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AUTO-MESHING RACK AND PINION GEAR

HP INC

Auto-meshing rack and pinion gear

In a mechanical system with a rack and pinion, typically the rack and pinion are always engaged with each other but, in some instances, it is necessary to have the pinion gear disengage and engage with the rack. When this happens, the rack and gear need to mesh properly each time that they engage. If the gears do not properly mesh, then the system can lockup, gears can break, or other similar problems occur.

One example of this is in a large format printer with a user replaceable printhead cleaner. A rack can be permanently placed in the printer (Figure 1), and then the printhead cleaner contain moving parts driven by the rack. The moving parts could be caps, spitrollers, webwipes, etc. An example of gears locking is shown in Figure 2.

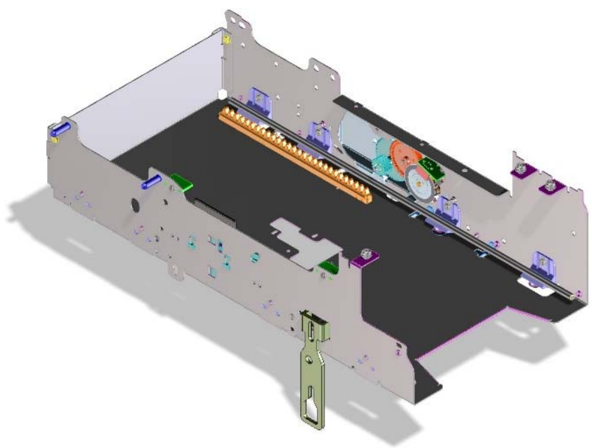

Figure 1 - Printer printhead cleaner station with rack

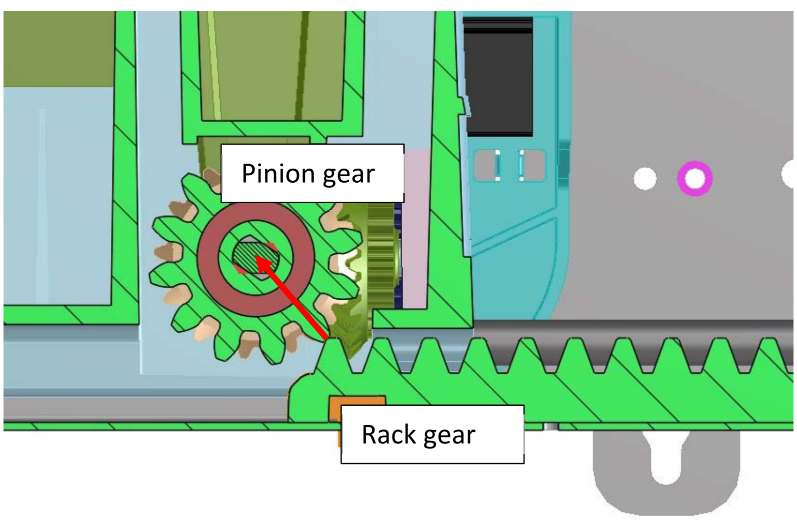

Figure 2 - Printhead cleaner with pinion gear locking up with rack

Typically, this meshing has been performed using a complex mechanism, such as a ratcheting mechanism, a Geneva Mechanism, or similar mechanism, to synchronize the timing of the two gears and allow them to engage. In each of these, the complex mechanism requires many parts and can be very expensive, especially compared with low cost electronics and mechatronics.

A low cost, auto-meshing rack can be injected molded from a soft plastic, such as polyethylene or polyoxymethylene, and avoid the problems mentioned above. An example design is shown in Figure 3 below. There are two main features of this rack design.

1. First, the initial teeth on the rack are modified from standard tooth profiles so that each tooth is slightly lower and angled more steeply. If the first point of contact has the root of the tooth pressing into the tooth, it avoids this point of contact. Instead a lower tooth will engage, and the normal force will cause the gear to turn and move into place.
2. Second, the initial teeth are molded over a thin, flexible region. If the first point of contact on the lower teeth results in a normal force which does not cause gear rotation, it will deflect the gear and slide past into the next gear.

Figure 3 shows the pinion in the same position as Figure 1. In this case, the locking gear misses the first tooth of the rack, and a later tooth is allowed to engage the rack and move the pinion normally.

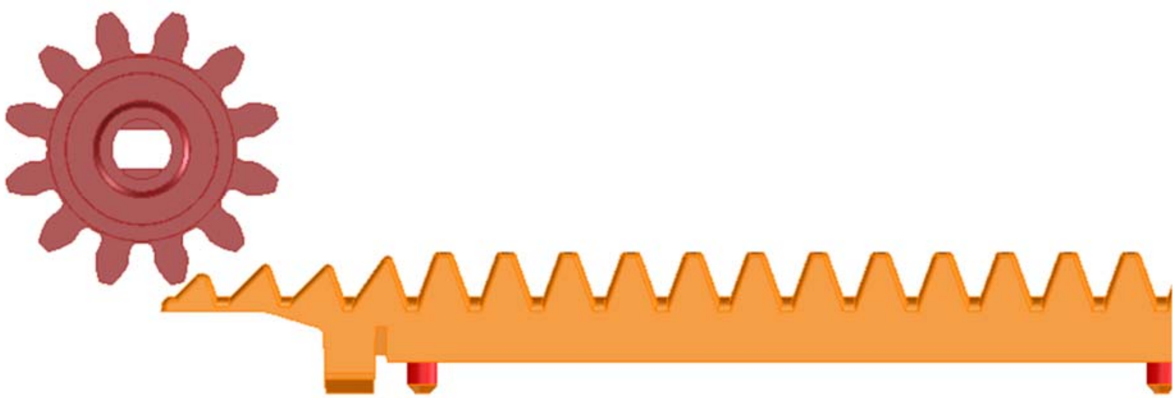

Figure 3 - Modified rack profile to allow automeshing of pinion gear

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