

April 15, 1969

J. CADIOU

3,438,152

COUNTERBALANCING APPARATUS FOR A PIVOTAL PANEL

Filed Dec. 6, 1966

Sheet 1 of 2

Fig. 1

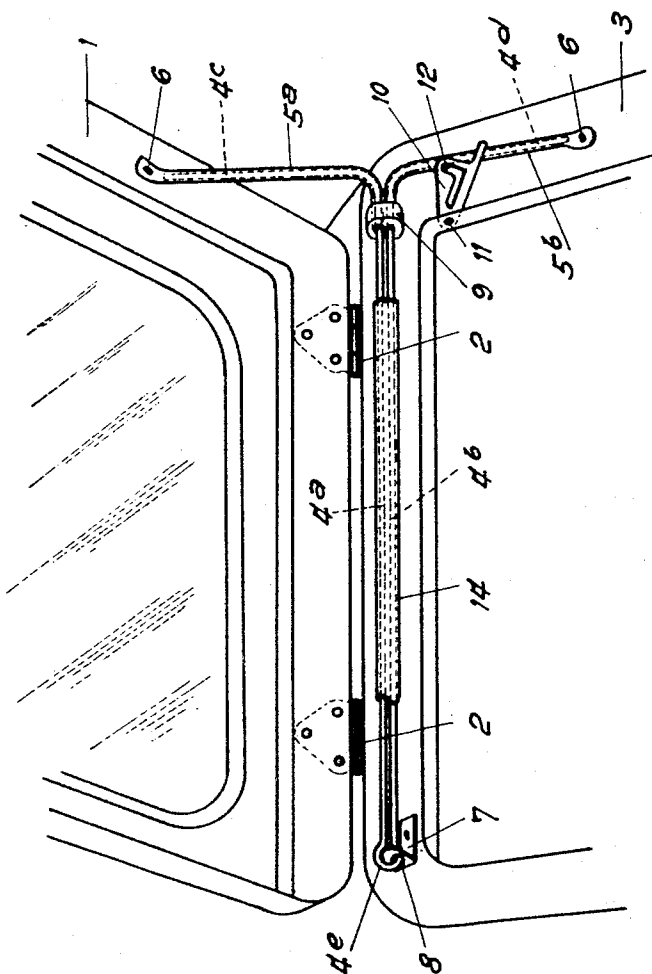
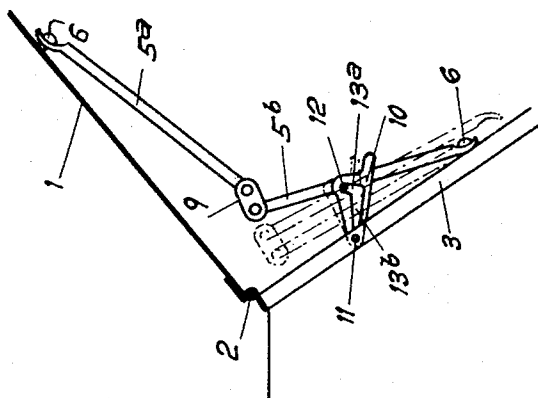


Fig. 2



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Fig. 3

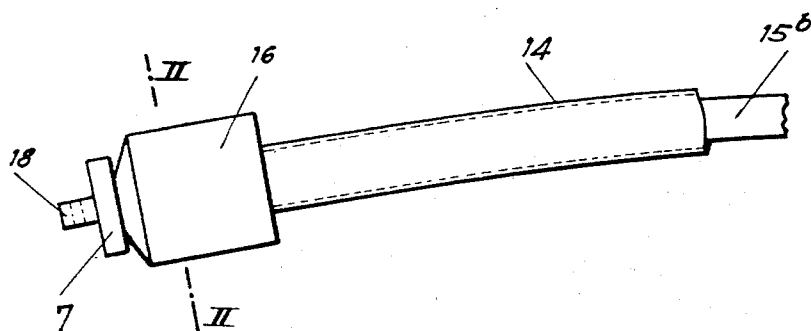
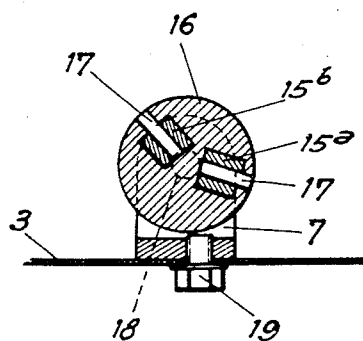


Fig. 4



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COUNTERBALANCING APPARATUS FOR A PIVOTAL PANEL

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3,245

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3 Claims 10

ABSTRACT OF THE DISCLOSURE

A pivotally mounted panel, such as the lid of an automobile trunk, is counterbalanced by two lengths of resilient material, which may be formed from a single steel rod bent about its midpoint, disposed parallel to the pivotal axis of the lid and in close proximity to each other, each length at one end being bent at right angles and secured, the one to the panel or lid and the other to the automobile frame. At the other or common end the two rods meet at their junction and are pivotally mounted to the automobile frame or lid about an axis parallel to the pivotal axis of the panel. When the lid is opened, each rod twists at an angle equal to half that of the pivotal angle of the panel or lid and thus provides a counterbalancing force to the weight of the lid.

The present invention relates to apparatus for counterbalancing a panel pivotally mounted with respect to a fixed frame and more particularly to apparatus which can be mounted in a small space and in which the counterbalance force remains practically constant during the displacement of the panel.

The present invention provides apparatus for counterbalancing a panel pivotally mounted with respect to a fixed frame, comprising two lengths of resilient material each having a portion parallel to a corresponding portion of the other length and having a portion substantially normal to said parallel portion, constraining means for constraining the respective free end of each said normal portion with respect to the panel and the fixed frame, and pivotal means for constraining the ends of said parallel portions remote from said normal portion, with respect to one another and pivotally mountable with respect to the frame.

An embodiment of apparatus for counterbalancing a back door of a commercial vehicle in accordance with the present invention, will now be described by way of example with reference to the accompanying diagrammatic drawings, in which;

FIGURE 1 is a perspective view of the counterbalancing apparatus showing a counterbalance spring attached to portions of a back door and bodywork of a commercial vehicle.

FIGURE 2 is a side elevation of the apparatus shown in FIGURE 1.

FIGURE 3 is a plan view of an alternative counterbalance spring; and

FIGURE 4 is a section along the line II—II of FIGURE 3.

In FIGURES 1 and 2, a back door 1 is pivotally connected to the bodywork 3 of a vehicle by means of hinges 2 along a horizontal pivotal axis.

The door 1 is counterbalanced so as to permit easy opening and closing thereof. The counterbalancing apparatus consists of a resilient steel rod which has been bent double to form two equal parallel lengths 4a and 4b, whose end portions 4c and 4d have been bent outwards at right angles with a respect to the lengths 4a and 4b.

In order to strengthen the end portions 4c and 4d of the rod and thereby to restrain them from bending these portions are threaded into two tubes 5a and 5b respectively which extend around the elbows connecting the end portions to the parallel lengths 4a and 4b.

The free ends of the tubes 5a and 5b are flattened and provided with an aperture so that they can be pivotally connected to the door 1 and the bodywork 3 respectively, by means of screws or pins 6 engaging the respective apertures.

The two lengths 4a and 4b disposed parallel to the horizontal hinge axis are attached at their juncture 4e to the bodywork 3 by a right-angled bracket or tab 7 one of whose lengths has an aperture 8 which is engaged with the rod at the juncture 4e.

The portions of the lengths 4a and 4b just below the elbows are enclosed by the tubes 5a and 5b which are connected together just below the elbows by a connector 9 not fixed to the bodywork 3 but which is welded to the tube 5b, the tube 5b being connected to the bodywork.

The lowering of the door 1 causes torsional strain the length 4a of the rod at the same time allowing the juncture 4e to pivot in the aperture 8 to cause torsion in the length 4b also. The torsion thus caused will tend to oppose the lowering of the door 1.

As shown in FIGURE 2, when the door is opened the elbows and the connector 9 move away from the bodywork. As a result, if an accidental push is exerted on these elbow portions, for example while loading the vehicle, the door will be caused to shut rapidly. In addition the action of a wind can equally cause the unexpected closure of the door.

In order to prevent undesired closure of the door 1, a latch 10 is provided which is pivotally mounted by means of a pivot 11 on the bodywork 3. This latch 10 has a shaped slot 13a, 13b in which a pin 12 engages, the pin 12 being rigid with the tube 5b. The portion 13a of the slot provides a locking position for the pin 12 while the portion 13b of the slot provides a release position for the pin 12.

Upon opening the door the latch 10 pivots downwards under its own weight so that the pin 12 engages with the portion 13a of the slot thereby latching the door in an open position. The door can be released by making the latch 10 pivot upwards to cause the pin 12 to engage the portion 13b.

A flexible protective sheath 14 covers part of the lengths 4a and 4b of the rod.

FIGURES 3 and 4 show how counterbalancing can be provided using two rods 15a and 15b having square cross-sections. Each rod has a portion corresponding to one of the portions 4a and 4b of the rod in FIGURES 1 and 2 and portions at right angles (not shown) corresponding to the portions 4c and 4d.

The portions of the rods 15a and 15b corresponding to portions 4a and 4b are parallel and covered by a protective sheath 14 while their free ends are encased in connecting member 16 and are held therein by pins 17.

The member 16 is rigid with pin 18 which is pivotally mounted in the aperture of a tab 7 corresponding to the aperture 8 and tab 7 of FIGURE 1. The tab 7 is secured to the bodywork 3 by a nut 19.

I claim:

1. In combination

a fixed frame,

a panel pivotally connected to said fixed frame,

two lengths of resilient material each having a portion parallel and adjacent to a corresponding portion of the other length and having a portion substantially normal to said parallel portion,

two constraining members constraining respective free

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ends of said normal portions with respect to the panel and the fixed frame, and
 pivot means pivoting the ends of the said parallel portions remote from said normal portions with respect to one another and with respect to the frame.
 2. In combination a fixed frame, a panel pivotally connected to said fixed frame, a single resilient member bent substantially about its mid point to form two lengths each having a portion parallel to a corresponding portion of the other length and each having a second portion extending substantially perpendicular to said parallel portion, to a free end, flexible protective sheath means covering said parallel portions, one of said second portions being secured to said panel at its end and one to said fixed frame, at its end said bend at said midpoint being pivotally connected with said frame so that said parallel portions are disposed substantially parallel to the pivotal axis of the panel, a connector constraining the ends of said parallel portions remote from said bend with respect to each other.

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3. The combination of claim 1 wherein each of said perpendicular portions is held within a hollow sleeve, one sleeve being secured to said frame and one to said panel, a latch secured to said frame, a pin extending from said sleeve secured to said frame, disposed in co-operating relation to said latch whereby said latch locks automatically when said panel is opened.

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