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ACTUATING MECHANISM

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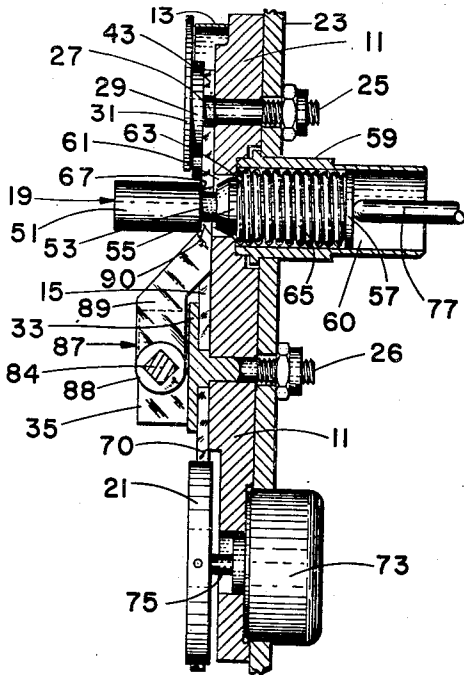


FIG. 1

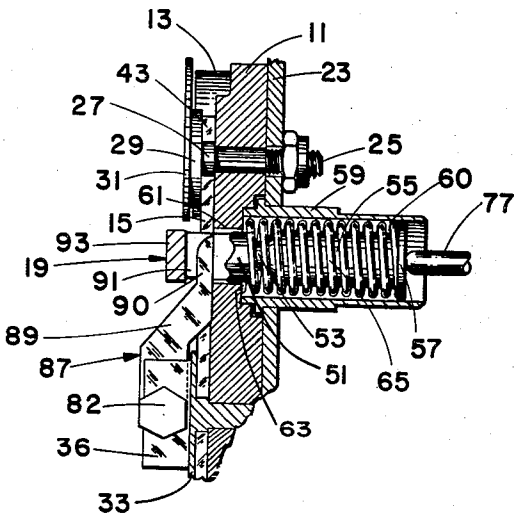


FIG. 2

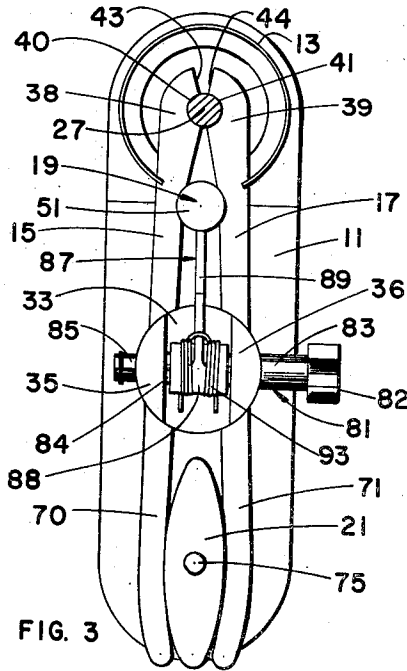


FIG. 3

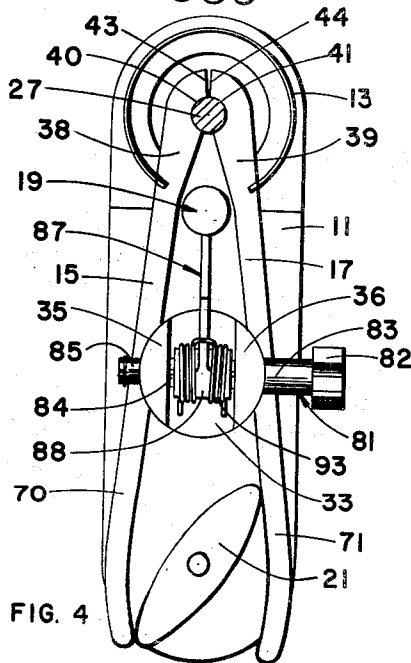


FIG. 4

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ACTUATING MECHANISM

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This invention relates to actuating means and more particularly concerns an actuating mechanism for operating a control element, such as the control rod of a locking device for a separable coupling.

An object of the present invention is to provide an improved actuating mechanism having a spring-biased plunger which is reliably restrained and easily released.

Another object is the provision of such an actuating mechanism which is adapted to be reset with ease after being operated.

A further object is the provision of an improved actuating mechanism having a spring-biased plunger which is normally restrained by two arms urged together by a C-shaped leaf spring.

An additional object is to provide an improved actuating mechanism which includes a spring-biased plunger, two arms arranged at the sides of the plunger for the restraint thereof, cam means for separating the restraining arms for operation of the plunger and reset means for returning the plunger to restrained or locked position.

The realization of the above objects along with the features and advantages of this invention will be apparent from the following description and the accompanying drawing in which:

FIG. 1 is a partially cross-sectioned side view of an embodiment of the invention and shows the horizontally-extending spring-biased plunger in locked position and the solenoid-operated cam for releasing the plunger;

FIG. 2 is a partially cross-sectioned side view similar to FIG. 1 with lower parts broken off and shows the plunger released and moved to the right as limited by the actuated control rod with the reset means adapted to move the plunger to the left;

FIG. 3 is an end view from left of FIG. 1 with parts omitted to show the C-shaped leaf spring and the spring ends of the locking arms above the plunger latch end and provides a showing of the cam in normal position and the plunger latch end restrained by the vertically-extending locking arms; and

FIG. 4 is an end view similar to FIG. 3 and shows the cam in rotated position with the plunger latch end released from the locking arms.

Referring to FIGS. 1 to 4, the actuating mechanism includes, as major components, an elongated mounting plate 11, a C-shaped leaf spring 13, two restraining or locking arms 15 and 17 urged together by spring 13, a horizontally-arranged spring-biased plunger 19 restrained by the locking arms 15 and 17 and an elliptical cam 21 for urging the arms 15 and 17 apart thereby releasing the plunger 19. Spring 13 is a circular band of spring steel and has its ends relatively closely spaced where attached to lock arms 15 and 17. Lock arms 15 and 17 are arranged perpendicular to the plunger 19 at opposite sides thereof and extend generally parallel to each other from the top to the bottom of plate 11 which extends vertically.

As shown in FIG. 1, the mounting plate 11 is attached to a housing wall 23 by means of an upper connector 25 and a lower connector 26. Upper connector 25 provides a pivot pin or shaft 27, an upper circular confining plate 29 for locking arms 15 and 17, and a cover plate 31 for C-shaped spring 13. Lower connector 26 provides a lower circular confining plate 33 for locking arms 15 and 17 and also two brackets 35 and 36 projecting from plate

33 for supporting reset means which will be described below.

As appears in FIG. 3, the upper or spring ends 38 and 39 of the locking arms 15 and 17 have shaft or pivot recesses 40 and 41 which pivot on pivot pin or shaft 27 of upper connector 25. Ends 38 and 39 also have facing edges 43 and 44 which are spaced to provide for limited rotation of arms 15 and 17 about shaft 27. C-shaped leaf spring 13 is normally concentric with shaft 27 and encircles spring ends 38 and 39. Spring 13 is connected to arms 15 and 17 adjacent plunger 19 for urging the arms toward each other to give reliable engagement with plunger 19.

Referring to FIGS. 1 and 2, plunger 19 includes a cylindrical latch end or part 51 at the left, a reduced-diameter neck 53, a large cylindrical body 55, and a circular guide piston 57 at the right. Tubular member 59 extends to the right from mounting plate 11 and housing wall 23 and provides a riding surface for the plunger guide piston 57 and plunger cavity 60. At the plunger opening 61 in mounting plate 11, a shoulder 63 is provided for confining the left end of coil spring 65. Spring 65 surrounding plunger body 55 is confined at the right end by the radially-projecting guide piston 57. The arms 15 and 17 are biased so as to have their inner edges firmly under the plunger latch shoulder 67 (see FIG. 1) formed at the juncture of the cylindrical part 55 and the neck 53 which limits arms 15 and 17.

The lower or cam ends 70 and 71 of the arms 15 and 17 fit along the major axis sides of cam 21 so that immediate, effective engagement with the arms 15, 17 results when the cam 21 is rotated. A rotary solenoid 73 has a shaft 75 connected to the elliptical cam 21 positioned between the slightly-inwardly-curved cam ends 70 and 71 of arms 15 and 17. Solenoid 73 provides means for limitedly rotating cam 21 so that arms 15 and 17 are moved apart with flexing of spring 13 and are disengaged from neck 53 and latch shoulder 67 of plunger 19. Control rod 77 which engages plunger piston 57 will be moved as limited by the device to which it is connected, as shown in FIG. 2. It is to be noted that spring 13 tensions arms 15 and 17 adjacent plunger 19 for reliable engagement and that cam 21 by acting at ends 70 and 71 has leverage action.

The means for resetting the plunger 19 is centrally located between the plunger 19 and the cam 21 and includes as seen in FIG. 3, an actuator shaft 81 having hexagonal turn nut 82 at the right, a first shaft portion 83 rotatably-mounted in the right bracket 36, a central mounting section 84 of square cross-section, and a second shaft portion 85 rotatably-mounted in the left bracket 35 of connector 26.

A reset lever 87 has a cylindrical part 88 with a square hole mounted on the square mounting section 84 of shaft 81. As shown in FIG. 2, a plate-like reset arm 89 extends from the cylindrical part 88 and has a curved-end contact foot 90. This foot 90 extends into a reset slot or opening 91 formed in the neck 53 and latch end 51 of the plunger 19. Foot 90 is constructed so that it engages the crossbar 93 of the plunger 19. Reset lever 87 can be rotated counterclockwise (as viewed in FIG. 2) moving plunger 19 to the left so that lock arms 15 and 17 clear the cylindrical latch end 51 and slip under circular latch shoulder 67 of the plunger 19. A return spring 93 for reset lever 87 is provided (as shown in FIGS. 3 and 4 but omitted from FIGS. 1 and 2) so that foot 90 will abut mounting plate 11 when reset lever 87 is not rotated by means of turn nut 82. Return spring 93 encircles the cylindrical part 88 of the reset lever 87 and loops over the reset arm 89 with the spring ends abutting connector plate 33. Thus, reset means are compactly provided over arms 15 and 17 and between the plunger 19 and the cam

21 for easily returning plunger 19 so that arms 15 and 17 re-engage latch shoulder 67.

The operation of the actuating mechanism is believed to be apparent from the foregoing. Thus, during normal operation, the plunger 19, lock arms 15 and 17, and cam 21 are positioned as shown in FIGS. 1 and 3 so that plunger 19 is locked. Control rod 77, for example, can be connected to a locking device of a coupling connecting a drive shaft to an electrical generator. Rod 77 will abut plunger piston 57 and when moved provides for the uncoupling of the generator if it fails. Plunger 19 is urged to the right by spring 65 but is firmly locked or restrained due to the edges of spring ends 38 and 39 of lock arms 15 and 17 being engaged with circular latch shoulder 67 at the neck 53 of plunger 19. Lock arms 15 and 17 are firmly tensioned toward each other by C-shaped leaf spring 13 as limited by the neck 53 of plunger 19. It is to be noted that the sides of lock arms 15 and 17 are slidably confined between the flat surface of the mounting plate 11 and the facing flat surfaces of the connector plates 29 and 33 so that movement away from the mounting plate 11 is prevented while pivoting of the lock arms 15 and 17 is permitted.

When it is desired to move control rod 77, a suitable switch (not shown) is closed to energize briefly solenoid 73. Such action would be taken, for example, when the generator above-mentioned malfunctions and it is necessary to operate the coupling locking device. Solenoid 73 when energized gives limited rotation to cam 21 as shown in FIGURE 4 so that lock arms 15 and 17 are spread apart or moved away from each other with spring end shaft recesses 40 and 41 turning on connector shaft 27. The spreading of lock arms 15 and 17 permits plunger shoulder 67 to disengage from the edges of the lock arms 15 and 17 and plunger 19 moves control rod 77 for its limited movement. Arms 15 and 17 are limited against latch end 51 when solenoid 73 is de-energized.

In order to reset the plunger 19, the turn nut 82 is rotated counterclockwise as mentioned above. Foot 90 of reset lever 87 moves in plunger slot 91 and engages the cross bar 93 of latch end 51, causing plunger 19 to move against spring 65. This movement will be sufficient for lock arms 15 and 17 to slip under shoulder 67 as limited by neck 53 so that the spring-biased plunger 19 is restrained whereby the actuating mechanism is re-locked. C-shaped leaf spring 13 tensions lock arms 15 and 17 so that they urge toward each other when cleared of the cylindrical end 51 of plunger 19 for locking under shoulder 67 as above mentioned.

It is to be understood that persons skilled in the art can make changes in the disclosed embodiment without departing from the invention as defined in the following claims.

What is claimed is:

1. An actuating device comprised of a spring-biased plunger, support means for said plunger including a mounting plate having a plunger opening receiving said plunger, said plunger having a cylindrical latch end and a neck projecting from said opening and providing a circular latch shoulder, two flat locking arms extending generally parallel to each other at opposite sides of said plunger and perpendicularly thereto, said arms engaging said latch shoulder and said neck, said arms having spring ends laterally spaced from said plunger and cam ends opposite said spring ends and laterally spaced from said plunger, a pivot pin projecting from said mounting plate, said spring ends being pivotally-mounted on said pivot pin, a C-shaped leaf spring arranged concentric with said pivot pin and encircling said spring ends, said C-shaped spring being connected to said spring ends adjacent said plunger to urge said arms toward each other, and cam means arranged to move said cam ends of said locking arms away from each other so that said arms release said plunger.

2. An actuating device comprised of a spring-biased

plunger, support means for said plunger including a mounting plate having a plunger opening receiving said plunger, said plunger having a cylindrical latch end and a neck projecting from said opening and providing a circular latch shoulder, two flat locking arms extending generally parallel to each other at opposite sides of said plunger and perpendicularly thereto, said arms engaging said latch shoulder and said neck, said arms having spring ends laterally spaced from said plunger and cam ends opposite said spring ends and laterally spaced from said plunger, a pivot pin projecting from said mounting plate, said spring ends being pivotally-mounted on said pivot pin, a C-shaped leaf spring arranged concentric with said pivot pin and encircling said spring ends, said C-shaped spring being connected to said spring ends adjacent said plunger to urge said arms toward each other, cam means including a rotary solenoid and an elliptical cam arranged to move said cam ends of said locking arms away from each other so that said arms release said plunger, and reset means between said plunger and said cam means operably connected to said latch end of said plunger and arranged to move said plunger so that said locking arms re-engage said latch shoulder to restrain said plunger.

3. An actuating device comprised of a spring-biased plunger, support means for said plunger including a mounting plate having a plunger opening receiving said plunger, said plunger having a cylindrical latch end and a neck projecting from said opening and providing a circular latch shoulder, two flat locking arms extending generally parallel to each other at opposite sides of said plunger and perpendicularly thereto, said arms engaging said latch shoulder and said neck, said arms having spring ends laterally spaced from said plunger and cam ends opposite said spring ends and laterally spaced from said plunger, a pivot pin projecting from said mounting plate, said spring ends being pivotally-mounted on said pivot pin, a C-shaped leaf spring arranged concentric with said pivot pin and encircling said spring ends, said C-shaped spring being connected to said spring ends adjacent said plunger to urge said arms toward each other, cam means including a rotary solenoid and an elliptical cam arranged to move said cam ends of said locking arms away from each other so that said arms release said plunger, reset means operably connected to said plunger and arranged to move said plunger so that said locking arms re-engage said latch shoulder to restrain said plunger, said reset means including a reset lever having a contact foot which abuts said mounting plate between said locking arms, said latch end and said neck having an opening therein receiving said contact foot, and brackets over said locking arms and located between said cam means and said plunger supporting said reset means.

4. An actuating mechanism for imparting motion to a control element comprised of support means including an elongated, vertically-arranged mounting plate and a horizontally-arranged tubular member projecting perpendicularly from one side of said mounting plate, said mounting plate having a plunger opening axially-aligned with said tubular member, a pivot pin projecting from the other side of said mounting plate adjacent the top thereof, two elongated flat locking arms abutting said mounting plate opposite said tubular member and extending generally-parallel to each other from said pivot pin to the bottom of said mounting plate, said arms having spring ends which are pivotally-mounted on said pivot pin and cam ends at the bottom of said plate which are slightly curved toward each other, a spring-biased plunger mounted in said tubular member and having a neck and cylindrical end projecting from said plunger opening, said cylindrical end and neck providing a latch shoulder, said arms engaging said latch shoulder at opposite sides thereof, a C-shaped leaf spring encircling said spring ends of said arms and being connected to said spring ends adjacent said plunger for biasing said arms toward said plunger, an

5

elliptical cam and rotary solenoid arranged to move said cam ends of said locking arms away from each other, bracket means projecting from said mounting plate over said arms, reset means mounted in said bracket means and having a reset lever and an actuator shaft, said reset lever being operably connected to said cylindrical end of said plunger for the return thereof, said actuator shaft extending across said arms and being rotatable to move said reset lever so that said reset lever moves said plunger and said locking arms re-engage said latch shoulder.

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