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MULTIPLE-BIT HAND TOOL INCLUDING POWER NUT/BIT DRIVER

Abstract

A reversible, multiple-bit, hand tool for driving threaded fasteners and nuts includes a handle and a reversible tool holder assembly. The reversible tool holder assembly is insertable into the handle in either of two orientations to present two different ends provide multiple different configurations for driving different types of threaded fasteners and nuts. The reversible tool holder assembly includes a reversible adapter barrel, a first tool holder, a second tool holder, a first reversible bit holder, and a second reversible bit holder. Each of the tool holders can be selectively used as a nut driver with the holder assembly inserted in either orientation in the handle or can be removed from the adapter barrel and used separately as a power bit driver or a power nut driver (PND) that is received in any conventional chuck of a powered rotary tool.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a continuation of U.S. patent application Ser. No. 17/721,006 filed Apr. 14, 2022 which claims priority to provisional U.S. Patent Application No. 63/233,186 filed Aug. 13, 2021, the entire disclosures of which are incorporated herein by reference.

BACKGROUND OF THE DISCLOSURE

[0002] The present disclosure relates to tools, and more particularly, to a multi-purpose hand tools for driving threaded fasteners and nuts, and to power nut and/or bit drivers that can be engaged in chuck of a standard rotary power tool, such as a handheld drill or impact driver.

[0003] Repairmen, technicians, and others are frequently required to carry a variety of tools for the various tasks that they are required to perform. As an example, tradesmen often carry both Phillips head and flat head screwdrivers as a rule. Depending on the application, different sized Phillips head or flat head screwdrivers may even be required. For example, a small screw may require, or be adapted to receive, only a small Phillips head bit, such as size #1 head, or the application may involve larger screws that may require, or be adapted to receive, a larger sized Phillips head bit, such as a #2 Phillips head bit. Of course, the same may be true of flat head screws. Different sized flat head bits may be required, depending on the size of the head of the screw. Additionally, other type bits, such as Torx head style bits or square drive bits, may be required for applications involving Torx head or square drive screws. In addition, various sized nut drivers may also be required. For example, 9/16, 3/8, 5/16, 1/4, and 3/16 sized nut drivers may be needed.

[0004] In any event, in order to be prepared to handle the various types of screws and nuts that may be encountered, tradesmen are required to carry a multitude of tools. Even though some of the screw or nut driver sizes may be used infrequently, tradesmen still may need to carry all the potential sizes for the screws and nuts that they may encounter, along with all of the other types of tools necessary for their work. It may be difficult and time-consuming for them to gather all of the separate tools that may be needed. It may also be unwieldy and cumbersome to carry all of the tools at the same time that may be required. In addition, it is also costly for a technician to purchase and carry all of the various tools that may be required. Furthermore, tradesmen may need to carry various sized power nut and/or bit drivers to use with a power drill or impact driver.

[0005] While conventional multiple bit drivers can reduce the number of tools that a tradesman may have to carry, there is always room for improvement. For example, no conventional multiple bit drivers eliminate the need to carry various sized power nut and/or bit drivers to use with a power drill or impact driver.

BRIEF SUMMARY OF THE DISCLOSURE

[0006] According to one feature of this disclosure, a reversible, multiple-bit, hand tool, includes: a handle having a body portion that includes a hollow bore formed at least partially through the body portion; and a reversible tool holder assembly insertable into the hollow bore of the body portion of the handle in either of two orientations to present two different ends extending from the handle. The reversible tool holder assembly includes a reversible adaptor barrel extending longitudinally from a first adapter end to a second adaptor end. The adaptor barrel includes: a first adaptor socket

formed in the first adaptor end, and a second adaptor socket formed in the second adaptor end. The reversible adaptor barrel is releasably engaged in the hollow bore in either of a first orientation and a second orientation. In the first orientation the first adapter end extends out from the handle and the second adaptor end extends into the handle. In the second orientation the second adapter end extends from the handle and the first adaptor end extends into the handle. The reversible tool holder assembly further includes a first tool holder extending longitudinally from a first shank end to a first socket end, the first tool holder including: a first shank extending from the first shank end toward the first socket end, and a first tool socket extending from the first socket end toward the first shank end. The first shank is releasably engageable in at least one of the first and second adaptor sockets to rotatably couple the first tool holder to the reversible adaptor barrel. The reversible tool holder assembly further includes a second tool holder extending longitudinally from a second shank end to a second socket end, the second tool holder including: a second shank extending from the second shank end toward the second socket end, and a second tool socket extending from the second socket end toward the second shank end. The second shank is releasably engageable in at least one of the first and second adaptor sockets to rotatably couple the second tool holder to the reversible adaptor barrel. The reversible tool holder assembly further includes a first reversible bit holder having a pair of oppositely opening first bit cavities, each first bit cavity adapted to releasably receive a tool bit. The first reversible bit holder is releasably engageable in at least one of the first and second tool sockets to rotatably couple the first reversible bit holder to the at least one of the first and second tool sockets in one orientation with one of the oppositely opening first bit cavities extending from the at least one of the first and second tool sockets and in another orientation with the other of the oppositely opening first bit cavities extending from the at least one of the first and second tool sockets. The reversible tool holder assembly further includes a second reversible bit holder having a pair of oppositely opening second bit cavities, each second bit cavity adapted to releasably receive a tool bit. The second reversible bit holder releasably engageable in at least one of the first and second tool sockets to rotatably couple the second reversible bit holder to the at least one of the first and second tool sockets in one orientation with one of the oppositely opening second bit cavities extending from the at least one of the first and second tool sockets and in another orientation with the other of the oppositely opening second bit cavities extending from the at least one of the first and second tool sockets.

[0007] In one feature, the hand tool of further includes four tool bits, each of the four tool bits engageable in at least one of first and second bit cavities to rotatably couple the tool bit with the corresponding one of the first and second reversible bit holders. In a further feature, at least one of the four tool bits is a reversible tool bit that is engageable in the at least one of the first and second bit cavities in either of two orientations to present different ends extending from the at least one of the first and second bit cavities. In yet a further feature, one of the four tool bits is a non-reversible tool bit that is engageable in a single orientation in the at least one of the first and second bit cavities.

[0008] According to another feature, the first tool socket is configured to serve as a first sized nut driver and the second tool socket is configured to serve as a second sized nut driver, with the second sized nut driver being a different size than the first sized nut driver.

[0009] As another feature, the first sized nut driver is configured to drive a $\frac{3}{8}$ inch hex nut, the second sized nut driver is configured to drive a $\frac{5}{16}$ inch hex nut, the first reversible bit holder has an outer surface defining a $\frac{3}{8}$ inch hexagonal cross-section, and the second reversible pit holder has an outer surface defining a $\frac{5}{16}$ inch hexagonal cross-section.

[0010] In one feature, the hand tool further includes a detent mechanism engaged between the hollow bore and the reversible barrel adaptor to resist removal of the reversible barrel adaptor from the hollow bore.

[0011] According to one feature, the hand tool further includes a detent mechanism engaged between the first shank and the at least one of the first and second adaptor sockets to resist removal

of the first shank from the at least one of the first and second adaptor sockets; and another detent mechanism engaged between the second shank and the at least one of the first and second adaptor sockets to resist removal of the second shank from the at least one of the first and second adaptor sockets.

[0012] As one feature, the hand tool further includes a detent mechanism engaged between the first reversible bit holder and the at least one of the first and second tool sockets to resist removal of the first reversible bit holder from the at least one of the first and second tool sockets; and another detent mechanism engaged between the second shank and the at least one of the first and second tool sockets to resist removal of the second reversible bit holder from the at least one of the first and second tool sockets.

[0013] In one feature, at least one of the first and second reversible bit holders further comprises a magnet located in one of the bit cavities.

[0014] According to one feature, each of the shanks has an outer surface defining a $\frac{1}{4}$ hexagonal cross-section and is configured to be received in a chuck for a powered impact driver.

[0015] As one feature, the handle further includes an insert defining at least part of the hollow bore, the insert engaged with the reversible adapter barrel in both the first and second orientations to rotatably couple the reversible adapter barrel with the handle.

Description

BRIEF SUMMARY OF THE SEVERAL VIEWS OF THE DRAWINGS

[0016] FIG. 1 is a perspective view from the front and side of a multiple-bit hand tool according to this disclosure;

[0017] FIG. 2 is a perspective view from the back and side of the hand tool of FIG. 1;

[0018] FIG. 3 is a side elevation view of the hand tool of FIGS. 1 and 2;

[0019] FIG. 4 is a longitudinal section view taken from line 4-4 in FIG. 3;

[0020] FIG. 5 is an enlarged longitudinal section view of a handle of the hand tool of FIGS. 1-4;

[0021] FIG. 6 is an exploded side elevation view of a reversible tool holder assembly of the hand tool of FIGS. 1-4;

[0022] FIG. 7 is a view similar to FIG. 4 but taken from a line that is rotated 90 degrees from line 4-4 in FIG. 3;

[0023] FIG. 8 is a view similar to FIG. 4 but showing several components in a reversed orientation from that shown in FIG. 4;

[0024] FIG. 9 is an exploded view of selected components shown in FIG. 4;

[0025] FIG. 10 is an exploded view of selected components shown in FIG. 8;

[0026] FIG. 11 is a side elevation view showing a slightly modified embodiment of the hand tool of FIGS. 1-10;

[0027] FIG. 12 is an exploded side elevation view of the reversible tool holder assembly of the embodiment shown in FIG. 11.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0028] With reference to FIGS. 1-10, a reversible, multiple-bit, hand tool 10 is shown for driving threaded fasteners and nuts. As best seen in FIG. 1-4, the hand tool 10 includes a handle 12 and a reversible tool holder assembly 14. As best seen in FIGS. 4 and 5, the handle 12 includes a body portion 16 and a hollow bore 18 that extends partially through the body portion 16, with the body portion 16 and hollow bore 18 centered on a longitudinal axis 19. The reversible tool holder assembly 14 is insertable into the hollow bore 18 in either of two orientations to present two different ends, shown generally at 20A and 20B, extending from the handle 12 to provide multiple different configurations for driving different types of threaded fasteners and nuts. In both orientations, the assembly 14 is centered on the axis 19.

[0029] As best seen in FIG. 5, in the illustrated and preferred embodiment, the body portion **16** of the handle **12** includes a rigid body **22**, a grip **24**, and a collet **26**. The rigid body **22** is molded from a suitable material, typically a suitable plastic and includes a stepped cylindrical bore **28** that defines part of the hollow bore **18**. The grip **24** overlays an outer surface of the body **22** is also molded from a suitable material, typically a suitable rubber material. The collet **26** is formed from a suitable metal, typically a suitable stainless steel and is preferably permanently fixed in the handle **12** via a press fit and/or bonding with the rigid body **22** to rotatably couple the collet **26** to the body **22**. In this regard the collet **26** may also include a knurling on an outer surface to provide a further rotational couple with the body **22**. The collet **26** includes an inwardly facing cylindrical surface **30** that defines a portion of the hollow bore **18**, with a pair of axially extending grooves **32**, each of which serves as an anti-rotation feature that transfers torque to the tool holder assembly **14** and rotatably couples the handle **12** with the assembly **14**. The collet **26** and the surface **30** are centered on the axis **19**.

[0030] As best seen in FIG. 6, the reversible tool holder assembly **14** includes a reversible adapter barrel **38**, a first tool holder **40**, a second tool holder **42**, a first reversible bit holder **44**, a second reversible bit holder **46**, and three reversible tool bits **48A**, **48B**, and **48C**, and one non-reversible tool bit **50**. Each of the components **38**, **40**, **42**, **44**, **46**, **48A-C**, and **50** are made from a suitable material, and will typical be a metallic material, such a suitable steel or stainless steel. As will be discussed in more detail below, the reversible adapter barrel **38** can be releasably engaged in the hollow bore **18** of the handle **12** in two different orientations to extend opposite ends of the barrel **38** from the handle **12**, each of the reversible bit holders **44** and **46** can be releasably engaged in a corresponding one of the tool holders **40** and **42** in two different orientations to extend opposite ends of the bit holders **44** and **46** from the corresponding one of the tool holders **40** and **42**, and each of the reversible tool bits **48A-C** can be releasably engaged in either of the bit holders **44** and **46** in two different orientations to extend opposite ends of each tool bit **48A-C** from the bit holders **44** and **46**. It should be noted that FIGS. 1-4 and 7 show each of the components **38**, **40**, **42**, **44**, **46**, and **48A-C** in one of their orientations and FIG. 8 shows each of the components **38**, **40**, **42**, **44**, **46**, and **48A-C** reversed in their other orientation, with the assembly **14** shown in one orientation in FIGS. 1-4 and 7 and in a reversed orientation in FIG. 8. In all of these orientations, the components **38**, **40**, **42**, **44**, **46**, **48A-C**, and **50** are centered on the axis **19**.

[0031] Each of the bit holders **44** and **46** can be completely removed from each of the tool holders **40** and **42** to allow each of the tool holders **40** and **42** to be selectively used as a nut driver with the assembly **14** inserted in either orientation in the handle **12**. Advantageously, each of the tool holders **40** and **42** can be removed from the adapter barrel **38** and used separately as a power bit driver or a power nut driver (PND) that is received in any conventional chuck of a powered rotary tool. In this regard, it is preferred that each of the tool holders **40** and **42**, each of the bit holders **44** and **46**, and each of the tool bits **48A-C** and **50** be configured and made of materials suitable for impact ratings so that they can be driven by an power rotary impact driver.

[0032] All of the foregoing features allow for a user to selectively arrange the hand tool **10** in multiple different configurations, with each of the configurations being adapted and/or optimized for a particular type of threaded fastener or nut.

[0033] Turning to a more detailed description of the illustrated and preferred embodiments of each of the components of the assembly **14**, as best seen in FIG. 4, the reversible adapter barrel **38** extends longitudinally along the axis **19** from a first adapter end **52** to a second adapter end **54**, with a first adaptor socket **56** formed in the end **52** and a second adaptor socket **58** formed in the end **54**. In preferred embodiment, each of the sockets **56** and **58** includes a drive cavity **60** having a hexagonally shaped cross-section centered on the axis **19** for driving engagement with either of the tool holders **40** and **42**. In illustrated and preferred embodiments, the cavity **60** is configured to transfer a drive torque (drive) a standard ¼ hexagonal bit driver shank. The adapter barrel **38** includes a cylindrical outer surface **62** centered on the axis **19** and that is a close fit with the

cylindrical surface **30** of the collet **26**, with a pair of axially extending ribs **63** formed on the surface **62**, with each of the ribs **63** engaged in one of the grooves **32** in the collet **26** to rotationally couple the adapter to the collet **26** and the handle **12** so that torque can be transferred from the handle **12** to the adapter barrel **38** and the rest of the assembly **14**. As mentioned above, the adaptor barrel **38** can be releasably engaged in the hollow bore **18** in either of a first orientation and a second orientation. In the first orientation, the end **52** extends out from the handle **12** and the end **54** extends into the handle, with the wings **64** engaged in the grooves **32**. In the second orientation, the end **54** extends out from the handle **12** and the end **52** extends into the handle **12**, again with the wings **64** engaged in the grooves **32**. In the illustrated and preferred embodiment, the barrel **38** further includes a spring-loaded ball detent **64** that releasably engages an recess/bore **66** in the collet **26** to resist removal of the barrel **38** and assembly **14** from the handle **12**. It should be noted that in the illustrated and preferred embodiment, the barrel **38** is symmetric about a transverse axis that extends through the ball detent **64**.

[0034] The first tool holder **40** extends longitudinally along the axis **19** from a first shank end **66** to a first socket end **68**. The tool holder **40** includes a first shank **70** extending longitudinally from the end **66** toward the end **68**, and a first tool socket **72** extending longitudinally along the axis **19** from the end **68** toward the end **66**. The second tool holder **42** extends longitudinally along the axis **19** from a second shank end **76** to a second socket end **78**. The tool holder **42** includes a second shank **80** extending longitudinally from the end **76** toward the end **78**, and a second tool socket **82** extending longitudinally along the axis **19** from the end **78** toward the end **76**. As best seen in FIG. **6**, in the illustrated and preferred embodiments, the shanks **70** and **80** are identical to each other, and each of the shanks **70** and **80** has an exterior surface **84** defining a $\frac{1}{4}$ hexagonal cross-section and is configured to be received in a conventional chuck of a powered rotary tool. In this regard, each of the shanks **70** and **80** includes an annular concave groove **86**, as is often typical for power bit drivers and/or power nut drivers, that can be engaged by a detent or other retention feature provided by the handle of a hand tool or the chuck of a powered rotary tool. Additionally, in the preferred embodiments, each of the shanks **70** and **80** includes a plurality of detent notches **88** each of which is configured to closely conform to an engagement tip **90** of a detent pin **92** (best seen in FIG. **7**) provided in each of the adaptor sockets **56** and **58** to provide a more accurate and positive releasable retention of the shanks **70** and **80** in the sockets **56** and **58**. In this regard, each of the detent pins **92** is guided for translation in a detent through bore **94** provided in each of the sockets **56** and **58**, with a helical spring **94** wrapped around an exterior of the corresponding socket **56**, **58** and engaging a head of the pin **92** to bias the pin **92** into engagement with corresponding notch **88**. In the illustrated and preferred embodiments, the first tool socket **72** is configured to serve as a first sized nut driver **72**, and the second tool socket **82** is configured to serve as a second sized nut driver **82** that is a different size than the first sized nut driver. In the illustrated and highly preferred embodiment, the first sized nut driver **72** is configured to drive a $\frac{3}{8}$ inch hex nut with an interior surface **96** that defines a hexagonal cross-section, the second sized nut driver is configured to drive a $\frac{5}{16}$ inch hex nut with an interior surface **98** that defines a hexagonal cross-section, the first reversible bit holder **44** has an outer surface **100** (best seen in FIG. **6**) defining a $\frac{3}{8}$ inch hexagonal cross-section that conforms to the surface **96**, and the second reversible bit holder **46** has an outer surface **102** (best seen in FIG. **6**) defining a $\frac{5}{16}$ inch hexagonal cross-section that conforms to the surface **98**.

[0035] The first reversible bit holder **44** includes a pair of oppositely opening bit cavities **104** and **106**, with each bit cavity **104**, **106** configured to releasably receive one of the tool bits **48A-C** or **50**. The bit cavities **104** and **106** extend longitudinally along the axis **19** and are centered on the axis **19**. The bit holder **44** is releasably engageable in the first tool socket **72** to rotatably couple the bit holder **44** to the tool socket **72** in either one of a first orientation and a second orientation. In the first orientation, the bit cavity **104** extends from the tool socket **72** and in the second orientation the bit cavity **106** extends from the tool socket **72**. In the illustrated and preferred embodiment, each of

the bit cavities **104** and **106** define a hexagonal shaped cross-section that is configured to rotatably couple with a hexagonally shaped exterior surface **108** on each of the tool bits **48A-C** and **50**. In this regard, it is preferred that each of the surfaces **108** define a ¼ inch hexagonal cross-section and that each of the bit cavities **104** and **106** have a corresponding shape to receive the surfaces **108**. As illustrated, it is also preferred that a magnet **110** be fixed in the bit cavity **106** to retain the tool bit **50** in the cavity **106** via magnetic force. It is further preferred that a spring-loaded ball detent **112** be provided in a centrally located portion **114** of the holder **44** to extend radially outward from one of the flats defined by the surface **100** to engage a flat defined by the surface **96** to resist removal of the holder **44** from the tool socket **72**.

[0036] The second reversible bit holder **46** includes a pair of oppositely opening bit cavities **120** and **122**, with each bit cavity **120**, **122** configured to releasably receive one of the tool bits **48A-C** or **50**. The bit cavities **120** and **122** extend longitudinally along the axis **19** and are centered on the axis **19**. The bit holder **46** is releasably engageable in the second tool socket **82** to rotatably couple the bit holder **46** to the tool socket **82** in either one of a first orientation and a second orientation. In the first orientation, the bit cavity **120** extends from the tool socket **82** and in the second orientation the bit cavity **122** extends from the tool socket **82**. In the illustrated and preferred embodiment, each of the bit cavities **120** and **122** define a hexagonal shaped cross-section that is configured to rotatably couple with a hexagonally shaped exterior surface **108** on each of the tool bits **48A-C** and **50**. As noted above, it is preferred that each of the surfaces **108** define a ¼ inch hexagonal cross-section and that each of the bit cavities **120** and **122** have a corresponding shape to receive the surfaces **108**. As with the bit holder **44**, it is preferred that a spring-loaded ball detent **124** be provided in a centrally located portion **126** of the holder **46** to extend radially outward from one of the flats defined by the surface **102** to engage a flat defined by the surface **98** to resist removal of the holder **46** from the tool socket **82**. It should be noted that in the illustrated and preferred embodiment, the bit holder **46** is symmetric about a transverse axis that extends through the ball detent **124**.

[0037] In the illustrated and preferred embodiment, each of the tool bits **48A-C** is engageable in each of the bit cavities **104**, **106**, **120**, and **122** in either of two orientations to present different bit tips/ends extending from the bit cavity **104**, **106**, **120**, and **122**. In the illustrated and preferred embodiments, each of the tool bits **48A-C** includes a spring-loaded ball detent **127** to engage each of the interior surfaces of the bit cavities **104**, **106**, **120**, and **122** to resist removal of the tool bits **48A-C** from the bit cavity **104**, **106**, **120**, and **122** into which it is inserted. The non-reversible tool bit **50** preferably has a flat end surface **130** that engages against a flat surface **132** on the magnet **110** to provide optimized retention via the magnetic force. While any suitable selection of fastener head engaging tips may be provided on the tool bits **48A-C** and **50**, in the illustrated embodiment, the tool bit **48A** has a flat/blade tip on one end and a Philips head tip on the other end, the tool bit **50** has a different size Philips head tip on its end, the tool bit **48B** has a first size square drive on one end and a larger size square drive on the other end, and the tool bit **48C** has a first size Torx drive on one end and a larger size Torx drive on the other end.

[0038] FIGS. **11** and **12** shown a slightly modified embodiment of the hand tool **10** wherein the shanks **70** and **80** do not include the detent notches **88** and the sockets **56** and **58** do not include the detent pins **92**, but do include ball detents (not shown) that engage the grooves **86** and that are each preloaded by a helical spring **150** wrapped around an exterior of the corresponding socket **56**, **58**.

[0039] Preferred embodiments of the inventive concepts are described herein, including the best mode known to the inventor(s) for carrying out the inventive concepts. Variations of those preferred embodiments will become apparent to those of ordinary skill in the art upon reading the foregoing description. The inventor(s) expect skilled artisans to employ such variations as appropriate, and the inventor(s) intend that the inventive concepts can be practiced otherwise than as specifically described herein. Accordingly, the inventive concepts disclosed herein include all modifications and equivalents of the subject matter recited in the claims appended hereto as

permitted by applicable law. Moreover, any combination of the above-described elements and features in all possible variations thereof is encompassed by the inventive concepts unless otherwise indicated herein or otherwise clearly contradicted by context. Further in this regard, while highly preferred forms of the hand tool **10** are shown in the figures, it should be understood that this disclosure anticipates variations in the specific details of each of the disclosed components and features of the hand tool **10** and that no limitation to a specific form, configuration, or detail is intended unless expressly and specifically recited in an appended claim.

[0040] For example, while specific and preferred forms have been shown for the handle **12**, other handle constructions may be desired, including for example, handle constructions that do not include a grip **24** and/or that form the features **30** and **32** directly in the ridged body **22**, or that include different configurations for the features **30** and **32**, such as a non-cylindrical bore and/or a different type of anti-rotation feature **32**. As another example, while specific types of detents have been shown and described herein, in some applications it may be desirable for other types of detents to be used and/or for some or all of the detents to be eliminated. As another example, while the barrel **38** and the bit holder **46** have been shown and described as being symmetrical about a transverse axis centered on their respective detents, in some applications it may be desirable for one or both of these components to be non-symmetrical about the respective transverse axis. As another example, while the several components have been shown and described as providing hexagonal cross-sections, in some applications it may be desirable for other cross sections to be provided, such as for example, square cross-sections, triangular cross-sections, or oval cross-sections.

Furthermore, while preferred sizes have been described for a number of features (for example, $\frac{1}{4}$ inch, $\frac{3}{8}$ inch, $\frac{5}{16}$ inch), other sizes may be desired depending upon the particular application.

[0041] The use of the terms “a” and “an” and “the” and “at least one” and similar referents in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. The use of the term “at least one” followed by a list of one or more items (for example, “at least one of A and B”) is to be construed to mean one item selected from the listed items (A or B) or any combination of two or more of the listed items (A and B), unless otherwise indicated herein or clearly contradicted by context. The terms “comprising,” “having,” “including,” and “containing” are to be construed as open-ended terms (i.e., meaning “including, but not limited to,”) unless otherwise noted. The use of any and all examples, or exemplary language (e.g., “such as”) provided herein, is intended merely to better illuminate the inventive concepts disclosed herein and does not pose a limitation on the scope of any invention unless expressly claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the inventive concepts disclosed herein.

[0042] All references, including publications, patent applications, and patents, cited herein are hereby incorporated by reference to the same extent as if each reference were individually and specifically indicated to be incorporated by reference and were set forth in its entirety herein.

[0043] The following are examples of features that could be claimed from this disclosure.

However, it should be understood that the inventive concepts disclosed herein do not require each of the features discussed below or above, may include any combination of the features discussed herein, and may include features not specifically discussed below.

[0044] 1. A reversible, multiple-bit, hand tool, comprising:

[0045] a handle having a body portion that includes a hollow bore formed at least partially through the body portion;

[0046] a reversible tool holder assembly insertable into the hollow bore of the body portion of the handle in either of two orientations to present two different ends extending from the handle, the reversible tool holder assembly comprising:

[0047] a reversible adaptor barrel extending

longitudinally from a first adaptor end to a second adaptor end, the adaptor barrel including:

[0048] a first adaptor socket formed in the first adaptor end, and [0049] a second adaptor socket formed in

the second adaptor end, the reversible adaptor barrel releasably engaged in the hollow bore in either of a first orientation and a second orientation, in the first orientation the first adaptor end extends out from the handle and the second adaptor end extends into the handle, in the second orientation the second adaptor end extends from the handle and the first adaptor end extends into the handle; a first tool holder extending longitudinally from a first shank end to a first socket end, the first tool holder including: [0050] a first shank extending from the first shank end toward the first socket end, and [0051] a first tool socket extending from the first socket end toward the first shank end, the first shank releasably engageable in at least one of the first and second adaptor sockets to rotatably couple the first tool holder to the reversible adaptor barrel; [0052] a second tool holder extending longitudinally from a second shank end to a second socket end, the second tool holder including: [0053] a second shank extending from the second shank end toward the second socket end, and [0054] a second tool socket extending from the second socket end toward the second shank end, the second shank releasably engageable in at least one of the first and second adaptor sockets to rotatably couple the second tool holder to the reversible adaptor barrel; [0055] a first reversible bit holder having a pair of oppositely opening first bit cavities, each first bit cavity adapted to releasably receive a tool bit, the first reversible bit holder releasably engageable in at least one of the first and second tool sockets to rotatably couple the first reversible bit holder to the at least one of the first and second tool sockets in one orientation with one of the oppositely opening first bit cavities extending from the at least one of the first and second tool sockets and in another orientation with the other of the oppositely opening first bit cavities extending from the at least one of the first and second tool sockets; and [0056] a second reversible bit holder having a pair of oppositely opening second bit cavities, each second bit cavity adapted to releasably receive a tool bit, the second reversible bit holder releasably engageable in at least one of the first and second tool sockets to rotatably couple the second reversible bit holder to the at least one of the first and second tool sockets in one orientation with one of the oppositely opening second bit cavities extending from the at least one of the first and second tool sockets and in another orientation with the other of the oppositely opening second bit cavities extending from the at least one of the first and second tool sockets.

[0057] 2. The hand tool of claim **1** further comprising four tool bits, each of the four tool bits engageable in at least one of first and second bit cavities to rotatably couple the tool bit with the corresponding one of the first and second reversible bit holders.

[0058] 3. The hand tool of claim **2** wherein at least one of the four tool bits is a reversible tool bit that is engageable in the at least one of the first and second bit cavities in either of two orientations to present different ends extending from the at least one of the first and second bit cavities.

[0059] 4. The hand tool of claim **3** wherein one of the four tool bits is a non-reversible tool bit that is engageable in a single orientation in the at least one of the first and second bit cavities.

[0060] 5. The hand tool of claim **1** wherein the first tool socket is configured to serve as a first sized nut driver and the second tool socket is configured to serve as a second sized nut driver, with the second sized nut driver being a different size than the first sized nut driver.

[0061] 6. The hand tool of claim **1** wherein the first sized nut driver is configured to drive a $\frac{3}{8}$ inch hex nut, the second sized nut driver is configured to drive a $\frac{5}{16}$ inch hex nut, the first reversible bit holder has an outer surface defining a $\frac{3}{8}$ inch hexagonal cross-section, and the second reversible bit holder has an outer surface defining a $\frac{5}{16}$ inch hexagonal cross-section.

[0062] 7. The hand tool of claim **1** further comprising a detent mechanism engaged between the hollow bore and the reversible barrel adaptor to resist removal of the reversible barrel adaptor from the hollow bore.

[0063] 8. The hand tool of claim **1** further comprising:

[0064] a detent mechanism engaged between the first shank and the at least one of the first and second adaptor sockets to resist removal of the first shank from the at least one of the first and second adaptor sockets; and

[0065] another detent mechanism engaged between the second shank and the at least one of the first and second adaptor sockets to resist removal of the second shank from the at least one of the first and second adaptor sockets.

[0066] 9. The hand tool of claim 1 further comprising:

[0067] a detent mechanism engaged between the first reversible bit holder and the at least one of the first and second tool sockets to resist removal of the first reversible bit holder from the at least one of the first and second tool sockets; and

[0068] another detent mechanism engaged between the second shank and the at least one of the first and second tool sockets to resist removal of the second reversible bit holder from the at least one of the first and second tool sockets.

[0069] 10. The hand tool of claim 1 wherein at least one of the first and second reversible bit holders further comprises a magnet located in one of the bit cavities.

[0070] 11. The hand tool of claim 1 wherein each of the shanks has an outer surface defining a $\frac{1}{4}$ hexagonal cross-section and is configured to be received in a chuck for a powered impact driver.

[0071] 12. The hand tool of claim 1 wherein the handle further comprises an insert defining at least part of the hollow bore, the insert engaged with the reversible adapter barrel in both the first and second orientations to rotatably couple the reversible adapter barrel with the handle.

Claims

1. A reversible, multiple-bit, hand tool, comprising: a handle having a body portion that includes a hollow bore formed at least partially through the body portion; a reversible tool holder assembly insertable into the hollow bore of the body portion of the handle in either of two orientations to present two different ends extending from the handle, the reversible tool holder assembly comprising: a reversible adaptor barrel extending longitudinally from a first adaptor end to a second adaptor end, the adaptor barrel including a first adaptor socket formed in the first adaptor end, the reversible adaptor barrel releasably engaged in the hollow bore in either of a first orientation and a second orientation, in the first orientation the first adaptor end extends out from the handle and the second adaptor end extends into the handle, in the second orientation the second adaptor end extends from the handle and the first adaptor end extends into the handle; a first tool holder extending longitudinally from a first shank end to a first socket end, the first tool holder including: a first shank extending from the first shank end toward the first socket end, and a first tool socket extending from the first socket end toward the first shank end, the first shank releasably engageable in the first adaptor socket to rotatably couple the first tool holder to the reversible adaptor barrel; a first reversible bit holder having a pair of oppositely opening first bit cavities, each first bit cavity adapted to releasably receive a tool bit, the first reversible bit holder releasably engageable in the first tool socket to rotatably couple the first reversible bit holder to the first tool socket in one orientation with one of the oppositely opening first bit cavities extending from the first and second tool socket and in another orientation with the other of the oppositely opening first bit cavities extending from the first socket.

2. The hand tool of claim 1 wherein: the adaptor barrel further includes a second adaptor socket formed in the second adapter end; and the hand tool further comprises: a second tool holder extending longitudinally from a second shank end to a second socket end, the second tool holder including: a second shank extending from the second shank end toward the second socket end, and a second tool socket extending from the second socket end toward the second shank end, the second shank releasably engageable in at least one of the first and second adaptor sockets to rotatably couple the second tool holder to the reversible adaptor barrel; and a second reversible bit holder having a pair of oppositely opening second bit cavities, each second bit cavity adapted to releasably receive a tool bit, the second reversible bit holder releasably engageable in at least one of the first and second tool sockets to rotatably couple the second reversible bit holder to the at

least one of the first and second tool sockets in one orientation with one of the oppositely opening second bit cavities extending from the at least one of the first and second tool sockets and in another orientation with the other of the oppositely opening second bit cavities extending from the at least one of the first and second tool sockets.

3. The hand tool of claim 2 further comprising four tool bits, each of the four tool bits engageable in at least one of first and second bit cavities to rotatably couple the tool bit with the corresponding one of the first and second reversible bit holders.

4. The hand tool of claim 3 wherein at least one of the four tool bits is a reversible tool bit that is engageable in the at least one of the first and second bit cavities in either of two orientations to present different ends extending from the at least one of the first and second bit cavities.

5. The hand tool of claim 4 wherein one of the four tool bits is a non-reversible tool bit that is engageable in a single orientation in the at least one of the first and second bit cavities.

6. The hand tool of claim 2 wherein the first tool socket is configured to serve as a first sized nut driver and the second tool socket is configured to serve as a second sized nut driver, with the second sized nut driver being a different size than the first sized nut driver.

7. The hand tool of claim 1 further comprising a detent mechanism engaged between the hollow bore and the reversible barrel adaptor to resist removal of the reversible barrel adaptor from the hollow bore.

8. The hand tool of claim 1 further comprising: a detent mechanism engaged between the first shank and the first adaptor socket to resist removal of the first shank from the first adaptor socket; and a detent mechanism engaged between the first reversible bit holder and the first tool socket to resist removal of the first reversible bit holder from the first tool socket.

9. The hand tool of claim 1 wherein the shank has an outer surface defining a $\frac{1}{4}$ hexagonal cross-section and is configured to be received in a chuck for a powered impact driver.

10. The hand tool of claim 1 wherein the handle further comprises an insert defining at least part of the hollow bore, the insert engaged with the reversible adapter barrel in both the first and second orientations to rotatably couple the reversible adapter barrel with the handle.

11. A reversible, multiple-bit, hand tool, comprising: a handle having a body portion that includes a hollow bore formed at least partially through the body portion; a reversible tool holder assembly insertable into the hollow bore of the body portion of the handle in either of two orientations to present two different ends extending from the handle, the reversible tool holder assembly comprising: a reversible adaptor barrel extending longitudinally from a first adapter end to a second adaptor end, the adaptor barrel including: a first adaptor socket formed in the first adaptor end, and a second adaptor socket formed in the second adapter end, the reversible adaptor barrel releasably engaged in the hollow bore in either of a first orientation and a second orientation, in the first orientation the first adapter end extends out from the handle and the second adaptor end extends into the handle, in the second orientation the second adapter end extends from the handle and the first adaptor end extends into the handle; a first tool holder extending longitudinally from a first shank end to a first socket end, the first tool holder including: a first shank extending from the first shank end toward the first socket end, and a first tool socket extending from the first socket end toward the first shank end, the first shank releasably engageable in at least one of the first and second adaptor sockets to rotatably couple the first tool holder to the reversible adaptor barrel; a second tool holder extending longitudinally from a second shank end to a second socket end, the second tool holder including: a second shank extending from the second shank end toward the second socket end, and a second tool socket extending from the second socket end toward the second shank end, the second shank releasably engageable in at least one of the first and second adaptor sockets to rotatably couple the second tool holder to the reversible adaptor barrel; and a first reversible bit holder having a pair of oppositely opening first bit cavities, each first bit cavity adapted to releasably receive a tool bit, the first reversible bit holder releasably engageable in at least one of the first and second tool sockets to rotatably couple the first reversible bit holder to the

- at least one of the first and second tool sockets in one orientation with one of the oppositely opening first bit cavities extending from the at least one of the first and second tool sockets and in another orientation with the other of the oppositely opening first bit cavities extending from the at least one of the first and second tool sockets.
- 12.** The hand tool of claim 11 further comprising two tool bits, each of the two tool bits engageable in at least one of first bit cavities to rotatably couple the tool bit with the first reversible bit holder.
- 13.** The hand tool of claim 12 wherein at least one of the two tool bits is a reversible tool bit that is engageable in the at least one of the first bit cavities in either of two orientations to present different ends extending from the at least one of the first bit cavities.
- 14.** The hand tool of claim 13 wherein one of the two tool bits is a non-reversible tool bit that is engageable in a single orientation in the at least one of the first bit cavities.
- 15.** The hand tool of claim 1 wherein the first tool socket is configured to serve as a first sized nut driver and the second tool socket is configured to serve as a second sized nut driver, with the second sized nut driver being a different size than the first sized nut driver.
- 16.** The hand tool of claim 11 further comprising a detent mechanism engaged between the hollow bore and the reversible barrel adaptor to resist removal of the reversible barrel adaptor from the hollow bore.
- 17.** The hand tool of claim 11 further comprising: a detent mechanism engaged between the first shank and the at least one of the first and second adaptor sockets to resist removal of the first shank from the at least one of the first and second adaptor sockets; and another detent mechanism engaged between the second shank and the at least one of the first and second adaptor sockets to resist removal of the second shank from the at least one of the first and second adaptor sockets.
- 18.** The hand tool of claim 11 further comprising: a second reversible bit holder having a pair of oppositely opening second bit cavities, each second bit cavity adapted to releasably receive a tool bit, the second reversible bit holder releasably engageable in at least one of the first and second tool sockets to rotatably couple the second reversible bit holder to the at least one of the first and second tool sockets in one orientation with one of the oppositely opening second bit cavities extending from the at least one of the first and second tool sockets and in another orientation with the other of the oppositely opening second bit cavities extending from the at least one of the first and second tool sockets.
- 19.** The hand tool of claim 11 wherein each of the shanks has an outer surface defining a $\frac{1}{4}$ hexagonal cross-section and is configured to be received in a chuck for a powered impact driver.
- 20.** The hand tool of claim 11 wherein the handle further comprises an insert defining at least part of the hollow bore, the insert engaged with the reversible adapter barrel in both the first and second orientations to rotatably couple the reversible adapter barrel with the handle.
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