



Issue 35: Bud's Take on Bearing Basics - Cages, Retainers, Separators

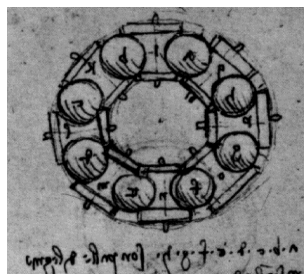
Bearing Basics - Cages, Retainers, Separators

To start my discussion of cages, retainers and separators, I will recite my favorite quote by the late, great, engineer Leonardo Da Vinci (1452-1519.)

"... But if balls or rollers touch each other in their motion, they will make the movement more difficult than if there were no contact between them, because their touching is by contrary motions and this friction causes contrariwise movements.

But if the balls or rollers are kept at a distance from each other, they will touch at one point only between the load and its resistance...and consequently it will be easy to generate movement."

There it is! The definition from long before we were all born! Mr. Da Vinci defined the need for a cage, retainer, or separator.



Picture 1: Da Vinci sketch of thrust bearing (including separator)

Definitions:

Cage: a device that confines, keeps in place.

Separator: a device that prevents contact between elements.

Retainer: a device that holds elements or components in a specific position.

Function of the Cage, Retainer, Separator

As seen by the separate definitions, in bearings the cage, retainer and separator are the same. I have also heard the one-piece press on style called crowns, but that is going too far. (From this point I will use the term cage, just my preference.) The main function of the cage has not changed; its primary job is to keep rolling elements from contacting each other. Carrying load is not a function of the cage; load is determined by the contact stress between the rolling element and raceways. Particular styles of cages allow for extra or larger rolling elements affecting load rating.

Types and Material:

There are many special cages with exotic materials. I am going to discuss only standard type cages.



Picture 2: Pressed steel cage

Pressed steel cages are the most common due to relatively high strength and low cost. They are a two-piece retainer normally held together by rivets. This cage is made of low carbon sheet steel but can be made with more exotic material to meet its application needs.



Picture 3: Bronze/Brass cage designs

Machined brass (commonly called bronze) cages are available in many designs, one-piece, finger, window, split, and so on. This type cage is quiet running, good in marginal lubrication, and unaffected by most lubricants. This cage is heavy and not normally used in high-speed applications.



Picture 4: Polyamide cage

Polyamide cages are injection molded with glass fiber reinforcement. This type cage is lightweight and has good strength and elastic mechanical properties. Some temperature concerns are associated with polyamide cages: high temperatures may cause ageing (permanent changes), low temperatures (-40 and below) may cause loss of elasticity (become brittle.) Don't let this scare you; almost all car wheel hub units use polyamide cages!

Conclusion:

I know this type material can be dry, so I tried to keep it as light as possible. When you have an unusual application and the manufacturer ask many questions, they are trying to ensure you receive the best bearing (including cage) to meet your needs!

To wrap all the terms together: the function of this bearing component is to **separate** the rolling elements, reducing friction, **retain** them to maintain equal distance, distribute load and guide the rolling elements in the unloaded zone of the bearing.

If you have any questions, comments, ideas for future topics please feel free to contact me directly at bud@midpointbearing.com

