Specification

Automatic crankshaft homing device having speed adjusting function.

Technical Field

This invention relates to a kind of automatic crankshaft homing device having speed adjusting function for door closer or floor spring can automatically slow closing the door panel after the door panel opened. More particularly, this invention provides an automatic homing device let the crankshaft of door closer, concealed transom closer or floor spring automatic slow homing with precise speed adjustment.

Technical Background

At present, the door closer which installed on the top of the door or the floor spring which installed on the bottom of the door provided with a crankshaft on basement which can be connected to the door panel. Moreover, the crankshaft can control the rotational speed by the hydraulic mechanism, which accumulate preparatory pressure when the crankshaft rotated from the door opening. When the door is released, the door panel is slowly rotated to homing to the closed position, because the hydraulic mechanism can provide a resistance to the homing rotation of the crankshaft.

The hydraulic mechanism is generally provided with an adjustment valve, which can adjust the opening rate of the oil return passage for the oil in the hydraulic mechanism. It is thereby adjusting the flow rate of the oil to adjust the volume of the preparatory pressure which from oil accumulation and then control the speed of automatic homing of the door panel.

However, the maximum angle of the opened door is between 90 to 180 degrees approximately, which means the distance from the crankshaft rotation by door panel is not long. The hydraulic mechanism must have the enough preparatory pressure from oil accumulation to resist the homing rotation of the crankshaft by short distance from the crankshaft rotation . Even if the adjustment valve of the hydraulic mechanism is slightly adjusted, the preparatory pressure accumulated in the hydraulic mechanism is greatly changed, resulting in difficult to precision adjust the preparatory pressure, and so let the speed of the door closing too slow or too fast.

In addition, the pressure required to rotate the rest of the machine shaft is reduced by a much lower speed ratio after a gear shift. Therefore, the resistance pressure required for the medium is relatively low in the case of the same load. In the current market, because the floor spring or door closer operate with high pressure, if it’s without strict quality control, it's easy to have leakage

situation. Moreover, after a certain period of time, the high pressure is also easy to damage the oil seal and oil leakage, affecting the product life.

The content of invention

The purpose of the present invention is to provide an automatic Crankshaft homing device having speed adjusting function, having a structure capable of increasing the move distance to provided between a crankshaft and an accumulating structure for automatically resetting the preliminary pressure to overcome the prior technical problem. So even a slight adjust to the hydraulic adjustment valve causes the hydraulic mechanism to accumulate the preparatory pressure to generate a greatly change, so it is difficult to precision adjust the preparatory pressure, which let door panel close too slow or too fast and because the oil leakage impacted negatively on product's service life.

In order to solve the above-mentioned problems, the present invention has an automatic crankshaft homing device having speed adjusting function , and it comprises components in a base as follow.

A crankshaft, a push component mounted on said crankshaft and have a push path.

A sliding component which receives a pushing path from said push component and having a tendency to push said slider toward along a move path from the first position to the second position.

A resilient component which provides a slider with a function of returning from the second position to the first position.

At least a first traction portion is provided on said slider. Fifthly, at least one energy storage component has a push portion for storing energy by the energy storage component by the movement of the push portion, and the stored energy may also generate a push effect by the push portion.

At least one push route conversion component coupled between the first traction portion and the push portion, and generate a longer move distance to the push portion then the first traction portion.

Wherein the push component comprises a cam, using the edge of the cam to have the push trajectory of the slider. The slider being interposed between the cam and the resilient component, the first traction portion comprises a first rack and it extends along the movement path; Said, energy storage component contained a cylinder, the push portion includes a cylinder rod (protruding from the cylinder) acting on the push route conversion component, and a second rack

having a function on the cylinder rod, and the other end of the cylinder with at least one flow regulating valve, said, the push conversion comprises a gear set, which meshing between the first rack and the second rack; the mentioned, the energy storage component equipped with an energy medium input and output component, The input and output component are further provided with a flow regulating valve, the cam can followed the crankshaft rotation and moved along the pushing path to move the slider to the resilient component direction, bring the first rack through the gear set to drive the cylinder rod by the second rack, and the resilient component is capable of elastically driving the slider toward the cam direction, bring the first rack through the gear set to reverse drive the cylinder rod by the second rack, ,wherein the cylinder sucks and discharges the medium via the piston and the flow regulating valve when the cylinder rod is driven, and the flow control valve can control the flow rate of the cylinder suction and discharge medium, thereby adjusting the push out speed when the push portion generated.

By means of the above, the crankshaft can be provided as the crankshaft or turning crankshaft of door closer, floor spring or conceal transom closer, said the door closer, floor spring or conceal transom closer can be install on the door panel. Said the resilient component in normal condition can elastically driving the slider to push the cam, when opening the door, cam and crankshaft can followed the door panel rotation to make the cam to drive the slider moving toward the resilient component direction, and compressing the resilient component, and the first rack moves in the direction of the resilient component with the slider, to make the first rack through the gear set to drive the second rack, and then drive the cylinder's rod and piston, to drive the cylinder through the flow regulating valve to suck the medium, to form a preliminary pressure to resist the automatically homing of the crankshaft.

When the door panel turned loose, the resilient component immediately releases the compression force and elastically drives the slider moving toward the cam direction, and the first rack followed the slider as well, to make the first rack through the gear set to drive the second rack, and then reverse drives the rod and the piston of the cylinder, to drive the cylinder body through the flow regulating valve to discharge media ; during which, because of the flow regulating valve limited the flow volume of the medium output from the cylinder, so, the second rack is moved slowly with the cylinder rod and the piston, that make the second rack through the gear set and slowly drive the first rack, make the slider to follow the first rack slowly push the cam and crankshaft to rotate return, to force the door to return to the closed position as the crankshaft slowly rotates.

In this way, the short-distance from rotation stroke of the crankshaft can be converted into a long-distance linear movement through the first rack and the gear set, the long-distance linear movement of the second rack, the cylinder rod and the piston compare to the short-distance from rotation of the crankshaft, is obviously easy to adjust by the flow regulating valve for precise movement; therefore, when attempt to adjust the speed of the door panel automatically return and closed, can through the flow regulating valve directly adjust flow of the medium when the cylinder

suction and discharge, then slightly adjust the second rack, cylinder rod and piston movement per second, and then precisely adjust the crankshaft automatically homing speed.
According to the above-described structure, the slider slide on at least one sliding track component. The slider is further set a guide component for string the resilient component. According to the above construction, the cam droved the cylinder rod out of the cylinder through the first rack, the gear set and the second rack, the resilient component through the first rack of the slider, the gear set and the second rack to drive the cylinder rod into the cylinder. Or, the cam through the first rack of the slider, gear set and the second rack to drive the cylinder rod into the cylinder, resilient component through the first rack of the slider, gear set and the second rack to drive the cylinder rod out of the cylinder. According to the above-mentioned structure, the push component is provided with a concave for the slider to fix position, and a convex for driving the slider to shift out.
According to the above-described structure, the part of the slider is provided with a roller capable of pressing against the push component, to reduce the frictional force between the slider and the cam, so that the cam and the slider can be smoothly transmitted with each other.
According to the above-described structure, the flow regulating valve includes a one-way discharge flow regulating valve and a suction flow regulating valve or a control valve, the discharge flow regulating valve capable of adjusting the discharge flow of the medium in the cylinder, to control the automatic closing speed of the door panel; and the one-way suction flow regulating valve or the control valve is capable of controlling the suction flow of the medium sucked into the cylinder, to control the door panel speed when accept opening.
According to the above-described structure, the second rack extends along with the displacement path, can save the second rack occupied installation space.
According to the above-described structure, the gear set can be set as the forming relative acceleration gear set from the first traction portion toward the pushing portion, to promote the linear movement distance of second rack, cylinder rod and piston.
According to the above-described structure, the base is provided with a stop bolts which limited the position of slider which produce movement from the first position toward the second position on the movement path, to limit the movement volume of the slider moving toward the resilient component direction.

The explanation of figure:

Figure 1a is an exploded view of a preferred embodiment of the present invention;
Figure 1b is an exploded view of a preferred embodiment 2 of the present invention;
Figure 2a is a detailed exploded view of Figure 1a;
Figure 2b is a detailed exploded view of Figure 1b;
Figure 3a is a partially enlarged view of Figure 1a;
Figure 3b is a partially enlarged view of Figure 1b;
Figure 4a is a top view of one use state of the embodiments of Figure 1a;

Figure 4b is a top view of one use state of the embodiments of Figure 1b;
Figure 5a is a top view of another use state of the embodiment of Figure 1a;
Figure 5b is a top view of another use state of the embodiment of Figure 1b.
Wherein the reference numerals in figure are explain as below:
1 is the base
101 is the first position
102 is the second position
103 is the moving trajectory
104 for the movement path
11 for the crankshaft
2 for the cam as a push component
21 is a concave part
22 is a convex part
3 is the resilient component
4 is the slider
41 is the first rack
410 is the first traction portion
42 for the roller
5 for the cylinder
50 for the energy storage component
51 is the cylinder rod
510 for the pushing portion
52 is a second rack
53 for the piston
6 for the gear set
60 is a push route conversion component
61, 62, 63, 64, 65, 66 as the gears
7 for the guide
70 as a sliding track component
8 for the flow adjustment valve
81 is a one-way discharge flow adjustment valve
82 is a one-way suction flow adjustment valve or control valve
9 as a stop bolt.

The concrete implement way

The detailed description of the preferred embodiments and the present invention will now be described in further detail with reference to the accompanying drawings and specific embodiments. In the present invention, Figs. 1a, 2a, 3a, 4a, and 5a are the better example 1 of automatic

crankshaft homing device having speed adjusting function, figure 1b, 2b, 3b, 4b and 5b are the better example 2.

Please refer to Figures 1a, 1b and 3a, 3b for the implementation method of the present invention icon, the mentioned icon explaining the present invention has the automatic crankshaft homing device having speed adjusting function, including in the base 1 is provided with a crankshaft 11, a push component 20, a slider 4, a resilient component 3, at least one first traction portion 410, at least one energy storage component 50, and at least a push route conversion component 60; the push component 20 is set on the crankshaft 11, the push component 20 has a push track 103 (as shown in Figures 5a, 5b); the slider 4 accepted the function of push track 103 from the push component 20, and have the tendency of push slider 4 along with movement path 104, from a first position 101(as shown in Figures 4a, 4b) slide toward a second position 102; resilient component 3 to the slider 4 provided with the function from second position 102 returned to first position 101 ; the first traction portion 410 is set on the slider 4; the energy storage component 50 has a push portion 510, through the movement of pushing portion 510, can make the energy storage component 50 stored energy and the stored energy can also push out by the push portion 510, push route conversion component 60 is connected between the first traction portion 410 and the push portion 510, let the push portion 510 has enlarged movement than the first traction portion 410.

In a more specific implementation, the push component 20 comprises a cam 2 which set on the crankshaft 11 for drive the cam 2 coaxial rotation with the crankshaft 11, use the edge shape of the cam 2 to from the movement path 103 of pushing the slider 4, and make the slider 4 able to slide along with the movement path 104 in between the cam 2 and the resilient component 3. The slider 4 is sliding on at least one slide track component 70, and the slide track component 70 can be a slide pin or slide base, and the slider 4 is set with at least one guide component 7 which through resilient component 3 and setting between the cam 2 and the resilient component 3, and the guide component 7 extends along with the movement path 104, the guide component 7 can set as a guide rod or guide base , and the slider 4 is slide on the guide 7. The first traction portion 410 includes a first rack 41 set on the slider 4 and the first rack 41 extends along with the movement path 104 on the surface of the slider 4.

The energy storage component 50 comprises a cylinder 5, which can be a pneumatic cylinder or a hydraulic cylinder, the cylinder 5 has a piston 53 set inside, the push portion 510 includes one cylinder rod 51 extending from cylinder 5 which function is to the push route conversion component 60, and a second rack 52 acting on the cylinder rod 51; in particular, the cylinder rod 51 is connected to the piston 53 and the second rack 52 set on the cylinder rod 51, so that the second rack 52 extends along with the movement path 104.

The cylinder 5 is provided with cylinder rod 51 at one end, an energy medium inlet and outlet component provided with a flow adjustment valve 8 are set on the energy storage component 50, in fact, the flow adjustment valve 8 can be set on the other side of cylinder 5. The flow adjustment valve 8 can control the medium flow of the suction and discharge of the cylinder 5, thereby

adjusting the push out speed that the push portion 510 produced. When the cylinder 5 is a pneumatic cylinder, the medium can be the gas; when the cylinder 5 is a hydraulic cylinder, the medium can be the oil.

The route conversion component 60 comprises a gear set 6, which included many intermeshing gears 61, 62, 63, 64, 65, 66, and the gears 61, 62, 63, 64, 65, 66 engaged between the first rack 41 and the second rack 52, and the gear set 6 can be set as relative speed up gear set from the first traction portion 410 toward the push portion 510. In the present embodiment, the first rack 41, the cylinder 5 and the gear set 6 can be set several sets , and the first rack 41 can be set on both sides of the slider 4, and the cylinder 5 and the gear set 6 can be set on both sides of the base 1, so that the slider 4 and the resilient component 3 are located between cylinder 5.

As shown in Figures 5a and 5b, the cam 2 is able to rotate with crankshaft 11, and drive the slider 4 along the movement track 103 toward the direction of the resilient component 3, to bring the first rack 41 through the gear set 6 to drive cylinder rod 51 by the second rack 52. As shown in Figs. 4a and 4b, the resilient component 3 is capable of resiliently drive the slider 4 moving to the direction of the cam 2, to bring the first rack 41 through the gear set 6 and the second rack 52 reverse drive cylinder rod 51.

In detail, the cam 2 through first rack 41 of the slider, the gear set 6 and second rack 52 to drive the cylinder rod 51 to move out from the cylinder 5, resilient component 3 through the first rack 41 of slider 4, the gear set 6 and the second rack 52 to drive the cylinder rod 51 retract to the cylinder 5. Or, cam 2 through the first rack of slider 4, the gear set 6 and the second rack 52 drive the cylinder rod 51 retract to the cylinder 5, the resilient component 3 through the first rack of slider 4, the gear set 6 and the second rack 52 to drive cylinder rod 51 move out from the cylinder 5.

During the cylinder rod 51 accepted the driving, the cylinder 5 sucks and discharges the medium via the piston 53 and the flow adjustment valve 8, and the flow adjustment valve 8 includes a one-way discharge flow adjustment valve 81 and a suction flow adjustment valve 82, the flow adjustment valve 8 can also be one capable of controlling the medium discharge and suction flow control valve. The one-way discharge flow adjustment valve 81 smoothly discharges the medium out of the cylinder 5, and can adjusted the discharge flow of the medium in the cylinder 5. The one-way suction flow adjustment valve 82 smoothly sucks the medium into the cylinder 5 and is capable of adjusting the suction flow when the medium into the cylinder 5

And the one-way suction flow adjustment valve 82 is closed when the cylinder 5 discharges the medium.

The end side of slider4 has provided with roller 42 which touchable the cam 2 of push component 20, to reduce the frictional force between the slider 4 and the cam 2 so that the cam 2 and the slider component 4 can be smoothly transmitted with each other. The cam 2 of the push component 20 have a concave part 21 for the roller 42 of the slider 4 to position by pushing, and a convex part 22 can drive the slider 4 toward the direction of the resilient component 3. The base 1

is provided with a stopper bolt 9 to limit the end position of slider 4 which move from second position 102 toward the first position 101 on the movement path 104, can limit and adjust the movement volume of slider 4 toward to the resilient component 3

Through the above-described components assembly, can set the crankshaft 11 as a crankshaft or rotation crankshaft of door closer, floor spring or a concealed transom closer, the mentioned door closer, floor spring or a concealed transom closer can install on the top or bottom of the door panel. Figures 4a and 4b depict that the resilient component 3 can resiliently drove the slider 4 to the first position 101 in normal condition and made the roller 42 of the slider 4 to push against the concave part 21 of the cam 2. As shown in Figs. 5a and 5b, when the door panel is opened, the cam 2 and the crankshaft 11 are able to rotate with the door panel, and made convex part 22 of the cam 2 along with the push path 103 to drive the slider 4 to the direction of the resilient component 3, and let the slider 4 moving to the second position 102, and force the slider 4 to press the resilient component 3 to store the elastic force, in the meantime, first rack 41 followed the slider 4 and moved to the direction of the resilient component 3, so that the first rack 41 via the gear set 6 to drives the second rack 52, and then drive the cylinder rod 51 and the piston 53 of the cylinder 5, to let the cylinder rod 51 move out of the cylinder 5, and drive the cylinder 5 to suck the medium through the one-way suction flow adjustment valve 82 to form a preliminary pressure for against the automatic homing of the crankshaft 11.

Referring to Figures 4a and 4b again, when the door is released, the resilient component 3 immediately releases the compressive force and resiliently drive slider 4 moving to the direction of the cam 2,and let the slider 4 move to the first position 101, and the first rack 41 followed slider 4 moving to the direction of cam 2, and let the first rack through the gear set 6 to drive the second rack 52, and then reverse drive the cylinder rod 51 and the piston 53 of the cylinder 5,to let the cylinder rod 51 retracted into the cylinder 5, and drive the cylinder 5 through the one-way discharge flow adjustment valve 81 to discharge the medium, in the meantime, because the one-way discharge flow adjustment valve 81 limit the flow of discharged medium from the cylinder 5 to the outside, so, the second rack 52 will move slowly by follow cylinder rod 51 and piston 53 , and let the second rack 52 through gear set 6 slowly drive the first rack 41, to let slider 4 followed the first rack slowly push against cam 2 and crankshaft 11 to rotate and return, force the door panel followed crankshaft 11 slowly turning and return to the close position.

According to the above, the short-distance from rotation distance of crankshaft 11, can pass the first rack 41 and gear set 6 to turned to the long-distance linear movement distance of the second rack 52, compare to the adjustment of short-distance from rotation distance of crankshaft 11, the long-distance linear movement distance of the second rack 52,cylinder rod 51 and piston 53, obviously easy to through the one-way discharge flow adjustment valve 81 to make the precise movement adjustment; therefore, when want to adjust the speed of door panel automatic return close, can through the one-way discharge flow adjustment valve 81 directly control the discharged medium flow of cylinder 5, can slightly adjusted the movement per second of the second rack 52,

cylinder rod 51 and piston 53, and then precise adjusted the automatic homing speed of crankshaft 11.

According to this, through in between the crankshaft 11 and the push portion 510 of energy storage component 50, set up the first traction portion 410, push route conversion component 60 and the second rack 52 that can increase the rotation distance of the crankshaft 11 , to reach the purpose of above mentioned precise adjusted automatic homing speed of crankshaft 11, and overcome the above mentioned prior technology, slightly adjusted hydraulic mechanism adjustment valve, but prduce the significant change of preparatory pressure which accumulate by hydraulic mechanism ,result in defects of the difficulty of precise adjusting preparatory pressure, and make the door panel easy to produce the closing speed too slow or too fast, and influence on its service life caused by oil leakage.

The above description is just the better embodiment of this invention, and any changes, modifications, alterations or equivalent permutations which extending in accordance with the technical means and scope of this invention are intended to fall within the protection range of the present applied patent.

Industrial applicability

The automatic crankshaft homing device having speed adjusting function provided by the present invention, through the crankshaft short-distance from rotation distance can pass the first rack and gear set converted into a long-distance linear movement distance of the second rack, compared with the adjustment of the short-distance from rotation distance of the crankshaft, the mentioned long-distance linear movement distance of the second rack, cylinder rod and piston, obviously easy to through the flow adjustment valve to make precise adjustment of the movement; therefore, when wanted to adjusted the door panel automatic return close speed, can through the mentioned flow adjustment valve and directly adjusted the cylinder flow of suction and discharge medium, and then can slightly adjusted the movement per second of the second rack, cylinder and piston, then precise adjusted the crankshaft automatic homing speed, with industrial applicability.

The claims

1. An automatic crankshaft homing device having speed adjusting function. Which is characterized in that, included set up in a base with: One crankshaft; one push component, set on the mentioned crankshaft, with a push path; one slider , accepted the push path function of the mentioned push component, and have the tendency of slide along with the movement path from first position toward the second position; one resilient component, provided the function of returning from the second position to the first position of the mentioned slider ; at least one traction portion, set up on the mentioned slider ; at least one energy storage component, have one push portion, pass through the mentioned movement function of push portion let energy storage component to store energy, the stored energy can through push portion produced the push out function; and at least one push route conversion component, connected between the mentioned first traction portion and push portion, to make the push portion relatively enlarge the movement than the first traction portion.

2. According to claim 1, wherein said the automatic crankshaft homing device having speed adjusting function, its characterize is at, the mentioned energy storage component is provided with an energy medium input / output component, said the component being further provided with a flow adjustment valve, the flow adjustment valve controls the flow of the energy storage component suction and discharge the medium, and adjusts the push out speed that the mentioned push portion produced.

3. As the claims 2 mentioned, the automatic crankshaft homing device having speed adjusting function, its characterize is at, the mentioned flow adjustment valve included one one-way discharged flow adjustment valve, and at least one one-way suction flow control valve.

4. As the claims 1 or 2 or 3 mentioned the automatic crankshaft homing device having speed adjusting function, its characterize is at, the said first traction portion included one first rack, and the first rack extended along with the said movement path.

5. According to claim 4, wherein said the automatic crankshaft homing device having speed adjusting function, its characterize is at, the said energy storage component included one cylinder, the mentioned push portion included one cylinder rod out from the cylinder and function on

the mentioned push route conversion component, and the second rack which setup on the cylinder rod.

6. According to claim 5, wherein said the automatic crankshaft homing device having speed adjusting function, its characterize is at, the mentioned route conversion component included onegear set, said gear set meshing between the first rack and the second rack.

7. According to claim 5, wherein said the automatic crankshaft homing device having speed adjusting function, its characterize is at, the mentioned second rack extended along with the movement path.

8. According to claim 1 or 2 or 3, wherein said the automatic crankshaft homing device having speed adjusting function, its characterize is at, the mentioned push route conversion component set up as from the first traction portion toward the push portion to form relatively accelerate gear set.

9. As claims 1 or 2 or 3, wherein said the automatic crankshaft homing device having speed adjusting function, its characterize is at, the mentioned push component included one cam, use the cam edge to form the mentioned push path of the slider component, and the slider is in between the cam and the resilient component.

10. As the claims 1 or 2 or 3, wherein said the automatic crankshaft homing device having speed adjusting function, its characterize is at, the mentioned slider component set up on at least one sliding track component.