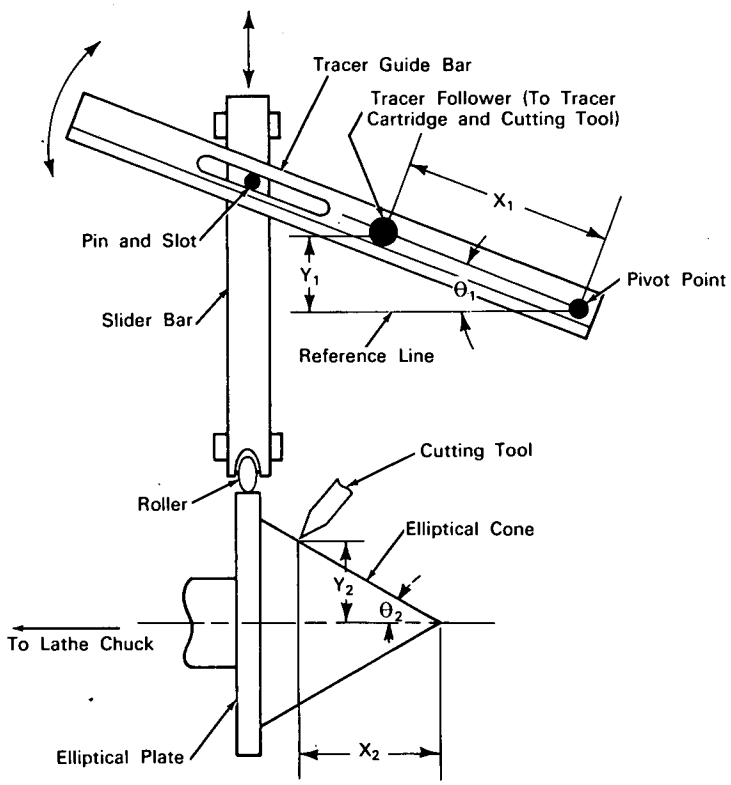
NASA TECH BRIEF

Lathe Attachment Used to Machine Elliptical Cones



The problem: To eliminate expensive and time-consuming hand operations in fabricating close-tolerance elliptical cones required in limited quantities for experimental purposes. Two methods are commonly used for such fabrication. The first method requires a handmade pattern that is then used to provide a casting which must be tediously ground and machined to the desired dimensions. The second method requires several machine operations and handwork to produce the elliptical cone from bar stock.

The solution: A simple cutting-tool guide assembly used in conjunction with a conventional tracer cartridge on a turret lathe. With this arrangement, only two machine operations are required to produce the finished cone. An oversized right circular cone is first cut from bar stock in the normal manner on the lathe, and then the guide assembly is used with the tracer cartridge to machine the cone to the desired elliptical shape.

(continued overleaf)

How it's done: The guide assembly consists of an elliptical plate, which is an accurate scale (2 to 1, 1 to 1, etc.) of the base of the cone, a sliding bar, and a pivoted tracer guide bar. These members are all mounted on a standard turret lathe. The lathe cutting tool is positioned by a tracer cartridge (not shown), which is controlled by the guide assembly. The cross-sectional contour of the finished cone is determined by the curvature of the elliptical plate which is used as a pattern. The elliptical plate is mounted in the lathe chuck behind the oversized right circular cone (which has been previously cut on the lathe). A roller mounted on the end of the slider bar engages the edge of the elliptical plate, so that as the plate rotates (with the cone), the slider bar moves in and out following the elliptical contour of the plate. Since the pin on the slider bar engages the slot in the tracer guide bar, the latter oscillates about its pivot in conformance with the movement of the slider bar. The motion of the tracer follower, which rides against a guiding surface of the tracer guide bar, is sensed by the tracer cartridge. The linear distance (X_1) of the follower from the pivot point of the guide bar is proportional to the distance (X_2) of the cutting-tool edge from the vertex of the cone. The angular position (θ_1) of the tracer guide bar from a fixed reference is equal to the semi-vertex angle (θ_2) of the cone at each position of contact with the cutting tool. Thus, the distance (Y_1) of the tracer follower from the fixed reference is proportional to the distance (Y_2) of the cutting-tool edge from the center line of the cone.

Notes:

1. With this device, elliptical cones can be made in two machine operations to an accuracy of ± 0.0005 inch.
2. Guide assemblies based on the principle described can be used to make accurate, inexpensive dies for mass-producing metallic or plastic-molded parts.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Manned Spacecraft Center
   P.O. Box 1537
   Houston, Texas, 77001
   Reference: B65-10168

Patent status: NASA encourages the immediate commercial use of this invention. It is owned by NASA and inquiries about obtaining royalty-free rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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