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PUSHING-PULLING DEVICE FOR A DOOR PANEL

1. Field of the Invention

The present invention relates to a pushing-pulling device for a door panel, and more particularly to a pushing-pulling device for which an assembling position can be adjusted easily.

2. Description of Related Art

A conventional pushing-pulling device for a door panel is applied for a door panel to slide in a door track to be in an open status or in a closed status, and the conventional pushing-pulling device has a buffer device that can provide a cushioning effect such that excessive pushing or pulling force applied to the door panel will not cause the door panel to hit a door frame abruptly.

An engagement block is mounted in an end of the door track. The buffer device is mounted on the door panel and has a hydraulic cylinder, a sliding stick, a sliding base and a spring, wherein the sliding stick is slidably inserted into the hydraulic cylinder, the sliding base is connected with an end of the sliding stick, and the spring is connected with the sliding base and the hydraulic cylinder. When the engagement block and the sliding base abut each other, the spring and the hydraulic cylinder can provide a cushioning effect.

The position of the engagement block relative to the door track is determined based on the stroke of the buffer device, so the position of the engagement block needs to be adjusted to fit with the door panels of different weights or doorframes or door tracks in different lengths.

As the engagement block is to be assembled on the door track, an



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installation hole needs to be disposed in the door track, and then the engagement block can be combined with the door track via the installation hole by a fixing unit.

However, when the position of the engagement block has to be adjusted, the fixing unit has to be first removed from the engagement block, and then another installation hole is disposed in the door track. At the time, the door track has to be disassembled from the doorframe and re-assembled after the new installation hole is disposed. As a result, it is inconvenient for assembling.

On the other hand, the new installation hole cannot be disposed adjacent to the original installation hole in order to avoid forming an elongated hole. If an elongated hole is formed, the engagement block can slide into the elongated hole and thus cannot be mounted on a fixed position on the door track, such that the buffer device cannot be operated at the same position. As a result, adjusting the position of the engagement block is not easy.

The main object of the present invention is to provide a pushing-pulling device for a door panel, which has a door track, an engagement portion, a door panel, and a buffer device.

The door track has a bottom, a longitudinal direction, an inner surface formed inside the door track and having two sides, a track opening formed in the bottom along the longitudinal direction, and two track flanges protruding from the sides of the inner surface along the longitudinal direction respectively. Each track flange has a top and a bottom.

The engagement portion is selectively and moveably mounted in the

door track and has a first clamping plate mounted in the tops of the track flanges respectively and having a screw hole formed in the first clamping plate, a second clamping plate mounted in the bottoms of the track flanges respectively and having a pass-through hole aligned with the screw hole, an engagement block protruding downward from the first clamping plate and extending over the second clamping plate, and a fixing unit inserted through the pass-through hole and screwed in the screw hole.

The door panel is moveably mounted on the door track and has a first hanging-wheel device combined on the door panel and slidably mounted in the door track, and a second hanging-wheel device combined on the door panel and slidably mounted in the door track.

The buffer device is mounted in the door track and connected with the first hanging-wheel device.

The first clamping plate and the second clamping plate clamp the track flange, and are combined with each other by the fixing unit, such that the engagement portion is assembled in the door track easily.

The fixing unit can be released relative to the first clamping plate and the second clamping plate, such that the engagement portion can slide in the door track, and the position of the engagement portion relative to the door track can be adjusted easily.

IN THE DRAWINGS

Fig. 1 is a front view of a preferred embodiment of a pushing-pulling device for a door panel in accordance with the present invention;

Fig. 2 is a perspective view of the pushing-pulling device in Fig. 1;

Fig. 3 is a side view in partial cross section of the pushing-pulling device in Fig. 1;

Fig. 4 is an enlarged perspective view of the abutment base of the pushing-pulling device in Fig. 1;

Fig. 5 is an enlarged partially exploded perspective view of the pushing-pulling device in Fig. 1;

Fig. 6 is an enlarged exploded perspective view of the first hanging-wheel device of the pushing-pulling device in Fig. 1;

Fig. 7 is a partial exploded perspective view of the pushing-pulling device in Fig. 1;

Fig. 8 is a partial perspective view of the pushing-pulling device in Fig. 1

Fig. 9 is an enlarged front view of the pushing-pulling device in Fig. 1;

Fig. 10 is an operational front view of the pushing-pulling device in Fig. 1;

Fig. 11 is an operational front view of the pushing-pulling device in Fig. 1;

Fig. 12 is an enlarged operational front view of the pushing-pulling device in Fig. 1;

Fig. 13 is an enlarged operational front view of the pushing-pulling device in Fig. 1; and

Fig. 14 is an operational front view of the pushing-pulling device in Fig. 1.

With reference to Fig. 1 and Fig. 2, a pushing-pulling device for a door panel in accordance with the present invention has a door track 10, an engagement portion 20, a door panel 30, and a buffer device 40.

With reference to Fig. 1, Fig. 3 and Fig. 4, the door track 10 is made as a hollow tube by aluminum-extrusion. The door track 10 has a bottom, a longitudinal direction, a cross section, two ends, a track opening 11, two track flanges 12, a flange distance and an abutment base 13.

The cross section of the door track 10 is rectangular along the longitudinal direction. The door track 10 forms two openings on the ends respectively. The track opening 11 is formed in the bottom of the door track 10 along the longitudinal direction. The track flanges 12 protrude from two sides of the inner surface of the door track 10 along the longitudinal direction respectively and face each other. The flange distance is defined between the track flanges 12. Each track flange 12 has two clamping troughs 120 respectively formed in the top and the bottom of the track flange 12. The abutment base 13 is mounted in one of the ends of the door track 10 and has a buffer base 130, two cushion plates 131, multiple plate fins 132, and multiple cushions 133. The cushion plates 131 are made of shock-absorbing material, are abreast connected with the buffer base 130 and extend towards the end of the door track 10 opposite to the abutment base 13. The plate fins 132 are mounted on the sides of the cushion plates 131 respectively and abut the inner surface of the door track 10 respectively. The cushions 133 are mounted between the plate fins 132 respectively.

With reference to Fig. 3 and Fig. 5, the engagement portion 20 is selectively and moveably mounted in the door track 10 and has a first clamping plate 21, a second clamping plate 22, an engagement block 23, and two fixing units 24.

The first clamping plate 21 is wider than the flange distance, is mounted in the clamping troughs 120 in the tops of the track flanges 12, and has two screw holes 210 formed through the first clamping plate 21. The second clamping plate 22 is wider than the flange distance, is mounted in the clamping troughs 120 in the bottoms of the track flanges 12, and has two pass-through holes 220 aligned with the screw holes 210 respectively. The engagement block 23 protrudes downward from an end of the first clamping plate 21 that faces the abutment base 13, and extends over the second clamping plate 22. The engagement block 23 has a block cover 230 mounted around the engagement block 23. The fixing units 24 are mounted through the pass-through holes 220 from the bottom of the second clamping plate 22 and are screwed with the screw holes 210 respectively, such that the first clamping plate 21 and the second clamping plate 22 can clamp the track flanges 12.

As a result, the engagement portion 20 can be fixed on the door track 10 by the first clamping plate 21, the second clamping plate 22, and the fixing units 24. The position of the engagement portion 20 relative to the door track 10 can be adjusted by screwing the fixing units 24 out of the screw holes 210 and moving the engagement portion 20 relative to the door track 10. By the above non-destructive methods, users can assemble the engagement portion 20 on the

door track 10 and adjust the position of the engagement portion 20 relative to the door track 10 easily.

With reference to Fig. 1 and Fig. 2, the door panel 30 is moveably mounted on the door track 10 and has a first hanging-wheel device 31 and a second hanging-wheel device 32.

With reference to Fig. 2 and Fig. 6, the first hanging-wheel device 31 has a first wheel base 310, two first wheel sets 311, a connecting base 312, and a first combining base 313. The first wheel base 310 is fixed on the top of the door panel 30 and located in the door track 10. The first wheel sets 311 are mounted on the sides of the first wheel base 310 and moveably abut on the bottom surface in the door track 10. The connecting base 312 is connected with an end of the first wheel base 310 that faces the abutment base 13. The first combining base 313 is mounted on the bottom of the first wheel base 310, protrudes out of the track opening 11 and has a combining plate 314, a combining hole 315, and a combining assembly. The ends of the combining plate 314 are bent and combined with the top of the door panel 30. The combining hole 315 is formed in the center segment from a side of the combining plate 314. The combining assembly has a bolt 316, two washers 317, a collar 318 and a nut 319. The bolt 316 is inserted into the combining hole 315 from a side of the combining plate 314, is combined with the first wheel base 310 and has a bolt trough. The washers 317 and the collar 318 are mounted around the bolt 316, wherein the washers 317 are located on the top side and the bottom side of the combining plate 314 respectively and the collar 318 is located in the combining hole 315.

The nut 319 is combined on the bolt 316 between the combining plate 314 and the first wheel base 310.

With reference to Fig. 2, the second hanging-wheel device 32 has a second wheel base 320, an abutting block 321, two second wheel sets 322, and a second combining base 323. The second wheel base 320 is fixed on the top of the door panel 30 and located in the door track 10. The abutting block 321 is connected with the end of the second wheel base 320 that faces the abutment base 13, and the abutting block 321 can be inserted between the cushion plates 131. The second wheel sets 322 are mounted on the sides of the second wheel base 320 and moveably abut on the bottom surface in the door track 10, such that the door panel 30 can be slidably mounted in the door track 10 by the first wheel sets 311 and the second wheel sets 322. The second combining base 323 is mounted on the bottom of the first wheel base 310 and the structure of the second combining base 323 may be same as that of the first combining base 313.

With reference to Fig. 2, Fig. 7 and Fig. 8, the buffer device 40 is mounted in the door track 10, is connected with the first hanging-wheel device 31 and has two clamping plates 41, two track plates 42, a hydraulic buffer 43, a spring 44, and a sliding base 45.

The clamping plates 41 are elongated and abreast mounted in the door track 10 and are combined with each other, and the ends of the clamping plates 41 opposite to the abutment base 13 clamp and are combined with the connecting base 312. Each clamping plate 41 has a longitudinal direction, a top edge, a bottom edge, two plate flanges 410, an inner side, a plate rib 411 and two

anti-bump washers 412. The plate flanges 410 protrude from the top edge and the bottom edge along the longitudinal direction respectively, the plate rib 411 protrudes from the inner side along the longitudinal direction, and the anti-bump washers 412 are mounted on the ends of the top edge.

With reference to Fig. 7, Fig. 8 and Fig. 9, the track plates 42 are elongated, are clamped between the clamping plates 41 and are combined with the clamping plates 41 and with each other. Each track plate 42 has an inner surface, a longitudinal direction, a track 420, a shock-absorbing base 421, and an engaging trough 422. The track 420 is formed in the inner surface along the longitudinal direction and has a track inner diameter d_2 . The shock-absorbing base 421 is wear-resistant and shock-absorbing and is mounted on the inner surface. The engaging trough 422 is curved and is formed in the shock-absorbing base 421 and communicates with the track 420. The engaging trough 422 has a trough inner diameter d_1 . The trough inner diameter d_1 is shorter than the track inner diameter d_2 .

The track plates 42 are combined with each other by four combining bases 423 and four combining sticks 424. The combining bases 423 are mounted on the ends of one of the track plates 42, and the combining sticks 424 are mounted on the ends of the other track plate 42. The track plates 42 engage with the clamping plates 41 by two plate troughs 425. The plate troughs 425 are formed on the track plates 42 along the longitudinal direction at sides facing the clamping plates 41 and engaged with the plate ribs 411 respectively, such that the track plates 42 can be mounted between the clamping plates 41 firmly.

With reference to Fig. 2, Fig. 7 and Fig. 8, the hydraulic buffer 43 may be conventional and has a hydraulic cylinder 430, a sliding stick 431, two leak proof rings 432, a wheel set 433, and two engaging columns 434. The hydraulic cylinder 430 is mounted between the clamping plates 41, an end of the hydraulic cylinder 430 is clamped between the track plates 42, and the other end of the hydraulic cylinder 430 is combined with the clamping plates 41, such that the hydraulic cylinder 430 can be fixed between the clamping plates 41. The sliding stick 431 is slidably mounted in the hydraulic cylinder 430, protrudes out of an end of the hydraulic cylinder 430 and is aligned with the tracks 420. The leak proof rings 432 are mounted on the ends of the hydraulic cylinder 430, such that the noise generated during the movement of the sliding stick 431 can be reduced. The wheel set 433 is connected with the end of the hydraulic cylinder 430 opposite to the sliding stick 431 and is slidably mounted in the door track. The engaging columns 434 protrude from the end of the sliding stick 431 opposite to the hydraulic cylinder 430 and are slidably mounted in the tracks 420. The spring 44 is connected with an end of the hydraulic cylinder 430.

With reference to Fig. 7, Fig. 8 and Fig. 10, the sliding base 45 is pivotally mounted on the end of the sliding stick 431 on which the engaging columns 434 are formed, is connected with the end of the spring 44 opposite to the wheel set 433 and has two sliding columns 450, a block trough 451, and a column trough 452. The sliding columns 450 protrude from the sides of the sliding base 45 respectively and are slidably mounted in the tracks 420 and the engaging troughs 422. The block trough 451 is formed in the top of the sliding

base 45 and selectively engages the engagement block 23. The column trough 452 engages the engaging columns 434, such that the sliding base 45 can rotate relative to the engaging columns 434.

As a result, when the sliding columns 450 move in the engaging troughs 422, the impact force between the sliding columns 450 and the engaging troughs 422 can be absorbed by the shock-absorbing bases 421, such that the door plate 30 can slide in the door track 10 noiselessly.

With reference to Fig. 1, Fig. 5 and Fig. 6, the pushing-pulling device is mounted on a top of a doorframe 50 by the door track 10. The doorframe 50 has a fixed door panel 51 mounted in the doorframe 50, such that an exit is formed between the fixed door panel 51 and the doorframe 50. The door panel 30 is slidably mounted on the exit, such that the door panel 30 can be slid along the door track 10 to open or close the exit. The fixing units 24 can be screwed out of the screw holes 210 to prevent the first clamping plate 21 and the second clamping plate 22 from tightly abutting the track flanges 12, such that the position of the engagement portion 20 relative to the door track 10 can be adjusted.

With reference to Fig. 10, when the door panel 30 is in a closed status, the sliding stick 431 is pulled into the hydraulic cylinder 430, and the block trough 451 engages the engagement block 23.

With reference to Fig. 10, Fig. 11 and Fig. 12, when the door panel 30 is pushed to slide towards the fixed door panel 51, which means the door panel 30 slides towards the left side as shown in Fig. 10, the connecting base 312 pushes

the track plates 42 and the track plates 42 push the hydraulic cylinder 430, such that the sliding stick 431 will extend from the hydraulic cylinder 430 because the engaging columns 434 are mounted on the sliding base 45, the sliding base 45 is mounted on the engagement block 23, and the engagement block 23 is mounted on the door track 10. When the sliding stick 431 is in an extending status relative to the hydraulic cylinder 430, the spring 44 is also stretched to store the elasticity force, cushioning the force that pushes the door panel 30 to keep the door panel 30 from hitting the doorframe 50 until the sliding columns 450 slide into the ends of the engaging troughs 422.

With reference to Fig. 12 and Fig. 13, when the sliding columns 450 slide into and engage the ends of the engaging troughs 422, the sliding base 45 will pivot relative to the engaging columns 434 and disengage from the engagement block 23.

With reference to Fig. 4 and Fig. 14, when the abutting block 321 moves and engages between the cushion plates 131, the plate fins 132 and the cushions 133 can further cushion the force that pushes the door panel 30.

When the door panel 30 is pulled opposite to the fixed door panel 51, which means that the door plate 30 slides towards the right side as shown in the drawings, the abutting block 321 moves to depart from the cushion plates 131. The buffer device 40 is driven by the door panel 30 to slide in the door track 10.

With reference to Fig. 12 and Fig. 13, the sliding base 45 slides to allow the block trough 451 to abut the engagement block 23, and then the sliding base 45 pivots relative to the engaging columns 434 to allow the sliding columns 450

to depart from the engaging troughs 422. The elasticity force of the spring 44 will drive the sliding column 450 to slide into the tracks 420.

With reference to Fig. 11, the elasticity force can further drive the sliding stick 431 to retract relative to the hydraulic cylinder 430, and then the door panel 30 can move into a closed status smoothly and slowly.

CLAIM(S)

1. A pushing-pulling device for a door panel comprising:
 - a door track (10) comprising
 - a bottom;
 - a longitudinal direction;
 - an inner surface formed inside the door track and having two sides;
 - a track opening (11) formed in the bottom along the longitudinal direction; and
 - two track flanges (12) protruding from the sides of the inner surface along the longitudinal direction respectively and each track flange (12) having
 - a top; and
 - a bottom;
 - an engagement portion (20) selectively and moveably mounted in the door track (10) and comprising
 - a first clamping plate (21) mounted in the tops of the track flanges (12) and having a screw hole (210) formed in the first clamping plate (21);
 - a second clamping plate (22) mounted in the bottoms of the track flanges (12) and having a pass-through hole (220) aligned with the screw hole (210);
 - an engagement block (23) protruding downward from the

first clamping plate (21) and extending over the second clamping plate (22); and
a fixing unit (24) inserted through the pass-through hole (220)
and screwed in the screw hole (210);
a door panel (30) moveably mounted on the door track (10) and
having
a first hanging-wheel device (31) combined on the door panel
(30) and slidably mounted in the door track (10); and
a second hanging-wheel device (32) combined on the door
panel (30) and slidably mounted in the door track (10); and
a buffer device (40) mounted in the door track (10) and connected
with the first hanging-wheel device (31).

2. The pushing-pulling device as claimed in claim 1, wherein each track
flange (12) has two clamping troughs (120) formed on the tops and bottoms of
the track flanges (12) respectively, and the clamping troughs (120) accommodate
the first clamping plate (21) and the second clamping plate (22) respectively.

3. The pushing-pulling device as claimed in claim 1, wherein the buffer
device (40) has

two clamping plates (41) being elongated and abreast mounted in the
door track (10) and combined with each other and having

a longitudinal direction;

a top; and

a bottom;

two track plates (42) being elongated and combined between the

clamping plates (41) and combined with each other, and each track plate (42) having

a top;

a bottom;

an inner surface formed inside the track plate;

a longitudinal direction;

a track (420) formed in the inner surface along the longitudinal direction;

a shock-absorbing base (421) being wear-resistant and shock-absorbing and mounted on the inner surface; and

an engaging trough (422) being curved and formed in the shock-absorbing base (421) and communicating with the track (420);

a hydraulic buffer (43) mounted between the track plates (42) and having

a hydraulic cylinder (430) having two ends;

a sliding stick (431) slidably mounted in the hydraulic cylinder (430) and aligned with the tracks (420) and protruding out of the hydraulic cylinder (430) and having an end opposite to the hydraulic cylinder (430);

two engaging columns (434) protruding on the end of the sliding stick (431) and slidably mounted in the tracks (420);

a spring (44) connected with the hydraulic cylinder (430);

a sliding base (45) pivotally mounted on the engaging columns (434) and connected with the spring (44) and having

a top;
two sliding columns (450) protruding on the sliding base (45)
and slidably mounted in the tracks (420) or the engaging troughs (422); and
a block trough (451) formed on the top of the sliding base (45)
and selectively engaging the engagement block (23).

4. The pushing-pulling device as claimed in claim 2, wherein the buffer device (40) has

two clamping plates (41) being elongated and abreast mounted in the door track (10) and combined with each other and having

a longitudinal direction;

a top; and

a bottom;

two track plates (42) being elongated and combined between the clamping plates (41) and combined with each other, and each track plate (42) having

a top;

a bottom;

an inner surface formed inside the track plate;

a longitudinal direction;

a track (420) formed in the inner surface along the longitudinal direction;

a shock-absorbing base (421) being wear-resistant and shock-absorbing and mounted on the inner surface; and

an engaging trough (422) being curved and formed in the shock-absorbing base (421) and communicating with the track (420);

a hydraulic buffer (43) mounted between the track plates (42) and having

a hydraulic cylinder (430) having two ends;

a sliding stick (431) slidably mounted in the hydraulic cylinder (430) and aligned with the tracks (420) and protruding out of the hydraulic cylinder (430) and having an end opposite to the hydraulic cylinder (430);

two engaging columns (434) protruding on the end of the sliding stick (431) and slidably mounted in the tracks (420);

a spring (44) connected with the hydraulic cylinder (430);

a sliding base (45) rotatably mounted on the engaging columns (434) and connected with the spring (44) and having

a top;

two sliding columns (450) protruding on the sliding base (45) and slidably mounted in the tracks (420) or the engaging troughs (422); and

a block trough (451) formed on the top of the sliding base (45) and selectively engaging the engagement block (23).

5. The pushing-pulling device as claimed in any one of claim 3 or 4, wherein the hydraulic buffer (43) further has two leak proof rings (432) mounted on the ends of the hydraulic cylinder (430).

6. The pushing-pulling device as claimed in claim 5, wherein

each engaging trough (422) has a trough inner diameter (d1); and

each track (420) has a track inner diameter (d2) shorter than the trough inner diameter (d1).

7. The pushing-pulling device as claimed in claim 6, wherein

each clamping plate (41) has

two plate flanges (410) protruding on the top and the bottom along the longitudinal direction of the clamping plate (41); and

a plate rib (411) protruding on the clamping plate (41) along the longitudinal direction; and

each track plate (42) abuts the plate flanges (410) by the top and the bottom of the track plate (42), and further has a plate trough (425) formed on the track plate (42) along the longitudinal direction of the track plate (42) and engaged with the plate rib (411).

8. The pushing-pulling device as claimed in claim 7, wherein each clamping plate (41) further has two anti-bump washers (412) mounted on two ends of the top of the clamping plate (41).

9. The pushing-pulling device as claimed in claim 8, wherein

the door track (10) further has an abutment base (13) mounted in the door track (10) and having

a buffer base (130);

two cushion plates (131) abreast connected with the buffer base (130), and each cushion plate (131) has a side facing the inner surface of the door track (10);

multiple plate fins (132) mounted on the sides of the cushion

plates (131) respectively and abutting the inner surface of the door track (10);

and

multiple cushions (133) mounted between the plate fins (132) respectively; and

the second hanging-wheel device (32) has an abutting block (321) selectively inserted between the cushion plates (131).

10. The pushing-pulling device as claimed in claim 9, wherein the first hanging-wheel device (31) has a first connecting base (313) combined with the door panel (30), and the second hanging-wheel device (32) has a second connecting base (323) combined with the door panel (30), wherein the first connecting base (313) and the second connecting base (323) both have

a combining plate (314) abutting the door panel (30) and having a top and a bottom;

a combining hole (315) formed in the combining plate (314);

a bolt (316) inserted into the combining hole (315);

two washers (317) mounted around the bolt (316) and abutting the top and the bottom of the combining plate (314);

a ring (318) mounted around the bolt (316) and in the combining hole (315); and

a nut (319) combined with the bolt (316) that is defined on the top of the combining plate (314).

11. The pushing-pulling device as claimed in claim 10, wherein the track plates (42) are combined with each other by multiple combining bases (423) and

multiple combining sticks (424).