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Tool with Pivoting Head

Abstract

Various embodiments of a tool with a pivoting head and locking mechanism are provided. The tool includes a handle and a head that is pivotable relative to the handle. The tool includes a locking mechanism adjustable between a locked position and an unlocked position. In one embodiment, the locking mechanism is biased toward remaining in the locked position when in the locked position and biased toward remaining in the unlocked position when in the unlocked position. In another embodiment, the locking mechanism includes a rotating switch coupled to a lock shuttle that is offset from a central axis of the handle. In another embodiment, the locking mechanism includes a rotating switch coupled to the lock shuttle, the rotating switch includes a projection configured to engage a retention step of the shuttle.

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Background/Summary

CROSS REFERENCE TO RELATED PATENT APPLICATIONS [0001] The present application claims the benefit of and priority to U.S. Provisional Application No. 63/568,810, filed Mar. 22, 2024, and to U.S. Provisional Application No. 63/555,239 filed Feb. 19, 2024, and which are incorporated herein by reference in their entireties.

BACKGROUND OF THE INVENTION
[0002] The present disclosure is directed generally to a tool, such as a ratchet wrench, with a pivoting head. The present disclosure relates specifically to a ratchet wrench with a pivoting head and a locking mechanism that locks the head at the desired pivoted position.
SUMMARY OF THE INVENTION
[0003] An embodiment of the invention relates to a driving tool. The driving tool includes a handle extending along a longitudinal axis and a head coupled to the handle such that the head is pivotable about a pivot joint to a plurality of angular positions relative to the handle. The head includes a toothed projection extending toward the handle. The driving tool further includes a workpiece engagement structure coupled to the head and a locking mechanism. The locking mechanism includes an engagement member. The engagement member includes a locking end, a bore, and a ledge. The locking end is configured to engage the head. The bore extends though the engagement member and the ledge is positioned within the bore. The locking mechanism further includes a control mechanism coupled to the engagement member. The control mechanism includes an actuator, a shaft extending from the actuator where the shaft extends into the bore, and a projection extending radially outward from the shaft.
[0004] Another embodiment of the invention relates to a driving tool. The driving tool includes a handle extending along a longitudinal axis and a head coupled to the handle. The driving tool further includes a workpiece engagement structure coupled to the head and a pivot joint positioned between the handle and the head. The pivot joint couples the handle to the head such that the head is pivotable about the pivot joint to a plurality of angular positions relative to the handle. The driving tool includes a slot defined in the handle and a locking mechanism. The locking mechanism includes a sliding switch positioned in the slot, the switch is moveable along the longitudinal axis. The switch includes a locking end that is configured to engage the head. The locking mechanism further includes a retaining member extending through the sliding switch, a first recess, and a second recess spaced from the first recess along the longitudinal axis. The locking mechanism is moveable between a locking position in which the angular position of the head relative to the handle is fixed and an unlocked position in which the head is pivotable about the pivot joint.
[0005] Another embodiment of the invention relates to a driving tool. The driving tool includes a handle extending along a central, longitudinal axis and a head coupled to the handle such that the head is pivotable about a pivot joint to a plurality of angular positions relative to the handle. The driving tool further includes a workpiece engagement structure coupled to the head and a locking mechanism. The locking mechanism includes an engagement member with a locking end configured to engage the head and a protrusion. The locking mechanism further includes a control mechanism that includes an actuator, a shaft extending from the actuator into the handle and an open section defined in the shaft. The open section is configured to receive the protrusion of the engagement member to couple the engagement member to the control mechanism. The locking mechanism is moveable between a locked position in which the angular position of the head relative to the handle is fixed and an unlocked position in which the head is pivotable about the pivot joint.

[0006] Additional features and advantages will be set forth in the detailed description which follows, and, in part, will be readily apparent to those skilled in the art from the description or recognized by practicing the embodiments as described in the written description included, as well as the appended drawings. It is to be understood that both the foregoing general description and the following detailed description are exemplary.
[0007] The accompanying drawings are included to provide further understanding and are incorporated in and constitute a part of this specification. The drawings illustrate one or more embodiments and, together with the description, serve to explain principles and operation of the various embodiments.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0008] This application will become more fully understood from the following detailed description, taken in conjunction with the accompanying figures, wherein like reference numerals refer to like elements in which:
[0009] FIG. **1** is a perspective view of a ratchet wrench with a pivoting head and slide lock, according to an exemplary embodiment.
[0010] FIG. **2** is a cross-sectional view of the ratchet wrench with the pivoting head of FIG. **1**, according to an exemplary embodiment.
[0011] FIG. **3** is an isolated view of the head of the ratchet wrench of FIG. **1**, according to an exemplary embodiment.
[0012] FIG. **4** is a top view of the ratchet wrench with the pivoting head of FIG. **1** in a locked state, according to an exemplary embodiment.
[0013] FIG. **5** is a top view of the ratchet wrench with the pivoting head of FIG. **1** in an unlocked state, according to an exemplary embodiment.
[0014] FIG. **6** is a perspective view of a ratchet wrench with a pivoting head and rotating lock, according to an exemplary embodiment.
[0015] FIG. **7** is a top view of the ratchet wrench with the pivoting head of FIG. **6**, according to an exemplary embodiment.
[0016] FIG. **8** is an isolated perspective view of the rotating lock of the ratchet wrench with the pivoting head of FIG. **6**, according to an exemplary embodiment.
[0017] FIG. **9** is an isolated perspective view of the rotating lock of the ratchet wrench with the pivoting head of FIG. **6**, according to an exemplary embodiment.
[0018] FIG. **10** is a perspective view of a ratchet wrench with a pivoting head, according to another exemplary embodiment.
[0019] FIG. **11** is a top view of the ratchet wrench with the pivoting head of FIG. **10**, according to an exemplary embodiment.
[0020] FIG. **12** is a bottom view of the ratchet wrench with the pivoting head of FIG. **10**, according to an exemplary embodiment.
[0021] FIG. **13** is a perspective view of the ratchet wrench with the pivoting head of FIG. **10** with the handle removed.
[0022] FIG. **14** is an exploded view of a locking mechanism of the ratchet wrench of FIG. **10**, according to an exemplary embodiment.
[0023] FIG. **15** is a cross-sectional view of the locking mechanism of the ratchet wrench with the handle removed, according to an exemplary embodiment.
[0024] FIG. **16** is a top view of the ratchet wrench of FIG. **10** in a locked position, according to an exemplary embodiment.
[0025] FIG. **17** is detailed view from below of the locking mechanism in the locked position,

according to an exemplary embodiment.
[0026] FIG. **18** is a top view of the ratchet wrench of FIG. **10** in an unlocked position, according to an exemplary embodiment.
[0027] FIG. **19** is detailed view from below of the locking mechanism in the unlocked position, according to an exemplary embodiment.
DETAILED DESCRIPTION
[0028] Referring generally to the figures, various embodiments of a tool, such as a ratcheting wrench with a pivoting head and locking mechanism, are provided. In various embodiments, the tool includes a locking mechanism that engages the pivoting head to hold or lock the pivoting head at a desired angular position relative to the head. Some conventional ratchet wrenches include locking mechanisms that are always biased toward the locked position, which can cause unintended locking when adjusting the angular position of the pivoting head. In certain embodiments discussed herein, the locking mechanism is designed to be held or maintained in either the locked or the unlocked state as selected by the user.
[0029] Referring to FIG. **1**, a driving tool, such as wrench **10**, is shown according to an exemplary embodiment. In the embodiment shown, wrench **10** is a ratchet wrench including a tool body or handle **12** extending along a longitudinal axis **13**, a pivot joint **14** and a pivoting portion, shown as head **16**. In general, pivot joint **14** is located between handle **12** and head **16** and allows the user to change the angular position of head **16** relative to handle **12**.
[0030] In some embodiments, head **16** includes a workpiece engagement structure with a ratchet mechanism. The workpiece engagement structure can be any structure that allows for engagement of a workpiece (e.g., a fastener, a bolt, a nut, etc.). Handle **12** acts as a handle and lever to apply torque to the workpiece. In specific embodiments, the workpiece engagement structure is an open wrench head, a closed wrench head, a screwdriver head, a post configured to releasably engage a socket, etc. In some embodiments, head **16** is configured to support a ratchet mechanism coupled to the workpiece engagement structure such that the ratchet mechanism provides ratcheting action to the workpiece engagement structure. The ratchet mechanism is a mechanical structure that allows for free or unrestricted rotation of handle **12** around the workpiece engagement structure in a first direction and allows for restricted or driving rotation of handle **12** around the workpiece engagement structure in a second direction opposite of the first direction. Wrench **10** may include a selection mechanism that allows the user to select which rotational direction provides driving rotation and which provides free rotation. In a specific embodiment, the ratchet mechanism includes a gear structure, one or more pawls and a biasing component.
[0031] Referring to FIGS. **1** and **2**, a driving tool, shown as a wrench **10** includes a pivot joint **14** that allows the user to adjust the angular position of head **16** relative to handle **12**. Head **16** includes a projection **18** extending toward handle **12** along longitudinal axis **13**. Projection **18** includes a plurality of toothed projections or splines **20**. Handle **12** includes a pair of arms or flanges **22** that extend toward head **16** in a direction parallel to longitudinal axis **13** from an engagement end of handle **12**. Arms **22** each include openings **24** that are oriented perpendicularly to longitudinal axis **13** and align with each other. As shown in FIG. **2**, projection **18** includes a channel **26** and is positioned between arms **22** such that channel **26** and openings **24** are aligned along a rotational axis **28**. In some embodiments, head **16** is rotatably coupled to handle **12**, such as by a pin or axel that extends along rotational axis **28** and passes through openings **24** and channel **26**.
[0032] Wrench **10** includes a locking mechanism **30** that allows the user to selectably and reversibly lock head **16** in a desired angular position relative to the handle **12**. Locking mechanism **30** includes a switch **32** located within a slot **34** of handle **12**. In various embodiments, slot **34** is an elongate slot. In various specific embodiments, slot **34** is defined in an outward, longitudinal surface of handle **12**. In such embodiments, slot **34** extends through only a portion of handle **12**. In other words, in such embodiment, slot **34** does not extend through handle **12** and switch **32** can

only be actuated from a single side of wrench **10**.

[0033] As shown in FIG. **2**, slot **34** includes a first recess or detent **36** and a second recess or detent **38** spaced from the first detent **36** along longitudinal axis **13**. In various embodiments, slot **34** includes a third recess or detent **36** that opposes or faces the first detent **36** and a fourth recess or detent **38** that opposes or faces the second detent **38**. In various specific embodiments, handle **12** and specifically slot **34** includes a first set or pair of recesses or detents **36** and a second set of recesses or detents **38**. First set of detents **36** is spaced apart from second set of detents **38** along longitudinal axis **13** such that first set of detents **36** is located between second set of detents **38** and a distal end of handle **12**. Second set of detents **38** is located between first set of detents **36** and rotational axis **28** with respect to longitudinal axis **13**. In a specific embodiment, first set of detents **36** and/or second set of detents **38** include two detents located on opposing sides of handle **12** with respect to longitudinal axis **13**. In other words, first set of detents **36** and second set of detents **38** are defined on laterally inward facing surfaces **37** of handle **12** and more specifically slot **34**. In other words, inward facings surfaces **37** each face toward longitudinal axis **13**.

[0034] Locking mechanism **30** includes a shuttle **40** rigidly coupled to switch **32**. In a specific embodiment, switch **32** and shuttle **40** are integrally formed as a single, continuous, contiguous component. Shuttle **40** has a locking or engagement end **42** that is configured to engage splines **20** of head **16** to lock head **16** at an angular position with respect to handle **12**. Shuttle **40** also includes a retaining member **44** configured to be releasably retained within either first set of detents **36** or second set of detents **38**. In some embodiments, retaining member **44** includes one or more retractable ball-nose ends configured to fit within either first set of detents **36** or second set of detents **38**. In various specific embodiments, retaining member **44** extends in a generally perpendicular (e.g., 90 degrees plus or minus 10 degrees) orientation to longitudinal axis **13**. In various embodiments, retaining member **44** extends through switch **32** and between lateral facing surfaces **39** of switch **32**. When switch **32** is positioned within slot **34**, lateral facing surfaces **39** face inward facing surfaces **37** of handle **12**.

[0035] Referring to FIG. **3**, an isolated view of head **16** is shown, according to an exemplary embodiment. In a specific embodiment, the plurality of splines **20** are spaced circumferentially about a portion of projection **18** with respect to rotational axis **28**. Splines **20** are place along an arcuate surface of projection **18** that extends through an arc angle of between 210 and 135 degrees with respect to rotational axis **28**, and specifically, through an angle of about 180 degrees. The configuration of splines **20** around projection **18** allows users to lock head **16** into a plurality of angular positions with respect to handle **12**.

[0036] Referring to FIGS. **4** and **5**, locking mechanism **30** is moveable between a locked position, shown in FIG. **4**, in which the angular position of head **16** relative to handle **12** is fixed and an unlocked position, shown in FIG. **5**, in which head **16** is pivotable about rotational axis **28**. To adjust the locking mechanism **30** into the locked position, the user moves switch **32** parallel to longitudinal axis **13** toward head **16** such that locking end **42** of shuttle **40** is engaged and in contact with splines **20** of head **16**. To adjust locking mechanism **30** into the unlocked position, the user moves switch **32** parallel to longitudinal axis **13** away from head **16** such that locking end **42** of shuttle **40** is not in contact with splines **20** of head **16**.

[0037] Referring back to FIG. **2**, when locking mechanism **30** is in the locked position, retaining member **44** is releasably retained within second set of detents **38** such that locking end **42** of shuttle **40** engages splines **20** of head **16** until sufficient force is applied to switch **32** to remove retaining member **44** from second set of detents **38**. Similarly, when locking mechanism **30** is in the unlocked position, retaining member **44** is releasably retained within first set of detents **36** such that locking end **42** does not engage splines **20** of head **16** until sufficient force is applied to switch **32** to remove retaining member **44** from second set of detents **38**. Unlike some conventional rotatable wrench head locking mechanisms that are always biased toward a locked position, the configuration of retaining member **44**, first set of detents **36** and second set of detents **38** provides a

locking mechanism that is stably held or maintained in both a locked position and an unlocked position.

[0038] Referring to FIGS. **6-9**, wrench **110** is shown, according to an exemplary embodiment. Wrench **110** is substantially similar to wrench **10** except for the differences discussed herein. As discussed in greater detail below, Applicant has designed additional embodiments of a locking mechanism for a tool with a pivoting head and locking mechanism. Some conventional ratchet wrenches with locking mechanisms that include a rotational switch have a lock shuttle for engaging the wrench head that is centered within the handle portion of the wrench. In certain embodiments discussed herein, the locking mechanism includes a rotational switch and a lock shuttle that is offset from the central axis of the wrench handle. Applicant believes this configuration results in a secure locking mechanism that requires fewer and simpler components than some conventional designs which may provide for a smaller sized locking mechanism suitable for a smaller sized tool.

[0039] As shown in FIG. **6**, wrench **110** includes a handle **112** extending along a longitudinal axis **113** that forms a pivot joint **114** with head **16**. Handle **112** includes arms **122** having openings **124**, and a locking mechanism **130** having a control mechanism shown as a rotating lever **144**. Similar to wrench **10**, openings **124** align with channel **26** of head **16**, shown in FIG. **3**, along a rotational axis **128**.

[0040] Referring to FIG. **7**, locking mechanism **130** further includes an engagement member, shown as shuttle **140** having a locking end **142** and a shuttle protrusion **143**. Shuttle protrusion **143** extends from a shaft of shuttle **140**. In specific embodiments, protrusion **143** is positioned between locking end **142** and an opposing end of shuttle **140**. Locking end **142** is configured to engage toothed projections or splines **20** of head **16** to fix the angular position of head **16** with respect to handle **112**. Rotating lever **144** includes an open section or recessed section **146** located on a portion of rotating lever **144** within handle **112** and configured to receive shuttle protrusion **143** to couple shuttle **140** to rotating lever **144**.

[0041] As shown in FIG. **8**, rotating lever **144** also includes a lever shaft **148** that extends the actuating portion of lever **144** downward along an axis of rotation of rotating lever **144**. Open section **146** is located on lever shaft **148**. When wrench **110** is assembled, lever shaft **148** is located within the body of handle **112**. Referring to FIGS. **8** and **9**, shuttle **140** includes a plurality of teeth **152**. Teeth **152** extend from locking end **142** and are configured to cooperate with and engage splines **20** of head **16**.

[0042] Rotating lever **144** allows users to actuate locking mechanism **130** between a locked position and an unlocked position. When rotating lever **144** is set in the locked position, as shown in FIGS. **6** and **7**, teeth **152** on locking end **142** of shuttle **140** are in contact with and engage splines **20** of head **16**, fixing the angular position of head **16** with respect to handle **112**. Locking mechanism **130** can be actuated from the locked position to an unlocked position by rotating lever **144** clockwise. Referring back to FIG. **7**, shuttle **140** is offset with respect to longitudinal axis **113** of handle **112**. By offsetting shuttle **140** from a centerline of handle **112** (i.e. longitudinal axis **113**), the rotational motion of rotating lever **144** is transferred to translational motion of shuttle **140**. In other words, shuttle **140** is positioned on one side of the central longitudinal axis **113**. In specific embodiments, shuttle **140** is positioned entirely on one side of the central, longitudinal axis or centerline.

[0043] As rotating lever **144** rotates, the surfaces forming the sides of open section **146** push shuttle protrusion **143** such that shuttle **140** slides translationally in a direction parallel to longitudinal axis **113**. When rotating lever **144** is set in the unlocked position, locking end **142** of shuttle **140** is spaced apart from splines **20** of head **16** such that head **16** can pivot about rotational axis **128** with respect to handle **112**. The configuration of open section **146**, shuttle protrusion **143**, and shuttle **140** being offset from longitudinal axis **113** provides for a rotating locking mechanism that is easily actuated between a locked and unlocked position while only requiring two components.

[0044] Referring to FIGS. **10-19**, wrench **210** is shown, according to an exemplary embodiment.

Wrench **210** is substantially similar to wrench **10**, **110** except for the differences discussed herein. As discussed in greater detail below, Applicant has designed additional embodiments of a locking mechanism for a tool with a pivoting head and locking mechanism. Some conventional ratchet wrenches with locking mechanisms that include a rotational switch have a lock shuttle for engaging the wrench head that may have unwanted shuttle movement (such as when wrench is dropped) that causes the switch to disengage. In certain embodiments discussed herein, the locking mechanism includes a rotational switch and a lock shuttle that includes a retention step or ledge configured to engage with a projection on the switch. Applicant believes this configuration results in a secure locking mechanism that requires fewer and simpler components than some conventional designs which may provide for a more secure engagement between the shuttle and switch.

[0045] Referring to FIGS. **10-12**, driving tool, shown as a wrench **210** includes a pivot joint **214** that allows the user to adjust the angular position of head **16** relative to handle **212**. Head **16** includes a projection **18** extending toward handle **212** along longitudinal axis **213**. Projection **18** includes a plurality of toothed projections or splines **20**. Handle **212** includes a pair of arms or flanges **222** that extend toward head **16** in a direction parallel to longitudinal axis **213** from an engagement end of handle **212**. Arms **222** each include openings **224** that are oriented perpendicularly to longitudinal axis **213** and align with each other. Projection **18** includes a channel (see e.g., **26** in FIG. **3**) and is positioned between arms **222** such that channel and openings **224** are aligned along a rotational axis **228**.

[0046] In various specific embodiments, wrench **210** and specifically head **16** supports a thumbwheel **216**. As can be seen in FIG. **12**, a retention clip **217** is positioned along a rear surface of head **16** to secure thumbwheel **216** to wrench **216**. Wrench **210** includes a reverse switch **232** configured to change the driving direction of wrench **210**. Wrench includes a control mechanism shown as locking mechanism **239** which includes an engagement member shown as shuttle **234** engaged or coupled to switch an actuator shown as locking switch **230**. In a specific embodiment, switch **230** and shuttle **234** are each integrally formed as a single, continuous, contiguous components.

[0047] Referring to FIGS. **13-15**, details of locking mechanism **239** are shown according to an exemplary embodiment. Shuttle **234** has a locking or engagement end that is configured to engage splines **20** of head **16** to lock head **16** at an angular position with respect to handle **212**. In various embodiments, shuttle **234** includes one or more teeth or splines **236** configured to engage with splines **20**. Shuttle **234** further includes a channel **240** defined in a surface that opposes splines **236** (e.g., faces away from head **16**). A biasing component, shown as spring **238** is positioned within channel **240** of shuttle **234**. In various specific embodiments, channel **240** and/or spring **238** are aligned along longitudinal axis **213**.

[0048] Shuttle **234** further includes a switch bore **242** configured to receive locking switch **230**. As previously discussed, Applicant believes the engagement between shuttle **234** and switch **230** provides more secure engagement and reduces the likelihood of disengagement between components if wrench **210** is dropped. Switch bore **242** includes a recessed portion **244** with a ledge or retention step **246**. In other words, the ledge **246** is connected to or positioned within the bore **242**. In specific embodiments, switch bore **242** extends through shuttle **234** in a generally perpendicular orientation (e.g., 90 plus or minus 10 degrees) to longitudinal axis **213** and pivot axis **228**. In specific embodiments, switch bore **242** extends through the entire shuttle **234** (e.g., from top surface to bottom surface).

[0049] As shown in FIG. **14**, locking switch **230** includes an actuator or lever **250** connected to a shaft **252**. Locking switch **230** further includes a projection **254** extending radially outward from a portion of shaft **252**. In various specific embodiments, projection **254** is a single projection extending from shaft **252**. In other words, shaft **252** includes only one projection **254**. In various embodiments, lever **250** extends radially in a first direction and projection **254** extends radially in a second direction. In specific embodiments, the first direction and the second direction are different.

In other words, the radial extension of projection **254** is not aligned with lever **250**.
[0050] When locking mechanism **239** is assembled, projection **254** of locking switch **230** is positioned within recessed portion **244** while shaft **252** is positioned within a main portion of the switch bore **242**. Further, when locking switch **230** is positioned within bore **242**, an end of locking switch **230** and more specifically shaft **252** extends beyond or past an end of switch bore **242**. In other words, the end of shaft **252** is not flush with the end of switch bore **242** (see e.g., FIG. **15**).
[0051] In various embodiments, projection **254** is an asymmetrical projection. In specific embodiments, projection **254** is a singular asymmetrical projection. In specific embodiments, an outermost radial surface of projection **254** is curved. In various embodiments, locking switch **230** and more specifically shaft **252** includes a planar portion extending along a longitudinal axis of the shaft **252**. In specific embodiments, shaft **252** has a non-circular cross-sectional shape. In other words, in specific embodiments, shaft **252** is not symmetrical.
[0052] Referring to FIGS. **16-19**, details of locking mechanism **239** moving between a locked and unlocked position are shown according to an exemplary embodiment. As shown in FIGS. **16-17**, when locking switch **230** is rotated in a first direction (e.g., counterclockwise direction), projection **254** is moved into recessed portion **244** of shuttle **234** to provide secure engagement between shuttle **234** and locking switch **230**. More specifically, projection **254** is positioned above retention step **246** (in the orientation shown in FIG. **17**) and therefore resists movement of locking switch **230** relative to shuttle **234**. As previously discussed, Applicant believes the reduced space of recessed portion **244** reduces the likelihood of locking switch **230** falling out of or disengaging from shuttle **235** during a forceful event like dropping of wrench **210**.
[0053] As shown in FIGS. **18-19**, when locking switch **230** is rotated in a second direction that opposes the first direction (e.g., clockwise direction), projection **254** is moved out of recessed portion **244** of shuttle **234**. More specifically, projection **254** of locking switch **230** is moved away from recessed portion **244** and toward the longitudinal axis **213** and/or biasing component **238**.
[0054] It should be understood that the figures illustrate the exemplary embodiments in detail, and it should be understood that the present application is not limited to the details or methodology set forth in the description or illustrated in the figures. It should also be understood that the terminology is for description purposes only and should not be regarded as limiting.
[0055] Further modifications and alternative embodiments of various aspects of the disclosure will be apparent to those skilled in the art in view of this description. Accordingly, this description is to be construed as illustrative only. The construction and arrangements, shown in the various exemplary embodiments, are illustrative only. Although only a few embodiments have been described in detail in this disclosure, many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter described herein. Some elements shown as integrally formed may be constructed of multiple parts or elements, the position of elements may be reversed or otherwise varied, and the nature or number of discrete elements or positions may be altered or varied. The order or sequence of any process, logical algorithm, or method steps may be varied or re-sequenced according to alternative embodiments. Other substitutions, modifications, changes and omissions may also be made in the design, operating conditions and arrangement of the various exemplary embodiments without departing from the scope of the present disclosure.
[0056] Unless otherwise expressly stated, it is in no way intended that any method set forth herein be construed as requiring that its steps be performed in a specific order. Accordingly, where a method claim does not actually recite an order to be followed by its steps or it is not otherwise specifically stated in the claims or descriptions that the steps are to be limited to a specific order, it is in no way intended that any particular order be inferred. In addition, as used herein, the article “a” is intended to include one or more component or element and is not intended to be construed as

meaning only one. As used herein, “rigidly coupled” refers to two components being coupled in a manner such that the components move together in a fixed positional relationship when acted upon by a force.
[0057] Various embodiments of the disclosure relate to any combination of any of the features, and any such combination of features may be claimed in this or future applications. Any of the features, elements or components of any of the exemplary embodiments discussed above may be utilized alone or in combination with any of the features, elements or components of any of the other embodiments discussed above.
[0058] For purposes of this disclosure, the term “coupled” means the joining of two components directly or indirectly to one another. Such joining may be stationary in nature or movable in nature. Such joining may be achieved with the two members and any additional intermediate members being integrally formed as a single unitary body with one another or with the two members or the two members and any additional member being attached to one another. Such joining may be permanent in nature or alternatively may be removable or releasable in nature.
[0059] While the current application recites particular combinations of features in the claims appended hereto, various embodiments of the invention relate to any combination of any of the features described herein whether or not such combination is currently claimed, and any such combination of features may be claimed in this or future applications. Any of the features, elements, or components of any of the exemplary embodiments discussed above may be used alone or in combination with any of the features, elements, or components of any of the other embodiments discussed above.
[0060] In various exemplary embodiments, the relative dimensions, including angles, lengths and radii, as shown in the Figures are to scale. Actual measurements of the Figures will disclose relative dimensions, angles and proportions of the various exemplary embodiments. Various exemplary embodiments extend to various ranges around the absolute and relative dimensions, angles and proportions that may be determined from the Figures. Various exemplary embodiments include any combination of one or more relative dimensions or angles that may be determined from the Figures. Further, actual dimensions not expressly set out in this description can be determined by using the ratios of dimensions measured in the Figures in combination with the express dimensions set out in this description.

Claims

1. A driving tool, comprising: a handle extending along a longitudinal axis; a head coupled to the handle such that the head is pivotable about a pivot joint to a plurality of angular positions relative to the handle, the head including a toothed projection extending toward the handle; a workpiece engagement structure coupled to the head; a locking mechanism, the locking mechanism comprising: an engagement member, the engagement member comprising: a locking end, the locking end configured to engage the head; a bore extending through the engagement member; and a ledge positioned within the bore; and a control mechanism coupled to the engagement member, the control mechanism comprising: an actuator; a shaft extending from the actuator, wherein the shaft extends into the bore; and a projection extending radially outward from the shaft.
2. The driving tool of claim 1, wherein the locking mechanism is moveable between a locked position in which the angular position of the head relative to the handle is fixed and an unlocked position in which the head is pivotable about the pivot joint.
3. The driving tool of claim 2, wherein, when the locking mechanism is in the locked position, the ledge resists movement of the projection of the control mechanism within the bore.
4. The driving tool of claim 2, wherein, when the locking mechanism is in the unlocked position, the projection is spaced from the ledge.
5. The driving tool of claim 1, wherein the bore of the engagement member includes a recessed

portion that is at least partially defined by the ledge.
6. The driving tool of claim 5, wherein the recessed portion extends along the longitudinal axis and away from the head.
7. A driving tool, comprising: a handle extending along a longitudinal axis; a head; a workpiece engagement structure coupled to the head; a pivot joint positioned between the handle and the head, the pivot joint coupling the handle to the head such that the head is pivotable about the pivot joint to a plurality of angular positions relative to the handle; a slot defined in the handle; and a locking mechanism comprising: a sliding switch positioned in the slot, the switch moveable along the longitudinal axis, the switch comprising: a locking end, the locking end configured to engage the head; a retaining member extending through the sliding switch; a first recess; and a second recess spaced from the first recess along the longitudinal axis; wherein the locking mechanism is moveable between a locked position in which the angular position of the head relative to the handle is fixed and an unlocked position in which the head is pivotable about the pivot joint.
8. The driving tool of claim 7, further comprising a first inward facing surface of the handle positioned in the slot, wherein the first recess and second recess are positioned on the first inward facing surface.
9. The driving tool of claim 8, further comprising: a second inward facing surface of the handle positioned in the slot, the second inward facing surface opposing the first inward facing surface; a third recess positioned on the second inward facing surface; and a fourth recess positioned on the second inward facing surface and spaced from the third recess along the longitudinal axis.
10. The driving tool of claim 9, wherein the third recess faces the first recess and wherein the fourth recess faces the second recess.
11. The driving tool of claim 9, wherein, when the retaining member is engaged with the first recess the retaining member is engaged with the third recess.
12. The driving tool of claim 7, wherein, when the retaining member is engaged with the first recess, the sliding switch is spaced from the head and secured in the unlocked position.
13. The driving tool of claim 12, wherein, when the retaining member is engaged with the second recess, the sliding switch is engaged with head and secured in the locked position.
14. The driving tool of claim 7, wherein the retaining member extends in a generally perpendicular orientation to the longitudinal axis between opposing inward facing surfaces of the slot.
15. A driving tool, comprising: a handle extending along a central, longitudinal axis; a head coupled to the handle such that the head is pivotable about a pivot joint to a plurality of angular positions relative to the handle; a workpiece engagement structure coupled to the head; a locking mechanism, the locking mechanism comprising: an engagement member, the engagement member comprising: a locking end, the locking end configured to engage the head; and a protrusion; and a control mechanism comprising: an actuator; a shaft extending from the actuator, wherein the shaft extends into the handle; and an open section defined on the shaft and configured to receive the protrusion of the engagement member to couple the engagement member to the control mechanism; wherein the locking mechanism is moveable between a locked position in which the angular position of the head relative to the handle is fixed and an unlocked position in which the head is pivotable about the pivot joint.
16. The driving tool of claim 15, wherein the engagement member is positioned on a side of the central, longitudinal axis of the handle.
17. The driving tool of claim 15, wherein the engagement member is offset from the central, longitudinal axis of the handle.
18. The driving tool of claim 15, wherein, when the actuator is moved in a first direction to the locked position, the shaft is rotated such that the locking end of the engagement member is engaged with the head.
19. The driving tool of claim 18, wherein, when the actuator is move in a second direction to the unlocked position, the shaft is rotated such that the locking end of the engagement member is

spaced from the head.

20. The driving tool of claim 15, wherein the protrusion of the engagement member extends from a shaft of the engagement member and is positioned between the locking end and a distal end that opposes the locking end.