Institute of Engineering
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PRESENTATION
ON
TV & RADAR

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TELEVISION TRANSMITTER

- A simplified functional block diagram of a television transmitter is shown in Fig. Necessary details of video signal modulation with picture carrier of allotted channel are shown in picture transmitter section of the diagram. Note the inclusion of a dc restorer circuit (DC clamp) before the modulator.
- Also note that because of modulation at a relatively low power level, an amplifier is used after the modulated RF amplifier to raise the power level.
- Accordingly this amplifier must be a class-B push-pull linear RF amplifier. Both the modulator and power amplifier sections of the transmitter employ specially designed VHF triodes for VHF channels and klystrons in transmitters that operate in UHF channels.

Vestigial Sideband Filter

- The modulated output is fed to a filter designed to filter out part of the lower sideband frequencies. As already explained this results in saving of band space.

Antenna

- The filter output feeds into a combining network where the output from the FM sound transmitter is added to it.

- This network is designed in such a way that while combining, either signal does not Interfere with the working of the other transmitter.

- A coaxial cable connects the combined output to the antenna system mounted on a high tower situated close to the transmitter.

- A turnstile antenna array is used to radiate equal power in all directions. The antenna is mounted horizontally for better signal to noise ratio

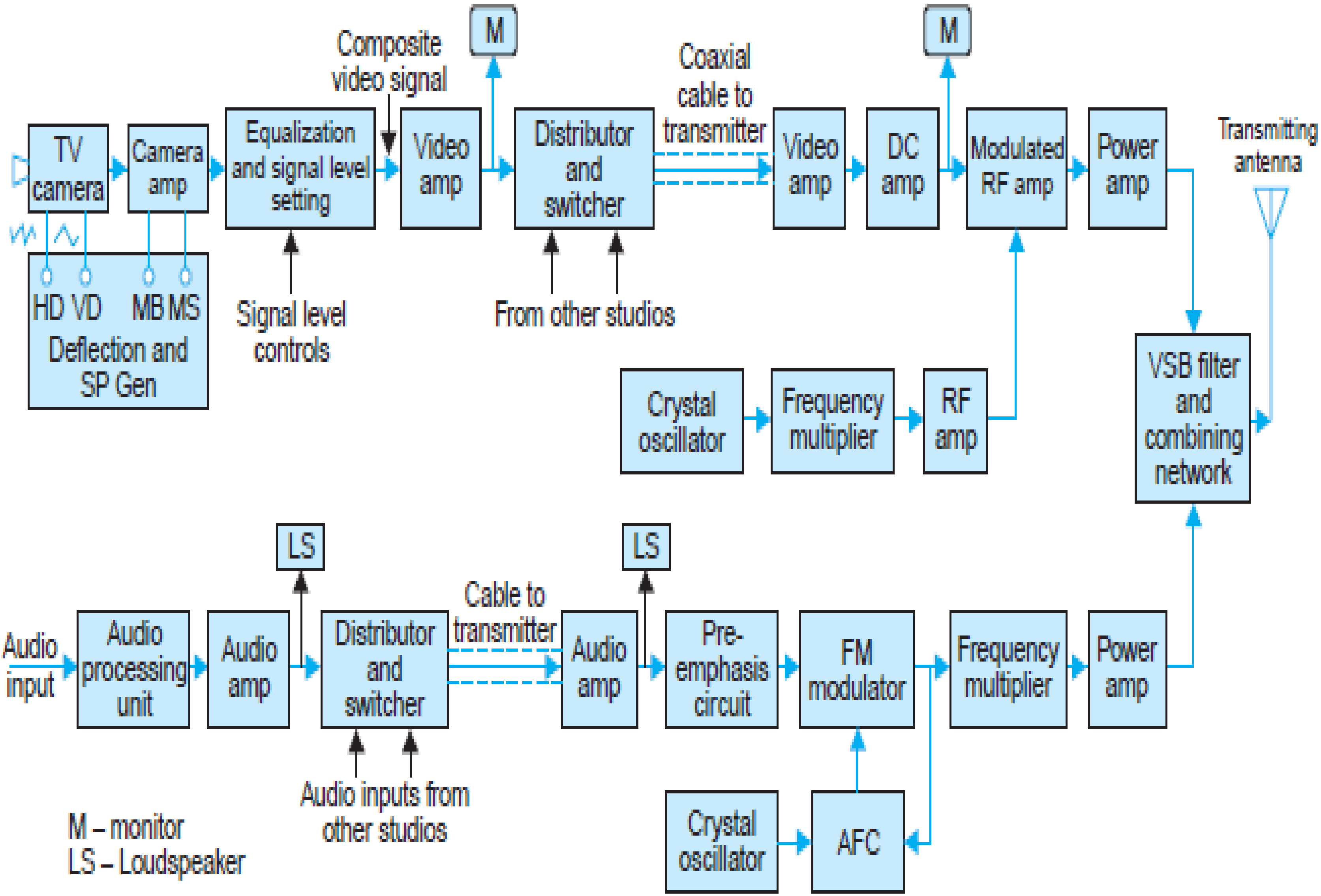

Figure. Simplified block diagramof a television transmitter.

TELEVISION RECEIVERS

The receiver may use tubes for all stages, have all solid-state devices-transistors and integrated circuits, or combine tubes and transistors as a hybrid receiver

(a) All Tube Receivers. This type mainly applies to earlier monochrome receivers. All the functions are provided by about 12 tubes including several multipurpose tubes with two or three stages in one glass envelope. The dc supply for tubes is between 140 to 280 volts.

(b) Solid-State Receivers. In this type all states except the picture tube use semiconductor diodes, transistors and integrated circuits. The dc supply is between 12 to 100 volts for various stages. The heater power to the picture tube is supplied through a separate filament transformer.

(c) Hybrid Receivers. In this type the deflection circuits generally use power tubes, while the signal circuits use transistor and integrated circuits. These receivers usually have a line connected power supply, with series heaters for the tubes. Two dc sources, one for semiconductor devices and the other for tubes are provided.

RECEIVER SECTIONS

It is desirable to have a general idea of the organization of the receiver before going into circuit details. Figure shows block schematic diagram of a typical monochrome TV receiver. As shown there, the receiver has been divided into several main sections depending on their functions and are discussed below.

- Antenna section
- RF tuner section
- Video signal and AGC section
- Audio signal section
- Synchronous separator section
- Oscillator section
- EHT section

Function of various blocks

Antenna section:

- To receive the TV signals, antenna is mounted at the top of a building. Converts the received electromagnetic waves into electrical signals.
- A half wave length antenna is mostly used for UHF band channels. Normally yagi antenna is used in TV receiver.

RF tuner section:

- RF amplifier, mixer and local oscillator are collectively called as RF tuner.
- The other input to the mixer is fed from a local oscillator
- Used to select the desired band and channel.

Video signal and AGC section:

- The video section consists of 1F amplifier video detector, video amplifier and picture tube.
- So a video amplifier is used at the output of video detector.
- So an automatic gain control (AGC) circuit is used to automatically control the gain of the amplifiers

Audio signal section:

- In this section we have audio IF amplifier, FM demodulator audio amplifier and loud speaker.
- A loud speaker is used for the reproduction of sound.

Sync separator section:

- This section consists of a sync separator integrator and differentiator
- So the output of sync separator contains both the horizontal and vertical sync pulses.
- The differentiated horizontal sync pulses of line frequency are used to trigger the horizontal oscillator

Horizontal and vertical oscillator section

- Vertical section consists of vertical oscillator output amplifier and vertical deflection coil.
- Similarly the horizontal is synchronized by the trigger pulses from the differentiator

EHT section (Extra High Tension section)

- In this section only the high voltage needed by final anode is developed.
- Using the damper diode section boosted B+ supply is taken out.

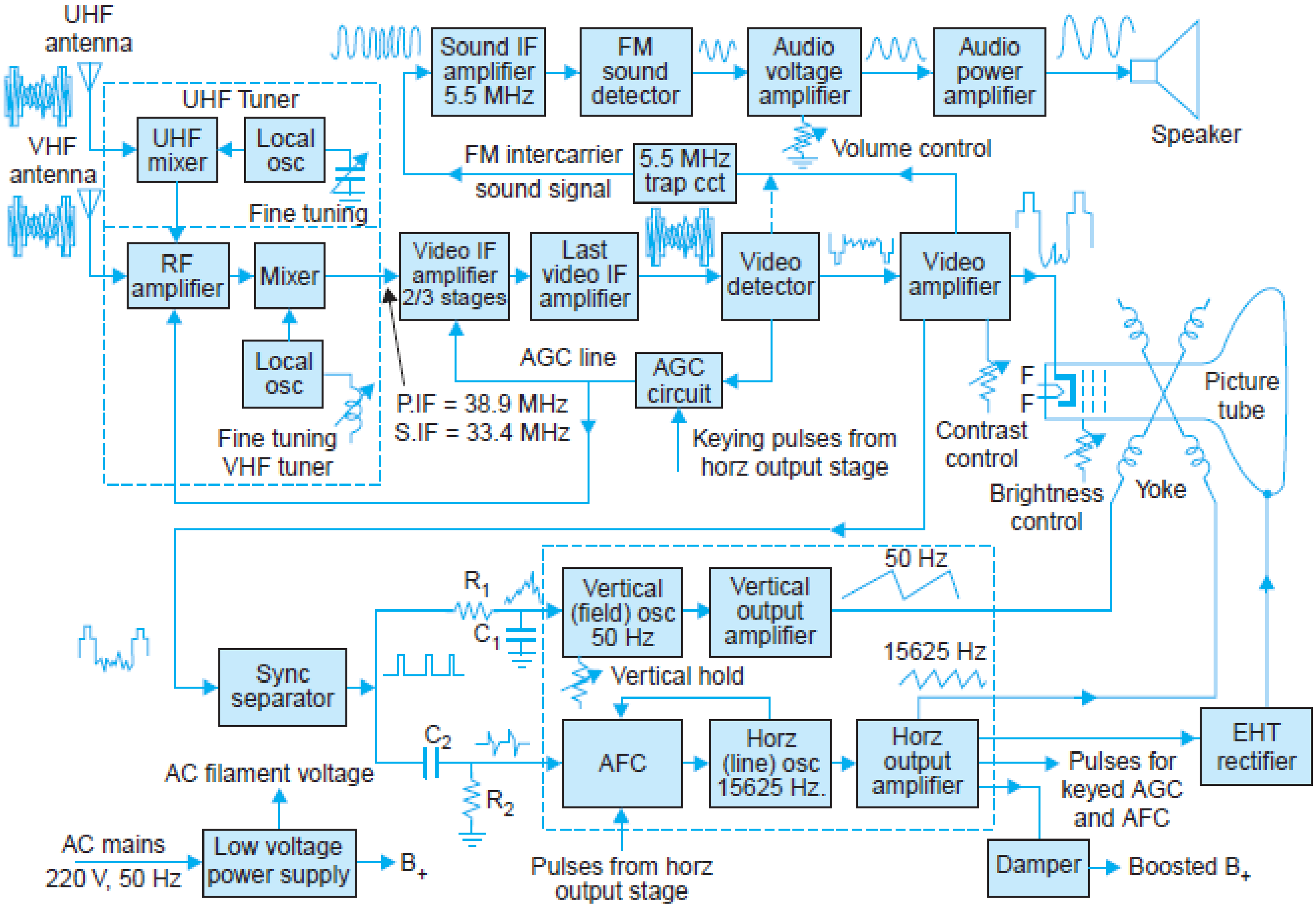

Fig. Block diagram of a monochrome television receiver

Co-channel Interference

- Two stations operating at the same carrier frequency, if located close by, will interfere with each other. This phenomenon which is common in fringe areas is called co-channel interference.
- As the two signal strengths in any area almost equidistant from the two co-channel stations become equal, a phenomenon known as 'venetian-blind' interference occurs
- This takes the form of horizontal black and white bars, superimposed on the picture produced by the tuned channel. These bars tend to move up or down on the screen.
- Co-channel interference was a serious problem in early days of TV transmission, when the channel allocation was confined to VHF band only. This necessitated the repetition of channels at distances not too far from each other.
- The sharing of channel numbers is carefully planned so that within the 'service area' of any station, signals from the distant stations under normal conditions of reception are so weak as to be imperceptible
- co-channel interference can occur in fringe areas. The use of highly directional antennas is very helpful in etiminating co-channel interference.

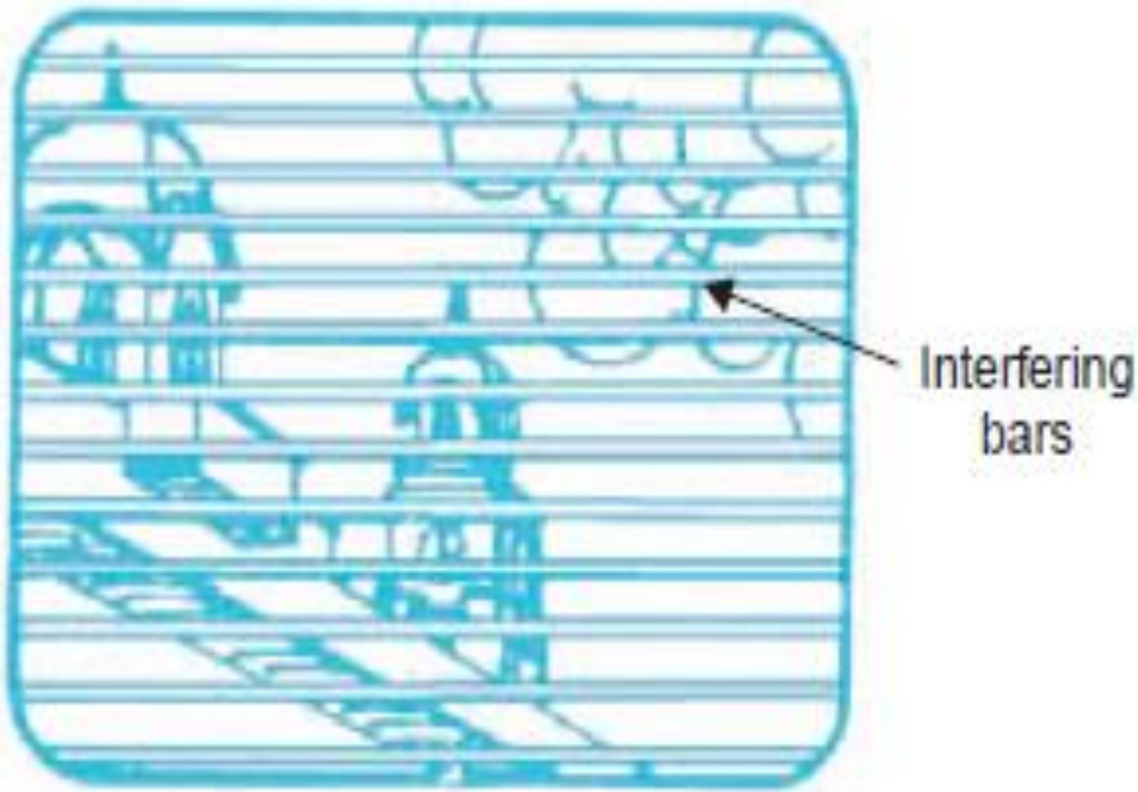

Fig. 9.3. Venetian-blind interference caused by beat frequency between picture carriers of co-channels.

Ghost Interference

- Ghost interference arises as a result of discrete reflections of the signal from the surface of buildings, bridges, hills, towers etc
- Figure 9.4 (a) shows paths of direct and reflected electromagnetic waves from the transmitter to the receiver. Since reflected path is longer than the direct path, the reflected signal takes a longer time to arrive at tke receiver.
- The direct signal is usually stronger and assumes control of the synchronizing circuitry and so the picture, due to the reflected signal that arrives late, appears displaced to the right. Such displaced pictures are known as 'trailing ghost' pictures.
- On rare occasions, direct signal may be the weaker of the two and the receiver synchronization is now controlled by the reflected signal. Then the ghost picture, now caused by direct signal, appears displaced to the left and is known 'as leading ghost' picture.
- Figure 9.4 (b) shows formation of trailing and leading ghost pictures on the receiver screen.
- The general term for the propagation condition which causes ghost pictures is 'multipath transmission'.
- The effect of such reflected signals (ghost images) can be minimized by using directional antennas and by locating them at suitable places on top of the buildings.

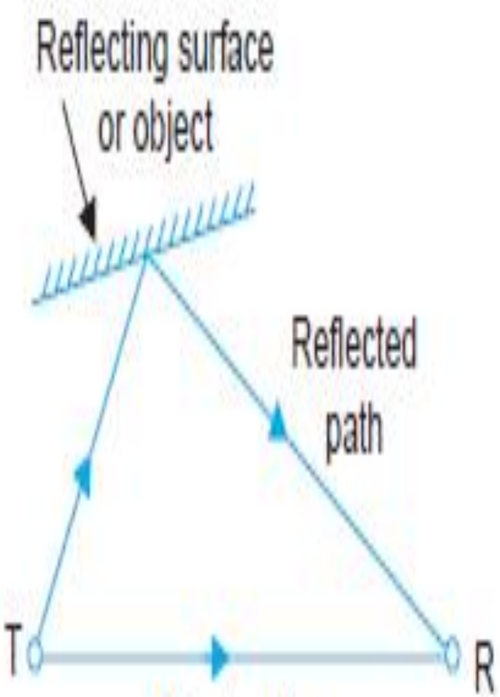

Fig. 9.4 (a). Geometry of multiple path transmission.

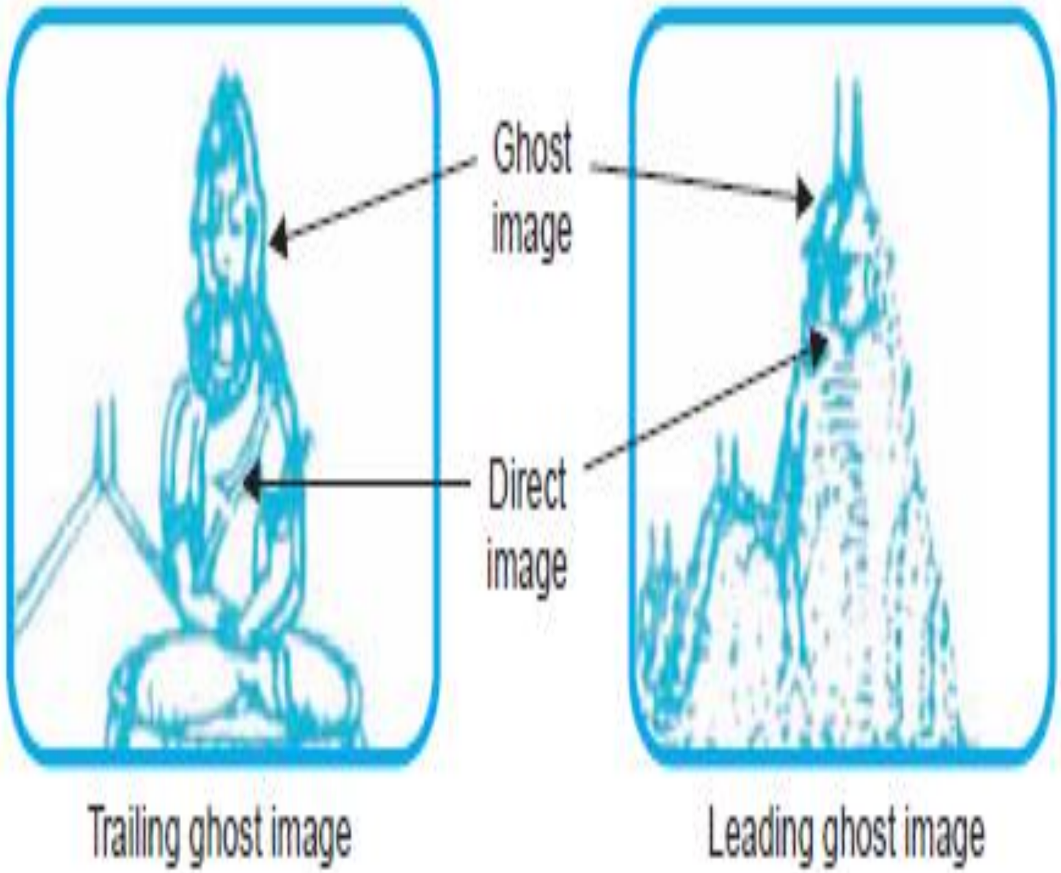

Fig. 9.4 (b). Ghost interference.

Automatic degaussing (ADG) circuit

Introduction:

There are many degaussing circuits in use. The following section gives an overview about the Automatic degaussing Circuit.

Overview of the AGC:

- Figure 1.1 (a) shows details of a popular automatic degaussing circuit.
- It uses a thermistor and a varistor for controlling the flow of alternating current through the degaussing coil.
- When the receiver is turned on the ac voltage drop across the thermistor is quite high (about 60volts) and this causes a large current to flow through the degaussing coil.
- Because of this heavy current, the thermistor heats up, its resistance falls and voltage drop across it decreases.
- As a result, voltage across the varistor decreases thereby increasing its resistance.
- This in turn reduces ac current through the coil to a very low value.
- The circuit components are so chosen that initial surge of current through the degaussing coil is close to 4 amperes and drops to about 25 mA in less than a second.
- This is illustrated in Fig.
- Once the thermistor heats up degaussing ends and normal ac voltage is restored to the B rectifier circuit.

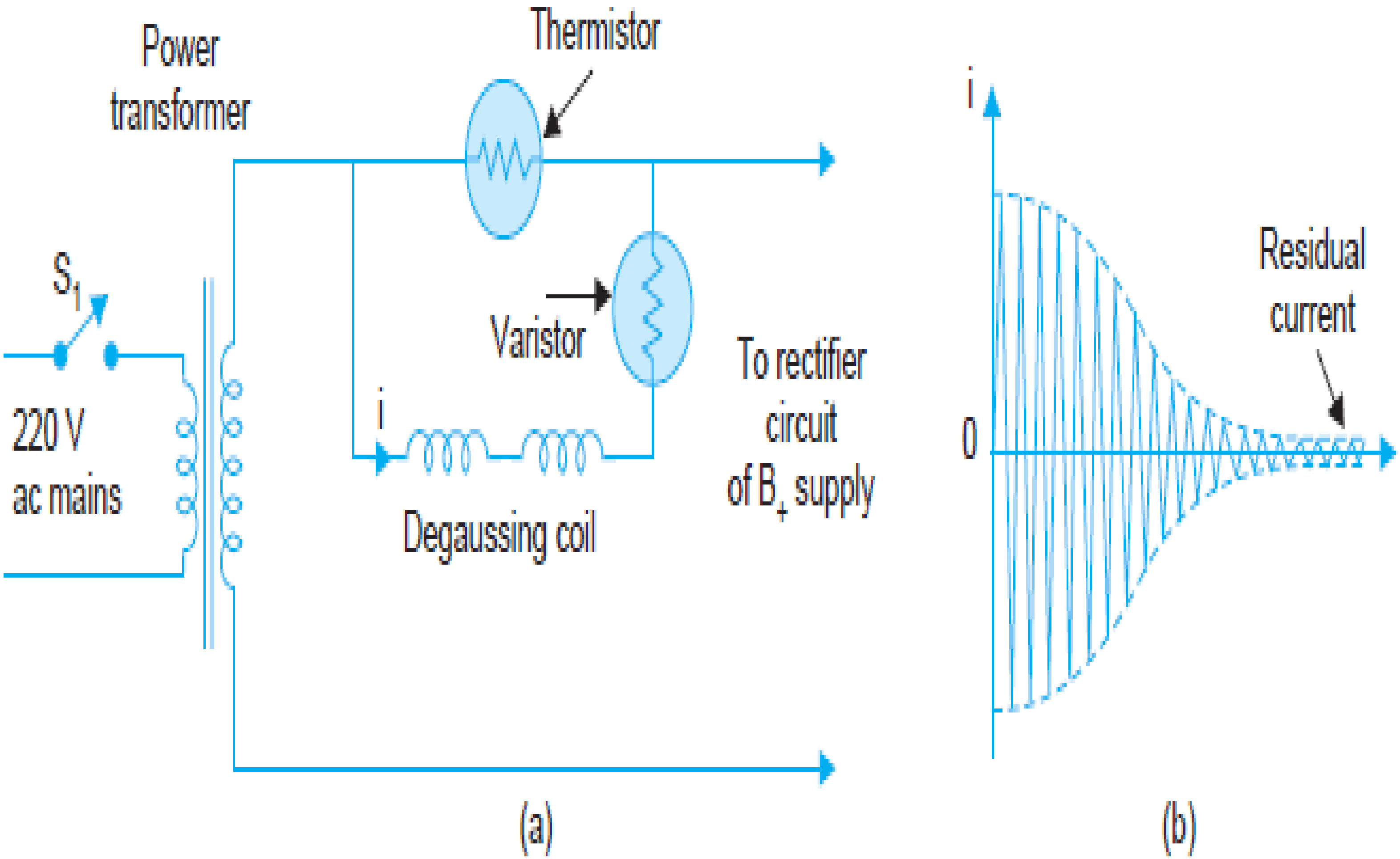

Fig. Automatic degaussing (ADG) (a) typical circuit (b) variation of current in the degaussing coil when receiver is just switched on.

THANK YOU