

PATENT SPECIFICATION

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- (24) Application No. 47411/76 (22) Filed 15 Nov. 1976 (19)
 (31) Convention Application No. 51/072 828
 (32) Filed 22 June 1976 in
 (33) Japan (JP)
 (44) Complete Specification published 30 April 1980
 (51) INT. CL.³ B05F 3/00
 (52) Index at acceptance
 E2M 11F2 12E1A 12F1A 16
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(54) DOOR CLOSING DEVICE

(71) I, YOSHITAKA NAKANISHI, a citizen of Japan, of 12-9, Yawata, 5-chome, Ichikawa-shi, Chiba-ken, Japan, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a door closing device, particularly to a structure for fixing a door closing device to a door.

Heretofore, a door closing device has been directly fixed to a door by means of screws, so that it was not easy to fix a heavy door closing device onto a door, especially at higher positions.

It is an object of this invention to provide a door closing device which may be fixed onto a door promptly and easily as well as secured with good appearance.

Another object of this invention is to provide a door closing device which may be used in common for a left-handed or a right-handed door.

A further object of this invention is to provide a door closer which has good appearance, simple and strong fitting structure, assuring easy manufacture.

30 According to the present invention there is provided a door closing device comprising: a main body having on each of two opposite sides thereof female coupling means; a plate-shaped mounting bracket for mounting said main body to a door, said main bracket having two parallelly extending male coupling portions which are slidably engageable with either one of said female coupling means and are provided for engagement with one of said female coupling means to mount said main body to the door, and a covering plate having two parallelly extending male coupling portions which are slidably engageable with either one of said female coupling means and are provided for engagement with the other of said female coupling means to cover said other female coupling means, wherein, in use, the mounting plate is fixed to the door so that the

male coupling portions extend horizontally.

The present invention will be further described with reference to the accompanying drawings, in which:

Fig. 1 is an elevational view of an embodiment of a door closing device according to this invention which is fixed to a door, a part of the door and the door frame being omitted;

Fig. 2 is a perspective view of the door closing device illustrated in Fig. 1;

Fig. 3 is an exploded perspective view of the door closing device of Figs. 1 and 2;

Fig. 4 is a transverse sectional view of the door closing device fixed to the door;

Fig. 5 is a transverse sectional view of a second embodiment of a door closing device according to the invention; and

Fig. 6 is a transverse sectional view of a third embodiment of a door closing device according to the invention.

Fig. 6 is a transverse sectional view of a third embodiment of a door closing device according to the invention.

In Fig. 1, a main body 2 of a door closing device 1 according to this invention, is fixed to an upper portion of a door 3 by means of a mounting bracket 4. Within the main body 2 of the door closing device, a known mechanism (not shown) is included, which has a door closing function and controls the door closing speed. As door closing mechanism, springs (not shown) are suitably employed, and as the controlling mechanism for door closing speed, generally a combination of a movable piston (not shown) and oil pressure (not shown) for controlling the movement of said piston is suitably employed.

A driving shaft 5 projects upwardly from an upper wall 6 of the main body of the door closing device and one end of an arm 7 is fixed to the driving shaft. Another end of the arm 7 is pivoted on one end of another arm 8 by a pin 9, another end of the arm 8 is pivoted on a bracket 10 by a pin 11, and the bracket 10 is connected to a stationary door frame 12. Manually opened door 3 will be closed with desirable speed by the

driving force of the driving shaft 5 through the arms 7 and 8.

As shown in Fig. 2 and Fig. 3, the mounting bracket 4 is formed by an elongate rectangular plate and has a pair of long tongue-shaped male coupling portions 14 on its upper and lower edges, which portions are mutually parallel and, when the mounting bracket is fixed to a door, extend horizontally. The mounting bracket 4 is fixed to the door 3 by screws 16 passing through holes 15 in the mounting bracket.

The main body 2 of the door closing device is formed by an elongate rectangular parallelepiped, as shown in Fig. 2 and Fig. 3, and has mutually parallel front wall 17 and rear wall 18. These walls are provided with groove-shaped female coupling means or portions 19 and 20 which are mutually parallel and elongate in the longitudinal direction of the main body. Into the female coupling portion 20 of the rear wall 18 of the main body 2, the male coupling portion 14 of the mounting bracket 4 is inserted to connect the mounting bracket with the main body, and into the female coupling portion 19 of the front wall 17, a male coupling portion 25 of a rectangular covering plate 21 is inserted to connect the covering plate with the main body. Both of the female coupling portions 19, 20 are of the same shape and size, and the male coupling portions 14 and 25 of the mounting bracket 4 and of the covering plate 21 may be inserted into either of the female coupling portions 19 and 20, and both of the female coupling portions 19 and 20 are arranged symmetrically with respect to the vertical central plane of the main body 2.

Therefore, in the case of the door 3 being left-handed, the male coupling portion 14 of the mounting bracket 4 is inserted into the female coupling portion 20 and the male coupling portion 25 of the covering plate 21 into the female coupling portion 19, as shown in Fig. 2, thereby to fix the main body 2 to the door 3 through the mounting bracket 4. And, in the case of the door 3 being right-handed, the male coupling portion 14 of the mounting bracket 4 is inserted into the female coupling portion 19 and the male coupling portion 25 of the covering plate 21 into the female coupling portion 20 thereby to fix the main body 2 to the door 3 through the mounting bracket 4. Thus, by selectively inserting the male coupling portions 14 and 25 of the mounting bracket and the covering plate into the female coupling portions 19 and 20, the same door closing device may be fixed selectively to a left-handed or right-handed door. When the door closing device is fixed to a left-handed or right-handed door, since the top wall 6 of main body 2 of the device is always located at the upper position, top whether

in use for a left- or a right-handed door the driving shaft 5 need only project from the top wall 6 and need not project from the bottom wall. Therefore, the structure of the door closer is simple and compact.

Since the light and handy mounting bracket 4 is fixed to the door by screws and then the main body is fixed to the door by slidably engaging the female coupling portion 19 or 20 of the main body 2 with the male coupling portion 14 of the mounting bracket 4, the mounting operation thereof may be effected easily and promptly. When the device is fixed to the door, fixing screws 16 for the mounting bracket are held down by the bottom of female coupling portion 19 or 20 of the main body 2, so that the screws will never become loose. The fixing of the device is favourably maintained and has good appearance, the screws being invisible from outside.

In order to slidably engage the male coupling portions 14 and 25 of the mounting bracket 4 and the covering plate 21 with the female coupling portions 19 and 20 of the main body of the device, each of the female coupling portions 19 and 20 is undercut having a pair of confronting inner wall faces 23 or 24 forming a dovetail groove as shown in Fig. 4, and these inner wall faces 23 or 24 are mutually parallel and inclined so as to decrease the dimension between both of inner wall faces 23 or 24 as these faces advance towards the opening face of the grooves. Also, the mounting bracket 4 and the covering plate 21 have a cross-sectional shape substantially equal to those of female coupling portions 19 and 20. Each of the upper and lower edge portions of the male coupling portions 14 and 25 of plates 4 and 21 respectively are mutually parallel and inclined so as to engage with the inner wall faces 23 and 24. The thickness of the mounting bracket 4 and the depth of female coupling portions 19 and 20 of the main body 2 are substantially equal, and when the main body 2 is fixed to the wall face of door 3 through the mounting bracket 4, the rear face 18 of the main body contacts the wall face of the door to hide the mounting bracket 4, thereby the fixed device has good appearance.

The male coupling portions 14 of the mounting bracket 4 and the female coupling portion 19 or 20 of the main body 2 allow sliding between these portions. The sliding between these portions 14 and 19 or 20 is prevented after assembly by inserting a screw 22 into a through hole 26 of the main body 2 and by screwing it into a screw hole 27 of the mounting bracket 4. So that a head 28 of the screw 22 does not protrude from the bottom face 19' or 20' of the female coupling portion, for instance, the head is formed as a flush head, and a conical bot-

tom face 29 is formed to receive the flush head. Since the head 28 of the screw is held down by the covering plate 21, looseness of the screw 22 is prevented, and since the covering plate covers the female coupling portion bottom face 19¹ or 20¹, the head of fixing screw and the female coupling portion are hidden to give a good appearance of front face of the main body. The covering plate 21 may be coloured and/or patterned in various manners, and by using this covering plate, the front face of the door closing device may be made colourful and attractive. The covering plate may be made of metal, but is preferably formed from synthetic resin to facilitate the decoration of the covering plate. Further, relative sliding between the covering plate 21 and the female coupling portion bottom face 19¹ or 20¹ of the main body 2 may be prevented by tight fitting of the covering plate 21 in the female coupling portion 19 or 20 of the main body, but it may be more strongly prevented by providing a projecting portion 30 on the rear face of the covering plate which fits into a dent 31 provided on bottom face 19¹ or 20¹ of the female coupling portion.

The mounting bracket 4 may be modified as shown in Fig. 5. The modified mounting bracket 4a has a flange 32 which extends upwards and downwards from one end of an inclined male coupling portion 14a, with which flange 32 the rear face 18 (or front face 17) of the main body 2 contacts. Contact faces of the mounting bracket 4a and the main body 2 are more easily and exactly formed than contact faces of the door 3 and the main body 2. Thus the male coupling portion of the mounting bracket may be easily inserted in the female coupling portion of the main body.

In Fig. 6, there is shown a further modified coupling portion of a mounting bracket 4b, a covering plate 21b and a main body 2b. The mounting bracket 4b and the covering plate 21b have T-shaped male coupling portions 14b and 25b extending upwards and downwards from side faces thereof. Female coupling portions 19b, 20b of the main body have T-shaped cross-sections, having extended portions 23b and 24b extending from opening edges in opposite directions. Between the extended portions 23b and 24b and the bottom of grooves, tongue-shaped male coupling portions 14b and 25b of the mounting bracket and the covering plate are fitted to connect with each other.

It is to be understood that the present invention is not limited to the above men-

tioned embodiment thereof, but may be otherwise variously modified within the scope of the invention.

WHAT I CLAIM IS:—

1. A door closing device comprising; a main body having on each of two opposite sides thereof female coupling means; a plate-shaped mounting bracket for mounting said main body to a door, said main bracket having two parallelly extending male coupling portions which are slidably engageable with either one of said female coupling means and are provided for engagement with one of said female coupling means to mount said main body to the door, and a covering plate having two parallelly extending male coupling portions which are slidably engageable with either one of said female coupling means and are provided for engagement with the other of said female coupling means to cover said other female coupling means, wherein, in use, the mounting plate is fixed to the door so that the male coupling portions extend horizontally.
2. A device according to claim 1, wherein said mounting bracket and said main body each has a hole therein, and further comprising a connecting member which, in use, extends through the holes in said bracket and in said main body to prevent relative sliding therebetween.
3. A device according to claim 1 or 2, wherein said covering plate has a projection provided on a rear face thereof and said main body has a recess on an outside face thereof engageable with said projection to fix the covering plate to the main body against relative sliding therebetween.
4. A device according to claim 1, 2 or 3 wherein the cross-section of each of said female coupling means is dovetail shaped.
5. A device according to claim 1, 2 or 3, wherein the cross-section of each of said female coupling means is T-shaped.
6. A device according to claim 7, wherein said covering plate is formed of a synthetic resin.
7. A door closing device substantially as herein described with reference to Figure 2 with or without reference to any of Figures 1 and 3 to 6 of the accompanying drawings.

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tom face 29 is formed to receive the flush head. Since the head 28 of the screw is held down by the covering plate 21, looseness of the screw 22 is prevented, and since the covering plate covers the female coupling portion bottom face 19¹ or 20¹, the head of fixing screw and the female coupling portion are hidden to give a good appearance of front face of the main body. The covering plate 21 may be coloured and/or patterned in various manners, and by using this covering plate, the front face of the door closing device may be made colourful and attractive. The covering plate may be made of metal, but is preferably formed from synthetic resin to facilitate the decoration of the covering plate. Further, relative sliding between the covering plate 21 and the female coupling portion bottom face 19¹ or 20¹ of the main body 2 may be prevented by tight fitting of the covering plate 21 in the female coupling portion 19 or 20 of the main body, but it may be more strongly prevented by providing a projecting portion 30 on the rear face of the covering plate which fits into a dent 31 provided on bottom face 19¹ or 20¹ of the female coupling portion.

The mounting bracket 4 may be modified as shown in Fig. 5. The modified mounting bracket 4a has a flange 32 which extends upwards and downwards from one end of an inclined male coupling portion 14a, with which flange 32 the rear face 18 (or front face 17) of the main body 2 contacts. Contact faces of the mounting bracket 4a and the main body 2 are more easily and exactly formed than contact faces of the door 3 and the main body 2. Thus the male coupling portion of the mounting bracket may be easily inserted in the female coupling portion of the main body.

In Fig. 6, there is shown a further modified coupling portion of a mounting bracket 4b, a covering plate 21b and a main body 2b. The mounting bracket 4b and the covering plate 21b have T-shaped male coupling portions 14b and 25b extending upwards and downwards from side faces thereof. Female coupling portions 19b, 20b of the main body have T-shaped cross-sections, having extended portions 23b and 24b extending from opening edges in opposite directions. Between the extended portions 23b and 24b and the bottom of grooves, tongue-shaped male coupling portions 14b and 25b of the mounting bracket and the covering plate are fitted to connect with each other.

It is to be understood that the present invention is not limited to the above men-

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2. A device according to claim 1, wherein said mounting bracket and said main body each has a hole therein, and further comprising a connecting member which, in use, extends through the holes in said bracket and in said main body to prevent relative sliding therebetween.

3. A device according to claim 1 or 2, wherein said covering plate has a projection provided on a rear face thereof and said main body has a recess on an outside face thereof engageable with said projection to fix the covering plate to the main body against relative sliding therebetween.

4. A device according to claim 1, 2 or 3 wherein the cross-section of each of said female coupling means is dovetail shaped.

5. A device according to claim 1, 2 or 3, wherein the cross-section of each of said female coupling means is T-shaped.

6. A device according to claim 7, wherein said covering plate is formed of a synthetic resin.

7. A door closing device substantially as herein described with reference to Figure 2 with or without reference to any of Figures 1 and 3 to 6 of the accompanying drawings.

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