

2z-01 Tutorial and Solution

Question 1

Devise a control system to fill a container with water after it is emptied through a stopcock at the bottom. The system must automatically shut off the water when the container is filled.

The simplified schematic diagram (Fig. 1-5) illustrates the principle of the ordinary toilet tank filling system.

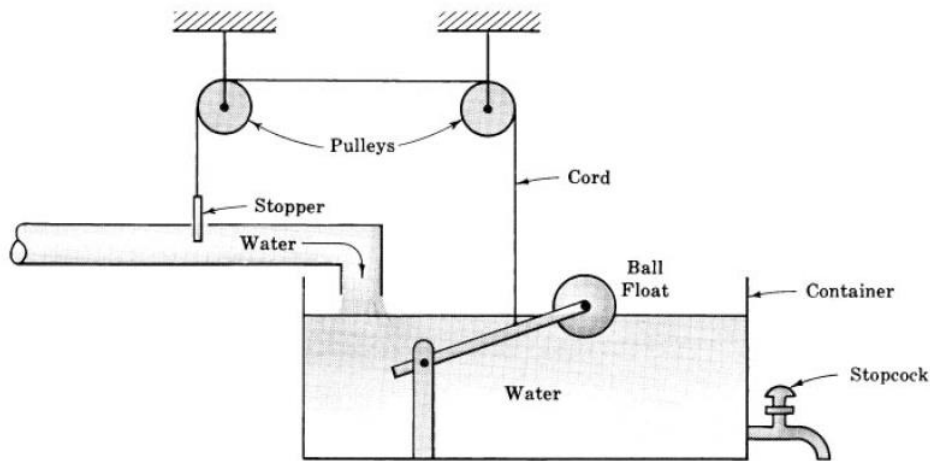


Fig. 1-5

The ball floats on the water. As the ball gets closer to the top of the container, the stopper decreases the flow of water. When the container becomes full, the stopper shuts off the flow of water.

Question 2

Devise a simple control system which automatically turns on a room lamp at dusk, and turns it off in daylight.

A simple system that accomplishes this task is shown in Fig. 1-6.

At dusk, the photocell, which functions as a light-sensitive switch, closes the lamp circuit, thereby lighting the room. The lamp stays lighted until daylight, at which time the photocell detects the bright outdoor light and opens the lamp circuit.

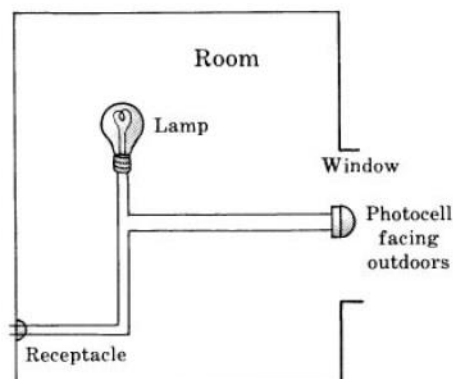


Fig. 1-6

Question 3

Devise a closed-loop automatic toaster.

Assume each heating element supplies the same amount of heat to both sides of the bread, and toast quality can be determined by its color. A simplified schematic diagram of one possible way to apply the feedback principle to a toaster is shown in Fig. 1-7. Only one side of the toaster is illustrated.

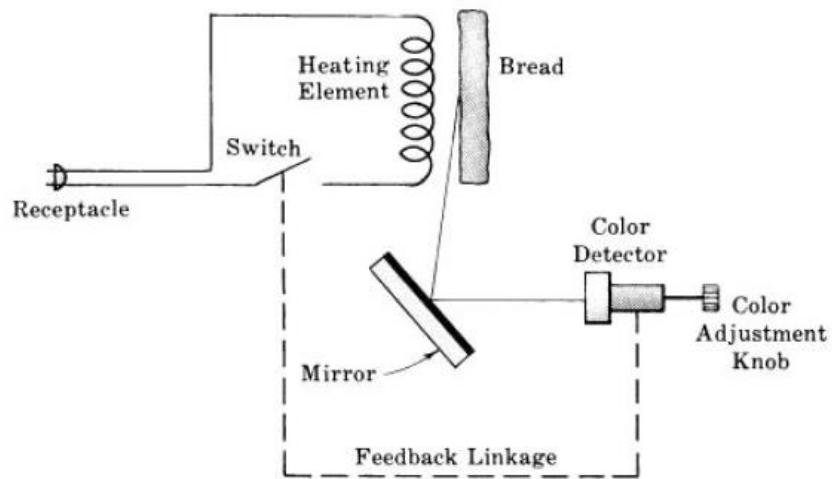


Fig. 1-7