Jan. 19, 1937. C. H. TAYLOR 2,067,990

PAWL AND RATCHET DEVICE

Filed Oct. 2, 1935 2 Sheets-Sheet 1

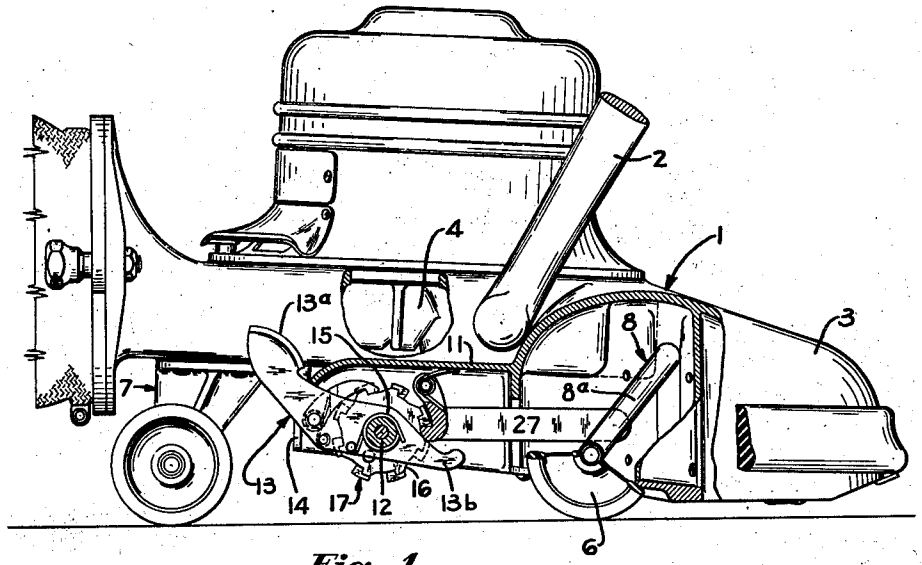


Fig. 1

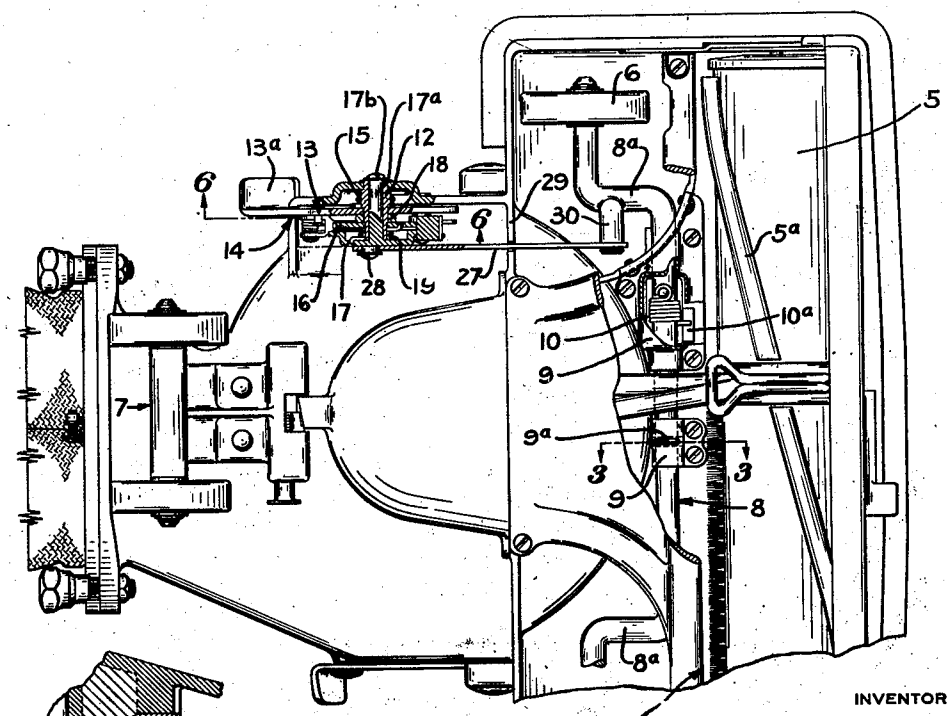


Fig. 2

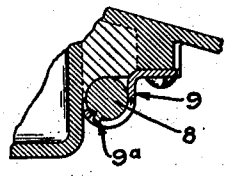


Fig. 3

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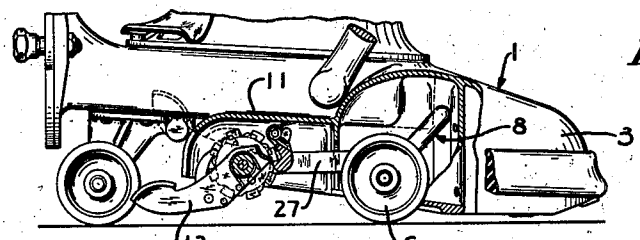


Fig. 4

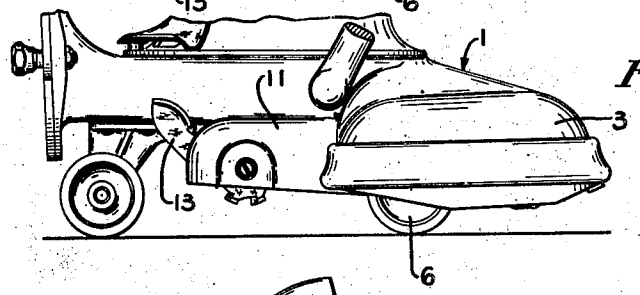


Fig. 5

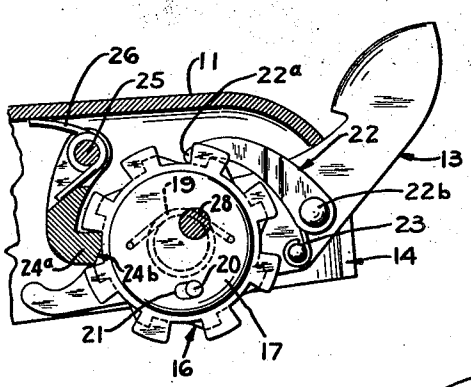


Fig. 6

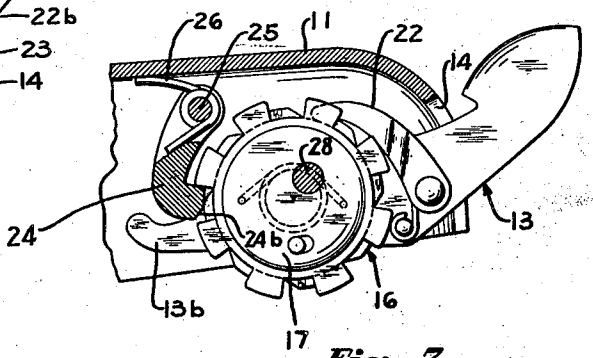


Fig. 7

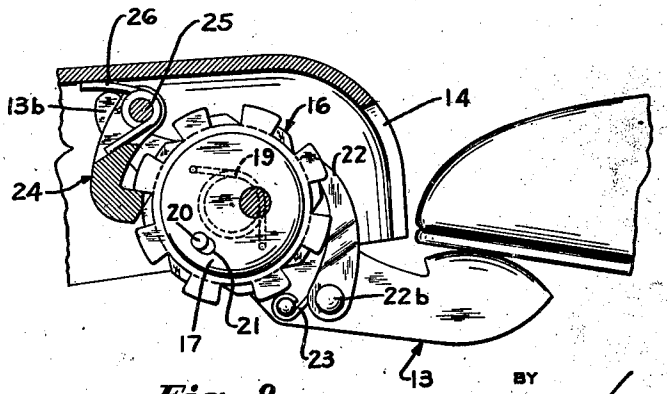


Fig. 8

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PAWL AND RATCHET DEVICE

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Application October 2, 1935, Serial No. 43,131

8 Claims. (Cl. 74—155)

This invention relates to improvements in suction cleaners and more particularly to means for adjusting the height of the nozzle of a suction cleaner with relation to the surface of the floor covering to be cleaned.

The object of the invention is to provide a simple and effective mechanism for accomplishing the desired adjustment either for the purpose of gauging the nozzle height to the particular kind of floor covering or for elevating the nozzle and associated parts above or out of contact with the floor covering when the cleaner is being operated with the auxiliary cleaning tools and connecting hose.

Although nozzle adjusting devices have long been associated with suction cleaners, the present invention is characterized by a foot actuated pedal and a novel type of ratchet mechanism operating the primary adjusting members in such manner as to obtain the required adjustment with the least physical effort and without unduly complicating the structure of the cleaner.

The preferred embodiment of the invention is disclosed in the accompanying drawings in which:—

Figure 1 is a view in side elevation of a suction cleaner with portions broken away to show the nozzle adjusting mechanism.

Figure 2 is a bottom plan view of the cleaner showing the nozzle adjusting mechanism in section.

Figure 3 is an enlarged detail view in section taken on line 3—3 of Figure 2.

Figure 4 is a view of the cleaner in side elevation similar to Figure 1 showing the nozzle in lowered position and the foot pedal in its depressed position.

Figure 5 is a view similar to Figure 4 showing the cleaner with the nozzle in elevated position.

Figures 6, 7 and 8 are enlarged views in section taken on line 6—6 of Figure 2 and showing the successive positions of the parts of the adjusting mechanism during each downward stroke of the foot pedal.

The suction cleaner to which the adjusting mechanism is applied comprises in general a wheeled casing 1 adapted to be maneuvered over the floor by a handle having a forked extremity or bail 2 pivoted to the casing. The forward portion of the casing constitutes the nozzle 3, the same having a wide downwardly opening slot 3a through which the air is drawn by suction maintained by a motor driven fan 4 mounted within the casing. Also driven by the fan is a cylindric agitator 5 extending lengthwise of the nozzle opening and having helically arranged beater bars 5a projecting slightly from its surface for contact with the floor covering.

The cleaner is supported upon wheels preferably consisting of a pair of front wheels 6, 6, located just rearwardly of the nozzle slot 3a and adjacent opposite ends thereof and a double wheel caster assembly 7 mounted centrally and at the rear of the casing 1.

As a preferable and suitable mounting for the front wheels, a shaft 8 is journalled within the nozzle portion 3 of the casing just rearwardly of the nozzle opening 3a and above the axis of the wheels, said shaft having its end portions bent at right angles to provide crank arms 8a, 8a terminating in stub shafts on which the wheels 6, 6 are journalled. Suitable bearings 9, 9 support the central portion of the shaft 8 for a rocking movement limited to an arc of something less than 180 degrees by a suitable pin and slot connection 9a in one of the bearings 9 as shown in Figures 2 and 3.

As clearly shown in Figure 1 the crank arms 8a, 8a normally assume a position of rearward inclination to the vertical plane of the axis of the shaft 8, being held in that position by the action of a torsion spring 10 surrounding the shaft with one end anchored thereto and the other end bearing against a shoulder 10a on the casing. Hence, by swinging the crank arms forwardly or counter-clockwise against the tension of the spring 10, the nozzle will be elevated as the wheels approach a vertical position.

The range of adjustment is thus confined to arc between the vertical and rearwardly inclined positions of the wheel supporting crank arms 8a, 8a and the mechanism about to be described functions to obtain and maintain this adjustment.

The adjusting mechanism is preferably mounted on one side of the casing 1 and partially, if not almost completely enclosed within a separate housing 11, preferably cast integral with the casing 1 just rearwardly of the nozzle portion 3. The support for the adjusting mechanism located within the housing 11 is a tubular bearing or stub shaft 12, supported at one end only in the outer vertical wall of the housing and projecting inwardly therefrom.

As clearly shown in Figure 2 a foot actuated lever 13 is mounted on the shaft 12 immediately adjacent the side wall of the housing, said lever projecting through a slot 14 in the rear wall of said housing and terminating in a pedal 13a immediately exterior thereof. Coiled around the stub shaft 12 between the lever 13 and the side

wall of housing 11 is a coil spring 15 having one end anchored in the housing wall and the other end to the lever, thereby acting to hold the latter in its elevated position. Incidentally, the lever 13 has a short arm 13b on the opposite side of the stub shaft from its pedal extremity, said arm 13b serving as a stop to limit the depression of the pedal under the pressure of the foot as will presently be seen. Also, the coil spring 15 is not to be confused with another coil spring associated with the pedal operated ratchet mechanism and presently to be identified.

The ratchet mechanism comprises a pair of discs 16 and 17 mounted substantially face to face to rotate about the stub shaft 12, the disc 16 being journalled on the shaft just inwardly beyond the foot actuated lever 13 and separated therefrom by a spacing collar 18. The outermost disc 16 is preferably flat, whereas the disc 17 is located at the extreme inner end of the stub shaft 12 and is provided with an integral shaft 17a having bearing in the central bore of the stub shaft 12 and held in place by a screw and washer as at 17b (Figure 2).

Moreover, the disc 17 is dished or concave at its center, whereas the disc 16 is flat, thereby bringing the marginal portions of the two discs into contact with each other and providing a space on the shaft for a torsion spring 19, consisting of two coils or turns surrounding the shaft 12 and having its ends inserted through a hole in each disc as shown in Figure 6. Moreover, these discs are interconnected by a pin 20 carried by the disc 16 and engaging an arcuate slot 21 in the other disc 17, said slot describing a relatively small arc, thereby limiting the relative rotation of the discs to a few degrees, this arc being predetermined by the spacing of the teeth on the discs as will presently be explained.

The peripheries of both discs are surrounded by teeth complementing each other in number and pitch but differing in shape and depth. More definitely, the teeth on the outermost disc 16 are in the nature of ratchet teeth while the teeth on the innermost disc 17 are more in the nature of clutch or cam teeth. For convenience in distinguishing the two discs hereafter, they will accordingly be termed the ratchet disc 16 and the clutch disc 17. Moreover, the teeth on the ratchet disc 16 may be distinguished by their shortness radially and the beveled edge at the forward end of each tooth, whereas the teeth on the clutch disc 17 are substantially square, having radial front and rear edges thus forming uniform U-shaped notches therebetween.

Now, coacting with the ratchet disc 16 is a pawl 22 having the form of a link pivotally mounted on the foot operated lever 13 and having a detent 22a at its free end engaging the ratchet disc 16 at a point above the axis thereof. A coiled torsion spring 23, surrounds a pivot pin 22b on which the pawl is mounted and, anchored at its ends to the pawl and lever, yieldingly holds the former in contact with the ratchet teeth.

To complete the ratchet mechanism assembly a spring actuated keeper or latch member 24 coacts with both discs, at a point spaced in a counter-clockwise direction from the point of contact of the pawl with the ratchet teeth. This latch member is pivoted on a pin 25 supported in the vertical wall of the housing 11 and depending therefrom has a relatively broad detent 24a at its free end, adapted to engage the teeth of both ratchet and clutch discs. A coil spring 26 mounted on the pin 25 acts to press the latch member against the discs.

And finally, a link 27 pivotally connected at one end to a pin 28 eccentrically positioned on the outer face of the cam disc 17, extends horizontally and forwardly through a vertical slot in a transverse wall 29, (Figure 2), separating the forward end of the housing 11 from the compartment or space wherein the wheels 6 and their supporting crank arms 8a are located. The forward end of the connecting rod 27 has pivotal connection with a short arm 30 extending at right angles from the crank arm 8a at the adjacent end of the wheel carrying shaft 8.

Now, it is apparent that in the rotation of the ratchet disc 17, endwise movement will be imparted to the connecting link or rod 27 and if this movement be forwardly the wheel supporting crank arms 8a will be shifted toward a vertical position carrying the wheels forwardly and thus elevating the nozzle to a greater height above the floor level as is seen by comparing Figures 4 and 5. Contrarywise, by shifting the rod 27 rearwardly the tension of the spring 10 on the wheel supporting shaft will act to swing the crank arms rearwardly, thus depressing the wheels and lowering the nozzle.

From Figures 6, 7 and 8, the action of the ratchet mechanism in accomplishing the nozzle adjustment will be readily understood: From the normal and elevated position of the foot lever 13 (Figure 6) in which it contacts with the upper end of the guide slot 14 and held by the action of the spring 15, the first movement upon applying pressure on the pedal is a slight turning of the ratchet disc 16 forwardly in a clockwise direction relative to the cam disc 17, this relative movement being limited to the small arc described by the pin 20 in shifting from the rear to the forward end of the slot 21, as shown in Figure 7. The primary result of this initial relative movement between the discs it to lift or radially shift the latch member 24 out of contact with bottom of the notch to the top edge of the advancing ratchet tooth by the cam action of the latter as its beveled leading edge rides under a complementary beveled edge 24b of the latch member. This preliminary shifting of the latch member 24 will be noted by comparing Figures 6 and 7, and observing particularly that in the radial shifting of the latch member its beveled edge is now in a position to respond to the cam action of the next tooth of the clutch disc 17.

Now, continuing the downward pressure on the foot pedal, the lower limit of which is gauged by the striking of the extension finger 13b against the pin 25 supporting the latch member 24 (see Fig. 8), the following movements occur: First, the ratchet disc 16 is rotated further in a clockwise direction through an arc of about 45 degrees by the pawl 22; second, the cam disc 17 is rotated with the ratchet disc and through the same arc by virtue of the pin and slot connection therebetween; and third, the latch member 24 is lifted completely out of contact with the ratchet disc 16 by the cam action of the advancing tooth of the clutch disc 17, thus causing the latch member to slide over said clutch tooth and drop into the next notch and into contact with the next ratchet tooth as shown in Figure 8.

In the meantime, however, the disc 17, having been rotated with the disc 16 through the arc equal to the throw of the depressed foot lever 13, has imparted an endwise movement to the connecting link 27 which in turn is converted into

the nozzle height adjusting movement of the wheel supporting cranks, as already explained. But it will be observed that the latch member 24 has been shifted to the next notch in the clutch disc 17 so that the foot pedal 13 can now be released without any movement being imparted to said disc 17 in a reverse or counter-clockwise direction. Thus upon releasing the foot pedal the pawl 22 travels upwardly into position to engage the next racthet tooth, while the ratchet disc 16 being momentarily released by the pawl, rotates in a counter-clockwise direction through the arc permitted by the travel of the pin 20 from the forward to the rear end of the slot 21, that is, from the position of Figure 8 to the position of Figure 6, and in this same movement the latch member 24 slips back into full engagement with the ratchet disc, also, from the position of Figure 8 to that of Figure 6. In brief, the act of releasing the foot pedal automatically restores the ratchet mechanism to its initial or normal position and in readiness for further operation of the foot pedal in case repeated depressions thereof are required to obtain the desired height adjustment of the nozzle.

Thus it will be seen that with each depression of the foot pedal, the discs advance through a predetermined arc and always in the same direction, the adjustment being either upwardly or downwardly depending on which portion of its crank circle the pin 28 is traversing at the particular time the adjustment is being made. And this accounts for the fact that it may be necessary to operate the ratchet mechanism repeatedly until the desired nozzle height adjustment is obtained.

Having set forth the preferred embodiment of the invention,

I claim:

1. In a mechanical movement for imparting an intermittent rotary motion, the combination of a ratchet disc and a clutch disc rotative about a common axis and having limited relative rotation through a small arc, tension means acting to hold said discs at one extremity of their relative rotative movement, an operating lever including a pawl engaging teeth on said ratchet disc and operative to rotate said discs through a predetermined angle in one direction during each operating stroke thereof, a spring-pressed latch member engaging teeth on said clutch disc to normally hold the same against rotation, said ratchet disc acting in its initial rotation to displace said latch member and permit the same to pass over one of said clutch teeth with each operating stroke of said operating member.

2. In a mechanical movement for imparting an intermittent rotary motion, the combination of a ratchet disc and a clutch disc rotative about a common axis and having limited relative rotation through a small arc of predetermined angularity, tension means acting to hold said disc at one extremity of the arc representing their relative rotative movement, an operating lever including a pawl engaging peripheral teeth on said ratchet disc and operative to rotate said discs through a predetermined angle in one direction during each operating stroke thereof, a spring-pressed latch member engaging teeth on said clutch disc to hold the same against rotation in the opposite direction, said ratchet teeth acting on said latch member during the initial relative rotation of said disc to release the same from latching engagement with said clutch disc with each stroke of said operating member and to permit it to resume its latching engagement with said clutch disc during the return movement of said operating member to its initial position.

3. In a mechanical movement for imparting intermittent rotary motion, the combination of a ratchet disc and a clutch disc mounted for rotation about a common axis, an operating pawl lever acting to rotate said ratchet disc through a given arc with each stroke thereof, said ratchet disc having teeth with sloping leading edges and said clutch disc having substantially square teeth projecting beyond the said ratchet teeth, a spring-pressed latch member engaging said ratchet disc and provided with a detent engaging said clutch teeth to prevent the backward rotation of said discs after each stroke of said operating lever, said clutch and ratchet discs having pin and slot connection permitting a limited relative movement through a small arc during the initial rotation thereof to effect the radial displacement of said latch member by said ratchet teeth, whereupon the further rotation of said disc permits the latch member to pass over one of the clutch teeth into contact with the top of the following clutch tooth, and a torsion spring acting to rotate the discs relative to each other in the direction opposed to their initial relative rotation upon the release of said operating lever, whereby the parts are returned to their normal positions.

4. A mechanical movement for imparting intermittent rotary motion, the combination of a ratchet disc and a clutch disc mounted for rotation about a common axis, an operating lever acting to rotate said discs through a given arc during each operating stroke thereof, said ratchet and clutch discs having complementary teeth, a spring-pressed latch member engaging the teeth of said discs to prevent their backward rotation after each forward movement by said operating lever, said ratchet teeth being relatively short and having sloping leading edges and said clutch teeth being substantially square and projecting radially beyond their complementary ratchet teeth, said discs having pin and slot connection whereby the same have a limited relative movement through a small arc permitting the ratchet disc to rotate slightly in advance of said clutch disc during the initial rotation of said discs, to displace said latch member radially from the bottom to the top of one of said ratchet teeth, whereupon in further rotation of said discs the latch member passes over the complementary clutch tooth and into latching engagement with the following clutch tooth, and a torsion spring acting upon the release of said operating lever to shift the discs relative to each other in the direction opposed to their normal direction of rotation whereby the complementary ratchet tooth is advanced to its normal position.

5. In a mechanical movement for imparting intermittent oscillating motion to a crank arm, the combination of a pair of discs rotatively mounted in close proximity on a common axis and having pin and slot connection permitting their angular displacement throughout a relatively small arc, a torsion spring acting to normally retain discs at one extremity of their relative angular displacement, said discs having substantially the same pitch diameter and complementary peripheral teeth, the teeth of one of said discs being shorter and sloped at their leading edges, the teeth of the other disc being substantially longer and relatively square, an oper-

ating pawl lever engaging the teeth of the first mentioned disc whereby said discs are rotated through a predetermined arc during each stroke of said operating lever, a spring-pressed latch member engaging the teeth of both of said discs, the shorter teeth of the first mentioned disc acting to displace said latch member radially outward from the complementary tooth of the other disc during their angular displacement at the commencement of the operating stroke of said pawl lever, thereby permitting said latch member to successively pass over the teeth of said last mentioned disc with each stroke of said pawl lever and to effect its normal latching engagement with the following clutch tooth upon the angular displacement of said disc in the opposite direction under the tension of the said torsion spring upon the completion of each operating stroke, and a rod connecting said last mentioned disc with said crank arm.

6. In a mechanical movement for imparting intermittent oscillating motion to a crank arm, the combination of a pair of discs rotatively mounted in close proximity on a common axis and having pin and slot connection permitting their angular displacement through a relatively small arc, a torsion spring acting to normally retain said discs in one position of their relative angular displacement, one of said discs having peripheral ratchet teeth, an operating lever having a pawl engaging said ratchet teeth and operative to rotate said disc through a predetermined angle during each operating stroke thereof, the other said disc having substantially square clutch teeth complementing said ratchet teeth and projecting beyond the same, a spring-pressed latch member engaging the teeth of said discs, said ratchet teeth being inclined at their leading edges and acting to partially release said latch member from the complementary clutch tooth during the angular displacement of the said discs at the commencement of each operating stroke of said operating lever and permitting the same to pass over said clutch tooth and into locking connection with the following clutch tooth upon continued rotation of said discs, whereupon the angular displacement of said discs in the opposite direction and under the tension of said torsion spring restores the discs to their normal positions when said operating lever is released at the completion of each operating stroke, and a connecting rod between said clutch disc and said crank arm.

7. In a mechanical movement for imparting intermittent rotary motion, the combination of a pair of discs rotative about a common axis and having limited relative rotation through a relatively small arc of predetermined angularity, one of said discs having ratchet teeth with sloping leading edges, an operating member having a pawl lever engaging said ratchet teeth for rotating the same through a predetermined arc in the same direction with each stroke thereof, said other disc being provided with clutch teeth projecting radially beyond the teeth of said ratchet disc, a spring-pressed latch member normally engaging said clutch teeth and adapted to be displaced radially by the sloping edges of said ratchet teeth during the initial relative rotation of said discs to facilitate the passing of said latch member from one clutch tooth to the next during the continued unitary rotation of said discs.

8. A mechanical movement for imparting intermittent rotary motion, the combination of a pair of discs rotative about a common axis and having limited relative rotation through a small arc of predetermined angularity, one of said discs having ratchet teeth with sloping leading edges, a pawl lever engaging said ratchet teeth for imparting intermittent rotation to said discs through a predetermined arc in one direction with each stroke thereof, a spring-pressed latch member yieldingly held against said ratchet disc, said other disc being provided with complementary clutch teeth projecting radially beyond said ratchet teeth and likewise engaged by said latch member, said ratchet disc acting in the initial relative rotation of said discs to displace said latch member radially outward from the base of said clutch teeth and thereby permitting the same to pass from one clutch tooth to the next in the continued unitary rotation of said disc during each stroke of said pawl lever.

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