12. Holes

holes in housings, shafts and flanges (for instance bolt holes), pin and indexing holes or ports to the reception of cables or liquids, also lead to stress concentrations in components working under high dynamic loads. Typical examples for this are bolt holes in flange connections of turbine sections, oil channels in crankshafts or cooling holes in turbine parts or in in drilling rods (see chapter 9).

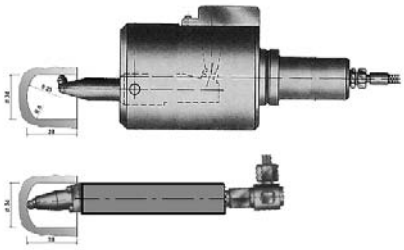

Fig. 12-1: deep rolling of a blindhole including bottom

Also the notch effect of holes can be eliminated through deep rolling or at least can be reduced sufficiently. It essentially depends on the treatment of the surface of with defined rolling force, independently on diameter deviations by manufacturing tolerance. This means that tools must feature an automatic tolerance compensation and load control. These demands are fulfilled by hydrostatic tools the best.

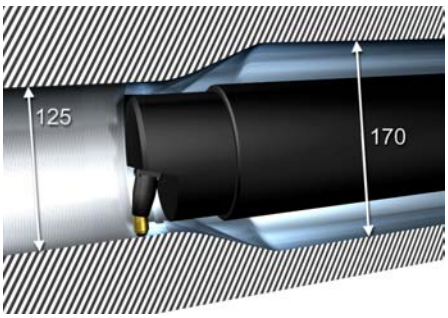

Fig. 12-2: deep rolling of a narrowing bore area

A **blind pin hole** represented a critical notch in a **turbine disk**. Through deep rolling of the bore mantle, the bottom and the transition radius, the drilling area became durable. The entire drilling contour was processed subsequently with three different tools HG6-1 in three treatment zones (Fig. 12-1).

The **narrowing area of a bore** of a highly loaded tubular components showed critical material fatigue by stress concentration. This was closed by the changing cross-section and machining marks. The special hydrostatic tool, designed like a boring bar is used for deep rolling of the whole critical area (Fig. 12- 2).

Fig. 12-3: deep rolling of bolt holes

A hydrostatic tool for **bolt holes** with diameter 6 mm and up in connection flanges of airplane turbines and other components is developed and commercially available (Fig. 12-3).

All these above described tools as well as this of described HG13-4 fulfill the demand for defined and controlled Rolling force with simultaneous tolerance compensation.