

ADJUSTABLE TORQUE HINGE

PRIORITY

[0001] (1) This application claims the benefit of priority based upon Taiwanese Patent Application Ser. No. 099126071, filed on August 5, 2010 in the name of the same applicant, which is hereby incorporated into the present application by reference.

(2) This application claims the benefit of priority based upon People's Republic of China (PRC) Patent Application Ser. No. 201010273481.5, filed on September 7, 2010 in the name of the same applicant, which is hereby incorporated into the present application by reference.

FIELD

[0002] The present invention relates to a hinge type device, and, more particularly, an adjustable torque hinge used for pivotal rotation purposes.

BACKGROUND

[0003] Most pivot-rotating objects generally apply a hinge device mounted on a fixed object, wherein the object rotates to perform open and close operations, for example: door panels, windows, cabinet doors, etc. Referring to FIG. 1 of a well-known recovery torque hinge device **10**, said device includes a first wing plate **11**, a second wing plate **12**, a washer **13**, a pivot **14**, two set screws **15**, a torque spring **16**, an adjusting sleeve **17** and an adjusting pin **18**; the first and second wing plates **11**, **12** are respectively employed on the door panel and frame (not shown), and the sides of said wing plates include counterpart pin joint sleeve members **111**, **121**. The sleeve members **111**, **121** are interactively superimposed, wherein a washer **13** is interposed between the sleeve members for pivotal rotation. The pivot **14** is inserted inside the pin joint sleeve members **111**, **121**, whereby the first and second wing plate **11**, **12** match to form a pin joint. The two set screws **15** are threadedly employed at the outside

peripheral surface of the pin joint sleeve member **111** of the first wing plate **11**, thereby, the pivot **14** being tightly screwed and fixed, the pivot **14** having a bearing rod **141** that extends from the bottom of pivot **14**. The adjusting sleeve **17** can rotatably sleeve inside the pin joint sleeve member **121** of the second wing plate **12**; a dent area at the center consists a bearing hole **171** to enable the bearing rod **141** to sleeve inside, and a torque spring **16** is set on the bearing rod **141**, wherein the top side is mounted and fixed on the pivot **14** with the bottom side mounted and fixed on the adjusting sleeve **17** so that torque spring **16** can operate on the first and second wing plates **11**, **12**. An expected amount of torque force is created by the hinge device **10** to automatically close the door. Moreover a slide slot **122** is located in the circumferential direction at the bottom of the pin joint sleeve member **121** of the second wing plate **12**, and the outer periphery of the adjusting sleeve **17** consists a number of insert holes **172** at the dent locations of the corresponding slide slot **122**; the adjusting pin **18** can be inserted into one of the insert holes **172** at the desired position through the slide slot **122**. After the adjusting pin **18** slides along with rotation of the adjusting sleeve **17** to abut against the inner wall of the slide slot **122**, the torque spring **16** begins to twist and store energy. As a result, the user can insert the adjusting pin **18** into different insert holes **172** to adjust the torque spring **16** to produce different values of torque force.

[0004] The previously described hinge device **10** features with a recovering torque effect which still, however, exists with disadvantages. The well-known hinge device **10** employs an adjusting pin **18** to first block the inner wall of the slide slot **122** before the adjusting sleeve **17** begins to twist the torque spring **16** to produce torque. However, the slide slot **122** can be opened with only just a small distance which results in limited adjusting of torque size. Moreover, the adjusting of the hinge device **10** employs the inserting of the adjusting pin **18** into different positions of the insert holes **172**. This type of inset-adjustment operation consumes much time and shows to be inconvenient.

SUMMARY

[0005] The objective of the invention herein is to provide an adjustable torque hinge which accumulates pressure in both normal and reverse directions to adjust the torque force in a convenient manner.

[0006] With this invention, there is provided an adjustable torque hinge set comprising of a hinge unit, a torque providing unit and a torque adjusting unit. The hinge unit includes a first wing plate, a second wing plate, a first sleeve and second sleeve. The first wing plate includes a set of first sleeve knuckles, and the second wing plate includes a set of second sleeve knuckles, which the second sleeve knuckles couple with the first sleeve knuckles. A movable connection is formed by the combined first and second sleeves, and a first cam is included with the first sleeve; the torque providing unit includes a movable pivot located between the first and second sleeve knuckles, and an overlay torque spring on the pivot. The outer periphery of the pivot is connected with the first sleeve knuckles to form a movable connection with the first wing plate, and the torque spring end working on the pivot; the torque adjusting unit includes a torque adjustment member which is movable inside the first sleeve, and also a spring on the torque adjustment member. The outer periphery of the torque adjustment member includes a second cam, and the second and first cams couple together as the torque adjustment member receives a resilient resistance force by the spring. A dent located at the outer edge of the torque adjustment member provides tools to drive the adjustment hole, as the other end of the torque spring works on the torque adjustment member to enable the torque adjustment member rotate along a certain direction to move the coupled first cam and second cam to rotate in the opposite direction resulting in idle rotation.

[0007] The performance of the invention herein uses a torque spring of a torque providing, which a torque adjustment member enables the torque spring to freely adjust the torque force. The design enables torque adjusting in a convenient manner.

[0008] Additional features and benefits of the present invention will become apparent from the detailed description, figures and claims set forth below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The present invention will be understood more fully from the detailed description given below and from the accompanying drawings of various embodiments of the invention, which, however, should not be taken to limit the invention to the specific embodiments, but are for explanation and understanding only.

FIG.1 is an exploded view of a well-known hinge device;

FIG.2 is an elevation view of the adjustable torque hinge of the present invention in accordance with a preferred embodiment;

FIG.3 is an exploded view of the above preferred embodiment;

FIG.4 is an exploded view of the above preferred embodiment;

FIG.5 is a cut-away view of the above preferred embodiment;

FIG.6 is an exploded view of the above preferred embodiment;

FIG.7 is a perspective view of the above preferred embodiment;

FIG.8 is a cross-sectional view of the above preferred embodiment;

FIG.9 is a cross-sectional view of the above preferred embodiment;

FIG.10 is an actuation view of the above preferred embodiment (1);

FIG.11 is an actuation view of the above preferred embodiment (2); and

FIG. 12 is an actuation view of the above preferred embodiment (3).

DESCRIPTION OF MAIN COMPONENT SYMBOLS

20..... Hinge unit

21..... First wing plate

211..... First sleeve knuckle
 22..... Second wing plate
 221..... Second sleeve knuckle
 222..... Engaging member
 23..... First sleeve
 231..... pin face
 233..... First cam
 24..... Second sleeve
 241..... Pin face
 242..... Slide slot
 25..... Stop pin
 30..... Torque providing unit
 31..... Pivot
 311..... Protrusion
 312..... Slot
 313..... Cam portion
 32..... Torque spring
 321..... Stand
 322..... Second stand
 40..... Torque adjusting unit
 42..... Torque adjustment member
 421..... Second cam
 422..... Slot
 423..... Adjustment hole
 43..... Spring
 50..... Speed adjusting unit

52.....	Speed adjustment member
521.....	Adjustment hole
522.....	Threaded segment
53.....	Resilient member
54.....	Cam member
541.....	Guide block
542.....	Cam face
543.....	Locating slot
544.....	Second locating slot

DETAILED DESCRIPTION

[0010] The previous description of the present invention and its other technological descriptions, characteristics and performances are described in detail with the drawings of a preferred embodiment.

[0011] Those of ordinary skills in the art will realize that the following detailed description of the embodiment of present invention is illustrative only and is not intended to be in any way limiting. Other embodiments of the present invention will readily suggest themselves to such skilled persons having the benefit of this disclosure. Reference will now be made in detail to implementations of the present invention as illustrated in the accompanying drawings.

[0012] In the interest of clarity, not all of the routine features of the implementations described herein are shown and described. It will, of course, be appreciated that in the development of any such actual implementation, numerous implementation-specific decisions must be made in order to achieve the developer's specific goals, such as compliance with application- and business-related constraints, and that these specific goals will vary from one

implementation to another and from one developer to another. Moreover, it will be appreciated that such a development effort might be complex and time-consuming, but would nevertheless be a routine undertaking of engineering for those of ordinary skills in the art having the benefit of this disclosure.

[0013] Referring to FIGS. 2-4, the adjustable torque hinge of the invention herein is in accordance to a preferred embodiment, shown here particularly use to door panels, comprises a hinge unit **20**, a torque providing unit **30**, a torque adjusting unit **40** and a speed adjusting unit **50**. The shape and patterns of the members and assemblies in accordance to this embodiment are described in detail as follows.

[0014] The hinge unit **20** includes a first wing plate **21**, a second wing plate **22**, a first sleeve **23**, a second sleeve **24** and two stop pins **25**. The side of the first wing plate **21** includes small-sized and large-sized first sleeve knuckles **211** to couple with the three second sleeve knuckles **221** located on the side of the second wing plate **22**. The inner wall of each of the second sleeve knuckles **221** includes two engaging members **222**. The first sleeve **23** is inserted into the first sleeve knuckle **211** through the second sleeve knuckle **221** at one end of the second wing plate **22**, and the second sleeve **24** is inserted into the first sleeve knuckle **211** through the second sleeve knuckle **221** at the other end of the second wing plate **22**. The outer periphery of the first and second sleeves **23**, **24** include two pin faces **231**, **241** which couple with the engaging member **222**. Two stop pins **25** are screwed into the outer peripheries of the first and second sleeves **23**, **24** through the second sleeve knuckles **221**, as such the first and second sleeves **23**, **24** are limitedly fixed within the second sleeve knuckles **221**.

[0015] Referring to FIGS. 4 and 7, the torque providing unit **30** includes a pivot **31** and a torque spring **32**. The pivot **31** is movable and located within the first sleeve **23**, and has a pair of angularly spaced-apart protrusions **311** protruding from a central portion of an outer periphery of the pivot **31**. The protrusions **311** are mounted within the first sleeve knuckle **211** of the first wing plate **21** to form a movable connection between the pivot **31** and the first

wing plate **21**. The top edge of the protrusion **311** includes a slot **312**, and the pivot **31** includes two symmetrical cam portion **313** at the sides of the protrusion **311**. The two ends of the torque spring **32** respectively include a stand **321** and a second stand **322**, and the stand **321** is inserted into the slot **312** of the pivot **31** to enable the torque spring **32** end work on the pivot **31**.

[0016] Referring to FIGS. 7 and 8, the torque adjusting unit **40** includes a torque adjustment member **42** and a spring **43**. The first sleeve **23** includes a torque adjustment member **42**, a spring **43**, a torque spring **32** and inserted pivot **31** inside. The inside wall of the first sleeve **23** is surrounded with a gear-shaped first cam **233** (as shown in FIG. 5). The relative outer periphery of the torque adjustment member **42** includes a gear-shaped second cam **421** which couples with the first cam **233** as a movable combination. The edge of the outer periphery of the torque adjustment member **42** includes a slot **422** and the torque spring **32** includes a second stand **322** which is inserted to the slot **422**, and allows the torque spring **32** to work towards the torque adjustment member **42**. The outer end of the torque adjustment member **42** is exposed at the outer side of the first sleeve **23**, and is formed with a dent hexagonal adjustment hole **423**. The adjustment hole **423** allows permitted tools (for example: hex keys) to drive the torque adjustment member **42** and turn back the torque spring **32**, and obtain a performance in adjusting the torque force. The inner side of the torque adjustment member **42** can be inserted with a spring **43**, which the spring **43** has a resilient resistance against the torque adjustment member **42** to maintain the second cam **421** and first cam **233** remain its geared-coupling to position the angular position of the torque adjustment member **42** after rotation. When the user presses the torque adjustment member **42** with force, the turn back effect of the torque spring **32** would drive the torque adjustment member **42** to separate the second cam **421** with the first cam **233** to release the torque spring **32** back to its most relaxed status.

[0017] Referring to FIGS.6-8, the speed adjusting unit **50** comprises of a speed

adjustment member **52**, several resilient members **53** and a cam **54**. The speed adjustment member **52**, resilient members **53** and cam **54** can be inserted inside the second sleeve **24**. Outside of the speed adjustment member **52** includes a tool to insert and turn the adjustment hole **521**. The outer periphery of the inner side includes a connected threaded segment **522** with the second sleeve **24**. The outer periphery of the cam **54** includes two guide blocks **541** and two slide slots **242** at the inside wall of the second sleeve **24**. The cam portion **313** facing towards the pivot **31** includes a cam face **542**, wherein a locating slot **543** and second locating slot **544** is respectively located at the dent positions of the cam face **542** at appropriate angular positions. The cam **54** is resisted by the top of the cam portion **313** and moves toward the direction of the resilient member **53**. The resilient member **53** then contacts with the cam member **54** to create a friction resistance towards the pivot **31** to control the rotary speed of the door panel. In this embodiment, the resilient member **53** is consisted with several conical washers (or either can be replaced by compression springs). The thread rotation speed of the adjustment member **52** can change the size of the friction resistance of the resilient member **53** to the pivot **31**. The mechanism enables to adjust the rotary speed of the door panel.

[0018] The above gives a description of the various members and assembly patterns for the present invention of an adjustable torque hinge; the operation movements of the present invention are further described as follow:

[0019] When the user opens a door panel installed with the invention, the first and second wing plates **21**, **22** will pivot rotate counterclockwise in relative to the first and second sleeve knuckles **211**, **221**. The rotational direction would cause the first and second cams **233**, **421** to couple with each other. At the very moment, the first cam **233** drives the second cam **421** to rotate, and further causes the turn back of the torque spring **32** to store energy.

[0020] After the door is opened, the first and second wing plates **21**, **22** shall create a returning torque due to the energy storage by the torque spring **32**. With the condition of nobody operating the door, the door panel would automatically produce a door shutting

movement with the returning torque.

[0021] In one embodiment, a torque adjusting unit **40** adjusts the closing force to the door panel. The user first uses a tool (such as a hex key) to insert into the adjustment hole **423** of the torque adjustment member **42** and turn. As the torque adjustment member **42** drives the second cam **421** to rotate counterclockwise, the first cam **233** pushes back the second cam **421**. At the same time the rotation of the second cam **421** shall press the torque spring **32** to increase the torque. After the tool is released, the torque adjustment member **42** shall automatically make the second cam **421** lock with the first cam **233** due to the resilient resistance by the spring **43**. As a result, the torque spring **32** is positioned at the desired angle position and consisting a suitable torque force.

[0022] In a general situation, if the first wing plate **21** is fixed onto a door panel, making the second wing plate **22** as the stationary plate, the pivot **31** in connection with the first wing plate **21** becomes the rotational bearing. As the first wing plate **21** rotates, the torque spring **32** uses the second stand **322** as pivot point and stand **321** shall rotate with the door panel to start accumulating pressure. Furthermore, if the first wing plate **21** is fixed to a door frame, which the second wing plate **22** serves as the rotating plate, the first sleeve **23** and second sleeve **24** would become the pivoted axle with the rotation of the second wing plate **22**. The torque spring **32** would apply stand **321** as the fixed pivot point, and the second stand **322** would rotate with the door panel to start accumulating pressure. The present invention is able to accumulate pressure in both normal and reverse rotations, which the present invention is therefore suitable for either left-opening or right-opening door panels and may use the same sets of hinge devices for installation.

[0023] Referring to FIG.9, when the user gently pushes the door panel to close the door, the cam portion **313** of the pivot **31** would move with an angular direction with the cam face **542** of the cam member **54**. The cam **54** presses against the resilient member **53** to produce a resistance to control the rotary speed of the door panel. Referring to FIG.10, when the cam

portion **313** begins to escape from the locating slot **543**, the overall rotary speed of the door panel would appear faster as the inclination contact with the cam member **54** is rather leveled and has less friction resistance to the pivot **31**. When the door panel is opened between 0 to 30 degrees, the friction force is least (nearly none friction), and the door panel would use its fastest speed for door-shutting operations. Referring to FIGS.11 and 12, when the rotational angle of the door panel is between 30 to 45 degrees, the inclination between the cam face **542** of the cam member **54** and cam portion **313** of the pivot **31** is steeper, also with the addition of the resilient resistance of the resilient member **53** against the cam member **54**, the friction resistance toward the pivot **31** becomes larger and the door panel will close with a slower speed.

[0024] Further referring to FIG.7, when the user pushes the door panel to open the door, when the opening angle of the door panel reaches to a suitable angle, the cam **54** receives a resilient resistance from the resilient member **53** and the above locating slot **543** or second locating slot **544** will lock the cam portion **313** on the pivot **31**. The door panel is opened to a certain angle and fixed, ceasing any closing effects.

[0025] The present adjustable torque hinge solves the using problems of the well-known hinge device **10**. The technological means and advantages of the present invention include mainly of the following:

(1). Produces an automatically open and close operation: The present invention uses a torque spring **32** of a torque providing unit **30**, to provides a constant output torque force to the first and second wing plates **21**, **22** to enable the door panel perform an automatic shut-door effect.

(2). Controllable rotation force: The torque adjusting unit **40** of the present invention can insert a tool to turn the torque adjustment member **42** to drive and change the torque value of the torque spring **32**, which is used to control the torque force toward the door panel. The adjusting operation is fast and convenient. In addition, the torque adjustment

member **42** has a 360-degree rotation; the tightness of the torque spring **32** would not be limited by the angle, as the user can arbitrarily adjust the torque spring **32** to produce a suitable torque.

(3). Controllable rotary speed: The present invention includes a speed adjusting unit **50** to adjust the rotary speed of the door panel. Inside the speed adjusting unit **50** includes a resilient member **53** which creates a brake damper effect to the speed adjustment member **52**. This slows the pivotal rotation of the door panel to avoid strong collisions of the door panel to the door frame. Furthermore, the user only needs to use a tool towards the speed adjustment member **52** to perform adjusting. The operations of speed control are both quite fast and convenient.

(4). Smooth rotation: During the door opening rotation process, the two wing plates **21, 22** of the present invention applies the pin joint combination between the first and second sleeves **23, 24** with the first sleeve knuckles **211** and second sleeve knuckles **221** to block the loading influence to the inside members. As a result the two wing plates **21, 22** rotate smoothly.

[0026] The above description is only for the preferred embodiment of the present invention, and should not be limited to the scope of the present invention. Any simple equivalent changes or modifications within the scope of the present invention and description remain to be within the scope of this invention. The hinge device can be broadly applied, such as doors, windows, cabinet doors, notebooks, mops, and other movable connections.

CLAIMS

What is claimed is:

1. An adjustable torque hinge comprising:

a hinge unit having a first wing plate, a second wing plate, a first sleeve and a second sleeve, said first wing plate including a set of first sleeve knuckles, said second wing plate including a set of second sleeve knuckles, said sets of first and second sleeve knuckles being coupled together, said first sleeve being sleeved in said first and second sleeve knuckles, with its outer periphery connected co-movably to said second sleeve knuckle, said first sleeve is provided with a first cam therein, wherein said outer periphery of said first sleeve includes an engaging surface fitted in said second sleeve knuckles, and wherein said hinge unit further includes a stop pin extending through one of said second sleeve knuckles to fix said first sleeve relative to said second sleeve knuckles;

a torque providing unit having a movable pivot extending through said first and second sleeve knuckles, and a torque spring sleeved on said pivot, an outer periphery of said pivot being connected co-movably to said first sleeve knuckles of said first wing plate, said torque spring having one end working on said pivot; and

a torque adjusting unit having a movable torque adjustment member set within said first sleeve, and a spring disposed on the torque adjustment member, said torque adjustment member having an outer periphery that is provided with a second cam, said spring biasing resiliently said torque adjustment member to couple said second cam to said first cam, an outer end of said torque adjustment member being formed with an adjustment hole for driving operation of a tool, said torque spring having the other end working on said torque adjustment member such that when said torque adjustment member rotates in a direction, said first cam and second cam are coupled to each other to be co-rotatable and when said torque adjustment member rotates in another direction, said first cam and second cam are uncoupled to rotate in an opposite direction resulting in idle rotation.

2. The adjustable torque hinge according to claim 1, wherein said outer periphery of said pivot includes a protrusion mounted inside one of said first sleeve knuckles, and wherein said protrusion has a slot for insertion of said one end of said torque spring.

3. The adjustable torque hinge according to claim 1, further comprising a speed adjusting unit including a speed adjustment member that is threadedly disposed

within said second sleeve, a resilient member that is disposed in said second sleeve and that is able to be pressed by said speed adjustment member, and a cam member that is disposed movably in said second sleeve and that is able to be pressed by said resilient member.

4. The adjustable torque hinge according to claim 3, wherein said pivot includes a cam portion, said cam member being biased by said resilient member to contact the pivot cam member so as to generate a resisting force.

5. The adjustable torque hinge according to claim 4, wherein said cam member is formed with a locating slot for insertion of said cam portion at a predetermined angular position.