

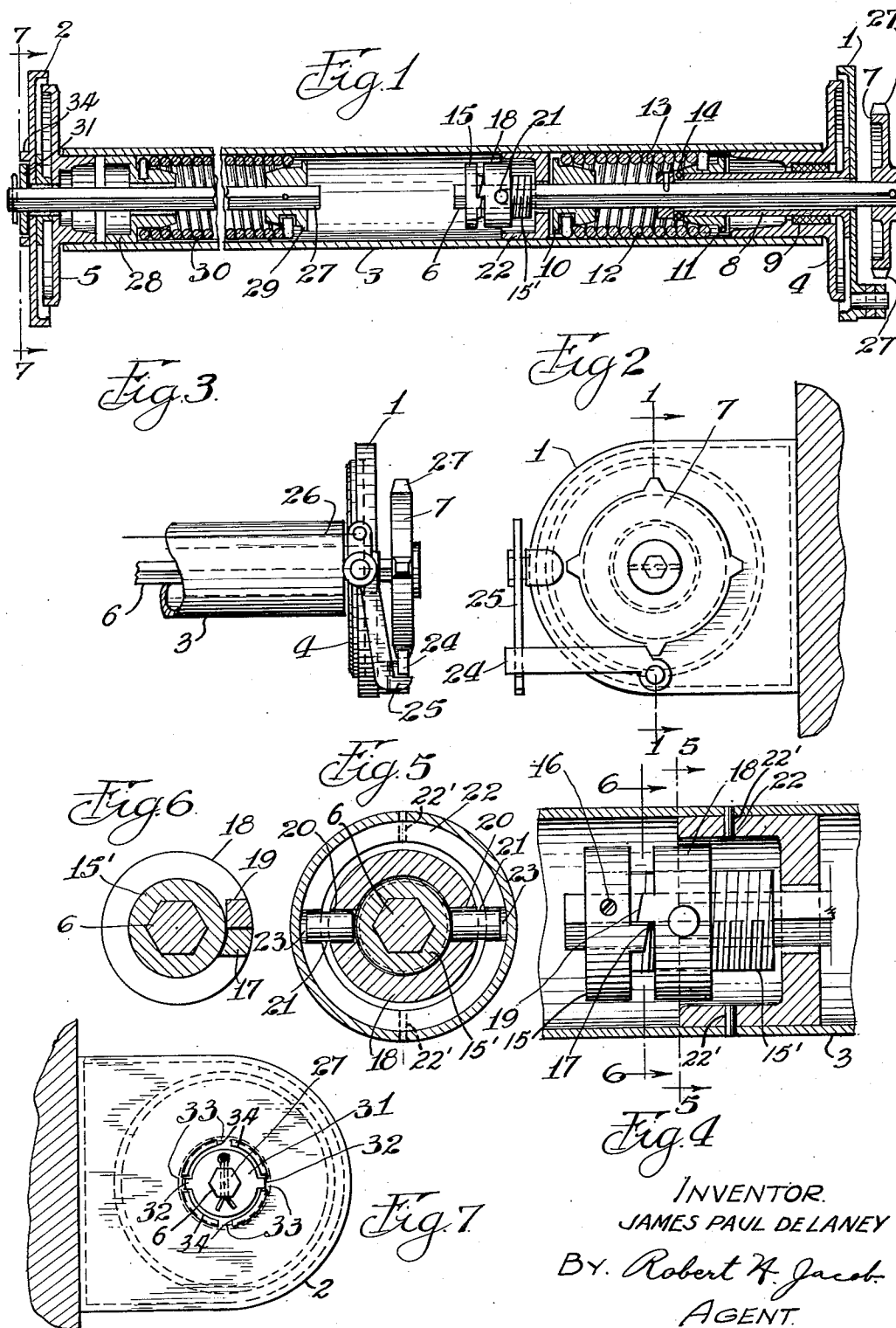
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J. P. DE LANEY

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CONTROL MECHANISM FOR FIRE DOORS

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INVENTOR.
JAMES PAUL DELANEY
BY. Robert H. Jacob.
AGENT.

UNITED STATES PATENT OFFICE

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CONTROL MECHANISM FOR FIRE DOORS

James Paul De Laney, Chicago, Ill.

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The present invention relates to operating and control mechanisms for overhead fire doors or shades of the rolling shutter type which close automatically in case of fire and which can be operated manually under normal conditions.

More in particular, the invention relates to control units for this purpose which employ helical tension springs mounted to cooperate with shafts which are in operative relation with the carriers on which the slats constituting the shutters of the fire doors are rolled.

It is the primary object of the present invention to provide a reliable control mechanism by means of which fire doors or shades can be automatically closed under emergency conditions, or manually closed and opened under normal conditions and which can be conveniently and economically installed, which are readily accessible for adjustment purposes and which can be easily and efficiently adjusted.

It is an additional object of the present invention to provide in combination with this mechanism readily accessible and adjustable means for cushioning the fall of the doors both, when automatically and when manually operated.

The operating and control mechanism in accordance with the present invention comprises a drum upon which the closure slats are rolled; an operating shaft and a helical spring adapted to rotate said shaft; locking means for holding the shaft stationary under normal conditions and for allowing it to rotate automatically in case of fire; means for transferring the rotary motion imparted by the spring to the shaft, from the shaft to the drum and for permitting the movement of the drum while the shaft is held by the locking means; and in combination with the foregoing means, means including a stationary shaft cooperating with a helical spring, adapted to cushion the fall of the door under all operating conditions.

For a better understanding of the invention reference is made to the accompanying drawing in which,

Fig. 1 is a central longitudinal section of the operating mechanism taken along line 1—1 of Fig. 2 illustrating the manner of operation of the structure;

Fig. 2 is an end view of the mechanism showing the locking means for the operating shaft;

Fig. 3 is a view of the locking mechanism taken from the left of Fig. 2;

Fig. 4 is an enlarged sectional view of the means shown in Fig. 1 for transferring the rotary movement from the shaft to the drum and for

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permitting the manual operation of the door while the shaft is stationary;

Fig. 5 is a sectional view taken along line 5—5 of Fig. 4;

Fig. 6 is a sectional view along line 6—6 of Fig. 4;

Fig. 7 is a view taken along line 7—7 of Fig. 1 showing the adjusting means for the cushioning spring.

The door proper or curtain which is of conventional design and which is mounted upon the drum is not shown as its mounting and function are obvious to the man skilled in the art.

As shown in Fig. 1, the structure is supported by brackets 1 and 2 which are securely fastened to the wall above the door opening by any convenient means. The barrel or drum 3 upon which the slats of the door are rolled is supported by hub shells 4 and 5 to which it is rigidly fastened and which are adapted to rotate in and with respect to the supporting brackets.

The operating shaft 6 which is preferably of hexagonal cross-section extends through the supporting bracket 1 and into the drum 3 as shown. It is provided at its outwardly projecting end with a locking disk 7 which is securely held in position by means of a pin or screw.

A long sleeve 8 which is secured to the bracket 1 extends into the drum through hub shell 4 which it supports upon its outer surface by means of a suitable bearing 9, while in its interior it supports a long section of the shaft 6. Two collars 10 and 11 are secured to shaft 6 and sleeve 8, respectively, and the ends of operating spring 12 are secured to the collars as shown, or in any other conventional manner.

A lock ring 13, fastened to shaft 6 by means of a pin or bolt, and separated from sleeve 8 and collar 11 by means of a thrust bearing 14 prevents the shaft 6 from moving outwardly when spring 12 is under tension, the thrust bearing being provided to prevent friction between the lock ring 13 and the ends of the sleeve 8 and collar 11.

Upon the inner end of the shaft 6 a threaded member 15 having a hilt which forms an integral part thereof is securely fastened by means of a pin or bolt 16 (Fig. 4), and is provided at its hilt with a lug 17. A nut 18, having a lug 19 which is adapted to engage lug 17, is provided upon the threaded portion 15' of member 15 in threaded engagement therewith. In the present embodiment of the invention the threads on portion 15' of the member 15 and of nut 18 are left hand threads, but it is obvious that in a different ar-

rangement of the parts right hand threads could be employed to the same advantage.

The nut 18 is provided with bores 20 (Fig. 5) to loosely engage pins 21 approximately up to their mid-portions. A recessed collar 22, having slots 23 for engaging the ends of pins 21 which project from the bores 20 is securely fastened by pin 22' to the drum 3 of the structure with which it rotates.

For the manual operating condition of the door the shaft 6 is held stationary by means of the co-operating locking disk 7 and levers 24 and 25 which are held in the position shown in Figs. 2 and 3 by means of a fusible link as indicated at 26 or any other conventional equivalent means. The levers 24 and 25 may be conveniently supported upon supporting bracket 1 as shown and the fusible link or wire can be extended across the full width of the structure for support on the bracket 2. The locking disk 7 is provided with teeth which engage lever 24 when a rotary pressure in a clockwise direction is applied through the collar 10 to the shaft 6 by the tension of the spring 12. It is, of course, obvious that any other suitable locking device for the shaft 6 can be provided without departing from the spirit of the present invention.

When the shaft 6 is locked under control of lever arm 24, rotation of collar 22 in a clockwise direction forces the pins 21 which are in engagement with slot 23 to rotate with it, thereby causing nut 18 to follow the rotary movement, and to travel along the threaded portion of member 15 further into the recessed portion of the collar. This action takes place when unwinding the slats or curtain from the drum to close the door.

It is obvious that a reverse movement of the parts will take place when the door is raised and the drum 3 moves in a counter-clockwise direction. Under these conditions, the nut 18 travels in a direction away from the collar 22 until lug 19 engages lug 17. At this point the rotation of the collar 22 and the upward movement of the door are arrested as the member 15 which is securely fastened to the shaft 6 cannot rotate as long as spring 12 is under tension. This feature makes it possible, by properly positioning the threaded member 15 upon the shaft, securing it to the shaft by means of bolt 16 and adjusting the nut upon the thread, to stop the upward movement of the door in any predetermined position.

The cushioning or counter-balancing means include a shaft 27 which extends into the drum 3 through the supporting bracket 2 and hub shell 5. Shaft 27 is supported by the bracket 2 and in turn supports the drum through hub shell 5 and collar 28.

Collar 28 is provided with a circular bore which snugly fits around shaft 27, which is preferably of hexagonal cross-section, with the corners of the shaft, which may be slightly rounded, providing bearing support for the collar. It comprises a section of smaller external diameter which serves as a support for one end of cushioning spring 30, and a section of larger external diameter which slidably fits into and is securely fastened to the interior surface of drum 3 with which it rotates. A collar 29 is securely fastened by any convenient means to the inner end of shaft 27 and supports the other end of the spring 30.

A locking disk 31 is mounted on the outwardly projecting end of the shaft 27, to which it is rigidly fastened (see Fig. 7). Extending radially

from disk 31 are lugs 32 which are adapted to engage the slots 33 cut out of a raised annular portion 34 provided upon the outer surface of supporting bracket 2. The disk 31 can be moved outwardly with the shaft 27 so that the shaft can be rotated with the collar 29 for adjusting the tension of the spring 30. Normally the lugs 32 rest in the slots 33 and consequently the shaft 27 is stationary during the operation of the door.

For automatic operation the mechanism can be adjusted in very simple fashion. When the mechanism is installed the pin carrying rider nut 18 is turned on the threaded collar 15 until lug 19 of the nut is in contact with lug 17 of the collar. The pins 21 in the slots 23 of collar 22 which is rigidly fastened to the rotary drum 3 are then fully in the entrances of slots 23. The door slats which are fastened at the upper end to the drum or barrel are now slowly raised while the drum is carefully rotated. The slotted collar 22 rotates with the drum and the rotary movement is transferred from the collar 22 to the pins 21 resting in the slots 23 and through the lug 19 of the nut which abuts the lug 17 on the threaded member to the shaft 6 upon which this member is secured against horizontal movement. As the shaft 6 rotates the collar 10 also rotates and winds the spring 12 which is fastened at one end to the stationary collar 11. When the door is completely raised and wound upon the drum the locking disk 7 is secured by means of lever arms 24 and 25 the latter of which is held in engagement with the former by means of the fusible link. The automatic operating mechanism is now in condition for operation.

Should it be found that the spring pressure for the downward movement of the door is greater than desired and that consequently the door could be damaged when released by the locking mechanism the tension of the spring can be readily reduced. This is effected by turning the locking disk 7 with the shaft 6 counter-clockwise (as viewed in Fig. 2) while the door is in the closed position, thereby moving the nut 18 with the pins 21 further into the collar 22 and breaking the contact between lugs 17 and 19. When the door is now raised, the drum can be turned while the shaft is held stationary until contact is made between the lugs. In this manner the shaft is turned only after the door has been raised to a desired height so that it revolves a lesser number of turns before the uppermost position of the door is reached than if it were turned during the entire upward movement of the door, and as a result, the spring is wound less tightly. Under these conditions matters can be so arranged that the spring after it has come to neutral position during the downward movement of the door, will start winding in the opposite direction so that its resistance to the downward movement of the door is added to that of the cushioning spring. This arrangement will be found desirable where a heavy door is employed and one cushioning spring cannot adequately satisfy the requirements for the automatic operation.

The cushioning spring 30 can be conveniently adjusted while the door is in the topmost position. The adjusting disk 31 with shaft 27 is moved horizontally outwardly by means of any convenient tools until the disk and its lugs 32 are free to rotate. For normal operation and when the spring 30 is of the proper strength to cushion the fall of the door, the spring is adjusted to substantially neutral position by rotat-

ing the disk the lugs 32 of which are then allowed to snap back into the slots 33 in raised annular portion 34. When the door is now moved downwardly the spring tension increases with the downward movement so that it substantially counter-balances the weight of the door, thereby slowing up the movement sufficiently to prevent serious damage.

It is evident from the foregoing description and from the drawings that the operating mechanism in accordance with the present invention can be installed and adjusted with a minimum of work as it is readily accessible. It is also evident that it is adapted for use with doors or curtains of different length, width and weight as the same parts, such as shafts, collars and springs can be employed for different door structures, although it may be necessary or desirable under some conditions to provide springs of different strength.

It is, of course, understood that any convenient means, such as pins or bolts can be used for securing the collars and disks to the shafts and the drum to the collars and to the hub shells. Since any man skilled in the art is familiar with the conventional fastening means, such means are not described in detail.

If a closed carrier drum, such as illustrated, is employed in combination with the operating mechanism according to the present invention, it will be found convenient and time saving to provide openings adjacent collars 10 and 29, as well as adjacent member 15 and nut 18, through which adjustments can be made without dismantling the entire mechanism.

When the fire door is operated manually, shafts 6 and 27 are stationary. As the door is raised from the closed to the opened position drum 3, hubs 4 and 5, as well as collars 22 and 28 rotate counter-clockwise with respect to the shafts as seen in Fig. 2 and the other stationary parts of the mechanism. By means of the pins 21 the ends of which are in engagement with the slots 23 in collar 22 the nut 18 is forced to rotate and travels along the threaded member until lugs 19 and 17 make contact. Consequently the rotation of the drum then ceases and the upward movement of the door is stopped in the uppermost position for which the mechanism has been previously adjusted. Simultaneously the spring 30 unwinds, releasing its tension through the collar 28, thereby applying a force to the drum which acts in a counter-clockwise direction and aids in the raising of the door.

When the door is moved downwardly, the drum and all other rotatable parts move clockwise and the nut 18 travels into the recess in collar 22 until the door arrives in the desired position. The spring 30 is thus being wound up and as its tension increases a resistance to the rotary movement of the drum is developed which acts to counter-balance the weight of the door.

Under emergency conditions, for example in the case of fire, the fusible link melts and releases the lever 25, which, in turn, allows lever 24 to drop, thereby allowing the tension of the spring to be applied to collar 10. This causes collar 10 to rotate in a clockwise direction. The rotary movement of the collar is transferred to the drum 3 through member 15, nut 18 and collar 22. As the tension of the spring decreases, the weight of the unwinding door increases, developing a momentum in a downward direction which is counterbalanced by the cushioning mechanism. This prevents the door from moving too rapidly down-

ward, which is necessary to avoid damage to the door.

It is obvious from this that the spring 30 should be stronger than spring 12. However, it is difficult to specify the relative strengths of the springs as they naturally vary with the weight of the door; but any man skilled in the art will be readily able to determine the correct size of springs to be used for specific doors. Since the springs can be adjusted to a considerable extent after the mechanism is installed, it is not necessary to determine their strength within close limits.

While I have described my invention and its operation with reference to one specific embodiment thereof, I do not desire to be limited thereto, as it is obvious that the principles disclosed herein can be incorporated in different embodiments without departing from the spirit or scope of the invention.

What I claim is:

1. Operating mechanism for fire door of the rolling shutter type adapted for both manual and automatic operation and comprising, in combination with a drum, a first adjustable means including a shaft, a helical spring adapted to impart torque to said drum and a locking mechanism for said spring under control of a fusible member, a second adjustable means including a shaft and a helical spring adapted to cushion the downward movement of said door, and adjustable stopping means associated with said first shaft adapted to stop the upward motion of said shutter during the manual operation of said door and to transfer torque from said first shaft to said drum during automatic operation thereof.

2. Operating mechanism according to claim 1, wherein said adjustable stopping means include a threaded member mounted upon said first shaft and having a first lug, a nut in threaded engagement with said member having a second lug adapted to engage said first lug and provided with one or more radial bores, a ring, secured to said drum and having a pin engaging slot aligned with each bore, and a connecting pin for each bore having one end resting in its bore and the other end in the associated slot for sliding engagement therewith.

3. Operating mechanism for fire door of the rolling shutter type adapted for both manual and automatic operation and, comprising, in combination with a rotary shutter drum and supporting means therefor, a first adjustable means for imparting rotary motion in one direction to said drum, said means including a rotatable shaft, a helical spring and a locking mechanism connected to said shaft, and an intermediate adjustable means between said shaft and said drum and adapted to transfer said rotary motion from said first means to said drum for the automatic operation of said door and to stop the rotation of said drum in the other direction during the manual operation thereof.

4. Operating mechanism according to claim 3, wherein a sleeve extends into said mechanism from said drum supporting means for supporting said shaft, a locking ring secures said shaft against outward horizontal movement, and a thrust bearing separates said sleeve from said fixedly mounted spring support.

5. Operating mechanism according to claim 3, wherein said intermediate adjustable means includes a threaded member secured to said shaft and provided with a lug, a nut is in engagement with said threaded member and is provided with a cooperating lug, one or more connecting pins

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project radially from said nut, and a ring provided with one or more slots which engage said pins is secured to said drum.

6. Operating mechanism for fire doors or the like, comprising, in combination, a closure supporting drum, two hub shells, two supporting brackets, two shafts extending into opposite ends of said drum and provided proximate to their outwardly projecting ends with locking disks; two helical springs, each supported around one of said shafts by two collars, one of each pair of said collars being secured to its associated shaft, the second one of one pair of said collars being secured to said drum for rotary movement relatively to its shaft and the second one of the other pair of said collars being mounted in fixed position along its associated shaft and said drum; a threaded member secured to the inner end of said last mentioned shaft and provided with a lug, a nut movable upon said threaded member having a lug adapted to cooperate with said lug

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on said threaded member, a collar secured to said drum and provided with a recessed portion in which said nut may move, said nut having at least one radial bore and said collar having at least one slot extending along its recessed portion, and at least one connecting pin resting at one of its ends in a radial bore in said nut and at its other end in a slot in said collar for sliding movement in said slot.

JAMES PAUL DE LANEY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
984,799	Collins	Feb. 21, 1911
1,052,735	McCloud	Feb. 11, 1913
2,019,085	Miller	Oct. 29, 1935