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ROLLING DOOR CONTROL DEVICE

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2 Sheets-Sheet 1

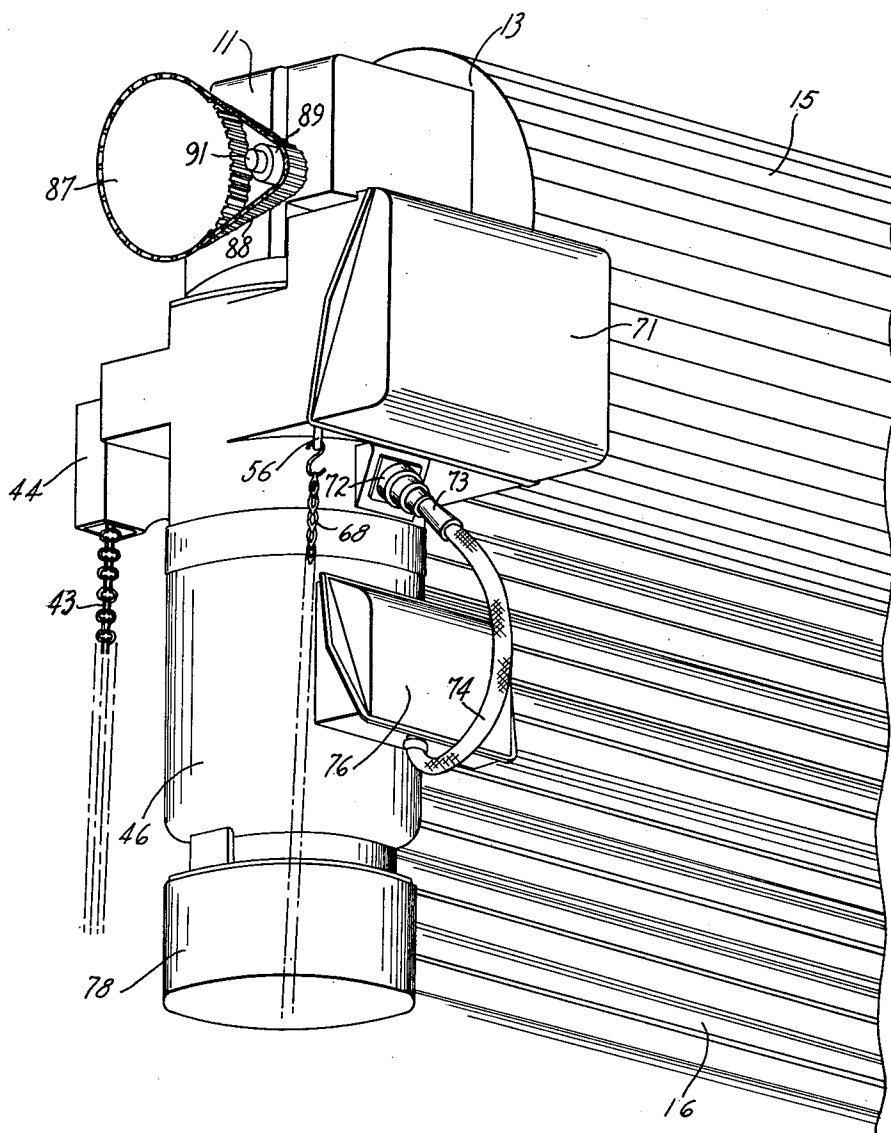


Fig. 1.

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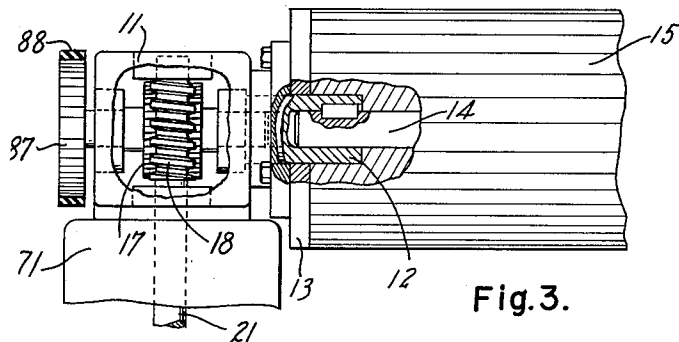


Fig. 3.

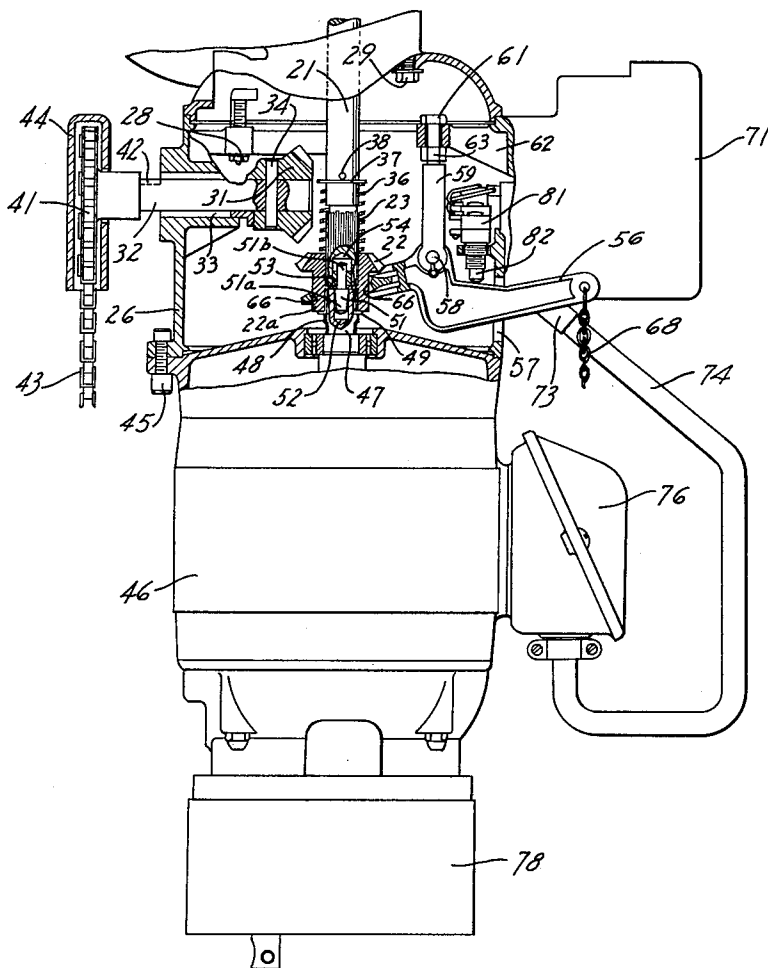


Fig. 2.

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ROLLING DOOR CONTROL DEVICE

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12 Claims. (Cl. 74-625)

This invention relates generally to a rolling door control device and more particularly to a rolling door control device of the type which can be either motor operated or manually operated.

In the past, rolling doors have been provided with door control devices which can be either power operated or operated manually. However, such door control devices have not been completely satisfactory because of the relative complexity and their high cost of manufacture.

In general, it is an object of the invention to provide a rolling door control device which is relatively simple and which can be easily manufactured.

Another object of the invention is to provide a door control device of the above character which can be mounted directly on the shaft of the counterbalancing barrel.

Another object of the invention is to provide a door control device of the above character in which the gearing within the device is completely enclosed and is constantly lubricated by an oil bath.

Another object of the invention is to provide a door control device of the above character in which the entire motor can be removed as a unit without affecting the hand operator or the limit switch.

Another object of the invention is to provide a door control device of the above character in which motor operation or hand operation can be readily selected.

Another object of the invention is to provide a door control device of the above character in which a particularly novel means is provided for connecting the output shaft of the motor to the input shaft of the worm gear assembly.

Another object of the invention is to provide a door control device of the above character in which the motor cannot be energized during the time the hand operated means is being utilized.

Additional objects and features of the invention will appear from the following description in which the preferred embodiment of the invention is set forth in detail in conjunction with the accompanying drawings.

Referring to the drawings:

FIGURE 1 is a perspective view of a door control device incorporating my invention mounted upon a rolling door.

FIGURE 2 is an enlarged detail view of a major portion of the door control device shown in FIGURE 1 with certain portions broken away.

FIGURE 3 is a front elevational view with certain parts in cross-section of the door control device shown in FIGURE 1.

In general, my door control device is utilized for raising and lowering a rolling door of the type which has a curtain adapted to be coiled onto a counterbalanced barrel mounted on a shaft. However, it can be used with other types of doors and it also may be used as an electric or manual drive for operation of valves, machinery, etc. It consists of a speed reducing unit having an output shaft which is connected to the counterbalanced barrel. The speed reducing unit is provided with an input shaft and a first gear slidably and nonrotatably mounted on the input shaft for movement longitudinally thereon. A second gear is adapted to be engaged by the first gear and manually operated means is provided for rotating the second gear. Means is also provided for yieldably urging the

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first gear out of engagement with the second gear. Motor operated means is provided and has an output shaft. Means is carried by the output shaft and adapted to be engaged by the first gear as the first gear is urged out of engagement with the second gear by said yieldable means so that as the output shaft of the motor means is rotated, the first gear and the input shaft of the speed reducing unit are rotated to raise and lower the door.

As shown in the drawings, my door control device consists of a speed reducing unit 11 of a suitable type such as a worm gear assembly which is provided with a hollow output shaft 12. The speed reducing unit 11 is mounted in a suitable manner such as on a face of the wall bracket 13 as shown. One end of the output shaft 12 of the speed reducing unit 11 is hollow and receives the driven shaft 14 of the counterbalanced barrel assembly 15. The barrel assembly 15 is of a conventional construction and has one end of a curtain 16 secured thereto. The curtain 16 is also of conventional construction and is formed of interlocking slats fabricated from suitable material such as cold rolled strip steel. This curtain, as is well known to those skilled in the art, is adapted to be wound into and out of the barrel assembly 15 during opening and closing of the doorway by the curtain in which the rolling door is mounted.

The worm gear assembly of the speed reducing unit 11 has a worm gear 17 connected to shaft 12 which is driven by a worm 18. The worm is mounted on an input shaft 21 which extends downwardly as shown particularly in FIGURE 2. A first gear 22 of a suitable type such as a bevel gear is non-rotatably and slidably mounted on the input shaft 21 for movement longitudinally of the input shaft. Thus, as shown, the input shaft 21 is provided with splines 23. The bevel gear 22 is internally splined and is formed with a substantially splined hub portion for a purpose hereinafter described.

The input shaft 21 extends downwardly into a substantially cylindrical housing 26 which is secured to a top cap 27 by suitable means such as cap screws 28. The cap 27 is secured to the housing for the speed reducing unit 11 by suitable means such as cap screws 29.

A second gear 31 is rotatably mounted within the housing 26. The second gear is of a suitable type which is adapted to cooperate with the first gear 22 and, as shown, can be a bevel gear. Gear 31 is secured to a shaft 32 which is rotatably mounted in a bushing 33 mounted in the housing 26. It is fixed to the shaft 32 by a pin 34. As can be seen from FIGURE 2, the axes of rotation of the shafts 32 and 21 are at right angles to each other so that the bevel gears 22 and 31 can engage each other.

Means in the form of a coil spring 36 is mounted on the shaft 21 and is adapted to yieldably urge the first gear 22 out of engagement with the second gear 31 for a purpose hereinafter described. One end of the spring 36 engages the bevel gear 22, whereas the other end engages a washer 37 mounted on the shaft 21 and is retained in a fixed position by a pin 38 extending through the shaft 21.

Means is provided for rotating the shaft 32 and consists of a sprocket wheel 41 which is secured to the shaft 32 by suitable means such as a key 42. A hand chain 43 is provided on the sprocket wheel 41 and extends downwardly therefrom sufficiently far so that it can be readily grasped by an operator standing on the ground by the doorway. A chain guard 44 is provided to prevent the chain from accidentally jumping off the sprocket wheel.

Motive means of a suitable type such as an electric motor 46 is provided for driving the speed reducing unit. It is provided with an output shaft 47. Means is carried by the output shaft 47 adapted to be engaged by the first gear 22 so that as the output shaft of the motor 46 is rotated, the first gear 22 together with the shaft 21 on

which it is mounted is also rotated. In the embodiment shown in the drawing, this means consists of splines 43 which are adapted to be engaged by the internal splines provided in the hub 22a of the gear 22 as shown in the drawing. As hereinbefore described, the spring 36 continuously and yieldably urges the gear 22 onto the output shaft 47 and into engagement with the splines 48 on the output shaft so that the output shaft 47 of the motor and the input shaft 21 of the speed reducing unit will operate in unison. The movement of the gear 22 onto the shaft 47 is limited by a "Tru-arc" ring 49 which is provided on the shaft 47.

From the construction shown in FIGURE 2, it can be seen that the input shaft 21 of the speed reducing unit 11 and the output shaft 47 of the motor 46 must be in alignment in order for the bevel gear 22 to readily slide onto the shaft 47. In order to maintain this alignment, a pin 51 is provided. One end 51a of the pin 51 is mounted in a bore 52 provided in the shaft 47 in a suitable manner such as by a press fit so that it rotates with the shaft. The other end 51b of the pin 51 is rotatably mounted in a bushing 53 provided in a bore 54 in the input shaft 21. Although the pin 51 has been shown as a separate element, it is readily apparent that, if desired, the pin 51 can be provided as an integral part of the shaft 47 by merely machining the shaft 47 so that it has a portion such as a portion 51b which is adapted to seat within the bushing provided in the shaft 21. Alternatively, instead of rotating with respect to the shaft 21, the pin can be mounted so that it rotates with respect to the shaft 47.

Means is provided for urging the first bevel gear 22 into engagement with the second bevel gear 31 against the force of the yieldable means 36 and consists of a lever 56 which extends out of an opening 57 provided in the housing 26. The lever is pivotally mounted upon a pin 58 carried by a forked member 59. The forked member 59 is supported in a desired position by a cap screw 61 which is threaded into the upper end of the member 59. The cap screw 61 is supported by an extension 62 provided in the housing 26. The member 59 is locked in the desired position by a lock nut 63. The inner end of the lever 56 is flattened and is provided with a hole 66 which receives the hub 22a of the bevel gear 22. Means is provided for operating the lever and consists of a chain 68 which extends downwardly from the outer end of the lever 56 and which is adapted to be grasped by hand.

A conduit box 71 is mounted on the housing 26 and is provided with conventional terminals (not shown). It is also provided with an electrical receptacle 72 which is adapted to receive a plug 73. The plug 73 is connected by a cable 74 to conduit box 76 provided for the motor 46. The motor 46 is provided with a brake unit 78 of a conventional type which is energized when the motor is deenergized to rapidly bring the motor to a stop and which is deenergized when the motor 46 is energized.

Means is provided for preventing energization of the motor 46 during the time that the manually operated means is held in engagement by the chain 68. It consists of a normally open switch 81 which is mounted on the side wall of the housing 26. The switch 81 has an operating lever 82 which is yieldably urged into engagement with the lever 56. When the outer end of the lever 56 is pulled downwardly by the chain 68, the switch 81 assumes its normally open position to prevent energization of the motor 46.

The motor 46 is also provided with limit control device 86 of the type known to those skilled in the art. The limit control device is driven by a sprocket wheel 87 which is mounted on the other end of the output shaft 12 of the speed reducing unit. A chain 88 is mounted on the sprocket wheel and drives a small sprocket 89 which is mounted on a shaft 91 that forms a part of the limit control device. The limit control device is provided with cams (not shown) which operate switches (not shown) to deenergize the motor 46 when the rolling door has been

moved to its lowermost position or to its uppermost position.

Operation of my rolling door control device may now be briefly described as follows. During power operation or motor operation, the door control device is in the position shown in FIGURE 2 in which the bevel gear 22 is out of engagement with the bevel gear 31. In this position, it can be seen that the bevel gear 22 engages the splines 48 provided on the output shaft 47 and on the input shaft 21 so that when the motor is operated, the shafts 47 and 21 will operate in unison to raise or lower the rolling door depending upon the direction of travel of the motor 46.

When it is desired to manually operate the door, the lever 56 is pulled downwardly by means of the chain 68 and the chain 68 is secured in this position by attaching the same to a hook (not shown) or other suitable securing means. As hereinbefore explained, this urges the bevel gear 22 into engagement with the gear 31 against the force of the spring 36. As soon as this is accomplished, the switch 81 is moved to its normally open position to prevent accidental energization of the motor 46. The rolling door can then be operated by movement of the chain 43 and the shaft 32 to cause rotation of the bevel gear 31 and the bevel gear 22 to cause rotation of the input shaft 21 of the speed reducing unit 11.

When the manual operation is no longer desired, the chain 68 is released. As soon as this is accomplished, the spring 36 will urge the bevel gear 22 out of engagement with the bevel gear 31, and at the same time will operate the switch 81 to close the same so that the motor 46 can again be controlled in a conventional manner.

The motor 46 can be readily removed as a unit without affecting the chain operator 43 or the limit control device 86 by merely removing the bolts 45. Thus, it can be seen that the motor can be readily removed for repair and a replacement unit installed with very little difficulty.

It is apparent from the foregoing that I have provided a new and improved drive control unit for rolling doors which forms a single compact unit which is fully enclosed and which can be directly connected to the door drum or barrel shaft. Changing from power operation to manual operation is relatively simple. Also, the power operated means cannot be accidentally energized during the time that manually operated means is being utilized.

I claim:

1. In a control device for controlling the rotation of a driven shaft, a speed reducing unit having an output shaft adapted to be connected to the driven shaft, an input shaft and means connecting the input shaft to the output shaft so that the output shaft is rotated as the input shaft is rotated, a first gear non-rotatably and slidably mounted on the input shaft, a second gear adapted to be engaged by the first gear, means yieldably urging said first gear out of engagement with said second gear, manually operated means for rotating said second gear, means for moving the first gear into engagement with the second gear against the force of the yieldable means, motor operated means having an output shaft, and means carried by the output shaft of the motor operated means and engageable by said first gear so that when the motor operated means rotates the output shaft of the motor operated means, said first gear and the input shaft of the speed reducing unit are rotated in unison with the output shaft of the motor operated means.

2. A control device as in claim 1 wherein said first and second gears are bevel gears having axes of rotation at right angles to each other and wherein the input shaft of the speed reducing unit and the output shaft of the motor operated means are in axial alignment.

3. A control device as in claim 2 together with means connecting the input shaft of the speed reducing unit to the output shaft of the motor operated means to maintain the same in axial alignment while permitting rotation of the shafts with respect to each other.

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4. A control device as in claim 2 wherein the input shaft of the speed reducing unit and the output shaft of the motor operated unit are provided with splines and wherein the first bevel gear is provided with splines adapted to engage the splines on the input shaft of the speed reducing unit and the output shaft of the motor operated means, said bevel gear being normally urged into a position by said yieldable means to engage the splines on the output shaft of the motor operated means and the input shaft of the speed reducing unit so that the output shaft of the motor operated means and the input shaft of the speed reducing unit rotate in unison.

5. A control device as in claim 1 together with switch means operated by said means for moving said first gear against the force of the yieldable means for preventing energization of the motor operated means when the first gear is in engagement with the second gear.

6. A control device as in claim 2 wherein said input shaft of the speed reducing unit and the output shaft of the motor operated unit are in substantially vertical positions.

7. In a control device for raising and lowering a rolling door of the type having a curtain adapted to be coiled onto a drum or barrel mounted on a driven shaft, a speed reducing unit having an output shaft adapted to be connected to the driven shaft on which the barrel is mounted, the speed reducing unit also having an input shaft and means connecting the input shaft to the output shaft so that the output shaft is rotated as the input shaft is rotated, a first bevel gear mounted on said input shaft so that as the first bevel gear is rotated the input shaft is rotated, said first bevel gear being mounted on said input shaft for movement longitudinally of the input shaft, a second bevel gear having an axis of rotation at right angles to the axis of rotation of the first bevel gear, manually operated means for rotating the second bevel gear, means yieldably urging the first bevel gear in one direction on the input shaft, means engaging the first bevel gear and adapted to move the same against the force of the yieldable means, motor operated means having an output shaft, and means carried by the output shaft and adapted to be engaged by the first bevel gear when it is moved to said one position to connect said output shaft of the motor operated means to the input shaft of the speed reducing unit so that they operate in unison.

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8. A control device as in claim 7 wherein the output shaft of the motor operated means and the input shaft of the speed reducing unit are in axial alignment.

9. A control device as in claim 8 together with means for connecting the output shaft of the motor operated means and the input shaft of the speed reducing unit so that they remain in axial alignment, said means including a member fixed to one of the axially aligned shafts and rotatably mounted in the other of the axially aligned shafts to permit rotation of the axially aligned shafts with respect to each other.

10. A control device as in claim 7 wherein the output shaft is formed with means adapted to receive the first bevel gear and to cause the first bevel gear to rotate with said output shaft.

11. A control device as in claim 10 wherein the input shaft to the speed reducing unit and the output shaft of the motor operated means are splined and wherein the first bevel gear is splined.

12. In a control device for controlling the rate of rotation of a driven shaft, a first gear, an input shaft, means connecting the input shaft to the driven shaft, a first gear nonrotatably and slidably mounted on the input shaft, a second gear adapted to be engaged by the first gear, means yieldably urging said first gear out of engagement with said second gear, manually operated means for rotating said second gear, means for moving the first gear into engagement with the second gear against the force of the yieldable means, motor operated means having an output shaft, and means carried by the output shaft of the motor operated means and engageable by said first gear so that when the motor operated means rotates the output shaft of the motor operated means, said first gear and the input shaft are rotated in unison with the output shaft of the motor operated means.

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