| Max. overall length: | 113mm |
| Max. seated length: | 89mm |
| Max. diameter: | 33mm |

## HEATER

| | | |
|---|---|---|
| $V_h$ | 6·3 | V |
| $I_h$ | 1·4 (approx) | A |

## MAXIMUM RATINGS

| | Absolute | Design Max. | |
|---|---|---|---|
| $V_a$ | 850 | 800 | V |
| $V_{g2}$ | 650 | 600 | V |
| $V_{a,g2}$ | 650 | 600 | V |
| $p_a$ | 32 | 25 | W |
| $p_{g2}$ | 6·0 | 6·0 | W |
| $p_{a+g2}$ | 35 | 28 | W |
| $I_k$ | 200 | 180 | mA |
| $V_{h-k}$ | 200 | 150 | V |
| $-V_{g1}$ | 220 | 200 | V |
| $R_{g1-k}$ (cathode bias) | | | |
| $p_{a+g2} \leqslant 28W$ | | 1·0 | MΩ |
| $p_{a+g2} > 28W$ | | 0·5 | MΩ |
| $R_{g1-k}$ (fixed bias) | | | |
| $p_{a+g2} \leqslant 28W$ | | 0·5 | MΩ |
| $p_{a+g2} > 28W$ | | 0·25 | MΩ |
| $T_{bulb}$ | 250 | 230 | °C |

**CAPACITANCES** (Measured on a cold unscreened valve)

$c_{g1-a}$: 1·0pF; $c_{g1-\text{all, less a}}$: 16·5pF; $c_{a-\text{all, less g1}}$: 9·0pF

# KT77

## CHARACTERISTICS

**Tetrode Connection**

| | | |
|---|---|---|
| $V_a$ | 250 | V |
| $V_{g2}$ | 250 | V |
| $I_a$ | 110 | mA |
| $I_{g2}$ | 10 | mA |
| $g_m$ | 10·5 | mA/V |
| $r_a$ | 23 | kΩ |
| $\mu_{g1-g2}$ | 11·5 | — |

**Triode Connection**

| | | |
|---|---|---|
| $V_{a,g2}$ | 250 | V |
| $I_{a+g2}$ | 120 | mA |
| $g_m$ | 11 | mA/V |
| $r_a$ | 1050 | Ω |
| $\mu$ | 11·5 | — |

## TYPICAL OPERATION

**Ultra-linear Connection. 43% Taps. Push-Pull. Class AB1. Cathode Bias**

| | | |
|---|---|---|
| $V_{a(b)}$ | 430 | V |
| $V_{a,g2}$ | 390 | V |
| $R_{g2}$ | 2×22 | Ω |
| $R_k$ | 2×470±5% | Ω |
| $R_{L(a-a)}$ | 6·0 | kΩ |
| $I_{a+g2(o)}$ | 2×66 | mA |
| $I_{a+g2(max)}$ | 2×80 | mA |
| $p_{a+g2(o)}$ | 2×26 | W |
| $p_{a+g2(max)}$ | 2×14 | W |
| $-V_{g1}$ | 31 (approx) | V |
| $v_{in(g1-g1)(pk)}$ | 69 | V |
| $P_{out}$ | 34 | W |
| $D_{tot}$ | 2·5 | % |

**Ultra-linear Connection. 43% Taps. Push-Pull. Class AB1. Fixed Bias**

| | | | | |
|---|---|---|---|---|
| $V_{a(b)}$ | 600 | 500 | 400 | V |
| $V_{a,g2}$ | 594 | 493 | 391 | V |
| $R_{g2}$ | 2×22 | 2×22 | 2×22 | Ω |
| $R_{L(a-a)}$ | 9·0 | 5·5 | 4·5 | kΩ |
| $I_{a+g2(o)}$ | 2×47 | 2×57 | 2×70 | mA |
| $I_{a+g2(max)}$ | 2×109 | 2×126 | 2×121 | mA |
| $p_{a+g2(o)}$ | 2×28 | 2×28 | 2×27·5 | W |
| $p_{a+g2(max)}$ | 2×28 | 2×28 | 2×24 | W |
| *$-V_{g1}$ (approx) | 56 | 43 | 31 | V |
| $v_{in(g1-g1)(pk)}$ | 94 | 82 | 61 | V |
| $P_{out}$ | 72 | 67 | 45 | W |
| $D_{tot}$ | 1·5 | 1·0 | 0·8 | % |

*A negative bias range of ±25% of these values should be available for each valve.

**Tetrode Connection. Push-Pull. Class AB1**

The KT77 is designed primarily for use under ultra-linear conditions and this connection is recommended. However, similar performance can be obtained in the tetrode connected arrangement but the output impedance will be greatly increased. For tetrode connection the fixed screen supply must not exceed 300V.

**Triode Connection. Push-Pull. Class AB1. Cathode Bias.**

| | | |
|---|---|---|
| $V_{a(b)}$ | 430 | V |
| $V_{a,g2}$ | 396 | V |
| $R_{g2}$ | 2×22 | Ω |
| $R_k$ | 2×440±5% | Ω |
| $R_{L(a-a)}$ | 5·0 | kΩ |
| $I_{a+g2(o)}$ | 2×69 | mA |
| $I_{a+g2(max)}$ | 2×75 | mA |
| $p_{a+g2(o)}$ | 2×27 | W |
| $p_{a+g2(max)}$ | 2×20 | W |
| $-V_{g1}$ | 30 (approx) | V |
| $V_{in(g1-g1)(pk)}$ | 66 | V |
| $P_{out}$ | 18·0 | W |
| $D_{tot}$ | 1·2 | % |

**Class A Series Stabiliser** (see fig. 1)

| | | | |
|---|---|---|---|
| $V_{in}$ | 400 | 400 | V |
| $V_{out}$ | 200 | 200 | V |
| Load current | 0 to 100 | 100 | mA |
| Voltage change | 1·0 | 0·2 | V |
| Stabilisation | — | 0·1 | % |
| Regulation | 0·5 | — | % |

**Stabilisation** is defined as $\frac{\Delta V_{out}}{V_{out}} \times 100\%$ for a change in $V_{in}$ of $\pm 7\%$ corresponding to the usual maximum permitted mains fluctuation.

**Regulation** is defined as $\frac{\Delta V_{out}}{V_{out}} \times 100\%$ for a change in loading from zero load to full load current.

## LIFE PERFORMANCE

The average life expectancy of the KT77 when operated at absolute maximum ratings (see page 1) is at least 5000 hours. At a reduced absolute rating of $p_{a+g2}$=25W a life of at least 10000 hours should be obtained. The environment must be a static one and the valve should be switched not more than 12 times in each 24 hours. Attention should also be paid to the recommendations of the British Standard Code of Practice CP1005 *The Use of Electronic Valves.*

A valve is considered to have reached the end of life when it is either inoperative or one or more of its characteristics have reached the following values:

| | | |
|---|---|---|
| $P_{out}$ | 50% of initial value | |
| *$g_m$ | <9·3 | mA/V |
| *Measured at: | | |
| $V_a$ | 250 | V |
| $V_{g2}$ | 250 | V |
| $I_a$ | 100 | mA |

## INSTALLATION

The valve may be mounted in any position. Free air circulation around the valve is desirable.

When a pair of valves is mounted horizontally it is recommended that the centres of the valve sockets are not less than 3½in. apart and that the keyways on the spigots of each valve are in the vertical plane.

When a pair of valves is mounted vertically it is recommended that the centres of the valve sockets are not less than 3½in. apart and that the keyways on the spigots lie along the line joining the centres.

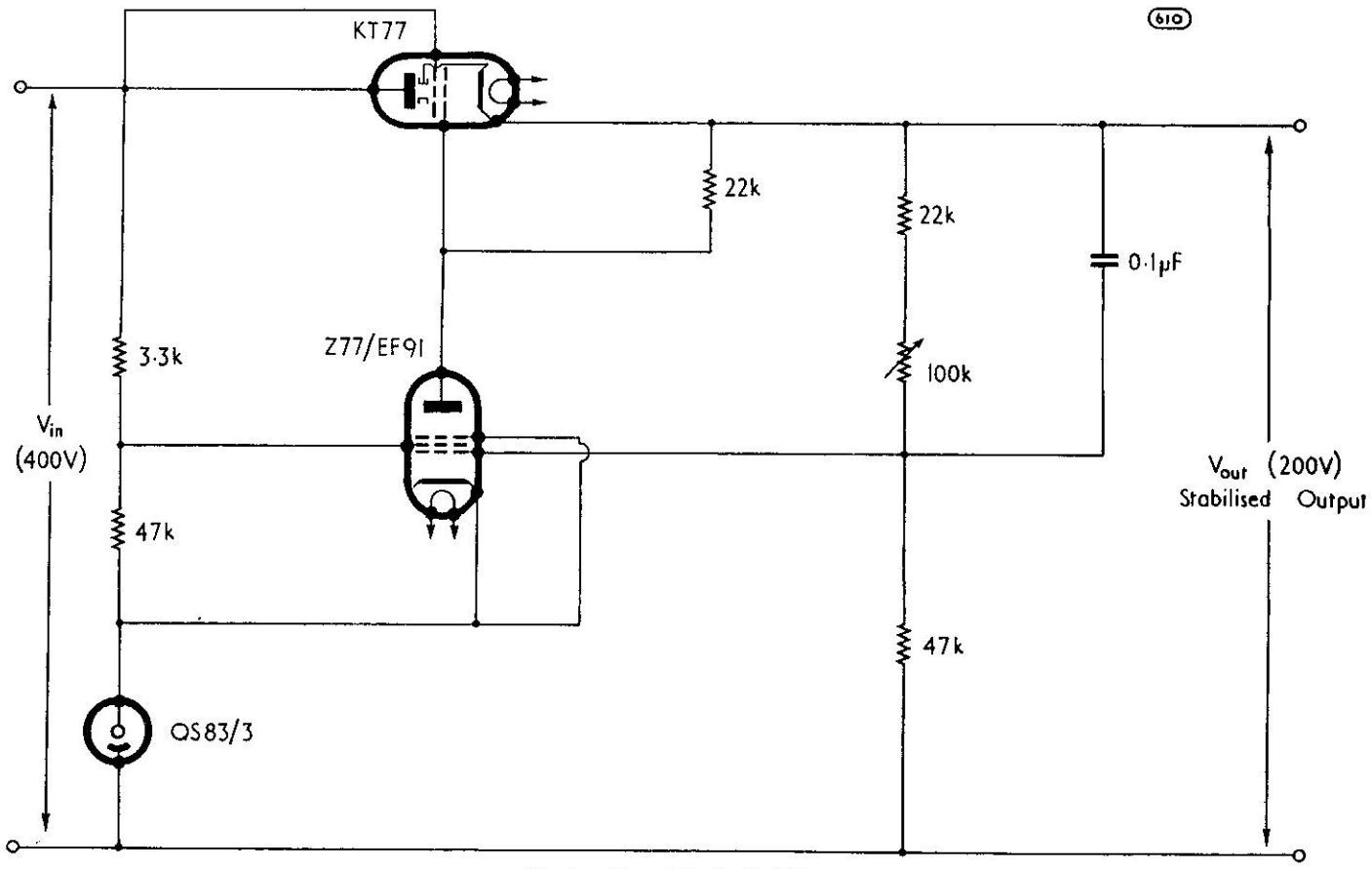



Fig. 1. Class A Series Stabiliser.

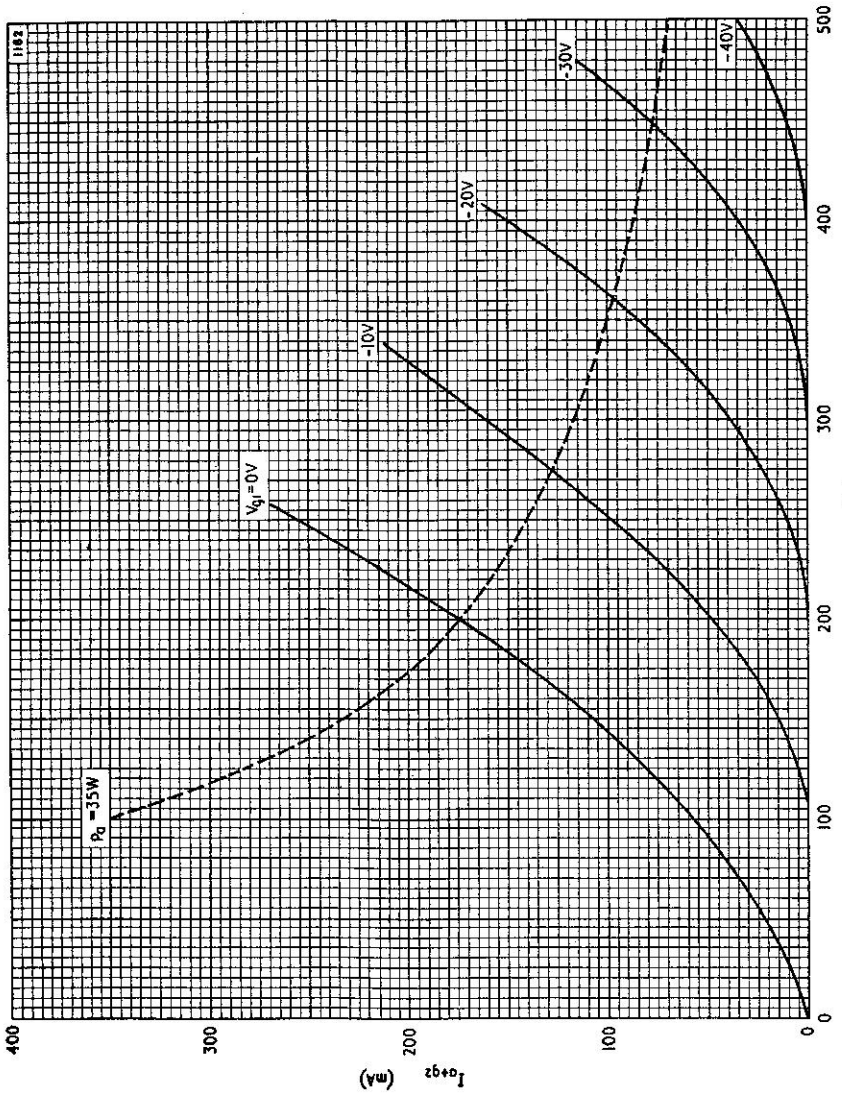

1182
$P_a$ =35W
$V_{g1}$=0V
-10V
-20V
-30V
-40V
$I_{a+g2}$ (mA)
400
300
200
100
0
0
100
200
300
400
500
$V_a$ $V_{g2}$ (V)

Fig. 2.

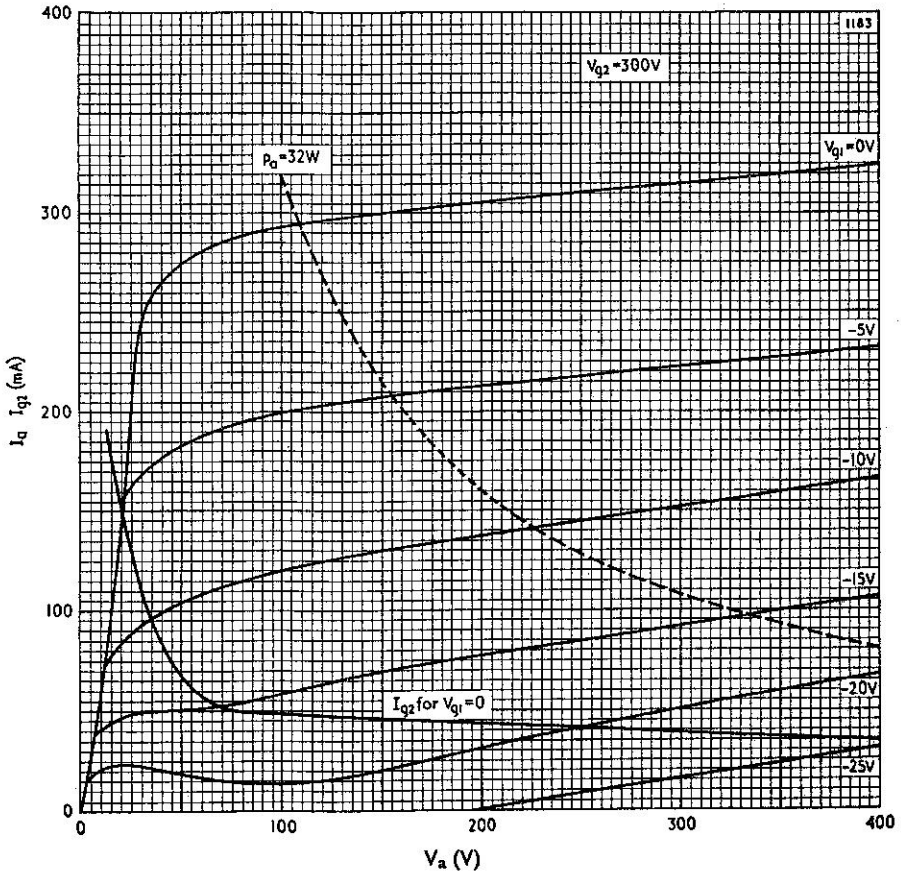

1183
$V_{g2}$=300V
$P_a$=32W
$V_{g1}$=0V
-5V
-10V
-15V
-20V
-25V
$I_{g2}$ for $V_{g1}$=0
$I_a$ $I_{g2}$ (mA)
$V_a$ (V)
0
100
200
300
400

Fig. 3.

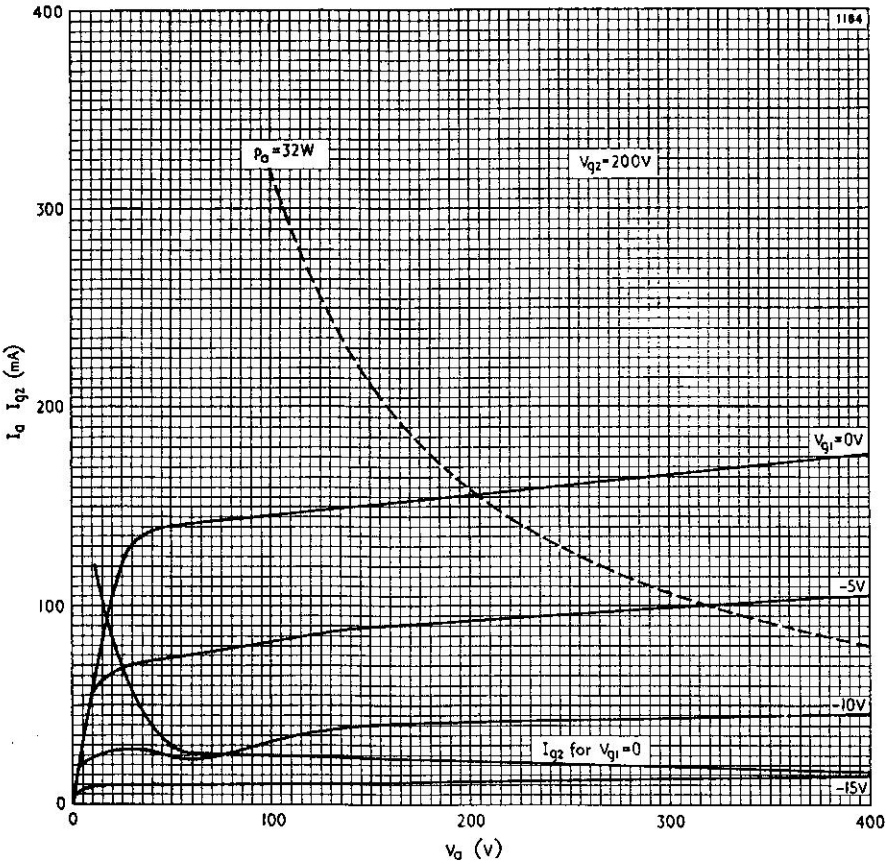

1184
$P_a$=32W
$V_{g2}$=200V
$V_{g1}$=0V
-5V
-10V
-15V
$I_{g2}$ for $V_{g1}$=0
$I_a$ $I_{g2}$ (mA)
$V_a$ (V)
0
100
200
300
400

Fig. 4.

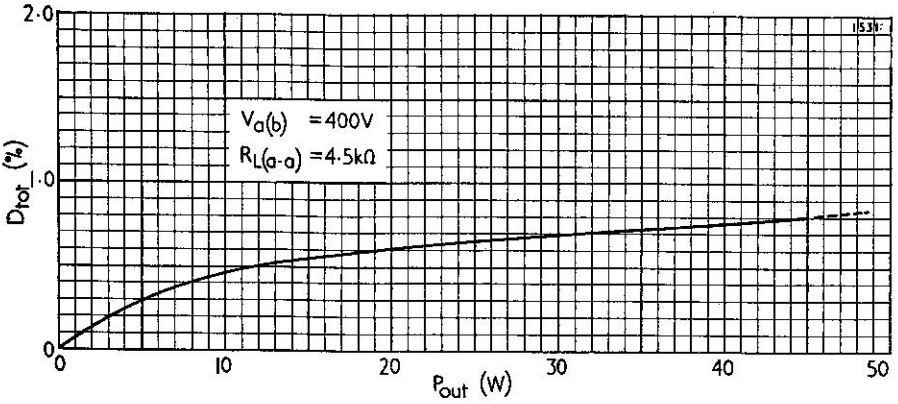



Fig. 5. Ultra-linear connection. 43% taps. Push-pull. Class AB1. Fixed bias.

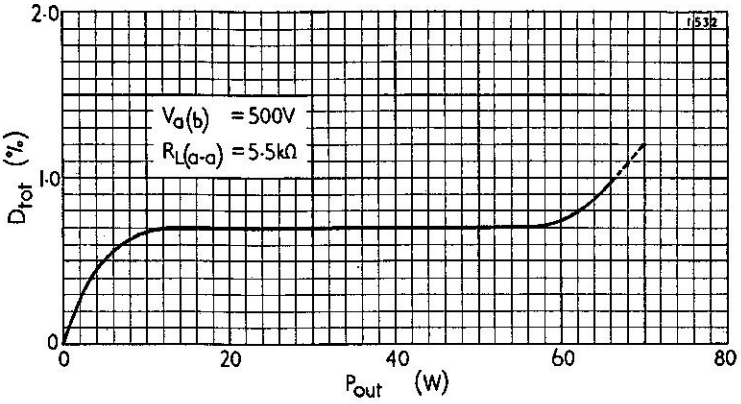



Fig. 6. Ultra-linear connection. 43% taps. Push-pull. Class AB1. Fixed bias.

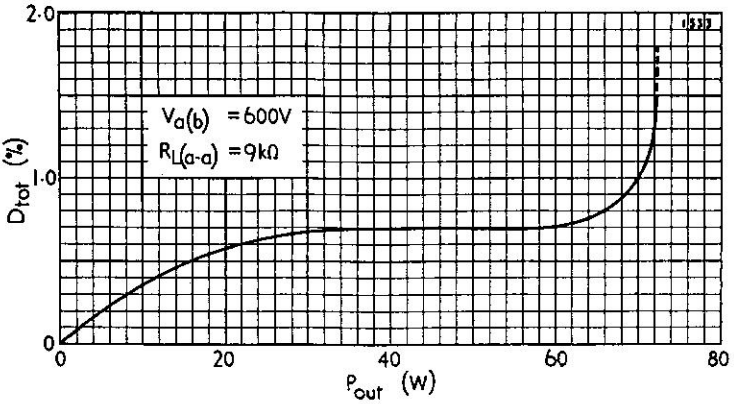



Fig. 7. Ultra-linear connection. 43% taps. Push-pull. Class AB1. Fixed bias.

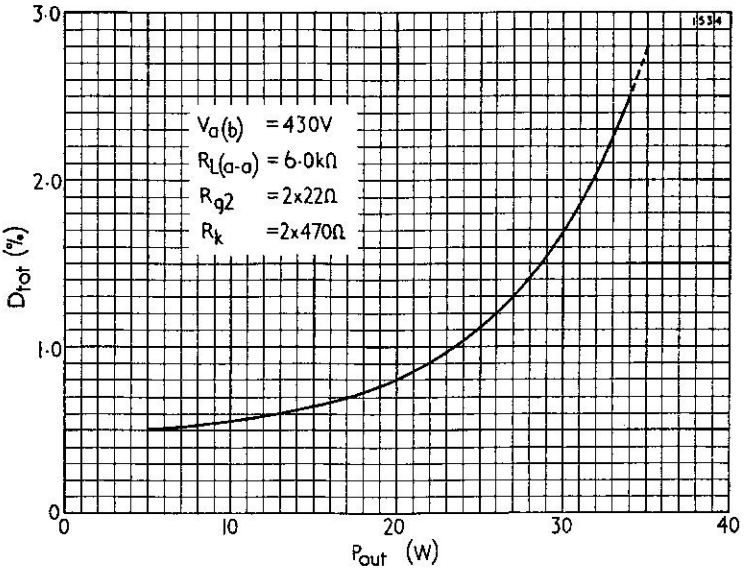



Fig. 8. Ultra-linear connection. 43% taps. Push-pull. Class AB1. Cathode bias.

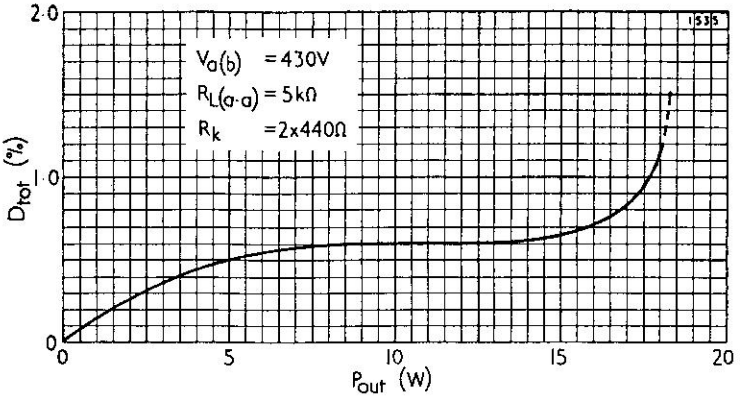



Fig. 9. Triode connection. Push-pull. Class AB1. Cathode bias.