

ABOUT MODELING COMPLEX ASSEMBLIES IN SOLIDWORKS – LARGE AXIAL BEARING

prof.PhD.eng. Cătălin IANCU

Faculty of Technical, Medical and Behavioral Sciences, "C-tin Brâncuși" Univ. of Tg-Jiu,
ciancu@utgjiu.ro

Abstract: In this paperwork is presented the modeling strategy used in SOLIDWORKS for modeling special items as large axial bearing and the steps to be taken in order to obtain a better design. In the paper are presented the features that are used for modeling parts, and then the steps that must be taken in order to obtain the 3D model of a large axial bearing used for bucket-wheel equipment for charcoal moving.

Keywords: SOLIDWORKS, axial bearing, large assembly, Circular Pattern, Mate, Exploded View.

1. INTRODUCTION

In [1] has been presented some of SOLIDWORKS advanced design features, which allows modeling of complex 3D shape items such an auger gear.

In [2] has been presented another method for modeling the special *auger gear* or so called *feed screw*, used for an industrial dusting filter for cement industry. The advanced features presented made possible the modeling of complex 3D shapes. In this paperwork it will be presented the features of another component of SOLIDWORKS, the assembly module, on the example of a *large axial bearing* used for bucket-wheel equipment for charcoal moving. In figure 1 is presented the *axial bearing* that will be modeled.

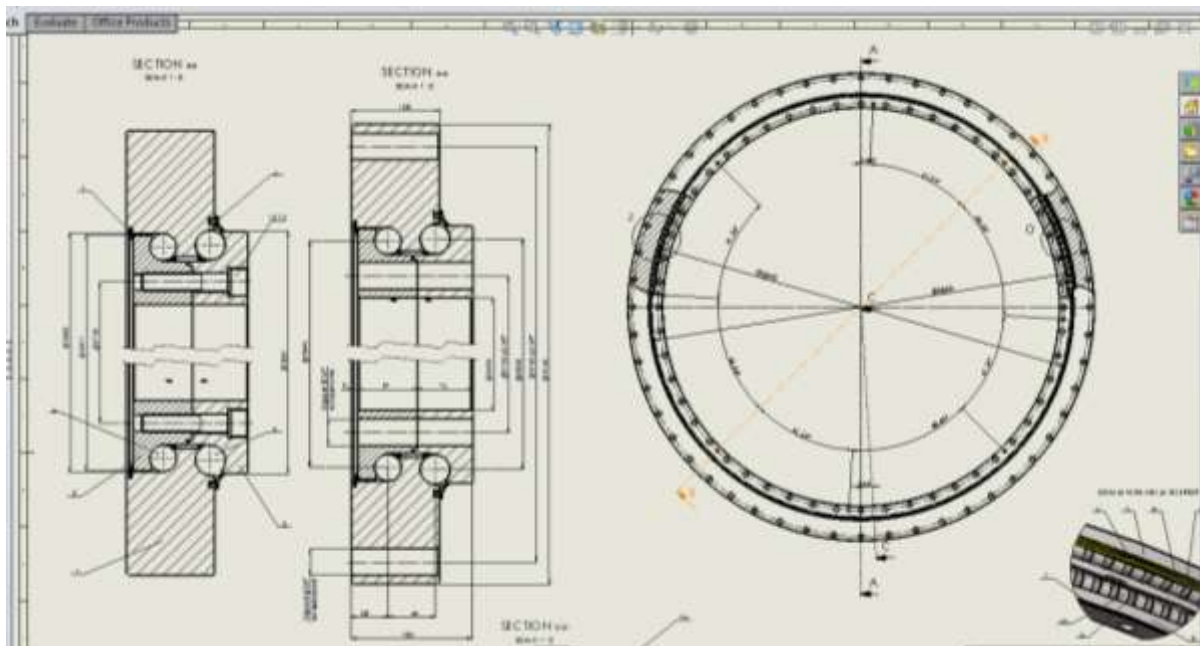


Fig. 1. Axial bearing

2. MODELING COMPONENT PARTS [3]

The axial bearing is composed of several components, as seen in figure 1:

- outer ring – 1 pc;
- upper ring – 1 pc;
- lower ring – 1 pc;
- ball $\Phi 36$ – 224 pcs;
- ball $\Phi 40$ – 199 pcs;
- spacer 36/40 – 223/198 pcs;
- gasket 1 – 1 pc;
- gasket 2 – 1 pc;
- fixing screw + washer – 8 pcs;
- lubricator – 12 pcs.

The interesting part of this axial-type bearing it's its size and the large number of rolling bodies (423 balls), meaning:

- outside diameter – $\Phi 3160$ mm
- inside diameter – $\Phi 2690$ mm
- width – 165 mm

So it was begun the modeling of component parts, as shown in figure 2, 3 and 4.

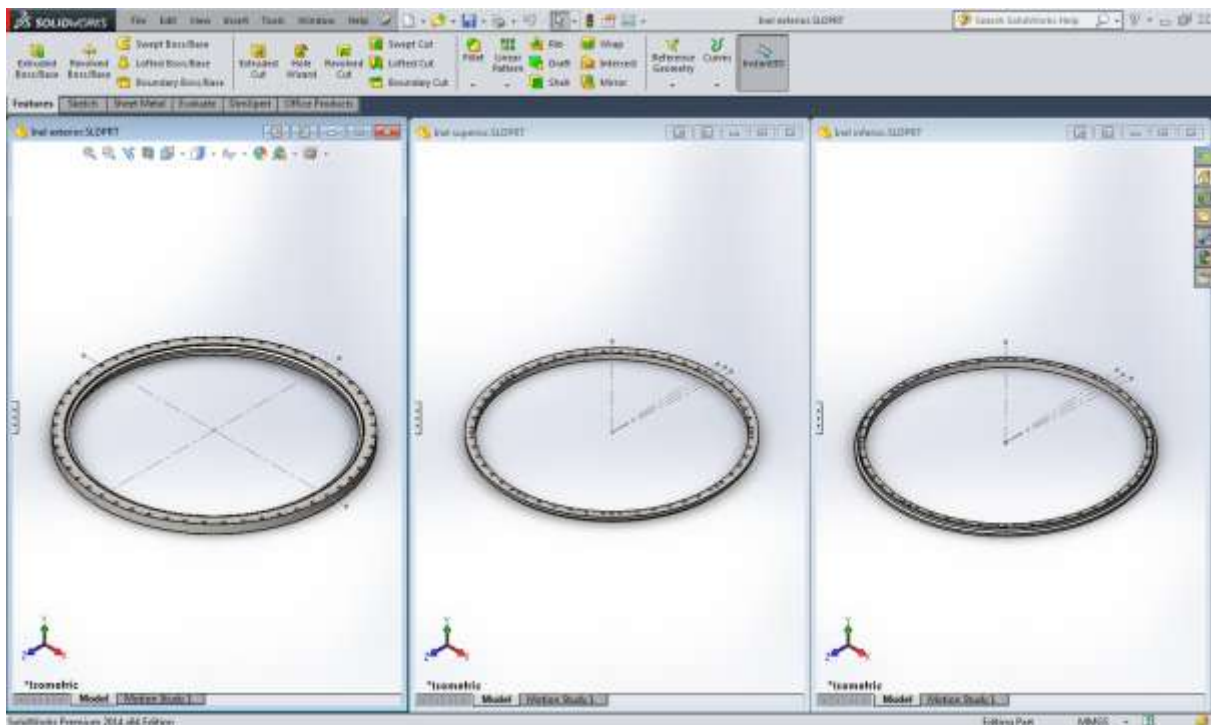


Fig.2. Outer / Upper / Lower ring

The component parts are modeled starting with a 2D *Sketch*, which is revolved using *Revolve* feature. Then is performed a hole using *Hole Wizard*, which is multiplied by using *Circular Pattern* feature (outer/upper/lower ring). In some cases was used *Revolved Cut* feature for modeling a channel or circular cut. Some of the components are even simpler, using the 2D *Sketch* and *Revolve* or *Extruded Boss/Base* Feature (ball, spacer).

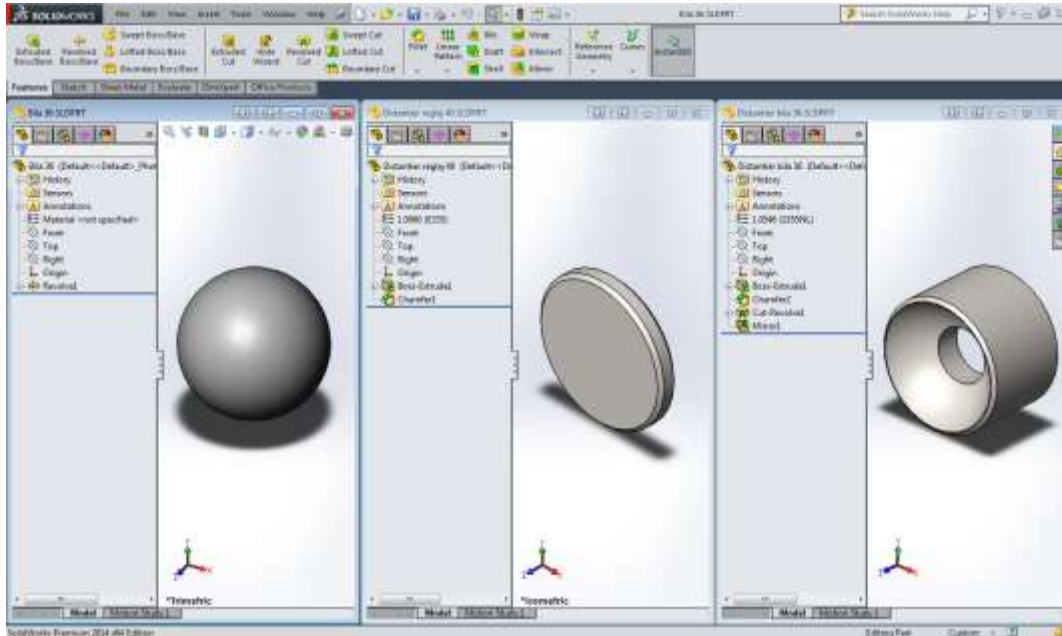


Figure 3. Ball – Adjustment spacer – Spacer 36

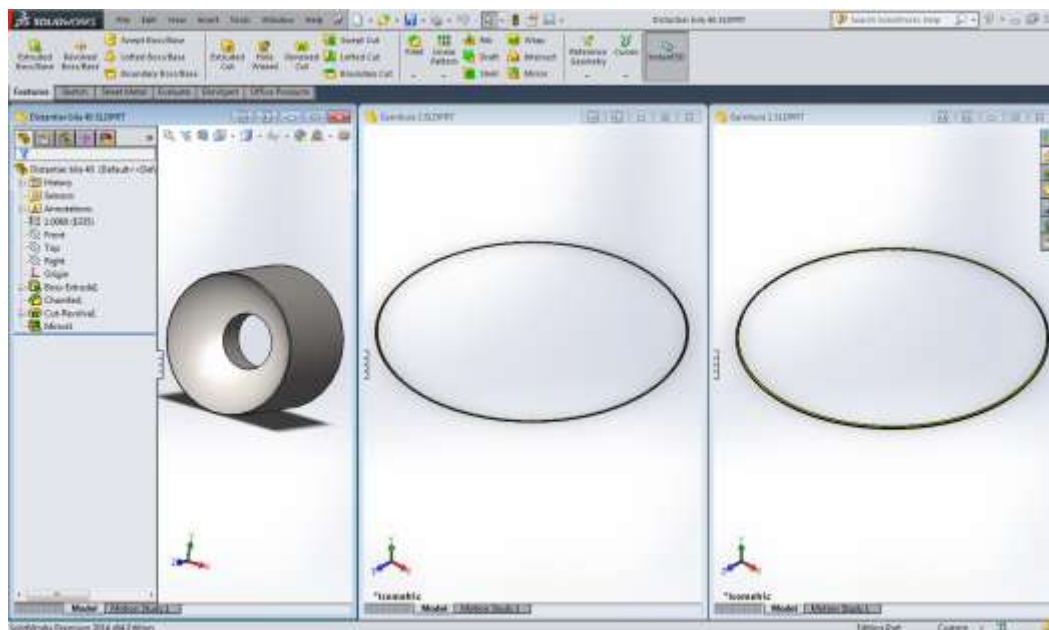


Fig. 4. Spacer 40 – Gasket 1 – Gasket 2

3. MODELING AXIAL BEARING ASSEMBLY

The modeling [3], [4] of whole axial bearing starts with **the outer ring** on which they are mounted all the other parts of the bearing: balls, spacers, adjustment spacers, gaskets, upper and lower ring. In the end are mounted the fixing screws and washers and the necessary lubricators.

For obtaining the assembly was used *Mate* feature for correct positioning of parts. Were used standard mate conditions as:

- concentric;
- parallel;
- coincident;
- distance.

Was used also *Circular Pattern* feature for positioning hundreds of identical items, such balls 36 (224 pcs.) and balls 40 (199 pcs.), and of course the correspondent spacers. The bearing assembly is shown in figure 5.

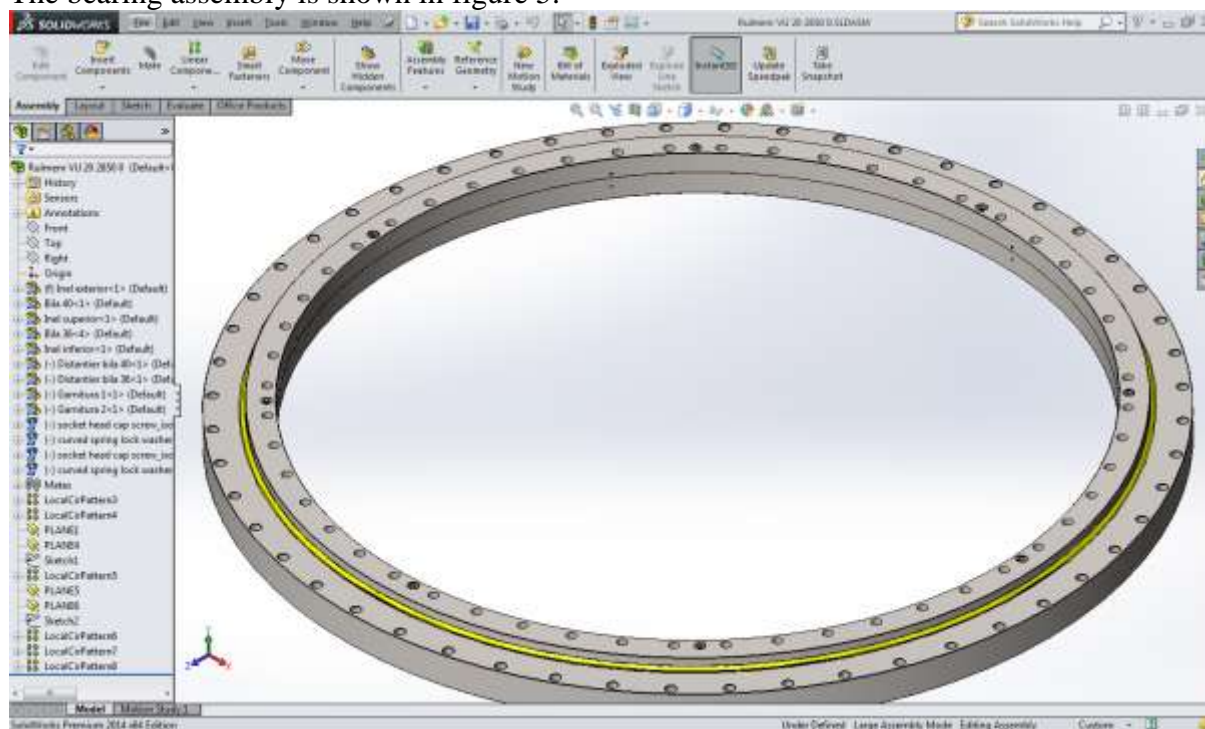


Fig. 5. Axial bearing assembly

For visualization of the components of assembly and their correct positioning may be used some useful features like *Exploded View*. “An exploded view shows an assembly's components spread out, but positioned to show how they fit together when assembled. You create exploded views by selecting and dragging parts in the graphics area, creating one or more explode steps.” [4].

The result of this operation is shown in figure 6.

Another feature that can be useful is Change transparency which allows modifying the transparency of a part such as is possible that rear components can be seen. It's used the following icon, accessible by right-click on part to be modified [4]:



Transparency (blank) - No transparency applied (part is opaque).

Transparent - 75% transparency applied to the color of the component.

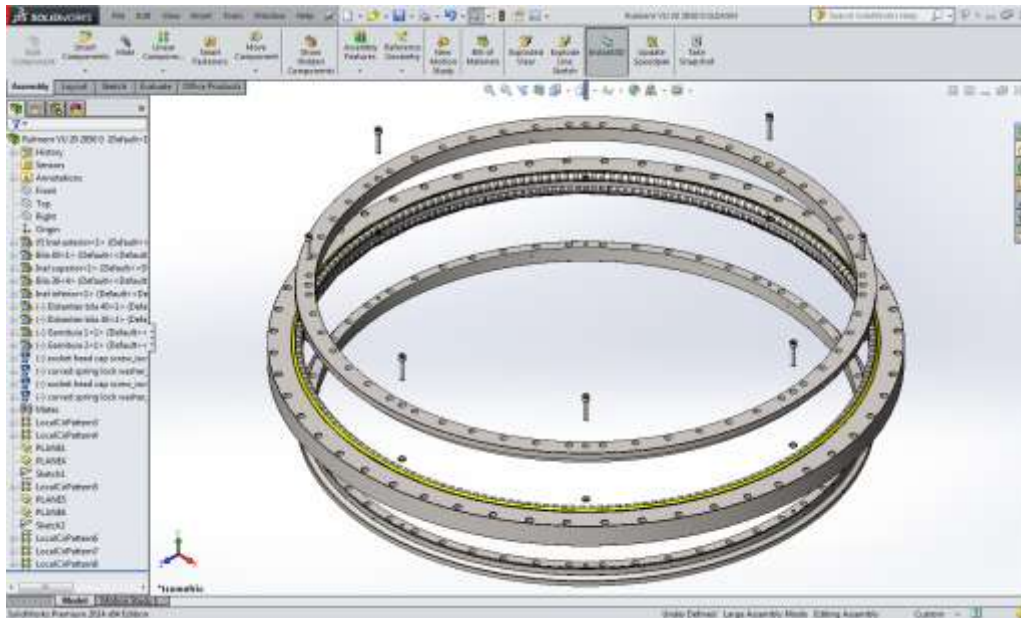


Fig. 6. Exploded axial ball bearing

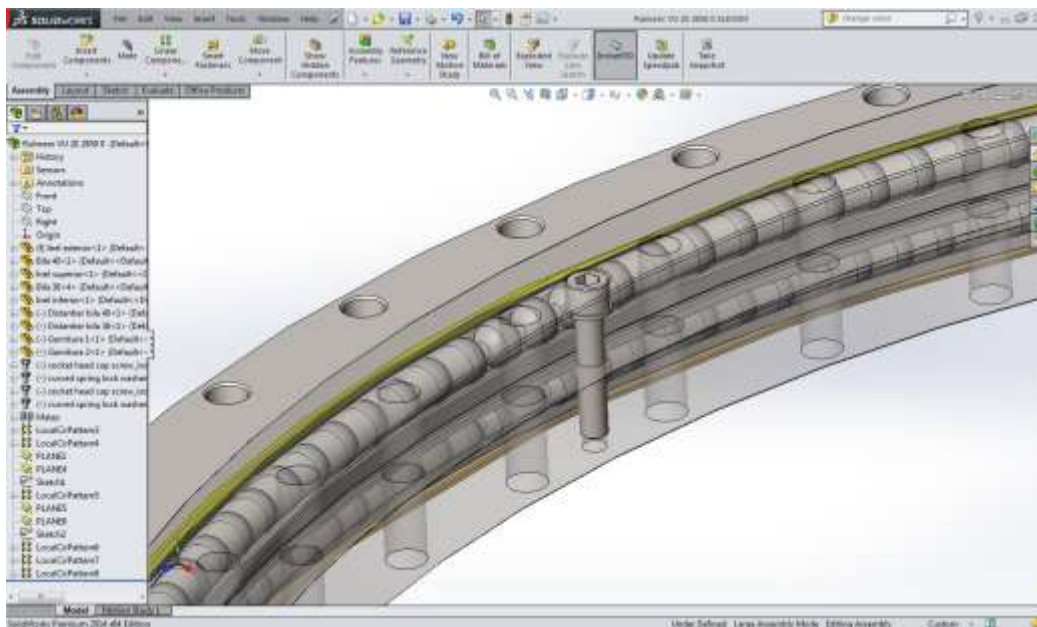


Fig.7. Detail of axial ball bearing using transparency

In this detail can be seen the upper balls, the lower balls and the spacers mounted in the running track provided by the outer ring of the bearing. It can be seen also the mounting screws and washers.

4. CONCLUSIONS

As it was presented, SOLIDWORKS offer a series of advanced design features right in the core of the software, used for the modeling of a *large axial bearing*.

For modeling the bearing components were used features as:

- *2D Sketch*
- *Revolve*
- *Hole Wizard*
- *Circular Pattern*
- *Revolved Cut*
- *Extruded Boss/Base*

For assembling the axial bearing were used features as:

- *Mate* feature, with standard mate conditions as:
 - *concentric*;
 - *parallel*;
 - *coincident*;
 - *distance*.

For visualization and verification were used features as:

- *Exploded view*
- *Change transparency*

Following the steps presented, and using the features presented, one can obtain the geometric model of a *large axial balls bearing*, used for bucket-wheel equipment for charcoal moving.

Once being ready, the geometric model of the axial bearing can be used for various post-modeling assembly analysis, like *Interference Detection* analysis, *Clearance Verification* analysis, *Hole Alignment* analysis or any other *Geometry* analysis, so the possibilities for optimizing design are extended, conducting at saving time and money for a quite consuming and laborious activity like CAD/CAM/CAE/.

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