April 24, 1962 T. EIHOLZER 3,030,653

DEVICE FOR KEEPING A WING OF A DOOR OPEN AT A CERTAIN ANGLE OF APERTURE

Filed May 5, 1960

3 Sheets-Sheet 1

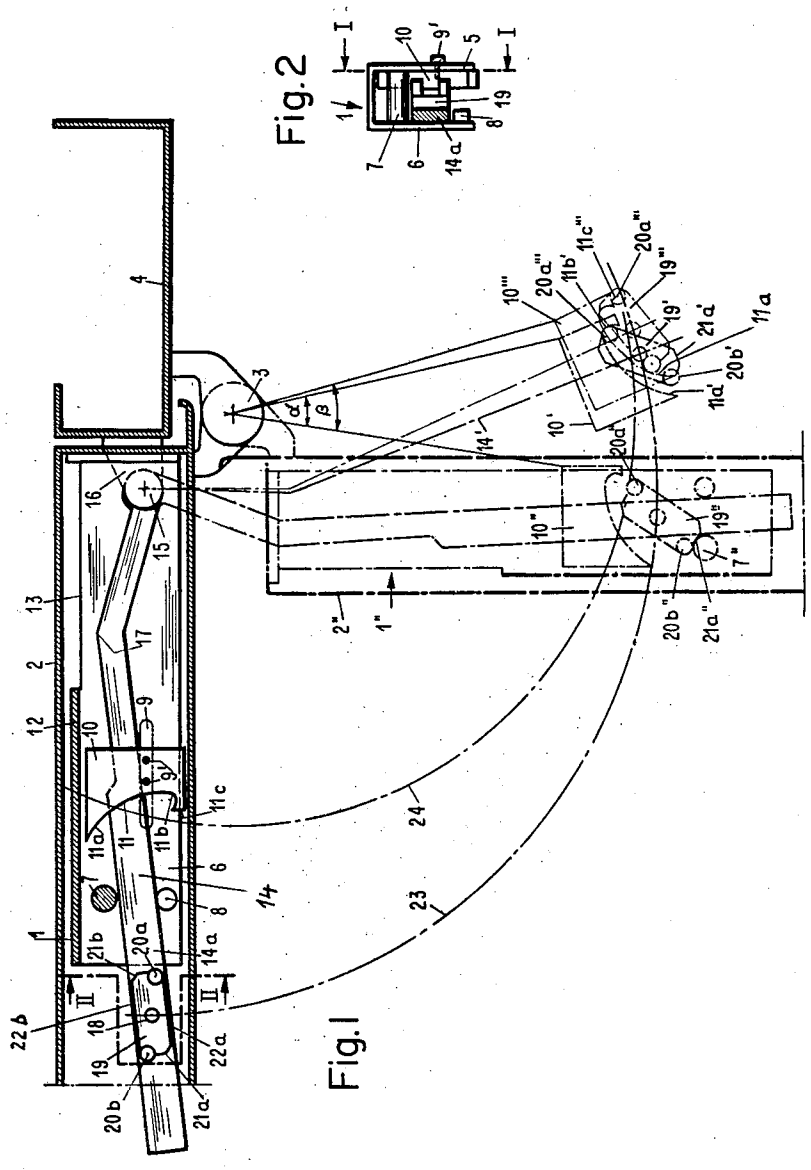


Fig.1

Fig.2

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3 Sheets-Sheet 2

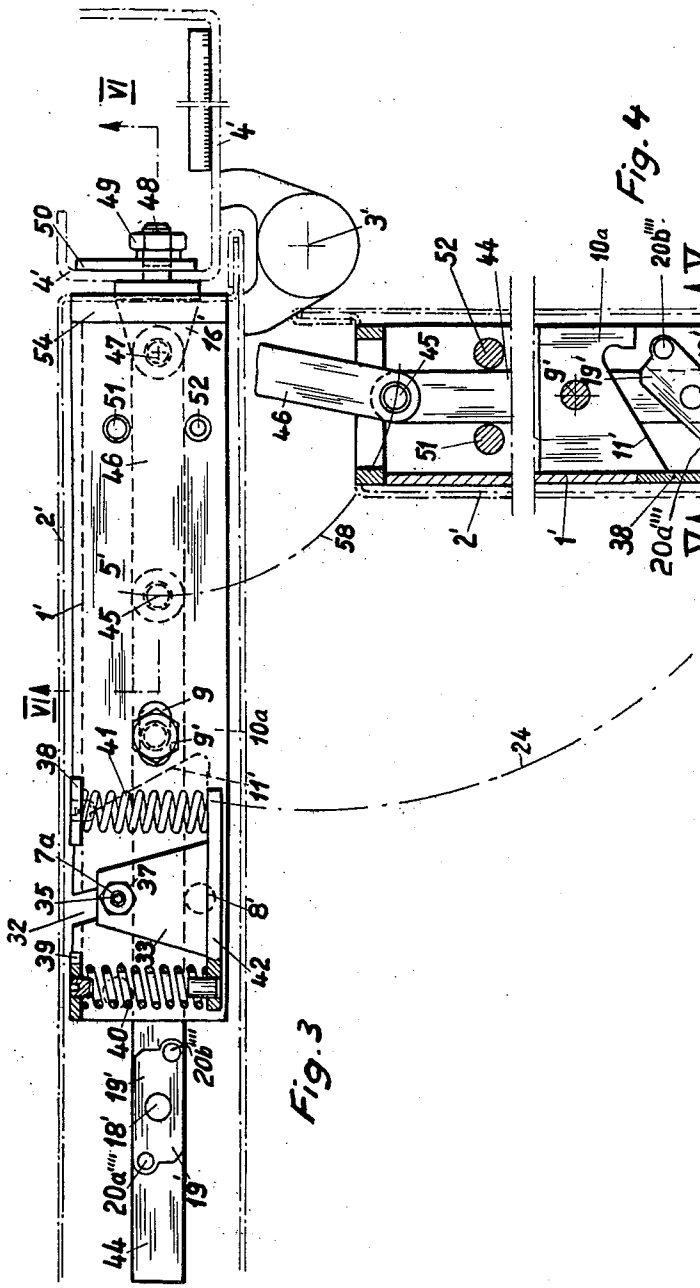


Fig. 3

Fig. 4

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Filed May 5, 1960 3 Sheets-Sheet 3

Fig.6

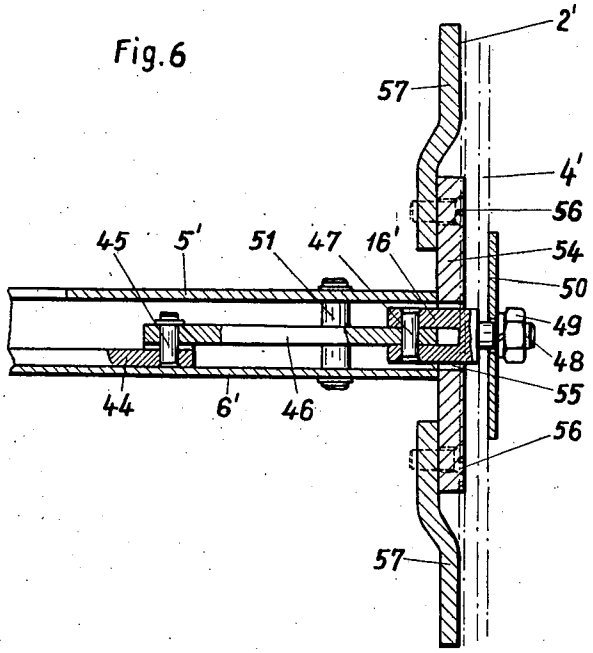
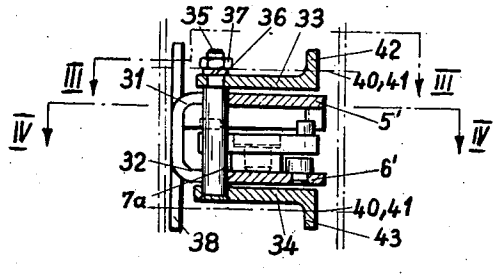


Fig.5



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United States Patent Office 3,030,653 Patented Apr. 24, 1962

3,030,653

DEVICE FOR KEEPING A WING OF A DOOR OPEN AT A CERTAIN ANGLE OF APERTURE

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Filed May 5, 1960, Ser. No. 27,144
Claims priority, application Switzerland Jan. 8, 1960
8 Claims. (Cl. 16—82)

The invention relates to a device referred to hereinafter as a "door arrester" to be attached to a door, and has the primary object of keeping a wing of a door open at a certain angle of opening.

It is another object of the invention to provide a device of the kind referred to, wherein no operating members are required for securing the wing of the door in its open position or for releasing the same from its arrested position.

It is yet another object of the invention to provide a door equipped with a device according to the invention which is suitable for the doors of elevators.

With these and other objects in view which will become apparent later from this specification and the accompanying drawings, I provide a device for keeping open a wing of a door comprising in combination: a fixed door frame, a door wing hinged to the said fixed door frame. first arrester means stationarily mounted relative to the said door wing, and a fixing means having second arrester means mounted moveably relative to the said door wing and being moved relative thereto, when turning the said door wing relative to the said fixed door frame, the said first and second arrester means co-operating with one another in such a manner that when the said door wing is moved from its closed position in the sense of opening an angle exceeding 90° by a predetermined angle α a subsequent closing movement is resisted, and that when moving the said door wing a predetermined angle β, exceeding said angle α, beyond 90° in the opening direction, the said door wing is released for its closing movement.

For example the said first arrester means include a base box, preferably of U-shaped profile, fixed in the said door wing, an arrester pin and a cam plate fixedly mounted on the said base box, and the said second arrester means consist in a member, preferably a lever, pivotally mounted in said fixed door frame about an axis offset from the hinge axis of the said door wing to the said fixed door frame, a centrally symmetrical rotatable plate pivotally mounted on the said member, two dog pins mounted diagonally symmetrically on the said rotatable plate and co-operating with the said cam plate, the said member being guided on the said arrester pin in such a manner that upon moving the said door wing relative to the said fixed door frame, part of the said member slides along the said arrester pin.

These and other features of my said invention will be clearly understood from the following description of two embodiments thereof given by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a horizontal section of a first embodiment of the invention taken along line I—I of FIG. 2;

FIG. 2 is a vertical section on the line II—II of FIG. 1, with the door wing frame omitted for clarity.

FIG. 3 is a horizontal section on the line III—III of FIG. 5 of a second embodiment of the invention shown in the closed position of the door;

FIG. 4 is a broken off horizontal section on the line IV—IV of FIG. 5 through the part of the door arrester located in the wing of the door, in the open position;

FIG. 5 is a vertical section taken along line V—V of FIG. 4; and

FIG. 6 is a vertical section taken along line VI—VI of FIG. 3.

The door arrester illustrated in FIGS. 1 and 2 has a base box 1 of U-shape profile which at one of its end faces is fixed by means of screws (not shown) to a frame 2 of a door wing, that is articulated by means of a hinge 3 to the stationary door frame 4. In the base box 1, between the opposite legs 5 and 6 thereof, an arrester pin 7 is mounted, by the side of which a short guide pin 8 is provided on the lower leg. In the upper leg 5 a longitudinal slot 9 is provided through which two screws 9', extend, by means of which a cam plate 10 is adjustably fixed to the leg 5 of the box. The cam plate 10 has at its side facing towards the pins 7 and 8 an edge profiled according to a curve 11. This curve 11, has firstly a section 11*a* inclined to the transverse direction of the base box, which leads into a re-entrant arrester recess 11*b*, and finally a short transversely directed section 11*c*. Part of the back 12 of the U-shaped base box is cut-off at 13.

Between the two pins 7 and 8 a portion 14*a* of an arrester lever 14 is guided, which is articulated at 15 to a fork 16 attached to the door frame 4 in a manner not shown in more detail, for example by means of screws.

The lever 14 has a slight kink at 17 and has a rectangular profile on its portion 14*a* guided between the pins 7 and 8. On this portion 14*a* of the lever a substantially rectangular plate 19 is rotatably mounted on a pin 18. On two diagonally opposite corners of the rotatable plate 19 two dog pins 20*a* and 20*b* are arranged, while the two other ends of the plate are cut off. The two short end faces of the plate 19 are denoted 21*a* and 21*b*, and the two lateral faces 22*a* and 22*b*. The whole arrangement 19–21 is symmetrical about the pin 18. It is further assumed that an automatic door keeper of the usual type (not shown) is provided on the door.

The door arrester described operates in the following way:

When the wing of the door is opened, the pin 18 describes a circular arc 23, the centre of which is formed by the articulation point 15 of the lever 14, while the cam plate 10 turns about the hinge 3, as indicated by the circular arc 24. It will be seen that the lever 14 moves positively relative to the wing of the door, the portion 14*a* of the lever moving along the pins 7 and 8 so that the dog pin 20*a* reaches the section 11*a* of the cam 11. The cam section 11*a* leads the dog pin 20*a* to the re-entrant arrester recess 11*b*, whereby the rotatable plate 19 is turned relative to the portion 14*a* of the lever in the clockwise direction. This position of the cam plate and of the rotatable plate as indicated in chain-dotted lines results at an aperture angle of the wing of the door which exceeds 90° by an angle α, the illustrated elements of the door arrester being indicated as 10', 11*a*', 11*b*', etc. in this position. It is clear that the wing of the door cannot now be opened any further.

When the door wing is released, the same is moved by the automatic door keeper (not shown) in the sense of closing. The dog pin 21*a* then moves out of the re-entrant arrester recess 11*b*. The dog pin 20*b* abuts the arrester pin 7, whereby the rotatable plate 19 is turned additionally a small angle in the clockwise sense relative to the lever portion 14*a*, until eventually its end face 21*a* abuts the arrester pin 7. Thereby any further closing movement of the door wing is prevented since the lever portion 14*a* cannot now move outward relative to the base box 1 any further. In this desired opening position the wing of the door is illustrated in chain-dotted lines, and the components shown are denoted 1'', 2'', etc.

When it is now intended to close the door wing, one moves the same again in the sense of opening. Owing

to the small additional rotation of the rotatable plate **19**, the dog pin **20***a* does no longer enter into the arrester recess **11***b*, but meets the short transversely positioned section **11***c* of the cam, whereby a further rotation of the rotatable plate **19** is effected, until the dog pin **20***b* abuts the section **11***a* of the cam and thereby prevents any further opening movement of the door wing. The position just described, in which the components illustrated are denoted **10'''**, **11***a'''*, etc., is attained at an aperture angle of the door wing of $90°+\beta$, β slightly exceeding α. When the door wing is then released and moves under the action of the automatic door keeper in the sense of closing, the end face **21***a* of the rotatable plate **19** does not meet any more the arrester pin **7** because of the continued rotation of this rotatable plate, so that the door wing is no longer retained at 90° and returns to the original closed position.

During the closing movement, the longitudinal edge **22***a* of the rotatable plate **19** abuts the arrester pin **7**, since the portion **14***a* of the lever advances between this pin **7** and the pin **8**. Thereby the rotatable plate **19** is turned further, until the lateral edges **22***a* and **22***b* are again in alignment with the portion **14***a* of the lever, and the rotatable plate **19** has accordingly undergone a total rotation of 180°. The cycle can begin now anew, the part played by the elements **20***a*, **21***a* and **22***a* being however exchanged with that of the elements **20***b*, **21***b* and **22***b*.

It is to be emphasized that the door arrester described does not comprise any spring, in that the rotation of the rotatable plate **19** always takes place positively. This is very advantageous, since springs after a while are liable to break.

The whole door arrester is built into the frame **2** of the door wing. For the functioning of the door arrester it is obviously not necessary to have an automatic door keeper available; however in this case the movements of the wing of the door in the sense of closing have then to be carried out by hand. It is clear that the aperture angle at which the door wing is to be arrested need not necessarily amount to 90°, but in general an aperture angle of $90°\pm10°$ is preferred.

The embodiment described hereinabove of the door arrester has a certain disadvantage. It may happen that the door is used at some time by a person who—in spite of the plate of instructions—does not understand its manner of operation. It may then happen, that the user intends to close the open door wing, but instead of firstly moving it a bit further in the opening direction, pulls it forcibly inward. Since the arrester means prevent the closing movement, it may happen that an annoyed user applies such a force to the door wing in the closing sense that the door arrester is thereby seriously damaged.

This disadvantage is overcome by the embodiment described hereinafter with reference to FIGS. 3 to 6.

The door arrester illustrated in FIGS. 3 to 6 has a base box **1'** of a U-shaped profile, which is attached at one end to a frame **2'** of the door wing articulated by means of a hinge **3'** to the stationary door frame **4'**. In the base box **1'** transversely to the opposite legs **5'** and **6'** thereof an arrester pin **7***a* is provided, by the side of which a short guide pin **8'** is arranged on the lower leg **6'**.

The arrester pin **7***a*, in contrast to the pin **7** of the first embodiment, is not fixedly mounted in the base box **1'**, but is slidable in two oblique slots **31** and **32**, parallel to one another, of the legs **5'** and **6'**, respectively of the box. The ends of the arrester pin **7***a* are mounted in two angle pieces **33** and **34**, the upper end of this pin in FIG. 5 being formed as a reduced threaded portion **35**, on which a washer **36** and a nut **37** are mounted, securing the pin in its longitudinal direction.

In the back of the base box **1'** two small transverse plates **38** and **39** are inserted, which protrude beyond this back and serve at their ends as the abutments for two pairs of compression springs **40** and **41**, respectively, of which in FIG. 5 merely the axes are indicated by chain dotted lines and denoted with these reference characters. These springs **40** and **41** are on the other hand supported on the ends of the vertical legs **42** and **43** of the angle pieces **33** and **34**. It will be seen that the angle pieces **33** and **34** under the bias of the compression springs **40** and **41** tend to hold the arrester pin **7***a* in the position illustrated, i.e. on the bottom of the slots **31** and **32**.

In the upper leg **5'** a longitudinal slot **9** is provided through which passes a screw **9'**, by means of which a cam plate **10***a* is adjustably mounted on the leg **5'** of the box. The cam plate **10***a* has an edge profiled in accordance with a curve **11'**. This curve runs in a manner very similar to the corresponding curve in the first embodiment.

Between the two pins **7***a* and **8'** an arrester bar **44** of rectangular profile is guided, which is articulated at its inner end by means of a pin **45** to one end of a connecting rod **46**, the other end of which is articulated by a pin **47** to the fork **16'**. This fork **16'** is attached by means of a threaded bolt **48** provided on it and of a nut **49** to the stationary door fram **4'**, which is reinforced by a plate **50**.

For the guidance of the connecting rod **46** and of the arrester bar **44** two transversely directed guide pins **51** and **52** are provided on the legs **5'** and **6'** of the box adjacent the fork **16'**. A further guide pin **53** is arranged in a like manner adjacent the free end of the base box **1'**.

On the arrester bar **44**, not far from its free end, the substantially rectangular plate **19'** is mounted rotatably by means of the pivot **18'**. On two diagonally opposite corners of the rotatable plate **19'** two dog pins **20***a* and **20***b* are arranged, while the two other corners of the plate are cut off.

For the attachment of the base box **1'** to the frame of the door wing **2'** a plate **54** is welded to an end face (the right hand side one in FIGS. 3 and 6) of the base box **1'**, which plate has a passage opening **55** for the fork **16'** and is screwed by means of screws **56** to two connector plates **57** welded to the frame of the door wing.

FIGS. 3 and 4 are so arranged relative to one another, that the door wing **2'** in FIG. 4 is turned 90° relative to its position in FIG. 3, as indicated by the circular arc **24**, the centre of which lies in the hinge **3'** (FIG. 3). When turning the door frame into the opening position, the connecting rod **46** turns about the pin **47**, which is rather remote from the hinge **3'**, as indicated by the circular arc **58**. Thereby the arrester bar **44** is shifted in the longitudinal direction relative to the base box **1'**. The arrester bar **44** and the connecting rod **46** accordingly take over the function of the kinked arrester lever **14** of the first embodiment; however, the components **44** to **46** of the present embodiment are applicable to left hand side and right hand side door wings alike, owing to being symmetrical to the middle plane.

The cam plate **10***a* and the rotatable plate **19'** with its dog pins **20***a''''* and **20***b''''* co-operate in a like manner with one another, as described in the first embodiment. After the door wing has been opened an angle $90°+\alpha$, it is turned back an angle α by an automatic door keeper (not shown), whereafter the rotatable plate **19'** turned by the preceding movements of the door wing in the position shown in FIG. 4 abuts with its small end face **21***a* the arrester pin **7***a* and thereby keeps the door wing open at an angle of 90°. In order to close the door wing the same has to be moved slightly in the sense of opening, which in conjunction with the cam plate **10'** results in a further slight rotation of the rotatable plate **19'**, so that when releasing the door wing the arrester pin **7***a* does no longer prevent the same from being closed by the automatic door keeper.

If one tries to turn the open door wing forcibly in the closing direction instead of turning it firstly a little in opening direction, the pressure applied by the rotatable plate **19'** to the resiliently mounted arrester pin **7***a*

rises eventually so high, that it overcomes the force of the two pairs of springs **40** and **41**. The arrester pin *7a* then slides outward in the two oblique slots **31**, **32** so far, that the end face *21a* disengages itself from this pin *7a*, and the door wing consequently closes in spite of this irregular treatment. The strength of the springs **40** and **41** is so chosen, that the mechanism of the door arrester does not suffer any damage. Without the safety means **31** to **43** described hereinabove it may however happen, that by the forcible closing torque the stationary door frame **4'** is locally deformed or torn by the fork **16'**, or that parts of the door arrester are bent or otherwise made useless.

While I have herein described and illustrated in the accompanying drawings what may be considered typical and particularly useful embodiments of my said invention, I wish it to be understood that I do not limit myself to the particular details or dimensions described and illustrated; for obvious modifications will occur to a person skilled in the art.

What I claim as my invention and desire to secure by Letters Patent is:

1. A device for keeping a turnable wing of a door open at a certain angle with respect to a door frame, comprising first arrester means stationarily mounted relative to said door wing, second arrester means mounted on a fixing member and movable relative to said door wing and being moved relative to the door wing when the door wing is turned with respect to the door frame, the first and second arrester means cooperating with each other in such a manner that when the door wing is turned with respect to the door frame from its closed position to an open position beyond a predetermined opening angle a subsequent closing movement of the door wing is resisted, and when the door wing is further opened beyond said open position the door wing is released for closing movement thereof, said first arrester means including a base box fixed in the door wing, an arrester pin and a cam plate fixedly mounted on said base box, said second arrester means including another member pivotally mounted on said fixing member, a symmetrical rotatable plate pivotally mounted on said other member and having an end face, and two dog pins mounted on said rotatable plate and co-operating with said cam plate, said other member being guided in such a manner that upon turning the door wing part of said other member slides along the arrester pin.

2. A device as claimed in claim 1, wherein the base box has a U-shaped profile and said other member is a lever, the pivot axis of which is offset from the turning axis of the door wing.

3. A device as claimed in claim 1, wherein the cam plate is adjustably mounted on the base box.

4. A device as claimed in claim 1, wherein the cam plate has a first section inclined transversely of the base box, a re-entrant arrester recess adjoining the first inclined section, and a final section transverse of the base box, one of the dog pins of the rotatable plate being guided by said first inclined section into the re-entrant recess when the door wing is further opened beyond said open position.

5. A device according to claim 4, wherein the rotatable plate is rectangular, the two dog pins being mounted at two diagonally opposite corners of the rotatable plate, the two other diagonally opposite corners of the rotatable plate being cut off.

6. A device for keeping a turnable wing of a door open at a certain angle with respect to a door frame, comprising a first arrester means stationarily mounted relative to said door wing, spring means retaining said first arrester means in one position during a closing movement of the door wing unless retention force of the spring is overcome by excessive turning torque applied to the door wing during the closing movement of the door wing, whereupon said spring means allows the first arrester means to move from said one position, a fixing means stationarily mounted with respect to said door frame, said fixing means having second arrester means movable relative to the door wing and being moved relative to the door wing when the door wing is turned relative to the door frame, the first and second arrester means cooperating with each other in such a manner that when the door wing is turned with respect to the door frame from its closed position to an open position beyond a predetermined opening angle a subsequent closing movement of the door wing is resisted, and when the door wing is further opened beyond said open position the door wing is released for closing movement thereof, said first arrester means including an arrester pin resiliently mounted on the said door wing.

7. A device as claimed in claim 6, further comprising a base box having a U-shaped profile with flat sides, said box being fixedly mounted in the door wing and provided with oblique slots in its sides, said arrester pin being slidably guided in the oblique slots and being biased by said spring means towards ends of the slots.

8. A device as claimed in claim 6, wherein the said second arrester means include an arrester bar and a connecting rod articulated to the arrester bar and to the door frame, respectively, the articulation point thereof on the door frame being offset from the turning axis of the door wing with respect to the door frame.

References Cited in the file of this patent

UNITED STATES PATENTS

1,431,040	Rawlings	Oct. 3, 1922
1,710,570	Collins	Apr. 23, 1929
2,664,590	Allen	Jan. 5, 1954
2,914,792	Campbell	Dec. 1, 1959

FOREIGN PATENTS

351,066	Great Britain	June 22, 1931