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Construction performances of building and transport mechanization revolving support

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Different working and construction demands have conditioned the development of bonds between revolving and non-revolving constructions of building and transport mechanization machines. Solutions that have been used so far, basically represent the revolvin and non-revolving construction, carried out in the shape of "H" and "X" type. Such construction solutions do not contribute the reliable and long-term work of indirect components embedded between the revolving and non-revolving parts in the following machines:excavators, construction pole cranes, truck-cranes and portal cranes. Problem occurs due toinsufficient torsion stiffness of carrying construction, which manifests further on through unfavourable load distribution within the indirect components (big diameter bearings).

Tha paper shows the use of the above mentioned two construction types ("H" and "X") as well as the other characteristic construction types in use. Besides the mentioned ones there is also a display of support surface construction to the radial-axial bearing bond, as well as the summary from the comparative analysis of "H" and "X" construction types, carried out in the paper [6].

Keywords: supporting frame, conceptions, stiffness

1 INTRODUCTION

Through development evolution of transport and building mechanization machines constructions, there have occured different construction types conditioned by their purpose. So, two basic types were extracted that have been in use so far. Namely, ''H“ and ''X'' construction types, that are applied with the machines: excavators, construction pole cranes, truck-cranes and portal cranes.

According to the analysis of carried out solutions, we can see that their development happened influenced by various working and construction demands, such as:

- construction dimensions must be within certai limits in order to enable the efficient transport of machines or their segments
- construction stiffness is to be satisfactory so that the deplanation of surface on which radial-axial bearing lays should be the least possible
- maintenance and corrosion protection should cost the least possible
- construction should be simple and light and to demand small material consumption at making, etc.

We can see that the above mentioned restrictions characterize an ideal construction, and that all this is difficult to achieve. Nevertheless, such construction solution should be amed, which would be the best possible compromise between all the demands.

Due to support surface bumps, while the excavator works, it is not possible to make a full contact between caterpillar runnung gear machine and support surface, so the support structure torsion occurs, which causes the support surface deplanation of structure for radial-axial bearing bond. Long life and functionality of these bearings largely depends on support surface stifness to bearing bond.

2 DISPLAY OF EXISTING CONCEPTION SOLUTIONS AND THEIR USE

Need for carrying out different work demands regarding the use of construction mechanization conditioned great presence of revolving movement at many machine segments. Of special significance is the bond of revolving

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and non-revolving parts of top and bottom building of characteristic construction machines.

Bottom building is spatial, thin-walled cast or welded steel construction which leans on moving mechanism with wheels or caterpillars. Older constructions end on their top side with a cylinder which has a toothed wheel and with a column (vertical tube) in the middle. Modern constructions end with a ring horizontal surface. Shape of upper part of bottom building depends on the shape of radial-axial bearing with toothed wheel, which is mounted on it.

Constructive shape of bottom building carrier is adapted to moving mechanism and to top building revolving mechanism.

Bottom building function is:

- to carry the load of radial-axial bearing to the base (ground),
- to provide the change of work position machine moving,
- to provide stable work position of the machine, etc.

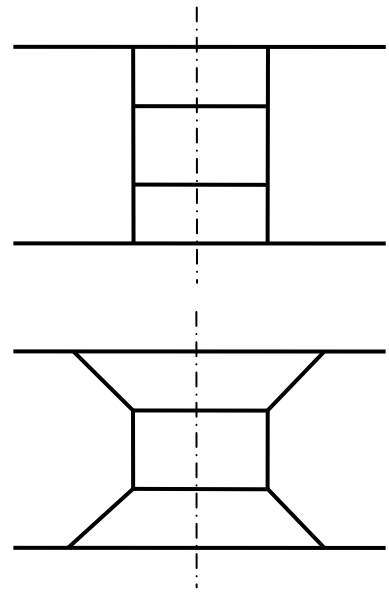


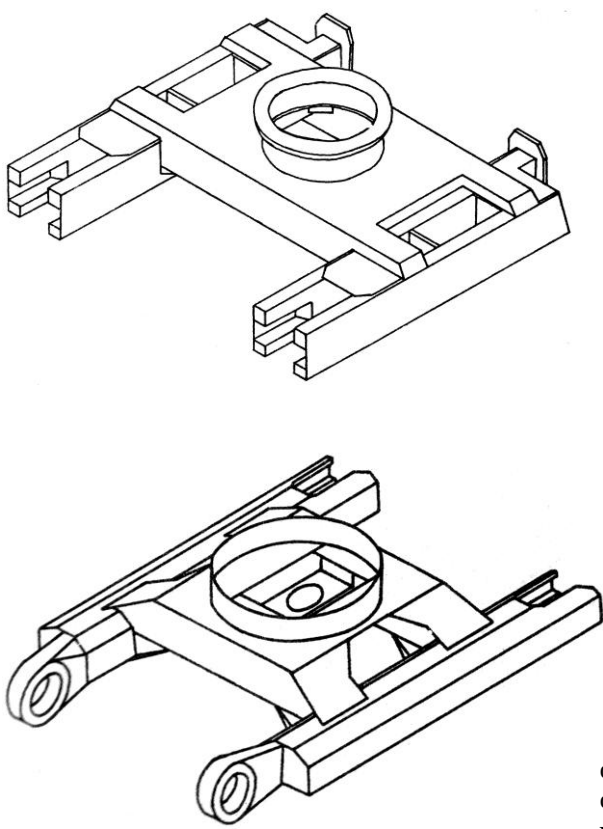
Fig. 1. *Schematic display of bottom building ''H'' and ''X'' types*

Fig. 2. *Examples of top and bottom building revolving bond use with various machines*

The biggest rise in development of constructive performances of ''H'' and ''X'' bottom building types is achieved with excavators due to its wide usage, where these conception solutions were carried out exactly for the reason of unfavorable terrain conditions. All these improvements were also applied to other machines, such as: construction pole cranes, truck-cranes and portal cranes, because support problems are of crucial significance for their proper functioning.

Some of ''H'' conception type performances are illustrated in Figure 3, while ''X'' conception type performances are illustrated in Figure 4.

Fig. 3. *Bottom building type ''H''*



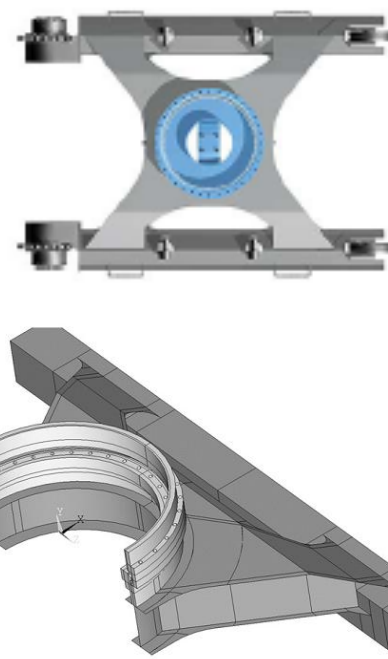


Fig. 4. *Bottom building type ''X''*

Besides ''H'' and ''X'' types, there are others which are most often used with truck-cranes, portal cranes and rotating excavators and whose construction is conditioned by different application demands.

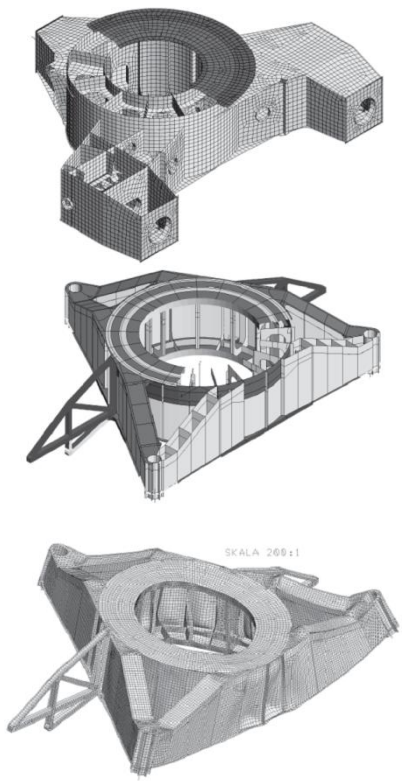


Fig. 5. *Other characteristic construction types*

Torsion stiffness of radial-axial bearing is very small. Thus, it is necessary to design a structure that will fulfill the following:

- provide the base for bearing installation
- protect from over deformation to provide the proper bearing geometry
- provide the installation of additional mechanisms (top building revolving drive mechanism, etc.).

What is common for all types of bottom building is the shape of stand where radial-axial bearing leans and it is the integral part of this construction. This stand can be made of plates by welding or casting, depending on its dimensions, complexity and economic use adaptability of all the named production procedures.

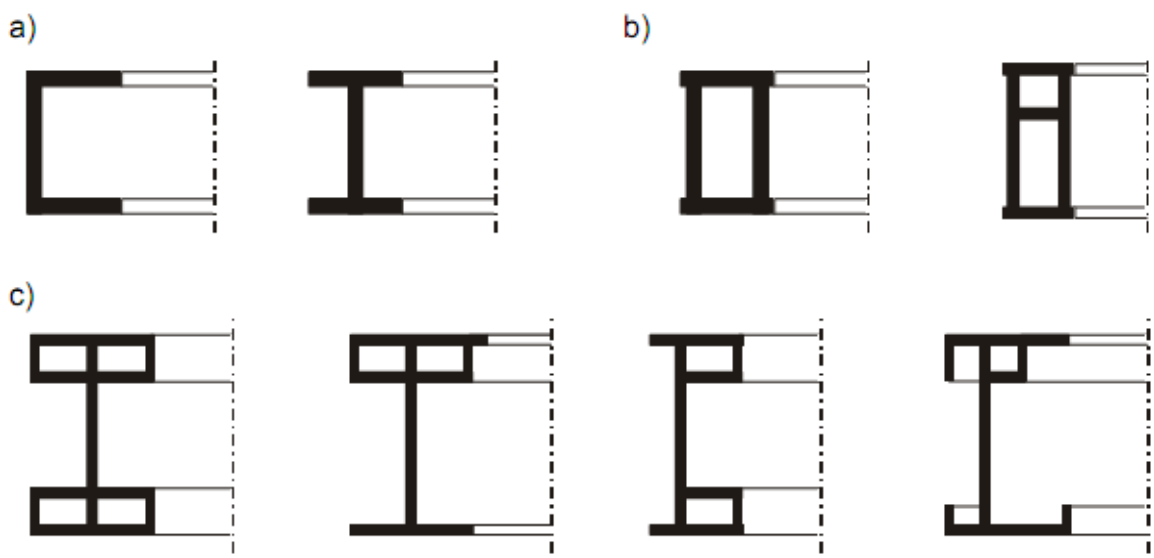


Fig. 6. Schematic display of support surfaces for radial-axial bearings bond:
a)open; b)closed; c)open– closed;

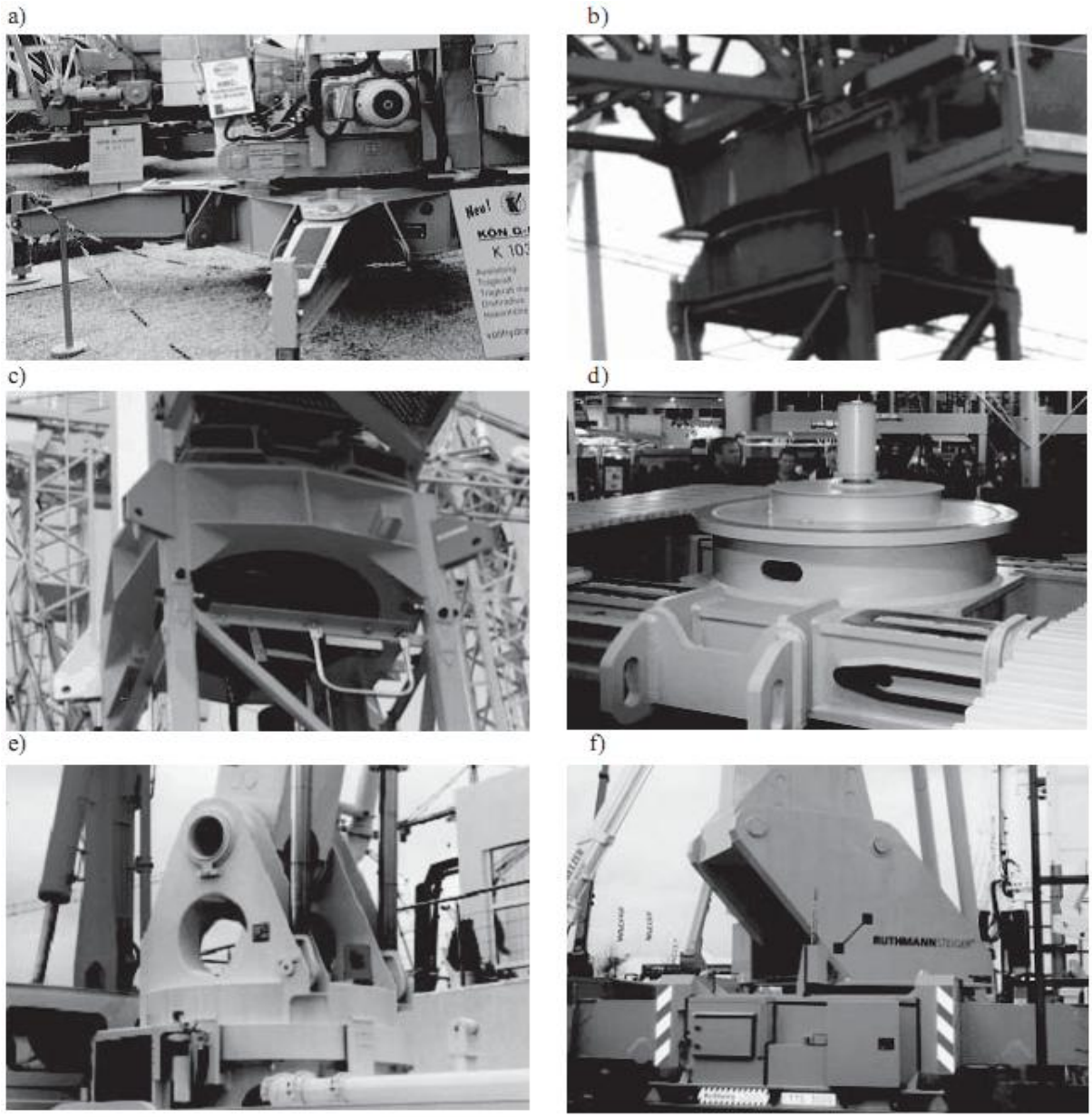


Fig. 7. *Examples of support surface for radial-axial bearings bond in construction mechanization*

3 COMPARATIVE ANALYSIS OF BOTTOM BUILDING ''H'' & ''X'' STRUCTURE TYPES

The paper [6] shows comparative analysis of bottom building ''H'' & ''X'' structure types. On the ground of obtained results, the conclusion is that support structure ''H'' type is more elastic than ''X'' type, i.e. it is more adaptable to track conditions for about 15%. In practice, the percentage is even bigger.

Figure 8 shows the diagrams of load and stiffness relations in ''H'' and ''X'' types.

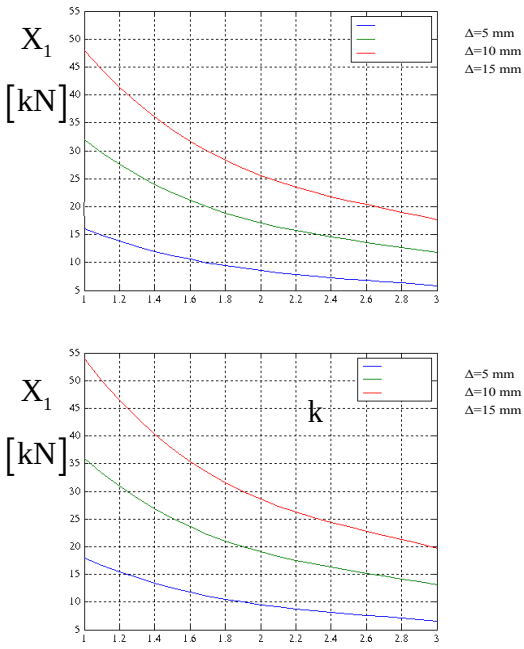


Fig. 8. *Comparative diagram of relation X_1 from quotient k for 'H'&'X'construction types*

The aim of this analysis was to show the influence of support structure shape and geometry on proper function of revolving and non-revolving machine parts bond.

4 CONCLUSION

The paper is a survey of existing bottom building structure types, as well as the support structures for radial-axial bearing bond. Also, the summary from comparative analysis of ''H'' and ''X'' structure types carried out in the paper [6] is shown.

It is clear that for proper function of revolving and non-revolving machine parts, the crucial role has the stiffness of whole bottom building structure, as well as, separately viewed, suppor surface stiffnes to radial-axial bearing bond. The whole structure stiffness and also the support surface stiffness to radial-axial bearing bond can be realized by suitable choice of geometric values and support structure shape.

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