Jan. 28, 1969 M. H. ROSENBLATT 3,424,223

DOOR REINFORCING ASSEMBLY FOR VERTICALLY OPERATING DOORS

Filed Oct. 19, 1967 Sheet 1 of 2

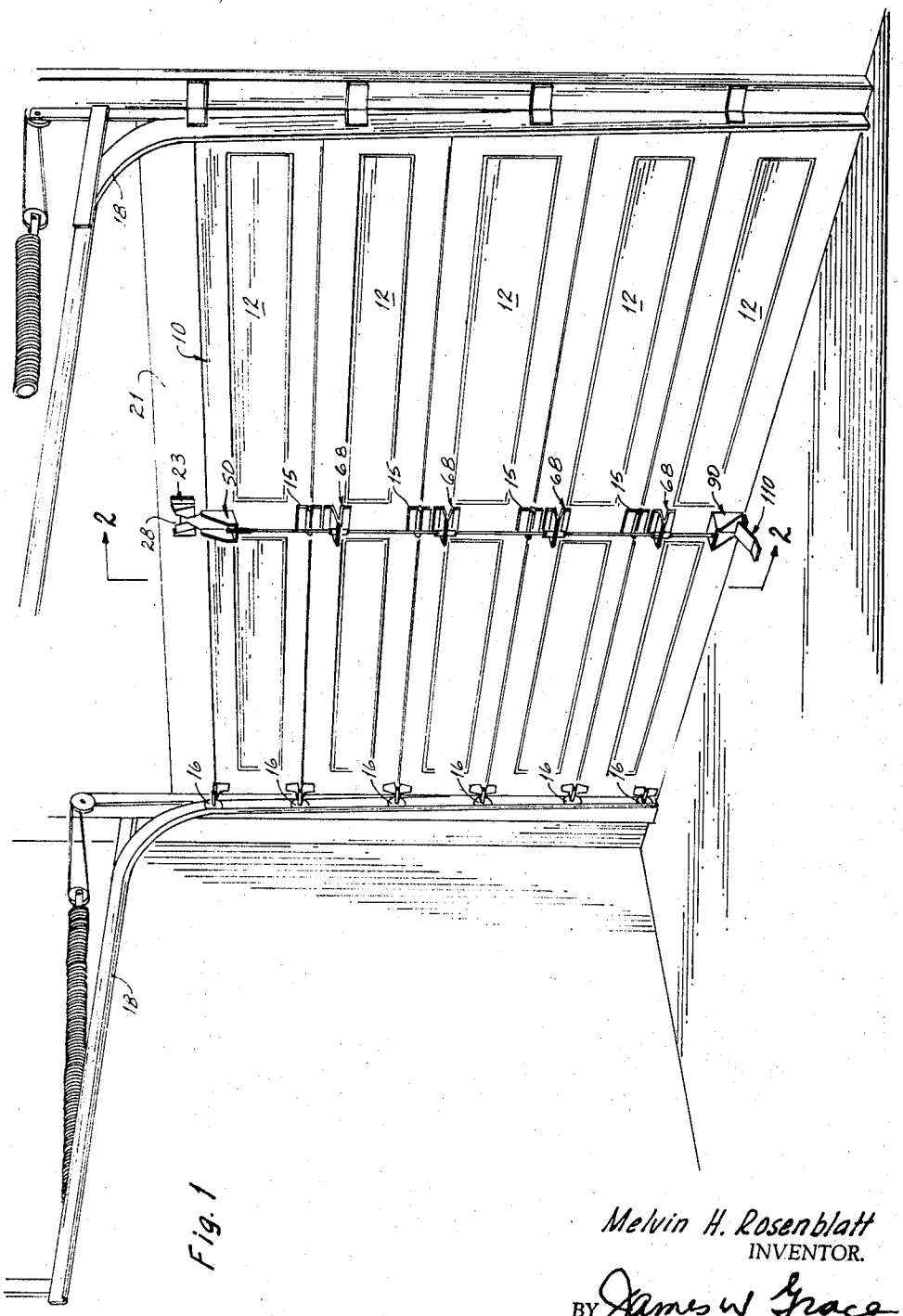


Fig. 1

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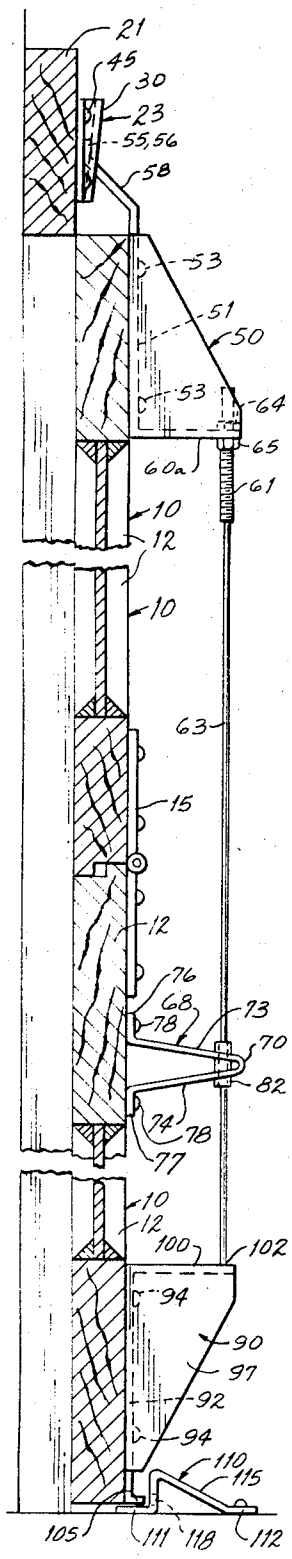
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Fig. 2



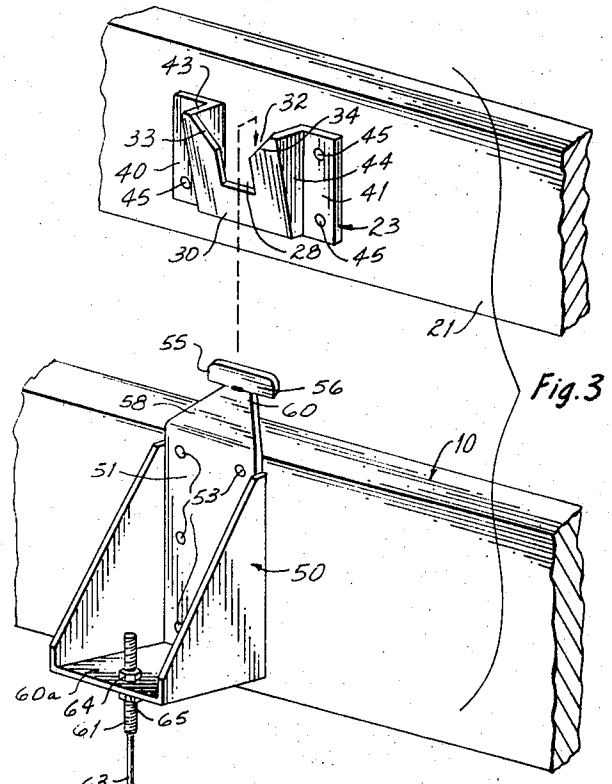


Fig. 3

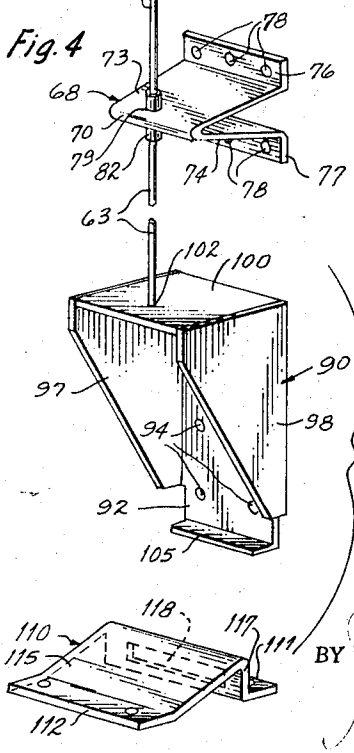


Fig. 4

Fig. 5

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DOOR REINFORCING ASSEMBLY FOR VERTICALLY OPERATING DOORS

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Int. Cl. E05d *15/38;* E06b *3/70*

ABSTRACT OF THE DISCLOSURE

A door reinforcing assembly for vertically-operating doors has tension means attached to the top and bottom of the door to distribute external forces applied to said door to the door frame through locking means engageable with the door frame and prevent excessive destructive deformation of said door.

Background of the invention

The present invention is applicable to vertically-operating doors, and particularly garage doors, although its general use should not be considered to be so restricted.

The specific embodiment will be described in the context of the conventional garage doors in residential or commercial installations. As is well known, such garage doors are vertically-operating doors mounted on rollers which engage tracks aligned at each side of the door to guide the door in operation. The doors can be either one piece or have a plurality of hinged panels forming the major area thereof. Each door is arranged to fit snugly against a door frame to keep out ariborne dirt particles and provide protection against inclement weather conditions, such as rain or snow. The bottom edge of the door generally lies on top of and against a floor or deck, so as to close the garage opening.

Since many of such doors are manually operated, they are generally carefully counterbalanced and most of them have spring means to assist in opening the door. The door should not be of excessive weight, as this makes installation more difficult. In addition the garage owners prefer doors which are light and easily operable.

On the other hand, strong winds, such as those during violent windstorms and hurricanes, put great strains upon the doors which act in a manner similar to sails because of their great exposed areas. The doors are usually heavily reinforced to prevent their collapse during such storms. Generally, the reinforcing structure takes the form of heavy beams fastened to the inside of the door; thus, aggravating the weight problem. In contrast to current practice, reinforcement assemblies should be as simple as possible to install, and be as economical as possible as many of these doors are sold in connection with relatively inexpensive building construction. Any substantial increase in the cost of reinforcing a garage door can result in lost markets for the door manufacturer.

Another factor to consider is the inventory problem in maintaining different lines of doors, namely, those reinforced and those not reinforced. Obviously from the manufacturers' standpoint, if a simple and inexpensive assembly can be supplied for quick and easy attachment to garage doors to reinforce them, he need maintain only an unreinforced type of door in inventory and sell a kit to those who wish to reinforce their doors of abnormal storm conditions. Furthermore, for the numerous garage doors now installed, a simple modification kit could be sold to garage owners for their own installation.

The prior art generally shows such doors reinforced with heavy cross-members of either wood or steel. Usually, the reinforced door is made as a unit and must be stored

in inventory. Furthermore, any externall forces applied to the face of the door are transmitted to the door tracks which may distort or bend and cause difficulty in door operation. Additionally, those doors now installed cannot be modified in any simple fashion to provide protection against collapse from strong winds.

Summary of the invention

The door reinforcing assembly is designed to be connected to the door and door frame, so as to transmit external forces to the door frame and base floor when such forces are applied without interfering with normal operation in the absence of such forces.

The assembly comprises bracket catches which are fastened to the door at its top and bottom edges with a tensioning means connected between the elements, and bracket catch housing attached respectively to the door frame and floor for engagement with said bracket catches upon the application of destructive external forces to said door.

It is an object of the present invention to provide a novel door reinforcing assembly which is light in weight and effective in operation.

It is yet another object of the present invention to provide a novel door reinforcing assembly which prevents destruction of a door by external forces without interfering with normal door operation.

It is a further object of the present invention to provide a novel reinforcing assembly, elements of which can be sold as separate items for installations in previously installed doors.

It is a further object of the present invention to provide a novel door reinforcing assembly which prevents destruction in case of sudden (no warning) strong winds or cases of owner absenteeism where some existing reinforcing assemblies are added ad removed as dictated by weather conditions.

Other objects and features of this invention will become apparent to those skilled in the art when the description thereof is considered in the light of the attached drawings, in the several figures of which like numerals refer to like elements, and in which

FIGURE 1 is a perspective view of the interior side of a garage door as installed, with the invention in place;

FIGURE 2 is a side section elevational view taken along lines 2—2 of FIGURE 1, and

FIGURES 3, 4 and 5 are expanded views of elements of the invention shown in FIGURE 1.

With reference to FIGURES 1 and 2, there is therein shown a vertically-operating door **10** having five panels **12** connected by hinges **15** to form a unitary structure. The door **10** is mounted on rolers **16** which run in tracks **18** to permit vertical operation of the door.

Fastened on an upper cross-member **21**, which is a beam forming the lintel for door **10**, is an upper bracket catch housing **23**. Upper bracket catch housing **23** may be formed from steel or other suitable metal and has a slot **28** centrally located in a face plate **30**. Slot **28** has a throat **32** which has downwardly and inwardly inclined edges **33** and **34** to guide a portion of an upper bracket catch in interlocking engagement therewith when the door **10** is in a closed position. Upper bracket catch housing **23** has outwardly extending flanges **40** and **41** connected to but spaced rearwardly from face plate **30** by depending integral sides **44**. Sides **44** are trapezoidal in shape and by having their narrower edges at the bottom of face plate **30**; they cause face plate **30** to form a wedge-type locking housing to receive and lock an upper bracket catch in place. Wood screws or other fasteners **45** fasten upper bracket catch housing **23** to cross-member **21**.

Aligned with upper bracket catch housing **23** but fastened to the door **10** along its upper edge is an upper

bracket catch **50**. In FIGURE 3, upper bracket catch **50** is shown slightly below upper bracket catch housing **23**; with a dashed arrow illustrating the manner of their engagement. In actual practice, since the door is closed vertically from an overhead position, the upper end of upper bracket catch **50** is always above or engaging housing **23**. Upper bracket catch **50** has a main plate portion **51** fastened to door **10** by wood screws or bolts **53**. At its upper free end bracket catch **50** has a pair of outwardly extending wings **55** and **56** (shown in greater detail in FIGURE 3). A tapered extension **58** of main plate **51** connects wings **55** and **56** with the main plate portion **51**, leaving a narrow recessed area **60** adjacent wings **55** and **56**. Tapered extension **58** is bent toward upper bracket catch housing **23** at its end near the main portion of plate portion **51**, while end of tapered extension **58** near the winged portion of plate **51** is bent so that the wings **55** and **56** are generally parallel to the inclined face plate **30** of upper bracket catch housing **23**, so as to engage the inner surface thereof above the lower edge of slot **28** of bracket housing **23**. Extending at about a right angle to the lower edge of bracket catch **50** is a bracket extension **60***a* which is drilled to receive a hollow stud **61** to anchor one end of a cable **63**. A pair of clamping nuts **64** and **65** complete the assembly to secure one end of cable **63** to bracket catch **50**, and permit tensioning of the cable **63** so that it acts as a reinforcing medium for the door. If desired, additional rigidity may be imparted to bracket extension **60***a* by outwardly extending sides **66** and **67** which can be welded to extension **60***a*.

Referring now to FIGURES 1, 2, and 4 the cable **63** is held in spaced relation from the inner surface of door **10** by brackets **68**. Since brackets **68** are identical, only one such bracket will be described in detail. Brackets **68** are generally V-shaped with a gradual or U-shaped configuration at the outer ends **70**. Main portions **73** and **74** of brackets **68** terminate in flanges **76** and **77** which in turn are fastened to the door panels **12** by suitable wood screws **78**. Main portions **73** and **74** are drilled with aligned holes **79** into which interiorly flared bushings **82** are inserted, and held in place by welding or brazing, as desired. Cable **63** is dropped through the bushings **82** of the brackets **68**.

A lower bracket catch **90** (shown in FIGURES 1, 2, and 5) is fastened adjacent to the lower edge of bottom panel of door **10** in alignment with the upper bracket catch **53**. Lower bracket catch **90** comprises a bed plate **92** which is fastened by wood screws **94** adjacent the lower edge of the bottom panel. A pair of somewhat triangularly shaped side flanges **97** and **98**, integral with bed plate **92** are bent outwardly from plate **92**. Side flanges **97** and **98** are tapered so that their narrow ends are at the bottom of plate **92** with their wide ends near the upper end of plate **92**. A third flange **100** is bent outwardly at the upper end of plate **92** and is welded to side flanges **97** and **98** to receive support therefrom. Flange **100** is drilled, as at **102**, to receive the lower end of cable **63** which is affixed thereto. The lower end of plate **92** terminates in a short outwardly extending flange **105** which is located beyond the lower ends of side flanges **97** and **98**.

To complete the description of the mechanical features of the invention, reference may again be made to FIGURES 1, 2, and 5 which shown a lower bracket catch housing **110** which is fastened to the floor below but just inside the garage door. Lower bracket catch housing **110** has two flanges **111**, and **112** which are fastened to the floor. Extending upwardly at acute angle from flange **112** is a plate portion **115**. A depending flange portion **117** connects one end of plate portion **115** to flange portion **111**. Flange **117** has a notch **118** cut therein for the reception of flange **105** of lower bracket catch **90**, when the door is moved inwardly in its closed position.

Having described the mechanical features of the invention, is mode of operation will now be discussed. For normal operation door **10** moves vertically from a closed to an open position and vice versa in the same manner as any conventional unmodified door, with the possible exception that the wings **55** and **56** of upper bracket catch **50** engage the slot **28** of the upper bracket catch housing **23** when the door is closed.

When an external force such as a high wind pushes the closed door **10** inwardly, its lower edge also moves inwardly so that flanges **105** of lower bracket catch **90** engages slot **117** of lower bracket housing **110**. Further force on the door results in a locking effect with the lower edge of the door **10** engaged in lower bracket housing **110** while the top edge of the door is held rigidly in position by the engagement of upper bracket catch **50** in upper bracket catch housing **23**.

As further force is applied to the door, it tends to deflect inwardly but the force is transmitted through the brackets **68** to cable **63** where the force is uniformly distributed. The tensioned cable acts as a reinforcing element for the door and prevents its rupture. As the force increases, as in a hurricane, the cable acts to dissipate the force further. When the weather condition returns to normal, and the external force on the door is relieved and the door operation returns to its normal condition, with the disengagement of lower bracket catch **90** from lower bracket catch housing **110**.

In order to test the efficacy of the invention, an actual door with the reinforcing elements attached thereto in accordance with the invention was placed across an opening in a vacuum chamber. The vacuum chamber was a room about 17 feet long, about 8 feet high and about 2 feet deep having an opening into which a door could be mounted. A centrifugal pump was connected to evacuate the air from the chamber, and a plastic film was secured over the face of the door to seal the door against air leakage.

The following chart shows the results of the test when a door 16 feet by 7 feet was tested across the front of the chamber.

The following test data were recorded:

CHART I

Simulated wind load "vacuum chamber," (p.s.f.)	Wind velocity (m.p.h.)	Pressure differential (inches of water)	Deflection center of "door" (inch)
0	0	0	0
10.4	73	2 0	2 5
20.8	92	4 0	4 0
26.0	102	5 0	4 5
31.2	112	6 0	4 93
36.4	119	7 0	5 30
40.0	125	7 7	5 68

P.s.f.=pounds per square feet.
M.p.h.=miles per hour.

Load was applied for thirty (30) seconds.

Door returnability was 90% from zero.

The wind velocity in the above chart was determined in accordance with the data set forth in the magazine "Practical Builder" of June 1967, which correlates pounds per square foot pressure with wind velocity.

The load was applied for 30 esconds and in each case the door returned to 90% of its deflection. Similar doors without the reinforcing assembly of the invention but otherwise identical to the tested door have failed to pass this test at 20 p.s.f. Thus, the reinforcing assembly has proved its effectiveness

In the recent test performed for the Metropolitan Dade County Building and Zoning Department, the reinforced door assembly of the invention successfully passed the requirements for wind loads according to Chapter 23 of the South Florida Building Code and was given Certificate of Competency No. 3210.

In summary, the present invention is directed to a novel door reinforcing assembly so that external forces transmitted to the door frame by means of locking elements attached to the door and the door frame when such forces are applied to the door.

I claim:

1. A door reinforcing assembly comprising: a door, said door being track-mounted for vertical operation:

a door frame having at least an upper cross-member located adjacent the upper edge of said door when said door is in a closed position, and a base member located adjacent the lower edge of said door when said door is in a closed position;

an upper bracket catch housing mounted on said upper cross-member and adapted to receive a portion of an upper bracket catch;

an upper bracket catch mounted on said door and having a portion thereof adapted to be received in said upper bracket catch housing;

a lower bracket catch housing mounted on said base member and adapted to receive a portion of a lower bracket catch;

a lower bracket catch mounted on said door and having a portion thereof adapted to be received in locking relationship in said lower latch housing;

and flexible tensioning means connected between said upper bracket catch and said lower bracket catch.

2. A door reinforcing assembly as set forth in claim 1 in which said tensioning means includes a flexible cable and a plurality of brackets mounted on said door for spacedly supporting said cable from said door so that forces applied to said door are distribued to said door frame.

3. A door reinforcing assembly as set forth in claim 1 in which said upper bracket catch housing includes an upwardly opening slot with downwardly and inwardly inclined edges leading thereto,

and said upper bracket catch has a pair of outwardly extending wings connected integrally to an outwardly inclined portion of said upper bracket catch,

said upper bracket catch housing and said upper bracket catch being aligned so that upon the closure of said door said outwardly extending wings enter into locking engagement with said slot in said upper bracket catch housing.

4. A door reinforcing assembly as set forth in claim 1 in which said tensioning means includes means for adjusting the tension thereof.

5. A door reinforcing assembly as set forth in claim 2 in which said tensioning means includes spacer bracket means having guiding protective bushings adapted to receive said flexible cable.

6. A door reinforcing assembly as set forth in claim 1 in which said lower bracket catch includes a flat base plate mounted on said door and a lower flange extending outwardly therefrom at about right angles thereto,

and said lower bracket catch housing includes a slot in registration but spaced from said lower flange of said lower bracket catch when said door is in normal closed position.

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U.S. Cl. X.R.

160—201