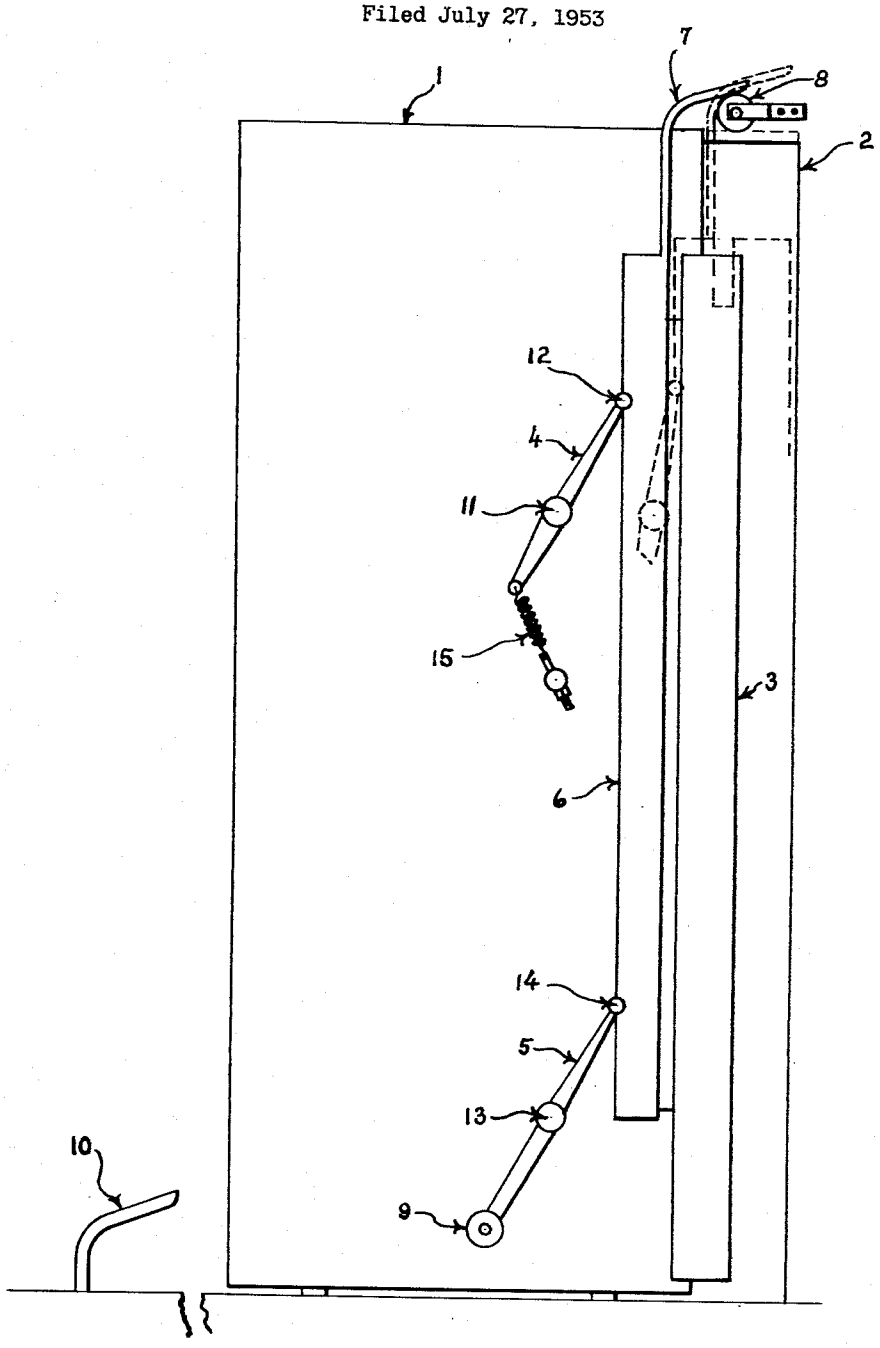
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RETRACTING MEANS FOR SAFETY EDGES OF ELEVATOR DOORS

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RETRACTING MEANS FOR SAFETY EDGES OF ELEVATOR DOORS

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This invention pertains to the improvement in the operation of elevators which are equipped with safety edges on the door or doors. These safety edges perform their task best when they precede the door as it moves towards its closed position. By so doing it encounters any object in the line of the door travel before the door strikes this object. The safety edge is arranged to cause the door to be immediately opened when it encounters any such object. If the car has two doors then the encountering of an object by one of the safety edges causes both doors to immediately open.

It has been found desirable in some cases, and necessary in others, to retract the safety edge or edges when the door nears its fully open or fully closed position. In the case of an elevator car having two center opening doors it may be felt desirable to retract the edges so that they will not be deformed by continually bumping against each other as the doors fully close. In the type of safety edge which is not rendered inactive for the last few inches of travel as shown in my copending application No. 215,305 dated March 13, 1951, for Safety Edge Mechanism, the edges are retracted so that they do not touch each other in the fully closed position. In some installations where there is insufficient room in the hatchway to accommodate the safety edge when the door is fully closed the edge must be retracted. There are cases where an advantage might accrue from retracting the safety edge, or edges, when the doors are fully opened. A freight elevator car may be loaded with large objects which almost fill the door opening. To have the edges retracted in such an instance results in speedier loading and less chance of harming the safety edges. The same is true of a hospital elevator car into which patients on stretchers or in wheel chairs are loaded. Even the ordinary passenger elevator there is a tendency to incline people to walk single file rather than side by side if the door opening is too small. If the edges are retracted it gives a wider appearance to the eye which results in quicker loading and unloading of the car.

The foregoing illustrations indicate that there are many reasons why the safety edges should be retracted in the door closed or door open position or both. However there are various objectionable features encountered in practice when the door or doors have edges that are retracted. One objection is that the safety edge parts receive more vibration than otherwise would. This is because the usual method of retracting the

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edge is to abruptly bring it to a stop by some such means as a rubber stop or roller tending to give infinitive deceleration. The roller stop being employed because there is usually a slight lifting of the edge as it is retracted due to the link method of suspending the edge. Another serious objection to the usual method of retracting the edges is the noise caused by the abrupt stop just described. In some installations noise is not so important; but in apartment houses, hospitals, office buildings, hotels and many other installations noise can be very objectionable.

To aid in the cutting down of noise and vibration of the safety edge parts the following method was conceived. The retraction of the edge begins a measurable horizontal distance before the edge reaches its final position, in contrast to the method now used in practice and it is done so that the retarding force, though not absolutely constant for practical reasons, is kept substantially constant. The method of retardation also employs the fact that in the retracted position the edge is raised, and has therefore more potential energy, by using this to absorb some of the kinetic energy of motion.

The accompanying sketches show the method conceived and how the features just described are attained.

Fig. 1 shows the view of a door on which is mounted a safety edge and which is equipped with a retracting device for either door open or door closed position.

In the drawing the door is shown as 1 and the door opening as 2. In the position illustrated the safety edge is just about to be retracted as the door, propelled by any suitable power means, moves to the right towards its fully closed position. The dotted lines in this sketch show the fully retracted position of the edge with the door closed. The safety edge is shown as 3 and is movable with respect to the door by being pivotally connected to the door by the arms 4 and 5. The safety edge 3 is shown directly connected with the safety edge frame 6 but it may be movable relative to said frame, if desired, as shown in the aforementioned application. The arm 4 is connected to the door by the pivot 11 and the safety edge frame by the pivot 12. The arm 5 is connected to the door by the pivot 13 and to the safety edge frame by the pivot 14. The frame 6 has an extended cam part 7 which is shaped like a horn. The cam 7 engages with a roller 8 made of yieldable material such as rubber and which is free to turn on a pivot which is rigidly connected to the car frame. The lower arm 5 is

extended backwards in order to support a roller 9 which can be the same as 8 and is free to turn on part 5. Part 10 is shaped exactly as part 7 and is mounted rigidly on the car. An adjusting spring is shown as 15.

Referring to the drawing, it will be noted that the position of the door and edge, as indicated by the full lines, is quite some distance from the edge of the door opening towards which they are moving as the door is closing. It is at this position that the cam 7 engages the roller 8 and begins to retract the safety edge with respect to the door. The deceleration of the safety edge takes place while it travels from the position just mentioned to the position shown by the dotted lines in Fig. 1. By making this distance a sizable amount as indicated in Fig. 1 the force needed to decelerate the safety edge and its associated parts is greatly lessened compared to that required by the usual method of coming to an abrupt stop wherein the deceleration takes place in the extremely short length equal to the amount the stop is distorted by the blow. By using the suggested cam method of decelerating the safety edge higher door speeds should be possible than could be used with the conventional method of abruptly stopping the edge. When the cam 7 first engages the roller 8 it touches it very close to the top. Due to this there is very little shock received by the safety edge mechanism. Variations in the manufacture and installation of such devices makes it inadvisable to shape the horn so as to engage too close to the top of the roller. As the door proceeds further the cam 7 rolls up on the roller 8 and this causes the safety edge frame 6 and edge 3 to be retracted with respect to the door 1. At the same time the upward pressure of the roller 8 and the cam 7 causes the safety edge parts to be given an upward momentum which is desirable because these parts must move up in order to be retracted since the arms 4 and 5 move in an arcuate path. The cam 7 is shaped with a view to simplicity of manufacture and with due regard to the tolerances of the safety edge and its installation and also so as to give a substantially constant deceleration of the safety edge parts as they are retracted. This results in minimizing the shock to the parts and thereby reducing the noise to such a level as to be unobjectionable.

Referring again to the drawing the roller 9 located on the arm 5 and the lower cam 10 located on the car are for retracting the edges in the door open position. If the roller 9 is the same diameter as the roller 8, and the shape of the cam 10 is the same as the cam 7, then from geometrical considerations the amount the edge is retracted will be the same for retraction in the door open position as for retraction in the door closed position for equal movements of the door. In other words the retraction relative to the door follows the same pattern for either case.

It is to be noted that either one or both of the safety edge retracting means above described may be used and that while a single door is shown the structure herein described may be duplicated for double door structures.

I make the following claims:

1. In a safety-edge mechanism for use with a power actuated elevator door of the type which moves rectilinearly to open and closed position relative to the elevator frame, the combination of a safety edge mounted on the door for movement with and relative to the door, and means for retracting said safety edge as the door moves to its closed position comprising a part connected with said safety edge and a part on the elevator frame, said parts having a camming action relative to each other to shift said safety edge backwardly as the door moves to its closed position and acting to gradually decelerate the movement of said edge.

2. In a safety-edge mechanism for use with a power actuated elevator door of the type which moves rectilinearly to open and closed positions relative to the elevator frame, the combination of a safety edge mounted on the door for movement with and relative to the door, and means for retracting said safety edge as the door moves to the closed position comprising a cam member connected with said safety edge and a yieldable roller on said elevator frame engaged by said cam member in advance of the closing of the door and of the edge reaching its ultimate position measured horizontally and while said door moves to its closed position, said cam being gradually inclined to cause a gradual decelerating movement of said edge.

3. In a safety-edge mechanism for use with a power actuated elevator door of the type which moves rectilinearly to open and closed positions relative to the elevator frame, the combination of a safety edge mounted on the door for movement with and relative to the door, and means for retracting said safety edge as the door moves to its open position comprising a part connected with said safety edge and a part on the elevator frame, said parts having a camming action relative to each other to shift said safety edge forwardly as the door moves to its open position and acting to gradually change the movement of said edge.

4. In a safety-edge mechanism for use with a power actuated elevator door of the type which moves rectilinearly to open and closed position relative to the elevator frame, the combination of a safety edge mounted on the door for movement with and relative to the door, and means for retracting said safety edge as the door moves to the open position comprising a cam member on said elevator frame and a yieldable roller operatively connected with said safety edge and engaged by said cam member in advance of the final opening of the door and of the edge reaching its ultimate position measured horizontally and while said door moves to its open position, said cam being gradually inclined to cause a gradual change of movement to said edge.

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