

Another Rotating Cylinder Problem – explain from moving frame view

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Can anyone explain this rotating disk problem from the point of view of a moving observer?

In the rest frame let there be two rotating disks of diameter D perpendicular to the x axis. Let the distance between the disks be L . Let there be a rotating cylinder of the same diameter and length connecting these two disk. Let the disks be massive and made out of steel and let the cylinder be made out of wax. Let the cylinder and disks rotate at one revolution per second.

Let there be a frame moving along the x axis relative to this rest frame with some V . Let L and V be such that simultaneous events measured in the moving frame at each disk (separation L) are measured as a half– second time interval in the rest frame. At time t_0 as measured in the moving frame a thin straight wire is simultaneously attached to the two disks at the top position of each disk and along the top of the wax cylinder. This is a straight line in the moving frame, but spirals around the cylinder making a half revolution as viewed in the rest frame.

Now very slowly the tension of this wire is increased – the wire is stretched. This means the wire is very slowly approaching a straight line as viewed in the rest frame. As the tension is increased this wire cuts through the wax cylinder. Eventually the wire becomes a straight line and any further stretching of the wire does not change its shape.

As viewed in the moving frame the wire is a straight wire on the surface of the cylinder rotating with the cylinder before we start stretching the wire. Now as the wire is stretched the center point of this wire eventually touches the center of the rotating cylinder (the x –axis) as the wire slices through the wax. Can anyone explain as viewed in the moving frame why the center of this straight wire cuts the wax all the way through to x –axis as the wire is stretched?

If you post an explanation, does the same explanation work when the straight wire is simultaneously attached as measured in the rest frame and then the wire is slowly stretched? That is, the wire is stretched

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and stretched but it never cuts into the wax eventhough it spirals around the cylinder as viewed in the moving frame.

This physics result of SR seems non-sensical to me.

Thanks,

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