Triode *Type DET22*

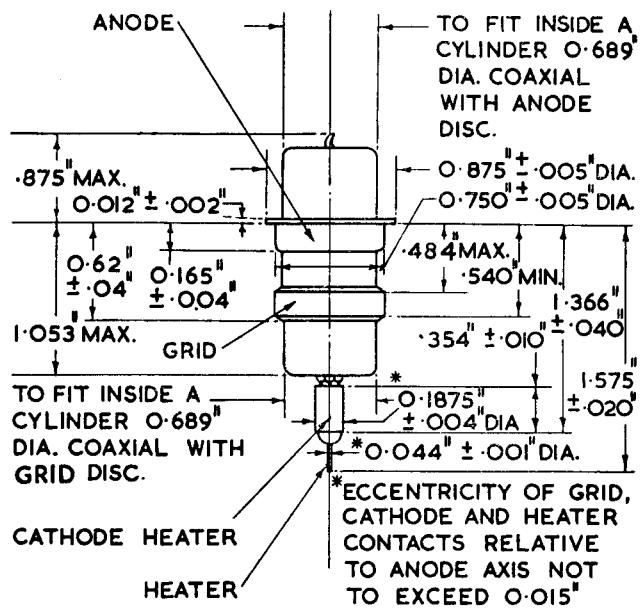
(OSCILLATOR AND VHF AMPLIFIER)

General. The DET 22 is a disc seal triode, without internal feedback, fitted with an indirectly heated oxide-coated cathode. It is intended mainly as a common-grid, earthed-anode, concentric-line oscillator, but may also be used as a power amplifier.

When used in a co-axial line circuit with an anode input of 10 W the output power is approximately 1 W at 10 cm. rising to 3 W at 30 cm. The lower limit of operating wavelength is 7 to 8 cm.

Cooling. The anode seal temperature must not exceed 284°F (140°C). In order to limit the temperature, and rate of change of temperature of the anode seal, it is necessary for the mass of metal in close thermal contact with the anode disc to be not less than 2 oz. (60 gm. approx.) of brass or its equivalent.

Mounting. The valve may be mounted in any position.



TYPICAL CIRCUIT ARRANGEMENT.

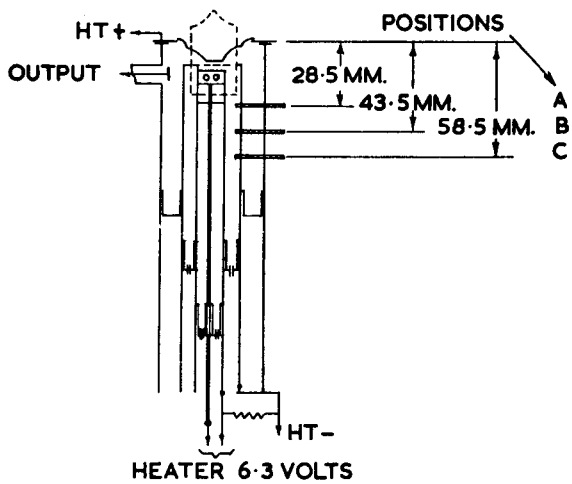


FIG. 1

RECOMMENDED CIRCUIT DIMENSIONS.

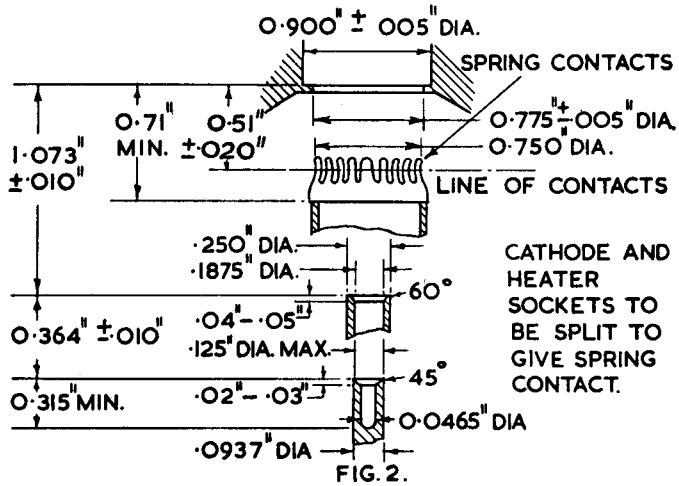


FIG. 2.

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APPROXIMATE DATA

V_f	6·3	V
I_f	0·4	A
$V_{a(max)}$	350	V
$p_{a(max)}$	10	W
$I_{a\ (pk)\ (max)}$	150	mA
$I_{a(max)}$	40	mA
μ	30	
g_m (taken at V_a 250 V, I_a 20 mA)	6	mA/V
$C_{a\text{-}gl}$	1·1	pF
$C_{a\text{-}k}$	0·02	pF
$C_{gl\text{-}k}$	2·2	pF

APPLICATION DATA

A typical circuit arrangement is shown in Fig. 1, where the anode-grid and grid-cathode circuits are both co-axial lines, the grid tube being common to both circuits.

The anode-grid and grid-cathode circuits are both tuned by means of movable bridges, and it is essential that good contact be maintained between these bridges and the tubes on which they slide. Ideally these bridges should be one-quarter of a wavelength in length, in order that the actual contact may occur at a current node, but over the wavelength range of 10-60 cm. a good compromise is effected with a bridge of 2·5 cm. in length. In order that bias may be used, a capacity is incorporated in the grid-cathode bridge.

When the valve is to be used as an oscillator, feed-back is obtained by means of a probe (6BA threaded rod) which makes contact with the anode line and passes through a $\frac{1}{4}$ in. diameter hole in the grid line. The displacement of the end of the probe from the cathode tube is thus readily adjustable. For wavelengths longer than 30 cm. it is desirable to terminate the probe by a small circular plate, but for wavelengths below 30 cm. the plate may be dispensed with, and for wavelengths around 10 cm. the increased capacitance prohibits its use.

The output may be taken from the oscillator into a 75 Ω cable by means of a capacity probe, as indicated in Fig. 1. The coupling can be adjusted to optimum by sliding the probe along the line or by varying the depth of penetration towards the grid line.

The complete range of oscillation between the lower wavelength limit (determined by the valve or the circuit) and the upper wavelength limit (determined by the circuit) is not possible with a single probe position. A complete range of oscillation can be obtained with three positions, and for a typical circuit and the probe positions marked A, B and C in Fig. 1, the range of wavelengths that was obtained is given in the following table:

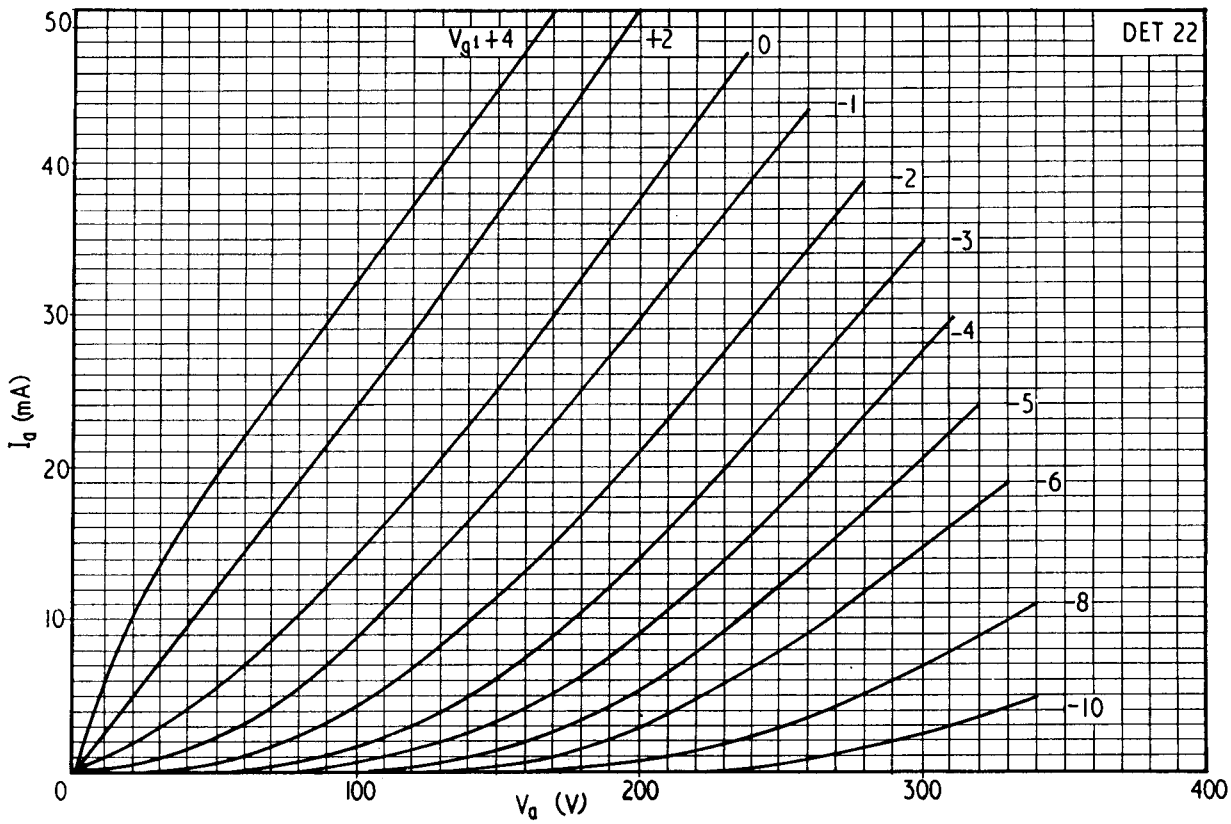
Probe position	Distance from anode plane	Range of λ with anode line on $\frac{3\lambda}{4}$ mode	Min. λ with anode line on λ/4 mode
A	28·5 mm.	9-14 cm.	24 cm.
B	43·5 mm.	11-19 cm.	29 cm.
C	58·5 mm.	21-24 cm.	35 cm.

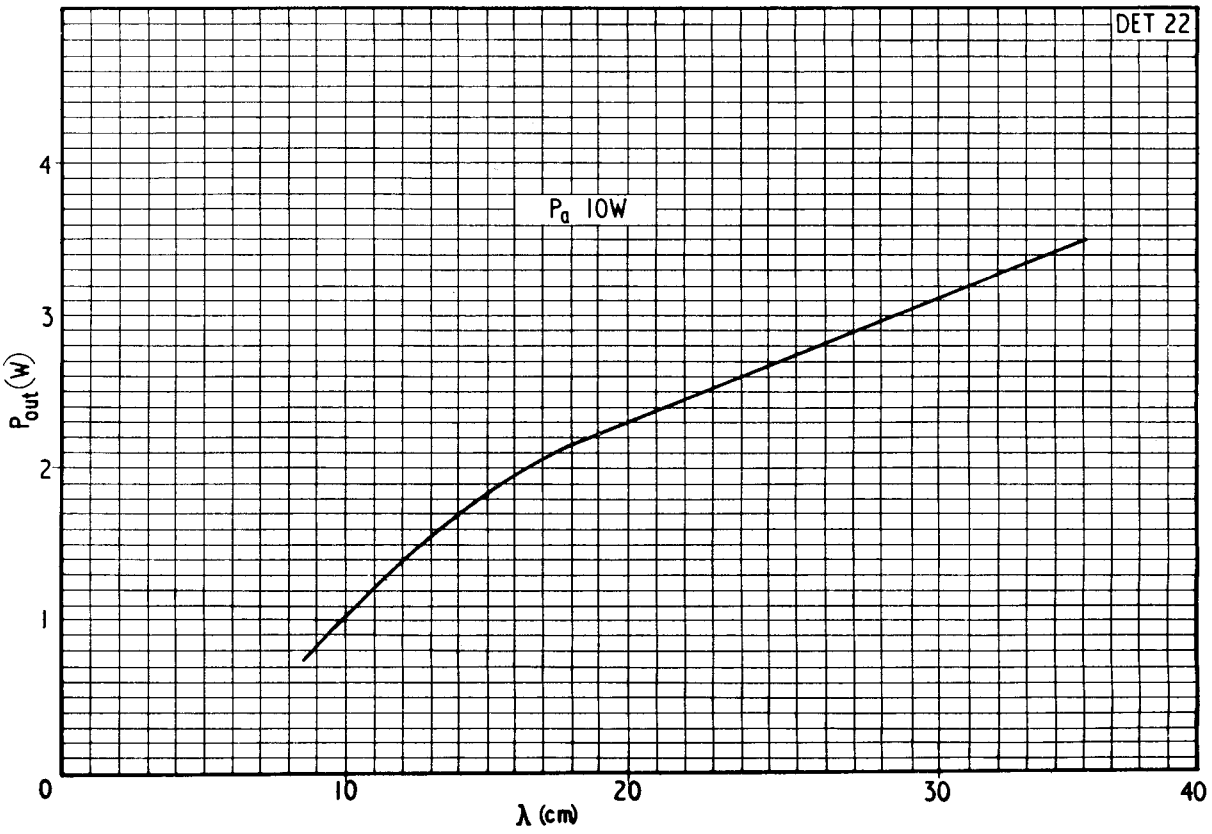
The heater-cathode circuit may be tuned by means of a capacity bridge. The tuning is not critical for the longer wavelengths, but it is necessary for wavelengths around 10 cm., and must be used if maximum efficiency is required. However, a bridge fixed 7·2 cm. from the valve end of the cathode line will give reasonable operation over the range 8-12 cm.

A curve shows the power output obtainable over the wavelength range of 10-35 cm., with a constant input power of 10 W, using the appropriate probe position and coupling, and with optimum grid bias. The optimum value of grid bias varies with the frequency, and the following table gives the approximate cathode bias resistance for various wavelengths.

λ	30	15	12 and less	cm.
R_k	300-350	100	Zero	Ω

The use of zero bias at a wavelength of 30 cm. may cause a reduction in efficiency of as much as 50%.


DET 22
V_{g1} +4
+2
0
-1
-2
-3
-4
-5
-6
-8
-10
I_a (mA)
50
40
30
20
10
0
100
200
300
400
V_a (V)


DET 22
P_a 10W
P_{out} (W)
4
3
2
1
0
10
20
30
40
λ (cm)

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