US 20210060674A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2021/0060674 A1**

Liao (43) **Pub. Date: Mar. 4, 2021**

(54) **TUBE CUTTER WITH LUBRICATING FUNCTION**

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(21) Appl. No.: **16/861,310**

(22) Filed: **Apr. 29, 2020**

(30) **Foreign Application Priority Data**

Aug. 30, 2019 (TW) 108211588

Publication Classification

(51) **Int. Cl.**

B23D 59/02 (2006.01)

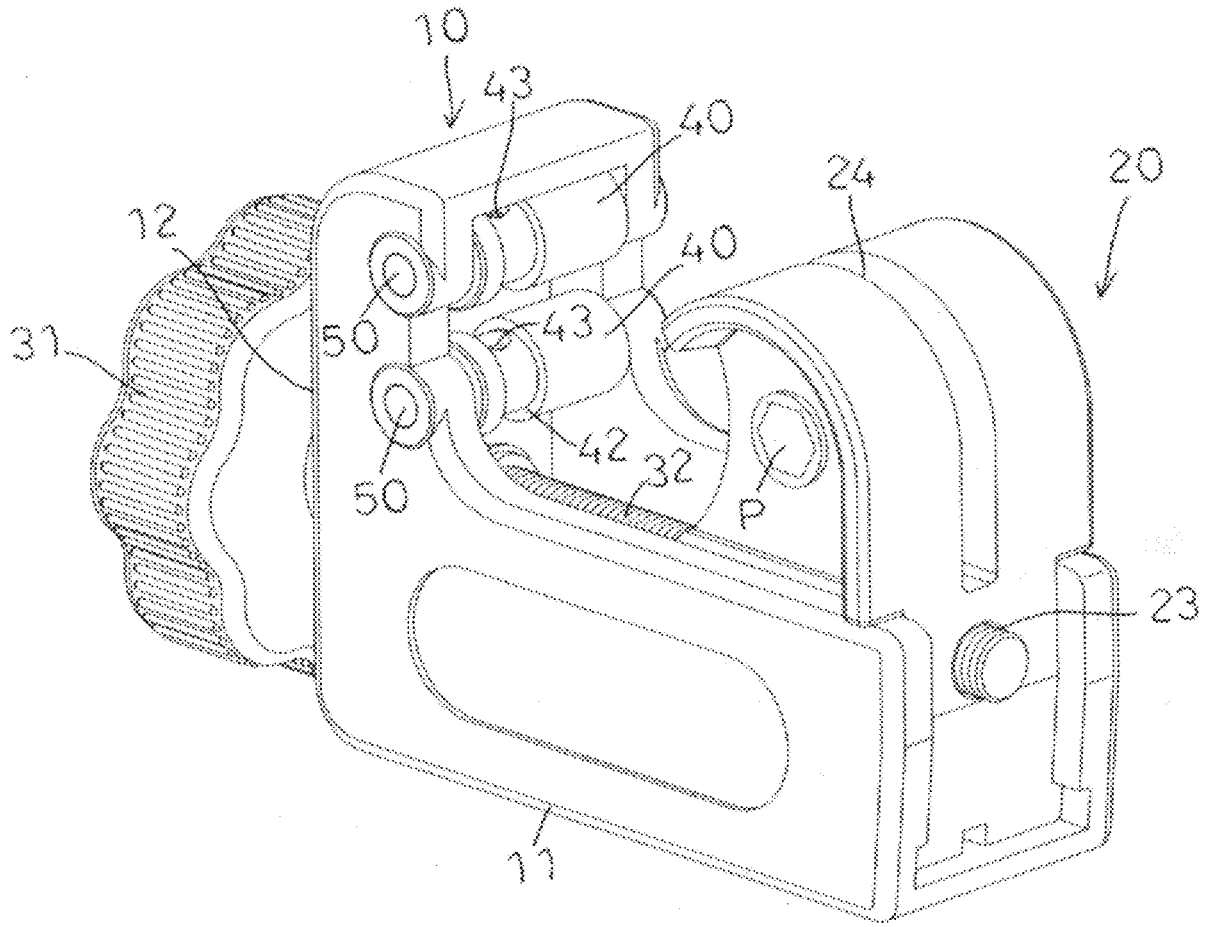
B23D 45/16 (2006.01)

(52) **U.S. Cl.**

CPC ***B23D 59/02*** (2013.01); ***B23D 45/16*** (2013.01)

(57) **ABSTRACT**

A tube cutter includes a main body, a holder slidably mounted on the main body, a guide bolt rotatably mounted on the main body to move the holder, two rollers pivotally mounted on the main body, a cutting wheel rotatably mounted on the holder and corresponding to the rollers, and two pivot shafts extending through the main body and the rollers. Each of the pivot shafts has a periphery provided with at least one oil storage groove, and each of the rollers is radially provided with an oil filling hole corresponding to the at least one oil storage groove of each of the pivot shafts. Thus, lubricating oil is filled between each of the rollers and each of the pivot shafts to provide a lubricating function.



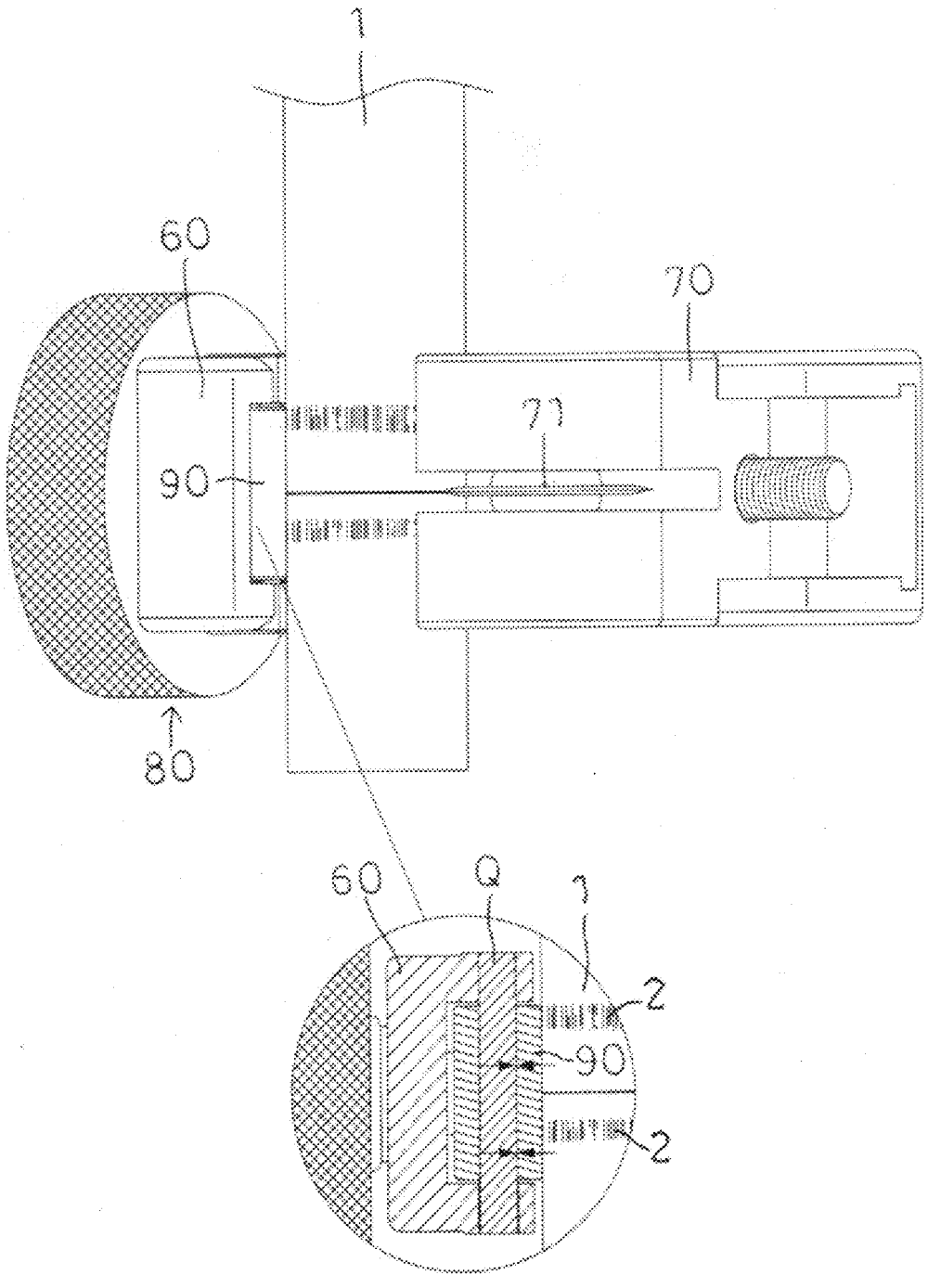


FIG. 1 (PRIOR ART)

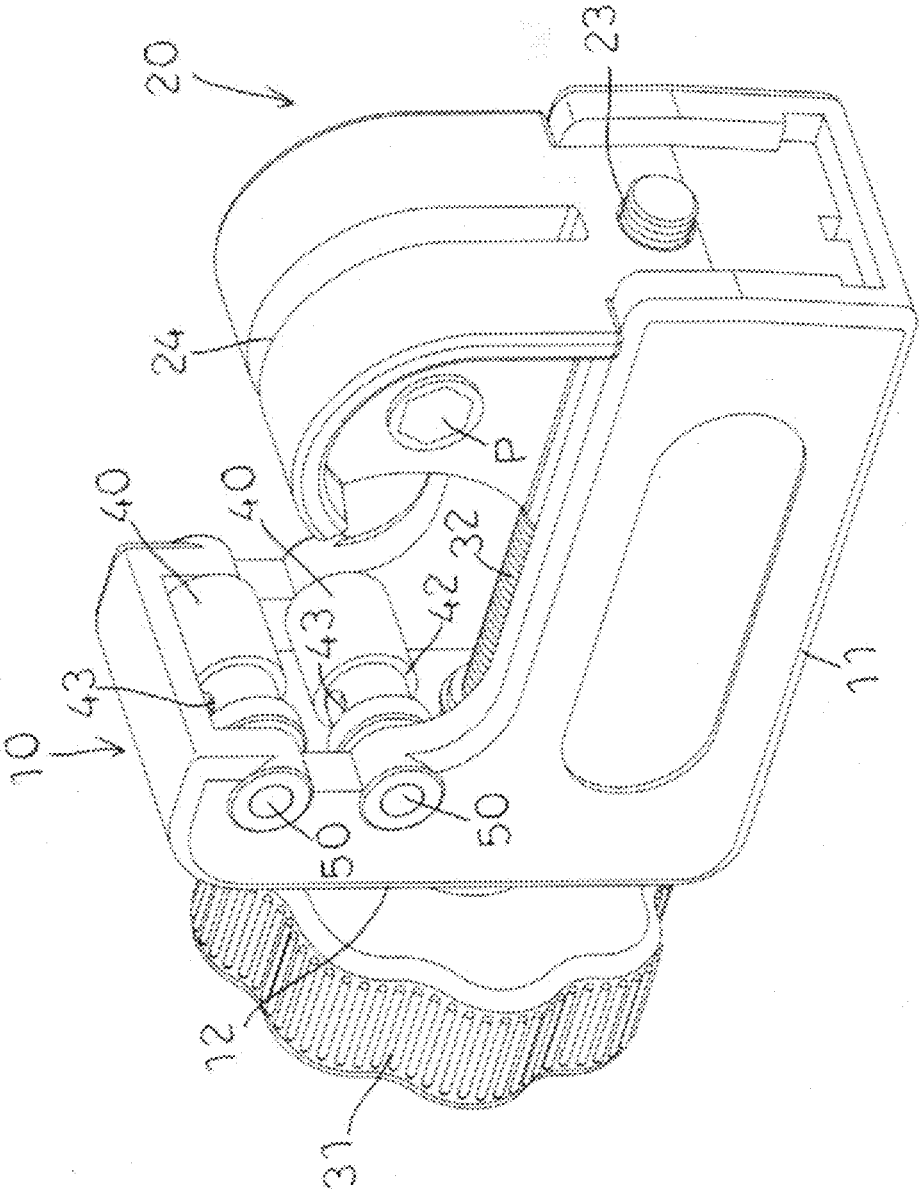


FIG. 2

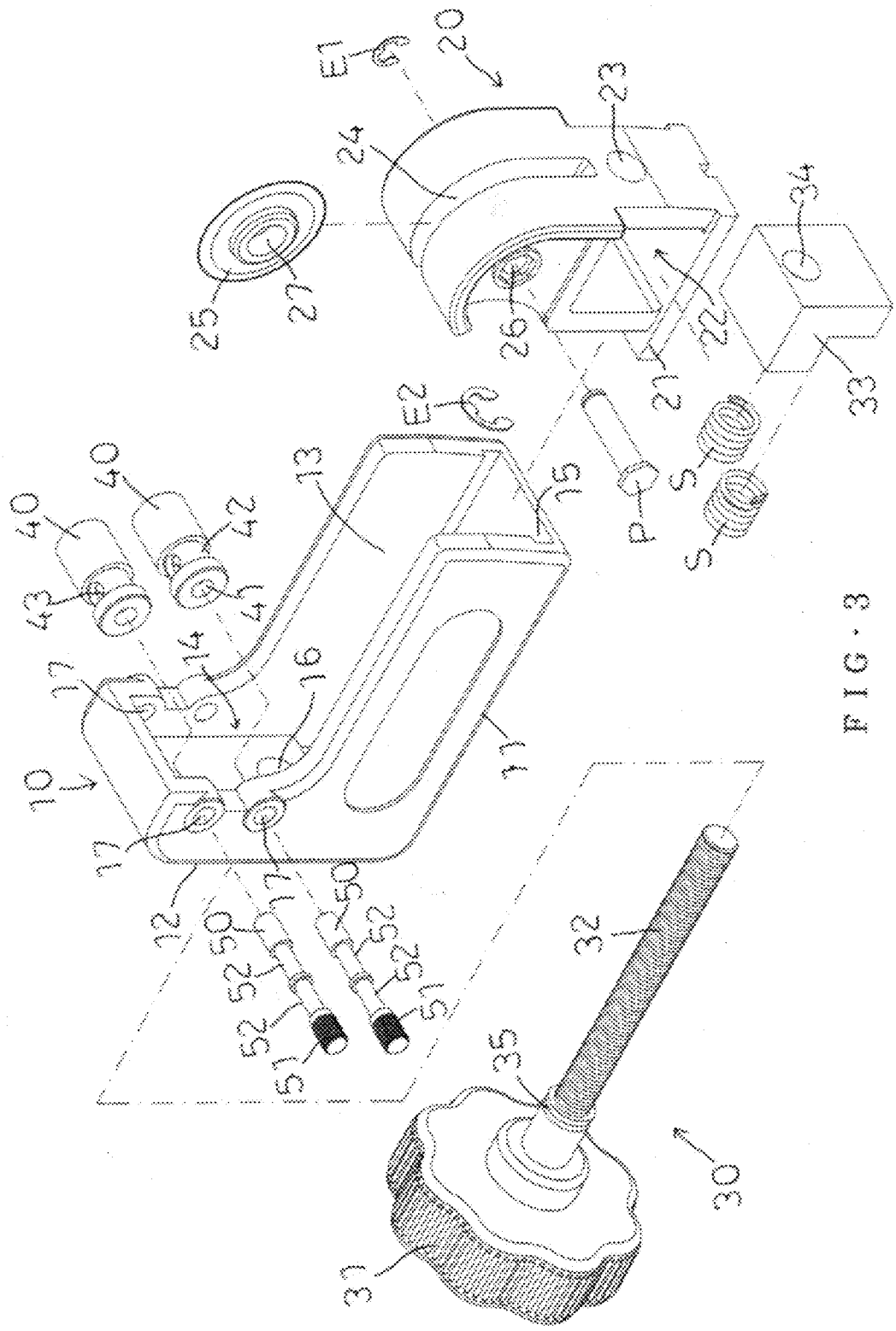

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FIG. 3

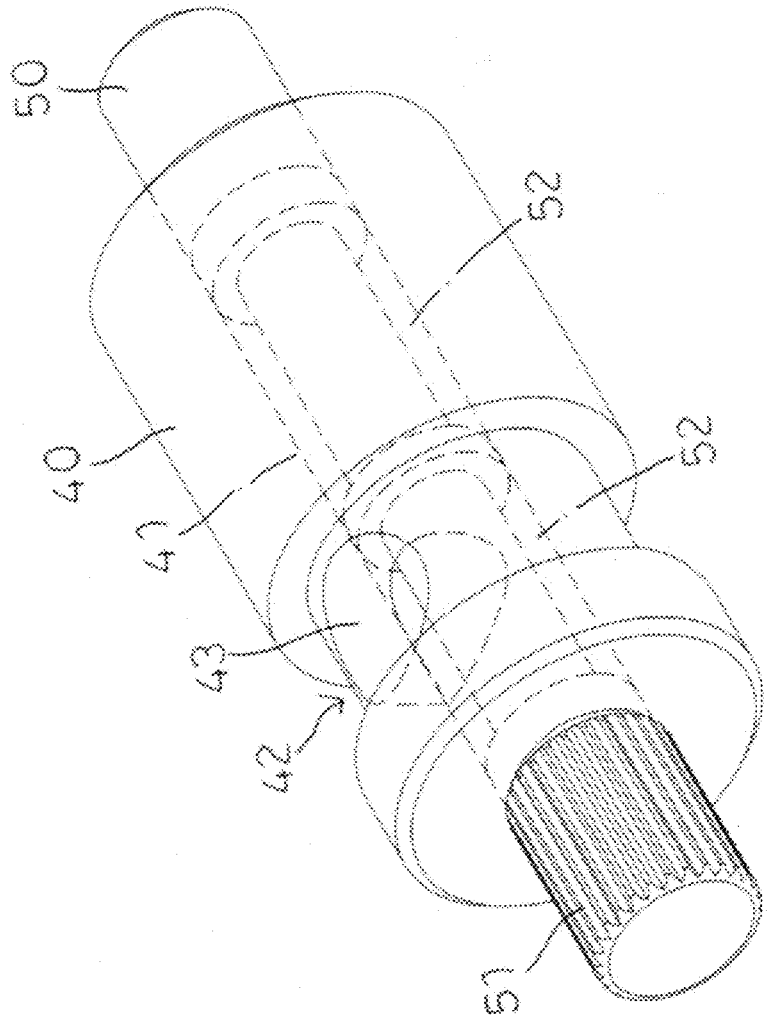

FIG. 4

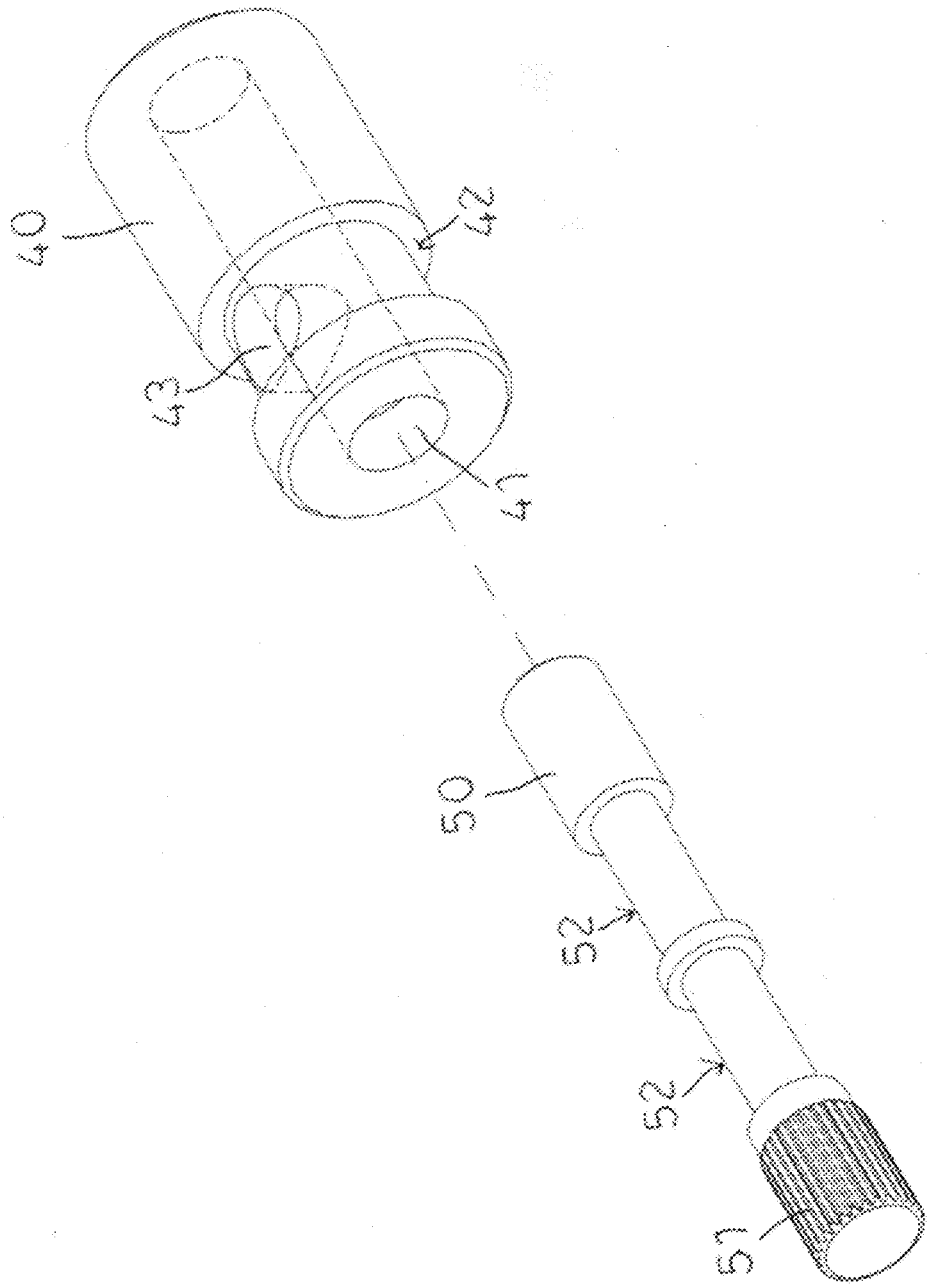

FIG. 5

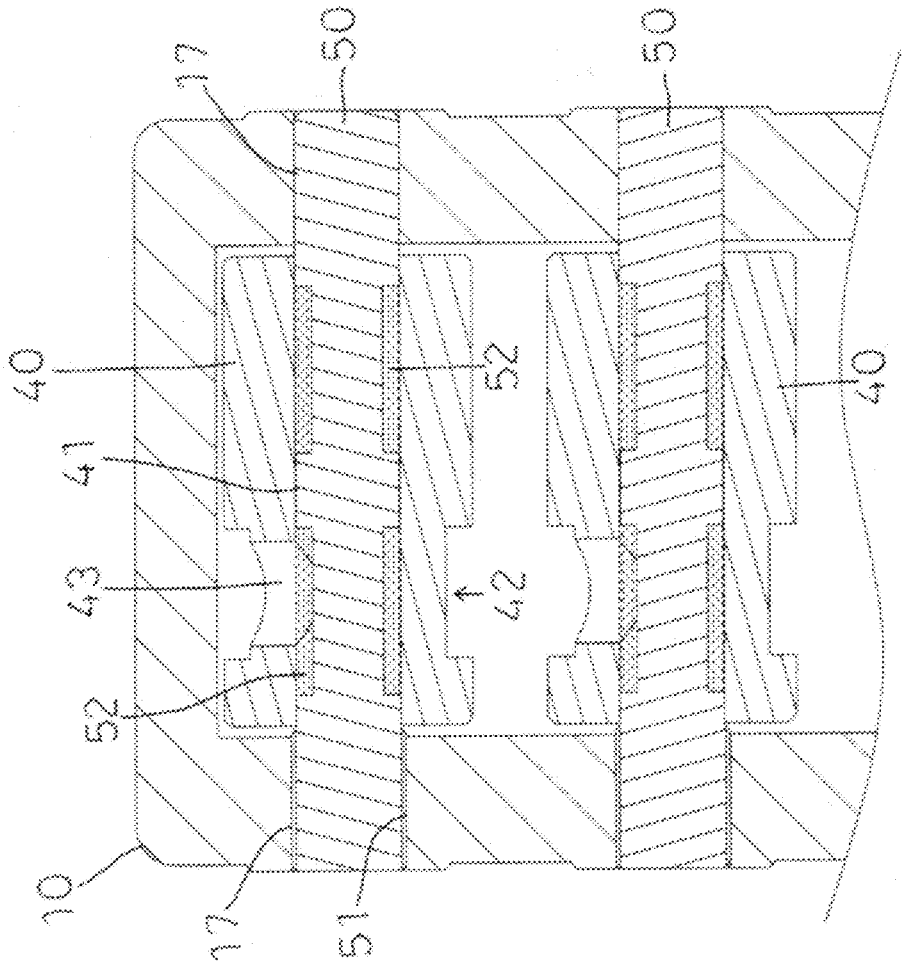

FIG. 6

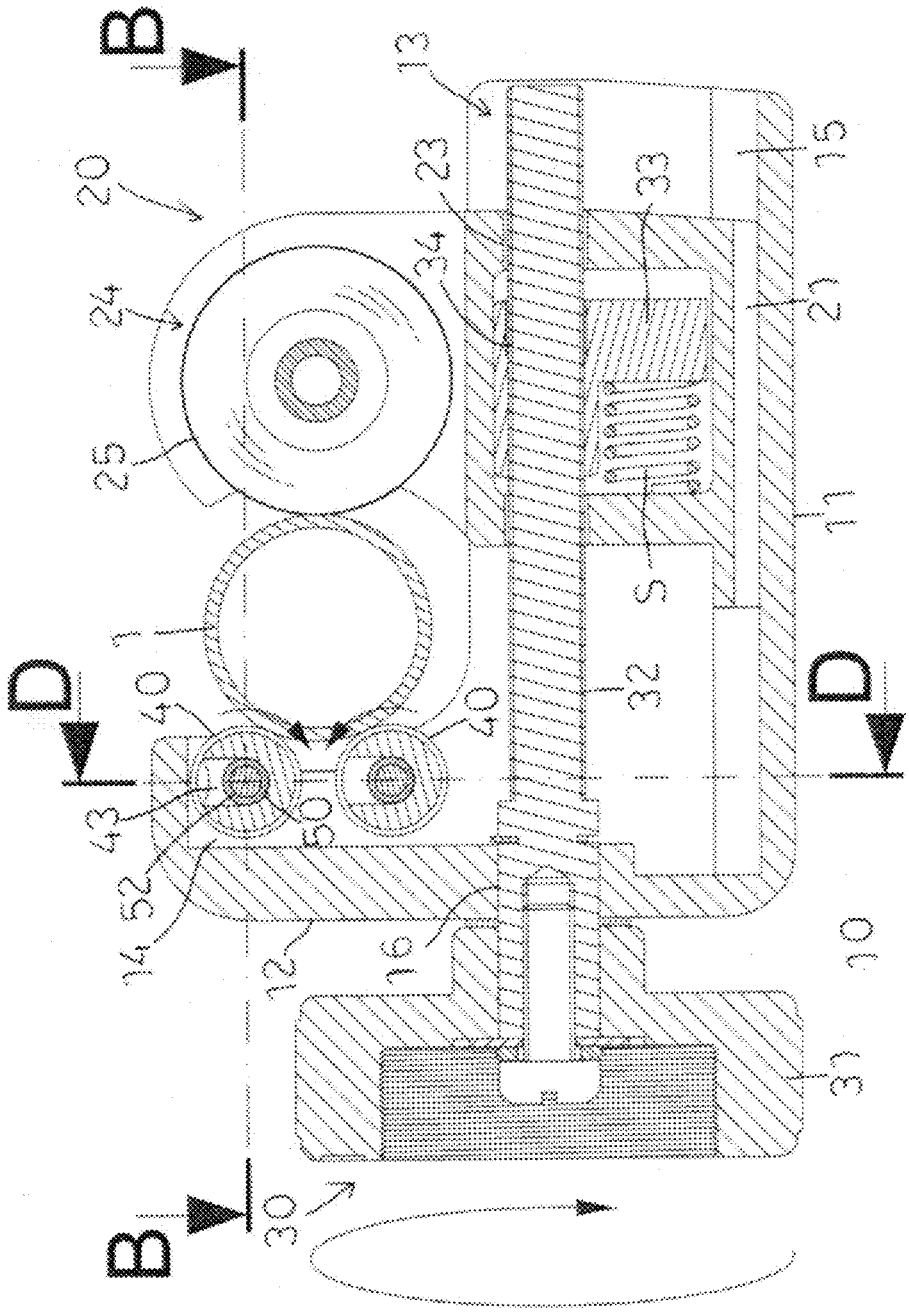
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FIG. 7

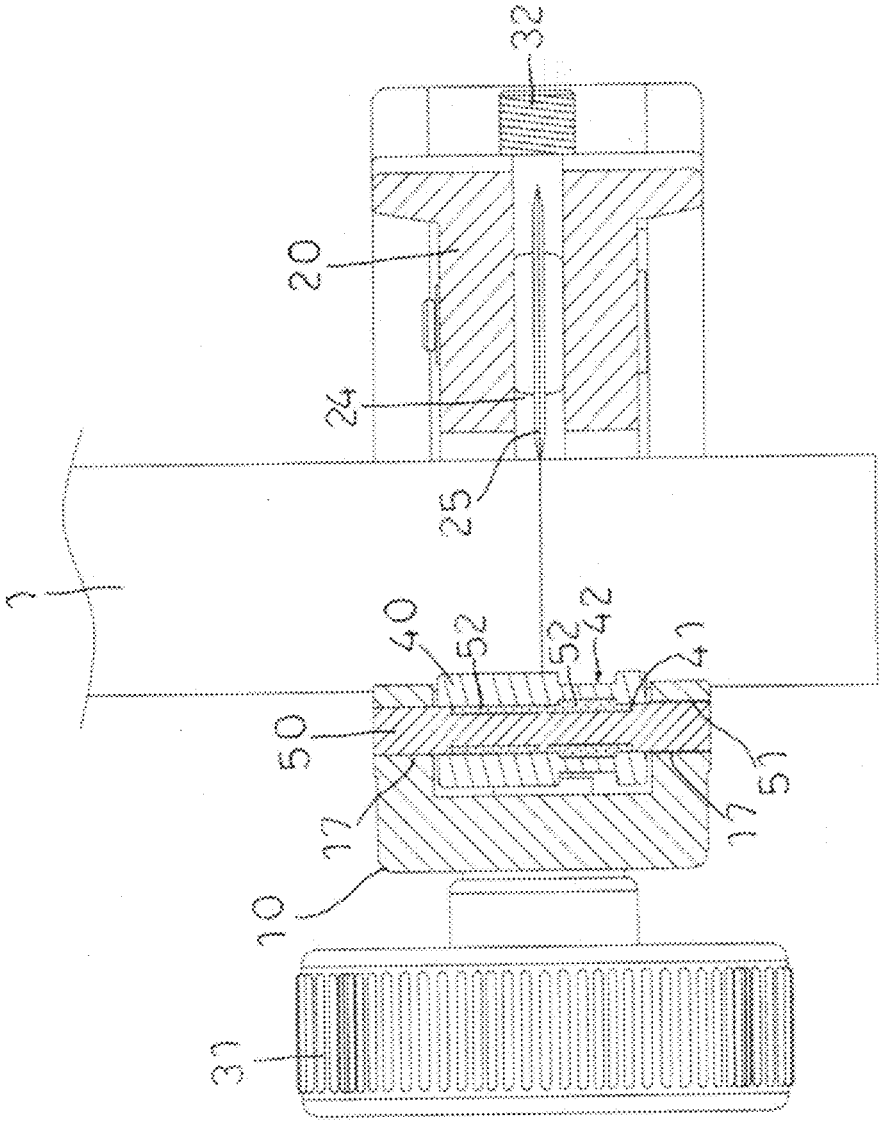
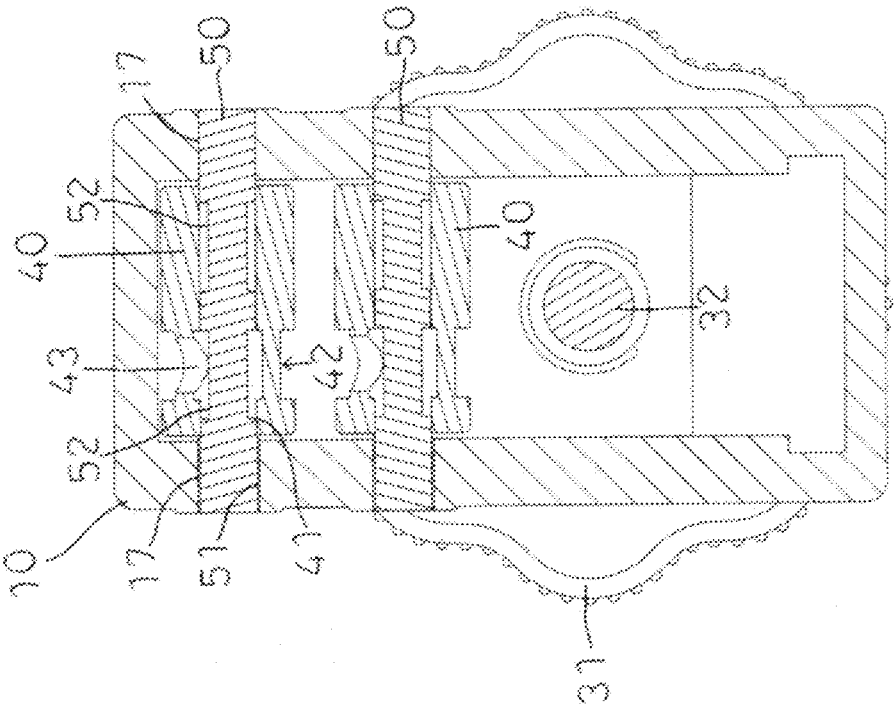


FIG. 8



D-D
FIG. 9

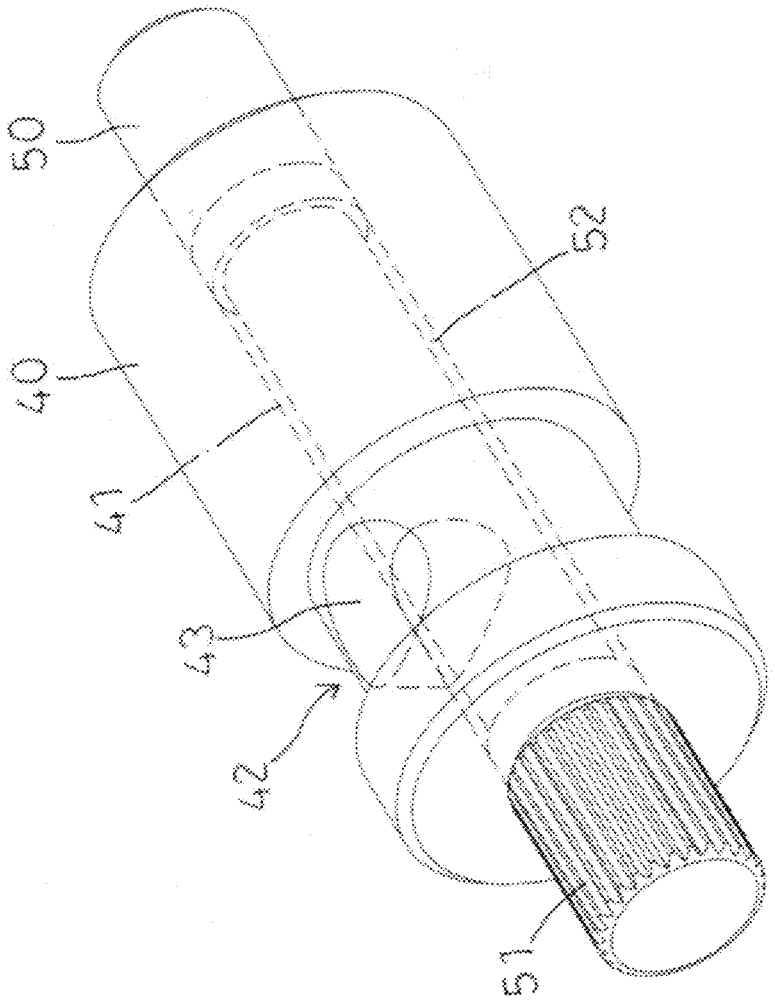


FIG. 10

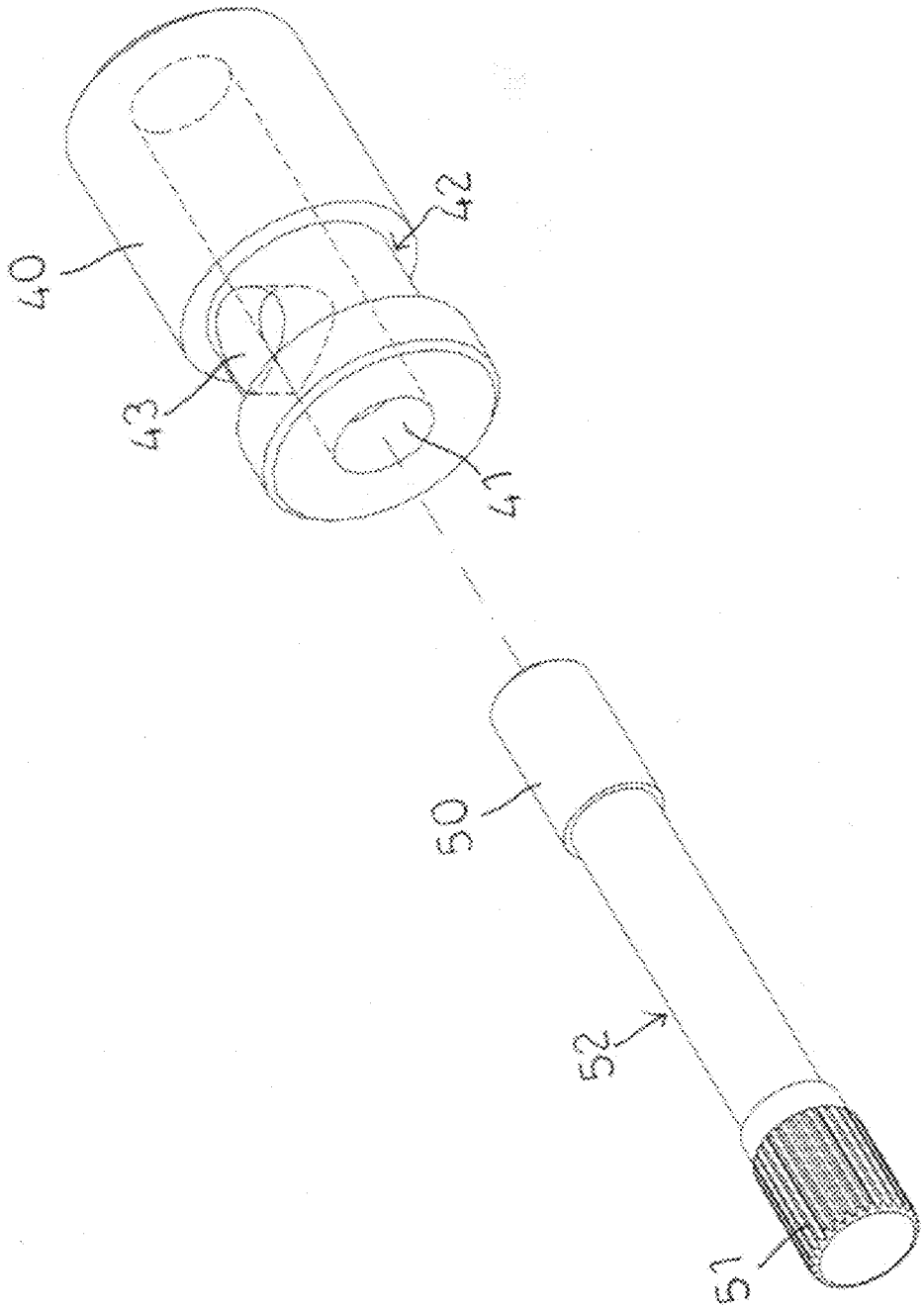


FIG. 11

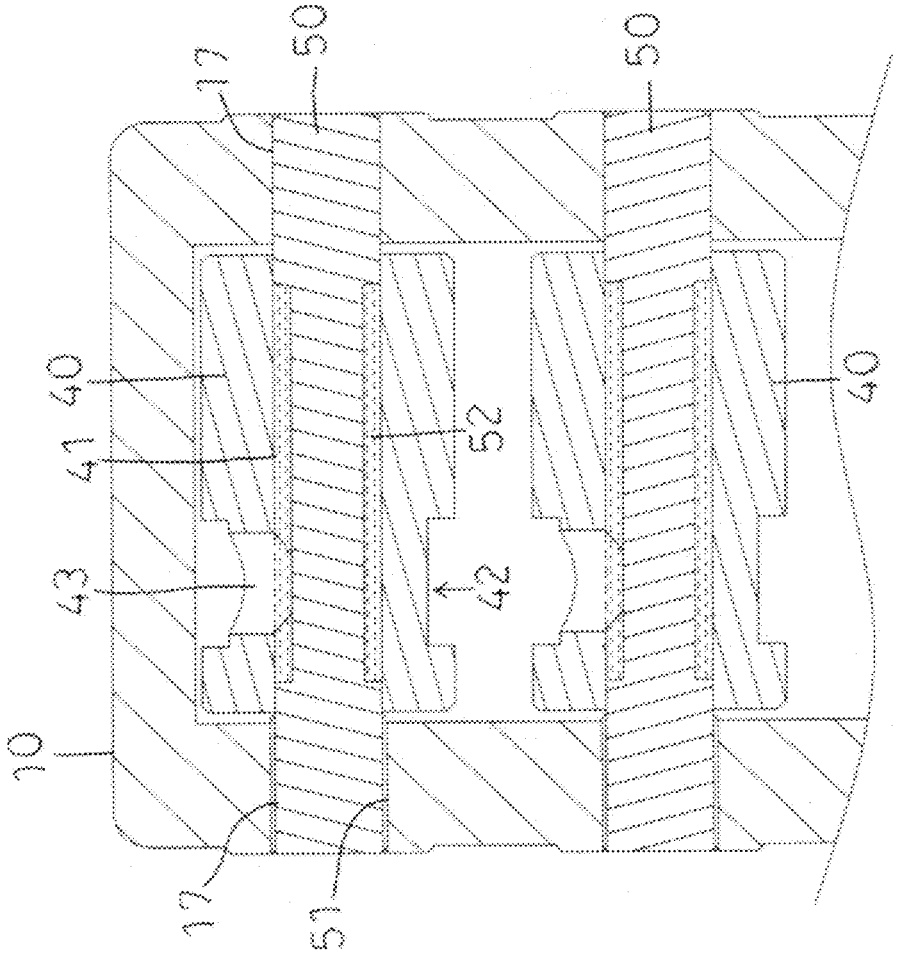


FIG. 12

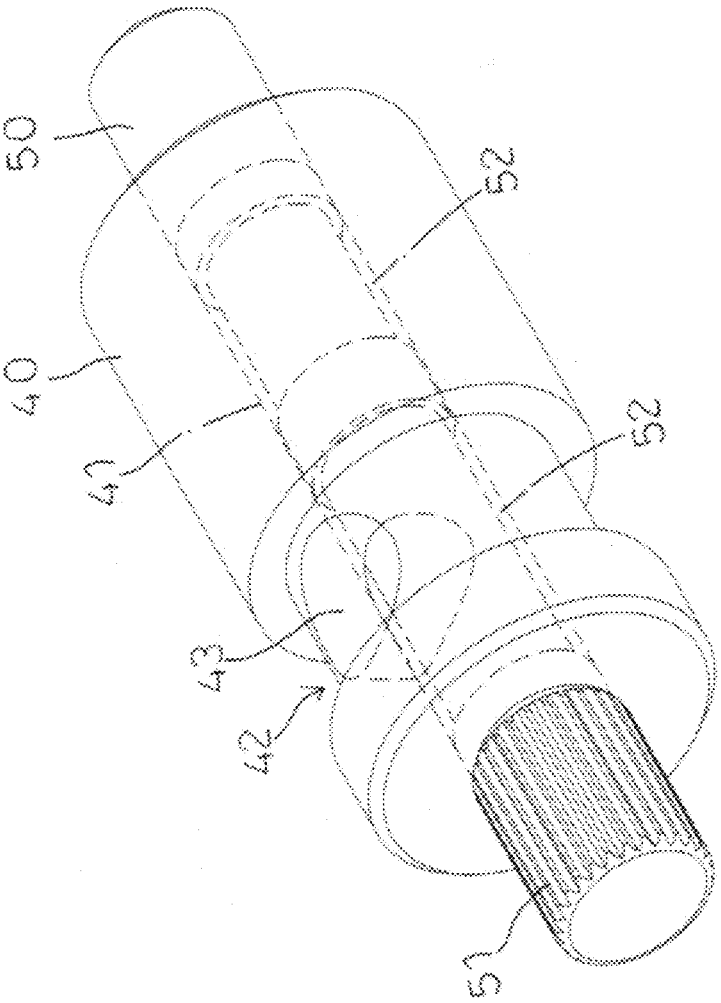


FIG. 13

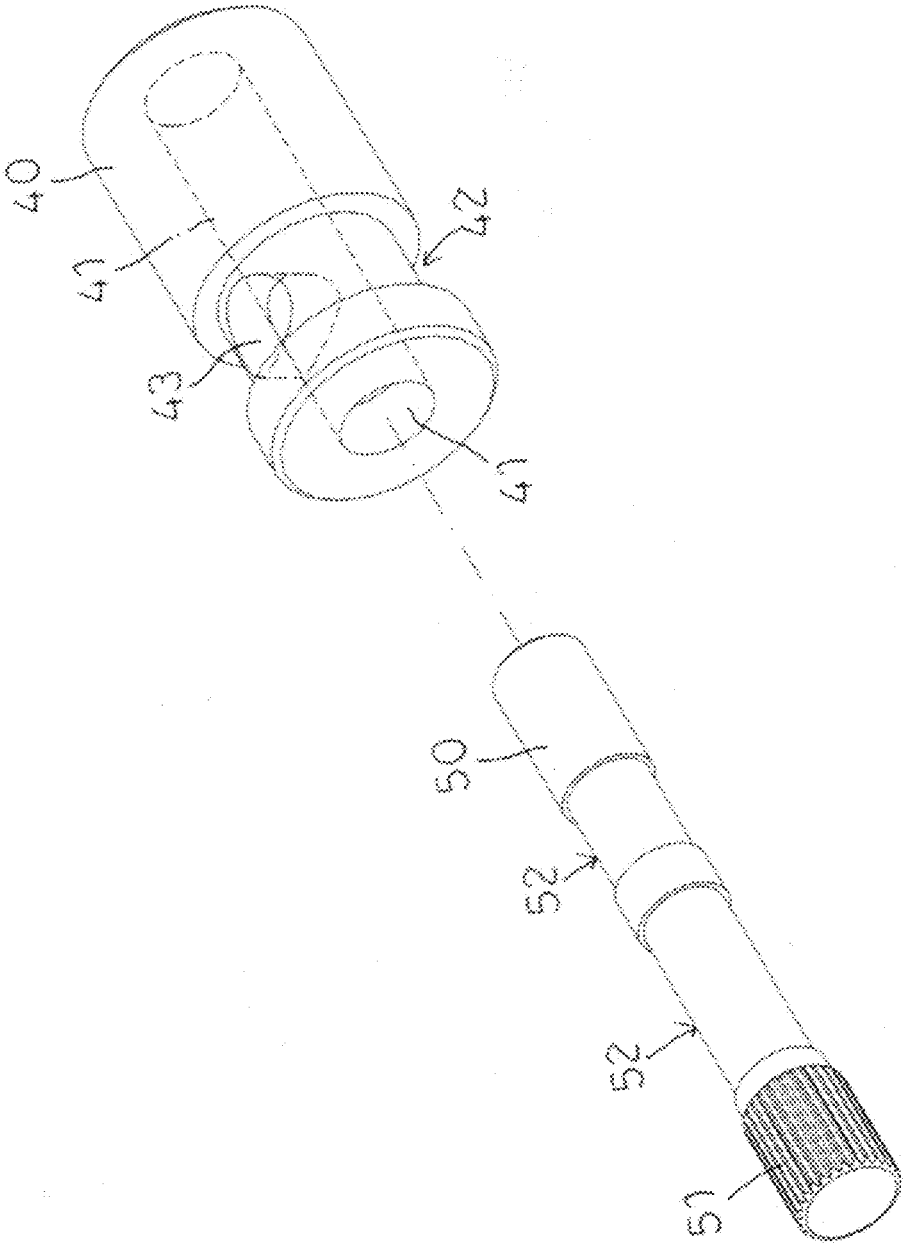


FIG. 14

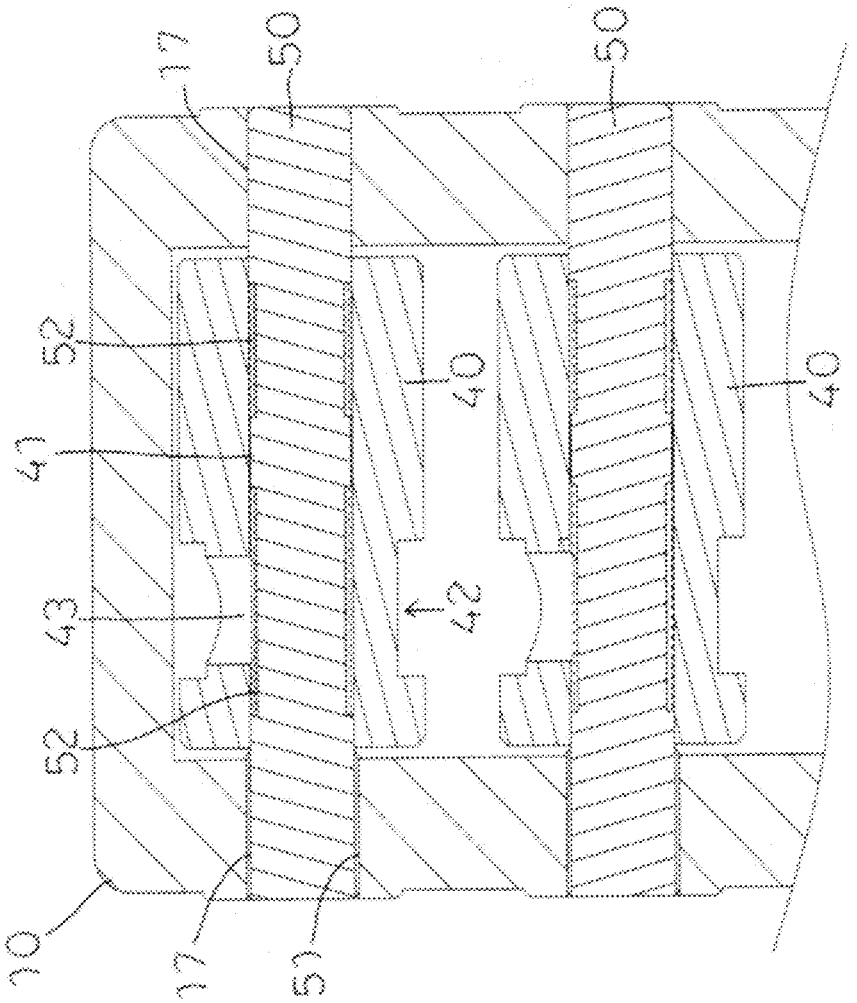


FIG. 15

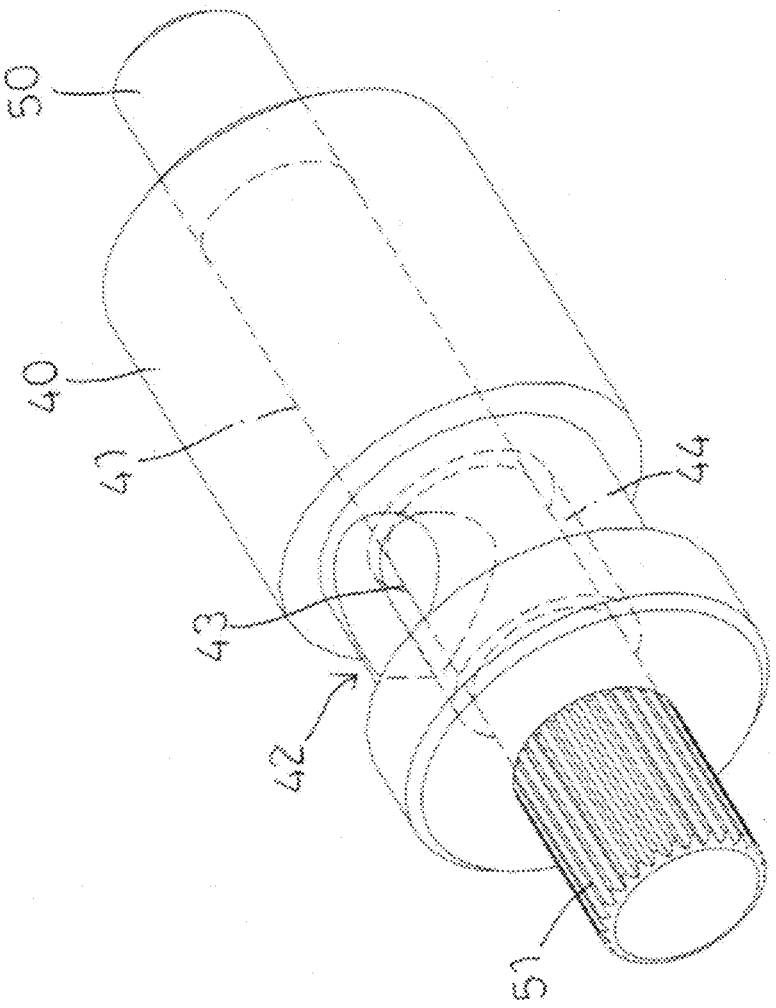


FIG. 16

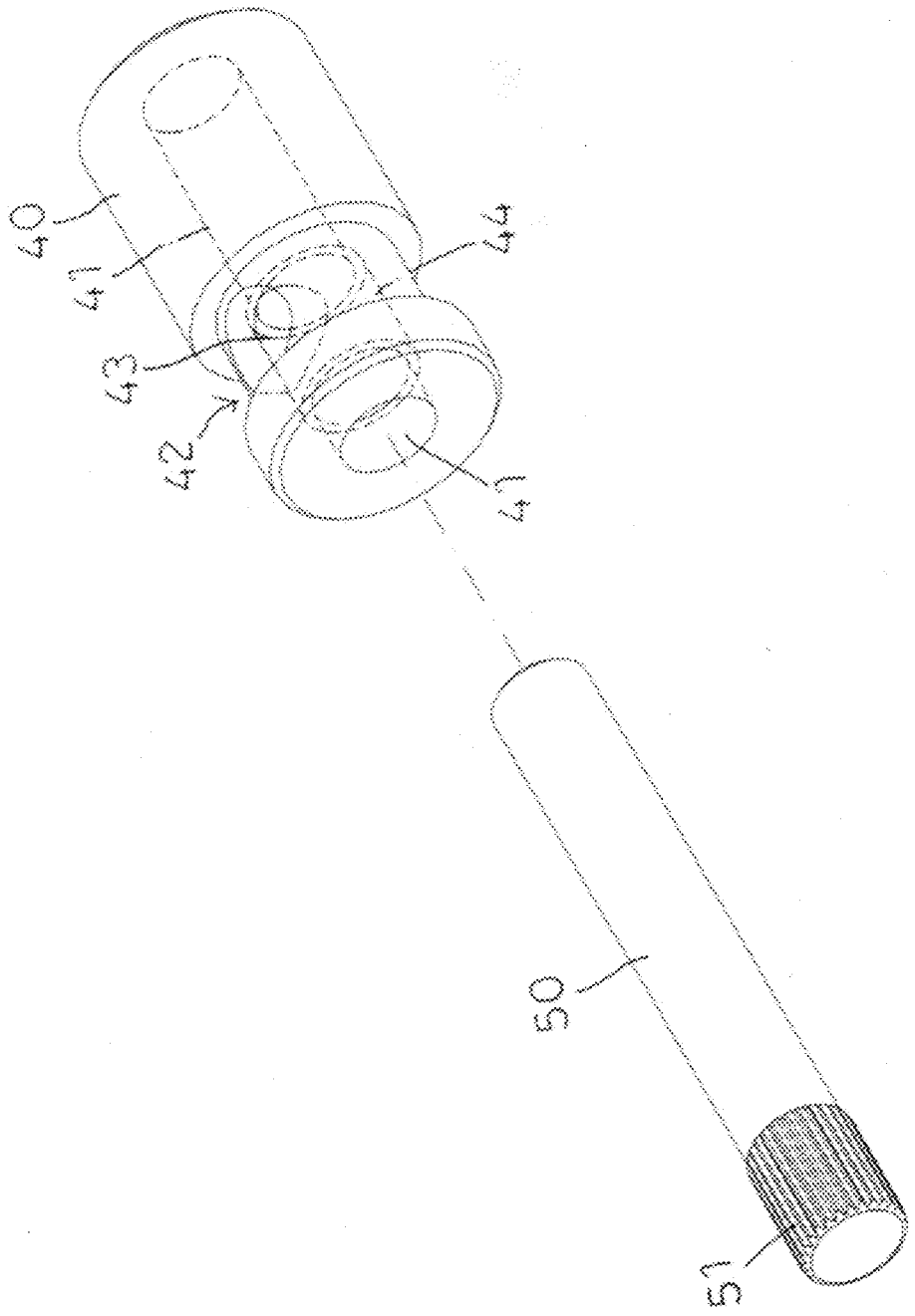


FIG. 17

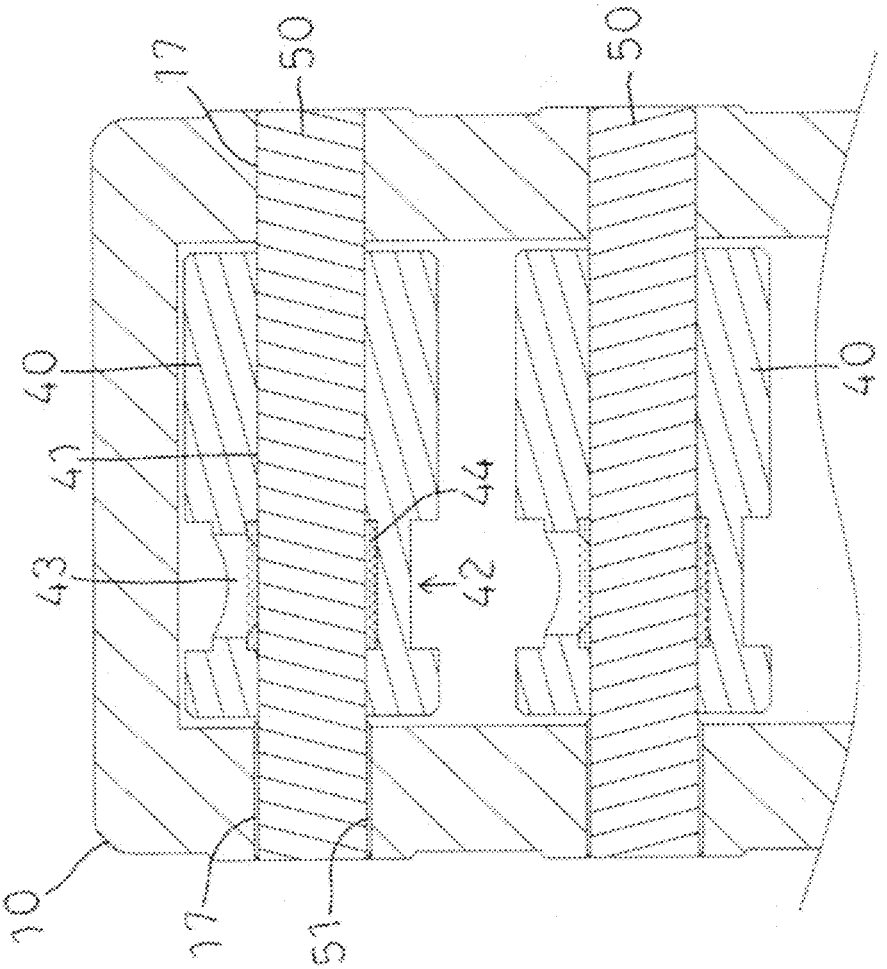


FIG. 18

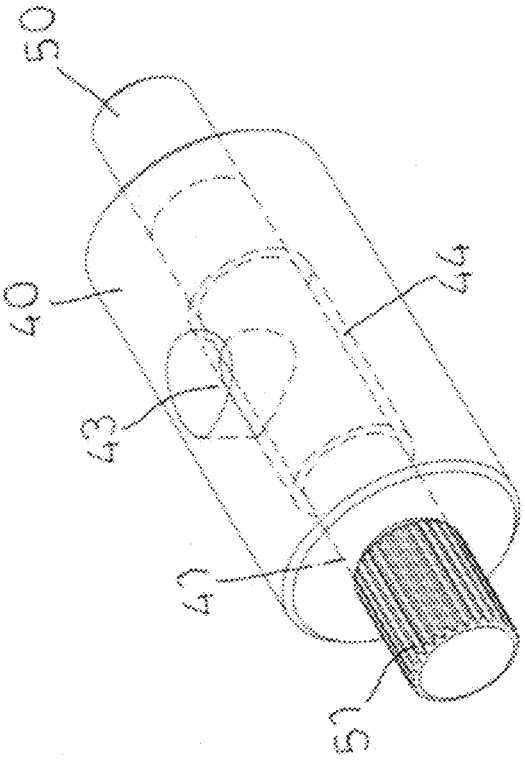


FIG. 19

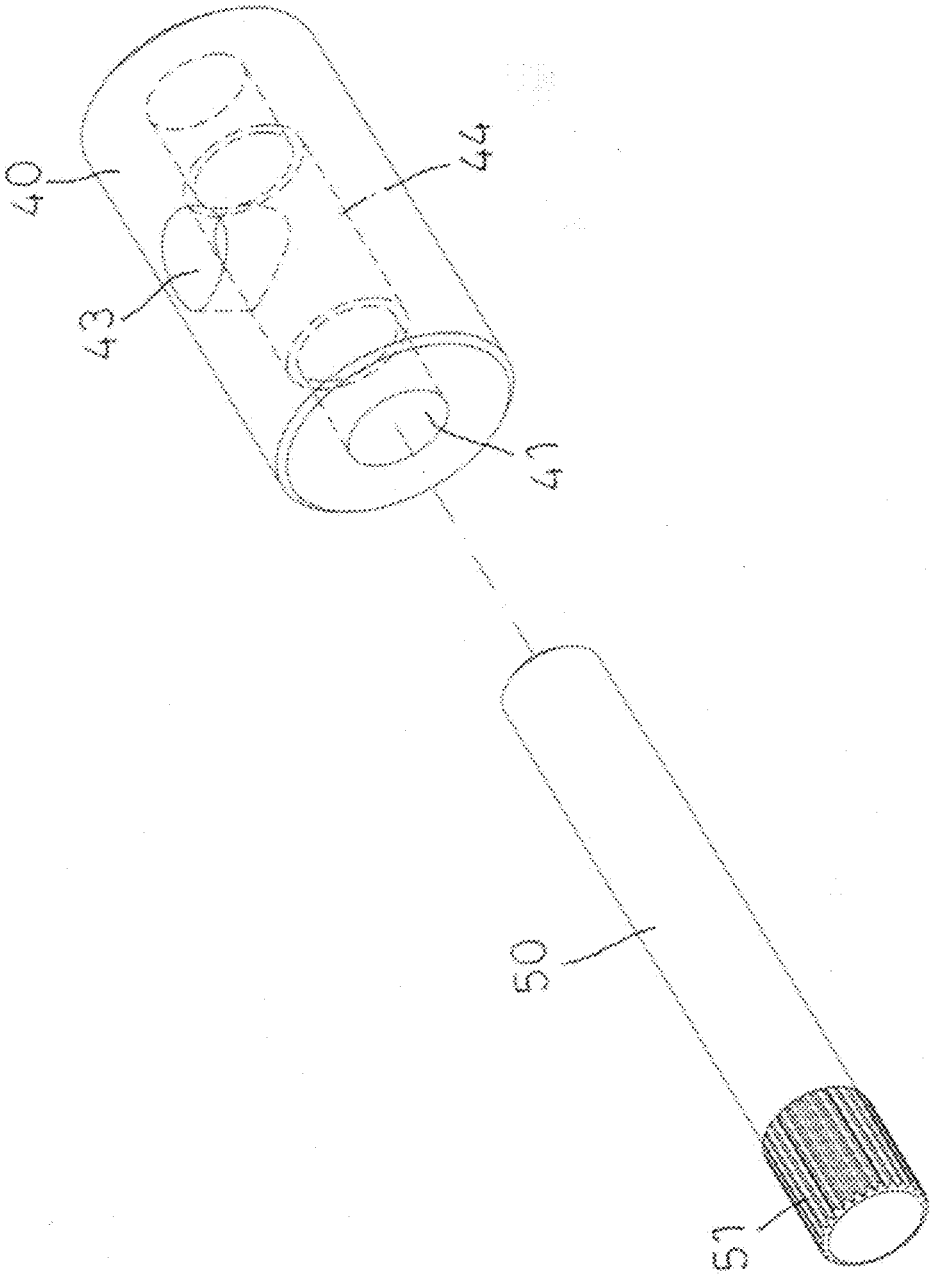


FIG. 20

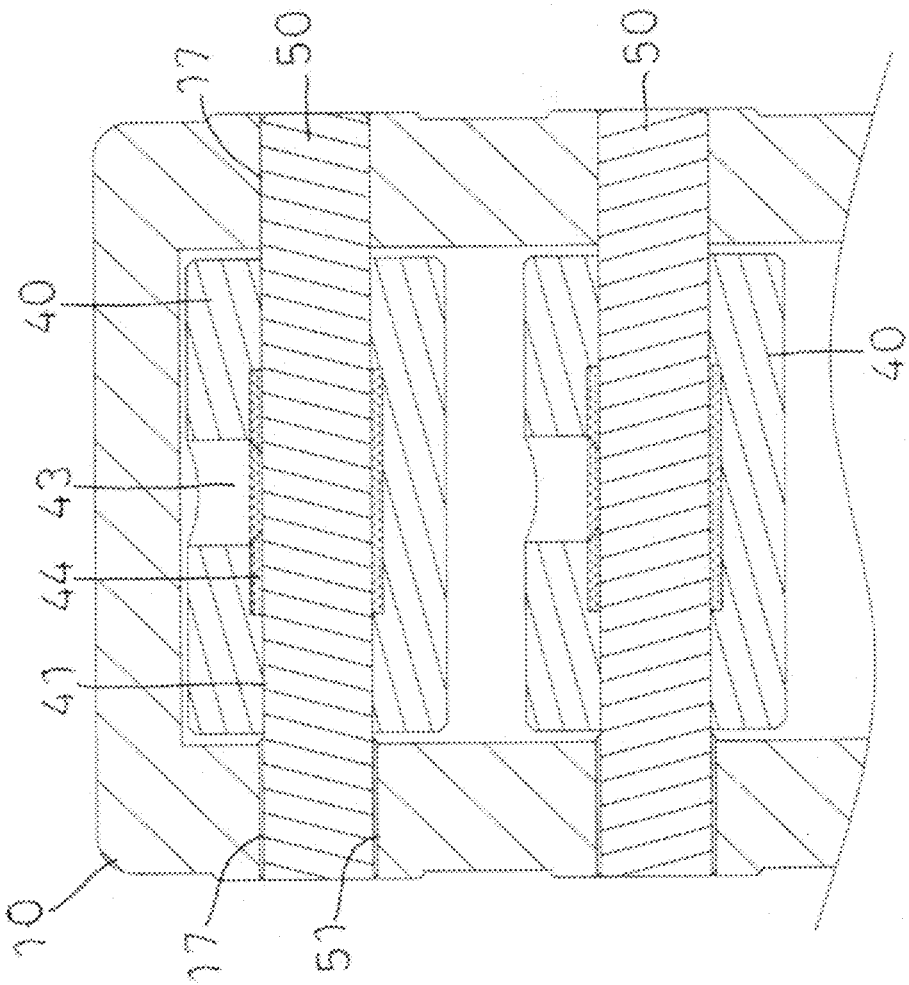


FIG. 21

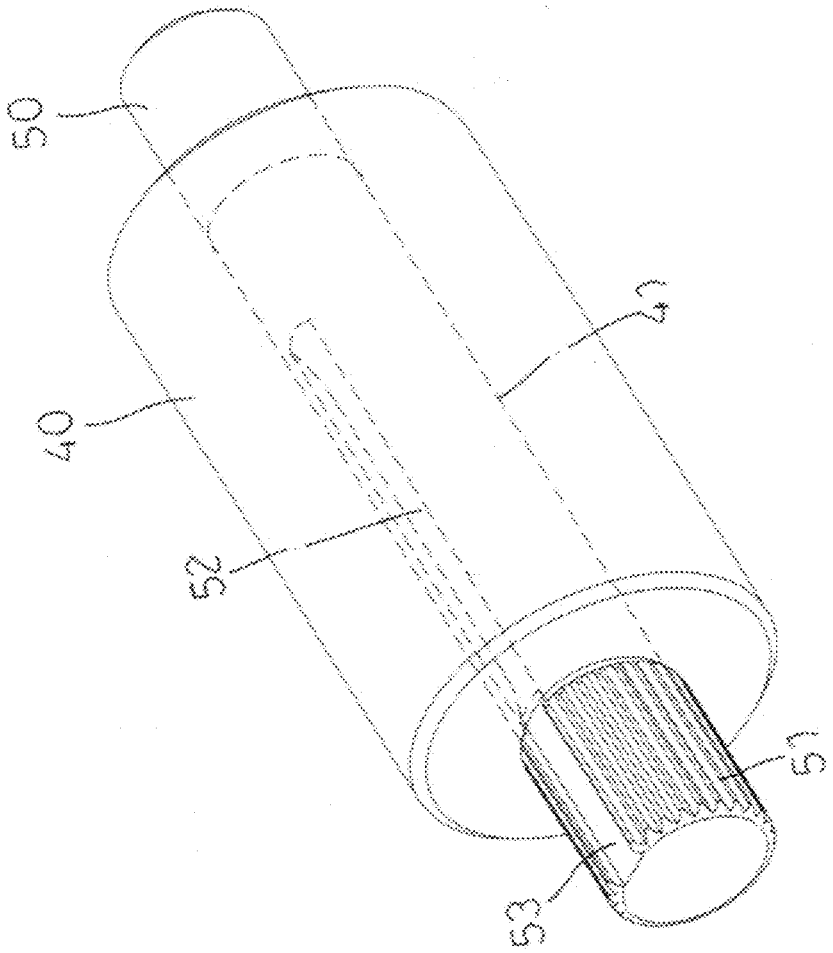


FIG. 22

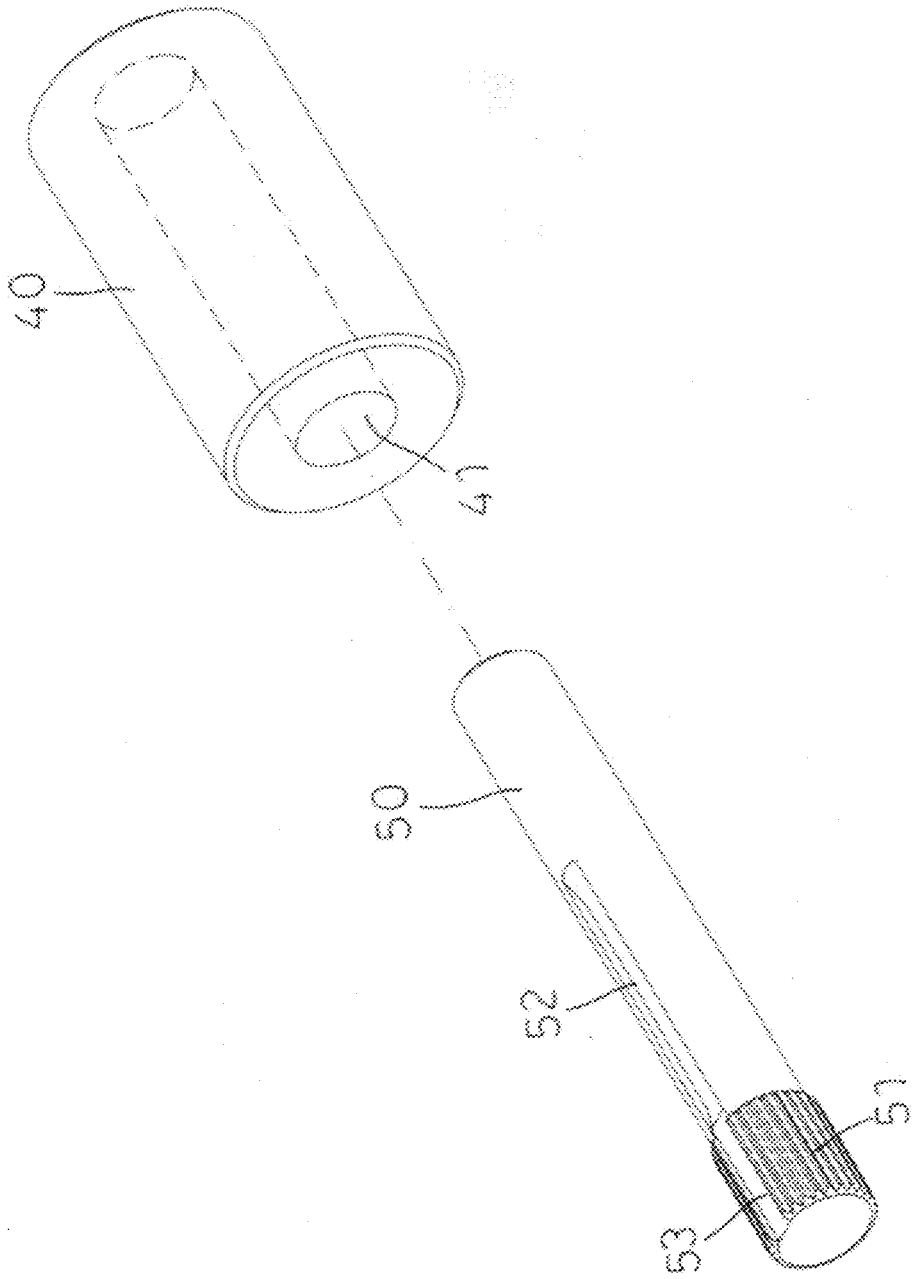


FIG. 23

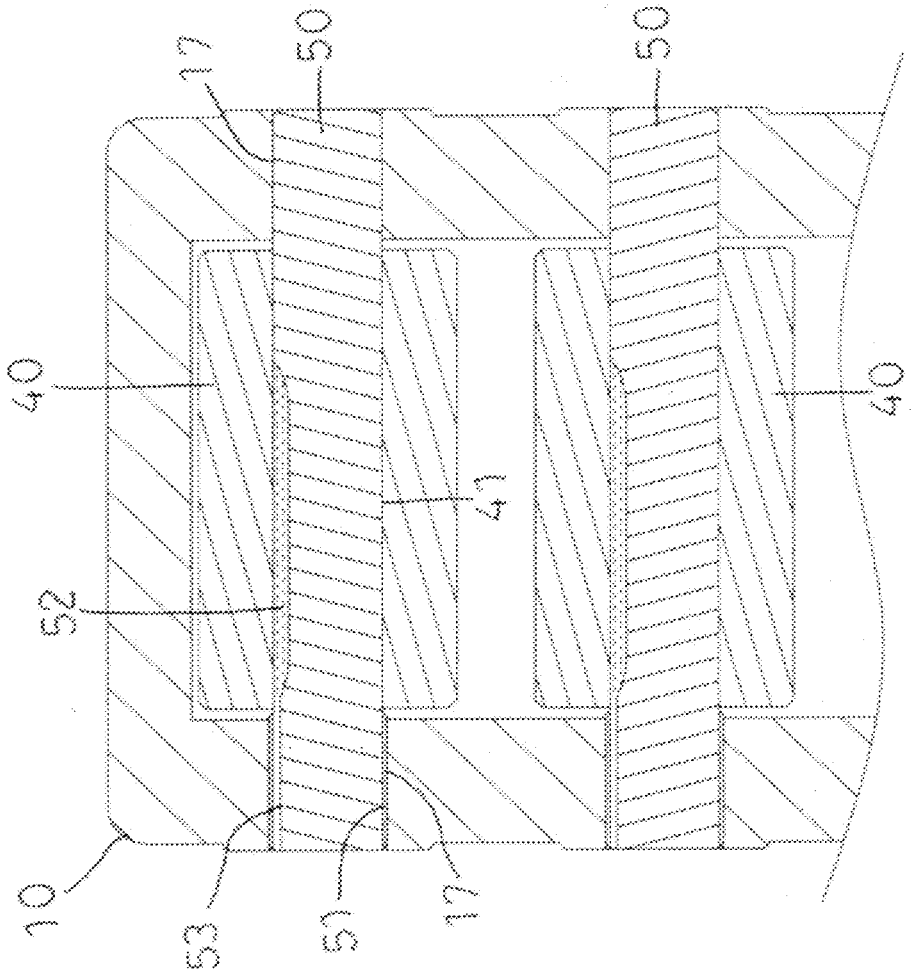


FIG. 24

TUBE CUTTER WITH LUBRICATING FUNCTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a cutter and, more particularly, to a tube cutter for cutting a tube.

2. Description of the Related Art

[0002] A conventional tube cutter comprises a substantially U-shaped main body having a first end provided with a screw hole, a cutting wheel mounted on a second end of the main body, a slide movably mounted on the main body, two rollers mounted on the slide and aligning with the cutting wheel, and a threaded rod screwed through the screw hole of the main body and having a first end resting on the two rollers, and a control knob secured on a second end of the threaded rod. In operation, when the threaded rod is rotated by the control knob, the threaded rod is moved axially relative to the main body to drive the two rollers which drive the slide to move on the main body, so that the two rollers are moved relative to the cutting wheel. Thus, when the tube cutter is mounted on a tube or pipe, the two rollers rest on the tube. Then, the threaded rod is rotated by the control knob, and the two rollers are moved toward the cutting wheel, so that the tube is clamped between the two rollers and the cutting wheel. Then, the main body is held by the user's hand and is rotated relative to the tube, so that the cutting wheel is revolved on the tube so as to shear the tube gradually and successively until the tube is cut. However, the conventional tube cutter does not have an automatically feeding function so that the user has to rotate the control knob successively to move the two rollers to press the tube during the shearing process, thereby causing inconvenience to the user, and thereby wasting the energy and working time. In addition, the conventional tube cutter has a small torque so that the user has to apply a large force on the main body to rotate the main body is held by the user's hand and is rotated relative to the tube, so that the cutting wheel is revolved on the tube so as to shear the tube relative to the tube so as to shear the tube, thereby wasting the user's energy and time.

[0003] A conventional automatically feeding tube cutter in accordance with the prior art shown in FIG. **1** comprises a main body **60**, a holder **70** slidably mounted on a first side of the main body **60**, a guide bolt **80** rotatably mounted on the main body **60** and driving and moving the holder **70**, two rollers **90** pivotally mounted on a second side of the main body **60**, a cutting wheel **71** rotatably mounted on the holder **70** and corresponding to the two rollers **90**, and two pivot shafts "Q" extending through the main body **60** and the two rollers **90**. However, there is no lubricating oil provided between each of the two rollers **90** and each of the two pivot shafts "Q", such that the two rollers **90** are easily locked or jammed and cannot be rotated freely during a long-term utilization. In addition, when a tube **1** to be cut is clamped between the two rollers **90** and the cutting wheel **71**, pressed indentations are easily formed on the surface of the tube due to the friction between the two rollers **90** and the tube **1**, thereby decreasing the aesthetic quality of the tube **1**.

BRIEF SUMMARY OF THE INVENTION

[0004] The primary objective of the present invention is to provide a tube cutter with a roller lubricating function.

[0005] In accordance with the present invention, there is provided a tube cutter comprising a main body, a holder slidably mounted on a first side of the main body, a guide bolt rotatably mounted on the main body and driving and moving the holder, two rollers pivotally mounted on a second side of the main body, a cutting wheel rotatably mounted on the holder and corresponding to the two rollers, and two pivot shafts extending through the main body and the two rollers.

[0006] In accordance with a first embodiment of the present invention, each of the two pivot shafts has a periphery provided with at least one oil storage groove, and each of the two rollers is radially provided with an oil filling hole corresponding to the at least one oil storage groove of each of the two pivot shafts.

[0007] In accordance with a second embodiment of the present invention, each of the two rollers has an inner diameter provided with at least one oil storage groove, and each of the two rollers is radially provided with an oil filling hole corresponding to the at least one oil storage groove.

[0008] In accordance with a third embodiment of the present invention, each of the two pivot shafts has a surface provided with at least one oil storage groove, and each of the two pivot shafts has an end provided with an oil filling hole corresponding to the oil storage groove.

[0009] According to the primary advantage of the present invention, the lubricating oil is filled between each of the two rollers and each of the two pivot shafts to provide a lubricating function, so as to reduce the friction between each of the two rollers and each of the two pivot shafts, such that the two rollers are rolled smoothly, thereby preventing the two rollers from leaving pressed indentations on the tube during operation.

[0010] Further benefits and advantages of the present invention will become apparent after a careful reading of the detailed description with appropriate reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

[0011] FIG. **1** is a schematic operational view and a locally enlarged view of a conventional tube cutter in accordance with the prior art.

[0012] FIG. **2** is a perspective view of a tube cutter in accordance with the preferred embodiment of the present invention.

[0013] FIG. **3** is an exploded perspective view of the tube cutter as shown in

[0014] FIG. **2**.

[0015] FIG. **4** is a perspective assembly view of a roller and a pivot shaft of the tube cutter in accordance with the first preferred embodiment of the present invention.

[0016] FIG. **5** is an exploded perspective view of the roller and the pivot shaft of the tube cutter as shown in FIG. **4**.

[0017] FIG. **6** is a partially cross-sectional view showing an oil filling state of the tube cutter as shown in FIG. **4**.

[0018] FIG. **7** is a cross-sectional operational view of the tube cutter as shown in FIG. **2**.

[0019] FIG. **8** is a cross-sectional view of the tube cutter taken along line B-B as shown in FIG. **7**.

[0020] FIG. **9** is a cross-sectional view of the tube cutter taken along line D-D as shown in FIG. **7**.

[0021] FIG. **10** is a perspective assembly view of a roller and a pivot shaft of the tube cutter in accordance with the second preferred embodiment of the present invention.

[0022] FIG. **11** is an exploded perspective view of the roller and the pivot shaft of the tube cutter as shown in FIG. **10**.

[0023] FIG. **12** is a partially cross-sectional view showing an oil filling state of the tube cutter as shown in FIG. **10**.

[0024] FIG. **13** is a perspective assembly view of a roller and a pivot shaft of the tube cutter in accordance with the third preferred embodiment of the present invention.

[0025] FIG. **14** is an exploded perspective view of the roller and the pivot shaft of the tube cutter as shown in FIG. **13**.

[0026] FIG. **15** is a partially cross-sectional view showing an oil filling state of the tube cutter as shown in FIG. **13**.

[0027] FIG. **16** is a perspective assembly view of a roller and a pivot shaft of the tube cutter in accordance with the fourth preferred embodiment of the present invention.

[0028] FIG. **17** is an exploded perspective view of the roller and the pivot shaft of the tube cutter as shown in FIG. **16**.

[0029] FIG. **18** is a partially cross-sectional view showing an oil filling state of the tube cutter as shown in FIG. **16**.

[0030] FIG. **19** is a perspective assembly view of a roller and a pivot shaft of the tube cutter in accordance with the fifth preferred embodiment of the present invention.

[0031] FIG. **20** is an exploded perspective view of the roller and the pivot shaft of the tube cutter as shown in FIG. **19**.

[0032] FIG. **21** is a partially cross-sectional view showing an oil filling state of the tube cutter as shown in FIG. **19**.

[0033] FIG. **22** is a perspective assembly view of a roller and a pivot shaft of the tube cutter in accordance with the sixth preferred embodiment of the present invention.

[0034] FIG. **23** is an exploded perspective view of the roller and the pivot shaft of the tube cutter as shown in FIG. **22**.

[0035] FIG. **24** is a partially cross-sectional view showing an oil filling state of the tube cutter as shown in FIG. **22**.

DETAILED DESCRIPTION OF THE INVENTION

[0036] Referring to the drawings and initially to FIGS. **2-9**, a tube cutter in accordance with the preferred embodiment of the present invention comprises a main body **10**, a holder **20** slidably mounted on a first side of the main body **10**, a slide **33** slidably mounted in the holder **20**, a guide bolt **30** rotatably mounted on the main body **10**, two rollers **40** pivotally mounted on a second side of the main body **10**, a cutting wheel **25** rotatably mounted on the holder **20** and corresponding to the two rollers **40**, and two pivot shafts **50** extending through the main body **10** and the two rollers **40**.

[0037] The main body **10** is provided with a first through hole **16** corresponding to the holder **20** and allowing passage of the guide bolt **30**. The holder **20** is provided with a receiving space **22** corresponding to the guide bolt **30**. The holder **20** is provided with two second through holes **23** located at two sidewalls of the receiving space **22** and aligning with the first through hole **16** of the main body **10**. The two second through holes **23** of the holder **20** allow passage of the guide bolt **30**. The two rollers **40** are rotatably mounted on the main body **10** by the two pivot shafts **50**. The slide **33** is received in the receiving space **22** of the holder **20** and has a height flush with that of the receiving space **22** as shown in FIG. **7**. The slide **33** is provided with a screw hole **34**. Two elastic members "S" are mounted in the receiving space **22** of the holder **20** and biased between the slide **33** and the holder **20**. The guide bolt **30** extends through the main body **10**, the holder **20**, and the slide **33**. The guide bolt **30** has a first end provided with a rotation portion **31** protruding from the first through hole **16** of the main body **10** and a second end provided with an external thread **32** screwed through the screw hole **34** of the slide **33**. In assembly, the external thread **32** of the guide bolt **30** initially extends through the first through hole **16** of the main body **10** and a front one of the two second through holes **23** of the holder **20**, is then screwed through the screw hole **34** of the slide **33**, and then extends through a rear one of the two second through holes **23** of the holder **20**.

[0038] In practice, the slide **33** is driven by rotation of the guide bolt **30** to drive and move the holder **20** forward or backward, while the holder **20** is pushed by an elastic force of the elastic members "S", so that the cutting wheel **25** is fed toward the two rollers **40** automatically during a cutting process. In the preferred embodiment of the present invention, the main body **10** is provided with two slideways **15**, and the holder **20** is provided with two slides **21** slidably mounted in the two slideways **15** of the main body **10** so that the holder **20** is moved forward or backward.

[0039] In the preferred embodiment of the present invention, the main body **10** has a substantially L-shaped profile and includes a horizontal portion **11** and a vertical portion **12** located at a side of the horizontal portion **11**. The horizontal portion **11** of the main body **10** is provided with a horizontal receiving channel **13**, and the vertical portion **12** of the main body **10** is provided with a vertical receiving channel **14**. The two slideways **15** are formed in the horizontal portion **11** of the main body **10** and connected to the horizontal receiving channel **13**. The first through hole **16** is formed in the vertical portion **12** of the main body **10**. The holder **20** is slidably mounted in the horizontal receiving channel **13** of the main body **10** so that the holder **20** is moved forward or backward in the horizontal receiving channel **13** of the main body **10**. The two rollers **40** are pivotally mounted in the vertical receiving channel **14** of the main body **10**.

[0040] In the preferred embodiment of the present invention, the holder **20** is provided with an arcuate slot **24** corresponding between the two rollers **40**, and the cutting wheel **25** is rotatably mounted in the slot **24** of the holder **20**. The holder **20** is provided with two coaxial through bores **26** located at two sidewalls of the slot **24**. The cutting wheel **25** is provided with an axial bore **27**. A screw "P" extends through the two through bores **26** of the holder **20** and the axial bore **27** of the cutting wheel **25**, and a snap ring "E**1**" is mounted on the screw "P". Thus, the cutting wheel **25** is rotatable freely on the screw "P".

[0041] In the preferred embodiment of the present invention, each of the two rollers **40** has a periphery provided with a receiving groove **42** to receive or avoid a protruding edge of a workpiece, such as a tube **1**, to be cut.

[0042] In the preferred embodiment of the present invention, the guide bolt **30** has a mediate position provided with a retaining groove **35**, and a snap ring "E**2**" is mounted in the retaining groove **35** to prevent the guide bolt **30** from being detached from the main body **10**.

[0043] In the preferred embodiment of the present invention, the vertical receiving channel **14** of the main body **10** has two sidewalls each provided with two pivot holes **17**. Each of the two rollers **40** is provided with a shaft hole **41**. The two pivot shafts **50** extend through the pivot holes **17** of the main body **10** and the shaft holes **41** of the two rollers **40**, so that the two rollers **40** are rotatable freely in the vertical receiving channel **14** of the main body **10**.

[0044] In the preferred embodiment of the present invention, each of the two pivot shafts **50** has an end provided with a toothed portion **51** engaging an inner wall of one of the pivot holes **17** of the main body **10**.

[0045] In the preferred embodiment of the present invention, each of the two pivot shafts **50** has a periphery provided with two oil storage grooves **52**. Each of the two rollers **40** is radially provided with an oil filling hole **43** corresponding to the two oil storage grooves **52** of each of the two pivot shafts **50**. The oil filling hole **43** of each of the two rollers **40** is connected to the shaft hole **41** and the two oil storage grooves **52** of each of the two pivot shafts **50**. The two oil storage grooves **52** of each of the two pivot shafts **50** is connected to and fully received in the shaft hole **41** of each of the two rollers **40**. Preferably, each of the two oil storage grooves **52** of each of the two pivot shafts **50** has an annular shape, a straight shape, an oblique shape or a helical shape.

[0046] Thus, lubricating oil is filled through the oil filling hole **43** of each of the two rollers **40** into the two oil storage grooves **52** of each of the two pivot shafts **50** to provide a lubricating function, and to reduce a friction between each of the two rollers **40** and each of the two pivot shafts **50**, such that the two rollers **40** are rolled smoothly, thereby preventing the two rollers **40** from forming a pressed indentation on the tube **1** to be cut.

[0047] In operation, referring to FIGS. **7-9** with reference to FIGS. **2-6**, when the tube cutter is used to shear a workpiece, such as a tube **1**, the tube **1** is inserted between the two rollers **40** and the cutting wheel **25** as shown in FIG. **7**, so that the two rollers **40** and the cutting wheel **25** are under a three-point contact condition to support the tube **1** steadily. At this time, the holder **20** is pressed by the tube **1** to compress the elastic members "S". Then, the main body **10** and the holder **20** are held by the user's fingers and are rotated relative to the tube **1**, so that the cutting wheel **25** is revolved on the tube **1** reciprocally so as to shear the tube **1** gradually and successively until the tube **1** is cut. At this time, the holder **20** is pushed toward the tube **1** by the elastic force of the elastic members "S", so that the cutting wheel **25** is fed toward the tube **1** automatically during the cutting process, so as to tightly engage and shear the tube **1** successively according to the thickness of the tube **1**.

[0048] It is appreciated that, the external thread **32** of the guide bolt **30** is screwed into the screw hole **34** of the slide **33**, so that when the guide bolt **30** is rotated by the rotation portion **31**, the slide **33** is displaced in the receiving space **22** of the holder **20**, and is moved forward or backward to compress or loosen the elastic members "S", so as to regulate the tension and restore the elastic force of the elastic members "S". In such a manner, the elastic force of the elastic members "S" is regulated by rotation of the guide bolt **30** so as to correspond to and match the thickness of the tube **1**, so that the cutting wheel **25** engages the tube **1** closely and tightly. For example, when the rotation portion **31** of the guide bolt **30** is rotated clockwise, the slide **33** is moved forward to compress the elastic members "S", so as to increase the elastic force of the elastic members "S", and when the rotation portion **31** of the guide bolt **30** is rotated anticlockwise, the slide **33** is moved backward to loosen the elastic members "S", so as to decrease the elastic force of the elastic members "S".

[0049] Accordingly, the holder **20** is pushed by the elastic force of the elastic members "S", so that the cutting wheel **25** is fed toward the tube **50** automatically during the cutting process, so as to shear the tube **50** successively until the tube **50** is cut, thereby facilitating the user operating the tube cutter when cutting the tube **50**. In addition, the lubricating oil is filled between each of the two rollers **40** and each of the two pivot shafts **50** to provide a lubricating function, so as to reduce the friction between each of the two rollers **40** and each of the two pivot shafts **50**, such that the two rollers **40** are rolled smoothly, thereby preventing the two rollers **40** from leaving pressed indentations on the tube **1** during operation.

[0050] Referring to FIGS. **10-12**, each of the two pivot shafts **50** has a periphery provided with an oil storage groove **52**. Each of the two rollers **40** is radially provided with an oil filling hole **43** corresponding to the oil storage groove **52** of each of the two pivot shafts **50**. Thus, the lubricating oil is filled through the oil filling hole **43** of each of the two rollers **40** into the oil storage groove **52** of each of the two pivot shafts **50** to provide a lubricating function, and to reduce the friction between each of the two rollers **40** and each of the two pivot shafts **50**, such that the two rollers **40** are rolled smoothly, thereby preventing the two rollers **40** from forming a pressed indentation on the tube **1**.

[0051] Referring to FIGS. **13-15**, each of the two pivot shafts **50** has a periphery provided with two oil storage grooves **52** with different dimensions. Each of the two rollers **40** is radially provided with an oil filling hole **43** corresponding to the two oil storage grooves **52** of each of the two pivot shafts **50**. Thus, the lubricating oil is filled through the oil filling hole **43** of each of the two rollers **40** into the two oil storage grooves **52** of each of the two pivot shafts **50** to provide a lubricating function, and to reduce the friction between each of the two rollers **40** and each of the two pivot shafts **50**, such that the two rollers **40** are rolled smoothly, thereby preventing the two rollers **40** from forming a pressed indentation on the tube **1**.

[0052] Referring to FIGS. **16-18**, the shaft hole **41** of each of the two rollers **40** has a periphery provided with an oil storage groove **44** corresponding to the receiving groove **42**. Each of the two rollers **40** is radially provided with an oil filling hole **43** corresponding to the oil storage groove **44**. The oil filling hole **43** of each of the two rollers **40** is connected to the shaft hole **41** and the oil storage groove **44**. Preferably, the oil storage groove **44** of each of the two rollers **40** has an annular shape, a straight shape, an oblique shape or a helical shape. Thus, the lubricating oil is filled through the oil filling hole **43** of each of the two rollers **40** into the oil storage groove **44** to provide a lubricating function, and to reduce the friction between each of the two rollers **40** and each of the two pivot shafts **50**, such that the two rollers **40** are rolled smoothly, thereby preventing the two rollers **40** from forming a pressed indentation on the tube **1**.

[0053] Referring to FIGS. **19-21**, the shaft hole **41** of each of the two rollers **40** has a periphery having a middle provided with an oil storage groove **44**. Each of the two rollers **40** is radially provided with an oil filling hole **43**

corresponding to the oil storage groove **44**. Thus, the lubricating oil is filled through the oil filling hole **43** of each of the two rollers **40** into the oil storage groove **44** to provide a lubricating function, and to reduce the friction between each of the two rollers **40** and each of the two pivot shafts **50**, such that the two rollers **40** are rolled smoothly, thereby preventing the two rollers **40** from forming a pressed indentation on the tube **1**.

[0054] Referring to FIGS. **22-24**, each of the two pivot shafts **50** has a surface provided with an oil storage groove **52**. The oil storage groove **52** has an elongate shape and extends longitudinally along each of the two pivot shafts **50**. The oil storage groove **52** of each of the two pivot shafts **50** is connected to the shaft hole **41** of each of the two rollers **40**. Each of the two pivot shafts **50** has an end provided with an oil filling hole **53** corresponding to the oil storage groove **52**. The oil filling hole **53** extends longitudinally along each of the two pivot shafts **50** and is connected to the oil storage groove **52**. The oil filling hole **53** of each of the two pivot shafts **50** protrudes outward from the shaft hole **41** of each of the two rollers **40**. Thus, the lubricating oil is filled through the oil filling hole **53** of each of the two pivot shafts **50** into the oil filling hole **53** to provide a lubricating function, and to reduce the friction between each of the two rollers **40** and each of the two pivot shafts **50**, such that the two rollers **40** are rolled smoothly, thereby preventing the two rollers **40** from forming a pressed indentation on the tube **1**.

[0055] Although the invention has been explained in relation to its preferred embodiment(s) as mentioned above, it is to be understood that many other possible modifications and variations can be made without departing from the scope of the present invention. It is, therefore, contemplated that the appended claim or claims will cover such modifications and variations that fall within the scope of the invention.

1. A tube cutter comprising:
a main body;
a holder slidably mounted on a first side of the main body;
a guide bolt rotatably mounted on the main body and driving and moving the holder;
two rollers pivotally mounted on a second side of the main body;
a cutting wheel rotatably mounted on the holder and corresponding to the two rollers; and
two pivot shafts extending through the main body and the two rollers;
wherein:
each of the two pivot shafts has a periphery provided with at least one oil storage groove; and
each of the two rollers is radially provided with an oil filling hole corresponding to the at least one oil storage groove of each of the two pivot shafts.

2. The tube cutter as claimed in claim **1**, wherein:
each of the two rollers is provided with a shaft hole;
each of the two pivot shafts extends through the shaft hole of each of the two rollers; and
the oil filling hole of each of the two rollers is connected to the shaft hole.

3. A tube cutter comprising:
a main body;
a holder slidably mounted on a first side of the main body;
a guide bolt rotatably mounted on the main body and driving and moving the holder;
two rollers pivotally mounted on a second side of the main body;
a cutting wheel rotatably mounted on the holder and corresponding to the two rollers; and
two pivot shafts extending through the main body and the two rollers;
wherein:
each of the two rollers has an inner diameter provided with at least one oil storage groove; and
each of the two rollers is radially provided with an oil filling hole corresponding to the at least one oil storage groove.

4. The tube cutter as claimed in claim **3**, wherein:
each of the two rollers is provided with a shaft hole;
the shaft hole of each of the two rollers is connected to the at least one oil storage groove;
each of the two pivot shafts extends through the shaft hole of each of the two rollers; and
the oil filling hole of each of the two rollers is connected to the shaft hole.

5. A tube cutter comprising:
a main body;
a holder slidably mounted on a first side of the main body;
a guide bolt rotatably mounted on the main body and driving and moving the holder;
two rollers pivotally mounted on a second side of the main body;
a cutting wheel rotatably mounted on the holder and corresponding to the two rollers; and
two pivot shafts extending through the main body and the two rollers;
wherein:
each of the two pivot shafts has a surface provided with at least one oil storage groove; and
each of the two pivot shafts has an end provided with an oil filling hole corresponding to the oil storage groove.

6. The tube cutter as claimed in claim **5**, wherein:
the oil storage groove has an elongate shape and extends longitudinally along each of the two pivot shafts; and
the oil filling hole extends longitudinally along each of the two pivot shafts.

7. The tube cutter as claimed in claim **5**, wherein:
each of the two rollers is provided with a shaft hole;
each of the two pivot shafts extends through the shaft hole of each of the two rollers; and
the oil storage groove of each of the two pivot shafts is connected to the shaft hole of each of the two rollers.

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