Jan. 31, 1967 P. H. WECHSLER 3,301,089

ADJUSTABLE CAM

Filed Nov. 9, 1964

FIG. 1.

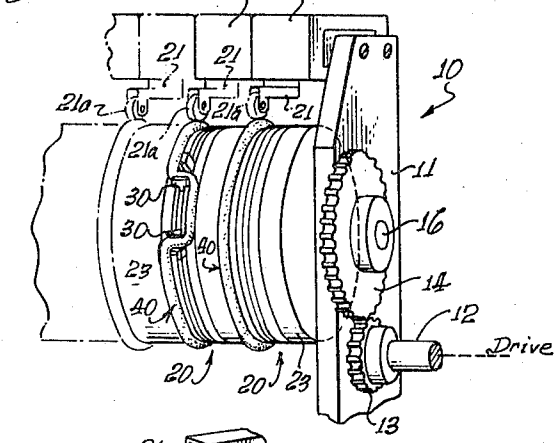


FIG. 4.

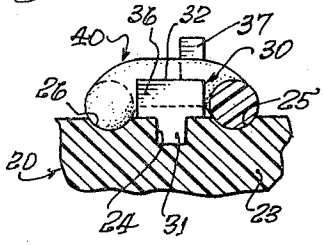


FIG. 2.

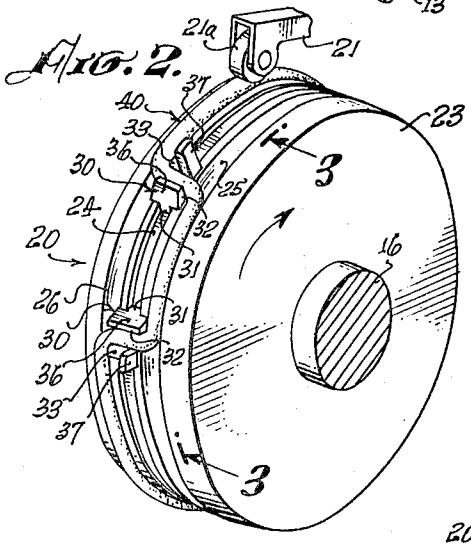


FIG. 3.

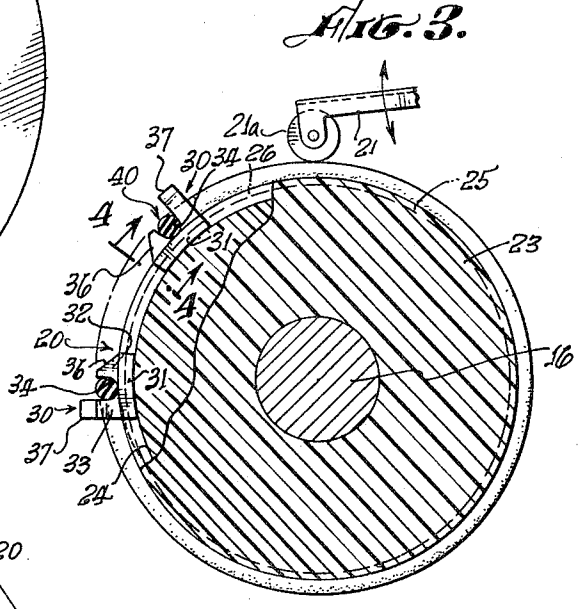
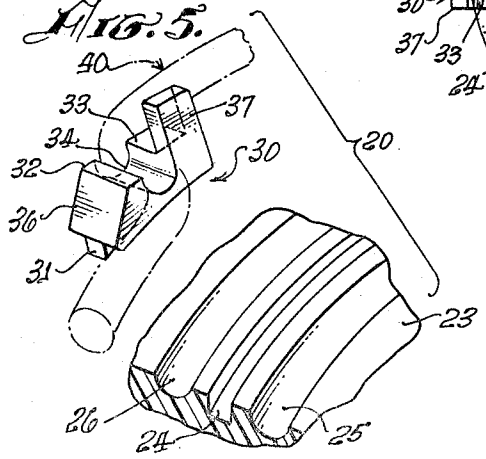


FIG. 5.



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ADJUSTABLE CAM

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The present invention relates to an adjustable cam, and more particularly to an adjustable cam in which a ring of flexible material on a rotatable drum has some parts of the ring in one plane along the drum axis and other parts of the ring in another plane along the drum axis, and is held by movable positioner elements.

Cams have heretofore been provided which could be adjusted so that the movement of the cam follower could be varied. In general, however, the prior art adjustable cams were expensive to manufacture, often requiring complex machining or forming operations. Further, the adjustable cams heretofore known generally used screws in order to adjust the cams. The use of screws required threading of holes in the cam assembly, or the provision of nuts to cooperate with the screws, and for either construction additional expense was entailed, or the number of parts required was unduly mutiplied. Further, the constructions utilizing screws were inherently time-consuming in making an adjustment of the cam, and the adjustment was often difficult to make. The prior cams were also subject to inadvertent movement of the adjusting mechanism.

An object of the present invention is to provide a cam which may be readily adjusted.

Another object of the present invention is the provision of an adjustable cam of simple and economic construction.

A further object of the present invention is to provide an adjustable cam capable of providing multiple cam actions during a single cycle.

Another object of the present invention is the provision of an adjustable cam which does not require screws.

Yet another object of the present invention is to provide an adjustable cam which will remain fixed in any selected position.

Still another object of the present invention is the provision of an adjustable cam construction which may be readily "ganged."

The novel features which are believed to be characteristic of the invention, both as to its organization and method of operation, together with further objects and advantages thereof will be better understood from the following description considered in connection with the accompanying drawing in which a presently preferred embodiment of the invention is illustrated by way of example. It is to be expressly understood, however, that the drawing is for the purpose of illustration and description only, and is not intended as definition of the limits of the invention.

FIGURE 1 is a perspective view of an assembly of multiple cams in accordance with the present invention;

FIGURE 2 is a perspective view of a single adjustable cam in accordance with the present invention, and showing a cam follower;

FIGURE 3 is a cross-sectional view taken on the line 3—3 of FIGURE 2;

FIGURE 4 is a cross-sectional view taken on the line 4—4 of FIGURE 3;

FIGURE 5 is an exploded perspective view showing a portion of the cam surface and a positioner element.

Referring now to the drawings, wherein like or corresponding reference numerals are used to designate like or corresponding parts throughout the several views, there is shown in FIGURE 1 a ganged or multiple cam assembly generally designated **10** and including a mounting plate **11**, a drive shaft **12** journaled therein, a gear **13** on shaft **12**, and a gear **14** in mesh with gear **13**. Gear **14** is fixed to a cam shaft **16** which is also journaled in the mounting plate **11**, and which carries a plurality of adjustable cams **20**. A cam follower **21** is provided for cooperating with each adjustable cam **20**, and controls the operation of a device such as a switch **22**.

Follower **21** is in the form of a lever arm, and carries a roller **21***a* for engagement with a ring **40**.

Referring now to FIGURE 2, the adjustable cam **20** on the cam shaft **16** may be seen to comprise a drum **23** having a groove **24** in the surface thereof, groove **24** lying in a plane perpendicular to the axis of drum **23**. Grooves **25** and **26** are also provided in the surface of drum **23**, adjacent to and parallel with groove **24**, on either side thereof.

Positioner elements generally designated **30** are carried by the drum, in a manner set forth below, and a resilient ring **40** is positioned on the drum, lying partly in the groove **25** and partly in the groove **26**. The ring **40** crosses the groove **24**, and is held by the positioner elements **30** at the point of crossing of groove **24**; ring **40** is of flexible material, preferably resilient, and is conveniently made of a rubber-like material of circular cross-section.

As may be seen from FIGURES 4 and 5, the groove **24** is generally rectangular in cross-section and is relatively deep, whereas the grooves **25** and **26** on either side thereof are generally sector-shaped in cross-section and are relatively shallow.

The positioner element **30** is provided with a circumferentially extending projection **31** (see also FIGURE 3) which is of rectangular cross-section and which mates with the groove **24**, as is best shown in FIGURE 4. Element **30** is provided with a pair of circumferentially spaced lugs **32** and **33** which extend outwardly of the surface of drum **23**. A groove **34** of sector-shaped cross-section extends between the lugs **32** and **33**, and is generally parallel to the axis of drum **23**. Lug **32** has a ramp **36** thereof, which extends from the surface of drum **23**, and lug **33** has a handle **37** which extends outwardly.

The cam **20** is assembled by placing the ring **40** about the drum **23**, and by placing two or more of the positioner elements **30** on the drum **23**, with the projections **31** in the groove **24**. The ring **40** is then placed so that it is partly in groove **25** and partly in groove **26**, positioner elements **30** being utilized to provide a guiding and supporting structure for carrying the ring **40** between groove **25** and groove **26**, across groove **24**. Thus, ring **40** is in mating relationship with grooves **25**, **26** and **34**. The drum **23**, with additional drums **23** as desired, are secured to the shaft **16** with the groove **26** in the same plane as the follower **21**. When the shaft **16** and drum **23** are rotated, the follower will ride in an outer or raised position on ring **40**, where ring **40** is in groove **26**, and will then descend, by means of ramp **36** of a first positioner element **30** to the level of the surface of drum **23**, which is an inner or lower position, as will be understood from FIGURES 2 and 3. As drum **23** continues to rotate, the roller **21***a* will engage the ramp **36** of the lower positioner element **30** shown therein and will rise to the level of the outer surface of ring **40**. Thus, the switch **22**, or upper device, will be actuated from a first position, to a second position, and then back to the first position.

To adjust the actuating position for the cam follower **21**, it is only necessary to lift the positioner element from groove **24**, rotate it so as to tend to straighten that portion of ring **40** carried in the groove **34**, reposition the positioner element **30** with the aid of handle **37**, and reinsert its projection **31** into groove **24** at the new desired position.

There has thus been provided an adjustable cam made up of simple and economical parts, and which may be readily adjusted to change the actuating position for the cam follower. The adjustable cam herein disclosed does not require screws, and due to the resiliency of the ring **40**, is readily retained in any selected position. While only two positioner elements have been disclosed in the drawings, it will be understood that more than two may be utilized on a single drum, to thereby provide for multiple cam actions during a single drum rotation. As will be apparent, as many of the adjustable cams of the present invention as desired may be ganged on a single shaft.

The invention is to be construed not only in the light of the drawings and specification hereof, but as provided in the claims appended hereto.

What is claimed is:

1. An adjustable cam comprising:

a drum, said drum having a first circumferential groove in the peripheral surface thereof in a plane perpendicular to the drum axis, second and third circumferential grooves parallel to said first groove;

positioner elements slidably adjustably mounted in said first groove, each of said positioner elements having a circumferentially extending projection in the said first groove in mating relationship therewith and a pair of circumferentially spaced lugs extending outwardly of the surface of said drum;

a flexible ring encircling said drum and lying partly in said second groove and partly in said third groove, said ring engaging said lugs of said positioner elements and being guided thereby to said second and third grooves, the outermost part of said ring being outwardly of the drum surface; and a cam follower contiguous with said drum and overlying said third groove for movement by the outermost part of that portion of said ring in said third groove.

2. The cam of claim **1**, said ring being of resilient material.

3. An adjustable cam comprising:

a drum, said drum having a first circumferential groove in the peripheral surface thereof in a plane perpendicular to the drum axis, second and third circumferential grooves of section-shaped cross-section parallel to and adjacent said first groove on either side thereof;

positioner elements slidably adjustably mounted in said first groove, each of said positioner elements having a circumferentially extending projection in said first groove in mating relationship therewith and a pair of circumferentially spaced lugs extending outwardly of the surface of said drum, at least one of said lugs having a ramp extending from the surface of said drum;

a flexible resilient ring of circular cross-section encircling said drum and lying partly in said second groove and partly in said third groove in mating relationship therewith, said ring extending across said first groove between the lugs of said positioner elements, the outermost part of said ring being outwardly of the drum surface; and, a cam follower contiguous with said drum and overlying said third groove for movement by the outermost part of that portion of said ring in said third groove.

4. An adjustable cam comprising:

a drum, said drum having a first circumferential groove in the peripheral surface thereof in a plane perpendicular to the drum axis, said first groove being relatively deep, second and third relatively shallow circumferential grooves parallel to and adjacent said first groove on either side thereof;

positioner elements slidably adjustably mounted in said first groove, each of said positioner elements having a circumferentially extending projection in said first groove in mating relationship therewith, and a pair of circumferentially spaced lugs extending outwardly of the surface of said drum, at least one of said lugs having a ramp extending from the surface of said drum and partially overlying said third groove;

a resilient ring encircling said drum and lying partly in said second groove and partly in said third groove, said ring extending across said first groove between the lugs of said positioner elements, the outermost part of said ring being outwardly of the drum surface; and a cam follower contiguous with said drum and overlying said third groove for movement by said ramp and the outermost part of that portion of said ring in said third groove.

5. An adjustable cam comprising:

a drum, said drum having a first circumferential groove in the peripheral surface thereof in a plane perpendicular to the drum axis, said first groove being relatively deep, second and third relatively shallow circumferential grooves of sector-shaped cross-section parallel to and adjacent said first groove on either side thereof

positioner elements slidably adjustably mounted in said first groove, each of said positioner elements having a circumferentially extending projection in said first groove in mating relationship therewith and a pair of circumferentially spaced lugs extending outwardly of the surface of said drum, at least one of said lugs having a ramp extending from the surface of said drum and partially overlying said third groove;

a resilient ring encircling said drum and lying partly in said second groove and partly in said third groove, said ring extending across said first groove between the lugs of said positioner elements, the outermost part of said ring being outwardly of the drum surface, said ring being of circular cross-section mating with the grooves in which it lies; and a cam follower contiguous with said drum and overlying said third groove for movement by said ramp and the outermost part of that portion of said ring in said third groove.

6. An adjustable cam comprising:

a drum, said drum having a first circumferential groove of rectangular cross-section in the peripheral surface thereof in a plane perpendicular to the drum axis, said first groove being relatively deep, second and third relatively shallow circumferential grooves of sector-shaped cross-section parallel to and adjacent said first groove on either side thereof;

positioner elements slidably adjustably mounted in said first groove, each of said positioner elements having a circumferentially extending projection of rectangular cross-section in mating engagement with said first groove and a pair of circumferentially spaced lugs extending outwardly of the surface of said drum, at least one of said lugs having a ramp extending from the surface of said drum and partially overlying said third groove;

a resilient ring encircling said drum and lying partly in said second groove and partly in said third groove, said ring extending across said first groove between the lugs of said positioner elements, the outermost part of said ring being outwardly of the drum surface, said ring being of circular cross-section mating with the grooves in which it lies; and a cam follower contiguous with said drum and overlying said third groove for movement by said ramp and the outermost part of that portion of said ring in said third groove.

7. An adjustable cam comprising:

a drum, said drum having a first circumferential groove of rectangular cross-section in the peripheral surface thereof in a plane perpendicular to the drum axis, said first groove being relatively deep, second and third relatively shallow circumferential grooves of sector-shaped cross-section parallel to and adjacent said first groove on either side thereof;

positioner elements slidably adjustably mounted in said first groove, each of said positioner elements having a circumferentially extending projection of rectangular cross-section in mating engagement with said first groove and a pair of circumferentially spaced lugs extending outwardly of the surface of said drum, a groove between said lugs generally parallel to the drum axis, at least one of said lugs having a ramp extending from the surface of said drum and partially overlying said third groove, at least one of said lugs having an outwardly projecting handle;

a resilient ring encircling said drum and lying partly in said second groove and partly in said third groove, said ring extending across said first groove in the groove between the lugs of said positioner elements, the outermost part of said ring being outwardly of the drum surface, said ring being of circular cross-section mating with the grooves in

which it lies; and a cam follower contiguous with said drum and over-lying said third groove for movement by said ramp and the outermost part of that portion of said ring in said third groove.

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