Journal of the Technical University of Gabrovo

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CREATION OF A DATABASE OF DOUBLE-CLAMP COLLET CHUCKS (DCCC)

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ARTICLE INFO

Article history:
Received 4 August 2024
Accepted 5 September 2024

Keywords:
data bank, collet chuck, double clamp, genetic approach

ABSTRACT

In the article, it is proposed to describe collet chucks of double clamping at three levels: chromosomal, object, population with the formation of a genetic data bank.

A characteristic feature of "Industry 4.0" is digitization [9], which requires a creative approach [6, 11, 12] and the use of achievements in science and technology, in particular in mechanical engineering [1, 3-5] and its objects, which include clamping mechanisms and clamping cartridges of various designs [7, 8, 10].

Collet chucks with a double clamp (Fig. 1) are created from a clamping collet by fully dismembering along the axis (code — YY or 304) [2], introducing various connections with the drive, between additional and main clamping elements (CE) or between collets. A positive effect of such cartridges is the high stiffness of the clamp.

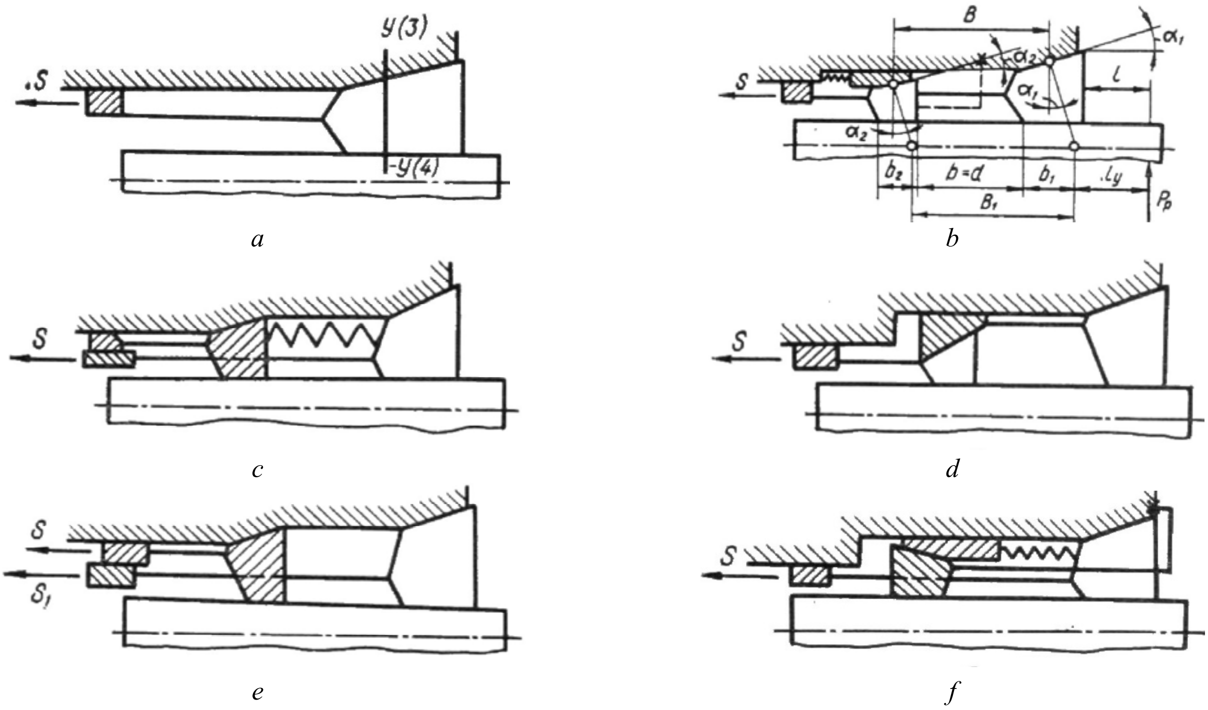

Fig. 1. Schemes of collet cartridges with a double clamp, synthesized by complete transverse dissection (code 304): a) original cartridge (prototype); b) connection of the main collet with the drive through an additional rigid connection; c) connections of the main collet with the drive and through the elastic element with the additional one; d) connections of the additional collet with the drive and along the cone with the main one; e) connection of the main and additional collet with the drive; f) connections of the main collet with the drive, through an elastic element between itself and an additional rigid one with the spindle

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In the absence of a rigid connection of the main or additional collet with the spindle, such dismemberment has the disadvantage of long collets - pulling the part during clamping. You can get rid of this shortcoming, for example, by introducing a rigid connection of the additional CE with the spindle and rearranging it (the tops of the cones of the main and additional CE are turned in opposite directions).

Different transmission-amplifying links (PPL) can be implemented (Fig. 2): lever; lever wedges; wedge-lever; wedge-elastic; other combinations.

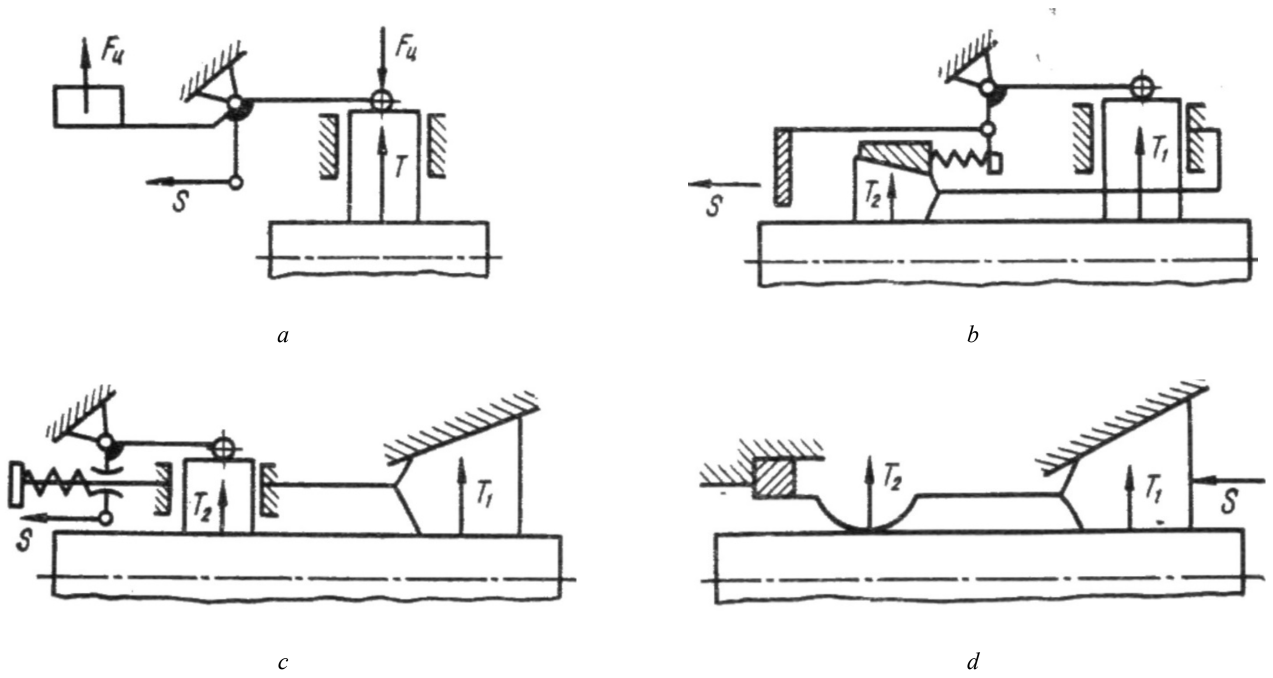
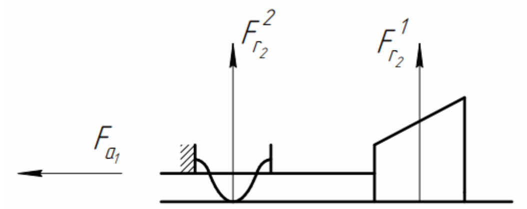
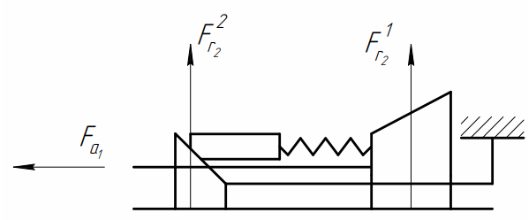
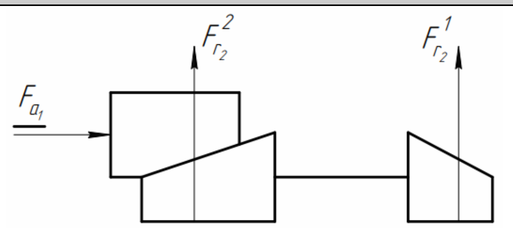
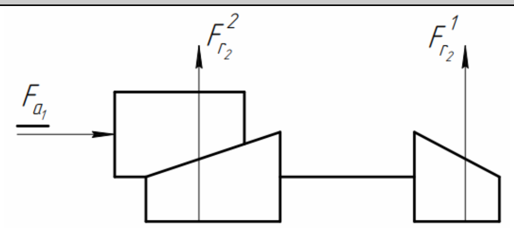
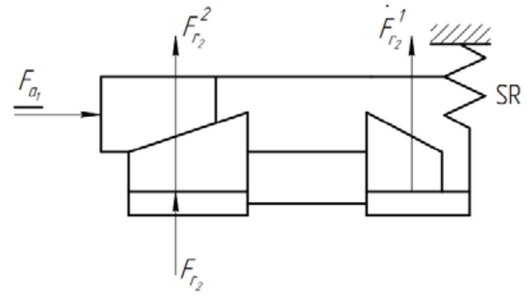


Fig. 2. Synthesized schemes of cartridges with various connections and combinations of PPL: a) lever (P) with balancing for compensation of centrifugal forces $F_{ц}$; b) lever-wedge (V-K); y) wedge-lever (K-B); d) wedge-elastic (K-P); S - axial force of clamping, T_1, T_2 - radial force of clamping by the main and additional clamping elements Below are the schemes of the CPDZ with structural formulas at 3 levels of description: chromosomal, object, population [12]

DCCC 1	DCCC 2
 $F_{a_1} - F_{r_1}$ - chromosomal level $F_{a_1} - \left(F_{r_2}^2 + F_{r_2}^1\right)$ - object level $F_{a_1} - \left[\left(SR - F_{r_2}^2\right) + \left(WD - F_{r_2}^1\right)\right]$ - population level	 $F_{a_1} - F_{a_1}$ - chromosomal level $F_{a_1} - \left(F_{r_2}^2 + F_{r_2}^1\right)$ - object level $F_{a_1} - \left[\left(\underline{WD} - F_{r_2}^2\right) + \left(WD - F_{r_2}^1\right)\right]$ - population level
DCCC 3	**DCCC 4**
 $\underline{F_{a_1}} - F_{r_2}$ - chromosomal level $\underline{F_{a_1}} - \left(F_{r_2}^2 + F_{r_2}^1\right)$ - object level $\underline{F_{a_1}} - \left[\left(WD - F_{r_2}^2\right) + \left(\underline{WD} - F_{r_2}^1\right)\right]$ - population level	 $\underline{F_{a_1}} - F_{r_2}$ - chromosomal level $\underline{F_{a_1}} - \left(F_{r_2}^2 + F_{r_2}^1\right)$ - object level $\underline{F_{a_1}} - \left[\left(WD - F_{r_2}^2\right) + \left(WD - SR - F_{r_2}^1\right)\right]$ - population level

DCCC 5

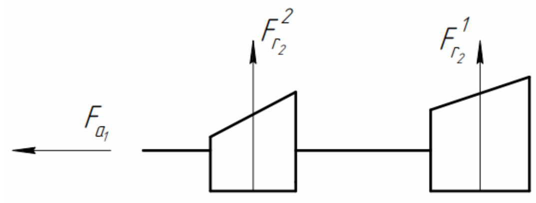


$F_{a_1} - F_{r_2}$ - chromosomal level

$F_{a_1} - \left(F_{r_2}^2 + F_{r_2}^1\right)$ - object level

$F_{a_1} - \left[\left(WD - SR - F_{r_2}^2\right) + \left(WD - SR - F_{r_2}^1\right)\right]$ - population level

DCCC 6

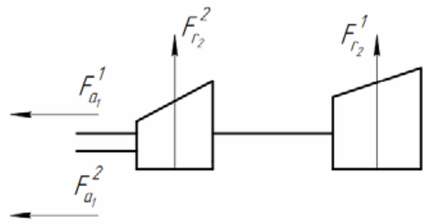


$F_{a_1} - F_{a_1}$ - chromosomal level

$F_{a_1} - \left(F_{r_2}^2 + F_{r_2}^1\right)$ - object level

$F_{a_1} - \left[\left(WD - F_{r_2}^2\right) + \left(WD - F_{r_2}^1\right)\right]$ - population level

DCCC 7

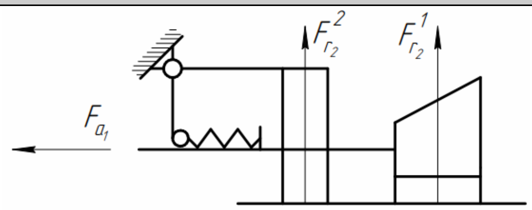


$F_{a_1} - F_{a_1}$ - chromosomal level

$\left(F_{a_1}^1 + F_{r_2}^1\right) + \left(F_{a_1}^2 + F_{r_2}^2\right)$ - object level

$\left(F_{a_1}^1 - WD - F_{r_2}^1\right) + \left(F_{a_1}^2 - WD - F_{r_2}^2\right)$ - population level

DCCC 8

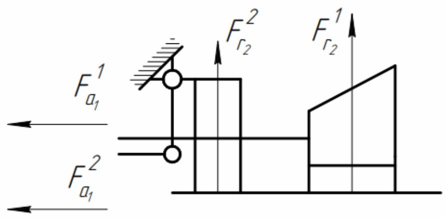


$F_{a_1} - F_{r_1}$ - chromosomal level

$F_{a_1} - \left(F_{r_2}^2 + F_{r_2}^1\right)$ - object level

$F_{a_1} - \left[\left(LV - F_{r_2}^2\right) + \left(WD - F_{r_2}^1\right)\right]$ - population level

DCCC 9

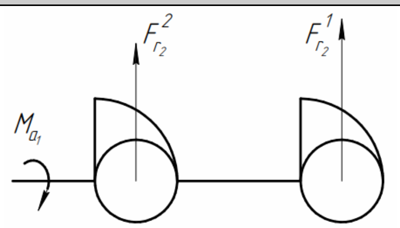


$F_{a_1} - F_{a_1}$ - chromosomal level

$\left(F_{a_1}^1 + F_{r_2}^1\right) + \left(F_{a_1}^2 + F_{r_2}^2\right)$ - object level

$\left(F_{a_1}^1 - WD - F_{r_2}^1\right) + \left(F_{a_1}^2 - LV - F_{r_2}^2\right)$ - population level

DCCC 10

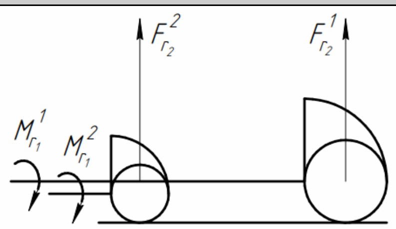


$M_{a_1} - F_{r_1}$ - chromosomal level

$M_{a_1} - \left(F_{r_2}^2 + F_{r_2}^1\right)$ - object level

$M_{a_1} - \left[\left(SP - F_{r_2}^2\right) + \left(SP - F_{r_2}^1\right)\right]$ - population level

DCCC 11



$M_{a_1} - F_{r_1}$ - chromosomal level

$\left(M_{a_1}^1 + F_{r_2}^1\right) + \left(M_{a_1}^2 + F_{r_2}^2\right)$ - object level

$\left(M_{a_1}^1 - SP - F_{r_2}^1\right) + \left(M_{a_1}^2 - SP - F_{r_2}^1\right)$ - population level

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