July 13, 1948. R. J. KIEFFER 2,445,223

INTERMITTENT CAM

Filed Nov. 13, 1946 4 Sheets-Sheet 1

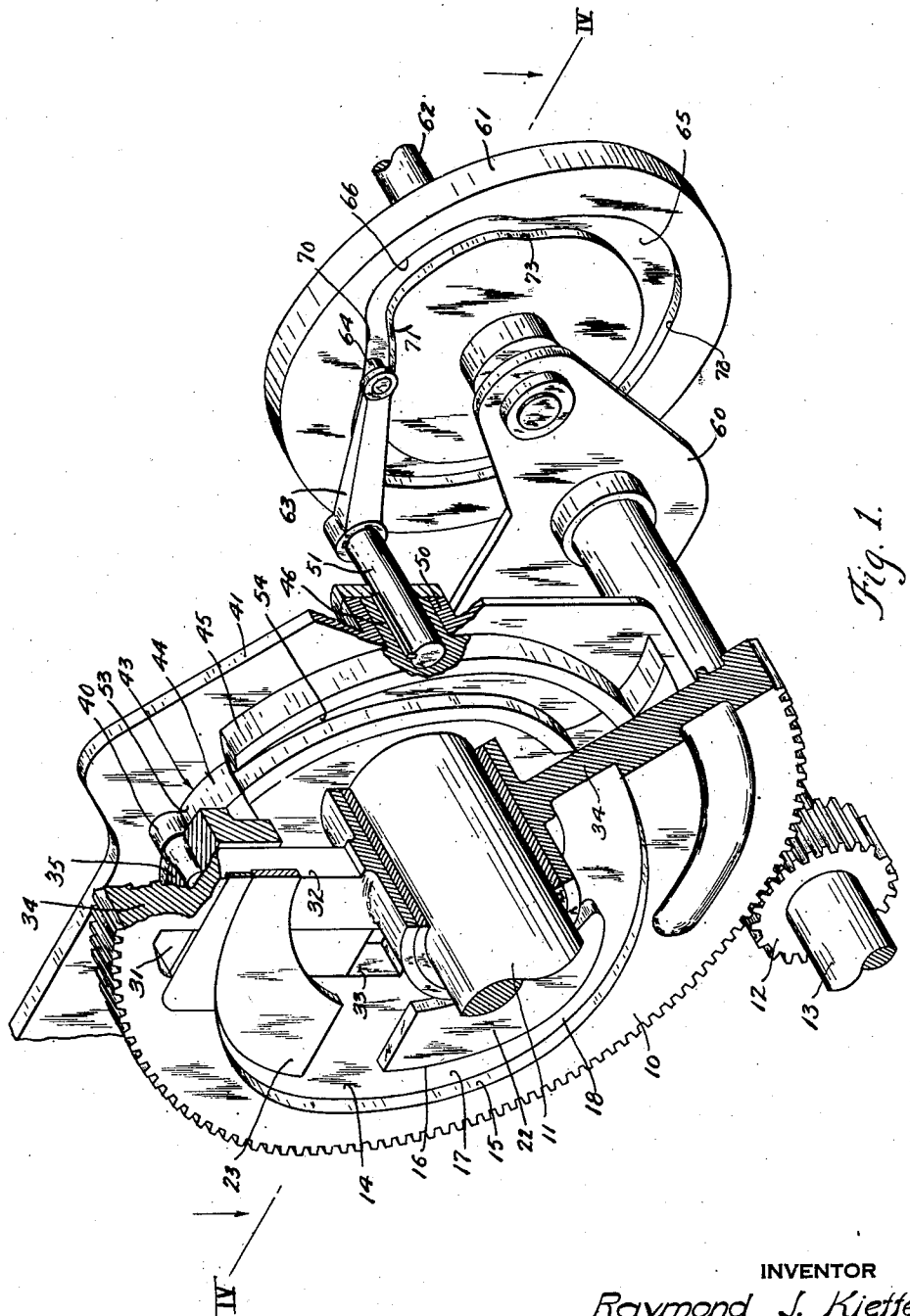


Fig. 1.

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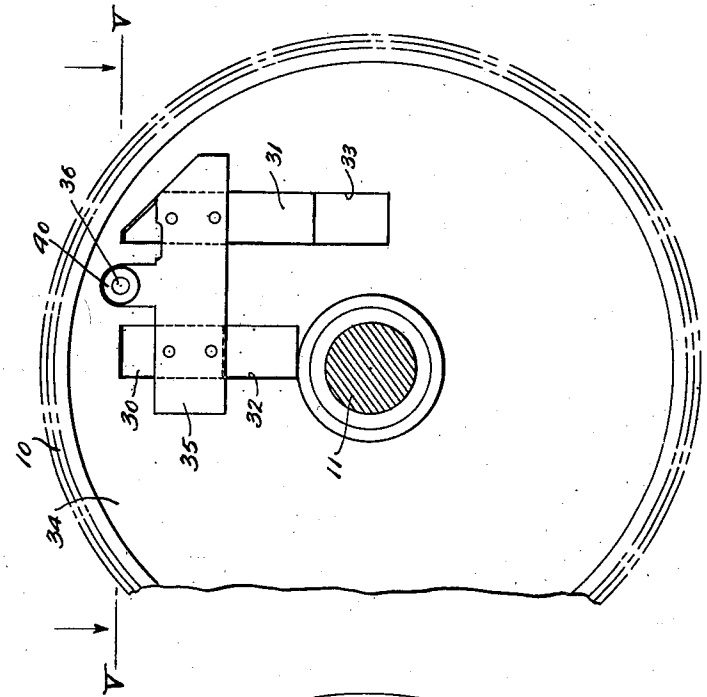


Fig. 3.

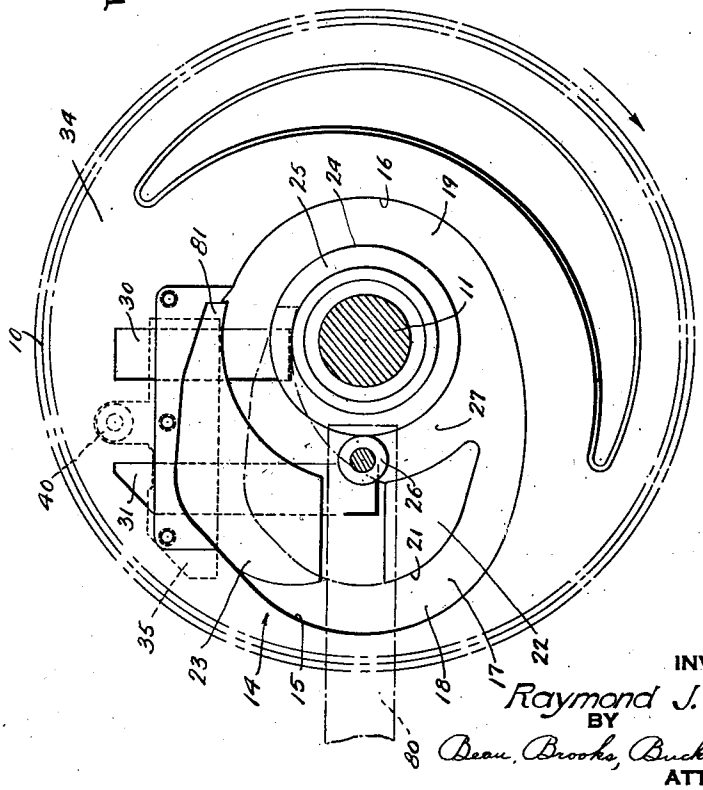


Fig. 2.

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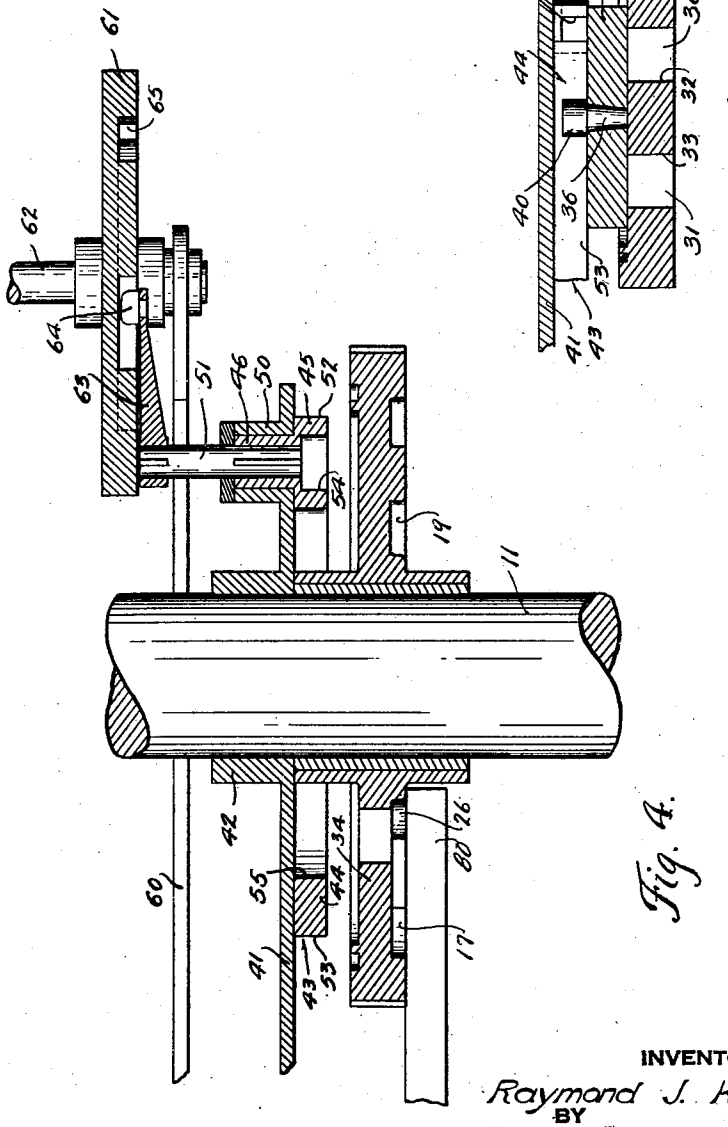


Fig. 4.

Fig. 5.

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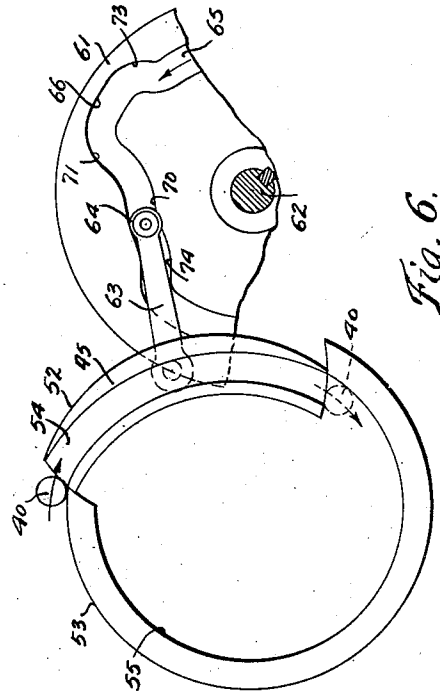


Fig. 6.

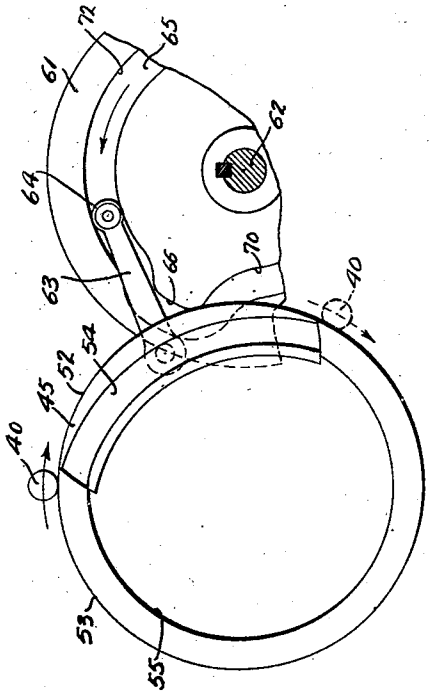


Fig. 7.

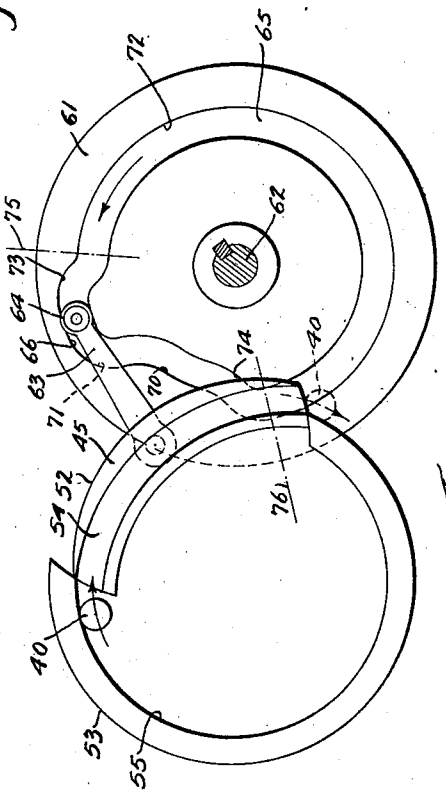


Fig. 8.

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Patented July 13, 1948 2,445,223

UNITED STATES PATENT OFFICE

2,445,223

INTERMITTENT CAM

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Application November 13, 1946, Serial No. 709,471

6 Claims. (Cl. 74—567)

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My invention relates to cams for producing intermittent operation of various machine parts. It is of the type shown and described in the pending application of Lowell B. Gilbert and Raymond J. Kieffer, Serial No. 572,168, filed January 10, 1945.

The intermittent cam described in the Gilbert et al. application is self-actuating and alternate cycles of operation are produced.

The principal object of my present invention is to produce an intermittent cam actuated by separate associated means whereby the cam roller may be permitted to make a number of idle revolutions to each working revolution of the cam, thereby permitting the intermittent working cycle of the cam to have substantially any definite desired relation to the complete operating cycle thereof.

Another object has been to provide independent and mechanically actuated deflector means for transferring the cam-actuated roller from one side of a cam roller holding track to the other side in any desired cycle.

Another object has been to increase the number of shifting degrees of the cam thereby making the inclined working surfaces thereof more gradual, whereby the impactive action of the cam-actuated roller upon the working surfaces of the cam may be greatly reduced thereby more smoothly operating the machine being actuated.

Furthermore, my invention permits an increased speed of rotation of the cam while at the same time reducing the impactive action of the roller upon the cam surface.

The above objects and advantages, as well as others which will be apparent to those skilled in the art, have been accomplished by the device shown in the accompanying drawings, of which:

Fig. 1 is a perspective view of my device;

Fig. 2 is a fragmentary front elevation of the cam gear;

Fig. 3 is a similar view of the back side of the gear;

Fig. 4 is a sectional plan view taken on line IV—IV of Fig. 1;

Fig. 5 is a fragmentary sectional view taken on line V—V of Fig. 3; and,

Figs. 6, 7, and 8 are fragmentary side elevational views showing various sequential positions of the parts during the cycle of operation.

My invention is applicable to any machine requiring the cam actuation of a reciprocating part, and may be applied to a chain forming machine like that shown and described in said Gilbert and Kieffer application.

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The device comprises a cam gear 10 which is suitably mounted for rotation upon or with the main shaft 11 of the machine to which my invention is applied, and the shaft is suitably mounted in the main bearings (not shown) of the machine. A cam gear pinion 12 may be provided for driving the cam gear 10, and this is suitably mounted upon an operating shaft 13.

The gear 10 carries the forming cam 14 which is of the usual face cam type giving motion in opposite directions. It is formed in its face with a groove 17 and provided with a working portion 18 and a non-working portion 19. A non-working groove 27 is also formed in the face of the cam and a portion of this groove is concentric with the non-working portion 19 of the groove 17. The groove 17 is bounded by an outer working surface 15 and an outer non-working surface 16. The groove 17 is also bounded by an inner working surface 21 formed upon a stationary cam portion 22 and a movable cam portion 23. An inner non-working cam surface 24 is formed by the hub 25 of the gear and serves as a boundary for the non-working portion 19 of the groove 17 and the coincidental portion of non-working groove 27. The cam-actuated roller is shown at 26 and is designed to engage either the working groove 19 or the non-working groove 27. This roller is transferred from one groove to the other by the movable cam portion 23 which is carried by slide blocks 30 and 31 mounted for reciprocation respectively within parallel channels 32 and 33 formed in the web 34 of the gear 10. These slide blocks extend through the channels and a shifter plate 35 is secured to them. The shifter plate which is located on the side of the gear web opposite to the movable cam portion is provided with a stud 36 extending outwardly from the plate and carrying a holding track roller 40 at its extreme end, whereby the shifter plate 35 and movable cam portion 23 may be moved radially toward and away from the center of the cam gear, as shown in Figs. 1 and 2 by the full line and dot and dash line positions of the movable cam portion, whereby the cam-actuated roller 26 may be caused to move from the working groove 17 to the non-working groove 27, or vice versa, as will be hereinafter more fully described.

Mounted adjacent the cam gear 10 is a cam plate 41 having a centrally arranged hub 42 whereby it is mounted upon the main shaft 11. The cam plate 41 is permanently located with relation to the other parts of the device, and it may, if desired, be bolted to the main bearing

(not shown) of the machine with which it its being used. Mounted on the face of the cam plate adjacent the gear is a cam track 43 comprising a stationarily arranged holding track portion 44 and a deflector or shifter portion 45. The shifter portion is provided with a bearing hub 46 which passes through a suitable bearing 50 carried by the cam plate 41, and a shaft 51, actuated by means to be hereinafter described, causes the deflector portion 45 of the track to be shifted to the three positions shown in Figs. 6–8. The shifter portion 45 of the track is provided with an exterior peripheral surface 52 which will complete the circular periphery 53 of the holding portion 44 of the track when this portion of the track is in the neutral position shown in Fig. 7. The deflector portion 45 is also provided with an arc-shaped groove 54 which during certain cycles of operation of the device cause the track roller 40 to be transferred from the exterior periphery 53 of the holding portion of the track to the interior periphery 55 thereof, as shown in Fig. 6; and then, in the desired sequence of operation, from the interior periphery 55 to the exterior periphery 53 thereof, as shown in Fig. 8.

Arranged in spaced relation to the cam plate 41 is a bearing plate 60 which is securely fastened by any suitable means to any stationary part of the machine or to the cam plate 41. Mounted upon this bearing plate 60 is the control cam 61 of my device. This cam is mounted upon a control cam shaft 62 which is connected in any suitable manner to the driving mechanism of the intermittent cam, as for instance to the operating shaft 13 thereof, for synchronous rotation with the cam gear 10. As hereinbefore stated, the cam-operated roller 26 may have one, two, three, or more idle or non-working rotations to one working rotation, and therefore the control cam is rotated in relation to the cam gear in the desired ratio. As shown, the parts are so designed as to permit three rotations of the cam gear to each rotation of the control cam. In order to accomplish this cycle of operation, the deflector portion 45 of the cam track 43 is oscillated back and forth, as above described, by means of a rocker arm 63 which is rigidly secured to the outer end of the shaft 51. This rocker arm carries a track roller 64 which engages the working groove 65 of the control cam. In order to accomplish this oscillation from one extreme position shown in Fig. 6 to the opposite extreme position shown in Fig. 8, the groove 65 is provided with an outer dwell 66 and with an inner dwell 70. Each of these dwells is concentric with the center of rotation of the control cam and each is connected to the other by means of a cam surface 71, and each is also connected to one end of a neutral dwell surface 72 by means of inclined cam surfaces 73 and 74. The working portion of the cam surface of the control cam is that portion indicated as lying between the dot and dash lines 75 and 76, the remaining portion of the cam surface being occupied by the neutral dwell surface 72. As shown in the illustrative form of my invention, the track roller 40 is designed to move during its working stroke around the interior periphery 55 of the holding portion of the track for a portion of one revolution only, and around the exterior periphery 53 thereof (during its non-working stroke), for three almost complete revolutions. It is necessary therefore that when the roller is being transferred from the outer periphery to the inner periphery as shown in Fig. 6, that the deflector portion 45 of the track be caused to dwell in its shifting position long enough to effect the transfer, which is accomplished by engagement of the roller 64 with the inner dwell 70. As soon as the transfer above mentioned has been effected, the roller 64 will have been moved from the dwell 70 to the outer dwell 66, during which time the roller will ride over the inclined connecting surface 71 and cause the deflector portion to be moved from the position shown in Fig. 6 to the position shown in Fig. 8 whereby the track roller 40 when in engagement with the groove 54 will be transferred from the inner periphery 55 of the holding track 43 to the outer periphery 53 thereof after the working stroke of the cam-actuated roller 26 is completed. As the control cam 62 now continues to rotate in a counterclockwise direction as indicated by the arrow in Fig. 8, the roller 64 will engage the inclined portion 73 causing the roller to engage the advanced end of the neutral dwell 72. This will move the outer surface 52 of the deflector track portion into registration with the ends of the outer periphery 53 of the holding portion of the track thus completing the track periphery and causing the roller to travel around the combined outer periphery of both portions of the holding track for the desired number of revolutions. During this portion of the cycle, the neutral dwell surface 72, being concentric to the axis of the control cam, will cause the deflector portion of the track to be retained in the position shown in Fig. 7 until the surface 74 of the cam reaches the track roller 64, at which time said roller will be transferred by the deflector track portion to its working position on the inner periphery 55 (shown in Fig. 6).

Since the track roller 40 is carried by the shifter plate 35, this plate is caused to be actuated from one extreme to the other, carrying with it the movable portion 23 of the intermittent cam. By way of illustrative use of the device, I have shown in dot and dash lines in Fig. 3 the forming slide 80 of a chain forming machine or any other device which is to be reciprocated by the cam roller 26. With the cam parts in the position shown in Fig. 2, the track roller 40 will travel around in the non-working groove 27 of the cam and will permit the cam gear to rotate a number of revolutions equal to the number of idle revolutions of the track roller without producing any action upon the slide 80. When, however, the control cam has reached the position shown in Fig. 6, and the track roller 40 is transferred from the outer non-working periphery of the holding portion of the track to the inner working periphery thereof, the movable portion 23 of the cam will be moved from the full line position of Fig. 2 to the dot and dash position in this figure. When moved to this position, the non-working groove 27 of the cam will be closed by leg 81 of the movable cam portion and the roller 26 will be guided thereby into the working groove 17 thereby causing the reciprocation of the slide 80. As the cam roller reaches the finishing end of the irregular or working portion 18 of the groove 17 and as the roller is approaching the outer concentric non-working portion 16 thereof, the control cam will have actuated the deflector portion 45 of the track to the position shown in Fig. 7 which will cause the cam roller 26 to be guided into the non-working groove 27 where it will remain until the deflector portion of the track is again actuated to the position shown in Fig. 6.

What is claimed is:

1. An intermittent cam comprising a rotating cam disk formed in its face with a working groove and a non-working groove, a cam roller engageable with and controlled by said grooves, a fixed cam part carried by said disk and having cam faces common to both cam grooves, a movable cam part carried by said disk, said movable part being shiftable in linear direction and having cam faces registrable with either cam groove, stationarily arranged annular holding means for retaining said movable cam part in either of its operative positions, a deflector forming a part of said holding means and operable to shift said movable part to either of its operative positions, and separately operated means for actuating said deflector in synchronism with the operation of said cam disk.

2. An intermittent cam comprising a rotating cam disk formed in its face with a working groove and a non-working groove, a cam roller engageable with and controlled by said grooves, a fixed cam part carried by said disk and having cam faces common to both cam grooves, a movable cam part carried by said disk, said movable part being shiftable in linear direction and having cam faces registrable with either cam groove, shifter means cooperative with said movable part, stationarily arranged annular holding means having an inner periphery and an outer periphery for retaining said shifter means to hold said movable part in either of its operative positions, a deflector forming a part of said holding means and operable to deflect said shifter means from one periphery of said holding means to the other, and separately operative means for actuating said deflector in synchronism with the rotation of said cam disk.

3. An intermittent cam comprising a rotating cam disk formed in its face with a working groove and a non-working groove, a cam roller engageable with and controlled by said grooves, a fixed cam part carried by said disk and having cam faces common to both cam grooves, a movable cam part carried by said cam disk, said movable part being shiftable in linear direction and having cam faces registrable with either cam groove, shifter means cooperative with said movable part, stationarily arranged annular holding means having an inner periphery and an outer periphery for retaining said shifter means to hold said movable part in either of its operative positions, a deflector forming a part of said holding means and formed with an outer surface movable to a position of registration with the outer periphery of said holding means, said deflector also having an arc-shaped groove for connecting the outer periphery at one end of the holding means with the inner periphery at the opposite end thereof in either of two extreme positions of said deflector, and separately operated means for actuating said deflector in synchronism with said cam disk.

4. An intermittent cam comprising a rotating cam disk formed in its face with a working groove and a non-working groove, a cam roller engageable with and controlled by said grooves, a fixed cam part carried by said disk and having cam faces common to both cam grooves, a movable cam part carried by said disk, said movable part being shiftable in linear direction and having cam faces registrable with either cam groove, stationarily arranged annular holding means for retaining said movable cam part in either of its operative positions, a deflector forming a part of said holding means and operable to shift said movable part to either of its operative positions, and a separately operated control cam rotatable in timed relation to the rotation of said cam disk for controlling the movement of said deflector.

5. In an intermittent cam having alternate paths of cam roller travel, a fixed cam part and a movable cam part for defining said paths, and shifter means for controlling the movements of said movable part to guide the cam roller into either of the paths, of means for actuating said shifter, comprising a fixed annular holding track formed with a cut-away portion and having an outer periphery and an inner periphery, a roller carried by said shifter means and engageable with either periphery of said holding track, a deflector mounted in a cut-away portion of said track and movable to a position for completing the outer periphery of said track, said deflector having a fixed axis of oscillation and formed with a transfer groove registrable alternately at opposite ends with one end of the outer track periphery and the opposite end of the inner track periphery, and separately operated control means for actuating said deflector in synchronism with the rotation of said cam.

6. In an intermittent cam having alternate paths of cam roller travel, a fixed cam part and a movable cam part for defining said paths, and shifter means for controlling the movements of said movable part to guide the cam roller into either of the paths, of means for actuating said shifter, comprising a fixed annular holding track formed with a cut-away portion and having an outer periphery and an inner periphery, a roller carried by said shifter means and engageable with either periphery of said holding track, a deflector mounted in a cut-away portion of said track and movable to a position for completing the outer periphery of said track, said deflector having a fixed axis of oscillation and formed with a transfer groove registrable alternately at opposite ends with one end of the outer track periphery and the opposite end of the inner track periphery, a separately operated control cam, and means connecting said deflector with said control cam.

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