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To: VLBA Data Acquisition Group

From: Alan E.E. Rogers

Subject: Influence of axis misalignment on edge guiding force

In VLBA Acquisition Memo #330 we noted that an axis misalignment between the capstan and idler can alter the edge guiding force and influence the door margin test. The forces produced by misalignment can be calculated using the assumptions given in VLBA Acquisition Memo #132. For operation with an idler it is assumed that the tape remains perpendicular to both rotating axes. The figure in VLBA Acquisition Memo #132 shows that (see mode 3) with a tilted capstan the tape is bent to remain perpendicular to the capstan and idler axes. The force needed to bend the tape from bending beam theory is

$$F = \frac{YtW^3\theta}{12L^2} \sim 2.5 \times 10^{-5} \; lbs/arcsec$$

where F = force in edge guiding region

      Y = Young's modulus of tape in machine direction (10^6 psi)

      t = tape thickness (16 μm)

      W = tape width (1")

      L = distance from capstan to idler (3")

      θ = angle between capstan and idler axes

For an axis misalignment of 4 minutes of arc and a vacuum of 10" (0.45 lbs tension) this force is 1.4% of the tape tension. Using the variation of edge force with door position from VLBA

**** Acquisition Memo #326, 4 minutes of arc misalignment will produce a force equivalent to a change in front door position of about 6 mils.
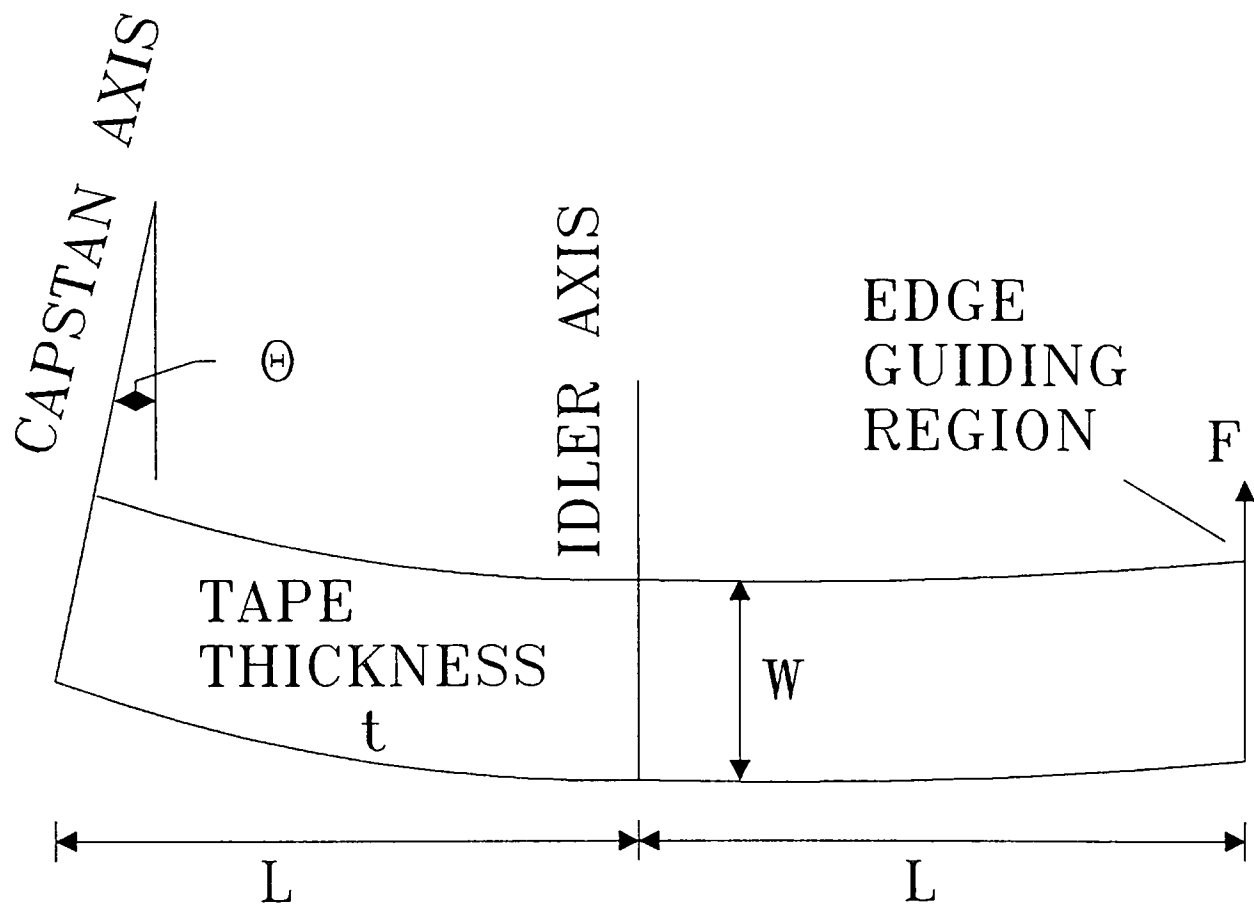
****326 NOT 362

FIGURE   Effect of axis misalignment