Nov. 7, 1961 R. WARDLAW 3,007,342

ROLLING DOOR OPERATING MECHANISM

Filed April 13, 1959 2 Sheets-Sheet 1

FIG_1

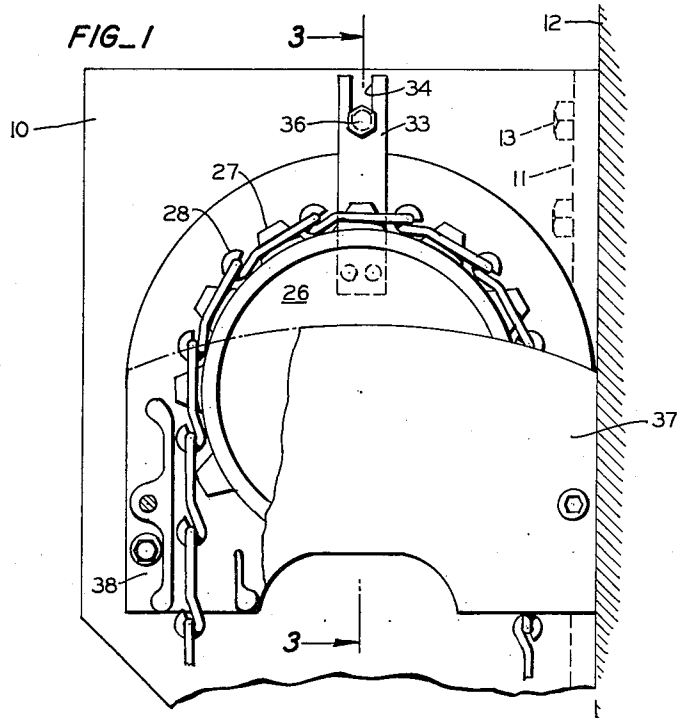
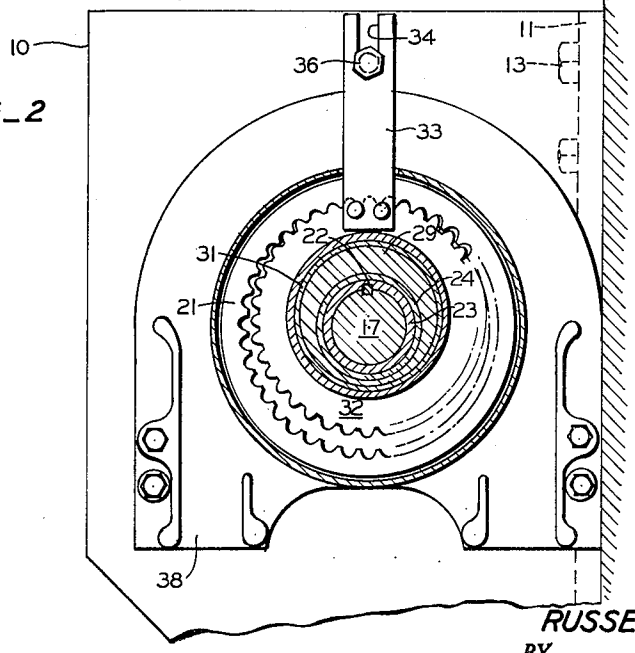


FIG_2



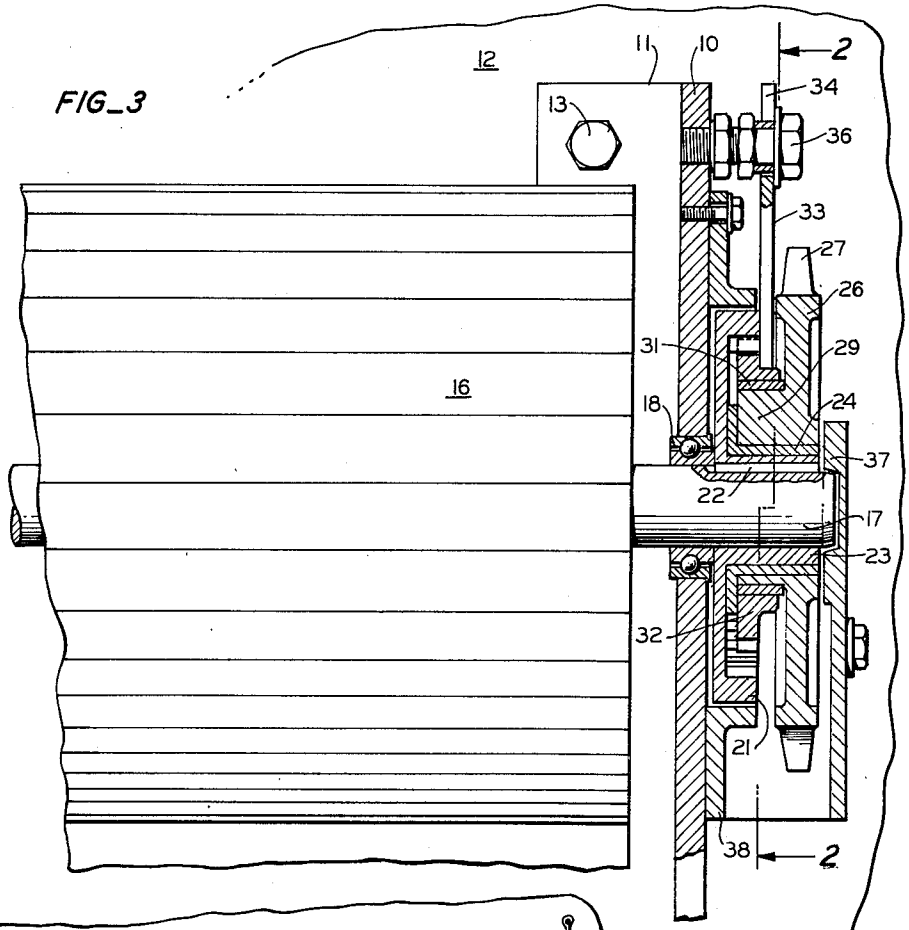
INVENTOR.
RUSSELL WARDLAW
BY
Fleker & Swain
ATTORNEYS

Nov. 7, 1961 R. WARDLAW 3,007,342

ROLLING DOOR OPERATING MECHANISM

Filed April 13, 1959 2 Sheets-Sheet 2

FIG_3



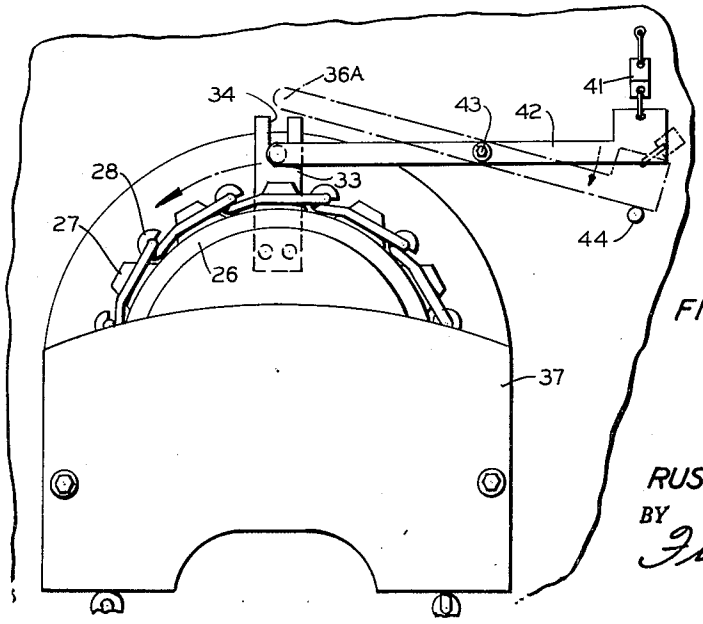


FIG_4

INVENTOR.
RUSSELL WARDLAW

BY Fleker & Swain

ATTORNEYS

United States Patent Office 3,007,342 Patented Nov. 7, 1961

3,007,342

ROLLING DOOR OPERATING MECHANISM

Russell Wardlaw, San Rafael, Calif., assignor to The Cookson Company, San Francisco, Calif., a corporation of California

Filed Apr. 13, 1959, Ser. No. 805,983
7 Claims. (Cl. 74—2)

This invention relates to operating mechanisms for rolling doors and particularly to the mechanism for raising and lowering the door.

Such doors consist of an articulated curtain which is adapted to be raised and lowered to open or close an aperture or doorway. The curtain is rolled about or unrolled from a barrel mechanism which is rotatably mounted adjacent the upper top edge of the opening. As the barrel is rotated, the curtain is payed off from it to close the door or rolled around it to open the door.

The barrel may be rotated manually or by means of some mechanical device such as, for example, an electric motor and suitable gearing. A combination of the two may be utilized. The simplest form, however, is the manual means which customarily comprises a chain mounted upon a sprocket which is secured to the barrel. The chain hangs down from the sprocket to a position adjacent the side of the opening where it may be operated by an individual. The curtain is payed off from or around about the barrel in response to the direction of pull exerted upon the chain. The sprocket and barrel may be locked against rotation by locking the chain in a predetermined position.

Various gear mechanisms have been provided to permit easy operation and actuation of the door. These have usually been bulky and reasonably expensive to manufacture and install.

It is an object of this invention to provide a simplified gearing assembly which occupies a very small area and which is easy to manufacture, assemble and service.

It is a further object of this invention to provide a gear reducing mechanism which serves to lock the barrel against rotation which may be caused by the weight of the curtain.

It is a further object of this invention to provide a gear mechanism which incorporates a safety mechanism, that is, one in which a fusible link may be incorporated to permit the curtain to drop by its own weight upon fusing of the link.

Other objects and advantages of this invention will appear from the following specification taken in conjunction with the accompanying drawings in which:

FIGURE 1 is an end view, with a portion of a guard removed, of a gear assembly showing the chain operator therefor.

FIGURE 2 is a view through the line 2—2 of FIGURE 3 showing the gear assembly in cross-section.

FIGURE 3 is a section of the door operator taken along the line 3—3 of FIGURE 1, and

FIGURE 4 is a view similar to FIGURE 1 showing a modification of the apparatus disclosed in FIGURES 1, 2 and 3.

As illustrated in FIGURES 1 and 3, the entire rolling door operating assembly is adapted to be supported by a plate 10 which is provided with flange 11 and which is adapted to be secured to wall 12 by means of bolts 13.

The curtain and barrel assembly 16 are supported upon a shaft 17 which is rotatably mounted in a suitable bearing 18 carried by the plate 10. Shaft 17 not only serves to support the curtain and drum assembly 16 but is keyed thereto so that rotation of the shaft 17 controls raising and lowering of the curtain, which is adapted to be operated by the gear assembly illustrated most completely in FIGURES 2 and 3.

The gear assembly mechanism which actuates the shaft 17 is basically an axial system using a common axis for

the input and output about which the system rotates. More specifically the gear train consists of an internal ring gear 21 which, in this instance, is provided with sixty teeth, although it is to be clearly understood that any suitable number of teeth may be provided on the ring gear 21. The ring gear 21 is coaxial with the shaft 17 and is secured thereto by a key 22 whereby rotation of the gear 21 causes similar rotation of the shaft 17. The hub 23 of the gear 21 supports a bearing 24 upon which a sprocket 26 is rotatably mounted. The exterior of the hub 23 and the bearing 24 are coaxial with respect to the shaft 17 as is the sprocket 26. Sprocket 26 is provided with teeth 27 which are adapted to be engaged by a chain 28.

Sprocket 26 is provided with a hub 29 which is eccentric with respect to the axis of the shaft 17 and hub 23. Hub 29 supports bearing 31 upon which a pinion gear 32 is mounted. The pinion gear 32 in this instance is provided with 52 teeth, although here again, it is to be understood that it may be provided with any suitable number of teeth less than the number of teeth found in the ring gear 21. Some of the teeth of the pinion gear 32 are always meshed with some of the teeth of the ring gear 21. Rotation of the pinion gear 32 is prevented by a lever or link 33 which is secured thereto in any suitable manner such as the rivets shown. This link is provided with an open ended elongated slot 34 which cooperates with a bolt 36 which threadedly engages the plate 10. Link 33 is free to reciprocate along its major axis within the limits defined by the slot 34 and the pin 36. Thus, the pinion gear 32 does not rotate but operates eccentrically and its axis rotates about the axis of the shaft 17. The eccentricity of the pinion gear 32 serves to rotate the ring gear 21.

Suitable shroudings 37 and 38 are provided so that the gear assembly is reasonably well concealed.

Operation of the device may briefly be described as follows:

The chain 28 is actuated in such a manner that the sprocket 26 is rotated about the axis of the shaft 17. The rotation of the sprocket 26 imparts eccentric motion to the pinion gear 32. Rotation of the pinion gear 32 is prevented by the link 33 which engages and is adapted to reciprocate with respect to the pin 36. The eccentric movement of the gear 32 causes its teeth to engage teeth on the ring gear 21 and rotate the ring gear about its axis. As has previously been pointed out, rotation of the gear 21 imparts like rotary motion to the shaft 17 and to the curtain and barrel assembly 16.

This construction provides irreversibility and prevents feed back in the same manner as worm gearing or a nut and screw system.

The input to the system may be said to be through rotation of the eccentric hub 29 which causes the pinion gear to scan the ring gear. Since the pinion cannot rotate because of the restraining link 33, the ring gear will be rotated the difference between the numbers of teeth of the ring and the pinion gears. For example, the ratio of the system can be expressed for this specific arrangement as:

$$\frac{60}{(60-52)}=\frac{15}{2}$$

Input through the shaft 17, which may be by virtue of the weight of the curtain and barrel assembly 16 will not be transmitted into rotary motion of the shaft 17. In other words, the effect of the action of the link 33 which prevents rotation of the pinion gear 32, is to lock the gears 32 and 21 against rotation caused by input through the shaft 17. Thus I have a locking and safety feature which permits the elimination of a locking mechanism which ordinarily must be applied to the chain 28 in ordinary gear train assemblies used for this purpose.

It will be apparent that should the link 33 no longer

be restrained by bolt 36 it would be free to rotate and, in this event, power put into the system through the shaft 17 would result in free rotation of the assembly. I propose to take advantage of this phenomenon by providing a fusible member 41 which supports the pin 36 and this modification is illustrated in FIGURE 4 where the fusible link 41 serves to support a weighted arm 42 which is pivotally mounted at 43 on the plate 10 and which on its remote end is provided with a pin 36a. While the fusible link 41 remains unfused as indicated, pin 36a is maintained in the slot 34 in the link 33. However, when the fusible link 41 is parted as, for example, by its fusing under heat, the weighted arm 42 swings downwardly against a stop 44 (as indicated) and the pin 36a is freed from the slot 34. In this way, the restraining effect of the link 33 is eliminated and the gear 32 is free to rotate under the influence of the gear 21. Thus, the weight of the curtain and drum assembly which is put into the system through the shaft 17 will cause rotation of both the gears 21 and 32. The path which the link 33 will follow must of course be clear from other obstructions so that it may rotate freely. When this gear drive assembly is utilized in connection with a fire door, I have an automatic door lowering system. When the heat of a fire fuses the link 41, the weight of the curtain and door assembly 16 will cause the door to close automatically.

I claim:

1. In a rolling door operating mechanism for raising and lowering a rolling door of the type which includes a rotatable axle, a barrel fixed to the axle and a curtain adapted to be rolled onto the barrel, the operating mechanism comprising an internal ring gear adapted to be fixed to the axle, a sprocket and operating means for rotating the sprocket, the sprocket having an eccentric hub, a pinion gear mounted on the hub to permit rotation of the hub with respect to the pinion gear, said pinion gear engaging said ring gear and serving to rotate the ring gear about its axis as the pinion gear is gyrated, means for locking the pinion gear against rotation in either direction and means for unlocking the locking means so that said pinion gear is free to rotate.

2. A rolling door operating mechanism as in claim 1 wherein said means for unlocking the pinion gear includes a fusible member and means secured to said fusible member to render the locking means inoperative upon fusing of the fusible member.

3. A rolling door operating mechanism as in claim 1 wherein said sprocket is adapted to be rotatably mounted on said axle.

4. In a rolling door operating mechanism for raising and lowering a rolling door of the type which includes a rotatable axle, a barrel fixed to the axle and a curtain adapted to be rolled onto the barrel, the operating mechanism comprising an internal ring gear adapted to be fixed to the axle, the ring gear having a hub, a sprocket rotatably mounted on the hub of the ring gear, an endless chain mounted on the sprocket so that the sprocket can

be rotated by hand, the sprocket having an eccentric hub, a pinion gear mounted on the hub to permit rotation of the hub relative to the pinion gear, said pinion gear engaging said ring gear and serving to rotate the ring gear about its axis as the pinion gear is gyrated means locking the pinion gear against rotation in either direction, and means to inactivate said locking means whereby said pinion gear may become free to gyrate.

5. A rolling door operating mechanism as in claim 4 wherein said locking means includes a lever arm fixed to said pinion gear, the lever arm having a slot therein remote from the end fixed to the pinion gear, and a pin disposed in said slot.

6. A rolling door operating mechanism as in claim 5 wherein unlocking the slot in said lever arm is open ended together with means for automatically moving said pin out of said slot to permit rotation of said lever arm.

7. In a rolling door operating mechanism for raising and lowering a rolling door of the type which includes a rotatable axle, a barrel fixed to the axle and a curtain adapted to be rolled onto the barrel, the operating mechanism comprising an internal ring gear adapted to be fixed to the axle, the ring gear having a hub, a sprocket rotatably mounted on the hub of the ring gear, an endless chain mounted on the sprocket so that the sprocket can be rotated by hand, the sprocket having an eccentric hub, a pinion gear mounted on the hub to permit rotation of the hub relative to the pinion gear, said pinion gear engaging said ring gear and rotating the ring gear as the pinion gear is gyrated and means locking the pinion gear against gyration in either direction, said locking means including a lever arm fixed to said pinion gear, said lever arm having a slot therein remote from the end fixed to said pinion gear and a pin disposed in said slot, said slot in said lever arm being open ended and means for automatically moving said pin out of said slot to permit rotation of said lever arm, said last named means including a fusible link so that when the fusible link is fused, said pin is automatically removed from the open ended slot to permit rotation of the lever arm.

References Cited in the file of this patent

UNITED STATES PATENTS

763,381	Ebner	June 28, 1904
1,215,614	Brown	Feb. 13, 1917
1,942,794	Benson	Jan. 9, 1934
1,942,796	Benson	Jan. 9, 1934
2,208,039	Mills	July 16, 1940
2,313,132	Elliott	Mar. 9, 1943
2,564,208	Michelman	Aug. 14, 1951
2,604,790	Derby et al.	July 29, 1952
2,667,076	Favre	Jan. 26, 1954

FOREIGN PATENTS

973,323	France	Feb. 9, 1951
2,163	Great Britain	Jan. 30, 1908