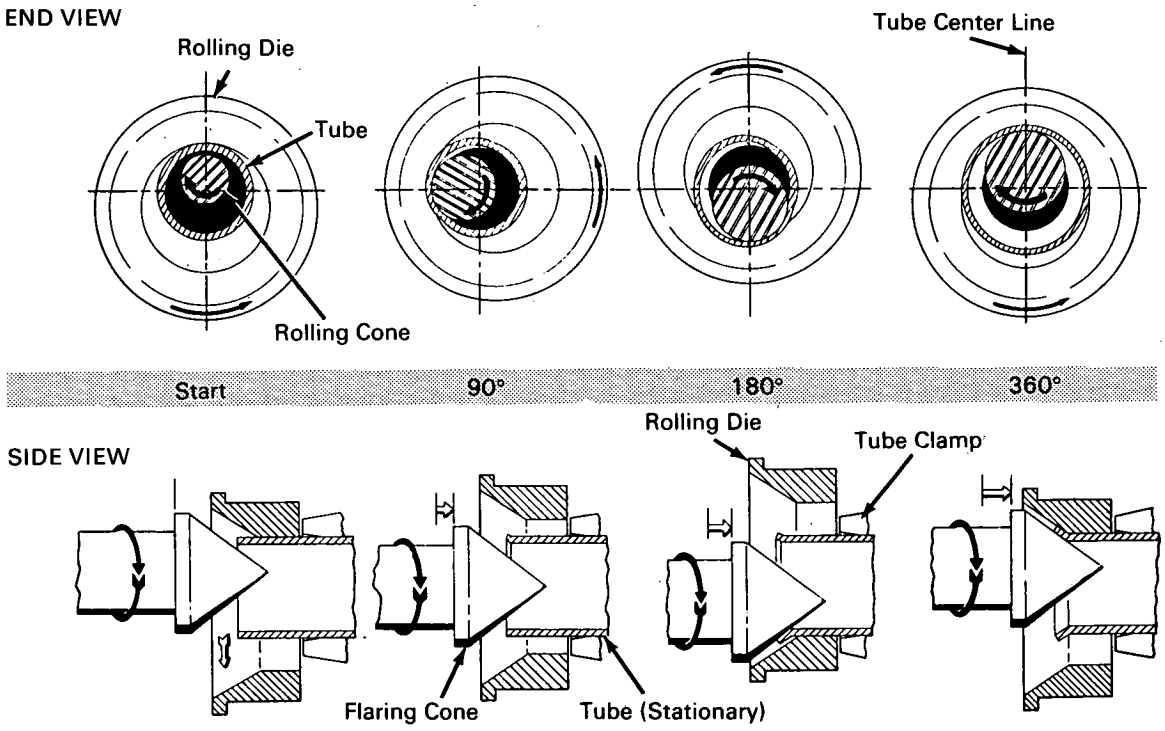
NASA TECH BRIEF

Orbital Tube Flaring System Produces Tubing Connectors with Zero Leakage



The problem:

The use of high pressure hydraulic and pneumatic systems requires tubing connectors with a zero-leakage potential. The zero-leakage can be obtained from welded and brazed joints or from precision mechanical connectors which may be assembled and disassembled. Although many methods of tube flaring are available, including impact forming, ballistic forming, hydraulic forming, pneumatic forming, and the conventional split die and cone method, it is extremely difficult to produce a flared tube configuration with zero leakage.

The solution:

The orbital tube flaring system (a modified version of the split die and cone) which incorporates a rolling cone and rolling die to closely control flare characteristics.

How it's done:

The orbital system produces a flare on the tube end by rolling the material between an externally orbiting rolling die and an eccentrically rolling internal cone. The rolling die is the essential difference between the orbital flaring method and the conventional flaring system which uses a split die as the flare receptacle.

(continued overleaf)

The rolling die and the rolling cone are held in rotational register at all times permitting the tube material being flared to be formed between the two rolling surfaces.

The orbital system utilizes three primary parts: the tube clamp, the I.D. flaring cone, and the O.D. rolling die. The tube clamp is designed to hold the O.D. of the tube concentric with the centerline of rotation of the main spindle which drives the orbital adaptor flaring head. The tube holder design incorporates an iris type collet which compensates for slight variations of the tube diameter; therefore, it always centers the O.D. of the tube to a concentric position. The split jaw die holder on the commercial machine has been replaced with a one-piece bracket which concentrically positions the iris type tube collet.

The I.D. flaring cone of the orbital system functions in a similar manner to the I.D. flaring cone on the conventional flaring machine. The cone is completely bearing mounted and is free to roll about its own centerline. The centerline of the cone shaft is slightly eccentric to the centerline of rotation of the main drive spindle. Therefore, during operation, the centerline of the cone orbits around the centerline of the main drive spindle. The flaring action takes place as the O.D. surface of the flare cone is forced axially against and rolls around the I.D. of the tube. The cone is driven only by frictional contact when the material being flared bottoms against the rolling die.

Note:

Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference; B67-10019

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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(M-FS-2016)