

# Microwave Engineering

## Unit-3

## Reflex Klystrons

- The reflex klystron has been the most used source of microwave power in laboratory applications.

# Construction

- A reflex klystron consists of an electron gun, a cavity with a pair of grids and a repeller plate as shown in the above diagram.
- In this klystron, a single pair of grids does the functions of both the buncher and the catcher grids.
- The main difference between two cavity reflex klystron amplifier and reflex klystron is that the output cavity is omitted in reflex klystron and the repeller or reflector electrode, placed a very short distance from the single cavity, replaces the collector electrode.

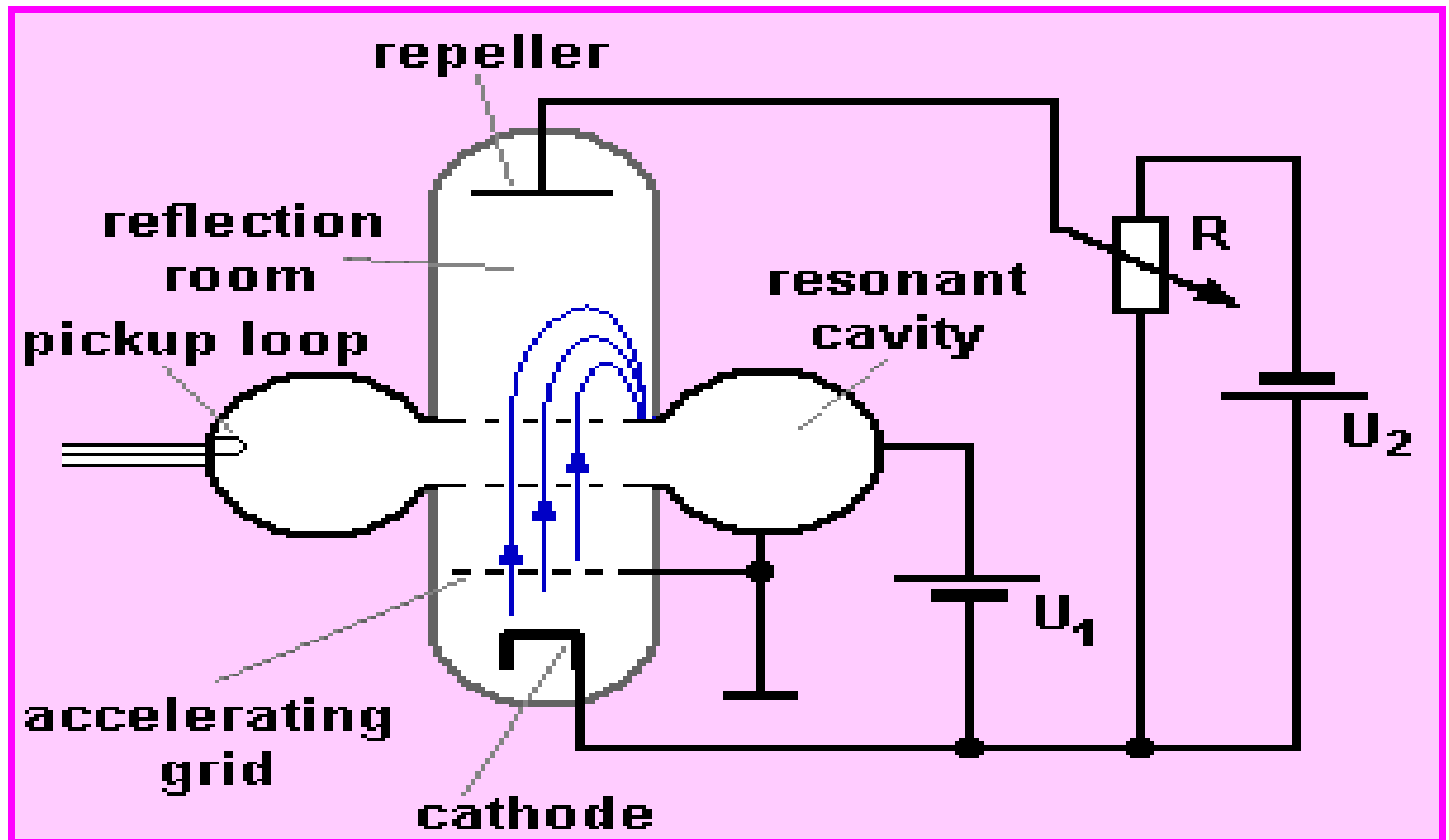
## Working

- The cathode emits electrons which are accelerated forward by an accelerating grid with a positive voltage on it and focused into a narrow beam.
- The electrons pass through the cavity and undergo velocity modulation, which produces electron bunching and the beam is repelled back by a repeller plate kept at a negative potential with respect to the cathode.
- On return, the electron beam once again enters the same grids which act as a buncher, thereby the same pair of grids acts simultaneously as a buncher for the forward moving electron and as a catcher for the returning beam.

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# Reflex Klystron oscillator



# Working

- The feedback necessary for electrical oscillations is developed by reflecting the electron beam, the velocity modulated electron beam does not actually reach the repeller plate, but is repelled back by the negative voltage.
- The point at which the electron beam is turned back can be varied by adjusting the repeller voltage.
- Thus the repeller voltage is so adjusted that complete bunching of the electrons takes place at the catcher grids, the distance between the repeller and the cavity is chosen such that the repeller electron bunches will reach the cavity at proper time to be in synchronization.
- Due to this, they deliver energy to the cavity, the result is the oscillation at the cavity producing RF frequency.

## Performance Characteristics

1. Frequency: 4 – 200 GHz
2. Power: 1 mW – 2.5 W
3. Theoretical efficiency : 22.78 %
4. Practical efficiency : 10 % - 20 %
5. Tuning range : 5 GHz at 2 W – 30 GHz at 10 mW



# Applications

- The reflex klystrons are used in
  1. Radar receivers
  2. Local oscillator in microwave receivers
  3. Signal source in microwave generator of variable frequency
  4. Portable microwave links
  5. Pump oscillator in parametric amplifier