CONSTRUCTIVE AND FUNCTIONAL GEOMETRY OF THE ACTIVE PART OF THE TAMPING TOOLS

BEŞLEAGĂ Cr., DRAGOI D.D., BADEA S.G.

SC IMCF SA Bucharest, University of Bacău, Romania

Abstract: The theoretical researches of the tamping tool and particularly of the active part have permitted accomplishments regarding to constructive and functional geometry of active part of the tamping tools. The analyze and the study of the functional and constructive geometry of active part of the tamping tools has a great importance regarding to discover and design a new constructive geometry, which can help to obtain a new tamping tools much better for their technologically qualities or on the other hand to obtain a new functional geometry, much better regarding the exploitation of the tamping tools and the quality of the tamping operation

Keywords: *tamping, lastingness, tamping tool, constructive and functional geometry*

1. GENERAL CONSIDERATION

The investigations in specialized literature regarding at the actual stage of the researches, design, manufacture and exploitation of the tamping tools have showed a low level of information and technical details regarding these types of tools. Increasing the lastingness of the tamping tools is a primordial factor in the efficient exploitation, technologically and economically, and is an important process for the tamping tools and for the tamping machines as well. These new constructive geometries must guide in the end to increase the lastingness of the tamping tools and to reduce the construction, exploitation and reconditioning costs. The geometry of active part of the tamping tools is similarly in many ways with the geometry of cutting tools, existing some significant different that during the technologically tamping process doesn't results splinters, but is taking place the vibration (oscillation) and squeeze of the ballast under the sleeper (Fig. 1).

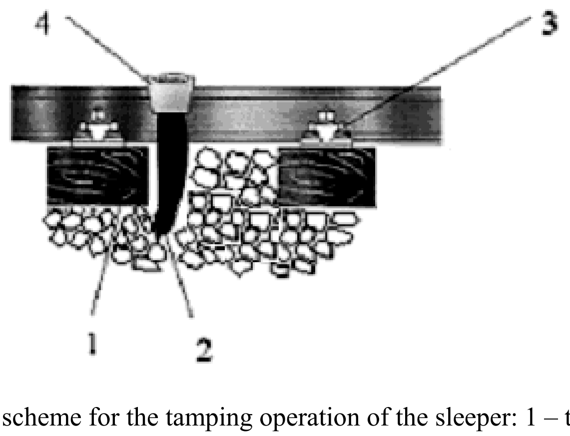


Fig. 1 The basic scheme for the tamping operation of the sleeper: 1 – the sleeper; 2 – the tamping tool; 3 – fixed spare parts; 4 - port tool [1]

2. THE CONSTRUCTIVE GEOMETRY OF THE ACTIVE PART OF THE TAMPING TOOLS

Regarding the geometry, the surfaces and edges of active part of the tamping tool can be engaged in different relatives position in the space, which are defined by the angle made with the axis of a rectangular reference system.

These angles could be indicated in comparison with a constructive rectangular reference system or a functional (real) rectangular reference system [2].

The axis and the geometry planes of the constructive rectangular reference system [3] are defined by (Fig. 2):

- O – point of the edge of active part of the tamping tool where the geometry is measured
- Oy – the axis that is represented by the axis on which is attached the port tool, which is passing throw measure point O
- Oz – the axis that shows the tamping direction
- Ox – the axis which is perpendicular on plane Oyz (the constructive measure plane)
- Oxy plane – is the constructive basic geometry plane which passes throw measure point O and is perpendicular on the tamping direction
- The constructive edge geometry plane Oxz, which contains the constructive edge or the tangent in the measure point O and it is perpendicular on the constructive basic geometry plane Oxy
- The constructive measure geometry plane Oyz, which passes throw measure point O on the constructive edge geometry plane Oxz, and on the constructive basic geometry plane Oxy as well.

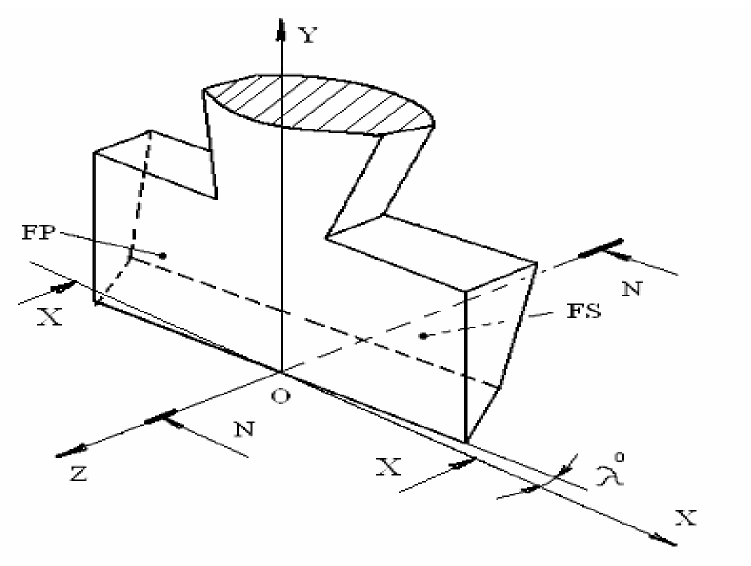


Fig. 2 The constructive geometry of active part of the tamping tool and the constructive reference system

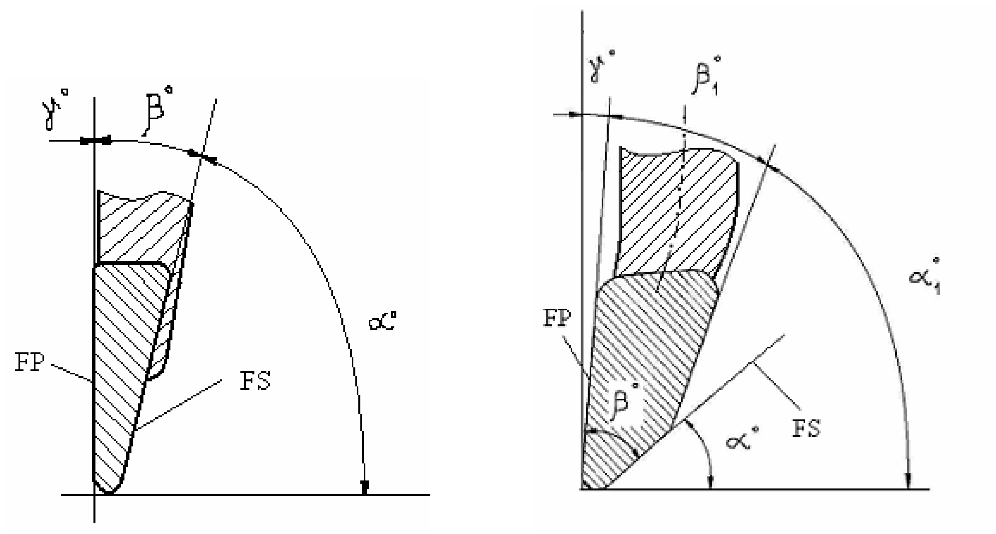
In the section (N – N) – Fig. 3, for the different types (a – P&T 09-32 CSM; b – BNRI – 85), the geometry of active part of the tamping tools is described by the next constructive angles:
γ – the main surface angle
β – the sharp angle of active part of the tamping tool
α – the secondary surface angle (the secondary surface can be made from two surfaces with different inclination angles α and α_1)
δ – the “cutting” angle

$$\delta = \alpha + \beta \qquad (\delta_1 = \alpha_1 + \beta_1) \tag{1}$$

FP – the main surface of active part of the tamping tool
FS – the secondary surface of active part of the tamping tool
As in the cutting tools case, the relation is:

$$\alpha + \beta + \gamma = 90^0 \qquad (\alpha_1 + \beta_1 + \gamma_1 = 90^0) \tag{2}$$

λ – the inclination angle of the constructive edge



a b

Fig. 3 The section (N – N) for the different types (a – P&T 09-32 CSM; b – BNRI – 85) of the active part active of the tamping tools

On the X – X direction, the geometric shape of active part of the tamping tools is described by the K angles of the lateral surfaces measured in comparison with the constructive edge geometry plane Oxz, for the different types (a – P&T 09-32 CSM; b – BNRI – 85, Fig. 4)

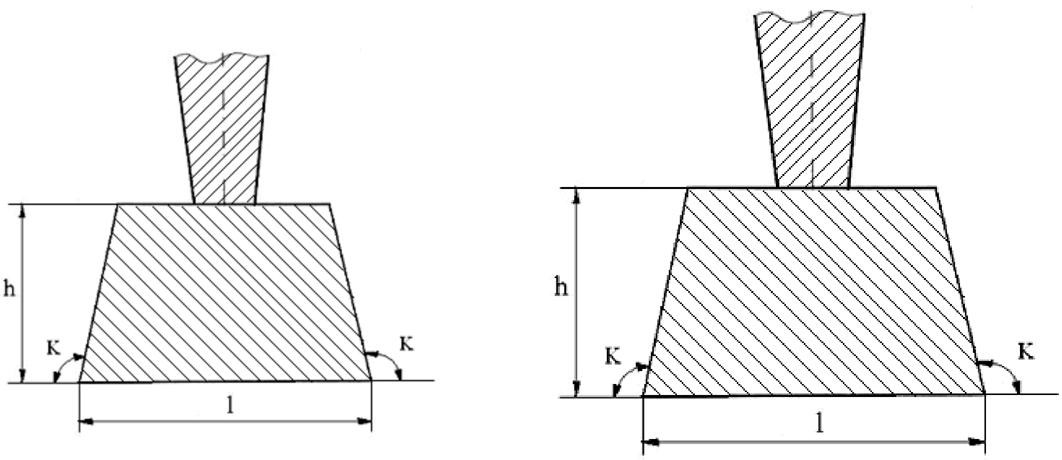


Fig. 4 The section (X – X) of the tamping tool type: a - P&T 09 –32 CSM, BNRI – 85; b - P&T 08-275 UM

3. THE FUNCTIONAL GEOMETRY OF ACTIVE PART OF THE TAMPING TOOL

The real angles, which the tamping tool is working, are angles that represent effective or functional angles; they are measured in comparison with the functional (real) rectangular reference system [3]. This reference system is made of (Fig. 5):

- Oy_e – the axis that shows the penetration direction of the tamping tool into the ballast
- Oz_e – the axis which is perpendicular on Oy_e and shows the effective tamping direction
- Ox_e – the axis which is perpendicular on the axis Oy_e and Oz_e and which shows the positioning direction of the tamping tool (at the switch tamping machine)

- The functional basic geometry plane Ox_ey_e which passes throw measure point O from the active edge on which the geometry is measured, geometry plane that contains the penetration movement direction into the ballast Oy_e and it is perpendicular on the effective tamping direction Oz_e

- The active edge functional plane Oz_ex_e which passes throw measure point O, contains the active edge or the tangent in measure point O and it is perpendicular on the penetration direction of the tamping tool into the ballast Oy_e

- The functional measure plane Oy_ez_e which passes throw the measure point O and is perpendicular on the functional basic plane Ox_ey_e and on the functional active edge plane Oz_ex_e.

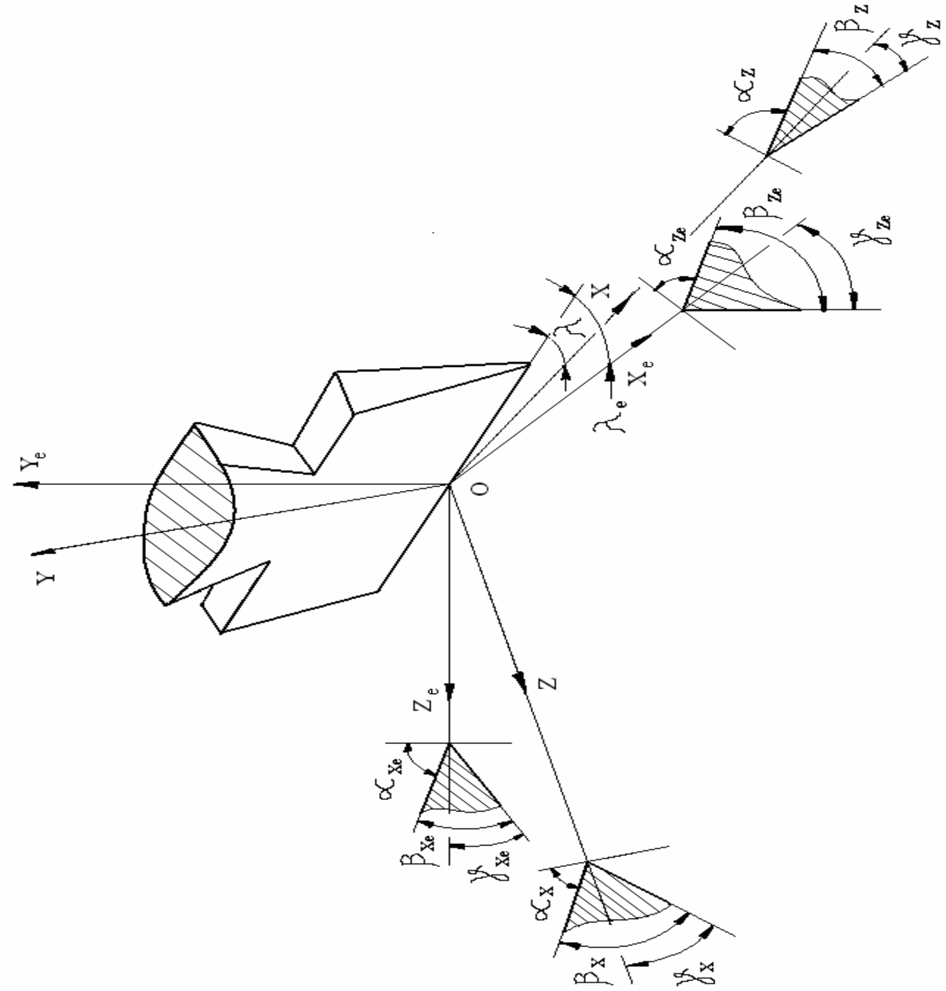


Fig. 5 The functional geometry of active part of the tamping tool and the functional reference system

4. CONCLUSIONS

The wear and lastingness of the tamping tools are influenced by many factors: physical and mechanical properties, the quality of the tamping tool and the active part, the working regimen parameters of the tamping tool, the geometry of active part of the tamping tool, the conditions of working.

The theoretical investigations of the tamping tool and particularly of the active part permitted the next accomplishments:

- some elements and conditions that must be realized at the establishments of shapes and dimensions of the tamping tools
- establishments of the constructive reference system necessary for construction, reconditioning and verifying the active part geometry of the tamping tools (constructive angles).
- establishments of the functional reference system which can define functional geometry (real angles which the tamping tools are working, angles that represents effective or functional angles). The functional geometry of the tamping tools is importance regarding the definition of the real angles (effective or functional angles) that the tamping tools are working. This fact leads to the up gradation of the constructive geometry of the tamping tools with the main purpose of obtaining efficient tamping tools from the constructive point of view, to realize a high level quality of the tamping operation, to reduce the solicitations of the tamping tools and to increase the lastingness of those.

REFERENCES:

[1]. Plasser&Theurer, *Tamping depth control SDA-03/2-23, Adjusting instruction*, Plasser&Theurer, Linz, 1994
[2]. Enache St., Belousov V., *Design of the cutting tools,* Ed. Did. and Ped., Bucharest, 1983
Linz, 1994
[3]. Beşleagă Cr.*, Contributions regarding to increase the lastingness of the tamping tools*, Doctorate thesis, Bucharest, 2006