United States Patent [19]

Stieler

[11] **3,842,892**

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[54] **ROLLING DOOR OPERATING MECHANISM**

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[73] Assignee: **RCM Corporation,** Warren, Mich.

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[52] **U.S. Cl.** **160/133,** 160/189

[51] **Int. Cl.** **E06b 9/08**

[58] **Field of Search** 160/9, 121, 133, 189, 191

[56] **References Cited**

UNITED STATES PATENTS

2,097,242	10/1937	Robinson	160/191
2,099,191	11/1937	Blodgett	160/189
2,878,865	3/1959	Manley	160/189
3,637,004	1/1972	Wardlaw et al.	160/133

Primary Examiner—Mervin Stein

Attorney, Agent, or Firm—Barnes, Kisselle, Raisch & Choate

[57] **ABSTRACT**

A safety mechanism for a rolling door operating mechanism for preventing accidental descent of the door which includes a pair of adjacent rotating blocks having limited angular motion relative to each other, one of these blocks serving as a lock ratchet and the other of said blocks serving as a release mechanism to permit lowering of the door under normal circumstances. In the event of power failure, chain breakage or counterbalance failure which may cause the door to descend, one of the blocks will overrun the drive block and permit a latch bar engagement.

6 Claims, 8 Drawing Figures

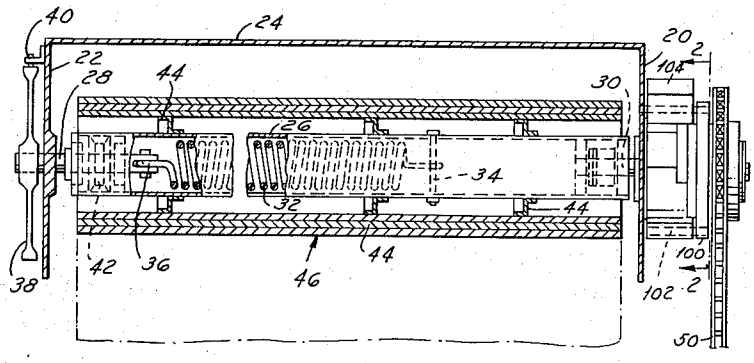


FIG. 1

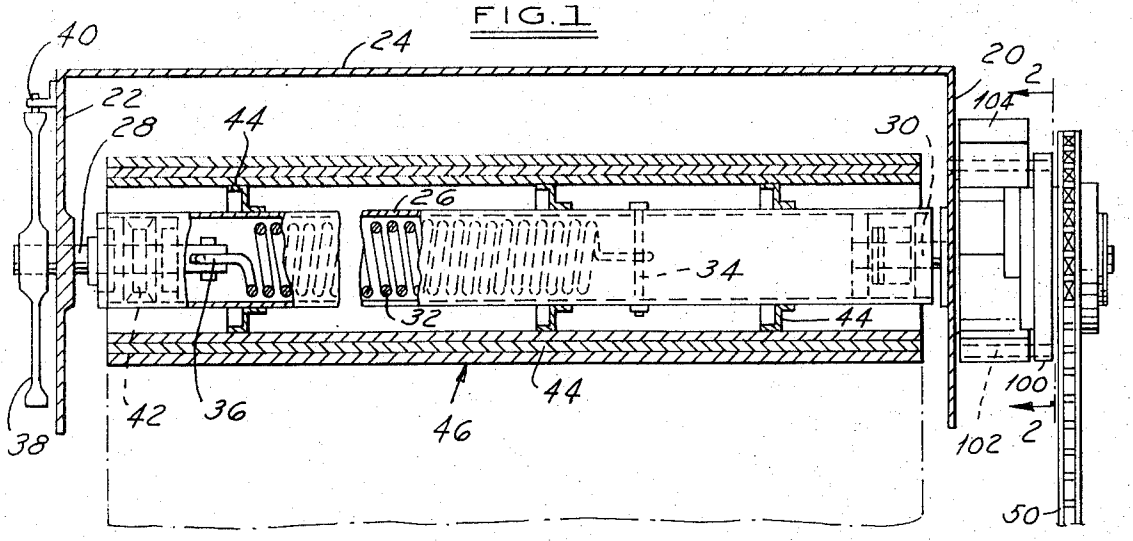


FIG. 4

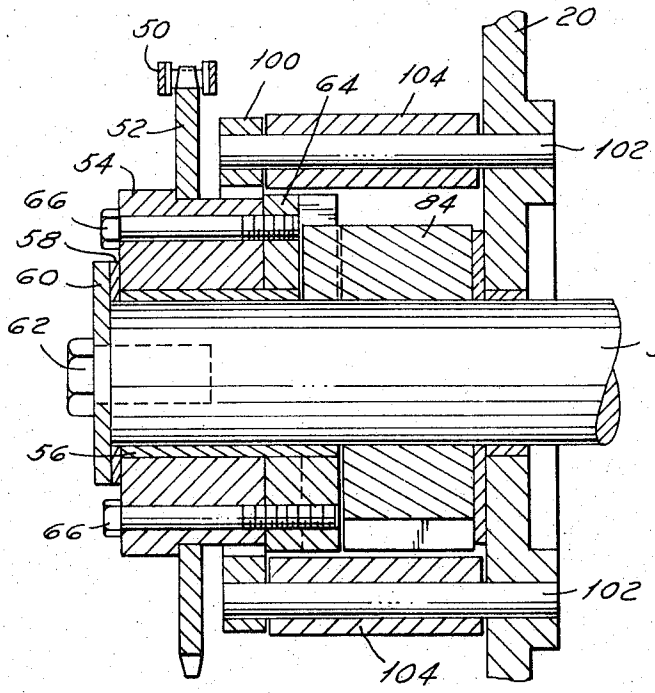


FIG. 8

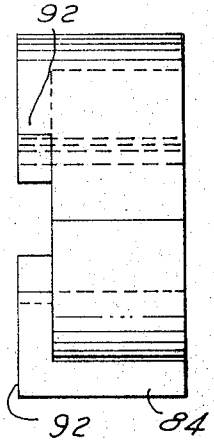


FIG. 6

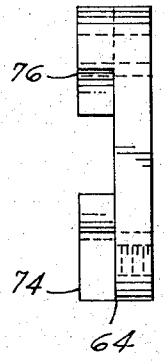


FIG. 2

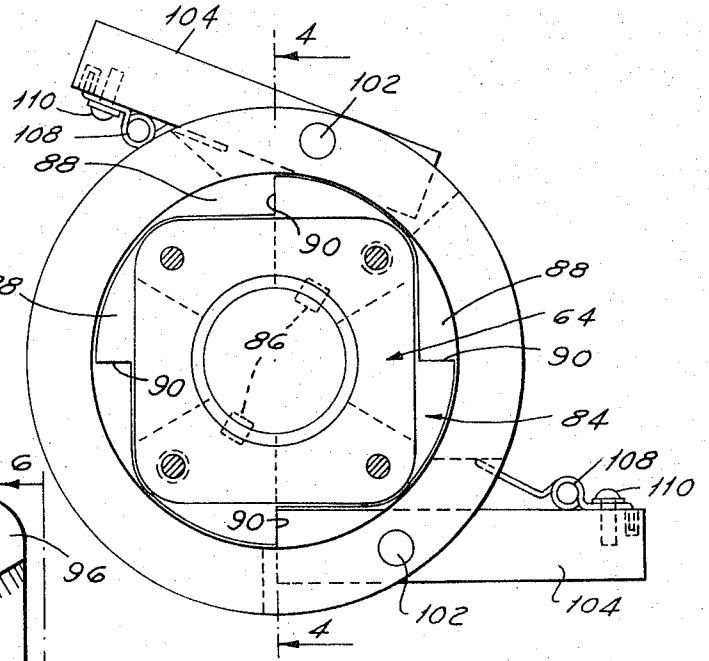


FIG. 5

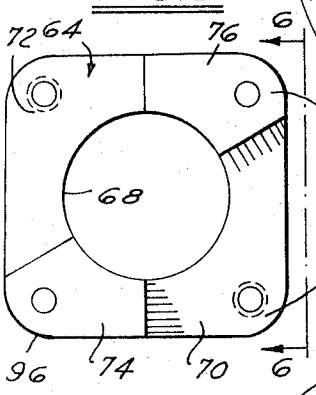


FIG. 3

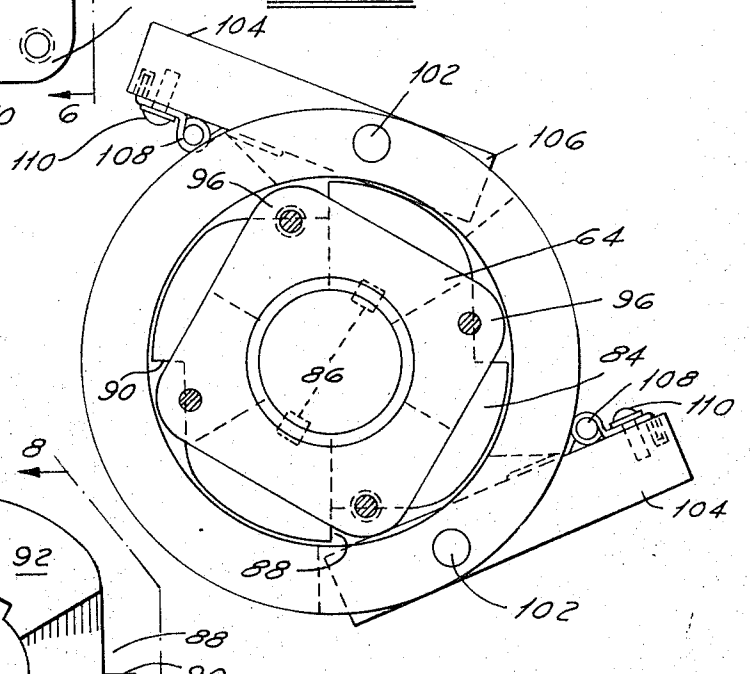
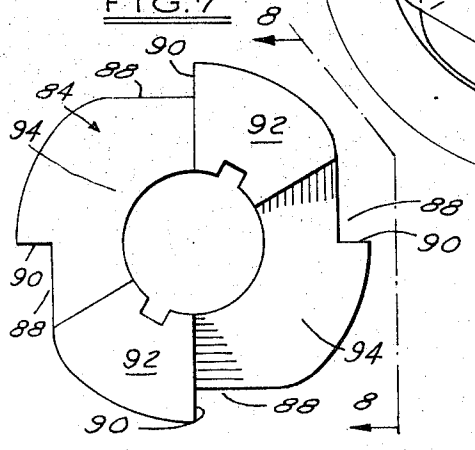


FIG. 7



ROLLING DOOR OPERATING MECHANISM

This invention relates generally to a Rolling Door Operating Mechanism and more particularly to a novel safety drive for powering a counterbalance rolling door curtain and protecting against malfunction, breakage, or loss of power.

Rolling doors consist of a curtain of articulated slats which can be raised and lowered to open and close an aperture or doorway. The curtain is rolled and unrolled from a roll cylinder which is mounted horizontally adjacent the top of an opening. If the cylinder is rotated, the curtain is unrolled from the cylinder to close the door and rolled around it to open the door. To counterbalance the weight of the articulated curtain, a coiled torsion spring is generally mounted within the barrel mechanism. Energy is stored in the spring upon unrolling the curtain from the cylinder and energy is released from the spring when the curtain is again rolled up around the cylinder.

Inasmuch as there is a possibility of power failure or loss of voltage which will reduce power and also a possibility that the counterbalance mechanism may malfunction, it is desirable that a safety mechanism be provided to arrest the downward motion of the door or to prevent motion when suitable power is not available.

This invention is intended to be an improvement over certain safety mechanisms for rolling doors such as described, for example, in U.S. Pat., to Manley, No. 2,878,865, dated Mar. 24, 1959 and, to Wardlaw et al., No. 3,637,004, dated Jan. 25, 1972.

It is an object of the present invention to provide a relatively simple and inexpensive structure which will provide the necessary safety functions and yet one which can be readily adapted to the mounting and power structures that are presently available for these rolling doors.

It is a further object to provide a safety device which will function in either the raising or lowering action of the door or in the event of power reduction which is insufficient to raise the door.

It is a further object to provide a safety system which will operate in the event of motor failure or a power or drive chain failure or a failure of the counterbalance.

It is also an object to provide a safety device which has relatively few parts which are easily machined and easily maintained.

Other objects and features of the invention will be apparent in the following description and claims in which the principles of operation of the invention and the use thereof are described in connection with details of the best mode presently contemplated for the structure.

Drawings accompany the disclosure and the various views thereof may be briefly described as:

FIG. 1, a view of a rolling door operating mechanism illustrating the manner in which the structure of the present invention will be incorporated.

FIG. 2, a sectional view of the mechanism taken on line 2—2 of FIG. 1.

FIG. 3, a view similar to FIG. 1 showing different parts in a different relative position.

FIG. 4, a sectional view taken on line 4—4 of FIG. 2.

FIG. 5, an illustration of a drive block of the assembly.

FIG. 6, a side elevation of the part illustrated in FIG. 5 taken on line 6—6 of FIG. 5.

FIG. 7, a view of a ratchet block which is part of the assembly.

FIG. 8, a side elevation of the part illustrated in FIG. 7 taken on line 8—8 of FIG. 7.

Referring to FIG. 1, end supporting plates 20 and 22 support a housing drum 24 which surrounds the assembly and has a horizontal slot at a lower portion (not shown) to allow the door to enter and leave the drum. A roll cylinder 26 is supported at the end plate 22 by a shaft 28 and at the end plate 20 by a shaft 30. In the left-hand end of the cylinder 26 is mounted a counterbalance spring 32 which is anchored at its inner end on a cross bolt 34 and anchored at its outer end at 36 in shaft 28. A spoke member 38 latched at 40 makes it possible to adjust the tension of the spring. The shaft 28 is mounted in the roll cylinder 26 in a suitably dimensioned support spool plug 42. Spaced along the roll cylinder 26 are rings 44 which support the articulated slats shown generally at 46 in the rolled position.

A suitable power system in the form of a motor and necessary reduction gears (not shown) drives a power chain 50 which runs on a sprocket 52 mounted on a drive block 54 which in turn is mounted on a bearing sleeve 56 surrounding shaft 30. The drive block is held on the shaft by a suitable bearing washer 58 and a retainer plate 60 held by a bolt 62. The sprocket 52 has a driving engagement with the drive block 54. On the right-hand end of the drive block 54 is an extension block 64 held securely by a plurality of circumferentially spaced bolts 66. This block 64 is shown in profile in FIG. 5 as a substantially rectilinear block having rounded corners and an opening 68 to receive the bearing sleeve 56. The block has segmental recesses 70 and 72 which are defined by segmental portions 74–76. The recesses extend through approximately 120° around the center of the block, leaving about 60° at the lands 74–76. Mounted axially adjacent the extension drive block 64 is a ratchet block 84 which is keyed to shaft 30 by keys 86 shown in FIGS. 2 and 3. This ratchet block is generally round in configuration, but it is provided with semi-chordal recesses 88 which terminate in radial shoulders 90. One side face of the ratchet block 84 also has segmental lands 92 which create 120° segmental recesses 94 therebetween.

Thus, when the lands 76 and 74 of the drive block 64 interengage with the lands 92 of the ratchet block, they have a driving relation to each other which has a 60° lost motion relationship when the direction is reversed. Thus, the drive block and the ratchet block will have two relative positions. In FIG. 2, one of these positions is shown wherein the drive block 64 is so positioned that the recesses 88 are exposed around the periphery of the two parts. In FIG. 3, it will be seen that the corners 96 of the drive block are positioned over the recesses 88.

Mounted on the end plate 20 is a support ring 100 supported by pins 102 which serve as supporting pivots for latch bars 104 shown in FIGS. 2, 3 and 4. The latch bars have a short end 106 with an inside corner adapted to engage the ratchet recesses of the ratchet block 84. The longer ends of the latch bars project tangentially outwardly and carry coil springs 108 mounted at 110 which urge the latch bars in a clockwise direction as viewed in FIGS. 2 and 3.

It will be seen that as the parts are related in FIG. **2**, the latch bars will be urged by the springs inwardly so that they will engage the shoulders **90** to prevent counterclockwise motion of the ratchet block. When the parts are related as shown in FIG. **3**, the corner protuberances of the drive block **64** register with the recesses **88** and effectively block the latch bars from entering the ratchet recesses.

In connection with the operation of the assembly as described, reference should first be made to FIG. **2**. The sprocket **52** driven by the chain **50** will turn and through the block **54** drive the drive plate **64** which runs on the bushing **56**. When the lands **74–76** contact the lands **92** of the ratchet block **84**, the ratchet block will assume the position shown in FIG. **2** the maximum rotation before engagement being 60°. The operation in the clockwise direction will cause the short ends of the latch bars to raise in each case and pass the latch bars and the roll cylinder **26** will raise the articulated door slats. If for some reason the drive motor which is operating the sprocket **52** did not develop sufficient power to raise the door, then the door would stop at any point along the way or slip back to allow the latch bars **104** to engage the ratchet shoulders **90** and thus prevent the door from falling. This power shortage might result from the failure of the counterbalance spring or for some other voltage decrease in the power line. Should the drive chain **50** fracture or become disconnected during the raising of the door, the door curtain may slip back and under these circumstances, the same action would take place that the latch bars would engage the ratchet shoulders. Under some circumstances, if the chain should break when the door is near the top, the counterbalance might run the door to the top and there would be no problem of an accidental drop of the door.

When the door is being closed, the sprocket would turn the drive plate **64** in a counterblockwise direction which would position it as illustrated in FIG. **3**. In this position, it will be noted that the latch bars are cammed away from the recesses by the corners **96** of the drive plate **64** and they would ride on these corners as well as on the periphery of the ratchet block. Thus, the door can be rotated downwardly under power working against the counterbalance. Should there be a spring failure, the door curtain will fall; and under these circumstances, the ratchet block **84** will overrun the drive block. This action is assured by the fact that the latch bars provide a frictional drag on the drive bar which would make it easy for the ratchet bar to reach the overrun position. Thus, the parts will then be positioned as shown in FIG. **2** and the latch bars may engage and prevent the curtain from dropping. The same action would occur in the event there was a drive chain failure or any failure in the power system.

Thus, it will be seen that there is a relatively simple safety system provided with parts which are sturdy and uncomplicated.

I claim:

1. In a rolling door operating mechanism including rollable interlocked slats mountable for movement between raised and lowered positions and counterbalance means providing a bias against movement of the door to its lowered position, including a roll cylinder mounted to support said door in various positions, a shaft to drive said cylinder and a drive means, that improvement which comprises:

a. a pair of blocks on said shaft positioned axially adjacent each other,

b. means to limit circumferential motion of said blocks relative to each other wherein rotative driving of a first of said blocks will effect a rotative driving of the second of said blocks and a driving of said shaft,

c. a plurality of latch bars extending tangentially over said blocks adapted to cooperate with a plurality of stop recesses formed in said second blocks, and

d. a plurality of radial protuberances on said first block to cam said latch bars away from said stop recesses in a first relative position of said blocks and to allow said latch bars to engage said recesses in a second relative position,

wherein a driving force on said first block will maintain said blocks in said first position, and a driving force on said second block from the roll cylinder will shift said blocks to a second relative position to allow said latch bars to engage to prevent precipitous descent of a rolling door on said roll cylinder.

2. A rolling door operating mechanism as defined in claim **1** in which means is provided acting on said latch bars to move them toward said blocks wherein a friction drag is applied to said first block to shift it relative to said second block in the absence of driving force thereon.

3. A rolling door operating mechanism as defined in claim **1** in which said first block is square in cross-section with corners serving as protuberances and said second block is round and provided with partial chordal recesses, each terminating in a radial shoulder to engage a latch bar, said corners overlying said chordal recesses axially to block said latch bars in said first relative position of said parts.

4. A rolling door operating mechanism as defined in claim **1** in which said second block is keyed to a shaft to drive said roll cylinder, said first block being mounted rotatably on said shaft, and gear means to connect said first block to said drive means.

5. A rolling door operating mechanism as defined in claim **1** in which said means to limit circumferential motion of said blocks comprises interengaging segmental lobes on the adjacent faces of said blocks dimensioned to allow approximately 60° relative circumferential motion between said blocks.

6. In a rolling door operating mechanism including rollable interlocked slats mountable for movement between raised and lowered positions and counterbalance means providing a bias against movement of the door to its lowered position, including a roll cylinder mounted to support said door in various positions, a shaft to drive said cylinder and a drive means, that improvement which comprises:

a. a ratchet block on said shaft having a plurality of radial shoulders peripherally distributed and circumferentially spaced around said block, each shoulder facing in the same circumferential direction,

b. a frame surrounding said block,

c. a plurality of latch bars mounted on said frame movable selectively to engage one of said shoulders on said block to stop rotary motion of said block and said shaft,

d. a latch block rotatable relative to said shaft having a plurality of configurations equal to the number of

shoulders on said ratchet block to move said latch bar radially away from said ratchet block to prevent engagement with said shoulders when said latch block is in a predetermined circumferential orientation relative to said ratchet block, means drivingly connecting a sprocket and said latch block, and means to limit relative motion between said ratchet block and said latch block wherein driving motion of said latch block by said drive means will drive said ratchet block and said shaft while said blocks are in a relative position of circumferential orientation to block entrance of said latch bars into engagement with said shoulders,

said blocks being shiftable by reverse input on said shaft from said door to a position wherein one or more of said latches will engage said ratchet block.

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