



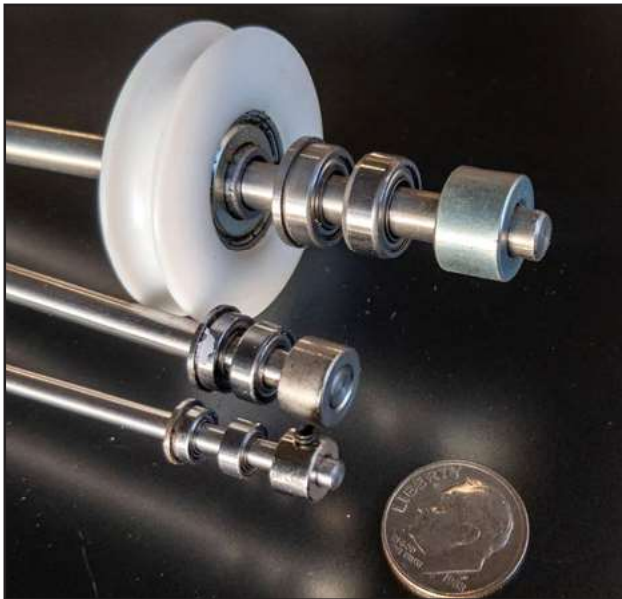
a PART of the story

How bearings reduce friction and extend the life of your automata

by Jim Coffee • San Diego, California, USA • Photos by the author

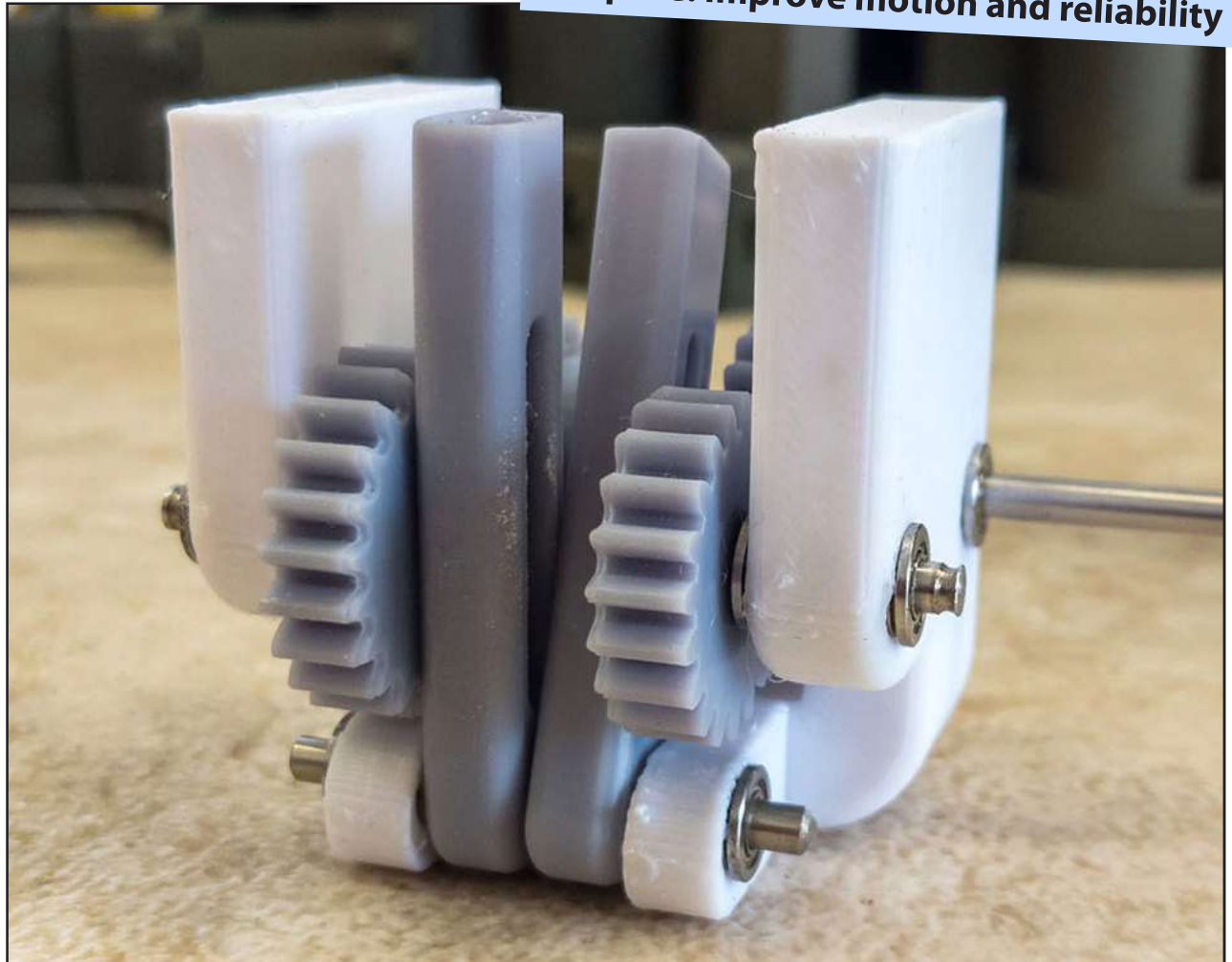
Automata rely heavily on motion, which often involves shafts rotating within a fixed structure. This can create friction, wear, and noise, along with the intended movement. Bushings or bearings can be used to reduce or eliminate these unwanted effects.

Many automata creators have found success by using ball bearings in conjunction with wood or stainless-steel shafts. This combination results



Three sizes of ball bearings are shown: $\frac{1}{2}$ " x $\frac{1}{4}$ ", $\frac{3}{8}$ " x $\frac{3}{16}$ ", and $\frac{1}{4}$ " x $\frac{1}{8}$ ". Also shown are collars and a grooved ball-bearing assembly that is used to follow cams.

Technology: Ball bearings
Purpose: Improve motion and reliability



This is the drive frame for the pilot and copilot of an airship. The mechanism causes their arms to wave. Eight flanged $\frac{1}{4}$ " x $\frac{1}{8}$ " ball bearings enable quiet, reliable, and precise motion.



Shown here is a sleeve of 10 ball bearings, a linear ball bearing, a one-way ball bearing, a thrust bearing, a grooved bearing, and six bearings that I commonly use.



One of my automata operated a Nordic Track (ski machine)-sort of mechanism. Linear-motion bearings like this one were used. In this image, you can see the small bearings that recirculate as the bearing moves along the shaft.



Grooved bearings are extremely useful. Several of these were sourced from the screen-door-hardware department. Also shown is a hub that is used to mount things to a shaft, a collar, and several spacers.

in quieter operation, more precise movement, and minimal wear on the parts.

There are several types of ball bearings available for automata construction, as follows:

- Simple ball-bearing assemblies
- Flanged bearings (bearings with a flange on one side for added stability)
- One-way bearings (restricting rotation to a single direction)
- Thrust bearings (designed to handle end loads)
- Linear bearings (bearings that slide on the shaft)
- Grooved ball bearings (ideal for following the contours of a cam)

Bearings come in a variety of sizes, both imperial and metric. Common sizes used in

automata include $\frac{1}{4}$ " x $\frac{1}{8}$ " and $\frac{1}{2}$ " x $\frac{1}{4}$ ". Similar sized metric bearings are also available. Flanged bearings are generally preferred for added stability and convenience. One-way bearings offer quiet and reliable operation for limiting crank movement to one direction. Grooved bearings excel at following cams. The cost of these small bearings in the US is typically around \$1.50 +/- each, and it's recommended to order them in packs of 10 for convenience.

If you envision your automaton captivating audiences for decades to come, consider incorporating ball bearings into some or all of its moving parts. This will ensure smooth, quiet operation and minimize wear for a long-lasting and captivating creation. 