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(54) **TOOL HOLDING MECHANISM FOR A MOTOR DRIVEN SURGICAL INSTRUMENT**

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(*) Notice: This patent is subject to a terminal disclaimer.

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Related U.S. Patent Documents

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(51) **Int. Cl.**[7] **A61B 17/56**
(52) **U.S. Cl.** **606/80**; 606/180; 408/231
(58) **Field of Search** 606/80, 180, 79, 606/1; 408/231, 232, 233; 433/165, 166

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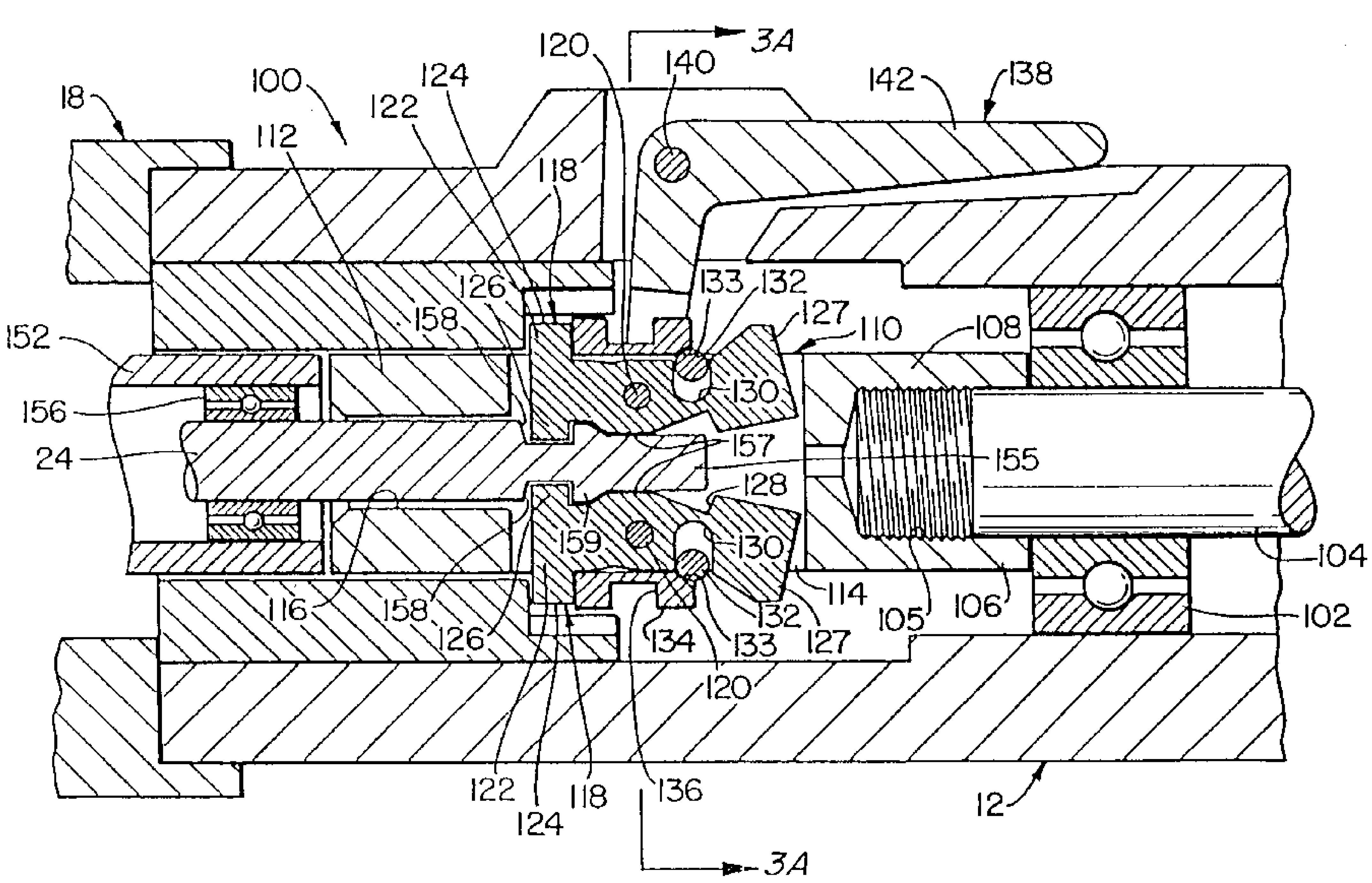
(57) **ABSTRACT**

A surgical instrument has a housing which contains a motor that drives a spindle. A tool bit is attached to the motor by a holder that includes a body with a first end portion connected to the spindle, a central portion with a cavity therein, and a second end portion having an aperture through which a shaft of the tool bit passes into the cavity. A pair of lock pawls are pivotally mounted in the cavity with each one having a first tab that enters a slot in the shaft when the lock pawls are in a first position to hold the tool bit in the instrument. The first tabs retract from the slot when the lock pawls are in a second position for changing the tool bit. The lock pawls have second tabs that engage a restrainer only in the second position to prevent the body from rotating. A ring extends around the body and pivots the lock pawls between the first and second positions when the ring moved longitudinally along the body. A manually operable shift lever is pivotally coupled to the housing and move the ring longitudinally along the body.

36 Claims, 4 Drawing Sheets



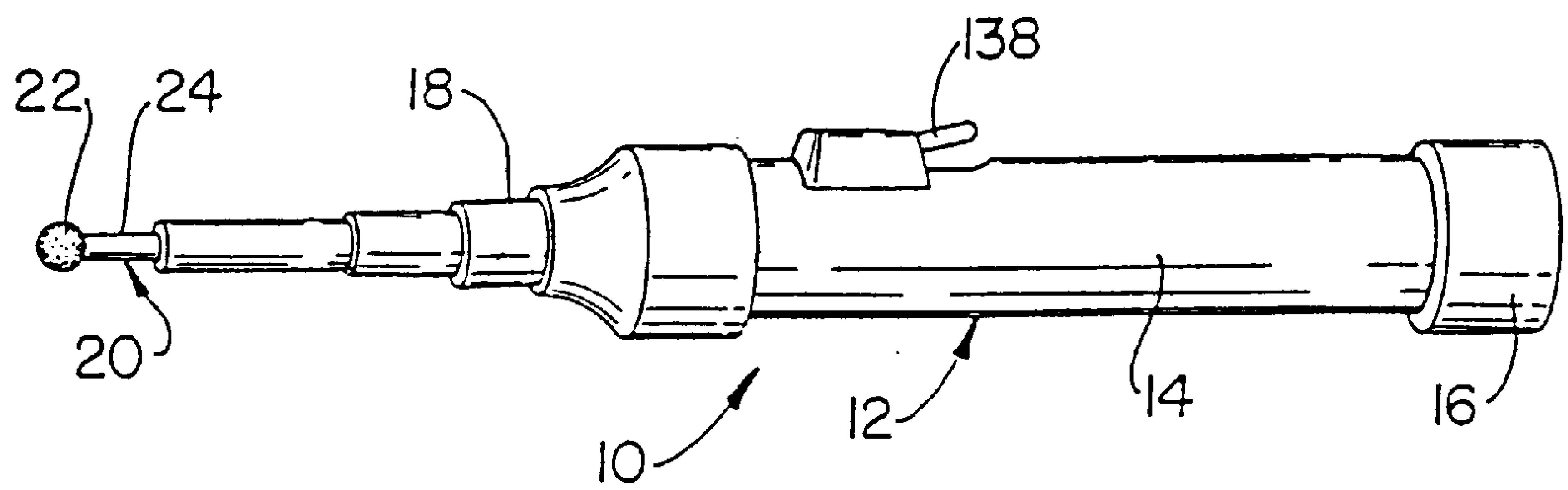


FIG. 1

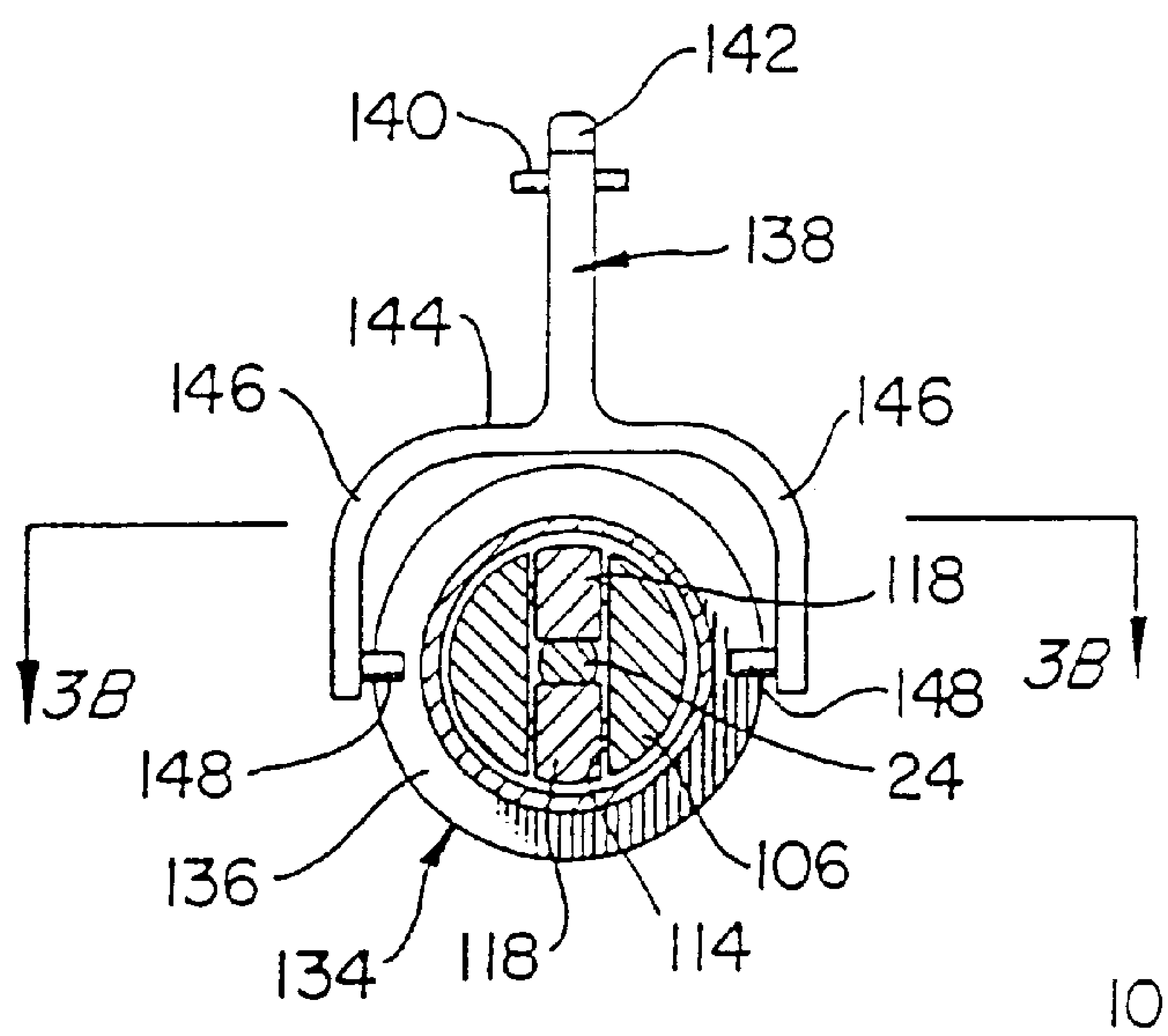


FIG. 3A

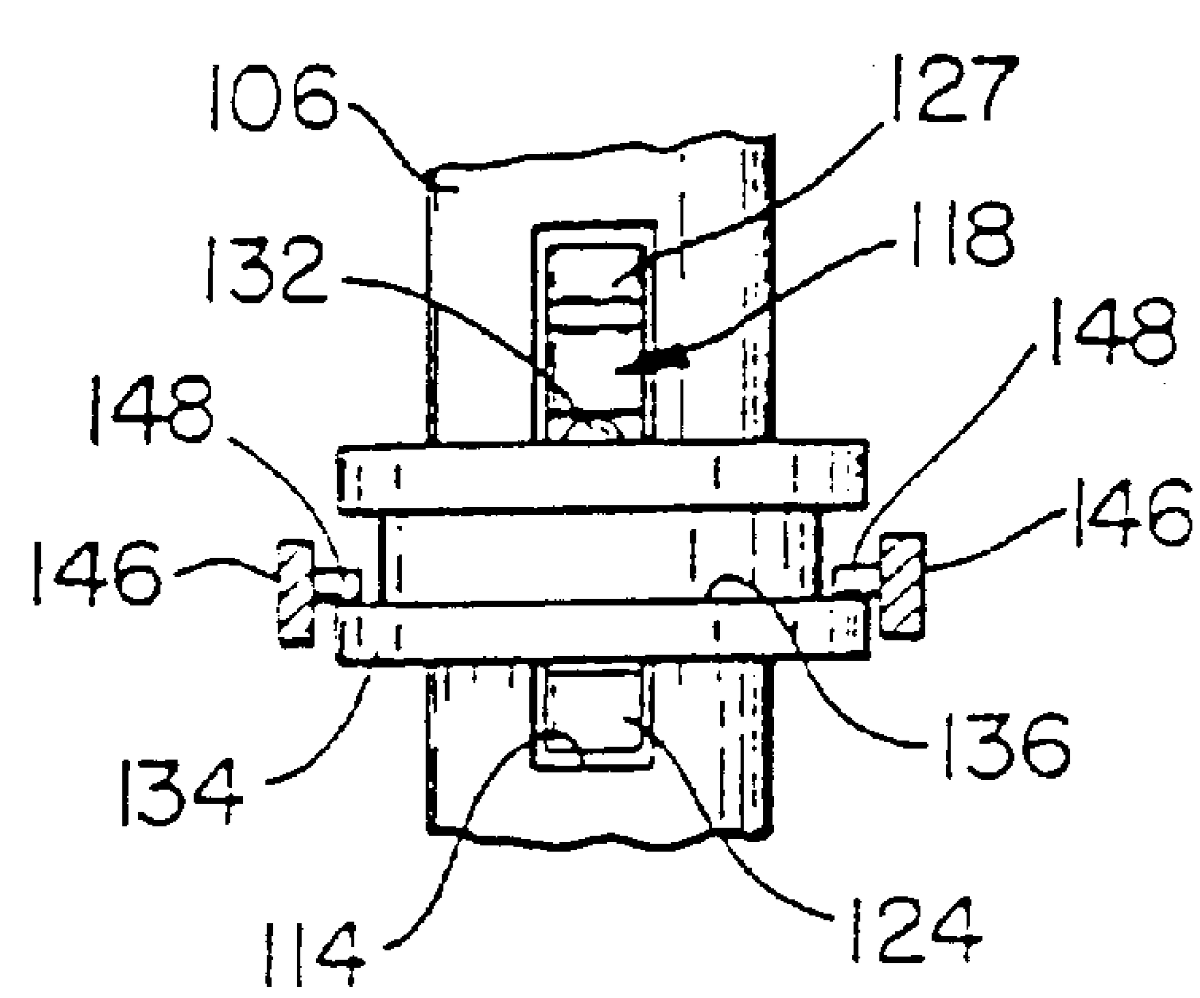
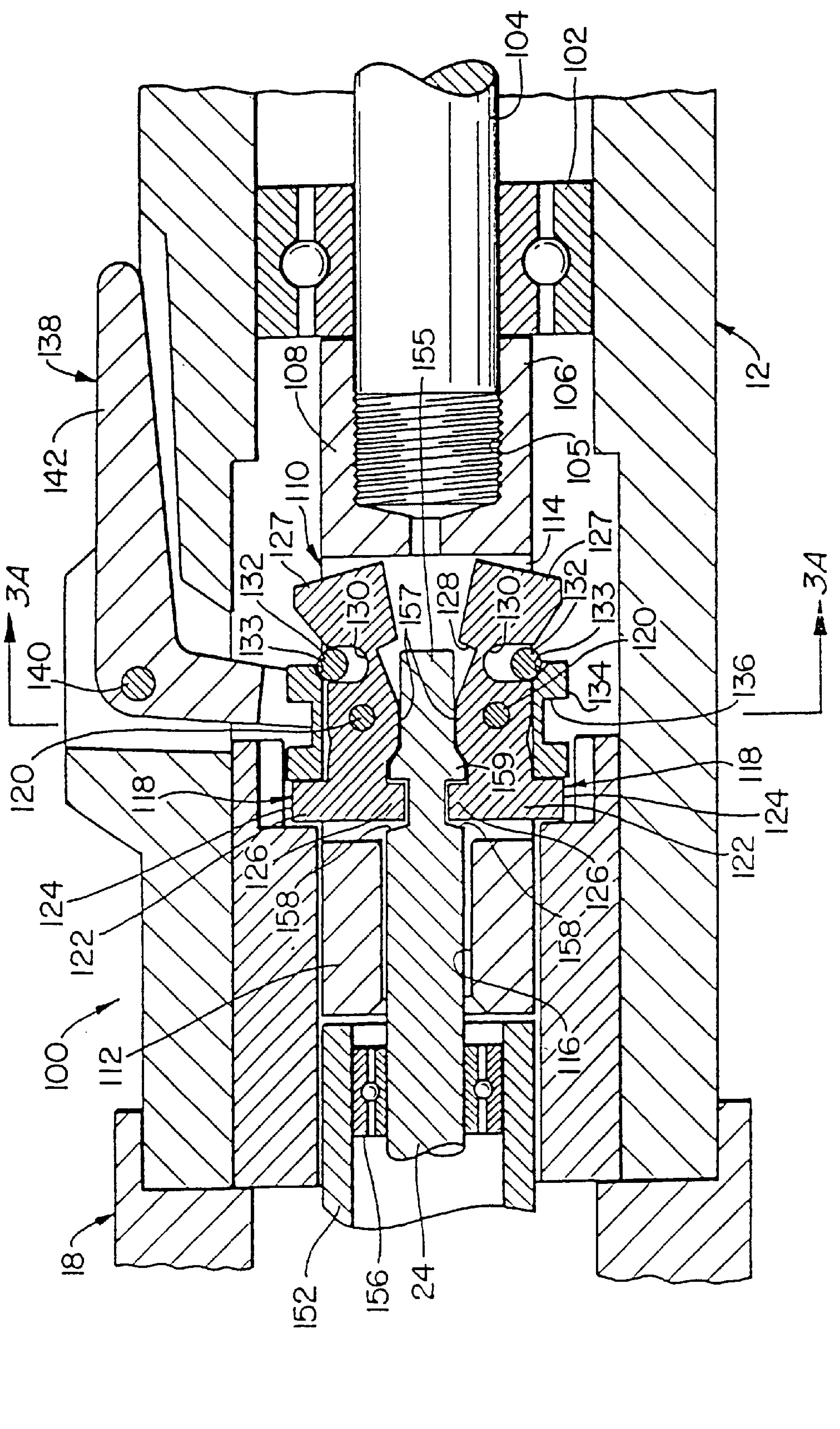


FIG. 3B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102
138
12
108
155
106
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3A
130
128
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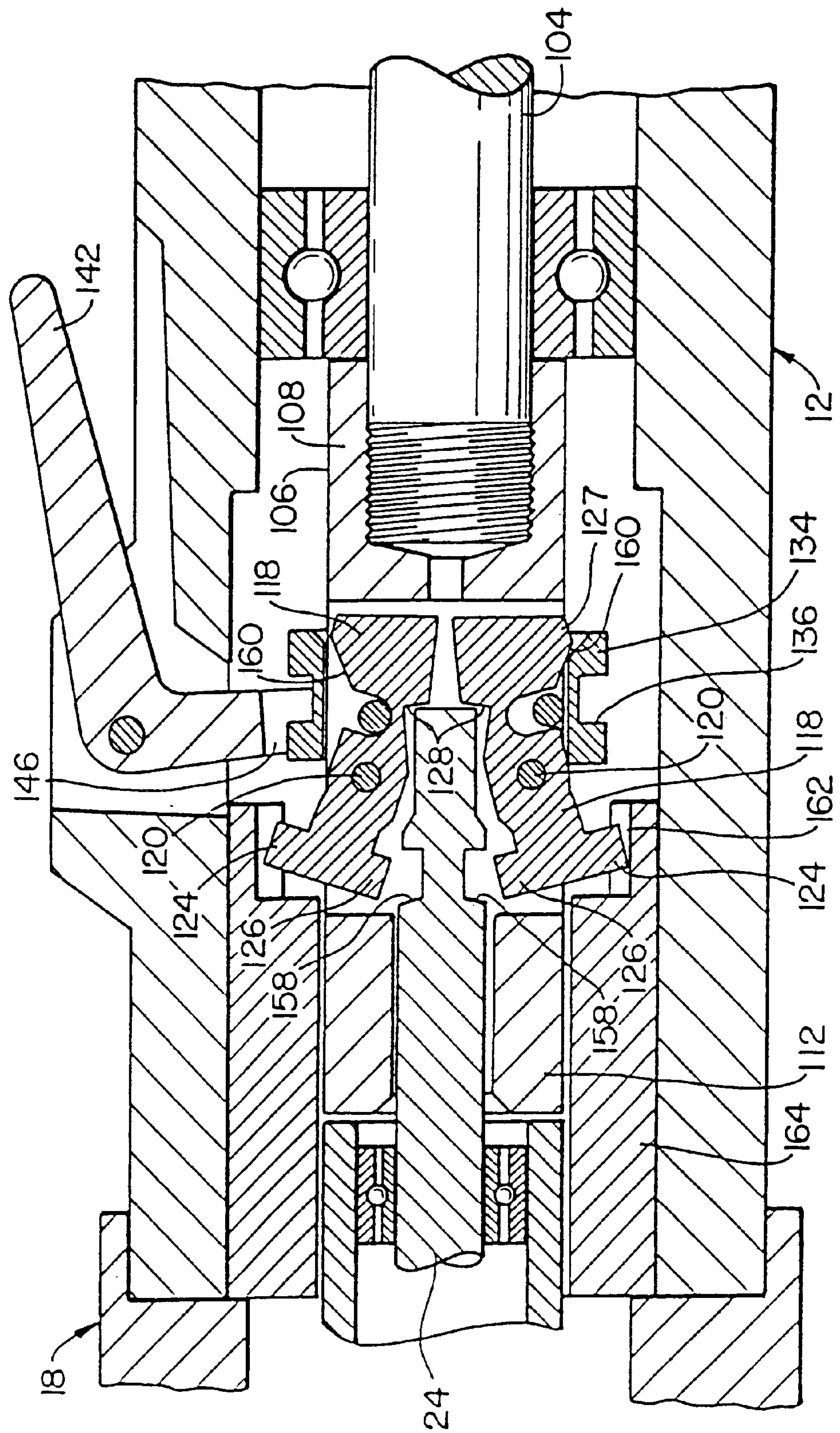
133
157
133
120
3A
140
134
136
120
159
118
118
124
126
122
120
124
122
158
126
158
100
112
116
18
152
156
24

FIG. 2


104
142
12
108
106
118
127
160
134
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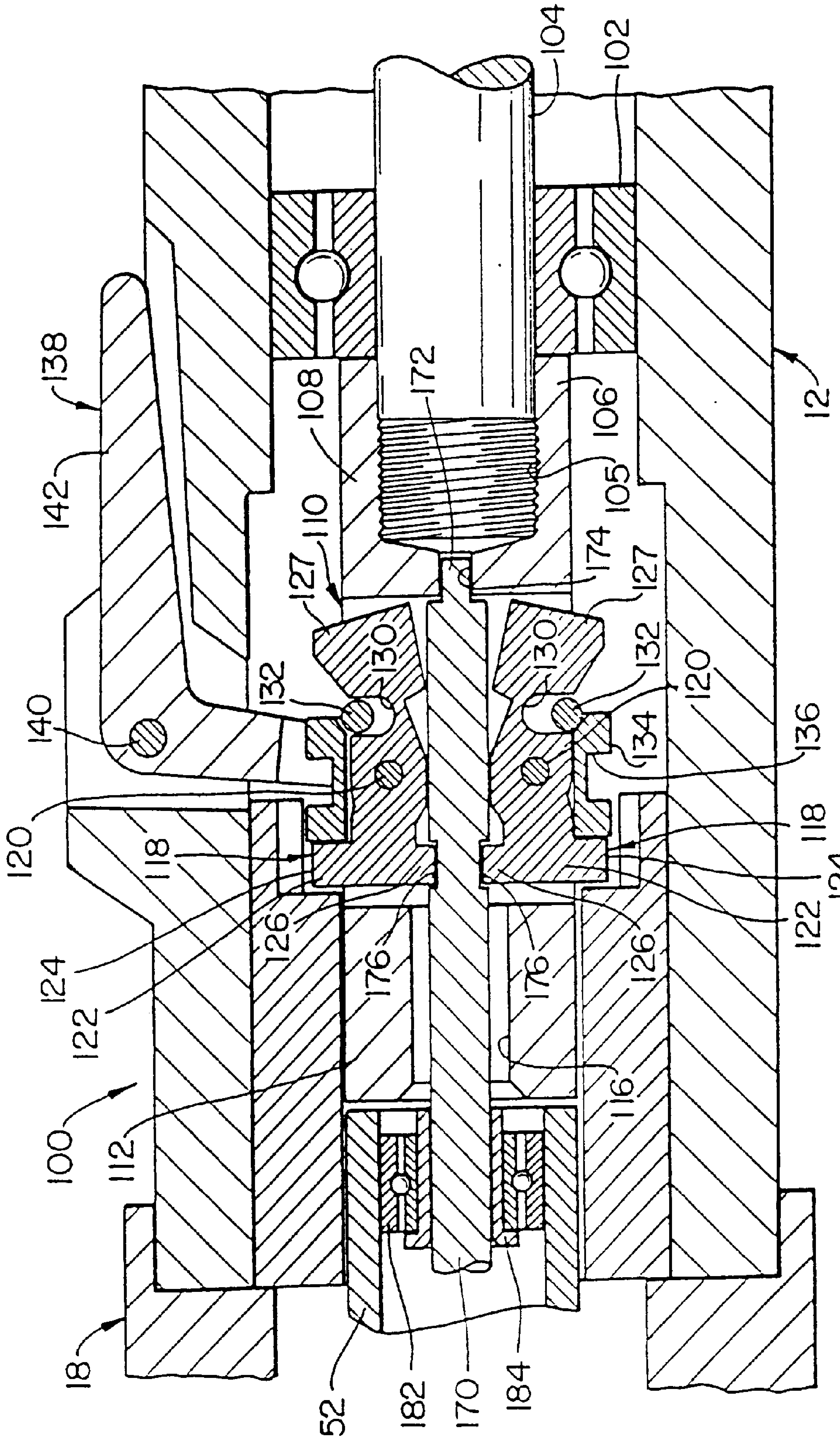
124
126
158
112
164
18
24

FIG. 4


104
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172
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106
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174
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127
132
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132
120
140
136
134
120
118
118
124
124
122
126
122
126
176
176
116
112
100
18
152
182
170
184

FIG. 5

TOOL HOLDING MECHANISM FOR A MOTOR DRIVEN SURGICAL INSTRUMENT

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

This is a continuation of application Ser. No. 08/531,136, filed Sep. 20, 1995, and issued as U.S. Pat. No. 5,630,818 on May 20, 1997. U.S. Pat. No. 5,630,818 is a division of application Ser. No. 08/320,057, filed Oct. 7, 1995, and issued as U.S. Pat. No. 5,601,560 on Feb. 11, 1997.

BACKGROUND OF THE INVENTION

The present invention relates to motor driven surgical instruments; and specifically to mechanisms for releasably attaching a variety of different tool bits to the surgical instrument.

Orthopedic and neurological surgeons frequently use a power driven surgical instrument to cut, shape and drill into bone. Such an instrument utilizes a small pneumatically driven motor contained in a cylindrical housing which is held by the surgeon during use. A hose from the source of compressed air attaches to one end of housing. A tool bit is received by a fitting at the other end of the housing and is rotated by the motor when compressed air is applied to the instrument.

A wide variety of different shaped and sized tool bits are available for drilling into, cutting, and shaping bone as needed during a surgical procedure. Thus, the surgical instrument must be able to accept various kinds and sizes of tool bits.

One common surgical instrument of this type used a collet to connect an end of the tool bit shaft to the spindle of the motor. This connection required a special collet wrench in order to replace the tool bit. In addition, the various tool bits had different sized shafts thus requiring different size collets. The need for corresponding sized collets and wenches not only made tool replacement time consuming and cumbersome, it required that additional items be stocked in the operating room. Further because a sterile environment was necessary for the surgical procedure, the different collets and wrenches have to be sterilized between the procedures.

SUMMARY OF THE INVENTION

The general object of the present invention is to provide a single mechanism which is capable of attaching a variety of different sized tool bits to a power driven surgical instrument.

Another object is to provide a mechanism for attaching tool bits which does not require the use of special wrenches to change tool bits.

A further object is to eliminate the use of separate collets for each tool bit of a different size.

Yet another object of the present invention is to provide a mechanism for attaching tools which prevents the motor spindle from rotating when the instrument is not in use. This feature inhibits the tool bit from accidentally rotating when the instrument is at rest.

A powered surgical instrument includes a housing that contains a motor and a restrainer, such as a ring gear, fixedly attached to said housing. The instrument also comprises a holder for attaching a variety of different tool bits to the motor. The holder has a body within the housing with a first

end portion connected to the motor for rotation about an axis, a central portion with a cavity therein, and a second end portion that has an aperture which receives tool bit shafts of various sizes.

A pair of lock pawls are pivotally mounted in the cavity. Each lock pawl includes a first tab that projects toward the axis of rotation and a second tab that projects away from the axis of rotation. When each lock pawl is pivoted into a first position, its first tab enters a slot in the shaft of a tool bit inserted into the instrument. In this state the lock pawl prevents the shaft of the tool bit from being removed from the instrument. When the lock pawl is pivoted into a second position the first tab is retracted from the shaft slot enabling the tool bit to be removed.

The second tab engages the restrainer when the lock pawl is in the second position thereby preventing rotation of the body. This enables the tool bit to be replaced without the possibility of the motor accidentally rotating the body. In the first position of the lock pawl, the second tabs are disengaged from the restrainer thus allowing operation of the instrument.

A ring extends around the body and pivots the first and second lock pawls as the ring moves longitudinally along the body. A manually operable shift lever is pivotally coupled to the housing and causes longitudinal movement of the ring along the body, thereby pivoting the first and second lock pawls.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a pictorial representation of a surgical instrument according to the present invention;

FIG. **2** is a longitudinal, cross-sectional view through a mechanism for attaching tool bits to the motor of the surgical instrument.

FIG. **3A** is a partial sectional view taken along line **3A—3A** of FIG. **2**;

FIG. **3B** is a partial sectional view taken along line **3B—3B** of FIG. **3A**;

FIG. **4** is a longitudinal, cross-sectional view through the tool attaching mechanism in a different operating state; and

FIG. **5** is a longitudinal, cross-sectional view similar to FIG. **2** with a different size tool bit.

DETAILED DESCRIPTION OF THE INVENTION

Referring initially to FIG. **1**, a surgical instrument **10** that incorporates the present invention has a housing **12** which encloses a pneumatic motor **14**. A hose (not shown) from a source of compressed air connects to a fitting **16** at one end of the housing **12**. A removable nose **18** is attached to the other end of the housing and receives an interchangeable tool bit **20**. The illustrated tool bit **20** has a spherical head **22** for shaping bone during the surgical procedure. Other tool bits have cylindrical, trapezoidal and other geometrical heads depending on their intended use. The head **22** is attached to a shaft **24** that extends through nose **24** and couples to a tool holder inside housing **12**.

With reference to FIG. **2**, the tool holder **100** within the motor housing **12** includes a main bearing **102** which receives the spindle **104** of the pneumatic motor **14** of the surgical instrument **10**. The remote end of the motor spindle **104** has external screw threads which engage internal screw threads in an aperture **105** at one end of a lock body **106**. The motor spindle **104** is attached to the lock body **106** during manufacture of the surgical instrument and remains attached thereto, except for maintenance or replacement due to failure.

The cylindrical lock body **106** has a motor coupling section **108** at the one end which attaches to the motor spindle **104**. A tool receptor section **112** is located at the other end of lock body with a central portion **110** between sections **108** and **112**. A slot-like, rectangular cavity **114** extends transversely through the central section **110** and occupies approximately the middle one-third of the diameter of lock body **106** (see also FIG. **3**A). The tool receptor **112** has a longitudinal, centrally located aperture **116** extending from the other end of the lock body **106** to the rectangular cavity **114**.

With reference to FIGS. **2** and **3**A, a pair of lock pawls **118** are located within the rectangular cavity **114** and pivot about pawl pins **120** that extend between opposite side walls of the lock body **106** which form the rectangular cavity. Each lock pawl **118** has a cross member **122** at a first end which is adjacent to the tool receptor **112**. The cross member **122** forms a T-shaped end of the lock pawl with an outer tab **124** projecting outward away from the longitudinal axis of the instrument and an inner tab **126** projecting inward toward the longitudinal axis. The opposite second end **127** of each lock pawl **118** is enlarged and has a notch **128** in its interior surface which acts as a stop during insertion of a tool bit **20** into the tool holder **100**, as will be described. The outer surface of each lock pawl **118** has a notch **130** with a ball **132** freely located therein.

An actuator, comprising a shift ring **134** and a shift lever **138**, is provided to manually operate the lock pawls **118**. The shift ring **134** extends around the central portion **110** of the lock body **106** and around the two lock pawls **118**. The width of the shift ring is less than the distance between the cross member **126** and the second end **127** of each lock pawl **118** allowing the shift ring to move longitudinally therebetween. As will be described, the longitudinal movement of the shift ring **134** along body **106** causes each lock pawl **118** to pivot about pawl pin **120**. That longitudinal movement of the shift ring **134** is produced by a shift lever **138** which rotates about a lever pin **140**. The shift lever **138** has an L-shaped handle **142** with an aperture through which lever pin **140** extends. An end of the handle **142** within the motor housing **12** joins a forked section **144** of the shift lever **138**, as shown in FIG. **3**A. The forked section **144** has two tines **146** which curve around opposite sides of the shift ring **134**. A separate pin **148** projects inwardly from the end of each tine **146** into an annular groove **136** around the shift ring **134** as shown in FIG. **3**B. When the exposed end of the shift lever handle **138** is moved up and down in the orientation of the tool holder **100** in FIG. **2**, the shift lever acts as a driver whereby pins **148** at the end of the tines **146** press against walls of annular groove **136** which causes the shift ring **134** to move longitudinally along the lock body **106**. In the closed state of the tool holder **100** shown in FIG. **2**, the shift ring **134** is pushed toward the tool receptor **112** of the lock body **106**. In this position, the shift ring **134** causes the lock pawl **118** to pivot so that the cross members **122** have a generally vertical orientation with their inner tabs **126** moved toward the longitudinal axis of the lock body.

The instrument nose **18** has a tubular casing **152** with a bearing **156** located at one end thereof. The shaft **24** of the tool bit **20** extends through the nose bearing **156** and projects from the instrument nose **18** into the tool holder **100**. This projecting portion of the shaft **24** extends through circular aperture **116** in the tool receptor **112** and into cavity **114** in the body **106**. The outer diameter of the shaft **24** varies from tool bit to tool bit depending upon the size of the bit **22** attached to the opposite end of the shaft. The diameter of receptor aperture **116** is sized to accommodate the largest diameter shaft. The tip **155** of the shaft **24** has flat sides, thereby forming a portion of the shaft that has a polygonal cross section, and the distance between those flat sides is the same for all sizes of tools. The flat sides of the shaft tip **155** abut the flat inner surface **157** of the lock pawls **118** in the illustrated closed state of the holder **100**, so that as the motor spindle **104** rotationally drives the lock body **106**, torque is applied to the shaft **24** thereby rotating the tool bit **20**.

The circular rod-like shaft **24** has two diametrically opposed slots **158** cut therein and spaced from the tip **155**. The distance between the bottom surfaces of each slot **158** is the same for all tool bits regardless of the outer diameter of the main part of shaft **24**. In the closed state of the tool holder **100** illustrated in FIG. **2**, the inner tabs **126** of the lock pawls **118** enter the slots **158**, acting as opposing jaws which engage an axial stop **159** formed by a rim at one side of slot **158**, to securely hold the tool bit **20** from being pulled longitudinally from the tool holder **100**. Thus the opposing slots **158** act as a retainer preventing removal of the tool bit. The flat inner surface of each inner tab **126** is spaced from the flat inner surface of each slot **158** so that torque is not applied to the tool bit **20** through the lock pawl tabs. In the tool bit shown in FIG. **2**, the shaft tip **155** has a cross-sectional area that is greater than a cross-sectional area of the shaft portion in which slots **158** are located, and the axial stop portion **159** has a still greater cross-sectional area.

In order to reduce friction between the rotating and non-rotating components of the tool holder **100**, the pins **148** on the tines of the lock lever **138** are smaller than the width of the annular groove **136** in shift ring **134**. When the instrument is to be operated, the surgeon presses the shift lever **138** into the position shown in FIG. **2** and the pins engage the walls of the annular groove **136** as illustrated in FIG. **3**B. The engagement of the pins forces the shift ring **134** toward the tool receptor **112**, but not far enough for the shift ring to contact the outer tabs **124** on the lock pawls **118**. When the instrument motor is energized by pressurized air, the spindle **104** produces rotation of the lock body **106** attached to the spindle. As the lock body spins, the balls **132** located within the notches **130** of lock pawls **118** are driven outward by centrifugal force as shown in FIG. **2**. The balls **132**, so driven, apply force against a beveled edge **133** of the shift ring **134**, moving the shift ring further toward the tool receptor **112**. This action pushes the shift ring **134** farther toward the tool receptor **112** and away from contact with the pins **148** of the shift lever **138** allowing the shift ring **134** to rotate with minimal friction.

FIG. **4** illustrates the tool holder **100** in an open state for removal or insertion of a tool bit **20**. In this state, the shift lever **138** is pivoted outward from the housing **12** which causes the tine pins **148** to push the shift ring **134** toward the spindle **104**. This action causes the shift ring to exert pressure against tapered surfaces **160** of each lock pawl **118** which pivots the lock pawls **118** about pawl pins **120** withdrawing the inner tabs **126** from the slots **158** in the tool shaft **24**. This allows the tool shaft to be pulled out of the tool receptor **106** and the nose **18**.

As each of the lock pawls **118** pivot into the position shown in FIG. **4**, the outer tabs **124** engage teeth **162** of a ring gear **164** which is fixed to the casing of the tool holder **100**. The ring gear **164** acts as a restrainer whereby engagement of the lock pawls **118** with the ring gear teeth prevents the lock body **106** and the shaft **24** from rotating. Thus, the surgical instrument can be placed aside without the possibility that tool bit **20** will spin should the motor be energized inadvertently.

When the tool is reinserted into the holder **100**, the end of the shaft **24** contacts the stop surfaces **128** of the two lock pawls **118**. This locates the shaft in the proper longitudinal position so that the inner tabs **126** of the lock pawls **118** can enter the slots **158**. This engagement occurs when the shift lever is once again pushed into the casing so that the shift ring **134** slides toward the tool receptor **112** and into a position illustrated in FIG. **2**. This movement of the shift ring **134** applies force to each of the lock pawls **118** causing their rotation about pawl pins **120** so that the outer tabs **124** no longer engage teeth of the ring gear.

FIG. **5** illustrates the tool holder **100** with a relatively small tool bit attached thereto. The shaft **170** of this tool bit extends through the nose **18** and specifically through a bearing **182** with a reduction bushing **184** therewithin. The reduction bushing **184** reduces the inner diameter of the bearing **182** to support the outer diameter of shaft **170**, The end of the shaft **170**, that extends beyond the nose **18** into the tool holder **100**, is significantly smaller in diameter than the shaft **24** of the tool bit illustrated in the previously described figures. The diameter of the shaft **170** is so small that it does not contact the surfaces of the pawls **118**. Instead, this shaft **170** has an elongated end **172** with a rectangular cross section that fits within a rectangular aperture **174** in the interior wall of the lock body **106**. It is the engagement of the rectangular end **172** of the shaft **170** with the rectangular aperture **174** that provides mechanical coupling between the lock body **106** and the shaft **170** to apply torque to the tool bit when the spindle **104** rotates.

The shaft **170** has a pair of diametrically opposed slots **176** cut in its external surface within which the inner tabs **126** of lock pawls **118** fit when the tool holder **100** is in the closed state. In this embodiment walls of the slots **176** act as axial stops. The positioning of the inner tabs **126** within slots **176** prevents longitudinal movement of the tool shaft **170** and thus prevents the tool bit from disengaging from the tool holder **100**. It is noted that the surfaces of inner tabs **126** do not contact the tool shaft **170** in the closed state of the tool holder **100**.

We claim:

1. A tool bit for a motor driven instrument having a housing with at least one movable lock pawl, said tool bit comprising:

a shaft defining a longitudinal axis of rotation and having first and second ends;

said first end having a first outwardly facing surface engageable by said at least one lock pawl for rotation therewith;

said first end having a pair of slots disposed axially and inwardly of said first outwardly facing surface for partially receiving said at least one lock pawl;

said pair of slots having further and respective outwardly facing surfaces with portions disposed radially inwardly of said first outwardly facing surface and having respective side surfaces facing said second end and defining an axial stop engageable with said at least one lock pawl to retain said tool bit in said motor driven instrument; and,

a bit formed at said second end of said shaft.

2. The tool bit of claim **1**, wherein said first end has an axially outwardly facing surface engageable with said at least one lock pawl during tool bit attachment.

3. The tool bit of claim **1**, wherein said portions of said further and respective outwardly facing surfaces are radially closely spaced from said at least one lock pawl during normal rotation of said shaft, said further and respective outwardly facing surfaces being engageable with said at least one lock pawl only after a failure of an engagement of said first outwardly facing surface and said at least one lock pawl.

4. The tool bit of claim **3**, wherein said axial spacing between said first outwardly facing surface and said pair of slots is so dimensioned that said first outwardly facing surface is engageable with said at least one lock pawl and said pair of slots receives said at least one lock pawl in a first lock pawl position and said axially outwardly facing surface is engageable with said at least one lock pawl in a second lock pawl position.

5. The tool bit of claim **1**, wherein said axial spacing between said first outwardly facing surface and said pair of slots is so dimensioned that said first outwardly facing surface is engageable with said at least one lock pawl and said pair of slots receives said at least one lock pawl in a first lock pawl position.

6. The tool bit of claim **5**, wherein said axially outwardly directed surface is so axially positioned relative to said first outwardly facing surface and said pair of slots that said axially outwardly directed surface is engageable with said at least one lock pawl in a second lock pawl position.

7. The tool bit of claim **6**, wherein said further and respective outwardly facing surfaces are engageable with said at least one lock pawl only in a third lock pawl position.

8. The tool bit of claim **1**, wherein said first end has an end-most, axially outwardly facing surface axially spaced from said pair of slots, said axial spacing between said first outwardly facing surface and said pair of slots and said axial spacing between said axially outwardly facing surface and said pair of slots being respectively so dimensioned that said axially outwardly facing surface is engageable with said at least one lock pawl only in a first lock pawl position, said first outwardly facing surface is engageable with said at least one lock pawl and said at least one lock pawl is received in said slots but not engageable with said further and respective outwardly facing surfaces only in a second pawl position, and said further and respective outwardly facing surfaces are engageable with said at least one lock pawl only in a third lock pawl position.

9. The tool bit of claim **1**, wherein said first end has an end-most, axially outwardly facing surface axially spaced from said pair of slots, said axial spacing between said first outwardly facing surface and said pair of slots and said axial spacing between said axially outwardly facing surface and said pair of slots being respectively so dimensioned that said axially outwardly facing surface is engageable with said at least one lock pawl only during tool bit attachment, said first outwardly facing surface is engageable with said at least one lock pawl and said at least one lock pawl is received in said slots but not engageable with said further and respective outwardly facing surfaces only during normal rotation of said shaft, and said further and respective outwardly facing surfaces are engageable with said at least one lock pawl only after a failure of an engagement of said first outwardly facing surface and said at least one lock pawl during said normal rotation.

10. A tool bit for a motor driven instrument having a housing with movable lock pawls, said tool bit comprising:

a shaft defining a longitudinal axis of rotation and having first and second ends;

said first end having a first set of outwardly facing surfaces respectively engageable by said lock pawls for rotation therewith;

said first end having a pair of slots disposed axially and inwardly of said first set of outwardly facing surfaces, each of said slots adapted to partially receive one of said lock pawls;

said pair of slots having further and respective outwardly facing surfaces with portions disposed radially inwardly of said first outwardly facing surface and having respective side surfaces facing said second end and defining an axial stop engageable with said lock pawls to retain said tool bit in said motor driven instrument; and,

a bit formed at said second end of said shaft.

11. A tool bit for a motor driven instrument having a housing with lock pawls movable into and out of driving engagement with said tool bit, said tool bit comprising:

a shaft having a longitudinal axis of rotation and having at one end of said shaft a longitudinal profile having only bilateral symmetry;

said profile having first and second pairs of at least radially different recessed portions for receiving corresponding projections of said lock pawls during said driving engagement;

said profile also having at least two pairs of radially projecting surfaces engageable by respective portions of said projections of said lock pawls for preventing axial movement of said tool bit during said driving engagement; and,

a bit formed at the other end of said shaft.

12. The tool bit of claim **11**, wherein said at least two pairs of radially projecting surfaces are adjacent to one another and together separate said first and second pairs of recesses.

13. The tool bit of claim **12**, wherein said at least two pairs of radially projecting surfaces form walls of said first and second pairs of recesses.

14. The tool bit of claim **11**, wherein said first and second pairs of recesses comprise radially outwardly directed surfaces.

15. The tool bit of claim **14**, wherein said radially outwardly directed surfaces comprise edges respectively engageable by said projections of said lock pawls in said driving engagement, depending upon relative dimensions of said projections and said radially different recessed portions.

16. The tool bit of claim **11**, wherein:

said first and second pairs of recesses have respective longitudinal lengths along said axis; and,

said first and second pairs of recesses are longitudinally separated from one another along said axis by a distance smaller than each of said respective longitudinal lengths.

17. The tool bit of claim **11**, wherein said profile comprises a pair of radial projections between said first and second pairs of recesses, said radial projections having non circular, radially outward surfaces.

18. The tool bit of claim **11**, wherein said profile comprises a pair of radial projections between said first and second pairs of recesses, said radial projections having flattened, radially outward surfaces.

19. The tool bit of claim **11**, wherein no part of said profile has a complete circular cross section when viewed axially from the distal point of said one end.

20. A tool bit for a motor driven instrument having a housing with lock pawls movable into and out of driving engagement with said tool bit, said tool bit comprising:

a shaft having a longitudinal axis of rotation and having at one end of said shaft a symmetrical longitudinal profile along said axis;

said profile having first and second pairs of recessed portions for receiving corresponding projections of said lock pawls during said driving engagement;

said profile also having at least one pair of radially projecting surfaces engageable by portions of said

projections of said lock pawls for preventing an axial movement of said tool bit during said driving engagement;

no part of said profile having a complete circular cross section when viewed axially from the distal point of said one end; and,

a bit formed at the other end of said shaft.

21. The tool bit of claim 1, wherein said first outwardly facing surface is provided by each of a pair of diametrically opposing engagement surfaces, said further outwardly facing surface of each of said pair of slots, directly adjacent said axial stop, being disposed radially inwardly of said pair of diametrically opposing engagement surfaces.

22. The tool bit of claim 21, wherein each of said pair of diametrically opposing engagement surfaces is flat.

23. The tool bit of claim 21, wherein the axial stop extends axially from said side surfaces of said pair of slots, said axial stop providing a pair of back surfaces terminating at a juncture with said pair of diametrically opposing engagement surfaces.

24. The tool bit of claim 23, wherein the pair of back surfaces are inclined, sloping axially toward said pair of diametrically opposing engagement surfaces.

25. The tool bit of claim 21, wherein the cross-sectional area of the shaft at the axial stop is greater than the cross-sectional area of the shaft of said pair of diametrically opposing engagement surfaces and the cross-sectional area of the shaft at said pair of diametrically opposing engagement surfaces is greater than the cross-sectional area of the shaft at the pair of slots.

26. The tool bit of claim 21, wherein said pair of diametrically opposing engagement surfaces are axially and radially parallel to said further outwardly facing surfaces of said pair of slots, directly adjacent said axial stop.

27. The tool bit of claim 21, wherein each of said pair of diametrically opposing engagement faces and said further outwardly facing surface of each of said pair of slots, each comprise edges adapted to be engaged by one of the lock pawls in driving engagement, depending upon relative dimensions of said pair of diametrically opposing engagement faces and said further outwardly facing surface of each of said pair of slots.

28. The tool bit of claim 21, wherein:

said pair of diametrically opposing engagement faces and said pair of slots have respective longitudinal lengths along said axis and are longitudinally separated from one another along said axis by a distance smaller than each of said respective longitudinal lengths.

29. The tool bit of claim 20, wherein said first pair of recessed portions are axially separated from said second pair of recessed portions by said pair of radially projecting surfaces, said first pair of recessed portions being disposed radially inwardly of said second pair of recessed portions.

30. The tool bit of claim 29, wherein each recessed portion of said first and second pair of recessed portions is flat.

31. The tool bit of claim 29, wherein the pair of radially projecting surfaces define an axial stop extending axially from said first pair of recessed portions to said second pair of recessed portions, said axial stop providing a pair of back surfaces terminating at a juncture with said second pair of recessed portions.

32. The tool bit of claim 31, wherein the pair of back surfaces are inclined, sloping axially toward said second pair of recessed portions.

33. The tool bit of claim 29, wherein the cross-sectional area of the shaft at the axial stop is greater than the *cross-sectional area of the shaft at said second pair of recessed portions and the cross-sectional area of the shaft at said second pair of recessed portions is greater than the cross-sectional area of the shaft at said first pair of recessed portions.*

34. The tool bit of claim 29, wherein said second pair of recessed portions are axially and radially parallel to said first pair of recessed portions.

35. The tool bit of claim 29, wherein each of said first pair of recessed portions and said second pair of recessed portions each comprises edges adapted to be engaged by one of the lock pawls in driving engagement, depending upon relative dimensions of said first and second pair of recessed portions.

36. The tool bit of claim 29, wherein:

said first and second pair of recessed portions have respective longitudinal lengths along said axis and are longitudinally separated from one another along said axis by a distance smaller than each of said respective longitudinal lengths.

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