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Hook assembly for power tool

Abstract

A hook assembly for a power tool includes a connection shaft having a first end and a second end opposite each other. The first end of the connection shaft is connectable to a housing of the power tool, the second end is connected to a hook member, and the hook member has a handle part and a hook part extending from the handle part. The hook member has a first position and a second position opposite the first position and the hook member is rotatable around a central axis of the connection shaft when in the second position.

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Background/Summary

BACKGROUND AND SUMMARY OF THE INVENTION

(1) The present invention relates to a power tool, in particular to a hook assembly for hanging a power tool.

(2) It is well known that hangers (such as hooks) are already used in all kinds of power tools, to enable such power tools to be hung on another hook, protrusion, bar or other similar object arranged on a wall, workbench or operator's belt. In the prior art, patent document CN105899338A has disclosed a dual-axis hook assembly for a power tool; the hook assembly can be incorporated into a housing of a power tool, to enable the tool to be hung from a hook or bar when not in use. The hook assembly has a dual-axis design, so that a hook element can be positioned near or adjacent to a body of the tool, for minimum hindrance to the tool when in use. When the tool is not being used, the hook element can extend outward from the body of the tool and can be oriented in multiple directions to facilitate hanging of the tool.

(3) However, the hook assembly disclosed in the abovementioned patent document has an extremely complex structure; the directions in which the hook assembly can rotate are defined to be

around two intersecting axes, and the angle of the hook assembly relative to the tool is limited. Moreover, in the solution disclosed in the above patent, it is only possible to adjust the position and direction of the hook within a specific angular range according to the position of a slot thereof.

(4) Thus, there are problems in the prior art, specifically a limited angle and insufficient flexibility and convenience when a hook assembly is used to hang a power tool.

(5) The technical problem to be solved by the present invention is to provide a hook assembly for a power tool, that is capable of flexible adjustment of the angle of a hook relative to a power tool, and capable of automatic adjustment of a hanging angle under the action of the weight of the power tool itself, thereby ensuring the safety and stability of the power tool when hung.

(6) To solve the abovementioned technical problem, the technical solution of the present invention is as follows: a hook assembly for a power tool, the power tool comprising a housing, the hook assembly being attached to the housing of the power tool, the hook assembly comprising a connection shaft having a first end and a second end opposite each other, the first end of the connection shaft being connected to the housing of the power tool, the second end being connected to a hook member, and the hook member comprising a handle part and a hook part extending from the handle part; the hook member has a first position and a second position opposite the first position, and the hook member can rotate around a central axis of the connection shaft when in the second position.

(7) The first position is a position of the hook member when in a closed state, and the second position is an initial position of the hook member when in an open state.

(8) According to an embodiment of the present invention, the hook member is rotatable between the first position and second position thereof. Preferably, the handle part of the hook member is connected at one end thereof to the second end of the connection shaft by means of a pin, wherein the handle part can rotate from the first position to the second position around the pin. More preferably, the first position and second position are centrosymmetric with respect to the pin.

(9) According to another embodiment of the present invention, the hook assembly further comprises a support member, the support member surrounding the second end substantially in a circumferential direction, and having at least two limiting openings, respectively configured to clamp the handle part in the first position or second position.

(10) According to another embodiment of the present invention, between the first end and second end, the connection shaft further comprises at least one lug extending radially outward from a part of a circumferential surface of the connection shaft, the housing has reserved thereon a mounting channel and a holding part, the first end and lug of the connection shaft pass through the mounting channel and are received in the holding part, and an elastic component is provided between the first end and the holding part.

(11) Preferably, the mounting channel is provided with at least one groove capable of accommodating the lug to pass through, the holding part has a mounting hole for accommodating the first end, and a hole opening of the mounting hole is provided with an axially extending stop part at a position corresponding to the groove.

(12) According to a preferred embodiment of the present invention, at least one slot is defined at an edge of the mounting channel at a housing interior side; once the lug has passed through the groove, the connection shaft is rotated such that the lug is received in the slot. Preferably, the slot is multiple slots, defining multiple different angular positions of the hook member relative to the central axis of the connection shaft, wherein the position of one slot corresponds to the first position of the hook member.

(13) The present invention also provides a power tool, comprising a housing, the housing being connected to the hook assembly for a power tool according to any one of the preceding claims, the housing defining the center of gravity of the power tool, and the handle part of the hook member substantially coinciding with the center of gravity of the power tool when the power tool is hung up.

(14) A power tool can be hung in a desired position flexibly and conveniently by means of the hook assembly for a power tool according to the present invention. When the hook member is at the first position in the closed state, the hook assembly will not hinder the process of using the tool, and is effectively integrated with the power tool. When the tool is not in use, the hook member is rotated to the initial position in the open state, i.e., the second position, at which time the hook member can rotate flexibly and conveniently around the central axis of the connection shaft connected to a housing handle part, through an angle that is adjustable, i.e., rotate through any angle within a certain range, thereby achieving flexible and convenient adjustment of a hanging angle, and can automatically adjust a hanging direction and position according to the center of gravity of the power tool.

(15) The embodiments mentioned can be better understood through the following detailed description while perusing the accompanying drawings. It is emphasized that the various components are not necessarily drawn to scale. In fact, dimensions can be enlarged or reduced at will for the purposes of clear discussion. In the drawings, identical reference labels denote identical elements.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) FIG. 1 is a schematic drawing of an operating state in which the hook assembly of the present invention is fitted onto a power tool.

(2) FIG. 2 is perspective view of an embodiment of the hook assembly according to the present invention.

(3) FIG. 3 is a sectional view of the hook assembly shown in FIG. 2.

(4) FIG. 4 is a sectional view taken along line A-A of the hook assembly shown in FIG. 3.

(5) FIG. 5 is a schematic drawing of the hook assembly of the present invention in the process of moving from the first position to the second position.

(6) FIG. 6 is a schematic drawing of an operating state when the hook assembly of the present invention fitted onto a power tool is at the second position.

(7) FIG. 7 is a schematic drawing of a power tool fitted with the hook assembly of the present invention when hung up.

(8) FIG. 8 is a schematic drawing of another power tool fitted with the hook assembly of the present invention when hung up.

DETAILED DESCRIPTION OF THE DRAWINGS

(9) A hook assembly for a power tool according to an embodiment of the present invention is described below with reference to FIGS. 1-8.

(10) According to an embodiment of the present invention, a power tool **1** is a handheld circular saw. In an alternative embodiment, a hook assembly **2** of the present invention may be used in any type of power tool, hand tool or tool fitting.

(11) Referring to FIG. 1, the power tool **1** comprises a housing **10** having a handle part; the hook assembly **2** is attached to the housing **10** of the power tool **1**. The position of the hook assembly **2** depends on the type of power tool, the weight distribution of the tool, the position of the handle, and other factors. In the embodiments shown in FIGS. 1-7, the hook assembly **2** is arranged on a part of the housing **10** that is close to a front end of the handle **11**.

(12) According to an embodiment of the present invention, referring to FIGS. 2, 3 and 4, the housing **10** of the power tool is provided with a mounting channel **12** for accommodating and supporting the connection shaft and a holding part **13** for receiving one end of the connection shaft. The hook assembly **2** comprises a connection shaft **20** having a first end **21** and a second end **22** which are opposite each other; the first end **21** of the connection shaft is connected to the housing

10 of the power tool, and the second end **22** is connected to a hook member **24**. Preferably, between the first end **21** and the second end **22**, the connection shaft **20** further comprises at least one a lug **23**, which extends radially outward from a part of a circumferential surface of the connection shaft **20**. More preferably, the lug **23** comprises two lugs, arranged symmetrically along a central axis of the connection shaft.

(13) As shown in FIG. 4, the mounting channel **12** is provided with a groove **14** capable of accommodating the lug **23** of the connection shaft **20** to pass through. Preferably, the groove **14** is a pair of grooves **14** extending radially outward from a part of a circumferential surface of the mounting channel **12**; the shape and size of the groove correspond to the shape and size of the lug mentioned above, that is to say, the lug **23** can pass through the groove **14**. More preferably, at least one slot **15** is defined at an edge of the mounting channel **12** at a housing interior side; once the lug **23** has passed through the groove **14**, the connection shaft **20** is rotated such that the lug **23** is accommodated in the slot **15**. Preferably, the slot **15** is multiple slots, defining multiple different angular positions of the hook member **24** relative to the central axis of the connection shaft **20**, wherein the position of one pair of slots **15'** corresponds to a first position of the hook member **24**, so as to ensure that the hook member **24** will not randomly rotate around the axis of the connection shaft **24** when in the first position. Preferably, the shape of the slot **15** is substantially smooth, and the slot cannot be too deep; when the hook member **24** is located at a second position, overcoming a biasing force of an elastic component **17**, the lug **23** can easily slide in and out of the slot **15**, thereby ensuring that the hook member **24** can flexibly rotate around the central axis of the connection shaft. Preferably, the slot is four slots, arranged in pairs symmetrically with respect to the axis center of the connection shaft, wherein one pair of slots is the slots **15'** corresponding to the first position of the member **24**, and the other pair of slots corresponds to the position of a maximum rotation angle required by the hook member. More preferably, the slot **15** is disposed at a position approximately 30-45 degrees from the groove **14** close thereto. In an alternative embodiment, a greater number of slots may be arranged around the rotation axis.

(14) The holding part **13** substantially comprises a mounting hole **16** for receiving the first end **21** of the connection shaft; an elastic component **17** is provided between the first end **21** and the holding part **13**. The size and shape of the mounting hole **16** are designed to be adapted to the first end **21** of the connection shaft, and configured to allow rotational movement and axial movement of the first end **21** in the mounting hole **16**. Preferably, the connection shaft **20** further comprises a head **28** extending along an axis of the first end **21** and having a reduced diameter; the elastic component **17** is fitted round the head **28**, and supported between the first end and the bottom of the mounting hole **16**. The elastic component **17**, for example a compression spring, provides a biasing force, for the purpose of keeping the lug **23** of the connection shaft **20** able to abut the interior of the slot **15**. More preferably, a hole opening of the mounting hole **16** is provided with an axially extending stop part **18** at a position corresponding to the groove **14**. The stop part **18** is configured such that when the lug **23** has passed through the groove **14** and the lug **23** has been caused to fall into the slot **15** by rotating the connection shaft **20**, the axially extending stop part **18** at least partially coincides with the lug in the axial direction of the connection shaft and is offset with respect to the lug **23** in the circumferential direction of the connection shaft, thereby blocking the lug **23** from re-entering the groove **14** during rotation of the connection shaft, and ensuring that the lug **23** will not come out of the groove **14**.

(15) According to a preferred embodiment of the present invention, the housing **10** comprises two halves, being split into the two halves at a center line position of the handle **11**; during assembly of the power tool, the two halves are fitted together to form the housing **10**. In the present invention, the mounting channel **12** and the holding part **13** are arranged on the two halves of the housing respectively, such that when the lug **23** of the connection shaft has first of all passed through the mounting channel **12** arranged on one of the halves, it extends into the holding part **13** arranged on the other half, the connection shaft **20** is rotated, causing the lug **23** to enter the slot **15** on an end

face of the mounting channel **12** that faces toward the other half, then the two halves are joined; and with regard to the stop part **18** of the holding part arranged in the other half, due to the fact that the position of the axially extending stop part **18** corresponds to the position of the groove **14** of the mounting channel **12**, the stop part **18** blocks the region axially in front of the groove **14** of the mounting channel **12**. The elastic component **17** arranged between the first end **21** of the connection shaft **20** and the holding part **13** is compressed axially, and the biasing force thereof causes the lug of the connection shaft **20** to be held in the slot **15**. Moreover, since the axially extending stop part **18** at least partially coincides with the lug **23** in the axial direction, the stop part **18** blocks the rotation angle of the lug **23** in the circumferential direction, thereby ensuring that the hook member is mounted to the power tool reliably and simply.

(16) Referring to FIGS. 2-4, the hook member **24** comprises a handle part **25** and a hook part **26** extending from the handle part. The handle part **25** substantially comprises a straight longitudinal portion, used for attaching the hook member **24** to the second end **22** of the connection shaft **20**. Preferably, the handle part **25** is connected at one end thereof to the second end **22** of the connection shaft by means of a pin **27**, wherein the handle part **25** can rotate around the pin **27**. The handle part **25** is substantially perpendicular to the connection shaft. The hook part **26** extends from one end of the handle part **25**, and has a suitable hook shape for use in hanging of the tool. Preferably, the hook part **26** comprises a portion substantially parallel to the axis of the connection shaft **20** and a portion substantially perpendicular to the axis of the connection shaft **20**; such a structural configuration of the hook part **26** facilitates secure and stable hanging.

(17) Referring to FIGS. 1, 2, 5 and 6, the hook member of the present invention has a first position **41** and a second position **42** opposite the first position, wherein the first position **41** is the position of the hook member **24** when in a closed state thereof, that is to say, the first position **41** is the position of the hook member when the power tool does not need to be hung up by the hook member; for example, when the tool is being used, the user wishes that the hook member cause minimum hindrance to the use of the tool, and therefore, preferably, the first position **41** is below the front end of the handle **11**, such that the hook member can be positioned near or adjacent to a body of the tool. When the hook member **24** needs to hang up the power tool, the hook member **24** must be moved to the second position **42** thereof; the second position **42** is an initial position of the hook member **24** when in an open state, and the second position **42** enables the hook member **24** to extend outward from the body of the tool to facilitate hanging of the tool. When the hook member **24** is in the initial position in the open state, it can rotate to a final position thereof around the central axis of the connection shaft **20**.

(18) According to an embodiment of the present invention, referring to FIGS. 1, 3 and 5, the hook member **24** is rotatable between the first position **41** and second position **42** thereof. Since the handle part **25** of the hook member **24** is connected to the second end **22** of the connection shaft **20** by means of the pin **27**, the handle part **25** can rotate from the first position **41** to the second position **42** around the pin **27**. More preferably, the first position **41** and second position **42** are centrosymmetric with respect to the pin **27**, that is to say, the hook member **24** rotates through 180 degrees from the first position **41** to reach the second position **42**. More preferably, the second end **22** of the connection shaft is provided with a narrow slot for accommodating the handle part; the narrow slot extends radially outward and is centered at the pin **27**, and corresponds to the first position and/or second position of the hook member. According to another embodiment of the present invention, the hook assembly further comprises a support member **30**; the support member **30** surrounds the second end **22** of the connection shaft **20** substantially in the circumferential direction, and the support member **30** has at least two limiting openings **31**. The limiting opening **31** corresponds to the position of the narrow slot, and is configured to clamp the handle part **25** in the first position and/or second position. According to a preferred embodiment of the present invention, the support member **31** is a plastic member having certain degree of elasticity; the limiting opening **31** comprises a part for accommodating the handle part, and a slide groove

slightly smaller than the size of the handle part. The limiting opening 31 is configured such that when the hook member 24 is at the first position, the handle part 25 is restricted in the opening, and will not randomly come out of the opening, but at the same time, when the handle part 25 is rotated from the first position 41 to the second position 42, the handle part can come out of the limiting opening 31 corresponding to the first position 41, and when the hook member 24 has rotated to the second position 42, the handle part can enter the limiting opening corresponding to the second position 42, and be restricted thereby, so as to avoid unnecessary rotation around the pin 27 when the hook member 24 is at the first position and/or second position.

(19) Now referring to FIGS. 6-8, when the hook member 24 is rotated to the second position 42, since the connection shaft 23 is rotatable relative to the housing, the hook member 24 can further rotate to a desired angle around the central axis of the connection shaft 20. When the power tool is hung up, the hook part 26 is hung on a bar or hook; at this time, the weight of the power tool itself overcomes the biasing force generated by elastic component 17, such that the lug 23 of the connection shaft 20 slides out of the slot 15 on the end face of the mounting channel 12, and the connection shaft 20 rotates under the action of the weight of the tool, until the direction of the handle part 25 of the hook member 24 substantially coincides with the center of gravity of the power tool, at which time the hook assembly has the optimal hanging position and direction.

(20) The hook assembly of the present invention can be integrated into the housing of the power tool, so that possible hindrance to the use of the tool is at a minimum, and can hang the tool in a desired position such as on another hook, protrusion, bar or other similar object when the tool is not in use, and automatically adjust to a mounted hanging position according to the center of gravity of the tool.

(21) The present invention also provides a power tool, comprising a housing, the housing being connected to the hook assembly for a power tool according to any one of the preceding claims, the housing defining the center of gravity of the power tool, and the hook member substantially coinciding with the line of gravity of the power tool when the power tool is hung up. As shown in FIG. 7, when the power tool is equipped with a battery of lower weight, the center of gravity of the power tool is closer to the middle of the tool; in this case, when the hook assembly of the present invention hangs up the tool, the tool as a whole is closer to being horizontal. When the power tool is equipped with a battery of higher weight, as shown in FIG. 8, the center of gravity of the power tool moves toward the rear of the tool due to the increase in weight of the battery, and when the hook assembly of the present invention is used to hang up the tool, the tool is obviously tilted further toward the rear. The automatic adjustment of the hanging angle and/or direction according to the center of gravity of the power tool by means of the hook assembly of the present invention better ensures the safety, stability and convenience of tool hanging.

(22) As stated above, although demonstrative embodiments of the present invention have already been explained herein with reference to the accompanying drawings, the present invention is not limited to the particular embodiments described above; many other embodiments are possible, and the scope of the present invention should be defined by the claims and their equivalent meaning.

Claims

1. A power tool, comprising: a housing; and a hook assembly for hanging the power tool, wherein the hook assembly has a connection shaft with a first end and a second end opposite each other, wherein the connection shaft is supported in a mounting channel of the housing, wherein the first end is disposed within a mounting hole of a holding part of the housing, wherein the second end is connected to a hook member, and wherein the hook member comprises a handle part and a hook part extending from the handle part; wherein an elastic component is disposed between the first end of the connection shaft and a bottom of the mounting hole of the holding part of the housing; wherein the hook member is rotatable between a first position and a second position opposite the

first position, wherein the first position is a position of the hook member when in a closed state and when the power tool is in use, and wherein the second position is an initial position of the hook member when in an open state and when the power tool is not in use such that the hook member extends outward from a body of the power tool to facilitate hanging of the power tool; wherein the handle part of the hook member is connected at a first end of the handle part to the second end of the connection shaft by a pin such that the handle part is rotatable from the first position to the second position around the pin; wherein when the power tool hangs from the hook assembly, the hook member is further rotatable from the second position around a central axis of the connection shaft to a final position by a weight of the hanging power tool overcoming a biasing force generated by the elastic component such that a lug of the connection shaft between the first end of the connection shaft and the second end of the connection shaft slides out of a slot on an end face of the mounting channel of the housing and the connection shaft rotates under an action of the weight of the hanging power tool until a direction of the handle part of the hook member coincides with a center of gravity of the hanging power tool.

2. The power tool as claimed in claim 1, wherein the first position and second position are centrosymmetric with respect to the pin.

3. The power tool as claimed in claim 1, wherein a support member of the hook assembly surrounds the second end in a circumferential direction and wherein at least two limiting openings of the support member are respectively configured to clamp the handle part in the first position and/or the second position.
