APPARATUS FOR FORMING GEARS
2 Claims, 3 Drawing Figs.

ABSTRACT: Method and apparatus for forming a gear from a cylindrical blank by forcing it through a circular-toothed die. The ends of the teeth of the die are tapered to facilitate displacement of metal. The blank is subjected to a multiplicity of rapid impacts by means equivalent to an air hammer.
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BRIEF SUMMARY OF THE INVENTION

In accordance with the present invention a cylindrical gear or pinion, such for example as a spur or helical gear or pinion, is produced from a circular blank. The operation employs an internally toothed die the teeth of which are substantially conjugate to the teeth to be formed on the gear or pinion. The ends of the teeth are tapered preferably to a substantially sharp edge to facilitate entry of the teeth of the die into the material of the blank.

The blank is initially of a diameter approximately equal to the pitch diameter of the gear to be formed. The material displaced outwardly from the tooth spaces is approximately equal to the material appearing as portions of the teeth radially outwardly of the pitch cylinder. The actual flow of metal however, may involve lateral displacement of material from the portion of the blank which becomes tooth spaces into the dedendum portion of the gear teeth resulting substantially radially outward displacement of the blank into the addendum portions of the gear teeth.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal section through the apparatus for forming gears.

FIG. 2 is a section on the line 2-2, FIG. 1.

FIG. 3 is a fragmentary view looking at the top of a tooth of the die in the direction of the arrow A, FIG. 1.

DETAILED DESCRIPTION

The apparatus for forming the gear teeth comprises an outer shell 10 which is supported on a solid support surface 12. The shell is provided with an internal annular recess 14 forming a shoulder 16 on which the internally toothed cylindrical die 18 is supported. Mounted within a second internal enlargement 20 within the shell is an annular pilot 22.

Vertically movable inside the pilot 22 is an arbor 24 having a cylindrical enlargement 26 fitted to slide within the pilot 22. Below the enlargement 26 the arbor is reduced as indicated at 28 to a diameter having slight clearance as indicated with the crests of the teeth of the die. At its lower end the arbor 24 is further reduced having a portion 30 received within the opening 32 in an annular blank 34.

The die 18 is provided with a multiplicity of teeth 36, the teeth being tapered both laterally and radially, as best seen in FIG. 3 to provide a substantially sharp entering edge 38 to initiate the flow of metal from the portions of the blank which are to be tooth spaces into the portions of the blank which are to be teeth.

The arbor 24 has an annular plate 40 fixed thereto adapted to retain the arbor on a driver or spud 42 having a radial flange 44 formed thereon. The end of the driver 42 beyond the flange 44 is received in a recess 46 formed at the top of the arbor, and the recess and plate 40 are formed to provide an annular pocket 48 in which the flange is received. With this arrangement there is limited vertical movement permitted between the arbor 24 and the driver 42.

Means are connected to the driver 42 for imparting a multiplicity of rapid blows or impacts of substantial amount. This means may for example take the form of a conventional air hammer, a portion of which is indicated diagrammatically in broken lines at 50.

The magnitude of the impacts required to drive the gear blank through the die will depend upon several factors, among which are the material of the blank, the size of the blank, and the pitch of the gear teeth. In general, it may be said that the magnitude of these impacts may be on the order of several hundred foot-pounds.

Means are provided to separate the finished work gear from the reduced end 30 of the arbor 24. This means may take the form of a plurality of air passages 52 connected to a suitable supply of compressed air (not shown), pressure being ad-