

# Institute of Engineering JIWAJI UNIVERSITY



## PRESENTATION ON TV & RADAR

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EL- 804

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# CAMERA TUBES

- A TV camera tube may be called the eye of a TV system.
- A camera tube is an important unit that is used to convert the optical image into electrical signal.
- T.V. Camera tubes use photo emission or photo conduction principle for converting the optical source.
- The purpose of a TV pick-up tube is to sense each element independently and develop a signal in electrical form proportional to the brightness of each element.

# CHARACTERISTICS OF CAMERA TUBES

- **LIGHT TRANSFER CHARACTERISTIC:**

It gives the relation between light falling on the camera tube and the electrical current produced

- **SPECTRAL RESPONSE:**

It is the ability of the camera tube to response equally to all colours like the human eye.

- **SENSITIVITY:**

Good camera tubes have high sensitivity. It is the ability to respond for even very low illumination.

- **DARK CURRENT:**

Even if there is no illumination on the face plate of a camera tube, there is a small amount of signal, current flow in the output circuit. This current is called 'Dark Current'.

- **LAG CHARACTERISTICS:**

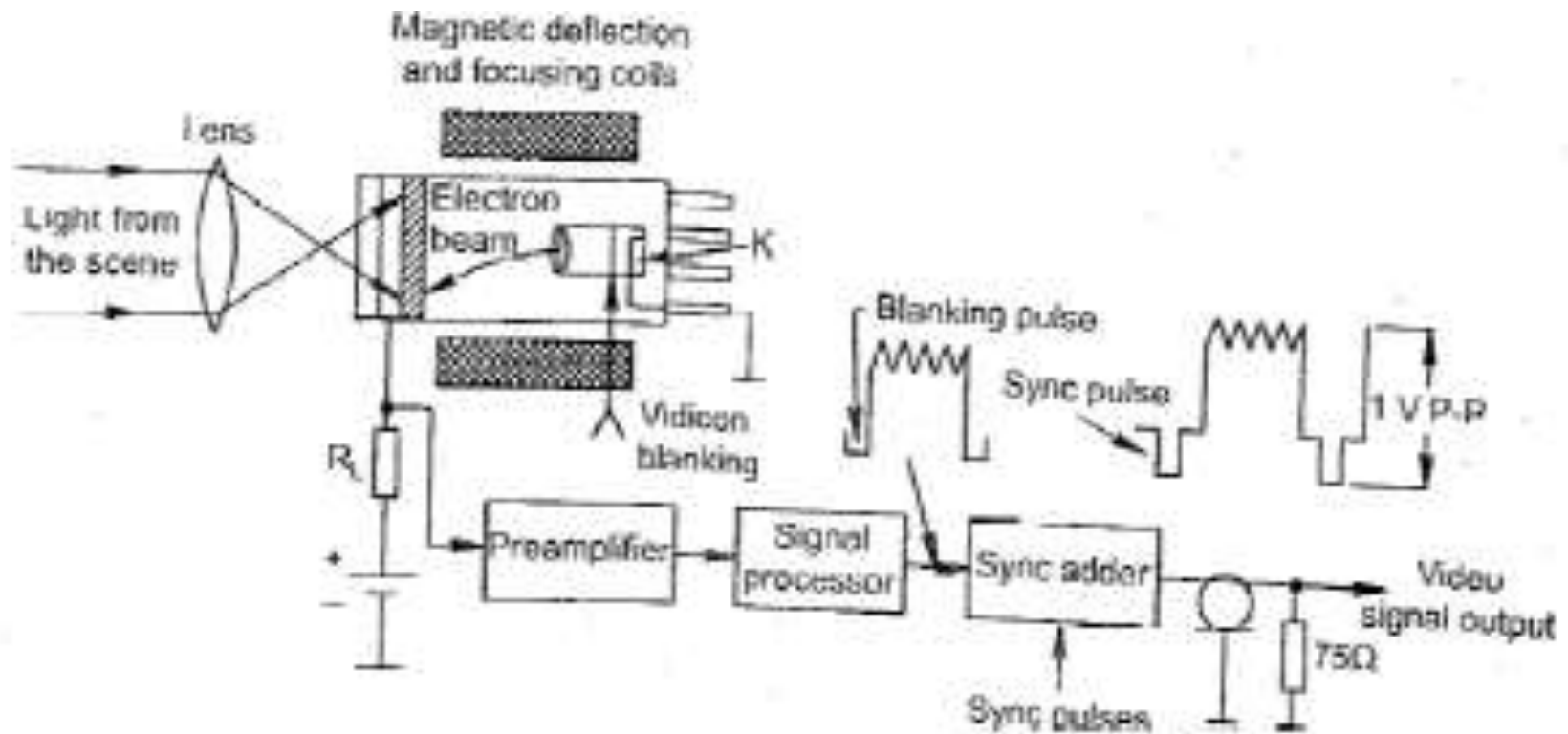
It is the inability of photo sensitive layer to follow faster changes in illumination on the camera tube.

- **RESOLVING POWER:**

Number of black and white lines of resolution in the picture increased the signal current produced is not able to full changes in the black and white level.

# VIDEO PROCESSING OF CAMERA PICKUP SIGNAL

The optical image is focused by the lens on the glass face of target plate. The lens regulates the light, by the iris build into the lens housing. The output of video signal is taken across the load resistor.



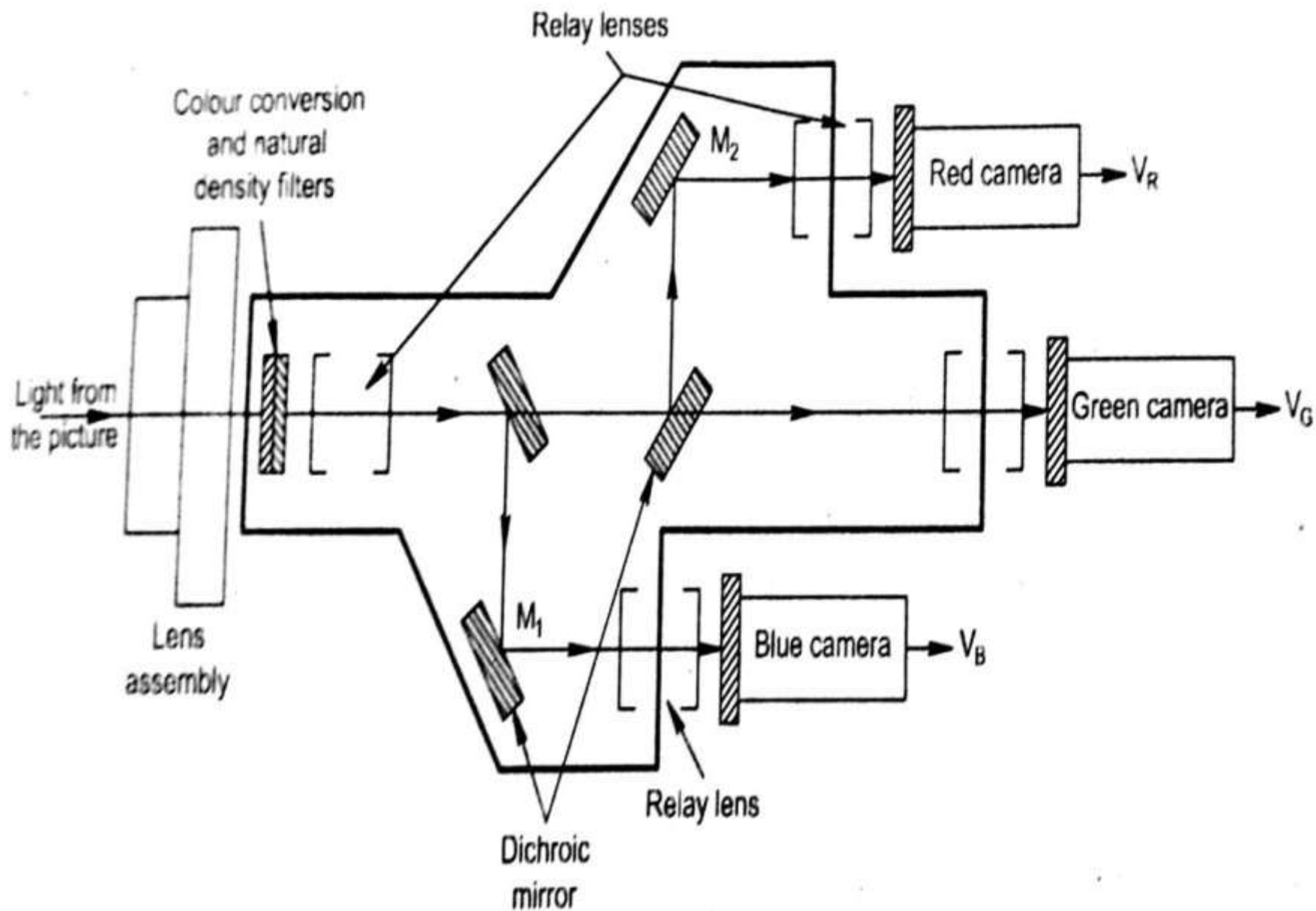
# **PRINCIPLE OF WORKING & BLOCK DIAGRAM OF COLOUR TV CAMERA**

A colour camera tube is used to split the optical image into primary colours. A special type of mirror called dichroic mirror is used.

That is red dichroic mirror reflect red colour and allow other colours to pass through it. The scene is focused by the zoom lens package on the dichroic mirror setup. Then they are passed through the colour filters. These filters can provide precise primary colour images. Each camera tube develops video signal voltage, proportional to the colour intensity received by it.

A video pre amplifier amplifies VR, VB VG signals. In the output stage a resistance network is used to generate the luminance (y) signal and colour signal.

The resistance values are so related, such that  $Y = 0.3R + 0.59G + 0.11B$ . If only red colour light is focused, then we have only red camera output VR.



# TYPES OF CAMERA TUBES

- **BASED ON PRINCIPLE:**

Three photo electric effects are used for converting variations of light inten

1. Photo emissive camera tubes.
2. Photo conductive camera tubes.
3. Photo voltaic camera tubes.

- **BASED ON TARGET PLATE :**

1. Image Orthicon
2. Vidicon
3. Plumbicon

# IMAGE ORTHICON

This tube makes use of the high photoemissive sensitivity obtainable from photocathodes, image multiplication at the target caused by secondary emission and an electron multiplier.

It has three main sections: image section, scanning section and electron gun-cum-multiplier section.

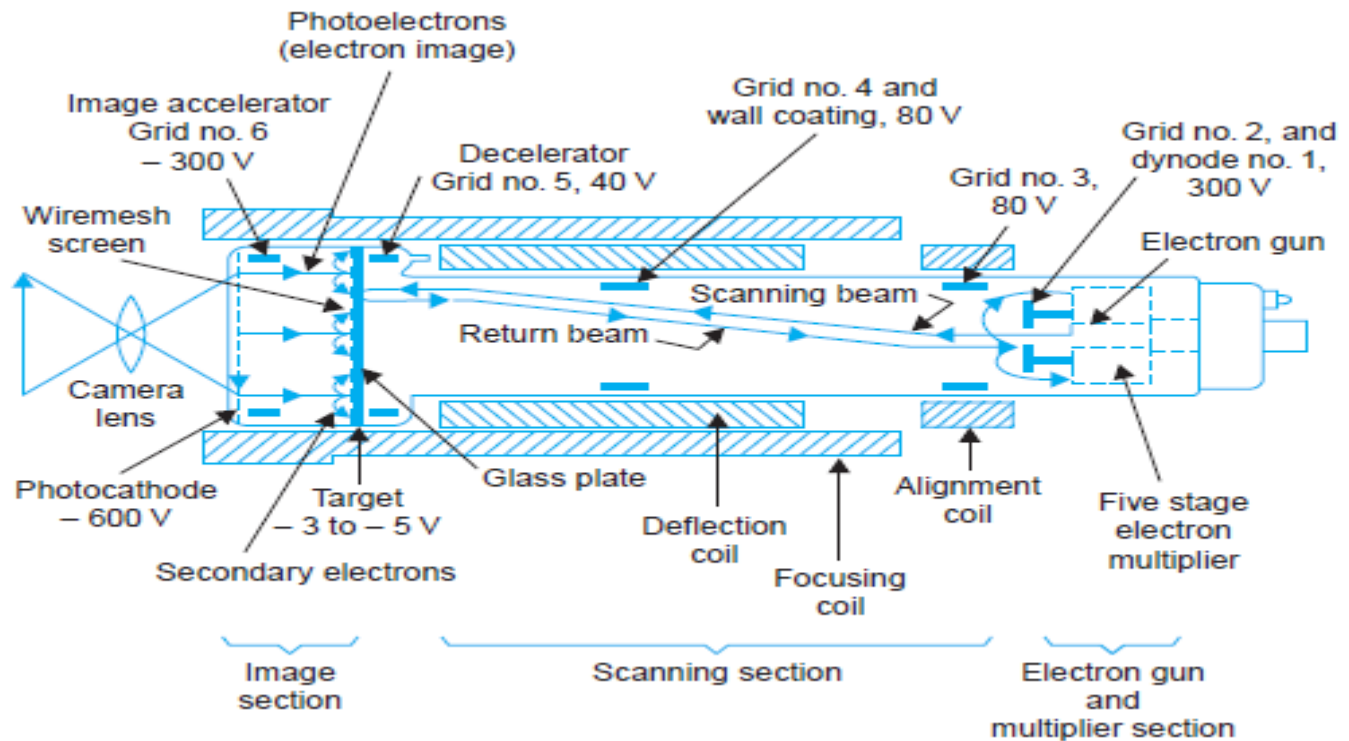


Fig. Principle of operation of Image Orthicon (non-field mesh type).



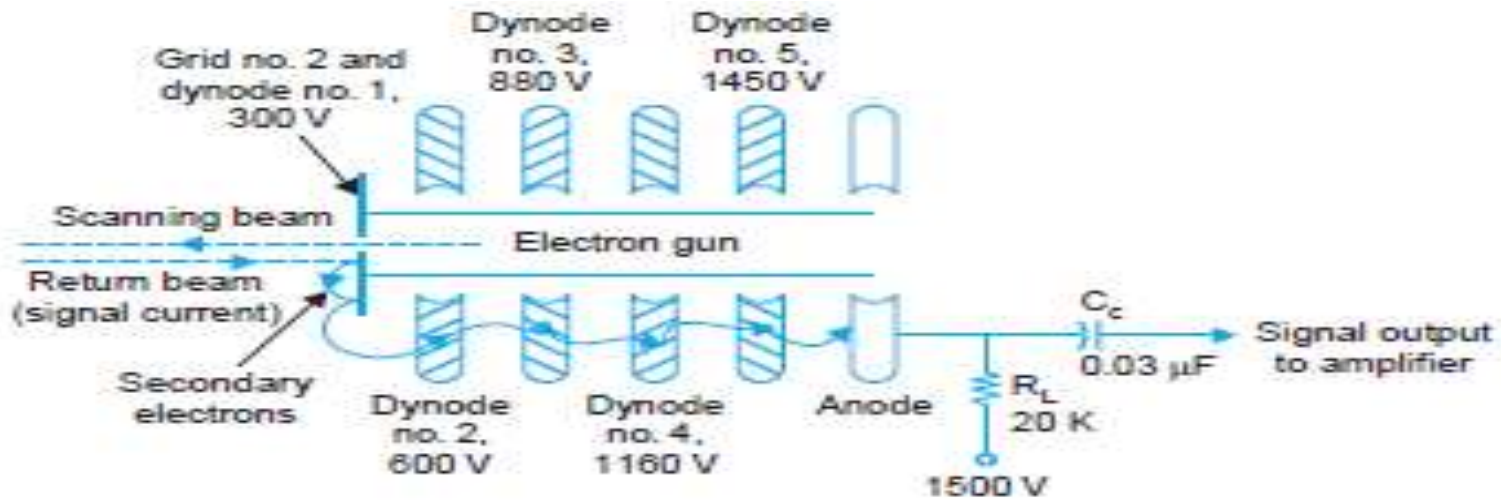


Fig. Electron-multiplier section of the Image Orthicon.

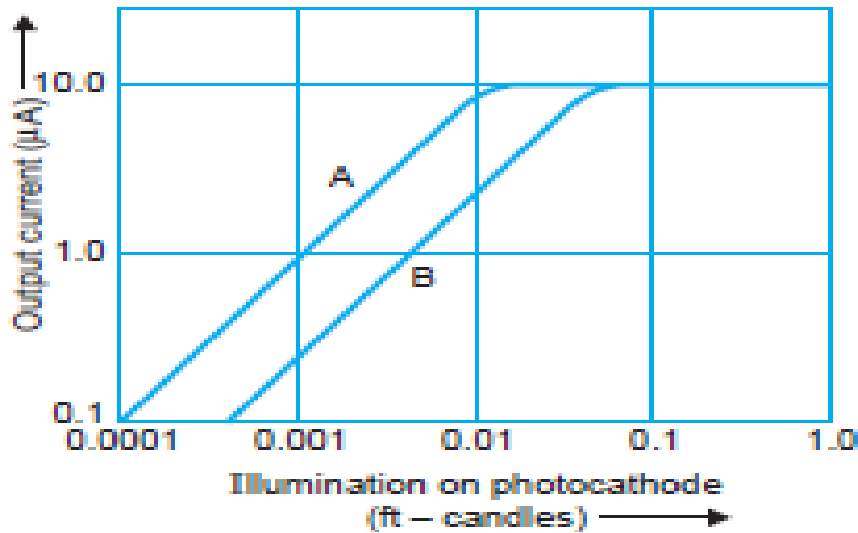


Fig. Light transfer characteristics of two different Image Orthicons.

# VIDICON

The Vidicon came into general use in the early 50's and gained immediate popularity because of its small size and ease of operation. It functions on the principle of photoconductivity

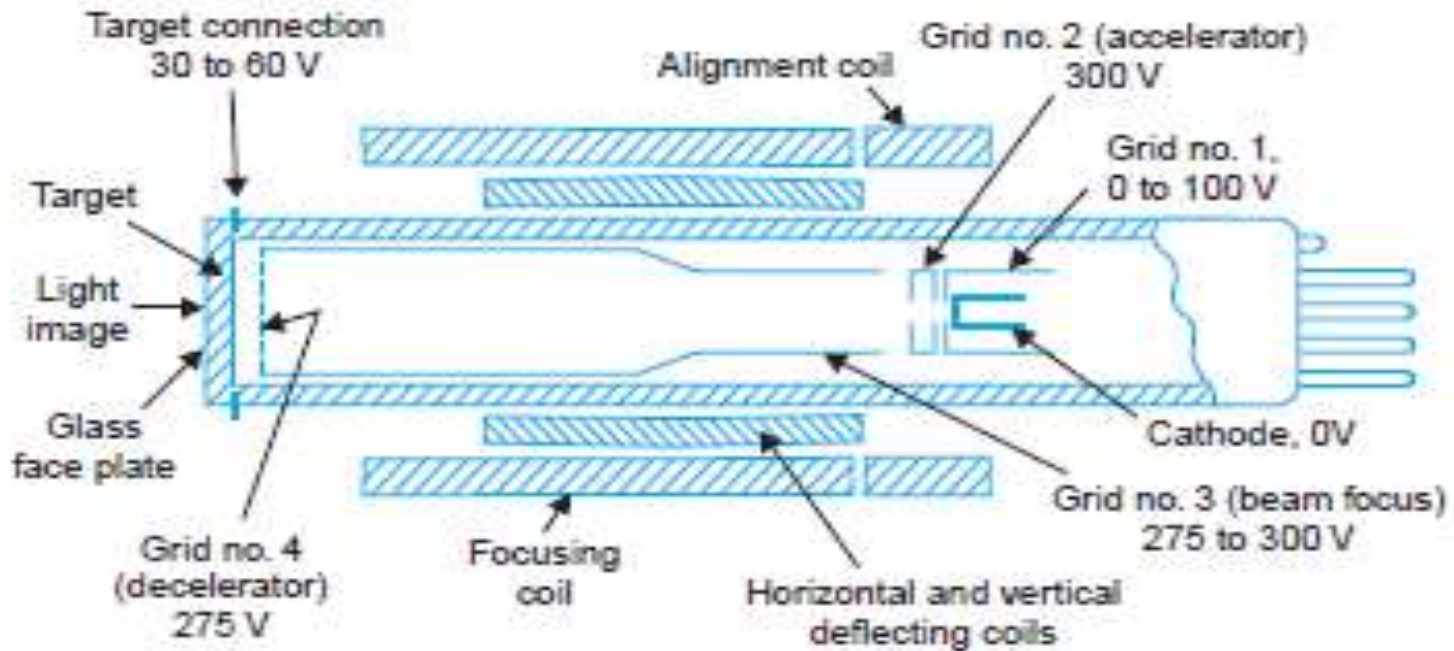


Fig. Vidicon camera tube cross-section

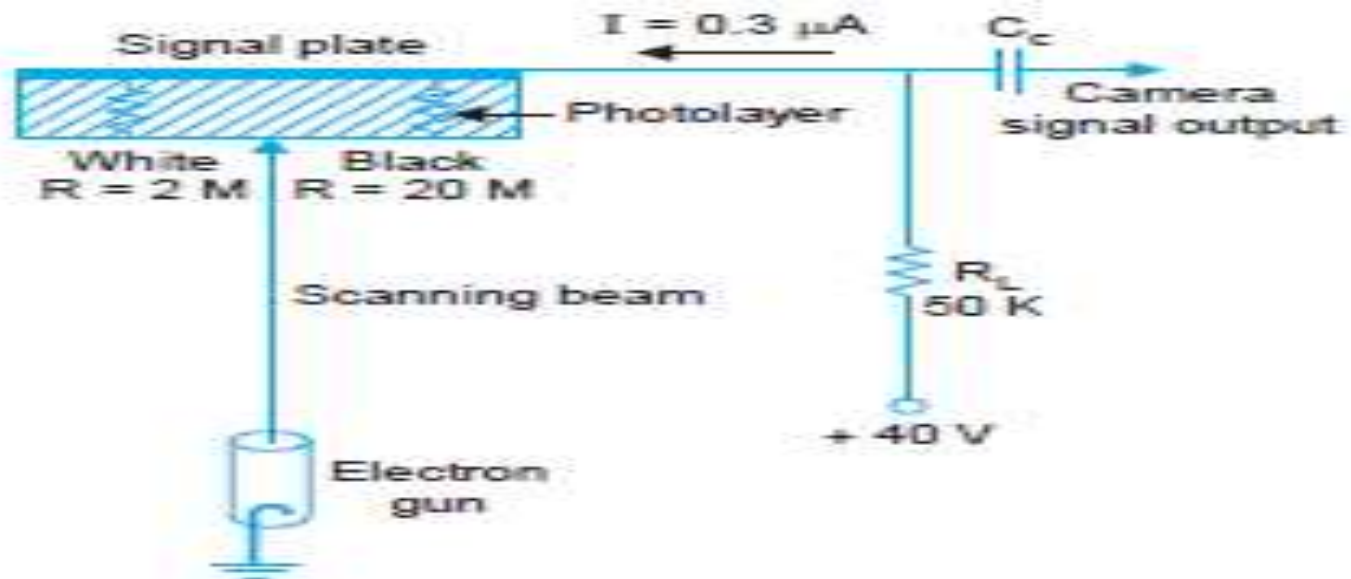


Fig. Circuit for output signal from a Vidicon camera tube.

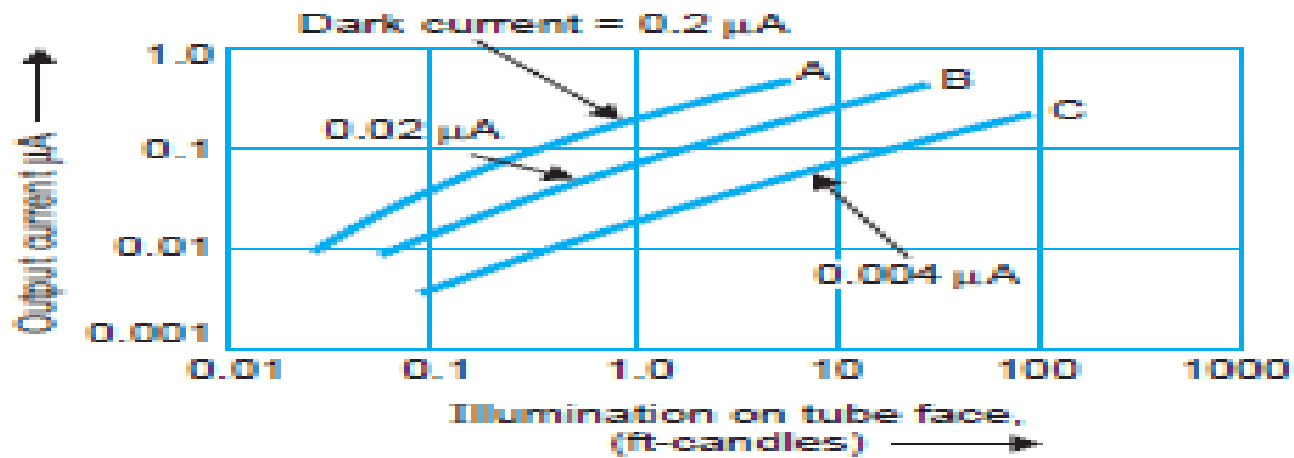
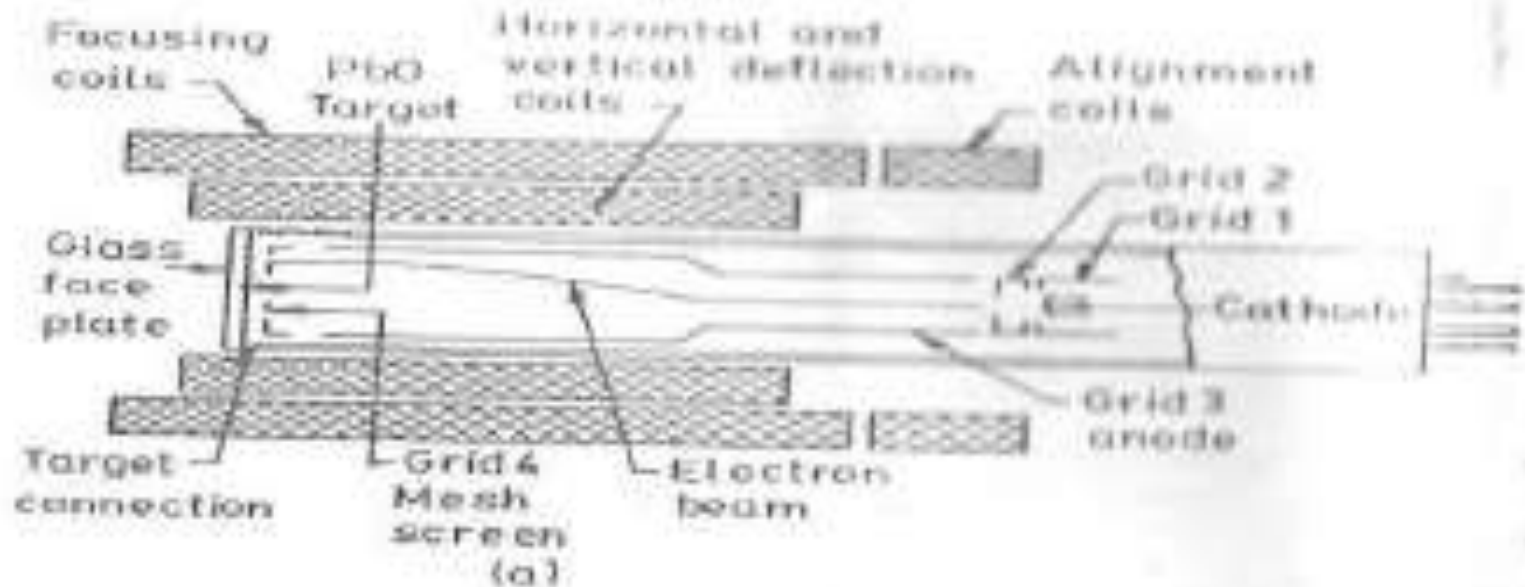


Fig. Light transfer characteristics of Vidicon.

# PLUMBICON

This picture tube has overcome many of the less favourable features of standard vidicon. It has fast response and produces high quality pictures at low light levels. Its smaller size and light weight, together with low-power operating characteristics, makes it an ideal tube for transistorized television cameras.



*a) Sectional view*  
*Fig 2.6 Plumbicon camera tube*

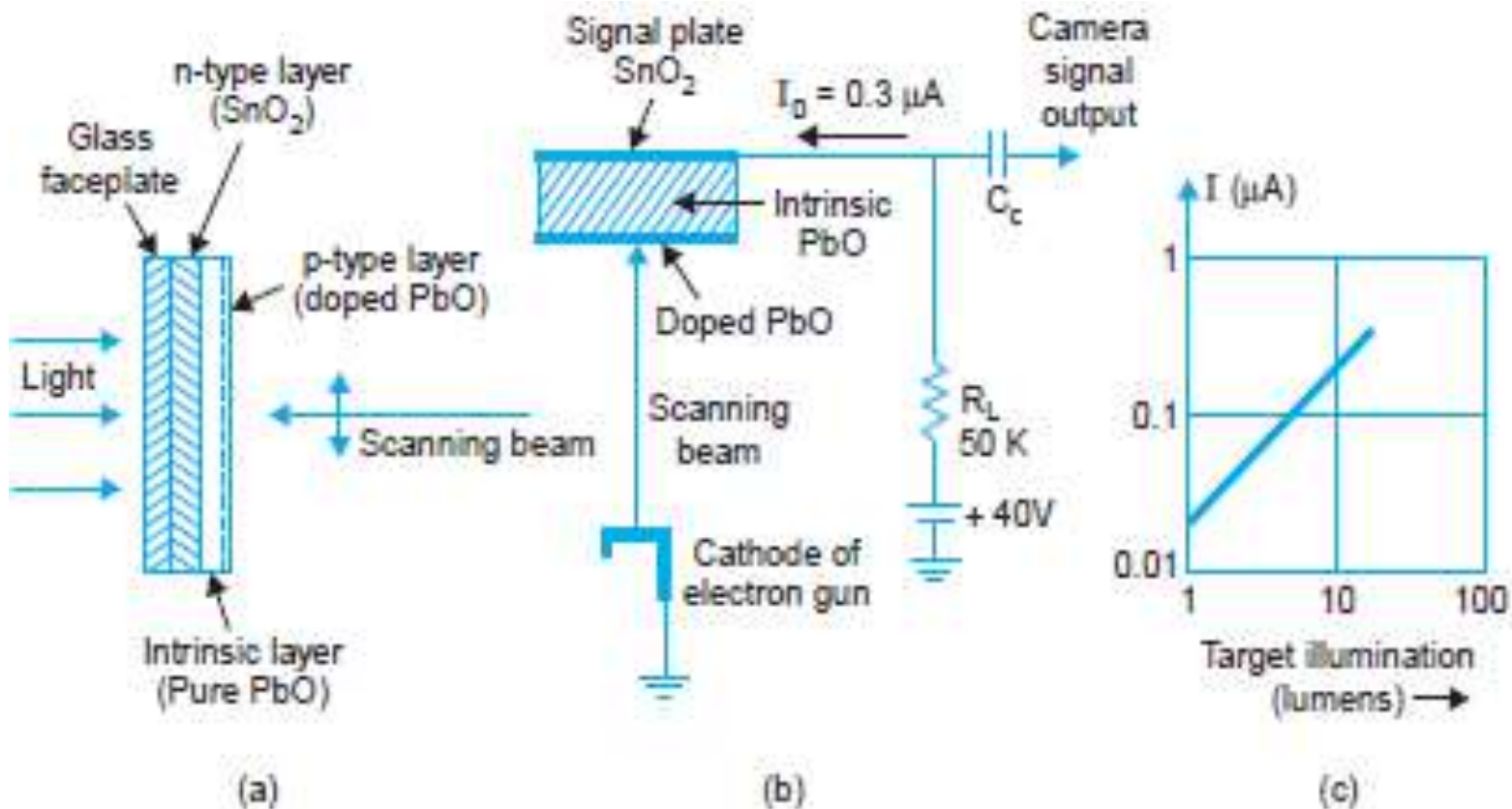


Fig. Plumbicon camera tube (a) target details (b) output signal current and (c) characteristics.

Construction is similar to vidicon except target plate and output signal. The target plate acts as a PIN semi conductor diode. The inner surface of glass plate is coated with a transparent conducting layer of SnO<sub>2</sub>.

***THANK YOU***