

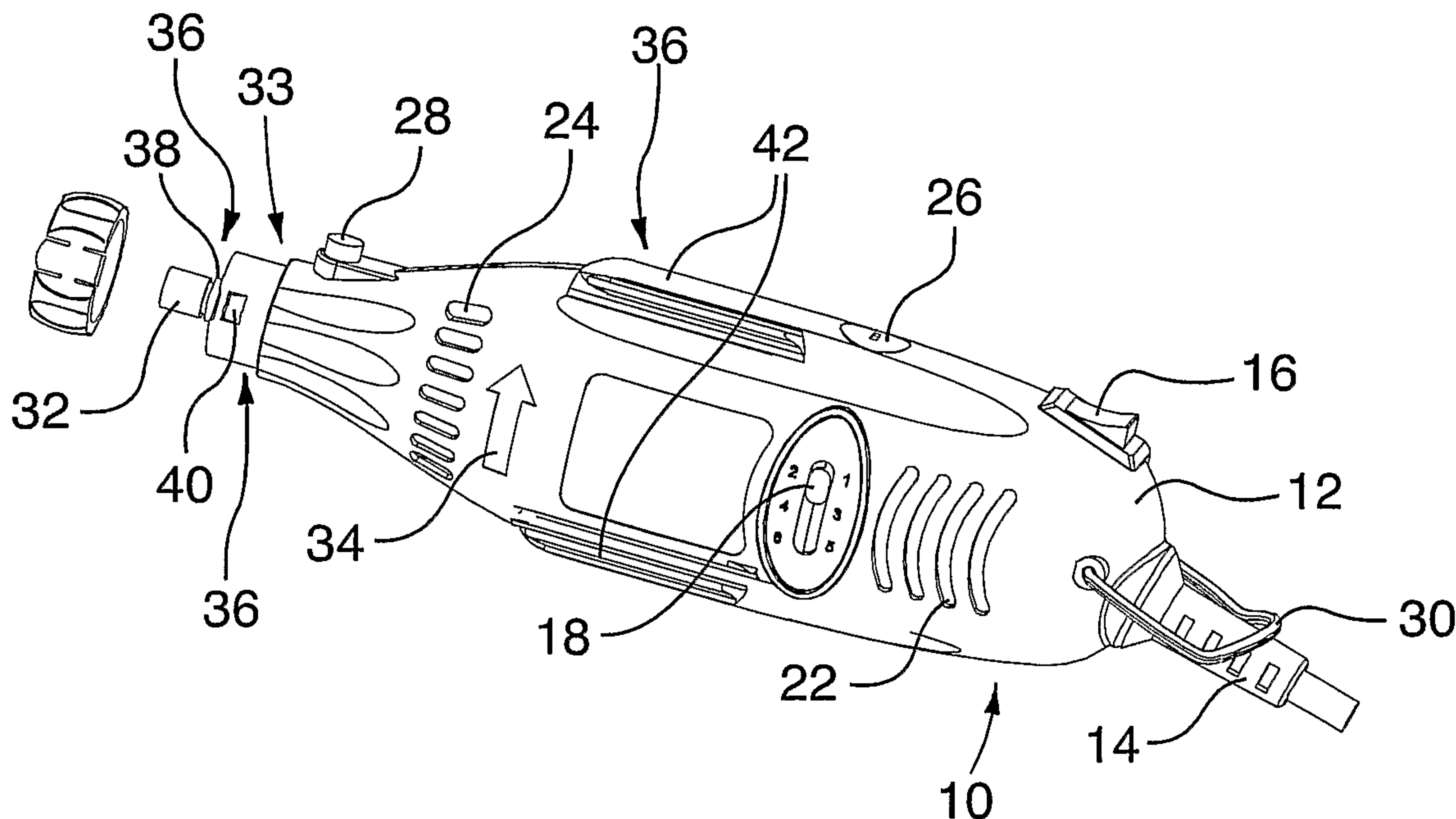


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(54) Title: ROTARY TOOL WITH IMPROVED CONNECTING MEANS FOR ATTACHMENTS THERETO



(57) Abrégé/Abstract:

The present invention is directed at a handheld power tool comprising means for receiving a tool accessory; means for rotating said tool accessory; and at least one quick connect means for use with power tool attachments.

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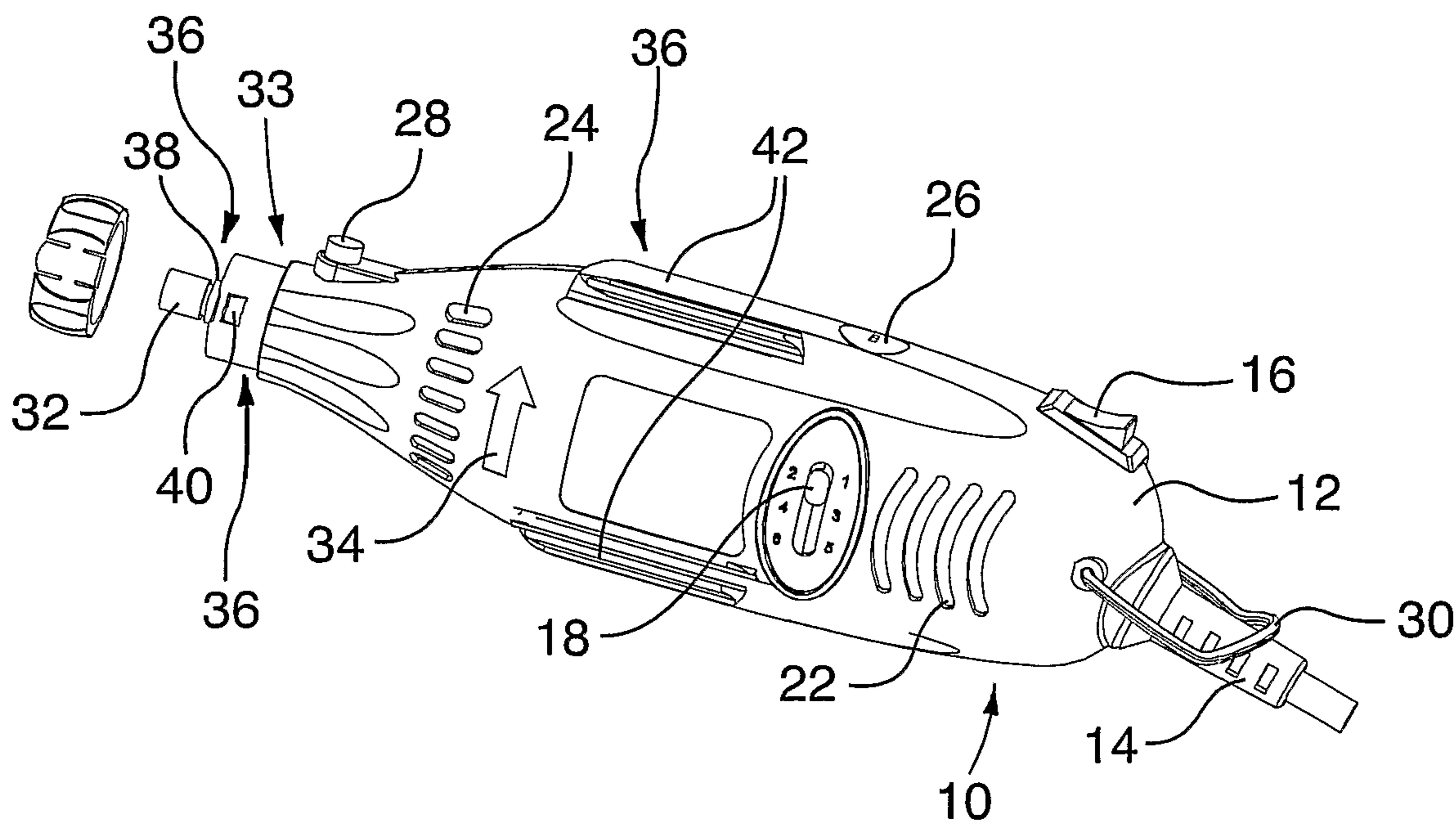
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(54) Title: ROTARY TOOL WITH IMPROVED CONNECTING MEANS FOR ATTACHMENTS THERETO



(57) Abstract: The present invention is directed at a handheld power tool comprising means for receiving a tool accessory; means for rotating said tool accessory; and at least one quick connect means for use with power tool attachments.

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ROTARY TOOL WITH IMPROVED CONNECTING MEANS FOR ATTACHMENTS THERETO

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 60/552,734 filed March 15, 2003, which is incorporated herein by reference.

TECHNICAL FIELD

The present invention relates generally to electric powered rotary tools. More particularly, the present invention relates to a hand held power tool with a rotational motor having quick connect means.

BACKGROUND ART

It can be appreciated that rotary tools have been used for many years. Rotary tools are generally used with accessories and attachments. Each can be sold separately or combined as a set in various combinations. While accessories are used for rotary tool applications such as cutting, grinding, polishing, routing trimming among others, the attachments are used to assist the user for specific tasks. A common example of this is a cutting guide attachment that is installed onto the rotary tool for use with a cutting accessory to guide the cutting path of the rotary tool in a controlled manner relative to a work-piece. Other attachments available include work lights, tool and blade sharpeners, a grout removal guide, holders, flexible shaft extensions, routing attachments, drilling attachments and shaper tables.

Connection means for receiving the attachments typically comprise of two methods. One method is to have a threaded portion at a spindle end of the tool housing. The attachment is then screwed onto this portion and secured for use. When the attachment is not connected, a housing nut is placed over the threads to protect them. A second method of connection between the attachment and the rotary tool is with circumferential clamps surrounding the tool housing which are securely tightened with thumb or machine screws. Circumferential clamps are often integrated with the attachment.

Connection means for the accessory typically comprise a clamping head or a chuck on the shaft of the accessory. The chuck comprises a split collar and tightening nut whereby the tightening nut screws onto a threaded portion of the spindle. One end of

the spindle end is affixed to the tool motor and the other end collaborates with the chuck to secure the accessory from rotation relative to the spindle when tightened in order to lock and prepare for use. In order for the clamping mechanism to work effectively, the spindle thread is required to be a high threads-per-inch count thereby requiring many rotations to loosen and tighten the nut over a given axial distance with an even more significant amount of rotation to remove the nut altogether. This is obviously quite time consuming.

Each exchange, removal or addition of any attachment or accessory involves a process of shutting off the tool, waiting for the tool to fully stop, loosening the attachment securing mechanism, removing the accessory or attachment, exchanging the attachment, and repeating the process in reverse to re-secure the attachment or a new attachment. In some cases where the accessory is larger than the inner diameter of the housing nut, this process needs to be performed for both the chuck and the housing nut in sequence to complete the installation which requires more time. When considering the multitude of accessories combined with the multitude of attachments, a significant disadvantage of the known art is recognized. More specifically, the exchange of accessories or attachments is very time consuming and cumbersome which may frustrate the user and deter them from making the best use of their rotary tool. The time required to connect the chuck to the spindle, any attachment to the threaded portion of the tool housing and any attachment of clamps to the tool housing prolongs the time in which a user may finish the job.

Aside from the foregoing there are several other disadvantages of the connection means in the known art, not the least of which is the threaded connection. While this method of attachment is a widely accepted practice for connecting an attachment to a rotary tool, its application in high RPM rotary tools causes loosening and tightening over time. In the example of the tightening nut on the spindle, a common problem is that over time the nut tightens resulting in the need to use a wrench to loosen the clamp prior to exchanging accessories and attachments. The threaded connection can also cause an adverse effect and loosen the connection resulting in loss of functionality of the attachments or accessories and even worse, unsafe tool operation.

Threaded connections cause the user to be uncertain as to how much torque on the connection is required for proper installation. Again, if the threaded connection is too loose, operation of the rotary tool and safe operation is jeopardized and conversely if the connection is too tight, undue strain or even fracture of the components adjacent to the connection may be experienced. Many product components are manufactured with thermoplastic and therefore cannot withstand such forces, causing irreparable damage.

This problem may relate to either connection means for the attachments to the rotary tool housing or with any connect means which include a threaded portion. If the fracture is undetected, this leads to even a greater risk of harm to the operator.

Yet another disadvantage of the threaded connection is its difficulty to obtain axial and radial location referencing or predicted axial and radial displacement. Common, cost effective thread manufacturing methods generally do not provide reliable axial location of attachments with respect to the accessory and the work-piece. Several applications of a rotary tool may benefit from consistent and reliable location positioning.

Another problem with conventional rotary tools is it offers limited storage options after or during use. Most rotary tools are provided with a wire hanger and a storage box but storage capability is limited to such and does not offer the capability for customized storage options. Providing the capability for the tool to be stored on a workbench, on a stand, on your belt, on the wall, in a portable workstation among other areas would improve storage options for the user.

Rotary tools currently on the market have been designed for indoor use or in environments with controlled conditions. Provisions have not been provided to use the tool in applications for outdoor, uncontrolled or otherwise harsher environments.

Traditionally, rotary tools have also been designed to be substantially cylindrical. This shape is not conducive to providing the user with ergonomic comfort, a variety of gripping options, a tool that does not roll off the workbench, adaptability to various applications among others.

Use of the rotary tool is also more prominent in do-it yourself applications rather than industrial applications. It would be obvious that with all the inherent disadvantages of the known art there are several limiting factors that would prevent more standard use of this tool in industrial applications. Contractors, professionals, small business owners rely on tools that are designed to improve efficiencies of use because their profitability relies on this.

It is, therefore, desirable to provide a rotary tool having quick connect means which overcomes the disadvantages of the prior art.

DISCLOSURE OF THE INVENTION

It is an object of the present invention to obviate or mitigate at least one disadvantage of prior art handheld power tools. The present invention is directed at a handheld power tool with quick connect means which provides better functionality for several uses.

Thus in the invention, the handheld power tool provides means for quick connect and removal of attachments in order to reduce the amount of time required to finish a job. The quick connect means also allow for improved flexibility in handheld power tool applications and/or improved user safety and comfort and universality for general or specific application design and use.

The present invention generally comprises universal connecting means for attaching an attachment to the handheld power tool. The quick connect means may be located at the spindle, the end of the handheld power tool, a power end of the handheld power tool, the housing surface of the handheld power tool or a combination thereof. The invention even further comprising of auto-locking and quick releasing securing means to the quick connect means.

A first aspect of the present invention is to provide a handheld power tool with quick connect means that will overcome the shortcomings of the prior art devices.

Another aspect of the present invention is to provide a handheld power tool having quick connect means that is universal in construction such that the handheld power tool housing can be created with at least one mating portion of a connection and multiple attachments are constructed with the opposing mating portion.

Another aspect of the invention provides a handheld power tool having quick connect means on the larger diametrical portion of the tool housing and/or the spindle end of the tool housing so as to create a connectivity for smaller attachments at the spindle end, connectivity for larger attachment around the larger portion of the housing and multiple connectivity for other attachments that would benefit from the added strength and stability of multiple connections.

In another aspect of the invention, there is provided a handheld power tool having quick connect means such that the connection and disconnection is quick and simple so as to facilitate efficient exchange of attachments.

In a further aspect, there is provided a handheld power tool having quick connect means such that when the attachment is installed (or connected), the attachment may be easily secured. It is a further aspect to provide an optional auto-locking and quick release feature in the attachments for such securing means.

Another aspect of the invention is to provide a handheld power tool having quick connect means on the distal end of the spindle so as to facilitate quick removal and installation of the accessory chuck.

Another aspect of the invention provides a handheld power tool having quick connect means for receiving various attachments that assist to improve the connectivity of attachments for various handheld power tool applications and to create new

attachments that otherwise may have been technically and cost prohibitive with the conventional quick connect means.

In one aspect of the present invention, there is provided a harness for providing quick connect means to a handheld power tool having a rotational motor comprising: a first holder portion for attachment to one end of the handheld power tool; a second holder portion for attachment to a second end of the handheld power tool; means for securing the first and the second holder portion to the handheld power tool; an attachment portion connecting the first holder portion to the second portion; and wherein the attachment portion further comprises quick connect means for receiving a handheld power tool attachment.

In another aspect, there is provided a handheld power tool attachment comprising at least one mating means for mating with quick connect means on a handheld power tool with a rotational motor.

In yet a further aspect, there is provided handheld power tool comprising means for receiving a tool accessory; means for rotating the tool accessory; and at least one quick connect means for use with handheld power tool attachments.

Other objects and advantages of the present invention will become obvious to the reader and it is intended that these aspects and advantages are within the scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Various other objects, features and attendant advantages of the present invention will become fully appreciated as the same becomes better understood when considered in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the several views, and wherein;

Figure 1 is a perspective view of a rotary tool having quick connect means;

Figure 2 is a perspective view of the rotary tool of Figure 1 along with attachments for connecting with the quick connect means;

Figure 3 is an exploded view of the rotary tool of Figure 1 of an attachment and one of the quick connect means;

Figure 4 is an exploded view of the rotary tool of Figure 1 of an attachment and another one of the quick connect means;

Figure 5 is an exploded view of the of the rotary tool of Figure 1 of an attachment and another one of the quick connect means;

Figure 5a is a perspective view of one embodiment of the quick connect means;

Figure 6 is a perspective view of a rotary tool having quick connect means being mounted to a base attachment;

Figure 7 is a perspective view of another embodiment of a rotary tool having quick connect means and an attachment for connecting with the quick connect means;

Figure 8 is a perspective view of yet another embodiment of a rotary tool having quick connect means and an attachment for connecting with the quick connect means;

Figure 9 is a perspective view of a rotary tool having quick connect means mounted to a portable workstation;

Figure 10 is a perspective view of a rotary tool having quick connect means with an attachment connected to the quick connect means;

Figure 11 is a perspective view of a rotary tool having quick connect means with another embodiment of an attachment connected to the quick connect means;

Figure 12 is a perspective view of a rotary tool having quick connect means with another embodiment of a rotary tool attachment connected to the quick connect means;

Figure 13 is a perspective view of a rotary tool having quick connect means with two attachments connected to the quick connect means;

Figure 14 is a perspective view of a rotary tool having quick connect means with a single attachment connected to multiple quick connect means;

Figure 15 is a side view of a rotary tool having quick connect means with an attachment, shown in section, connect to the quick connect means;

Figure 16 is a perspective view of a rotary tool having quick connect means attached to a router table attachment;

Figure 17 is a section view along line 17-17 of Figure 16;

Figure 18 is a perspective view of a rotary tool having quick connect means with another rotary tool attachment connected to the quick connect means;

Figure 19 is a perspective view of a harness having quick connect means for mounting to a known rotary tool to provide a rotary tool having quick connect means;

Figure 20 is a perspective of a rotary tool having quick connect means connected to a flex shaft having quick connect means;

Figure 21 is a perspective view of a rotary tool having quick connect means mounted to a portable workstation attachment;

Figure 22 is a perspective view of a rotary tool having quick connect means mounted to the outside of a portable workstation;

Figure 23 is a perspective view of a rotary tool having quick connect means and a power cord attachment for connecting with the quick connect means;

Figure 24 is a perspective view of the rear of the rotary tool of Figure 23;

Figure 25 is a perspective view of a rotary tool having quick connect means and a battery pack attachment for connecting with the quick connect means; and

Figure 26 is a perspective view of the attachment in Figure 25 connected to the quick connect means.

BEST MODE FOR CARRYING OUT THE INVENTION

Turning to Figure 1, a hand held power tool with a rotational motor, or rotary tool, having a plurality of quick connect means is shown. It will be understood that the rotational motor may turn in a single direction or may be bi-directional such as in a drill (which may also be considered a rotary tool). Although the following detailed description is directed at rotary tools, it will be understood that handheld power tools having bi-directional rotational motors, for example, a drill, may also include the described quick connect means. The rotary tool **10** comprises a housing **12** which houses a motor (not shown) and a power cord **14** having a first end connected to the motor and a second end protruding from the housing **12** of the rotary tool **10**. Although not shown, the second end of the power cord **14**, preferably includes means for connecting the power cord **14** to a power source in order to provide power to the rotary tool **10**. Operation of the rotary tool **10** is controlled by a power switch **16** while the rotational speed of the tool is preferably controlled by a speed adjustment button **18**, both of which are in electrical communication with the motor. Although shown in this embodiment as being separate controls, it will be understood that the power switch **16** and speed adjustment button **18** may be provided in a single control.

The rotary tool **10** further comprises an intake air vent **22** which is used to draw atmospheric air into the housing **12** in order to cool the motor and an exhaust air vent **24** which is used to release heated air that is produced by the motor while the rotary tool is being used. In the present embodiment, the rotary tool also includes a motor brush access **26**, a shaft lock button **28** and a tool hanger **30**, all of which will be known to one skilled in the art.

A spindle end shaft **32** is located at a tool end **33** of the rotary tool **10** and is directly attached to or manufactured integral with the motor in the housing **12** such that when the motor is in operation, the motor causes the spindle end shaft **32** to rotate and provide the necessary rotational movement for the rotary tool to operate. Since the rotation of the rotary tools is typically uni-directional, the housing **12** may include an arrow **34** to indicate the direction of rotation of the tool with respect to the housing **12**. It will be understood that if the rotary tool was a drill, the arrow could have two ends or the arrow could be removed from the housing **12**.

As disclosed above, the rotary tool **10** also includes a plurality of quick connect means **36** such as a spindle end quick connect means **38**, a tool housing end quick connect means **40** and a housing surface quick connect means **42**. Although the housing surface quick connect means **42** are shown at the top and bottom of the rotary tool **10**, it will be understood that there are many possible locations for these quick connect means **42**. Furthermore, it will be understood that there may be any combination of the described quick connect means **36** rather than each rotary tool comprising all of the different quick connect means **36**. The quick connect means **36** of the present invention are preferably universal in nature so as to facilitate the connection of the rotary tool with a multitude of attachments.

Turning to Figure 2, the rotary tool is shown with some example attachments. As described above, the rotary tool **10** includes quick connect means **36** for receiving, or connecting to, attachments which preferably enhance the functionality of the rotary tool **10**. In Figure 2, an accessory chuck attachment **44** is shown which may be mounted, or connected to, the spindle end quick connect means **38**, a cutting guide attachment **46** which may be mounted, or connected to, the tool housing end quick connect means **40** and a handle **48** which may be mounted, or connected to, one of the tool housing surface quick connect means **42**. More detail relating to the connection of the attachments with the quick connect means **36** will be described below.

Turning to Figure 3, a schematic diagram of one embodiment of the quick connect means is shown. The accessory chuck attachment **44** is preferably mounted, or connected to, the spindle end quick connect means **38** at one end and accepts an accessory, such as tool accessory **50**, at a second end.

In the embodiment shown in Figure 3, the accessory chuck attachment **44** comprises mating means, seen as a mating section, **52**, a sleeve **53** and a hole **54** bored through a body **55** of the accessory chuck attachment **44**. The chuck attachment **44** also includes a clamp lock **62** which serves as a means for axial location, auto-locking and quick releasing for the tool accessory **50**.

The spindle end quick connect means **38** preferably comprises a substantially round shaft (seen as a mating section) **56** with a flat section **58** around a portion of the perimeter of the shaft **56**. The shape of the mating section **52** is manufactured to correspondingly fit with the shaft **56** of the spindle end quick connect means **38**. It will be understood that Figure 3 is not drawn to scale and that the mating section **56** should fit within the mating section **52**. The spindle end quick connect means **38** also includes an groove **60** around the shaft **56** so as to provide a means for mating with the clamp lock **62**. The clamp lock **62** comprises a clip **63** of a spring-like material which is secured onto

the accessory chuck attachment **44** to engage the groove **60** when the accessory chuck attachment **44** is fully inserted into an installed position thus securing the accessory chuck attachment **44** to the spindle end quick connect means **38**. The groove **60** also serves to axially locate the position of the attachment with respect to the rotary tool and the quick connect means.

When the rotary tool is turned on, the motor causes the spindle end shaft **32**, and therefore the flat section **58**, to rotate which in turn, causes the flat section **58** to drive the accessory chuck attachment **44** relative to the motor in the housing **12**. This rotational movement causes the clamp to move due to centrifugal forces but this movement further secures the attachment to the quick connect means by tightening the connection in the groove. The rotational movement also causes the tool accessory **50** to rotate thereby rendering the rotary tool operational. It is preferred that the fit between the spindle end quick connect means **38** and the mating section **52** be relatively free of play to ensure a proper and functioning connection between the accessory chuck attachment **44** and the spindle end quick connect means **38**.

Figure 4 provides a view of an attachment for connection with the tool housing end quick connect means **40**. As with the other quick connect means **26**, the tool housing end quick connect means **40** provides support to and connection for attachments that operate in conjunction with any rotary tool accessories.

In Figure 4, the cutting guide attachment **46** comprises mating means **64** for connecting the cutting guide attachment **46** to the tool housing end quick connect means **40**. The tool housing end quick connect means **40** comprises a cylindrical portion **63** which mates with the mating means **64** (seen as a hole) in the cutting guide attachment **46**. It is preferred that the fit of the cylindrical portion **63** and the hole **64** be such that the cylindrical portion **63** compliments the hole **64**. The quick connect means **40** further comprises a slot **66** for receiving and guiding a corresponding clip **68** in the mating means **64** of the cutting guide attachment **46**. When connected, the clip **68** fits within the slot **66** until it is locked in an installed position. By locking the clip **68** in the slot **66**, the attachment is further prevented from axial displacement while the rotary tool **10** is being used. The connection between the clip and the slot may be further supported by a keyway to further assist in preventing the chuck attachment from moving.

It will be understood that this is simply one method of providing tool housing end quick connect means and that other means for quickly locking and releasing attachments to and from the rotary tool may be contemplated.

Figure 5 provides a view of an attachment for connecting with the housing surface quick connect means **42**. The housing surface quick connect means are preferably

formed as an integral part of the tool housing, and more specifically via an injection moulding, preferably single-shot. The housing surface quick connect means may also be assembled to the housing of the rotary tool. The attachment for this quick connect means, seen as the handle, **48** comprises mating means **84** allowing the handle to be connected to the housing surface quick connect means **42**. The attachment **48** further comprises a handle **86** and ergonomically shaped surfaces **88** and **90** which provide a comfortable grip for a user's hand. In the present embodiment, the housing surface quick connect means **42** comprise a dovetail type connection **71** along a portion of the housing **12** in a longitudinal direction for mating with the mating means **84** of the attachment **48**. Alternatively, the connection may be in the form of T-slot, recess and projection, magnetic or other types of connections. In this embodiment, there are two quick connect means on opposite sides of the tool so as to provide symmetrical quick connect means and to facilitate the mounting of two separate attachments on opposite sides of the rotary tool **10**.

As further shown in Figure 5a, each dovetail-type connection **71** comprises a surface **72** which is preferably co-planar with the surface of the housing **12**, a pair of edges **74** generally parallel to a longitudinal axis of the rotary tool **10**, an inwardly angled surface **76** from each edge **74** resulting in a distance between the edges **74** greater than a distance between the ends of the angled surfaces **76** to receive the attachment **18**. At a distal end of the housing surface quick connect means **42** is a lead-in **80** and at an opposing end of the housing surface quick connect means **42** is a stop-wall **82**.

The lead-in **80** provides a guide for guiding the attachment after the mating means of the attachment and the dovetail connection have been mated. The stop-wall **82** serves as a location reference point on the tool housing **12** and as a perpendicular stop to the attachment **48** when it is connected to the housing surface quick connect means **42**. The connection between the mating means **84** of the attachment **48** and the dovetail connection **71** of the housing surface quick connect means **42** may be provided with various types of fits including a loose fit, a location fit, a transitional fit or even an interference fit depending on the type and use of the attachment. Additional securing means may also be applied to the housing surface quick connect means **42** for attachments which require stronger locking or securing means.

It will be understood that many alternative configurations and properties for housing surface quick connect means **42** may be appreciated such as location, quantity and form.

Figure 6 provides another diagram of a rotary tool having quick connect means attached to a base. The rotary tool **10** is connected to a router base attachment **92** via the

tool housing end quick connect means **40** and the housing surface quick connect means **42**. In the present embodiment, the connection is facilitated by the two different quick connect means **36** and support means. The router base attachment **92** comprises a first support **94** which mates with the tool housing end quick connect means **40** and a second support **96** which mates with both tool housing surface quick connect means **42**. By connecting the rotary tool **10** to the router base attachment **92** at multiple locations, substantial support and multiple connection points are provided. The attachment **92** further comprises a mating recess **93** which is configured to cooperatively fit with the tool housing surface quick connect means **42**. An extension **98** of the attachment **92** comprises a tab **100** which fits within a recess **101** in the tool housing surface quick connect means **42** to lock the attachment **92** in the installed position. The tab **100** further serves to provide a means of quick-release of the rotary tool **10** from the attachment **92**. It will be understood that any suitable means can be applied to lock and release attachment **92** from the rotary tool. Similarly, other attachments can be fitted with multiple quick connect means for applications such as a drywall cutter, a panel trimmer, a "roto-zip" attachment, etc.. The quick connect means **36** allows the rotary tool to be quickly removed from the base when the user requires use of the rotary tool.

Figure 7 provides another embodiment of a rotary tool having quick connect means. In this embodiment, the rotary tool **10** includes housing surface quick connect means **42** for receiving an attachment **102** with means for functionally integrating with the rotary tool **10**. In this embodiment, the attachment **102** comprises mating means **104** cooperatively configured to fit with a dovetail connection of the housing surface quick connect means **42**. The attachment **102** further comprises a contact section **106** to fit with a means for receiving the functionally integrated attachment, seen as a mating contact section **108**, mounted on the rotary tool. The contact section **108** comprises electrically conductive pins **110** that are connected to means for controlling the motor housed in the rotary tool. The pins **110** further serve as an interface with respective electrically conductive contacts (not shown) in the contact section **106** of the attachment **102**. When the attachment **102** is in an installed position, the mating of the contact sections **106** and **108** connects the contacts in the attachment contact section **106** with the corresponding pins **110** in the mating contact section **108** serving to close an electric circuit between the attachment **102** and the rotary tool **10**. The attachment **102** further comprises a trigger **112** that is electronically connected to the contacts within the contact section **106** so that when the trigger is activated (i.e. pressed), the motor is turned on and begins to rotate. The attachment **102** further comprises ergonomically shaped surfaces **114** and **116** to provide a comfortable grip to the user.

When the attachment **102** is connected to the rotary tool **10**, the trigger **112** operates as a user interface to control the electronic circuit between the attachment **102** and the rotary tool **10** and therefore control the rotation of the motor. The more the trigger **112** is pressed, the higher the rotational speed of the motor and conversely releasing the pressure on the trigger **112** causes the rotational speed of the motor to decrease. The trigger **112** may further control the motor to stop the rotation of the motor when the trigger is fully released. Several auxiliary features utilizing the benefits of this and other similar connections may be incorporated including but not limited to sensing devices and display devices.

Figure 8 shows yet a further embodiment of a rotary tool having quick connect means. In this embodiment, the rotary tool **10** is adapted to receive an attachment by way of a functionally integrated electrical connection. As will be understood, this is only one of many types attachments which may be mounted in this manner. The attachment **118** comprises mating means **120** configured to cooperatively fit with the dovetail connection of the housing surface quick connect means **42**. The housing surface quick connect means **42** comprise electrically conductive contacts **122** mounted within a surface of the housing surface quick connect means **42**. The electrically conductive contacts **122** are mounted on the surface in a manner similar to how battery contacts are mounted to a surface.

The contacts **122** are connected to a power supply means within the rotary tool **10** and serve to interface with corresponding electrically conductive contacts (not shown) located on the underside of the mating means **120**. When the attachment **118** is in the installed position, the connection between the contacts within the mating means **120** and the contacts **122** on the quick connect means **42** serve to close an electric circuit between the attachment **118** and the rotary tool **10** thereby provided power to the attachment **118** when the rotary tool **10** is in operation. In order to protect the user from injury, the open contact **122** is hidden from the user or the contact **122** is designed such that inadvertent contact by the user is harmless.

In the present embodiment, in order to assist the user in using the rotary tool, closing of the circuit by connecting the contacts in the attachment and the contacts **122** of the quick connect means **42**, an indicator light bulb **124** is turned on to illuminate the work area. In a similar manner, the attachment may be a laser light attachment.

Figure 9 shows another embodiment of a rotary tool with quick connect means attached to a rotary tool workstation or accessory case. In the figure, the rotary tool **10** is conveniently stored on the side of the workstation **126** but may be attached to any other location on the surface of the workstation provided the location has mating means for

cooperating with the quick connect means **36** of the rotary tool. The workstation **126** includes an integral bracket **128**, mounted on the side, such that the tool housing surface quick connect means **42** slides easily into the bracket for easy storage and removal of the tool from the workstation **126**. The quick connect means of the present invention facilitates storage capability in other configurations as well. Furthermore, by attaching the rotary tool to the outside of the portable workstation, at the point of purchase, the consumer is able to see what is available with the workstation.

Figure 10 shows another embodiment of a rotary tool having quick connect means for receiving an attachment. For some users, long periods of use and tool vibration contribute to the possibility of the user experiencing repetitive strain injuries (RSI), disorders or the like. In the present embodiment, the quick connect means receive at least one attachment designed to provide salutary or curative benefits. Each attachment **130** is a custom designed pad **132** manufactured from one or more materials specially configured to prevent or reduce RSI. This has particular application to the industrial sector. The preferred embodiment comprising two attachments **130** mountable to housing surface quick connect means **42** of the rotary tool **10**. The attachments **130** comprise the shaped pad **132** with mating means **136** configured to cooperatively mate with the housing surface quick connect means **42**. As described above, the mating means **136** are preferably shaped to mate with a dovetail connection of the housing surface quick connect means **42**. The pad **132** is preferably manufactured from a gel material which absorbs, transfers, shields or removes harmful energy, vibration which may cause injury to the user while the rotary tool is in use. It will be understood that other materials (other than a gel material) may be contemplated and are suitable for such an application.

Turning to Figure 11, a rotary tool having quick connect means for receiving an attachment **140** such as an anti-roll base is shown. This attachment **140** prevents cylindrical shaped tools, such as a rotary tool, from rolling so that the rotary tool **10** is stationary when not in use. The anti-roll base **140** further serves as a stand for temporary placement while the tool is not in use.

The anti-roll base **140** comprises a wall **142** with mating means **144** configured to cooperatively mate with the dovetail connection of the housing surface quick connect means **42**. The attachment **140** further comprises a pair of side walls **146** extending downwardly away from the wall **142** and substantially angled respective to the top wall **142** along the longitudinal axis of the tool. A third wall **148** joins the ends of the pair of walls **146** and has a projection (seen as feet **147**) which serves as a contact point

between the attachment **140** and the work-surface when the rotary tool **10** is placed onto the work-surface.

Figure 12 shows an attachment mounted to a rotary tool via quick connect means. The attachment, or blow-off tool, **150** is generally intended for use in discarding dust, chips or otherwise unwanted materials at the cutting area of the accessory and comprises an extension **152** for mounting to the rotary tool **10**, an exhaust tunnel **154** and an air converging channel **156**. The extension **152** further comprises mating means configured to cooperatively mate with the dovetail connection of the housing surface quick connect means **42**. The exhaust tunnel **154** further comprises a hollow under-carriage to encapsulate the exhaust air vent **24** to direct the heated airflow to the channel **156**. The channel **156** comprises a hollow section which converges in a cross section towards an orifice **158** adjacent to the tool end of the rotary tool **10**. Similarly, a vacuum device may be attached to the air intake vent of the rotary tool, and a deflecting mechanism to prevent contaminants from being drawn into the air intake vent and to extract the unwanted material from the work area and out away from the rotary tool.

Turning to Figure 13, a rotary tool having two attachments mounted via quick connect means is shown. As described above, the rotary tool **10** may comprise multiple housing surface quick connect means. In this embodiment, one of the housing surface quick connect means **42** is located at the top of the rotary tool and the other quick connect means is located the bottom of the rotary tool.

The two attachments thereby facilitates a multitude of uses for the user and it will be understood that any suitable combination of attachments are contemplated. In this embodiment, the two attachments are a handle **160** and an accessory container attachment **162**. The container attachment **162** comprises mating means configured to cooperatively mate with the dovetail connection of the housing surface quick connect means **42** located at the top of the rotary tool. The container attachment **162** further comprises a box section **164** with a lid **166** cooperatively configured to the box section **164** to house accessories **168** within the container. Any suitable means may be used to retain or otherwise contain the accessories. The container attachment **162** is preferably used to house rotary tool accessories **168** in order to permit portability of accessories and remote use of the rotary tool. There are several possible configurations of the container attachment **162** for several different uses of accessories thereby resulting in a multitude of possibilities of configurations or construction.

As described above, the container attachment **162** may also be mounted to a hand held power tool with a bi-directional motor to house tool accessories for use with the hand held power tool with a bi-directional motor. The container attachment **162** is

preferably beneficial for many other power tools, in the example of a drill, since the container attachment **162** may house power tool bits so that a user has easy and quick access to these bits.

The handle **160** also comprises mating means configured to cooperatively mate with the dovetail connection of the housing surface quick connect means **42** located at the bottom of the rotary tool. The user simply connects the mating means and the housing surface quick connect means **42** (as previously described above) and attaches the handle **160** to the rotary tool **10** to enhance the usability of the rotary tool.

Figure 14 shows a chuck actuation attachment attached to the rotary tool via quick connect means. In this embodiment the housing surface quick connect means **42** are used in a different manner in that the quick connect means assist to guide the attachment in a sliding motion. It will be understood that there are other attachments that would benefit in a similar manner. Furthermore, the embodiment illustrates the different quick connect means may be used together to receive attachments.

A chuck attachment **173** is mounted to the spindle quick connect means **38** at the tool end of the rotary tool **10**. The chuck actuator attachment **170** comprises a chuck interface **172**, attachment connection means **174**, a user interface **176** and a body **178**. The chuck interface **172** comprises fork-like extensions to actuate the chuck in a longitudinal direction thereby actuating the chuck to release the accessory held within. The chuck attachment may be returned to a lock position manually with the actuator **170** or by spring biasing within the chuck. The chuck interface **172** permits free rotation of the chuck when the tool is in use. The attachment connection means **174** comprising mating means to mate with the tool housing end quick connect means **40**. Alternatively, the connection may be achieved by using a spring clamp. The spring clamp construction permits the actuator **170** to be attached from the top of the tool which improves the functional requirements of the user. The connection means **174** further serving to guide the body **178** within. The user interface **176** comprises a button type gripping means for the user to initiate actuation. Actuation of the user interface **176** transfers motion to the body **178** guided by connection means **174** thereby actuating the chuck with the chuck interface **172**.

In this embodiment, the multi-use of the quick connect means is further illustrated. The housing surface quick connect means **46** are used as axially guiding means for the attachment, the tool end quick connect means **40** are used as locking means for keeping the attachment in place and the spindle end quick connect means are used as locating means and for locking the chuck actuator attachment **170** to the rotary tool.

Figure 15 shows a rotary tool having a protective boot attachment mounted thereon via quick connect means. The protective boot attachment **180** facilitates use of the rotary tool in outdoor or otherwise harsh environments for example, a chemical environment. The protective boot attachment **180** may be manufactured from various materials, and is preferably pliable, with the construction thereof designed to suit the intended environment of use. The attachment **180** preferably facilitates the use of the tool in environments otherwise not feasible with the known art.

The protective boot attachment **180** comprises mating means **184** for attaching the boot to the dovetail connection of the housing surface quick connect means **42**. This allows the boot attachment **180** to be mounted to the rotary tool **10** while maintaining the boot attachment **180** longitudinally and rotationally in place as required. In the preferred embodiment, the protective boot attachment **180** (shown in section) comprises a housing collar **182**, mating means **184** and a protective cover **186**. The housing collar **182** is circular and shaped to fit onto the tool housing end quick connect means **40** and is secured to the protective cover **186**. The mating means **184** are also secured to the protective cover so that the protective cover is a continuous cover. The protective cover **186** is optionally transparent can include additional material conducive to air flow secured into the locations over the exhaust and intake vents thereby permitting air flow for the proper function of the tool. The protective cover **186** is further constructed to provide and ensure an appropriate interface for the user to access the tool controls such as the power switch **16** and speed adjustment button **18**. The protective cover **186** comprises an opening with closure means on the end opposite to the end with collar **182** which allows the protective cover to be initially wrapped around the rotary tool. The connection between the mating means and the dovetail connection prevents the protective cover from sliding during use.

Alternatively, the boot attachment **180** may be inserted onto the tool at the end with the tool housing end quick connect means **40** subsequently attached to the housing surface quick connect means **42** into an installed position and the closure means then employed. Closure means could include any suitable means such as a zipper, Velcro or a button flap.

Figure 16 displays a rotary mounted to a router or shaper table tool via quick connect means. The table **188** is generally rectangular in shape with a top surface **189** having a set of four legs **190** connected to a bottom of the top surface **189**. The table also includes a cylindrical opening, or hole, **192** through a central area of the top surface **189**. The underside of the top surface generally comprises means **194** which mates with the quick connect means of the rotary tool to mount the rotary tool to the table **188**.

Therefore, after the user is finished with the rotary tool, it may be easily disconnected from the table and used elsewhere.

Figure 17 provides a sectional view, taken along line 17-17 of Figure 16. The rotary tool contacts the table **188** via the tool housing end quick connect means **40** and the housing surface quick connect means **42** which are used as securing means, guiding means or adjustments means or combinations thereof.

In the preferred embodiment, the tool housing end quick connect means **40** cooperate with a locknut **196**. The locknut **196** secures the tool end of the rotary tool to a sliding collar **198**, the collar **198** provides guided adjustments when the rotary tool is sliding within the cylindrical opening **192** of the table **188**. The table **188** also mates with the housing surface quick connect means **42** via a pair of mating means **197** located on support walls **199** on opposite sides of the table. The mating means further serve to guide the tool and sleeve **200** respective of the table **188**.

A locking screw **202** is secured into table **188** and used for securing the connection between the table **188** and the quick connect means **42**.

Similarly the rotary tool **10** may be connected to an attachment and be used as a profile sander. This embodiment further illustrates that the present invention facilitates support and multiple connection means for various rotary tool applications.

Figure 18 is directed at an embodiment of a rotary tool having quick connect means for receiving an attachment such as a depth gauge attachment. Use of the depth gauge attachment **204** as the attachment illustrates how the quick connect means may provide longitudinal location referencing for the rotary tool. Other attachments are possible which provide other location referencing attachments for locating positions longitudinally or rotationally. In this embodiment, the gauge attachment **204** is secured onto the housing surface quick connect means **42**. As previously described, the housing surface quick connect means **42** may include a stop wall **82**. The stop wall **82** is preferably in a location relative to the end of the spindle. Accordingly, dimensional relationships are established from the depth gauge attachment through to an accessory **206** with associated interrelationships from the spindle to a chuck **208** and the chuck to the accessory **206**, in this case the distal end of the accessory. The gauge attachment **204** can thereby measure accurately the depth at which the end of accessory **206** has been set to relative to the end of the chuck by reading the value adjacent to an indicator **210**. This permits for readjustment as required. Alternatively, the user can set the gauge attachment **204** to drill holes to a predetermined depth. The gauge is first used to measure the location of the end of the accessory. The user subtracts the desired depth, adjusts the gauge and locks with thumbscrew **212**.

Figure 19 is a perspective view of a harness having quick connect means which may be mounted to a conventional rotary tool (shown in broken lines) in order to provide a rotary tool having quick connect means. The harness **220** comprises a first holder portion **222** which is mounted around the larger end of the rotary tool **224** and a second holder portion **226** which is mounted near a tool end **228** of the rotary tool **224**. The harness **222** further comprises an attachment portion **230** which connects the first and second holder portions. On top of the attachment portion **230** is a quick connect means **232**, seen as a dovetail connection.

Both holder portions **222** and **226** comprise securing means **234** which allow the harness to be secured to the rotary tool. The size (hole size) of the holder portions may be adjusted so that they are able to fit most conventional rotary tools. After attaching the harness to the rotary tool, the rotary tool may receive attachments having mating means for attaching with the quick connect means **232**.

Figure 20 is a perspective view of a rotary tool having quick connect means with a flex shaft connected to the rotary tool. The rotary tool **10** includes quick connect means **36** seen as the housing surface quick connect means **42**. A flex shaft **240** is connected for use at the end of the rotary tool via the spindle end quick connect means **38** and the tool end quick connect means **40** in a manner similar to the one described above with respect to Figure 3. At the tool end of the flex shaft, the flex shaft includes quick connect means **242**, seen as a dovetail connection, which may receive attachments having mating means configured to cooperatively mate with the dovetail connection. Therefore since the use of the tool may be remote from the rotary tool, the presence of the quick connect means **242** allows a user to still connect attachments to the flex shaft to assist in the rotary tool application.

Figure 21 is a perspective view of a rotary tool having quick connect means connected to a portable workstation. The rotary tool **10** includes housing surface quick connect means **42** which allow the rotary tool to be mounted to the portable workstation **244**. By mounting the rotary tool to the portable workstation using the quick connect means, the rotary tool may also be quickly disconnected from the workstation once the user is finished with the tool in order to quickly provide a larger work space to the user. Figure 22 shows the rotary tool connected to the portable workstation in a second position.

Figure 23 is a perspective views of a rotary tool **10** having quick connect means **36** mounted to the outside of a tool case or portable workstation **246**. The rotary tool may be easily and quickly attached to the tool case without having to open up the case. Therefore, if a user wishes to bring a rotary tool, the user does not have to open up the

case to put it in but can simply connect the rotary tool **10** (via the housing surface quick connect means **42**) to the corresponding mating means on the surface of the tool case/portable workstation **246**.

Turning to Figure 24, a perspective view of a rotary tool **10** having quick connect means **36** is shown. Along with the housing surface quick connect means **42**, the rotary tool **10** also comprises a power end quick connect means **248**. The power end quick connect means **248** is preferably a dovetail connection but it will be understood that other quick connect means such as a T-slot connection may be used. The power end quick connect means **248** is preferably used to guide a power cord **250** having mating means **252** which are configured to mate with the power end quick connect means **248** in order to guide the mating of the power cord with the power receptacle **254** in the rotary tool **10**. The power receptacle is wired to the motor in order to provide power to the motor when the power cord is connected to the rotary tool and a power source (not shown).

Turning to Figure 25, a schematic diagram of a rotary tool having quick connect means is shown. The rotary tool is similar to the rotary tool of Figure 24 with the difference being that the power end quick connect means **248** are configured to receive a battery pack **260** having mating means for cooperating with the power end quick connect means of the rotary tool. Figure 26 shows the battery pack connected to the rotary tool

Alternatively, a clip attachment may be mounted to the rotary tool via the quick connect means to hold a vacuum hose in place in order to extract unwanted materials from the work area. The clip attachment may also be used with the rotary tool when in the hand of the user. The clip attachment may be mounted on either or both of the housing surface quick connect means.

In another embodiment, a gear reduction unit attachment may be mounted to the rotary tool via the quick connect means. The gear reduction unit attachment may be mounted using any number of the quick connect means depending on the construction of the attachment. The gear reduction unit attachment preferably comprises a set of planetary gears or other suitable means to reduce the revolutions per minute of the rotary tool to that of a drill or other suitable tool. The gears would preferably be housed within a casing with an input shaft connectable to the spindle of the rotary tool and an output shaft connectable to a chuck accessory attachment. Similarly, a drive transfer may be applied for right angle attachments to convert rotation to reciprocation as in the case of a reciprocal converter for sawing motion as well as other such mechanisms.

In another embodiment, the rotary tool may be attached via the quick connect means to a swivel base with or without a bench clamp. The clamp can be mounted on the edge of a work-surface and the rotary tool affixed to a mating section which is configured

to mate with the quick connect means which allows the rotary tool to be stationary and secured and the work-piece manipulated by the user. This arrangement allows the rotary tool to be held firmly in one position and provides flexibility in that the rotary tool may be positioned in a variety of positions to accomplish a wide range of tasks.

In another embodiment, a level may be attached to the rotary tool via the quick connect means to improve the functionality of the rotary tool for various applications. For example, if the user was drilling holes into a large work-piece, the power tool may be mounted onto a workbench with the level assisting in proper alignment of an accessory relative to the work-bench thereby allowing the user to drill the required holes moving the work-piece relative to the workbench.

In another embodiment, the rotary tool may be attached to a bench clamp via the quick connect means that in turn is fastened to the edge of a work-surface.

In yet another embodiment, the rotary tool can be attached via the quick connect means to a fixture to be used as a radial-arm saw, a drill press, etc. The quick connect means provides improved attachment means for such applications.

In another embodiment, an upright, rigid stand may be attached to the quick connect means of the rotary tool allowing the use of other attachments to be attached to the spindle end of the housing such as a flexible extension. The upright, rigid stand may also be adapted for height adjustability and further serve as a drill press.

In yet another embodiment, the quick connect means provides means for the rotary tool the ability to be connected with a circle cutter.

In another embodiment, the rotary tool having quick connect means may mate with a wall bracket having mating means to offer temporary tool placement for the user while freeing the hands for other tasks.

In yet another embodiment, a clear protective dust/spark shield may be connected to the quick connect means of the rotary tool. Such an attachment can be connected to any of the different quick connect means on the tool housing to provide extended capability for the user to operate the rotary tool in a safer environment.

In still another embodiment, a magnifying glass may be connected to one of the housing surface quick connect means of the rotary tool. There are accessories available in standard sets that are used for carving, etching, and other fine work, and having a magnifying glass becomes essential. Furthermore the magnifying glass may be used in conjunction with a task light as combined into one attachment or used as separate attachments.

In another embodiment, a template guide system can be attached to the quick connect means of the rotary tool for guiding the accessory in a predetermined path. The quick connect means facilitates improved use of such attachments.

In further embodiments, other attachments such as a cutting guide or a protractor can be attached to the quick connect means of the rotary tool.

In another embodiment, an actuator can be configured to act as a multi-positional spindle lock upon attachment to the tool. If a particular chuck were to be used that would require locking the spindle for an accessory change than this can provide actuation of the spindle lock closer to the user than that of typical spindle lock buttons. Similarly, an attachment such as this could be used as spindle brake to provide the user capability to bring the motor speed to a stop in a quicker manner. This would further serve to improve the safe use of the tool.

Other attachments include but are not limited to a grout remover, a lawn mower blade sharpener, and a multi-purpose cutting guide.

An advantage of the present invention is that the quick connect means allows the rotary tool to be switched between multiple functionality in a shorter period of time. Since the attachments may be easily disconnected from the rotary tool and new attachments immediately connected, there is time saved for the user in order to allow the user to complete their job in a timely fashion without having to face delays in unscrewing attachments and then screwing on the new attachments.

The accessory chuck attachment **44** and the spindle end quick connect means **38** further comprise locating, supporting, driving, locking and releasing means.

Therefore the foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

WHAT IS CLAIMED IS:

1. A handheld power tool with a rotational motor comprising:
means for receiving a tool accessory;
means for rotating said tool accessory; and
at least one quick connect means for use with power tool attachments.
2. The handheld power tool of claim 1 wherein said power tool is a rotary tool.
3. The handheld power tool of claim 1 further comprising at least two quick connect means for use with said power tool attachments.
4. The handheld power tool of claim 1 wherein said at least one quick connect means is selected from a group consisting of a spindle end quick connect means, a tool housing end quick connect means, a housing surface quick connect means and power end quick connect means.
5. The handheld power tool of claim 4 wherein said housing surface quick connect means are located on a surface of said handheld power tool.
6. The handheld power tool of claim 5 wherein said housing surface connect means comprise dovetail shaped connection means, T-slot connection means, a recess, a projection, or magnetic means.
7. The handheld power tool of claim 1 wherein said rotary tool further comprises a flex shaft connected to a tool end of said rotary tool.
8. The handheld power tool of claim 7 wherein said flex shaft comprises quick connect means.
9. The handheld power tool of claim 5 wherein said housing surface quick connect means are integrally moulded.
10. The handheld power tool of claim 9 wherein said integrally moulded housing surface quick connect means are injection mounted.

11. The handheld power tool of claim 1 further comprising locking means for securing said power tool attachment to said at least one quick connect means.
12. The handheld power tool of claim 1 wherein said at least one quick connect means is mounted to said handheld power tool.
13. The handheld power tool of claim 3 wherein said at least two quick connect means cooperate with each other for use with a power tool attachment.
14. The handheld power tool of claim 1 further comprising means for receiving functionally integrated attachments.
15. The handheld power tool of claim 14 wherein said means is a pin connection or an electrical connection.
16. A harness for providing quick connect means to a handheld power tool with rotational motor comprising:
 - a first holder portion for attachment to one end of said handheld power tool;
 - a second holder portion for attachment to a second end of said handheld power tool;
 - means for securing said first and said second holder portion to said handheld power tool;
 - an attachment portion connecting said first holder portion to said second portion;and wherein said attachment portion further comprises quick connect means for receiving a power tool attachment.
17. A handheld power tool attachment comprising:
 - at least one mating means for mating with quick connect means on a handheld power tool with rotational motor.
18. The handheld power tool attachment of Claim 17 wherein said handheld power tool attachment is selected from a group consisting of an accessory chuck attachment, a cutting guide attachment, a handle, a router base attachment, a functionally integrated attachment, a light attachment, a laser attachment, a portable workstation, a salutary gel pad attachment, an anti-roll base attachment, a blow-off tool attachment, a container, a

chuck actuation attachment, a protective boot attachment, a router table attachment, depth gauge attachment, a flex shaft attachment, a power cord attachment and a battery pack attachment.

19. The handheld power tool attachment of Claim 17 further comprising at least two mating means for mating with a handheld power tool having multiple quick connect means.

20. The handheld power tool of Claim 1 wherein said at least one quick connect means are used for guiding, locating, adjusting, supporting, driving, attaching, locking or releasing.

21. The handheld power tool of Claim 5 wherein said housing surface quick connect means are assembled to said handheld power tool.

22. The handheld power tool attachment of claim 17 further comprising means for functionally integrating with said handheld power tool.

23. The handheld power tool of claim 21 wherein said means is a pin connection or an electrical connection.

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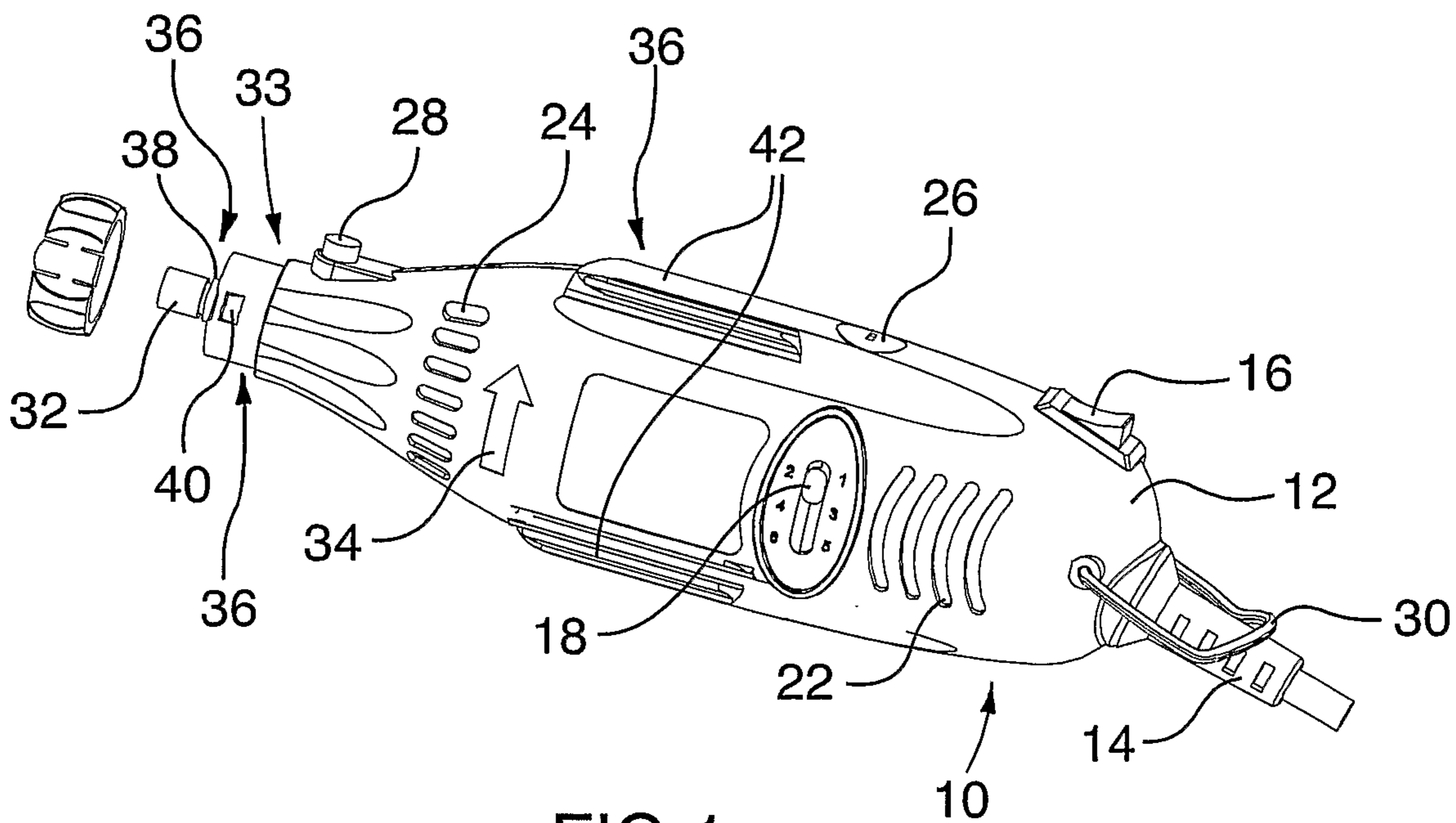


FIG. 1

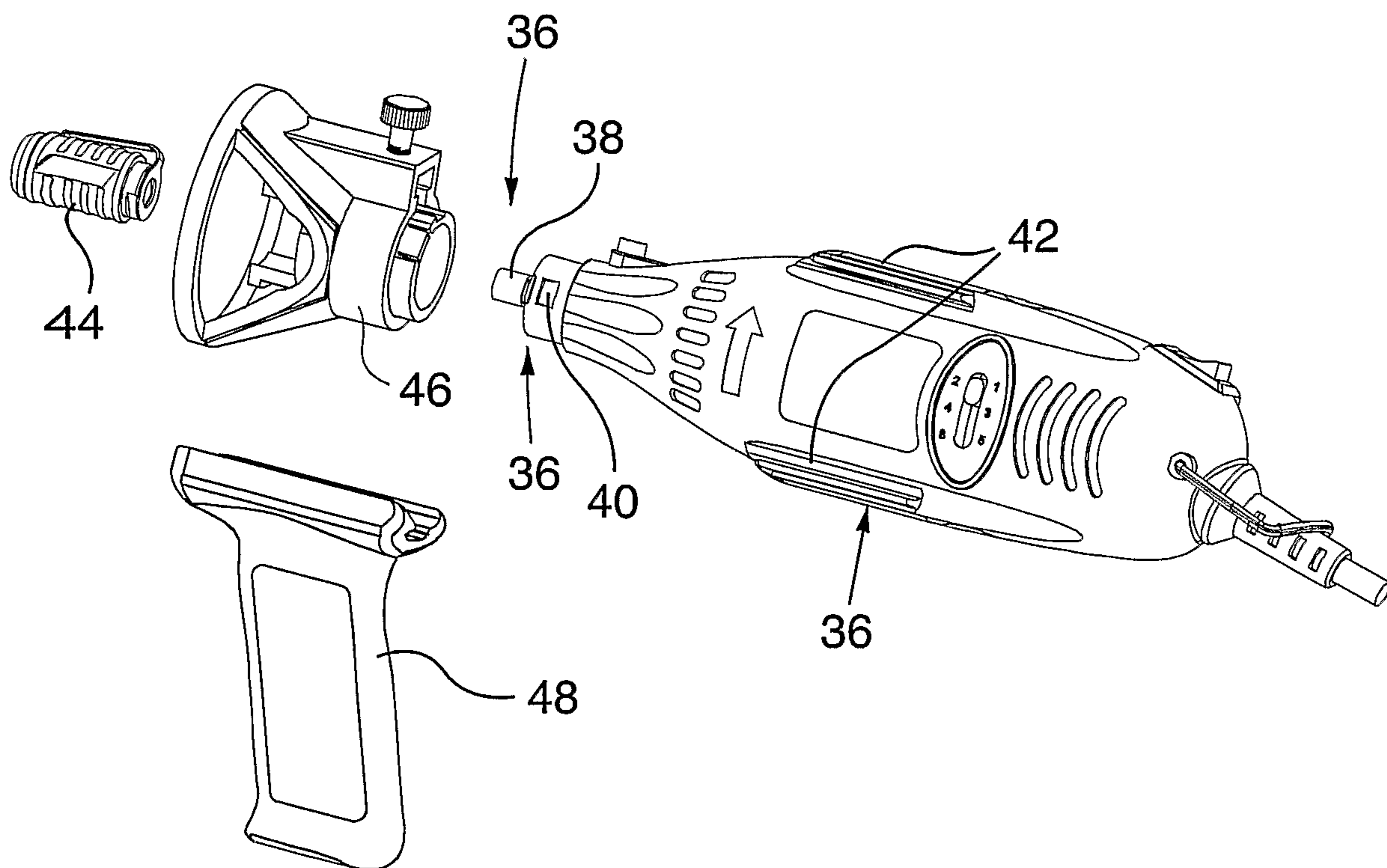


FIG. 2

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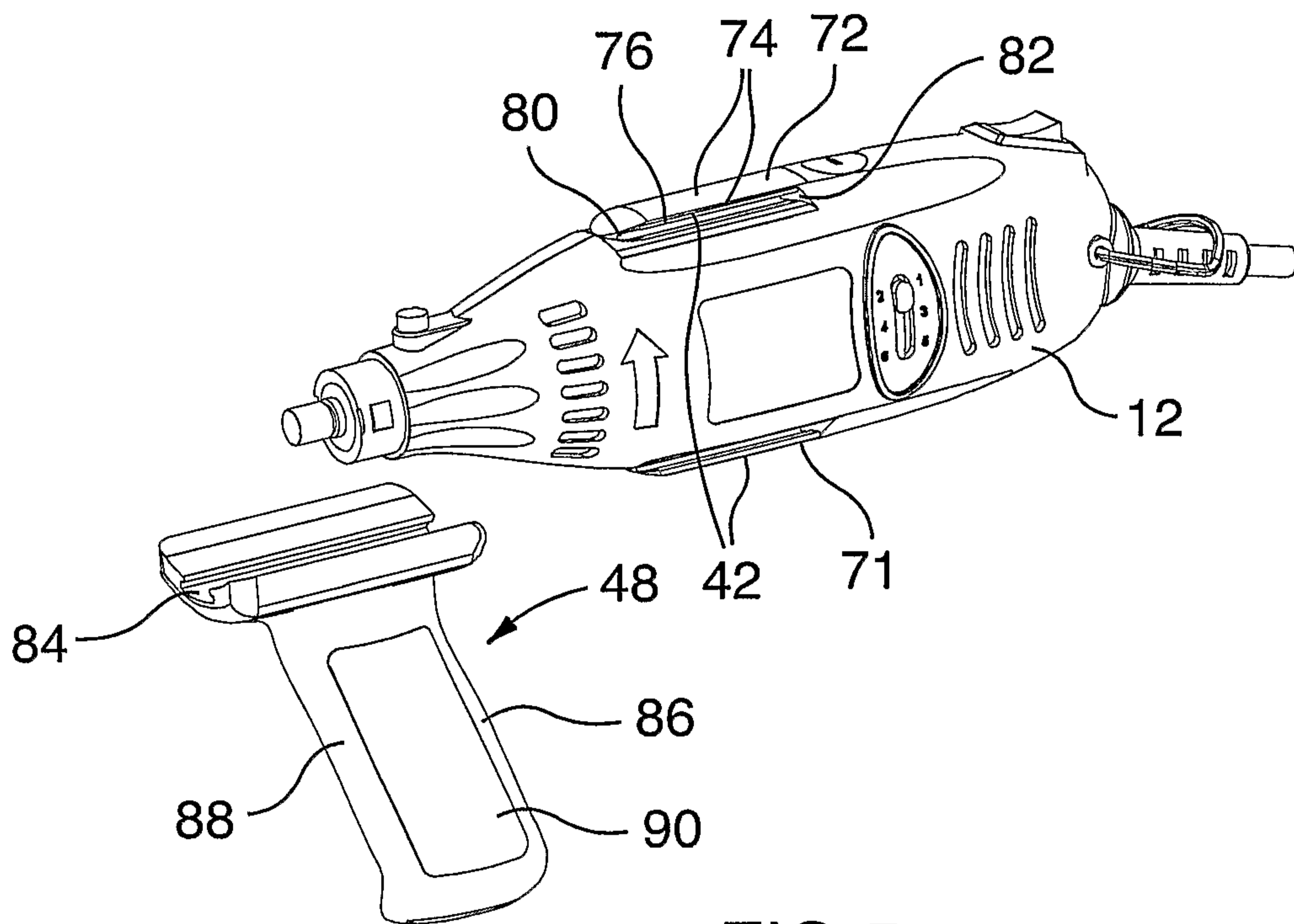


FIG. 5

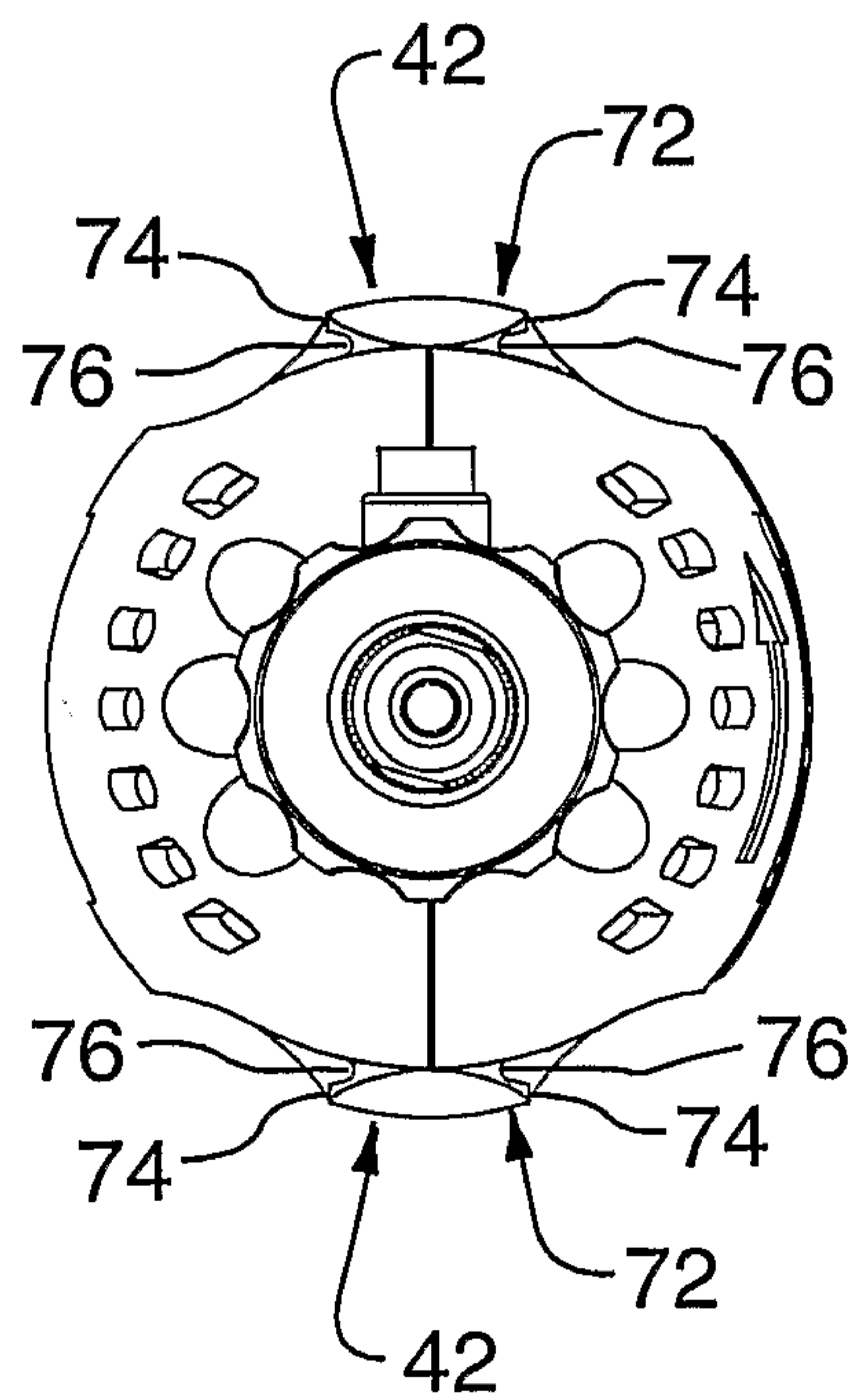


FIG. 5A

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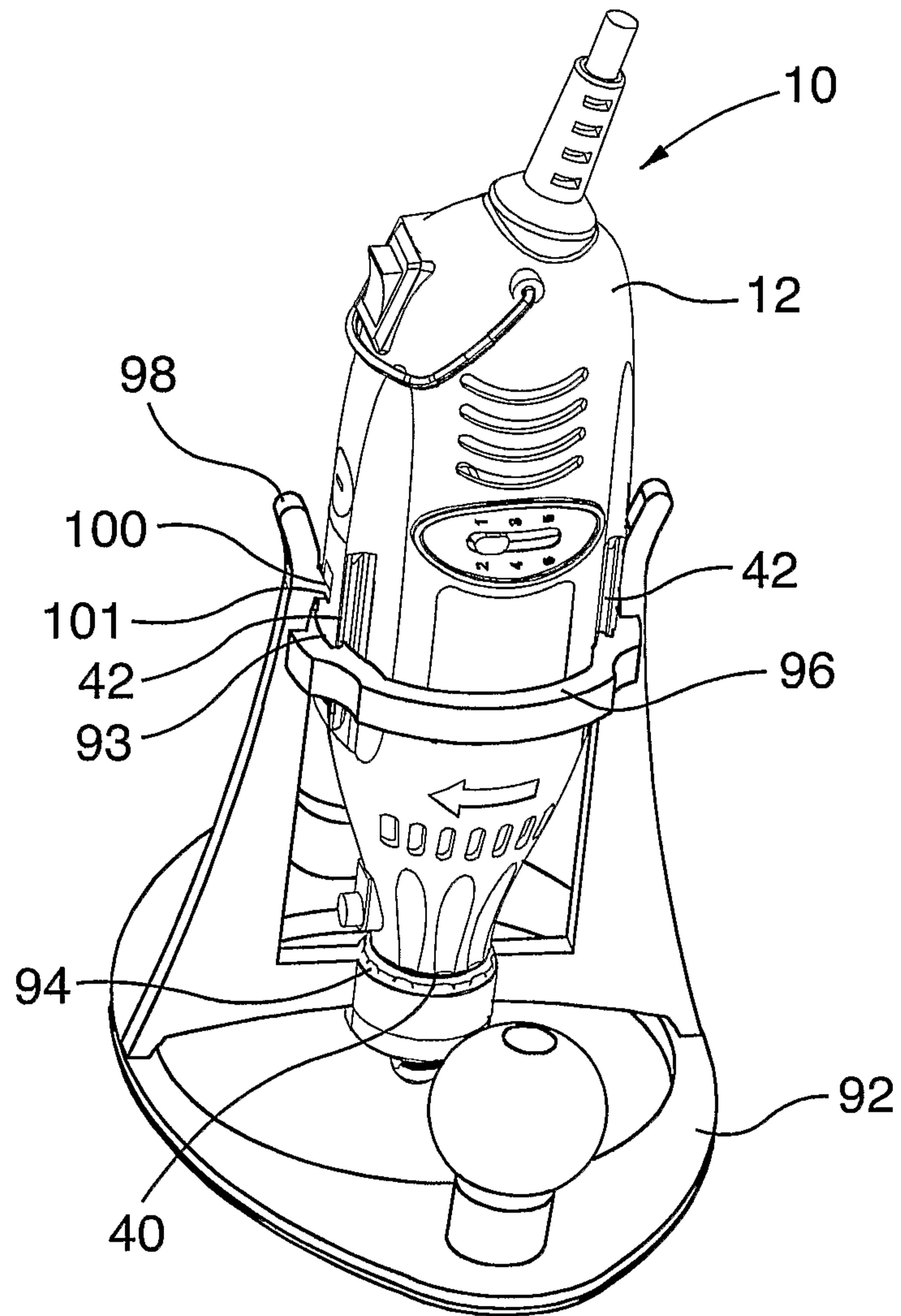


FIG. 6

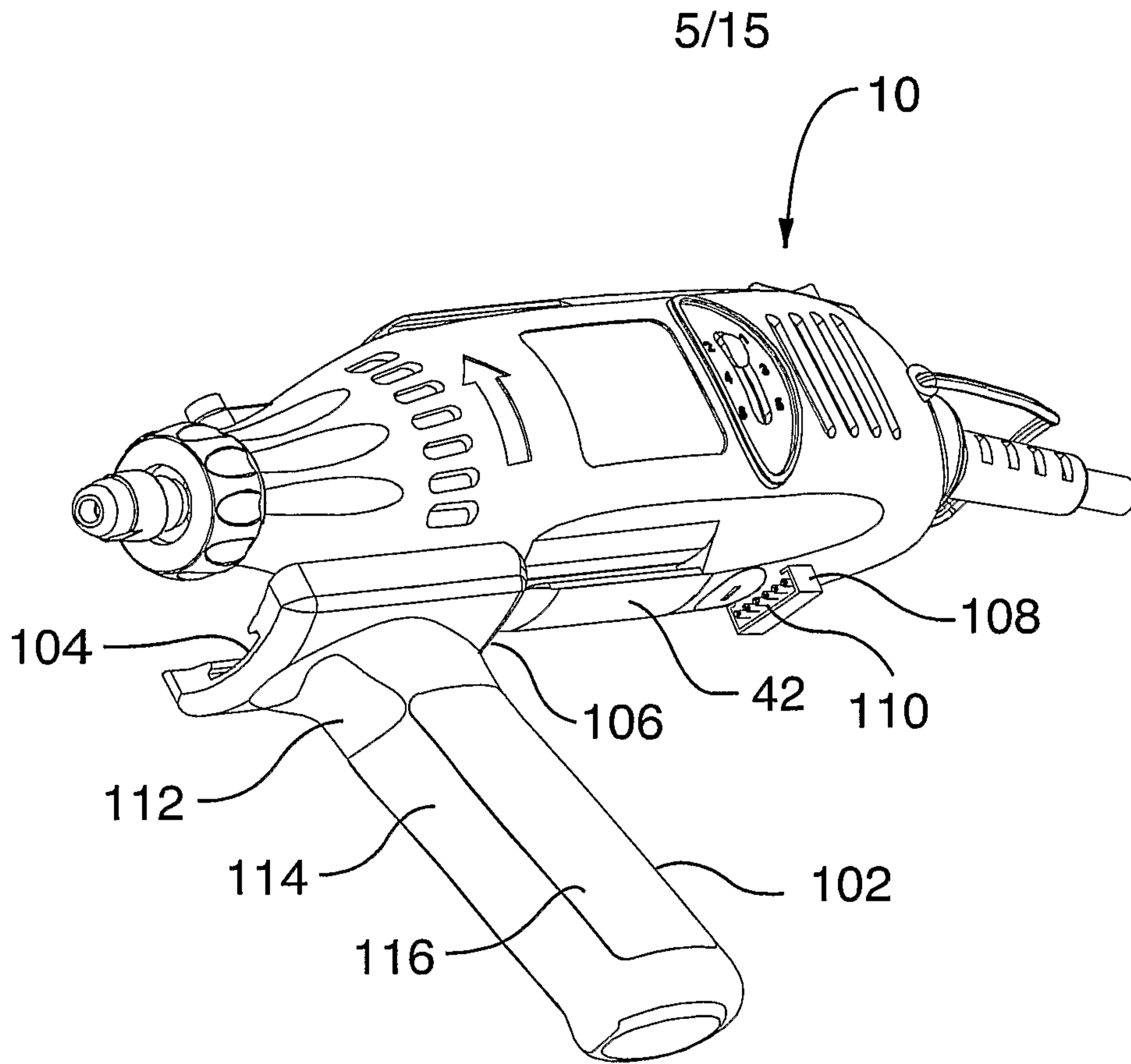


FIG. 7

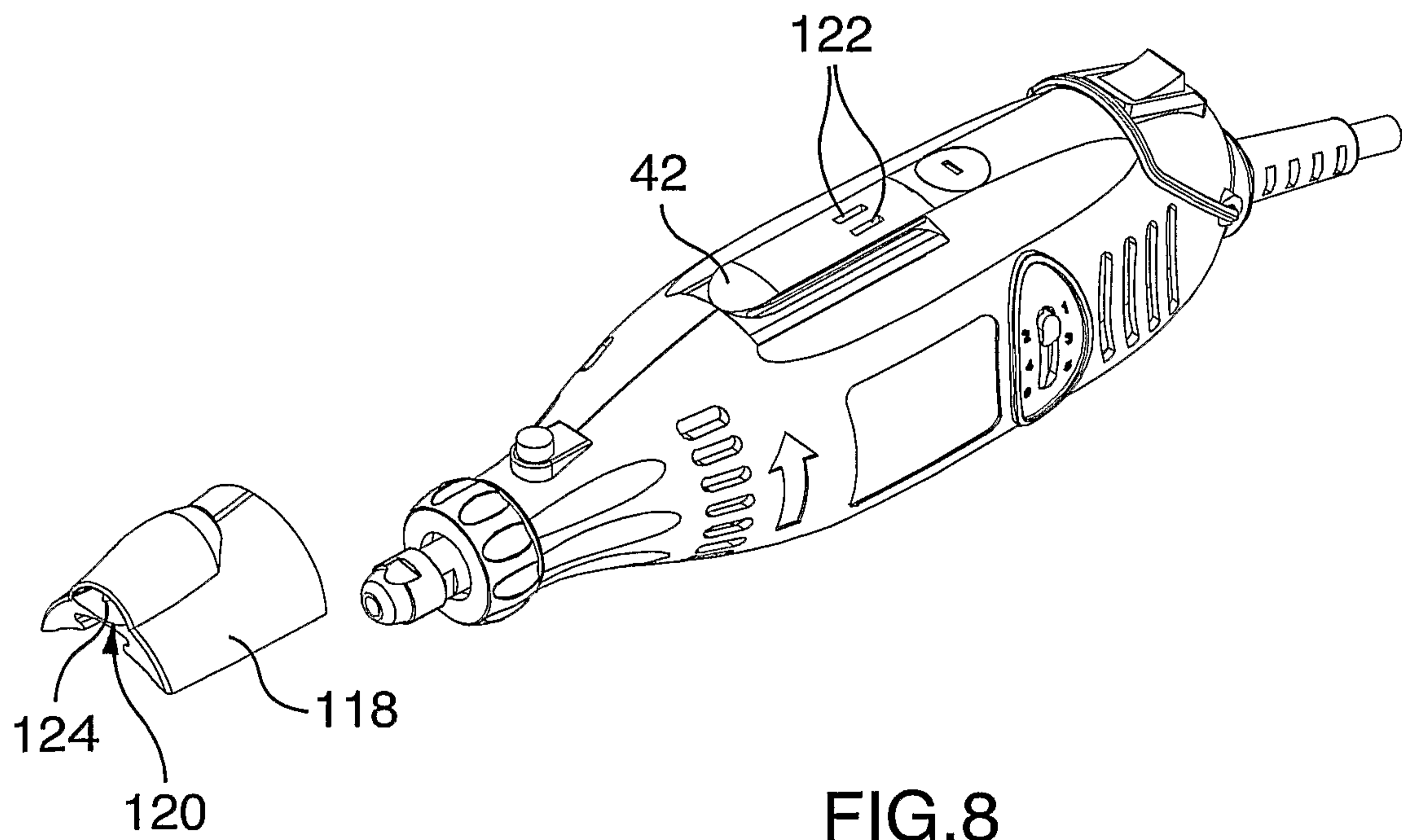


FIG. 8

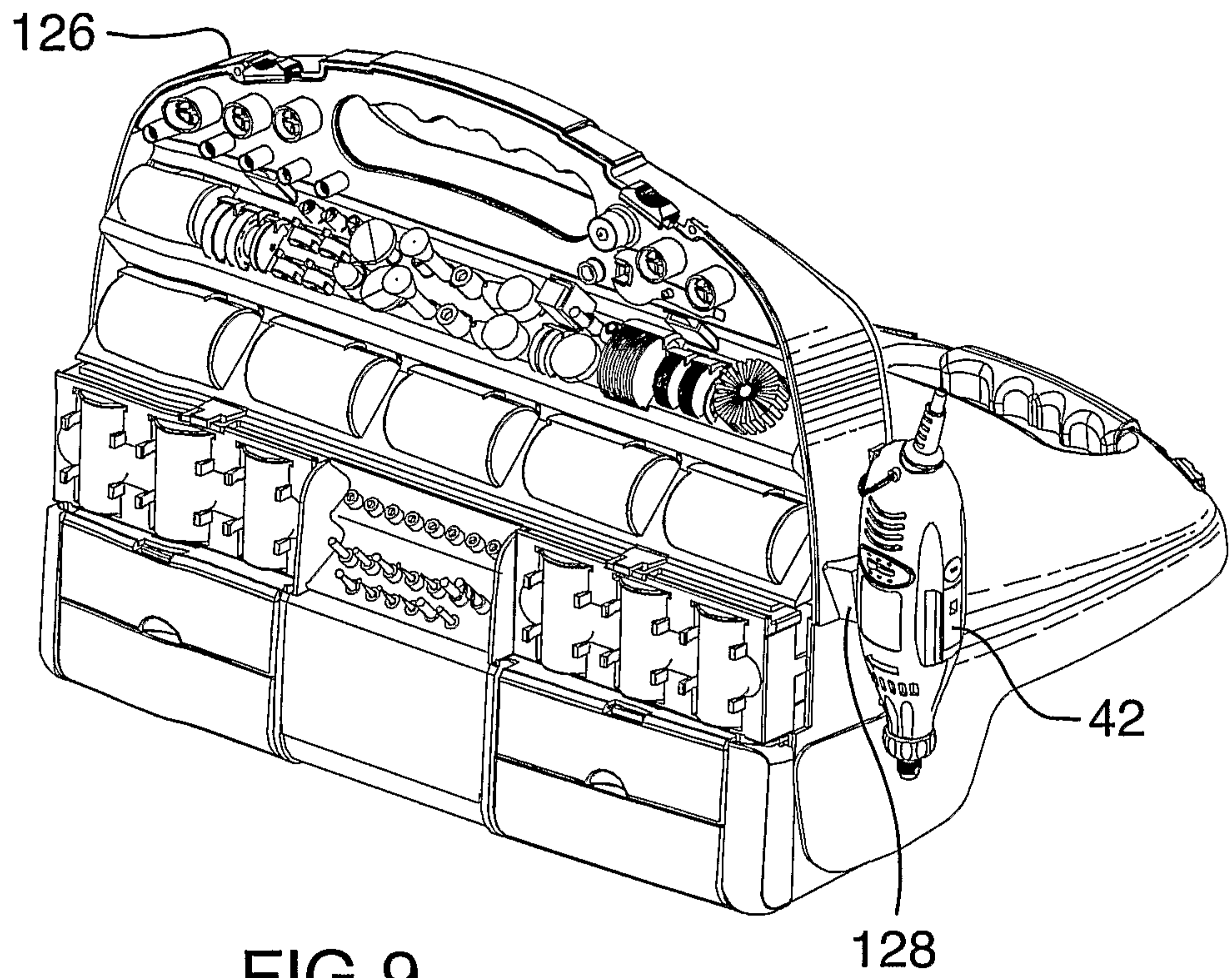


FIG. 9

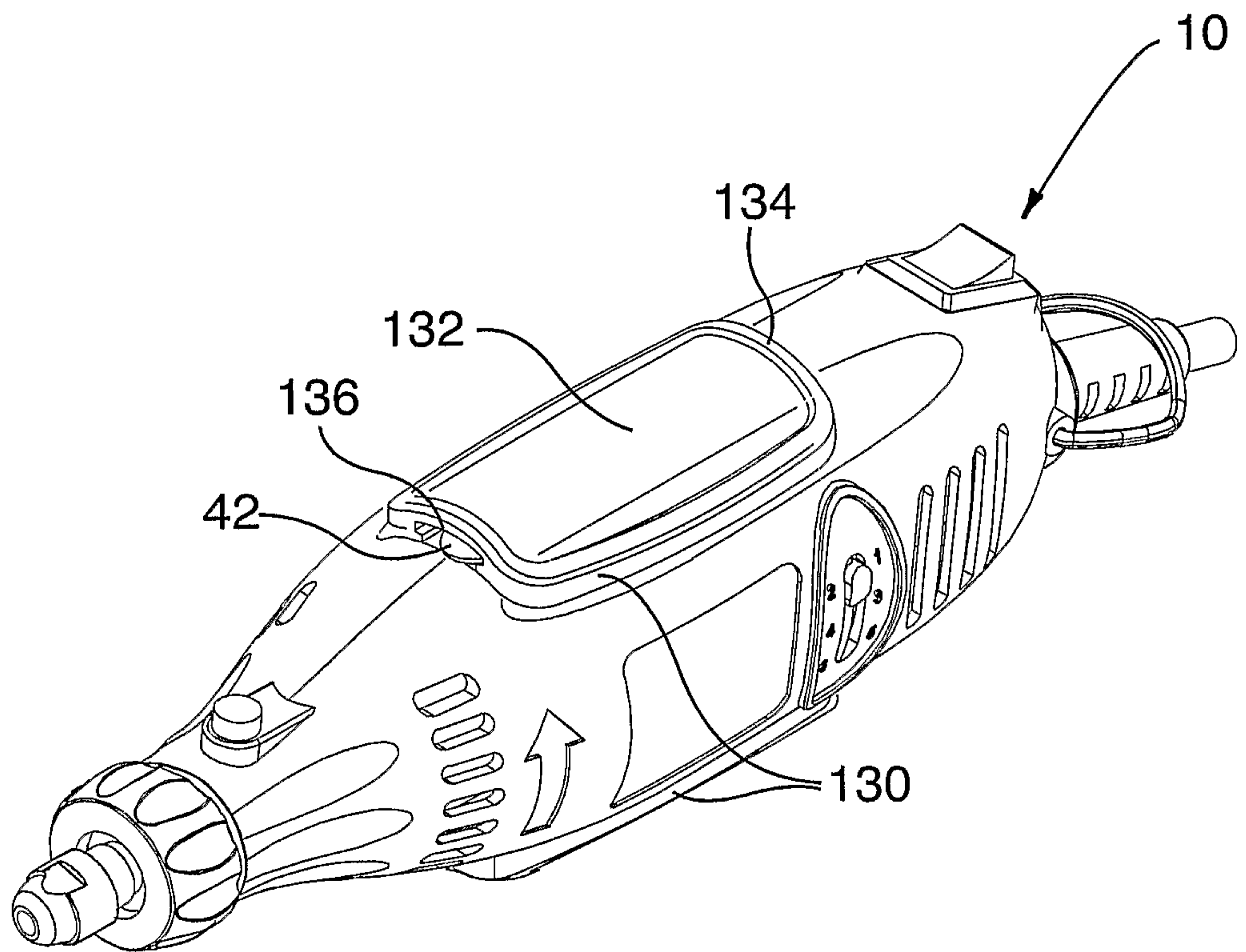


FIG. 10

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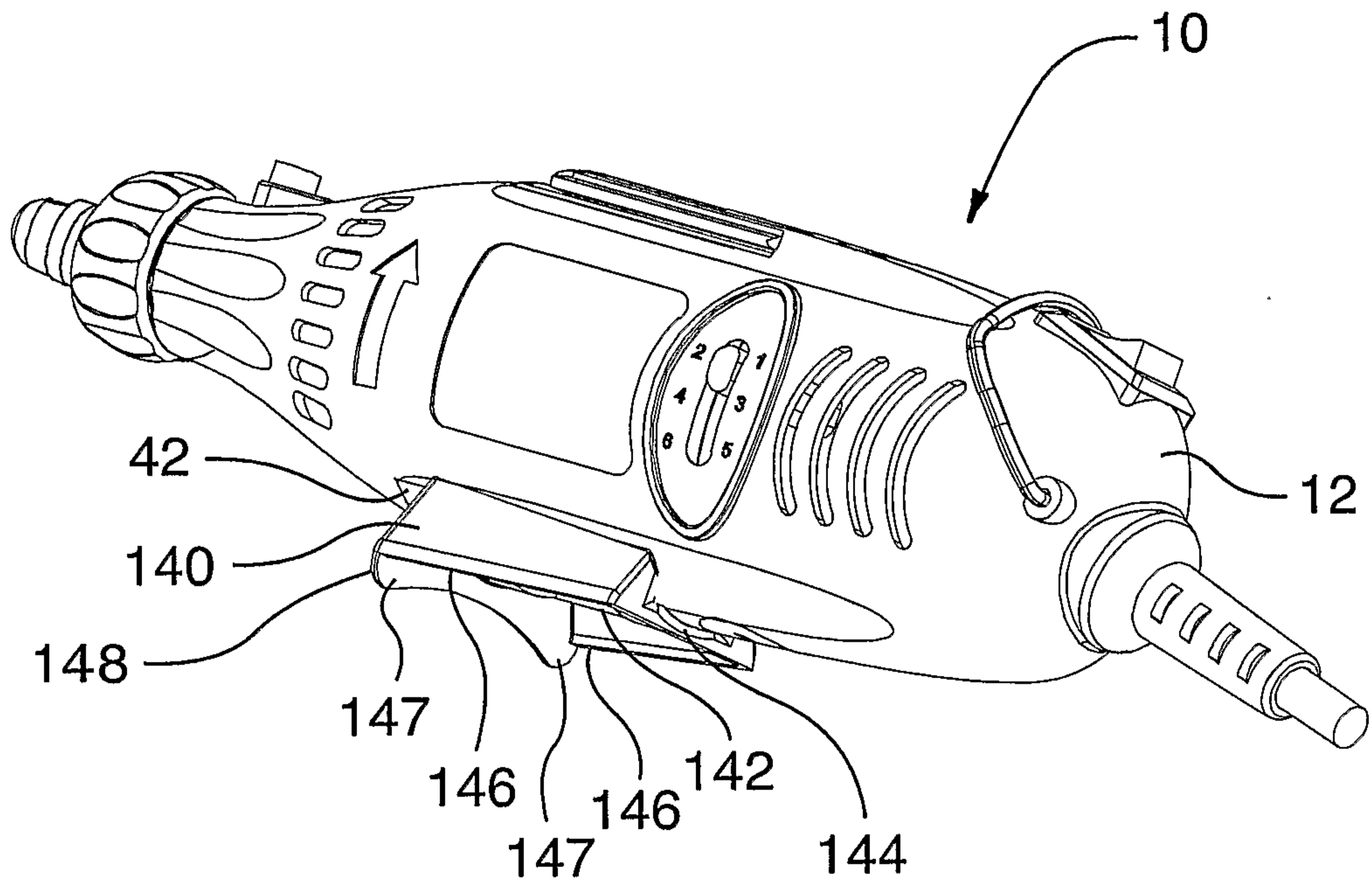


FIG.11

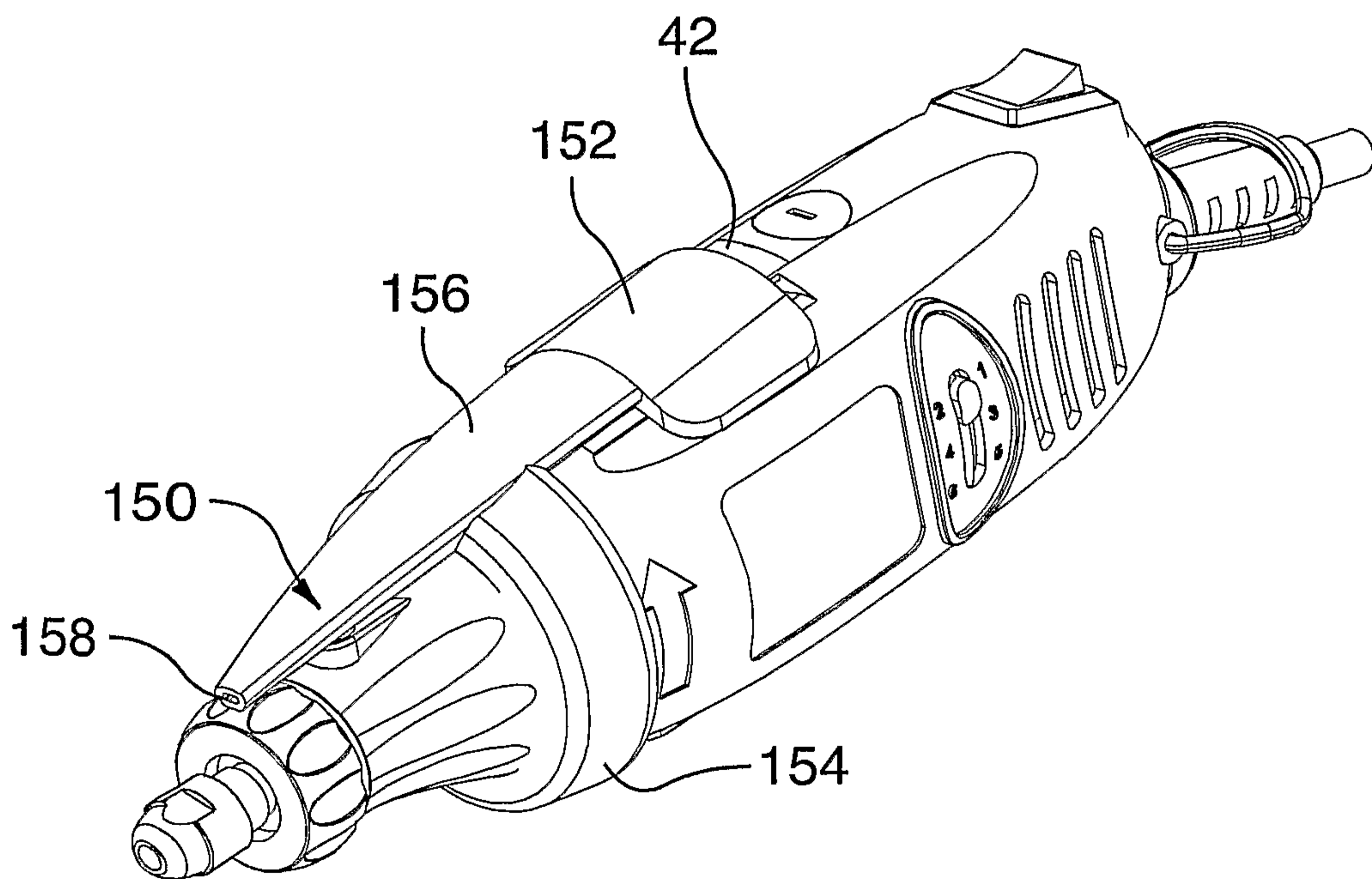


FIG.12

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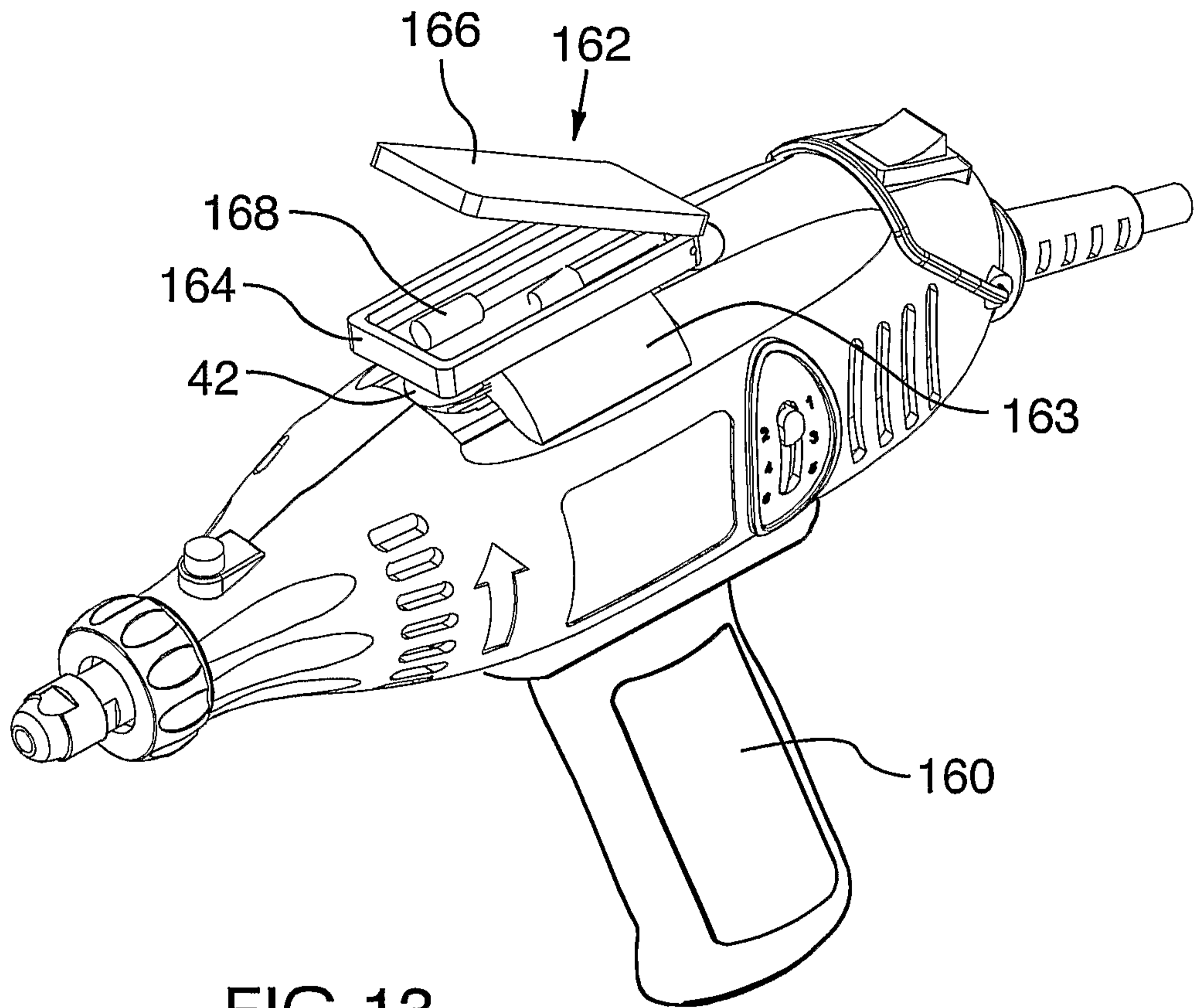


FIG. 13

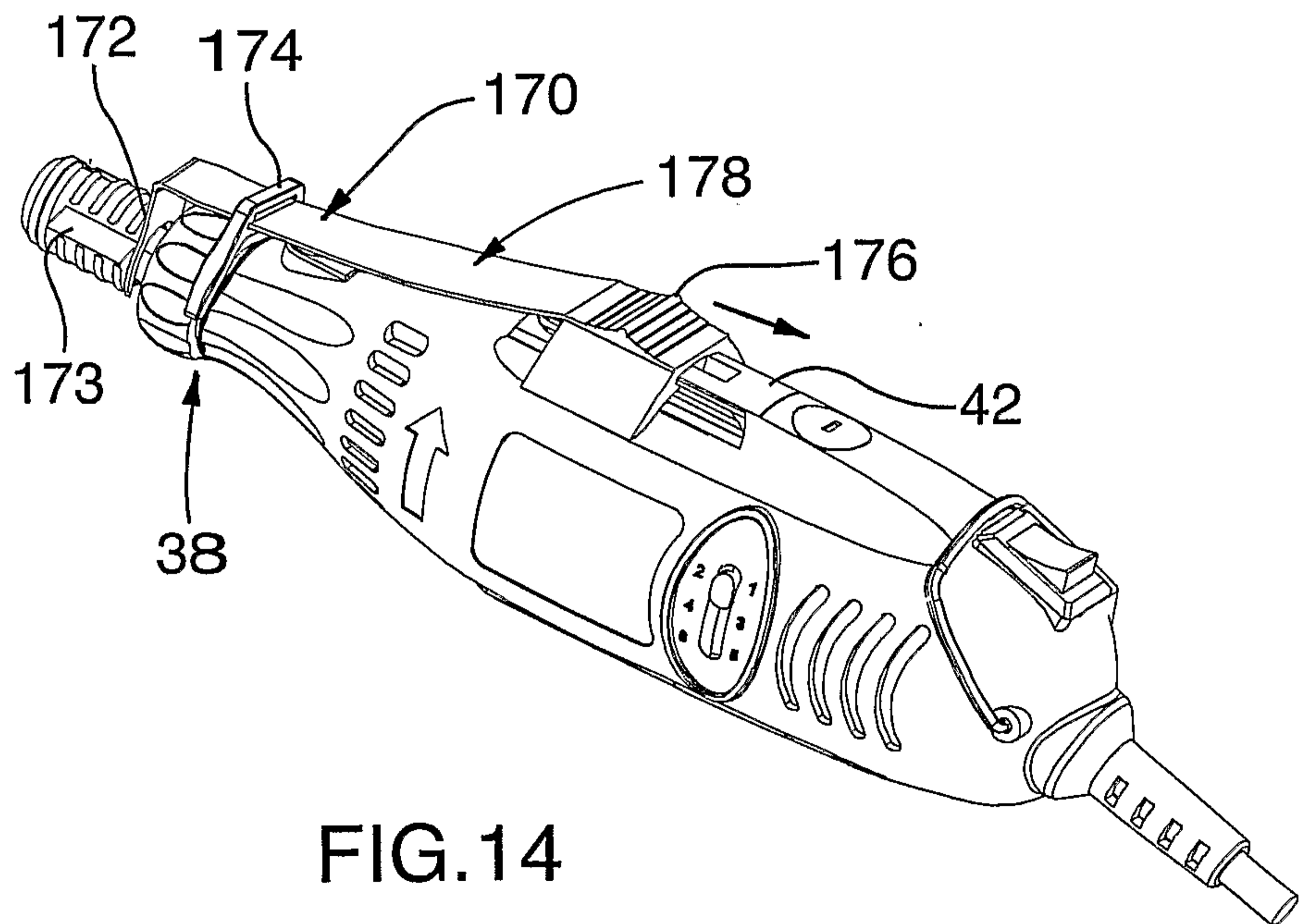


FIG. 14

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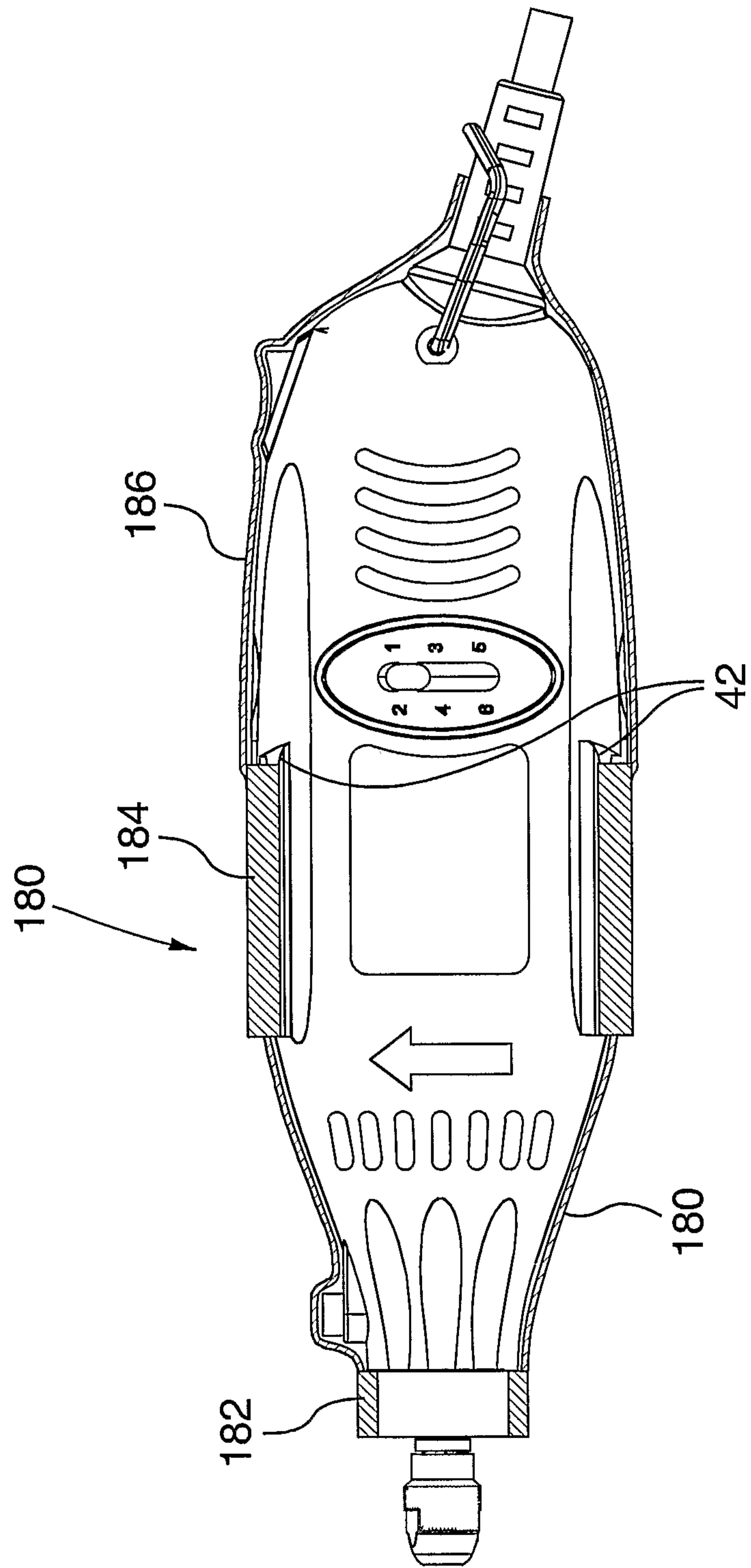


FIG 15

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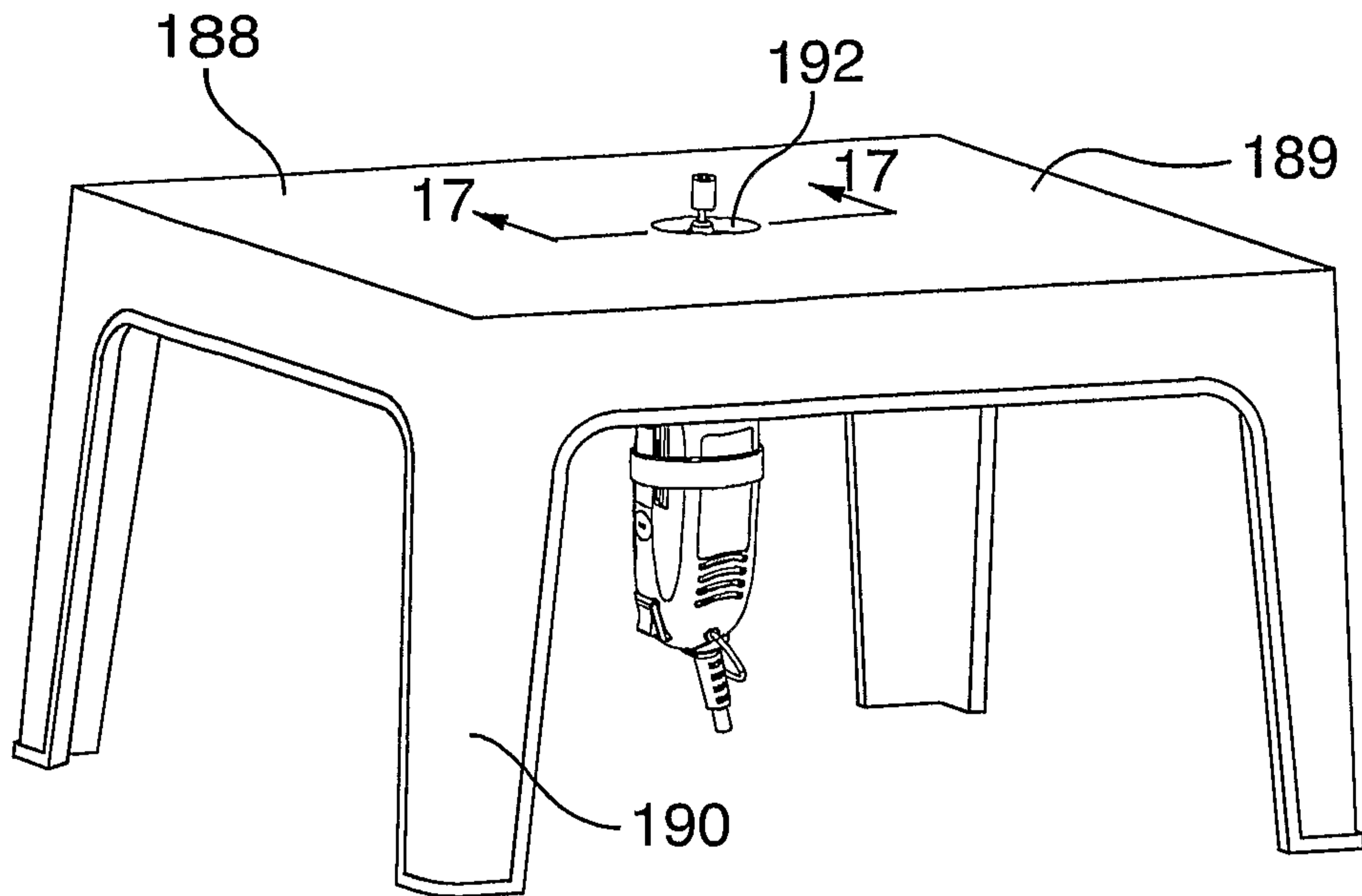


FIG. 16

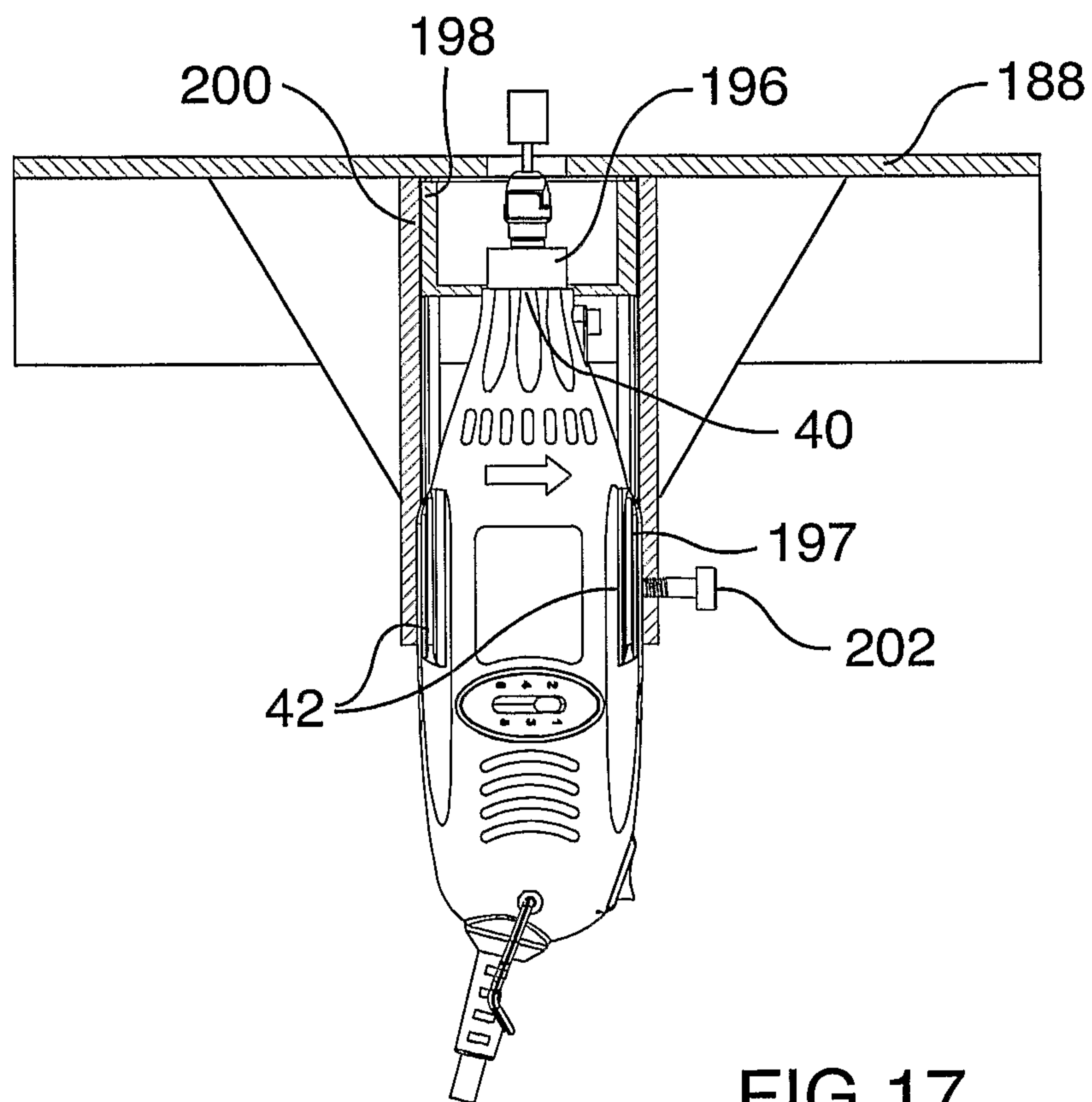


FIG. 17

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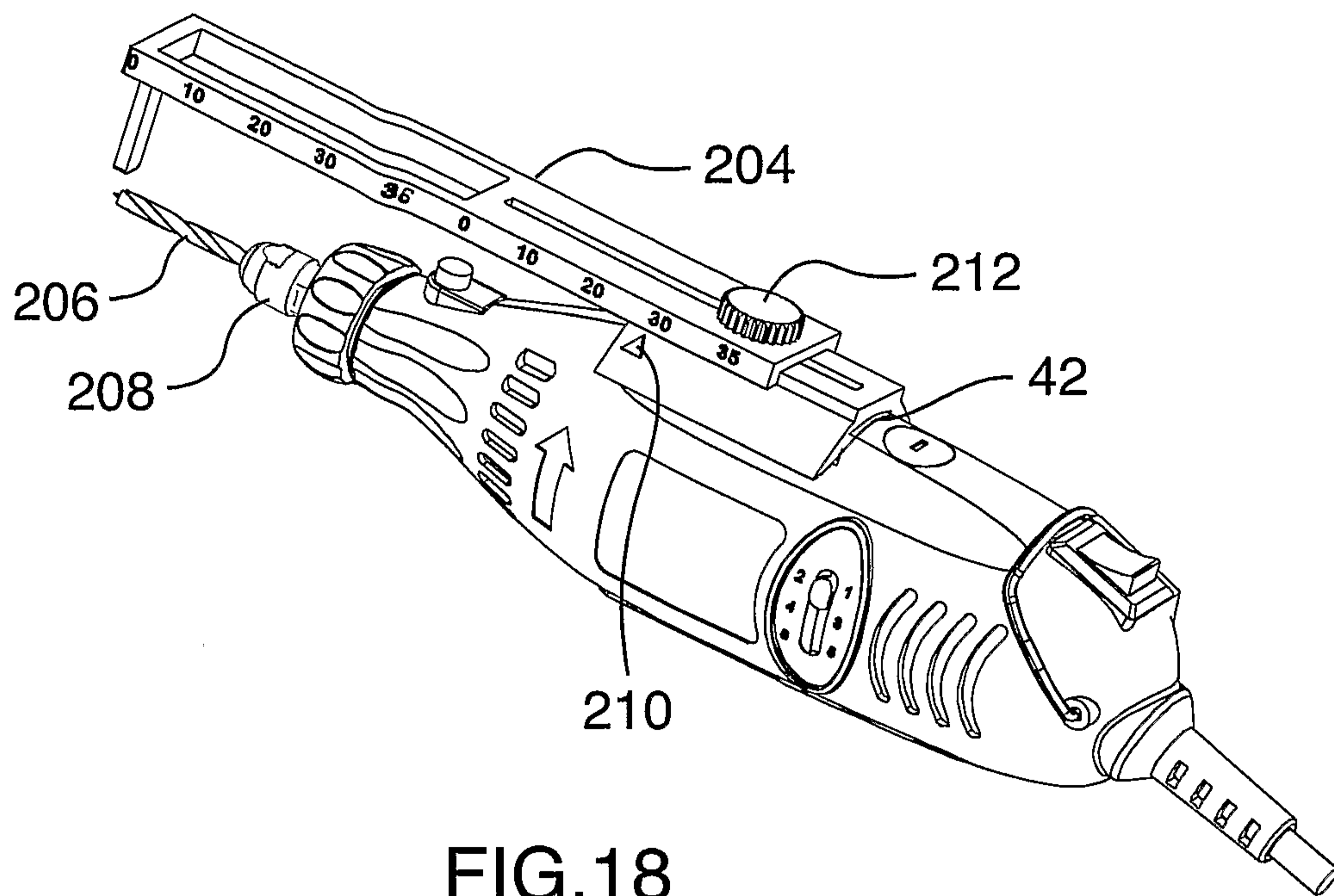


FIG. 18

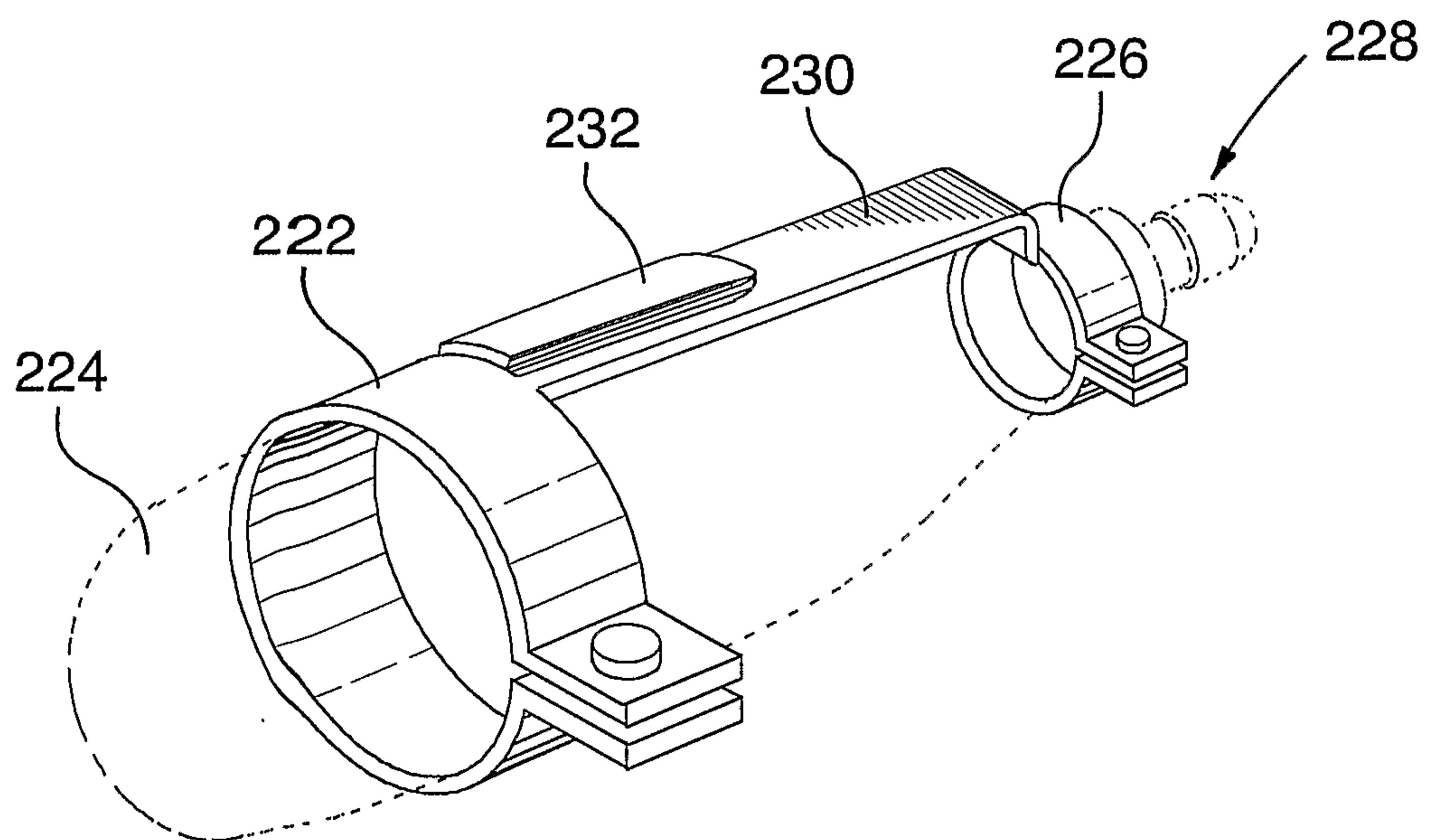


FIG. 19

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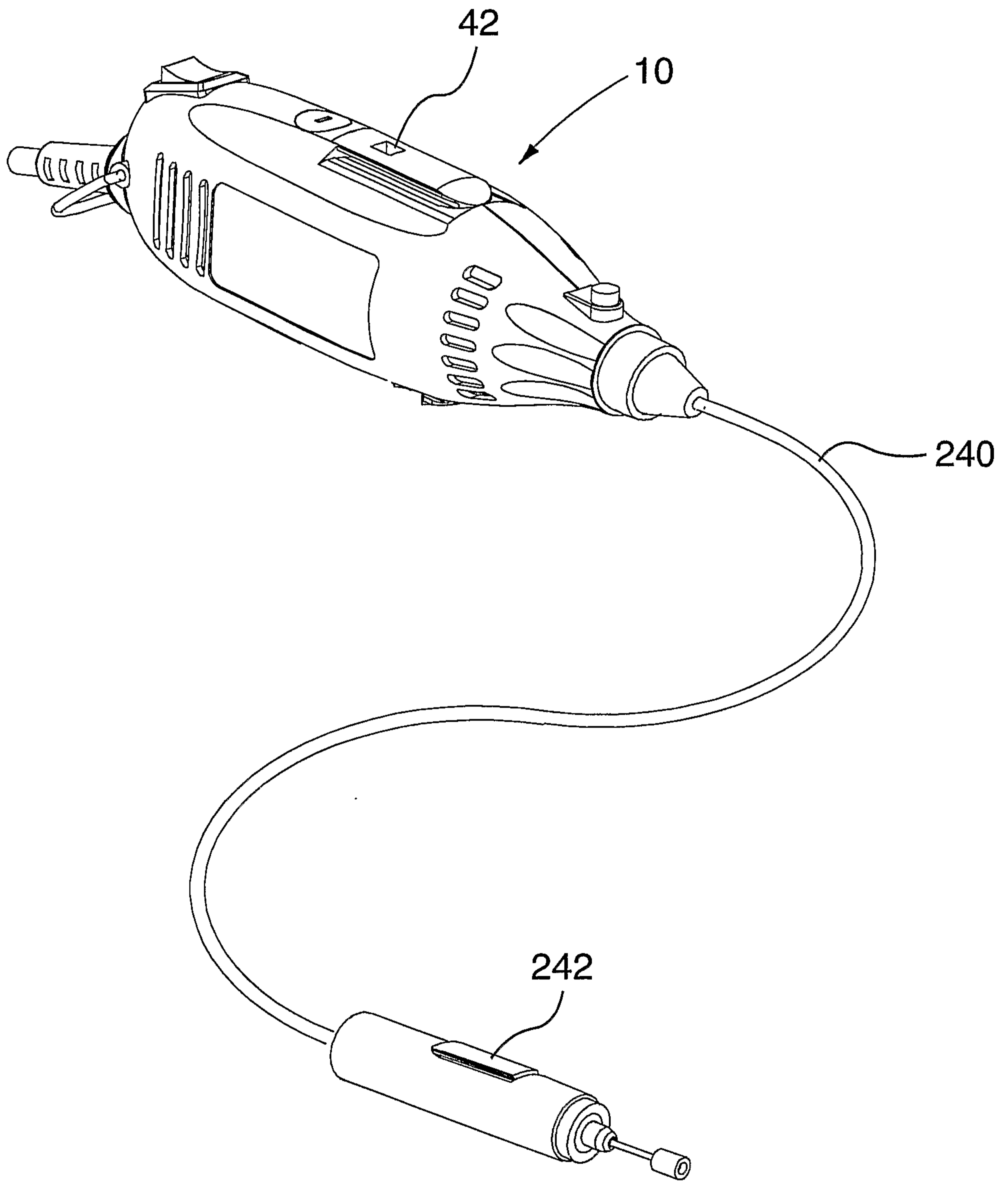


FIG.20

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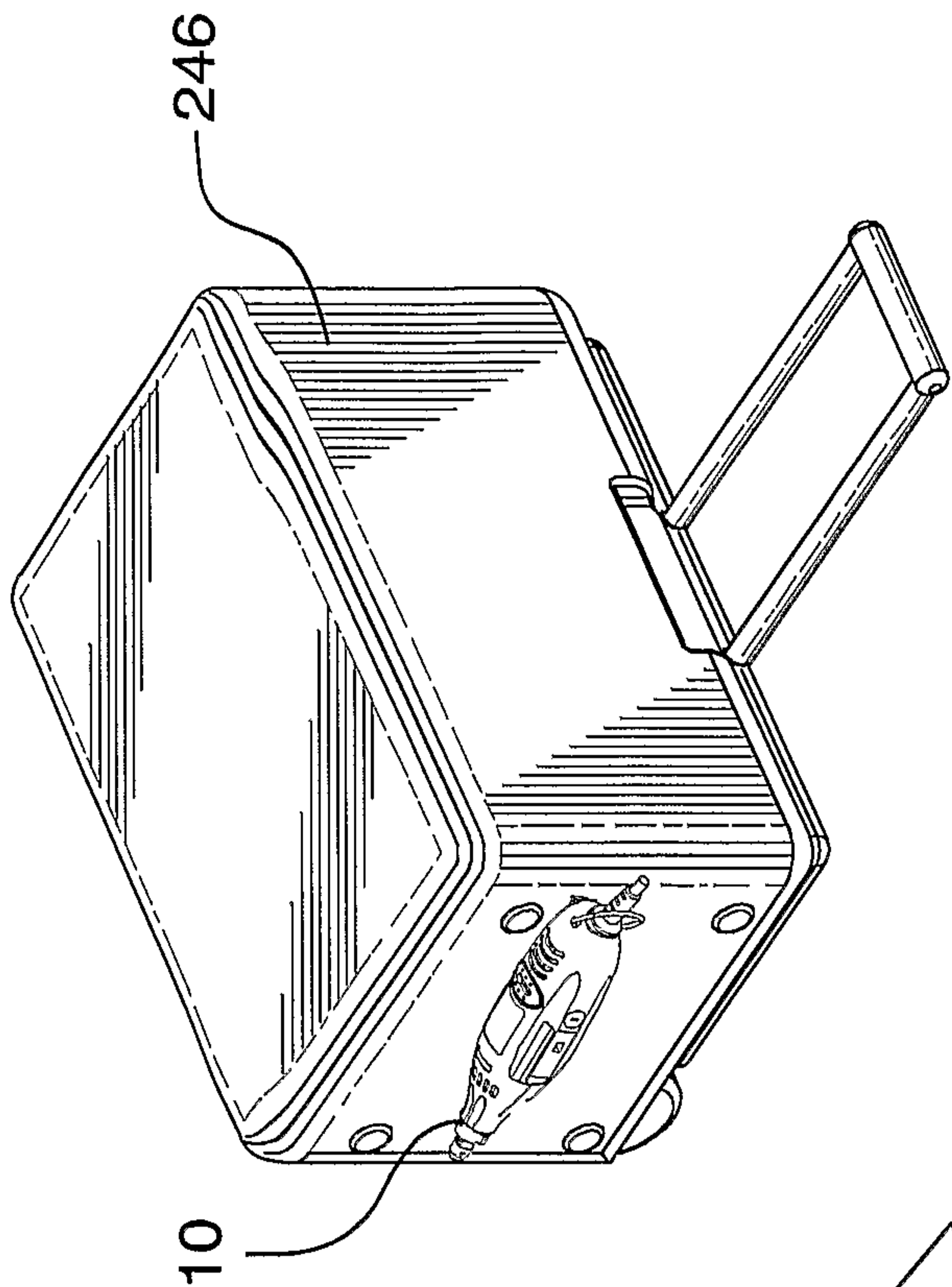


FIG. 22

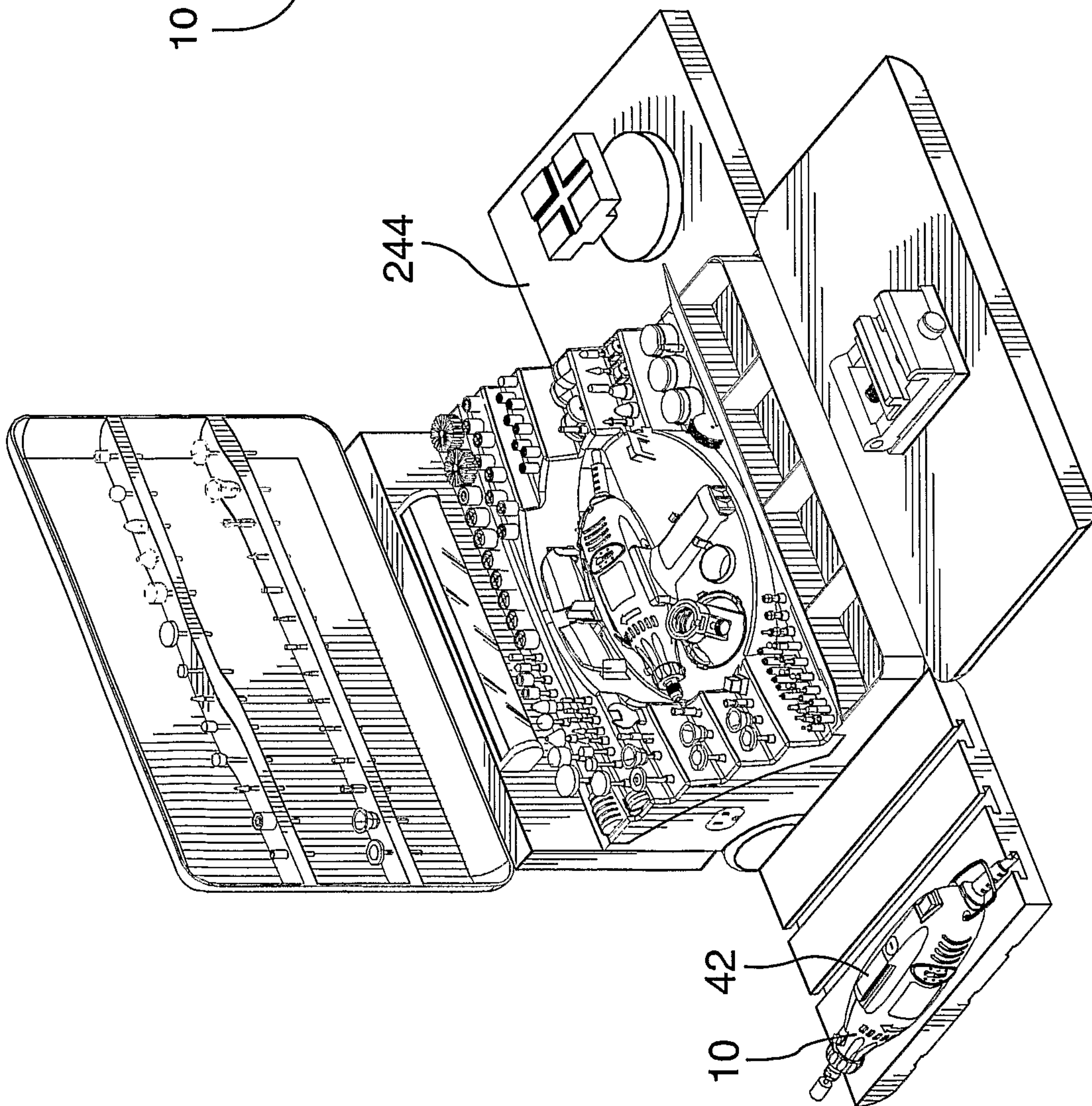


FIG. 21

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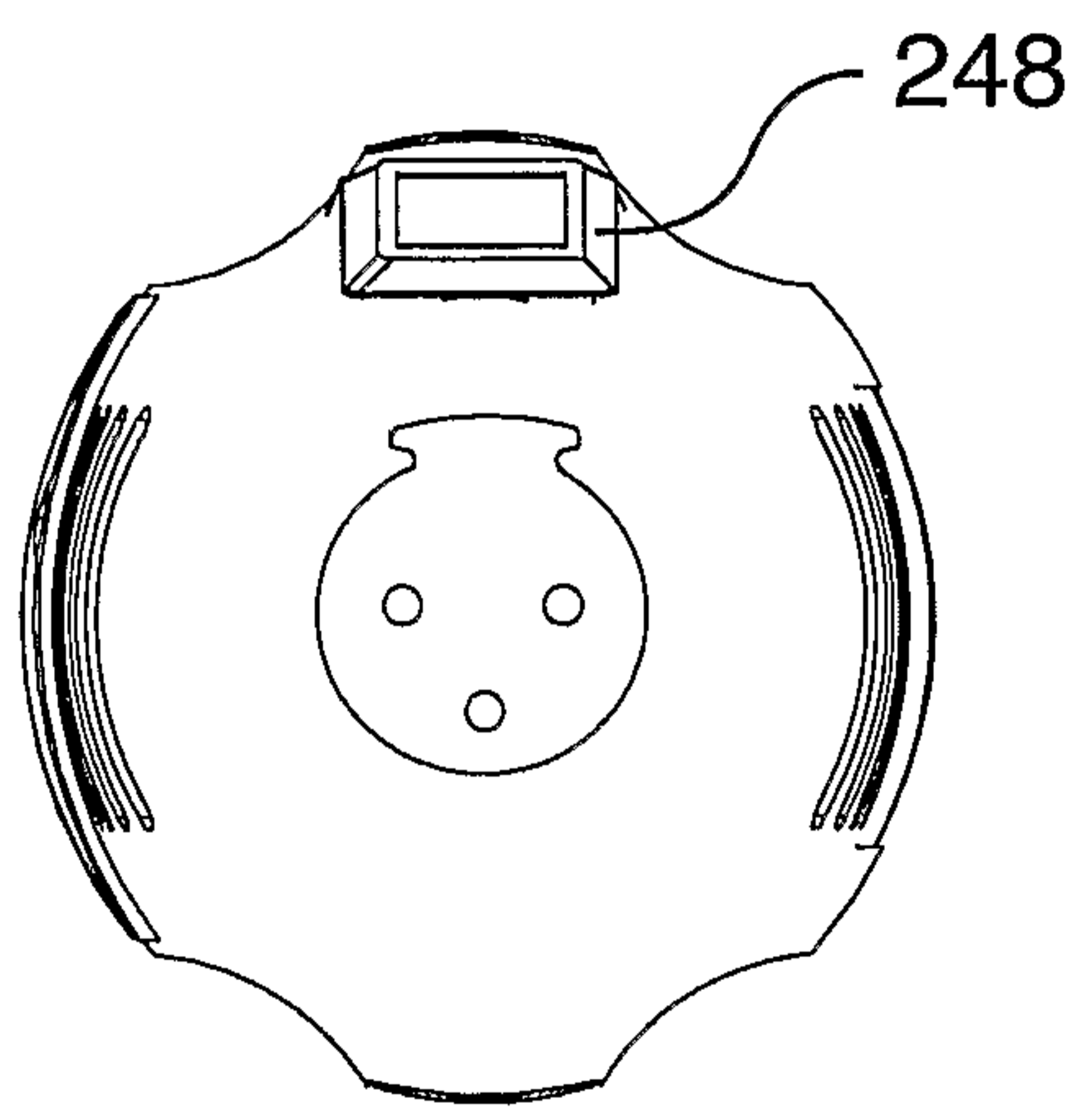
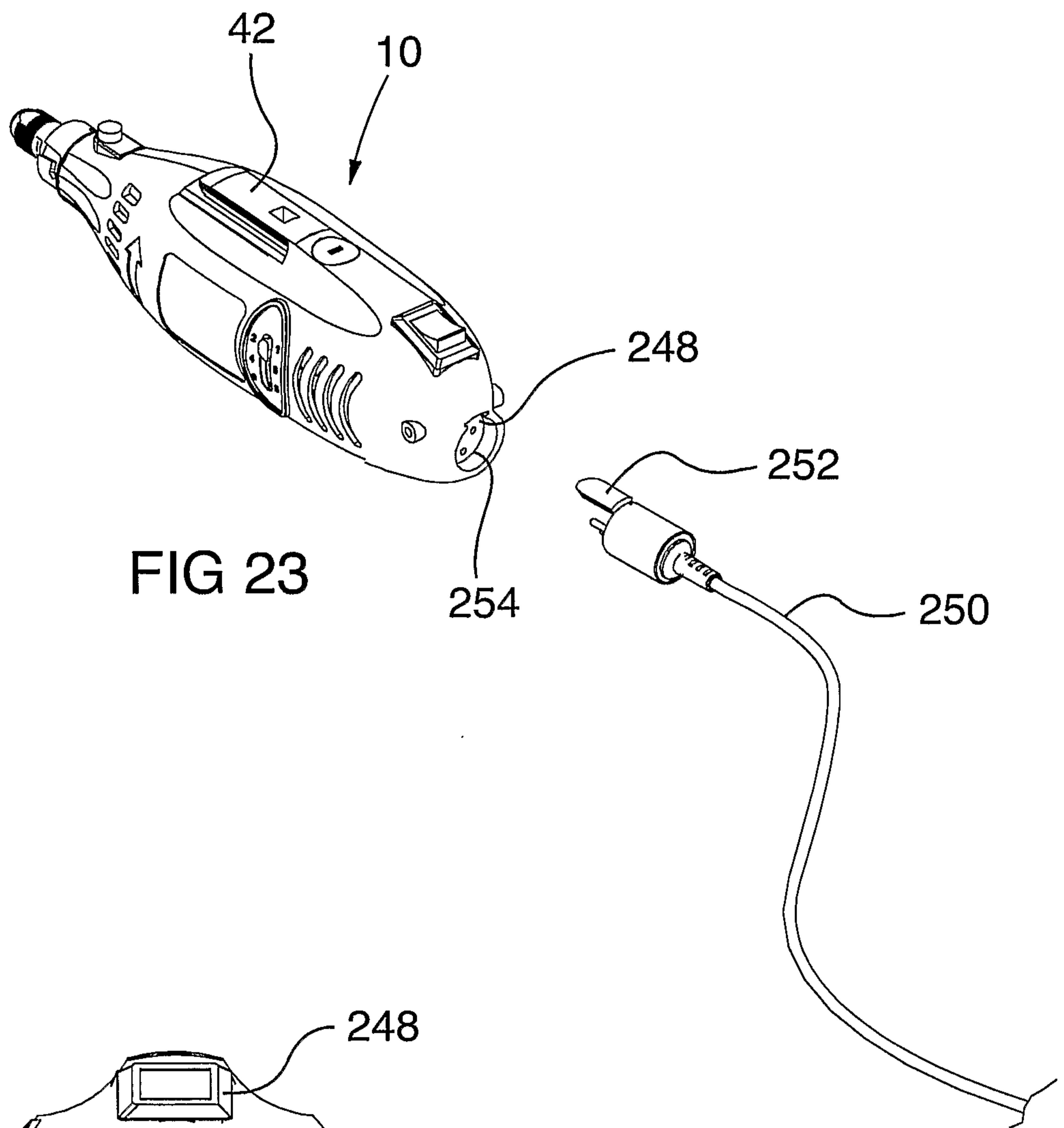


FIG 24

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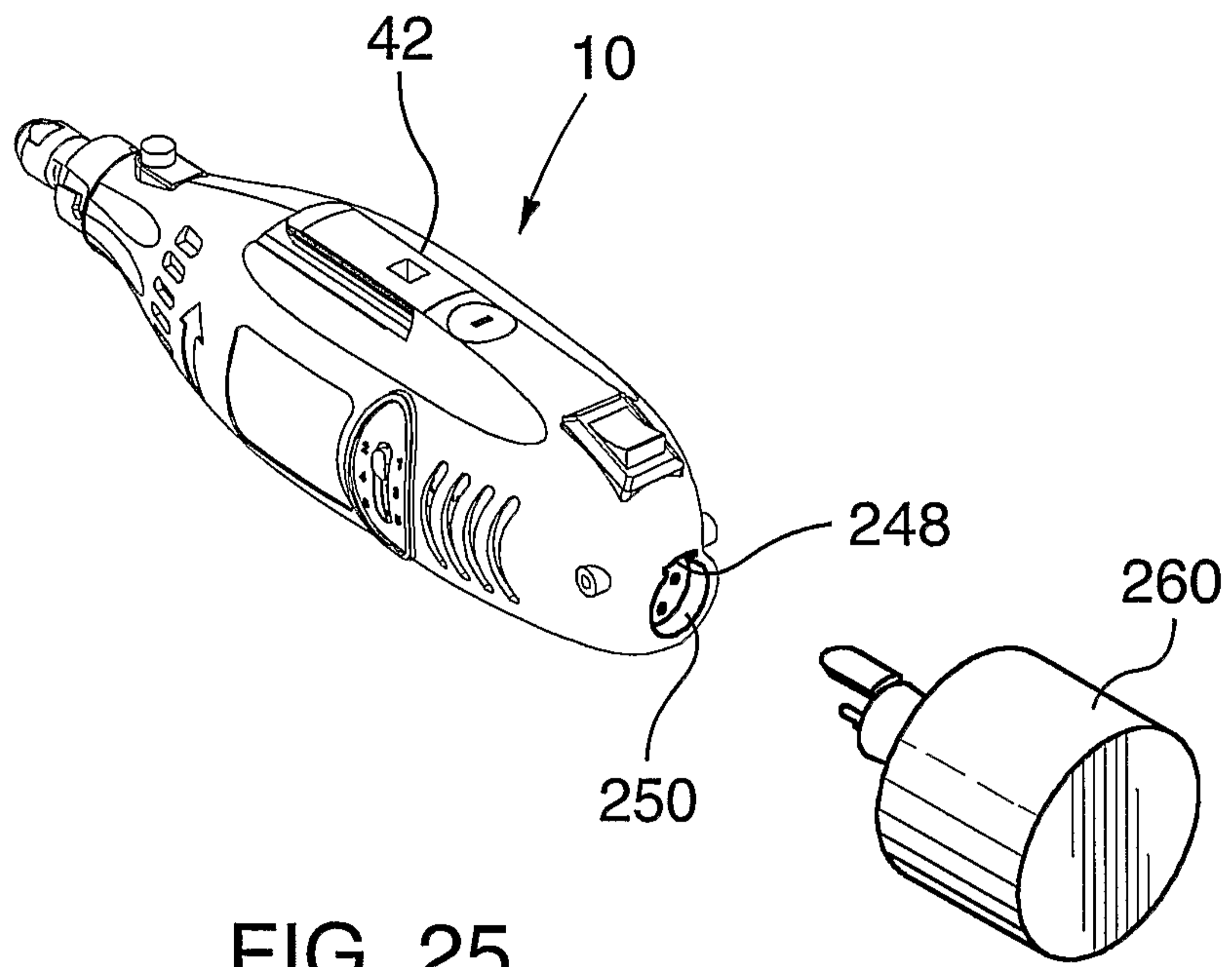


FIG. 25

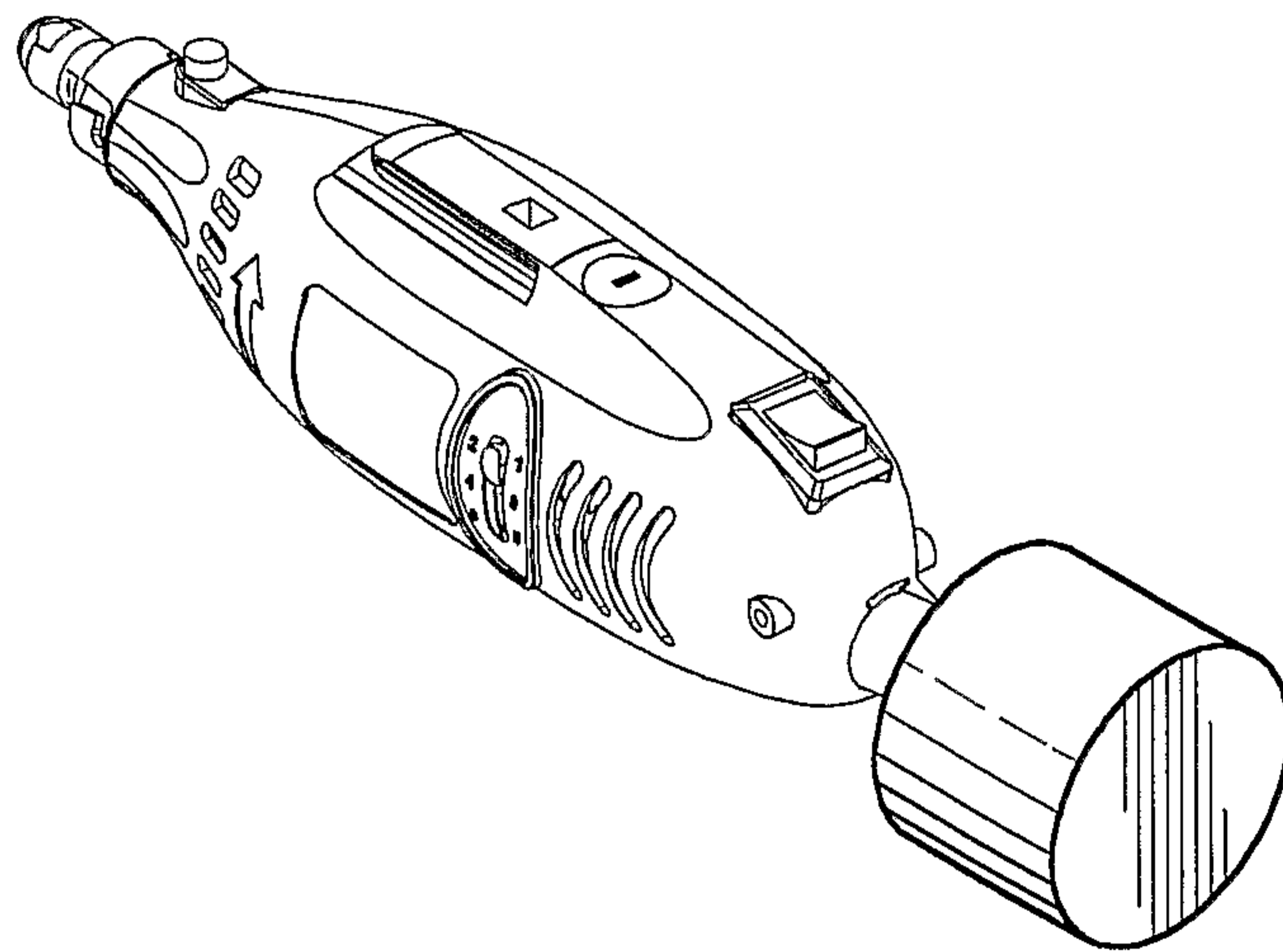


FIG. 26

