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Angle-adjustable power tool

Abstract

An angle-adjustable power tool has a handle, a driving head, and a positioning group. The handle has an engaging mount and an engaging disk. The engaging mount is disposed on a top of the handle and has a communicating recess and a fixing recess. The engaging disk is mounted in the fixing recess of the engaging mount. The driving head is rotatably connected to the handle and has a pivot base and a head portion. The pivot base is disposed in a bottom of the driving head and is rotatably connected to the handle to dispose the engaging mount and the engaging disk between the handle and the pivot base. The positioning group is disposed between the handle and the driving head and has a positioning mount, an elastic element, an abutting mount, and a toggling element.

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Background/Summary

BACKGROUND OF THE INVENTION

1. Field of the Invention

(1) The present invention relates to a power tool, and more particularly to an angle-adjustable power tool with a simple structure, which may be positioned accurately and may save cost.

2. Description of Related Art

(2) A conventional power tool is driven by eccentricity or gas to rotate a workpiece in a forward direction or a reverse direction. The conventional power tool has a handle and a driving head connected to the handle. When a user holds the handle and processes the workpiece by the driving head, a relative position between the user and the workpiece cannot be processed by the driving head, which will increase the inconvenience of use. Therefore, a pivot device is disposed between the handle and the driving head of the conventional power tool, and an angle between the driving head and the handle can be adjusted by the pivot device. Then the user can process the workpiece at a proper angle.

(3) However, the conventional power tool can adjust the angle between the driving head and the

handle by the pivot device to achieve an effect of convenient use. The pivot device disposed between the driving head and the handle lacks a stably positioned structure, so that the driving head may swing relative to the handle during processing after the angle adjustment, and may cause damage to the workpiece and work-safety hazards. Furthermore, if the conventional tool is driven by gas, in order to accurately transmit the gas to the driving head via the handle and the pivot device, the conventional power tool must be provided with a gas flow channel of a complex shape, causing difficulty in processing between the handle, the pivot device and the driving head, and this will increase the cost and time required for manufacturing the conventional power tool.

(4) To overcome the shortcomings, the present invention tends to provide an angle-adjustable power tool to mitigate the aforementioned problems.

SUMMARY OF THE INVENTION

(5) The main objective of the invention is to provide an angle-adjustable power tool with a simple structure, which may be positioned accurately, and may save cost.

(6) An angle-adjustable power tool in accordance with the present invention has a handle, a driving head, and a positioning group. The handle has an engaging mount and an engaging disk. The engaging mount is disposed on a top of the handle and has a communicating recess and a fixing recess. The engaging disk is mounted in the fixing recess of the engaging mount. The driving head is rotatably connected to the handle and has a pivot base and a head portion. The pivot base is disposed in a bottom of the driving head and is rotatably connected to the handle to dispose the engaging mount and the engaging disk between the handle and the pivot base. The positioning group is disposed between the handle and the driving head and has a positioning mount, an elastic element, an abutting mount, and a toggling element.

(7) Other objects, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) FIG. **1** is a perspective view of an angle-adjustable power tool in accordance with the present invention;

(2) FIG. **2** is another perspective view of the angle-adjustable power tool in FIG. **1**;

(3) FIG. **3**A is an exploded perspective view of the angle-adjustable power tool power tool in FIG. **1**;

(4) FIG. **3**B is an enlarged perspective view of an engaging disk of the angle-adjustable power tool;

(5) FIG. **4** is another exploded perspective view of the angle-adjustable power tool power tool in FIG. **1**;

(6) FIG. **5** is a side view of the angle-adjustable power tool in FIG. **1**;

(7) FIG. **6** is a side view of the angle-adjustable power tool along line **6**-**6** in FIG. **5**;

(8) FIG. **7** is a side view of the angle-adjustable power tool along line **7**-**7** in FIG. **5**;

(9) FIG. **8** is an operational side view of the angle-adjustable power tool in FIG. **1** after rotating;

(10) FIG. **9** is an operational perspective view of the angle-adjustable power tool in FIG. **1** after rotating;

(11) FIG. **10** is a top side view of the angle-adjustable power tool in FIG. **9** after rotating; and

(12) FIG. **11** is a sectional perspective view of the angle-adjustable power tool in FIG. **9** after rotating.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

(13) With reference to FIGS. **1** to **4**, an angle-adjustable power tool in accordance with the present invention comprises a handle **10**, a driving head **20**, and a positioning group **30**.

(14) With reference to FIGS. **1** to **4**, the handle **10** has a mounting recess **11**, a pivot recess **12**, an

engaging mount, and an engaging disk **14**. The mounting recess **11** is transversally formed through a top of the handle **10** and faces to the driving head **20**. The pivot recess **12** is transversally formed in the top of the handle **10** and communicates with the mounting recess **11**. Preferably, the pivot recess **12** has an inner diameter larger than an inner diameter of the mounting recess **11** to form a stepper structure between the pivot recess **12** and the mounting recess **11**. Furthermore, the handle **10** has a connecting head **15**, and the mounting recess **11** and the pivot recess **12** are formed in the connecting head **15**. In addition, a lower portion of the connecting head **15** of the handle **10** is connected to a housing to communicate with a high pressure air source via the housing. With reference to FIGS. **4** and **5**, the connecting head **15** has a communicating slot **151** longitudinally formed in the connecting head **15** below the pivot recess **12** and communicating with the pivot recess **12** and the lower portion of the connecting head **15**. Then the high pressure air source flows in the pivot recess **12** via the lower portion of the connecting head **15**, the communicating slot **151**, and the mounting recess **11**.

(15) With reference to FIGS. **3**A and **4**, the engaging mount **13** is mounted in the pivot recess **12**, extends out of the connecting head **15**, and may have multiple fasteners **131**. The multiple fasteners **131** are mounted through the connecting head **15** to connect the engaging mount **13** securely to the connecting head **15**. The engaging mount **13** has a communicating recess **132** formed in one of two sides of the engaging mount **13** that faces to the pivot recess **12**. The engaging mount **13** has a notch **133** radially formed in a bottom of the corresponding side of the engaging mount **13** and communicating with the communicating recess **132** and the communicating slot **151**. The engaging mount **13** has a fixing recess **134** formed in the other one of the two sides of the engaging mount **13**, opposite to the pivot recess **12**, and axially communicating with the communicating recess **132**. The fixing recess **134** has an inner diameter smaller than an inner diameter of the communicating recess **132** to form an annular stepper between the fixing recess **134** and the communicating recess **132**.

(16) With reference to FIGS. **3**A, **3**B, and **4**, the engaging disk **14** is securely connected to the engaging mount **13** and is mounted in the fixing recess **134**. Preferably, the engaging disk **14** and the engaging mount **13** can be separated or integrally formed, which is not limited here. The engaging disk **14** has a through hole **141**, multiple engaging units **142**, and at least one communicating hole **143**. The through hole **141** is axially formed through the engaging disk **14** and communicates with the communicating recess **132** via the fixing recess **134**. The multiple engaging units **142** are formed on a side of the engaging disk **14** faced to the pivot recess **12** at spaced intervals and are arranged around the through hole **141**. Preferably, each one of the multiple engaging units **142** is a tooth. The at least one communicating hole **143** is axially formed through the engaging disk **14** and the multiple engaging units **142** and communicates with the communicating recess **132**. In addition, the engaging disk **14** has multiple communicating holes **143** surrounding the through hole **141**.

(17) With reference to FIGS. **3**A, **4**, and **5**, the driving head **20** is pivotally connected to the handle **10** and has a pivot base **21** and a head portion **22**. The pivot base **21** is disposed in a bottom of the driving head **20**, is an annular structure, and is rotatably connected to the connecting head **15** of the handle **10**. The pivot base **21** has a connecting recess **211**, a mounting hole **212**, and a communicating channel **213**. The connecting recess **211** is transversally formed in a side of the pivot base **21** faced to the connecting head **15**, and the engaging mount **13** that extends out of the connecting head **15** is mounted in the connecting recess **211**. Then the engaging mount **13** is mounted between the pivot recess **12** of the connecting head **15** and the connecting recess **211** of the pivot base **21**. With reference to FIG. **5**, when the pivot base **21** is connected to the connecting head **15**, a gap d is formed between an inner side of the pivot base **21** and an inner side of the connecting head **15**. The mounting hole **212** is formed in an external surface of the pivot base **21**, opposite to the connecting head **15**, and communicates with the connecting recess **211**. Preferably, the mounting hole **212** is a polygonal hole. The communicating channel **213** is longitudinally

formed in the pivot base **21** and communicates with the at least one communicating hole **143** of the engaging disk **14** via the connecting recess **211**. The head portion **22** is disposed on a top of the driving head **20**, is connected to the pivot base **21**, and has components such as cylinder, rotor, and steering device same as the conventional components, which are not to be described in detail. Furthermore, the communicating channel **213** communicates with an interior of the head portion **22**.

(18) With reference to FIGS. **3**A to **5**, the positioning group **30** is disposed between the handle **10** and the driving head **20** to fix an angle of the driving head relative to the handle **10**, and has a positioning mount **31**, an elastic element **32**, an abutting mount **33**, and a toggling element **34**. The positioning mount **31** is rotatably and movably disposed between the connecting head **15** of the handle and the pivot base **21** of the driving head **20**, selectively engages with the engaging disk **14**, and has a linking head **35** and a positioning disk **36**. The linking head **35** is disposed on one of two ends of the positioning mount **31**, is connected to the mounting hole **212** of the pivot base **21** to enable the positioning mount **31** to rotate with the pivot base **21** via the linking head **35**, and has a fixing hole **351** and a fixing bolt **352**. The fixing hole **351** is axially formed in the linking head **35**. The fixing bolt **352** is securely connected to the fixing hole **351** via the mounting hole **212** from the external surface of the pivot base **21** to connect the positioning mount **31** securely to the pivot base **21** via the linking head **35**.

(19) The positioning disk **36** is disposed on a middle of the positioning mount **31**, is connected to the linking head **35**, and is movably mounted in the communicating recess **132** of the engaging mount **13**. The positioning disk **36** has a positioning structure **361** disposed on a side of the positioning disk **36** faced to the multiple engaging units **142** of the engaging disk **14** and selectively engaging with the multiple engaging units **142**. Preferably, the positioning structure **361** is a gear that engages with the teeth. With reference to FIG. **5**, the positioning structure **361** is a helical gear, and each one of the multiple engaging units **142** of the engaging disk **14** is a helical tooth structure that engages with the helical gear. The engagement between the helical gear and the helical tooth structure may improve the structural strength and stability between the positioning disk **36** and the engaging disk **14**, and may reduce the backlash between the helical gear and the helical tooth structure, so that it can be engaged accurately.

(20) With reference to FIGS. **2** to **5**, the other one of the two ends of the positioning mount **31** extends out of the connecting head **15** via the communicating recess **132** of the engaging mount **13**, the pivot recess **12**, and the mounting recess **11**. The elastic element **32** is disposed in the communicating recess **132** of the engaging mount **13**, is mounted around the positioning mount **31**, and has two ends. One of the two ends of the elastic element **32** abuts against the positioning disk **36** to push the positioning disk **36** to engage with the engaging disk **14**, and the other one of the two ends of the elastic element **32** extends into the mounting recess **11**. With reference to FIGS. **3**A, **4**, and **5**, the abutting mount **33** is disposed on an external surface of the connecting head **15** opposite to the pivot base **21**, is connected securely to the engaging mount **13** by the multiple fasteners **131**, and abuts against the end of the elastic element **32** that extends into the mounting recess **11**. The abutting mount **33** has at least one sliding slot **331** formed in an external surface of the abutting mount **33**. Preferably, the abutting mount **33** has multiple sliding slots **331** annularly formed in the external surface of the abutting mount at spaced intervals.

(21) The toggling element **34** is connected to the positioning mount **31** via the connecting head **15**, rotatably abuts the abutting mount **33**, and has at least one protrusion **341** formed on and protruded from a side of the toggling element **34** faced to the abutting mount **33**. The at least one protrusion **341** is selectively mounted in the at least one sliding slot or abuts against the external surface of the abutting mount **33**. Then the positioning mount **31** is moved relative to the engaging disk **14** with the rotation of the toggling element **34** to separate the positioning disk **36** from the engaging disk **14**, and the pivot base **21** is moved toward the connecting head **15** by the positioning mount **31** to reduce the gap d between the pivot base **21** and the connecting head **15**.

(22) With reference to FIGS. **5** and **8**, when the angle-adjustable power tool of the present invention is in use, a user wants to adjust an angle of the driving head relative to the handle **10**, and the user rotates the toggling element **34** relative to the abutting mount **33** to enable the at least one protrusion **341** to rotate with the toggling element **34** to separate from the at least one sliding slot **331** and to abut against the external surface of the abutting mount **33**. Then the toggling element **34** is moved outwardly relative to the connecting head **15**, and the positioning mount **31** that is connected securely to the toggling element **34** is moved with the toggling element **34** and is moved relative to the connecting head and the pivot base **21**. The positioning disk **36** is moved with the positioning mount **31** to enable the positioning structure **361** of the positioning disk **36** to separate from the multiple engaging units **142** of the engaging disk **14** and to compress the elastic element **32** between the positioning disk **36** and the abutting mount **33**. Since the positioning mount **31** is no longer restricted by the engaging disk **14**, as shown in FIG. **9**, the user can rotate the driving head **20** to change its angle relative to the handle **10** according to the user's needs. As the pivot base **21** is securely connected to the positioning mount **31**, the pivot base **21** can be rotated relative to the connecting head **15** by the movement of the positioning mount **31**. Then the driving head **20** is moved toward the handle **10** to reduce the gap d between the pivot base **21** and the connecting head **15** as shown in FIG. **8**.

(23) With reference to FIG. **10**, after the driving head **20** is rotated to a desired angle, the user can rotate the toggling element **34** to move the at least one protrusion **341** from the external surface of the abutting mount **33** into the at least one sliding slot **331**. At this time, the compressed elastic element **32** will push against the positioning disk **36**, so that the positioning mount **31** moves away from the connecting head **15** to enable the positioning structure **361** of the positioning disk **36** to engage with the multiple engaging units **142** of the engaging disk **14**. Then through the structural relationships between the engaging disk **14**, the positioning mount **31**, the abutting mount **33**, and the toggling element **34**, the angle of the driving head **20** is stably and accurately positioned relative to the handle **10** to prevent the driving head **20** from swinging relative to the handle **10** during processing, thereby causing damage to the workpiece and hindering work safety. Since the driving head **20** moves relative to the handle along with the positioning mount **31**, the driving head **20** can rotate relative to the handle **10** stably during the process of adjusting the angle of the driving head **20** relative to the handle **10**.

(24) Furthermore, with reference to FIGS. **3**A to **7**, the angle-adjustable power tool of the present invention is provided by the connecting head **15** with the communicating slot **151**, the engaging mount **13** with the communicating recess **132**, the through hole **141**, and the pivot base **21** with the communicating channel **213**, so that the high-pressure gas in the housing flows into the head portion **22** of the driving head **20** via the communicating slot **151**, the communicating recess **132**, the through hole **141**, and the communicating channel **213**. Then the head portion **22** is driven to process the workpiece without using air channels of complex shapes that make processing difficult, thereby effectively reducing the cost and time required for manufacturing. Furthermore, after the driving head **20** is rotated relative to the handle **10**, the high-pressure gas can still flow into the head portion **22** through the communicating slot **151**, the communicating recess **132**, the through hole **141**, and the communicating channel **213**.

(25) In addition to pushing the positioning disk **36** and the engaging disk **14** by the elastic element **32** for positioning, the high-pressure gas entering the connecting head **15** through the communicating slot **151** and the communicating recess **132** can also push the positioning disk **36** to firmly engage with the engaging disk **14**, so that the driving head **20** of the angle-adjustable power tool of the present invention can be firmly held with the handle before and after the rotation, thereby providing an angle-adjustable power tool with a simple structure, can be positioned accurately, and save cost.

(26) Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and features of the

invention, the disclosure is illustrative only. Changes may be made in the details, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

Claims

1. An angle-adjustable power tool comprising a handle, a driving head, and a positioning group, wherein: the handle has an engaging mount mounted in a top of the handle and having a communicating recess formed in the engaging mount; and a fixing recess formed in the engaging mount, communicating with the communicating recess, and faced to the driving head; and an engaging disk mounted in the fixing recess of the engaging mount; the driving head is pivotally connected to the handle and has a pivot base disposed in a bottom of the driving head and rotatably connected to the handle to dispose the engaging mount and the engaging disk between the handle and the pivot base; and a head portion disposed on a top of the driving head and connected to the pivot base; and the positioning group is disposed between the handle and the driving head to fix an angle of the driving head relative to the handle, and has a positioning mount rotatably and movably disposed between the handle and the pivot base, and selectively engaging with the engaging disk; an elastic element disposed in the communicating recess of the engaging mount and abutting against the positioning mount to push the positioning mount to engage with the engaging disk; an abutting mount disposed on an external surface of the handle opposite to the pivot base, connected securely to the engaging mount, and abutting against the elastic element, the abutting mount having at least one sliding slot formed in an external surface of the abutting mount; and a toggling element connected to the positioning mount and rotatably abutting the abutting mount, the toggling element having at least one protrusion formed on and protruding from a side of the toggling element facing the abutting mount, and being selectively mounted in the at least one sliding slot or abutting against the external surface of the abutting mount to move the positioning mount relative to the engaging disk with the rotation of the toggling element; wherein the toggling element is rotated relative to the abutting mount, the positioning mount is moved by the toggling element to separate from the engaging disk and to compress the elastic element, an angle of the driving head relative to the handle is adjusted via the pivot base, after angle-adjustment, the positioning mount is moved toward and engages with the engaging disk for positioning by the compressed elastic element.
2. The angle-adjustable power tool as claimed in claim 1, wherein the positioning mount has a linking head disposed on one of two ends of the positioning mount and securely connected to the pivot base; and a positioning disk disposed on a middle of the positioning mount, connected to the linking head, movably mounted in the communicating recess of the engaging mount, and selectively engaging with the engaging disk.
3. The angle-adjustable power tool as claimed in claim 2, wherein the engaging disk has multiple engaging units formed on a side of the engaging disk faced to the handle; and the positioning disk has a positioning structure disposed on a side of the positioning disk faced to the multiple engaging units of the engaging disk and selectively engaging with the multiple engaging units.
4. The angle-adjustable power tool as claimed in claim 3, wherein the positioning structure of the positioning disk is a helical gear; and each one of the multiple engaging units of the engaging disk is a helical tooth structure that engages with the helical gear.
5. The angle-adjustable power tool as claimed in claim 4, wherein the engaging disk has at least one communicating hole axially formed through the engaging disk and the multiple engaging units and communicating with the communicating recess.
6. The angle-adjustable power tool as claimed in claim 1, wherein the handle has a mounting recess transversally formed through the top of the handle and faced to the driving head; and a pivot recess transversally formed in the top of the handle and communicating with the mounting recess; the

engaging mount is mounted in the pivot recess; and the elastic element is disposed between the pivot recess and the communicating recess.

7. The angle-adjustable power tool as claimed in claim 6, wherein the handle has a connecting head; the mounting recess and the pivot recess are formed in the connecting head; the connecting head has a communicating slot longitudinally formed in the connecting head below the pivot recess and communicating with the pivot recess and a lower portion of the connecting head; the engaging mount is securely connected to the connecting head and has a notch radially formed in a bottom of a side of the engaging mount faced to the pivot recess and communicating with the communicating recess and the communicating slot; the pivot base is rotatably connected to the connecting head of the handle and has a connecting recess transversally formed in a side of the pivot base faced to the connecting head; and the engaging mount that extends out of the connecting head is mounted in the connecting recess.

8. The angle-adjustable power tool as claimed in claim 1, wherein the engaging disk has multiple engaging units formed on a side of the engaging disk faced to the handle; and the positioning disk has a positioning structure disposed on a side of the positioning disk faced to the multiple engaging units of the engaging disk and selectively engaging with the multiple engaging units.

9. The angle-adjustable power tool as claimed in claim 8, wherein the positioning structure of the positioning disk is a helical gear; and each one of the multiple engaging units of the engaging disk is a helical tooth structure that engages with the helical gear.