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Generation of the teeth precessional gears by plastic deformation

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Abstract. The paper presents a method for obtaining the teeth of the precessional gear by plastic deformation. There are analyzed the basic problems that must be resolved to apply this process: determination of dimensions of initial workpiece; choosing the correct machining regime; determination of necessary forces for material deformation for dimensioning of mechanisms used in machine-tool. The aim is obtaining of precessional gear wheel teeth, still from workpiece to ensure a minimum cost of machining and to improve operating conditions by providing a continuous material fibrillation.

1. Introduction

The quality of the car relies mostly on the high level degree of gearing. Transmissions through toothed wheels have gained a wider spread in machine's construction, with the widest range of power, torques and reliability. Gears are made of alloyed steels, and carbon steel, which are submitted to thermal, chemical treatment (cementation, nitration, cyanidation, and other methods.) When manufacturing toothed wheels, in principle, a distinction has to be made between the technology of the wheel body and the actual teeth technology. For the manufacturing of the wheel body, the working methods, which may be taken into consideration, are those generally used in machine building technology, especially casting and steel casting, forging and pressing. In this case, special problems for gears raise, in particular, the bodies made of welded elements, as well as the bodies of the gear wheels made through plastic deformation.

2. Determination of the linear velocity of the contact point of the tool with the blank

The speed of plastic deformation, has a major impact on the modification of the structure, and on the physical-mechanical properties of the deformed metal. Starting with the specificity of the spherical-space movement of the deformation tool, its linear velocity is determined by point D Figure 1 (a), which coincides with the center of the roller in the precession of the train gears [1]. From the angular velocity projection connexions, on the X, Y, Z, axes, we can obtain the linear velocity of the center of the deformation roll, noted by D, as follows:

-where R_D is the radius of the center O, around which the deformation roll effects spherical-space movement, up to point D.