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STEP-BY-STEP MECHANISM

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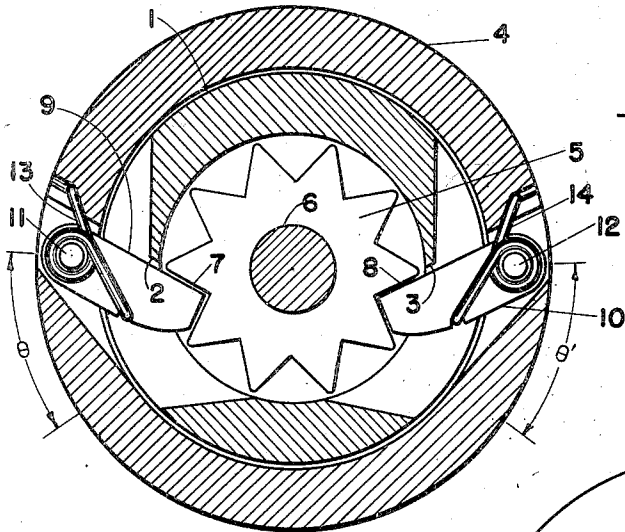


FIG. 1

FIG. 2

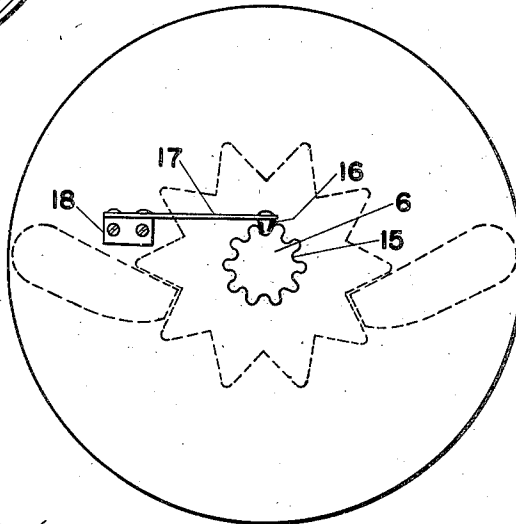
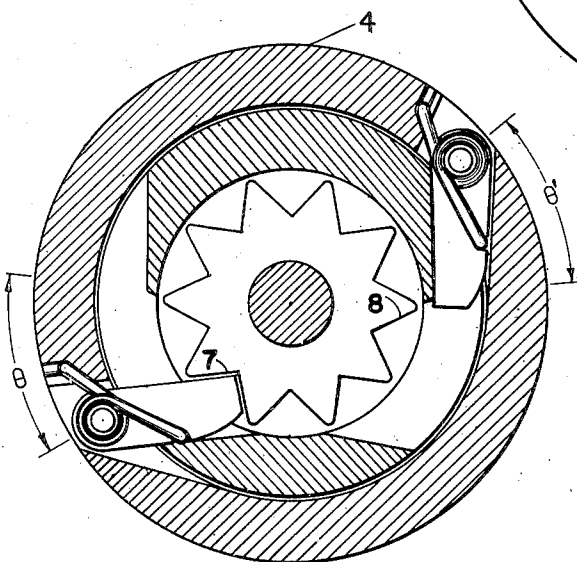


FIG. 3

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STEP-BY-STEP MECHANISM

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6 Claims. (Cl. 74—126)

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1

This invention relates to step-by-step mechanisms and more particularly, to ones which are not reversible.

It is old in the art to move a ratchet wheel step-by-step in either clockwise or counterclockwise direction. The prior art devices, however, are cumbersome and do not provide a simple means for locking the ratchet wheel against movement by other than the actuating mechanism. Usually, such devices have depended on two separate solenoids for the actuation of two pawls. Such devices have been difficult to maintain and have been uncertain in operation.

An object of this invention is to provide a compact, rugged and simple mechanism in which the component parts are symmetrically arranged about a common shaft to provide dynamic balance. Another object is to provide a step-by-step mechanism which can be easily operated in either clockwise or counterclockwise direction and which is locked against operation by forces other than those applied by the actuating means.

A further object is to provide a mechanism in which there is an efficient transfer of power from input to output elements.

The invention also resides in certain novel features of the component structure and arrangement which facilitate carrying out the foregoing objects and which contribute both to the simplicity of the step-by-step mechanism and to the reliability of operation as well as to the ease and expeditious manner with which step-by-step movements may be obtained. The mechanism is valuable for a wide range of uses, such as actuation of relays, signals and other devices. Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawing in which:

Figure 1 is a sectional view of the apparatus in centered position.

Figure 2 is a partial exterior view showing the detent means.

Figure 3 is a sectional view of the apparatus after a step movement in the counterclockwise direction.

While the invention is susceptible of various modifications and alternative arrangement, I have shown in the drawing, and will herein describe in detail the preferred embodiment. It is to be understood, however, that I do not intend to limit the invention by such disclosure for I aim to cover all modifications and alternative arrangements falling within the spirit and scope

2

of the invention as defined in the appended claims.

Figure 1 shows a fixed body member 1 the ends of which form stops 2 and 3 about which is disposed a sleeve 4 which is mounted for partial rotation in either clockwise or counterclockwise direction. Inside the fixed body member 1 is a star wheel 5 which is locked on shaft 6 for rotation in either direction. The star wheel is formed by substantially right angle notches, such as 7 and 8, the apices of which are directed toward the center of the wheel.

The body member is cut away to form two raised portions 19 and 20 with an intervening space to permit passage of the pawls for engagement with the star wheel. The exterior wall of the portion 19 is cut straight away to provide a space between the body member and sleeve to accommodate the inactive pawl, as may be seen in Fig. 3. The other raised portion 20, serves as a means for limiting the rotation of the sleeve. When turning the sleeve, the active pawl abuts this portion (Fig. 3) to restrict turning of the star wheel to a predetermined number of notches.

Pawls 9 and 10 are rotatively mounted on pivots 11 and 12 on opposite sides of the sleeve approximately 180 degrees apart. The pawls are biased by springs 13 and 14 in opposite directions into engagement with the star wheel. The engaging ends of the pawls extend through openings in the fixed body member and have approximately right angled engaging faces.

As shown in Figure 2, the outer end of shaft 6, carries notches 15 which are disposed in symmetry with the notches of the star wheel. Detent member 16 is mounted on spring 17 and support 18 for yielding engagement with notches 15.

In operation, a clockwise angular rotation θ' , or counterclockwise angular rotation θ is applied to sleeve 4. As shown in Figure 3 the counterclockwise rotation causes the pawl 9 to push star wheel 5 counterclockwise on shaft 6. The stop member 3 on the fixed body member disengages pawl 10 from notch 8 against the action to spring 14.

In resetting the sleeve, the star wheel and shaft will be held stationary by detent 16 acting on one of the notches 15 which agree in position with the notches in the star wheel. As the sleeve moves back to the center position after a counterclockwise step the pawl 9 rides over notch 7 on the star wheel and seats in the next adjacent notch. Pawl 10 at the same time seats in the

3

notch adjacent to notch 8. The mechanism is symmetrical and action in a clockwise direction is similar to that described for the counterclockwise direction except that the actions of pawls 9 and 10 are interchanged.

Due to the opposed position of pawls 9 and 10, the mechanism is irreversible. Application of reversed power impulses, such as torques on the output shaft 6 sufficient to overcome the action of the detent, produces no rotation for the mechanism is locked by the pawls to prevent rotation of the star wheel and, therefore, the shaft. Such torques on the output shaft might be the result of shock on the device which is driven by the step-by-step mechanism.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What I claim is:

1. A step-by-step mechanism providing either clockwise or counterclockwise rotation comprising a fixed body member, a rotatable star wheel mounted within the body member, a concentrically rotatable sleeve enclosing the body member, and two pawls mounted on said sleeve, the pawls being biased in opposite directions into engagement with the star wheel for alternate operation.

2. An irreversible step-by-step mechanism providing either clockwise or counterclockwise rotation comprising a stationary body member, a rotatable star wheel mounted within the body member, a concentrically rotatable sleeve enclosing the body member, and two pawls mounted on said sleeve, the pawls being biased in opposite directions into engagement with the star wheel for alternate operation, said stationary member disengaging one of the pawls when the other is operating the star wheel.

3. An irreversible step-by-step mechanism providing either clockwise or counterclockwise rotation comprising a fixed body member, a rotatable star wheel mounted within the body member, a concentrically rotatable sleeve enclosing the body member, two pawls mounted on said sleeve, the pawls being biased in opposite directions into engagement with the star wheel for alternate operation, said fixed member disengaging one of

4

the pawls when the other is operating the star wheel, and means for holding the star wheel stationary while the sleeve is repositioned after an operation.

4. An irreversible step-by-step mechanism providing either clockwise or counterclockwise rotation comprising a stationary member, a rotatable star wheel mounted with said member, a concentrically rotatable sleeve enclosing said member, two pawls mounted on said sleeve on opposite sides of the star wheel, springs biasing the pawls in opposite directions into engagement with the star wheel, stops integral with said member and positioned adjacent the pawls in the directions in which the pawls are biased, rotation of the sleeve in either direction causing one pawl to rotate the star wheel in the same direction while the other pawl is disengaged by its adjacent stop, and means for holding the star wheel stationary while the sleeve is repositioned after an operation, rotation of the star wheel in either direction by forces other than those applied by the pawls being prevented by the opposed pawls.

5. A step-by-step mechanism comprising a stationary hollow body circular in cross section, a portion of the body being cut away to provide pawl engaging stops and a sleeve movement limiting means, a circular sleeve concentrically mounted with respect to and enclosing the body, a shaft extending concentrically with the body, a star wheel mounted on the shaft and operable within the body, and spring biased pawls pivoted on the sleeve and adapted to actuate the star wheel when the sleeve is rotated about the body.

6. A device as in claim 5 and a means for holding the shaft against adverse rotation when the sleeve is returned to its normal position, said means including indentations on one end of the shaft and a spring compressed member engaging in the indentations.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
828,570	Regan	Aug. 14, 1906
1,080,486	Sheagren	Dec. 2, 1913