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R. GARY

3,210,496

SAFETY EDGE FOR HANGAR AND OTHER LARGE DOORS

Filed Dec. 10, 1962

4 Sheets-Sheet 1

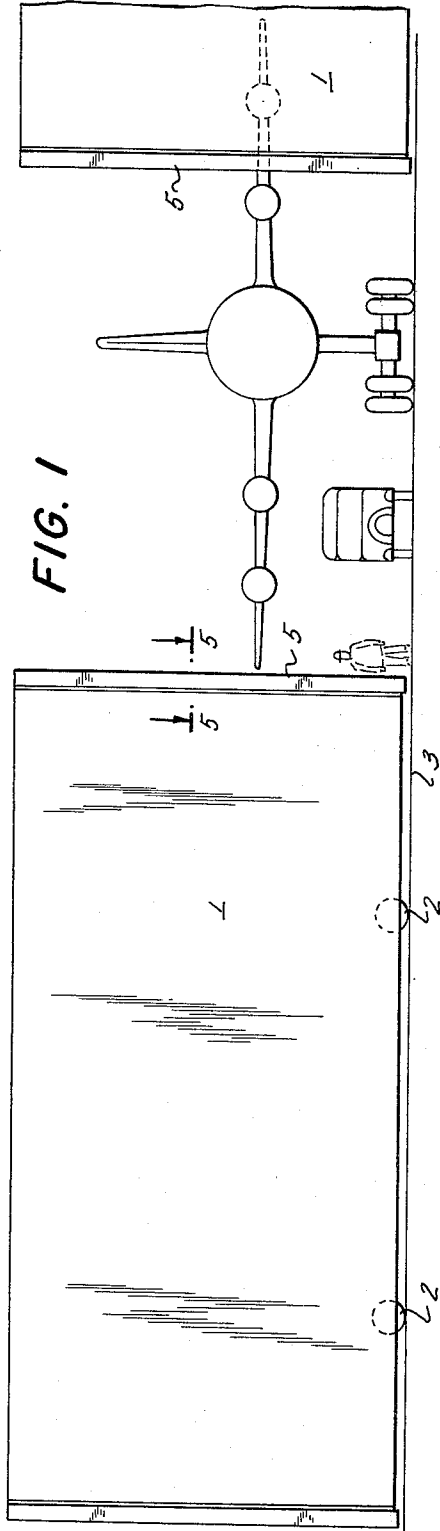


FIG. 2

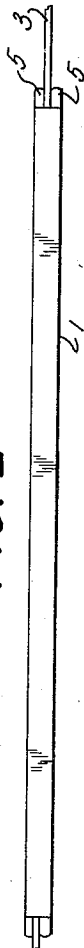


FIG. 4

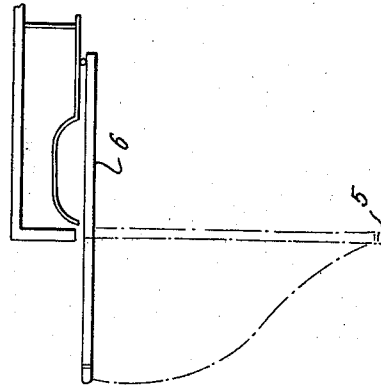
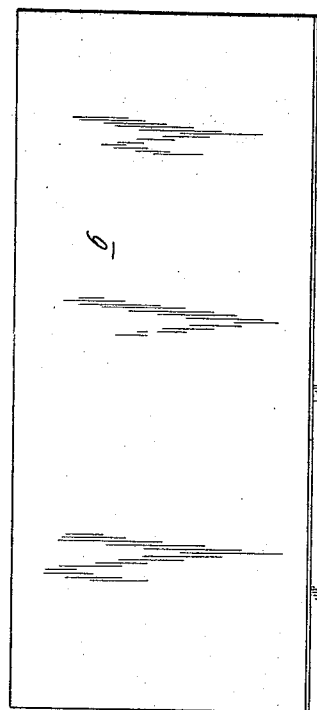


FIG. 3



INVENTOR.

BY *Robert Gary*
James J. Kennedy
Att'y

Oct. 5, 1965

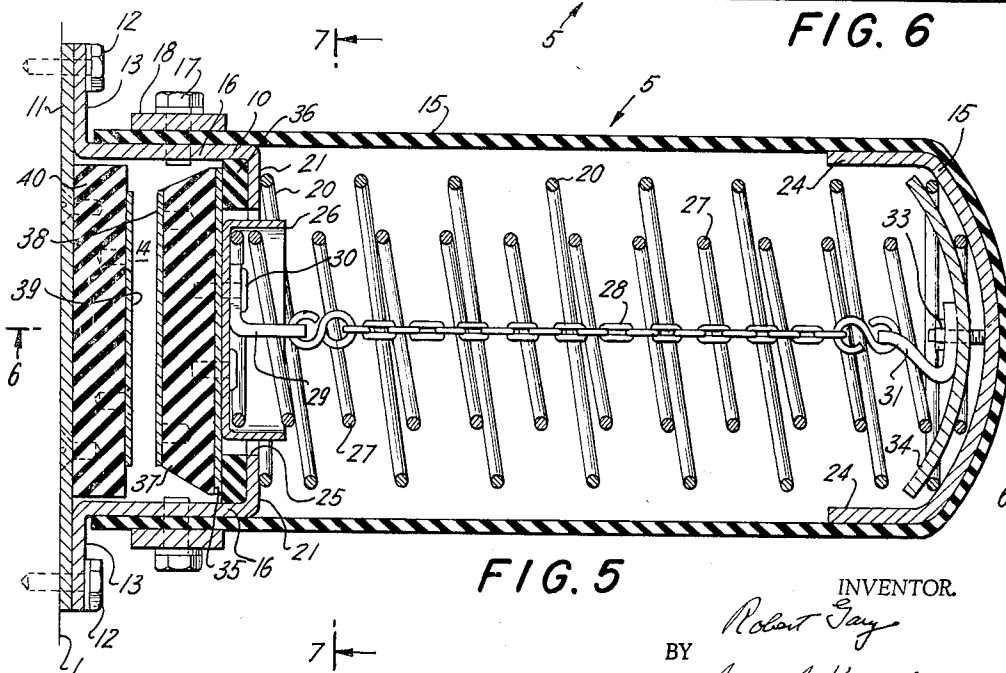
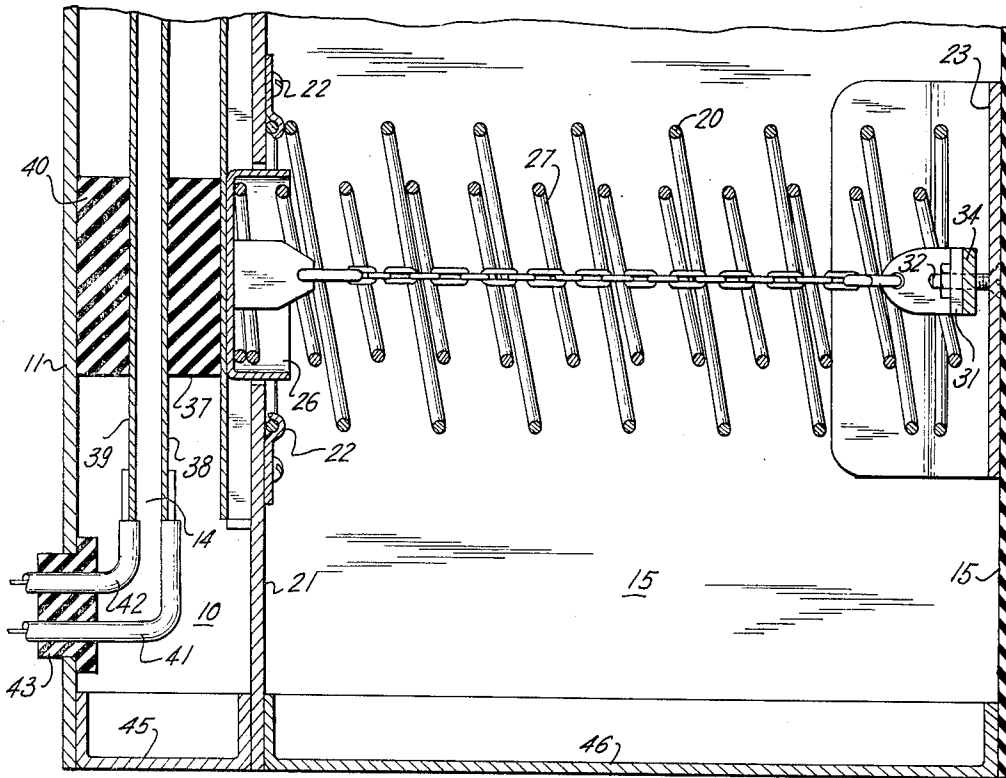
R. GARY

3,210,496

SAFETY EDGE FOR HANGAR AND OTHER LARGE DOORS

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4 Sheets-Sheet 2



INVENTOR.

BY

INVENTOR.
BY *Robert Gay*
James J. Homsey
Att'y.

Oct. 5, 1965

R. GARY

3,210,496

SAFETY EDGE FOR HANGAR AND OTHER LARGE DOORS

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FIG. 7

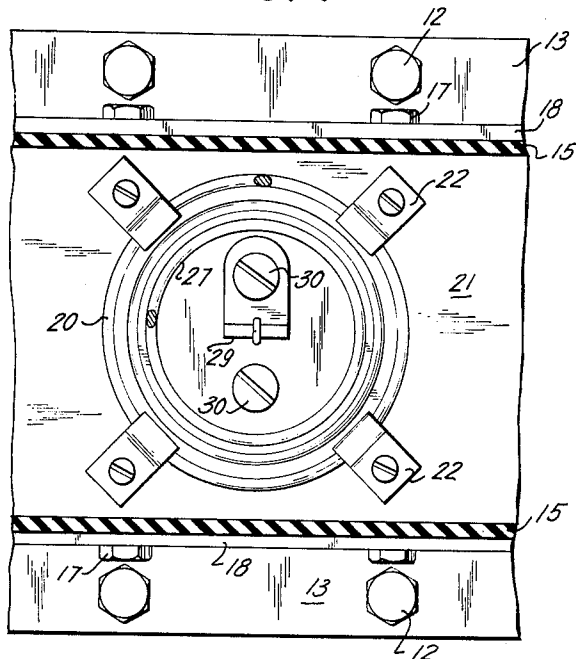


FIG. 11

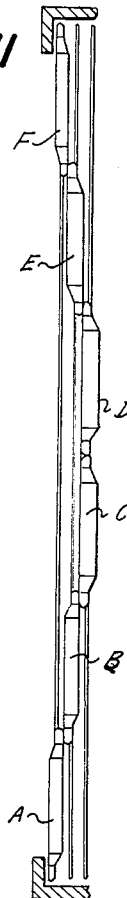
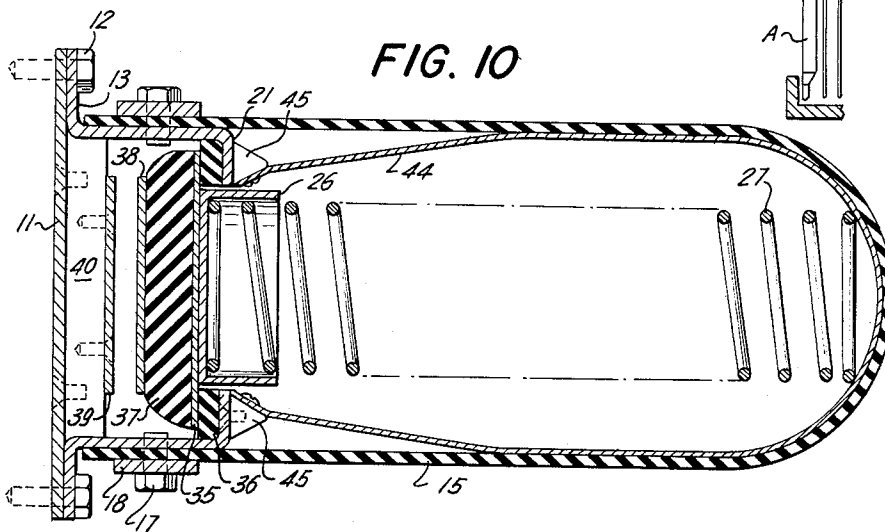


FIG. 12



FIG. 10



INVENTOR.

BY

Robert Gary
C. James J. Harnett
Att'y.

Oct. 5, 1965

R. GARY

3,210,496

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FIG. 13

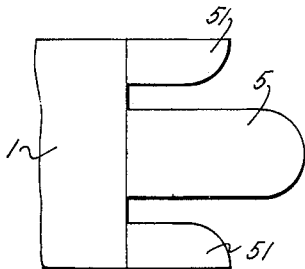


FIG. 14

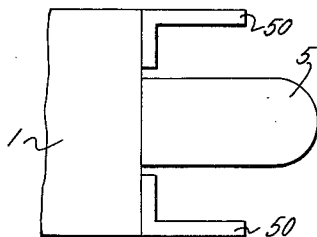


FIG. 15

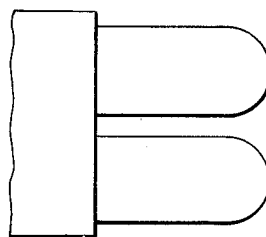


FIG. 9

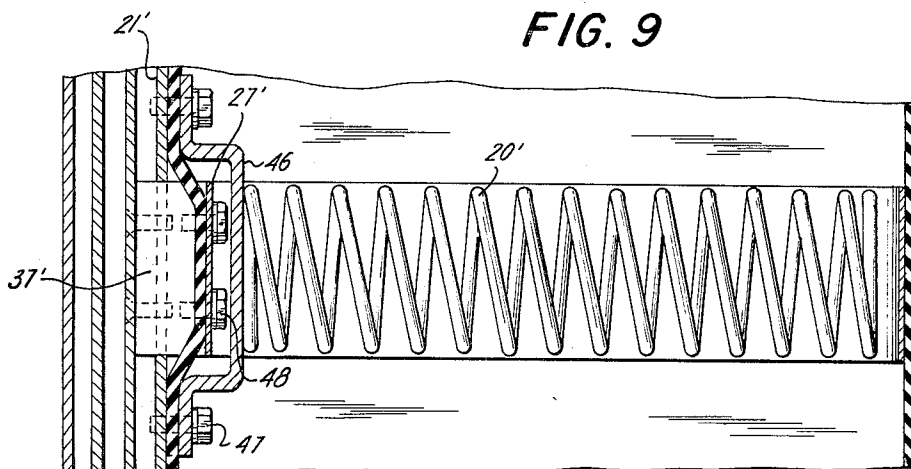
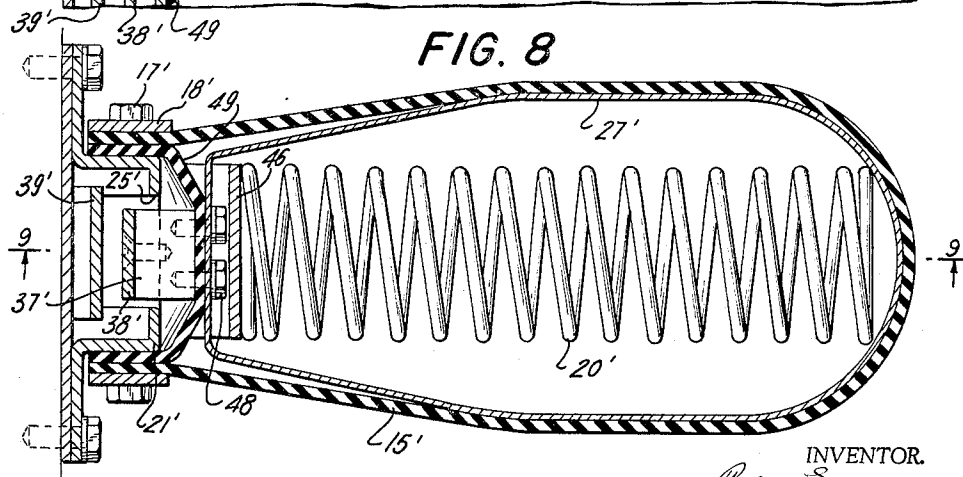


FIG. 8



INVENTOR.

Robert Gary

BY

James J. Hanning
Att'y

1

3,210,496

SAFETY EDGE FOR HANGAR AND OTHER LARGE DOORS

Robert Gary, Hyatt St., Sparkle Lake,
Yorktown Heights, N.Y.

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5 Claims. (Cl. 200-61.43)

This invention relates to safety edges for doors.

More particularly, the invention is concerned with safety edges for hangar doors or other large doors, which yield upon impact so as to avoid damage to either the door or to a person or object engaged by it. The door is also provided with contact mechanism used for de-energizing motor operator and energizing braking mechanism, this contact mechanism operating by a comparatively small compression or deflection of the safety edge and the safety edge itself being capable of a compression in excess of the normal amount of door travel which will occur after the brakes are applied.

The general object of the invention is to provide an improved safety edge of the type above indicated.

The safety edge requires local yieldability which is best achieved by utilizing a number of resilient elements spaced along the edge and at the same time requires contact mechanism which operates reliably regardless of the particular point along the edge where resistance may be encountered.

It is a further objects of the present invention to provide a safety edge fulfilling these requirements, in which the parts are of a minimum number and simple character and permit ready installation in forming safety edges of different lengths and depths.

A further object of the invention is to provide a safety edge of a suitably sealed character so as to protect the internal elements.

With the foregoing and other objects which will appear in the following full description in mind, mechanism embodying the invention in a preferred form will now be described with reference to the accompanying drawing, and the features forming the invention will then be pointed out in the appended claims.

In the drawing:

FIG. 1 is an elevation view of a horizontally moving hangar door installation;

FIG. 2 is a plan view of the door of FIG. 1;

FIG. 3 is a front elevation of a vertically movable door;

FIG. 4 is a side elevation of the door of FIG. 3;

FIG. 5 is a section on a much enlarged scale taken on the line 5-5 of FIG. 1;

FIG. 6 is a section on the line 6-6 of FIG. 5;

FIG. 7 is a section on the line 7-7 of FIG. 5;

FIGS. 8 and 9 are views similar to FIGS. 5 and 6, respectively, but showing a modified structure;

FIG. 10 is a view similar to FIG. 5 but showing another modified structure;

FIG. 11 is a schematic plan view of a multiple door arrangement; and

FIGS. 12-15 are schematic plan views on a larger scale showing different arrangements of the safety edge of the invention.

The doors 1 (FIGS. 1 and 2) are supported by wheels 2 riding on a rail 3 and have one or more safety edges 5 at either or both ends, as required. The doors may be fifty feet high and twice that width, or bigger, and weigh fifty tons or more. The safety edges 5 provide yielding edges capable of contacting personnel, aircraft or land vehicles without damaging the same and providing for the deenergizing of motor operator and energizing of door braking mechanism and stopping the door before

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damage can occur. The safety edges 5 may also be applied horizontally, as to the lower edge of a vertically moving door 6 (FIGS. 3 and 4).

FIGS. 5-7 show a preferred form of safety edge 5. Members 10 (a flanged channel or hat section) and 11 (plate) for a base box which may run the length of the edge to be protected and contains the contact mechanism. Bolts 12 fix the base box to the edge of door 1, going through bolt-holes in plate 11 and flanges 13 of the member 10. Flanges 13 and member 11 are sealed together by gasketing or sealing compound (not shown), to protect the space 14 within the base box 10-11 from moisture. A flexible cover 15 of fabric laminated rubber or other suitable flexible, waterproof material is secured to the side walls 16 of the base box by bolts 17 and flat bars 18, being compressed by the bars 18 so as to form a seal against the base box walls 10. A compression spring 20 seats against the outer wall 21 of the base box 10-11, being held in position thereon by clips 22 and the other end of spring 20 seats in a thrust member 23 which holds the cover 15 in the U-shaped position of FIG. 5. Member 23 has a rounded nose (FIG. 5) and parallel side flanges 24 supporting the cover 15.

Outer wall 21 of the base box has an aperture 25 accommodating a cup-shaped thrust member 26 and one end of an inner compression spring 27, concentric with spring 20, seats in member 26. The other end of spring 27 seats against the thrust member 23, previously referred to. Chain 28 is secured at one end to the center of thrust member 26, by means of a fitting 29 and screw 30 and at the other to the center of thrust member 23, by means of a fitting 31 and bolt and nut 32, 33. Arcuate strip 34 carried by the bolt 32 holds the last turn of springs 20, 27 in centered position around the chain 28.

A metal strip 35, running the length of the safety edge, is secured to the various thrust members 26 along the edge of the door and seats against resilient abutment strips 36 adhesively or otherwise fixed in place within the base box along the inner edges of the wall 21. Insulating blocks 37, secured to the strip 35 and thrust members 26, carry a contact strip 38 which is normally in spaced relation to a second contact strip 39 mounted on the base plate 11 by means of insulating blocks 40. Flexible electric connections 41, 42 lead through outlet fitting 43 (FIG. 6) to the brake control mechanism (not shown). The ends of the base box 10-11 are closed off by end pieces 45, adhesively or otherwise secured to members 10, 11 (FIG. 6) and sealed thereto, and the enclosure formed by cover 15 is similarly closed off at its ends by rubber or other elastic parts 46, sealed to the cover 15 and to the outer wall 21 of member 11.

The spring units as shown in FIGS. 5-7 may be spaced along the door at suitable intervals, as, for example, every ten inches or so and the length of springs 20, 27 may be comparable (also about ten inches).

The length of chain 28 is such that member 23 is held by spring 20 in a position where the cover 15 is held in the U-shape indicated, but in relaxed condition or under very slight tension. The pressure exerted by spring 20 against thrust member 23 may be about five pounds and the rate of the spring such that compression thereof involves only about a pound or so increase per inch of compression.

The spacing of contacts 38, 39 may be about $\frac{3}{16}$ inch so that a compression of the safety edge of that amount brings contacts 38, 39 together for deenergizing door motor operator and energizing the door braking mechanism. The travel of the door thereafter may be only two inches or less, so that when the safety edge encounters an obstacle, the door will be stopped within about two inches of travel and about two inches of compression of

the safety edge. One contact 38 engages contact 39, further movement of end fitting 23 compresses spring 27 as well as spring 20, but the total force exerted by both springs against member 23 may readily be held to low values, as in a range from three to eight pounds as stated above.

Aperture 25 is somewhat oval, having more clearance from the member 26 horizontally (FIG. 5) than vertically (FIG. 6), thus permitting a horizontal rocking of the member 26. If the safety edge engages an object at one side of member 23 (say, the upper corner thereof in FIG. 5), the outer end of the safety edge moves laterally (downward, in FIG. 5). Under these conditions the assembly 37-38, 35-26, 27-28, 23 moves as a body, rocking about one edge of the contact strip 35 (the upper edge in FIG. 5, under the assumed conditions) and bringing the other edge (lower edge under assumed conditions) in contact with contact strip 39 after less than an inch of lateral movement of member 23. Thereafter, the springs may flex in the plane of FIG. 5 or compress, or both, depending on the position of the obstruction encountered, until the door is stopped, as before. Axial and lateral movement of the end member 23 may be combined in any of various ways, thus combining the tilting and compressive action of the spring assemblies.

The working springs 20 may be substituted by strap springs 44 (as shown in FIG. 10), secured to the base box outer wall 21 by blocks 45, the action being otherwise the same as that described in connection with FIGS. 5-7. In this case, the inner spring works against the outer end of strap spring 44 and chain 28 may be omitted, the spring 27 serving to hold spring 44 in the position shown and only very light pressure being exerted against the cover 15 in the position of the figure.

In the embodiment shown in FIGS. 8 and 9, the working spring is positioned within the contact spring, which is a strap spring and contacts the cover on its sides as well as at its end. The base box, contact strip and cover are generally similar to corresponding parts as shown in FIGS. 5-7 and are identified by similar but primed reference numerals. The contact spring 27' is a strap spring shaped to hold the cover 15 in the shape indicated and the outer end of working spring 20' seats against the inside of spring 27' instead of the member 23 of FIGS. 5-7. The inner end of spring 20' is supported on a bracket 46 spanning the aperture 25' in the base box wall 21' and secured to the wall by screws 47. The inner end of contact spring 27' is positioned inwardly of bracket 46 and secured by screws 48 to insulating block 37' which carries movable contact strip 38'. A rubber gasket 49 fits over the base box, being secured to its sides along with the cover 15' by bars 18' and bolts 17' and to its outer wall 21' by the brackets 46 and screws 47. This gasket may be formed of thin sheet material or molded to a generally channel shaped form with bosses at the spring assembly location. In this structure, the strap spring 27' may be in substantially unstressed condition in the position of the figures, moving as a rigid body until resistance is encountered and then compressing as required.

Safety edges 5, in any of the forms mentioned, may be used with bumpers 50 or 51 as shown in FIGS. 13 and 14. Bumpers 50 may be angle irons or other protecting members extending out from about a third or half the width of the safety edge 5. Under impact from a moving vehicle the entire safety edge may compress into the space between bumpers 50. Bumpers 51, functioning similarly, are also formed to a curve to prevent the safety

edge bending around when subjected to lateral impact, while minimizing danger of damage to the safety edges.

Doors with wide edges may be fitted with single safety edges 5 by using wedge-shaped adapters 52 (FIG. 12) or provided with two safety edges (FIG. 15). Various door sections (A to F, FIG. 11) may abut in closed position (sections C and D) or overlap in closed position (e.g., A and B, FIG. 11), the capacity of the edges 5 to operate when compressed either diagonally or straight permitting practically any desired door arrangement.

What is claimed is:

1. A door safety edge comprising a base box secured along an edge of the door, a flexible cover element secured to the base box, springs spaced along the base box and normally extending substantially at right angles to the edge of the door so as to engage the cover and hold the same in extended position while permitting compressive and lateral movement thereof, axially yieldable means extending generally parallel to the first said springs and having their outer ends fixed with respect thereto, contact blocks within the said base box and carried by the inner ends of the said yieldable means and contact elements within the base box operable by the said blocks.

2. A door safety edge comprising a base box secured along an edge of the door, a flexible cover, means attaching the edges of the cover to the side walls of the base box, a plurality of spring assemblies spaced along the base box for holding the cover in normally extended position, each such assembly comprising a spring seating against the box at one end and against the cover at the other, a second spring having its outer end fixed in relation to the outer end of the first spring, a flexible tension member secured to the outer end of the said second spring and a block secured to the inner end of the tension member so as to maintain the second spring under compression, the said base box having an aperture in its outer wall accommodating the second said spring and wall portions adjacent the aperture engaged by the block, whereby the first said spring acting through the tension member normally holds the block against the said outer wall of the base box, contact elements within the base box and operable by the said block upon bodily movement inwardly thereof and also upon rocking movement thereof.

3. A door safety edge according to claim 2, in which the first said spring is a coil spring seating against the base box outer wall and comprising a thrust member for the outer ends of said spring and means fastening the said outer ends thereto.

4. A door safety edge according to claim 2, in which the first said spring comprises a strap spring having a normal configuration substantially conforming to the cover at its end and part way down its sides.

5. A door safety edge according to claim 2, in which the first said spring comprises a coil spring and having a bracket member supporting the inward end of the same from the base box, and in which the second said spring comprises a strap spring fitting around the said coil spring and conforming to the contour of the cover, the said strap spring being secured to the said block between the bracket and base box.

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BERNARD A. GILHEANY, *Primary Examiner.*