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Researches on Design and Manufacturing of Innovative Double Gears Pumps

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Abstract

This paper presents the results of the researches with application in production for the innovative realization of the double gear pumps with minimum axial gauge and minimum number of parts for the increase of reliability in use and reducing the production costs. The innovative design characteristic is represented by adaptive dimensioning with minimum gauge, depending on requirements, the type of drive, the fixing method, the connections for the hydraulic circuit and intermediary sealing between stages which allows the operation with different liquid mediums.

The innovative technological characteristic is on integrated adaptive system (lean production) using computer assisted manufacturing on CNC machines with minimal production time and high quality. This way of production of double gear pumps is obtaining significant reductions in the cost of manufacturing and much smaller gauges the double pump available on the market.

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1. Introduction

There is a market demand of single and double pumps with low axial overall dimension and high reliability, which are used on machine tools, plastic injection and die-casting machines [1], [2].

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So far, there have been required only simple pumps Group 1 with very small overall dimensions and very high reliability for use on hydraulic power pack that led to innovative design of these pumps.

As a result of additional requirements appeared on the market were realized double pumps in innovative construction [2].

The usual gear pumps can be realized at the required parameters, but they have large overall dimensions that do not allow optimizing hydraulic installations of machines [3], [4].

Therefore it was important to investigate a way to reduce the gear pumps overall dimensions. A method to solve this problem consists of an innovative design that takes into account the required parameters and allows the development of compact construction with minimal number of pieces and very high reliability.

The innovative design requires the use of CNC machines (machining centers) in production, which ensures high precision of die-casting aluminum alloy pieces, along with a very high productivity [5].

The incorporated labor costs will be reduced due to the fact that CNC machines allow multi servicing (more machines can be operated by one man simultaneously) or work in automatic cycle.

2. Innovative solution for pumps design, compared with the classic pumps

Because double gear pumps consist of two stages, ie two simple pumps, to highlight the constructive changes, in a first step, we present innovations performed on simple pumps.

The components of the hydraulic standard pumps (Fig. 1) are: a fastening flange (position 1), a body (position 2), an end cover (position 3), two compensators (position 6) with the role of radial and axial bushings for pinions (positions 4 and 5) [6] and the role of frontal sealing at contact with pinions, by creating hydraulic axial forces.

In compensators are placed compensation seals that bound the area hydrostatic loaded by the working pressure that is in correspondence with the inlet [3], [7].

The construction also provides other components, such for sealing, for positioning and for blocking.

In this variant, the bushings are located in the compensator and the axial pump closing is made with a fastening flange and an end cover having a relatively high thickness.

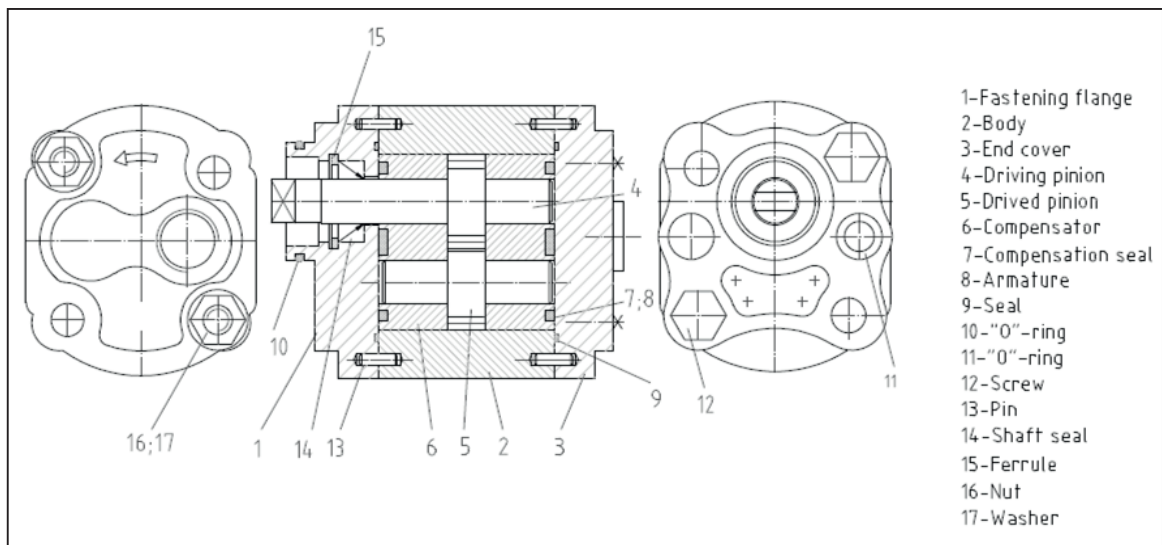


Fig. 1. Standard gear pump.

The innovative version, Fig. 2, consists of a pump that has the bushing in the body and cover and has only one compensator located in the body.

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