

Description

This invention relates to door locking systems and more particularly but not exclusively to an elevator car door lock.

It is required to equip the car doors of an elevator with a lock. The lock prevents the car doors from opening if the car is not at a position in a hoistway to allow passengers to exit the car safely.

U.S. Patent 4,934,488 entitled "Door Lock For An Elevator Car" to Umemura, shows a door lock which interacts with cam surfaces placed on a surface of the elevator hoistway. The lock may also be activated by a solenoid 44. The hardware required is expensive to manufacture, install and maintain.

Accordingly, a new car door lock is sought.

It is an object of the invention to provide a car door lock which is simple to manufacture, install and maintain. According to the invention, there is provided a door system having inner and outer doors, the system having a mechanism comprising a cam for locking and unlocking one of said inner or outer doors, said cam moving a given distance to unlock said one of said inner or outer doors, said cam being capable of moving beyond said given distance, and the system also having a door lock for locking or unlocking the other of said inner or outer doors, said door lock comprising:

following means for following the motion of said cam, and

means actuated by said following means to lock said other of said inner or outer doors if said following means detects that said cam has travelled a greater distance than said given distance.

According to an embodiment of the invention, an elevator door system utilizes the cam to unlock hoistway doors, which cam is required by code to have a greater swing motion than is required to unlock the hoistway doors. A following means follows the motion of the cam and locks the car doors when the cam is beyond the swing motion required to actuate a hoistway door lock. If the cam is in contact with the hoistway door lock it is kept within its normal swing motion, and the car door may open. If the cam is not in contact with the hoistway door lock, the car must not be in a safe passenger exit area and the cam may move beyond its normal motion so that the following means will lock the car door.

According to a further embodiment of the invention, the following means consists of a cam which operates a linkage and a locking tab to lock and unlock the car doors.

An embodiment of the present invention will now be described by way of example only and with reference to the accompanying drawings, wherein:

Figure 1 shows a front view, partly in schematic form, of an elevator door system embodying the invention;

Figure 2 is a side view of a retiring cam of Figure 1;

Figure 3 is an expanded view of a portion of Figure 2;

Figure 4 is a perspective view of an embodiment of a door lock of the invention;

Figure 5 is a side view, partially in phantom of the operation of the door lock of Figure 4.

Referring to Figure 1, an embodiment of the invention is shown. A bi-directional motor 10 is mounted, by conventional means, atop an elevator car 12. The motor has an output sheave 14 which is attached at its outer periphery to a pair of linkages 18. Each linkage attaches by means of a coupling device 20 to a car door 22.

A strike arm 100 is fixedly attached, by conventional means, to the output sheave 14 to rotate therewith. The strike arm controls the motion of a retiring cam 102 to lock and unlock the hoistway doors 136 (see Figs. 2 and 3) as will be discussed infra.

The strike arm 100 has a cam surface 104 for engaging a first roller 106 which is attached to a first end of a lever 108. The lever rotates about an axle 112. A stop 114 limits the motion of the first roller to control the motion of the retiring cam as will be discussed infra.

A cable 116 attaches to a second end 118 of the lever 108 via an adjustment screw 117. The cable extends about an idler pulley 122 mounted atop the elevator car. The idler pulley directs the cable downwardly where it attaches to the retiring cam 102.

The retiring cam, as shown in Figure 2 and as known in the art, consists of a parallelogram having a vertical first leg 124, a second leg 126 parallel to the first leg, an upper leg 128 and a lower leg 130. The cable attaches to the first leg by conventional means.

As the strike arm 100 rotates in a clockwise direction with the operation of the motor 10, the first roller 106 moves in a counterclockwise direction along the cam surface 104 of the strike arm causing the cable 116 to lower the retiring cam into the position shown in Figure 2. The retiring cam engages a second roller 132 which, via shaft 134 rotates a first locking tab 136 to unlock a hoistway door 137.

Referring to Figure 4, the car door lock 138 consists of a base 140 attached to a car header 142 atop the elevator car 12, a shaft 144 rotatably mounted within the base, a second locking tab 146 fixedly attached to one end of the shaft, a lever 148 fixedly attached to the other end of the shaft, a third roller 150 rotatably mounted to the lever and

riding on the upper leg 128 of the retiring cam, and backlash spring 152. A locking bracket is mounted on a car door hanger 156. The second locking tab is set at a distance d from the bracket in the direction of opening.

The base 140 consists of a flat plate 158, which is bolted to the car door header 142, and a pair of brackets 160 extending upwardly therefrom. Each bracket has an opening 162 housing a bearing 164. The bearings are adapted to rotatably receive the shaft 144. The backlash spring 152 is fixedly attached to one bracket and fixedly attached to the shaft by means of clamp 166.

Referring now to Figure 5, operation of the cam lock 138 is shown. In phantom position 1, the car 12 is running up and down the hoistway (not shown). The first leg 124 of the retiring cam 102 is normally kept in an upper, retracted position such that the second locking tab 146 (via roller 150, which follows the upper leg 128 of the retiring cam, lever 148 and shaft 144) does not interfere with the motion of the car door locking bracket 154. As such, the car doors are not locked.

In the second phantom position 2, the car 12 is at a landing (not shown). When the retiring cam 102 operates, the first leg 124 is lowered to a position where it contacts the second roller 132 of a hoistway door lock to unlock it (see Figs. 2 and 3). As the hoistway door lock only allows the retiring cam to move to the position shown, the car doors are free to open. The second locking tab 146 does not interfere with the lock bracket 154.

As shown in the phantom position 3, the car 12 is outside a landing zone. If a passenger tries to open the car doors, the motion of the car doors drives the motor 10 via the linkages 18. The motor lowers the first leg 124 of the retiring cam 102 via the cable 116. The retiring cam descends to the position shown as phantom position 3 because the retiring cam does not contact the second roller of the hoistway door lock. The retiring cam is fully down, beyond the stroke required to operate the hoistway door lock, as may be required by code. The third roller 150 follows the path of the upper leg 128 thereby rotating the shaft 144 and the second locking tab 146 such that the second locking tab interferes with the lock bracket 154 on the car doors 22. The car doors are now locked.

Because the car door lock utilizes hardware, such as the hoistway door lock, which already exists within the elevator, the car door lock is simple to install. Because the car door lock utilizes the motion of the existing retiring cam, operation is simple and energy efficient. Because the car door lock consists essentially of a one piece linkage, the car door lock is simple to maintain and install.

While the present invention has been illustrated and described with respect to a particularly pre-

ferred embodiment thereof, it will be appreciated by those skilled in the art that changes, in the form and detail thereof may be made therein. One of ordinary skill will appreciate, for instance that the hoistway and car door lock systems may be reversed. One of ordinary skill in the art will also appreciate that the system may be utilized in other inner and outer door systems such as shuttles.

Claims

1. A door system having inner and outer doors, the system having a mechanism comprising a cam (102) for locking and unlocking one of said inner or outer doors, said cam (102) moving a given distance to unlock said one of said inner or outer doors, said cam being capable of moving beyond said given distance, and the system also having a door lock (138) for locking or unlocking the other of said inner or outer doors, characterized in that said door lock (138) comprises following means (150) for following the motion of said cam (102); and means (146) actuated by said following means (150) to lock said other of said inner or outer doors if said following means (150) detects that said cam (102) has travelled a greater distance than said given distance.
2. A door system as claimed in claim 1, for an elevator wherein said inner and outer doors comprise respectively elevator car (22) and hoistway (137) doors.
3. An elevator door system as claimed in claim 2, wherein the mechanism locks and unlocks a hoistway door (137).
4. An elevator door system as claimed in claim 3, wherein said means actuated by said following means comprises a rotatable linkage (150, 144) engaging said cam (102) for motion therewith, and a locking tab (146) attached to said linkage for interfering with the motion of said car door (22).
5. An elevator door lock for an elevator door system as claimed in claim 2, 3 or 4 comprising following means (150) adapted to follow the motion of a hoistway door locking and unlocking mechanism, and car door locking means (146) actuated by said following means (150) to lock a car door when the following means (150) has moved more than a predetermined distance.



riding on the upper leg 128 of the retiring cam, and backlash spring 152. A locking bracket is mounted on a car door hanger 156. The second locking tab is set at a distance d from the bracket in the direction of opening.

The base 140 consists of a flat plate 158, which is bolted to the car door header 142, and a pair of brackets 160 extending upwardly therefrom. Each bracket has an opening 162 housing a bearing 164. The bearings are adapted to rotatably receive the shaft 144. The backlash spring 152 is fixedly attached to one bracket and fixedly attached to the shaft by means of clamp 166.

Referring now to Figure 5, operation of the cam lock 138 is shown. In phantom position 1, the car 12 is running up and down the hoistway (not shown). The first leg 124 of the retiring cam 102 is normally kept in an upper, retracted position such that the second locking tab 146 (via roller 150, which follows the upper leg 128 of the retiring cam, lever 148 and shaft 144) does not interfere with the motion of the car door locking bracket 154. As such, the car doors are not locked.

In the second phantom position 2, the car 12 is at a landing (not shown). When the retiring cam 102 operates, the first leg 124 is lowered to a position where it contacts the second roller 132 of a hoistway door lock to unlock it (see Figs. 2 and 3). As the hoistway door lock only allows the retiring cam to move to the position shown, the car doors are free to open. The second locking tab 146 does not interfere with the lock bracket 154.

As shown in the phantom position 3, the car 12 is outside a landing zone. If a passenger tries to open the car doors, the motion of the car doors drives the motor 10 via the linkages 18. The motor lowers the first leg 124 of the retiring cam 102 via the cable 116. The retiring cam descends to the position shown as phantom position 3 because the retiring cam does not contact the second roller of the hoistway door lock. The retiring cam is fully down, beyond the stroke required to operate the hoistway door lock, as may be required by code. The third roller 150 follows the path of the upper leg 128 thereby rotating the shaft 144 and the second locking tab 146 such that the second locking tab interferes with the lock bracket 154 on the car doors 22. The car doors are now locked.

Because the car door lock utilizes hardware, such as the hoistway door lock, which already exists within the elevator, the car door lock is simple to install. Because the car door lock utilizes the motion of the existing retiring cam, operation is simple and energy efficient. Because the car door lock consists essentially of a one piece linkage, the car door lock is simple to maintain and install.

While the present invention has been illustrated and described with respect to a particularly pre-

ferred embodiment thereof, it will be appreciated by those skilled in the art that changes, in the form and detail thereof may be made therein. One of ordinary skill will appreciate, for instance that the hoistway and car door lock systems may be reversed. One of ordinary skill in the art will also appreciate that the system may be utilized in other inner and outer door systems such as shuttles.

Claims

1. A door system having inner and outer doors, the system having a mechanism comprising a cam (102) for locking and unlocking one of said inner or outer doors, said cam (102) moving a given distance to unlock said one of said inner or outer doors, said cam being capable of moving beyond said given distance, and the system also having a door lock (138) for locking or unlocking the other of said inner or outer doors, characterized in that said door lock (138) comprises following means (150) for following the motion of said cam (102); and means (146) actuated by said following means (150) to lock said other of said inner or outer doors if said following means (150) detects that said cam (102) has travelled a greater distance than said given distance.
2. A door system as claimed in claim 1, for an elevator wherein said inner and outer doors comprise respectively elevator car (22) and hoistway (137) doors.
3. An elevator door system as claimed in claim 2, wherein the mechanism locks and unlocks a hoistway door (137).
4. An elevator door system as claimed in claim 3, wherein said means actuated by said following means comprises a rotatable linkage (150, 144) engaging said cam (102) for motion therewith, and a locking tab (146) attached to said linkage for interfering with the motion of said car door (22).
5. An elevator door lock for an elevator door system as claimed in claim 2, 3 or 4 comprising following means (150) adapted to follow the motion of a hoistway door locking and unlocking mechanism, and car door locking means (146) actuated by said following means (150) to lock a car door when the following means (150) has moved more than a predetermined distance.



Patentansprüche

1. Türanordnung mit einer inneren und einer äußeren Türe und mit einer Vorrichtung, die eine Steuerflächeneinrichtung (102) zum Sperren und Entsperren einer von der inneren oder der äußeren Türe aufweist, wobei sich die Steuerflächeneinrichtung (102) zum Entsperren der einen von der inneren oder der äußeren Türe um eine vorgegebene Strecke bewegt und sich über diese vorgegebene Strecke hinaus bewegen kann, und wobei die Anordnung auch eine Türsperre (138) zum Sperren und Entsperren der anderen von der inneren und der äußeren Türe aufweist, dadurch gekennzeichnet, daß die Türsperre (138) aufweist: eine Folgeeinrichtung (150) zum Folgen der Bewegung der Steuerflächeneinrichtung (102); und eine Einrichtung (146), die von der Folgeeinrichtung (150) betätigt wird, um die andere von der inneren oder der äußeren Türe zu sperren, wenn die Folgeeinrichtung (150) feststellt, daß die Steuerflächeneinrichtung (102) eine größere Strecke als die vorgegebene Strecke zurückgelegt hat.
2. Türanordnung nach Anspruch 1 für einen Aufzug, wobei die innere Türe eine Aufzugskabinentüre (22) und die äußere Türe eine Schachttüre (137) ist.
3. Aufzugstüranordnung nach Anspruch 2, bei der die Vorrichtung eine Schachttüre (137) sperrt und entsperrt.
4. Aufzugstüranordnung nach Anspruch 3, bei der die durch die Folgeeinrichtung betätigte Einrichtung einen Drehmechanismus (150; 144), der mit der Steuerflächeneinrichtung (102) in Eingriff kommt, um sich damit zu bewegen, und einen Sperrvorsprung (146) aufweist, der an dem Mechanismus angebracht ist, um die Bewegung der Kabinentüre (22) zu hindern.
5. Aufzugstürsperre für eine Aufzugstüranordnung nach Anspruch 2, 3 oder 4, die eine Folgeeinrichtung (150) zum Folgen der Bewegung einer Schachttür-Sperrvorrichtung und -Entsperrvorrichtung und eine Kabinentür-Sperreinrichtung (146) aufweist, die durch die Folgeeinrichtung (150) betätigt wird, um eine Kabinentüre zu sperren, wenn sich die Folgeeinrichtung weiter als eine vorbestimmte Strecke bewegt hat.

Revendications

1. Système de portes ayant des portes intérieure et extérieure, le système ayant un mécanisme qui comprend une came (102) servant à verrouiller et déverrouiller une première desdites portes intérieure et extérieure, ladite came (102) se déplaçant d'une distance donnée pour déverrouiller ladite première desdites portes intérieure et extérieure, ladite came pouvant se déplacer au-delà de ladite distance donnée et le système ayant aussi un verrouillage de porte (138) servant à verrouiller et déverrouiller l'autre desdites portes intérieure et extérieure, caractérisé en ce que ledit verrouillage de porte (138) comprend :
des moyens suiveurs (150) destinés à suivre le mouvement de ladite came (102), et
des moyens (146) actionnés par lesdits moyens suiveurs (150) pour verrouiller ladite autre desdites portes intérieure et extérieure si les moyens suiveurs (150) détectent que ladite came (102) a parcouru une distance supérieure à ladite distance donnée.
2. Système de portes selon la revendication 1, pour un ascenseur, dans lequel lesdites portes intérieure et extérieure comprennent respectivement des portes de cabine d'ascenseur (22) et de cage (137).
3. Système de portes d'ascenseur selon la revendication 2, dans lequel le mécanisme verrouille et déverrouille une porte de cage (137).
4. Système de portes d'ascenseur selon la revendication 3, dans lequel lesdits moyens actionnés par ledit moyen suiveur comprennent une tringlerie tournante (150, 144) qui coopère avec ladite came (102) pour se déplacer avec celle-ci, et un taquet de verrouillage (146) fixé à ladite tringlerie pour interférer avec le mouvement de ladite porte (22) de cabine.
5. Verrouillage de portes d'ascenseur pour un système de portes d'ascenseur selon la revendication 2, 3 ou 4, comprenant des moyens suiveurs (150) adaptés pour suivre le mouvement d'un mécanisme de verrouillage et déverrouillage de porte de cage, et lesdits moyens (146) de verrouillage de la porte de cabine actionnés par lesdits moyens suiveurs (150) pour verrouiller une porte de cabine lorsque les moyens suiveurs (150) ont parcouru plus qu'une distance prédéterminée.