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None

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Selected US specifications from IPC sub-class E05F

(54) Safety device for a power-drive roller door

(57) A roller door (13) is driven via a chain (20) engaging two chainwheels (11, 14). A chain breakdown safety device comprises a movable rack (30) biased by a spring (36) and carrying an idler (37) for engagement with the chain. If the chain breaks the spring pulls the movable rack, thus rotating a gear (40) that is provided with ratchet pawls (43). The pawls are rotated to engage and stop the chain wheel on the roller door shaft from running in a reverse direction, thereby preventing injury or damage to people and objects by the roller door in question.

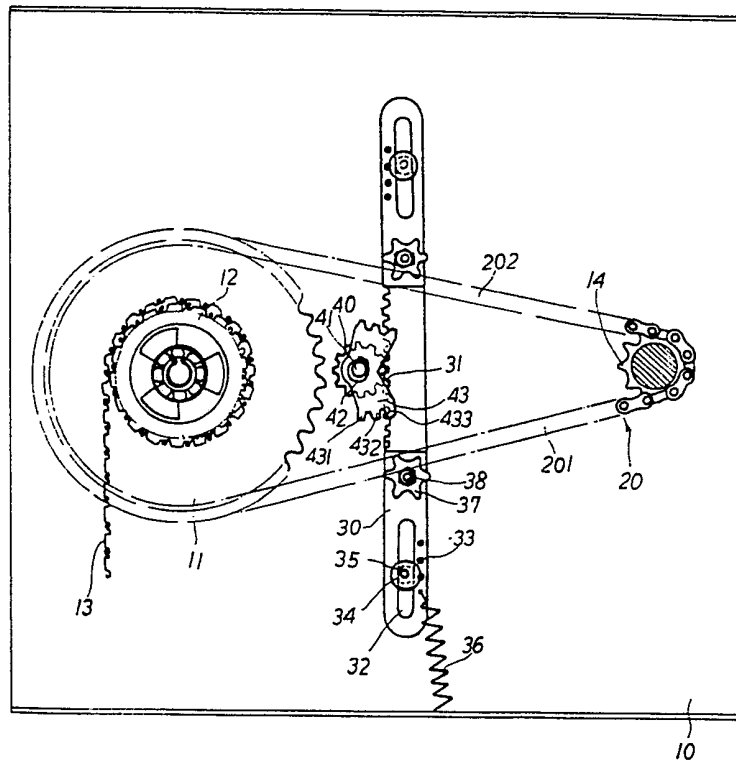
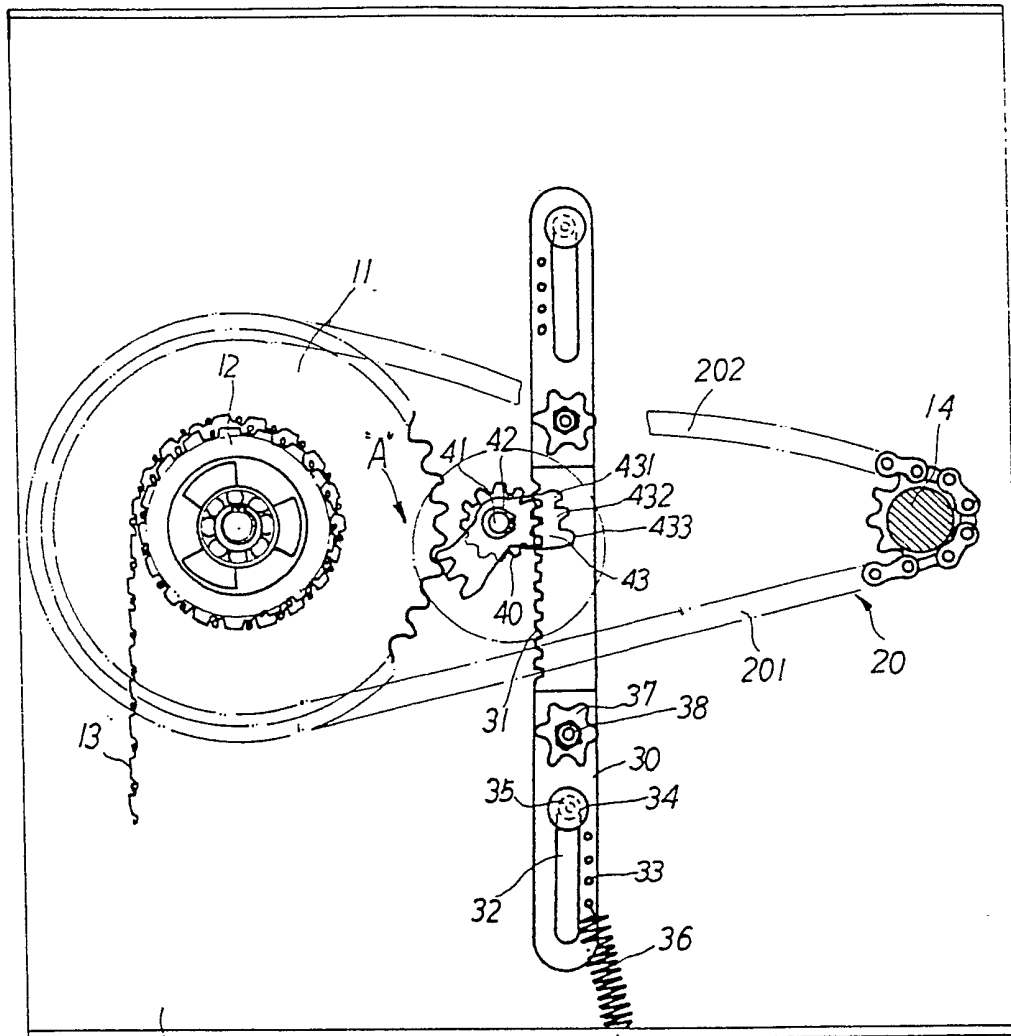


FIG. 1

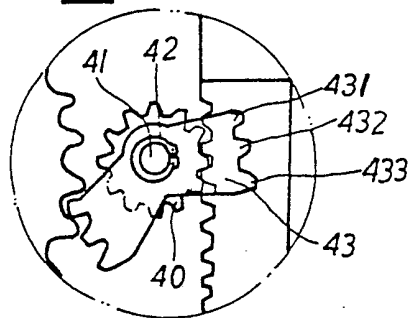
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FIG. 2



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A-A'



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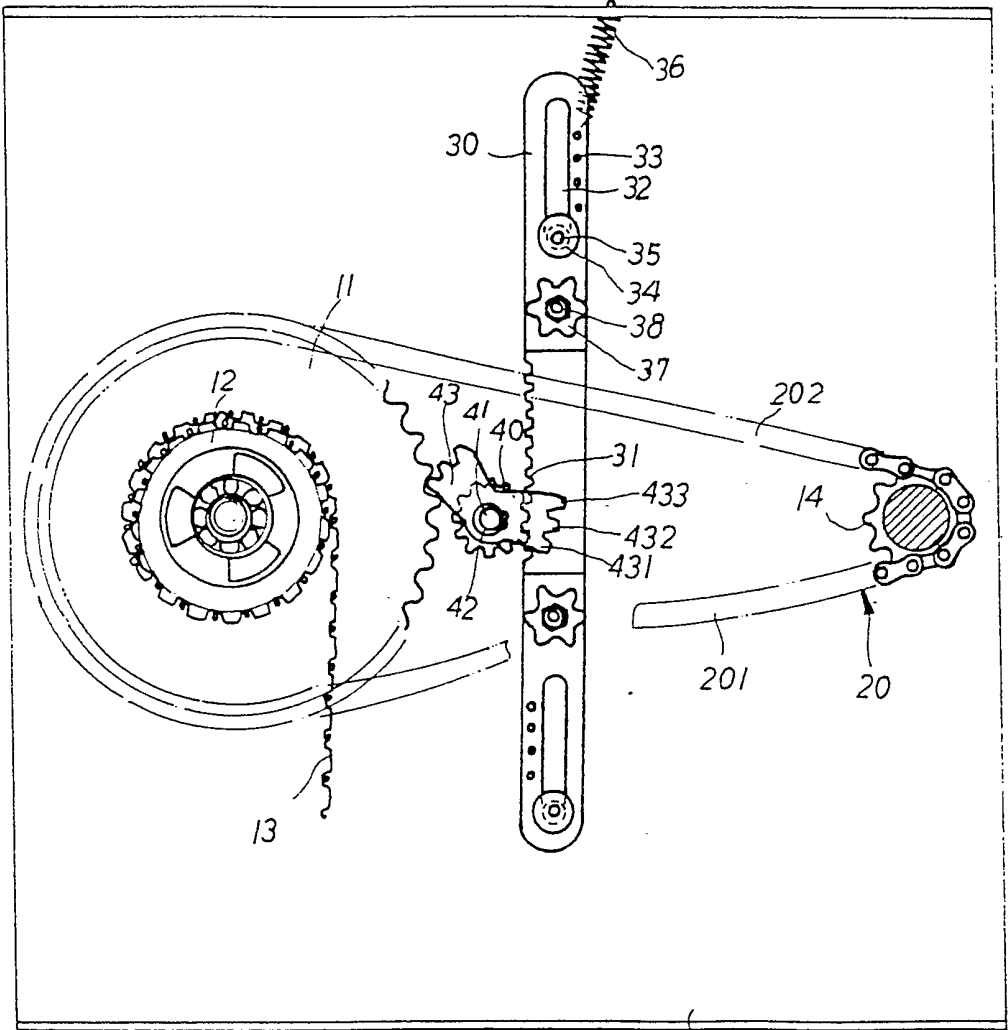


FIG. 3

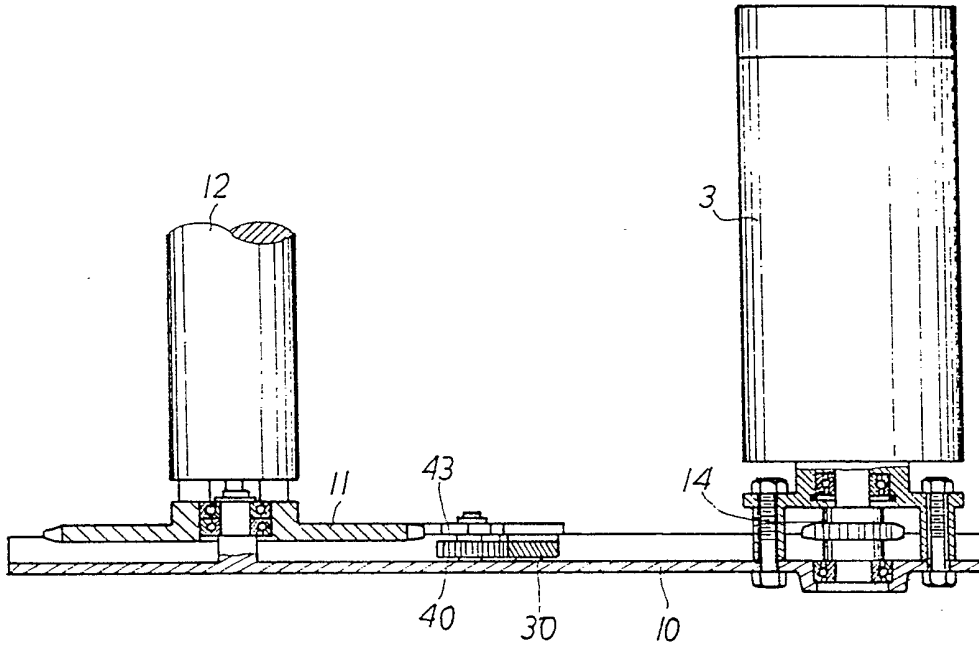


FIG. 4

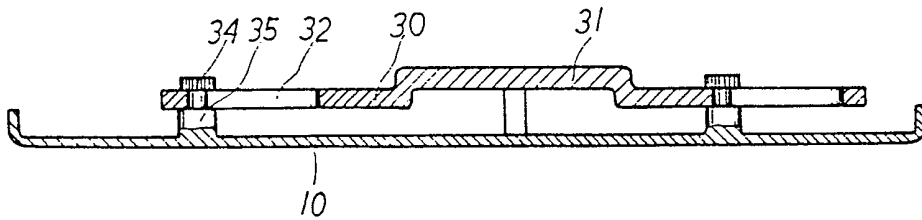


FIG. 5

SPECIFICATION

Safety device for a power-driven roller door

- 5 The present invention provides a chain breakdown safety device for a power-driven roller door, which can make a prompt and timely stop of a downfalling roller door, in the event of a sudden breakdown of the transmission chain, whether in a stationary condition or during a lift transmission, upgoing or downgoing, through the activation of a ratchet wheel, by a movable rack when the incident takes place, thereby achieving safe operation at all times. 5
- 10 The so-called power-driven roller doors currently in use everywhere in the world are widely adopted, yet cases do arise when such roller doors, on the point of suffering a breakdown of the transmission chain, as a result of long service, will collapse and slump down due to gravity, and owing to the absence of any safety devices which should have been provided to safeguard such horrible incidents, the tremendous force of destruction by a slumping roller door being self-evident and beyond description whether the victims be human beings, animals or valuables. In other words, something has to be worked out to prevent the terrible loss of life or the like due to the accelerated slump-down of a roller door as a result of abrupt failure or breakdown of the transmission chain, during a lift or under stationary conditions. Until such a preventive device is worked out, everybody can turn out a victim of such an accident. 10
- 15 In view of the foregoing reasoning, that being the background stimulation for the present invention, the inventor has taken it upon himself to work on a safety device, for years through repeated trial and error tests, experiments, and finally succeeded in realizing such a device, the present invention. 15
- 20 In short, the primary object of the present invention is to provide a chain breakdown safety device, which incorporates a spring-driven movable rack, by the side of the chain compartment in the system of a roller door, with which to transmit indirectly a ratchet pawl, thus preventing the chain wheel from running in the reverse direction at any time. 25
- A further object of the present invention lies in the provision of a chain breakdown safety device, wherein an idler gear provided on the movable rack is meant for engagement with the chain, so as to bring the gear and ratchet pawl into rotation when the movable rack undergoes radial displacement, thereby holding the chain wheel under the ratchet pawl control. 30
- A further object of the present invention lies in the provision of a chain breakdown safety device, wherein the idlers for the movable rack are mounted outside the chain, one such idler being kept to maintain a position securely engaged with the chain, in order that its push-back pressure be discharged when the chain breaks open, so that the movable rack may cause the ratchet pawl and gear to rotate so as to stop the chain wheel from further rotation. 35
- Other features and advantages of the present invention will emerge from the following description of embodiments given by way of illustration, but not in any way limiting, with reference to the accompanying drawings in which: 40
- 40 *Figure 1* the present invention seen in one embodiment under normal execution; 40
Figure 2 is an illustration of the chain held under control when it breaks open;
Figure 3 is another illustration of the chain held under control when it breaks open;
Figure 4 is a bottom perspective of the invention; and
Figure 5 is a perspective of the movable rack hereunder.
- 45 A description of the reference numbers follows: 45
- | | | |
|-----------------------------|---------------------------|----|
| door rolling machine 3 | board support 10 | |
| chain 20 | door rolling shaft 12 | |
| roller door 13 | driving chain wheel 14 | |
| 50 principal chain wheel 11 | slack part 201 | 50 |
| tight part 202 | movable rod 30 | |
| rack 31 | long hole 32 | |
| hook hole 33 | screwnut 34 | |
| steering rod 35 | spring 36 | |
| 55 idler 37 | wheel shaft 38 | 55 |
| gear 40 | cam shaft 41 | |
| snap ring 42 | ratchet pawl 43 | |
| first engaging tooth 431 | second engaging tooth 432 | |
| third engaging tooth 433 | | |
- 60 Referring to Fig. 1 it is seen that to facilitate the uplifting operation of the door the rolling shaft 12 of the roller door 13 mounted coaxially with the principal chain wheel is driven by chain 20 as the driver chain wheel 14, in engagement with chain 20 is driven by the door rolling machine 3 installed on the board support 10. Two conjugate steering rods 35 are provided, each symmetrical to the other between the two chain wheels, to permit engagement with long, 65

ellipsoidal holes 32, provided on the oblong, movable rod 30. The steering rods 35 are each fastened in position with screwnut 34 to prevent off-slipping. The middle section of the movable rod 30 is recessed but flat, and on one side thereof is provided a rack 31, to permit engagement with a gear 40 having a ratchet pawl 43 thereon. A wheel shaft 38 is provided projectingly near the chain 20, and an idler 37 is set in engagement with the chain by a screwnut 37. On one side of the long, ellipsoidal hole 32 are provided, in equal spaces, a number of hook holes 33, to facilitate setting of modulation hooks as part of the spring 36. A gear 40 incorporating a winglike ratchet pawl 43, is disposed onto a cam shaft 41 on the board support 10, then fastened with a snap ring 42, to bring the gear 40 into engagement with the rack 31 on the movable rod 30.

On the other hand, the hook holes 33 at either end of the movable rod 30 are configured symmetrical to each other, so as to accommodate optional hook-on laying of spring 36, the other end of spring 36 being attached in a spring hole near the edge of board support 10.

Accordingly, when the door rolling machine 3 transmits torque to the chain wheel 11 through the driver chain wheel 14 and chain 20, to cause the door rolling shaft 12 to lift up relative to the roller door 13, the upper end of the chain 20 will, as a result of more exposure to stresses being applied thereto, become a tight part 202, whilst the lower end turns to be a relatively slack part 201. So as the stresses build up from day to day as the use terms increase, the chain 20 may eventually run down someday, but until it breaks down, the spring 36 will always exert certain tension, small it may be, with respect to the movable rod 35, thus compelling the idler 37 on the other side to abut closely against the chain 20.

As will be apparent from references to Fig. 1 and Fig. 2, the moment the chain 20 breaks down the idler 37 will effect radial pull by dint of the tension from the spring 36 in step with movable rod 30, whereupon the rack 31 will engage with gear 40, this setting the winglike ratchet pawl 43 on top into rotation, the ratchet pawl 43 with its first engaging tooth 431 in the meantime checking the chain wheel 11, and in spite of the backpush exerted by the reacting chain wheel 11, the tangential component of the stress, passing the central position of both the first engaging tooth 431 and the cam shaft 41, will offset to yield a total instantaneous couple of zero, according to the principal of the mechanics of materials. As a result, there is no need to worry about the possibility of derailing, disengagement, and otherwise unwanted incidents caused by the gear 40 and the ratchet pawl 43, since the dangers are precluded accordingly. Furthermore, should any momentum of force of rotation of the chain wheel 11 in the reverse direction be of such magnitude as to be sufficient to defeat or wear out the first engaging tooth 431, then the second engaging tooth 432 will come down in no time to respond to discharge the stopping effects instead. So it is obvious that the roller door 13 will stop where it is the moment the chain 20 breaks down.

Referring to Fig. 3 it is seen of a roller door 13 assembled in the reverse order, that the same advantageous performances remain. Replacement of the tight and slack parts can be done by changing the position of spring 36 to the end point of the movable rod 30 on the opposite side, and having the idler 37 underneath in engagement with chain 20.

The invention, by the provision of a bilateral changeover facility, will prove equally useful by installing at either side of the roller door. In addition, the chain thereof will permit discretionary exchange application if the chain should break down, anytime and anywhere without any restrictions whatsoever. Most importantly, with the incorporation of the invention device in a power-driven roller door system, the door will stop where it is in the event of a breakdown or failure of the chain compartment during a lift execution, thereby maintaining human beings, and other creatures, unharmed anytime that they are exposed straight underneath the door in question.

CLAIMS

1. A chain breakdown safety device for a power driven roller door, comprising a chain, a roller door shaft coaxially mounted with a principal chain wheel, a driver chain wheel, a gear provided with ratchet pawls and a movable rod mounted on a support board such that the chain engages both chain wheels and the gear is in engagement with a central rack portion of the rod, axial movement of which causes the gear to rotate and the ratchet pawls to engage with the chain wheel preventing further rotation of the roller door shaft.

2. A chain breakdown safety device for a power driven roller door as claimed in Claim 1, in which the movable rod is attached at one end to the support board by a spring hookset in a hook hole provided at that end of the rod, serving to bring an idler gear mounted on the rod into engagement with the chain.

3. A chain breakdown safety device for a power driven roller door as claimed in Claims 1 or 2 in which the movable rod is slotted at both ends, through which are fitted steering rods associated with the board support, and fastened such that the rod can only move in an axial direction, its displacement being governed by the length of the slots.

4. A chain breakdown safety device for a roller door as claimed in any one of the preceding claims in which there are two idler gears mounted on wheel shafts adjacent the inner end of the

slots at both ends of the rod and a plurality of hook holes alongside both slots to allow for the adjustment of tension in the spring.

5. A chain breakdown safety device for a roller door claimed in any one of the preceding claims in which the gear is mounted on a cam shaft positioned on the support board intercon-
- 5 necting the principal chain wheel and the movable rod, and having a top portion extended to incorporate a number of differently sized engaging teeth, facilitating engagement with the chain wheel the position where the teeth engage the chain being situated collinear with a line between
- 10 the core of the gear shaft and a tangent to an outer rim of the chain wheel.
6. A chain breakdown safety device for a roller door substantially as hereinbefore described
- 10 with reference to and as shown in the accompanying drawings.