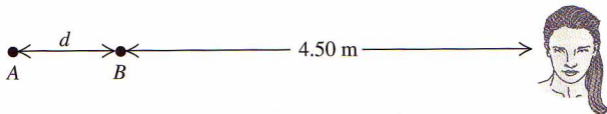


53. • Two small speakers *A* and *B* are driven in step at 725 Hz by the same audio oscillator. These speakers both start out 4.50 m from the listener, but speaker *A* is slowly moved away. (See Figure 12.42.) (a) At what distance  $d$  will the sound from the speakers first produce destructive interference at the location of the listener? (b) If *A* keeps moving, at what distance  $d$  will the speakers next produce destructive interference at the listener? (c) After *A* starts moving away, at what distance will the speakers first produce constructive interference at the listener?



▲ **FIGURE 12.42** Problem 53.

52. • A railroad train is traveling at 25.0 m/s in still air. The frequency of the note emitted by the locomotive whistle is 400 Hz. What is the wavelength of the sound waves (a) in front of the locomotive? (b) behind the locomotive? What is the frequency of the sound heard by a stationary listener (c) in front of the locomotive? (d) behind the locomotive?
54. • A car alarm is emitting sound waves of frequency 520 Hz. You are on a motorcycle, traveling directly away from the car. How fast must you be traveling if you detect a frequency of 490 Hz?
55. •• A stationary police car emits a sound of frequency 1200 Hz that bounces off of a car on the highway and returns with a frequency of 1250 Hz. The police car is right next to the highway, so the moving car is traveling directly toward or away from it. (a) How fast was the moving car going? Was it moving towards or away from the police car?