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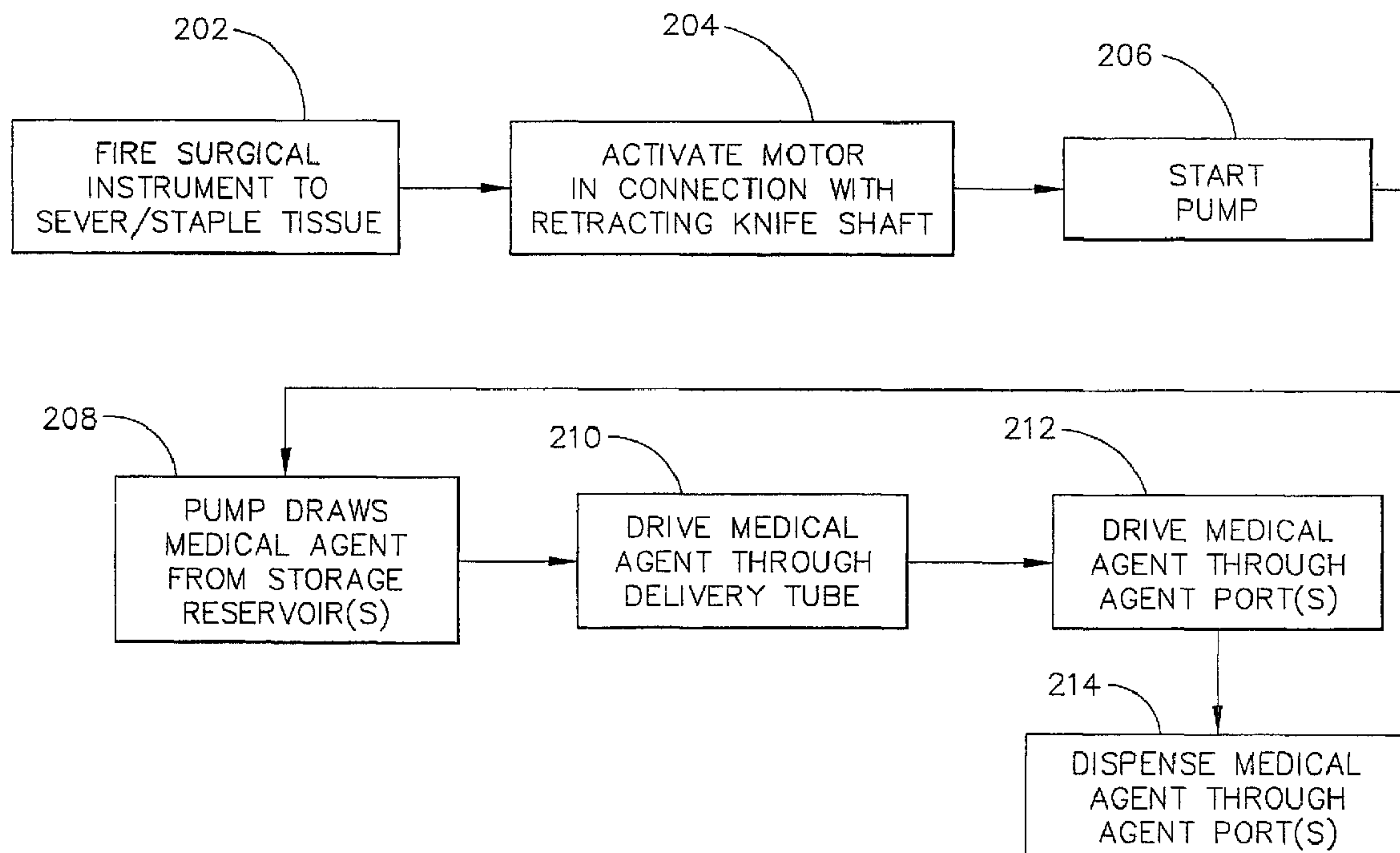
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(54) Titre : AGRAFEUSES CHIRURGICALES STRUCTUREES POUR L'ADMINISTRATION ASSISTEE PAR POMPE DE
SUBSTANCES MEDICALES

(54) Title: SURGICAL STAPLING INSTRUMENTS STRUCTURED FOR PUMP-ASSISTED DELIVERY OF MEDICAL
AGENTS



(57) Abrégé/Abstract:

A medical agent dispensing system and surgical instruments that employ the medical agent dispensing system are provided. The dispensing system may be structured for use with a surgical severing/stapling instrument structured for severing and stapling

(57) **Abrégé(suite)/Abstract(continued):**

tissue. The dispensing system may include at least one storage reservoir structured for storing at least a component of a medical agent and a pump in communication with the storage reservoir; a delivery tube in communication with the pump which is structured to receive a quantity of the medical agent from the storage reservoir during operation of the pump; and, at least one agent tube in communication with the delivery tube which is structured for communication with a least one agent port formed in a staple cartridge or an anvil of the surgical instrument for dispensing the medical agent therethrough.

ABSTRACT

A medical agent dispensing system and surgical instruments that employ the medical agent dispensing system are provided. The dispensing system may be structured for use with a surgical severing/stapling instrument structured for severing and stapling tissue. The dispensing system may include at least one storage reservoir structured for storing at least a component of a medical agent and a pump in communication with the storage reservoir; a delivery tube in communication with the pump which is structured to receive a quantity of the medical agent from the storage reservoir during operation of the pump; and, at least one agent tube in communication with the delivery tube which is structured for communication with a least one agent port formed in a staple cartridge or an anvil of the surgical instrument for dispensing the medical agent therethrough.

SURGICAL STAPLING INSTRUMENTS

STRUCTURED FOR PUMP-ASSISTED DELIVERY OF MEDICAL AGENTS

FIELD OF THE INVENTION

[0001] The present invention generally relates to surgical instruments. The invention more particularly relates to delivery and application of medical agents in association with the use of surgical instruments to promote closure and healing of severed and stapled tissue.

BACKGROUND

[0002] Conventional surgical staplers that can be used to simultaneously make longitudinal incisions in tissue and apply lines of staples on opposing sides of the incisions are known in the art. Such instruments commonly include a pair of cooperating jaw members that, when employed in endoscopic or laparoscopic applications, are capable of passing through a cannula passageway. One of the jaw members typically receives a staple cartridge having at least two laterally spaced rows of staples. The other jaw member defines an anvil having staple-forming pockets correspondingly aligned with the rows of staples in the cartridge. Such stapling instruments may also include a plurality of reciprocating wedges that pass through openings in the staple cartridge when driven and engage drivers supporting the staples to effect the firing of the staples toward the anvil and through tissue.

[0003] Examples of surgical staplers suitable for use with endoscopic applications are described in U.S. Patent Application No. US 2004/0232196 A1. In operation of the surgical stapler, a clinician closes or clamps the jaw members of the stapler on tissue to position the tissue

prior to firing or activation of the stapler. Once the clinician has determined that the jaw members are clamping the tissue in a desired position, then the surgical stapler can be fired by the clinician to create an incision in the tissue and at the same time staple tissue surrounding the incision. This simultaneous action of the stapler avoids complications that often arise when the severing and stapling operations are performed sequentially (or at different times) with different surgical tools (i.e., one device is used to sever the tissue, and then another device is used to staple the tissue).

[0004] In general, application of certain medical agents to tissue incisions can promote healing, reduce the possibility of infection, and/or promote proper sealing of the incisions. If assisted by the action of such medical agents, many surgical staplers could achieve better surgical results with respect to enhanced healing, improved infection resistance, and improved sealing of tissue incisions. However, the structure of many conventional surgical staplers, and the procedures in which such staplers are employed, do not leverage the benefits of medical agents or systems that dispense medical agents.

[0005] In view of the foregoing, there is a need for improved surgical instruments and medical agent dispensing systems than can more effectively and efficiently promote closure, treatment, and healing of tissue incisions severed and stapled during operations involving surgical staplers.

SUMMARY

[0006] In accordance with the present invention, various embodiments of a medical agent dispensing system can be provided. The dispensing system may be structured for use with

a surgical severing/stapling instrument structured for severing and stapling tissue. The dispensing system may include at least one storage reservoir structured for storing at least a component of a medical agent, and a pump in communication with the storage reservoir. Also, a delivery tube may be in communication with the pump which is structured to receive a quantity of the medical agent from the storage reservoir during operation of the pump. The dispensing system may also include at least one agent tube in communication with the delivery tube which is structured for communication with a least one agent port formed in a staple cartridge of the surgical instrument for dispensing the medical agent therethrough.

[0007] In certain embodiments of the invention, a medical agent dispensing system may be provided that includes at least one storage reservoir structured for storing at least a component of a medical agent, and a pump in communication with the storage reservoir. Also, a delivery tube may be in communication with the pump which is structured to receive a quantity of the medical agent from the storage reservoir during operation of the pump. The dispensing system may also include at least one agent tube in communication with the delivery tube which is structured for communication with a least one agent port formed in an anvil of the surgical instrument for dispensing the medical agent therethrough.

[0008] In various embodiments of the invention, a surgical severing/stapling instrument may be provided that includes a medical agent dispensing system. The instrument may include a handle portion including at least one storage reservoir structured for storing at least a component of a medical agent. The handle portion may further include a pump in communication with the storage reservoir. The instrument may also include a shaft portion connected to the handle portion that includes a delivery tube in communication with the storage

reservoir, such that a medical agent is deliverable from the storage reservoir to the delivery tube during operation of the pump. The instrument may further include an end effector portion operatively associated with the shaft portion, and the end effector may include a channel having a staple cartridge positioned removably therein. The dispensing system may also include at least one agent tube in communication with the delivery tube that extends from the shaft portion to communicate with a least one agent port formed in the staple cartridge for dispensing the medical agent therethrough.

[0009] In certain embodiments of the invention, a surgical severing/stapling instrument may be provided that includes a medical agent dispensing system. The instrument may include a handle portion with at least one storage reservoir structured for storing at least a component of a medical agent and a pump in communication with the storage reservoir. The instrument may further include a shaft portion connected to the handle portion. The shaft portion may include a delivery tube in communication with the storage reservoir, such that a medical agent is deliverable from the storage reservoir to the delivery tube during operation of the pump. The instrument may also include an end effector portion operatively associated with the shaft portion, wherein the end effector portion has an anvil. The dispensing system may include at least one agent tube in communication with the delivery tube that extends from the shaft portion to communicate with a least one agent port formed in the anvil for dispensing the medical agent therethrough.

BRIEF DESCRIPTION OF THE FIGURES

[0010] The accompanying drawings, which are incorporated into and constitute a part of this specification, illustrate embodiments of the invention. Together with the description of the embodiments provided herein, the drawings serve to explain the principles of the present invention for those skilled in the art.

[0011] Figure 1 depicts an three-dimensional, partially cut-away, partially schematic view of a surgical instrument that may be provided in association with embodiments of a medical agent dispensing system in accordance with the present invention;

[0012] Figure 2 illustrates a disassembled, three-dimensional view of the end effector and a shaft portion of the surgical instrument of Figure 1;

[0013] Figure 3 includes schematic depictions of handle, shaft and end effector portions of the surgical instrument of Figure 1;

[0014] Figure 4 includes an enlarged view of portions of the shaft and end effector of the surgical instrument of Figure 3;

[0015] Figure 5 includes an enlarged three-dimensional view of portions of the shaft and handle portion of the surgical instrument of Figure 3;

[0016] Figure 6 includes an end view of the channel of the surgical instrument of Figure 2;

[0017] Figure 7 includes a schematic of a pump that may be employed in accordance with various embodiments of the invention;

[0018] Figure 8 includes a schematic of a pump that may be employed in accordance with various embodiments of the invention;

[0019] Figure 9 includes a process flow diagram illustrating various aspects of an example of a method for using embodiments of the medical agent dispensing system of the present invention;

[0020] Figure 10 illustrates a disassembled, three-dimensional view of the end effector and a shaft portion of a surgical instrument that may be configured in association with embodiments of a medical agent dispensing system of the present invention;

[0021] Figure 11 includes an enlarged three-dimensional view of the end effector of the surgical instrument with the staple cartridge removed;

[0022] Figure 12 includes a schematic view of certain portions of the shaft and end effector of the surgical instrument;

[0023] Figure 13 includes a cut-away, three-dimensional view of certain portions of the shaft and end effector of the surgical instrument;

[0024] Figure 14 includes a three-dimensional view of the end effector of the surgical instrument;

[0025] Figure 15 includes a three-dimensional view of portions of the shaft and the end effector of the surgical instrument;

[0026] Figure 16 includes a schematic of portions of the handle portion and the shaft of the surgical instrument; and,

[0027] Figure 17 includes a process flow diagram illustrating various aspects of an example of a method for using embodiments of the medical agent dispensing system of the present invention.

DESCRIPTION

[0028] As applied herein, the term “tissue” may include a variety of human or animal tissues, membranes, or other organic substrates. The term “tissue” may also include any substance, substrate, or composition of matter capable of being severed and stapled by the various embodiments of surgical stapling/severing instruments described herein.

[0029] As applied herein, the term “medical agent” may include a variety of liquid chemicals, or other compositions of matter in liquid form that may be applied to tissues. Examples of “medical agents” may include, without limitation, hemostatic agents, healing agents, adhesives, sealants, antibacterial agents, infection-resistant agents, analgesics, and various other kinds of medicinal or beneficial substances.

[0030] With general reference to Figures 1 through 6, in association with various embodiments of the invention, a surgical severing/stapling instrument 10 may be structured with a handle portion 20 connected to an implement portion 22. The implement portion 22 may include a shaft 24 which extends distally from the handle portion 20 and terminates in an end effector 26. The end effector 26 may include an actuator or E-beam firing mechanism (“firing bar”) 28 that controls spacing between an elongated channel 30 and a pivotally translatable anvil 32 included within the end effector 26. It can be seen that the spacing between the channel 30 and the anvil 32 may be configured to promote effective stapling and severing of tissue during use of the surgical instrument 10 by a clinician, for example.

[0031] The handle portion 20 of the instrument 10 may include a pistol grip 34 toward which a closure trigger 36 may be pivotally drawn by the clinician, for example, to cause clamping or closing of the anvil 32 toward the channel 30 of the end effector 26. In operation,

the tissue of a patient, for example, may be clamped by the closing of the anvil 32 toward the channel 30. A firing trigger 38 positioned adjacent to the closure trigger 36 can be pivotally drawn in the direction of the pistol grip 34 to substantially simultaneously staple and sever tissue clamped in the end effector 26 of the instrument 10. In a surgical operation, the clinician first activates the closure trigger 36 to clamp the tissue of a patient, for example. Once the clinician is satisfied with the positioning of the end effector 26, the closure trigger 36 may be drawn back to a fully closed and locked position proximate to the pistol grip 34. The firing trigger 38 of the instrument 10 may then be actuated to sever and staple the clamped tissue. The firing trigger 38 may springedly return to a normal, inactivated state when the clinician removes pressure applied to the firing trigger 38. A release button 40 positioned on the proximal end of the handle portion 20 may be pressed by the clinician to release the locked closure trigger 36 to its normally open position (as shown in Figure 1).

[0032] In various embodiments, the distal end of the shaft 24 may include a closure tube 52 structured to receive and contain portions of the components of the end effector 26, such as the anvil 32 and the channel 30. The closure tube 52 may also be structured to receive a spine 54 extending therethrough that supports a knife shaft 56 having a distally positioned severing edge 58. The knife shaft 56 may operatively interact with the firing bar 28 at the severing edge 58 of the knife shaft 56. A knife spring 60 may be inserted within the spine 54 and structured with a resilient downward bias that promotes proper and secure positioning of the knife shaft 56 within the spine 54. In operation, when the instrument 10 is fired, the knife shaft 56 and its severing edge 58 are moved through the channel 30 by a knife rod 61 to sever tissue clamped between the anvil 32 and the channel 30. The channel 30 may be structured to receive a

removable staple cartridge 62 therein. The staple cartridge 62 may have multiple staple holes (such as illustratively representative staple holes 64, 66, 68) formed therein and through which multiple staples (not shown) may be driven to staple severed tissue when the instrument 10 is fired. In certain embodiments, the staple cartridge 62 may be an “ETS45” or “ETS60” six-row cartridge, for example, marketed by Ethicon Endo-Surgery, Inc., of Cincinnati, Ohio.

[0033] Examples of the structure and operation of typical surgical stapling instruments that may be provided in association with embodiments of the present invention are disclosed in a United States published patent application to Shelton et al. entitled, “Surgical Stapling Instrument having Separate Distinct Closing and Firing Systems” (U.S. Pub. No. 2004/0232196, Serial No. 10/441,632, filed on May 20, 2003).

[0034] With regard to embodiments of a medical agent dispensing system that may be provided in conjunction with the surgical instrument 10, a delivery tube 72 may be positioned to extend longitudinally through the spine 54, and may extend from the handle portion 20 of the instrument 10 to a lateral manifold 74. One or more agent tubes 78, 80 may be positioned to communicate both with the lateral manifold 74 and with a plurality of agent ports (such as illustratively representative agent ports 82, 84, 86) formed in the staple cartridge 62 generally adjacent to the staple holes 64, 66, 68 of the cartridge 62. The agent tubes 78, 80 may be structured for communication with the agent ports 82, 84, 86 in the staple cartridge 62 as shown in the end view of the cartridge 62 of Figure 6. While a row of agent ports 82, 84, 86 is shown positioned next to both sides of a longitudinal center line of the channel 30, it can be appreciated that more or less such agent ports 82, 84, 86 may be provided in the cartridge 62. For example,

more agent ports 82, 84, 86 may be provided in place of one or more of the staple holes 64, 66, 68 formed in the cartridge 62. In various embodiments, one or more structures such as mounting blocks 79, 81 may be included within the channel 30 to facilitate securement and stability of the agent tubes 78, 80 (respectively) within the instrument 10 (see Figure 1). Also, it can be seen that the agent tubes 78, 80 (such as the left-hand side agent tube 78, as shown in Figure 4, for example) may be positioned generally adjacent to the knife shaft 56 as the agent tubes 78, 80 extend longitudinally through the shaft 24.

[0035] In various embodiments, the handle portion 20 may include one or more medical agent storage reservoirs 92, 94 mounted on the handle portion 20 and in communication with the delivery tube 72. The storage reservoirs 92, 94 may contain a variety of medical agents, or components thereof, that can be beneficially applied to severed and stapled tissue by action of the dispensing system in connection with use of the surgical instrument 10. While multiple storage reservoirs 92, 94 are depicted on the instrument 10 for convenience of disclosure, certain embodiments of the invention may employ only a single storage reservoir, for example, or more than two storage reservoirs. It can be seen that employing multiple storage reservoirs 92, 94 can facilitate real-time mixing of multiple-component medical agents during operation of the medical agent dispensing system. For example, the use of multiple storage reservoirs 92, 94 facilitates combination and use of two-part liquid adhesives, for example, in connection with operation of the dispensing system within the instrument 10. In certain embodiments, the medical agents stored in the storage reservoirs 92, 94 may be the same type of medical agent or different types of medical agents.

[0036] Also, in various embodiments of the medical agent dispensing system of the present invention, an electric motor 98 may be included within the handle portion 20 and operatively associated with a pump 100 configured to be driven by the motor 98. Those skilled in the art will appreciate that the electric motor 98 may be any conventional battery-driven or AC-powered motor provided with specifications (e.g., a motor rating) suitable for safe and effective use of the motor 98 in association with operation of the surgical instrument 10. In certain embodiments, the electric motor 98 may be activated through conventional electrical circuitry or components 102 that can be operatively associated with the firing trigger 38, the release button 40, and/or an independent manual activation switch 104 of the instrument 10. The electrical circuitry 102 may be configured to activate the motor 98 automatically in association with the firing operation of the instrument 10, for example; and/or to activate the motor 98 manually through use of the switch 104 which may be pressed by the clinician, for example, when using the instrument 10.

[0037] With reference to Figures 7 and 8, in various embodiments, the pump 100 may include, for example and without limitation, a peristaltic pump 122 (as shown in Figure 7); a diaphragm pump 124 (as shown in Figure 8); a rotary pump; or a variety of other types of pumps that may be suitably applied as the pump 100 in accordance with embodiments of the invention.

[0038] With reference to Figure 9, a process flow diagram illustrates a method of applying the instrument 10 with various embodiments of the medical agent dispensing system in a surgical procedure performed on tissue. At step 202, the instrument 10 may be fired as described above to sever tissue and to apply staples to areas on both sides of an incision made in the tissue. At step 204, in connection with retraction of the knife shaft 56 from the

severed/stapled tissue, the electric motor 98 may be activated to initiate rotation of the pump 100 at step 206. At step 208, the action of the pump 100 draws a quantity of a medical agent, or components combined to create a quantity of medical agent, from the storage reservoirs 92, 94 through the pump 100. At step 210, the medical agent is driven by the pump 100 through the delivery tube 72 (and associated tubing) to the lateral manifold 74. At step 212, the medical agent may be driven through the agent tubes 78, 80 to be dispensed at step 214 through the plurality of agent ports 82, 84, 86 formed in the staple cartridge 62. Once dispensed through the plurality of agent ports 82, 84, 86, the medical agent may then cover or deluge at least a portion of tissue areas severed/stapled by action of the instrument 10 at step 202.

[0039] With general reference to Figures 10 through 16, embodiments of the surgical severing/stapling instrument 10 may be structured with the closure tube 52 receiving and maintaining an end effector 26 including a modified anvil 254 and the channel 30. The channel 30 may be structured to removably receive a standard staple cartridge 256 therein. The staple cartridge 256 may have rows of multiple staple holes (such as illustratively representative staple holes 258, 260, 262, 264) formed therein and through which multiple staples (not shown) may be driven to staple severed tissue when the instrument 10 is fired. In certain embodiments, the staple cartridge 256 may be an “ETS45” or “ETS60” six-row cartridge, for example, marketed by Ethicon Endo-Surgery, Inc., of Cincinnati, Ohio. As shown more particularly in Figure 11, the anvil 254 may include multiple rows of staple receiving depressions 266, 268, 270, 272 positioned in a corresponding relationship with the rows of staple holes 258, 260, 262, 264 of the staple cartridge 256. The multiple rows of staple depressions 266, 268, 270, 272 function to

receive staples driven through the staple holes 258, 260, 262, 264 when the instrument 10 is fired to staple tissue.

[0040] With regard to embodiments of a medical agent dispensing system that may be provided in conjunction with the surgical instrument 10, a delivery tube 274 may be positioned to extend longitudinally through the spine 54 to a lateral manifold 276. One or more agent tubes 278, 280 may be positioned to communicate with the lateral manifold 276 and with one or more agent port blocks 282, 284 (respectively) having a plurality of agent ports (such as illustratively representative agent ports 286, 288, 290, 292) formed therein. In general, Figures 12 through 15 illustrate the manner in which the agent tubes 278, 280 may be routed through the spine 54 to the anvil 254 of the instrument 10. As shown in Figure 11, the agent port blocks 282, 284 may be connected to or formed on the anvil 254 generally adjacent to the rows of staple receiving depressions 266, 268, 270, 272 formed in the anvil 254. The agent ports 286, 288, 290, 292 may be formed on inner portions 282A, 284A of the agent port blocks 282, 284 to maximize the proximity of the agent ports 286, 288, 290, 292 to the staple receiving depressions 266, 268, 270, 272. It can be appreciated that the staple receiving depressions 266, 268, 270, 272 are proximate to severed/stapled tissue once the instrument 10 is fired. Thus, the positioning and sizing of the agent ports 286, 288, 290, 292 formed in the agent port blocks 282, 284 may be configured to maximize the portions of the severed/stapled tissue that can be covered or deluged by a medical agent delivered through the agent ports 286, 288, 290, 292 during operation of the instrument 10.

[0041] In various embodiments, the handle portion 20 of the instrument 10 may include one or more medical agent storage reservoirs 302, 304 mounted thereon and in

communication with the delivery tube 274 through a pump 306. With particular reference to Figures 7, 8 and 16, the pump 306 may include, for example and without limitation, the peristaltic pump 122 (as shown in Figure 7); the diaphragm pump 124 (as shown in Figure 8); a rotary pump (as shown in Figure 16); or a variety of other pumps that may be suitably applied in accordance with embodiments of the invention. The storage reservoirs 302, 304 may contain a variety of medical agents, or components thereof, that can be beneficially applied to severed and stapled tissue by the dispensing system in connection with use of the surgical instrument 10. While multiple storage reservoirs 302, 304 are depicted on the instrument 10 for convenience of disclosure, certain embodiments of the invention may employ only a single storage reservoir, for example, or more than two storage reservoirs. It can be seen that employing multiple storage reservoirs 302, 304 can facilitate real-time mixing of multiple-component medical agents during operation of the medical agent dispensing system. For example, one storage reservoir 302 may contain a first liquid and the other storage reservoir 304 may contain a second liquid. The first liquid may be the same kind of liquid as the second liquid, or the liquids may be different medical agents or components of medical agents. For example, multiple storage reservoirs 302, 304 can facilitate the use of two-part liquid adhesives designed to be combined during medical agent dispensing operations of the instrument 10. In operation, the medical agents stored in the storage reservoirs 302, 304 may be drawn to and driven through the delivery tube 274 by the action of the pump 306. The pump 306 may draw medical agents from the storage reservoirs 302, 304 through a reservoir manifold 309 in communication with the storage reservoirs 302, 304.

[0042] Also, in various embodiments of the medical agent dispensing system of the present invention, an electric motor 310 may be included within the handle portion 20 and operatively associated with the pump 306 to cause the pump 306 to draw medical agents from the storage reservoirs 302, 304. Those skilled in the art will appreciate that the electric motor 310 may be any conventional battery-driven or AC-powered motor provided with specifications (e.g., a motor rating) suitable for safe and effective use of the motor 310 in association with operation of the surgical instrument 10. In certain embodiments, the electric motor 310 may be activated as discussed above in association with the firing trigger 38, the release button 40, and/or the independent manual activation switch 104 of the instrument 10. In addition, as discussed above, the electrical circuitry 102 may be configured to activate the motor 310 automatically in association with the firing operation of the instrument 10, for example; and/or to activate the motor 310 manually through use of the switch 104 which may be pressed by the clinician, for example, when using the instrument 10.

[0043] With reference to Figure 17, a process flow diagram illustrates a method of applying the instrument 10 with various embodiments of the medical agent dispensing system in a surgical procedure performed on tissue. At step 402, the instrument 10 may be fired as described above to sever tissue and to apply staples to areas on both sides of an incision made in the tissue. At step 404, in connection with retraction of the knife shaft 56 from the severed/stapled tissue, the electric motor 310 may be activated to initiate the action of the pump 306 at step 406. At step 408, the pump 306 drives a quantity of a medical agent, or components combined to create a quantity of the medical agent, from the storage reservoirs 302, 304 through the pump 306 (and associated tubing). At step 410, the medical agent is driven and delivered

through the delivery tube 274 to the lateral manifold 276 by the action of the pump 306. At step 412, the medical agent may be driven through the agent tubes 278, 280 to be dispensed at step 414 through the agent ports 286, 288, 290, 292 formed in the agent port blocks 282, 284 of the anvil 254. Once dispensed through the agent ports 286, 288, 290, 292, the medical agent may then cover or deluge at least a portion of tissue areas severed and stapled by action of the instrument 10 at step 402.

[0044] It will be appreciated that the terms “proximal” and “distal” may be used herein as convenient terms of relative orientation, such as with reference to a clinician gripping a handle of an instrument. For example, the end effector 26 may be considered “distal” with respect to the “proximal” handle portion 20 (see, e.g., Figure 1). It will be further appreciated that, for convenience and clarity of disclosure, spatial terms of relative orientation such as “vertical” and “horizontal” or “downward” and “upward” may be used herein with respect to the drawings. Those skilled in the art will appreciate, however, that surgical instruments may be used in many orientations and positions, and such terms are not intended to be limiting and absolute.

[0045] Any patent, publication, or other disclosure material, in whole or in part, that is said to be incorporated by reference herein is done so only to the extent that the incorporated material does not conflict with existing definitions, statements, or other disclosure material set forth in the present disclosure. As such, and to the extent necessary, the disclosure as explicitly set forth herein supersedes any conflicting material incorporated herein by reference. Any material, or portion thereof, that is said to be incorporated by reference herein, but which conflicts with existing definitions, statements, or other disclosure material set forth herein will

only be incorporated to the extent that no conflict arises between that incorporated material and the existing disclosure material.

[0046] The examples presented herein are intended to illustrate potential and specific implementations of the present invention for those skilled in the art. No particular aspect or aspects of the examples included herein are necessarily intended to limit the scope of the present invention.

[0047] It is to be understood that the figures and descriptions of the present invention have been simplified to illustrate elements that are relevant for a clear understanding of the present invention, while eliminating, for purposes of clarity, other elements. Those of ordinary skill in the art will recognize, however, that these and other elements may be desirable in a typical computer system or database system. However, because such elements are well known in the art and because they do not facilitate a better understanding of the present invention, a discussion of such elements may not be provided herein.

[0048] Any element expressed herein as a means for performing a specified function is intended to encompass any way of performing that function including, for example, a combination of elements that perform that function. Furthermore the invention, as defined by such means-plus-function claims, resides in the fact that the functionalities provided by the various recited means are combined and brought together in a manner as defined by the appended claims. Therefore, any means that can provide such functionalities may be considered equivalents to the means shown herein.

[0049] In various embodiments of the present invention disclosed herein, a single component may be replaced by multiple components, and multiple components may be replaced

by a single component, to perform a given function or functions. Except where such substitution would not be operative to practice embodiments of the present invention, such substitution is within the scope of the present invention.

[0050] While the present invention has been illustrated by description of several embodiments and while the illustrative embodiments have been described in considerable detail, it is not the intention of the applicant to restrict or in any way limit. Additional advantages and modifications may readily appear to those skilled in the art. The present invention has been discussed in terms of endoscopic procedures and apparatus. However, use herein of terms such as “endoscopic” should not be construed to limit to a surgical stapling and severing instrument for use only in conjunction with an endoscopic tube (i.e., trocar). On the contrary, it is believed that surgical instruments structured in accordance with the present invention may find use in many surgical procedures, including but not limited to laparoscopic procedures and open procedures. Moreover, the unique and novel aspects of the embodiments of the present invention may find utility when used in connection with other forms of stapling apparatuses.

CLAIMS:

1. A surgical severing/stapling instrument including a medical agent dispensing system, the instrument comprising:

a handle portion including at least one storage reservoir structured for storing at least a component of a medical agent; a shaft portion connected to the handle portion, the shaft portion including a delivery tube in communication with the storage reservoir;

an end effector operatively associated with the shaft portion, the end effector including first and second jaw components one of which comprises a channel having a staple cartridge removably positioned therein and the other of which comprises an anvil;

at least one agent tube in communication with the delivery tube, the agent tube extending from the shaft portion to communicate with at least one agent port formed in one of the jaw components of the end effector for dispensing the medical agent therethrough;

wherein the handle portion further includes a pump in communication with the storage reservoir, the delivery tube being in communication with the storage reservoir through the pump such that a medical agent is deliverable from the storage reservoir to the delivery tube during operation of the pump, wherein the pump is configured, upon actuation, to draw the medical agent from the storage reservoir into the delivery tube and the agent tube to dispense the medical agent through the agent port in the end effector.

2. The instrument of claim 1, wherein the first jaw component of the end effector comprises a channel having a staple cartridge removably positioned therein, and wherein the agent tube extending from the shaft portion to communicate with the agent port formed in the staple cartridge for dispensing the medical agent therethrough.

3. The instrument of claim 1, wherein the second jaw component of the end effector comprises an anvil, and wherein the agent tube extends from the shaft portion to communicate with the agent port formed in the anvil for dispensing the medical agent therethrough.

4. The instrument of any one of claims 1 to 3, wherein the medical agent includes a hemostatic agent stored in at least one said storage reservoir.
5. The instrument of any one of claims 1 to 3, wherein the medical agent includes an adhesive stored in at least one said storage reservoir.
6. The instrument of any one of claims 1 to 5, wherein the pump is selected from the group consisting of a rotary pump, a peristaltic pump, and a diaphragm pump.
7. The instrument of any one of claims 1 to 6, wherein the delivery tube is in communication with the agent tube through a lateral manifold.
8. The instrument of claim 7, wherein the agent tube is in communication with both the lateral manifold and the agent port.
9. The instrument of any one of claims 1 to 8, further comprising at least a second agent tube in communication with the delivery tube, wherein the first agent tube communicates with a first plurality of agent ports, and the second agent tube communicates with a second plurality of agent ports.
10. The instrument of claim 2, wherein the agent port is formed generally adjacent to at least one staple hole of the staple cartridge.
11. The instrument of any one of claims 1 to 10, further comprising at least a second storage reservoir in communication with the delivery tube, the second storage reservoir being structured for storing at least a component of the medical agent.
12. The instrument of claim 11, further including an agent component stored in the first storage reservoir and an agent component stored in the second storage reservoir which are designed to be combined to form the medical agent.

13. The instrument of any one of claims 1 to 12, wherein the pump is operatively associated with a motor in the handle portion, the motor being operable to cause the pump to draw the medical agent from the storage reservoir to the delivery tube.
14. The instrument of claim 13, the motor is operatively associated with an electrical circuit.

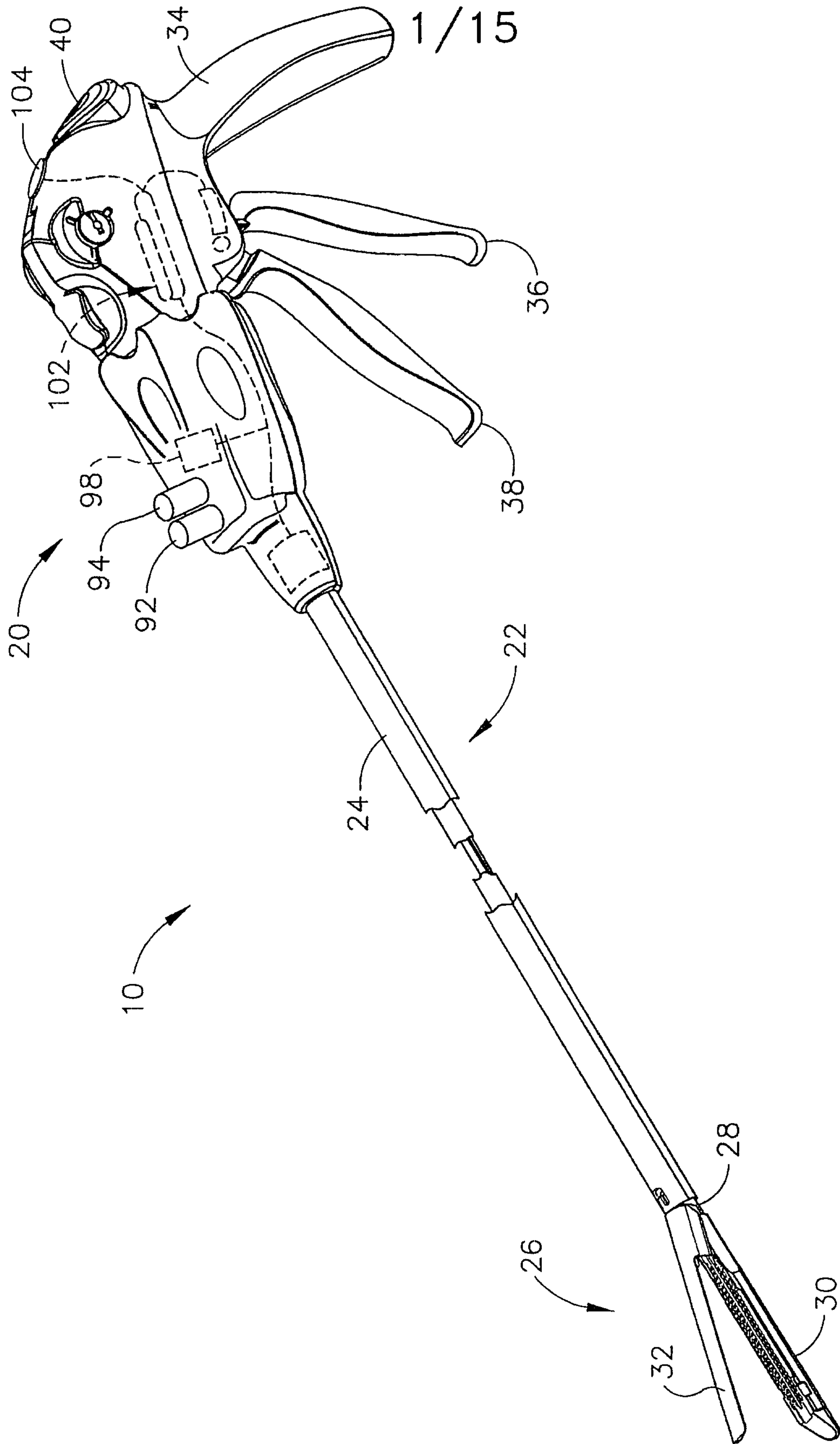
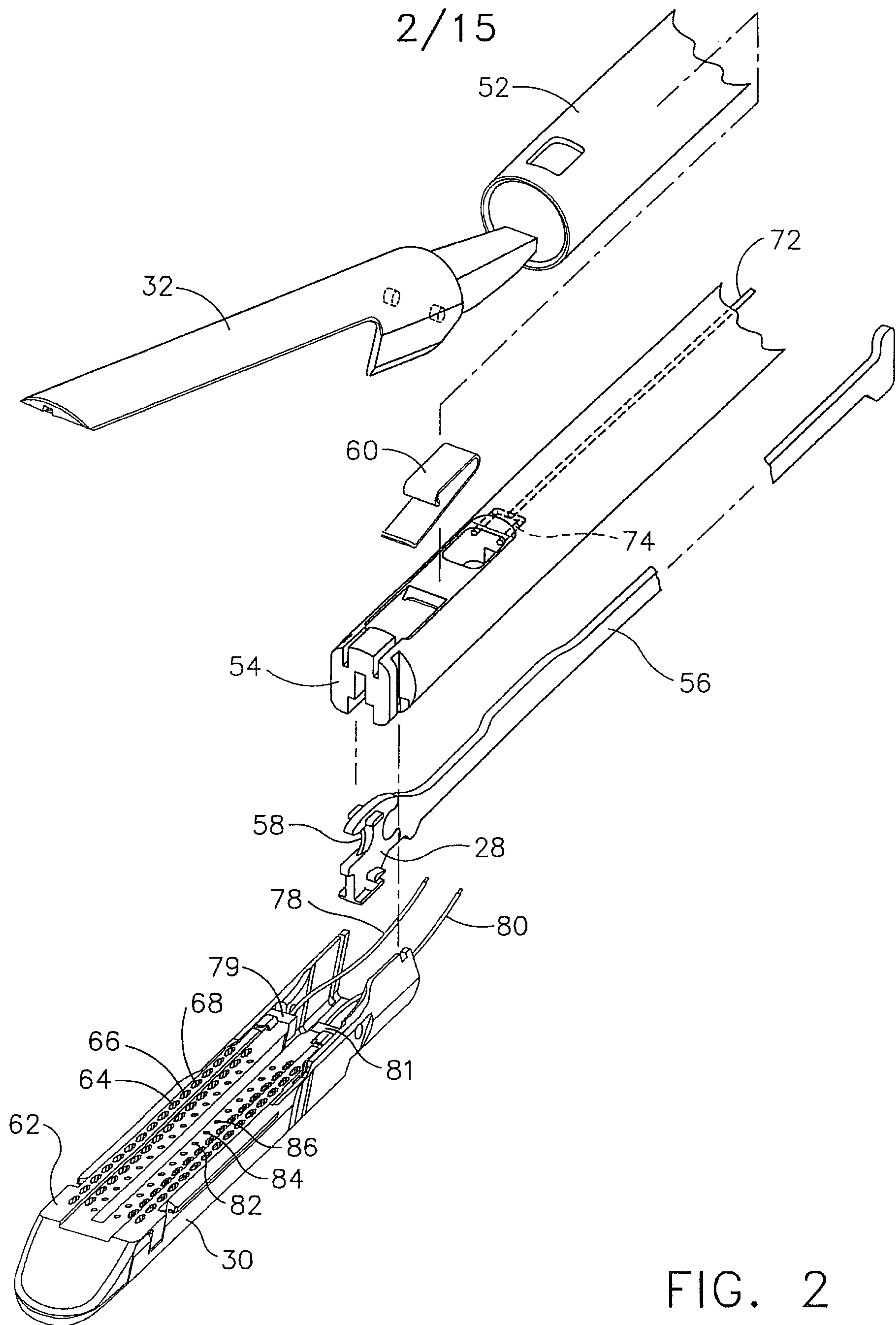
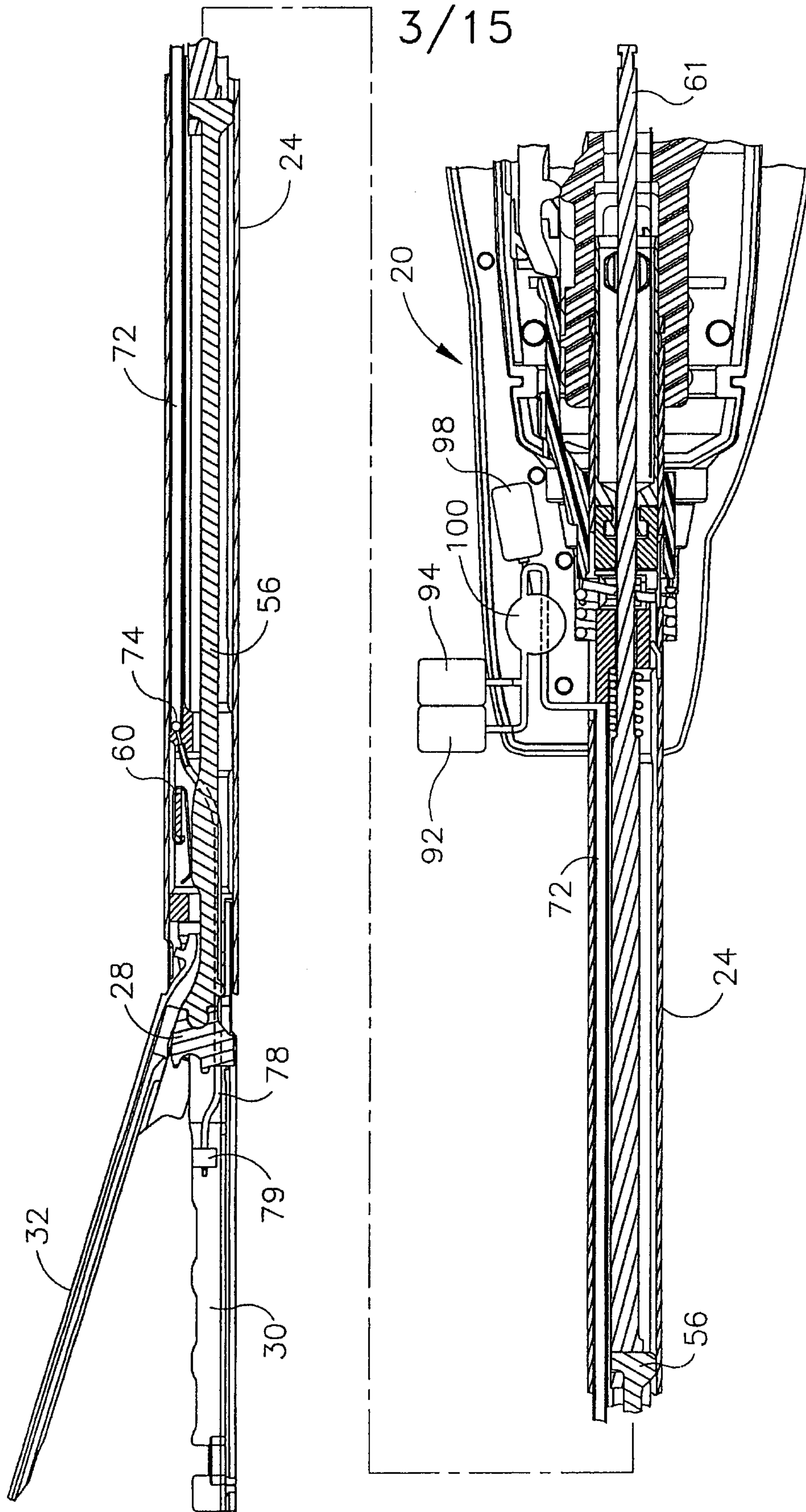


FIG. 1





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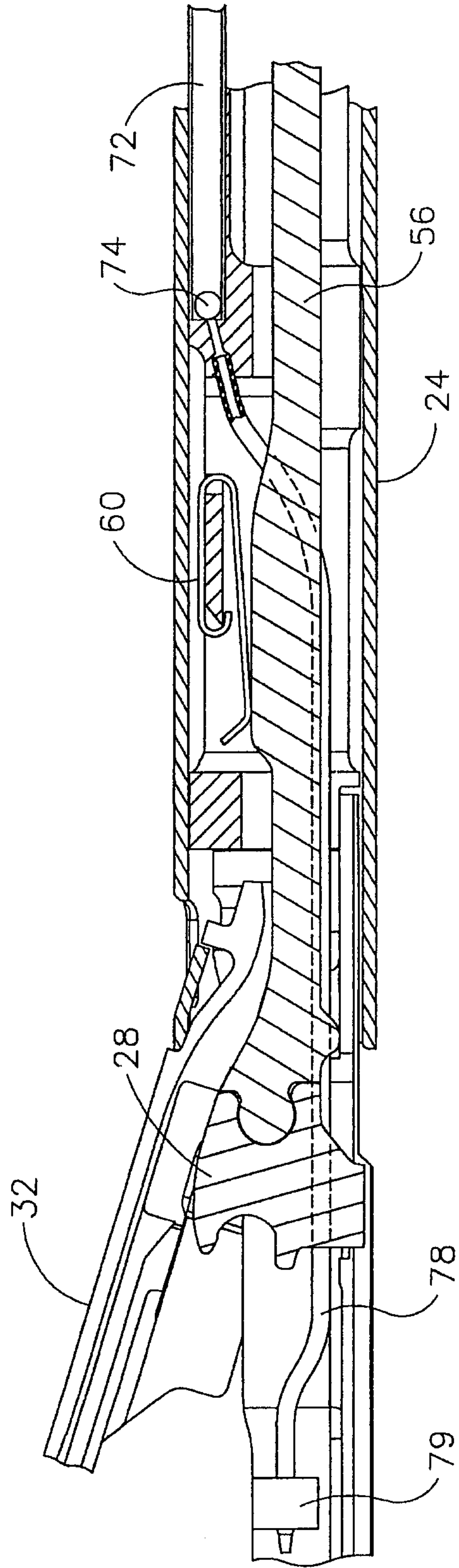


FIG. 4

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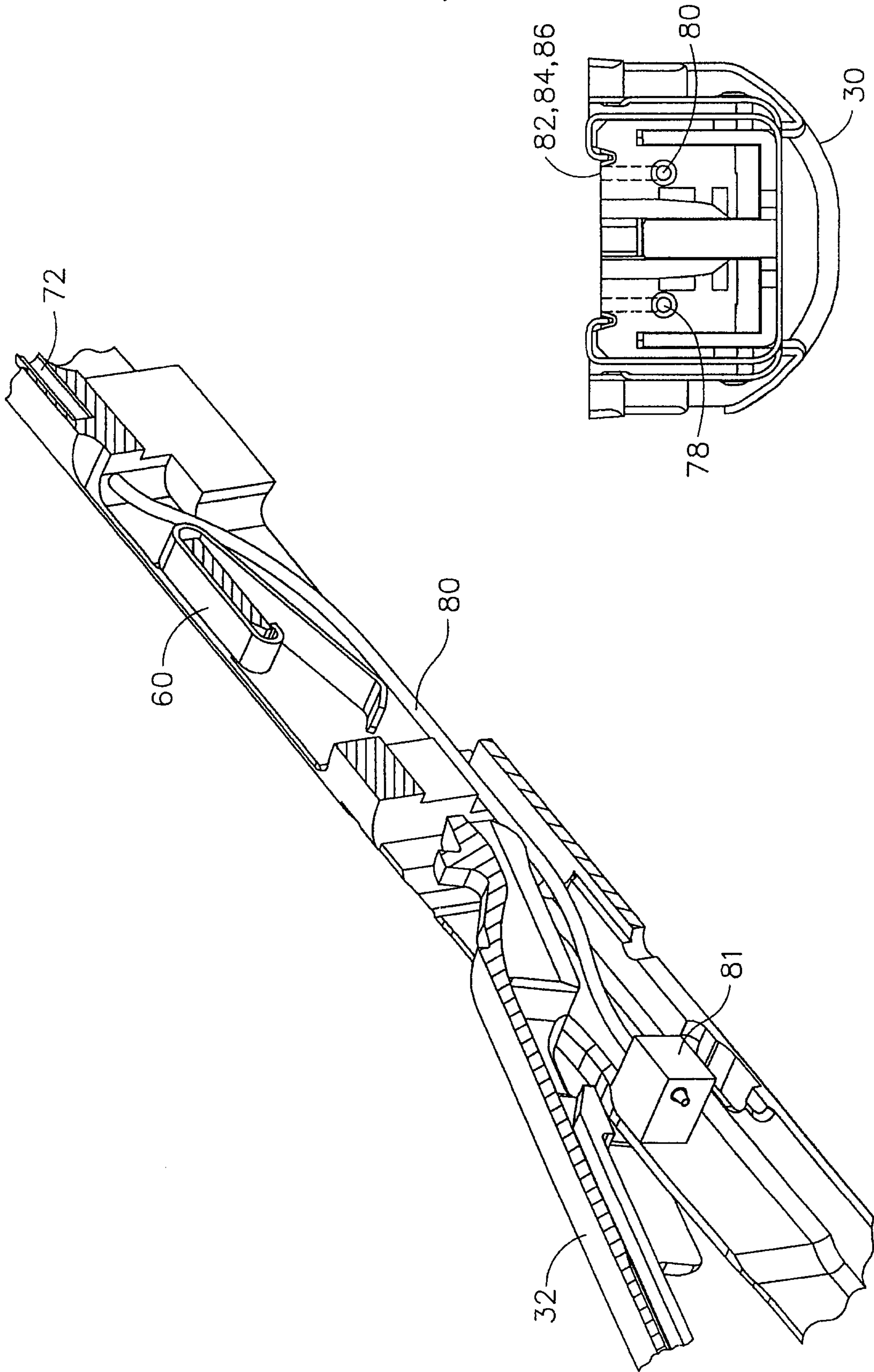


FIG. 6

FIG. 5

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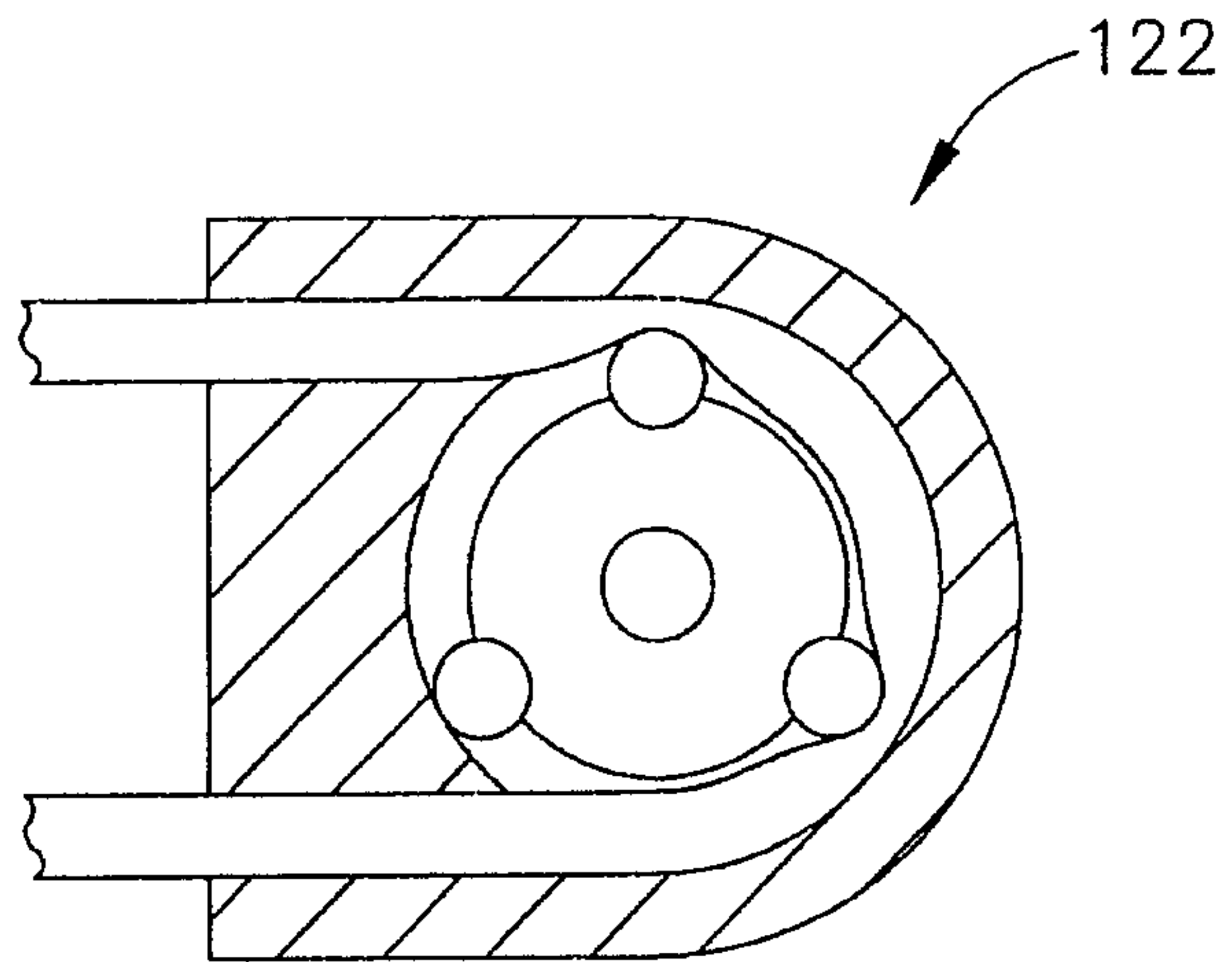


FIG. 7

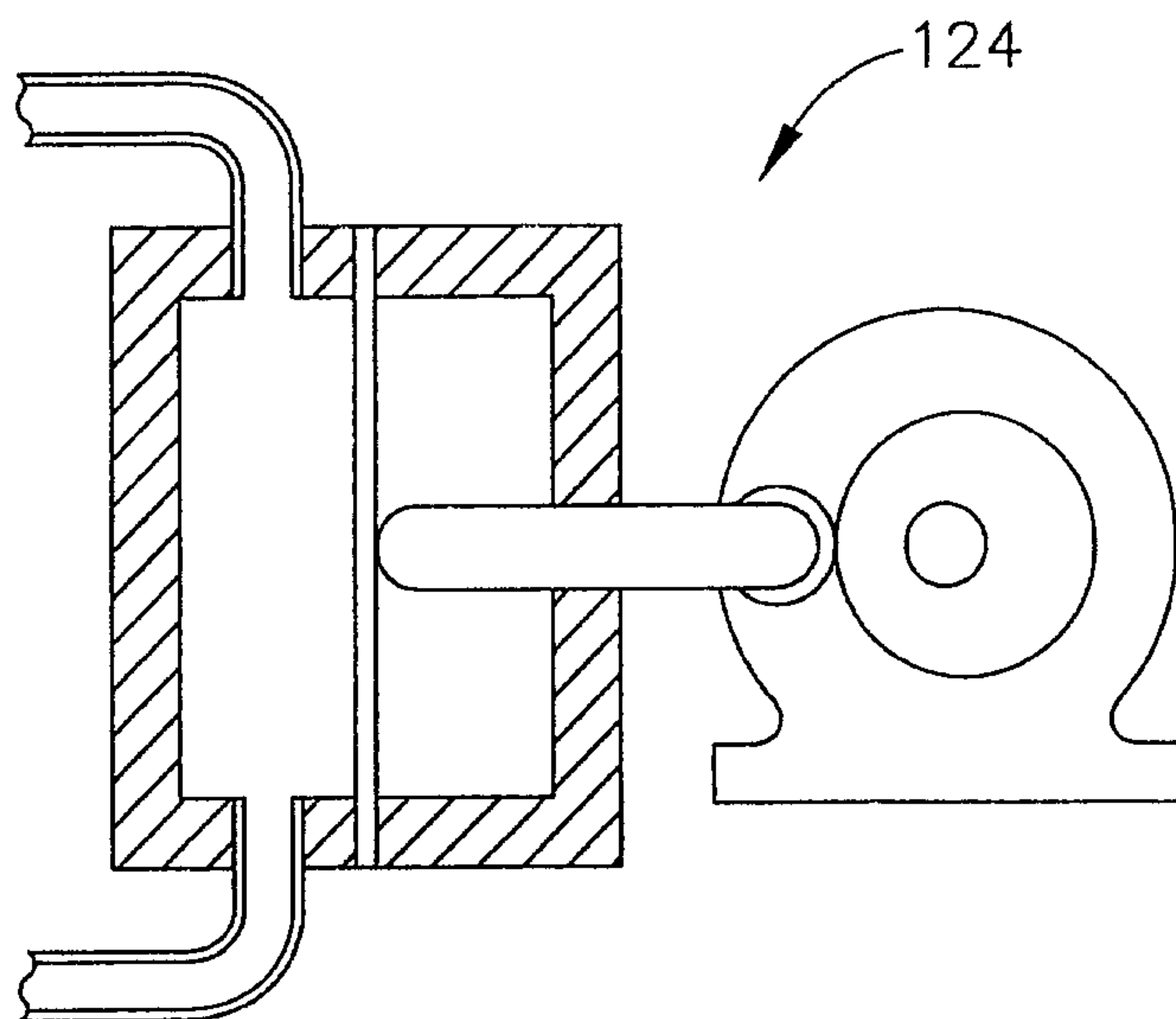


FIG. 8

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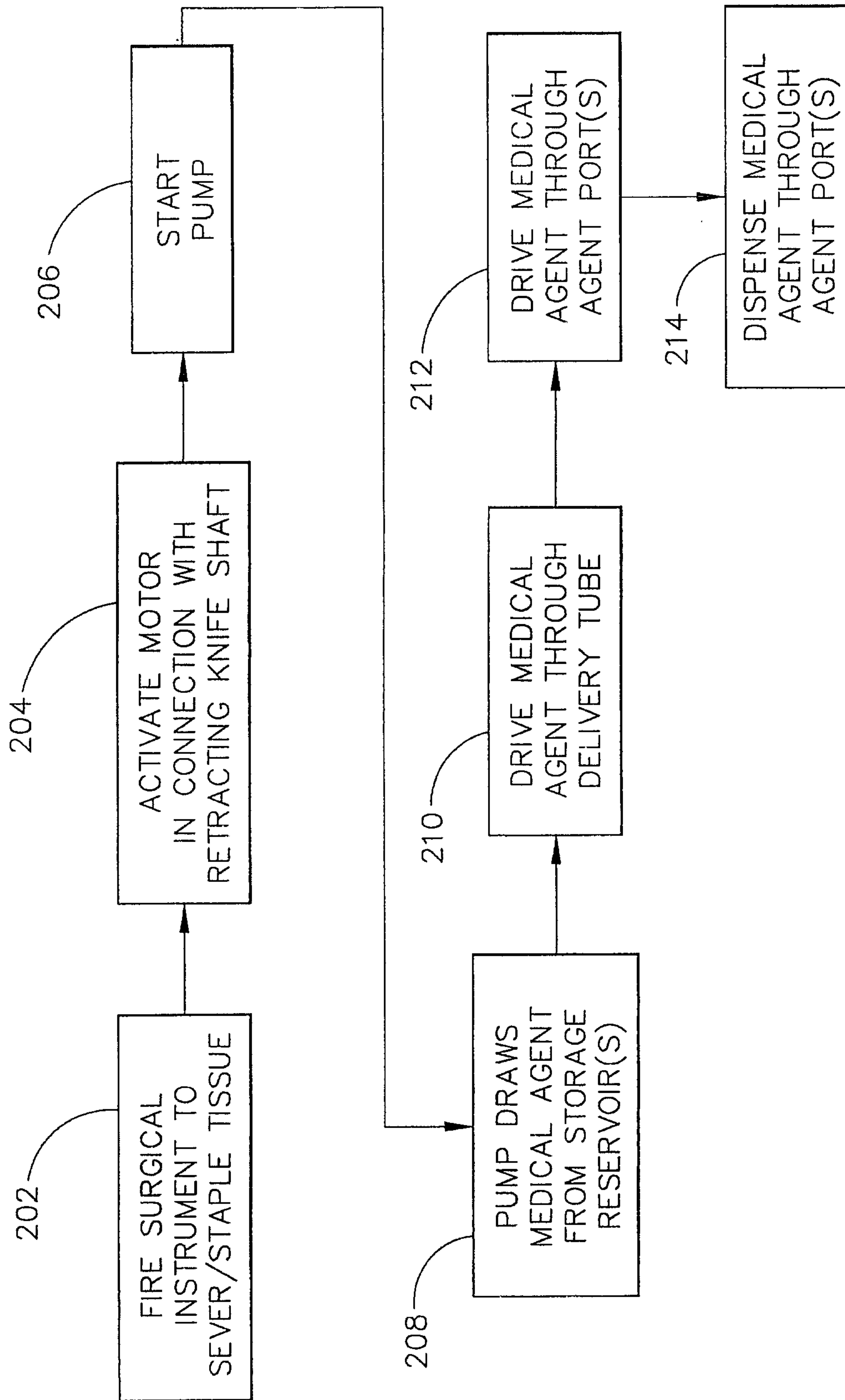
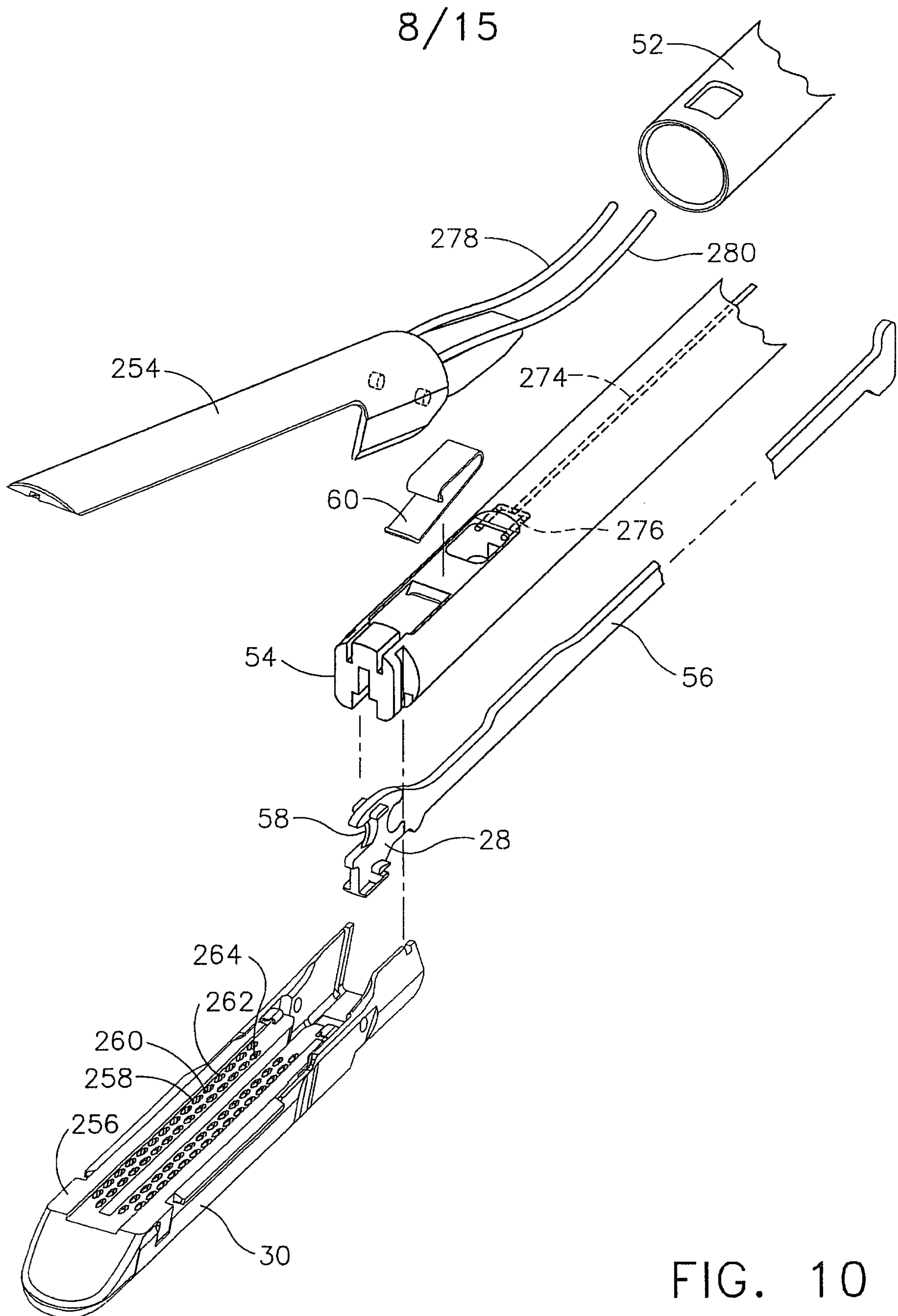


FIG. 9



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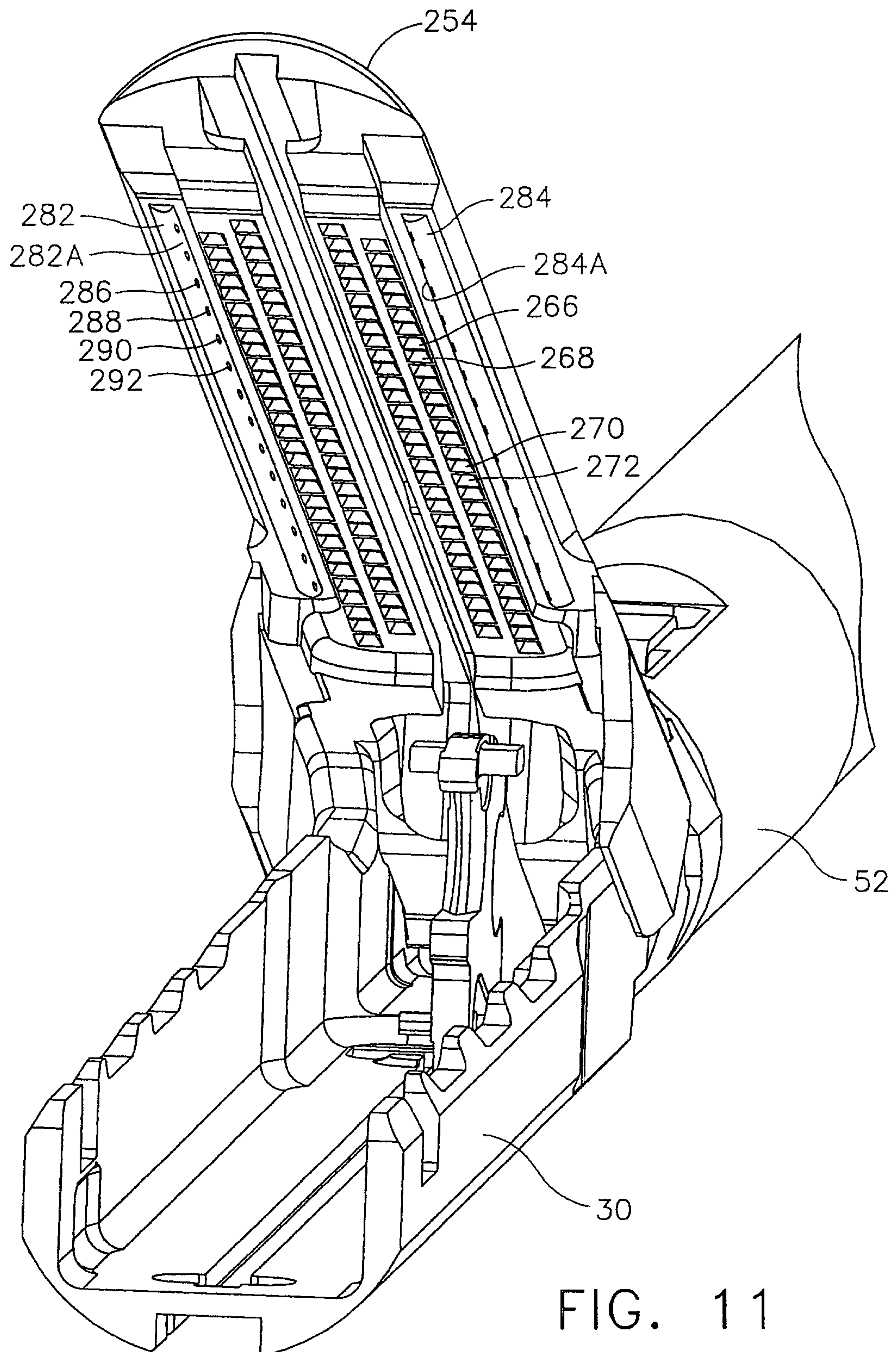


FIG. 11

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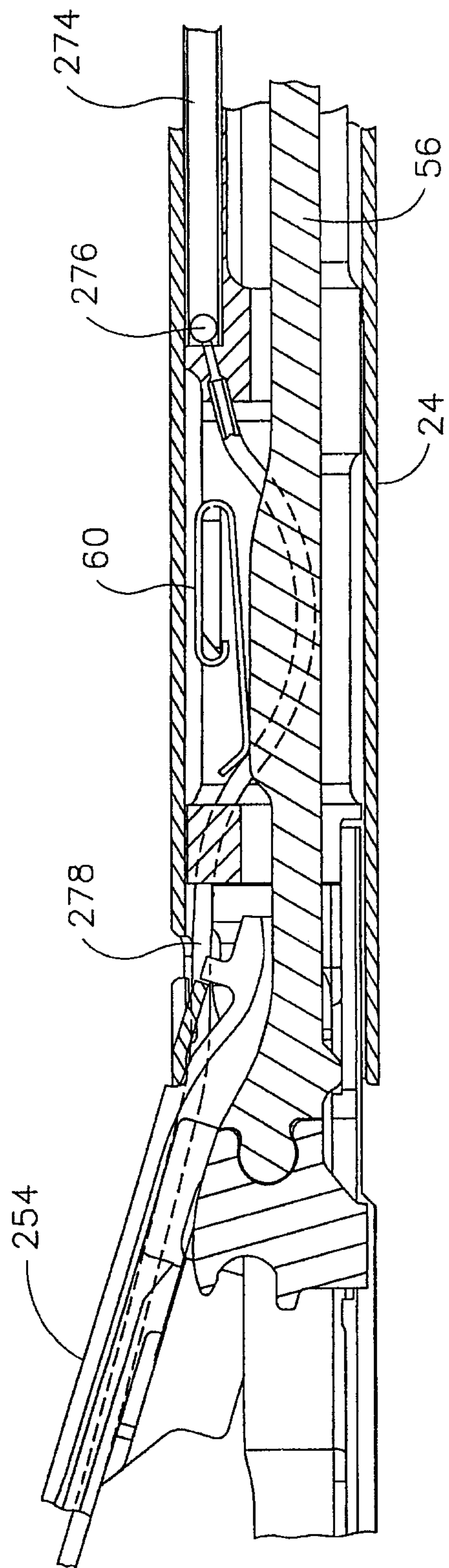


FIG. 12

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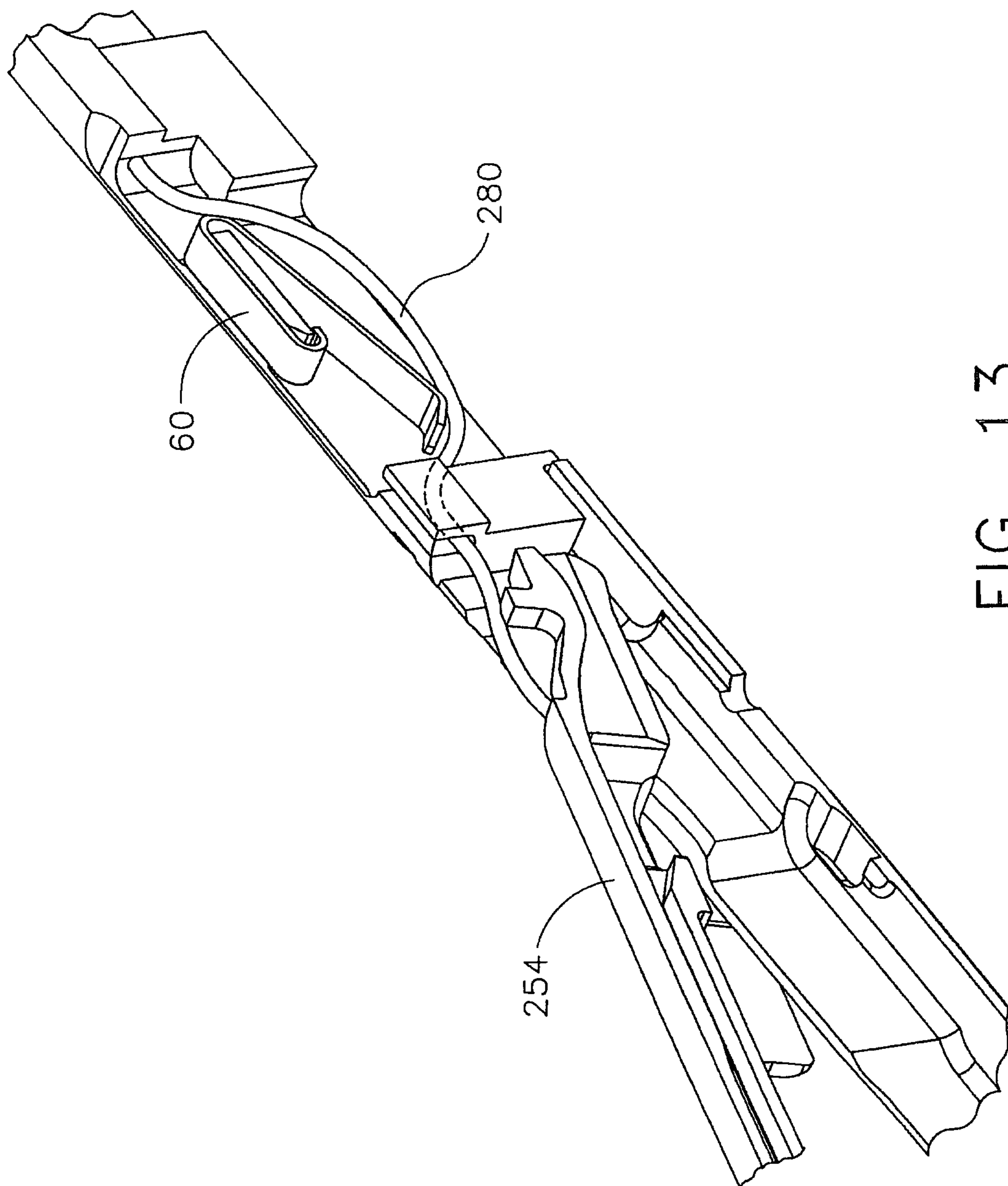


FIG. 13

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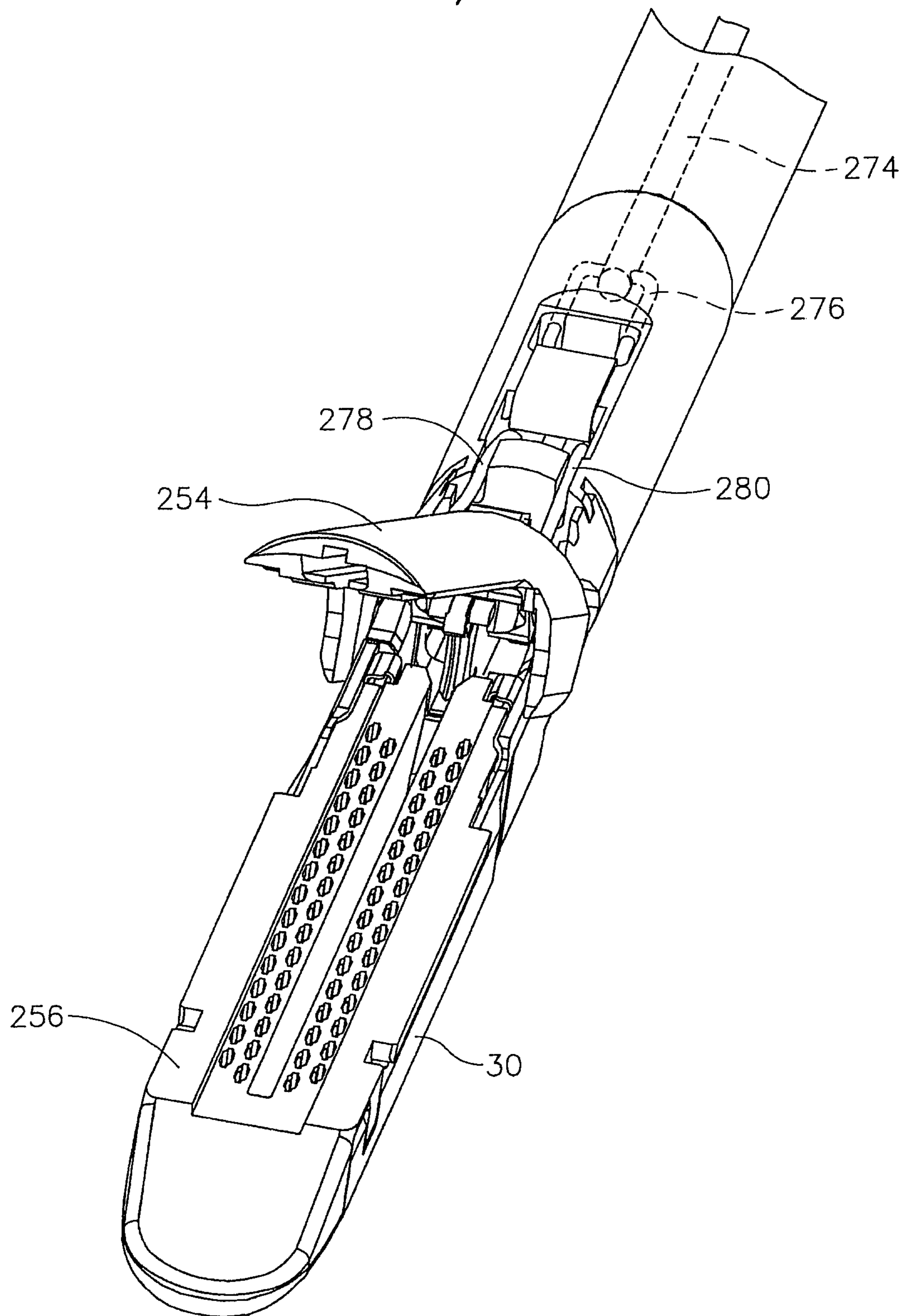


FIG. 14

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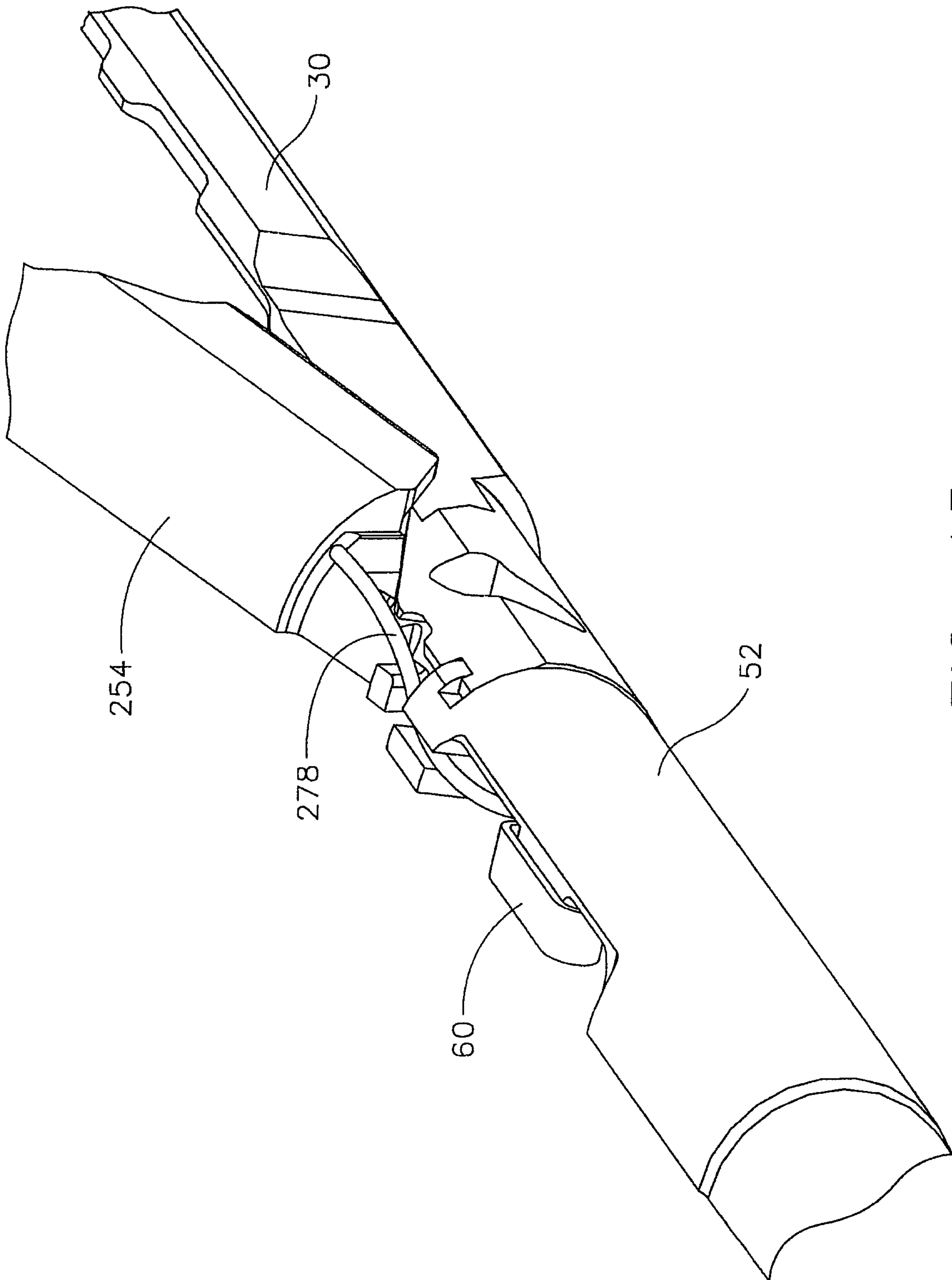


FIG. 15

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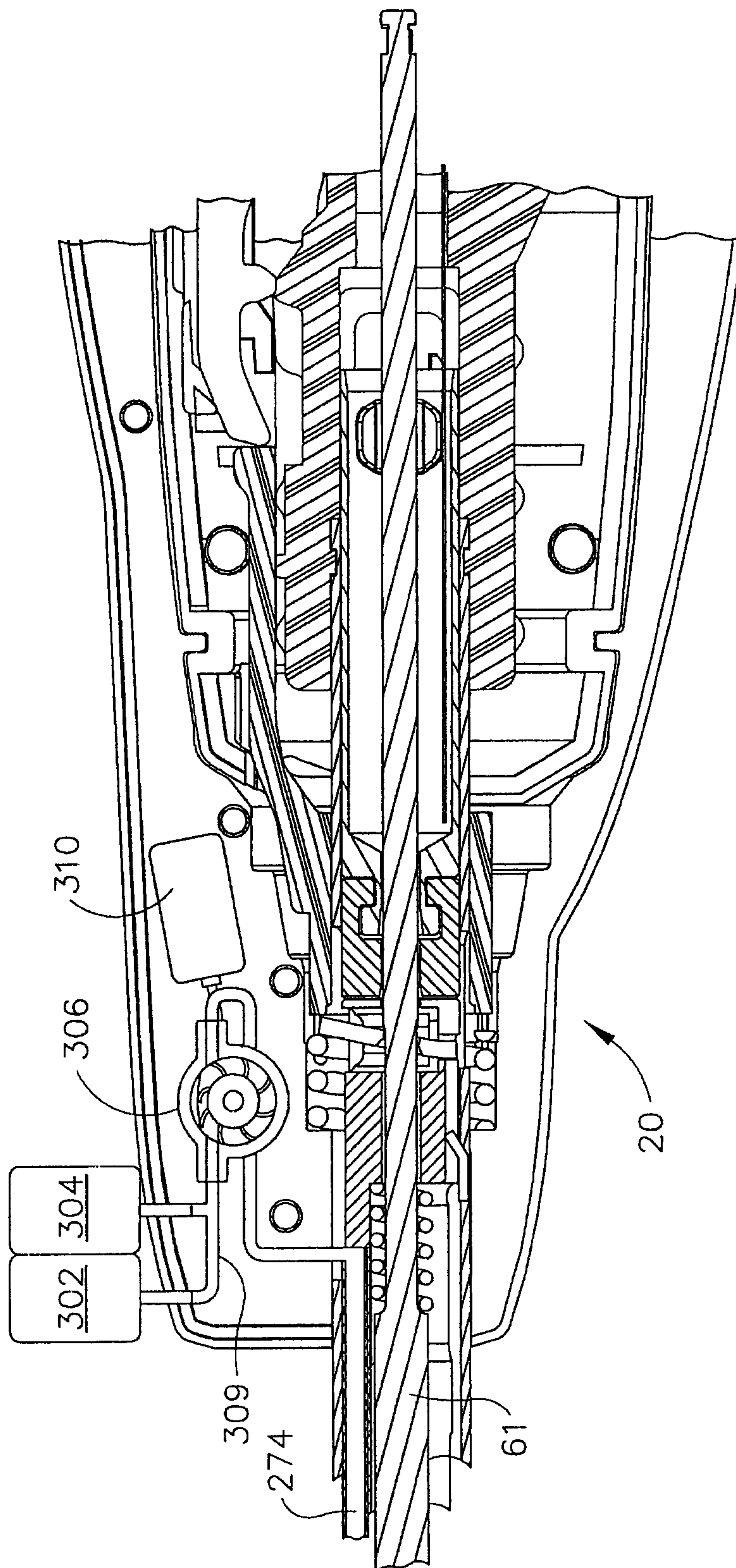


FIG. 16

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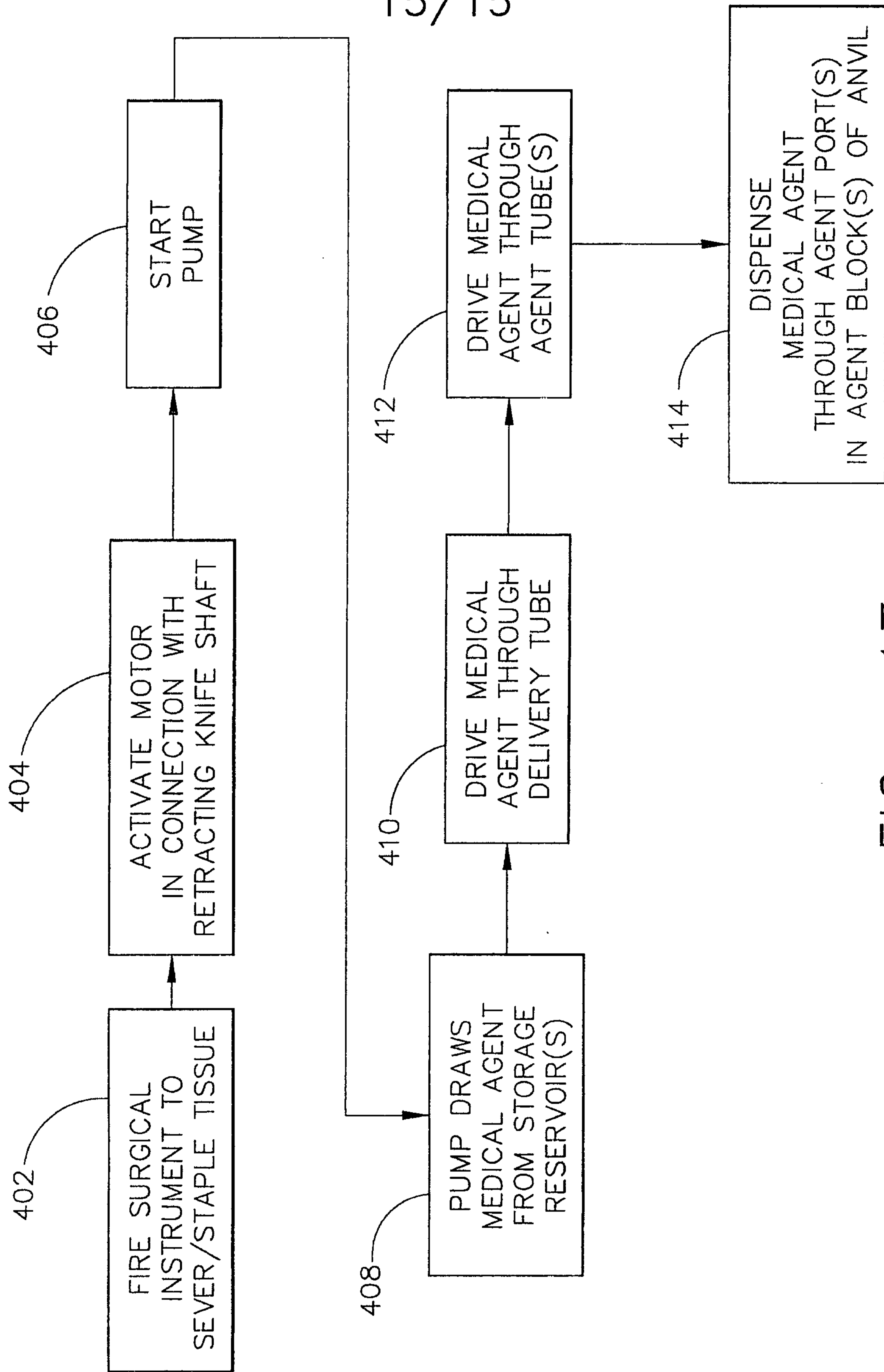


FIG. 17

