

Cams and gears team up in programmed motion

Pawls and ratchets are eliminated in this design, which is adaptable to the smallest or largest requirements; it provides a multitude of outputs to choose from at low cost

A new and extremely versatile mechanism provides a programmed rotary output motion simply and inexpensively. It has been sought widely for filling, weighing, cutting, and drilling in automatic and vending machines.

The mechanism, which uses overlapping gears and cams (drawing below), is the brainchild of mechanical designer Theodore Simpson of Nashua, N. H.

Based on a patented concept that could be transformed into a number of configurations (photo right), PRIM (Programmed Rotary Intermittent Motion), as the mechanism is called, satisfies the need for smaller devices for instrumentation without using spring pawls or ratchets.

It can be made small enough for a wristwatch or as large as required.

Versatile output. Simpson reports the following major advantages:

- Input and output motions are on a concentric axis.
- Any number of output motions of varied degrees of motion or dwell time per input revolution can be provided.
- Output motions and dwells are variable during several consecutive input revolutions.
- Multiple units can be assembled on a single shaft to provide an almost limitless series of output motions and dwells.
- The output can dwell, then snap around.

How it works. The basic model

(drawing, below left) repeats the output pattern, which can be made complex, during every revolution of the input.

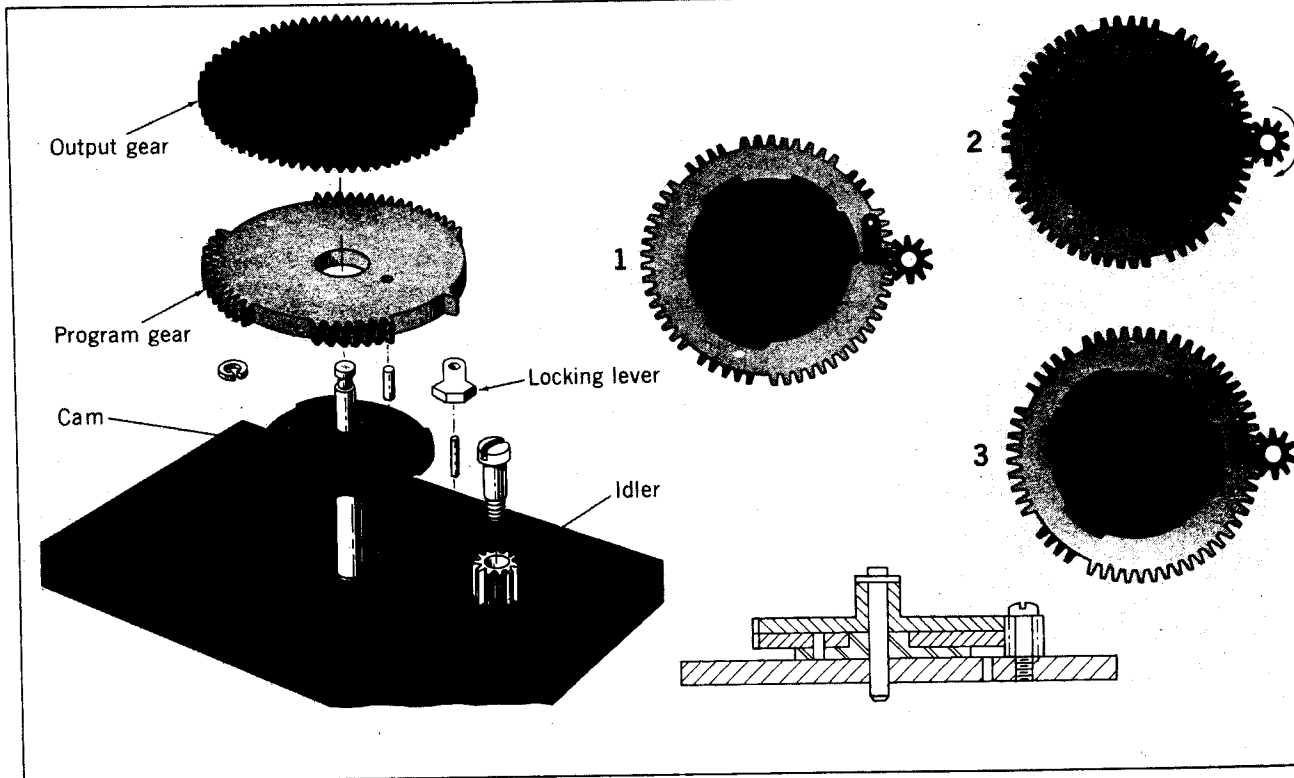
Cutouts around the periphery of the cam give the number of motions, degrees of motion, and dwell times desired. Tooth sectors in the program gear match the cam cutouts.

Simpson designed the locking lever so one edge follows the cam and the other edge engages or disengages, locking or unlocking the idler gear and output. Both program gear and cam are lined up, tooth segments to cam cutouts, and fixed to the input shaft. The output gear rotates freely on the same shaft, and an idler gear meshes with both output gear and segments of the program gear.

As the input shaft rotates, the teeth of the program gear engage the idler. Simultaneously, the cam releases the locking lever and allows the idler to rotate freely, thus driving the output gear.

Reaching a dwell portion, the teeth of the program gear disengage from the idler, the cam kicks in the lever to lock the idler, and the output gear stops until the next program-gear segment engages the idler.

Dwell time is determined by the



Basic intermittent-motion mechanism, at left in drawings, goes through the rotation sequence as numbered above.

space between the gear segments. The number of output revolutions does not have to be the same as the number of input revolutions. An idler of a different size would not affect the output, but a cluster idler with a matching output gear can increase or decrease the degrees of motion to meet design needs.

For example, a step-down cluster with output gear to match could reduce motions to fractions of a degree, or a step-up cluster with matching output gear could increase motions to several complete output revolutions.

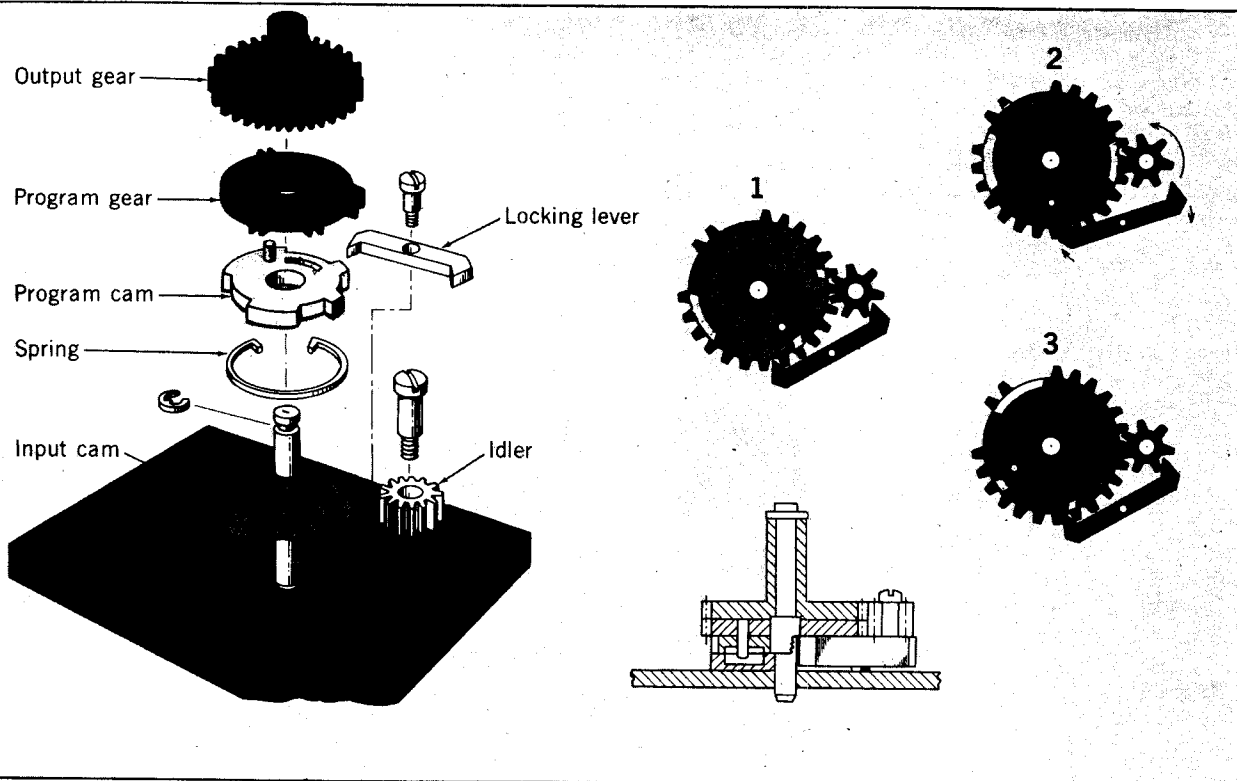
Snap action. A second cam and a spring are used in the snap-action version (drawing below). Here, the cams have identical cutouts.

One cam is fixed to the input and the other is lined up with and fixed to the program gear. Each cam has a pin in the proper position to retain a spring; the pin of the input cam extends through a slot in the program gear cam that serves the function of a stop pin.

Both cams rotate with the input shaft until a tooth of the program gear engages the idler, which is locked and stops the gear. At this point, the program cam is in position to release the lock, but misalignment



Designer Theodore Simpson shows plastic models of some of the many variations of his mechanism. Most are unique, but unit in foreground resembles the Geneva.



Snap-action version, with a spring and with a second cam fixed to the program gear, works as shown in numbered sequence.