May 15, 1945. J. B. A. E. DE RUSCHI ET AL 2,375,901

AUTOMATIC SAFETY DEVICE APPLYING TO DOORS AND WINDOWS

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Fig. 1

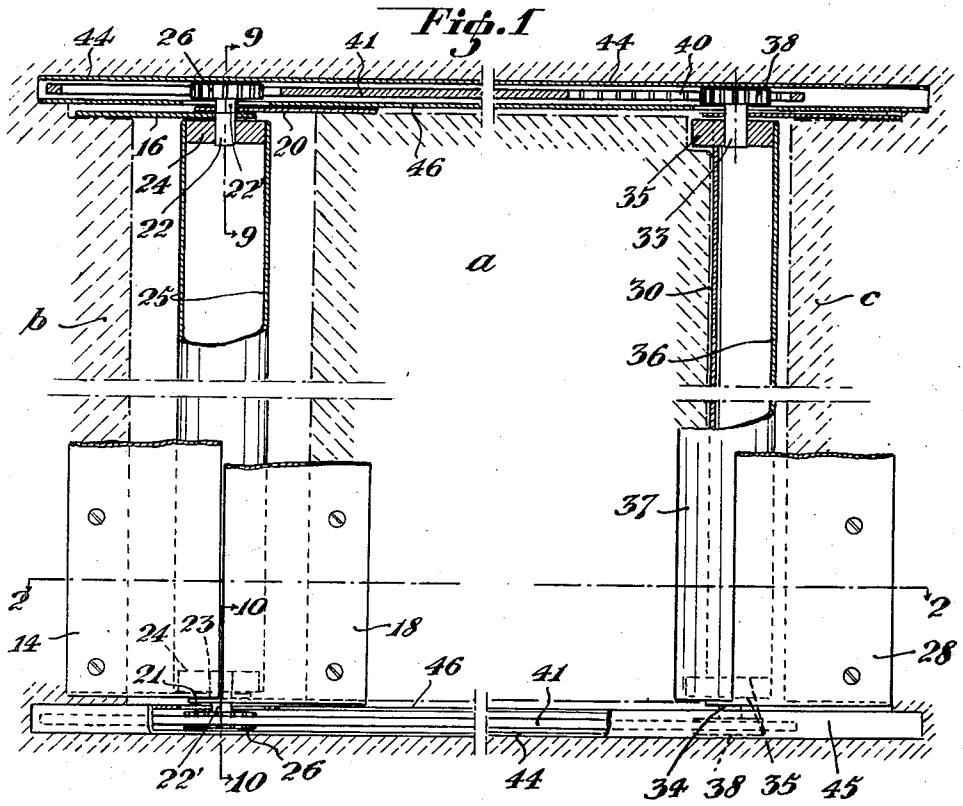


Fig. 6

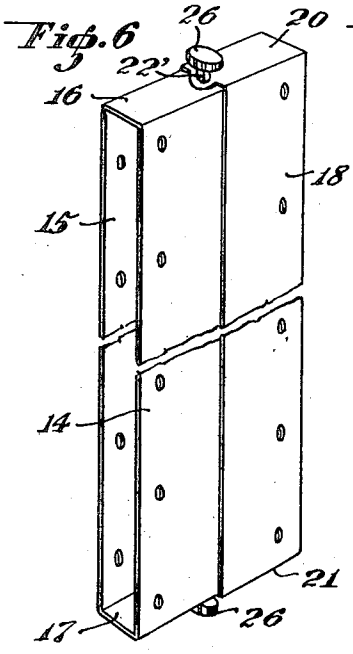


Fig. 7

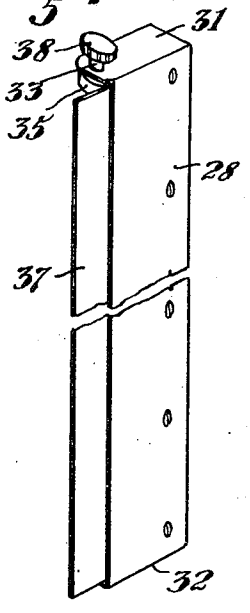
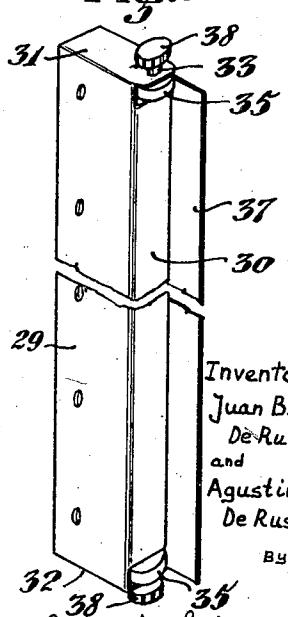


Fig. 8



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AUTOMATIC SAFETY DEVICE APPLYING TO DOORS AND WINDOWS

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Fig. 2

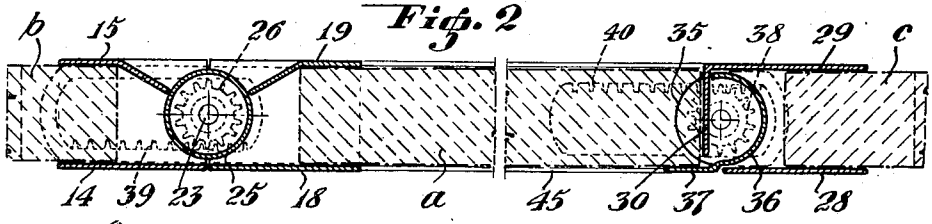


Fig. 3

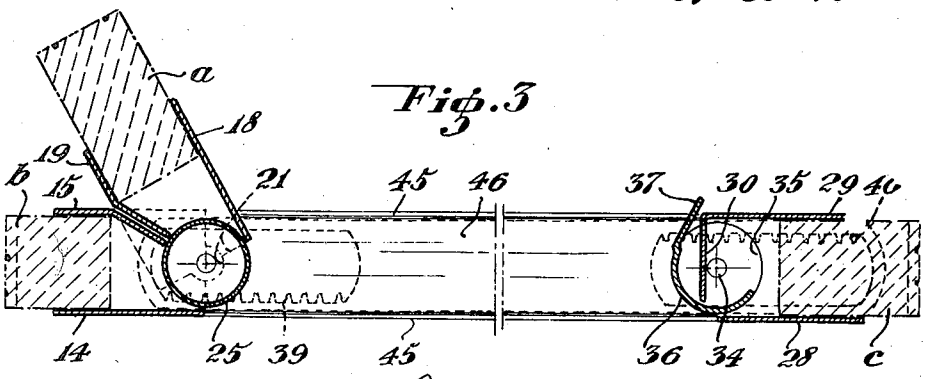


Fig. 4

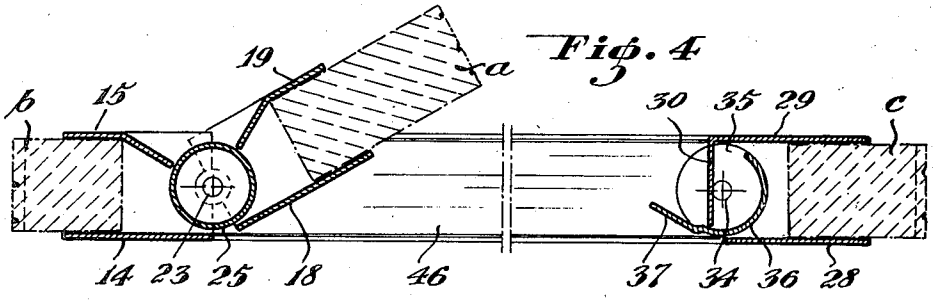


Fig. 5

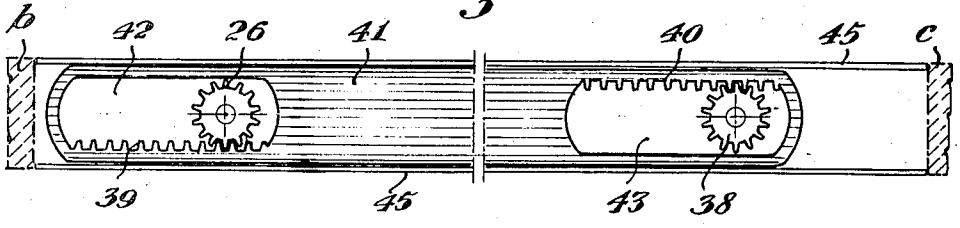
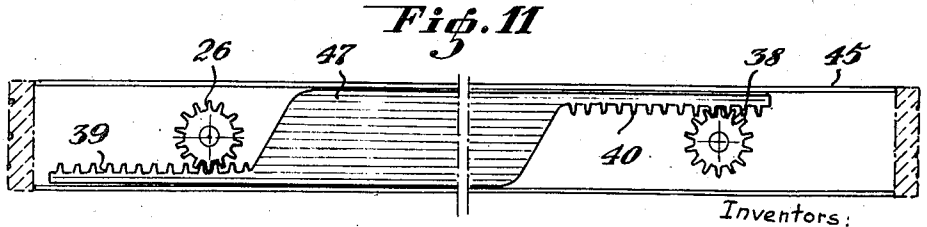


Fig. 11



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Fig. 9

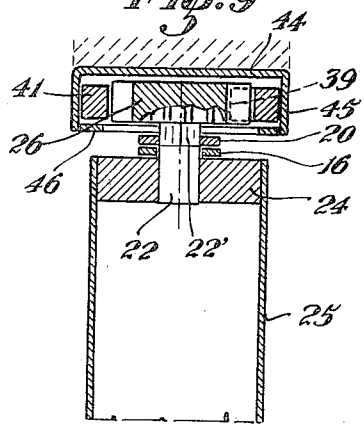


Fig. 10

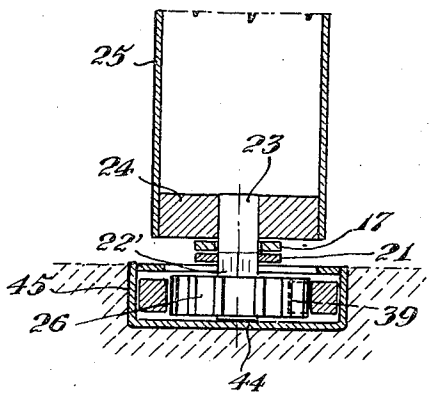


Fig. 12

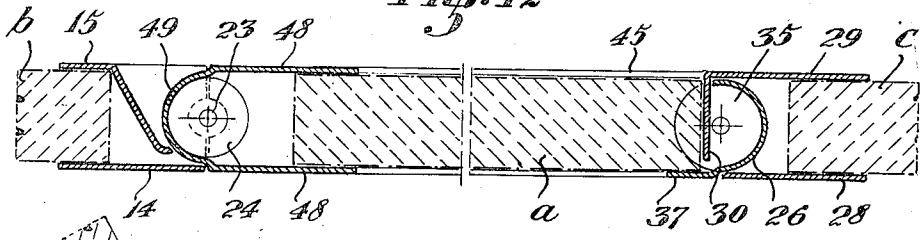
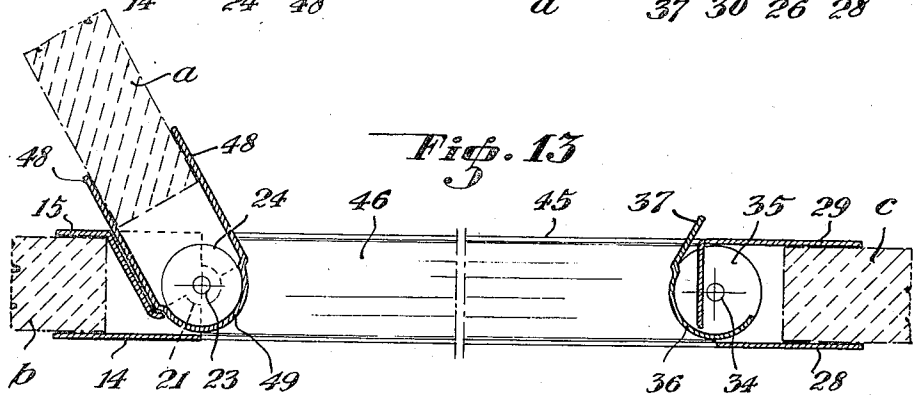


Fig. 13



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2,375,901

AUTOMATIC SAFETY DEVICE APPLYING TO DOORS AND WINDOWS

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Application May 10, 1943, Serial No. 486,282

1 Claim. (Cl. 20—16)

The present invention relates to an automatic safety device applying to any kind of doors or windows, its main object being to prevent users from having their fingers caught if through lack of care they should leave their fingers on the respective door or window-case whereupon the door or window is being closed.

Any ordinary door or window leaf, if open, leaves on its hinged side between its lateral edge and the corresponding door or window-case, a free angular space, and this space, at the same time as the door is being closed gets gradually smaller and eventually disappears while said lateral edge gets near to or is pressed against the corresponding door or window-case so that if, by lack of care, the user leaves its hand or fingers in said angular space while the door or window is being closed, there is a great risk for the hand or fingers to be caught unawares.

Likewise, the door or window leaves of the present art are known to close on the side opposed to the hinged side, applying themselves against a flange fixed to the door or window post and, as in the aforementioned case, should anybody carelessly leave their fingers or hands resting thereabouts while the door or window is being closed, they would be caught between said leaf end and said flange, endangering themselves with injuries of a more or less high degree.

Those disadvantages are overcome by the device reported as subject matter of our present invention, for in the hinged part of the door or window leaf we provide some elements which allow the existence of a curved surface which is always present between the edge of the door or window leaf and the door or window-case, whatever be the size of the opening, so as to prevent the hand or fingers to be caught in-between. With regard to the side opposed to the hinged side, the door or window leaf closes applying itself on a slidingly rotating flange, and when the leaf is open, said flange covers practically all the internal part of the case, but as soon as the leaf starts to close, said flange automatically rotates until it gets in aligned position with said leaf which, on being totally closed, remains in fitting contact with the flange.

By this arrangement, while the door or window leaf is open, it is impossible to apply one's hand upon the internal part of the door or window-post because that remains resting directly upon the sliding flange in such a manner that, when the door leaf closes, the flange will rotate, dragging the hand outwardly and away from the dangerous position, so as to avoid the possibility of the hand or fingers to be caught between the internal part of the leaf and the flange while the door is being closed.

In order that the rotation of said flange should be automatic in relation with the rotation of the door or window leaf, the device is provided with mechanical bonding means, preferably constituted of racks and pinions, the details of which will be given hereinafter.

The present invention also contains several new constructive features of the elements forming the device, all of which will come to light in the following specification.

In order that the present invention should be clearly understood and easily carried out we have shown one of its preferred embodiments in connection with the accompanying illustrative drawings, in which:

Fig. 1 represents an elevation and sectional view of a door wherein our device is applied.

Fig. 2 represents a sectional horizontal view taken through plan 2—2 of Fig. 1 and showing the relative position of the elements when the leaf of the door is totally closed.

Fig. 3 represents a similar view as that of Fig. 2, but showing the relative position of the elements when the door leaf is totally open.

Fig. 4 represents a view similar to the ones previously mentioned, showing the relative position of the elements when the door leaf is partially open.

Fig. 5 represents a plan view of the mechanical bonding means providing for the slidingly rotating motion of the flange and which is operated by the rotation of the door leaf.

Fig. 6 represents a perspective view of the articulate frame fixed at one end to the door case and at the other end to the door leaf substituting thereby the well known hinges of ordinary use.

Fig. 7 represents a perspective view of the frame having the slidingly rotating flange and forming the corresponding door case upon which the door will apply itself on being closed.

Fig. 8 represents a perspective view of the frame illustrated in Fig. 7 seen from the opposite side.

Fig. 9 represents in a larger scale a cross section taken on plane 9—9 of Fig. 1.

Fig. 10 represents in a larger scale a cross section taken on plane 10—10 of Fig. 1, being a similar view as Fig. 9 but in inverted position.

Fig. 11 represents one of the possible variations in the construction of the rack operating

the pinions connected to the door leaf and the slidingly rotating flange.

Fig. 12 represents a horizontal cross sectional view of a constructing variation of the articulate frame around which the door leaf rotates, showing the relative position of the elements when the door leaf is closed, and

Fig. 13 represents a similar view showing the relative position of the elements when the door leaf is open.

In the following description and in order to avoid repetitions we shall explain the construction and operation of our device referring only to a door leaf, as it will be easily understood that the same applies also to window leaves as well as to any other opening surfaces.

Now referring to the accompanying figures, *a* indicates the leaf of the door, *b* shows the door case of the corresponding side and around which said leaf rotates and *c* represents the case on the opposite side.

A frame as illustrated in perspective in Fig. 6 is fixed to the door case around which the door leaf rotates and to the door leaf, and is formed in two sections. One section is fixed to the door case and is made of two lateral surfaces **14** and **15** longitudinally fixed by any suitable means to case *b*, said surfaces being respectively connected at the top and bottom by means of parts **16** and **17**. The other section is fixed to the door leaf and is likewise made of two lateral surfaces **18** and **19** connected together at the top and bottom by means of parts **20** and **21**.

The coinciding ends of parts **16** and **20** at the top as well as the coinciding ends of parts **17** and **21** at the bottom are correspondingly perforated in order to lodge the respective axles **22** and **23**, said axles being rigidly fixed to respective discs **24** forming the basis of a hollow cylinder **25** running lengthwise to the articulate frame.

The axles **22** and **23** carry at their respective ends pinions **26** designated to impart motion to the mechanism.

The axles **22** and **23** are freely taken by the ends of parts **16** and **17** corresponding to the section of the frame fixed to the door case, so that they may freely rotate in the perforations made through parts **16** and **17**, while said axles are made to rotate with the rotation of parts **20** and **21** in the movable section of the frame and, for that purpose, the corresponding perforations of parts **20** and **21** are preferably square in shape and so is likewise the shape of the axle ends as indicated in **22'** corresponding to the ends taken by the parts **20** and **21**.

On the other end of the door case opposed to the rotating end of the door leaf, that is, on the door post receiving the door when closed, there is another frame fixed to that end, being indicated in perspective by Figs. 7 and 8. Said frame has the shape of a box or the like and is formed by two lateral surfaces **28** and **29** fixed lengthwise to the door case *c* by any suitable means. Surface **29** is bent at right angles in order to form a front **30** upon which the edge of the door leaf will rest when the door is closed. The top and bottom parts of that box carry the respective parts **31** and **32**, each provided with corresponding perforations allowing to lodge respective axles **33** and **34** rigidly fixed to upper and lower discs or the like **35** connected with each other through a semi-cylindrical sheet or wall **36** having a flange **37** projecting tangentially from said sheet or wall. Axles **33** and **34** carry in a fixed relation corresponding pinions **38** the rotation of which is followed by the discs or the like **35** and therefore by the semi-cylindrical wall **36** and flange **37**.

Inasmuch as the object of the apparatus is that the motion of the door leaf should act upon the motion of the flange **37**, the bond between said door leaf and said flange is established by the motion of pinions **26** and **38**. These pinions are geared with respective racks **39** and **40** made out of a piece **41** and having their teeth located in an alternate position, so as to have the motion of pinion **26** reproduced, in an inverted sense, in pinion **38**.

In Fig. 5 it may be seen that the teeth in racks **39** and **40** are made in the internal edges of spaces **42** and **43** and in this way, the piece **41** has its lateral sides straight and parallel.

Said piece **41** glides on a guiding piece, U-shaped and having a web **44** and flanges **45**, said flanges acting in such a way as to keep the piece **41** in correct alignment. The edges of said guiding pieces are covered with small plates **46** all along the piece **41** so as to hide from view the racks and the other elements of the device.

Fig. 11 shows a variant in the construction of the piece with the racks **39** and **40**. The piece is indicated with **47** and there is shown a way of saving material at the ends, as it only utilizes the material corresponding to the teeth. As it will be readily understood, the shape of this piece may be varied at will, provided that the end racks are always positioned in opposite relation.

In the variant illustrated in Figs. 12 and 13 is shown a modification of the section of the frame supporting the door leaf. In the previously described form, the frame where the door leaf rotates carries internally a cylinder **25**, the edges of the surfaces **18** and **19** gliding on the external surface of said cylinder **25**. This arrangement has been changed in this variant and, according to Figs. 12 and 13, the cylinder **25** has been eliminated, providing instead for supporting the door leaf, a clamp having lateral flanges **48**, united to form a semi-cylindrical element **49**. The lateral flanges **48** are fixed to the door leaf, and the semi-cylindrical surface is firmly fastened at the top and bottom ends to the corresponding discs **24** whereupon, as in the previously described case, the axles leading the pinions **26** are mounted. The other elements of the mechanism remain unchanged.

As it may readily be seen, in said figures, even when the door leaf is open, the edge of the same on the rotating side of the door case presents a surface which is devoid of any angles liable to cause the imprisonment of the fingers or the hand.

Operation.—The operation of the device is quite simple and can be clearly inferred by observing the plans. When the door leaf *a* is closed, i. e., in the position illustrated in Figs. 1, 2 and 12, its free end rests upon the flange **37**, which at that instant shows a correct alignment with the door leaf. At the same time, in the corresponding section where said leaf is articulate, at one side, the surfaces **14** and **18** appear one after the other without solution of continuity and, at the other end, the surfaces **15** and **19** present their ends resting on the cylinder **25**, forming another continuous surface.

When the door starts to open, as illustrated in Figs. 3 and 13, the surfaces **18** and **19** holding the door leaf are dragged along, and the top and bottom parts **20** and **21**, blocked on the square

shaped ends 22' of axles 22 and 23, similarly drag the axles along and they, in turn, cause the rotation of the pinions 26 which, on being geared to the teeth of racks 39, cause the latter to slide from the position shown by dotted lines in Fig. 2 to the position illustrated in dotted lines in Fig. 3.

Such displacement of the rack teeth 39 cause the displacement of teeth 40 as they form one only solid piece, and they in turn cause the rotation of pinions 38 geared thereto and consequently the rotation of axles 33 and discs 35, semi-cylindrical surface 36 and corresponding flange 37, said flange being positioned now as indicated in Fig. 3.

In this figure it may be noted that said flange entirely covers the edge of the door case whereon the door leaf applies when it is being closed, in such a way, that the hand about to be rested on that dangerous place can only touch or be rested upon said flange.

When it is desired to close the door leaf, the movement of the same and that of the mechanisms involved, is the reverse of the one described. While the door leaf rotates, the flange goes back to its former position (an intermediate position is shown in Fig. 4) and, should anybody carelessly leave the hand resting upon said flange, this would impel the hand away from the dangerous position and out of reach from the door edge, thus preventing the hand from being caught in-between.

The main object of this device, as may be deduced from this specification, is to obtain by means of the rotation of the door or window leaf, that the slidingly rotating flange may also have a rotating movement, and the elements illustrated above are considered to be most practical for that object.

This does not exclude—and the present invention also contemplates it—that the elements such as the racks imparting motion to the pinions may be substituted by cables or by rods articulate at one of their ends by arms or the like rigidly connected to axles 22 and 23, and at the other ends, by similar arms or the like rigidly connected to axles 33 and 34.

Likewise, in another variant in the construction of the device, the pinions 26 and 38 may be substituted by pinions of the chain type, and the transmission performed by a crossed chain, in order to get the same results.

It is evident that this device may be varied in construction as well as in details, either in the transmission of the movements, as indicated above, or in the shape of the other elements or the materials employed, without departing from the scope of the present invention, which is clearly pointed out in the claim following this description.

Having now particularly described and ascertained the nature of the present invention and the manner in which the same may be carried into practice, we declare to claim as our exclusive right and property:

An automatic safety device for doors and windows having a swingable panel and a frame closed and opened by the swinging of said panel and having an edge located closest to the axis of rotation of said panel and a second edge located opposite the first-mentioned edge, said safety device comprising a frame section carried by said panel, a pivot supporting said panel in said frame adjacent the first-mentioned edge and engaged on opposite sides by said frame section, whereby said pivot is rotated when said panel is swung, a pinion rotatable along with said pivot, another pivot rotatably mounted in said frame adjacent the second-mentioned edge, another pinion rotatable along with the second-mentioned pivot, a semi-cylindrical surface element connected with the second-mentioned pinion and rotatable therewith from a position wherein it covers the second-mentioned edge to a withdrawn position and vice versa, a flange projecting tangentially from said surface element and a rack having teeth engaging the first-mentioned pinion and other teeth engaging the second-mentioned pinion, the closing movement of said panel being transmitted through the first-mentioned pinion, said rack and the second-mentioned pinion to cause a movement of said surface element from the covering position to said withdrawn position.

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