

SAFETY DEVICE FOR A POWER-DRIVEN ROLLER DOOR

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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 engagement of the roller door chain wheel by locking means, by a movable rack when the incident takes place, thereby achieving safe operation at all times.

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.

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

It is an object of the present invention to provide a chain breakdown safety device for installation with a chain driven roller door comprising a movable rod, said rod having a central rack portion and means for mounting said rod, when in use, to a roller door support, means enabling the rod to engage an unbroken chain to prevent rod movement, means to move the rod upon breakage of the chain and rotatable primary gear means in engagement with said rack portion, said gear means having locking means whereby in use, movement of said rod causes the gear means to rotate which causes the locking means to move into engagement with a chain wheel of the roller door to prevent further rotation of the chain wheel and thereby the roller door.

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:

Fig. 1 the present invention seen in one
25 embodiment under normal execution;

Fig. 2 is an illustration of the chain held under control when it breaks open;

Fig. 3 is another illustration of the chain held under control when it breaks open;

30 Fig. 4 is a bottom perspective of the invention;
 and

Fig. 5 is a perspective of the movable rack hereunder.

A description of the reference numbers follows:

35 door rolling machine 3
chain 20

board support 10
door rolling shaft 12

roller door 13	driving chain wheel 14
principal chain wheel 11	slack part 201
tight part 202	movable rod 30
rack 31	long hole 32
5 hook hole 33	screwnut 34
steering rod 35	spring 36
idler 37	wheel shaft 38
gear 40	cam shaft 41
snap ring 42	locking means 43
10 first engaging tooth 431	second engaging tooth 432
third engaging tooth 433	

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, 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 locking means 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 locking means 43 in the form of a pair of winglike projecting toothed gear segments, 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.

5 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.

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
15 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
20 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 moving the rod 30 and compelling the idler 37 on the other side to abut closely against the chain 20.

25 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,
30 this setting the locking means 43 on top into rotation, the locking means 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
35 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 locking means 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.

A bilateral changeover facility may also be incorporated with the chain breakdown safety device to allow installation of the device 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.

Thus a chain breakdown safety device mounted on the side of the chain compartment in the system of a roller door, with which to transmit indirectly locking means, will thus prevent the chain wheel from running
5 in the reverse direction at any time.

A chain breakdown safety device, wherein an idler gear is provided on the movable rack is meant for engagement with the chain, so as to bring the gear and locking means into rotation when the movable rack
10 under-goes radial displacement, will thereby hold the chain wheel under the control of the locking means.

Also, 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
15 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 locking means and gear to rotate so as this prevents the chain wheel from further rotation.

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CLAIMS:

1. A chain breakdown safety device for installation
5 with a chain driven roller door comprising a movable
rod, said rod having a central rack portion and means
for mounting said rod, when in use, to a roller door
support, means enabling the rod to engage an unbroken
10 chain to prevent rod movement, means to move the rod
upon breakage of the chain and rotatable primary gear
means in engagement with said rack portion, said gear
means having locking means whereby in use, movement of
said rod causes the gear means to rotate which causes
15 the locking means to move into engagement with a chain
wheel of the roller door to prevent further rotation
of the chain wheel and thereby the roller door.

2. A chain breakdown safety device as claimed in
Claim 1, further comprising spring means attached at
20 one end to the movable rod and having means for
attaching another end, when in use, to a roller door
support and secondary gear means rotatably mounted on
the movable rod, whereby, in use, the spring means is
biased to bring said secondary gear means into
25 engagement with the driving chain of the roller door.

3. A chain breakdown safety device as claimed in
either claim 1 or claim 2 in which the means for
mounting the movable rod comprise at least one axial
30 slot at each end of the rod and at least a pair of
steering rods such that, in use, said steering rods
are affixed to the roller door support and the movable
rod fastened thereto such that the rod is movable in
an axial direction only, its limit of movement being
35 governed by the length of the slots.



4. A chain breakdown safety device as claimed in
any one of the preceding claims in which the secondary
gear means comprise two idler gears rotatably mounted
on wheel shafts adjacent inner ends of said slots and
5 a plurality of holes alongside both slots for
attaching the spring means thereto to allow for the
adjustment of tension in said spring means.

5. A chain breakdown safety device as claimed in
10 any one of the preceding claims in which the primary
gear means further comprises a cam shaft for mounting
said gear means, when in use, to a roller door
support, and the locking means comprise at least one
projection having a number of differently sized
15 engaging teeth, facilitating engagement, when in use,
with the chain wheel.

6. A chain breakdown safety device as claimed in
any one of the preceding claims further comprises
20 bilateral changeover means to enable the device to be
installed on either side of a roller door.

7. A chain breakdown safety device substantially as
hereinbefore described with reference to and as shown
25 in the accompanying drawings.

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