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USER INTERFACE CONSTRUCTION AND MOUNTING FOR IMPACTING FASTENING TOOLS

Abstract

A power tool includes a tool housing and a display assembly housed within the tool housing. The display assembly includes a display screen for displaying graphical information about the operation of the power tool and a printed circuit board operatively coupled to the display screen, where the printed circuit board includes control circuitry for the display screen. The display assembly also includes a rigid spacer between the display screen and the printed circuit board that defines cavities for receiving potting material. The display assembly further includes a boat peripherally surrounding and supporting the display screen, the printed circuit board, and the rigid spacer. The power tool also includes an elastomeric gasket seated between the printed circuit board and the boat for isolating the display screen. The power tool can include a protective cover for shielding the display screen.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] The present application is a continuation-in-part under 35 U.S.C. § 120 of U.S. patent application Ser. No. 18/909,275, filed Oct. 8, 2024, and titled “POWER TOOL AND REMOVABLE USER INTERFACE GUARD,” which claims priority under 35 U.S.C. § 119(e) of U.S. Provisional Application Ser. No. 63/589,106, filed Oct. 10, 2023, and titled “POWER TOOL WITH REMOVABLE USER INTERFACE GUARD.” U.S. patent application Ser. No. 18/909,275 and U.S. Provisional Application Ser. No. 63/589,106 are herein incorporated by reference in their entireties.

BACKGROUND
[0002] A power tool is a tool actuated by a power source other than manual labor.

Description

DRAWINGS
[0003] The Detailed Description is described with reference to the accompanying figures. The use of the same reference numbers in different instances in the description and the figures may indicate similar or identical items.
[0004] FIG. **1** is an isometric view illustrating an impact tool with a user interface in accordance with example embodiments of the present disclosure.
[0005] FIG. **2** is another isometric view of the impact tool illustrated in FIG. **1**.
[0006] FIG. **3** is a rear elevation view of the impact tool illustrated in FIG. **1**.
[0007] FIG. **4** is an isometric view illustrating an impact tool with a user interface and a removable guard for the user interface in accordance with example embodiments of the present disclosure.
[0008] FIG. **5** is an isometric view illustrating a removable guard for a user interface of a power tool, such as the power tools illustrated in FIGS. **1** through **4**, in accordance with example embodiments of the present disclosure.
[0009] FIG. **6** is a rear elevation view illustrating an impact tool with a user interface and a removable guard for the user interface in accordance with example embodiments of the present disclosure.
[0010] FIG. **7** is a partial cross-sectional side elevation view illustrating a mechanical pulse impact power tool, such as the impact tool illustrated in FIG. **1**, with a display assembly housed within a tool housing, where the display assembly includes a display screen, a printed circuit board, a rigid spacer, a boat, and an elastomeric gasket in accordance with example embodiments of the present disclosure.
[0011] FIG. **8** is a partial exploded isometric view of the mechanical pulse impact power tool illustrated in FIG. **7**.
[0012] FIG. **9** is another partial exploded isometric view of the mechanical pulse impact power tool illustrated in FIG. **7**.

[0013] FIG. **10** is a further partial exploded isometric view of the mechanical pulse impact power tool illustrated in FIG. **7**.
[0014] FIG. **11** is another partial exploded isometric view of the mechanical pulse impact power tool illustrated in FIG. **7**.
[0015] FIG. **12** is a cross-sectional side elevation view of the display assembly illustrated in FIG. **7**.
[0016] FIG. **13** is a partial cross-sectional isometric view of the display assembly illustrated in FIG. **7**.
[0017] FIG. **14** is an isometric view of the display screen, the rigid spacer, and the elastomeric gasket for the display assembly illustrated in FIG. **7**.
[0018] FIG. **15** is another partial exploded isometric view of the mechanical pulse impact power tool illustrated in FIG. **7**.

DETAILED DESCRIPTION

[0019] Referring generally to FIGS. **1** through **15**, power tools **100** having a user interface **102** and a removable user interface guard **104** are described. As described, the removable user interface guard **104** can protect user input and display/feedback components on the power tool **100** from damage and/or inadvertent operation. The removable user interface guard **104** can be securely attached to the power tool **100**, easily removed from the power tool **100**, and economically replaced. Power tools are commonly used in environments where space is tight. Consequently, such tools are often bumped or scraped against objects that occupy this space. User interface components such as electronic displays can sustain damage from this contact. Furthermore, user input controls such as keypad buttons can be actuated from this contact, causing unintended changes to the tool's operation and/or setup. The systems, apparatus, and techniques described herein can provide physical protection to these components to prevent these undesirable outcomes.
[0020] The removable user interface guard **104** is a strong and durable guard that attaches to the power tool **100** and covers the user interface **102** and user input controls (e.g., buttons **106**). The removable user interface guard **104** receives the bumps and scrapes that would otherwise be delivered to the user interface **102** and user input components. In some embodiments, the removable user interface guard **104** can be transparent so as to retain visibility of a display screen **108**, such as a liquid crystal display (LCD) screen or another type of screen, which shows important feedback to the operator about the power tool **100**, such as cycle status.
[0021] In some embodiments, the removable user interface guard **104** is a transparent cover. The removable user interface guard **104** can include protruding features **110** that can engage with recesses **112** in the housing **114** of the power tool **100** for secure attachment. In some embodiments, each side of the removable user interface guard **104** includes multiple (e.g., two, more than two) protruding features **110** that can engage with multiple corresponding recesses **112** in each side **122** of the housing **114** (e.g., as shown in FIGS. **1** through **5**). In some embodiments, each side of the removable user interface guard **104** includes a single protruding feature **110** that engages with a corresponding recess **112** in each side **122** of the housing **114**. However, it should be noted that the protruding features **110** and recesses **112** are provided by way of example and are not meant to limit the present disclosure. Other attachment features can also be used to attach the removable user interface guard **104** to the housing **114**, such as protruding features on a housing with recesses on a guard, and so forth. Additionally, such features can be mechanically actuated, such as spring biased, and so forth.
[0022] The removable user interface guard **104** can cover the display screen **108** to provide additional protection and can cover the buttons **106** of the user interface **102** to protect them and/or prevent them from being actuated when not intended. In instances where operators do not need to actuate these controls, a cover may be preferred to protect the components and/or to deter operators from accessing them. The removable user interface guard **104** can be removed when access to the buttons **106** is needed, and it may be easily replaced if it were to sustain damage. In some embodiments, there is clearance between the removable user interface guard **104** and the

components that the removable user interface guard **104** covers, e.g., to allow for deformation that may occur if the power tool **100** were to be dropped or impacted. In some embodiments, the removable user interface guard **104** can be constructed from a strong, transparent or semi-transparent material, such as transparent polycarbonate, which can provide durability to sustain abuse, an ability to deform so that the part may be snapped onto the tool and removed from it, and/or low cost.

[0023] In some embodiments, the power tool **100** is a pistol grip type power tool, such as an impact tool having a pistol grip **116**. However, a power tool **100** with a pistol grip **116** is provided by way of example and is not meant to limit the present disclosure. In other embodiments, a power tool **100** can be another type of power tool, including, but not necessarily limited to: an in-line tool, a right-angle tool, and so forth.

[0024] As described, the user interface **102** can be positioned on a back side **118** of the power tool **100**. For instance, the user interface **102** can be positioned opposite a working end **120** of the power tool **100**, e.g., facing an operator of the power tool **100** when the operator grips and uses the tool. This placement allows the operator to have good visibility to information displayed on the display screen **108**, such as visual feedback. In one example, such feedback can include different colored icons providing an indication of whether an actuator of the power tool **100**, such as a trigger, has been actuated for a sufficiently long time to complete an operation on a workpiece (e.g., a red icon indicating an early release of the trigger before completion of an operation). However, a power tool **100** with a user interface **102** positioned on the back side **118** of the power tool **100** is provided by way of example and is not meant to limit the present disclosure. In other embodiments, the user interface **102** can be positioned in one or more other locations, including, but not necessarily limited to: a side **122** of the power tool **100**, a top **124** of the power tool **100**, a bottom **126** of the power tool **100**, at a foot **128** of the power tool **100**, and so on.

[0025] In some embodiments, having user interface and user input controls located on the back side **118** of the power tool **100** allows the display screen **108** to be readily visible to the operator during use, e.g., for cycle status monitoring. Additionally, the controls are readily accessible for on-tool programming. However, the back side **118** of the power tool can be susceptible to damage and/or unintended actuation. The removable user interface guard **104** offers a secondary layer of protection with a component that is removable and replaceable. This gives more confidence to users and purchasers of the power tool that their investment is well-protected.

[0026] For example, positioning the user interface **102** on the back side **118** of the power tool **100** may provide for enhanced convenience and/or accessibility for an operator. However, in some instances the back side **118** of the power tool **100** can be subject to rough handling. For example, an operator may use the back side **118** of a power tool **100** that functions as an impact tool to hammer or pound on a workpiece. In many instances, an impact tool or another expensive power tool **100** may be owned and/or maintained by a company that employs operators who may not be diligent about protecting the back side **118** and the user interface **102** of the power tool **100** (and/or other side(s) where the user interface **102** can be positioned).

[0027] In some embodiments, the display screen **108** of the user interface **102** is covered by a transparent or at least semi-transparent display screen cover **130** extending over the display screen **108**, where the display screen **108** and the display screen cover **130** are supporting by the housing **114** of the power tool **100**. In some embodiments, the display screen cover **130** is made from a tough, impact resistant material, such as a polycarbonate material. However, a display screen cover **130** made from a polycarbonate material is provided by way of example and is not meant to limit the present disclosure. In other embodiments, a display screen cover **130** can be made from one or more other tough and/or impact resistant materials. As described, the display screen cover **130** provides a first layer of protection for the display screen **108**.

[0028] In embodiments, the user interface **102** also includes one or more selection buttons **106** and/or other actuation features for interacting with the power tool **100**. In some embodiments, the

power tool **100** includes four (4) selection buttons **106**, with sets of two (2) buttons **106** each positioned on opposite sides of the display screen cover **130**. As described, a selection button **106** can be used to set one or more desired operational parameters for the power tool **100** via the user interface **102**. Operational parameter selections can be displayed via the display screen **108**. Such operational parameters can include, but are not necessarily limited to: torque, revolutions per minute (RPM), and so forth.

[0029] In some instances, an owner or a manager of the power tool **100** may set one or more operational parameters for the power tool **100** prior to assigning the power tool **100** to an operator. For example, the owner or manager may employ the user interface **102** to set an operational torque for the power tool **100** as required for a particular job prior to assigning the power tool **100** to an operator. As previously discussed, the owner or manager may wish to protect the user interface **102**, including the display screen cover **130** and the selection buttons **106**, from rough or inadvertent handling, from idle handling, from fidgeting, and so forth. The owner or manager may also wish to prevent contact with the user interface **102**, including the display screen cover **130** and the selection buttons **106**, which could alter desired settings for the power tool **100**. Thus, the power tool **100** may provide a second layer of protection.

[0030] In some embodiments, the second layer of protection can include one or more protrusions (e.g., ridges **132**), which can be defined by the housing **114** of the power tool **100** and positioned proximate to (e.g., immediately above and/or below) the display screen cover **130**. The ridges **132** can protect the display screen cover **130** and/or the selection buttons **106** from an impact by the back side **118** of the power tool **100** with a surface, e.g., by offsetting the user interface **102** from the surface when the back side **118** impacts the surface. It should be noted that the second layer of protection can provide both real protection for the power tool **100** when in use by the operator, as well as perceived protection for an owner or manager of the power tool **100**.

[0031] As described, the second layer of protection can also be implemented with the removable user interface guard **104**, which can attach to the housing **114** of the power tool **100** over (e.g., covering) the user interface **102**. In some embodiments, the removable user interface guard **104** can wrap around the power tool **100** to cover or partially cover one or more sides **122** of the power tool. For example, the removable user interface guard **104** can cover the user interface **102** on the back side **118** of the power tool **100** and may also wrap around the two sides **122** of the power tool **100** immediately adjacent to the back side **118**. In embodiments of the disclosure, the removable user interface guard **104** can be an inexpensive, easily replaceable part, which can add to the real and/or perceived protection of the power tool **100** offered by the second layer of protection.

[0032] In some embodiments, the removable user interface guard **104** is made from a tough, impact resistant material, such as a polycarbonate material. However, a removable user interface guard **104** made from a polycarbonate material is provided by way of example and is not meant to limit the present disclosure. In other embodiments, the removable user interface guard **104** can be made from one or more other tough and/or impact resistant materials, including, but not necessarily limited to: acrylic materials, metal materials, composite materials, and so forth. From the perception of an owner or manager of a power tool **100**, the removable user interface guard **104** can be thought of as “safety glasses” for the power tool. In some embodiments, when the power tool **100** is purchased, the power tool **100** can include multiple (e.g., two, more than two) removable user interface guards **104**, which may be easily interchanged and replaced in case of damage.

[0033] In some embodiments, the removable user interface guard **104** can be transparent or at least semi-transparent. In other embodiments, the removable user interface guard **104** can be opaque. In some embodiments, the removable user interface guard **104** can act as a lens. For example, the removable user interface guard **104** can transmit light from the display screen **108** directly through the material of the removable user interface guard **104**, providing no magnification. In other embodiments, the removable user interface guard **104** can act as a magnifying lens, which can increase the apparent size of the display screen **108** when viewed through the removable user

interface guard **104**. Further, in some embodiments, the removable user interface guard **104** can include one or more coatings and/or surface finishes, such as glare reduction features, reflection reduction features, privacy filter features, color filter features, and so forth.

[0034] In some embodiments, the removable user interface guard **104** can be quickly and easily removed from the power tool **100**. For instance, the removable user interface guard **104** can slide between the ridges **132** proximate to the user interface **102** (e.g., via dovetail type connections). In other embodiments, the removable user interface guard **104** cannot be easily removed from the power tool **100**. In an example, the removable user interface guard **104** can include one or more protruding features **110** on each side of the removable user interface guard **104**, which can mate with matching recesses **112** on the sides **122** of the housing **114**. In some embodiments, the removable user interface guard **104** can be sufficiently stiff, and/or the fit between the removable user interface guard **104** and the housing **114** can be sufficiently snug, so as to prevent the removable user interface guard **104** from being easily removed from housing **114**, e.g., by idle operator activity, such as fidgeting with the removable user interface guard **104** by attaching and detaching it from the housing **114**. In this example, a screwdriver or another auxiliary tool may be used to lever the removable user interface guard **104** from the housing **114**.

[0035] In some embodiments, the removable user interface guard **104** can be connected to the housing of the power tool via a hinge or another attachment mechanism, where the removable user interface guard **104** can be hinged out and away from the power tool **100**, but also removed from the power tool **100**, e.g., by pulling the removable user interface guard **104** from the housing **114** at the hinge connection, which can be, for example, a friction fit. In some embodiments, the removable user interface guard **104** can include one or more resilient attachment features, e.g., elastomeric overmolding on the polycarbonate lens, which can be compliant for absorbing impacts, such as a drop onto the back side **118** of the power tool **100**, and/or which may also provide a seal for preventing material (e.g., moisture, debris, etc.) from infiltrating past the removable user interface guard **104** to the user interface **102**.

[0036] In some embodiments, the removable user interface guard **104** can be semi-permanently attached to the power tool **100** (e.g., secured with an auxiliary tool and not removable without the auxiliary tool, such as a screwdriver). For instance, the removable user interface guard **104** can be connected to the housing **114** by one or more fasteners (e.g., screws), which can be inserted through the removable user interface guard **104** and connected to the sides **122** of the housing **114** (e.g., via threaded connection(s) to the housing **114**).

[0037] As described, portions of the removable user interface guard **104** can be offset from the display screen cover **130** and/or the selection buttons **106**. The offset can be used to prevent the removable user interface guard **104** from contacting the user interface **102** if it deforms (e.g., bows inwardly) in an impact to the back side **118** of the power tool **100**. In some embodiments, the removable user interface guard **104** can be offset from the selection buttons **106** a sufficient distance for an operator to access a selection button **106** by reaching behind the removable user interface guard **104** to contact a selection button **106**. In some embodiments, the removable user interface guard **104** can include one or more compliant features, such as flexible, co-molded buttons that can be used to press the selection buttons **106** by pressing on the removable user interface guard **104** at the buttons **106**.

[0038] With reference to FIG. **6**, in some embodiments the removable user interface guard **104** can include an access port **134**, such as an aperture or another type of access point, for accessing a button **106** (or buttons) through the removable user interface guard **104**. The access port **134** can be used to provide access to a button **106** (or buttons) that may be frequently accessed during operation of the power tool **100** and would otherwise require frequent attachment and detachment of the removable user interface guard **104**. For example, an access port **134** can be used to facilitate access to a button used for changing between operational presets store in the power tool **100** (e.g., to change operational modes of the tool).

[0039] As described, the protrusions/ridges **132** defined by the housing **114** of the power tool **100** and positioned proximate to the display screen cover **130** can be shaped to create an aesthetically pleasing form factor for the power tool **100**, e.g., in combination with the removable user interface guard **104**. For example, the removable user interface guard **104** can rest between the ridges **132**, completing an arcuate profile at the back side **118** of the power tool **100**.
[0040] Referring now to FIGS. **7** through **15**, the power tool **100** can be an impacting or pulsing fastening tool, such as a mechanical pulse impact power tool. As described, the user interface **102** and user input controls/buttons **106** provide a convenient way for an operator to interact with the power tool **100** and make selections. For example, the display screen **108** can be a color, high-resolution display screen (e.g., an LCD screen). The user interface **102** can offer a great deal of information, ease of setup, and versatility for an operator. Information that can be viewed on the color display screen includes, but is not necessarily limited to: presets selected for operation; cycle results, such as successful completion, or unsuccessful completion, and a reason for the results; batch count status and batch completion; an indication when a fault occurs, and a fault code for troubleshooting; battery charge level; maintenance alarm status; connection status; tool information (e.g., model number, serial number, certification numbers, date, time); and so forth.
[0041] Aspects of tool operation that can be controlled via the user interface **102** and buttons **106** include, but are not necessarily limited to: connections, such as connections to a controller, connections to an application (app), disconnection and operation as a standalone unit; an active preset, such as a different preset selected for operation; a preset definition, such as defining a preset by choosing a power level, choosing a flush-detection level, choosing a direction of controlled tightening (clockwise for tightening right-handed threaded fasteners, counter-clockwise for tightening left-handed fasteners), and choosing the number of fasteners in a batch; and so on. However, with a user interface of this sophistication, and especially one positioned on the rear of an impacting/pulsing fastening tool, special provisions are needed for the user interface to endure the high level of vibration from within the tool, and/or the high level of potential torment from the operator and the environment.
[0042] In embodiments, a power tool **100**, such as a mechanical pulse impact power tool, includes a display assembly **136** housed within the tool housing **114**. The display assembly **136** includes the display screen **108** for displaying graphical information about the operation of the power tool **100**. In some embodiments, the display screen **108** is a full color, high-resolution display screen, which has been assembled in multiple layers. For example, the display screen **108** includes two layers of glass with a layer of liquid crystals between the glass layers. Electrical circuit traces can be used to selectively activate the liquid crystals. The display screen **108** can also include a light source and a reflector (e.g., a metal mirror) to illuminate the display screen **108**. However, it should be noted that this display screen assembly is provided by way of example and is not meant to limit the present disclosure. Thus, in other embodiments, an LCD display screen may be configured differently (e.g., using a backlight). Other types of display screens may also be used, including, but not necessarily limited to, an organic light-emitting diode (OLED) display screen, and so forth.
[0043] The display assembly **136** also includes a printed circuit board **138** operatively coupled to the display screen **108**, where the printed circuit board **138** has a first side **140** proximate to the display screen **108** and a second side **142** opposite the first side **140**. In embodiments, the second side **142** of the printed circuit board **138** can include control circuitry **144** for the display screen **108**. For example, a microprocessor and a wireless radio can be attached to the second side **142** of the printed circuit board **138**, where the microprocessor can be used to control the display screen **108** and other functions of the power tool **100**, and the wireless radio can be used for wireless communications between the power tool **100** and external devices. The printed circuit board **138** may also include microswitches **158** or other devices for receiving inputs from mechanical action of the buttons **106**. However, microswitches are provided by way of example and are not meant to limit the present disclosure. In other embodiments different actuatable devices can be used with the

buttons **106**, including, but not necessarily limited to, membrane switches, and so on.
[0044] The display assembly **136** further includes a spacer **146** (e.g., a rigid spacer) between the display screen **108** and the printed circuit board **138** for spacing the display screen **108** apart from the printed circuit board **138**. For example, the spacer **146** can be a rigid plastic standoff to which the display screen **108** is mounted. The spacer **146** serves to position the display screen **108** in close proximity to the rear of the power tool **100** for enhanced visibility. The spacer **146** also serves to achieve a more gradual transition from the display screen **108** to the printed circuit board **138**. For instance, the display screen **108** is connected to the control circuitry **144** via a ribbon cable **160**. The spacer **146** allows the ribbon cable **160** to gradually bend from the display screen **108** to the control circuitry **144**, e.g., as opposed to folding the ribbon cable onto itself, such as when a display screen is affixed directly to a PCB using double-sided tape. The rigid spacer **146** also serves to insulate the display screen **108** from mechanical loads applied to the power tool **100**. For example, when mechanical vibrations or forces are applied to the display screen **108**, the forces are spread through the spacer **146** and reduce stress concentrations on pressure sensitive components of the display screen **108**. In embodiments, the spacer **146** defines multiple cavities **148** for receiving potting material, such as glue, to affix the display screen **108** to the spacer **146** and/or to affix the spacer **146** to the printed circuit board **138**.
[0045] The display assembly **136** also includes a carrier or boat **150** for supporting the display screen **108**, the printed circuit board **138**, and the spacer **146**, where the boat **150** peripherally surrounds the display screen **108**, the printed circuit board **138**, and the spacer **146**. The boat **150** includes an aperture **152** for providing visibility to the display screen **108**. In some embodiments, the boat **150** can be captured by features of the housing **114**, such as ribs **162** on left and right clamshell halves of the housing. In this manner, the boat **150** can be held securely in place when two halves of the housing **114** are fastened together (e.g., using fasteners such as screws). In some embodiments, ultraviolet (UV) light curable glue or another adhesive can be used to create a seal around the perimeter of the printed circuit board **138** and the boat **150**, and possibly to seal vias in the printed circuit board **138**. Potting material can be applied over second side **142** of the printed circuit board **138** within the boat **150** to protect components from vibration and contaminants. In some embodiments, the boat **150** can include compliant overmolding to fill gaps between the display screen **108** and the lens/display screen cover **130**, e.g., to protect the display area from contamination and to form a viewing frame around the display area. The compliant overmolding may be the only direct contact between the lens/display screen cover **130** and the display screen **108**, so the electronic display can be protected from external forces applied to the lens.
[0046] The display assembly **136** further includes an elastomeric gasket **154** seated between the printed circuit board **138** and the boat **150** for isolating the display screen **108**. In some embodiments, the elastomeric gasket **154** can include a flexible button pad with compressible tubular shafts entrapped between the first side **140** of the printed circuit board **148** and the carrier/boat **150**. The shafts align with the microswitches **158** on the PCB. The shafts protrude through the carrier/boat **150** and through the lens/display screen cover **130**. As such, when a button **106** is pressed by an operator, it activates the corresponding microswitch **158** and then returns to its normal position when released. The elastomeric gasket **154** can provide a seal for the glue/potting material and encapsulate the microswitches **158**, providing protection to the microswitches **158** and the display screen **108** from contaminants.
[0047] As previously described, the power tool **100** also includes the protective display screen cover **130** for shielding the display screen **108**, where the display screen cover **130** is disposed on an outside of the housing **114** and offset from the display screen **108** to provide a gap **156** between the display screen **108** and the display screen cover **130**. In some embodiments, the power tool **100** can include a communications port **164**, such as a USB-C port or another communications port coupled with the circuitry of the printed circuit board **138**. In some embodiments, the communications port **164** can be included on a smaller printed circuit board mounted to the printed

circuit board **138** and recessed within the power tool **100**. For example, the communications port **164** can be flush with an external face of the boat **150**. Further, the power tool housing **114** can include an openable cover **166** over the communications port **164** to insulate the port from debris, impacts, and so forth.

[0048] Although the subject matter has been described in language specific to structural features and/or process operations, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims.

Claims

1. A mechanical pulse impact power tool, comprising: a tool housing; a display assembly housed within the tool housing, the display assembly including a display screen for displaying graphical information about the operation of the mechanical pulse impact power tool, a printed circuit board operatively coupled to the display screen, the printed circuit board having a first side proximate to the display screen and a second side opposite the first side, the second side of the printed circuit board including control circuitry for the display screen, a rigid spacer between the display screen and the printed circuit board for spacing the display screen apart from the printed circuit board, the rigid spacer defining a plurality of cavities for receiving potting material, a boat for supporting the display screen, the printed circuit board, and the rigid spacer, the boat peripherally surrounding the display screen, the printed circuit board, and the rigid spacer, the boat defining an aperture therethrough for providing visibility to the display screen, an elastomeric gasket seated between the printed circuit board and the boat for isolating the display screen; and a protective cover for shielding the display screen, the protective cover disposed on an outside of the tool housing and offset from the display screen to provide a gap between the display screen and the protective cover.

2. The mechanical pulse impact power tool as recited in claim 1, wherein the display screen is a color, high-resolution display screen.

3. The mechanical pulse impact power tool as recited in claim 1, wherein the display screen is connected to the control circuitry by a ribbon cable that wraps around the rigid spacer.

4. The mechanical pulse impact power tool as recited in claim 1, further comprising a plurality of buttons for receiving operator input to the mechanical pulse impact power tool.

5. The mechanical pulse impact power tool as recited in claim 4, wherein the plurality of buttons is integrally formed with the elastomeric gasket.

6. The mechanical pulse impact power tool as recited in claim 4, wherein the printed circuit board includes a plurality of switches on the first side of the printed circuit board mechanically coupled with the plurality of buttons.

7. A power tool comprising: a housing having a working end and a side separate from the working end; a user interface supported by the housing and positioned on the side of the housing, the user interface including a display screen; and a display assembly housed within the housing, the display assembly including a display screen for displaying graphical information about the operation of the power tool, a printed circuit board operatively coupled to the display screen, the printed circuit board having a first side proximate to the display screen and a second side opposite the first side, the second side of the printed circuit board including control circuitry for the display screen, a rigid spacer between the display screen and the printed circuit board for spacing the display screen apart from the printed circuit board, the rigid spacer defining a plurality of cavities for receiving potting material, a boat for supporting the display screen, the printed circuit board, and the rigid spacer, the boat peripherally surrounding the display screen, the printed circuit board, and the rigid spacer, the boat defining an aperture therethrough for providing visibility to the display screen, and an elastomeric gasket seated between the printed circuit board and the boat for isolating the display screen.

8. The power tool as recited in claim 7, further comprising a protective cover for shielding the display screen, the protective cover disposed on an outside of the housing and offset from the display screen to provide a gap between the display screen and the protective cover.
9. The power tool as recited in claim 7, wherein the display screen is a color, high-resolution display screen.
10. The power tool as recited in claim 7, wherein the display screen is connected to the control circuitry by a ribbon cable that wraps around the rigid spacer.
11. The power tool as recited in claim 7, further comprising a plurality of buttons for receiving operator input to the mechanical pulse impact power tool.
12. The power tool as recited in claim 11, wherein the plurality of buttons is integrally formed with the elastomeric gasket.
13. The power tool as recited in claim 11, wherein the printed circuit board includes a plurality of switches on the first side of the printed circuit board mechanically coupled with the plurality of buttons.
14. A mechanical pulse impact power tool, comprising: a tool housing; and a display assembly housed within the tool housing, the display assembly including a display screen for displaying graphical information about the operation of the mechanical pulse impact power tool, a printed circuit board operatively coupled to the display screen, the printed circuit board having a first side proximate to the display screen and a second side opposite the first side, the second side of the printed circuit board including control circuitry for the display screen, a rigid spacer between the display screen and the printed circuit board for spacing the display screen apart from the printed circuit board, the rigid spacer defining a plurality of cavities for receiving potting material, a boat for supporting the display screen, the printed circuit board, and the rigid spacer, the boat peripherally surrounding the display screen, the printed circuit board, and the rigid spacer, the boat defining an aperture therethrough for providing visibility to the display screen, an elastomeric gasket seated between the printed circuit board and the boat for isolating the display screen.
15. The mechanical pulse impact power tool as recited in claim 14, further comprising a protective cover for shielding the display screen, the protective cover disposed on an outside of the tool housing and offset from the display screen to provide a gap between the display screen and the protective cover.
16. The mechanical pulse impact power tool as recited in claim 14, wherein the display screen is a color, high-resolution display screen.
17. The mechanical pulse impact power tool as recited in claim 14, wherein the display screen is connected to the control circuitry by a ribbon cable that wraps around the rigid spacer.
18. The mechanical pulse impact power tool as recited in claim 14, further comprising a plurality of buttons for receiving operator input to the mechanical pulse impact power tool.
19. The mechanical pulse impact power tool as recited in claim 18, wherein the plurality of buttons is integrally formed with the elastomeric gasket.
20. The mechanical pulse impact power tool as recited in claim 18, wherein the printed circuit board includes a plurality of switches on the first side of the printed circuit board mechanically coupled with the plurality of buttons.