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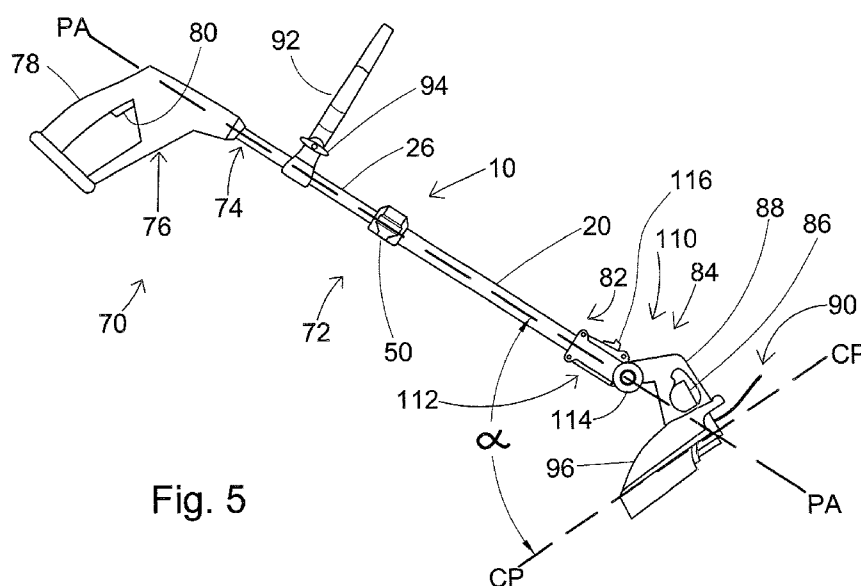


Fig. 5

(57) Abstract: A trimming tool (70) may have a variety of features such as a lockable telescoping tube (10), a tool guard (96) having a snap-fit fastener, an adjustment mechanism comprising a rotational mechanism (112) and a pivoting mechanism (114), or any combination of these features. A method of attaching a tool guard to a trimming tool is also provided.

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LINE TRIMMER

FIELD OF THE INVENTION

The present invention relates to a line trimmer. More specifically, the present invention relates to a line trimmer with one or more different features.

BACKGROUND

Line trimmers, sometimes commonly-referred to as “weed wackers”, are used for the trimming and sometimes the edging of lawns, light foliage, and their respective boundaries. Line trimmers typically employ a flexible nylon (or other plastic) cutting line connected to a rotating head which rotates at a high rate of speed so as to cut the vegetation. Such line trimmers may contain either an electric-powered or gas-powered engine which powers the rotating head either directly or indirectly.

Recently, additional features have been included in such line trimmers, such as replaceable heads, auto-feeding heads, telescoping handles, pivoting heads, and the like. Current telescoping heads require the turning of a screw, wing nut, or other type of screw-type device which holds a pole formed of concentric tubes in place via friction caused by the screw against a portion of the inner pole. However, it has been found that such mechanisms may be difficult / complicated to assemble, requiring multiple screws and parts. Such a mechanism may also be difficult for certain users, especially by those having small hands, and/or arthritic users, and it is often unclear whether or not the screw(s) has been tightened enough. If it/they are not tightened enough, then the cutting head may move during use which could be dangerous to the user or others nearby.

Some line trimmers contain a rotating head to allow the trimmer to also be used as an edging tool for the boundaries of grass or foliage. For example, to cut grass at the edges of a sidewalk, driveway, etc. Such a line trimmer often contains a rotating head, only. However, it has been found that the mechanisms for such a rotating head are often complicated and difficult to use, and/or confusing to the user. Or, the user is instructed to employ a pivoting head, and then to rotate the line trimmer along its pole axis to use it as an edging tool. Such a situation could be dangerous, as the line trimmer may be unwieldy when turned in such a manner.

Line trimmers typically contain safety features which protect the user from grass, foliage, sticks, rocks, etc. that are kicked up by the rapidly rotating cutting line. A typical safety feature is therefore a tool guard which is often a circular or semi-circular (i.e., arc-

shaped) shield attached above the cutting line which physically blocks flying debris from hitting the user. This tool guard may completely or partially-cover the cutting line. Such tool guards are typically permanently-affixed to the motor housing at various places with, for example, permanent adhesives, screws, etc. In an alternative, the tool guard may be permanently moulded into the engine housing. However, such a complicated manufacturing requires either significant effort and time during manufacturing and/or a specialized mould which makes maintenance much more difficult.

Accordingly, it has been found that there remains a need for an improved mechanism for providing a lockable, telescoping tube, an easier to assemble tool guard, and/or an improved mechanism to adjust the trimming head's orientation.

SUMMARY OF THE INVENTION

An embodiment of the present invention relates to a lockable, telescoping tube having an outer tube, an inner tube, a friction block and a pressure latch. The outer tube has a proximal outer tube end and a distal outer tube end opposite the proximal outer tube end. The inner tube has a proximal inner tube end and a distal inner tube end opposite the proximal inner tube end. The proximal inner tube end is slidably-inserted into the proximal outer tube end. A lower coupler is external to the proximal outer tube end. A shaft shield is attached to the proximal inner tube end via a snap-fit closure, and the shaft shield is slidably-inserted into both the proximal outer tube end and a lower coupler. An upper coupler is external to the inner tube. The shaft shield is physically blocked from passing into the upper coupler. The upper coupler is affixed to the lower coupler via a snap-fit closure, and the upper coupler is also affixed to the proximal outer tube end via a snap-fit closure. A pivot axis connects the upper coupler and the lower coupler. The friction block protrudes from the upper coupler and/or the lower coupler. The friction block is also releasably-pressable against the inner tube. The pressure latch at least partially encloses the pivot axis,. When the pressure latch is closed it physically presses the friction block against the inner tube so as to restrict movement of the inner tube. When the pressure latch is open the friction block releases pressure from the inner tube thereby allowing the inner tube to slidably-move.

Without intending to be limited by theory, it is believed that such a telescoping tube is both quick and easy to manufacture, due to the snap-fit-closures. Furthermore, it is believed that when the pressure latch is closed, the pressure latch sufficiently presses the friction block so as to substantially prevent sliding of the inner tube within the outer tube. However, when

the pressure lock is open, the friction block does not significantly press against the inner tube and therefor the inner tube may easily slide within the outer tube.

An embodiment of the present invention relates to a trimming tool having a pole, a trimmer head, and a tool guard with a snap-fit fastener. The pole contains a distal pole end having a handle, and a proximal pole end opposite the handle. The trimmer head contains an electric motor, a cutting tool operatively-connected to the electric motor, and a housing surrounding the electric motor. The trimmer head is attached to the proximal end of the pole, and the tool guard is attached to the trimmer head via the snap-fit fastener.

An embodiment of the present invention relates to a method for attaching a tool guard to a trimming tool having the steps of providing a trimming tool having a trimmer head having a housing, and wherein the housing has a clip, providing a tool guard having a fixture hole, and affixing the tool guard to the housing by inserting the clip into the fixture hole.

Without intending to be limited by theory, it is believed that the present invention allows for the quick and easy attachment of a tool guard to a trimming tool with minimal or even no attachment tools. Such a tool guard may be securely attached thereby speeding up production.

An embodiment of the present invention relates to a trimming tool having a pole, a trimmer head, and an adjustment mechanism. The pole contains a distal pole end, a handle at the distal pole end, and a proximal pole end opposite the handle. The pole also contains a pole axis running the length of the pole. The trimmer head has an electric motor, a cutting tool operatively-connected to the electric motor, and a housing surrounding the electric motor. The adjustment mechanism connects the pole to the trimmer head and contains a releasably-lockable rotational mechanism and a releasably-lockable pivoting mechanism. The releasably-lockable rotational mechanism allows the trimmer head to rotate about the pole axis of the pole, and the releasably-lockable pivoting mechanism allows the adjustment of the angle between the trimmer head and the pole.

Without intending to be limited by theory it is believed that such an adjustment mechanism is safer, and easier to use than existing mechanisms. The lockability of both the rotational and pivoting actions helps to prevent accidents.

Additional benefits may also be found with the present invention and/or combinations of the features describe herein.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows an exploded view of an embodiment of the lockable, telescoping tube of the present invention;

Fig. 2 shows an open configuration of an embodiment of the lockable, telescoping tube of Fig. 1;

Fig. 3 shows a closed configuration of an embodiment of the lockable, telescoping tube of Fig. 1;

Fig. 4 shows a cut-away side view of the pressure latch as seen along line 4-4 in Fig. 1;

Fig. 5 shows a partially-cut-away side view of an embodiment of a trimming tool of the present invention;

Fig. 6 shows a bottom perspective view an embodiment of the housing of the present invention;

Fig. 7 shows a bottom perspective view of an embodiment of the tool guard of the present invention;

Fig. 8 shows a bottom perspective view of an embodiment of the tool guard of the present invention;

Fig. 9 shows a bottom perspective view of an embodiment of the tool guard being attached to the trimmer head of the present invention;

Fig. 10 shows a side view of an embodiment of the pivoting mechanism; and

Fig. 11 shows a top perspective view of an embodiment of the pivoting mechanism and the rotational mechanism.

The figures herein are for illustrative purposes only and are not necessarily drawn to scale.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Unless otherwise specifically provided herein, all measurements are made in metric units. Furthermore, all percentages, ratios, etc. herein are by weight, unless specifically indicated otherwise. Unless otherwise specifically indicated, all individual components herein may be fabricated formed/made/constructed of standard materials in known in the art, and according to methods known in the art.

Lockable, Telescoping Tube

An embodiment of the present invention relates to a lockable, telescoping tube having an outer tube, an inner tube, a friction block and a pressure latch. The outer tube has a proximal outer tube end and a distal outer tube end opposite the proximal outer tube end. The inner tube has a proximal inner tube end and a distal inner tube end opposite the proximal inner tube end. The proximal inner tube end is slidably-inserted into the proximal outer tube end. A lower coupler is external to the proximal outer tube end. A shaft shield is attached to the proximal inner tube end via a snap-fit closure, and the shaft shield is slidably-inserted into both the proximal outer tube end and a lower coupler. An upper coupler is external to the inner tube. The shaft shield is physically blocked from passing into the upper coupler. The upper coupler is affixed to the lower coupler via a snap-fit closure, and the upper coupler is also affixed to the proximal outer tube end via a snap-fit closure. A pivot axis connects the upper coupler and the lower coupler. The friction block protrudes from the upper coupler and/or the lower coupler. The friction block is also releasably-pressable against the inner tube. The pressure latch at least partially encloses the pivot axis,. When the pressure latch is closed it physically presses the friction block against the inner tube so as to restrict movement of the inner tube. When the pressure latch is open the friction block releases pressure from the inner tube thereby allowing the inner tube to slidably-move.

Turning to the figures, Fig. 1 shows an exploded view of an embodiment of the lockable, telescoping tube, 10, of the present invention. The lockable, telescoping tube, 10, contains an outer tube, 20, having a proximal outer tube end, 22, and a distal outer tube end, 24, opposite the proximal outer tube end, 22. The lockable, telescoping tube, 10, also contains an inner tube, 26 which has a proximal inner tube end, 28, and a distal inner tube end, 30, opposite the proximal inner tube end, 28.

The inner tube, 20, and the outer tube, 26, are typically made from, for example, a metal, a plastic, or a combination thereof; or a metal; or steel, or aluminum. The inner tube is typically smaller in diameter than the outer tube and is therefore slidably-insertable into the outer tube. The inner tube and the outer tube typically have a round; or substantially round cross-sectional shape. If the inner tube and outer tubes do not both have a round cross-sectional shape, then the inner tube typically has a similar cross-sectional shape and is slidably-insertable into the outer tube. In an embodiment herein, the outer tube and/or the inner tube contains a ridge or other shape so as to prevent rotation and/or twisting of the two tubes relative to each other.

In Fig. 1, the proximal inner tube end, 28, is slidably-inserted into the proximal outer

tube end, 22. A lower coupler, 32, is external to the proximal inner tube end, 28, and the proximal inner tube end, 28, is also slidably-inserted the lower coupler, 32. The lower coupler, 32, contains a snap-fit closure, 34. In Fig. 1, the snap-fit closure, 34, is formed from a tab, 36, on the lower coupler, 32, which snaps into a fixture hole, 38, on an upper coupler, 40. The upper coupler, 40, therefore partially fits into the lower coupler, 32. The upper coupler, 40, further contains another snap-fit closure, 34, containing a tab, 36, which fits into a fixture hole, 38, near the proximal outer tube end, 22. When the proximal outer tube end, 22, is inserted into the upper coupler, 40, the tab, 36, snaps into the fixture hole, 38, thereby securely fastening the upper coupler, 40, to the outer tube, 20. Thus, the upper coupler, 40, is attached to both the outer tube, 20, and the lower coupler, 32, via snap-fit closures, 34. Once assembled, the outer tube, 20, is typically intended to be permanently-fastened to the upper coupler, 40, and the upper coupler, 40, is intended to be permanently-fastened to the lower coupler, 32. Thus, these three parts typically may not be separated unless one or more of the tabs, 36, is broken.

The upper coupler, 40, is external to at least a portion of the inner tube, 26, typically the inner tube end, 28. In an embodiment herein, the lower coupler, 32, is external to the upper coupler, 40, the proximal outer tube end, 22, and the inner tube, 26, and typically the proximal inner tube end, 28.

A shaft shield, 42, is attached to the proximal inner tube end, 28 via a snap-fit closure, 34. The tab, 36, on the shaft shield, 42, fits into a fixture hole, 38, near the proximal inner tube end, 28. The shaft shield, 42, is slidably-inserted into both the proximal tube outer end, 28, and the lower coupler, 32. The tab, 36, on the shaft shield, 42, is intended to permanently-fasten the shaft shield, 42, to the proximal outer tube end, 28. Thus, these two parts typically may not be separated unless the tab, 36, is broken.

The lower coupler, 32 is also external to the shaft shield, 42. Accordingly in the embodiment of Fig. 1, going from the outside to the inside, one would encounter in order, the lower coupler, 32, as the outermost piece, the upper coupler, 40, the outer tube, 20, inner tube, 26, and finally the shaft shield, 42 as the innermost piece.

A pivot axis, 44, connects the upper coupler, 40, and the lower coupler, 32. In the embodiment of Fig. 1, the pivot axis is a screw, 46, which is fastened with a nut, 48, through the upper coupler, 40, a pressure latch, 50, and then through the lower coupler, 32, as seen along line A-A. The pressure latch, 50, at least partially encloses; or substantially encloses; or encloses; the pivot axis, 44. The pivot axis allows the pressure latch, 50, to rotate open

and closed.

A friction block, 52, is provided and protrudes from the upper coupler, 40, and/or the lower coupler, 32. The friction block, 52, is releasably-pressable against the inner tube, 26, to prevent it from moving. Specifically, in Fig. 1, when the pressure latch, 50, is closed, then a protrusion, 54, on the pressure latch, 50, physically presses the friction block, 52, against the inner tube, 26 and thereby restricts the movement of the inner tube, 26, preventing it from moving relative to the outer tube, 20, the lower coupler, 32, the upper coupler, 40, the pressure latch, 50, and the friction block, 54. However, when the pressure latch, 50, is open, then the protrusion, 54, does not press against the friction block, 52, and therefore the friction block, 52, releases the pressure from the inner tube, 26, allowing it to slidably-move relative to the outer tube, 20, the lower coupler, 32, the upper coupler, 40, the pressure latch, 50, and the friction block, 54. This moving of the inner tube, 26, relative to the outer tube, 20, allows the total length of the two (inner and outer) tubes to expand or contract, which defines a telescoping tube.

The pressure latch, 50, further contains a finger tab, 56, which allows the user to easily lift the pressure latch, 50, when it is closed, so as to open the pressure latch, 50.

Without intending to be limited by theory, it is believed that this type of pressure latch is more easily opened and closed than a screw-type or wing-nut type of pressure fastener. Therefore, it is believed that the mechanism herein described is significantly easier for the user, especially an arthritic user, to use as the leverage is easier to apply as compared to a turning screw. Furthermore, it is believed that a user easily understands when such a mechanism is completely locked and the tubes are firmly locked together, as compared to a screw-type mechanism.

Fig. 2 shows an open and unlocked configuration of an embodiment of the lockable, telescoping tube, 10, of Fig. 1. As can be seen, when the pressure latch, 50, is open then the protrusion, 54, does not touch the friction block, 52. This releases the pressure on the inner tube, 26, and allows the inner tube, 26, to slidably-move relative to the outer tube, 20, in the direction of the arrow.

Fig. 3 shows a closed and locked configuration of an embodiment of the lockable, telescoping tube, 10, of Fig. 1. When the pressure latch, 50, is closed and therefore in a locked position, the protrusion (see Fig. 2 at 54) presses against the friction block (see Fig. 2 at 52) and prevents the inner tube, 26, from slidably-moving relative to the outer tube, 20.

Fig. 4 shows a cut-away side view of the pressure latch, 50, as seen along line 4-4 in

Fig. 1. The pressure latch, 50, contains a protrusion, 54, as well as a finger tab, 56, at one end of the pressure latch, 50. At the opposite end of the pressure latch, 50, from the finger tab, 56, is a latch hole, 58, through which the pivot axis (see Fig 1 at 44), extends. When the pressure latch, 50, is rotated from being closed to being open, the axis of rotation is along the latch hole, 58 and the pivot axis (see Fig. 1 at 44).

Trimming Tool

An embodiment of the present invention relates to a trimming tool having a pole, a trimmer head, and a tool guard. The pole contains a distal pole end having a handle, and a proximate pole end opposite the handle. The trimmer head contains an electric motor, a cutting tool operatively-connected to the electric motor, and a housing surrounding the electric motor. The trimmer head is connected to the proximal pole end. The tool guard has a snap-fit fastener and the tool guard is attached to the trimmer head via the snap-fit fastener.

Fig. 5 shows a partially-cut-away side view of an embodiment of a trimming tool, 70, of the present invention. The trimming tool, 70, has a pole, 72, which in this embodiment is a lockable, telescoping tube, 10. The pole, 72, contains a distal pole end, 74, to which is attached a handle, 76. the handle, 76, contains a handle grip, 78, with which the user holds the trimming tool, 70. The handle grip, 78, also contains a trigger, 80, which activates the trimming tool, 70.

The pole, 70, also contains a proximal pole end, 82, opposite the distal pole end, 74, and the handle, 76. A trimmer head, 84, is attached to the proximal pole end, 82. The trimmer head, 84, contains an electric motor, 86, therein. The trimmer head, 84 contains a housing, 88, which surrounds the electric motor, 86. Furthermore, a cutting tool, 90, is operatively-connected to the electric motor, 86. In an embodiment herein, the cutting tool is a line, such as a plastic line, a nylon line, a metal wire; or a plastic line; or a nylon line.

The pole, 70, contains the outer tube, 20, the inner tube, 26, and the pressure latch, 50, as previously-described. In addition, an optional auxiliary handle, 92, is attached to the pole, 72, via a knob, 94. The knob, 94, is typically adjustable, such as via an optional wing nut or a finger nut, which allows the user to adjust the angle of the auxiliary handle, 92, to suit the user's preference, height, etc. The auxiliary handle may be either removable from the pole, or may be permanently-attached to the pole. Furthermore, the position of the auxiliary handle on the pole may be either adjustable, or fixed.

Fig. 5 also shows a tool guard, 96, attached to the trimmer head, 84, and in this case is

attached to the housing, 84. The tool guard is intended to protect the user from items such as grass, twigs, rocks, and other debris which may be kicked up by the cutting tool. The tool guard, the housing, and the trimmer head is typically formed of a plastic, a resin, or other material which is easily formed and/or moulded into complex shapes.

Fig. 6 shows a bottom perspective view an embodiment of the housing, 88, having a buckle, 98. The buckle, 98, protrudes from the housing, 88, and helps to secure the tool guard (see Figs. 5, 7 at 96) in place. The housing, 88, further contains a snap-fit closure, 34, which consists of a clip, 100, which protrudes from the housing, and a fixture hole (See Fig. 7 at 38). The housing, 88, also contains an assist boss, 102, which helps to align the tool guard (see Figs. 5, 7 at 96) thereupon.

Fig. 7 shows a bottom perspective view of an embodiment of the tool guard, 96, useful herein. The tool guard, 96, contains a buckle hole, 104, through which the buckle (see Fig. 6 at 98) is inserted. The tool guard further contains a fixture hole, 38, through which the clip (see Fig. 6 at 100) is inserted so as to lock; or securely lock, the tool guard, 96, in place. The tool guard, 96, further contains a rubber block, 106, at the buckle hole, 104, to provide a more secure closure. In an embodiment of the present invention, the rubber block also helps to reduce vibrations and/or noise during use. In the embodiment in Fig. 7, the trimmer head (see Fig. 5 at 84); or the housing (see Fig. 6 at 88) is attached to the tool guard, 96, without any screws or rivets.

Fig. 8 shows a bottom perspective view of an embodiment of the tool guard, 96, and trimmer head, 88, of the present invention. As can be seen, during assembly the buckle, 98, is inserted into the buckle hole, 104, and then the tool guard, 96, is rotated towards the trimmer head, 84, such that the clip, 100, snaps into the fixture hole, 38, to lock the tool guard, 96, into place.

Fig. 9 shows a bottom perspective view of an embodiment of the tool guard, 96, attached to the trimmer head, 88, of the present invention. The buckle, 98 can be seen protruding from the buckle hole, 104, and the clip, 100, can be seen protruding from the fixture hole, 38, and thereby securing the tool guard, 96, in place. In addition, an optional screw, 108, can be seen further securing the tool guard, 96, to the trimmer head, 88. In an embodiment of the present invention, a screw; or two or more screws, is used to attach the tool guard to the trimmer head. In an embodiment of the present invention, the trimmer head is attached to the tool guard with only the snap-fit fastener and a single screw.

In an embodiment herein, the invention includes a method of attaching a tool guard to

a trimming tool by providing a trimming tool having a trimmer head, and providing a tool guard comprising a fixture hole. The trimmer head has a housing, and the housing has a clip. The tool guard is affixed to the housing by inserting the clip into the fixture hole. Together, the clip and the fixture hole form a snap-fit closure.

In an embodiment herein, the invention includes a method of attaching a tool guard to a trimming tool by providing a trimming tool having a trimmer head, and providing a tool guard comprising a clip. The trimmer head has a housing, and the housing has a fixture hole. The tool guard is affixed to the housing by inserting the clip into the fixture hole. Together, the clip and the fixture hole form a snap-fit closure.

In an embodiment of the method herein, the housing further contains a buckle, and the tool guard further contains a buckle hole. The buckle is inserted into the buckle hole, prior to inserting the clip into the fixture hole.

Rotatable Trimmer Head:

An embodiment of the trimming tool herein contains a pole, a trimmer head, and an adjustment mechanism. The pole contains a distal pole end, a handle at the distal pole end, and a proximal pole end opposite the handle and the distal pole end. The pole has a pole axis running the length of the pole. The trimmer head has an electric motor, a cutting tool operatively-connected to the electric motor, and a housing surrounding the electric motor. The adjustment mechanism connects the pole to the trimmer head, and the adjustment mechanism has a releasably-lockable rotational mechanism and a releasably-lockable pivoting mechanism. The releasably-lockable rotational mechanism allows the trimmer head to rotate about the pole axis of the pole, and the releasably-lockable pivoting mechanism allows adjustment of the angle between the trimmer head and the pole.

In an embodiment herein, the pole contains the locking, telescoping tube described herein.

In Fig. 5, the pole has a pole axis, PA, and the cutting tool, 90, defines a cutting plane, CP. The angle, α , is the angle between the pole axis, PA, and the cutting plane, CP. An adjustment mechanism, 110, contains a releasably-lockable rotational mechanism, 112, and a releasably-lockable pivoting mechanism, 114. An adjustment switch, 116, allows the user to unlock the rotational mechanism and/or the pivoting mechanism. Without intending to be limited by theory, it is believed that the adjustment switch herein allows a normal trimming tool to be converted into an edging tool. As one skilled in the art understands, a trimming

tool is used to cut grass, foliage, etc. when the cutting tool is roughly parallel to the ground. In contrast, an edging tool is used to cut grass, foliage, etc. when the cutting tool is roughly perpendicular to the ground, such as around the edge of sidewalks, etc. Thus, it is believed that the present invention allows a single trimming tool to be used for multiple purposes in a safe and reliable manner.

In an embodiment herein, the adjustment switch is locked while the cutting tool is in use, and will not unlock the rotational mechanism or the pivoting mechanism while the cutting tool and/or the electric motor is in use. In an embodiment herein, when the adjustment switch is activated, the cutting tool and/or the electric motor are deactivated.

In an embodiment herein, the adjustment switch, 116, releases the lock of the rotational mechanism, 112, to allow the user to rotate the trimmer head, 84, relative to the pole, 72, around the pole axis, PA.

In an embodiment herein, the adjustment switch, 116, releases the lock of the pivoting mechanism, 114, to allow the trimmer head, 84, to pivot and thereby adjust the angle, alpha, between the pole axis, PA, and the cutting plane, CP.

In an embodiment herein, alpha, is less than about 90 degrees, or less than about 75 degrees; or from about 75 to about 0 degrees; or from about 60 degrees to about 0 degrees; or from about 60 degrees to about 15 degrees; or from about 50 degrees to about 0 degrees; or from about 50 degrees to about 25 degrees, when in trimming mode; i.e., when the cutting tool is intended to be used parallel to the ground. In an embodiment herein, alpha, is about 0 degrees; or the cutting plane is parallel to the pole axis, PA, when the cutting tool is in edging mode; i.e., when the cutting tool is intended to be used perpendicular to the ground. Thus, in an embodiment of the present invention, alpha is from about 75 degrees to 0 degrees; or from about 60 degrees to about 0 degrees; or from about 50 degrees to about 0 degrees total.

Fig. 10 shows a side view of an embodiment of the pivoting mechanism useful herein. The adjustment switch, 116, is a biased switch that locks and unlocks both the rotational mechanism, 112, and the pivoting mechanism, 114 in place. When the adjustment switch, 116, is untouched, it is biased towards the locked position. When the adjustment switch, 116, is displaced in the direction of the arrow, X, then the (internal) lock disengages and the rotational mechanism, 112, is free to rotate about the proximal pole end, 82. At the same time, the pivoting mechanism, 114, is also disengaged/unlocked, and the housing, 88, is free to pivot back and forth. When the adjustment switch, 116, is released, then it automatically returns to its biased position, and both the rotational mechanism, 112, and the pivoting

mechanism, 114, are again safely locked in place.

In an embodiment herein, the adjustment switch unlocks/locks both the rotational mechanism and the pivoting mechanism.

In an embodiment herein, the adjustment switch contains a separate rotational mechanism switch and a pivoting mechanism switch. In such an embodiment, the rotational adjustment switch locks and unlocks the rotational adjustment mechanism and the pivoting mechanism switch locks and unlocks the pivoting mechanism.

Fig. 11 shows a top perspective view of an embodiment of the pivoting mechanism, 114, and the rotational mechanism, 112. As noted above for Fig. 10, when the adjustment switch, 116, is untouched, it is biased towards the locked position. When the adjustment switch, 116, is displaced, for example, by the user's finger, in the direction of the arrow, X, then the (internal) lock disengages and the rotational mechanism, 112, is free to rotate about the proximal pole end, 82, in the direction of the arrow, Y. The exact construction of the (internal) rotational mechanism, adjustment switch, and locking/unlocking of the rotational mechanism is not particularly important, as one skilled in the art understands the multiple manners in which such mechanisms may be constructed. It is understood that the rotational mechanism may have a plurality of fixed positions, or may rotate to any number of positions, as desired.

At the same time, when the adjustment switch, 116, is displaced in the direction of the arrow, X, then the (internal) lock disengages and the pivoting mechanism, 114, is also disengaged/unlocked, and the housing, 88, with the attached tool guard, 96, is free to pivot back and forth in the direction of the arrow, Z. This pivoting motion back and forth along the arrow, Z, increases or decreases the angle, α , seen in Fig. 5. In this embodiment, when the adjustment switch, 116, is released, then it automatically returns to its biased position, and both the rotational mechanism, 112, and the pivoting mechanism, 114, are again safely locked in place. The exact construction of the (internal) pivoting mechanism, adjustment switch, and locking/unlocking of the pivoting mechanism is not particularly important, as one skilled in the art understands the multiple manners in which such mechanisms may be constructed. It is understood that the pivoting mechanism may have a plurality of fixed positions, or may pivot to any number of positions, as desired.

In an embodiment herein, the electric motor is engageable only when both the releasably-lockable rotational mechanism and the releasably-lockable pivoting mechanism are locked in place. Such a feature may be either a physical or electrical/software control

feature and is intended to prevent accidents and to improve the safety of the trimming tool during use. Such a feature may be provided via various mechanical, electrical and/or software designs as known in the art.

In an embodiment herein, the lockable, telescoping tube herein is combined with the tool guard having a snap-fit fastener herein.

In an embodiment herein, the lockable, telescoping tube herein is combined with the adjustment mechanism herein.

In an embodiment herein, the snap-fit fastener herein is combined with the adjustment mechanism herein.

In an embodiment herein, the lockable, telescoping tube herein is combined with the tool guard having a snap-fit fastener herein and the adjustment mechanism herein.

Separately, it is understood that the methods of attaching a tool guard to a trimming tool herein may be combined with any of the embodiments herein, without limitation.

It should be understood that the above only illustrates and describes examples whereby the present invention may be carried out, and that modifications and/or alterations may be made thereto without departing from the spirit of the invention.

It should also be understood that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable subcombination.

CLAIMS

1. A lockable, telescoping tube comprising:
 - A. an outer tube comprising a proximal outer tube end and a distal outer tube end opposite the proximal outer tube end;
 - B. an inner tube comprising a proximal inner tube end and a distal inner tube end opposite the proximal inner tube end, wherein the proximal inner tube end is slidably-inserted into the proximal outer tube end;
 - C. a lower coupler external to the proximal outer tube end;
 - D. a shaft shield affixed to the proximal inner tube end via a snap-fit closure, wherein the shaft shield is slidably-inserted into both the proximal outer tube end and the lower coupler;
 - E. an upper coupler external to the inner tube, wherein the shaft shield is physically blocked from passing into the upper coupler, wherein the upper coupler is affixed to the lower coupler via a snap-fit closure, and wherein the upper coupler is affixed to the proximal outer tube end via a snap-fit closure;
 - F. a pivot axis connecting the upper coupler and the lower coupler;
 - G. a friction block protruding from the upper coupler and/or the lower coupler, wherein the friction block is releasably-pressable against the inner tube; and
 - H. a pressure latch at least partially enclosing the pivot axis, wherein when the pressure latch is closed the pressure latch physically presses the friction block against the inner tube so as to restrict movement of the inner tube, and wherein when the pressure latch is open the friction block releases pressure from the inner tube thereby allowing the inner tube to slidably-move.
2. The lockable, telescoping tube according to Claim 1, wherein the friction block comprises rubber.
3. The lockable, telescoping tube according to any preceding claim, wherein the pressure latch comprises plastic.
4. The lockable, telescoping tube according to any preceding claim, wherein the pressure latch comprises a protrusion, wherein the protrusion contacts the friction block when

- the pressure lock is closed, and wherein the protrusion does not contact the friction block when the pressure lock is open.
5. The lockable, telescoping tube according to any preceding claim, wherein the pressure latch comprises a latch hole, and wherein the pivot axis extends through the latch hole.
 6. The lockable, telescoping tube according to Claim 4, wherein the protrusion presses the friction block when the pressure lock is closed.
 7. A trimming tool comprising the locking, telescoping tube according to any preceding claim.
 8. The trimming tool according to Claim 7, wherein the trimming tool is a line trimmer.
 9. A trimming tool comprising:
 - A. a pole comprising:
 - i. a distal pole end comprising a handle; and
 - ii. a proximal pole end opposite the handle;
 - B. a trimmer head comprising:
 - i. an electric motor;
 - ii. a cutting tool operatively-connected to the electric motor; and
 - iii. a housing surrounding the electric motor,wherein the trimmer head is attached to the proximal pole end; and
 - C. a tool guard comprising a snap-fit fastener,
wherein the tool guard is attached to the trimmer head via the snap-fit fastener.
 10. The trimming tool according to Claim 9, wherein the cutting tool is a line.
 11. The trimming tool according to any one of Claims 9-10, wherein the line is selected from the group consisting of a plastic line, a nylon line, a metal wire, and a combination thereof.
 12. The trimming tool according to any one of Claims 9-11, wherein the trimmer head is attached to the tool guard without any screws or rivets.
 13. The trimming tool according to any one of Claims 9-12, wherein the trimmer head is attached to the tool guard with only the snap-fit fastener and a single screw.
 14. The trimming tool according to any one of Claims 9-13, wherein the housing further comprises a buckle, wherein the tool guard comprises a buckle hole, wherein the

- buckle is inserted into the buckle hole, and wherein the housing is attached to the tool guard via the snap fit fastener and the buckle.
15. The trimming tool according to Claim 14, wherein the buckle hole further comprises a rubber block.
 16. The trimming tool according to any one of Claims 9-15, wherein the trimmer head further comprises an assist boss to help align the tool guard.
 17. A trimming tool according to any one of Claims 9-16, further comprising the locking, telescoping tube according to any of Claims 1-6.
 18. A method of attaching a tool guard to a trimming tool comprising the steps of:
 - A. providing a trimming tool comprising a trimmer head, the trimmer head having a housing, wherein the housing comprises a clip;
 - B. providing a tool guard comprising a fixture hole; and
 - C. affixing the tool guard to the housing by inserting the clip into the fixture hole.
 19. A trimming tool comprising:
 - A. a pole comprising:
 - i. a distal pole end;
 - ii. a handle at the distal pole end; and
 - iii. a proximal pole end opposite the handle,wherein the pole has a pole axis running the length of the pole;
 - B. a trimmer head comprising:
 - i. an electric motor;
 - ii. a cutting tool operatively-connected to the electric motor; and
 - iii. a housing surrounding the electric motor; and
 - C. an adjustment mechanism connecting the pole to the trimmer head, the adjustment mechanism comprising:
 - i. a releasably-lockable rotational mechanism; and
 - ii. a releasably-lockable pivoting mechanism,wherein the releasably-lockable rotational mechanism allows the trimmer head to rotate about the pole axis of the pole, and wherein the releasably-lockable

pivoting mechanism allows adjustment of the angle between the trimmer head and the pole.

20. The trimming tool according to Claim 19, wherein the releasably-lockable rotational mechanism allows the trimmer head to rotate to a plurality of fixed positions.
21. The trimming tool according to any one of Claims 19-20, wherein the plurality of fixed positions comprises a fixed position at about 0 degrees and a fixed position at about 180 degrees around the pole axis from the original position.
22. The trimming tool according to any one of Claims 19-21, wherein the releasably-lockable pivoting mechanism allows the angle between the trimmer head and the pole to be adjusted to from about 75 degrees to about 0 degrees.
23. the trimming tool according to Claim 22, wherein the releasably-lockable pivoting mechanism allows the angle between the trimmer head and the pole to be adjusted to from about 60 degrees to about 0 degrees.
24. The trimming tool according to any one of Claims 19-23, wherein the releasably-lockable rotational mechanism comprises a locking mechanism.
25. The trimming tool according to any one of Claims 19-24, wherein the releasable-lockable pivoting mechanism comprises a locking mechanism.
26. The trimming tool according to any one of Claims 19-25, further comprising the locking, telescoping tube according to any one of Claims 1-6.
27. The trimming tool according to any one of Claims 19-26, further comprising a tool guard, wherein the tool guard is attached to the trimmer head via the snap-fit fastener.
28. The trimming tool according to Claim 26, further comprising a tool guard comprising a snap-fit fastener, wherein the tool guard attached to the housing via a snap-fit fastener.
29. The trimming tool according to any one of Claims 19-28, wherein the electric motor is engageable only when the releasably-lockable rotational mechanism is locked and the releasably-lockable pivoting mechanism is locked.

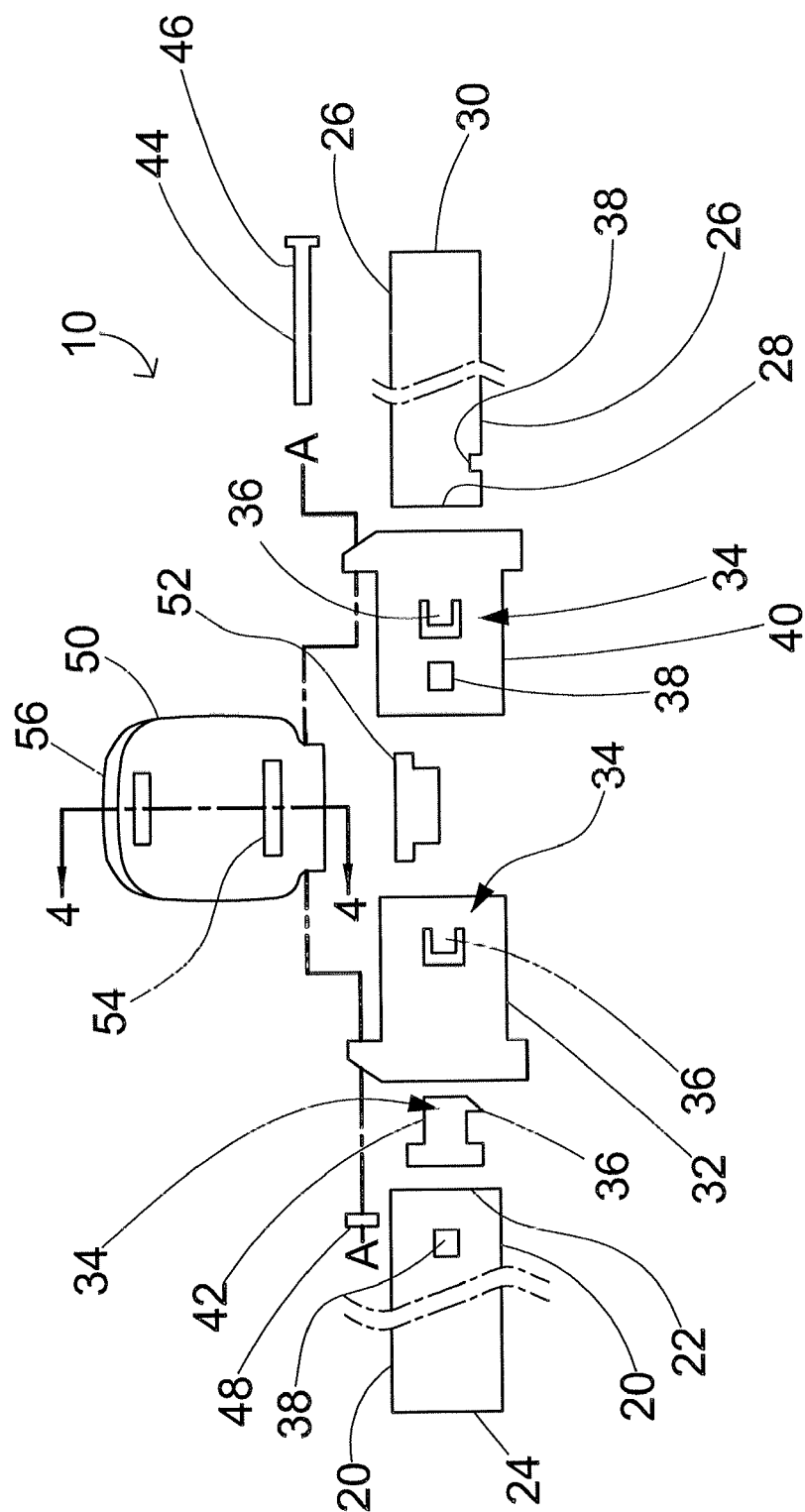
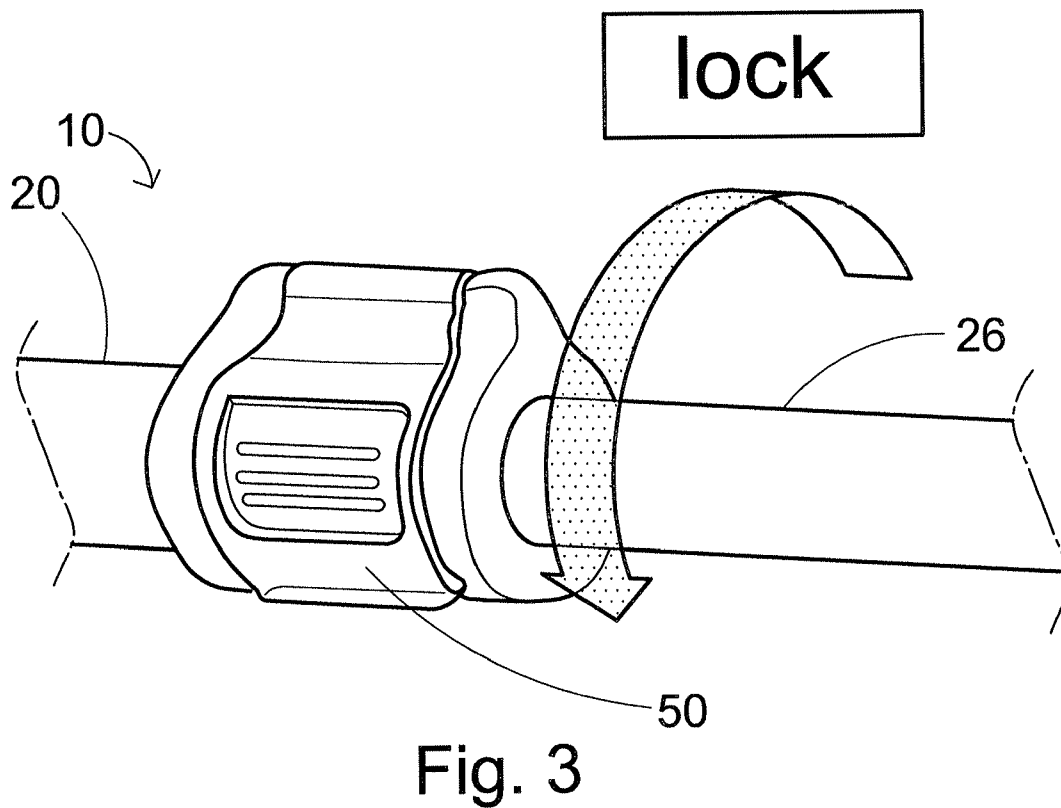
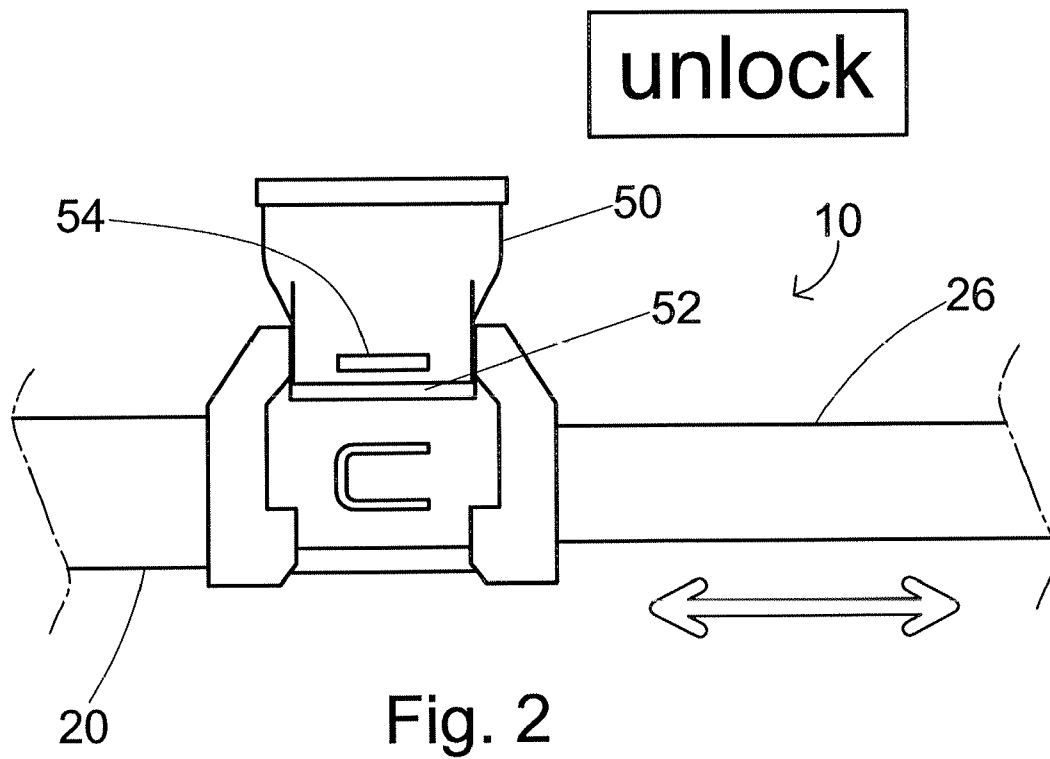


Fig. 1



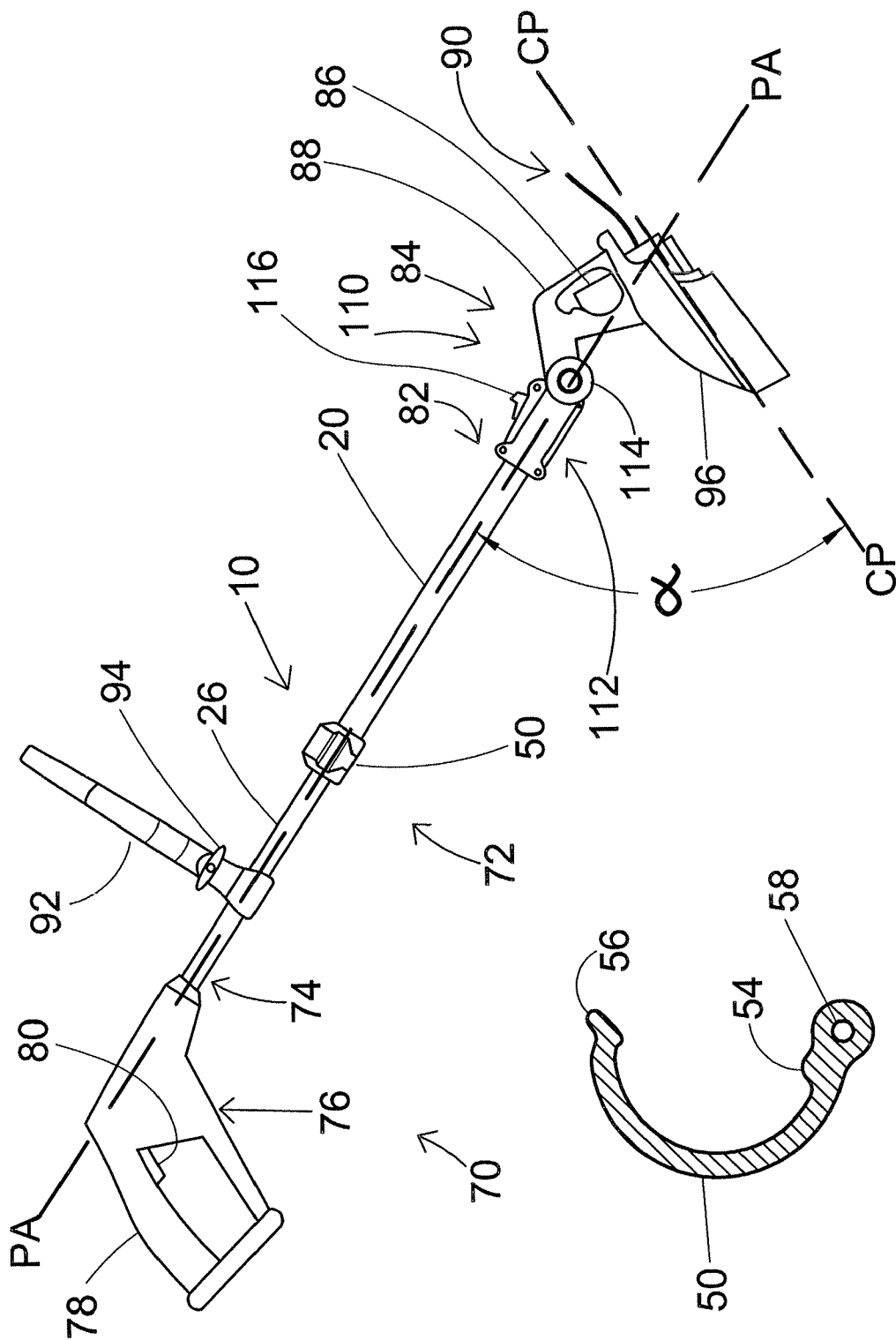


Fig. 5

Fig. 4

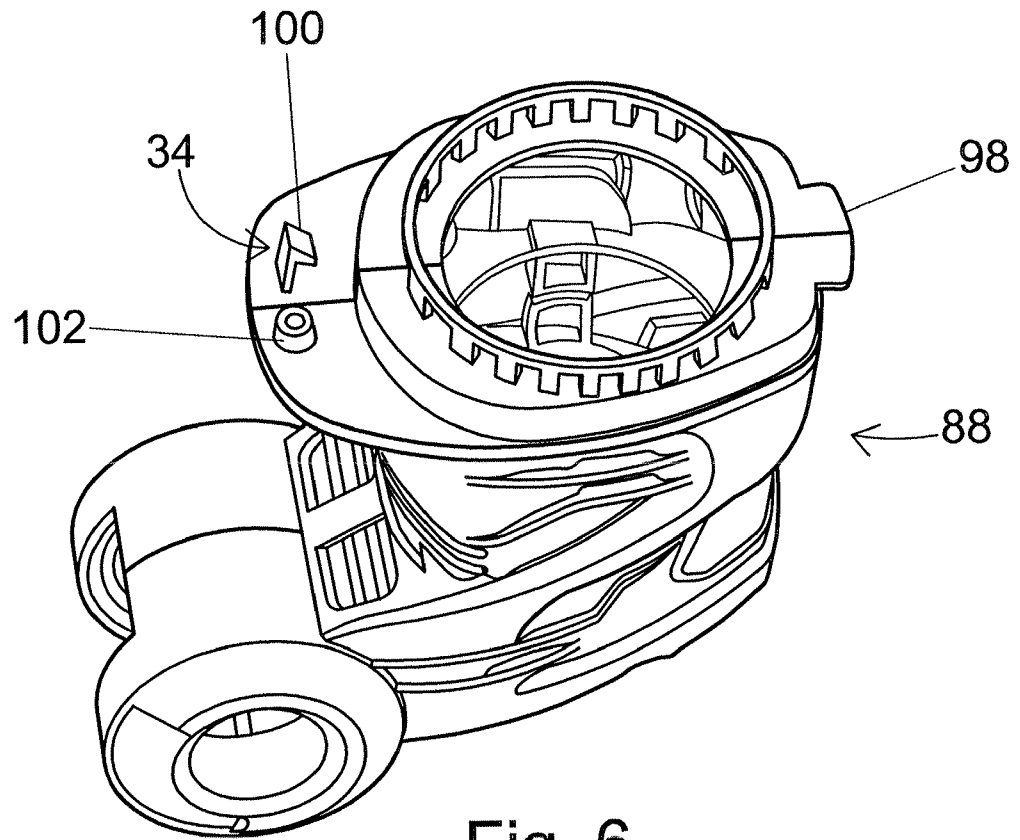


Fig. 6

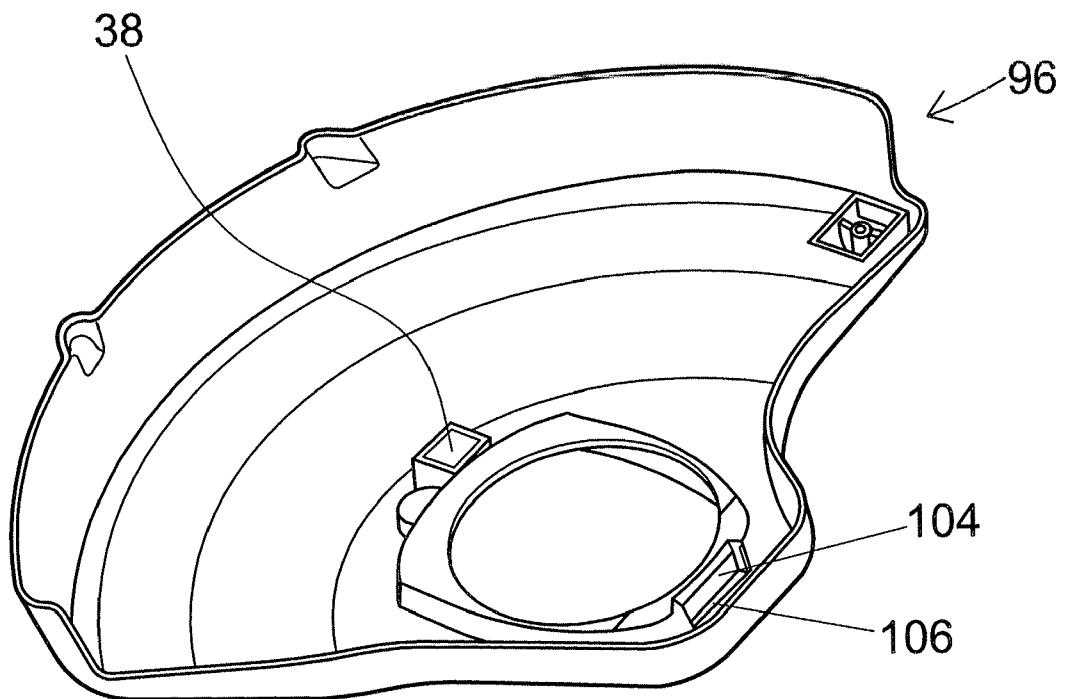


Fig. 7

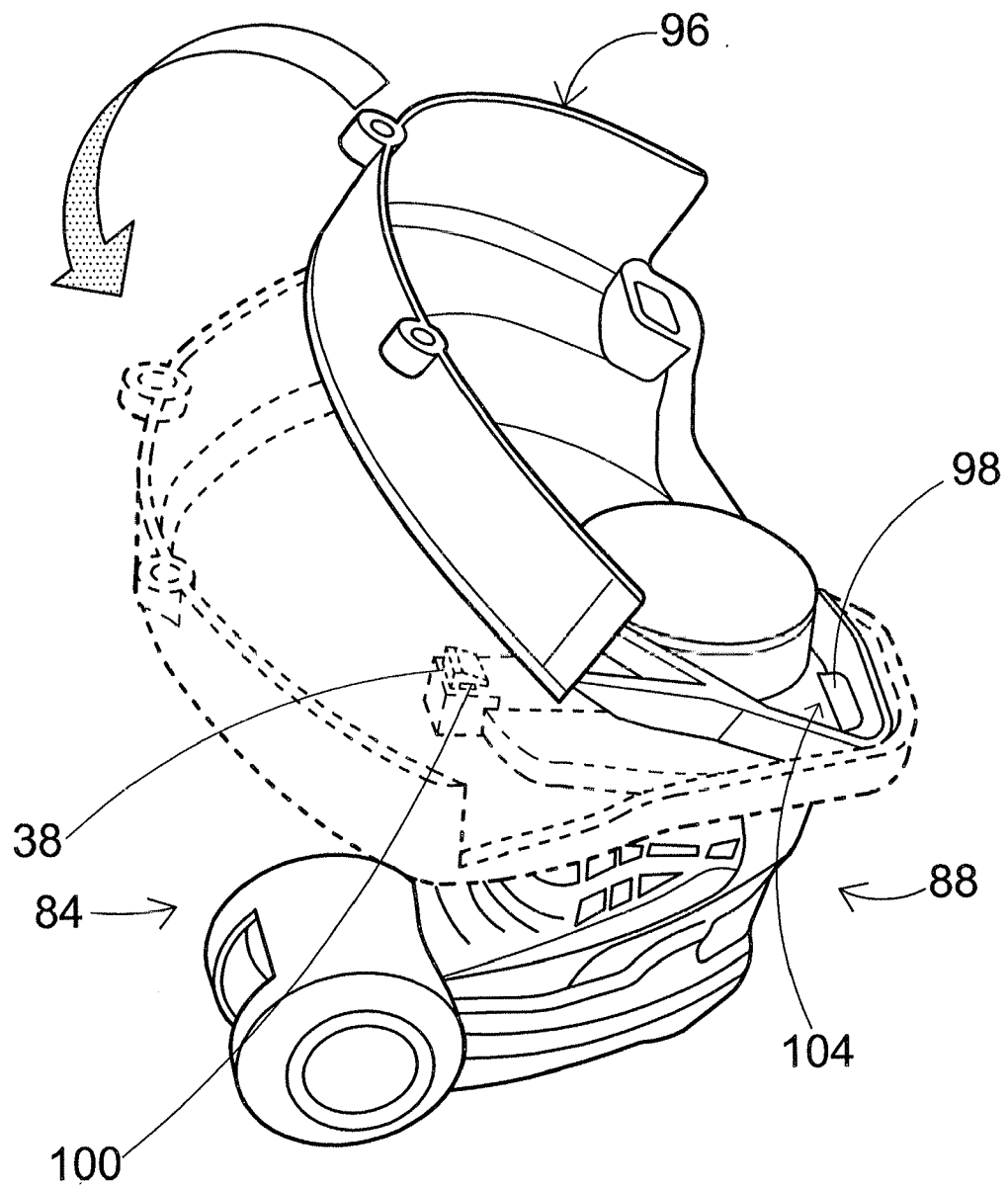


Fig. 8

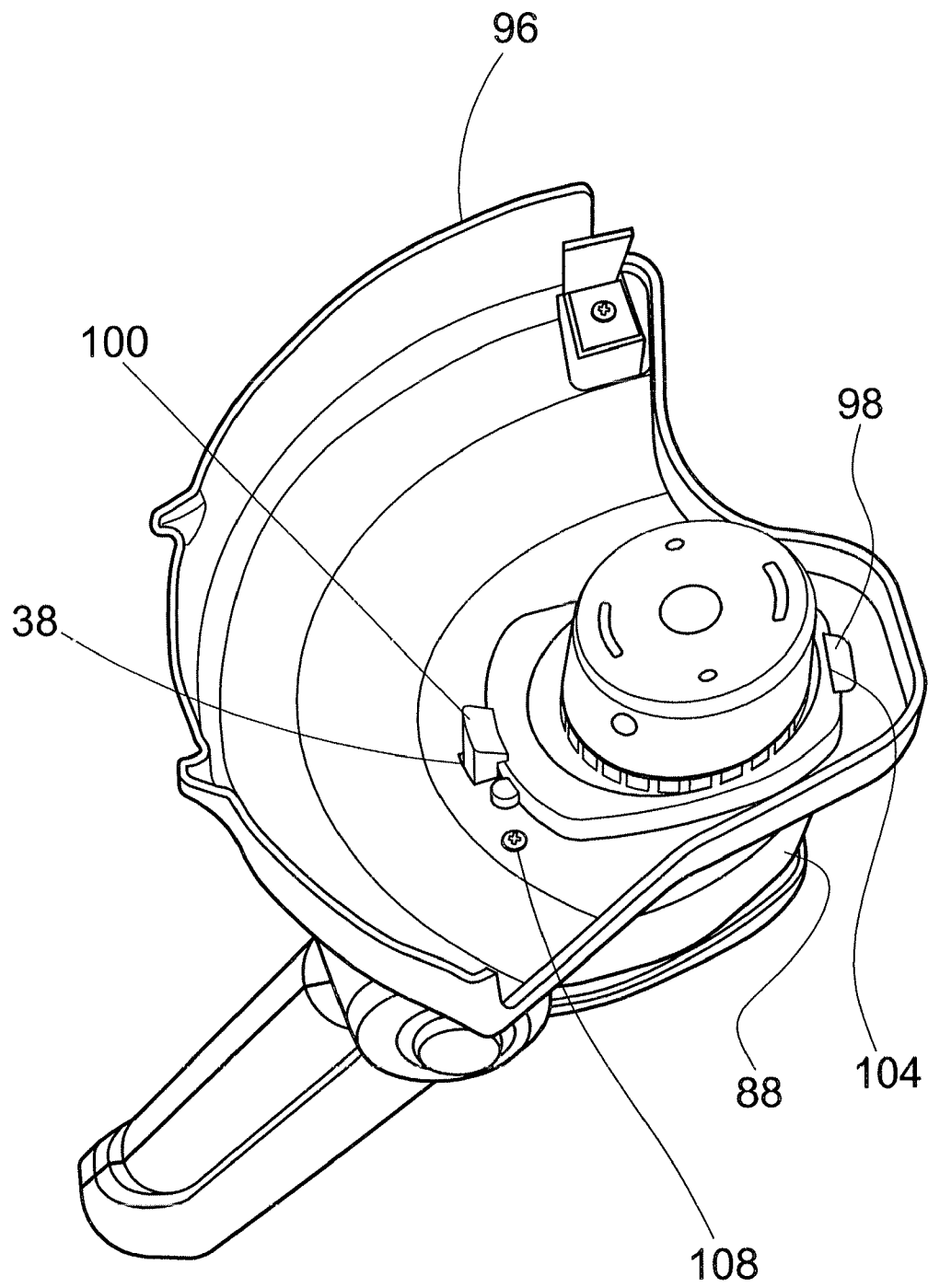
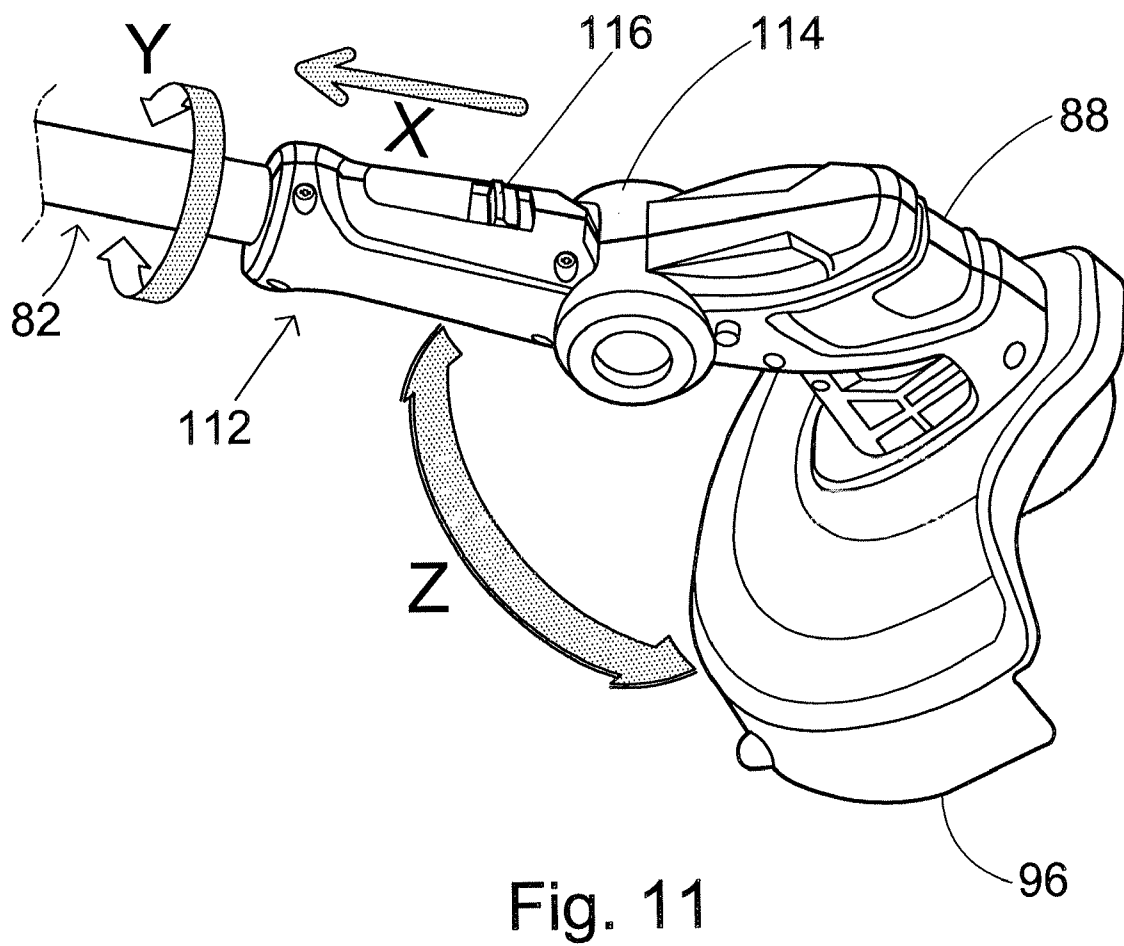
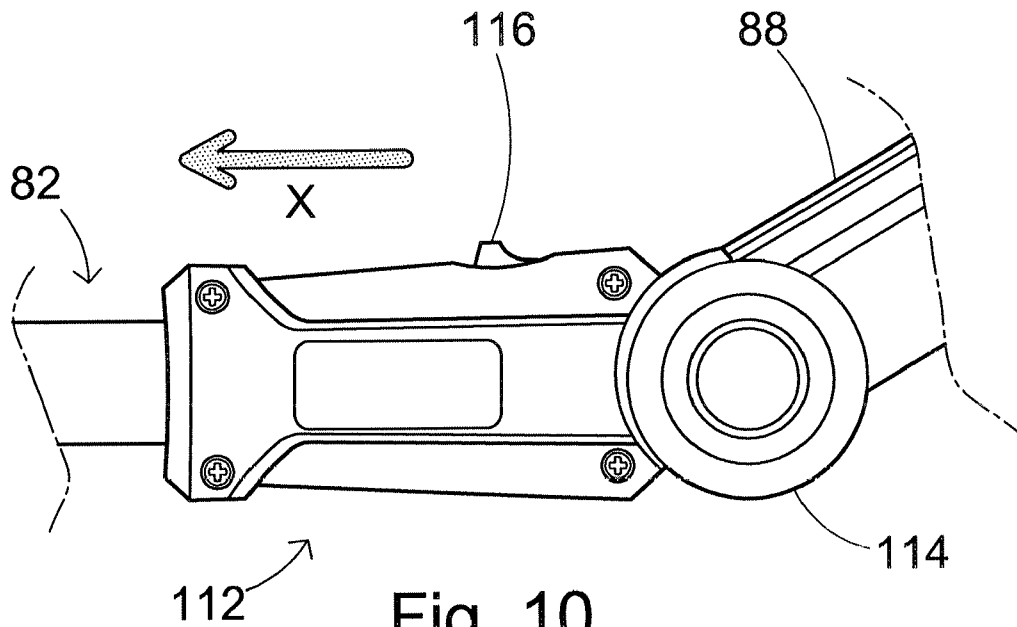


Fig. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2016/102197

A. CLASSIFICATION OF SUBJECT MATTER

A01D 34/412(2006.01)i; F16B 7/14(2006.01)i; A01D 34/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01D, F16B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, EPODOC, WPI, CNKI: trim+, cut+, lock+, telescop+, extension, tube, pole, rod, inner, outer, pivot, rotat+, couple+, slid+, snap, fit, friction, latch, hole, buckle, release, guard, housing, adjust+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 204860062 U (SHANGPENG SPORT EQUIPMENT CO., LTD.) 16 December 2015 (2015-12-16) paragraphs 21-29, figures 1-3	9-16, 18
A	CN 204860062 U (SHANGPENG SPORT EQUIPMENT CO., LTD.) 16 December 2015 (2015-12-16) paragraphs 27, 28, figure 1	1-8, 17
X	GB 2026928 A (WOLF GERAETE G.M.B.H.) 13 February 1980 (1980-02-13) page 1 lines 48-page 2 lines 67, figures 1-4	19-25, 27, 29
A	CN 104798526 A (SUZHOU BAOSHIDE ELECTRIC TOOL CO., LTD.) 29 July 2015 (2015-07-29) the whole document	1-29
A	EP 2281430 B1 (TECHTRONIC OUTDOOR PRODUCTS TECHNOLOGY LIMITED) 21 March 2012 (2012-03-21) the whole document	1-29



Further documents are listed in the continuation of Box C.



See patent family annex.

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“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

09 June 2017

Date of mailing of the international search report

27 June 2017

Name and mailing address of the ISA/CN

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Telephone No. (86-10)010-62413863

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2016/102197**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Information on patent family members

International application No.

PCT/CN2016/102197

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				WO	2015044012	A1	02 April 2015
				KR	20160061987	A	01 June 2016
CN	202285568	U	04 July 2012	None			