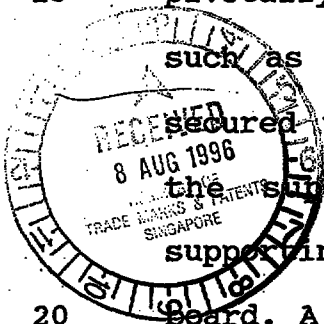


A TORQUE-ADJUSTABLE SUPPORTING DEVICE

BACKGROUND OF THE INVENTION

5 The present invention relates to a torque-adjustable supporting device which serves as a hinge applicable to cases, box bodies, doors or any other pivotable cover bodies. The supporting device is preset with a torque value so as to effectively control the
10 rotary angle of the cover bodies and prevent the same from automatically rotating back and shutting down.

 The cover of the case of a general foldable computer, a portable computer or a tool box or a door is
15 pivotally connected to the case by a supporting device such as a hinge. One end of the supporting device is secured to a stationary body, while a rotary shaft of
20 the supporting device is fitted in a pivotable supporting bracket which is secured to a movable cover board. A disk-like resilient plate is clamped between a
25 pad member and a locating board fitted around the rotary shaft for controlling the torque value. A fastening nut is tightened at the end of the rotary shaft so as to tightly assemble the respective parts of supporting device into an integral hinge unit. When the movable cover board is rotated relative to the stationary body, the disk-like resilient plate frictionally exerts a



fixed torque onto the supporting bracket as a braking force so as to keep the rotating force for the cover board constant.

5 The above conventional hinge structure includes complicated components such as pad member, locating board, disk-like resilient plate and fastening nut which are manufactured at high requirement of accuracy. When rotated, the supporting bracket is apt to drive all the
10 pad member, locating board and the disk-like resilient plate to rotate and slip. Therefore, an error of the preset torque value of the hinge structure will apparently take place after a period of use. Therefore, it is necessary to simplify the assembling procedure of
15 the hinge structure and stabilize the torque value even after a long period of use.

SUMMARY OF THE INVENTION

20 It is therefore a primary object of the present invention to provide a torque-adjustable supporting device which is easily manufactured with a stable torque value. The supporting device includes a central rotary shaft, a supporting bracket, a pad member and a
25 fastening nut. The central rotary shaft has a tapered push/extraction section, a shaft rod disposed with a securing board having two parallel plane faces and a

thread rod having outer thread and formed with two parallel plane locating faces at a small diameter end of the push/extraction section.

5 The supporting bracket includes a fixing section and a push/extraction sleeve formed with an inner hole having a peripheral conic push/extraction wall. A lubricant oil is painted over the peripheral wall of the inner hole of the push/extraction sleeve of the
10 supporting bracket and the push/extraction section of the rotary shaft is fitted into the push/extraction sleeve to abut against the conic push/extraction wall of the inner hole thereof.

15 The pad member is formed with an inner hole having a shape as that of the cross-section of the thread rod of the central rotary shaft. The fastening nut is formed with inner thread corresponding to outer thread of the thread rod of the central rotary shaft. The pad member
20 is fitted around the central rotary shaft, abutting against the end of the push/extraction sleeve. The fastening nut is screwed with the thread rod of the central rotary shaft to tighten the same.

25 It is a further object of the present invention to provide the above supporting device in which the central rotary shaft and the supporting bracket are

symmetrically constructed, whereby the central rotary shaft and the supporting bracket can be assembled in either direction. The conic push/extraction face can be replaced by a suitable curved face so as to increase the contacting area between the inner hole of the supporting bracket and the rotary shaft and enhance the strength against the tightening force of the fastening nut so that a greater torque value can be set up.

The present invention can be best understood through the following description and accompanying drawing, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

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Fig. 1 is a perspective exploded view of a first embodiment of the present invention;

Fig. 2 is a sectional assembled view according to Fig. 1;

20 Fig. 3 is a perspective exploded view of a second embodiment of the present invention;

Fig. 4 is a sectional assembled view according to Fig. 3;

25 Fig. 5 is a side view of another embodiment of the supporting bracket of the present invention;

Fig. 6 is a side sectional view showing another embodiment of the supporting bracket of the present

invention;

Fig. 6A is a stretched plane view of the supporting bracket of Fig. 6;

5 Fig. 7 is a side sectional view showing another embodiment of the central rotary shaft of the present invention;

Fig. 8 is a perspective assembled view of a third embodiment of the present invention;

10 Fig. 9 is a perspective exploded view of the third embodiment with additional restoring spring;

Fig. 10 is an axial sectional view of the third embodiment with additional restoring spring;

15 Fig. 11 is a side plane view of another aspect of the central rotary shaft of the third embodiment of the present invention;

Fig. 12 is a side plane view of still another aspect of the central rotary shaft of the third embodiment of the present invention; and

20 Fig. 13 is a side plane view of still another aspect of the central rotary shaft of the third embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

25 Please refer to Figs. 1 and 2. The torque-adjustable supporting device of the present invention includes a central rotary shaft 10, a supporting bracket

20, a pad member 30 and a fastening nut 40.

5 The central rotary shaft 10 has a conic push/extraction section 11 which is tapered leftward in this embodiment. The central rotary shaft 10 at one end further has a shaft rod disposed with a securing board 12 having two parallel plane faces. The securing board 12 is formed with two thread holes 13. The other end of the rotary shaft is disposed with a thread rod 14 having
10 outer thread and formed with two parallel plane locating faces 15.

15 The supporting bracket 20 includes a fixing section 21 and a push/extraction sleeve 22. The fixing section 21 is formed with two thread holes 23. The conic inner hole of the push/extraction sleeve 22 has a peripheral
20 conic push/extraction wall 24 with an inclination equal to (or slightly greater or less than) that of the conic push/extraction section of the rotary shaft.

20

 The pad member 30 is a frustoconic member formed with a central inner hole 31 having a shape as that of the cross-section of the thread rod 14 of the rotary shaft.

25

 The fastening nut 40 is formed with inner thread corresponding to the outer thread of the thread rod 14

of the rotary shaft.

A lubricant oil is painted over the peripheral wall of the inner hole of the push/extraction sleeve 22 of the supporting bracket 20 and then the push/extraction section 11 of the rotary shaft 10 is fitted into the sleeve 22 to abut against the conic push/extraction wall 24 of the inner hole thereof. Then the pad member 30 is fitted around the rotary shaft 10, abutting against the end of the sleeve 20. Then the fastening nut 40 is screwed with the thread rod 14 of the rotary shaft 10 to tighten the same by a certain torque.

Please refer to Figs. 3 and 4 which show a second embodiment of the present invention, wherein the push/extraction section 11 of the rotary shaft 10 includes a conic push/extraction face 16 on right side and a cylindrical rod 17 on left side. Therefore, the push/extraction section 11 of the rotary shaft 10 is characterized by the partial push/extraction face 16.

In accordance with the partial push/extraction face 16 of the rotary shaft 10, the inner hole of the push/extraction sleeve 25 has a partial conic push/extraction face 26.

Please refer to Figs. 5, 6 and 6A which show

another embodiment of the supporting bracket 20, wherein the push/extraction sleeve 22a of the supporting bracket 20 is not continuously constructed so that when suffering an axial pressure, the push/extraction sleeve 22a is resiliently restorable. In Fig. 6A, the inner wall of the push/extraction sleeve 22b is additionally formed with an oil reservoir groove 27 for storing oil so as to enhance the lubricating effect.

Fig. 7 shows another embodiment of the rotary shaft 10, wherein the push/extraction section 11 is formed with multiple annular grooves 18 for storing oil.

In use, the supporting bracket 20 is pivotably secured with a cover board. During the rotating operation, the conic push/extraction face 16 tends to transversely push the supporting bracket 20 leftward. At this time, the fastening nut 40 serves to stop the supporting bracket 20 so that the push/extraction sleeve 22 tends to diverge outward. Accordingly, the supporting bracket 20 can be rotated about the rotary shaft under minimized frictional resistance. During the rotation, the rotary center is constant. In addition, even after a long period of use, the torque value is kept stable and unchanged in contrast to the conventional device.

Figs. 8 and 9 show a third embodiment of the

present invention, which includes a central rotary shaft 10, a left supporting bracket 20a, a right supporting bracket 20b, two pad members 30, 30a, two fastening nuts 40, 40a and a restoring spring 50 (shown in Fig. 9).

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In this embodiment, the rotary shaft 10 has a middle cylindrical section 19 and two conic push/extraction sections 11, 11a on two sides. The push/extraction sections 11, 11a are tapered from the middle section to two sides of the rotary shaft 10. The rotary shaft 10 at two ends further has two thread rods 14 each of which has outer thread and is formed with two parallel plane locating faces 15.

15

Each of the supporting brackets 20a, 20b includes a fixing section 21 and a push/extraction sleeve 22. The fixing-section 21 is formed with two thread holes 23. The conic inner hole of the push/extraction sleeve 22 has a peripheral conic push/extraction wall 24 with an inclination equal to (or slightly greater or less than) that of the conic push/extraction section of the rotary shaft 10.

20

Each of the pad members 30, 30a is a frustoconic member formed with a central inner hole 31 having a shape as that of the cross-section of the thread rod 14 of the rotary shaft.

25

Each of the fastening nuts 40, 40a is formed with inner thread 41 corresponding to the outer thread of the thread rod 14 of the rotary shaft.

5 The restoring spring 50 has two outward extending leg sections 51, 52 at two ends.

 Please refer to Fig. 10. When assembled, a lubricant oil is painted over the peripheral walls of
10 the inner holes of the push/extraction sleeves 22 of the supporting brackets 20a, 20b and then the push/extraction sections 11, 11a of the rotary shaft 10 are respectively fitted into the push/extraction sleeves 22. The restoring spring 50 is fitted around the middle
15 cylindrical section 19 of the rotary shaft with the leg sections 51, 52 oppositely hooked on the fixing sections of the left and right supporting brackets 20a, 20b. The preset torque of the restoring spring 50 is greater than the adjustable torque between the two supporting
20 brackets and the central rotary shaft, whereby when the two supporting brackets are rotated relative to each other, they are subject to an automatic restoring force. Then the pad members 30, 30a are fitted around the thread rods of the rotary shaft 10, abutting against the
25 ends of the left and right supporting brackets 20a, 20b. Then the fastening nuts 40, 40a are screwed with the thread rods of the rotary shaft 10 to tighten the same

by a preset torque.

In use, any of the left and right supporting brackets can be pivotably secured with a cover board to serve as a lock mechanism without directional limitation.

Fig. 11 shows another embodiment of the central rotary shaft, wherein each of the push/extraction sections 11b of the rotary shaft 10 is disposed with a curved face 55. In accordance with the curved face 55, the peripheral wall 24 of the inner hole of the push/extraction sleeve 22 of the left or right supporting bracket 20a, 20b is formed with a corresponding curved face, whereby the contacting area between the push/extraction section 11b and the push/extraction sleeve 22 is increased and the torque can be set with a higher value.

Fig. 12 shows still another embodiment of the central rotary shaft, wherein the push/extraction section 11c includes a first curved face 56, a second curved face 57 and a push/extraction slope face 58 connected therebetween.

25

Fig. 13 shows still another embodiment of the central rotary shaft, wherein each of the

push/extraction sections includes a cylindrical section 19a, 19b and a partial curved face 59c.

5 In conclusion, the central rotary shaft is formed with the push/extraction section rotatably fitted in the push/extraction sleeve of the supporting bracket. The rotary shaft is assembled with the supporting bracket and tightened by the fastening nut with a set torque value. The supporting device of the present invention
10 has less components and a stable torque value even after a long period of use.

It is to be understood that the above description and drawings are only used for illustrating one
15 embodiment of the present invention, not intended to limit the scope thereof. Any variation and derivation from the above description and drawings should be included in the scope of the present invention.



WHAT IS CLAIMED IS:

1. A torque-adjustable supporting device comprising a central rotary shaft, at least a supporting bracket, at least a pad member and at least a fastening nut,
5 wherein:

the central rotary shaft has at least a tapered push/extraction section and a thread rod at a small
10 diameter end of the push/extraction section;

the supporting bracket includes a fixing section and a push/extraction sleeve formed with an inner hole having a peripheral conic push/extraction wall;
15

the pad member is formed with an inner hole having a shape as that of the cross-section of the thread rod of the central rotary shaft; and

20 the fastening nut is formed with inner thread corresponding to outer thread of the thread rod of the central rotary shaft, whereby a lubricant oil is painted over the peripheral wall of the inner hole of the push/extraction sleeve of the supporting bracket, the
25 push/extraction section of the rotary shaft being fitted into the push/extraction sleeve to abut against the conic push/extraction wall of the inner hole thereof,



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the pad member being fitted around the central rotary shaft, abutting against the end of the push/extraction sleeve, the fastening nut being screwed with the thread rod of the central rotary shaft to tighten the same.

5

2. A torque-adjustable supporting device as claimed in claim 1, wherein the thread rod of the central rotary shaft is formed with at least one plane locating face.

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3. A torque-adjustable supporting device as claimed in claim 1, wherein the push/extraction section of the central rotary shaft has partial conic push/extraction face.

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4. A torque-adjustable supporting device as claimed in claim 1, wherein the push/extraction section of the central rotary shaft is formed with at least one annular groove.

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5. A torque-adjustable supporting device as claimed in claim 1, 2 or 3, wherein the push/extraction section of the central rotary shaft is formed with several shallow dents for storing lubricant oil.

25

6. A torque-adjustable supporting device as claimed in claim 1, wherein the push/extraction sleeve of the supporting bracket is not in a close state in a



direction perpendicular to the axis.

5 7. A torque-adjustable supporting device as claimed in claim 1, wherein the inner hole of the push/extraction sleeve of the supporting bracket has partial conic push/extraction wall.

10 8. A torque-adjustable supporting device as claimed in claim 1, wherein the push/extraction sleeve of the supporting bracket is not in a close state in a direction parallel to the axis.

15 9. A torque-adjustable supporting device as claimed in claim 1, wherein the peripheral wall of the inner hole of the push/extraction sleeve of the supporting bracket is formed with oil reservoir groove.

20 10. A torque-adjustable supporting device as claimed in claim 1, wherein the push/extraction face of the push/extraction sleeve of the supporting bracket is corresponding to the push/extraction face of the push/extraction section of the central rotary shaft.

25 11. A torque-adjustable supporting device as claimed in claim 1, wherein the central rotary shaft has a middle cylindrical section and two conic push/extraction sections on two sides, the push/extraction sections



being tapered from the middle section to two sides of the rotary shaft, the inner hole of the push/extraction sleeve having a peripheral conic push/extraction wall corresponding to the conic push/extraction section of the rotary shaft.

12. A torque-adjustable supporting device as claimed in claim 1 or 10, wherein each of the push/extraction sections of the rotary shaft is replaced by a curved face.

13. A torque-adjustable supporting device as claimed in claim 1 or 10, wherein each of the push/extraction sections of the rotary shaft is replaced by a partial curved face.

14. A torque-adjustable supporting device as claimed in claim 1 or 10, wherein each of the push/extraction sections of the rotary shaft includes a curved face and the peripheral wall of the inner hole of the push/extraction sleeve of the supporting bracket includes a corresponding curved face.

15. A torque-adjustable supporting device as claimed in claim 10, wherein a restoring spring is disposed between the two supporting brackets, having two outward extending leg sections at two ends, the restoring spring



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being fitted around the middle cylindrical section of the rotary shaft with the leg sections oppositely hooked on the supporting brackets.

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