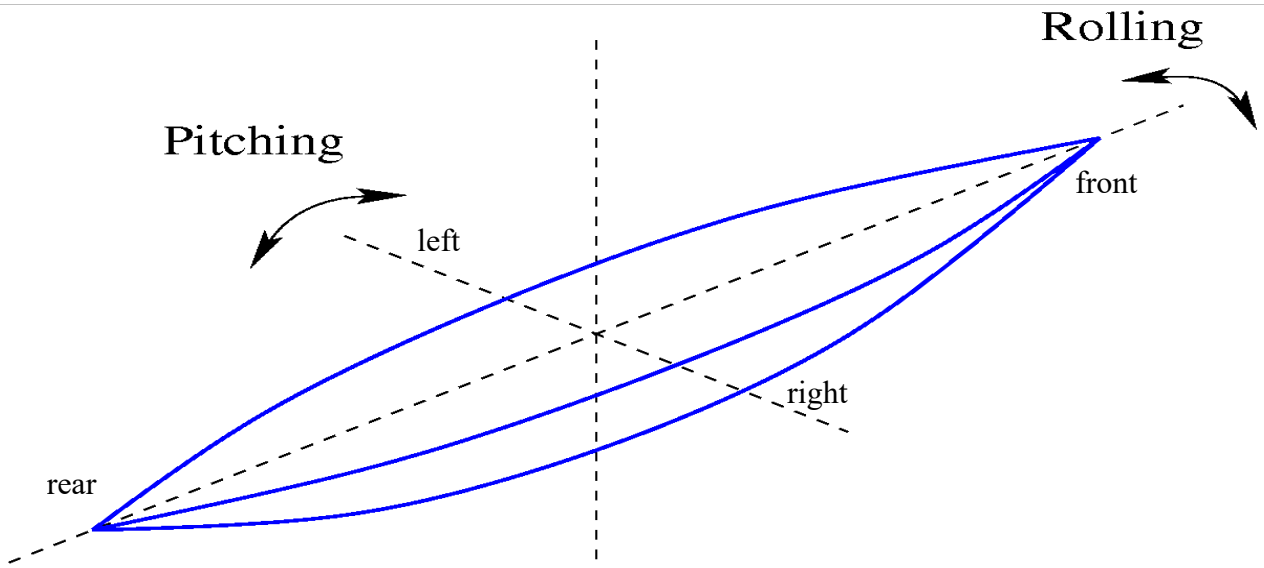


Diag. 1

Rattleback

The "rattle" motion. The rattleback is like a canoe (diag. 1) with a blunt offset keel running center to end(diag. 2. Keel is enhanced in diag. 3,4). When you spin the rattleback CW,

1. The table drags sideways and CCW against the keel (diag. 2), the keel acting like a garden rake being pushed instead of pulled.
2. The sideways dragging force rolls the canoe to the right (diag. 2), while the table kicks the front of the canoe upward. Like a teeter totter, the rear of the canoe pitches downward.
3. While the front of the canoe is up in the air, it is free to roll back to the left

Watch as the front-to-back pitching and the side-to-side rolling become more violent with each revolution of the canoe. You are seeing the "rattle" of the rattleback.

The "back" motion... When all of the initial CW spin energy has been converted into pitching and rolling and the canoe is momentarily at rest,

1. The leaning canoe (diag. 3) tries to right itself by rotating to an upright (diag. 4) position.
2. The CCW friction force (diag. 2,3) from the table resists this rotation and pushes the canoe into a CCW spin. The "rake" is now smoothly sliding, not pushing, on the "ground" (diag. 4).
3. The canoe now smoothly spins in the CCW direction.

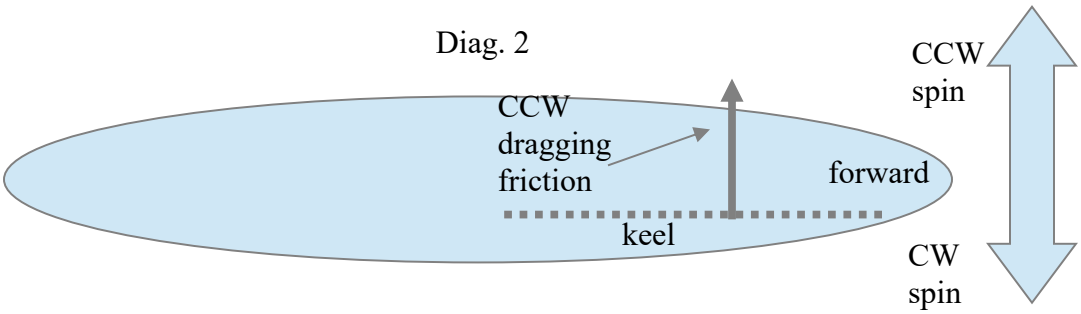
Questions...

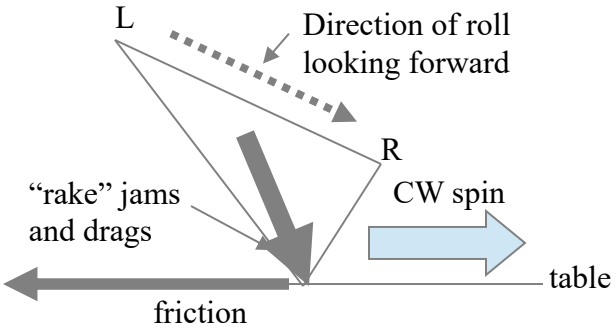
1. When you push down on one end of the rattleback and release, it always rotates CCW... explain.

2. Where does the pitching and rolling energy come from?

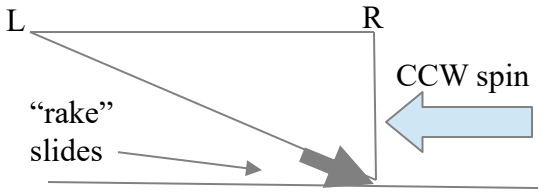
3. In your own words, explain the CW operation of the rattleback. Repeat with the CCW operation.

Diag. 2





Diag. 3 Angles enhanced for effect



Diag. 4 Angles enhanced for effect