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(54) HANDHELD ADHESIVE APPLICATOR

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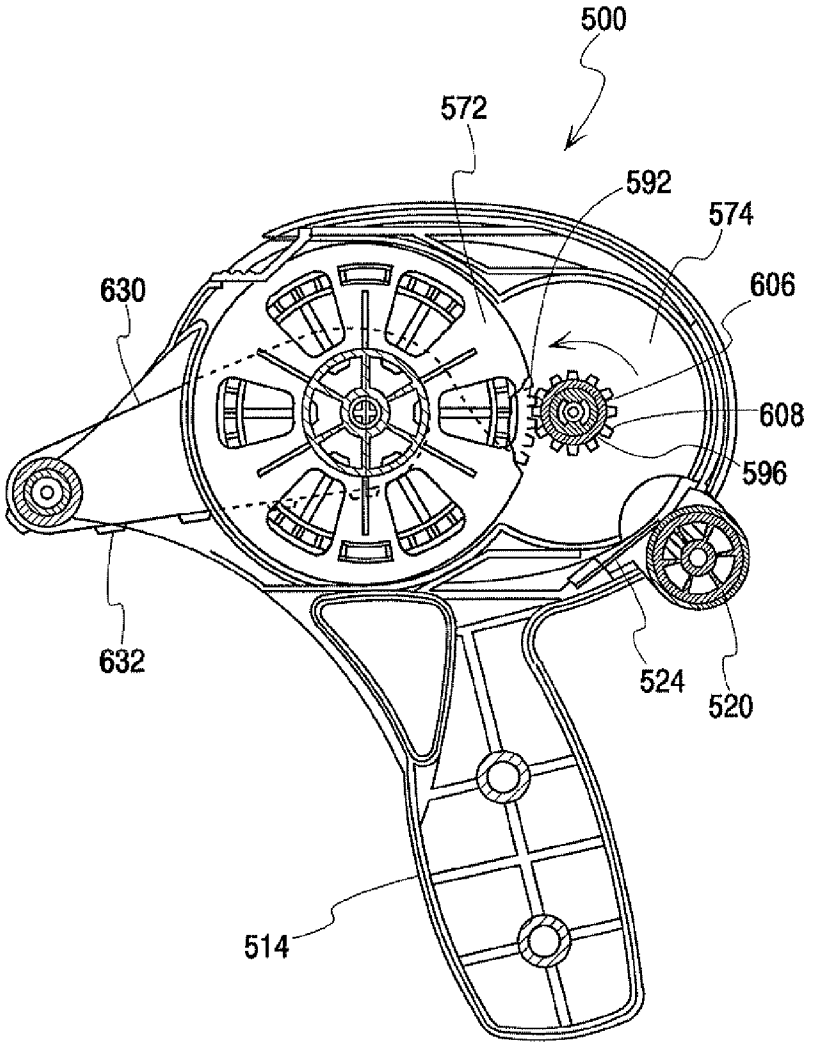
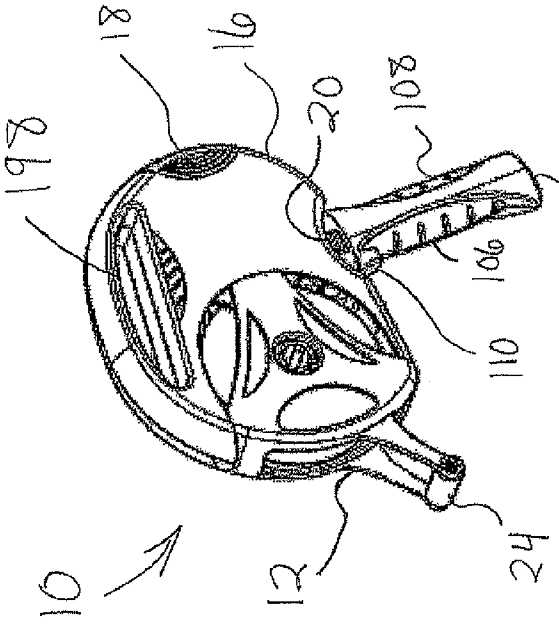
(57) **ABSTRACT**

A handheld adhesive applicator is provided with a housing assembly, a cartridge assembly removably connected to the housing assembly, and a handle assembly removably connected to the housing assembly. The cartridge assembly includes a primary spool for mounting an adhesive segment roll and a secondary spool for automatically winding a spent portion of the adhesive segment roll. A gear arrangement allows for numerous adhesive segments to be applied consecutively in a glide-type application or for a single adhesive segment to be accurately applied using a manual advance feature. The removable handle may be gripped during a primary mode of operation or removed for a secondary mode of operation in which the housing assembly is gripped during use.

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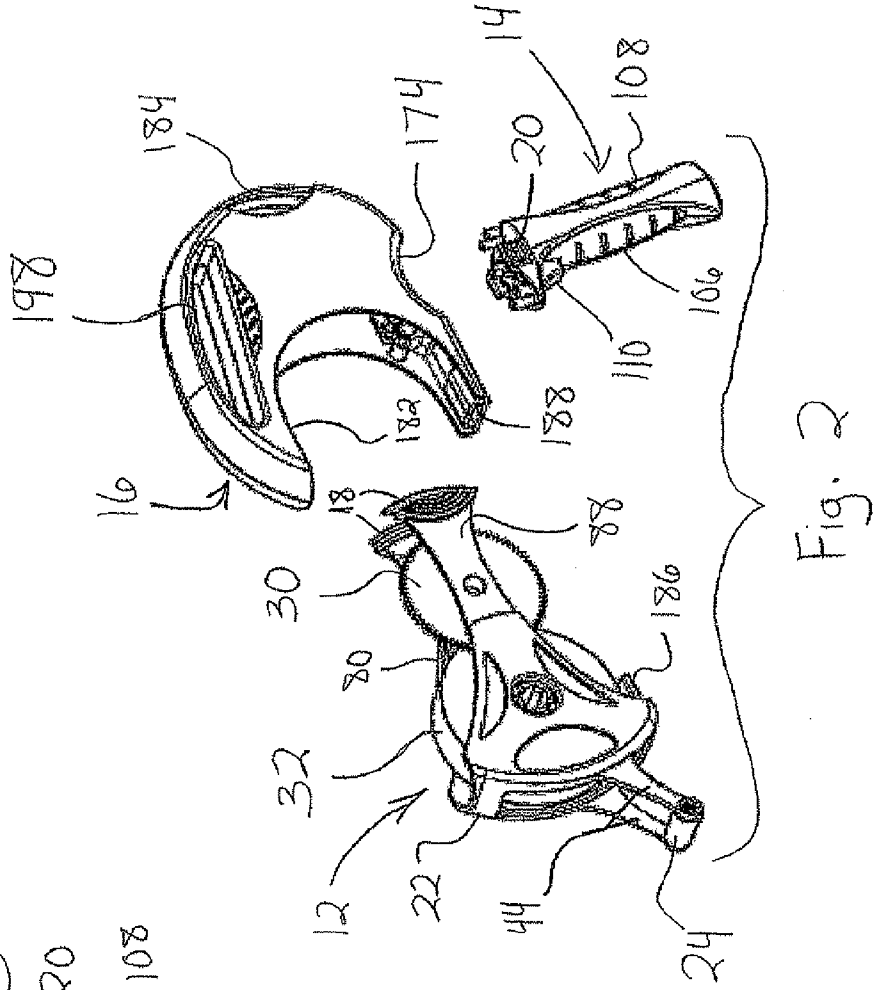
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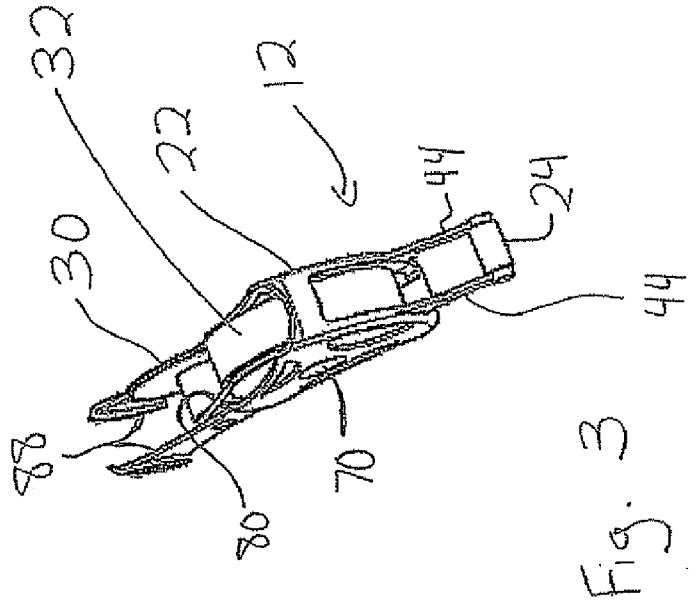
Fig. 2



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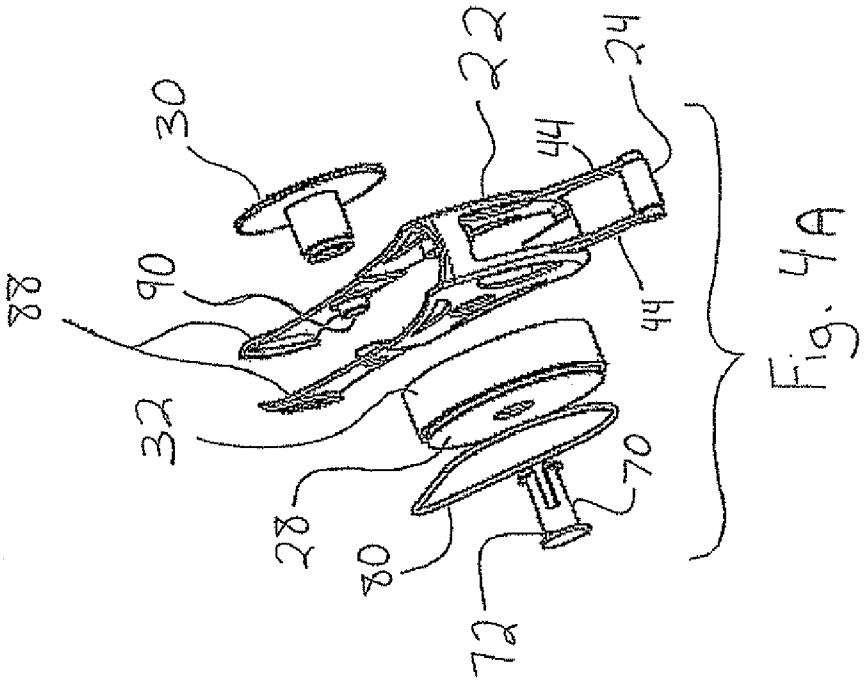

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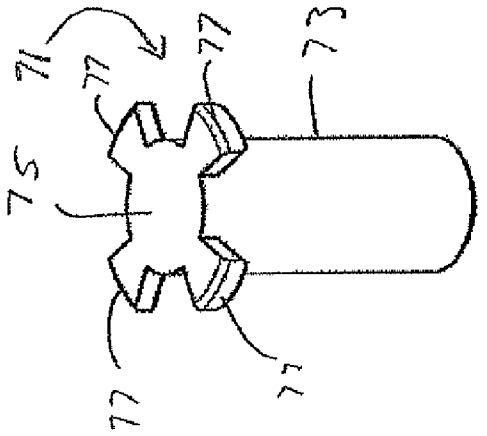

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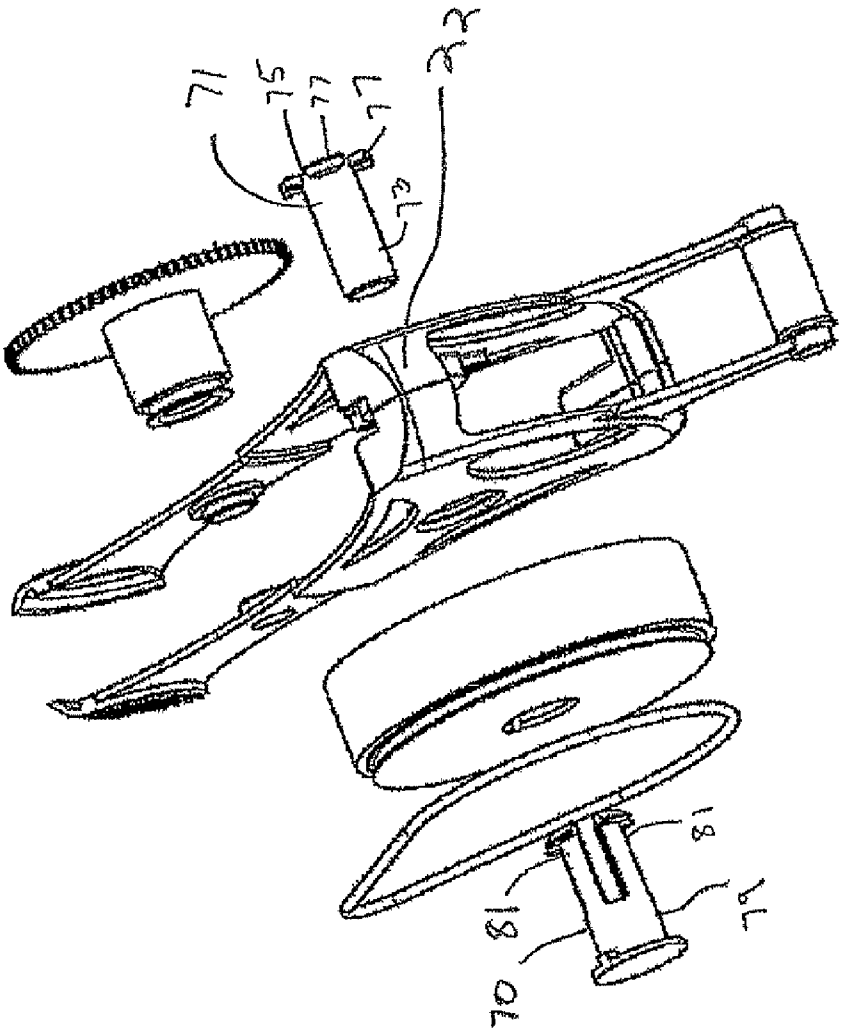

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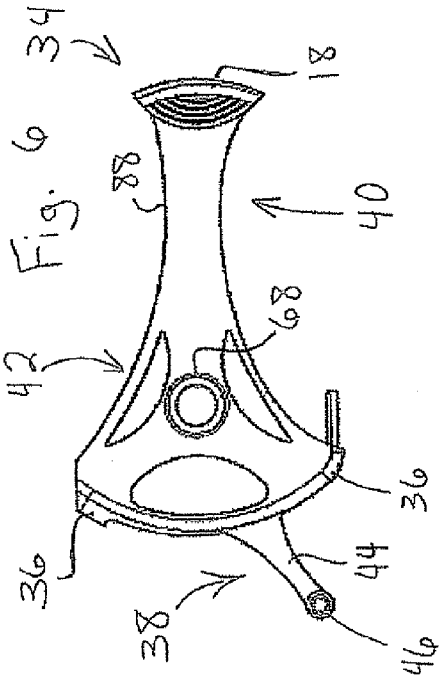

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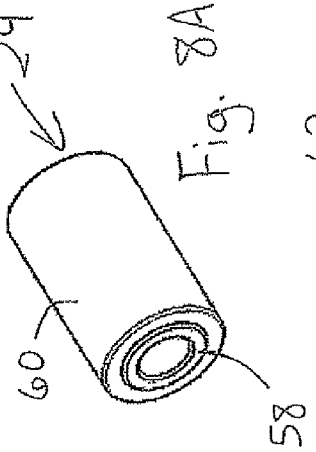

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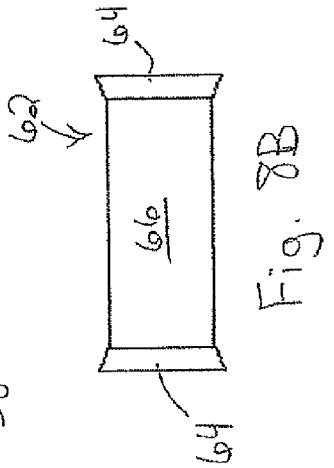

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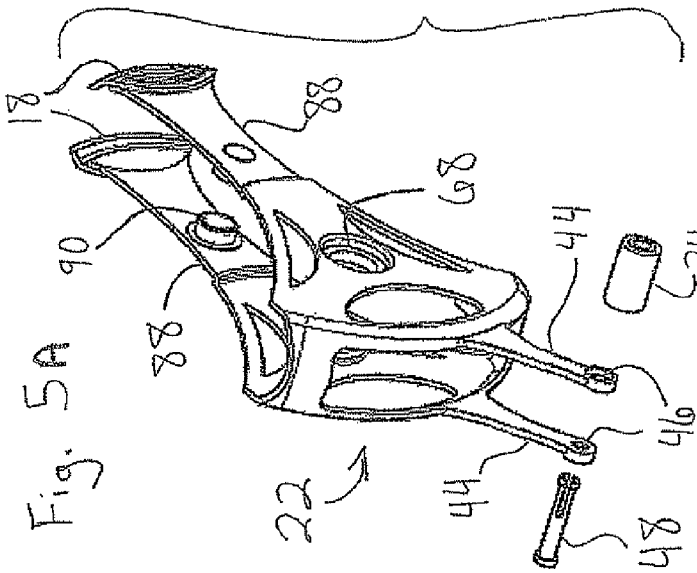

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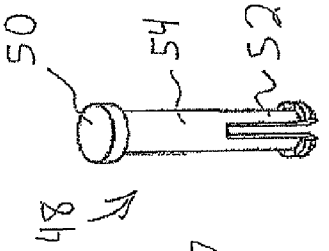

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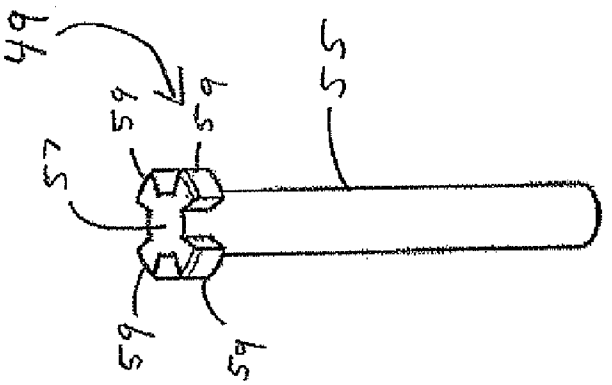

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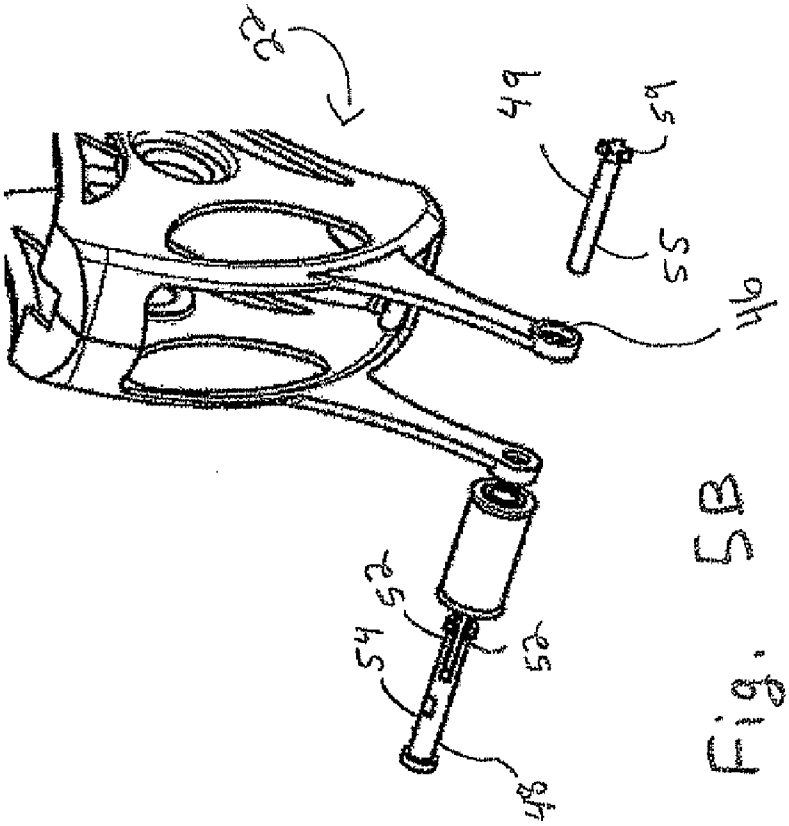

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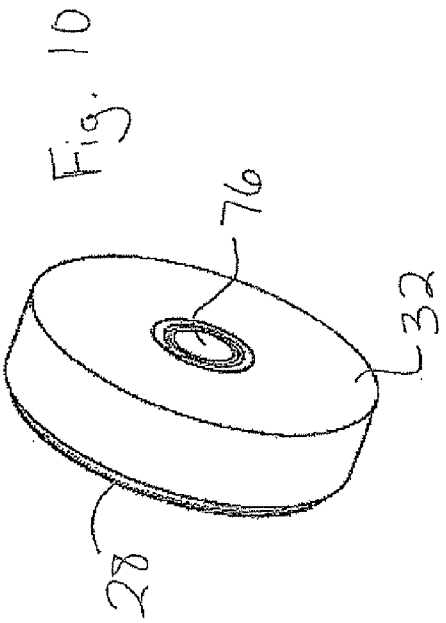

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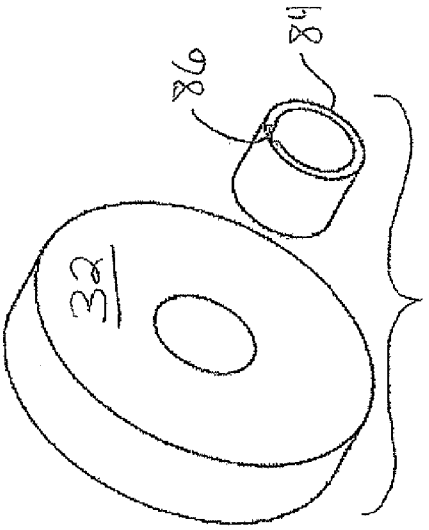

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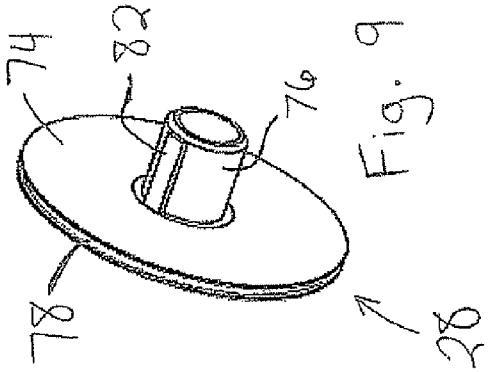

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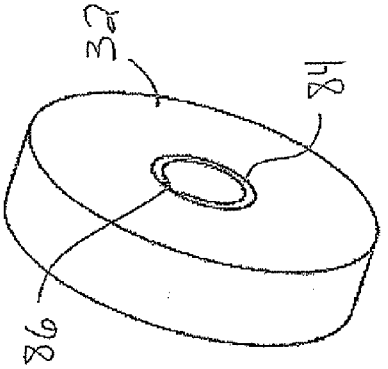

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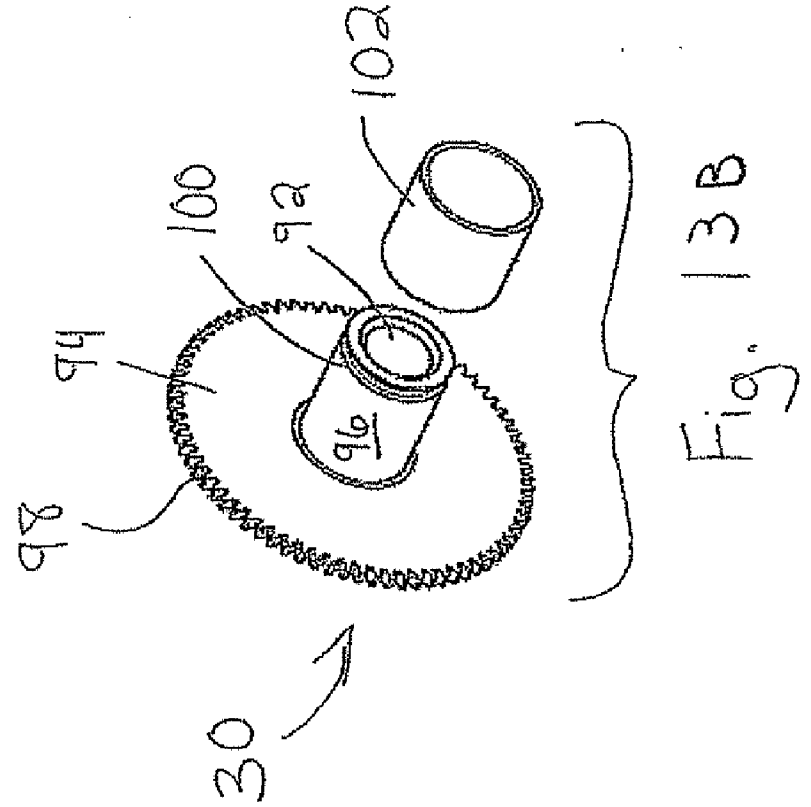

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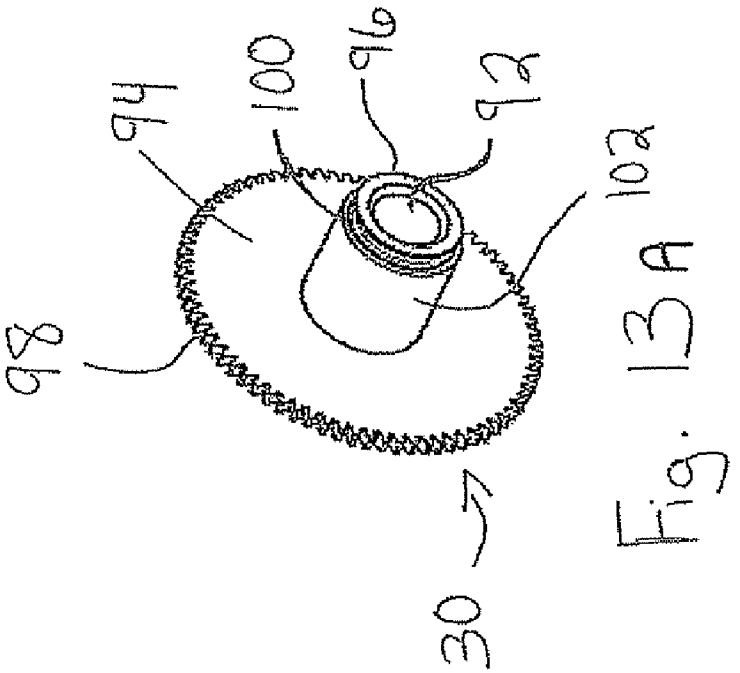

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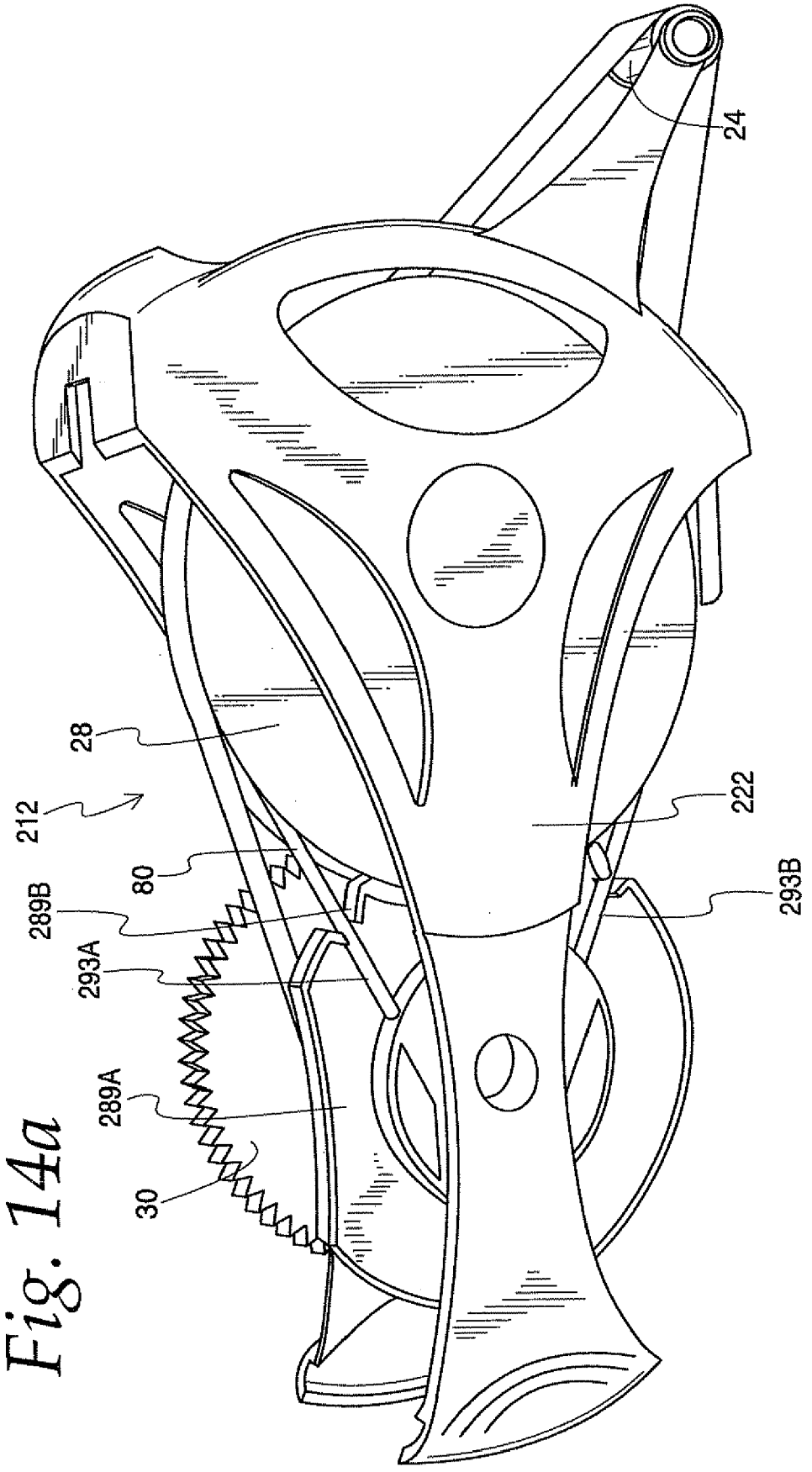

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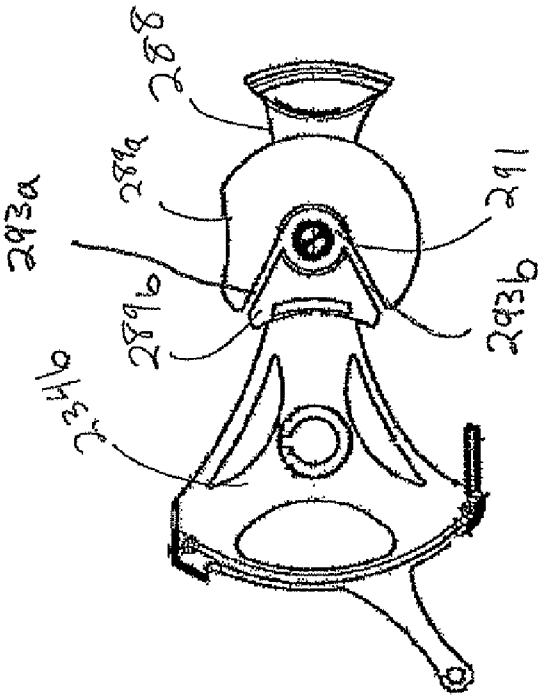

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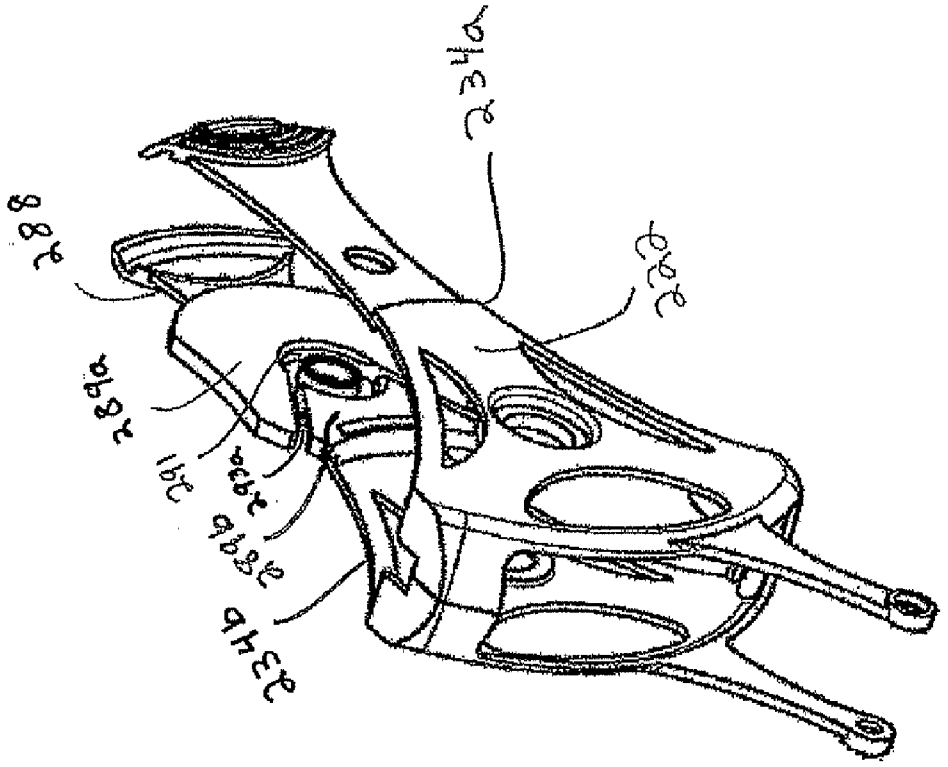

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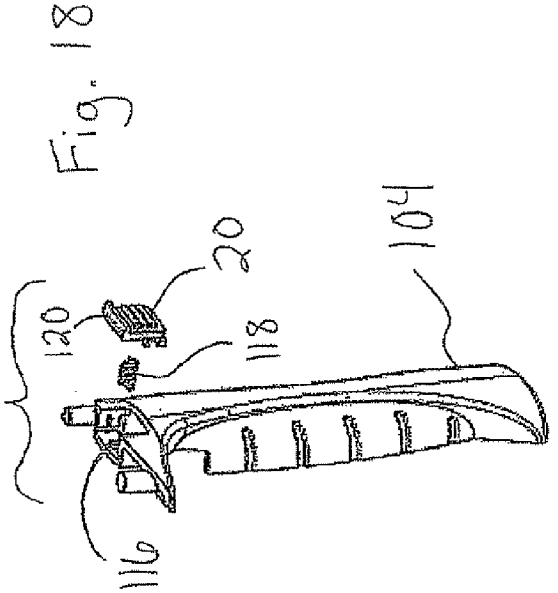

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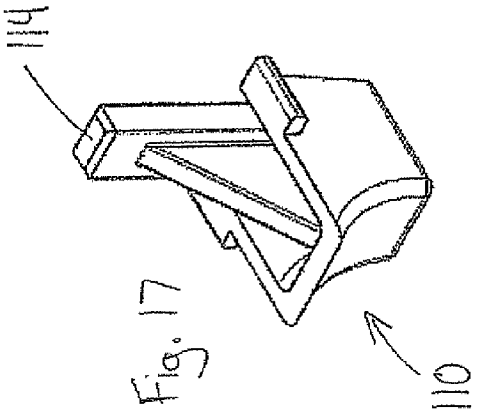

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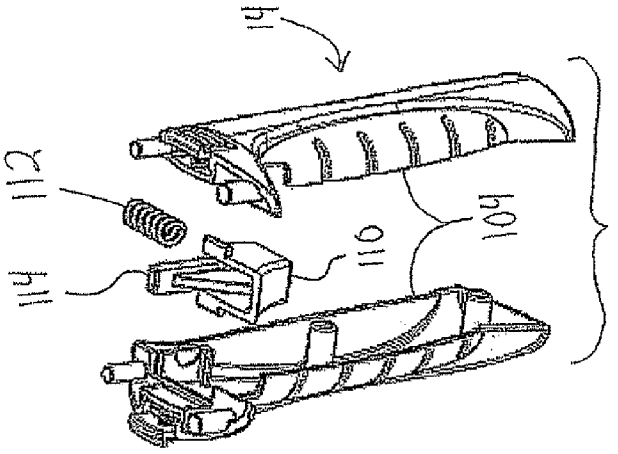

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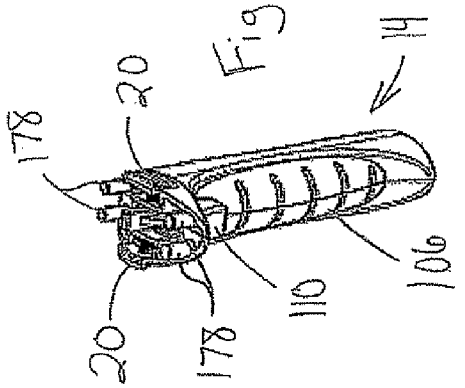

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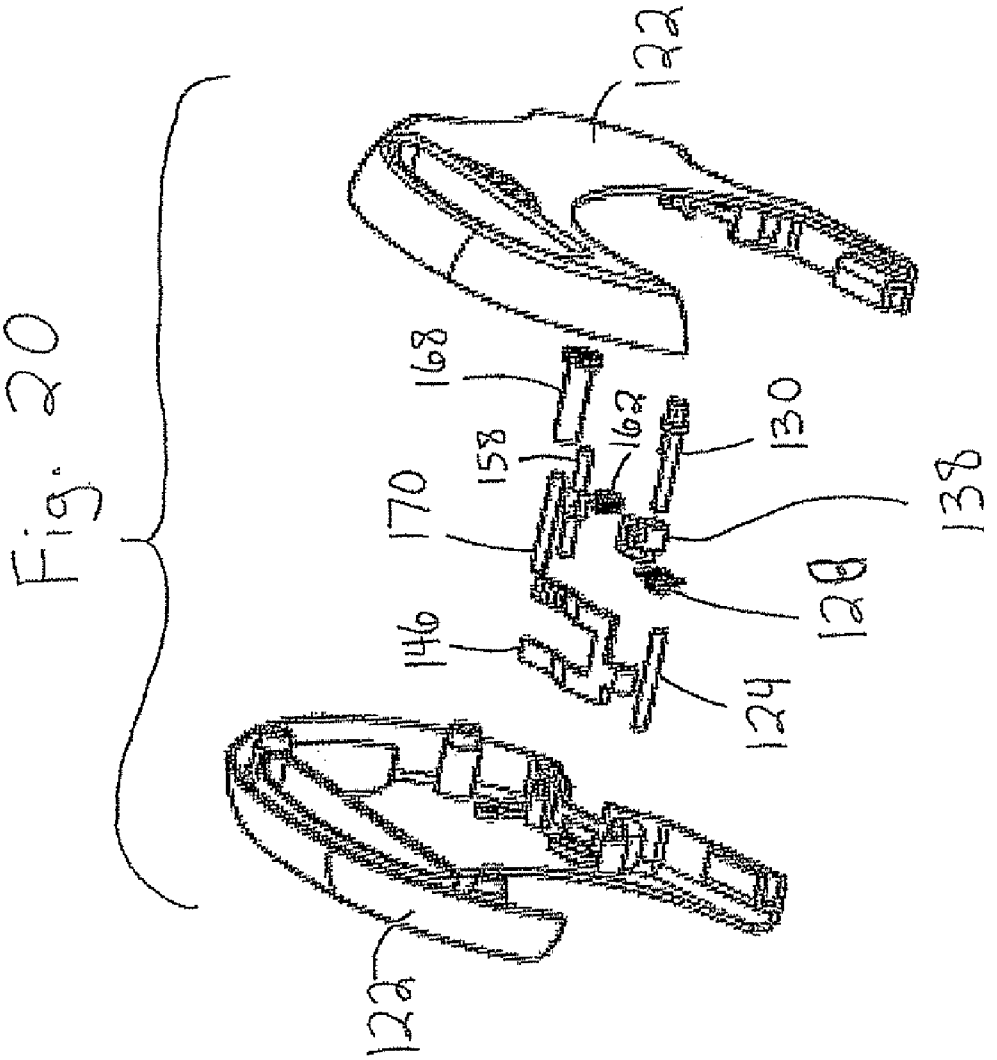

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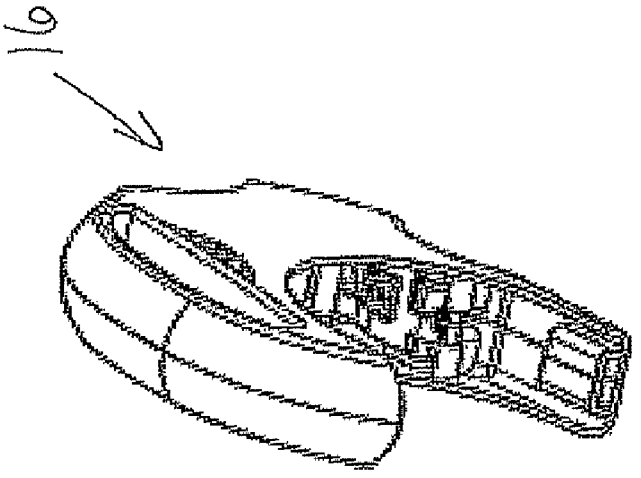

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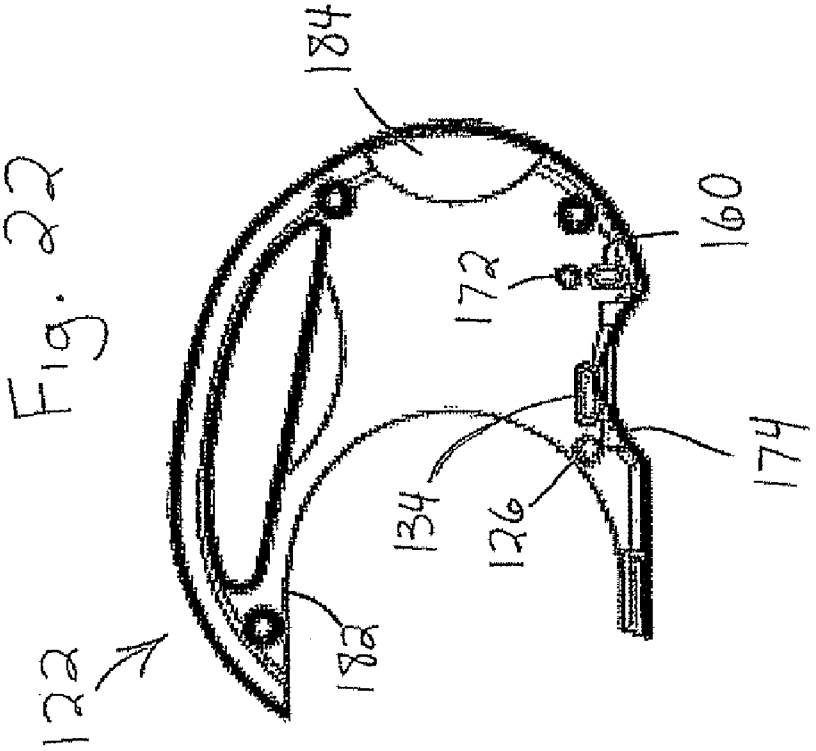

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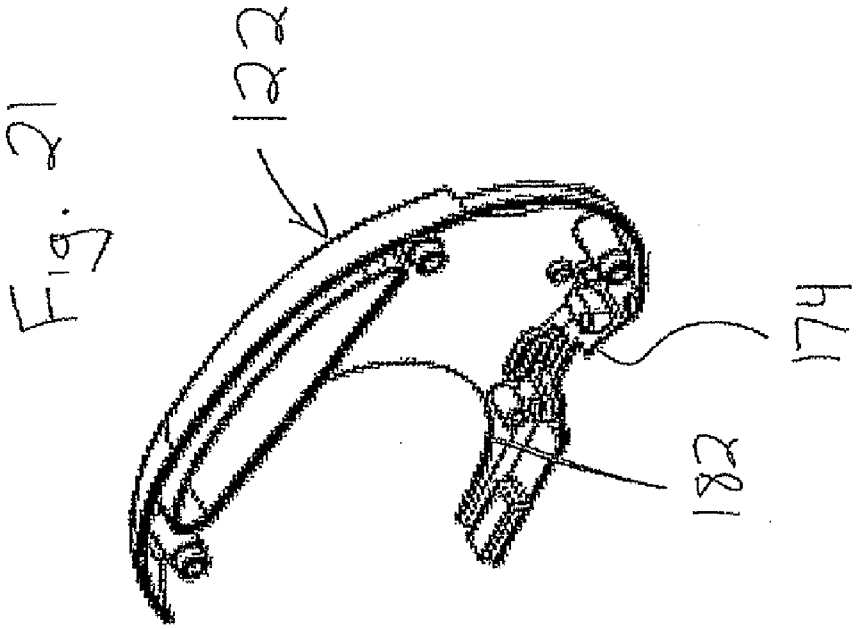

Fig. 21

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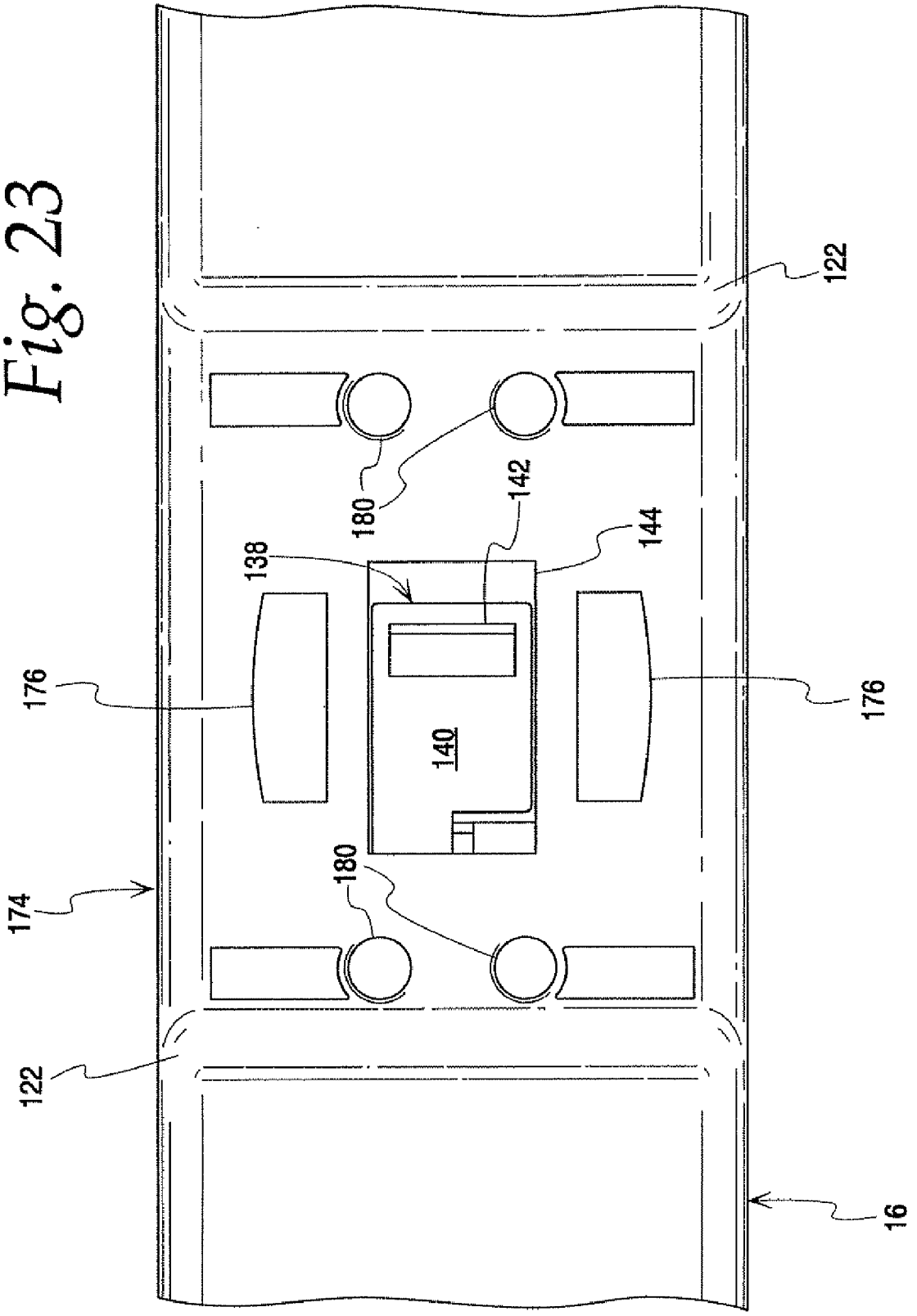

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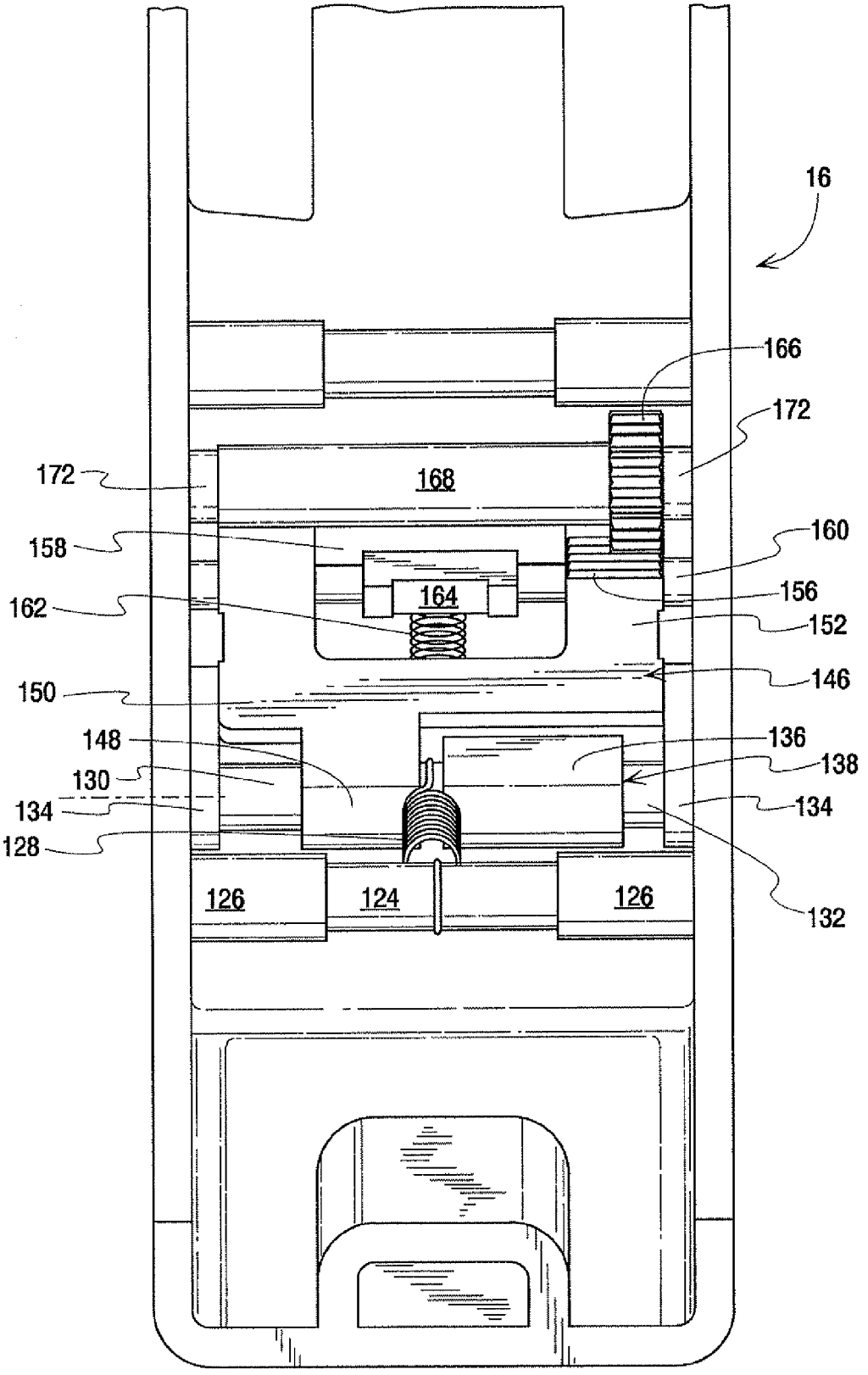
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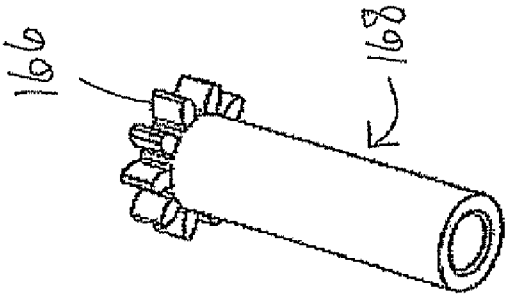

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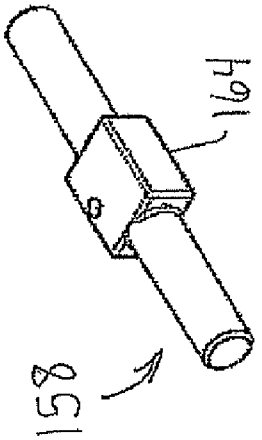

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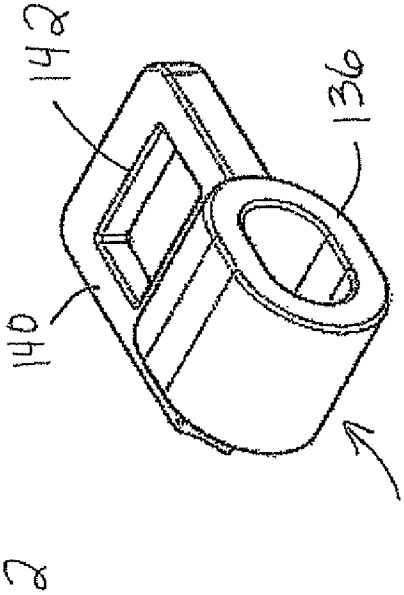

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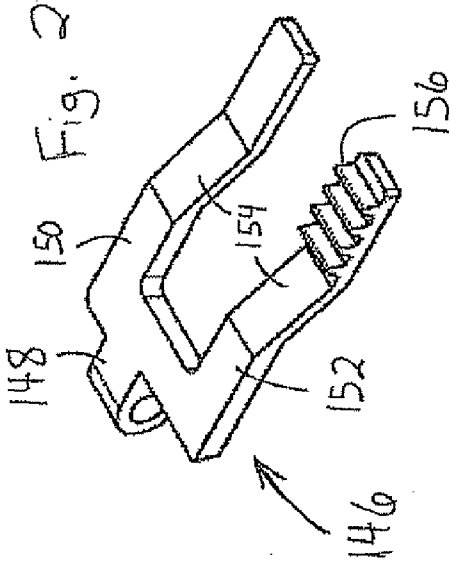

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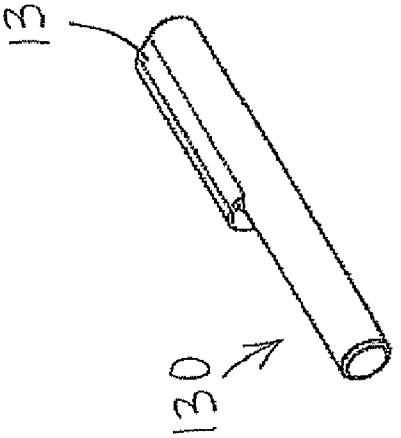

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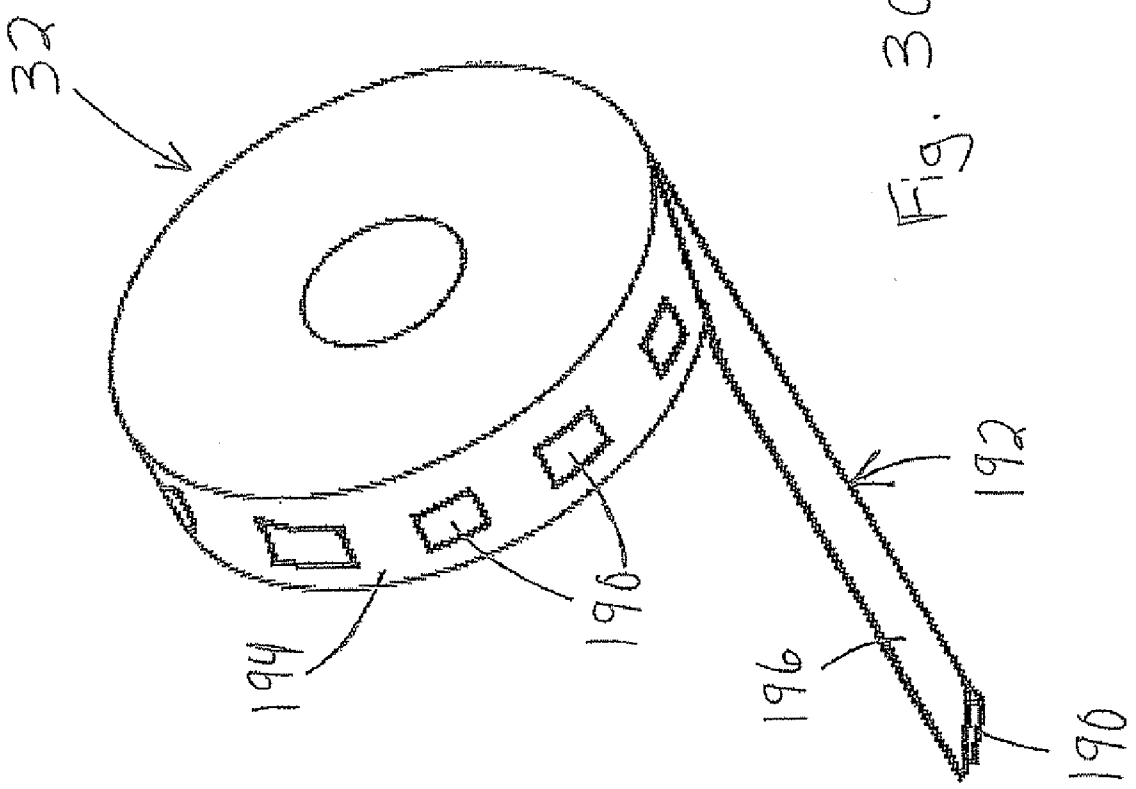

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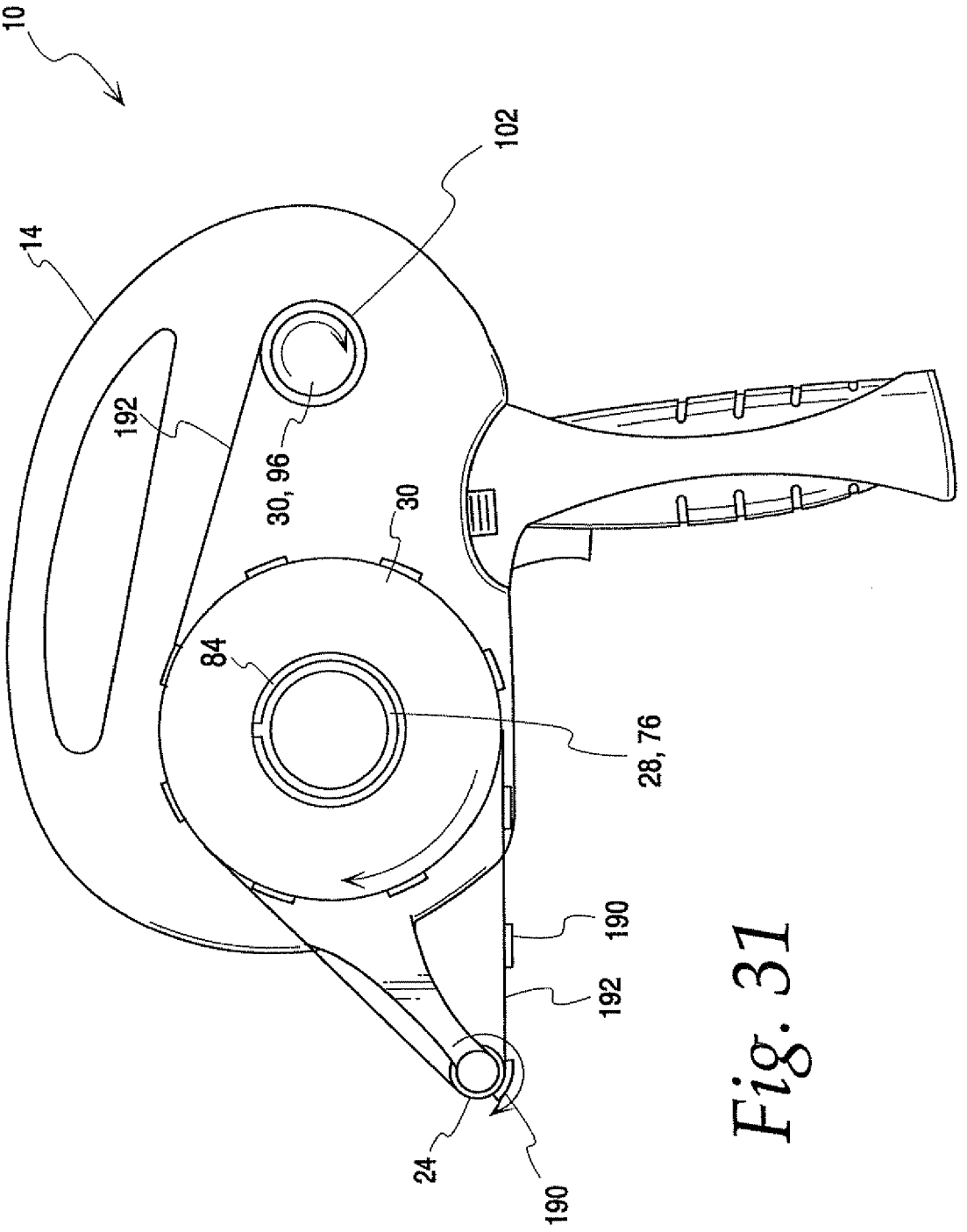

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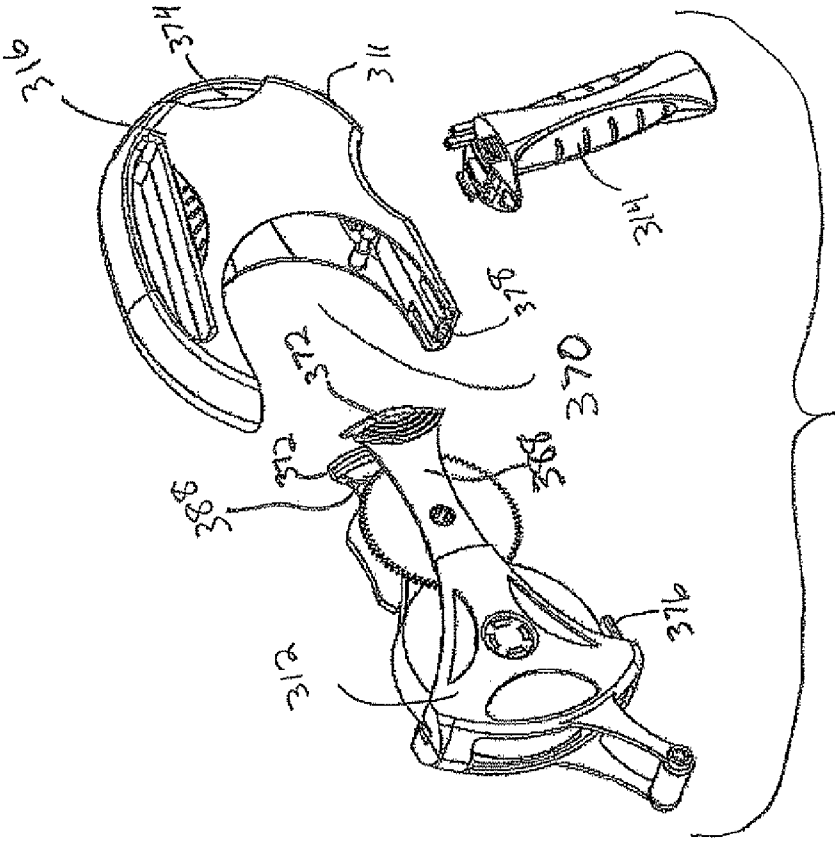

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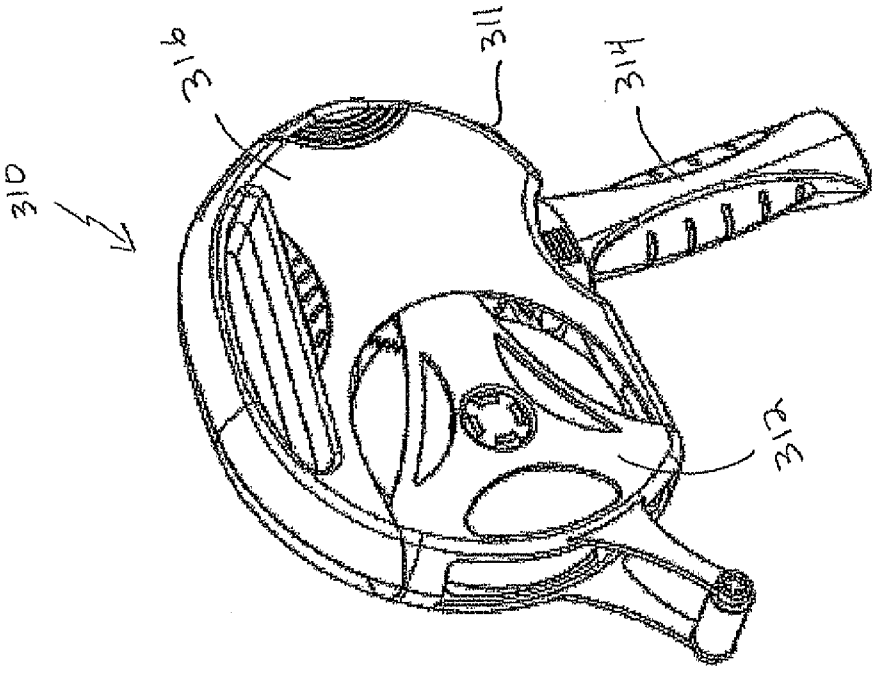

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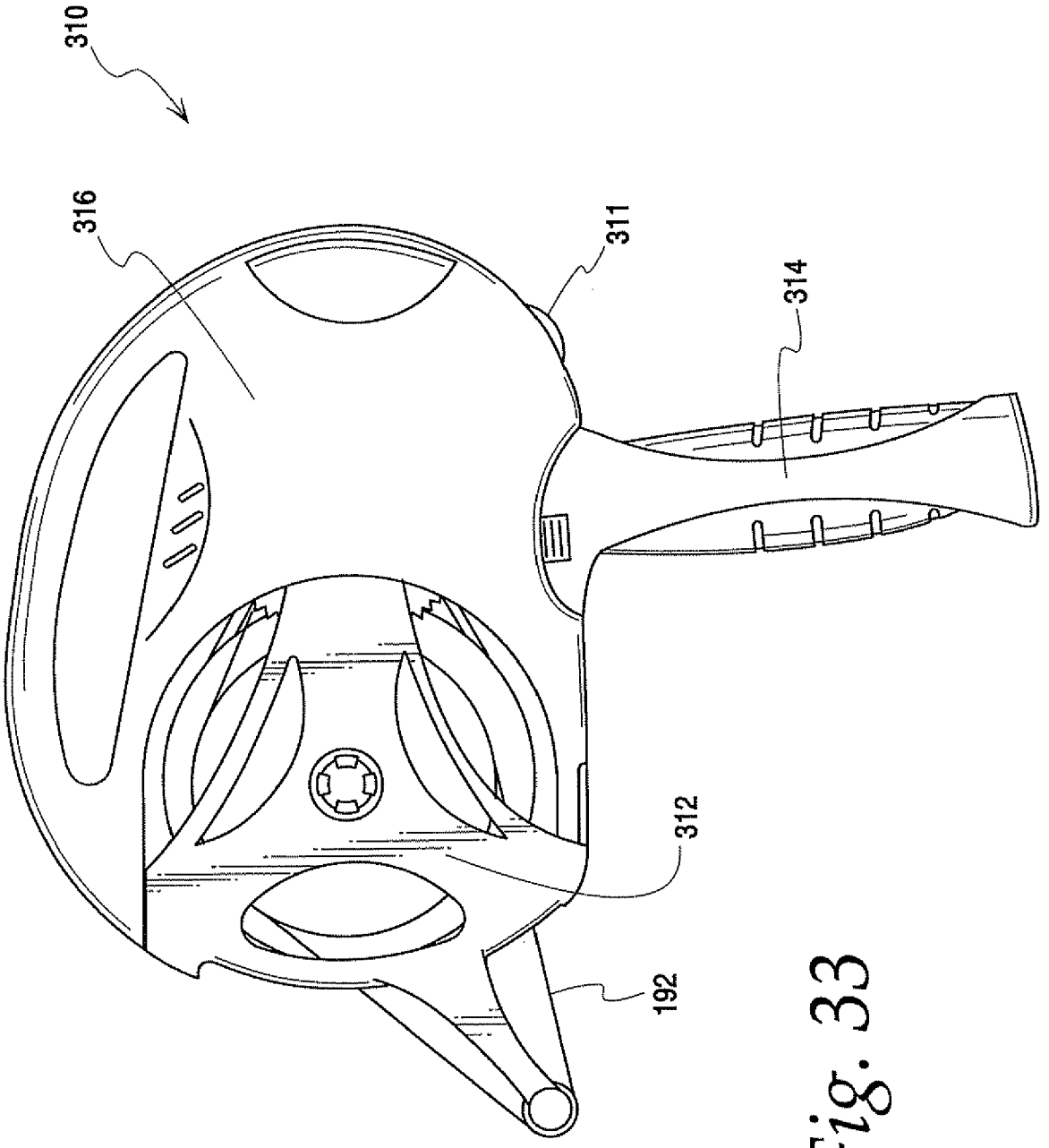

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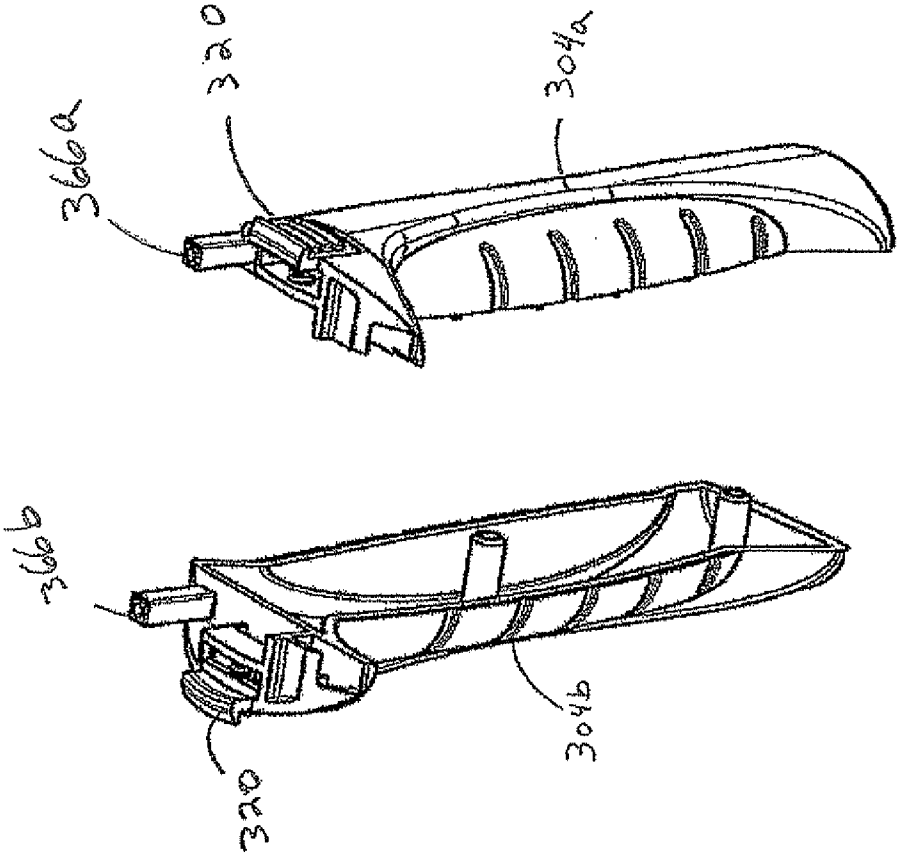
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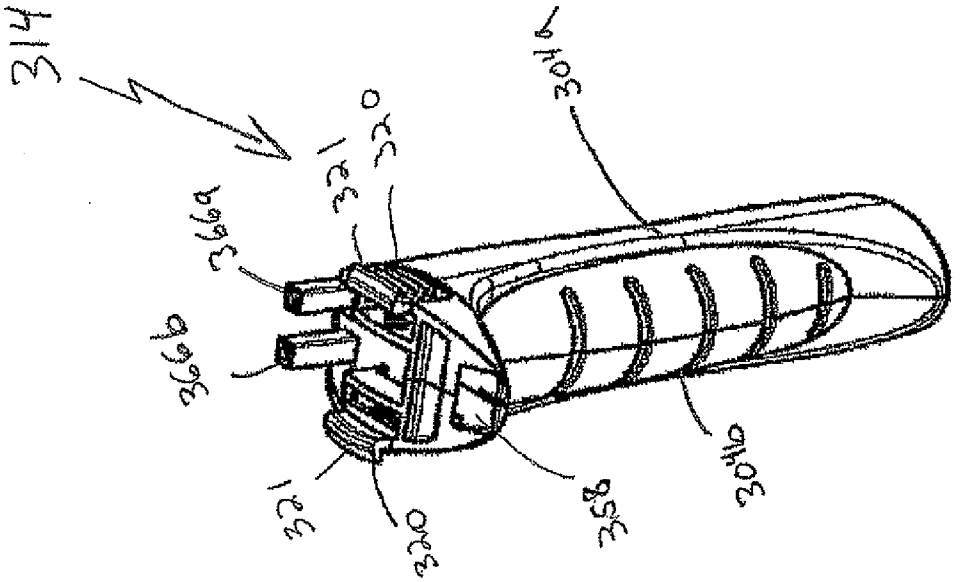
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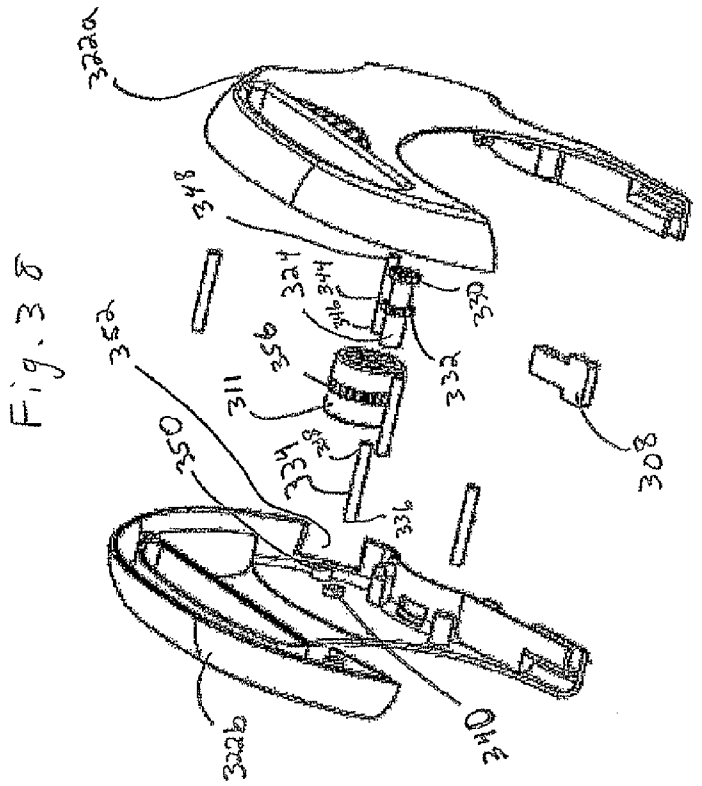

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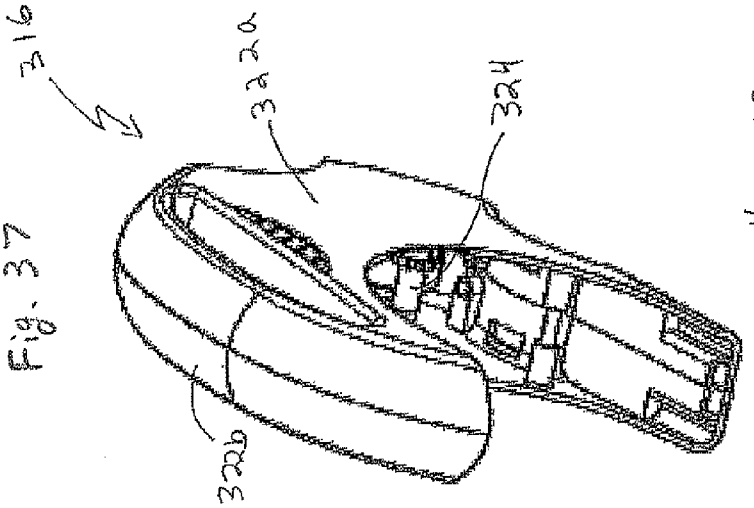

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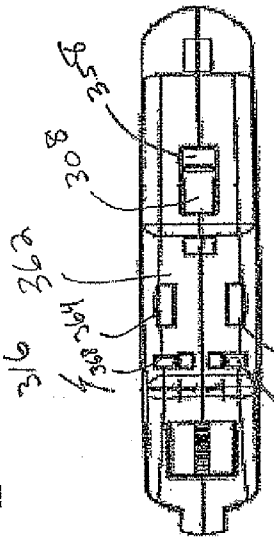

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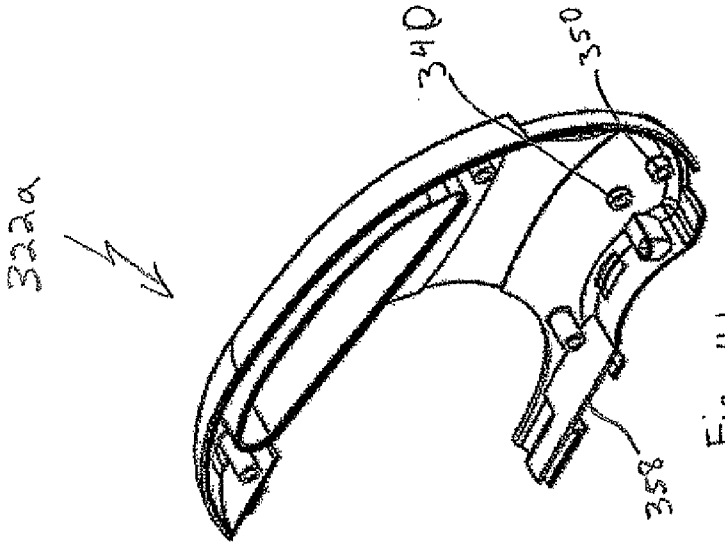

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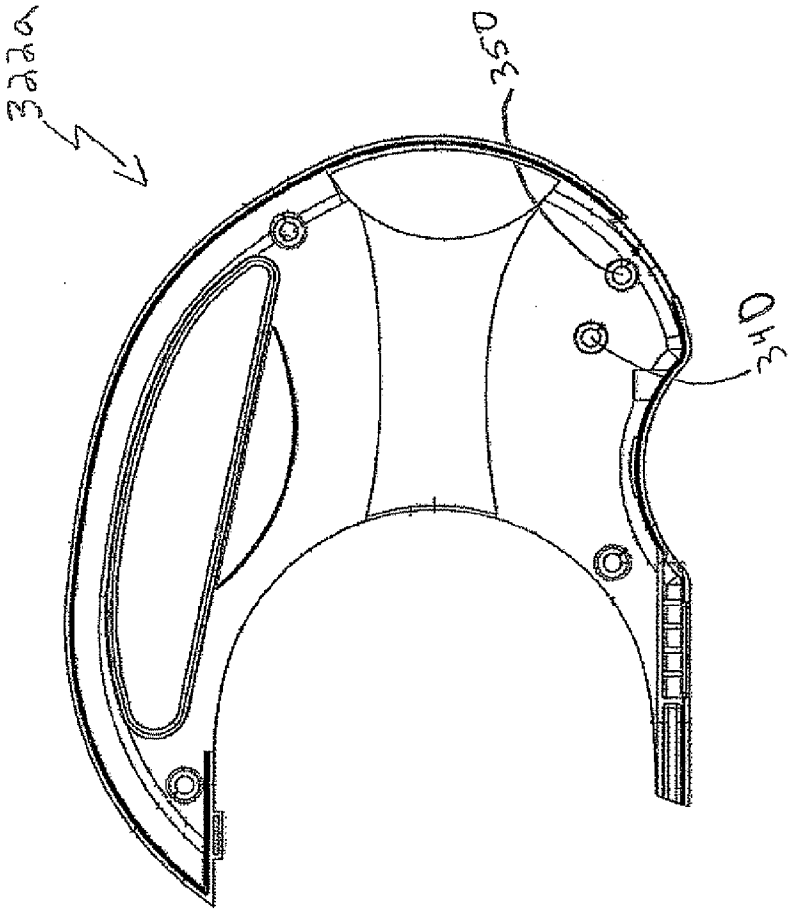

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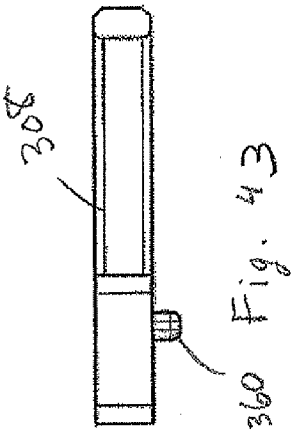

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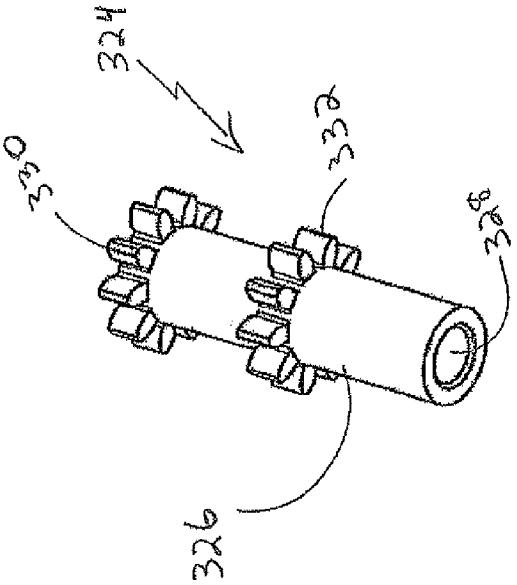

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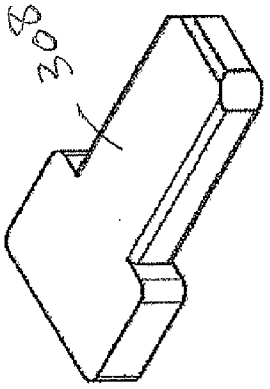

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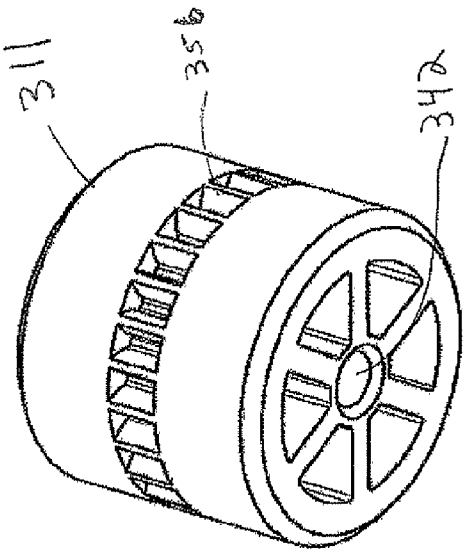

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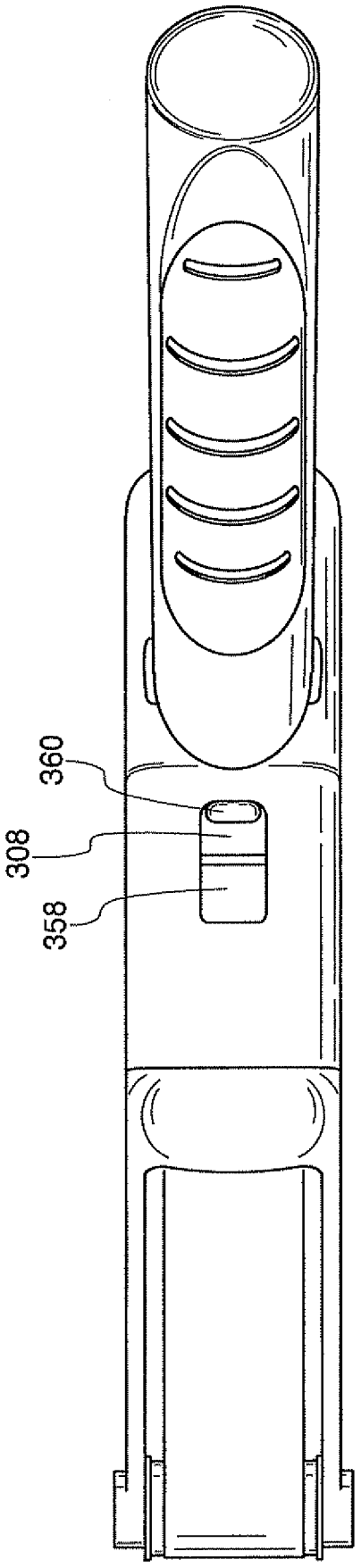


Fig. 46

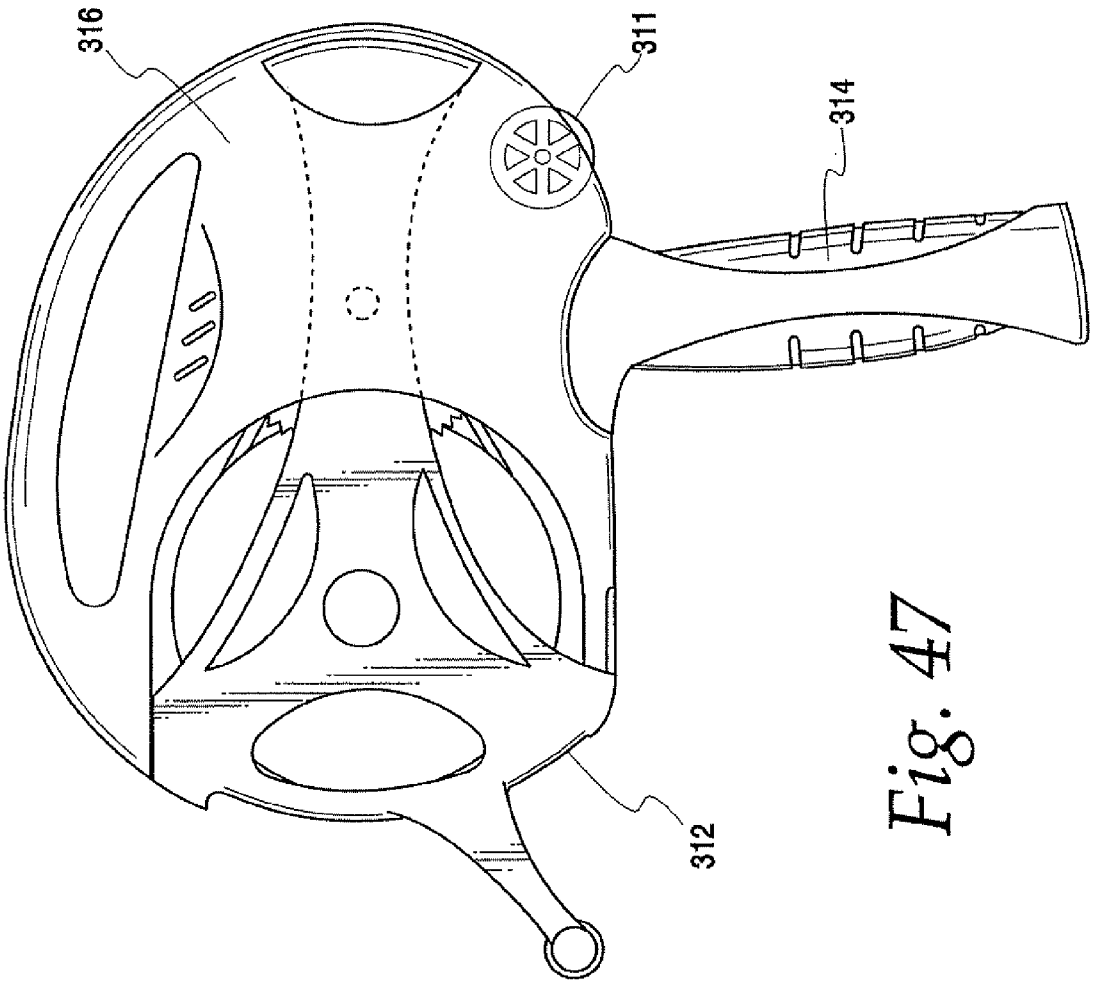
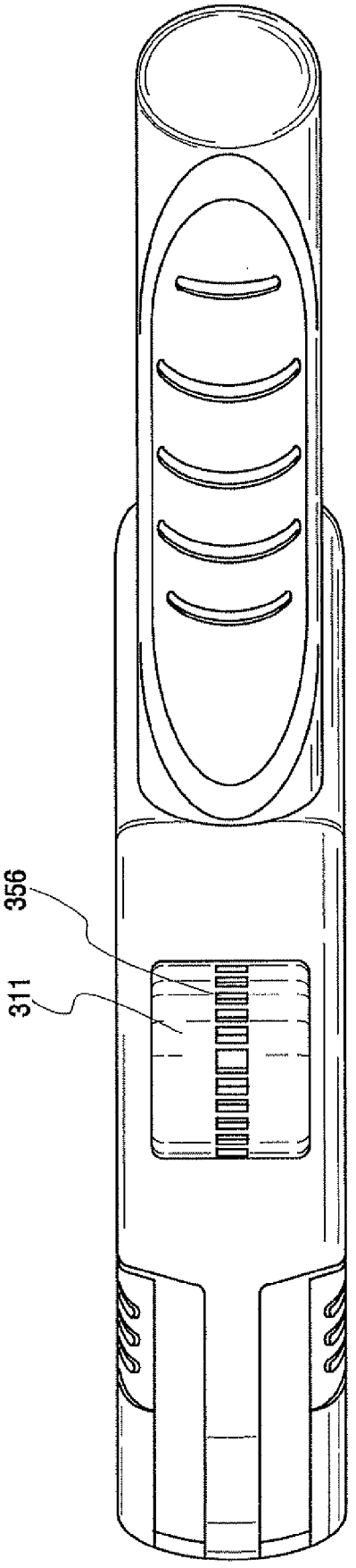


Fig. 47

Fig. 48



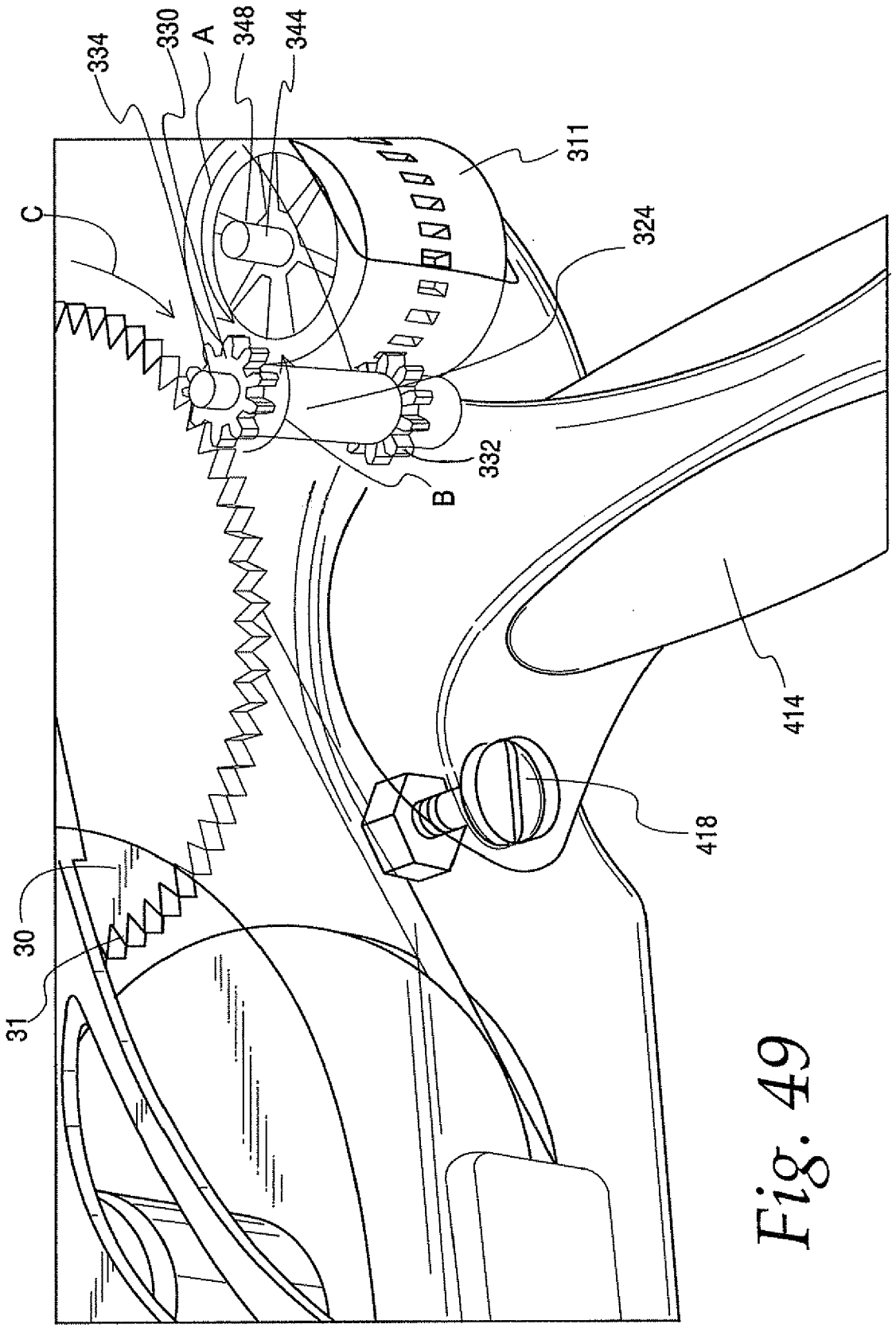


Fig. 49

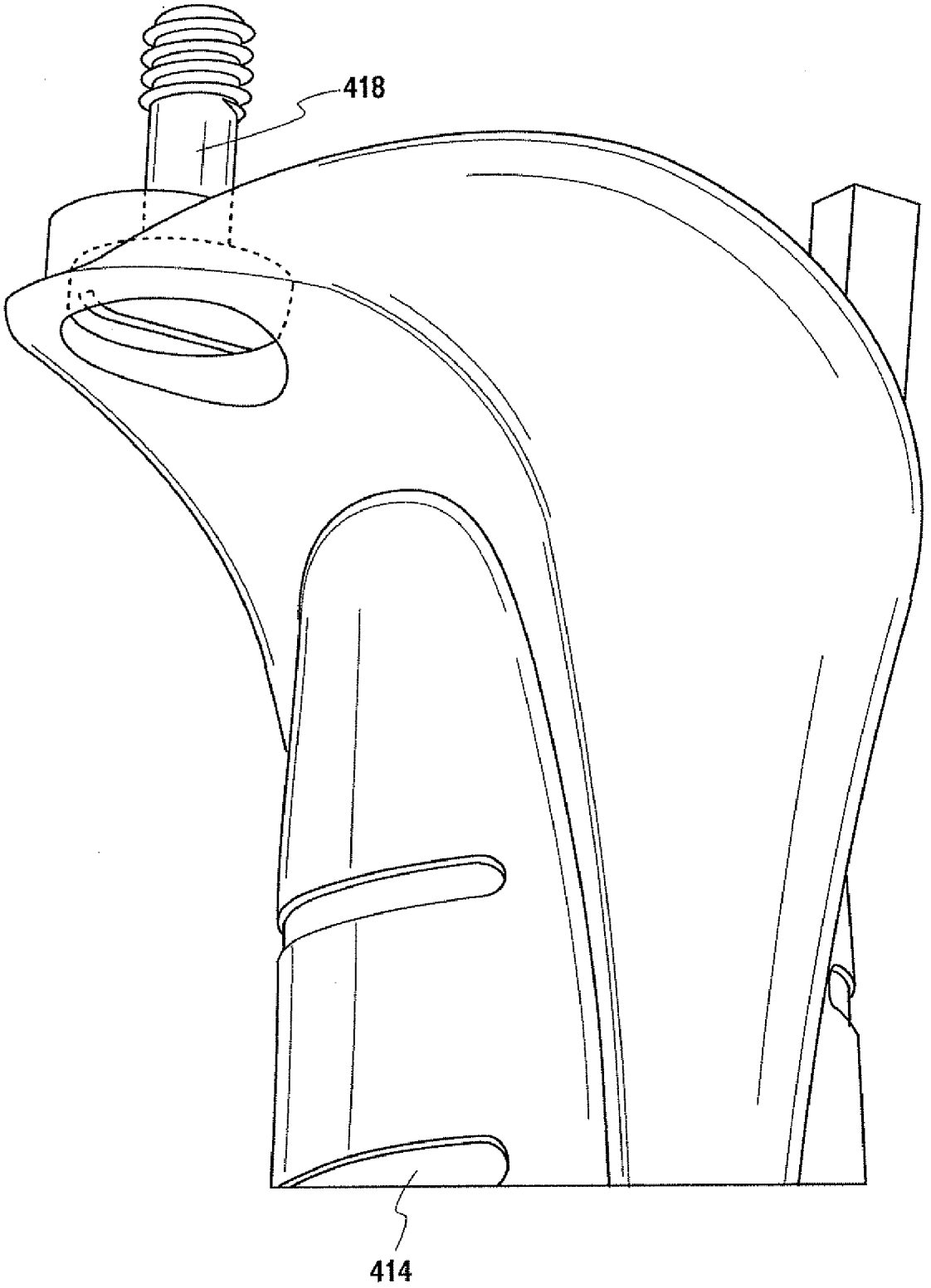


Fig. 50

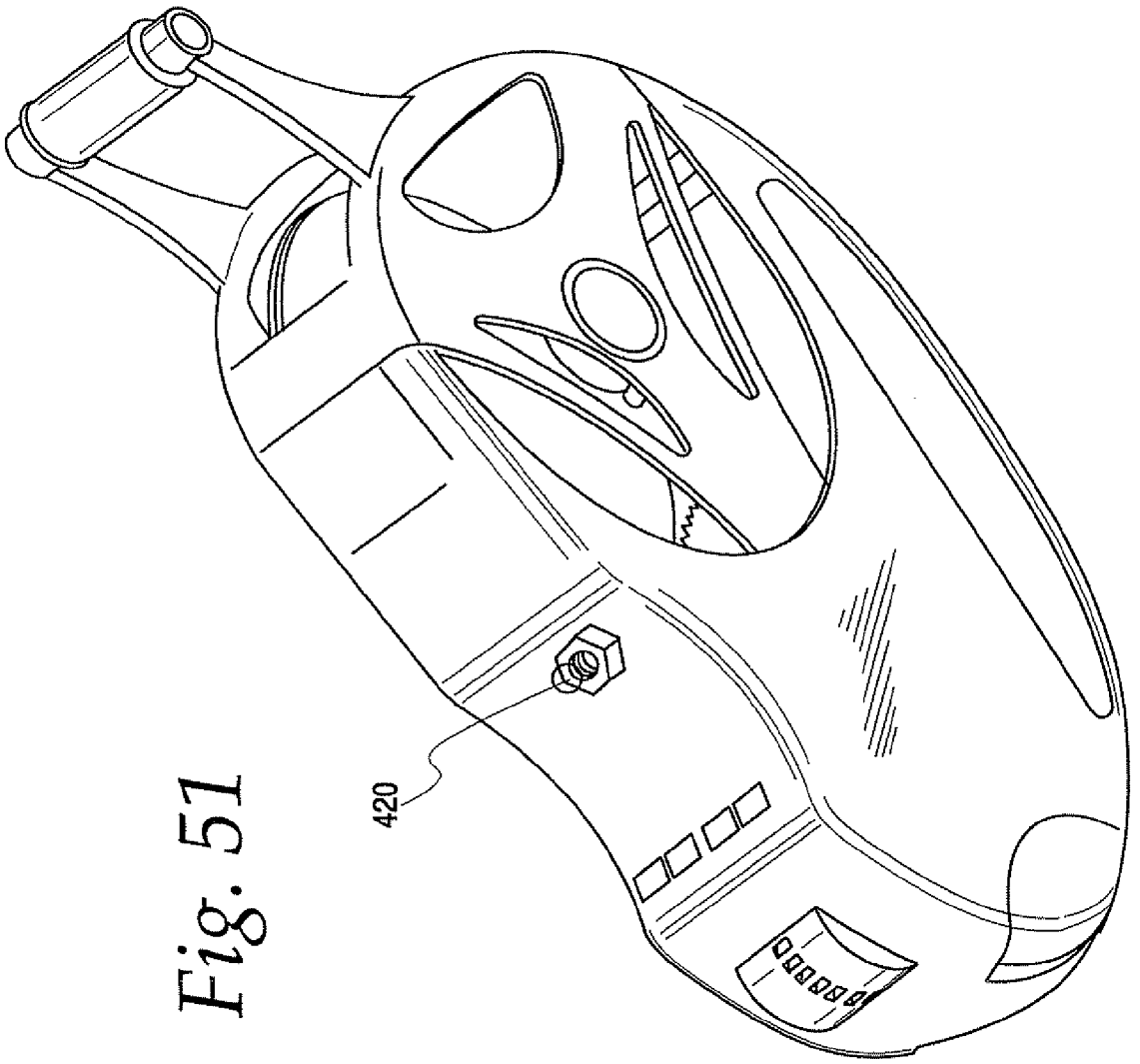


Fig. 51

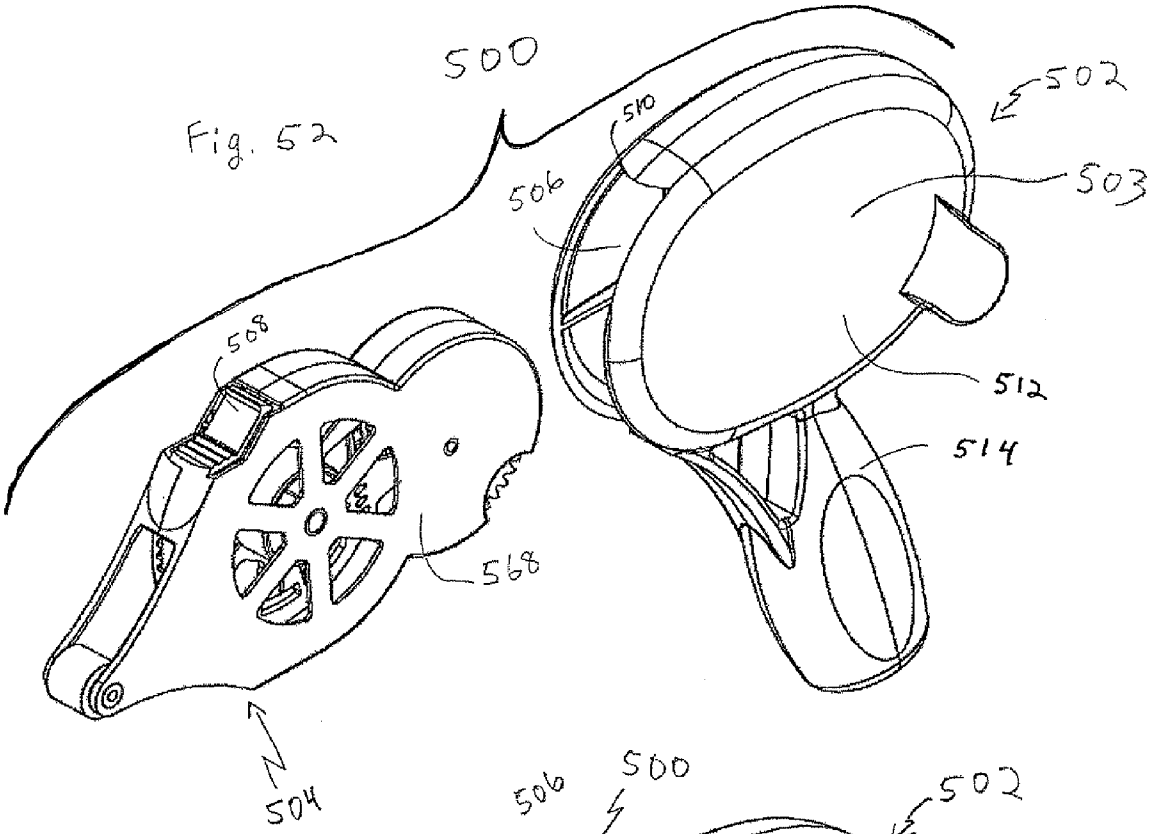

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Fig. 52

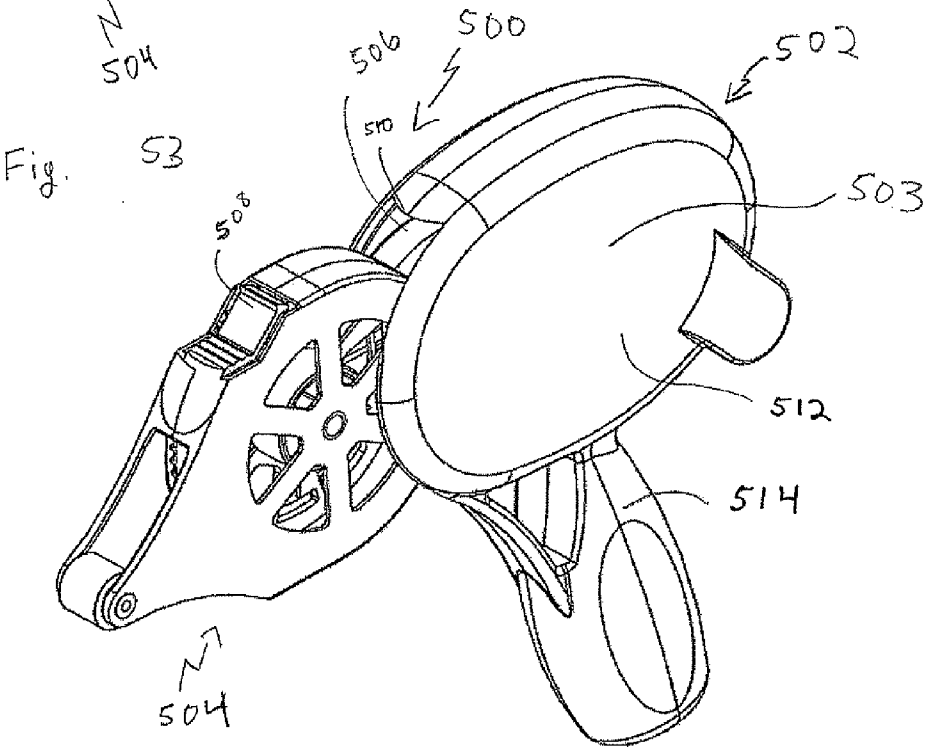
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Fig. 53

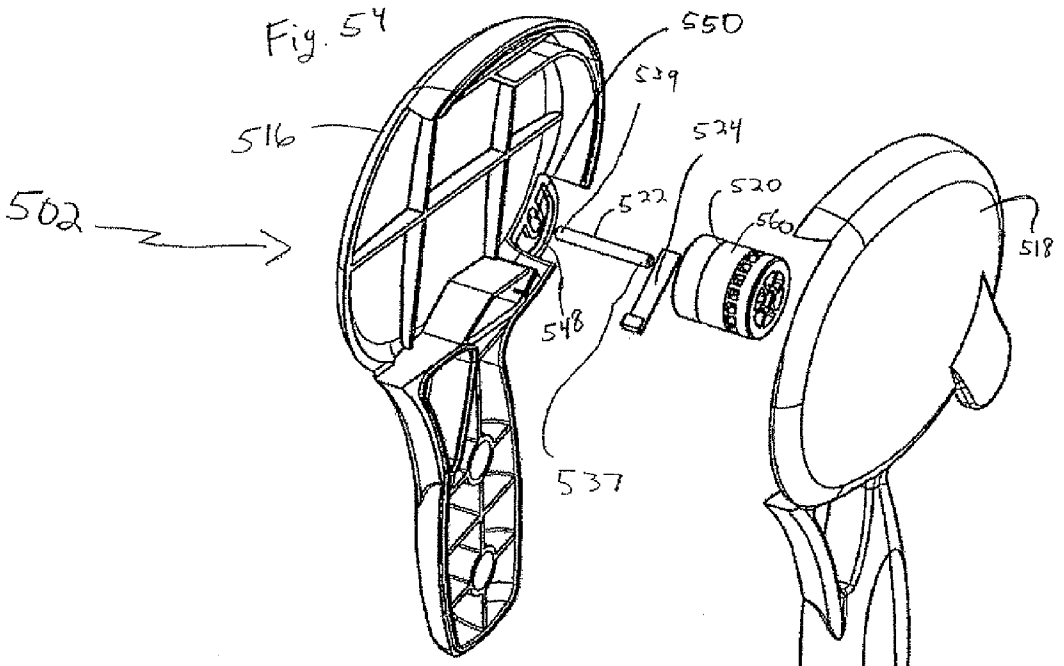
Fig. 54
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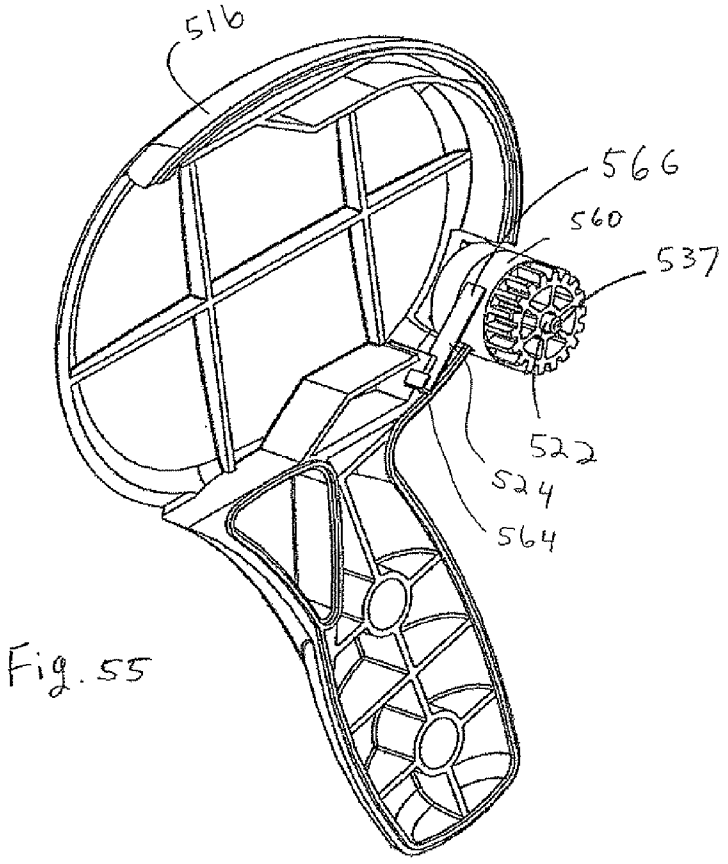
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Fig. 55

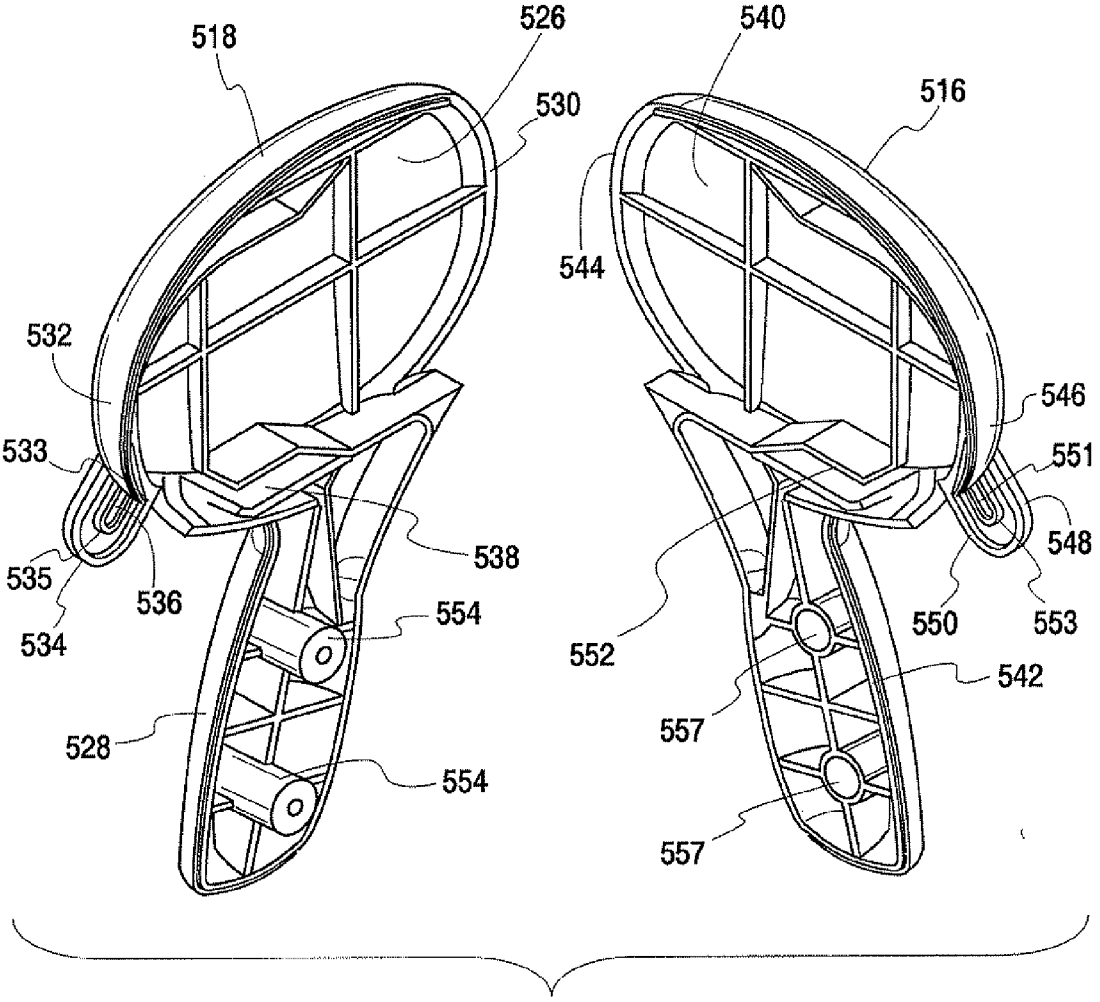


Fig. 56

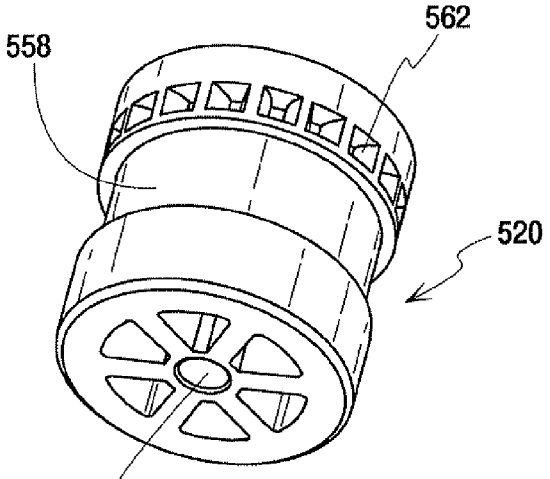


Fig. 57

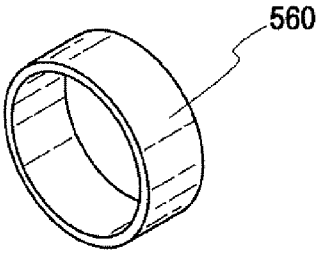


Fig. 58

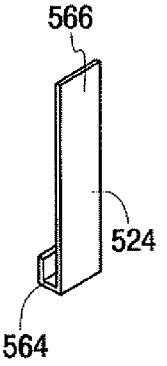


Fig. 59

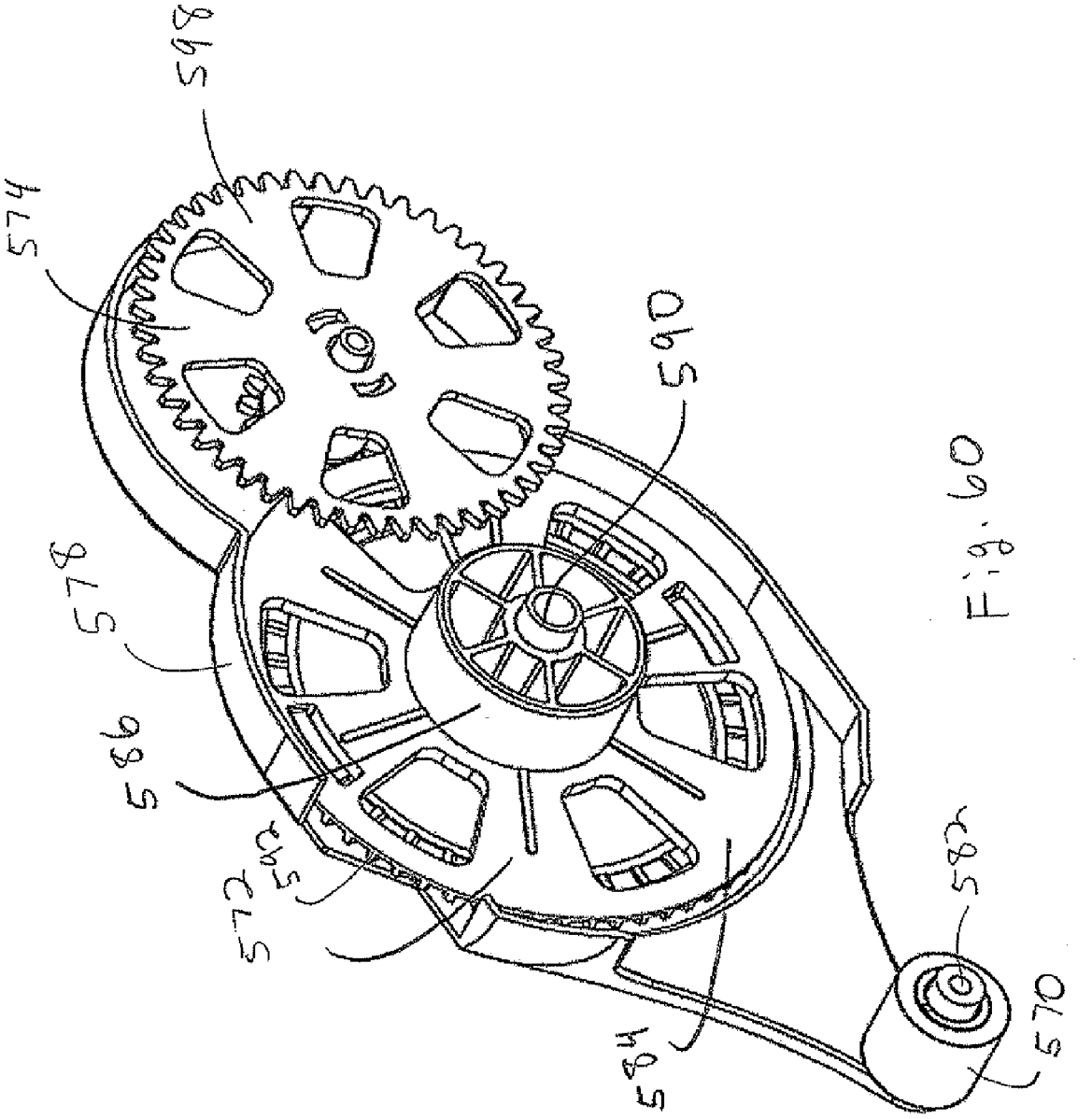
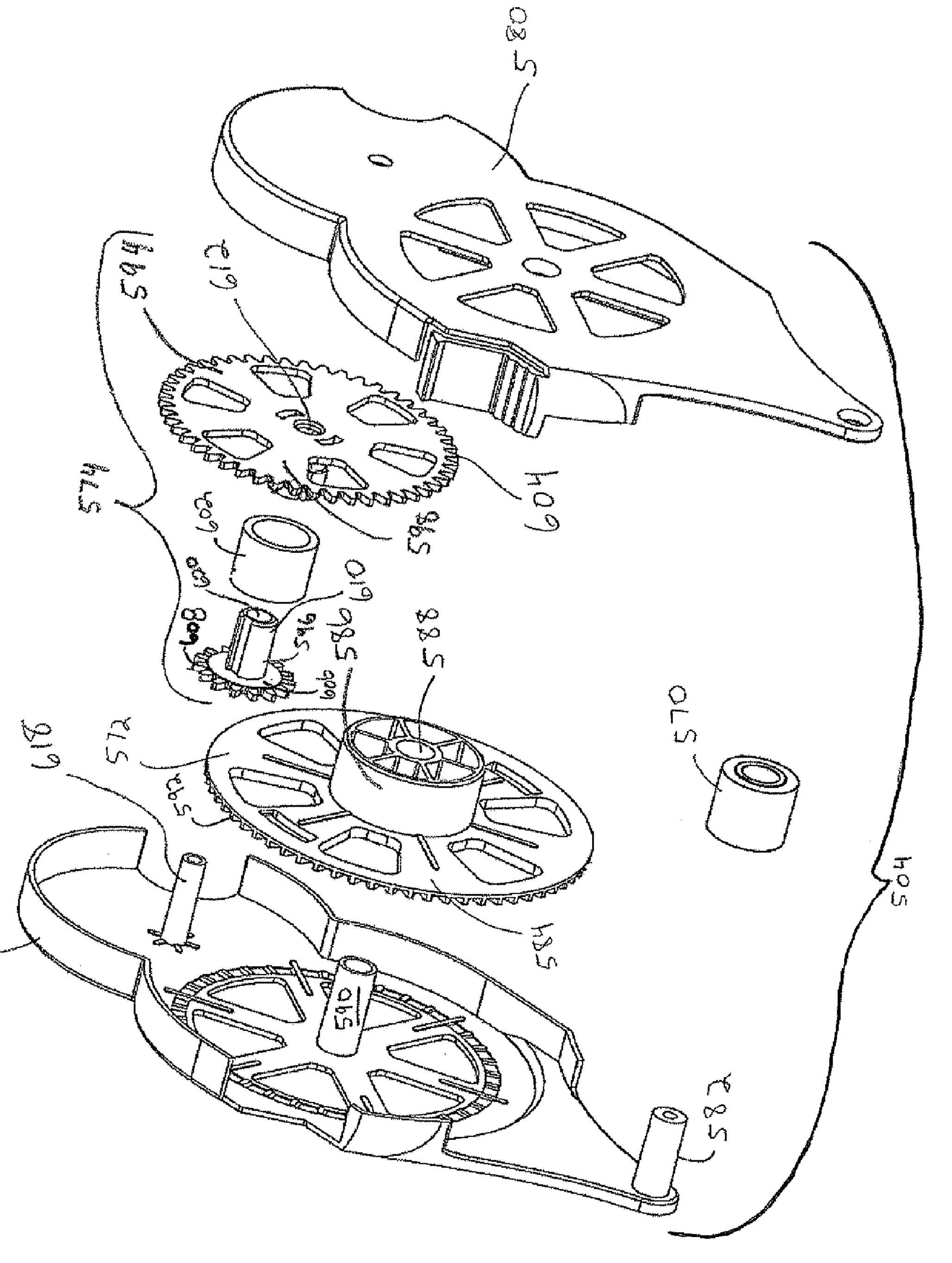


Fig. 60

Fig. 61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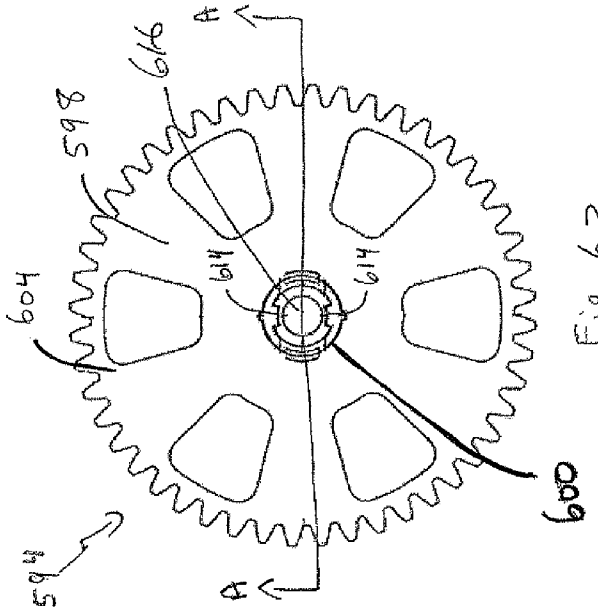

Fig. 63

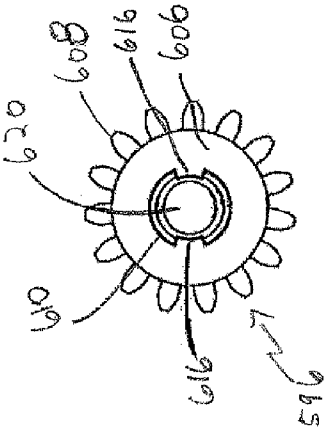

Fig. 65

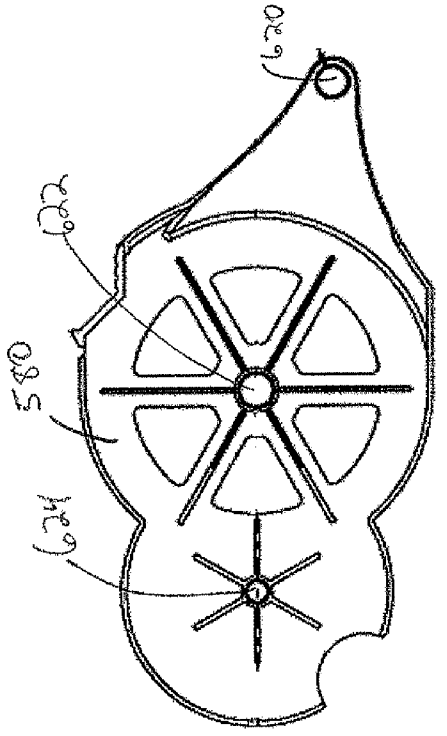

Fig. 62

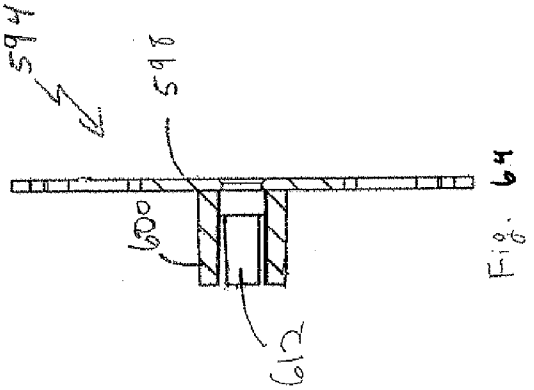

Fig. 64

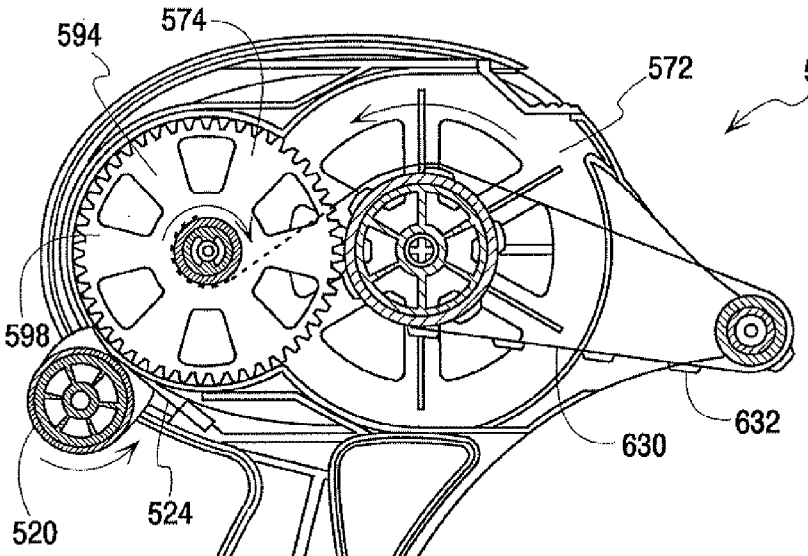
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Fig. 66

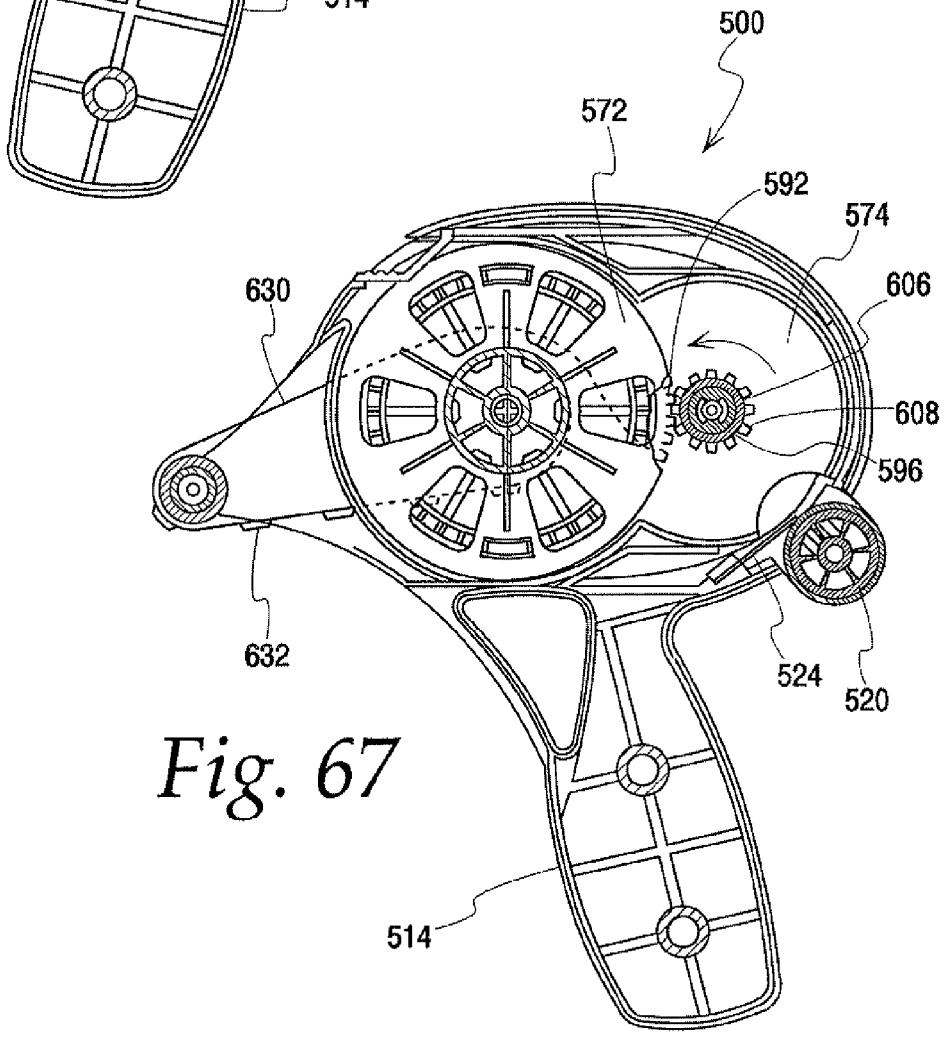
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Fig. 67

HANDHELD ADHESIVE APPLICATOR

[0001] The present application claims the benefit of U.S. Provisional Application Nos. 60/917,987 and 60/917,986, both filed May 15, 2007 and U.S. Provisional Application Nos. 60/987,506 and 60/987,491, both filed Nov. 13, 2007, all of which are incorporated by reference.

FIELD OF THE INVENTION

[0002] This disclosure generally relates to the application of pressure-sensitive adhesive segments from a release liner. More particularly, this disclosure relates to handheld devices for applying pressure-sensitive adhesive segments from a release liner.

DESCRIPTION OF RELATED ART

[0003] Hobbyists and home craft artists, particularly those involved in scrapbooking, commonly use pressure-sensitive adhesive segments dispensed from a release liner to attach displayed objects, such as photographs, newspaper clippings and other such memorabilia, to a substrate such as scrapbook pages or other display medium. The pressure-sensitive adhesive segments are typically arranged seriatim on the release liner in a manner that allows the segments to be dispensed either singly, i.e., one at a time, or multiply, i.e., in groups including a plurality of segments. Typically, adhesive segments are dispensed from a roll of release liner onto a recipient surface (of either the displayed object or the substrate to which it is attached) by bringing one or several of the adhesive segments into contact with the surface of the recipient. The adhesive segments intentionally have greater adherence to the recipient surface than to the release liner. As a result, subsequent relative movement between the release liner and the recipient causes the adhesive segment or segments to release from the release liner and remain adhered to the recipient. With the adhesive segment or segments adhered to the recipient, the displayed object may then be attached to the substrate.

[0004] One possible alternative to dispensing the adhesive segments directly from the release liner to the surface of a recipient is to remove an adhesive segment from the release liner by hand and then apply it to the object. However, there are numerous practical problems with such a method. For example, pressure-sensitive adhesive segments by their nature are, of course, sticky and gummy. When handled by hand, the adhesive tends to stick to the fingers and ball-up. Because of the stickiness of the adhesive segment, it is often difficult to transfer the adhesive segment from the hand to an object. Additionally, because the adhesive segment oftentimes balls-up when handle by hand, the adhesive segment is not applied to the recipient in its original shape nor in an even layer. Not applying the adhesive segment in its original shape nor in an even layer affects the adhesive segment's strength of adhesion. Furthermore, the human hand has oils that can negatively affect the adhesion and can also bring acid to the surface, adversely affecting long term archivability.

[0005] Applying adhesive segments according to the foregoing method may be adequate in limited circumstances when securing a relatively small object, but application by hand is not preferred for larger objects or projects requiring the repeated application of one or more adhesive segments to different recipients. Furthermore, adhesive segments are widely used in commercial applications to secure objects, e.g., applications such as removably securing a credit card to a transmittal letter, applying a product label, or sealing packaging. To that end, numerous handheld adhesive applicators have been provided, which allow for more controlled, rapid application of a larger number of adhesive segments to an object. Examples of known handheld adhesive applicators include those described in U.S. Pat. No. 7,195,049 and in U.S. Patent Application Publication No. US 2005/0178507, both of which are hereby incorporated by reference herein.

[0006] There are a number of disadvantages associated with known handheld adhesive applicators, most notably their general lack of operational flexibility. For example, some known devices are well-suited for a single type of application, such as in what will be referred to herein as glide-type applications. These are applications requiring several adhesive segments to be applied quickly in a straight line with an uninterrupted movement of the device. But these devices are poorly suited for other types of applications, such as those requiring the repeated application of a single adhesive segment. Other known handheld devices are provided with a pistol-grip handle that is suitable for some applications, but obtrusive for other applications. Additional disadvantages include the small roll capacity of some known devices and the need to manually thread and secure a new roll after a first adhesive segment roll has been exhausted.

[0007] Therefore, a need remains for a handheld device that provides enhanced operational flexibility. Other needs include a handheld device with an increased roll capacity and an improved roll reloading mechanism.

SUMMARY OF THE INVENTION

[0008] In accordance with one embodiment or aspect of the present disclosure, a handheld adhesive applicator is provided with a housing assembly, a cartridge assembly removably connected to the housing assembly, and a handle assembly removably connected to the housing assembly. The cartridge assembly includes a primary spool for mounting an adhesive segment roll and a secondary spool for automatically winding a spent portion of adhesive segment roll. A gear arrangement allows for numerous adhesive segments to be applied consecutively in a glide-type application or for a single adhesive segment to be accurately applied using a manual advance feature. The removable handle may be gripped during a primary mode of operation or removed for a secondary mode of operation in which the housing assembly is gripped during use.

[0009] One aspect of the present invention relates to a handheld adhesive applicator including a housing and a cartridge that is removably connected to the housing. The cartridge has a primary spool and a secondary spool. The primary spool receives an adhesive roll including a wound supply of a liner that has adhesive deposited thereon. The secondary spool collects portions of the liner that are advanced from the primary spool, and the primary spool and the secondary spool are operatively connected to each other by a drive belt.

[0010] Another aspect relates to a cartridge for use with a handheld adhesive applicator. The cartridge includes a primary spool which receives an adhesive roll. The adhesive roll has a wound supply of a liner that includes adhesive deposited thereon. The cartridge also includes a secondary spool that collects portions of the liner that are advanced from the primary spool, and the primary spool and the secondary spool are operatively connected to each other by a drive belt.

[0011] Yet a further aspect relates to a method of applying adhesive. The method includes providing an adhesive applicator having a housing and cartridge removably connected to the housing. The cartridge has a primary spool and a secondary spool. The primary spool receives an adhesive roll that includes a wound supply of a liner having adhesive deposited thereon. The secondary spool collects portions of the liner that are advanced from the primary spool, and the primary spool and the secondary spool are operatively connected to each other by a drive belt. A manual advancement member of the adhesive applicator is activated to advance a desired amount of the liner from the adhesive roll. As portions of the liner are advanced from the adhesive roll, the portions are collected on the secondary spool. Once the desired amount of liner has been advanced, the adhesive is applied to an objection from the liner.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** is a front perspective view of a handheld adhesive applicator according to an aspect of the present disclosure.

[0013] FIG. **2** is an exploded perspective view of the handheld adhesive applicator of FIG. **1**.

[0014] FIG. **3** is a front perspective view of a cartridge assembly of the handheld adhesive applicator of FIG. **1**.

[0015] FIG. **4**A is a partially exploded view of the cartridge assembly of FIG. **3**.

[0016] FIG. **4**B is a partially exploded view of another embodiment of a cartridge assembly suitable for use in the handheld applicator of FIG. **1**.

[0017] FIG. **4**C is a perspective view of a primary spool pin locking member suitable for use with the cartridge assembly of FIG. **4**B.

[0018] FIG. **5**A is an exploded view of a cartridge body of the cartridge assembly of FIG. **3**.

[0019] FIG. **5**B is an exploded view of the proximal portion of an alternative embodiment of a cartridge body suitable for use in the cartridge assembly of FIG. **3**.

[0020] FIG. **5**C is a perspective view of a roller pin locking member suitable for use with the cartridge assembly of FIG. **5**B.

[0021] FIG. **6** is a side elevational view of a cartridge body half suitable for constructing the cartridge body of FIGS. **5**A & **5**B.

[0022] FIG. **7** is a perspective view of a roller pin suitable for use with the cartridge assembly of FIG. **3**.

[0023] FIG. **8**A is a perspective view of a roller suitable for use with the roller pin of FIG. **7**.

[0024] FIG. **8**B is an elevational view of another embodiment of a roller suitable for use with the roller pin of FIG. **7**.

[0025] FIG. **9** is a perspective view of a primary spool of the cartridge assembly of FIG. **3**.

[0026] FIG. **10** is a perspective view of a roll of adhesive segments mounted on the primary spool of FIG. **9**.

[0027] FIG. **11** is a perspective view of the roll of adhesive segments of FIG. **10**.

[0028] FIG. **12** is an exploded view of the roll of adhesive segments of FIG. **11**.

[0029] FIG. **13**A is a perspective view of a secondary spool sub-assembly of the cartridge assembly of FIG. **3**.

[0030] FIG. **13**B is an exploded view of the secondary spool of FIG. **13**A.

[0031] FIG. **14**A is a perspective view of an alternative embodiment of a cartridge assembly suitable for use with the handlheld applicator of FIG. **1**.

[0032] FIG. **14**B is a perspective view of the cartridge body of the cartridge assembly of FIG. **14**A.

[0033] FIG. **14**C is an elevational view of the left half of the cartridge body.

[0034] FIG. **15** is a front perspective view of a handle assembly of the handheld adhesive applicator of FIG. **1**.

[0035] FIG. **16** is a partially exploded view of the handle assembly of FIG. **15**.

[0036] FIG. **17** is a front perspective view of a trigger of the handle assembly of FIG. **15**.

[0037] FIG. **18** is an exploded view of one of the handle body halves of FIG. **16**.

[0038] FIG. **19** is a front perspective view of a housing assembly of the handheld adhesive applicator of FIG. **1**.

[0039] FIG. **20** is an exploded view of the housing assembly of FIG. **19**.

[0040] FIG. **21** is a rear perspective view of one of the housing body halves of the housing assembly of FIG. **19**.

[0041] FIG. **22** is a side elevational view of the housing body half of FIG. **21**.

[0042] FIG. **23** is a bottom plan view of the housing assembly of FIG. **19**.

[0043] FIG. **24** is another front perspective view of the housing assembly of FIG. **19**.

[0044] FIG. **25** is a perspective view of a ratchet pin of the housing assembly of FIG. **19**.

[0045] FIG. **26** is a perspective view of a trigger actuator of the housing assembly of FIG. **19**.

[0046] FIG. **27** is a perspective view of a ratchet of the housing assembly of FIG. **19**.

[0047] FIG. **28** is a perspective view of a return driver of the housing assembly of FIG. **19**.

[0048] FIG. **29** is a perspective view of an idler gear of the housing assembly of FIG. **19**.

[0049] FIG. **30** is a perspective view of a roll of adhesive segments suitable for use with a handheld adhesive applicator according to the present invention.

[0050] FIG. **31** is a side elevational view of the handheld adhesive applicator of FIG. **1**, with selected components removed for clarity.

[0051] FIG. **32** is a front perspective view of another embodiment of a handheld applicator of the present disclosure.

[0052] FIG. **33** is a side perspective view of the handheld applicator of FIG. **32**.

[0053] FIG. **34** is an exploded perspective view of the handheld applicator of FIG. **32**.

[0054] FIG. **35** is a front perspective view of a handle assembly of the handheld applicator of FIG. **32**.

[0055] FIG. **36** is an exploded perspective view of the handle assembly of FIG. **35**.

[0056] FIG. **37** is a front perspective view of a housing assembly of the handheld applicator of FIG. **32**.

[0057] FIG. **38** is an exploded perspective view of the housing assembly of FIG. **37**.

[0058] FIG. **39** is a bottom plan view of the housing assembly of FIG. **37**.

[0059] FIG. **40** is a side elevational view of one of the housing body halves of the housing assembly of FIG. **37**.

[0060] FIG. **41** is a rear perspective view of the housing body half of FIG. **40**.

[0061] FIG. **42** is a perspective view of a handle locking member of the housing assembly of FIG. **37**.

[0062] FIG. **43** is a side elevational view of the locking member of FIG. **40**.

[0063] FIG. **44** is a perspective view of a tracking member of the housing assembly of FIG. **37**.

[0064] FIG. **45** is a perspective view of the idler gear of the housing assembly of FIG. **37**.

[0065] FIG. **46** is a bottom front perspective view of the handheld applicator of FIG. **32**.

[0066] FIG. **47** is a schematic illustration of the handheld applicator of FIG. **32**.

[0067] FIG. **48** is a bottom rear perspective view of the handheld applicator of FIG. **32**.

[0068] FIG. **49** is a schematic illustration of the drive mechanism of one embodiment of the handheld applicator of the present disclosure.

[0069] FIG. **50** is a perspective view of another embodiment of a handle assembly suitable for use with the handheld applicators disclosed herein.

[0070] FIG. **51** is a bottom perspective view of another embodiment of a handheld applicator to which the handle assembly of FIG. **50** can be attached.

[0071] FIG. **52** is an exploded view of another embodiment of a handheld applicator in accordance with the present disclosure.

[0072] FIG. **53** is a perspective view of the handheld applicator of FIG. **52**.

[0073] FIG. **54** is an exploded view of the housing assembly of the handheld applicator of FIG. **52**.

[0074] FIG. **55** is a perspective view of the housing assembly of FIG. **54** having one half of the body of the housing assembly removed to show the internal components.

[0075] FIG. **56** is a perspective view of the housing body halves of the housing assembly of FIG. **54**.

[0076] FIG. **57** is a perspective view of the track wheel of the housing assembly of FIG. **54**.

[0077] FIG. **58** is a perspective view of the gripping section of the track wheel of FIG. **54**.

[0078] FIG. **59** is a perspective view of the leaf spring of the housing assembly of FIG. **54**.

[0079] FIG. **60** is a perspective view of the cartridge assembly of FIG. **52** with half of the cartridge body removed to show the internal components.

[0080] FIG. **61** is an exploded view of the cartridge assembly of FIG. **52**.

[0081] FIG. **62** is an elevational view of one of the body halves of the cartridge assembly of FIG. **61**.

[0082] FIG. **63** is an elevational view of the disk-like portion of the secondary spool of the cartridge assembly of FIG. **61**.

[0083] FIG. **64** is a cross-sectional view of the secondary spool of FIG. **63** taken along lines A-A.

[0084] FIG. **65** is a plan view of the second portion of the secondary spool of the cartridge assembly of FIG. **61**.

[0085] FIGS. **66** and **67** are schematic illustrations of the drive mechanism of the handheld applicator of FIG. **52**.

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

[0086] Detailed embodiments of the present invention are disclosed herein. However, it is to be understood that the disclosed embodiments are merely exemplary of the invention, which may be embodied in various forms. Therefore, specific details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention in virtually any appropriate manner.

[0087] FIG. **1** illustrates one embodiment of a handheld adhesive applicator **10** of the present disclosure. FIG. **2** is an exploded view of the handheld adhesive applicator **10**, which shows three main subassemblies—a cartridge assembly **12**, a handle assembly **14**, and a housing assembly **16**. The subassemblies can be primarily comprised of a lightweight plastic material. The cartridge assembly **12** is provided with clips **18** that allow the cartridge assembly to releasably lock into the housing assembly **16** without the need for tools, as will be described in greater detail herein. The handle assembly similarly has clips **20** that allow it to be releasably attached to the housing assembly.

[0088] FIG. **3** is an isolated view of the cartridge assembly **12**, with FIG. **4**A showing a partially exploded view thereof. The cartridge assembly **12** includes a cartridge body **22** onto which are secured a number of rotatable components, namely a roller **24**, a primary spool **28**, and a secondary spool **30**. The cartridge assembly **12** of FIGS. **3** and **4**A is also shown with an adhesive segment roll **32** pre-loaded on the primary spool **28**, but it will be appreciated by those of ordinary skill in the art that the roll **32** may be provided separately from the cartridge assembly **12**.

[0089] FIG. **5**A is a front perspective view of the cartridge body **22**. The cartridge body **22** may be provided as a unitary structure or as a pair of symmetrical left and right halves. FIG. **6** illustrates one such half **34** of the cartridge body **22**, the other half (not illustrated) being substantially a mirror image of FIG. **6**. It is advantageous to provide the cartridge body as two halves to simplify the molding process. The two halves may be joined to each other at upper and lower bridge portions **36** by any of a number of means, including but not limited to ultrasonic welding.

[0090] The cartridge body **22** has a proximal portion **38**, a distal portion **40**, and an intermediate portion **42** between the proximal portion **38** and the distal portion **40** (FIG. **6**). The proximal portion **38** includes a pair of substantially parallel front prongs **44**. Each prong **44** includes a roller pin opening **46** aligned with the matching roller pin opening **46** of the other prong. FIG. **7** illustrates one embodiment of a suitable roller pin **48**, with a cap **50** on one end, a plurality of extending tabs **52** on the other end, and a shaft portion **54** extending therebetween. The tabs **52** are resiliently collapsible, allowing them to pass through the openings **46** and return to their original configuration, which prevents inadvertent removal of the roller pin **48**.

[0091] Optionally, as illustrated in FIG. **8**B a roller pin locking member **49** is employed to assist in keeping the roller pin **48** in place. FIG. **5**C illustrates one embodiment of the locking member **49**. The locking member **49** includes an elongated shaft **55** that is sized to fit within the shaft portion **54** of the roller pin **48**. The locking member **49** also includes a cap **57** that has a plurality of projections **59** extending radially outwardly from the cap. After roller pin **48** has been assembled in openings **46** of the cartridge body **22** (FIG. **5**B), the shaft **55** of the locking member **49** is inserted into shaft portion **54** of roller pin **48**, and projections **59** are positioned between and mate with tabs **52** of the roller pin. The mating between the tabs **52** and projections **59** aids in further securing roller pin **48** into place.

[0092] The roller pin **48** is adapted to receive a roller **24** between the prongs **44**, as shown in FIGS. **3** and **4**A. In one embodiment, illustrated in FIG. **8**A, the roller **24** is comprised of a substantially tubular roller core **58** surrounded by a substantially tubular roller overmold **60**. It may be advantageous for the roller core **58** to be comprised of a plastic material and for the roller overmold **60** to be comprised of an elastomeric material, but other materials may be employed without departing from the scope of the present invention.

[0093] FIG. **8**B illustrates another embodiment of a roller **62** suitable for use with the roller pin **48**. The roller **62** may be of a unitary construction or employ the core-overmold design of FIG. **8**A. In the embodiment of FIG. **8**B, the roller **62** has angled ends **64** at opposite sides of a substantially cylindrical midsection **66**. A roller so provided may be preferable to a purely cylindrical roller for a number of reasons. First, the angled ends **64** assist in centering the carrier strip of the adhesive segment roll during use. Also, the angled ends **64** maintain the outer surface of the roller in contact with the carrier strip to promote uniform tension in the carrier strip. Regardless of the particular configuration, the roller is rotatable about the associated roller pin **48** for use in applying adhesive segments to an object, as will be described in greater detail below.

[0094] The intermediate portion **42** of the cartridge body **22** is provided with opposing, aligned openings **68**, one of which is visible in FIG. **5**. The openings **68** are adapted to receive a primary spool pin **70** (FIGS. **3** and **4**), which may be configured and operate generally according to the foregoing description of the roller pin of FIG. **7**. In one embodiment, the cap of the primary spool pin **70** may include a head **72** (FIG. **4**) adapted to be received by a matching notch of one of the openings **68** (not illustrated) for preventing rotation of the primary spool pin **70** about its axis. Referring to FIG. **41**, in one embodiment, a primary spool pin locking member **71** can be used to assist in securing primary spool pin **70** to the carriage body **22**. As shown in FIG. **4**C, the locking member **71** includes an elongated shaft **73** and a cap **75**. Cap **75** includes a plurality of projections **77** extending radially from the cap. After the primary spool pin **70** has been inserted into openings **68** of the cartridge body **22**, the elongated shaft **73** of the locking member **71** is inserted into the shaft **79** of the primary spool pin **70**. The projections **77** of the cap **75** are positioned between and mate with tabs **81** (FIG. **4**B) of the primary spool pin **70**. The mating of the tabs **81** and projections **77** assists in securing the primary spool pin **70** to cartridge body **22**.

[0095] A primary spool **28** (FIG. **9**) is received on the primary spool pin **70** for rotation thereabout The primary spool **28** is comprised of a disk-shaped wheel portion **74** and a hub portion **76** extending away from one face of the wheel portion **74**. In one embodiment, the primary spool **28** is provided as a unitary molded plastic component.

[0096] The outer circumference of the wheel portion **74** includes a groove or channel **78** adapted to receive a band or drive belt **80** (FIGS. **3** and **4**). The drive belt **80** associates the primary spool **28** with the secondary spool **30**, as will be described in greater detail herein. The hub portion **76** is adapted to receive a roll of adhesive material **32**, as shown in FIG. **10**. Typically, the roll **32** is fixed with respect to the hub portion **76** to control the rate at which adhesive segments are applied, as will be described in greater detail herein. According to one manner of fixing the roll **32** with respect to the hub portion **76**, the hub portion **76** may be provided with an outward radial extension or key **82** (FIG. **9**). The roll **32**, in turn, may be provided with a tubular roll core **84** (FIGS. **11** and **12**) including an interior notch **86** having a mating relationship with the key **82**, such that the roll core **84** slides onto the hub portion **76**, with the key **82** fitting within the notch **86**. This configuration causes the roll **32** to rotate with the primary spool **28** about the primary spool pin **70** during use of the handheld adhesive applicator **10**.

[0097] The distal portion **40** of the cartridge body **22** includes a pair of substantially parallel rear prongs **88** (FIGS. **3**-**6**). In the illustrated embodiment, the free end of each rear prong **88** terminates at a clip **18**. The rear prongs **88** are preferably somewhat flexible, allowing the clips **18** to be pressed toward each other before resiliently returning to their equilibrium configuration. Such a configuration is advantageous in connecting the cartridge assembly **12** to the housing assembly **16**, as will be described in greater detail herein.

[0098] Each prong **88** includes a relatively short, substantially cylindrical stubshaft **90** (one of which is visible in FIGS. **4** and **5**) aligned with and extending toward a substantially identical stubshaft of the other prong. The substafts **90** are adapted to be received within the bore **92** (FIG. **13**A) of the secondary spool **30**, as generally illustrated in FIGS. **3** and **4**A.

[0099] The secondary spool **30** is illustrated in greater detail in FIGS. **13** and **13**B. The secondary spool **30** is comprised of a disk-shaped gear portion **94** and a tubular hub portion **96** extending away from one face of the gear portion **94**. In one embodiment, the secondary spool **30** is provided as a unitary molded plastic component. The outer circumference of the gear portion **94** includes a plurality of gear teeth **98** adapted to cooperate with an idler gear of the housing assembly **16**, as will be described in greater detail below. It will be understood that the secondary spool fits entirely between the rear prongs **88** of the cartridge assembly, mounted on the stubshafts **90**, i.e., the tubular hub portion **96** does penetrate either of the prongs **88** as might be suggested upon a cursory glance at FIG. **4**A.

[0100] The hub portion **96** of the secondary spool **30** includes a groove or channel **100** adapted to receive the drive belt **80** (FIG. **3**). The secondary spool **30** is typically mounted within the cartridge body **22** so as to position its channel **100** directly behind the channel **78** of the primary spool **28**, such that the drive belt **80** is seated within both channels. In one embodiment, the drive belt **80** is a relatively flexible band of elastomeric material that is stretched to fit snugly within both channels, such that it is rotated by one of the primary spool **28** or the secondary spool **30** to drive the other, as will be described in greater detail below.

[0101] In the embodiment of FIGS. **13**A and **133**B, the secondary spool **30** is provided with a slip sleeve **102**. The slip sleeve **102** is substantially cylindrical and slides over the hub portion **96**. Preferably, the slip sleeve **102** is adapted to fit between the gear portion **94** and the channel **100**, as shown in FIG. **13**A, to avoid interfering with the drive belt **80** within the channel **100**. Advantageously, the friction between the hub portion **96** and the slip sleeve **102** is such that the slip sleeve **102** will rotate with the hub portion **96** until a sufficient resistive force holds the slip sleeve **102** stationary and causes it to slip over the rotating hub portion **96** (rather than rotating therewith) until the magnitude of the resistive force decreases. The function of this interaction between the hub portion **96** and the slip sleeve **102** will be described in greater detail below.

[0102] FIG. **14**A illustrates another embodiment of a cartridge assembly **212** suitable for use with the handheld applicators disclosed herein. The cartridge assembly **212** is generally similar to cartridge assembly **12** of the previous embodiment and includes a cartridge body **222** onto which are secured a number of rotatable components—a roller **24**, a primary spool **28** and a secondary spool **30**.

[0103] FIG. **14**B is a front perspective view of cartridge body **222**. The cartridge body **222** may be provided as a unitary structure or as a pair of right and left halves **234***a* and **234***b*, respectively. The right half **234***a* is generally similar to that described above with respect to FIG. **6**. FIG. **14**C illustrates one embodiment of left half **234***b*. As seen in FIGS. **14**B and **14**C, the left half **234***b* includes a first raised portion **289***a* and a second raised portion **289***b*. The first and second raised portions **289***a* and **289***b* define a generally circular shaped recess **291** that is sized to except the end of hub **96** of the secondary spool **30** (FIG. **13**B). Additionally, a first guide channel **293***a* and a second guide channel **293***b* are defined by the spacing between the first and second raised portions **289***a* and **289***b*. As shown in FIG. **14**A, the guide channels **293***a* and **293***b* assist in guiding the drive belt **80** as the drive belt drives the secondary spool **30**. Additionally, the walls of the recess **291** surround channel **100** of hub **96** and aid in maintaining the drive belt **80** within channel **100**.

[0104] Turning now to the handle assembly **14**, FIG. **15** is an isolated view of the handle assembly **14**, while FIG. **16** is an exploded view. In the illustrated embodiment, the handle assembly **14** is comprised of two generally identical handle body halves **104**. The handle body halves **104** may be joined to each other by any of a number of known means, including but not limited to ultrasonic welding. Each handle body half **104** may be provided with a front overmold **106** and rear overmold **108** (FIGS. **1** and **2**). The overmolds may be comprised of an elastomeric material to provide improved comfort when the handle assembly **14** is gripped by a user.

[0105] When joined together, the handle body halves **104** define a cavity which receives a trigger **110** and trigger spring **112**. The trigger **110** is shown in greater detail in FIG. **17**. The trigger spring **112** is a coil spring which extends between a rear wall of the handle body cavity and a rear surface of the trigger **110** to resiliently bias the trigger **110** to an extended condition projecting out of the front of the handle assembly **14**. The handle assembly **14** is gripped and the trigger **110** is pressed by a user to compress the trigger spring **112** and move the trigger **110** to a depressed condition.

[0106] A trigger shank **114** of the trigger **110** extends upwardly from the handle assembly **14** and is moved back and forth by actuation of the trigger **110**. The trigger shank **114** interacts with a trigger actuator of the housing assembly **16** to apply adhesive segments, as will be described in greater detail hereinafter.

[0107] As seen in FIG. **18**, each handle body half **104** has a clip chamber **116** which receives a clip **20** and associated clip spring **118**. The clip spring **118** is a coil spring which extends between a wall of the clip chamber **116** and a rear surface of the clip **20** to resiliently bias the associated clip **20** to an extended condition. An upper surface **120** of each clip **20** may be angled, such that a downward force applied to the upper surface **120** will move the clip **20** from the extended condition to an at least partially depressed condition. Such a configuration is advantageous in connecting the handle assembly **14** to the housing assembly **16**, as will be described later.

[0108] The housing assembly **16** is shown in greater detail in FIGS. **19** and **20**. In the illustrated embodiment the housing assembly **16** is comprised of two generally identical housing body halves **122**. FIGS. **21** and **22** show additional views of a housing body half **122**. The housing body halves **122** may be joined to each other by any of a number of known means, including but not limited to ultrasonic welding. FIG. **23** is a bottom plan view of the joined housing body halves **122**.

[0109] When joined together, the housing body halves l**22** define a cavity which receives various drive mechanism components, all of which are illustrated in FIG. **20**. FIG. **24** shows the interior of the housing body cavity and the components as assembled, while selected components are also individually shown in FIGS. **25-29**. As configured within the housing body cavity, the foremost component is a return spring pin **124**. The return spring pin **124** is a shaft with ends fixed in opposing supports **126** of the housing body halves **122**. The supports **126** are relatively short, not touching each other when the housing halves **122** are joined to each other, as shown in FIG. **24**. Hence, a midsection of the return spring pin **124** remains bare and is used to secure one end of a return spring **128**. The return spring **128** is a coil spring with one end secured to the bare midsection of the return spring pin **124** and the other end secured to a ratchet pin **130**.

[0110] The ratchet pin **130** is illustrated in greater detail in FIG. **25** and is a cylindrical shaft having an enlarged portion **132** with a non-circular cross section. The ends of the ratchet pin **130** are received within opposing supports **134** of the housing body halves **122**. The supports **134** are horizontally elongated into an oval configuration, as perhaps best shown in FIG. **22**. This allows the ratchet pin **130** to slide a short distance along the length of the housing assembly **16**.

[0111] The enlarged portion **132** of the ratchet pin **130** is received by a mating sleeve portion **136** of a trigger actuator **138**. The trigger actuator **138** is shown in greater detail in FIG. **26**. The non-circular cross section of the enlarged portion **132** prevents the trigger actuator **138** from rotating about the ratchet pin **130**, but instead causes the ratchet pin **130** to rotate when the trigger actuator **138** is pivoted. Thus, it may advantageous for there to be some play when the enlarged portion **132** of the ratchet pin **130** is received within the associated support **134** to allow the ratchet pin **130** at least some degree of rotation.

[0112] In addition to the sleeve portion **136**, the trigger actuator **138** also includes a latch portion **140** having an aperture **142** therethrough (FIG. **26**). FIG. **23** is a bottom plan view of the housing assembly **16** and shows that the aperture **142** is accessible through a trigger shank opening **144** in the bottom of the housing assembly **16**. When the handle assembly **14** is connected to the housing assembly **16**, the trigger shank **114** passes through the trigger shank opening **144** and is received by the aperture **142** of the trigger actuator **138**. Hence, movement of the trigger **110** by a user will be transmitted to the trigger actuator **138** to ultimately allow for manual advancement of the adhesive segment roll, as will be described in greater detail herein.

[0113] The ratchet pin **130** also serves as the pivot point for a ratchet **146**. The ratchet **146** is illustrated in greater detail in FIG. **27**. The ratchet **146** includes a substantially tubular sleeve portion **148** that receives the ratchet pin **130** for rotation thereabout. The ratchet **146** also has a U-shaped portion comprising two legs **150** and **152**. Each leg has a downwardly angled portion **154**, such that the free end of each leg is lower than the connected end of each leg. In the illustrated embodi-

ment, the free end of one leg **150** is substantially planar and the free end of the other leg **152** includes a plurality of upstanding gear teeth **156**, which will be described in greater detail below.

[0114] The free ends of the ratchet legs **150** and **152** rest upon a return driver **158**, as shown in FIG. **24**. The return driver **158** is shown in greater detail in FIG. **28**. The ends of the return driver **158** are received within opposing supports **160** of the housing body halves **122**. The supports **160** are vertically elongated, into an oval configuration, as perhaps best shown in FIG. **22**. This allows the return driver **158** to slide a short distance along the height of the housing assembly **16**. A return driver spring **162** is positioned below the return driver **158** and extends from a bottom wall of the housing body cavity to an underside of a spring support box **164** of the return driver **158**. The return driver spring **162** is a coil spring which biases the return driver **158**, and hence the free ends of the ratchet legs **150** and **152** which are supported by the return driver **158**, to an up position. When a downward force is applied to the return driver **158** and/or the free ends of the ratchet legs **150** and **152**, the return driver spring **162** will compress and allow the return driver **158** and free ends of the ratchet legs **150** and **152** to move to a lowered position. The function of this range of movement will be described hereinafter.

[0115] When the return driver l**58** and free ends of the ratchet legs **150** and **152** are in the up position, the gear teeth **156** of the ratchet leg **152** mesh with the gear teeth **166** of an idler gear **168** (FIG. **24**), similar to a typical rack and pinion system. The idler gear **168** is shown in greater detail in FIG. **29**. The idler gear **168** is substantially hollow and rotatable about a shaft **170** having its ends received within opposing supports **172** of the housing body halves **122**. The supports **172** are advantageously positioned directly above the supports **160** for the ends of the return driver **158**. The supports **172** fix the ends of the shaft **170** and, hence, the vertical position of the idler gear **168**. Therefore, movement of the return driver **158** from the up position to the lowered position will move the leg **152** away from the idler gear **168** and at least partially disengage the gear teeth **156** of the ratchet leg **152** from the gear teeth **166** of the idler gear **168**.

[0116] The cartridge assembly **12** and the handle assembly **14** are connected to the housing assembly **16** as follows. The handle assembly **14** is pressed upwardly into a handle seat **174** at the bottom of the housing assembly **16** (FIG. **23**). The trigger shank **114** passes through the trigger shank opening **144** and each handle clip **20** moves into a mating handle clip opening **176** of the handle seat **174**. The clips **20** are slightly wider than the clip openings **176**, such that the perimeter of each clip opening will press against the angled upper surface **120** of the associated handle clip **20**, moving the clip **20** from an extended condition to an at least partially depressed condition. In the at least partially depressed condition, the clips **20** slide into the clip openings **176** before the clip springs **118** move the clips **20** back to the extended position, thereby locking the handle assembly **14** in place. When installed, the trigger shank **114** will extend into the housing body cavity to be received by the aperture **142** of the latch portion **140** of the trigger actuator **138**.

[0117] In the illustrated embodiment, the handle assembly **14** includes a plurality of upstanding posts **178** (FIG. **15**) adapted to fit within associated post openings **180** (FIG. **23**) of the handle seat **174**. The posts **178** help guide the handle assembly **14** into the handle seat **174** during installation and prevent the handle assembly **14** from wobbling during use of the handheld adhesive applicator **10**.

[0118] If the handle assembly **14** is to be removed, as may be desirable to operate the handheld adhesive applicator **10** in a secondary mode, the clips **20** are pinched towards each other and the handle assembly **14** is pulled away from the handle seat **174** of the housing assembly **16**.

[0119] The cartridge assembly **12** is installed by pressing the rear prongs **88** into a front opening **182** of the housing assembly **16** (FIG. **2**). The width of the housing body cavity is slightly narrower than the clips **18** of the prongs **88**, so the walls of the housing assembly **16** press against the clips **18** and bend them inwardly toward each other. This allows the prongs **88** to move through the housing body cavity until the clips **88** move into rear clip openings **184** of the housing assembly **16** and resiliently snap back outwardly to lock the cartridge assembly **12** in place. When installed, the gear teeth **98** of the secondary spool **30** will mesh with the gear teeth **166** of the idler gear **168**.

[0120] In the illustrated embodiment, the cartridge assembly **12** includes an alignment flange **186** adapted to slide into an alignment flange receptacle **188** of the housing assembly **16** (FIG. **2**). The alignment flange **186** helps guide the cartridge assembly **12** into the front opening **182** during installation and prevents the cartridge assembly **12** from wobbling during use of the handheld adhesive applicator **10**. If the cartridge assembly **12** is to be removed, the clips **18** are pinched towards each other and the cartridge assembly **12** is pulled away from the front opening **182** of the housing assembly **16**.

[0121] Prior to inserting the cartridge assembly **12** into the housing assembly **16**, an adhesive segment roll **32** is installed on the primary spool **28**. The exact configuration of the adhesive segment roll **32** may vary without departing from the scope of the present invention. In one suitable embodiment, illustrated in FIG. **30**, pressure-sensitive adhesive segments **190** are supplied on a release liner in the form of a sheet or a carrier strip **192**, configured as a roll **32**. The roll **32** may have a relatively large diameter, such as between approximately 4 and 4.5 inches, which is larger than the adhesive segment roll used with a number of known handheld adhesive applicators. The adhesive segments **190** are secured to a low surface energy release surface **194** of the carrier strip **192**. The release surface **194**, which may be provided as a silicone coated surface, allows the pressure-sensitive adhesive segments **190** to release or be removed from the carrier strip **192**. The measurement of surface energy is generally determined by the level of attraction between the molecules located at the surface of an object; higher attraction between molecules located at the surface generally equates with a high surface energy, and lower attraction between molecules located at the surface generally equates with a low surface energy. Higher surface energy surfaces generally have a stronger adhesion to adhesives because the higher attractive forces of the molecules have a greater attraction to the adhesive. Conversely, lower surface energy surfaces generally have a weaker adhesion to adhesives. The differential in surface energies is what allows a pressure-sensitive adhesive segment to be transferred from a carrier strip to the surface of an object.

[0122] The carrier strip **192** is wound about a spool with the adhesive segments **190** facing outwardly. The adhesive segments **190** contact the rear surface **196** of the portion of the carrier strip **192** overlaying them, but the rear surface **196** has a relatively low surface energy and adhesion, such that the

adhesive segments **190** detach from the rear surface **196** without detaching from the release surface **194** as the roll **32** is unwound.

[0123] To install the roll **32**, it is first mounted on a roll core **84**, according to the foregoing description, and the roll core **84** is slid onto the hub portion **76** of the primary spool **28**. The roll **32** is mounted such that the carrier strip **192** is dispensed in an underhand manner, as shown in FIG. **31**. The carrier strip **192** is wrapped below the roller **24** and then is passed back over the top of the roll **32**. In another embodiment, the cartridge assembly may be provided with a second roller (not illustrated) positioned between the roller **24** and the primary spool **28**, such that the carrier strip **192** is wrapped over the second roller before being wrapped below the illustrated roller **24**. From the top of the roll **32**, the carrier strip **192** continues toward the rear of the cartridge assembly **12**, where it is affixed to the slip sleeve **102** of the secondary spool **30**. The carrier strip **192** may be affixed to the slip sleeve **102** by any of a number of methods, for example by splice tape, such that the bare, i.e., spent, carrier strip **192** winds around the slip sleeve **102** as the adhesive segments **190** are applied to an object.

[0124] With the roll **32** installed in the cartridge assembly **12**, the cartridge assembly **12** may be loaded into the housing assembly **16** according to the foregoing description. In one embodiment, the cartridge assembly may be durable, wherein a cartridge assembly with an empty roll is removed from the housing assembly, the spent roll is replaced with a new roll, and the cartridge is thereafter reinstalled. In another embodiment, the cartridge assembly is provided to the user with an adhesive segment roll pre-loaded and is disposable. When the roll is spent, the entire cartridge assembly may be quickly replaced with another pre-loaded cartridge assembly. This latter embodiment may be preferred because it does not require the user to feed the carrier strip through the cartridge assembly, thereby saving a substantial amount of time. The handheld adhesive applicator **10** may be used in a number of ways. According to a primary mode, the cartridge assembly **12** and the handle assembly **14** are installed and the handheld adhesive applicator **10** can be used for either glide-type applications or single segment applications. To perform a glide-type application, a lead adhesive segment **190** is positioned to face away from the roller **24** and then pressed against an object. The user grips the handle assembly **14** and moves the handheld adhesive applicator **10** downwardly (with respect to the orientation of FIG. **31**) while continuing to press the carrier strip **192** against the object using the roller **24**. The carrier strip **192** advances to the next adhesive segment **190** and the user continues this movement of the handheld adhesive applicator **10** until the desired number of adhesive segments have been applied to the object.

[0125] The operation of selected components within the housing assembly **16** during such a glide-type application is noteworthy. First, it will be seen that advancing the carrier strip **192** rotates the primary spool **28**, which causes the belt **80** to drive the secondary spool **30**. This driving action wraps the spent portion of the carrier strip **192** around the slip sleeve **102** of the secondary spool **30**. However, as is evident in FIGS. **3**, **9** and **13**, the diameter of the wheel portion **74** of the primary spool **28** is greater than the diameter of the hub portion **96** of the secondary spool **30**, meaning that the secondary spool **30** must rotate relatively quickly to stay synchronized with the primary spool **28** as the adhesive segments **190** are dispensed. The slip sleeve **102** (to which the carrier strip **192** is affixed) operates to prevent this difference in rotational speed from damaging the carrier strip **192**.

[0126] The difference in rotational speed creates tension in the carrier strip **192** which, in turn, provides a resistive force that resists the tendency of the slip sleeve **102** to rotate with the secondary spool **30**. The slip sleeve **102** and the underlying hub portion **96** of the secondary spool **30** are configured such that the friction therebetween is initially great enough to overcome the resistive force imparted by the carrier strip **192**, thereby causing the slip sleeve **102** to rotate with the secondary spool **30** and further increasing the tension in the carrier strip **192**. When the tension in the carrier strip **192** reaches a threshold level (preferably less than the tensile strength of the carrier strip **192**), the resistive force imparted by the tension will overcome the friction between the slip sleeve **102** and the hub portion **96** and cause the slip sleeve **102** to slip, i.e., remain stationary while the secondary spool **30** continues to rotate. The tension in the carrier strip **192** decreases as the slip sleeve **102** slips over the hub portion **96**, thereby decreasing the resistive force imparted to the slip sleeve **102**. When the resistive force is sufficiently small, the slip sleeve **102** will begin to again rotate with the secondary spool **30** and the self-corrective process of alternating rotating and slipping is repeated. Thus, it can be seen that the slip sleeve and hub portion **96** acts as a rotational speed differential mechanism, such as a clutch, which can accommodates the differential and constantly changing diameters of the amount of tape on the respective spools.

[0127] According to another method of using the handheld adhesive applicator **10** in the primary mode, single adhesive segments may be applied by a manual advance system. Such a method requires the use of the trigger **110**. Squeezing the trigger **110** moves the trigger shank **114**, which is received by the aperture **142** of the trigger actuator **138**. This movement of the trigger shank **114** causes the trigger actuator **138** to move toward the rear of the housing assembly **16**. The trigger actuator **138** is connected to the ratchet pin **130**, so this movement of the trigger actuator **138** pulls the ratchet pin **130** toward the rear of the housing assembly **16**, The ratchet pin **130** is connected to the ratchet **146**, so it will be seen that squeezing the trigger **110** ultimately moves the ratchet **146** toward the rear of the housing assembly **16**. This movement of the ratchet **146** causes the ratchet gear teeth **156** to rotate the gear teeth **166** of the idler gear **168** a controlled amount in the forward direction. The forward rotation drives the secondary spool **30** and the drive belt **80**. The belt in turn drives the primary spool **28** to pay out a length of the carrier strip **192**.

[0128] When the trigger **110** is released, the above process is reversed, with the ratchet **146** moving back to its initial position. However, rather than the ratchet gear teeth **156** engaging the gear teeth **166** of the idler gear **168** and driving the system in reverse, during the backstroke of the trigger **110** the return driver spring **162** will be compressed, at least partially lowering the ratchet **146** and allowing the ratchet gear teeth **156** to "slip" or "jump" past the stationary gear teeth **166** of the idler gear **168**, maintaining the carrier strip **192** in the expected position when the trigger **110** is released. More advantageously, the ratchet gear teeth **156** are lowered to the point that they completely separate from the gear teeth **166** of the idler gear **168**, ensuring that the ratchet **146** returns to its initial position without driving the idler gear **168** in reverse.

[0129] The amount of carrier strip **192** paid out by a complete trigger squeeze may vary, but in one embodiment the

carrier strip **192** will be moved a distance equal to the distance between corresponding points of adjacent adhesive segments **190**. This is advantageous for operations requiring the repeated application of a single adhesive segment, because a first adhesive segment can be properly positioned and applied, then the next adhesive segment may be advanced to the proper position by one full squeeze of the trigger. The system may also allow for incremental advancement of the carrier strip, with a half squeeze of the trigger advancing the carrier strip half the distance achieved by a complete squeeze. This may be advantageous for fine adjustments to the position of the carrier strip and adhesive segments, and may also be used to position the carrier strip in preparation for a glide-type application.

[0130] According to a second mode of operation, the handheld adhesive applicator 1O may be used without the handle assembly **14**. By such a mode, a glide-type application similar to the one described previously for the first mode of operation may be carried out, with the one exception being that the housing assembly **16** is gripped instead of the handle assembly **14**. This may be advantageous for glide-type applications in which the handle assembly **14** is obtrusive. For example, with the handle assembly **14** removed, the bottom of the housing assembly **16** may be placed against an object and pulled along it to apply one or more adhesive segments **190**.

[0131] In one embodiment that may be advantageous for the second mode of operation, the housing assembly **16** may be provided with a secondary handle member **198** at a convenient position, such as near the top of the housing assembly **16** (FIGS. **1** and **2**), and with a feature (such as an opening) suitable for being gripped by a user's fingers.

[0132] FIGS. **32**, **33** and **34** illustrate another embodiment of a handheld applicator **310** of the present disclosure. This embodiment is generally similar to the previous embodiment and includes three main subassemblies—a cartridge assembly **312**, a handle assembly **314** and a housing assembly **316**. In this embodiment, the housing assembly **316** includes a track wheel **311** (best shown in FIG. **33**), which can be rotated, typically by hand, to move the carrier strip **192** incrementally or to remove slack from the carrier strip as explained in more detail below.

[0133] Turning to the handle assembly **314**, FIG. **35** is an isolated view of the handle assembly **314**, while FIG. **36** is an exploded view. The handle assembly **314** has many similarities to handle assemble **14** and includes two generally identical handle body halves **304***a* and **304***b* which are joined together by for example, sonic weld, adhesive or mechanical attachment.

[0134] When joined together, the handle body halves **304***a* and **304***b* define a cavity **305** (FIG. **35**), which receives a locking member **308** (FIG. **38**) for securing the handle assembly **314** to the body assembly **312**. The interaction between the locking member and the handle assembly will be explained in more detail below. Additionally, the handle assembly includes clips **320** which can be used to assist in attaching the handle assembly **314** to housing assembly **316** in a manner generally similar to that described above.

[0135] The housing assembly **316** is shown in greater detail in FIGS. **37** and **38**. In the illustrated embodiment, housing assembly **316** is comprised of two generally identical housing body halves **322***a* and **322***b*. Housing body halves **322***a* and **322***b* may be joined to each other by any of a number of known means, including but not limited to ultrasonic welding. FIGS. **40** and **41** show additional views of one of the housing body halves **322***a*. FIG. **39** is a bottom plan view of the housing assembly **316**.

[0136] When joined together, the housing body halves **322***a* and **322***b* define a cavity which receives various drive mechanism components, all of which are illustrated in FIG. **38**. Selected drive mechanism components are also individually shown in FIGS. **44** and **45**. The drive mechanism components include an idler gear **324** (FIG. **45**) and a track wheel **311** (FIG. **44**). FIG. **49** illustrates the interaction between the track wheel **311** and the idler gear **324** of the drive mechanism when such components are assembled within the housing assembly **316**. The idler gear **324**, which is shown in more detail in FIG. **45**, includes a generally hollow, elongated shaft **326** having a bore **328** passing therethrough. The idler gear **324** also includes a first set of teeth **330** and a second set of teeth **332**, which are spaced apart from each other. The idler gear **324** rotates about a pin **334** (FIGS. **38** and **49**), which extends through bore **328** of hollow shaft **326**. The pin **334** includes ends **336** and **338** which are received into opposing supports **340** of body housing halves **322***a* and **322***b* (FIGS. **38**, **40** and **41**). As illustrated in FIG. **49**, the first set of teeth **330** meshes with the teeth **31** of the secondary spool **30** when the cartridge assembly **312** is assembled with the housing assembly **316**.

[0137] The track wheel **311** is shown in more detail in FIG. **44** and has a generally cylindrically shaped body that includes a central passageway **342** extending therethrough. A pin **344** (FIGS. **38** and **49**) extends through the passageway **342** and the track wheel **311** rotates about the pin. The pin **344** includes ends **346**, **348** which are received into opposing supports **350** of body halves **322***a* and **322***b* (FIGS. **38**, **40** and **41**). The supports **350** hold the pin **344** and the track wheel **311** in place. When assembled in the housing assembly, the track wheel **311** is positioned in an opening **352** (partially shown in body half **322***b* of FIG. **38**) in the housing wall so that a portion of the track wheel **311** is within the cavity of the housing and a portion of the track wheel exposed. The track wheel **311** is rotated about the pin **344** by contacting the exposed portion, typically by hand, and applying force in one direction or the other. The track wheel **311** also includes a plurality of recesses **356** (best shown in FIGS. **44** and **48**) that extends circumferentially around the track wheel. Second set of teeth **332** of idler gear **324** mesh with the recesses **356** of track wheel **311** so that as the track wheel is rotated, it drives idler gear **324**.

[0138] When the body assembly housing halves **322***a* and **322***b* are assembled, they also define a second cavity **358** (shown in FIG. **46** and partially in FIG. **38**) that houses the handle assembly locking member **308**. The locking member **308** slides back and forth within the cavity **358** between an unlocked position (shown in FIG. **39**) and a locked position (shown in FIG. **46**). The locking member **308** includes a protrusion **360** (FIGS. **43** and **46**) that can be easily contacted with a finger to slide the locking member between the locked and unlocked position.

[0139] The cartridge assembly **312** and the handle assembly **314** are connected to the housing assembly **316** as follows. The handle assembly **314** is pressed upwardly into a handle seat **362** at the bottom of the housing assembly **316** (FIG. **39**). Each handle clip **320** moves into a mating handle clip opening **364** of the handle seat **362**. The clips **320** are slightly wider than the clip openings **364**, such that the perimeter of each clip opening will press against the angled upper surface **321** of the

associated handle clip **320**, moving the clip **320** from an extended condition to an at least partially depressed condition. In the at least partially depressed condition, the clips **320** slide into the clip openings **364** before the clip springs move the clips **320** back to the extended position, thereby locking the handle assembly **314** in place.

[0140] In the embodiment illustrated in FIG. **35**, the handle assembly **314** includes first and second upstanding posts **366***a* and **366***b* adapted to fit within associated post openings **368** (FIG. **39**) of the handle seat **362**. The posts **368** help guide the handle assembly **314** into the handle seat **362** during installation and prevent the handle assembly **314** from wobbling during use of the handheld adhesive applicator **310**. The locking member **308** is then slid rearwardly (FIG. **46**) and the end portion is received into cavity **358** (FIG. **35**) of the handle assembly **314** to lock the handle assembly into place.

[0141] If the handle assembly **314** is to be removed, as may be desirable to operate the handheld adhesive applicator **310** in a secondary mode, the lock **308** is slid into the unlocked position. The clips **320** are then pinched towards each other and the handle assembly **314** is pulled away from the handle seat **362** of the housing assembly **316**.

[0142] The cartridge assembly **312** is installed by pressing the rear prongs **388** into a front opening **370** of the housing assembly **316** (FIG. **34**). The width of the housing body cavity is slightly narrower than the clips **372** of the prongs **388**, so the walls of the housing assembly **316** press against the clips **372** and bend them inwardly toward each other. This allows the prongs **388** to move through the housing body cavity until the clips **372** move into rear clip openings **374** of the housing assembly **316** and resiliently snap back outwardly to lock the cartridge assembly **312** in place. When installed, the gear teeth **31** of the secondary spool **30** mesh with the gear teeth **330** of the idler gear **324** as illustrated in FIG. **49**.

[0143] In the illustrated embodiment, the cartridge assembly **312** includes an alignment flange **376** adapted to slide into an alignment flange receptacle **378** of the housing assembly **316** (FIG. **34**). The alignment flange **376** helps guide the cartridge assembly **312** into the front opening **370** during installation and prevents the cartridge assembly **312** from wobbling during use of the handheld adhesive applicator **310**. If the cartridge assembly **312** is to be removed, the clips **372** are pinched towards each other and the cartridge assembly **312** is pulled away from the front opening **370** of the housing assembly **316**.

[0144] Handheld applicator can be used for either glide-type applications or single segment applications. The glide-type application is similar to the glide-type application described above. The user grips the handle assembly, presses the carrier strip against an object and moves the handheld applicator downwardly or in the direction of desired adhesive application.

[0145] According to one method of using the handheld applicator, single adhesive segments may be applied by a manual advance system. Such a method requires the use of track wheel **311**. With reference to FIG. **49**, rotation of the track wheel **311** in the direction of arrow A (clockwise in FIG. **49**) rotates the idler gear **324** in the direction of arrow B (counter-clockwise in FIG. **49**), which in turn rotates the secondary spool **30** in the direction of arrow C (clockwise in FIG. **49**). As the secondary spool **30** rotates, it drives the drive belt **80** and the primary spool **28**. As the primary spool **28** rotates, it pays out a length of carrier strip. The length of carrier strip paid out varies and is advantageously controlled by the user. Preferably, the user rotates the track wheel **311** so that a single segment is in the proper position for application. After application, the user again rotates the track wheel **311** to pay out another length of the carrier strip and advance the next adhesive segment into position.

[0146] The track wheel **311** can also be used to take up any slack in the carrier tape between the primary spool **28** and secondary spool **30** that may occur during use. To take-up slack, the user simply rotates the track wheel **311** in the direction of arrow A of FIG. **49**. Because of the gear ratio, the secondary spool **30** rotates at a faster rate than the primary spool **28**. In one embodiment, the secondary spool **30** rotates at about a 4 to 1 ratio to the primary spool **28**. The differential in rotation between the spools causes the secondary spool **30** to take-up more carrier tape then is let out by the primary spool **28**, thereby taking-up any slack of the carrier tape between the spools.

[0147] FIGS. **49-51** illustrate another method of attaching the handle assembly **414** to body assembly **416**. As shown in FIG. **50**, the handle assembly **414** includes a fastening member, such as the illustrated screw **418**. Referring to FIGS. **49** and **51**, to attach the handle assembly to the body assembly, the screw **418** threads into a threaded opening **420** located into the bottom of the body assembly **416**. The fastening member provides stability to the handle and, optionally, eliminates the use of handle assembly clips.

[0148] FIGS. **52** and **53** illustrate another embodiment of a handheld applicator **500**, which includes a disengageable manual carrier strip advancement member that can be employed to advance the carrier strip or liner a desired amount to place a selected portion of adhesive into position for application of the adhesive to an object. In one embodiment, the disengageable advancement member can also be employed to remove carrier strip slack that may occur between the primary and secondary spools. Handheld applicator **500** includes a housing assembly **502** and a cartridge assembly **504**. When joined together, cartridge assembly **504** is received into cavity **506** defined by housing assembly **502**, and clip **508** of cartridge assembly **504** engages portion **510** of housing assembly **502** to releasably mount the cartridge assembly to the housing assembly **502**. In one embodiment, cartridge assembly **504** is a disposable cartridge that can be easily replaced after the cartridge is spent.

[0149] Housing assembly **502** includes a housing body **503** having an upper body portion **512** and a lower or handle portion **514**. Handle portion **514** preferably is ergonomically designed to be comfortably gripped by the hand of a user. Referring to FIG. **54**, housing assembly **502** includes two generally similar housing body halves **516** and **518**, a disengageable advancement member, such as track wheel **520**, a track wheel mounting pin **522** and a leaf spring **524**.

[0150] As shown in FIG. **56**, housing body halves **516** and **518** are generally symmetrical. Housing body half **518** includes an upper body portion **526** and lower handle portion **528** extending from upper body portion **526**. Upper body portion **526** includes a front portion **530** and a rear portion **532**. Extending from rear portion **532** is a mounting support **534** that includes an elongated slot **536** for receiving one end **537** of pin **522** (shown in FIG. **54**) and mounting the pin to body half **518**. Slot **536** includes a front end **533** and a rear end **535**, and pin end **537** is movable with the slot between the front end and the rear end. The upper body portion **526** also includes a spring mounting support **538** for mounting leaf spring **524** (shown in FIG. **54**) to housing assembly **502**.

Similarly, housing body half **516** includes an upper body portion **540** and a lower handle portion **542** extending from upper body portion **540**. Upper body portion **540** includes a front portion **544** and a rear portion **546**. A mounting support **548** extends from rear portion **546**. Mounting support **548** includes an elongated slot **550** for receiving the other end **539** of pin **522** (shown in FIG. **54**) and mounting the pin to body half **516**. Slot **550** includes a front end **551** and a rear end **553**, and pin end **539** is movable between the front and the rear ends. Upper body portion **540** can also include a leaf spring mounting support **552** for mounting leaf spring **524** (shown in FIG. **54**) to housing assembly **502**.

[0151] Housing body halves **516** and **518** can be joined to each other by any suitable methods, including but not limited to ultrasonic welding. In the illustrated embodiment, handle portion **528** of body housing half **518** includes projections **554** that are received into recesses **557** of handle portion **542** of body half **516** when the body halves are joined together. The mating of projections **554** and recesses **557** provides structural strength and stability to the handle **514** and housing assembly **502**.

[0152] When housing body halves **516** and **518** are joined together, the upper body portions **526** and **540**, respectively, define cavity **506** of housing assembly **502**, and handle portions **528** and **542** join together to define handle **514** of housing assembly **502**. Additionally, the track wheel **520** is rotatably mounted to housing assembly **502** by pin **522**, as will be explained in more detail below.

[0153] Referring to FIG. **57**, track wheel **520** is generally cylindrically shaped and has a central passageway **556** extending therethrough. Track wheel **520** also can include a channel **558** extending circumferentially around the track wheel. Channel **558** is configured to accept a grip ring **560**, shown in FIG. **58**. If employed, grip ring **560** provides a gripping surface that assists in gripping track wheel **520** with a finger, such a thumb, to rotate the track wheel **520** during use. Preferably, grip ring **560** can be comprised of any suitable polymer that provides a gripping surface for a finger. Furthermore, the polymer ring **560** can be placed around track wheel **520** by any suitable means, such as overmolding. Track wheel **520** also includes a plurality of gear teeth **562**, which can be a plurality of recess that are configured to mesh and cooperate with a sprocket of the cartridge assembly **504**, as explained in greater detail below.

[0154] Referring to FIGS. **54** and **55**, to rotatably secure the track wheel **520** to housing assembly **502**, pin **522** is placed into and extends through passageway **556** of the track wheel **520**. The ends **537** and **539** of pin **522** are received into the elongated slots **550** and **536** of opposing supports **548** and **534** of the housing body halves **516** and **518**, respectively. Supports **534** and **548** hold pin **522** and track wheel **520** in position, and the track wheel is rotatable about pin **522**. A portion of track wheel **520** is exposed so that the track wheel can be easily rotated by a user's finger.

[0155] Referring to FIG. **55**, leaf spring **524**, which is shown in more detail in FIG. **59**, includes a mounting end **564** and a free end **566**. In this embodiment, mounting end **564** is generally J-shaped and is mounted to either mounting support **538** of body half **518**, mounting support **552** of body half **516** or both. Free end **566** contacts and biases track wheel **520** rearwardly so that the pin ends **537** and **539** are positioned at the rear ends **535** and **553** of elongated slots **536** and **550** (shown in FIG. **56**), respectively, and the track wheel **520** is in a rearward or disengaged position. As will be explained in more detail below, is this position, the track wheel **520** is disengaged from gears of the cartridge assembly **504**. During use, a user can move the track wheel into an engaged position, i.e., the gear teeth **562** of the track wheel **520** are engaged with gears of the cartridge assembly **504**, by applying pressure to the track wheel **520**. Upon application of pressure, the leaf spring **524** will flex, and the pin ends **537** and **539** will move toward the front ends **533** and **551** of elongated slots **536** and **550**, respectively. As the pin **524** moves forwardly within slots **536** and **550**, the track wheel **520** also moves forward to engage the gears of the cartridge assembly **504**, as will be explained in more detail below. It should be understood that the disengageable track wheel and leaf spring can also be employed in the housing assembly **316** described above.

[0156] Referring to back to FIG. **52**, cartridge assembly **504** includes a cartridge body **568**, which may be provided as a unitary structure or as a pair of symmetrical body halves. The components of cartridge assembly **504** are shown in more detail in FIGS. **60** and **61**. A number of rotatable components, namely, roller **570**, primary spool **572** and secondary spool **574** are mounted onto cartridge body **568**. In the embodiment illustrated in FIG. **61**, the cartridge body includes a first body half **578** and a second body half **580**, which can be joined together by an suitable means.

[0157] Roller **570** is generally similar to the roller previously described, and is rotatably mounted to roller support member **582** of body half **578**, as shown in FIG. **60**. The primary spool **572** is comprised of a disk-shaped wheel portion **584** and a hub portion **586** extending away from the wheel portion **584**. A passageway **588** extends through the center of the hub portion **586** and the primary spool **572** is rotatable mounted to the cartridge body **568** by inserting a primary spool support **590** of housing body half **578** through passageway **588**, as shown in FIG. **60**. The hub portion **586** is adapted to receive a roll of adhesive material. The roll can be fixed to the hub portion by fiction fit, a key or adhesive, so that the roll rotates with the primary spool. A plurality of gear teeth **592** extend around the outer circumference of the wheel portion **584**. As explained in greater detail below, gear teeth **592** are configured to mesh and cooperate with the teeth of the secondary gear of the secondary spool **574**.

[0158] The secondary spool **574**, which is shown in FIG. **61** and in more detail in FIGS. **63**, **64** and **65**, includes a first portion **594** and a second portion **596** (as shown in FIG. **61**). The first portion **594** includes a disk-shaped sprocket portion **598** and tubular hub portion **600** extending away from the sprocket portion **598**, as shown in FIGS. **63** and **64**. Similar to the previous embodiments, the hub portion **600** is adapted to receive slip sleeve **602** (shown in FIG. **61**), which generally serves the same rotational speed differential function as described above. The outer circumference of the sprocket portion **598** includes a plurality of gear teeth **604** adapted to cooperate with the gear teeth **562** of the track wheel **520** when the cartridge assembly **502** is mounted to the housing assembly **502** and the track wheel **520** is in the engaged position. The second portion **596** of the secondary spool **574** includes a secondary sprocket portion **606** including a plurality of gear teeth **608** and a shaft portion **6 10** extending form the secondary sprocket portion **606**, as shown in FIGS. **61** and **64**. The first and second portions **594** and **596** of the secondary spool **574** are joined together by inserting the shaft portion **610** of the second portion **596** into a passageway **612** extending through the hub portion **600** of the first portion **594**. The shaft **610** engages the hub portion **600** so that the first and second

portions **594** and **596** of the secondary spool **574** are fixed to one another and rotate in unison. In the illustrated embodiment, the passageway **612** of the hub portion **600** has a pair of opposed projections **614** (as shown in FIG. **63**) extending into the passageway **612** and the shaft portion **610** of second portion **596** includes a pair of opposed notches **616** that are configured to accept and frictionally engage the projections **614**. Accordingly, the engagement between the notches **616** and the projections **614** results in the first and second portions **594** and **596** rotating together. The secondary gear teeth **608** of secondary sprocket portion **606** of the second portion **596** are configured to mesh and cooperate with the gear teeth **592** of the primary spool **572**, so that the secondary spool **574** rotates with and in the opposite direction of the primary spool **572** and vice versa.

[0159] The secondary spool **574** is rotatably mounted to body half **578** by inserting secondary spool support member **618** through a passageway **620** in the second portion **596** of the secondary spool **574** and through the passageway **616** of the hub portion **600** of the first portion **594**. When components of the cartridge assembly are mounted on there respective support members **582**, **590** and **618** and housing body halves **578** and **580** are joined together, the support members **582**, **590** and **618** of body half **578** engage openings **620**, **622** and **624** (best shown in FIGS. **61** and **62**) of the body half **580**. This engagement secures the components on the respective support members and assists in supporting the support members.

[0160] Referring to FIGS. **66** and **67**, handheld application **500** can be used for either glide-type applications or single adhesive segment applications. The glide-type application is similar to the glide type application described above. In such application, the use grips handle portion **514**, presses the linear or carrier strip **630** against and object (not shown) and moves the handheld applicator **500** downwardly or in the direction of adhesive application. As the handheld applicator **500** is moved, the friction between the carrier tape **630** and the object causes the primary spool **572** to rotate in a counter-clockwise direction in FIG. **66** and a clockwise direction in FIG. **67**. Referring to FIG. **67**, the cooperation of the gear teeth **592** of the primary spool **572** and the gear teeth **608** of secondary sprocket portion **606** of the second portion **596** of the secondary spool **574** cause the secondary spool **574** to rotate in the opposite direction and spent carrier tape **630** is automatically taken up by the secondary spool **574**. The glide motion continues until a desired number of adhesive segments **632** is transferred to the object. Additionally, because the leaf spring **524** is biasing the track wheel **520** to a disengaged position, and thus the track wheel **520** is disengaged from the secondary spool **574**, the primary and secondary spools **572** and **574** are free to rotate without interference from the track wheel **520**. With the track wheel **520** disengaged, less force is required to rotate the primary and secondary spools.

[0161] According to one method of using the handle held applicator **500**, a selected amount of adhesive **632** can be positioned for application to an object by manually advancing the carrier strip or liner **630** a desired amount. Referring to FIG. **66**, in this embodiment, the track wheel **520** is being held in a disengaged position by the leaf spring **524** and a user applies enough force to the track wheel **520** to flex the leaf spring **524** and move the track wheel **520** forwardly into the engaged position (not shown). In the engaged position, the gears **562** (not shown) of track wheel **520** engage the sprocket portion **598** of the first portion **594** of secondary spool **574**. With reference to FIG. **66**, rotation of the track wheel **520** in a counter-clockwise direction drives the secondary spool **574** in a clockwise direction. Turing to FIG. **67**, because of the cooperation between the secondary sprocket portion **606** of the secondary spool **574** and the gear teeth **592** of the primary spool **572**, the primary spool **572** rotates in a direction opposite the secondary spool **574**. As the primary spool **572** rotates, it advances or pays out a length of carrier tape **630**. The user rotates the track wheel **520** until a desired amount of carrier tape **630** is advanced from the primary spool **572**. Preferably, the user rotates the track wheel **520** to advance enough tape **630** to place one adhesive segment **632** into position for attachment to an object. It should be under stood that slack in the carrier tape **630** between the primary or supply spool **572** and the secondary or take-up spool **574** can be removed by rotating the track wheel **520** in the opposite direction.

[0162] It will be understood that the embodiments of the present invention which have been described are illustrative of some of the applications of the principles of the present invention Numerous modifications may be made by those skilled in the art without departing from the true spirit and scope of the invention, including those combinations of features that are individually disclosed or claimed herein.

1. A handheld adhesive applicator, comprising:
a housing; and
a cartridge adapted to be removably connected to the housing, the cartridge having a primary spool and a secondary spool, the primary spool adapted to receive an adhesive roll including a wound supply of a liner having adhesive deposited thereon, the secondary spool adapted for collecting portions of the liner that are advanced from the primary spool, and wherein the primary spool and the secondary spool are operatively connected to each other by a drive belt.

2. The handheld applicator of claim **1** further including a manual advancement member configured to advance a desired amount of liner from the adhesive roll.

3. The handheld applicator of claim **2** in which the manual advancement member comprises a finger actuated trigger.

4. The handheld applicator of claim **2** in which the manual advancement member comprises a finger rotatable element.

5. The handheld applicator of claim **4** in which the rotatable element is a track wheel.

6. The handheld applicator of claim **2** in which the manual advancement member is connected to the housing.

7. The handheld applicator of claim **2** in which the manual advancement member is operably associated with the primary spool.

8. The handheld applicator of claim **2** in which the manual advance member is disengageably associated with the secondary spool.

9. The handheld applicator of claim **1** in which the cartridge includes a rotational speed differential mechanism configured to compensate for a rotational speed differential between the primary and secondary spools.

10. The handheld applicator of claim **9** in which the rotational speed differential mechanism comprises a slip sleeve associated with the secondary spool.

11. The handheld applicator of claim **1** further including a handle removably attached to the housing.

12. The handheld applicator of claim **1** in which the cartridge includes a guide channel for guiding the drive belt between the primary and secondary spools.

13. A cartridge for use with a handheld adhesive applicator, comprising:

a primary spool adapted to receive an adhesive roll, the adhesive roll including a wound supply of a liner having adhesive deposited thereon; and

a secondary spool adapted for collecting portions of the liner that are advanced from the primary spool, and wherein the primary spool and the secondary spool are operatively connected to each other by a drive belt.

14. The cartridge of claim **13** further including a rotational speed differential mechanism configured to compensate for a rotational speed differential between the primary and secondary spools.

15. The cartridge of claim **14** in which the rotational speed differential mechanism comprises a slip sleeve associated with the secondary spool.

16. The cartridge of claim **13** in which the primary spool is configured to operably cooperate with a manual advancement member of the housing.

17. The cartridge of claim **13** further including a guide channel for guiding the drive belt between the primary and secondary spools.

18. A method of applying adhesive, comprising:

providing an adhesive applicator having a housing and cartridge removably connected to the housing, the cartridge having a primary spool and a secondary spool, the primary spool adapted to receive an adhesive roll including a wound supply of a liner having adhesive deposited thereon, the secondary spool adapted for collecting portions of the liner that are advanced from the primary spool, and wherein the primary spool and the secondary spool are operatively connected to each other by a drive belt;

activating a manual advancement member of the adhesive applicator to advance a desired amount of the liner from the adhesive roll;

collecting portions of the advanced liner on the secondary spool; and

applying adhesive from the liner to an object.

19. The method of claim **18** wherein activating a manual advancement member comprises rotating a rotatable member with a finger.

20. The method of claim **18** wherein activating a manual advancement member comprises applying force to a trigger.

21. The method of claim **19** including rotating the advancement member to place at least one adhesive segment carried by the liner into position for application to the object.

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