May 31, 1960 T. A. LATCH 2,938,394

MECHANICAL MOVEMENT HAVING UNLOCKING AND LOCKING CHARACTERISTICS

Original Filed March 5, 1951

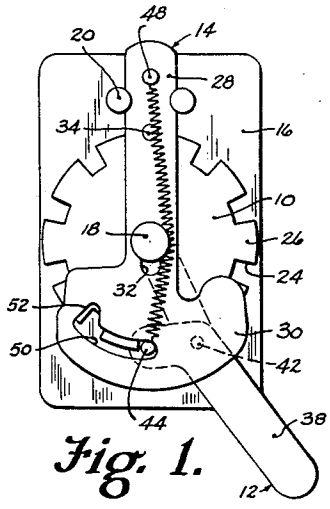


Fig. 1.

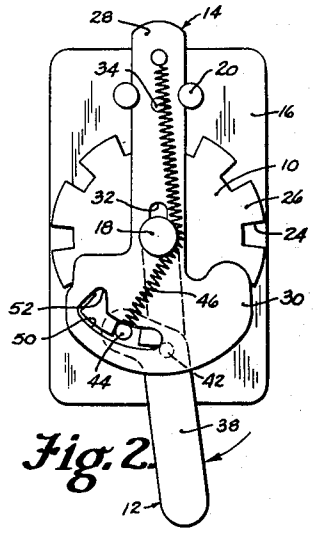


Fig. 2.

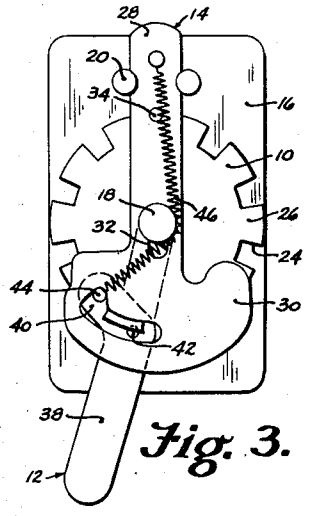


Fig. 3.

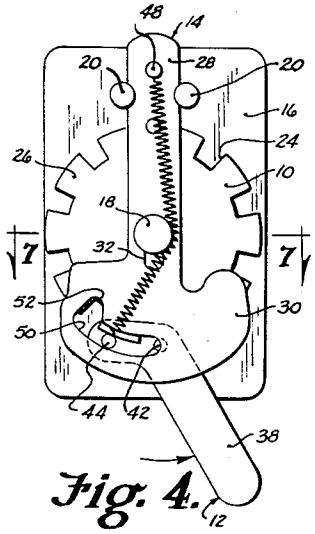


Fig. 4.

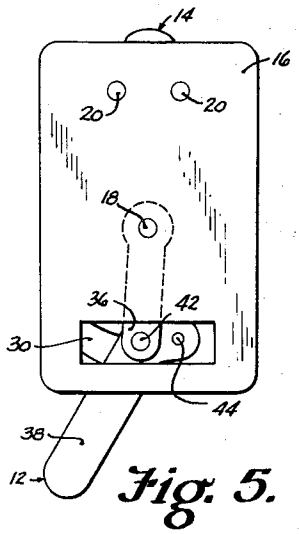


Fig. 5.

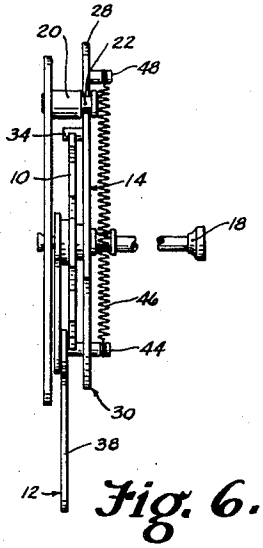


Fig. 6.

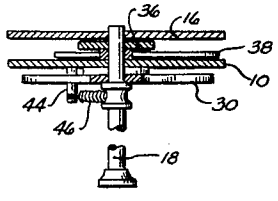


Fig. 7.

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MECHANICAL MOVEMENT HAVING UNLOCKING AND LOCKING CHARACTERISTICS

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Continuation of applications Ser. No. 213,825, Mar. 5, 1951, and Ser. No. 565,959, Feb. 16, 1956. This application Nov. 13, 1958, Ser. No. 773,795

13 Claims. (Cl. 74—152)

This invention is a continuation of my application for United States Letters Patent on a Mechanical Movement Having Unlocking and Locking Characteristics Serial No. 565,959 filed February 16, 1956, which is a continuation of my application for United States Letters Patent on a Mechanical Movement Serial No. 213,825 filed March 5, 1951, and relates to a device for controlling movement and has for its primary object the provision of means in the nature of an intermittent unlocked and locked ratchet or escapement for either imparting rotating movement to a member or limiting the extent of rotative movement thereof to a predetermined step by step, intermittent advancement.

A principal object of my invention is to provide a device having relatively movable parts including principles of ratchet mechanism and escapement apparatus for limiting rotational movement of a peripherally-toothed wheel or disc and including parts for locking and unlocking the disc or wheel against rotation in either direction at times.

A further object of the invention is to provide a simple, positive, and practical method of abutting a locking pallet in and out of mesh with a receptacle device by a traveling pallet whereby one or the other or both pallets are in mesh.

Another important object is to provide a control to always have one or more dogs fully and constantly in mesh with a driven gear or movable device having receptacles.

Another more important object is to unlock a gear or the like and simultaneously put into mesh a dog adapted to travel or move gear without movement of said gear until shifting is full and complete.

Another important object of this invention is the provision of a mechanical movement control device that includes a wheel having spaced apart receptacle notches and a swingable member movable to and from a position engaging the receptacles for controlling the extent of rotation of the wheel, together with a wheel lock that is automatically released during the actuation of the device.

Another important object is to provide a simple, positive, and practical method of shifting into and out of engagement with the receptacle device by constantly and continuously abutting the locking dog with a control or ratchet-type pallet causing a positive engagement as well as disengagement of locking dog.

A further object of the invention is to provide the unlocking of a locking dog and prohibit motion of the receptacle device until full engagement or mesh of control or ratchet-type pallet is completed; provision of rectilinear disengagement of locking dog is shown in the drawing—however, it is not the intention to be limited to rectilinear, transverse, circular, crosswise, or through travel within a receptacle or receptacles of the device.

Another object of the invention is to prevent movement of gear or the like yet to simultaneously unlock

a locking device and put in mesh a traveling dog or pallet in position to cause or control movement of said gear.

Another object of this invention is to provide a ratchet assembly including a notched or toothed wheel and a lock therefor shiftable to and from an operative position, there being a swingable pallet engageable with the wheel when swung in one directional and operable to shift the lock to a released position upon further swinging of the pallet after engagement with a tooth or notch of the wheel, all for the purpose of limiting the wheel to intermittent rotation and to hold the latter against rotation at all times except while the swingable pallet is in engagement with one of the teeth or notches of the wheel, and is rotating the wheel in one direction.

Another object is to provide a simple means to hold gear against rotation in either direction until released, whereby both dogs shift as a unit in preparation for indexing.

Another object is to provide spring means to shift locking pallet into mesh before ratchet-type pallet is out of mesh wherein positive means are provided in event of spring failure whereby ratchet-type pallet abuts locking dog causing it to become in mesh before said ratchet-type pallet can become out of mesh.

Other objects of this invention include the way in which the aforesaid lock and pallet are both yieldably held at one end of their respective paths of travel; the way in which the lock is guided and thereby confined to a predetermined, reciprocable path of travel; the manner of slotting and notching the locking members to assure trouble-free movement of all the parts of the mechanism; the way in which the tooth-engaging, swingable pallet is in turn pivotally secured to a link that is mounted for swinging movement on the axis of rotation of the toothed wheel; and many more minor objects, all of which will be made clear or become apparent as the following specification progresses.

These and other objects will be apparent to those skilled in the art.

My invention consists in the construction, arrangements, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claims, and illustrated in the drawings, in which:

Fig. 1 is a front elevational view of a mechanical movement control device made in accordance with my present invention showing the parts thereof in their normal inoperative positions,

Figs. 2 to 4, inclusive, are elevational views showing the progressive movement of the control pallet and its associated parts from the position shown in Fig. 1 and return,

Fig. 5 is a rear elevation view illustrating the actuating pallet intermediate the ends of its paths of travel,

Fig. 6 is an edge elevation view thereof, and

Fig. 7 is a transverse, cross-sectional view taken on line 7—7 of Fig. 4.

As will hereinafter become apparent to those skilled in the art, the mechanical movement device hereof may be placed in use in a large number of desired ways and to this end it is entirely immaterial whether ratchet wheel **10** is energized or driven by an external force (not shown) or by swingable pallet **12** that is operably connected thereto. In either event the operation of the pallet **12** is to control the rotation of wheel **10** or limit such rotation to a predetermined extent. Additionally, the means of motivation of the wheel **10** is immaterial so far as effect and function of a locking device **14** that is provided therefor.

The three aforesaid main parts **10**, **12** and **14** are

preferably mounted upon a suitable support 16, which in the present instance has been illustrated merely as a flat plate. Plate 16 carries a shaft 18 for rotatively receiving the wheel-like ratchet disc 10 and, if the latter is to be driven by an external source it may be desired to secure the shaft 18 rigidly to the wheel 10 and to rotatably mount the shaft 18 to the plate 16 and/or to additional supporting means including suitable bearings. Additionally, the plate 16 is provided with a pair of spaced apart guide pins 20 each having an annular groove 22 formed therein for slidably receiving the reciprocable locking member 14.

The ratchet wheel 10 is of conventional character and provided with a plurality of evenly spaced apart, peripheral notches or receptacles 24, presenting a number of teeth at its circumference. Here again the precise nature and configuration of the notches or receptacles 24 and the teeth 26 may be varied and is of no particular significance so far as the principles of operation of the present invention are concerned.

It is seen in the drawing, that the reciprocable locking member 14 is substantially T-shaped, presenting an elongated stem 28 and a head 30 on one end of and integral with the stem 28. Ratchet wheel 10 is preferably disposed between the lock 14 and the plate 16 and an elongated longitudinal slot 32 formed in the stem 28, receives the shaft 18 for free, rectilinear, reciprocable movement of the locking member 14 on the longitudinal axis of stem 28. It is now seen that the stem 28 is received by the grooves 22 of pins 20 for sliding movement therein during reciprocation of the lock 14. Stem 28 of lock 14 has a pin 34 between shaft 18 and the pins 20 that projects laterally therefrom toward the plate 16 and normally disposed within one of the notches or receptacles 24 of wheel 10 as illustrated most clearly in Fig. 6 of the drawing.

The shaft 18 also pivotally receives one end of a short link 36 for swinging movement about the axis of rotation of wheel 10. Link 36 is preferably disposed between plate 16 and the wheel 10, as is pallet 12 in the manner shown in Fig. 6 of the drawing.

Pallet 12 is substantially L-shaped presenting a relatively long leg 38 and a short leg 40. A pin 42 pivotally interconnects the pallet 12 at the point of merger between legs 38 and 40 thereof with the link 36 at that end of link 36 opposite to shaft 18. There is provided a pin 44 or ratchet-type traveling dog on the leg 40 of pallet 12 that extends laterally therefrom away from plate 16 terminating in spaced relationship to the outermost face of head 30. Pin 44 receives one end of a coil spring 46 and the opposite end of the latter is joined to a stud 48 on the stem 28 adjacent that end thereof opposite to head 30. The pin 44 on pallet 38 extends through a substantially L-shaped slot formed in the head 30 and including an elongated, arcuate portion 50 and a small notch 52 at one end of the portion 50 and extending toward the stem 28. This slot provides an enclosed continuous abutting track for the pin 44. The head 30 of member 14 with portions 50 and 52 can be considered as the link means connecting stem 28 (and pin 34) to pallet 12 (and pin 44).

All of the component parts of the control device hereof having been set forth and fully described, the operation is as follows:

Normally the pallet 12 is in the position illustrated in Fig. 1 of the drawing with the pin or ratchet dog 44 thereof within one of the notches or receptacles 24 of wheel 10. Spring 46 serves to yieldably hold the pin 44 in such position and, since it has been found advantageous to render the spring 46 common to pallet 12 and lock 14, it also serves to yieldably hold the lock 14 at one end of its path of travel with pin 34 in another of the notches or receptacles 24, which in the present illustration, is diametrically opposed to the notch 24 within which the ratchet pin 44 normally rests. At this time the locking pin 34 will lock the wheel 10 against any rotation. As soon as swinging movement is imparted to the leg 38 of pallet 12 in the direction of the arrow of Fig. 2, pallet 12 will swing on pivot pin 42 since wheel 10, being locked by pin 34, will not permit swinging movement of link 36 on shaft 18 while ratchet pin 44 is within a notch 24. Accordingly, as pallet 12 swings on pivot pin 42, pin 44 will be moved toward the shaft 18 and toward the bottom of the notch or receptacle 24 within which it rests, and by virtue of engagement of pin 44 with head 30 in the track slot portion 50, lock 14 will be shifted along shaft 18 and within grooves 22 to a position moving pin 34 radially outwardly with respect to wheel 10 and out of its proximal notch 24 thus unlocking the wheel as far as the pin 34 is concerned.

As the lock 14 has thus been moved to a released position with respect to wheel 10 against the action of spring 46, continued swinging movement imparted to the leg 38 of pallet 12 in the direction of the arrow of Fig. 2 will impart rotational movement to the wheel 10, or permit such rotation if the wheel 10 is separately energized, until such time as the pin 44 moves to a position to be received by the communicating notch 52 of head 30.

Fig. 2 of the drawing illustrates the positions of the component parts of the device when the lock 14 is in an unlocked condition and at the beginning of rotational movement of wheel 10, with pin 44 intermediate the ends of the slot portion 50. However, at this stage the abutting arcual track slot 50 will hold the ratchet pin 44 in a notch of the wheel 10, and the wheel 10 can only move to and with the member 12.

After lock 14 has been released with respect to wheel 10, the swinging movement of pallet 12 is permitted by virtue of link 36 swinging on shaft 18. In other words, as soon as lock 14 is released, pallet 12, including both of its legs 38 and 40, together with the link 36, swing as a unit on the shaft 18.

Fig. 3 of the drawing illustrates the position of the parts when pin 44 reaches the notch 52. It is highly significant and of importance to note that as soon as the pin 44 reaches a position to be received by notch 52, the ratchet lug is no longer confined to the track 50 and spring 46 will immediately operate to return the lock 14 to its normal operative position, thereby moving the head 30 and shifting the notch 52 thereof to a position partially surrounding the pin 44. Such movement of the lock 14 is permitted because of the fact that the partial rotation of wheel 10 moves a succeeding notch 24 into position for receiving the locking pin 34, and wheel 10 is again locked against rotation. During the movement of pin 44 from one end of the arcuate slot portion 50 toward the notch 52, spring 46 operates to hold the head 30 in sliding engagement with the pin 44, since slot portion 50 is concentric with the axis of rotation of wheel 10.

On return movement of the leg 38 from the position illustrated in Fig. 3 to the position of Fig. 1 as indicated by the arrow in Fig. 4 of the drawing, the first action on the part of pallet 12 is to again swing on pivot point 42 against the action of the spring 46 to move the pin 44 out of notch 52, and such action takes place without counter-rotation of wheel 10 because the latter is locked by pin 34 as shown in Figs. 3 and 4. Pin 44 will not only move out of notch 52 but will slide along the proximal tooth 26 until the same reaches the position shown in Fig. 4 of the drawing in sliding engagement with the outermost arcuate edge of such proximal tooth 26. As soon as the leg 38 reaches the position shown in Fig. 1, the pin 44 will be forced partially into another notch 24 as the same slides from the tooth 26 that may be seen through slot 50 in Fig. 4.

It shall be noted, that if spring 46 were eliminated, the reverse movement of pin 44 out of notch 52 would act on head 30 to pull locking member 14 and pin 34 back into locking engagement with one of the notch receptacles 24.

Spring 46 facilitates this relocking but the reverse movement of pallet 12 will effect the relocking if spring 46 should ever fail.

Assuming therefore that the pallet 12 is to be used as a motivating means for the wheel 10, swinging movement of the legs 38, as indicated in Fig. 2, causes rotation of wheel 10 in clock-wise direction by pin 44 bearing against a proximal tooth 26. On the other hand, if wheel 10 is separately energized, such as for instance through use of a spring wound to bias the wheel 10 for rotation in a clock-wise direction, then as soon as movement of pallet 12 releases the lock 14, wheel 10 will commence to rotate clock-wise and its extent of rotation will be limited by the length of the slot portion 50. In no event however can the wheel 10 rotate in the counter-clockwise direction with the parts arranged as illustrated in the drawing. It is obvious however that such counter-clockwise direction of rotation may be effected by a rearrangement of the parts with slot 50 on the opposite side of the longitudinal axis of stem 28.

One of the most important features of the present invention therefore, is the way in which a control pallet is provided for a rotatable member that in turn controls a lock capable of holding the rotating member against movement in either direction but when called upon to do so unlocks the wheel for rotation. It is only upon actuation of the control pallet that the locking device becomes operable and as soon as the extent of rotation of the rotating ratchet wheel has been completed, the locking device automatically moves into position to prevent rotation of the ratchet wheel in either direction. One important phase is that the width and position of the slotted track 50 relative to the periphery of the wheel is such that in one position of the travel of the member 28 the traveling dog 44 is confined in a receptacle notch 24 and in the other position of the member 28 the dog pin 44 may ride over the tooth 26, as shown in Fig. 4.

The absolute control of wheel 10 is guaranteed in several ways. The pins 44 and 34 are always in maximum and finished engagement with their respective notch receptacles while the wheel is absolutely motionless. Furthermore, the pin 44 does not move from this position of maximum and finished engagement with its notch receptacle while the wheel is moving. Also, either one or both of the pins 44 and 34 are always in a position of maximum and finished engagement with their respective notch receptacles at all times. The pins 44 and 34 move into their receptacles on a line passing through the center of wheel 10 so as to not rotate the wheel while they are entering or leaving the notch receptacles.

From the foregoing it will be seen that I have provided an unlocking factor by means of a traveling dog abutting on an unlocking dog or, in other words, simultaneously engaging two differently adapted pallets in mesh with receptacle devices, for the dual purpose of unlocking the device and positioning a ratchet-type pallet to positively control movement of same said receptacle device. It is also apparent that the various component parts chosen for illustration depict but one form of the present invention nad that the principles of operation thereof may be carried out through details of construction varying considerably from that shown.

Some changes may be made in the construction and arrangement of my mechanical movement having unlocking and locking characteristics without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. In a device of the class described, a base, a shaft, a wheel on said shaft having notch receptacles in its periphery, a pallet slidably mounted on said base and adjacent said wheel, a lug on said pallet capable of separately engaging the notch receptacles in said wheel when said pallet is moved in one direction for locking said wheel against rotation and clearing such notch receptacle when said pallet is moved in the opposite direction to unlock said wheel for rotation, a second pallet operatively pivoted to said shaft, a ratchet dog pin on said second pallet capable of separately entering and engaging a notch receptacle in said wheel, an arcuate slot in said first pallet embracing said ratchet dog pin, a notch opening in one end portion of said slot for permitting said ratchet dog pin to enter a notch receptacle in said wheel when said lug of said first pallet is in engagement with a notch receptacle in said wheel, and a spring means yieldingly drawing said two pallets toward each other whereby the unlocking is accomplished by end to end abutment contact of the said parts of the wheel.

2. In a device of the class described, a base, a shaft, a wheel on said shaft having notch receptacles in its periphery, a pallet rectilinearly slidably mounted on said base and adjacent said wheel, a lug on said pallet capable of separately engaging the notch receptacles in said wheel when said pallet is moved in one direction for locking said wheel against rotation and clearing such notch receptacle when said pallet is moved in the opposite direction to unlock said wheel for rotation, a second pallet operatively pivoted to said shaft, a ratchet dog pin on said second pallet capable of separately entering and engaging a notch receptacle in said wheel, an arcuate slot in said first pallet embracing said ratchet dog pin, a notch opening in one end portion of said slot for permitting said ratchet dog pin to enter a notch receptacle in said wheel when said lug of said first pallet is in engagement with a notch receptacle in said wheel, and a spring means yieldingly drawing said two pallets toward each other whereby the unlocking of the wheel is accomplished by the rectilinear movement of the first pallet in one direction.

3. In a device of the class described, a base, a shaft, a wheel on said shaft having notch receptacles in its periphery, a pallet slidably mounted on said base and adjacent said wheel, a lug on said pallet capable of separately engaging the notch receptacles in said wheel when said pallet is moved in one direction for locking said wheel against rotation and clearing such notch receptacle when said pallet is moved in the opposite direction to unlock said wheel for rotation, a link pivoted at one end to said shaft, a second pallet pivoted to said link, a ratchet dog pin on said second pallet capable of separately entering and engaging a notch receptacle in said wheel, an arcuate slot in said first pallet embracing said ratchet dog pin, a notch opening on one end portion of said slot for permitting said ratchet dog pin to enter a notch receptacle in said wheel when said lug of said first pallet is in engagement with a notch receptacle in said wheel, and a spring means yieldingly drawing said two pallets toward each other whereby the said ratchet dog pin on second pallet will abut said slot and unlock said lug from said wheel.

4. In a device of the class described, a base, a shaft, a wheel on said shaft having notch receptacles in its periphery, a pallet slidably mounted on said base and adjacent said wheel, a lug on said pallet capable of separately engaging the notch receptacles in said wheel when said pallet is moved in one direction for locking said wheel against rotation and clearing such notch receptacle when said pallet is moved in the opposite direction to unlock said wheel for rotation, a link pivoted at one end to said shaft, a second pallet pivoted to said link, a ratchet dog pin on said second pallet capable of separately entering and engaging a notch receptacle in said wheel, an arcuate slot in said first pallet embracing said ratchet dog pin, a notch opening in one end portion of said slot for permitting said ratchet dog pin to enter a notch receptacle in said wheel when said lug of said first pallet is in engagement with a notch receptacle in said wheel, and a spring means yieldingly drawing said two pallets toward each other whereby said wheel will be locked by

said lug when said dog pin travels from the notch in said slot.

5. Mechanism of the kind described comprising a shaft, a support for the shaft, a rotatable ratchet wheel carried by the shaft and provided with a series of peripheral notches, a locking device having a slot receiving the shaft, guide means on the support disposed to limit the device to rectilinear reciprocation, a locking pin on said device disposed within one of said notches when the device is at one end of its reciprocable path of travel to hold the wheel against rotation, a link a pallet swingably secured to the link, and a ratchet pin on the pallet normally disposed partially within another of said notches of the wheel, said ratchet pin slidably engaging the locking device whereby when the pallet is swung in one direction relative to the link the locking device is shifted to the opposite end of its path of travel to release the locking pin from the wheel as the ratchet pin moves further into the last mentioned notch of the wheel, said link being swingable on the shaft whereby when the wheel is unlocked, said pallet, the link, and said wheel are movable together as a unit about the axis of the shaft as the ratchet pin slides along the locking device.

6. Mechanism as set forth in claim 5 wherein said locking device is provided with a notch disposed to receive the ratchet pin upon movement of the pallet, the link and the wheel a predetermined amount in one direction, permitting return movement of the device to a position locking the wheel against rotation.

7. Mechanism as set forth in claim 5 wherein is provided resilient means connected with the pallet for yieldably holding the ratchet pin in sliding engagement with the locking device.

8. Mechanism as set forth in claim 5 wherein is provided resilient means connected with the locking device for yieldably holding the same biased toward said one end of its path of travel.

9. Mechanism as set forth in claim 5 wherein is provided resilient means interconnecting the pallet and the locking device for yieldably holding the ratchet pin in sliding engagement with the locking device and for yieldably holding the locking device at said one end of its path of travel.

10. Mechanism of the kind described comprising a shaft, a support for the shaft, a rotatable ratchet wheel carried by the shaft and provided with a series of peripheral notches, a locking device provided with an elongated stem, a head on one end of the stem having an arcuate slot concentric with the shaft, a locking pin adjacent the opposite end of the stem, and an elongated opening in the stem receiving the shaft for movement of the pin toward and away from the shaft as the device reciprocates longitudinally of the stem, means on the support engaging the stem for limiting the device to rectilinear reciprocation, a link swingable on the shaft, a pallet swingable on the link, a ratchet pin on the pallet slidably engaging the head within the slot, and a spring interconnecting the stem and the ratchet pin for normally holding the latter biased against the head and partially within one of said notches, and for normally holding the locking device biased toward one end of its path of travel with the locking pin disposed within another of said notches whereby upon swinging the pallet in one direction, the ratchet pin is first moved further into said one notch, the locking device is shifted to the opposite end of its path of travel to unlock the wheel, and the link, the pallet and the wheel are moved as a unit about the axis of the shaft as the ratchet pin slides along the head.

11. Mechanism as set forth in claim 10 wherein said head is provided with a notch communicating with said slot and disposed to receive the ratchet pin as the latter slides to one end of its path of travel relative to the device, whereby the spring acts on said device to relock the wheel prior to swinging of the pallet in the opposite direction to retract the ratchet pin from the wheel.

12. In a device of the class described, a base portion, a wheel member having notch receptacles movably secured to said base portion, a locking lug, an elongated stem secured to said locking lug, guide means operatively connecting said stem to said base portion to confine the movement of said stem on a straight line extending away from the center axis of said wheel member; said locking lug capable of entering into locking engagement with one of said notch receptacles at times to hold said wheel member rigidly motionless, a ratchet pallet capable of penetrating into one of said notch receptacles at times for purposes of operatively engaging said member, a movable means secured to said base portion; said ratchet pallet pivotally connected to said movable means to permit said ratchet pallet to travel to or from a position of maximum penetration in one of said notch receptacles on a straight line extending from the center axis of said wheel member, and a link means on said stem, said link means movably secured to said ratchet pallet to couple said stem and said ratchet pallet together, the accumulative distance measured from the center axis of said wheel member to said locking lug and to the position of engagement between said link means and said ratchet pallet being less than the diameter of said wheel member to prevent the locking lug and the ratchet pallet from being simultaneously and completely disengaged from said wheel member, a notch on said link means capable of receiving said ratchet pallet at times to permit said ratchet pallet and said locking lug to simultaneously attain positions of maximum penetration in said notch receptacles.

13. In a device of the class described, a base portion, a wheel member having notch receptacles movably secured to said base portion, a locking lug, an elongated stem rigidly secured against relative pivotal movement to said locking lug, guide means operatively connecting said stem to said base portion to confine the movement of said stem on a straight line relative to said base portion extending away from the center axis of said wheel member; said locking lug capable of entering into locking engagement with one of said notch receptacles at times to hold said wheel member rigidly motionless, a ratchet pallet capable of penetrating into one of said notch receptacles at times for purposes of operatively engaging said member, a movable means secured to said base portion; said ratchet pallet pivotally connected to said movable means to permit said ratchet pallet to travel to or from a position of maximum penetration in one of said notch receptacles on a straight line relative to said base portion extending from the center axis of said wheel member, and means on the end of said stem for operatively connecting said locking lug to said ratchet pallet to move said locking lug out of and into engagement with one of said notch receptacles while said ratchet pallet is moving to and from, respectively, positions of maximum penetration in one of said notch receptacles.

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