July 13, 1965 J. KOZAK 3,194,345

SAFE EDGE RETRACTION MECHANISM

Filed Dec. 26, 1962 3 Sheets-Sheet 1

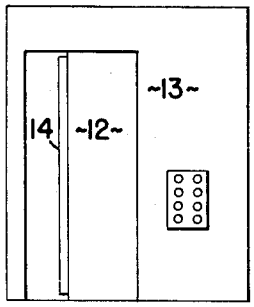


Fig. 1A

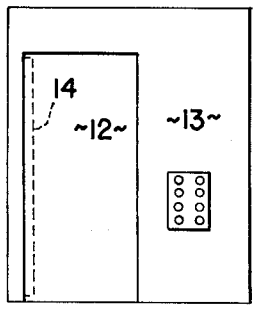


Fig. 1B

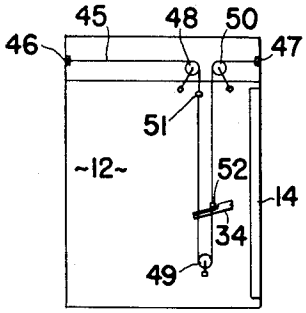


Fig. 3A

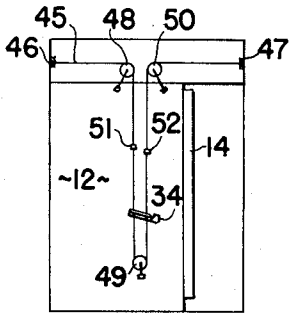


Fig. 3B

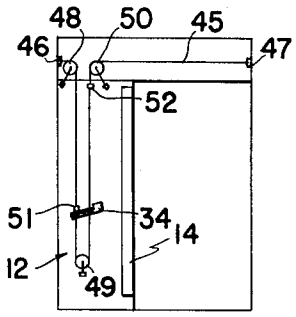


Fig. 3C

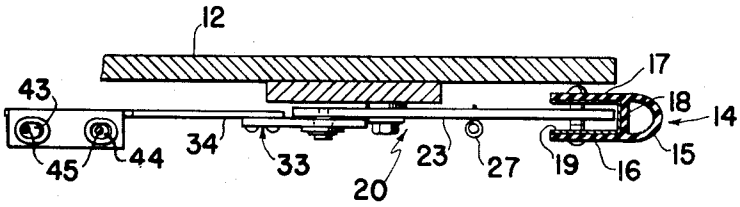


Fig. 7

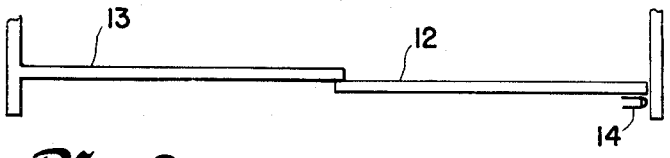


Fig. 2

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SAFE EDGE RETRACTION MECHANISM

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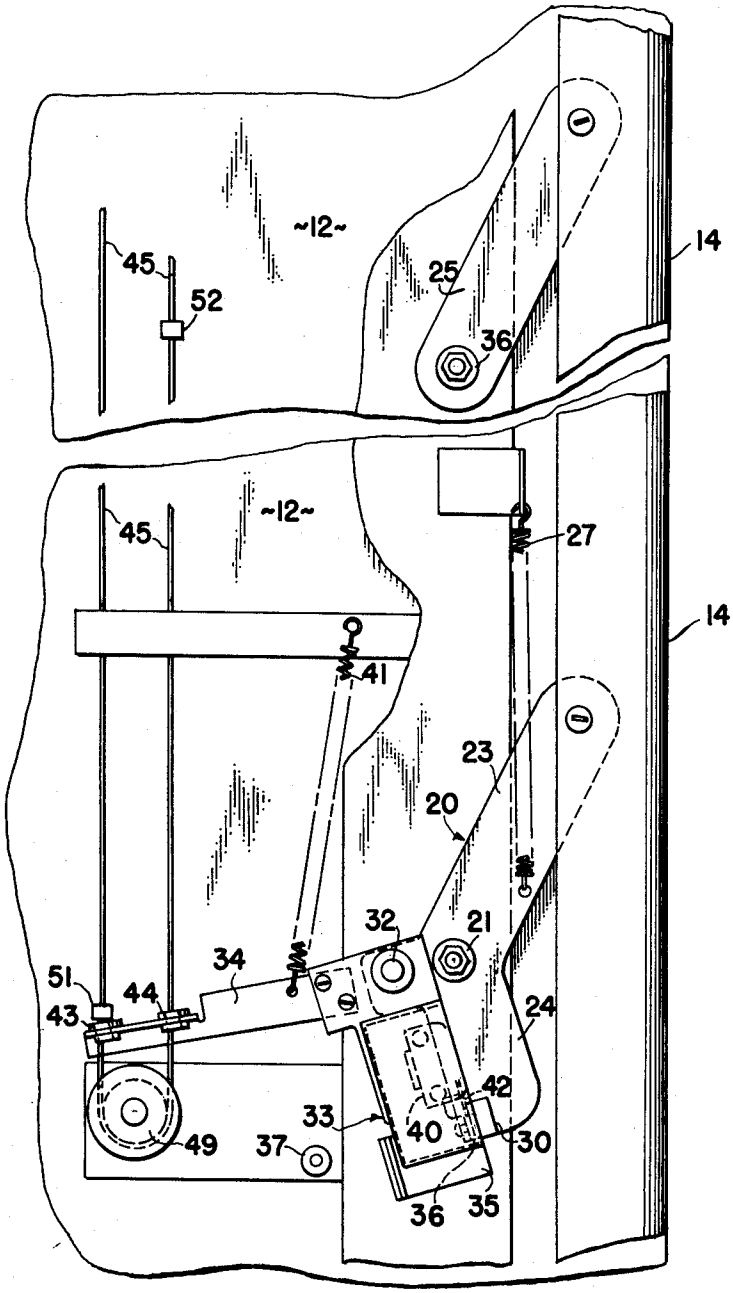


Fig. 5

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SAFE EDGE RETRACTION MECHANISM

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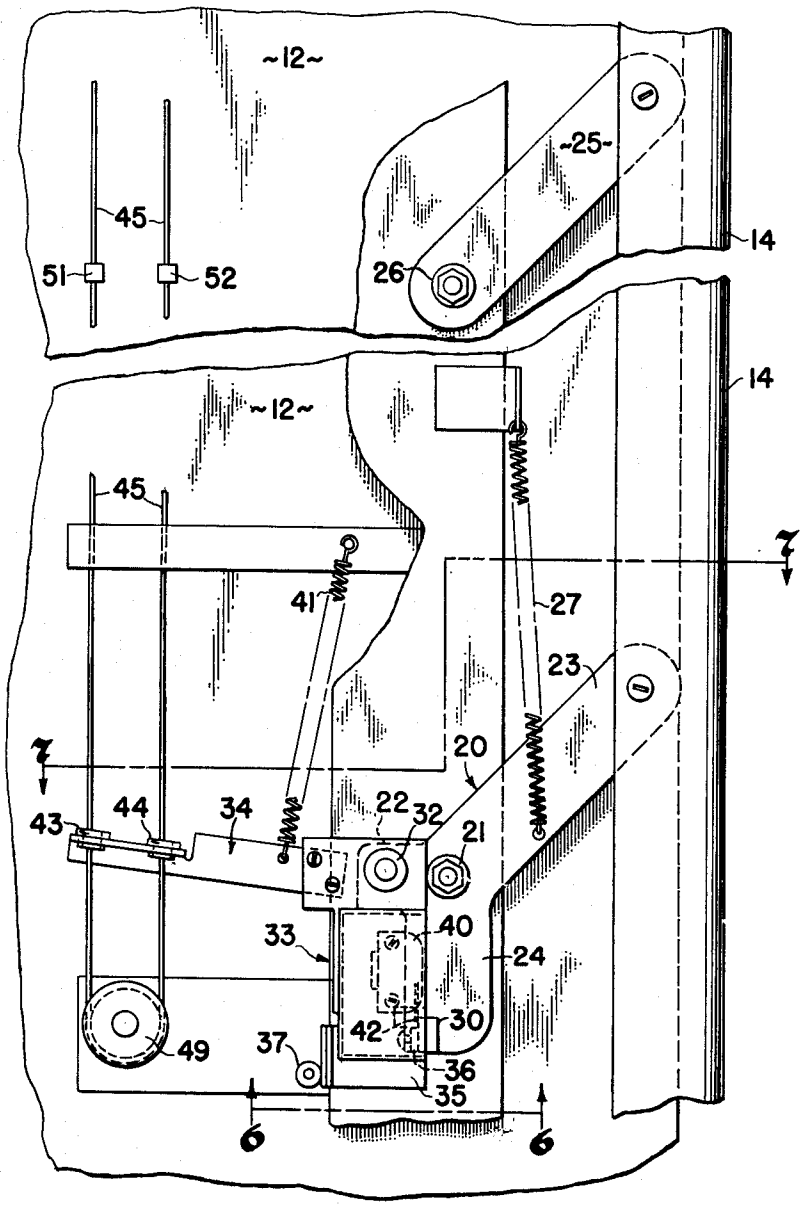


Fig. 4

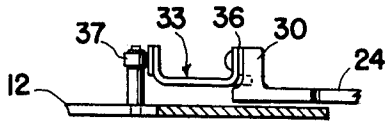


Fig. 6

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SAFE EDGE RETRACTION MECHANISM

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7 Claims. (Cl. 187—51)

This invention relates generally to a safe edge mechanism for power actuated elevator doors and more particularly to a safe-edge retraction mechanism to be used therewith.

Most power actuated elevator car doors are provided with some means for sensing obstacles in the path thereof and in accordance with this sensing to reverse or stop further closing of the door. The usual form of an obstacle sensing or detecting means is the well-known safe edge. Conventionally the safe edge has been made coextensive with the front margin of the door or doors of the elevator car to thereby react to obstacles of various sizes.

In order to serve their purpose more effectively it has been found desirable that the safe edges be in an extended or sensing position for the entire length of the door movement. However to prevent damage to the safe-edge while the door is in an open position, and in addition, to permit the widest path of egress and ingress to the elevator car it has been found desirable to retract the safe edges just prior to the door's assuming a fully open position. Similarly, to insure against damage to the safe edges due to collision between the safe edges in center opening elevator car doors, or between the safe edge and the elevator side in side operating type doors, as well as to provide a tight fit between the doors' front margin edges on center closing or opening doors, or between the door and the side of the elevator car, it has been found desirable to retract the safe edge, or edges, prior to the time that the door assumes a fully closed position. It has also been found to be desirable to have the door opening mechanism operable by the safe edges regardless of their positions.

Various schemes and mechanisms have been attempted to accomplish a retraction of the safe edge just prior to the doors being fully opened or closed. However, these prior art methods have proved to be costly in installation, design and maintenance. Also, since most of the prior art devices have involved camming actions for retraction of the safe edges it has been necessary to provide a cam and cam follower for both the leading and trailing edges of the door.

Accordingly, it is an object of this invention to provide an improved safe-edge retraction mechanism which is simple to install and maintain.

It is a further object to provide a retraction mechanism which is responsive to transverse movement of elevator doors to retract the safe edges thereof prior to the doors assuming a fully open or closed position.

It is still a further object of this invention to provide a safe edge retraction mechanism which is operable in accordance with the doors on which they are mounted approaching an open or closed position, and which permits movement of the safe edge relative to the doors regardless of the position of the doors.

Still a further object of this invention is to provide a lost motion retraction mechanism to withdraw the safe edge from an extended position when the door on which the safe edge is mounted nears an open or closed position.

Another object is the provision of a compact safe-edge retraction mechanism which although of sturdy design will softly touch the person or obstacle along its path of travel and instantly act to cause the door on which it is carried to be immediately withdrawn or stopped.

It is a further object to provide a safe edge retraction mechanism which requires no external power source for its operation.

Another object is to provide a silent, smooth operating improved safe-edge retraction mechanism which is operable as the door upon which it is carried assumes a fully open or closed position.

In accordance with the above objects the invention comprises a rectilinearly movable power actuated door which has bight forming, rotatably mounted, pulleys thereon, a safe edge coextensive with the front edge of the door and movably mounted thereon for relative movement therefrom, a cable which is trained around the bight forming pulleys and having its ends fixably mounted to opposite sides of an elevator entry, thereby forming a cable bight displaceable along a path of travel in accordance with the rectilinear motion of the door and attaining one extreme position of its path of travel for a closed position of the elevator door and the opposite extreme position of travel for an open position of the elevator door, first and second abutment means fixably mounted at predetermined positions on the cable bight for movement therewith, said first means reaching an effective position upon the door reaching one of its terminal positions and the second abutment means reaching an effective position upon the door reaching its other terminal position, and a safe edge retraction mechanism having one end operably connected to said safe edge and having its other end positioned along the path of travel of the bight and engageable by the abutment members in their effective positions for safe edge retraction.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts and wherein:

FIGS. 1A and 1B are views, from the inside of the elevator, and show respectively the elevator door being in an intermediate position with its associated safe edge in an extended position, and the door being fully closed and the safe edge retracted;

FIG. 2 shows a plan view of a fully closed, side opening elevator door;

FIGS. 3A, B and C are outside views of the front of the car cab and door showing the abutment means of the lost motion retraction mechanism with the doors in a closed, intermediate, and opened position respectively;

FIG. 4 is a fragmentary view of the safe edge advancing and retraction mechanism as it appears when the door is in an intermediate position between its terminal positions of fully open or closed;

FIG. 5 is a fragmentary view which shows the safe edge in a retracted position due to the door assuming a fully open position;

FIG. 6 is a fragmentary view along the line 6—6 of FIG. 4 and indicates the engaging relationship between the abutments of the safe edge retraction elements as well as their relationship to a roller pin which limits the clockwise movement thereof;

FIG. 7 is a view along the line 7—7 of FIG. 4 and indicates the construction of the safe edge and its connection to one leg of a spider and also a plan view of the driven arm of a driver bracket and the pivotal relationship between the driver bracket and the spider.

This specification and the accompanying drawings are intended to describe and illustrate a preferred form of the invention, but are not to be construed to impose limitations upon the scope of this invention.

This mechanism may be utilized with either center or side opening doors. FIGS. 1A and 1B indicate a view from inside of the car of a side opening door 12 mounted for transverse movement, opening from left to right, in an elevator car 13 and carrying thereon a safe edge 14.

The safe edge 14 is shown to be coextensive with, and mounted along, the leading edge of the door. The safe edge is shown in FIG. 1A to be in an extended position and in this position precedes the front margin of the door by about two inches. In the fully closed position, see FIG. 1B, as well as in the fully opened position, not shown, the safe edge is retracted to have its front edge substantially flush with the front margin of the door. FIG. 2 shows in plan view the relationship of the safe edge to the door and door jamb of a fully closed side opening door.

The construction of the safe edge is shown in detail at FIG. 7, which is a fragmentary section taken along the line 7—7 of FIG. 4. As shown in FIG. 7 the safe edge consists of a hollow semi-cylindrical nosing 15 with sides extending therefrom. The U-shaped channel formed by the longitudinally extending rib 18 and sides 16, 17 embrace a channel shaped aluminum strip 19 within which lies linking spider 20. Spider 20 is of considerably smaller transverse dimension than channel 19. The nosing 15 along with its extended sides 16 and 17 may be made of medium soft rubber or any equivalent soft elastic deformable material. The nosing and sides are then connected to the aluminum channel 19 by cementing 16 and 17 thereto. The spider 20, which will be discussed in more detail later and which may also be made of aluminum, is provided with openings for receiving fastening devices for mounting on the aluminum channel 19.

As shown in FIGS. 4 and 5 the safe edge mounting and retraction spider 20 is pivoted to the elevator door 12 at point 21 and has bracket mounting leg 22, safe edge supporting arm 23, and a switch actuating arm 24 radially extending therefrom. In addition, link 25 is also provided, see FIG. 4, and is mounted parallel to safe edge supporting leg 23 of spider 20 and is rotatable about point 26. In the above manner a collapsible parallelogram is formed having sides 23, 25 safe edge 14, and the part of door 12 between pivot points 21 and 26 forming the last arm. Accordingly spider leg 23, and link 25 are mounted for rotation about parallel axes near the edge of the door 12. A spring 27 also shown in FIG. 4 serves to counteract the weight of safe edge 14, and in this manner the pressure sensitivity of safe edge 14 to obstacles is increased. FIG. 5 indicates the position which spider 20 assumes when the safe edge 14 is in a retracted position due to the door having arrived at one of its terminal positions. Safe edge 14 will assume retracted position because of an obstruction being in the path of the elevator door, or by the door reaching a fully open or closed position. Furthermore, as indicated in FIGS. 4, 5 and 6 switch actuating leg 24 of spider 20 is provided with a projection or abutment 30 for the actual triggering of the switch 40.

Mounted upon the bracket mounting arm 22 of spider 20 for rotation about point 32, and thus rotating along an axis parallel to that of spider means 20 is a driving bracket indicated generally by the numeral 33. As shown in FIG. 4, the driving bracket 33, is made up of two arms 34 and 35. Driving arm 34 is fixedly mounted to driving bracket 33 in a position deviating slightly from the horizontal in a manner as shown in FIG. 4 or 5. In turn, drive arm 35 is formed integrally with bracket 33. It is of course possible to make the driver bracket unit 33 along with driven arm 34 and driving arm 35 a one piece bell crank. Selectively positioned on arm 35 is abutment element 36. Associated with and rotatably mounted at a predetermined position on door 12 is a roller pin 37, which serves to limit and guide the clockwise rotation of driver bracket 33 by cooperating with one edge thereof. A better view of the relationship between the elements 37 and 33 is shown in FIG. 6, which is a fragmentary view along line 6—6 of FIG. 4. Also, as clearly shown in FIGS. 4, 5 and 6 abutment element 36 of driving arm 35 is in engagement with abutment element 30 of switch actuating leg 24 to thereby transmit any movement of the driver bracket 33 to spider 20, and vice versa.

Furthermore, a biasing spring 41 mounted as shown in FIG. 4 urges driver bracket 33 in a clockwise direction about pivot point 32. Under non-obstacle sensing conditions and with the door in an intermediate position one edge of driver bracket 33 will be limited against roller pin 37 under the influence of biasing spring 41. In turn the weight of safety edge 14 will overcome the bias of spring 27, and will pivot spider 20 in a clockwise direction about pivot point 21 resulting in abutment 30 of switch actuating leg 24 to engage abutment element 36 of driven arm 35 and thereby position the safety edge in an extended or sensing position forward of the margin of door 12.

In addition selectively positioned for nonoperation in a non-obstacle sensing condition is micro-switch 40. Micro-switch 40 is provided with an extending triggering arm 42. As indicated in FIG. 4 abutment 30 of switch actuating leg 24 provides the activating element for switch 40, for as long as abutment 30 is in engagement with abutment 36 trigger arm 42 of switch 40 will be held in a position to retain the switch in its non-active state. This is true regardless of the position of the safety edge relative to the door margin. However, as soon as the safety edge is moved to a retracted position, due to its engagement with an obstacle, spider 20 will pivot in a counterclockwise direction relative to pivot point 21, whereas bias spring 41 will retain driver bracket 33 in its normal position, to disengage abutment elements 30 and 36. Upon the disengagement of abutment elements 30 and 36 switch arm 42 will be permitted to move relative to switch 40 and thereby activate or trigger it. The triggering of switch 40 will make or break circuits causing the door to stop or reverse its movement. The circuits and associated door operating mechanisms are of standard design and accordingly are not discussed herein or shown by the drawings.

In the preferred embodiment of this invention arm 34 of driver bracket 33 is shown to have two oblong apertures 43 and 44 proximate one of its ends. The oblong apertures 43 and 44 are furnished with mating bushings to thereby provide a better cable riding surface. These apertures accommodate the cable of a lost motion driving device. The apertures are shown in more detail in FIG. 7 which is a fragmentary view along the line 7—7 of FIG. 4. As mentioned previously for intermediate positioning of the door 12, or for obstacle sensing conditions of operation biasing spring 41 will urge arm 34 in a clockwise direction. However in a safe edge retraction conditions initiated by the door nearing a fully open or closed position rather than by the safe edge sensing an obstacle it is necessary to provide means for rotating driver bracket 33 in a counterclockwise direction, for a left hand side opening door. The rotation of driver bracket 33 in a counterclockwise direction about pivot point 32 will cause abutment 36 thereof to engage abutment 30 of switch actuating leg 24 and result in the rotation of spider 20 in a counterclockwise direction about pivot point 21. The counterclockwise rotation of spider 20 will obviously result in the retraction of safe edge 14 from an extended or sensing position relative to the front margin of door 12.

The lost motion driving means for rotation of driver bracket 33 will now be discussed in considerable detail. FIGS 3A, B and C indicate a cable 45 with its ends fixed at points 46 and 47 to the sides of an elevator door frame and having selectively positioned bight forming pulleys 48 through 50 rotatably mounted on the transversely movable door 12. As an alternative a single pulley 49 along with the apertures of arm 34 may provide the bight forming means. Also, the ends of the cable may be fixed to any suitable support member. FIGS. 3A, B and C disclose a preferred embodiment of applicant's lost motion driving arrangement. As shown thereat abutment type driving elements 51 and 52 are selectively posi-

tioned at predetermined points on the cable bight intermediate the ends thereof. As also shown in FIGS. 3A, B and C positioned proximate one end of the bight and intermediate pulley 49 and abutment driving elements 51 and 52 is the apertured arm 34 of driver bracket 33. As previously mentioned one side of the bight is trained through each of the two apertures in arm 34. It should also be mentioned that the transverse dimension of abutment driving elements 51 and 52 is larger than the diameter of the apertures in arm 33.

Since the two ends of the cable 45 are fixed and the bight forming pulleys are rotatably mounted on the transversely movable door intermediate the ends of the cable, it follows that as the door is moved the bight will accordingly move. In this manner a transversely positionable bight is formed, and any elements which are fixed to the bight will also move. However, whereas the bight is moving transversely the abutment elements thereon will move in a plane perpendicular to the movement of the bight, or in this case in a vertical direction. In accordance with this plan of operation the driving abutment elements 51 and 52 are positioned on each side of the bight at predetermined intervals away from arm 34. A further criterion for the positioning of elements 51 and 52 is that neither one of them is to engage arm 34 during the majority of transverse movement of door 12. However, as the door is proximate its closed position one abutment element is to engage arm 34, and in this case it will be element 52, and also as the door is proximate its fully opened position the other element, or in this case element 51, is to engage arm 34. These conditions are brought out diagrammatically in FIGS. 3A, B and C whereat the positioning of the elements with the door in a closed, intermediate, and opened position respectively are shown. Also, since the transverse dimension of driving elements 51 and 52 is larger than the inside diameter of the apertures in arm 34 it follows that arm 34 will be driven in the direction of travel of element 51 or 52 upon engagement thereby. Therefore, element 52 is positioned to engage and drive arm 34 in a downward direction as the door 12 nears a closed condition, and element 51 is positioned to engage and drive arm 34 in a downward direction prior to door 12 reaching a fully open position. However, for any position of the door intermediate the final portion of its range of travel to its open or closed position neither of elements 51 or 52 are effective and the system will then operate as a lost motion device.

It should again be emphasized that this safe-edge retraction mechanism is to be operable to retract the same as the door upon which it is carried nears an open or closed position. However it will not detract in any detail from the operativeness of the safe edge to sense an obstacle along its path of travel. Accordingly any pressure against safe edge 14 will be effective to fulcrum spider 20 about its pivot point 21. However because of counterbalancing spring 41 urging driven arm 34 in a clockwise direction driver bracket 33 will not remain in the same position it occupied prior to the obstacle disturbance to safe edge 14 but will be vertically displaced in a downward direction along the roller pin 37. In this manner abutment 30 carried by switch actuating arm 24 of spider 20 is disengaged from abutment 36 carried by driven arm 35 of driver bracket 33, and in turn this relative movement is effective to trigger switch 40, by movement of its arm 42. As explained above, triggering of switch 40 is effective to stop or reverse the movement of door 12.

There are of course many variations which may be made to this retraction arrangement in accordance with the desired time at which a retraction of the safe edge is to be accomplished. For example, if it were deemed desirable to have a retraction of the safe edge at only one extremity of door travel, with this extremity between opened or closed terminal position of the door, only a single abutment element, 51 or 52 would be supplied.

Likewise, if it is desired to achieve a retraction of the safe edge at an intermediate position of the door movement, such as upon the door assuming a half-open position, all that is required is to selectively position one of the abutment elements on cable 45 to engage arm 34 at the desired time and accordingly achieve a safe edge retraction.

Theory of operation

With the door in an intermediate position, as shown in FIG. 3B, neither of driving elements 51 or 52 will engage arm 34 of driver bracket 33 and therefore spring biasing means 41, see FIG. 4, will limit one side of arm 35 against roller pin 37. Accordingly driving arm 35 of driver bracket 33 will be rotated in a clockwise direction around pivot point 32 to thereby position abutment 36 mounted thereon, in its furthest clockwise direction. In turn the weight of the safe edge will rotate spider 20 about point 21 until its associated abutment 30 is limited against abutment 36 of driving arm 35. This results in safe edge 14 being in its most forward or extended position relative to the leading edge of door 12. It should further be stressed that the above movements of spider 20 and driving bracket 33 are not executed at separate times, but rather are carried out concurrently and thus abutments 30 and 36 are contiguous for the entire period of movement. The touching relationship of abutments 30 and 36 during the entire forward biasing of safe edge 14 of course prevents any movement of switch arm 42 and thereby prevents the triggering of switch 40.

As the door moves in a transverse direction the bight of cable 45 will also move in accordance therewith, and thereby displace driving elements 51 and 52 in a vertical direction. Let us assume the case in which the door is heading towards its closed position, see FIG. 3A, drive element 51 will therefore be displaced vertically upward and element 52 vertically downward. Also, in accordance with its selective positioning on cable 45 element 52 will be drawn into engagement with driven arm 34 as door 12 nears its closed position, and since element 52 is too large to pass through oblong aperture 44 it will abut against drive arm 34 and drive it in a downwardly or counterclockwise direction, relative to pivot point 32, and against the clockwise bias of spring 41. Now since, as has previously been explained, prior to the time that door 12 nears its closed position the abutment element 36 of unit 33 and abutment 30 of spider 20 are in engagement it follows that as unit 33 is rotated in a counterclockwise direction abutment elements 36 and 30 cooperate to pivot spider 20 in a counterclockwise direction about pivot point 21, and thereby results in the retraction of safe edge 14. Safe edge 14 is retracted by the counterclockwise rotation of safe edge supporting leg 23 of spider 20 and parallel link 25 with the resulting collapse of the parallelogram formed by sides 23, 14, 25 and door 12.

As the door is instructed to open, because the car has reached its destination or by the depression of a call button by a passenger, the proper door opening circuitry will operate to open the elevator doors. In a manner to be described, the safe edge will be extended immediately upon the opening of the elevator doors, and will be kept in the forward position until the door aproaches its fully opened position. As the door 12 moves in a transverse direction to an open position, as shown in FIG. 3C, the bight of cable 45 will also move in a transverse direction, and accordingly as explained above element 51 will be displaced in a vertically downward direction and element 52 in a vertically upward direction to a final position as shown in FIG. 5. Upon the disengagement of element 52 from its abutting relationship to driven arm 34, and which will take place upon the door assuming its intermediate position as shown in FIG. 3B, the weight of safe edge 14 will overcome the force of bias spring 27 and cooperate with spring 41 to conjointly pivot spider 20 and driver bracket 33 clockwise about pivot point 21. The conjoint movement of spider 20 and driver

bracket 33 will keep abutments 30 and 36 in a contiguous relationship and thereby prevent the triggering of switch 40. Also in accordance with the selective positioning of element 51 on the bight, contact will be made thereby with driven arm 34 as the cable bight is displaced in a transverse direction. Since element 51 is of a larger transverse dimension than the diameter of oblong aperture 43, a counterclockwise displacement force will be applied thereby to arm 34 of driver bracket 33. In a manner similar to that outlined above this will, through the engagement of abutment 36 of driving arm 35 with abutment 30 of switch actuating arm 24, result in a counterclockwise rotation of spider 20 with an eventual retraction of safe edge 14.

Thus it can be seen that the safe edge will be extended for all positions of the door intermediate its terminal positions, and that a retraction will be accomplished within the last few inches of travel before the door assumes a fully open or closed position. Additionally, this novel retraction mechanism in no way interferes with the normal retraction of the safe edge due to the sensing of an obstacle for any position of the door. Returning to FIG. 4, which depicts the safe edge in a forward position for intermediate positions of the elevator door, we see that abutment elements 51 and 52 are positioned well above driven arm 34. Under these conditions, as previously mentioned, spring 41 will bias driven arm 34 in its extreme clockwise position, and accordingly driver bracket 33 will be in its highest vertical position relative to roller pin 37. Furthermore, the weight of safe edge 14 will have overcome the bias of spring 27 and resulted in a pivoting of spider 20 about point 21 until abutment 30 is limited against abutment 36. The abutting relationship of elements 30 and 36 will prevent any relative movement of switch trigger arm 42 and accordingly switch 40 will not be triggered. The engagement by safe edge 14 with an obstacle or object will result in its moving inwardly relative to the leading edge of door 14 by the pivoting of spider 20 about point 21 with the resulting collapse of parallelogram 23, 25, 14 and 12. However, spring 41 will continue to urge driven arm 34 to its extreme clockwise position and since driver bracket 33 is pivoted to spider 20 at point 32 the result will be that driver bracket 33 will be driven, against a bias action of spring 41, to its extreme vertically downward position by spider arm 22. The downward movement of driver bracket 33 and the counterclockwise rotation of spider 20, under obstacle sensing condition, results in the separation of abutments 30 and 36 with the resulting movement of switch arm 42 relative to switch 40. The relative movement of switch arm 42 will trigger switch 40 and actuate the door operating mechanism to result in an opening thereof and prevent injury to the object or obstacle which initiated the safe edge retraction.

It should be understood, of course, that the foregoing disclosure relates to only a preferred embodiment of the invention and that numerous modifications or alterations may be made therein without departing from the spirit and the scope of the invention.

Having described the invention, I claim:

1. In an elevator, the combination comprising a car having an opening adapted to be closed by a rectilinearly movable power actuated door having a front margin and a safe edge coextensive with said front margin, a link joining said safe edge with said door, a pivot between said link and said door, a safe edge retraction spider spaced away from said link and positioned along said front margin of said door for rotation about an axis parallel to that of said pivot, a first leg of said retraction spider pivotally connected to said safe edge, a second leg of said spider carrying an abutment member, a driver bracket having a driven arm and a driving arm rotatably mounted on said spider, said driving arm having a projection for engagement with the abutment member of said spider, driving means including a cable having fixed ends and a bight carried by and transversely movable with said door, selectively positioned abutment means carried by said bight engageable with said driven arm of said rotatably mounted driver bracket prior to said door assuming at least one of its terminal positions whereby said first leg of said safe edge retraction spider is pivoted in a direction to retract said safe edge.

2. A safe edge mechanism for use with a rectilinearly movable power actuated elevator door which moves between a fully open and closed position in relation to an elevator car comprising, a safe edge coextensive with the front edge of said door, a bell crank pivotally mounted on said door, a first arm of said bell crank connected to said safe edge, a second arm of said bell crank having apertures therein, biasing means to urge said safe edge in a forwardly extended position, driving means including a cable having ends fixed with respect to said car, bight forming means including a pulley mounted for rotation on said door about which is trained said cable, the bight of said cable also being trained through said apertures of said second bell crank arm, and abutment driving means selectively positioned on opposite sides of said bight and movable in accordance with the door displacement, one of said abutment means engaging said second bell crank arm prior to said door reaching a fully closed position and thereby pivoting said bell crank in a direction to retract said safe edge, and the other of said abutment means engaging said bell crank arm prior to said door reaching a fully open position and thereby pivoting said bell crank in a direction to retract said safe edge.

3. In a safe edge mechanism for use with a rectilinearly movable power actuated elevator door which moves between open and closed positions in relation to an elevator car to expose an entry to said car, said door having a safe edge, mounting means fulcrumed on said door and connected to said safe edge thereby permitting movement of said safe edge with and relative to said door, the combination comprising a safe edge retraction mechanism for retraction of said safe edge including, a driving bracket having driven and driving arms pivotally mounted in operable relation to said fulcrumed safe edge mounting means and having its driving arm engageable with said fulcrumed mounting means, means biasing said driving bracket in a direction to urge said fulcrumed safe edge mounting means through the said driving arm to a safe edge extended position, a lost motion device including a cable having a bight with its ends fixed to said elevator car on opposite sides of the path of said door, cable guide means mounted on said elevator door for movement therewith, said guide means maintaining said cable out of the entry exposed by said open door, at least two of said guide means being aligned in anti parallel relationship to the direction of door movement, said bight being trained around said guide means for movement therewith, and driving means selectively positioned on said bight for engagement with the driven arm of said driving bracket when said door nears at least one of its terminal positions, whereby said driving bracket is pivoted to drive said fulcrumed safe edge mounting means in a direction to retract said safe edge.

4. A safety edge mechanism for use with a rectilinearly movable power actuated elevator door which moves between a fully opened and closed position in relation to an elevator car comprising, a safe edge coextensive with the front edge of said door, a lever pivotally mounted on said door and pivotally connected to said safe edge, biasing means to urge said safe edge in a forwardly extended position, driving means including a cable having ends fixed to said elevator car, a driven element operatively associated with said lever, a pair of cable guides on said door aligned with said fixed ends in the direction of door motion with respect to said car, a third cable guide displaced along said door from said pair of cable guides, said cable being trained from said ends to said pair of guides and forming a bight between said guides and said

third cable guide, said third guide being positioned to locate a portion of said bight adjacent said lever, and an abutment selectively positioned on said bight and movable with respect to said door along a path between said guides in accordance with the door displacement to operatively engage said driven element and pivot said lever with respect to said door in a direction to retract said safe edge.

5. In combination a structure having an opening, a door adapted for rectilinear movement to expose and to close said opening, a safe edge mounted on the leading edge of said door, means supporting said safe edge for movement with respect to said door, means for moving said safe edge with respect to said door, a cable having ends fixed with respect to said structure at points spaced in the direction of door movement, a pair of pulleys mounted for movement with said door, each of said pulleys being aligned in the direction of door movement with respective fixed end of said cable, said cable being trained over said pulleys, a run of said cable between said pulleys displaced from a position of alignment along the direction of door motion with the fixed ends of said cable, and an abutment fixed on said run and displaceable a long the path of said cable run by rectilinear motion of said door, said abutment being positioned on said cable run to actuate said means for moving said safe edge when said door reaches a predetermined point in its path of movement.

6. The combination comprising a rectilinearly movable power actuated door, a structure having an opening adapted to be closed by said door, bight forming pulleys rotatably mounted on said door, a safe edge coextensive with the front edge of the door and mounted thereon for movement relative thereto, a cable which is trained around the bight forming pulleys and having its ends fixably mounted to said structure on opposite sides of said opening thereby forming a bight displaceable along a path of travel in accordance with the rectilinear motion of the door and attaining one extreme position of its path of travel for a closed position of the elevator door and the opposite extreme position of travel for an open position of the elevator door, first and second abutment means fixably mounted at predetermined positions on the bight

for movement therewith, said first means reaching an effective position upon the door reaching one of its terminal positions and the second abutment means reaching an effective position upon the door reaching its other terminal position, a safe edge retraction member operably connected to said safe edge, and an element of said member positioned along the path of travel of said abutment means and engageable by the abutment means in their effective positions for safe edge retraction.

7. In combination a structure having an opening, a door adapted for rectilinear movement parallel to its major plane to expose and to close said opening, an element adapted to be shifted with respect to said door parallel to the direction of door motion, a linkage between said element and said door, pivoted couplings between said linkage and said door and between said linkage and said element, a driven member for displacing said element with respect to said door, means for moving said element with respect to said door comprising a cable having its ends fixed with respect to said structure at points spaced in the direction of door movement, a pair of cable guides mounted for movement with said door, each of said guides being aligned in the direction of door movement with a respective fixed end of said cable, a third guide displaced from one of said pair of guides in a plane parallel to the major plane of said door in a direction substantially normal to the direction of door movement, said cable being trained over said guides, and an abutment fixed on said cable between said one and said third guide and displaceable along a path between said one and said third guide by rectilinear motion of said door, said abutment path being positioned with respect to said driven member whereby said driven member is engaged by said abutment to displace said element with respect to said door.

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