(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
9 February 2012 (09.02.2012)

PCT

(10) International Publication Number
WO 2012/018361 A1

(51) International Patent Classification:
E05F 1/12 (2006.01)

(21) International Application Number:
PCT/US2010/054696

(22) International Filing Date:
29 October 2010 (29.10.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
099126071 5 August 2010 (05.08.2010) TW
201010273481.5 7 September 2010 (07.09.2010) CN

(71) Applicants: **HUI-FANG, Shaw, Hwee** [US/US]; 1395 Shenandoah Road, San Marino, CA 91108 (US). **WATERSON CORP.**; No.11 Dougong 12th Road, Douliou City, Yunlin County 64069 (TW).

(72) Inventor; and
(71) Applicant : **CHEN, Waterson**; 9f, No. 428, Wu Chung South Road, Taichung 40246 (TW).

(74) Agent: **WU, James, M.**; JW Law Group, 84 West Santa Clara Street, Suite 820, Santa Clara, CA 95113 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *with amended claims (Art. 19(1))*

(54) **Title**: ADJUSTABLE TORQUE HINGE

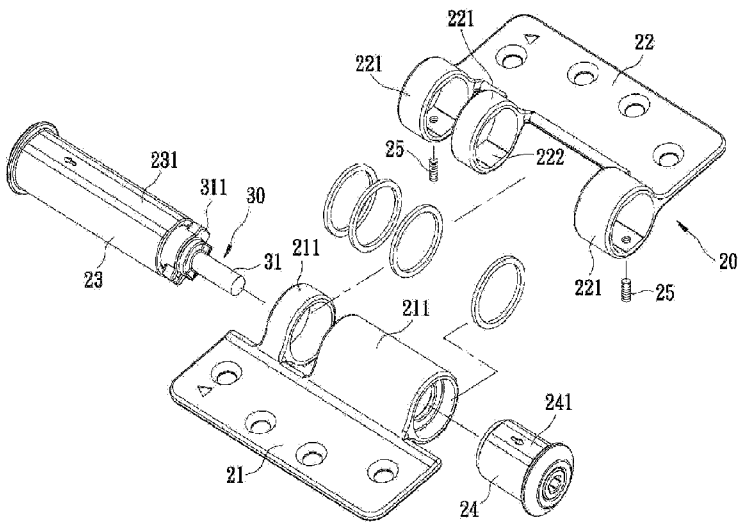


Fig. 3

(57) **Abstract**: An adjustable torque hinge includes a set hinge, a torque providing unit and a torque adjusting unit, the set hinge unit couples a first and second wing plate with a pivot pin, wherein the first and second wing plate forms a pin joint with a first sleeve and second sleeve; the torque providing unit includes a torque spring to provide turn back recovery, a torque adjusting unit which consists a torque adjustment member; the first sleeve includes a first cam inside, and the torque adjustment member includes a second cam which couples with the first cam to drive the torque adjustment member to perform torque adjustment to the torque spring, whereby the conversion between the first and second sleeves enables the bearing hinge to be used in both directions such that the present invention can accumulate pressure both in normal and reverse directions to adjust the torque force for open and close operations.

WO 2012/018361 A1

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**, with said device comprising of a recovery torque which 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 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; two set screws **15** are employed at the outside peripheral surface of the first wing plate **11** and pin joint sleeve member **111**, which the pivot **14** is tightly screwed and fixed, with a bearing rod **141** 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 longitude 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 the insert holes **172** at the desired position from the slide slot **122**, wherein the adjusting pin **18** rotates with the adjusting sleeve **17** and blocks the inner wall of the slide slot **122**, and the torque spring **16** begins to turn back and store energy. As a result, the user can insert the adjusting pin **18** into different positions of the 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 with the torque spring **16** turn back 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 ..... Pin 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 member

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 follow.

[0014] The hinge unit **20** includes a first wing plate **21**, 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 a set of small and large size 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 the second sleeve knuckles **221** includes two pin members **222**. The first sleeve **23** is inserted into the first sleeve knuckle **211** from one end of the second sleeve knuckle **221**, and the second sleeve **24** is inserted into the second sleeve knuckle **221** from one end of the first sleeve knuckle **211**. The outer periphery of the first and second sleeves **23, 24** include two pin faces **231, 241** which couple with the pin member **222**. Two stop pins **25** are screwed into the outer periphery of the first and second sleeves **23, 24** from the second sleeve knuckle **221**, such as 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 a protrusion **311** is each included at the center of the outer periphery on top and bottom. The protrusion **311** is 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 members **313** at the sides of the protrusion **311**. The two ends of the torque spring **32** respectively include a stand **321** and 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 edge of the torque adjustment member **42** is exposed at the outer side of the first sleeve 23, including a dent hex-shape 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 member **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 member **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 member **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 member **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 **54**2 of the cam member **54** and cam member **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 member **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 second sleeve, within the said first wing plate includes a set of first sleeve knuckles, the said second wing plate includes a set of second sleeve knuckles, which said knuckle sets couple together, the first sleeve is sleeved between the first and second sleeve knuckles, with its outer periphery connected to the second sleeve knuckle to form a movable device with the second wing plate, which the first sleeve includes a first cam within;

a torque providing unit having a movable pivot located between the knuckles of the first and second sleeves, and an overlay torque spring on the pivot, the outer periphery of with said pivot is connected to the first sleeve knuckle to form a movable device with the first wing plate, and the torque spring end working on the pivot; and

a torque adjusting unit having a movable torque adjustment member set within the first sleeve, and an overlay spring on the torque adjustment member, with the outer periphery of said torque adjustment member includes a second cam, which the spring resists the torque adjustment member to couple the second cam and first cam, whereas 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 said 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.

2. The adjustable torque hinge according to claim **1**, wherein the outer periphery

of the said first sleeve includes an overlay pin face with the second sleeve knuckle, and wherein said second sleeve is inserted with a stop pin to limit and stabilize the first sleeve.

3. The adjustable torque hinge according to claim **1**, wherein the outer periphery of the said pivot includes a projection mounted inside the first sleeve knuckle, and wherein said projection includes an insert slot for turn back of the spring.

4. The adjustable torque hinge according to claim **1**, wherein the said speed adjusting unit includes speed adjustment member which consists a screw within the second sleeve, and wherein said speed adjusting unit includes a resilient member able to withstand the resistance from the speed adjustment member, and a movable resilient member inside the second sleeve which can withstand the resilient resistance of the cam member.

5. The adjustable torque hinge according to claim **4**, wherein the said pivot includes a cam member, said cam member creates resistance when receiving resilient resistance from the resilient member and have contact with the pivot cam member.

6. The adjustable torque hinge according to claim **5**, wherein the cam member includes a cam member inserted in the locating slot of a dent position at an expected angle.

AMENDED CLAIMS
received by the International Bureau on02 March 2011 (02.03.2011)

1. An adjustable torque hinge comprising:

a hinge unit having a first wing plate, a second wing plate, a first sleeve and second sleeve, within said first wing plate includes a set of first sleeve knuckles, said second wing plate includes a set of second sleeve knuckles, which said knuckle sets couple together, said first sleeve is sleeved between said first and second sleeve knuckles, with its outer periphery connected to said second sleeve knuckle to form a movable device with said second wing plate, which said first sleeve includes a first cam, wherein said outer periphery of said first sleeve includes an overlay pin face with said second sleeve knuckle, and wherein said second sleeve is inserted with a stop pin to limit and stabilize said first sleeve;

a torque providing unit having a movable pivot located between said knuckles of said first and second sleeves, and an overlay torque spring on said pivot, said outer periphery of with said pivot is connected to said first sleeve knuckle to form a movable device with said first wing plate, and said torque spring end working on said pivot; and

a torque adjusting unit having a movable torque adjustment member set within said first sleeve, and an overlay spring on the torque adjustment member, with said outer periphery of said torque adjustment member includes a second cam, which the spring resists said torque adjustment member to couple the second cam and first cam, whereas a dent located at the outer edge of said torque adjustment member provides tools to drive the adjustment hole, as the other end of said torque spring works on said torque adjustment member to enable said 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.

2. (Canceled).

3. The adjustable torque hinge according to claim 1, wherein said outer periphery of said pivot includes a projection mounted inside said first sleeve knuckle, and wherein said projection includes an insert slot for turn back of the spring.

4. The adjustable torque hinge according to claim 1, wherein said speed adjusting unit includes speed adjustment member which consists a screw within said second sleeve, and wherein said speed adjusting unit includes a resilient member able to withstand the resistance from said speed adjustment member, and a movable resilient member inside said second sleeve which can withstand the resilient resistance of the cam member.

5. The adjustable torque hinge according to claim 4, wherein said pivot includes a cam member, said cam member creates resistance when receiving resilient resistance from said resilient member and have contact with the pivot cam member.

6. The adjustable torque hinge according to claim 5, wherein the cam member includes a cam member inserted in the locating slot of a dent position at an expected angle.

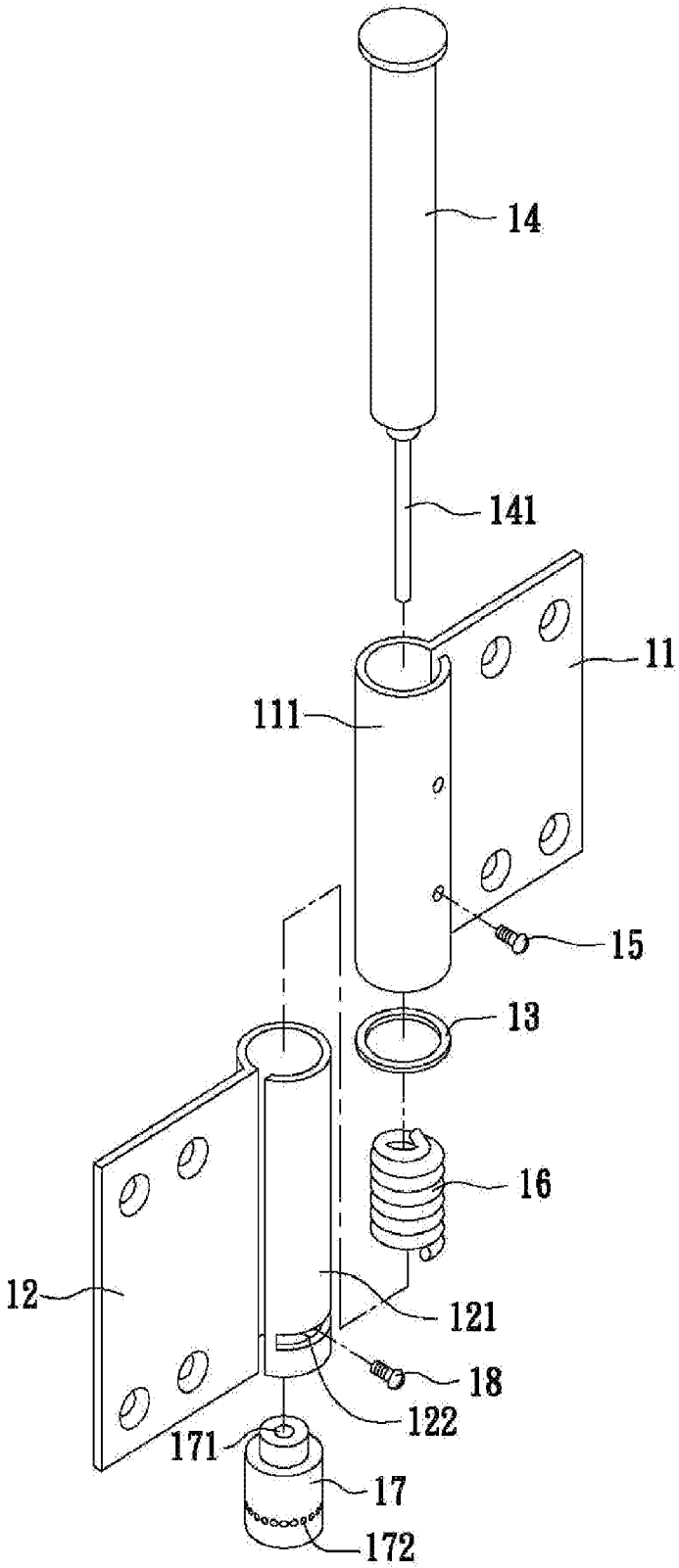


Fig. 1

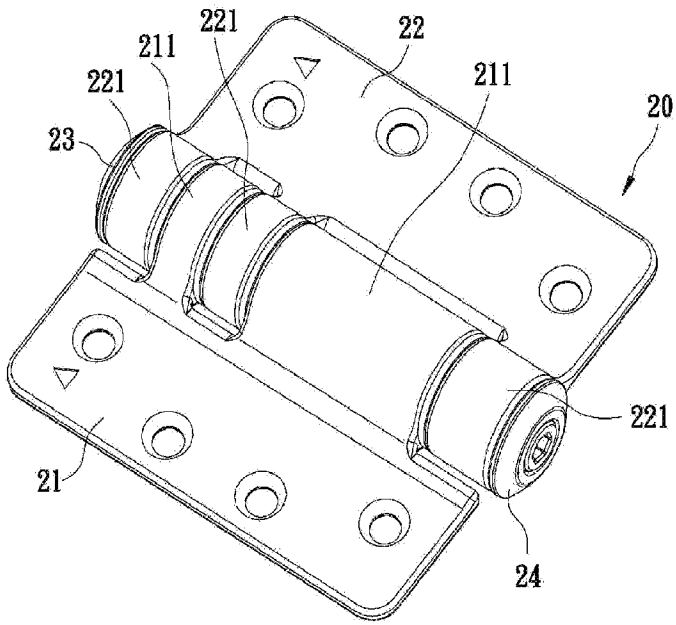

221
211
22
221
211
20
23
221
21
24

Fig. 2

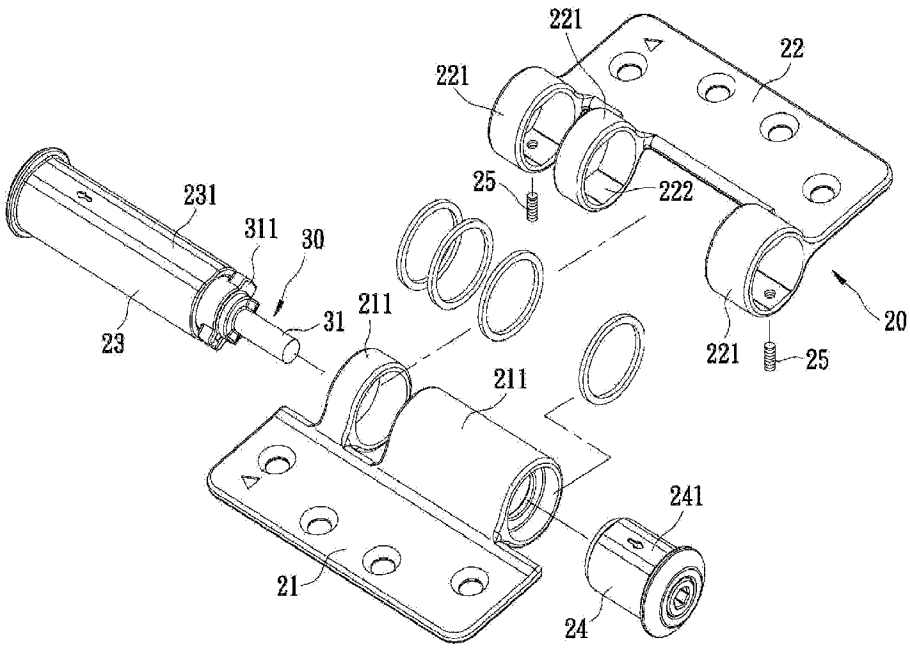

221
22
221
25
222
231
311
30
20
23
31
211
221
25
211
241
21
24

Fig. 3

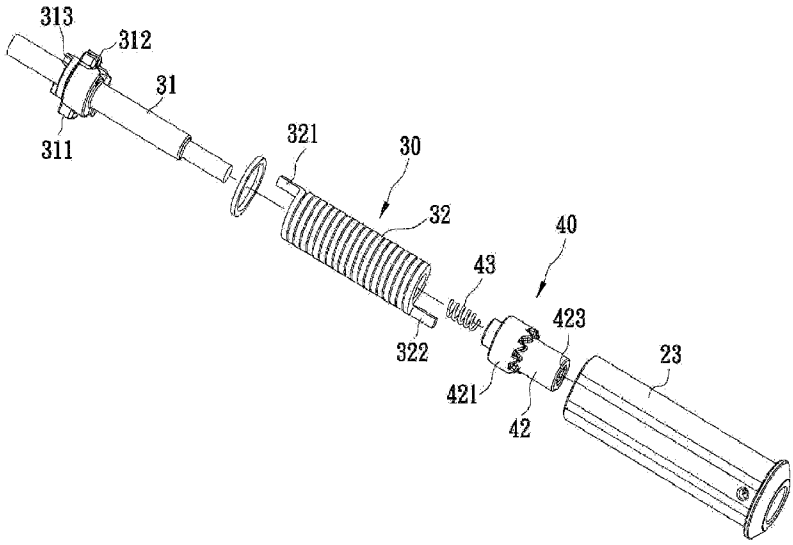


Fig. 4

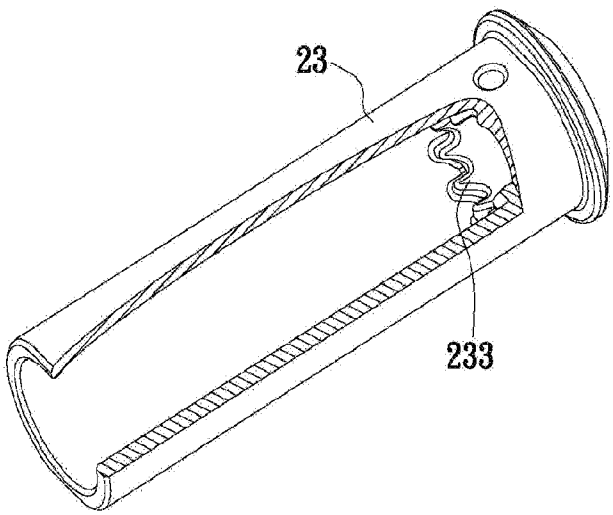


Fig. 5

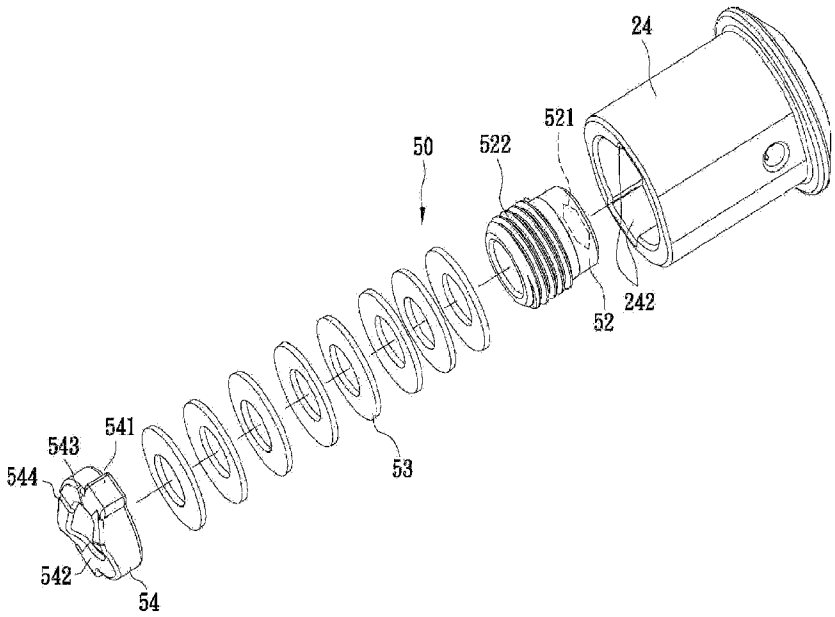

24
521
50
522
52
242
53
541
543
544
542
54

Fig. 6

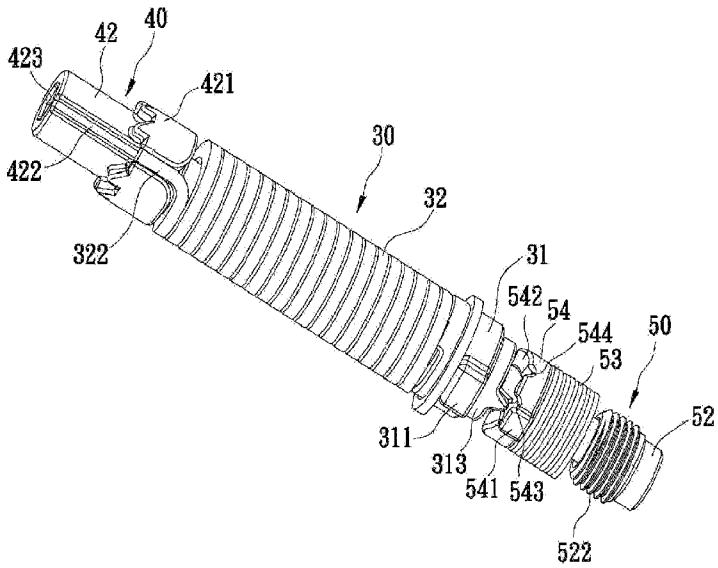

42
40
423
421
30
422
32
322
31
542
54
544
50
53
52
311
313
541
543
522

Fig. 7

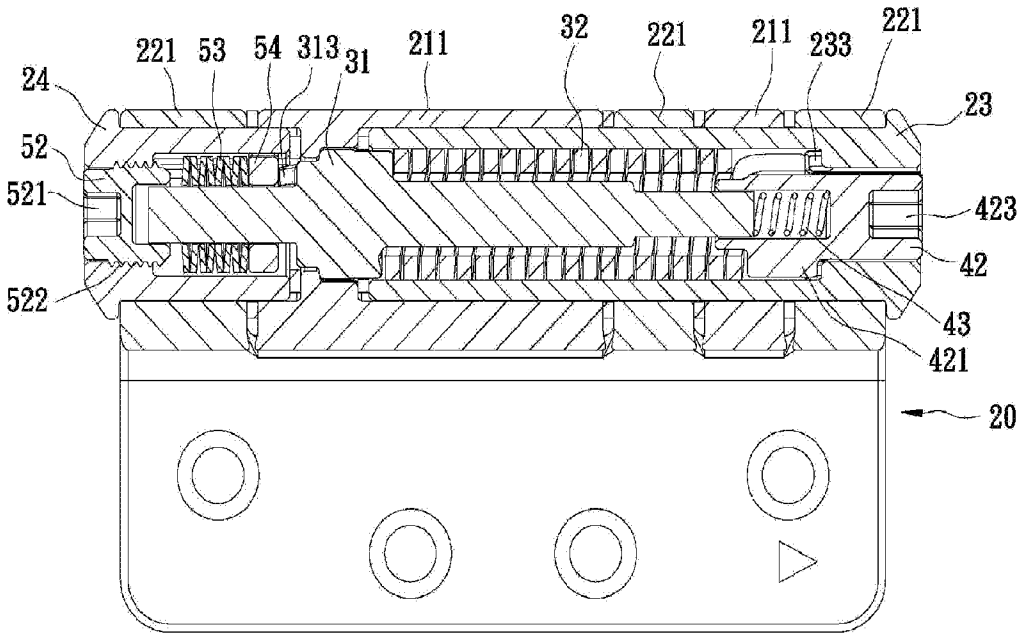

221
53
54
313
31
211
32
221
211
233
221
24
23
52
521
423
42
522
43
421
20

Fig. 8

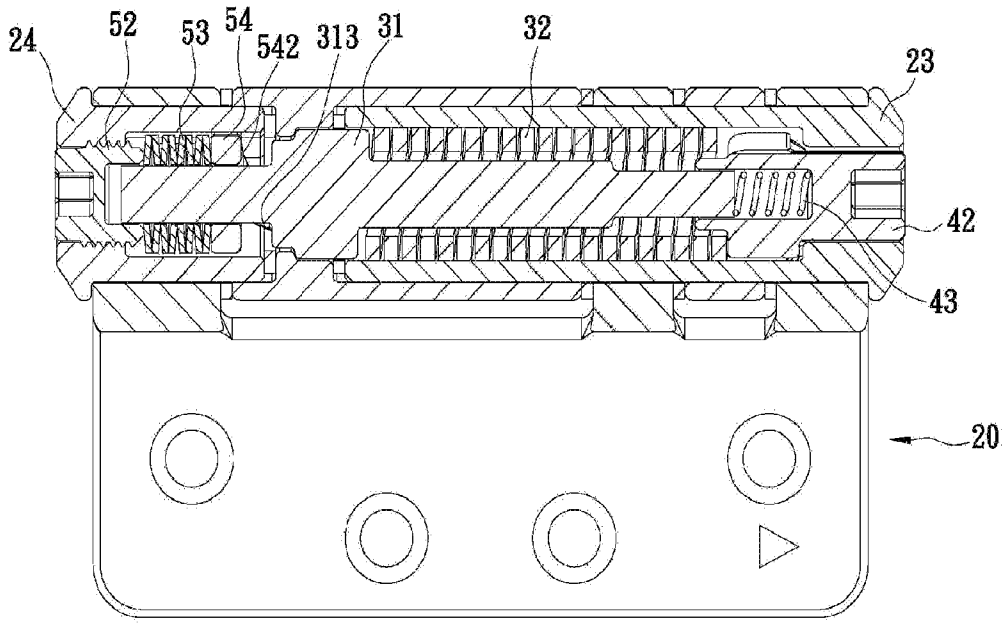

24
52
53
54
542
313
31
32
23
42
43
20

Fig. 9

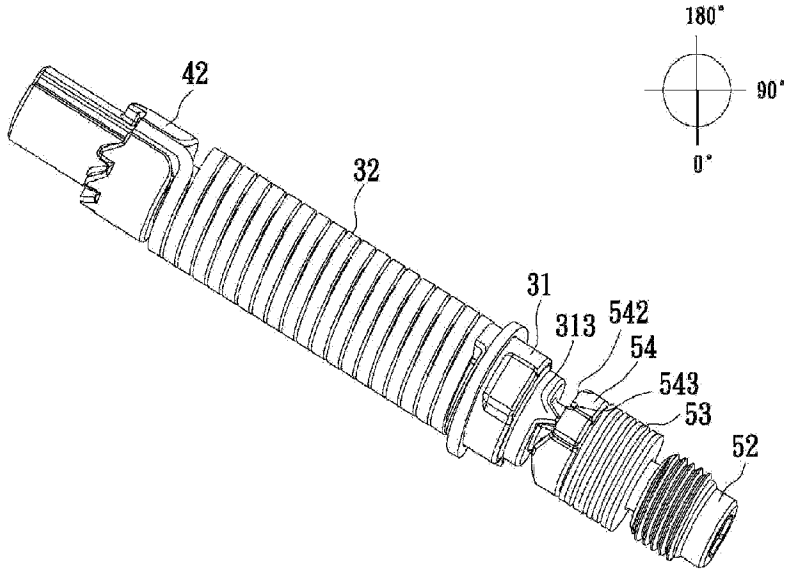

180°
90°
0°
42
32
31
313
542
54
543
53
52

Fig. 10

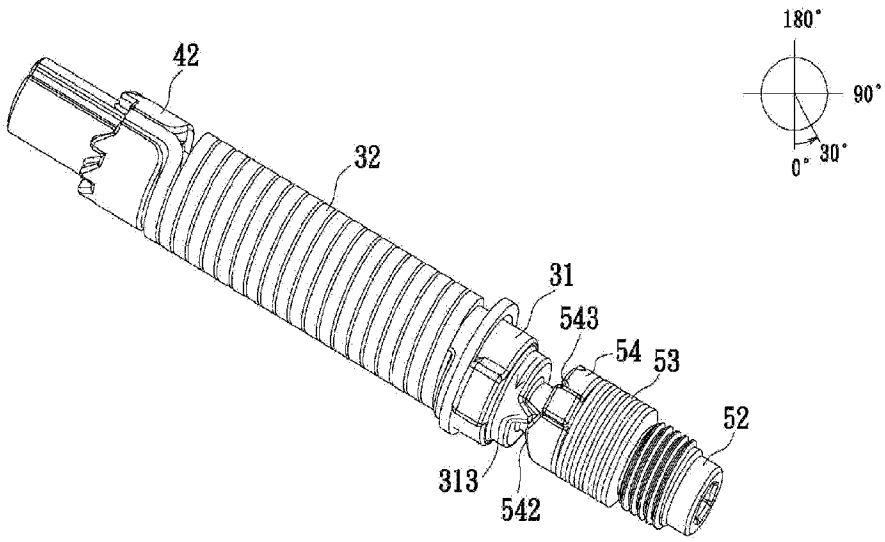

180°
90°
30°
0°
42
32
31
543
54
53
52
313
542

Fig. 11

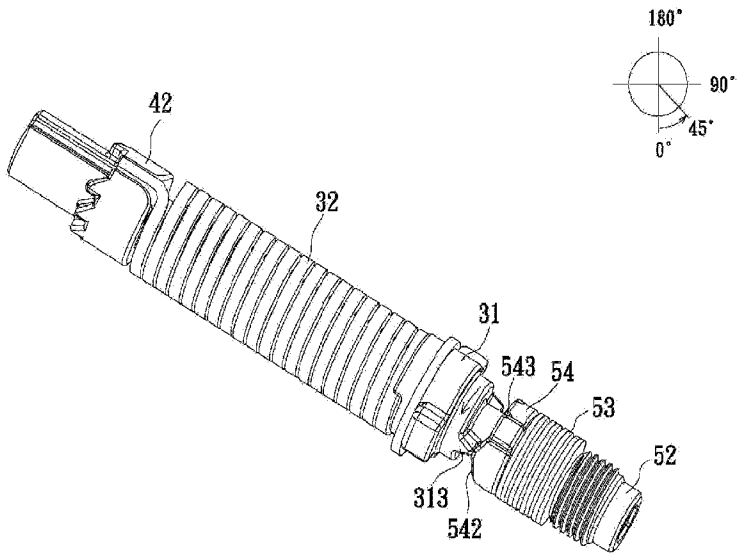


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/054696

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - E05F 1/12 (2010.01)
USPC - 16/50
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - E05F 1/12 (2010.01)
USPC - 16/50, 75, 76, 256, 298, 299, 300, 301, 303, 304, 307, 308, 337, 339, 342; 49/386

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
USPTO EAST System (US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT), PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,073,038 A (CURRY et al) 14 February 1978 (14.02.1978) entire document	1
A	US 6,618,902 B2 (WU) 16 September 2003 (16.09.2003) entire document	1-6
A	US 7,210,199 B2 (CLARK) 01 May 2007 (01.05.2007) entire document	1-6
A	US 5,572,768 A (DAUL) 12 November 1996 (12.11.1996) entire document	1-6
A	US 5,715,574 A (SCHALL) 10 February 1998 (10.02.1998) entire document	1-6

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 December 2010	04 JAN 2011

Name and mailing address of the ISA/US	Authorized officer:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)