Nov. 13, 1962 K. A. KOSBAB ETAL 3,063,299

PUMP ASSEMBLY

Filed Oct. 6, 1958 3 Sheets-Sheet 1

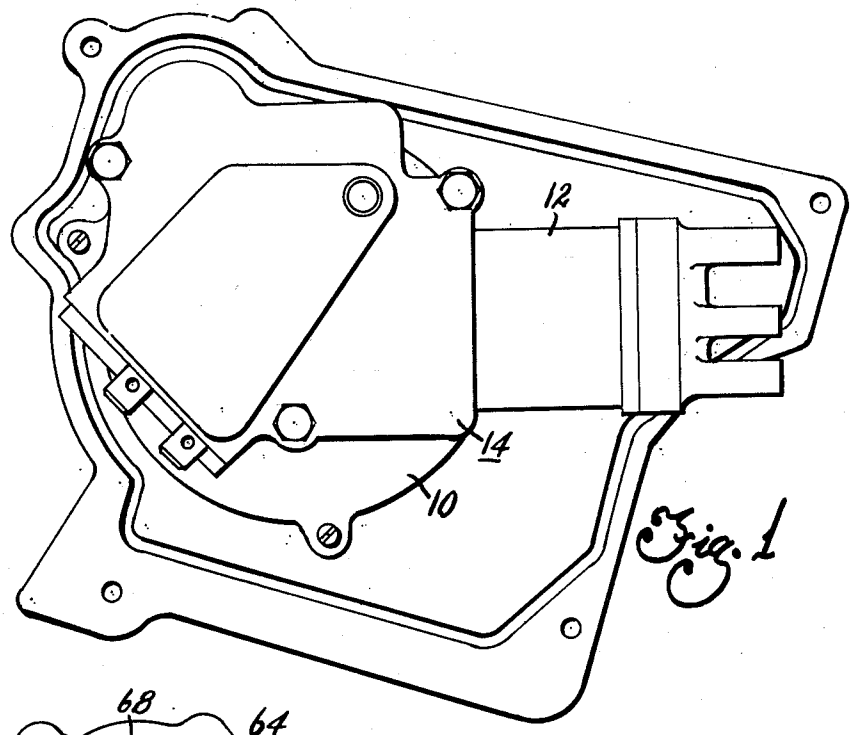


Fig. 1

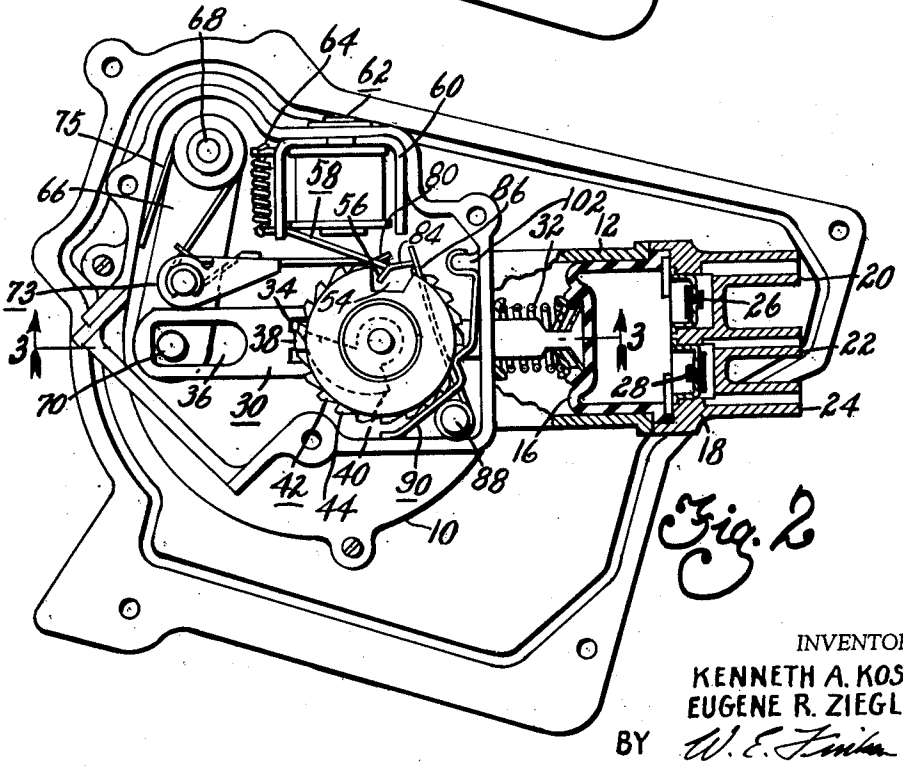


Fig. 2

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PUMP ASSEMBLY

Filed Oct. 6, 1958 3 Sheets-Sheet 2

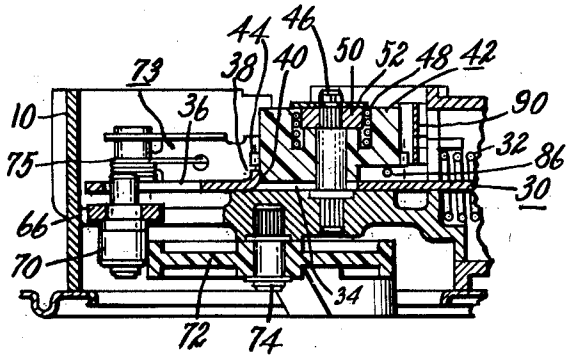


Fig. 3

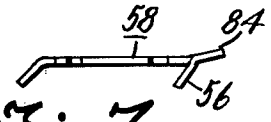


Fig. 7

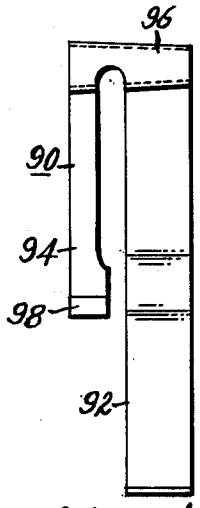


Fig. 4

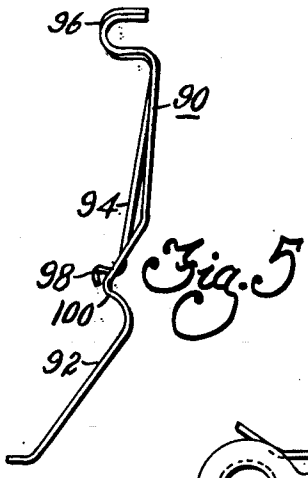


Fig. 5

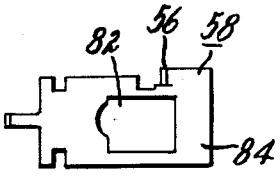


Fig. 6

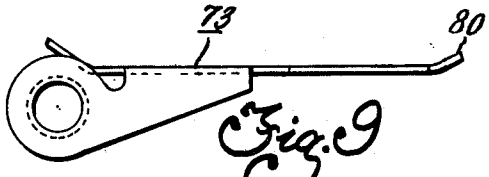


Fig. 9

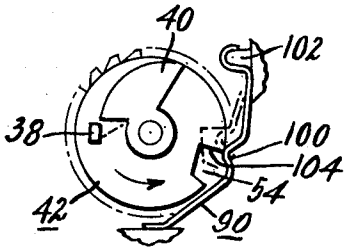


Fig. 10

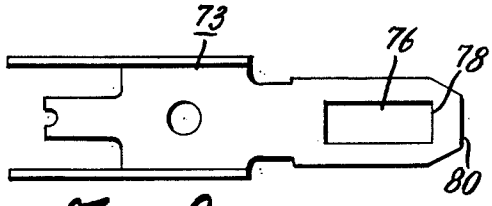


Fig. 8

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Nov. 13, 1962 K. A. KOSBAB ETAL 3,063,299

PUMP ASSEMBLY

Filed Oct. 6, 1958 3 Sheets-Sheet 3

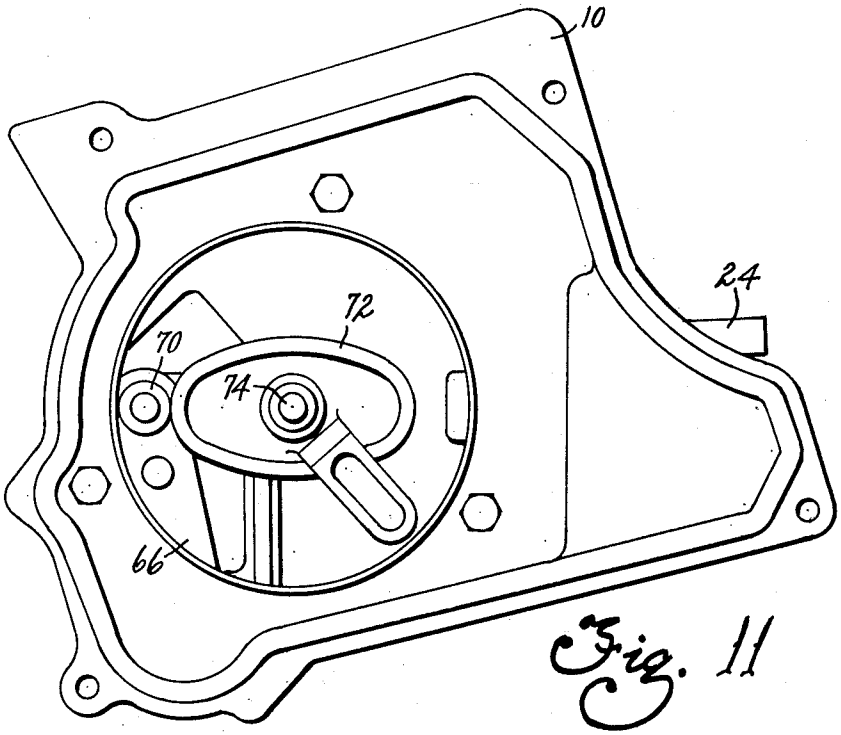


Fig. 11

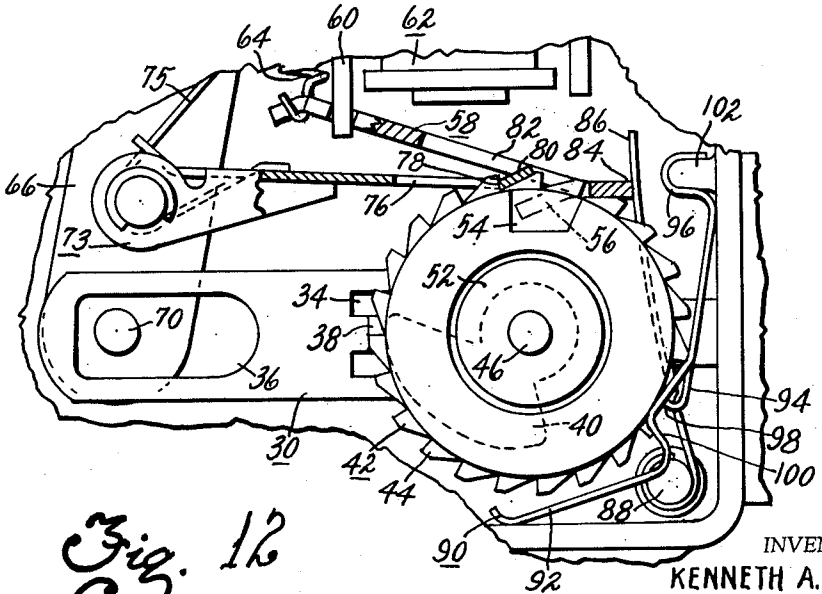


Fig. 12

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3,063,299

PUMP ASSEMBLY

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Filed Oct. 6, 1958, Ser. No. 765,615
6 Claims. (Cl. 74—125)

This invention pertains to a pump assembly, and particularly to improved control mechanism for a pump assembly of the reciprocating type.

In copending applications Serial No. 674,495 filed July 26, 1957, in the name of Harry W. Schmitz et al., now Patent No. 3,010,136 and Serial No. 709,056 filed January 15, 1958, in the name of Eugene R. Zeigler, now Patent No. 2,905,962, both assigned to the assignee of this invention, reciprocating pump assemblies particularly designed for use in a windshield cleaning system are disclosed. The control mechanism for the reciprocating pump includes a ratchet cam assembly which is rotatable in one direction and restrained against rotation in the opposite direction by a coil spring brake. However, it has been observed that due to production tolerances, the coil spring brake does not always perform its necessary function of preventing reverse rotation of the ratchet cam assembly.

The present invention relates to an improved pump assembly of the general type disclosed in the aforementioned copending applications including an auxiliary spring-type hold pawl, or ratchet lock, for preventing reverse rotation of the ratchet cam. In addition, the novel ratchet lock coacts with the ratchet cam to move the ratchet cam throughout a distance of one tooth at the end of the pumping cycle so as to assure positive engagement of the lockout cam with the pump rod lug. Accordingly, among our objects are the provision of an improved pump assembly; the further provision of a spring type ratchet lock for preventing reverse rotation of a ratchet wheel; and the still further provision of auxiliary means for moving a ratchet cam assembly throughout a distance of one tooth when the ratchet cam is moved to a predetermined angular position.

The aforementioned and other objects are accomplished in the present invention by incorporating a combined hold pawl and advancing means in the form of a spring, which spring coacts with the ratchet cam assembly to prevent reverse rotation thereof and advance the ratchet cam assembly throughout a distance of one tooth at a predetermined angular position thereof. Specifically, the pump assembly includes a bellows having a spring effected delivery stroke and a mechanically effected intake stroke. The mechanical intake stroke is effected by a reciprocable pump rod fixedly attached to the bellows and having a lost motion connection with a crank pin. The crank pin is attached to a pivotally supported lever, which crank pin may be integral with a cam follower. The pump rod includes an upstanding lug adapted to coact with a lockout cam formed on a ratchet cam assembly supported for rotation in one direction in the pump housing.

The ratchet cam assembly is supported on a fixed stud and is normally restrained against rotation in the reverse direction by a coil spring clutch. The ratchet cam has peripheral ratchet teeth which can be engaged by a drive pawl attached to the oscillatory lever. During each stroke of the lever, the ratchet cam is advanced one tooth. After a predetermined angular movement of the ratchet cam, the pump rod lug engages the lockout cam so as to interrupt the driving connection between the pump and the lever during continued step by step movement of the ratchet cam assembly.

The ratchet cam assembly is formed with a peripheral cutout portion that receives an armature in a predetermined angular position thereof, which armature prevents engagement of the driving pawl with the ratchet teeth. The novel spring-type ratchet lock of the present invention is disposed within the housing and has a bifurcated portion including legs of different length. One leg has a hooked end portion constituting a hold pawl for preventing reverse rotation of the ratchet cam. The other leg reacts against the housing and has an outwardly bulged intermediate portion that coacts with the cutout in the ratchet cam for moving the ratchet cam throughout the distance of one tooth so that the pump rod lug will solidly engage the lockout cam at the cutoff point.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a view in elevation of the improved pump assembly of this invention.

FIGURE 2 is a view, partly in section and partly in elevation, of the pump assembly shown in FIGURE 1 with the cover and terminal assembly removed.

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 2.

FIGURE 4 is a plan view in elevation of the ratchet spring lock.

FIGURE 5 is a side view in elevation of the ratchet spring lock.

FIGURE 6 is a plan view in elevation of the armature.

FIGURE 7 is a side view in elevation of the armature.

FIGURE 8 is an enlarged plan view in elevation of the drive pawl.

FIGURE 9 is an enlarged side view in elevation of the drive pawl.

FIGURE 10 is a diagrammatic view of the manner in which the ratchet spring lock advances the ratchet cam.

FIGURE 11 is a rear view in elevation of the improved pump assembly of this invention.

FIGURE 12 is an enlarged fragmentary view, partly in section and partly in elevation, of a portion of the pump assembly shown in FIGURE 2.

With particular reference to FIGURE 1, the pump assembly includes a housing **10** having an integral cylindrical pump casing **12** and a cover assembly **14** for the control mechanism. With reference to FIGURE 2, wherein the cover assembly **14** is removed, and the pump casing **12** is shown in section, the fluid displacing member comprises an elastomeric bellows, or bulb, **16**, the open end of which is attached to check valve housing **18** having an inlet nipple **20** and a pair of outlet nipples **22** and **24**. The inlet nipple **20** communicates with the bellows **16** through a one-way inlet check valve **26**, and the bellows **16** communicates with the outlet nipples **22** and **24** through a one-way outlet check valve **28**. The closed end of the bellows **16** is attached to the end of a reciprocating pump rod **30**, a coil spring **32** encompassing a portion of the rod **30**. One end of the spring **32** engages the housing **10** and the other end engages the bellows **16**, the spring **32** being used to collapse the bellows **16** and effect the delivery stroke thereof.

As seen in FIGURES 2 and 3, the pump rod **30** has an intermediate elongated slot **34** and a second elongated slot **36** adjacent the end thereof. In addition, the pump rod **30** has an upstanding lug **38** which coacts with a lockout cam **40** formed as an integral part of a ratchet cam assembly **42**. The ratchet cam assembly includes a peripheral toothed portion **44** and is supported for rotation on a fixed stud, or shaft, **46**. A coil spring brake **48** encompasses a portion of the hub of the ratchet cam **42** and also a por-

tion of a head member 50 attached to the fixed shaft 46. The coil spring brake 48 is retained in position by a cap 52 which is pressed over a knurl on the shaft 46. The function of the coil spring brake 48 is to prevent rotation of the ratchet cam 42 in the clockwise direction, as viewed in FIGURE 2.

The ratchet cam 42 is also formed with a peripheral cutout 54, axially offset from the toothed periphery 44, which receives a tang 56 of an armature 58 when the ratchet cam 42 is in the "off" position, as indicated in FIGURE 2. The armature 58 is pivotally attached to a U-shaped magnetic frame 60 which supports an electromagnet winding and core assembly 62. The armature 58 is spring biased into engagement with the ratchet cam by a coil spring 64.

The lockout cam 40 may extend throughout an arcuate distance of 120° and terminates in abrupt shoulders radial to the axis of the shaft 46. When the lug 38 of the pump rod 30 engages the lockout cam 40, reciprocation of the pump rod 30 to the right, as viewed in FIGURE 2, by the spring 32 is precluded, and hence the pump is rendered inoperative.

An oscillatory lever 66 is pivotally supported on a pin 68 in the housing 10, the lever 66 carrying a combined crank pin and cam follower 70, the crank pin portion of which is received within the slot 36 of the rod 30 and thus has a lost motion connection therewith. The oppositely extending cam follower portion engages a two-lobe cam 72 FIGURE 1, rotatably supported on a fixed shaft 74 within the housing 10. The cam 72 is rotated by any suitable means, such as shown in the aforementioned copending application Serial No. 705,199 filed December 26, 1957, in the name of Eugene R. Ziegler, now Patent No. 2,965,913 and assigned to the assignee of this invention. Accordingly, during rotation of the cam 72, oscillatory movement will be imparted to the lever 66. When the lug 38 of the pump rod 30 engages the lockout cam 40, reciprocation will not be imparted to the pump rod 30 and hence the pump will be inoperative.

With particular reference to FIGURE 12, a drive pawl 73 is pivotally attached to the lever 66 and spring biased into engagement with the ratchet cam 42 by a torsion spring 75, one end of which engages the drive pawl 73, the intermediate portion of which encircles the pivot pin 68 and the other end of which reacts against the housing 10. Since the drive pawl 73 is pivotally attached to the lever 66, the drive pawl will be reciprocated during rotation of the cam 72 and oscillation of the lever 66. With reference to FIGURES 8 and 9, the drive pawl 73 is formed with a slot, or window 76, the edge 78 of which is adapted to engage the ratchet teeth 44. In addition, the end 80 of the drive pawl 73 is bent upwardly as clearly shown in FIGURE 9. As seen in FIGURES 6 and 7, the armature 58 is formed with a slot, or window 82, through which the end of the drive pawl 73 extends when the armature 58 is in the position shown in FIGURE 2. Thus, when the electromagnet comprising a winding and coil assembly 62 is deenergized, reciprocation of the drive pawl 73 will not effect step by step movement of the ratchet cam 42, since the inclined end 80 of the drive pawl 73 rides up the ramp portion 84 of the armature 58. Thus, the armature 58 effectively interrupts the driving connection between the pawl 73 and the ratchet cam 42 when the electromagnet is deenergized, and the tang portion 56 of the armature is disposed within the cutout 54 of the ratchet cam. Moreover, at this time the driving connection between the pump rod 30 and the pump is likewise interrupted, since the lug 38 on the rod 30 is in engagement with the lockout cam 40 as clearly shown in FIGURE 2.

The pump assembly of this invention also includes a latchout spring 86, one end of which is pivotally mounted on a pin 88 in the housing 10, and the other end of which coacts with the ramp portion 84 of the armature 58 in the manner set forth in copending application Serial No. 708,197 filed January 10, 1958, in the name of Eugene R. Ziegler, now Patent No. 2,925,618, and assigned to the assignee of this invention. The latchout spring 86 is engageable with the periphery of the lockout cam 40 and functions to automatically recycle the washer pump if the electromagnet is reenergized after completion of the washing cycle during the first revolution of the ratchet cam 42.

The pump assembly also includes a spring-type ratchet lock generally designated by the numeral 90 in FIGURES 2 and 3. As seen in FIGURES 4 and 5, the spring-type ratchet lock comprises a spring metal member having a pair of legs 92 and 94 of different lengths which are interconnected by a hooked end 96. The leg 94, as seen particularly in FIGURE 5, has a hooked end portion 98 which coacts with the ratchet teeth 44 and constitutes a hold pawl for preventing reverse, or clockwise, rotation of the ratchet cam 42. The other leg 92 has a bulged or hooked intermediate portion 100, and the free end of the leg 92 reacts against the housing 10 as shown in FIGURE 2. The hooked end 96 of the ratchet spring lock engages a lug 102 integral with the housing 10.

As alluded to hereinbefore, the ratchet spring lock 90 performs a dual function, namely preventing reverse rotation of the ratchet cam 42 and moving the ratchet cam through a distance of one tooth at the cutoff point of the pump. With reference to FIGURE 10, the manner in which the ratchet spring lock 90 performs its second function will be described. The hooked portion 100 of the leg 92 is aligned with the cutout 54 on the ratchet cam 42. Upon energization of the electromagnet 62, the armature 58 is moved into engagement with the core of the electromagnet thereby establishing the driving connection between the drive pawl 73 and the ratchet cam 42. Accordingly, upon rotation of the cam 72, and oscillation of the lever 66, the ratchet cam 42 will be moved throughout the distance of one tooth in the counterclockwise direction, as viewed in FIGURE 2, during each complete stroke of the lever 66. Since the cam 72 is shown as being a two-lobe cam, the ratchet cam 42 will be moved throughout a distance of two teeth during each complete revolution of the cam 72. As soon as the ratchet cam 42 has moved in the counterclockwise direction throughout a distance of one tooth, the pump rod lug 38 is disengaged from the lockout cam 40, whereupon the spring 32 can effect a delivery stroke of the bellows 16. During continued step by step movement of the ratchet cam, the pump will be intermittently actuated, the intake stroke being completed by movement of the pump rod 30 to the left during clockwise oscillatory movement of the lever 66 as viewed in FIGURE 2, and the delivery stroke being effected by the spring 32 during counterclockwise movement of the lever 66 as viewed in FIGURE 2. After substantially a 240° movement of the ratchet cam 42 in the counterclockwise direction, the cutout portion 54 will be aligned with the hooked portion 100 of the ratchet spring lug 90. At this point, the hooked portion 100 will engage the edge 104 of the cutout 54 and effect a one tooth movement of the ratchet cam 42 in the counterclockwise direction independently of the drive pawl 73. This one tooth movement will enable the pump rod lug 38 to solidly engage the lockout cam 40 at the cutoff point. During continued step by step movement of the ratchet cam 42 to its initial position, as shown in FIGURE 2, the pump is inoperative. When the ratchet cam returns to the position shown in FIGURE 2, the follower tang portion 56 of the armature 58 falls into the cutout portion 54 thereby interrupting the driving connection between the pawl 73 and the ratchet cam.

While the embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. Drive mechanism for a ratchet cam assembly includ-

ing, a reciprocable drive pawl engageable with the ratchet cam assembly for imparting step by step movement thereto in one direction, said ratchet cam assembly having a cutout portion, means operable to prevent reverse rotation of said ratchet cam assembly, and spring means coacting with said cutout portion at only one predetermined angular position of said ratchet cam assembly for imparting a complete step movement thereto independently of said drive pawl when said ratchet cam assembly is moved to a predetermined angular position.

2. In combination, a rotatable ratchet member, means including a drive pawl for imparting step by step movement to said ratchet member, means operable to prevent reverse rotation of said ratchet member, and spring means coacting with said ratchet member at only one predetermined angular position thereof for imparting a complete step movement to said ratchet member independently of said drive pawl.

3. In combination, a stationary shaft, a ratchet member rotatably supported on said shaft having a toothed peripheral portion, means including a drive pawl coacting with the toothed peripheral portion of said ratchet member for imparting step by step movement thereto, coil spring brake means coacting between said stationary shaft and said ratchet member for preventing reverse rotation thereof, and spring means coacting with said ratchet member at only one predetermined angular position thereof for imparting a complete step movement to said ratchet member independently of said drive pawl.

4. In combination, a stationary shaft, a ratchet member rotatably supported on said shaft having a toothed peripheral portion, means including a drive pawl coacting with the toothed peripheral portion of said ratchet member for imparting step by step movement thereto, said ratchet member having a peripheral cutout axially offset from the toothed peripheral portion thereof, means operable to prevent reverse rotation of said ratchet member, and a leaf spring member having an outwardly bulged intermediate portion coacting with an edge of said cutout when said ratchet member is at a predetermined angular position for imparting a complete step movement thereto independently of said drive pawl.

5. In combination, a stationary shaft, a ratchet member having a toothed peripheral portion, means including a drive pawl coacting wtih the toothed peripheral portion of said ratchet member for imparting step by step movement thereto, said ratchet member having a peripheral cutout axially offset from the toothed peripheral portion thereof, and a bifurcated leaf spring having one leg with an outwardly bulged intermediate portion coacting with an edge of said cutout when said ratchet member is at a predetermined angular position for imparting a complete step movement thereto independently of said drive pawl, the other leg of said leaf spring coacting with the toothed peripheral portion of said ratchet member for preventing reverse rotation thereof.

6. Drive mechanism for a ratchet cam assembly including, a reciprocable drive pawl engageable with the ratchet cam assembly for imparting step by step movement thereto in one direction, said ratchet cam assembly having a cutout portion, and spring means coacting with said cutout portion at only one predetermined angular position of said ratchet cam assembly for imparting a complete step movement thereto independently of said drive pawl when said ratchet cam assembly is moved to a predetermined angular position, said spring means comprising a bifurcated leaf spring having one leg constituting a hold pawl for preventing reverse rotation of said ratchet cam assembly.

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