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KEYLESS DEVICE FOR WINDING UP CLOCKWORK MECHANISM

Fig. 1. A cross-sectional view of a mechanical device, likely a pump or valve. The device features a central vertical shaft (26) with a handle (25) at the top and a foot (27) at the bottom. A horizontal shaft (46) is connected to the central shaft via a coupling (48). The horizontal shaft (46) is supported by bearings (45, 47) and has a piston (31) at its end. The piston (31) is connected to a vertical rod (37) which passes through a seal (38). The device also includes a valve (29) and a spring (23). A handle (53) is attached to the side of the device. The entire assembly is housed in a frame (25). The label 'Fig. 1.' is at the bottom.

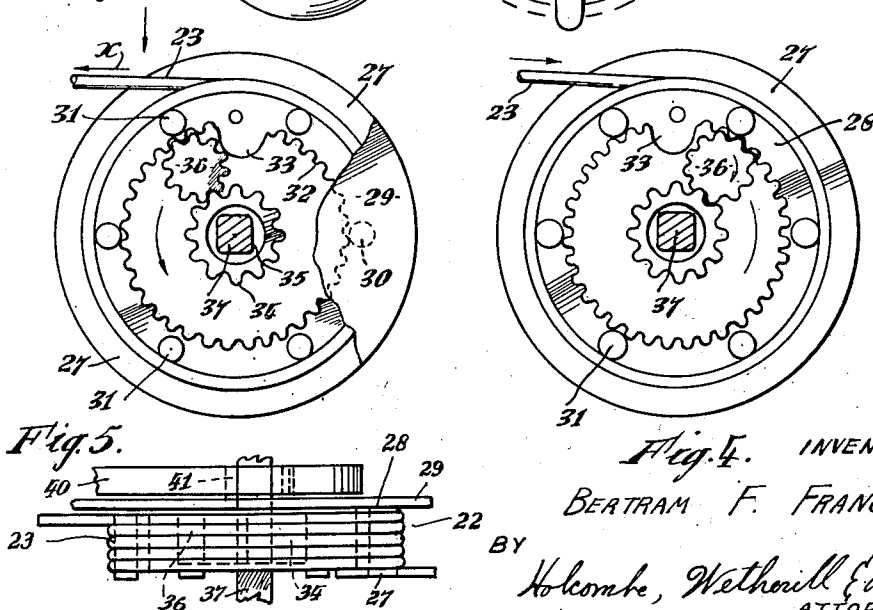
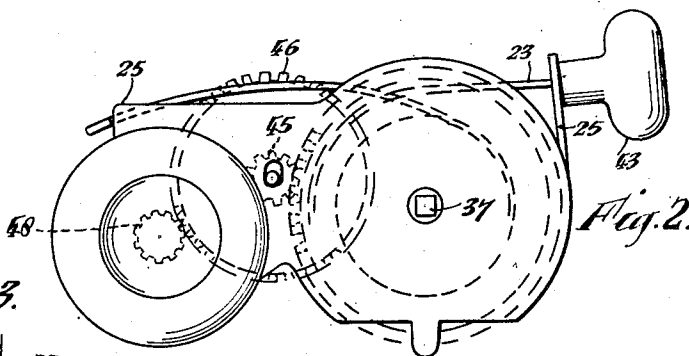


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KEYLESS DEVICE FOR WINDING UP CLOCKWORK MECHANISM

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This invention relates to a keyless device for winding up clockwork mechanism comprising a rotatable member adapted to drive the spring loaded shaft of the clockwork mechanism to wind up the spring and a manually operable withdrawable member one end of which is operatively connected to the rotatable member so that on withdrawing the said member it rotates the rotatable member in a direction to wind up the spring. A keyless device of the above kind is referred to hereafter as "of the kind referred to."

It has previously been proposed to provide a keyless device of the kind referred to for a toy in which the rotation of the rotatable member is transmitted to the spring shaft by a unidirectional drive.

The object of the invention is to provide a keyless device of the kind referred to with a cheap and reliable transmission between the withdrawable member and the rotatable member.

With the foregoing object in view in a keyless device of the kind referred to made in accordance with the invention the transmission between the rotatable member operated by the withdrawable member and the spring loaded shaft comprises an epicyclic gear train, and means for locking the gear elements of said gear train when said withdrawable member is withdrawn, thereby to rotate said shaft in a direction to wind the spring, and for unlocking said gear elements when said withdrawable member is released, to enable said withdrawable member to be returned to the starting position independently of the rotation of said spring loaded shaft.

The epicyclic gear train may comprise an outer internal gear mounted on and concentrically with the spring loaded shaft and adapted to be rotated by the manually operated member, an inner gear fixed on the said spring loaded shaft, and a floating intermediate gear in permanent mesh with the outer and inner gears and adapted to be locked to the outer gear when the latter is rotated to wind up the spring.

The means for locking the intermediate gear to the outer gear may comprise a stop fixed to the outer gear so as to make contact with the toothed periphery of the intermediate gear when the outer gear is rotated in a direction to wind the spring of the clockwork, and to move away from the intermediate gear when the outer gear is rotated in the opposite direction, thereby releasing the lock between the intermediate gear and the outer gear.

The rotatable member may comprise a pulley and the withdrawable member may comprise a cable, cord or the like (hereafter referred to as a "cable") passing around the pulley which is preferably formed with a peripheral groove to accommodate the cable, the free end of which may have fixed thereto a rigid knob or like operating member.

In the case that the device is fitted to the clockwork mechanism for a toy representing an open or sports type motor vehicle the operating member could be disposed on the instrument board or panel. If the toy represents

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a closed motor vehicle the operating member could be disposed at the front or back, or at the side, or at the top or bottom of the toy. The cable may be passed through an aperture in the instrument board or the body of the toy, the arrangement being such that one end of the operating member normally bears on the said board or body around the aperture from which it is pulled away to wind up the spring mechanism.

Means may be provided for automatically rewinding the cable on the pulley before the spring begins to unwind. These means may comprise a torsion spring operatively associated with the pulley so as to be energised when the pulley is rotated by the manually operated member, said torsion spring acting, when the manually operated member is released to rotate the pulley in the opposite direction, the cable being thereby rewound on the pulley.

The epicyclic gear train may comprise an outer internal gear mounted on and concentrically with the spring loaded shaft and adapted to be rotated by the manually operated member, an inner gear fixed on the said spring loaded shaft, and a floating intermediate gear in permanent mesh with the outer and inner gears and adapted to be locked to the outer gear when the latter is rotated to wind up the spring.

The means for locking the intermediate gear to the outer gear may comprise a stop fixed to the outer gear so as to make contact with the toothed periphery of the intermediate gear when the outer gear is rotated in a direction to wind the spring of the clockwork, and to move away from the intermediate gear when the outer gear is rotated in the opposite direction, thereby releasing the lock between the intermediate gear and the outer gear.

In the accompanying drawings which illustrate how the invention may be carried into effect,

Fig. 1 is a plan view of the front axle unit part of a toy motor car with a clockwork unit fitted with a keyless winding device made in accordance with the invention.

Fig. 2 is a side elevation of Fig. 1.

Figs. 3 and 4 are views taken on the line X—X, Fig. 1, Fig. 3 showing the epicyclic transmission in two positions corresponding respectively to spring unwound and spring wound, and Fig. 4 showing the transmission in position after the cable has been returned on to the pulley.

Fig. 5 is a detail plan view of the pulley and return spring.

As shown in these figures the clockwork unit is carried in a frame 25 on the front axle 26 of a toy motor vehicle driven thereby. The pulley is made in two parts, namely, one part consisting of a side plate 27 and a hub 28 moulded in one piece from a transparent plastic, and another part 29 of metal and constituting a second side plate. The plate 29 has a ring of apertures 30 and is fitted on to the side of the hub 28 remote from the plate 27 by a corresponding ring of pins 31 projecting from the side of the hub 28 and adapted respectively to be press-fitted into the apertures 30. When thus fitted together the parts 27, 28, 29 form a pulley with a peripheral recess 22 in which a cable 23 can be wound. The inner peripheral surface of the hub 28 is formed as an internal gear 32 and with a projection 33, the gear 32 forming the driving element of an epicyclic gear train, the other elements of which comprise an inner gear 34 formed with an integral bush 35, and an intermediate gear 36. The inner surface of the bush 35 is of square section and is designed to have a frictional sliding fit on the squared shaft 37 of the clockwork mechanism; the intermediate gear 36 is floating and in permanent mesh with the outer and inner gears 32 and 34.

The main spring 38 of the clockwork mechanism is con-

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nected at one end to the shaft 37 and at the other end to the frame 25 (see Fig. 2). A torsion spring 40 is connected at one end to a slotted projection 41 on the outside of the side plate 27 and at its other end to the frame 25. The free end of the cable 23 is fitted to a rigid knob 43 which, in the form shown in Figs. 1 and 2, bears against the frame 25 which is suitably apertured to provide passage for the cable 23.

When the shaft 37 is rotated by the spring 38 the drive is transmitted to the front axle 26 through gear 44 fixed on the shaft 37, gears 45 and 46 fixed on the stub axle 47, and gear 48 formed integral with the axle 26.

In the above embodiment the gear 32 has 32 teeth, the intermediate gear 36 has ten teeth and the inner gear 34 has 12 teeth. The operation is as follows:

As shown in Fig. 3, the spring is unwound and the parts at rest, and the intermediate gear is adjacent to or as actually shown, bears against the stop 33. On withdrawing the cable 23 the pulley 27, 28, 29 is rotated (see Fig. 3) in an anticlockwise direction so that if the stop 33 is not already in contact with the gear 36 it will be moved into contact therewith and the gears will be locked together. On continuing to withdraw the cable the gear 36, rotating with the gear 32, will drive the gear 34 and thus wind the spring, the relative position of the parts on completing the withdrawal of the cable still being as shown in Fig. 3. During this winding operation the torsion spring 40 is energised and serves, on releasing the knob 43, the shaft 37 being held against rotation, to return the pulley. During this return movement the gear 36 also moves back but at a slower rate than the pulley and stop 33, the pulley continuing its rotation until the stop 33 catches up with the gear 36. On now releasing the braking or restraining pressure on the shaft 37 the spring 38 will drive the shaft and the clockwork mechanism driven thereby, during which time the gear 36 will return to the position relatively to the stop 33 shown in Fig. 3 in readiness for the next winding operation.

In a modification of the construction shown in Figs. 1-5 the cable 23 and pulley are replaced by a rack and pinion device. In this modification the pulley 27 is replaced by an annular drum provided on its side with a ratchet pinion and the cable 23 is replaced by a slidable rack engaging the ratchet pinion. The drum is formed similarly to the pulley 27 with the internal gear 32.

What I claim and desire to secure by Letters Patent is:

1. A keyless device for winding up clockwork mechanism comprising a rotatable member adapted to drive the spring loaded shaft of the clockwork mechanism to wind up the spring, a manually operable withdrawable member one end of which is operatively connected to said rotatable member so that on withdrawing the said withdrawable member it rotates said rotatable member in a direction to wind up the spring acting on said shaft, and a drive transmission between said rotatable member and said spring loaded shaft, said transmission comprising an epicyclic gear train and means for locking the gear elements of said gear train when said withdrawable member is withdrawn, thereby to rotate said shaft in a direction to wind the spring, and for unlocking said gear elements when said withdrawable member is released, to enable said withdrawable member to be returned to the starting position independently of the rotation of said spring loaded shaft.

2. A keyless device according to claim 1 in which said epicyclic gear train comprises an outer internal gear mounted on and concentrically with said shaft and adapted to be rotated by said manually operated withdrawable member, an inner gear fixed on said shaft, and a floating intermediate gear in permanent mesh with said outer and inner gears, said locking means operating to lock said intermediate gear to said outer gear when the latter is rotated to wind up the spring.

3. A keyless device according to claim 1 in which said

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epicyclic gear train comprises an outer internal gear mounted on and concentrically with said shaft and adapted to be rotated by said manually operated withdrawable member, an inner gear fixed on said shaft, and a floating intermediate gear in permanent mesh with said outer and inner gears, said locking means which operate to lock said intermediate gear to said outer gear when the latter is rotated to wind up the spring, comprising a stop fixed to the outer gear so as to make contact with the toothed periphery of said intermediate gear when said outer gear is rotated in a direction to wind up the spring of the clockwork, and to move away from said intermediate gear when said outer gear is rotated in the opposite direction, thereby releasing the lock between said intermediate gear and the outer gear.

4. A keyless device according to claim 1 in which said rotatable member comprises an annular pulley and said manually operable withdrawable member comprises a cable adapted to be wound on the outer periphery of said pulley, and, further, in which said epicyclic gear train comprises an outer gear formed as an internal gear on the inner periphery of said pulley, said outer gear being mounted on and concentrically with said shaft and adapted to be rotated by said cable, an inner gear fixed on said shaft, and a floating intermediate gear in permanent mesh with said outer and inner gears, said locking means operating to lock said outer gear to said intermediate gear when said pulley is rotated by withdrawing said cable.

5. A keyless device according to claim 1 in which said rotatable member comprises an annular pulley made in two parts suitably fitted together, and said manually operable withdrawable member comprises a cable adapted to be wound on the outer periphery of said pulley, and, further, in which said epicyclic gear train comprises an outer gear formed as an internal gear on, and moulded integrally with, the inner periphery of said pulley, said outer gear being mounted on and concentrically with said shaft and adapted to be rotated by said cable, an inner gear fixed on said shaft, and a floating intermediate gear in permanent mesh with said outer and inner gears, said locking means operating to lock said outer gear to said intermediate gear when said pulley is rotated by withdrawing said cable.

6. A keyless device according to claim 1 in which said rotatable member comprises a pulley made in two parts, namely one part moulded in one piece from a plastic and comprising a side plate and an annular hub, and a second part comprising a side plate, and further comprising means for fitting said two parts together.

7. A keyless device according to claim 1 in which said rotatable member comprises a pulley made in two parts, namely one part moulded in one piece from a plastic and comprising a side plate and an annular hub, and a second part comprising a side plate, and further comprising means for fitting said two parts together, said epicyclic gear train comprising an outer gear formed as an internal gear on and moulded integrally with the inner periphery of said pulley, said outer gear being mounted on and concentrically with said shaft and adapted to be rotated by said manually operable withdrawable member, an inner gear fixed on said shaft, and a floating intermediate gear in permanent mesh with said outer and inner gears, said locking means operating to lock said outer gear to said intermediate gear when said pulley is rotated by withdrawing said withdrawable member.

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