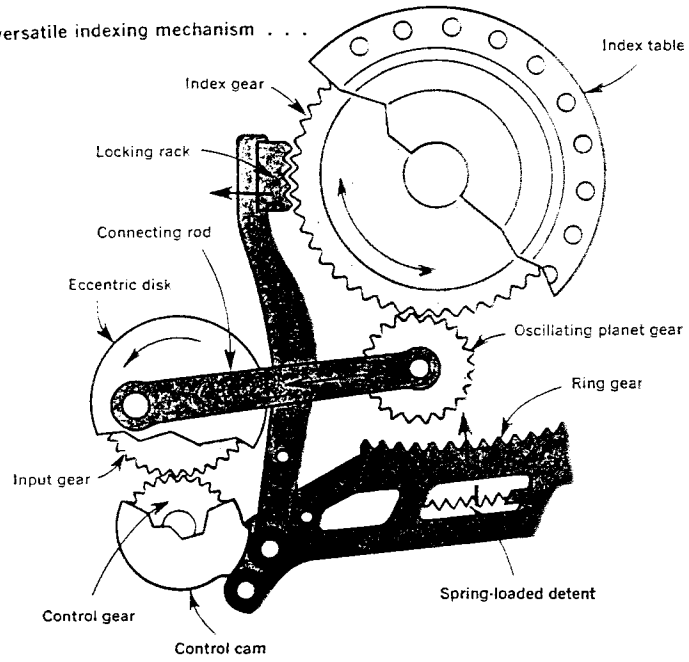
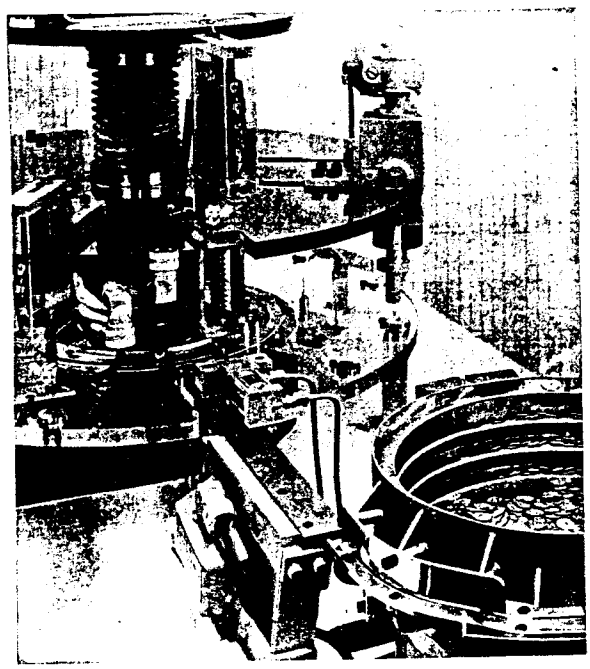
Gears and eccentric disk combine in quick indexing

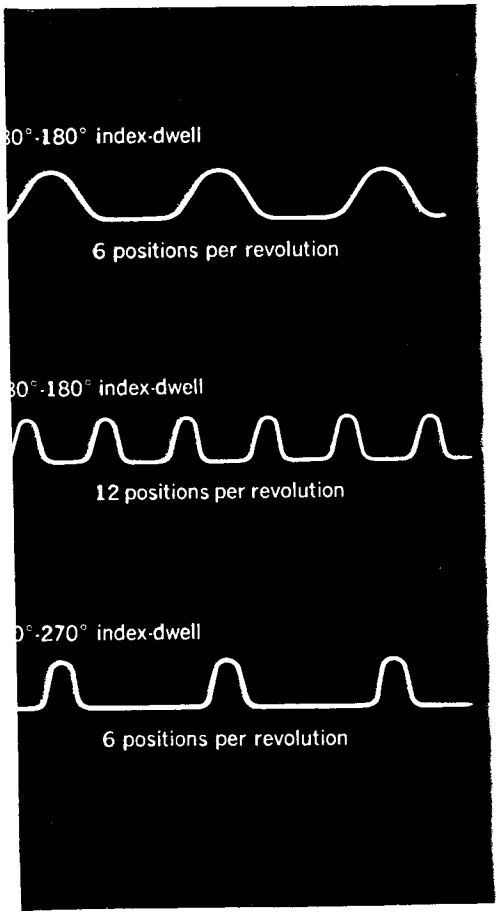
This versatile indexing mechanism . . .





Indexing mechanism is installed at base of rotary table

. . . provides choice of indexing modes



Both stops and dwell are adjustable.

An ingenious intermittent mechanism that looks Rube Goldberg-ish with its multiple gears, gear racks, and levers provides new smoothness and flexibility in converting constant rotary motion into a start-and-stop type of indexing.

It works equally well for high-speed operations, as fast as 2 sec per cycle, including index and dwell, or for slow-speed assembly functions. Its builder, Gilman Engineering & Mfg Co, Janesville, Wis, is confident enough to adopt it as the mechanical brain of its new Indexomatic rotary table.

The new device minimizes shock loads and offers more versatility than the indexing cams and genevas usually employed to convert rotary motion into start-stop indexing. The number of stations (stops) per revolution of the table can easily be changed, and so can the period of dwell during each stop.

Advantages. This flexibility broadens the scope of the automatic machine operations—feeding, sorting, packaging, weighing, etc—that the rotary table can perform. But the Gilman design offers other advantages, too:

- Use of gears instead of cams makes the device cheaper to manufacture, because gears are simpler to machine.
- The all-mechanical interlocked system achieves an absolute time relationship between motions.
- Gearing is arranged so that the machine automatically goes into a dwell when it is overloaded, preventing damage during jam-ups.
- Its built-in anti-backlash gear system averts rebound effects, play, and lost motion during stops.

How it works. Input from a single motor drives an eccentric disk and connecting rod. In the position shown in the drawing, the indexing gear and table are locked by the rack—the planet gear rides freely across the index gear without imparting any motion to it. Indexing of the table to its next position begins when the control cam simultaneously releases the locking rack from the index gear and causes the spring control ring gear to pivot into mesh with the planet.

We now have a planetary gear system containing a stationary ring gear, a driving planet gear, and a "sun" index gear. As the crank keeps moving to the right, it begins to accelerate the index gear with

harmonic motion—a desirable type of motion because of its low acceleration-deceleration characteristics while imparting high-speed transfer to the table.

At the end of 180-deg rotation of the crank, the control cam pivots the ring-gear segment out of mesh and, simultaneously, engages the locking rack. As the connecting rod is drawn back, the planet gear rotates freely over the index gear, which is locked in place.

The cam control is so synchronized that all toothed elements are in full engagement for a few brief instants when the crank arm is in full toggle at both the beginning and end of index. The device can be operated just as easily in the other direction.

Overload protection. The ring gear segment includes a spring-load detent mechanism, (simplified in the illustration) that will hold the gearing in full engagement under normal indexing forces. If rotation of the table is blocked at any point in index, the detent spring force is overcome and the ring gear pops out of engagement with the planet gear.

A detent roller (not shown) will then snap into a second detent position, which will keep the ring gear free during the remainder of the index portion of cycle. After that, the detent will automatically reset itself.

Incomplete indexing is detected by an electrical system that stops the machine at the end of the index cycle.

Easy change of settings. To change indexes for a new job setup, the eccentric is simply replaced with one having a different crank radius, which gives the proper drive stroke for 6, 8, 12, 16, 24, 32, or 96 positions per table rotation.

Because indexing occurs during one-half revolution of the eccentric disk, the input gear must rotate at two or three times per cycle to accomplish indexing of ½, ¼, or 1/16 of the total cycle time (which is equivalent to index-to-dwell cycles of 180/180, 90/270 or 60/300 deg). To change the cycle time, it is only necessary to mount a different set of change gears between input gear and control cam gear.