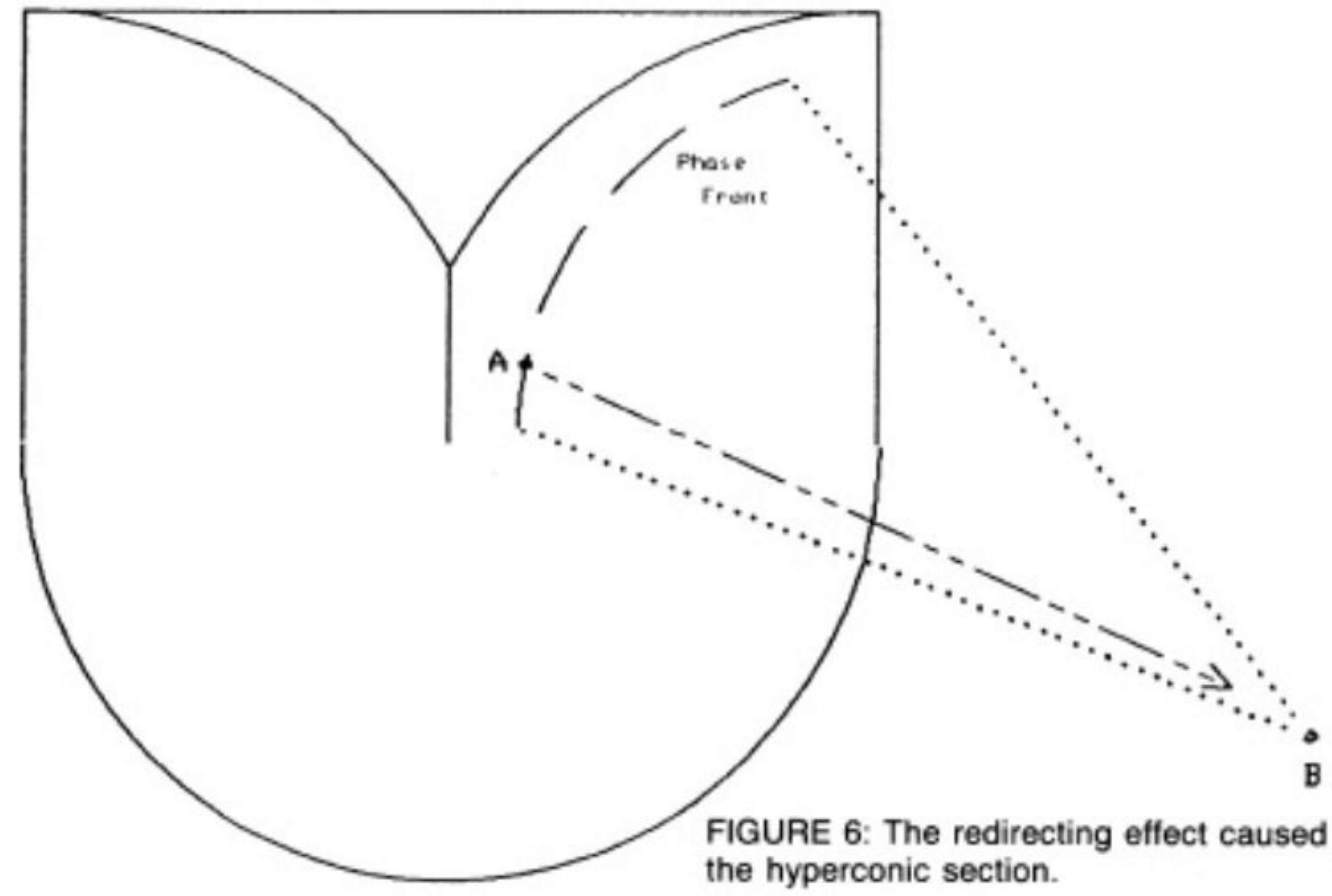

FIGURE 6: The redirecting effect caused by the hyperconic section.

only area where it is necessary to apply the principle.

At the outer edge, the driver is radiating like a point source (*Fig. 4*). It is easy to adapt the lens to two of the wave vectors that originate from this point source: the horizontal vector and the vertical vector. The horizontal wave vector must strike the lens at 90°—that is, straight on. Therefore, I simply approximated the cone shape at the top of the lens and brought the lens to a point with an almost vertical slope. The vertical wave vector, however, must strike the lens at 45°. This means the portion of the lens directly below the driver edge must have a slope that creates an angle of 45° with the driver axis.

At this point in the description, the lens is characterized by three features: the calculated slope, the 90° slope near the top, and the 45° slope near the bottom. From these three features, it is possible to approximate a lens curve that will connect all the points smoothly (*Fig. 5*).

More common, nondome tweeters (like the Polydax TW60s I used), however, do not have a flat radiating surface, but a curved one. For a case like this, it is necessary to derive the lens surface through an integration. It is helpful to imagine an infinite number of flat surfaces arranged around a single point all with slightly different slopes. Each surface is treated as the driver's actual surface and a lens calculation is done with each of the slightly differently angled pieces. Whichever driver and method you use, the calculation produces the shape of a regular cone.

REDIRECTING OUTPUT. As I stated earlier, I didn't want a simple cone, but a lens specifically designed to reflect the drivers' output away from the wall and to spread it uniformly throughout the room. To accomplish this, I slightly altered the rear portion of the lens. Since the phase vectors striking this area have the same angle associated with them as the front portion, the lens slope is unaltered. I built the rear portion, however, so it will deflect the drivers' output into the extremities of the room. This required that I change the horizontal components of the reflected wave vector.

The output from the rear of the driver must strike a lens that not only renders it vertically phase coherent, but also focuses it. For this reason, the back of the lens is hyperconic; it still possesses the same slope, but is the opposite of a cone. In *Fig. 6*, point A denotes the bottom of the wave vector (V), more easily seen in *Fig. 7*. This wave vector moves parallel to the driver's axis and has the phase front associated with it. Because of this, the lens must have the previously calculated slope. If the lens curvature (with respect to the X-Y axis) is altered slightly, however, the wave vector will be directed into the room and away from the wall.

Figure 6 displays this redirecting effect caused by the hyperconic section. B appears to be a focal point, but the focal point actually changes as you move around the driver. If you follow different wave vectors produced by different areas of the driver, you find that the focal point (B) moves. For this reason, the lens doesn't focus the output, but radiates it through 180° in the horizontal.

Huygen's Principle suggests that from a single point on the driver a spherical shell of wave vectors should arise. This gives rise to the following type of interference patterns: a spherical wave is created at point A (*Fig. 8*) on the driver; one wave vector (V1) strikes the lens and travels to point B, another (V2) strikes a different portion of the lens and travels to point B. These wave vectors have traveled different distances. Since they have a phase associated with them, they will interfere with one another. Fortunately, because we are not using a point source but a flat plane, the only wave vector that exists is the one perpendicular to the driver's surface, or V1. All others destructively interfere with the nonperpendicular wave vectors from nearby points. Interference occurs only due to the driver's edge effects.

Actually, the rear portion of the lens is used mostly to redirect the waves created at the edge of the driver. This can be seen in *Fig. 9*, where the dashed line indicates the driver's edge. It seems this hyperconic section need not be so large if only the inside portion redirects the main output of the driver. The extra size, however, is there for the same reason the lens is so much larger than the driver: to redirect as much of the output as possible.

From *Fig. 9* also notice the lens blade.

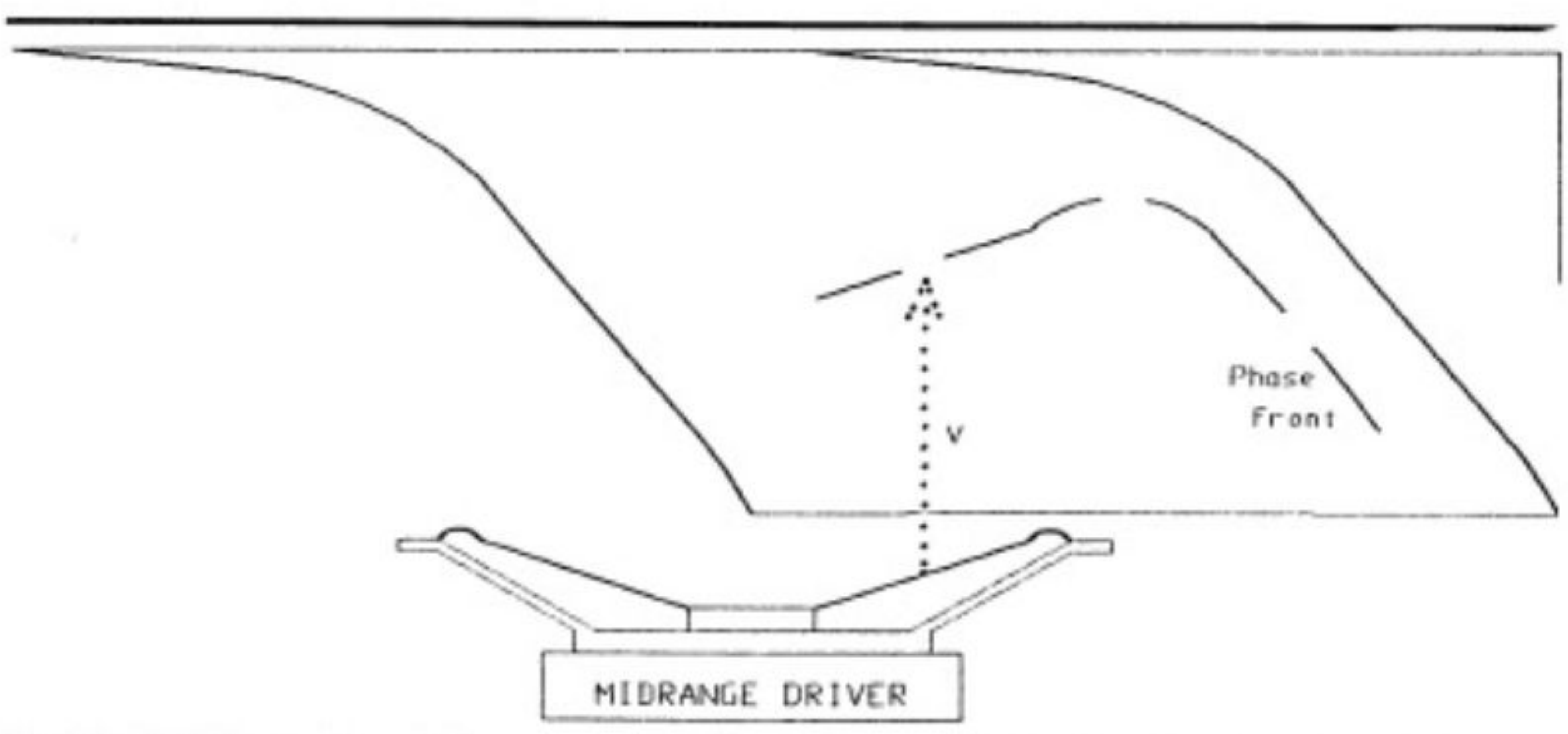

FIGURE 7: The bottom of the wave vector is moving parallel to the driver's axis and has the phase front associated with it.