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TOOL WITH MULTI-STAGE TRIGGER

Abstract

A multi-stage trigger assembly for portable, hand-held, battery powered tools is provided. The tool may be configured as a crimping tool, a cutting tool or other type of tool. The tool has an in-line handle assembly and a working head assembly. The trigger assembly has a first stage that is a manual operation and a second stage that is an electro-mechanical operation.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] The present application is a continuation of U.S. application Ser. No. 17/939,784 filed on Sep. 7, 2022, which claims benefit from U.S. Provisional Patent Application No. 63/241,477 filed on Sep. 7, 2021, the contents of each are incorporated herein in their entirety by reference.

BACKGROUND
Field
[0002] The present disclosure relates to trigger assemblies for portable, battery powered tools having one or more moving jaws. More particularly, the present disclosure relates to hand-held portable, hand-held tools with multi-stage trigger assemblies that provide a jaw hold feature where a jaw of a jaw assembly of the tool can be moved to hold an object before activation of the tool.
Description of the Related Art
[0003] Hand-held, battery powered tools, such as crimping tools, are known in the art. For example, using a hand-held, battery powered tool, an electrical wire termination can be manually held in place between a pair of jaws, typically a fixed jaw and a movable jaw. Crimping of the electrical wire termination is carried out when a motor is activated causing the movable jaw to move toward the fixed jaw so that the jaws impinge the object. However, manually holding an electrical wire termination between the pair of jaws and then activating the motor makes it difficult to align the electrical wire termination between the pair of jaws prior to activating the motor.
[0004] The present disclosure provides multi-stage trigger assemblies that can be used with hand-held, battery powered tools that use a single trigger assembly to facilitate activation of multiple tool functions.
SUMMARY
[0005] The present disclosure provides exemplary embodiments of two-jaw, portable, hand-held, battery powered or motorized tools and multi-stage trigger assemblies for such tools. In one exemplary embodiment, a multi-stage trigger assembly for moving a movable jaw of a two jaw, portable, hand-held, motorized tool includes a trigger and at least one switch. The trigger has a pivot portion, a lever portion extending from a first end of the pivot portion and at least one leg extending from a second end of the pivot portion. The at least one leg may be, for example, a pair of legs. The at least one switch is attached to an interior of the tool so that the pivot portion of the trigger is in close proximity to the at least one switch. The pivot portion of the trigger is pivotably coupled to a portion of a fixed jaw of the two jaws of the tool such that when the lever portion of the trigger is manually articulated a first predefined distance, the at least one leg interacts with the movable jaw of the tool mechanically causing the movable jaw to move from a fully open position to a hold position. Further, when the lever portion of the trigger is manually articulated a second predefined distance, the switch is activated causing a motor in the tool to activate to electro-mechanically move the movable jaw from the hold position to an operation cycle position where an operation of the jaw assemblies is performed.
[0006] In this exemplary embodiment, the pivot portion of the trigger is normally biased, using for example one or more springs, away from the at least one switch while the lever portion of the trigger is manually articulated the first predefined distance. When the lever portion of the trigger is manually articulated the second predefined distance the biasing force is overcome permitting the trigger to activate the switch. Preferably, a pivot pin is inserted into a mounting aperture in the pivot portion of the trigger to pivotably coupled the pivot portion to a portion of a fixed jaw of the two jaws of the tool. In this embodiment, a portion of the pivot pin activates the switch.
[0007] The multi-stage trigger assembly may also include a safety system that is configured to selectively block movement of the trigger, e.g., the lever portion of the trigger, to the first

predefined distance. In an exemplary embodiment, the safety system includes a button, a trigger blocking member and a cutout switch. The button is movable between an ON position and an OFF position. When the button is in the ON position the trigger blocking member blocks movement of the trigger, e.g., the lever portion of the trigger, to the first predefined distance and activates the cutout switch.

[0008] In one exemplary embodiment, a portable, hand-held, motorized tool includes a working head assembly, a handle assembly and a trigger assembly similar to the trigger assembly described above. The working head assembly has a fixed jaw assembly, a movable jaw assembly and a biasing member used to normally bias the movable jaw assembly in a direction away from the fixed jaw assembly to a fully open position.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The figures depict embodiments for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the structures illustrated herein may be employed without departing from the principles described herein, wherein:

[0010] FIG. **1** is a side perspective view of a first side of an exemplary embodiment of a battery-powered tool according to the present disclosure, illustrating a working head assembly and a handle assembly;

[0011] FIG. **2** is an exploded perspective view of an exemplary embodiment of jaw assemblies of the tool according to the present disclosure;

[0012] FIG. **3** is a side perspective view of the tool of FIG. **1** with a portion of the outer housing of the tool removed;

[0013] FIG. **4** is the side perspective view of the tool of FIG. **3** with a portion of one jaw of a fixed jaw assembly of the tool removed;

[0014] FIG. **5** is a partial cross-sectional view of the tool of FIG. **1**, illustrating a portion of one jaw of the fixed jaw assembly removed to reveal a switch used to activate a motor of the tool and a trigger of the tool in an open position;

[0015] FIG. **6** is an enlarged side elevation view of the tool of FIG. **5** taken from detail **6**;

[0016] FIG. **7** is the partial cross-sectional view of the tool of FIG. **5**, illustrating a portion of one jaw of the fixed jaw assembly removed to reveal the switch used to activate the motor of the tool and the trigger of the tool in a hold position where the jaw assembly of the tool holds an object between the fixed jaw assembly and the movable jaw assembly;

[0017] FIG. **8** is an enlarged side elevation view of the tool of FIG. **7** taken from detail **8**;

[0018] FIG. **9** is the partial cross-sectional view of the tool of FIG. **5**, illustrating a portion of one jaw of the fixed jaw assembly removed to reveal the switch used to activate the motor of the tool and the trigger of the tool in a crimp position where the motor is activated to cause the jaw assembly of the tool to activate;

[0019] FIG. **10** is an enlarged side elevation view of the tool of FIG. **9** taken from detail **10**;

[0020] FIG. **11** is the partial cross-sectional view of the tool of FIG. **5**, illustrating a portion of one jaw of the fixed jaw assembly removed to reveal the switch used to activate the motor of the tool and the trigger of the tool in an operation cycle position where the operation of the jaw assemblies is performed;

[0021] FIG. **12** is an enlarged side elevation view of the tool of FIG. **11** taken from detail **12**;

[0022] FIG. **13** is the partial cross-sectional view of the tool of FIG. **5**, illustrating a portion of one jaw of the fixed jaw assembly removed to reveal the switch used to activate the motor of the tool and the trigger of the tool in the operation cycle position;

[0023] FIG. **14** is an enlarged side elevation view of the tool of FIG. **13** taken from detail **12**;
[0024] FIG. **15** is a side perspective view of a first side of another exemplary embodiment of a battery-powered tool according to the present disclosure with a handle assembly removed, and illustrating another exemplary embodiment of the trigger assembly;
[0025] FIG. **16** is an enlarged side perspective view of the tool of FIG. **15** taken from detail **16**;
[0026] FIG. **17** is the enlarged side perspective view of the tool of FIG. **16** with a portion of jaw assemblies removed to reveal the trigger assembly;
[0027] FIG. **18** is a front elevation view of the tool of FIG. **16**;
[0028] FIG. **19** is a cross-section view of the tool of FIG. **19** taken from line **19-19**, and illustrating a biasing member of the trigger assembly used to normally bias a trigger of the trigger assembly in a direction away from the handle assembly;
[0029] FIG. **20** is an enlarged view of the portion of the tool in FIG. **19** taken from detail **20**; and illustrating the biasing member of the trigger assembly used to normally bias the trigger of the trigger assembly in a direction away from the handle assembly;
[0030] FIG. **21** is a side elevation view of the tool of FIG. **16** with a portion of a jaw plate for a first jaw assembly and a jaw plate of a second jaw assembly removed to reveal the trigger assembly and with the jaw assemblies in a fully open position;
[0031] FIG. **22** is an enlarged view of the portion of the tool in FIG. **21** taken from detail **22**;
[0032] FIG. **23** is the side elevation view of the tool of FIG. **21** with the jaw assemblies in a hold position;
[0033] FIG. **24** is an enlarged view of the portion of the tool in FIG. **23** taken from detail **24**;
[0034] FIG. **25** is the side elevation view of the tool of FIG. **21** with the jaw assemblies in a motor start position;
[0035] FIG. **26** is an enlarged view of the portion of the tool in FIG. **25** taken from detail **26**;
[0036] FIG. **27** is the side elevation view of the tool of FIG. **21** with the jaw assemblies in an operation cycle position where the operation of the jaw assemblies is performed;
[0037] FIG. **28** is an enlarged view of the portion of the tool in FIG. **27** taken from detail **28**;
[0038] FIG. **29** is the side elevation view of the tool of FIG. **21** with the jaw assemblies in a crimp complete position;
[0039] FIG. **30** is an enlarged view of the portion of the tool in FIG. **29** taken from detail **30**;
[0040] FIG. **31** is a side elevation view of a first side of another exemplary embodiment of a battery-powered tool according to the present disclosure, illustrating a working head assembly and a handle assembly;
[0041] FIG. **32** is a front elevation view of the battery-powered tool of FIG. **31**;
[0042] FIG. **33** is a side perspective view of the tool of FIG. **31** with the handle assembly removed, and illustrating another exemplary embodiment of the trigger assembly;
[0043] FIG. **34** is a cross-sectional view of the tool of FIG. **32** taken from line **34-34**, illustrating components of the trigger assembly;
[0044] FIG. **35** is an enlarged view of the portion of the tool in FIG. **34** taken from detail **35**, illustrating a biasing members used to bias the trigger of the trigger assembly;
[0045] FIG. **36** is a side perspective view of a first side of another exemplary embodiment of a battery-powered tool according to the present disclosure, illustrating a working head assembly and a handle assembly;
[0046] FIG. **37** is a side elevation view of a first side of the tool of FIG. **36** with the jaw assemblies in a fully open position;
[0047] FIG. **38** is a side elevation view of a second side of the tool of FIG. **36** with the jaw assemblies in a fully open position;
[0048] FIG. **39** is a front elevation view of the working head assembly and drive system of the tool of FIG. **36** with the handle assembly removed;
[0049] FIG. **40**A is a cross-sectional view of the working head assembly of FIG. **39** taken from line

40A-**40**A, illustrating a biasing member used to normally bias the second jaw assembly to the fully open position;

[0050] FIG. **40**B is the cross-sectional view of the working head assembly of FIG. **40**A, illustrating the biasing member compressing as the second jaw assembly is moved to the hold position;

[0051] FIG. **40**C is the cross-sectional view of the working head assembly of FIG. **40**B, illustrating the biasing member fully compressed with the second jaw assembly in the fully crimped position;

[0052] FIG. **41** is a perspective view from a first side of another exemplary embodiment of die assembly and a first side of an exemplary embodiment of a locator that can be used with the tools;

[0053] FIG. **42** is a perspective view from the first side of the die assembly and a second side of the locator of FIG. **41**;

[0054] FIG. **43** is an exploded perspective view from the first side of the die assembly and the first and second side of the locator of FIG. **41**;

[0055] FIG. **44** is a bottom plan view of the die assembly and the locator of FIG. **41** taken from line **44-44**;

[0056] FIG. **45** is a bottom plan view of the die assembly and the locator of FIG. **42** taken from line **45-45**;

[0057] FIG. **46** is a side elevation view of the first side of the die assembly and the first side of the locator of FIG. **41**, illustrating the dies separated;

[0058] FIG. **47** is a side elevation view of the second side of the die assembly of FIG. **41**, illustrating the dies separated;

[0059] FIG. **48** is a cross-sectional view of the die assembly and the first side of the locator of FIG. **47** taken from line **48-48**, illustrating a small gauge wire termination positioned between the die and aligned for impact;

[0060] FIG. **49** is a cross-sectional view of the die assembly and the first side of the locator of FIG. **47** taken from line **49-49**, illustrating a large gauge wire termination positioned between the die and aligned for impact;

[0061] FIG. **50** is a side elevation view of the first side of the die assembly and the second side of locator of FIG. **42**, illustrating the dies separated;

[0062] FIG. **51** is a side elevation view of the second side of the die assembly of FIG. **42**, illustrating the dies separated;

[0063] FIG. **52** is a cross-sectional view of the die assembly and the second side of the locator of FIG. **51** taken from line **52-52**, illustrating a small gauge wire termination positioned between the die and aligned for impact;

[0064] FIG. **53** is a cross-sectional view of the die assembly and the second side of the locator of FIG. **51** taken from line **53-53**, illustrating a large gauge wire termination positioned between the die and aligned for impact;

[0065] FIG. **54** is a side elevation view of a first side of another exemplary embodiment of a battery-powered tool according to the present disclosure, illustrating a working head assembly and a handle assembly;

[0066] FIG. **55** is a front elevation view of the battery-powered tool of FIG. **54**;

[0067] FIG. **56** is an outside perspective view of a housing half of the handle assembly according to the present disclosure, illustrating components of a safety system;

[0068] FIG. **57** is an inside perspective view of the housing half of the handle assembly of FIG. **56**;

[0069] FIG. **58** is front elevation view of a portion of the battery-powered tool of FIG. **55**, illustrating a button of a safety system in the unlocked position;

[0070] FIG. **59** is a side elevation view of the portion of the battery-powered tool of FIG. **58**, illustrating the button of the safety system in the unlocked position;

[0071] FIG. **60** is a cross-sectional view of the portion of the battery-powered tool of FIG. **58** taken from line **60-60**, illustrating the jaw assembly in the fully open position and the positioning of the safety system in the unlocked position;

[0072] FIG. **61** is a cross-sectional view of a portion of the battery-powered tool of FIG. **59** taken from line **61-61**, and illustrating the positioning of the safety system in the unlocked position;
[0073] FIG. **62** is front elevation view of a portion of the battery-powered tool of FIG. **55**, illustrating a button of a safety system in the locked position;
[0074] FIG. **63** is a side elevation view of the portion of the battery-powered tool of FIG. **62**, illustrating the button of the safety system in the locked position;
[0075] FIG. **64** is a cross-sectional view of the portion of the battery-powered tool of FIG. **62** taken from line **64-64**, illustrating the jaw assembly in the fully open position and the positioning of the safety system in the locked position;
[0076] FIG. **65** is a cross-sectional view of a portion of the battery-powered tool of FIG. **63** taken from line **65-65**, and illustrating the positioning of the safety system in the locked position;
[0077] FIG. **66** is front elevation view of a portion of the battery-powered tool of FIG. **55**, illustrating a positioning of a trigger blocking member of the safety system when attempting to move the safety system to the locked position while the jaws of the jaw assembly are in the hold position;
[0078] FIG. **67** is a side elevation view of the portion of the battery-powered tool of FIG. **66**, illustrating a positioning of a trigger blocking member of the safety system when attempting to move the safety system to the locked position while the jaws of the jaw assembly are in the hold position;
[0079] FIG. **68** is a cross-sectional view of the portion of the battery-powered tool of FIG. **66** taken from line **68-68**, illustrating a positioning of a trigger blocking member of the safety system when attempting to move the safety system to the locked position while the jaws of the jaw assembly are in the hold position;
[0080] FIG. **69** is a cross-sectional view of a portion of the battery-powered tool of FIG. **67** taken from line **69-69**, and illustrating the button of the safety system from moving toward the locked position;
[0081] FIG. **70** is a side elevation view of the handle assembly of FIG. **54**;
[0082] FIG. **70**A is an enlarged portion of the handle assembly of FIG. **70** taken from detail **70**A, and illustrating a portion of the handle assembly cutaway to reveal a trigger blocking member of the safety system;
[0083] FIG. **71** is an enlarged portion of the housing half of the handle assembly of FIG. **70**A taken from detail **71**, and illustrating the position of the trigger blocking member of the safety system when the safety system is in the unlocked position;
[0084] FIG. **72** is the enlarged portion of the housing half of FIG. **71**, illustrating the position of the trigger blocking member of the safety system in an intermediate position.
[0085] FIG. **73** is the enlarged portion of the housing half of FIG. **71**, illustrating the position of the trigger blocking member of the safety system when the safety system is in the locked position;
[0086] FIG. **74** is an enlarged view of another exemplary embodiment of a safety system according to the present disclosure, illustrating a positioning of a trigger blocking member of the safety system when the safety system is in the unlocked position;
[0087] FIG. **75** is the enlarged view of the safety system of FIG. **74**, illustrating a positioning of a trigger blocking member of the safety system when the safety system is in the locked position;
[0088] FIG. **76** is the enlarged view of the safety system of FIG. **75**, illustrating a positioning of a trigger blocking member of the safety system when attempting to move the safety system to the locked position while the jaws of the jaw assembly are in an intermediate position;
[0089] FIG. **77** is a side perspective view of a first side of another exemplary embodiment of a battery-powered tool according to the present disclosure, illustrating a working head assembly with a die wheel and a handle assembly;
[0090] FIG. **78** is a side elevation view of the first side of the battery-powered tool of FIG. **77**;
[0091] FIG. **79** is a side elevation view of a second side of the battery-powered tool of FIG. **77**;

[0092] FIG. **80** is a cross-sectional view of the working head assembly of the battery-powered tool of FIG. **79** taken from line **80-80**, illustrating a spring plunger mechanism used to lock the die wheel in position;
[0093] FIG. **81** is a side elevation of the working head assembly of the battery-powered tool of FIG. **79**.
[0094] FIG. **82** is a cross-sectional view of the working head assembly of the battery-powered tool of FIG. **81** taken from line **82-82**, illustrating the spring plunger mechanism when the die assembly of FIGS. **54** and **55** are used with the tool;
[0095] FIG. **83** is a side elevation view of a first side of the die wheel of FIG. **79**, illustrating an angular relationship between detents forming part of the spring plunger mechanism positioned around an inner portion of the die wheel and impacting surfaces on the outer perimeter of the die wheel;
[0096] FIG. **84** is a side elevation view of a second side of the die wheel of FIG. **79**, illustrating an angular relationship between detents forming part of the spring plunger mechanism positioned around an inner portion of the die wheel and impacting surfaces on the outer perimeter of the die wheel;
[0097] FIG. **85** is a cross-sectional view of the die wheel of FIG. **83** taken from line **85-85**; and
[0098] FIG. **86** is an end perspective view of the die assembly of FIG. **41**, illustrating a recess in the flat die providing clearance for the spring plunger mechanism when the flat die is used with the battery-powered tool of FIG. **77**.

DETAILED DESCRIPTION

[0099] The portable, battery-powered, hand-held tools contemplated by the present disclosure include crimping tools that crimp one or more conductors to an object and cutting tools used to cut one or more conductors. The present disclosure will be shown and described in connection with portable, battery-powered, hand-held tools with an in-line handle design. However, the handle design of the portable, battery-powered, hand-held tool may be a pistol grip design, a suitcase design or other type handle design. The present disclosure will also be shown and described in connection with a crimping tool. However, the crimping jaws of the tool may be substituted with jaws that perform other types of operations. For example, the crimping jaws of the tool may be substituted with cutting jaws to create a cutting tool.
[0100] For ease of description, the portable, battery-powered, crimping tools according to the present disclosure may also be referred to as the “tools” in the plural and the “tool” in the singular. Objects crimped by the crimping tool include wire terminations. Thus, objects crimped by the crimping tool may also be referred to herein as “wire terminations” in plural and “wire termination” in the singular. Non-limiting examples of the wire terminations include lugs and splices. The conductors, cables, wires or other objects to be crimped within the wire terminations by the tools of the present disclosure may also be referred to as the “conductors” in the plural and the “conductor” in the singular. In addition, as used in the present disclosure, the terms “front,” “rear,” “upper,” “lower,” “upwardly,” “downwardly,” “proximal,” “distal” and other orientation descriptors are intended to facilitate the description of the exemplary embodiments disclosed herein and are not intended to limit the structure of the exemplary embodiments or limit the claims to any particular position or orientation.
[0101] Referring to FIGS. **1** and **2**, a battery-powered, hand-held crimping tool **10** according to the present disclosure is shown. The tool **10** includes a working head assembly **12** and a handle assembly **14**. The working head assembly **12** includes a first jaw assembly **20** and a second jaw assembly **40**. A biasing member **28** is used to normally and automatically bias the second jaw assembly **40** in a direction away from the first jaw assembly **20** to a fully open position, seen in FIG. **3**. The first jaw assembly **20** includes a first jaw plate **22**, a second jaw plate **24** and a die **26**. The first jaw plate **22** and second jaw plate **24** are aligned in parallel and spaced apart, as shown in FIG. **2**. In this exemplary embodiment, the die **26** includes one or more impinging regions **30** and a

mounting member **32**. Each of the one or more impinging regions **30** may include one or more impacting surfaces **36**, each surface being configured and dimensioned to receive a barrel portion of a wire termination **800**, seen in FIG. **5**. The die **26** is secured to the first and second jaw plates **22** and **24** by positioning the mounting member **32** between the first and second jaw plates so that a fastener **34**, e.g., a bolt, can be passed through apertures in the plates **22** and **24** and the mounting member **32**, as shown, and tightened. In this exemplary embodiment, the first jaw assembly **20** is a fixed jaw assembly. The second jaw assembly **40** includes a first jaw plate **42**, a second jaw plate **44** and a die **46**. The first jaw plate **42** and second jaw plate **44** are aligned in parallel and spaced apart, as shown in FIG. **2**. In this exemplary embodiment, the die **46** includes one or more impinging regions **48** and a mounting member **50**. Each of the one or more impinging regions **48** may include one or more impacting surfaces **52**, each surface **52** being configured and dimensioned to receive a barrel portion of a wire termination **800**, seen in FIG. **5**. The die **46** is secured to the first and second jaw plates **42** and **44** by positioning the mounting member **50** between the first and second jaw plates **42** and **44** so that a fastener **54**, e.g., a bolt, can be passed through apertures in the plates **42** and **44** and the mounting member **50**, as shown, and tightened. In this exemplary embodiment, the second jaw assembly **40** is a movable jaw assembly. It is noted that the dies **26** and **46** form a die assembly.

[0102] Continuing to refer to FIGS. **1** and **2**, the second jaw assembly **40** is operatively coupled to the first jaw assembly **20** so that the second jaw assembly **40** is movable relative to the first jaw assembly **20**. Various known techniques may be used to couple the jaw assemblies **20** and **40**. For example, in the embodiment of FIG. **2**, a tang and clevis type configuration is used, where a portion of the first and second jaw plates **22** and **24** include through apertures **56** and **58** acting as a clevis **60**, and portion of the first and second jaw plates **42** and **44** include apertures **62** and **64** acting as a tang **66**. In this exemplary embodiment, the biasing member **28**, e.g., a helical torsion spring, is positioned within the tang **66** of the second jaw assembly **40** so that a central opening of the biasing member **28** is aligned with the apertures **62** and **64** in the tang **66**. One end **28***a* of the biasing member **28** is inserted into a spring aperture **68** in the second jaw plate **44** of the second jaw assembly **40** to couple the biasing member **28** to the second jaw assembly **40**. The tang **66** is then positioned between the clevis **60** of the first jaw assembly **20**, and another end **28***b* of the biasing member **28** is inserted into a spring aperture **70** in the second jaw plate **24** of the first jaw assembly **20** to couple the biasing member **28** to the first jaw assembly **20**. With the tang **66** aligned with the clevis **60**, a bolt **72** is passed through the clevis apertures **56** and **58**, the tang apertures **62** and **64**, and the central opening of the biasing member **28** to movably secure the second jaw assembly **40** to the first jaw assembly **20**. In this exemplary embodiment, the second jaw assembly **40** pivots relative to the first jaw assembly **20** where the bolt **72** acts as the pivot pin. As noted above, the biasing member **28** normally biases the second jaw assembly **40** in a direction away from the first jaw assembly **20** so that the jaw assemblies **20** and **40** are normally bias to an open position, seen in FIG. **5**.

[0103] Referring now to FIGS. **1-6**, the handle assembly **14** houses a drive system and one or more electrical controls, e.g., a control assembly, used to activate and deactivate the tool **10**. In the exemplary embodiment shown, the handle assembly **14** includes a housing **120**, seen in FIG. **1**, and a drive system similar to the drive system **710** shown in FIG. **15**. Exemplary embodiments of drive systems that may be included in the tool **10** are described in commonly owned U.S. patent application Ser. No. 17/105,172, filed on Nov. 25, 2020, which is incorporated herein in its entirety by reference. The housing **120** is configured and dimensioned to enclose or wrap around the drive system and at least a proximal portion of the working head assembly **12**. More specifically, the distal end of the housing **120** is a head portion **122** configured and dimensioned to enclose a portion of the jaw assemblies **20** and **40**. An intermediate portion of the housing **120** is a grip portion **124** that is configured and dimensioned to enclose the drive assembly. The proximal end of the housing **120** is an end portion **126** configured and dimensioned to receive a portion of a battery

128 and to house the components used to connect the battery **128** to the housing **120** using, for example, known battery clips. The head portion **122** of the housing **120** may also include one or more lights **130**, e.g., LEDs, used to illuminate an area between the first and second jaw assemblies **20** and **40** when, for example, the tool **10** is activated.

[0104] In the exemplary embodiment shown, the battery **128** is removably connected to the end portion **126** of the housing **120**. In another embodiment, the battery **128** could be removably mounted or connected to any suitable position on the housing **120**. In another embodiment, the battery **128** may be affixed to the housing **120** so that it is not removable. The battery **128** shown is a rechargeable battery, such as a lithium ion battery, that can output a voltage of at least 16 VDC, and preferably in the range of between about 16 VDC and about 24 VDC. The battery **128** provides power to a motor **700** in the drive system **710** via electrical contacts (not shown) on the motor **700**. To activate the motor **700** and the lights **130**, if used, one or more operator control assemblies **132** may be used. The operator control assemblies **132** may also be referred to herein as the trigger assemblies **132**. In the exemplary embodiment shown, the one or more trigger assemblies **132** may include a trigger **134** and a switch **136**, seen in FIGS. **2** and **4**. The trigger **134** includes a pivot portion **134***a* having a switch camming surface **134***b* and a mounting aperture **134***c*, a lever portion **134***d*, and a pair of legs **134***e* each having a leg camming surface **134***f*. The trigger **134** is operatively, e.g., pivotally, connected to a spring arm **80** extending from the first jaw plate **22** of the first jaw assembly **20** and to a spring arm **82** extending from the second jaw plate **24** of the first jaw assembly **20** to pivotably secure the trigger to the first jaw assembly **20**. More specifically, a first end of stop arms **88***a* and **88***b* are attached to the first jaw plate **22** and the second jaw plate **24** by passing bolt **90** through aperture **91** in the stop arms **88***a* and **88***b* into threaded aperture **92** in the first jaw plate **22** and the second jaw plate **24**. The stop arms **88***a* and **88***b* are provided to limit movement of the spring arms **80** and **82**. To secure the trigger **114** to the spring arms **80** and **82**, a bolt **94** is passed through an opening **96** in the stop arm **88***a*, through an aperture **82***a* in the spring arm **82**, through the mounting aperture **134***c* in the pivot portion **134***a* of the trigger **134**, through an aperture **80***a* in the spring arm **80**, and through the opening **96**, e.g., a slot, in the stop arm **88***b*. With the pivot portion **134***a* of the trigger **134** pivotably mounted to the first jaw assembly **20**, the leg camming surfaces **134***f* of each leg **134***e* of the trigger **134** are aligned to engage pins **45** extending from the first jaw plate **42** and the second jaw plate **44** of the second jaw assembly **40**. The spring arms **80** and **82** are provided to normally bias, i.e., apply a force on, the trigger **134** in the direction of arrow “A” so that the trigger **134** is normally at a furthest most position relative to the opening **96**, e.g., a slot, in the stop arms **88***a* and **88***b*, as shown in FIG. **3**.

[0105] The switch **136** may be, for example a single pole micro-switch, that operatively interacts with the switch camming surface **134***b* of the trigger **134**, seen in FIGS. **4-6**. The switch **136** is electrically connected between the battery **128**, the motor **700** and the one or more lights **130**, such that when the trigger **134** is depressed to a point where the camming surface **134***b* of the pivot portion **134***a* of the trigger **134** contacts and depresses the switch arm **136***a* causing the switch **136** to turn “on.” Turning the switch **136** “on” causes the control assembly (not shown) to activate the motor **700** in the drive system **710** and the one or more lights **130** to turn “on” illuminating the area between the first and second jaw assemblies **20** and **40**.

[0106] In this exemplary embodiment, generally the combination of the trigger **134**, the spring arms **80** and **82**, the biasing member **28**, and the switch **136** work together to provide the multi-stage operation of the trigger assembly **132**. The operation of the multi-stage trigger assembly **132** according to this exemplary embodiment will be described with reference to FIGS. **4-14**. Initially, as set forth above, the biasing member **28** normally and automatically biases the second jaw assembly **40** in a direction away from the first jaw assembly **20** so that the jaw assemblies are in a fully open position, as shown in FIGS. **5** and **6**. Further, the spring arms **80** and **82** normally and automatically biases the trigger **134** in the direction of arrow “A” so that the trigger **134** is normally at the furthest most position relative to the opening **96** in the stop arms **88***a* and **88***b*, as shown in

FIG. **3** and described above. When in the fully open position, the leg camming surfaces **134*f*** of the legs **134*e*** contact the pins **45** extending from the first jaw plate **42** and second jaw plate **44** of the second jaw assembly **40**, and the switch camming surface **134*b*** of the pivot portion **134*a*** of the trigger **134** is in contact with the switch arm **136*a*** of the switch **136** but the switch camming surface **134*b*** is not activating the switch **136**.

[0107] Continuing to refer to FIGS. **4-14**, for the first stage of the multi-stage function of the trigger assembly **132**, which is a hold stage, the lever portion **134*d*** is articulated in the direction of arrow "B," as seen in FIG. **8**, so that the leg camming surfaces **134*f*** of the legs **134*e*** in contact with the pins **45** cause the second jaw assembly **40** to move in the direction of arrow "C" toward the first jaw assembly **20** so that a wire termination **800** positioned between the jaw assemblies **20** and **40** can be held between an impacting surface **36** of the first jaw assembly **20** and an impacting surface **52** of the second jaw assembly **40**, as seen in FIG. **7**. The position of the jaw assemblies **20** and **40** holding the wire termination **800** is a hold position of the jaw assemblies. It is noted that moving the jaw assemblies from the fully open position to the hold position is a mechanical process independent of activation of the motor **700** of the drive system **710** of the tool **10**. When in the hold position, continued articulation of the lever portion **134*d*** in the direction of arrow "B," seen in FIGS. **9** and **10**, overcomes the biasing force of the spring arms **80** and **82** applied to the trigger **134** causing the switch camming surface **134*b*** to push the switch arm **136*a*** to close activating the motor **700** of the tool **10**. Closing the switch **136** initiates a second stage function of the trigger assembly **132**. This second stage function of the trigger assembly **132** is an electro-mechanical operation cycle, where the jaw assemblies are driven by the motor **700** of the drive system **710** to move from the hold position to an operation cycle position where the operation of the jaw assemblies is performed. For example, in this exemplary embodiment the jaw assemblies **20** and **40** perform a crimping operation, such that the second stage function of the trigger assembly **132** is a crimping operation.

[0108] Continuing to refer to FIGS. **9-14**, closing the switch **136** causes the control assembly (not shown) to activate the motor **700** of the drive system **710**, seen in FIG. **15**. With the motor **700** activated, a lead drive shaft **150** of the tool **10** rotates. Rotation of the lead drive shaft **150** of the drive system **710**, seen in FIG. **15**, is translated to linear motion of the jaw drive member **152** attached to the lead drive shaft **150**. Linear motion of the jaw drive member **152** causes the jaw drive member **152** to ride within slots **154**, seen in FIG. **13**, in the first and second jaw plates **42** and **44** in the second jaw assembly **40** causing the second jaw assembly **40** to continue to move in the direction of arrow "C," seen in FIGS. **9** and **10**. The lead drive shaft **150** includes a distal end portion, a proximal end portion and an intermediate portion between the distal end portion and the proximal end portion. The distal end portion may be threaded with, for example, buttress threads typically used for one-directional loading on the lead drive shaft **150**, or acme threads typically used for bi-directional loading on the lead drive shaft **150**. As set forth above, a more detailed description of the drive system **710**, including the lead drive shaft **150** and the jaw drive member **152** is described in commonly owned U.S. patent application Ser. No. 17/105,172, filed on Nov. 25, 2020, which is incorporated herein in its entirety by reference. The continued movement of the second jaw assembly **40** toward the first jaw assembly begins the crimping operation of the tool **10**. When performing the crimping operation, the lead drive shaft **150** causes the jaw drive member **152** to ride within slots **154** to and over an apex of the slots **154** providing additional force to continue the crimping operation, as seen in FIGS. **11** and **12**, to deform the wire termination **800**. When performing the crimping operation, after jaw drive member **152** of the lead drive shaft **150** has traversed along the slot **154**, seen in FIG. **13**, the jaw assemblies **20** and **40** are fully closed and the crimping operation has completed, seen in FIGS. **13** and **14**. When the jaw assemblies **20** and **40** are fully closed, a cycle end switch (not shown) closes causing the control assembly (not shown) to deactivate the motor **170** of the drive system **710**, ending the operating cycle of the jaw assemblies, here the crimp cycle.

[0109] Turning now to FIGS. **15-30**, another exemplary embodiment of the multi-stage trigger assembly for the tool **10** is shown. In this exemplary embodiment, the multi-stage trigger assembly **200** may include a trigger **202** and a switch **204**, seen in FIGS. **15-18**. The trigger **202** includes a pivot portion **202***a* having a mounting aperture **202***b*, seen in FIG. **16**, therethrough, a lever portion **202***c*, and a pair of legs **202***d* each having a leg camming surface **202***e*. The trigger **202** is operatively, e.g., pivotally, connected to a pair of trigger mounting arms **206**—one extending from the first jaw plate **22** of the first jaw assembly **20** and the other extending from the second jaw plate **24** of the first jaw assembly **20** to pivotably secure the trigger **202** to the first jaw assembly **20**. More specifically, each trigger mounting arm **206** has an opening **208**, e.g., a slot, that receives a pivot pin **210** inserted into the mounting aperture **202***b* of the trigger **202**. As shown in FIGS. **15-17**, the ends of the pivot pin **210** extend through the openings **208** to pivotably secure the trigger **202** to the first jaw assembly **20**. A rear portion of the pivot portion **202***a* of the trigger **202** has a spring receiving cavity **202***f*, seen in FIGS. **19** and **20**. The spring receiving cavity **202***f* receives a post **212** extending from a post bracket **214** between the first jaw plate **22** and the second jaw plate **24** of the first jaw assembly **20**, as shown in FIGS. **18-20**. A round the post **212** is a biasing member **216**, e.g., a coil spring, that applies a force to the pivot pin **210** to normally cause the pivot pin **210** to move in the direction of arrow “D,” seen in FIG. **20**, away from the post bracket **214**. Biasing the pivot pin **210** in the direction of arrow “D” prevents the portion of the pivot pin **210** in contact with the switch arm **204***a* of the switch **204**, seen in FIGS. **21-22**, from activating the switch until a force sufficient to overcome the biasing force of the biasing member **216** is applied to the lever portion **202***c* of the trigger **202**.

[0110] The switch **204** may be, for example, a single pole micro-switch, that is mounted to the second jaw plate **24** of the first jaw assembly **20** in close proximity to the opening **208** in the trigger mounting arm **206**. In this configuration, the switch **204** operatively interacts with a portion of the pivot pin **210**, as shown in FIGS. **16** and **17**, and described in more detail below. The switch **204** is electrically connected between the battery **128**, the motor **700**, seen in FIG. **15**, and the one or more lights **130**, seen in FIG. **1**, if used, such that when the trigger **202** is depressed to a point where the end of the pivot pin **210** contacts and depresses the switch arm **204***a*, the switch **204** turns “on” causing the control assembly (not shown) to activate the motor **700** and the one or more lights **130** to turn “on” illuminating the area between the first and second jaw assemblies **20** and **40**.

[0111] In this exemplary embodiment, generally the combination of the trigger **202**, the biasing member **28**, the biasing member **216**, the pivot pin **210**, and the switch **204** work together to provide the multi-stage operation of the trigger assembly **200**. The operation of the multi-stage trigger assembly **200** according to this exemplary embodiment will be described with reference to FIGS. **21-30**. Initially, as set forth above, the biasing member **28** normally and automatically biases the second jaw assembly **40** in a direction away from the first jaw assembly **20** so that the jaw assemblies are in a fully open position, similar to that shown in FIGS. **5** and **6**. Further, the biasing member **216** normally and automatically biases the pivot pin **210** in the direction of arrow “D” so that the switch arm **204***a* of the switch is not depressed as described above. When in the fully open position, the leg camming surfaces **202***e* of the legs **202***d* contact the pins **45** extending from the first jaw plate **42** and second jaw plate **44** of the second jaw assembly **40**, as seen in FIGS. **21** and **22**. For the first stage of the multi-stage function of the trigger assembly **200**, which is a hold stage or position, the lever portion **202***c* is articulated in the direction of arrow “E,” as seen in FIG. **23**, so that the leg camming surfaces **202***e* of the legs **202***d* in contact with the pins **45** cause the second jaw assembly **40** to move in the direction of arrow “F” toward the first jaw assembly **20** so that a wire termination **800** positioned between the jaw assemblies **20** and **40** can be held between the impacting surface **36** of the first jaw assembly **20** and the impacting surface **52** of the second jaw assembly **40**, as seen in FIG. **23**. The position of the jaw assemblies **20** and **40** holding the wire termination **800** is a hold position of the jaw assemblies. It is noted that moving the jaw assemblies from the fully open position to the hold position is a mechanical process independent of activation of the motor **700** of the tool **10**.

[0112] When in the hold position, continued articulation of the lever portion **202**_c_ in the direction of arrow “E,” seen in FIGS. **23** and **24**, overcomes the biasing force of the biasing member **216** applied to the pivot pin **210** causing a portion of the pivot pin **210** to push the switch arm **204**_a_ to close activating the motor **700** of the tool **10**. Closing the switch **204** initiates a second stage function of the trigger assembly **200**. This second stage function of the trigger assembly **200** is an electro-mechanical operation cycle, where the jaw assemblies are driven by the motor **700** to move from the hold position to an operation cycle position where the operation of the jaw assemblies is performed. For example, in this exemplary embodiment the jaw assemblies **20** and **40** perform a crimping operation, such that the second stage function of the trigger assembly **200** is a crimping operation.

[0113] Continuing to refer to FIGS. **25-30**, closing the switch **204** causes a control assembly (not shown) to activate the motor **700** of the drive system **710**. With the motor **700** activated, the lead drive shaft **150** of the drive system **710** rotates. Rotation of the lead drive shaft **150** of the drive system **710** is translated to linear motion of the jaw drive member **152** attached to the lead drive shaft **150**. Linear motion of the jaw drive member **152** causes a cam surface **154** of the jaw drive member **152** to contact a cam roller **156** positioned between the first and second jaw plates **42** and **44** in the second jaw assembly **40** causing the second jaw assembly **40** to continue to move in the direction of arrow “F,” seen in FIGS. **25** and **26**. As set forth above, a more detailed description of the drive system **710**, including the lead drive shaft **150** and the jaw drive member **152** is described in commonly owned U.S. patent application Ser. No. 17/105,172, filed on Nov. 25, 2020, which is incorporated herein in its entirety by reference. The continued movement of the second jaw assembly **40** toward the first jaw assembly **20** begins the crimping operation of the tool **10**. When performing the crimping operation, the lead drive shaft **150** causes the cam surface **154** of the jaw drive member **152** to ride along the cam roller **156** providing additional force to continue the crimping operation, as seen in FIGS. **27** and **28**, to deform the wire termination **800**. When performing the crimping operation, after the cam surface **154** of the jaw drive member **152** has traversed along the cam roller **156**, the jaw assemblies **20** and **40** are fully closed and the crimping operation has completed, seen in FIGS. **29** and **30**. When the jaw assemblies **20** and **40** are fully closed, a cycle end switch (not shown) closes causing the control assembly (not shown) to deactivate the motor **700** of the drive system **710**, ending the operating cycle of the jaw assemblies, here the crimp cycle.

[0114] Referring to FIGS. **31-35**, another exemplary embodiment of the trigger assembly **200** is shown. In this exemplary embodiment, the trigger assembly **200** is substantially the same as the trigger assembly of FIGS. **15-30** except for the description of the biasing member **216** used to apply a force to the pivot pin **210** to normally cause the pivot pin **210** to move in the direction of arrow “D” away from the post bracket **214**. In this exemplary embodiment, each trigger mounting arm **206** has an opening **208**, e.g., a slot, that receives a portion of the pivot pin **210** inserted into the mounting aperture **202**_b_ of the trigger **202** and that holds a biasing member **218** used to apply a force to the pivot pin **210** to normally cause the pivot pin **210** to move in the direction of arrow “G,” seen in FIG. **35**, toward the pivot pin **210**. More specifically, as shown in FIGS. **33-35**, each end of the pivot pin **210** that extend through the openings **208** has a cavity **210**_a_ configured and dimensioned to receive one end of the biasing member **218**. The other end of the biasing member **218** is positioned within the opening **208** of the mounting arm **206** and is aligned and held within the opening **208** using a rib **211**, shown in FIG. **35**, extending into the opening **208**. Biasing the pivot pin **210** in the direction of arrow “G” prevents the portion of the pivot pin **210** in contact with the switch arm **204**_a_ of the switch **204** from activating the switch **204** until a force sufficient to overcome the biasing force of the biasing members **218** is applied to the lever portion **202**_c_ of the trigger **202**. It is noted that in this exemplary embodiment, the die **26** and **46** differ from the die **26** and **46** shown in FIG. **2**. In this embodiment, the die **26** is a rotatable wheel die or die wheel with an impinging region **30** having a plurality of impacting surfaces **36**, and the die **46** has an impinging region **48** with a single impacting surface **52** similar to a nest, as will be described in more detail below.

[0115] Referring to FIGS. **36-40**C, another exemplary embodiment of the mechanism used to normally and automatically bias the second jaw assembly **40** in a direction away from the first jaw assembly **20** to a fully open position, seen in FIGS. **36-38** is shown. As described in the above embodiment, the mechanism used to normally and automatically bias the second jaw assembly **40** in a direction away from the first jaw assembly **20** to a fully open position was the biasing member **28**, e.g., a helical torsion spring. In this exemplary embodiment, a biasing member **220** is used to normally and automatically bias the second jaw assembly **40** in a direction away from the first jaw assembly **20**. However, in this exemplary embodiment, the biasing member **220** uses compression force to normally and automatically bias the second jaw assembly **40** in a direction away from the first jaw assembly **20** to a fully open position. In the exemplary embodiment shown, the biasing member **220** is a coil spring positioned around a post **222**. The post **222** has a first end secured to a bracket **224** positioned between and attached to the first jaw plate **42** and the second jaw plate **44** of the second jaw assembly **40**. The post **222** has a second end that extends into an aperture **226** in a bracket **228** positioned between the first jaw plate **42** and the second jaw plate **44** of the second jaw assembly **40** and secured to the first jaw plate **22** and the second jaw plate **24** of the first jaw assembly **20**. The aperture **226** is smaller in diameter than the diameter of the biasing member **220** so that an end of the biasing member **220** in contact with the bracket **228** does not pass through the aperture **226**. In this configuration, when the jaw assemblies **20** and **40** are in the fully open position, the biasing member **220** is at its normal extended position, as shown in FIG. **40**A. For the first stage of the multi-stage function of the trigger assembly **200**, which is the hold stage, the lever portion **202***c* of the trigger **202** is articulated in the direction of arrow "E," as seen in FIG. **40**B, so that the leg camming surfaces **202***e* of the legs **202***d* in contact with the pins **45** cause the second jaw assembly **40** to move in the direction of arrow "F" toward the first jaw assembly **20** so that a wire termination **800** positioned between the jaw assemblies **20** and **40** can be held between the impacting surface **36** of the die **26** of the first jaw assembly **20** and the impacting surface **52** of the die **46** of the second jaw assembly **40**, seen in FIG. **40**B. The position of the jaw assemblies **20** and **40** holding the wire termination **800** is a hold position of the jaw assemblies. It is noted that moving the jaw assemblies from the fully open position to the hold position is a mechanical process independent of activation of the motor **700** of the tool **10**. After the crimping cycle described in the embodiments above, the jaw assemblies **20** and **40** are in the fully crimped position, seen in FIG. **40**C. As the jaw assembly **40** is moved from the fully open position, seen in FIG. **40**A, to the hold position, seen in FIG. **40**B, and to the fully crimped position, seen in FIG. **40**C, the biasing member **200** compresses. After the crimp operation is completed and the control assembly (not shown) causes the motor **700** of the drive system **710** to return the jaw drive member **152** to its normal at rest position, seen in FIG. **40**A, the compressive force on the biasing member **220** is released so that the second jaw assembly **40** returns to the fully open position, seen in FIG. **40**A.

[0116] Referring now to FIGS. **41-53**, an exemplary embodiment of a locator **250** that can be used with the die assembly of the present disclosure is shown. In this exemplary embodiment, the die **300** would replace die **26** and the die **320** would replace die **46**. The dies **300** and **320** form the die assembly. The die **300** includes a main body portion **302** and a termination holding portion **304**. The main body portion **302** of the die **300** is attached to the first and second jaw plates **22** and **24** of the first jaw assembly **20** as described herein above. The termination holding portion **304** is configured and dimensioned to grip and hold one or more wire terminations **800** and to impact a barrel **804** of the wire terminations, as seen in FIG. **48**. In the embodiment shown, the termination holding portion **304** is configured to hold three different size wire terminations **800**. For example, as shown in FIG. **47**, the termination holding portion **304** can hold a wire termination **800** capable of receiving 18-22 AWG wire, 14-16 AWG wire and 10-12 AWG wire. It is noted that for each

AWG size range, the barrel **804** of the wire termination **800** would have a different inner diameter. Of course, the termination holding portion **304** of the die **300** may be configured to hold many different size ranges of wire. As shown in FIGS. **41**, **42** and **48**, the termination holding portion **304** includes a shroud gripping portion **306** and an impinging portion **308**. In the exemplary embodiment shown, the shroud gripping portion **306** is configured and dimensioned to grip and hold a shroud **802** of the wire termination **800** inserted between the dies **300** and **320**, and the impinging portion **308** is configured to grip and impact the barrel **804** of the wire termination **800**.

[0117] Continuing to refer to FIGS. **41** and **42**, the die **320** includes a main body portion **322** and a termination holding portion **324**. The main body portion **322** of the die **320** is attached to the first and second jaw plates **42** and **44** of the second jaw assembly **40** as described herein above. The termination holding portion **324** is configured and dimensioned to grip and hold one or more wire terminations **800** and to impact the barrel **804** of the wire terminations. In the embodiment shown, the termination holding portion **324** is configured to hold three different size wire terminations **800**. For example, as shown in FIG. **47**, the termination holding portion **324** can hold a wire termination **800** capable of receiving 18-22 AWG wire, 14-16 AWG wire and 10-12 AWG wire. It is noted that for each AWG size range, the barrel **804** of the wire termination **800** would have a different inner diameter. Of course, the termination holding portion **324** of the die **320** may be configured to hold many different size ranges of wire. As shown in FIGS. **41**, **42** and **48**, the termination holding portion **324** includes a shroud gripping portion **326** and an impinging portion **328**. In the exemplary embodiment shown, the shroud gripping portion **326** is configured and dimensioned to grip and hold the shroud **802** of the wire termination **800** inserted between the dies **300** and **320**, and the impinging portion **328** is configured to grip and impact the barrel **804** of the wire termination **800**.

[0118] Continuing to refer to FIGS. **41-53**, the locator **250** is provided to position the wire termination between the dies **300** and **320**, preferably so that the barrel **804** of the wire termination is substantially centered in the impinging portions **308** and **328**. The locator **250** has a mounting body **252** and a positioning wall **254**. The mounting body **252** is used, in this exemplary embodiment, to attach the locator **250** to the die **300** using fasteners **256** that pass through mounting holes **258** in the locator into mounting apertures **310** in the impinging portion **308** of the die **300**, as shown in FIG. **43**. The locator **250** is configured to be reversable, where a first side **260** is configured to position a first type of wire termination **800** between the dies **300** and **320**, and a second side **262** is configured to position a second type of wire termination **800** between the dies **300** and **320**. As a non-limiting example, the first side **260** of the locator **250** may be configured to position YAV-/YAEV-type wire terminations **800** between the dies **300** and **320**, and the second side **262** of the locator **250** may be configured to position T-/TN-/TP-type wire terminations **800** between the dies **300** and **320**. The locator **250** also includes a window **264** through which a terminal **806** of the wire termination **800** can pass when positioning the wire termination **800** between the dies **300** and **320**, as seen in FIGS. **48** and **49**. The positioning wall **254** of the locator **250** is configured so that the impinging portion **308** of die **300** and the impinging portion **328** of die **320** are at an approximate center of the barrel **804** of the wire termination **800** positioned between the dies **300** and **320**, as seen in FIGS. **48**, **49**, **52** and **53**. To achieve this objective, the positioning wall **254** of the locator **250** may be, for example, a curved wall that alters the distance between the positioning wall **254** and an approximate center of the impinging portion **308** of the die **300** and the impinging portion **328** of the die **320** so that a barrel of a particular wire termination is approximately centered on the impinging portion **308** of the die **300** and the impinging portion **328** of the die **320**. However, the present disclosure contemplates the positioning wall **254** to have any suitable shape that alters the distance between the positioning wall **254** and an approximate center of the impinging portion **308** of the die **300** and the impinging portion **328** of the die **320** so that a barrel of a particular wire termination is approximately centered on the impinging portion **308** of the die **300** and the impinging portion **328** of the die **320**. As a non-limiting example, the positioning wall **254** may be a segmented wall where each segment alters the distance between the positioning wall **254** and an approximate center of the impinging portion **308** of the die **300** and the impinging portion **328** of the die **320**. As another non-limiting example, the positioning wall **254** may be a stepped wall where each step in the positioning wall altering the distance between the positioning wall **254** and an approximate center of the impinging portion **308** of the die **300** and the impinging portion **328** of the die **320**.

[0119] Referring now to FIGS. **54-76**, exemplary embodiments of safety systems that may be included in the tool **10** are shown. The safety system is provided to block activation of the motor **700** of the tool **10** when the safety system is in an "off" state or position and to permit activation of the motor **700** when the safety system is in an "on" state or position. In this exemplary embodiment, the safety system **350** includes a button **352**, a trigger blocking member **354**, and a cutout switch **356**. The button **352** and trigger blocking member **354** are shown in FIG. **56**, and the cutout switch **356** is shown in FIG. **60**.

[0120] As shown in FIGS. **54-57**, the housing **120** of the handle assembly **14** is a two-part housing having a first housing half **120***a*, seen in FIGS. **55**, **56** and **57**, and a second housing half **120***b*, seen in FIG. **55**, that when joined form the housing **120**, seen in FIG. **55**. In this exemplary embodiment, the first housing half **120***a* includes a window **122***b* through which the button **352** and the trigger blocking member **354** are movably, e.g., slidably, connected to the first housing half **120***a* using a fastener **358**, as shown in FIGS. **56** and **57**. The window **122***b* is positioned on the first housing half **120***a* so that the trigger blocking member **354** is aligned to selectively interfere with the operation of the trigger **202**. More specifically, the trigger blocking member **354** includes a body **360** having a flexible ribbed arm **362** extending from the body **360** and a blocker **364** attached to an inside surface of the body **360**. The flexible ribbed arm **362** includes one or more ribs **366** configured to engage one or more detent members **368** secured to or monolithically formed into the first housing half **120***a*, as shown in FIGS. **70**, **70**A and **71-73**. The ribs **366** and detent member **368** holds the button **352** and the trigger blocking member **354** in an unlocked position or a locked position and provide a tactile indication when the button **352** and the trigger blocking member **354** are moved between the unlocked and locked positions. The blocker **364** includes a blocking arm **370** and a switch arm **372**, seen in FIGS. **71-73**. When the trigger blocking member **354** is in the locked position, seen in FIG. **64**, the blocking arm **370** is positioned to interfere with the pin **45** used to move the second jaw assembly **40** from the fully open position to the hold position. When the trigger blocking member **354** is in the unlocked position, seen in FIG. **60**, the blocking arm **370** is positioned to permit use of the pin **45** to move the second jaw assembly **40** from the fully open position to the hold position.

[0121] The operation of the safety system **350** will be described with reference to FIGS. **58-69**. With the button **352** of the safety system **350** in the unlocked position, seen in FIGS. **59** and **61**, the blocking arm **370** of the blocker **364**, seen in FIG. **60**, is positioned away from the pin **45** extending from the second jaw plate **44**. With the blocking arm **370** positioned away from the pin **45**, the blocking arm **370** is in an unblocking position and does not interfere with the movement of the pin **45**. As a result, the blocking arm **370** does not interfere with the movement the second jaw assembly **40** from the fully open position to the hold position. In addition, a switch arm of the cutout switch **356** is contacted by the switch arm **372** of the blocker **364** turning the cutout switch **356** "on." Turning the cutout switch "on" causes the control assembly (not shown) to enable the motor **700** to be activated by the trigger **202** as described herein. With the button **352** of the safety system **350** in the locked position, seen in FIGS. **62-65**, the blocking arm **370** of the blocker **364**, seen in FIG. **64**, is positioned to block movement of pin **45**. With the blocking arm **370** in a blocking position, the blocking arm **370** interferes with the movement of the pin **45** and thus interferes with the movement the second jaw assembly **40** from the fully open position to the hold position. In addition, with the button **352** in the locked position, the switch arm of the cutout switch **356** is no longer in contact with the switch arm **372** of the blocker **364** so that the cutout switch **356** is turned "off." Turning the cutout switch **356** "off" causes the control assembly (not shown) to disable the motor **700** from being activated by the trigger **202**. Further, when the button **352** of the safety system **350** is in the unlocked position and the trigger **202** is articulated to move the second jaw assembly **40** toward the hold position, seen in FIGS. **66-69**, the surface **374** of the blocker **364** contacts the pin **45** so that the pin moves along the surface **374** as the trigger **202** is moved. As a result, the surface **374** blocks the button **352** from being moved to the locked position when the trigger **202** is moved.

[0122] Referring to FIGS. **74-76**, another exemplary embodiment of the trigger blocking member **354** is shown. In this exemplary embodiment, the body **360** of the trigger blocking member **354** acts as the blocker **364** described above. More specifically, the body **360** includes the one or more ribs **366**, a first surface **360***a* that contacts the switch **356**, a second surface **360***b* that contacts the pin **45** and a blocking surface **360***c*. With the button **352** and trigger blocking member **354** of the safety system **350** in the unlocked position, seen in FIG. **74**, the one or more ribs **366** of the body **360** are positioned within the detent member **368**, seen in FIG. **73**, holding the button **352** and trigger blocking member **354** in the unlocked position. In this configuration, the blocking surface **360***c* is positioned away from the pin **45** extending from the second jaw plate **44**. With the blocking surface **360***c* of the body **360** positioned in an unblocking position, the blocking surface **360***c* does not interfere with the movement of the pin **45**. As a result, the blocking surface **360***c* does not interfere with the movement the second jaw assembly **40** from the fully open position to the hold position. In addition, with the button **352** in the unlocked position, the first surface **360***a* of the body **360** is in contact with the switch arm of the cutout switch **356** turning the cutout switch **356** "on." Turning the cutout switch "on" causes the control assembly (not shown) to enable the motor **700** to be activated by the trigger **202** as described herein. With the button **352** and trigger blocking member **354** of the safety system **350** in the locked position, seen in FIG. **75**, the blocking surface **360***c* of the body **360** is positioned to block movement of the pin **45** extending from the second jaw plate **44**. With the blocking surface **360***c* in a blocking position, the blocking surface **360***c* interferes with the movement of the pin **45**, and thus interferes with the movement the second jaw assembly **40** from the fully open position to the hold position. In addition, with the button **352** and trigger blocking member **354** of the safety system **350** in the locked position, the first surface **360***a* of the body **360** is no longer in contact with the switch arm of the cutout switch **356**. As a result, the cutout switch **356** is turned "off." Turning the cutout switch "off" causes the control assembly (not shown) to disable the motor **700** from being activated by the trigger **202**. Further, when the button **352** and trigger blocking member **354** of the safety system **350** are in the unlocked position and the trigger **202** is articulated to move the second jaw assembly **40** toward the hold position, seen in FIG. **76**, the second surface **360***b* of the body **360** contacts the pin **45** so that the pin moves along the surface **360***b* as the trigger **202** is moved. As a result, the surface **360***b* blocks the button **352** from being move to the locked position when the trigger **202** is moved.

[0123] Referring now to FIGS. **77-86**, another exemplary embodiment of a battery-powered tool according to the present disclosure is shown. In this exemplary embodiment, the tool **10** is substantially similar to the embodiments of the tools described herein, except the working head assembly **12** of the tool **10** is adapted to work with different die assemblies. As a non-limiting example, one type of die assembly includes a die wheel and a nest, and another type of die assembly includes the flat dies of FIGS. **2** and **43**. In the exemplary embodiment shown, the die assembly includes two dies. The first die **400** is a rotatable wheel die or die wheel and the second die **420** is a nest. The die wheel **400** includes a center mounting aperture **402** used for securing the die wheel **400** to the first jaw plate **22** and the second jaw plate **24** of the first jaw assembly **20** using a fastener **404** and a nut **406**, as shown in FIG. **80**. An outer perimeter of the die wheel **400** includes a plurality of impacting surfaces **408**. Each impacting surface **408** is configured and dimensioned to impact a certain size and type of wire termination **800**. In the exemplary embodiment shown in FIGS. **83** and **84**, the impacting surfaces **408** are arranged around the perimeter of the die wheel **400** from a smallest size to a largest size designed to accommodate wire

terminations **800** capable of receiving, for example 1-8 AWG wire. Each side of the die wheel **400** includes a plurality of detent holes **410** forming part of a detent mechanism **430**, e.g., spring plunger mechanism. The detent mechanism **430** includes a housing **432** holding a spring loaded ball **434** that is configured to be at least partially received within the detent holes **410** and used to hold the die wheel **400** in a fixed position. The detent holes **410** are positioned around an inner portion of each side of the die wheel **400** near the mounting aperture **402** as shown in FIGS. **83** and **84**. As noted, the detent holes **410** are aligned to interact with the spring loaded ball **434** of the detent mechanism **430** to hold the die wheel **400** in a fixed position until the die wheel is manually rotated with sufficient force to move the die wheel **400** to a new fixed position. The detent holes **410** are symmetrically positioned around the inner portion of each side of the die wheel **400** so that the same angular relationship “α” is between a center of each detent hole **410** and a corresponding vertical axis through a center of the mounting aperture **402** as shown in FIG. **83**. The angle “α” may be, for example, in the range of about 0 degrees and about 60 degrees. By symmetrically positioning the detent holes **410** around the inner portion of each side of the die wheel **400**, permits the die wheel **400** to be mounted into the first jaw assembly **20** with the sides of the die wheel facing either direction. The nest **420** includes a single impacting surface **422** that is configured and dimensioned to receive all of the sizes and type of wire terminations **800** that the die wheel **400** is configured to impact.
[0124] As noted above, the die wheel **400** and a nest **420** of FIGS. **77-79** may be changed for the flat dies of FIGS. **2** and **43**. In order for the flat dies to work with the detent mechanism **430**, the die **300**, shown in FIG. **86**, includes a notch **412** in which the ball **434** of the detent mechanism **430** can rest when the die **300** is mounted to the first jaw assembly **20**.
[0125] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the scope of the present invention. The description of an exemplary embodiment of the present invention is intended to be illustrative, and not to limit the scope of the present invention. Various modification, alternatives and variations will be apparent to those of ordinary skill in the art and are intended to fall within the scope of the invention.

Claims

1-18. (canceled)
19. A multi-stage trigger assembly for moving a movable jaw of a two jaw assembly, portable, hand-held, motorized tool, the multi-stage trigger assembly comprising: at least one actuator; and a trigger having a lever portion, at least one jaw moving member and a pivot portion, the pivot portion is positioned in close proximity to the at least one switch and is pivotably coupled to a portion of a second jaw of the two jaw assembly, such that when the lever portion is moved a first distance the at least one jaw moving member causes the movable jaw to move from a fully open position to a hold position without activating the at least one actuator, and when the lever portion is further moved a second distance, the pivot portion activates the at least one actuator causing a motor in the tool to move the movable jaw from the hold position to an operation cycle position where an operation of the two jaw assembly is performed.
20. The multi-stage trigger assembly according to claim 19, wherein the pivot portion is normally moved in a direction away from the at least one actuator using at least one force generating member.
21. The multi-stage trigger assembly according to claim 20, wherein the at least one force generating member comprises a biasing member.
22. The multi-stage trigger assembly according to claim 19, wherein the pivot portion includes a pivot pin, and wherein at least a portion of the pivot pin activates the at least one actuator.
23. The multi-stage trigger assembly according to claim 19, wherein the at least one jaw moving member extending from a second end of the pivot portion comprises at least one leg.

24. The multi-stage trigger assembly according to claim 19, further comprising a safety system configured to selectively block movement of the movable jaw.
25. The multi-stage trigger assembly according to claim 24, wherein the safety system selectively blocks movement of the movable jaw by at least one of the following: i. mechanically blocking movement of the movable jaw at least from the fully open position to the hold position; ii. preventing the at least one actuator from activating the motor; and iii. mechanically blocking movement of the movable jaw and preventing the at least one actuator from activating the motor.
26. The multi-stage trigger assembly according to claim 19, wherein the at least one actuator comprises a switch.
27. A multi-stage trigger assembly for moving a movable jaw of a two jaw assembly, portable, hand-held, motorized tool, the multi-stage trigger assembly comprising: at least one actuator; and a trigger having a lever portion, at least one jaw moving member and a pivot portion, the pivot portion is positioned in close proximity to the at least one actuator and is pivotably coupled to a portion of a second jaw of the two jaw assembly, such that when the lever portion is moved a first distance the at least one jaw moving member causes the movable jaw to move from a fully open position to a hold position, and when the lever portion is further moved a second distance, the pivot portion activates the at least one actuator causing a motor in the tool to move the movable jaw from the hold position to an operation cycle position where an operation of the two jaw assembly is performed; and a safety system configured to selectively block movement of the movable jaw.
28. The multi-stage trigger assembly according to claim 27, wherein the pivot portion is normally moved in a direction away from the at least one actuator using at least one force generating member.
29. The multi-stage trigger assembly according to claim 28, wherein the at least one force generating member comprises a biasing member.
30. The multi-stage trigger assembly according to claim 27, wherein the pivot portion includes a pivot pin, and wherein at least a portion of the pivot pin activates the at least one actuator.
31. The multi-stage trigger assembly according to claim 27, wherein the at least one jaw moving member extending from a second end of the pivot portion comprises at least one leg.
32. The multi-stage trigger assembly according to claim 27, wherein the safety system selectively blocks movement of the movable jaw by at least one of the following: i. mechanically blocking movement of the movable jaw at least from the fully open position to the hold position; ii. preventing the at least one actuator from activating the motor; and iii. mechanically blocking movement of the movable jaw and preventing the at least one actuator from activating the motor.
33. The multi-stage trigger assembly according to claim 27, wherein the at least one actuator comprises a switch.
34. A portable, hand-held, motorized tool comprising: a working head assembly having a fixed jaw assembly, a movable jaw assembly and a biasing member used to normally bias the movable jaw assembly in a direction away from the fixed jaw assembly to a fully open position; a handle assembly; and a trigger assembly including: at least one actuator; and a trigger having a lever portion, at least one jaw moving member and a pivot portion, the pivot portion is positioned in close proximity to the at least one switch and is pivotably coupled to a portion of the movable jaw assembly, such that when the lever portion is moved a first distance the at least one jaw moving member causes the movable jaw assembly to move from a fully open position to a hold position without activating the at least one actuator, and when the lever portion is further moved a second distance, the pivot portion activates the at least one actuator causing a motor in the tool to move the movable jaw assembly from the hold position to an operation cycle position where an operation of the jaw assemblies is performed.
35. The portable, hand-held, motorized tool according to claim 34, wherein the pivot portion is normally moved in a direction away from the at least one actuator using at least one force generating member.

36. The portable, hand-held, motorized tool according to claim 35, wherein the at least one force generating member comprises a biasing member.
37. The portable, hand-held, motorized tool according to claim 34, wherein the pivot portion includes a pivot pin, and wherein at least a portion of the pivot pin activates the at least one actuator.
38. The portable, hand-held, motorized tool according to claim 34, wherein the at least one jaw moving member extending from a second end of the pivot portion comprises at least one leg.
39. The portable, hand-held, motorized tool according to claim 34, further comprising a safety system configured to selectively block movement of the movable jaw assembly.
40. The portable, hand-held, motorized tool according to claim 39, wherein the safety system selectively blocks movement of the movable jaw assembly by at least one of the following: i. mechanically blocking movement of the movable jaw assembly at least from the fully open position to the hold position; ii. preventing the at least one actuator from activating the motor; and iii. mechanically blocking movement of the movable jaw assembly and preventing the at least one actuator from activating the motor.
41. The portable, hand-held, motorized tool according to claim 34, wherein the at least one actuator comprises a switch.
42. A portable, hand-held, motorized tool comprising: a working head assembly having a fixed jaw assembly, a movable jaw assembly and a biasing member used to normally bias the movable jaw assembly in a direction away from the fixed jaw assembly to a fully open position; a handle assembly; and a trigger assembly including: at least one actuator; a trigger having a lever portion, at least one jaw moving member and a pivot portion, the pivot portion is positioned in close proximity to the at least one actuator and is pivotably coupled to a portion of the fixed jaw assembly, such that when the lever portion is moved a first distance the at least one jaw moving member causes the movable jaw assembly to move from a fully open position to a hold position, and when the lever portion is further moved a second distance, the pivot portion activates the at least one actuator causing a motor in the tool to move the movable jaw assembly from the hold position to an operation cycle position where an operation of the jaw assemblies is performed; and a safety system configured to selectively block movement of the movable jaw assembly.
43. The portable, hand-held, motorized tool according to claim 42, wherein the pivot portion is normally moved in a direction away from the at least one actuator using at least one force generating member.
44. The portable, hand-held, motorized tool according to claim 43, wherein the at least one force generating member comprises a biasing member.
45. The portable, hand-held, motorized tool according to claim 42, wherein the pivot portion includes a pivot pin, and wherein at least a portion of the pivot pin activates the at least one actuator.
46. The portable, hand-held, motorized tool according to claim 42, wherein the at least one jaw moving member extending from a second end of the pivot portion comprises at least one leg.
47. The portable, hand-held, motorized tool according to claim 42, wherein the safety system selectively blocks movement of the movable jaw by at least one of the following: i. mechanically blocking movement of the movable jaw assembly at least from the fully open position to the hold position; ii. preventing the at least one actuator from activating the motor; and iii. mechanically blocking movement of the movable jaw assembly and preventing the at least one actuator from activating the motor.
48. The portable, hand-held, motorized tool according to claim 42, wherein the at least one actuator comprises a switch.