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United States Patent	12390910
Kind Code	B2
Date of Patent	August 19, 2025
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Driving mechanism

Abstract

The present disclosure provides a driving mechanism, which includes a driving shaft, a sleeve, a plurality of guiding members, an impact bulk and an output shaft. The sleeve is sleeved on the driving shaft and has a plurality of guiding grooves for accommodating the guiding members. The impact bulk is sleeved on the outside of the sleeve. Some guiding members are linearly immovable relative to the driving shaft; other guiding members are linearly immovable relative to the impact bulk. With the design of the guiding grooves, the torque input into the driving shaft is transferred into an impact torque applied on the output shaft.

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Appl. No.: **18/882764**

Filed: **September 12, 2024**

Prior Publication Data

Document Identifier	Publication Date
US 20250001562 A1	Jan. 02, 2025

Foreign Application Priority Data

TW	111147611	Dec. 12, 2022

Related U.S. Application Data

division parent-doc US 18164617 20230206 US 12115627 child-doc US 18882764

Publication Classification

Int. Cl.: **B25B21/02** (20060101); B25F5/00 (20060101)

U.S. Cl.:

CPC **B25B21/023** (20130101); **B25B21/02** (20130101); B25F5/001 (20130101)

Field of Classification Search

CPC: B25B (19/00); B25B (21/02); B25B (21/023); B25B (21/026); B25B (23/00); B25B (23/14); B25B (23/1453); B25D (11/00); B25F (5/001)

USPC: 173/93; 173/93.5; 173/93.6; 173/178; 173/104; 173/114; 173/217

References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
3228486	12/1965	Kaman	192/69.62	B25B 21/02
3789934	12/1973	Schoeps	173/93.5	B25B 21/026
4557337	12/1984	Shibata	173/93.5	B25B 21/026
4683961	12/1986	Schoeps	464/25	B25B 23/1453
4735595	12/1987	Schoeps	464/25	B25B 21/026
4767379	12/1987	Schoeps	464/25	B25B 21/02
6110045	12/1999	Schoeps	464/25	B25B 21/02
6311787	12/2000	Berry	192/223.2	B25F 5/001
6497316	12/2001	Hsu	192/223.2	B25B 21/004
6983808	12/2005	Chen	173/93.5	B25B 21/02
7063201	12/2005	Nakamura	192/223.1	B25F 5/001
7438140	12/2007	Sterling	173/104	B25B 21/02
7455574	12/2007	Chu	451/340	B25F 5/001
9636808	12/2016	Ho	N/A	B25B 21/02
12115627	12/2023	Chen	N/A	B25B 21/023
2002/0130007	12/2001	Nakamura	173/217	B25B 21/00
2009/0065229	12/2008	Uemura	173/93.5	B25B 23/1453
2015/0114674	12/2014	Ho	173/93.6	B25B 21/026

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) The present application is a divisional of the U.S. non-provisional patent application Ser. No. 18/164,617 filed Feb. 6, 2023, now U.S. Pat. No. 12,115,627, which claims the priority from the Taiwan patent application serial number

111147611 filed Dec. 12, 2022, and the disclosure of which is incorporated herein by reference in their entirety.

FIELD OF THE INVENTION

(1) The present invention relates to a driving mechanism, particularly a driving mechanism applicable to an impact wrench.

BACKGROUND

(2) Impact driver is a tool that provides high torque. A common impact driver has a driving shaft that can be driven, an impact bulk, an output shaft, balls and a resilient member. The driving shaft and the impact bulk both have guiding grooves. The impact bulk is sleeved on the driving shaft, and the ball is located in the guiding groove. The resilient member provides a tension between the driving shaft and the impact bulk. With the design of the shape of the guiding grooves of the driving shaft and the impact bulk, the movement of the ball in the guiding groove can make the rotating driving shaft cause the impact bulk to move in the axial direction and rotate at the same time. The surface of the impact bulk on which the output shaft abuts against has a plurality of protruding blocks, such that the rotating impact bulk will move backward automatically upon reaching a critical point and then the protruding blocks will abut against the output shaft. At that time, the resilient member is compressed and stores a greater tension. As the impact bulk continues rotating such that the surface on which the output shaft abuts against goes beyond the surface of the protruding block, the tension stored in the resilient member is exerted on the impact bulk instantaneously to provide it with a forward impulse. At that time, due to the limitation on the movement of the ball in the guiding groove, the impulse will be transferred to a torque applied to the impact bulk, which thereby causes the protruding block of the impact bulk to impact the output shaft in the circumferential direction so that the output shaft generates a instantaneous torque and achieve the objective of screwing in (tight) and out (loose) a screw.

(3) However, forming the guiding grooves on the driving shaft and the impact bulk requires precise processing technique, which will increase not only processing time but also cost. In addition, since the guiding grooves are located on the driving shaft and the impact bulk, they each can only has one design for the shape the guiding groove and cannot easily change the shape of the guiding groove to meet different usage needs.

SUMMARY OF THE INVENTION

(4) In some embodiments, the present disclosure provides a driving mechanism, which comprises a driving shaft, a sleeve, an impact bulk, a first guiding member and a second guiding member. The sleeve is sleeved on the driving shaft and has a first guiding groove and a second guiding groove. The impact bulk is sleeved on the sleeve. The first guiding member is movable in the first guiding groove and is configured to have no linear movement relative to the driving shaft. The second guiding member is movable in the second guiding groove and is configured to have no linear movement relative to the impact bulk. By means of the movement of the first guiding member in the first guiding groove and the movement of the second guiding member in the second guiding groove, the sleeve can move with respect to the driving shaft and the impact bulk in the axial direction.

(5) In some embodiments, the present disclosure provides a driving mechanism, which comprises an input mechanism, a sleeve, an impact bulk and a resilient member. The sleeve is sleeved on the input mechanism. The impact bulk is sleeved on the sleeve. The resilient member is configured to apply a tension to the impact bulk relative to the input mechanism in the axial direction. By means of a force-torque transfer mechanism, the tension applied to the impact bulk is transferred to a torque applied to the output mechanism.

(6) The above contents generally recite the technical features of the present disclosure so that the following detailed description of the present disclosure can be better understood. Other technical features constituting the subject matters of the claims of the present disclosure are recited in the

following contents. A person with general knowledge in the field of the present disclosure can easily modify or design other structures or manufacturing processes by utilizing the concept or specific embodiment and thereby achieve the same objectives of the present disclosure. A person with general knowledge in the field of the present disclosure should understand an equivalent structure cannot escape the spirit and scope as defined in the claims.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) The configurations of the present disclosure can be better understood according to the following embodiments when reading the present disclosure with the accompanying drawings. It should be noted that the features may have been depicted without reflecting the proportions and the size of the features may have been enlarged or narrowed in order to clearly describe the contents of the present disclosure.

(2) FIG. **1** is a perspective view depicting the driving mechanism of an embodiment of the present disclosure.

(3) FIG. **2** depicts the side view and the cross-sectional view of the driving mechanism in FIG. **1**.

(4) FIG. **3** is an exploded view depicting the driving mechanism in FIG. **1**.

(5) FIG. **4** is a perspective view depicting the driving mechanism of another embodiment of the present disclosure.

(6) FIG. **5** is an exploded view depicting the driving mechanism in FIG. **1**.

(7) FIG. **6** depicts perspective views of the driving mechanism at different rotational angles in an embodiment of the present disclosure.

(8) FIG. **7** depicts perspective views of the corresponding perspective views of the driving mechanism in FIG. **6**.

(9) In the drawings and embodiments of the present disclosure, same or similar elements are denoted by same reference numeral.

DESCRIPTION OF THE EMBODIMENTS

(10) FIG. **1** depicts the perspective view of the driving mechanism **1** of an embodiment of the present disclosure; FIG. **2** depicts the side view and the cross-sectional view of the drive mechanism shown in FIG. **1**; FIG. **3** depicts the exploded view of the driving mechanism shown in FIG. **1**. In some embodiments, FIG. **4** depicts the perspective view of the driving mechanism of another embodiment; FIG. **5** depicts the exploded view of the driving mechanism shown in FIG. **4**.

(11) In some embodiments, the driving mechanism **1** mainly comprises a driving shaft **11**, a sleeve **12**, an impact bulk **13** (depicted with broken lines in FIGS. **1** and **4**), a resilient member **15**, an output shaft **14**, a plurality of guiding members **16**, a rolling member **17** and an annular gasket **18**.

(12) In some embodiments, the driving mechanism **11** has a proximal end **111** close to the user and a distal end **112** far from the user. In some embodiments, the driving shaft **11** has an annular protruding portion **113** at the proximal end **111** thereof. In some embodiments, the sleeve **12** is sleeved on the driving shaft **11** from the distal end **112** of the driving shaft **11**; the impact bulk **13** is sleeved on the outer peripheral wall of the sleeve **12**. In some embodiments, the impact bulk **13** is roughly a hollow cylindrical body and has an annular groove **134** with an U-shaped cross-section; the annular gasket **18** and a plurality of rolling members **17** are accommodated in the annular groove **134**. In some embodiments, the output shaft **14** is an output mechanism which has a notch at one end thereof, the notch can be sleeved on a portion of the distal end **112** of the driving shaft **11** and thereby abuts against the distal end **112** of the driving shaft **11**. In some embodiments, the output shaft **14** abuts against the outer side wall **121** of the sleeve **12** in the longitudinal direction. In some embodiments, the resilient member **15** is sleeved on the driving shaft **11**. In some embodiments, one end of the resilient member **15** abuts against the annular protruding portion **113**

of the driving shaft **11** and the other end of the resilient member **15** abuts against the annular gasket **18** of the impact bulk **13**. When the resilient member **15** is compressed, it applies a tension between the driving shaft **11** and the impact bulk **13**.
(13) As shown in FIG. **3**, in some embodiments, the driving shaft **11** defines an axial direction and has a through hole **114** for the guiding member **16** to be disposed and penetrate therethrough, the through hole **114** penetrates the driving shaft **11** in the direction of the diameter of the driving shaft **11**. In some embodiments, the guiding member **16** is a pin which is disposed and penetrates through the through hole **114** with two ends protruding from the outer peripheral wall of the driving shaft **11**.
(14) As shown in FIG. **5**, in some embodiments, the outer peripheral wall of the driving shaft **11** has a plurality of recesses **114′** fort the disposition of the guiding member **16**. In some embodiments, the recesses **114′** are located on the radially opposing sides of the outer peripheral wall of the driving shaft **11**. In some embodiments, the guiding member **16** is a ball (e.g., steel ball) which can partially be accommodated in the recess **114′** of the driving shaft **11** and partially protrude from the outer peripheral wall of the driving shaft **11**.
(15) In some embodiments, the inner peripheral wall of the impact bulk **13** also has recesses **131** for the disposition of the guiding member **16**. In some embodiments, the recesses **131** are roughly located on the opposing sides of the inner peripheral wall of the impact bulk **13** in the radial direction. In some embodiments, the guiding member **16** is a ball (e.g., steel ball) which can be partially accommodated in the recess **131** of the impact bulk **13** and partially protrudes from the inner peripheral wall of the impact bulk **13**.
(16) In some embodiments, a plurality of rolling members **17** (e.g., balls) are disposed between the annular gasket **18** and the annular groove **134** of the impact bulk **13**. In some embodiments, the plurality of rolling members **17** are preferably twenty eight balls. Referring to FIG. **2**, the annular groove **134** of the impact bulk **13** extends in the longitudinal direction a distance smaller than the height of the impact bulk **13** from the outer surface of an end of the impact bulk **13**. That is, the annular groove **134** does not penetrate through the impact bulk **13**. Referring to FIGS. **3** and **5**, in some embodiments, the outer surface of the other end of the impact bulk **13** forms an annular recessed face **132**; a portion of the area of the annular recessed face **132** forms protruding blocks **133** with longitudinal cross-section having a trapezoidal shape. In some embodiments, the annular recessed face **132** has two opposing protruding blocks **133** with outer surfaces that are roughly flush with the outer surface of the impact bulk **13**.
(17) In some embodiments, the tension of the resilient member **15** is transmitted to the impact bulk **13** via the annular gasket **18** and the rolling members **17**. The disposition of the rolling members **17** can allow the friction between the rotating impact bulk **13** and the annular gasket **18** to decrease to a minimum.
(18) In some embodiments, the sleeve **12** has the shape of a hollow cylinder and a plurality of guiding grooves **122** for the guiding members **16** to move therein. Referring to FIGS. **3** and **5**, in some embodiments, the guiding grooves **122** penetrate through the sleeve **12**. In some embodiments, the guiding grooves **122** that are near the distal end **112** of the driving shaft **11** do not penetrate through the sleeve **12**. In some embodiments, the guiding grooves **122** that do not penetrate through the sleeve **12** are formed on the outer peripheral wall of the sleeve **12**. In some embodiments, the guiding grooves **122** of the sleeve **12** that are relatively near the proximal end **111** of the driving shaft **11** penetrate through the sleeve **12**; the guiding grooves **122** of the sleeve **12** that are relatively near the distal end **112** of the driving shaft **11** do not penetrate through the sleeve **12**. In some embodiments, the sleeve **12** has a pair of (two) guiding grooves **122** on one side or one end of the sleeve **12** in the longitudinal direction and also has a pair of (two) guiding grooves **122** on the other side or the other end of the sleeve **12** in the longitudinal direction, and the two guiding grooves **122** of each pair of the guiding grooves **122** are located on the radially opposite side of the sleeve **12**. In some embodiments, the two pairs of the guiding grooves **122** both

can penetrate through the sleeve **12**. In some embodiments, the two guiding grooves **122** that are relative near the distal end **112** of the driving shaft **11** are formed from the outer peripheral wall of the sleeve **12** but do not penetrate through the sleeve **12**. In some embodiments, each one of the guiding grooves **122** has a roughly V shape. In some embodiments, one pair of the two pairs of the guiding grooves **122** are disposed inversely with respect to the shape of the other pair of the guiding grooves **122**. That is, the guiding grooves **122** that are near the proximal end **111** of the driving shaft **11** have a V shape, the guiding grooves **122** that are near the distal end **112** of the driving shaft **11** have an inverse V shape. In some embodiments, the guiding grooves **122** each has a distance d from the proximal end to the distal end in the longitudinal direction. Referring to FIG. **6**, in some embodiments, the V-shaped guiding grooves **122** have a specific distance from the proximal end to the distal end in the longitudinal direction, such that in the course where the guiding member **16** moves from the very bottom end to the very top end of the V shape of the guiding groove **122**, the guiding member **16** moves a distance d in the longitudinal direction (i.e., the axial direction).

(19) Referring to FIG. **5**, in some embodiments, the guiding member **16** is a ball and is partially accommodated in the recess **114′** of the outer peripheral wall of the driving shaft **11** and partially protrudes out of the outer peripheral wall of the driving shaft **11**. The portion of guiding member **16** that protrudes out of the outer peripheral wall of the driving shaft **11** can move in the guiding groove **122** of the sleeve **12**. In some embodiments, the guiding member **16** in the recess **114′** of the outer peripheral wall of the driving shaft **11** is constrained by the recess **114′** and thus has no linear movement relative to the driving shaft **11**. Therefore, the force or torque applied to the driving shaft **11** can be transmitted to the sleeve **12** via the guiding member **16** and vice versa.

(20) Referring to FIGS. **1** and **3**, in some embodiments, when the driving shaft **11** has the through hole **114**, the guiding member **16** is a pin and is disposed in the through hole **114**, and the two ends of the pin protrude outwardly from the outer peripheral wall of the driving shaft **11**. The protruding portions of the pin can move in the guiding grooves **122** of the sleeve **12** but the pin has no linear movement relative to the driving shaft **11**. Utilizing the pin as the guiding member **16** can enhance structural strength between the guiding member **16** and the driving shaft **11** and thereby ensure that the large force or torque applied to the driving shaft **11** can be effectively transmitted to the sleeve **12** via the pin.

(21) Referring to FIGS. **3** and **5**, in some embodiments, the guiding member **16** is a ball and is partially accommodated in the recess **131** of the inner peripheral wall of the impact bulk **13**, and the portion of the guiding member **16** that protrudes out of the inner peripheral wall of the impact bulk **13** can move in the guiding groove **122** of the sleeve **12**. In some embodiments, the guiding member **16** in the recess **131** of the inner peripheral wall of the impact bulk **13** is constrained by the recess **131** and thus has no linear movement relative to the impact bulk **13**. Therefore, the force or torque applied to the impact bulk **13** can be transmitted to the sleeve **12** via the guiding member **16** and vice versa.

(22) According to the above, the transmission of the force and torque between the driving shaft **11** and the impact bulk **13** is achieved by means of the sleeve **12** and the guiding members **16**. Specifically, because the guiding member **16** disposed on the driving shaft **11** has no linear movement relative to the driving shaft **11** and because the guiding member **16** disposed on the impact bulk **13** has no linear movement relative to the impact bulk **13**, the movement of the driving shaft **11** and the impact bulk **13** can be controlled by means of the movement of the guiding members **16** in the guiding grooves **122** of the sleeve **12**, so that the objective of transmitting force and energy can be achieved. In addition, referring to FIG. **6**, with the design of the shape of the guiding grooves **122**, the torque input into the driving shaft **11** can be transferred to an axial force that can causes the sleeve **12** and the impact bulk **13** to move forward or backward.

(23) In some embodiments, the driving shaft of the driving mechanism **11** is an input mechanism which provides an input end and rotates by the power provided by a motor. In an embodiment, the

impact bulk **13** roughly has the shape of a hollow cylinder and has an annular recessed face **132** at one end. In an embodiment, the output shaft **14** abuts against the annular recessed face **132** of the impact bulk **13**. Referring to FIGS. **3** and **5**, in an embodiment, the end of the output shaft **14** that abuts against the driving shaft **11** has a protruding block **141** which roughly has the shape of a cuboid and abuts against the annular recessed face **132** of the impact bulk **13** and has a circular notch **142** in the middle of the protruding block **141** for being sleeved on the driving shaft **11**.

(24) Referring to FIGS. **6** and **7**, the middle figure thereof illustrates the driving mechanism **1** in the fully-extended state wherein the guiding members **16** are located at the axially furthest position of the two pairs of the guiding grooves **122**. When in use, the driving mechanism **1** rotates clockwise or counterclockwise according to the needs of fixing, tightening, or loosing during working, so that the sleeve **12** causes the impact bulk **13** to move in the axial direction (backward or forward) by means of the guiding grooves **122** and the guiding members **16**. Referring to the exemplary figure of the driving mechanism **1** at the top of FIGS. **6** and **7**, at the instant the impact bulk **13** moves backward toward a user, the protruding block **141** of the output shaft **14** (which is still rotating) will move from the annular recessed face **132** of the impact bulk **13** to the top of the protruding blocks **133** of the impact bulk **13**. At that time, the retracted impact bulk **13** will compress the resilient member **15** and causes it to generate a tension between the driving shaft **11** and the impact bulk **13**, and such tension pushes the impact bulk **13** towards the output shaft **14**. Now, the output shaft **14** continues rotating relative to the impact bulk **13**. When the protruding block **133** of the impact bulk **13** further rotates and exceeds the outer surface of the protruding block **141** of the output shaft **14** it abuts, the tension of the resilient member **15** pushes the impact bulk **13** forward to cause the protruding block **141** of the output shaft **14** to return to the annular recessed face **132** of the impact bulk **13**.

(25) The force-torque transfer mechanism of the present disclosure is elaborated in the following. In the above-mentioned process, the driving shaft **11** transmits rotational kinetic energy to the sleeve **12** via the guiding members **16** disposed thereon. The movement trajectory of the guiding member **16** can be constrained by means of the design of the V-shaped guiding groove **122**, such that the sleeve moves in the axial direction and rotates simultaneously. The movement of the sleeve **12** further transmits the kinetic energy to the guiding members **16** disposed on the impact bulk **13** and thereby causes the impact bulk **13** to move in the axial direction and rotate. At the instant the tension of the resilient member **15** pushes the impact bulk **13** forward to cause the protruding block **141** of the output shaft **14** to return to the annular recessed face **132** of the impact bulk **13**, the guiding member **16** corresponding to the impact bulk **13** can transfer the axial tension exerted on the impact bulk **13** to a torque due to the design of the shape of the guiding grooves **16** of the sleeve **12**, such torque causes the side face of the protruding blocks to impact the side face of the protruding block **141** of the output shaft **14** and thereby transmits the torque to the output shaft **14**. The entire movement process mentioned above repeats as the driving shaft **11** rotates constantly, such that in the process where the driving shaft **14** works (e.g., screwing a screw in or out), it applies an impact torque to the screw repetitively and thereby achieves a labor-saving effect

(26) Following further describes the detailed movement of the guiding grooves **122** of the sleeve **12** and the guiding members **16** in the operation of the driving mechanism **1** of the present invention. The exemplary view of the driving mechanism **1** in the middle of FIGS. **6** and **7** shows the sleeve **12** that is fully extended with respect to the driving shaft **11**. With reference to the exemplary views of the driving mechanism **1** in the middle and at the bottom of FIGS. **6** and **7**, when the driving shaft **11** rotates clockwise (from the viewpoint of a user), the guiding member **16** near the proximal end **111** will approach the right end of the guiding groove **122** from the lowest position of the V-shaped guiding groove (i.e., the middle of the V shape), such that the sleeve **12** will rotate and move backward toward the user by a distance d. At that time, the retracted sleeve **12** will cause the guiding members **16** in the other pair of the reversed-V-shaped guiding groove **122** near the distal end **112** to simultaneously approach toward the right end of the corresponding guiding groove **122**,

such that the impact bulk **13** will move backward toward the user by an additional distance d. Therefore, in the above process, the impact bulk **13** moves a total distance **2***d* toward the user (move backward) in the axial direction.
(27) With reference to the exemplary views of the driving mechanism **1** in the middle and on the top of FIGS. **6** and **7**, similarly, when the driving shaft **11** rotates counterclockwise (from the viewpoint of the user), the guiding member **16** will approach toward the left end of the guiding groove **122** from the lowest position of the V-shaped guiding groove (the middle of V shape), such that the sleeve **12** will rotate and move backward toward the user by a distance d. At that time, the retracted sleeve **12** will cause the guiding members **16** in the other pair of the reversed-V-shaped guiding groove **122** to simultaneously approach toward the left end of the corresponding guiding groove **122**, such that the impact bulk **13** will move backward toward the user by an additional distance d. Therefore, in the above process, the impact bulk **13** moves a total distance **2***d* toward the user (move backward).
(28) When the impact bulk **13** moves backward, the protruding block **141** of the output shaft **14** will move from the annular recessed face **132** of the impact bulk **13** to the outer surface of the protruding blocks **133** and causes the resilient member **15** to generate a tension that pushes the impact bulk **13** toward the output shaft **14**. When the impact bulk **13** rotates further such that the protruding block **133** rotates over the protruding block **141** of the output shaft **14** in the circumferential direction, the tension of the resilient member **15** pushes the impact bulk **13** toward the output shaft **14** so that the impact bulk **13** moves forward and causes the protruding block **141** of the output shaft **14** return to the annular recessed face **132** of the impact bulk **13**. When the impact bulk **13** is pushed forward by the tension of the resilient member **15**, the guiding members **16** disposed thereon cause the impact bulk **13** to rotate at the same time due to the design of the guiding grooves **122**, such that the tension in the axial direction is transferred to a torque applied to the impact bulk **13**. The protruding blocks **133** of the rotating impact bulk **13** further impact the protruding block **141** of the output shaft **14** to transfer the torque to the output shaft **14**.
(29) In comparison to the guiding groove formed on the outer peripheral wall of the driving shaft **11** and the inner peripheral wall of the impact bulk **13**, the sleeve **12** having the guiding groove **122** in the present invention can reduce the resistance to the movement of the guiding members **16** and can enhance the efficiency of transmission of kinetic energy (i.e., the power consumption of the tool used can be saved). In addition, because the guiding grooves **122** of the present invention are formed on the sleeve **12**, high-precision manufacturing process of forming guiding grooves on the outer peripheral wall of the driving shaft **11** and the inner peripheral wall of the impact bulk **13** can be avoided. Also, the present invention can satisfy different usage demands by replacing sleeves **12** with different design of guiding grooves **122**. Furthermore, the sleeve **12** of the present invention can increase the times (frequency) the impact bulk **13** impacts the output shaft **14** and reduce the operation travel of the driving mechanism **1**.
(30) The terminologies "approximately," "substantially," "basically" and "about" recited in the context are used to describe a small change. They may refer to the exact situation of an event or condition or very similar situation of an event or condition when used with events or conditions.
(31) Singular term "a/an" and "the" recited in the context may include a plurality of article designated unless otherwise is clearly defined. In some description of embodiments, an assembly disposed "on" or "above" another assembly may cover the situation where the former assembly is directly located on (e.g., physically contact) the latter assembly and the situation where one or more interfering assemblies are located between the former assembly and the latter assembly.
(32) Though the present disclosure is described and elaborated with reference to the particular embodiments, these descriptions and explanations do not form a limitation on the present disclosure. A person familiar with the technique of the present disclosure can clearly understand that various modification can be made without departing from the spirit and scope of the present disclosure defined in the claims attached, and replacement with equivalent assemblies are possible

in the embodiments. The drawings may not be depicted according to the actual scale and proportion. Due to variants in the manufacturing process and so on, there may be difference between the art in the present disclosure and practical apparatus. There may exist other embodiments of the present disclosure that are not explicitly disclosed. The specification and drawings should be considered explanatory rather than as a limitation. Modification can be implemented in order to make practical condition, material, substance composition, method or process comply with the objective, spirit and scope of the present disclosure. All modifications of this kind are within the scope of the claims as attached. Although the method disclosed in the contents are describe with specific operation that are implemented in a specific order, it can be understood that an equivalent method can be formed by combining, dividing or rearranging the operation without departing from the teaching of the present disclosure. Therefore, the order and classification of the operation do not form a limitation on the present disclosure unless otherwise specify in the contents.

Claims

1. A driving mechanism, comprising: a driving shaft defining an axial direction; a sleeve sleeved on the driving shaft and having a first guiding groove and a second guiding groove; an impact bulk sleeved on the sleeve; a first guiding member being movable in the first guiding groove and being configured to have no linear movement relative to the driving shaft; a second guiding member being movable in the second guiding groove and being configured to have no linear movement relative to the impact bulk; and wherein the first guiding groove and the second guiding groove being configured such that when the first guiding member is moving in the first guiding groove and the second guiding member is moving in the second guiding groove, the sleeve moves in the axial direction relative to the driving shaft and the impact bulk; wherein the driving mechanism further comprises a resilient member configured to apply a tension to the impact bulk relative to the driving shaft in the axial direction and an output shaft disposed on a side of the driving mechanism opposite to the driving shaft; wherein the first guiding groove and the second guiding groove are spaced apart in the axial direction of the sleeve and are spaced apart by an angle in the radial direction of the sleeve; and wherein the first guiding groove is closer to the driving shaft in the axial direction than the second guiding groove and the first guiding groove passes through the sleeve; wherein the sleeve additionally has a third guiding groove and a fourth guiding groove, and the third guiding groove is located on the opposite side of the first guiding groove and the fourth guiding groove is located on the opposite side of the second guiding groove; and wherein the driving mechanism further comprises a third guiding member configured to have no linear movement relative to the driving shaft but to move in the third guiding groove and a fourth guiding member configured to have no linear movement relative to the impact bulk but to move in the fourth guiding groove; and wherein the first guiding member and the third guiding member are a ball.
2. The driving mechanism according to claim 1, wherein the driving shaft has two recesses for accommodating the first guiding member and the third guiding member, and the impact bulk has two recesses for accommodating the second guiding member and the fourth guiding member.
3. The driving mechanism according to claim 2, wherein the second guiding member and the fourth guiding member are a ball.