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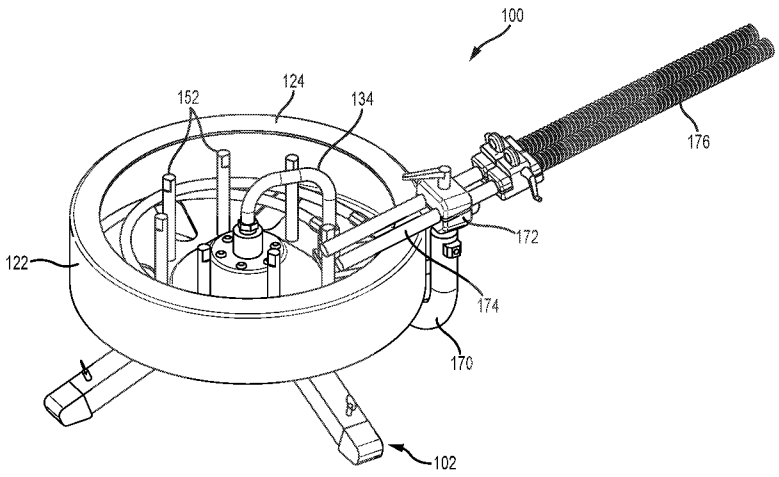

FIG.4

(57) Abstract: A multiple flexible lance hose take-up drum apparatus or device in accordance with the present disclosure includes a base having three or more support legs and a hollow take-up drum assembly rotatably supported from the base. The drum assembly includes a hollow cylindrical shell, a bottom plate fastened to the shell, a high pressure fluid supply connection and a manifold positioned radially along a bottom plate of the shell for connection to one end of each of a plurality of flexible lance hoses. The base includes an L shaped support arm extending from the bases alongside the shell. A plurality of guide tubes are supported by the support arm and aligned over a rim of the shell for guiding flexible lance hoses into and out of the take-up drum assembly.

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MULTIPLE HIGH PRESSURE FLEXIBLE LANCE HOSE TAKE UP DRUM

BACKGROUND OF THE DISCLOSURE

[0001] The present disclosure is directed to high pressure fluid handling systems. In particular, embodiments of the present disclosure are directed to an apparatus for collecting and supplying two or more flexible tube cleaning lances from and to a drive apparatus for inserting and withdrawing the lances from tubes within a heat exchanger tube bundle, or other multiple pipe or tubing arrangements while maintaining an orderly arrangement of the hoses.

[0002] One conventional tube lancing apparatus consists of a rotating reel flexible lance hose take-up and hose dispensing apparatus that carries a predetermined length of flexible lance hose wrapped around the exterior of a drum. The drum is rotated by an air motor to push the flexible lance or lances off of the drum and into one or two heat exchanger tubes. This drum apparatus necessarily must be somewhat remotely located from the heat exchanger tube sheet in order to accommodate the size of the drum and the air drive apparatus.

[0003] With the advent of small flexible lance drive apparatuses designed to be mounted directly to a heat exchanger tube sheet such as the drive apparatus disclosed in US Patent Application No. 14/693,259, filed April 22, 2015, the flexible lance hoses typically lie in disarray on the floor around the drive apparatus. They can become tangled together such that smooth feed may be disrupted. Hence there is a need for a storage and transfer apparatus that can accommodate two or more hoses equally while maintaining orderly storage of the multiple flexible lance hoses.

SUMMARY OF THE DISCLOSURE

[0004] A multiple flexible lance hose take-up drum apparatus or device in accordance with the present disclosure directly addresses such needs. One embodiment of a flexible lance take-up drum apparatus in accordance with the present disclosure includes a take-up drum apparatus for a plurality of flexible lance hoses. The apparatus includes a base having three or more support legs and a hollow take-up drum assembly rotatably supported from the base.

[0005] The drum assembly includes a hollow cylindrical shell, a bottom plate fastened to the shell, a high pressure fluid supply connection and a manifold positioned radially along a bottom plate of the shell for connection to one end of each of a plurality of flexible lance hoses. One embodiment of the base includes an L shaped support arm extending from the bases alongside the shell. A plurality of guide tubes are supported by the support arm and aligned over a rim of the shell for guiding flexible lance hoses into and out of the take-up drum assembly.

[0006] One embodiment of a take-up drum apparatus for a plurality of flexible high pressure fluid cleaning lance hoses in accordance with the present disclosure includes a base, and a hollow take-up drum assembly rotatably supported from the base via a rotary swivel. The drum assembly includes a hollow cylindrical shell having a bottom plate, a cylindrical side wall, a high pressure fluid supply connection and a manifold positioned on the bottom plate of the shell for connection of one end of each of a plurality of flexible lance hoses to the high pressure fluid supply connection. The base includes a support arm extending from the base extending outside of and across the side wall of the shell. One or more guide tubes are supported by the support arm and are positioned so as to guide flexible lance hoses into and out of the take-up drum assembly.

[0007] The base has a central socket for receiving a portion of the swivel and a set of three or more legs supporting the socket. The swivel further has a bearing supported tubular shaft in a housing that forms a stem adapted to be carried in the socket of the base. The bottom plate has a hub fastened to the tubular shaft of the swivel. The high pressure fluid supply connection is fastened to a stem of the swivel mounted in the socket. The take-up drum shell has a peripheral rim parallel to the bottom plate. The drum assembly further preferably includes an inverted U shaped tube connecting the swivel to the manifold in the shell.

[0008] An embodiment of a take-up drum apparatus in accordance with the present disclosure for receiving, storing and dispensing a plurality of high pressure cleaning fluid hoses to and from a flexible lance drive apparatus includes a base having three or more legs radiating from a central socket and a support arm extending from one of the legs and a hollow take-up drum assembly rotatably supported from the base by a rotary swivel.

[0009] The drum assembly includes a hollow cylindrical shell having a cylindrical side wall merging with a bottom plate having a central hub. The shell has a peripheral annular rim around the side wall parallel to the bottom plate. A manifold block is fastened to the bottom plate of the shell for connection of one end of each of a plurality of flexible lance hoses to a high pressure fluid supply connector through the swivel. The assembly includes one or more flexible lance guide tubes carried by the support arm and directed by the support arm tangent to the cylindrical shell.

[0010] Further features, advantages and characteristics of the embodiments of this disclosure will be apparent from reading the following detailed description when taken in conjunction with the drawing figures.

DESCRIPTION OF THE DRAWINGS

[0011] FIG. **1** is a perspective view of a flexible lance drive apparatus fastened to a frame adjacent a heat exchanger tube sheet.

[0012] FIG. **2** is a side view of one embodiment of a flexible lance take-up drum apparatus in accordance with the present disclosure.

[0013] FIG. **3** is a top plan view of the apparatus shown in FIG. **2**.

[0014] FIG. **4** is an upper perspective view of the apparatus shown in FIG. **2**.

[0015] FIG. **5** is a cross sectional view of the apparatus taken on the line **5-5** in FIG. **3**.

[0016] FIG. **6** is a bottom plan view of the apparatus shown in FIG. **2**.

[0017] FIG. **7** is a side view of another embodiment of a flexible lance take-up drum apparatus in accordance with the present disclosure.

[0018] FIG. **8** is a top plan view of the apparatus shown in FIG. **7**.

[0019] FIG. **9** is an upper perspective view of the apparatus shown in FIGS. **7** and **8**.

[0020] FIG. **10** is a cross sectional view of the apparatus taken on the line **5-5** in FIG. **3**.

[0021] FIG. **11** is an enlarged perspective view of the hose manifold in the apparatus shown in FIG. **7**.

DETAILED DESCRIPTION

[0022] An exemplary flexible lance drive apparatus **10** is shown in FIG. **1** with a side cover open showing the set of 3 pairs of drive rollers **12** arranged for driving two flexible high pressure lance hoses **160**. The apparatus **10** includes a housing **16** in which a drive motor **18** drives each of the six drive rollers **12**. FIG. **1** shows a drive apparatus **10** supported for guiding one or more flexible lance hoses **160** into and out of a tube in a heat exchanger tube sheet **11**. The drive apparatus **10** is typically mounted on a flexible lance guide **17** which is fastened to a frame **19** that places the drive apparatus **10** in alignment with the tubes penetrating the tube sheet **11**.

[0023] An exemplary take-up drum apparatus **100** in accordance with a first embodiment of the present disclosure is designed to dispense and take up flexible lance hoses **160** as they are supplied to or withdrawn from a piping system being cleaned, such as tubes in the heat exchanger **11** shown in FIG. **1**. An exemplary embodiment of the take-up drum apparatus **100** is shown in a side view in FIG. **2.** The apparatus consists of a base **102** having three or four legs **104** for resting the apparatus on a generally flat surface (not shown), and a take-up drum assembly **120** rotatably supported in a central recess or socket **106** of the base **102**.

[0024] The drum assembly **120** has a hollow cylindrical outer shell **122** with an upper annular rim **124** and an annular disc shaped bottom plate **126** as seen in FIG. **3**. The annular rim **124** extends around the shell **122** parallel to the bottom plate **126**. The disc shaped bottom plate is bolted to the base of a central truncated conical hub **128**. The top of the truncated conical hub **128** is fastened to a tubular shaft **140** of a high pressure swivel **130**. The shaft **140** of the swivel **130** is threaded to one end **132** of an inverted U shaped tube **134**. The opposite end **136** of the tube **134** is threaded into a radially extending manifold **138** that is fastened to the bottom plate **126**. The central truncated conical hub **128** and the tubular shaft **140** of the swivel **130** rotate with the shell **122** about a vertical axis through the swivel **130**. The tubular shaft **140** of the swivel **130** is carried by bearings **142** in a stem **144** that slides vertically into the socket **106** of the support base **102**. This

stem **144** has a central passage **146** that communicates with a hose fitting **148**, shown in FIG. **6**, for connecting a high pressure water source to the apparatus **100**.

[0025] When the stem **144** of the swivel **130** is inserted into the socket **106** of the support base **102**, the stem **144** is captured therein and the stem **144** does not rotate. Instead, the tubular shaft **140** of the swivel **130** rotates in the bearings **142**. High pressure seals **150** at the top and bottom of the shaft **140** of the swivel **130** prevent water leakage and seal the bearings **142** from fluid pressure.

[0026] Preferably a series of axially extending guide posts **152** are spaced around the interior of the shell **122** and extend upward from the bottom plate **126**. These posts **152** serve as hose guides and may be elongated nuts threaded onto bolts **154** joining the hub **128** to the bottom plate **126**. These guide posts **152** may be replaced by a sheet metal sleeve or other guide structure to ensure that the hoses **160** are stored or wrapped around the internal periphery of the shell **122**.

[0027] The radial manifold **138** fastened to the bottom plate **126** serves as an attachment point for one end of each of the two or more flexible lance hoses **160**. The other end of each of the flexible lance hoses **160** extends out of the apparatus **100** and feeds into the high pressure flexible lance drive apparatus **10**.

[0028] The base **102** of the apparatus **100** is stationary. The base **102** has an L shaped support arm **170** that has one end fastened to one of the legs **104**. This support arm **170** extends laterally out from the leg **104** beyond the shell **122** and curves up alongside the cylindrical shell **122** to a position just above and tangent to the rim **124**. A hose guide tube support **172** is fastened to the distal end of the support arm **170** and carries two or more hose guide stub tubes **174** oriented tangent to the shell **122**. The hoses **160** are each routed through one of these hose guide stub tubes **174** into a protective sleeve **176** that is connected to a lance drive apparatus such as the lance drive apparatus **10** shown in FIG. **1**.

[0029] This protective sleeve **176** primarily confines the path that the lance hose **160** can take as it is withdrawn by the lance drive apparatus **10** from tubes or other piping being cleaned. By confining the path of the hose **160** to the take-up drum **120** of the apparatus **100**, the sleeve essentially pushes the hose **160** into and through the guide stub tubes **174** and into the shell **122**. This hose movement is what causes the shell **122** and the hub **106** of the drum assembly **120** to rotate on

the bearings **142** such that the hose is uniformly deposited into the shell **122**. This protective sleeve **176** may also be configured to direct pneumatic and/or electric power to the flexible lance drive apparatus.

[0030] During operation, high pressure lance hoses **160** that are being withdrawn from tubes being cleaned are fed by the drive apparatus back through the sleeve **176**, the stub tubes **174**, and into the shell **122** of the take-up apparatus **100**. The drum assembly **120** is thus pushed around by the advancing hoses **160** into the shell **122** and wrap cleanly around the inside of the shell **122**. The guide posts **152** help ensure that the hoses **160** do not cross over the hub **128** and instead wrap around the inside of the shell **122**.

[0031] The manifold **138** may be configured to accept one, two, or a number of hoses. Thus, two, three, four or more hoses **160** may be connected to the manifold **138** and simultaneously extracted or returned to the take-up drum apparatus **100** as above described. A drive motor (not shown) may be added to rotate the hollow drum assembly **120** if needed for a particular application.

[0032] An exemplary take-up drum apparatus **200** in accordance with a second embodiment of the present disclosure for handling three flexible lance hoses simultaneously is shown in a side view in FIG. **7.** The apparatus **200** includes a base **202** having three or four legs **204** for resting the apparatus **200** on a generally flat surface (not shown), and a take-up drum assembly **220** rotatably supported in a central recess or socket **206** of the base **202**. This socket **206** may be a C shaped tubular sleeve welded or otherwise firmly attached to the legs **204**.

[0033] The drum assembly **220** includes a hollow cylindrical outer shell **222** with an upper annular rim **224** and an integral disc shaped bottom plate **226** as seen in FIG. **8**. The disc shaped bottom plate **226** preferably has a central truncated conical hub **228**. The top of the truncated conical hub **228** is fastened to an upper end of a tubular shaft **240** of a high pressure rotary swivel **230**. The upper portion of the swivel **230** is a tubular shaft **240** which is threaded to one end **232** of an inverted U shaped tube **234**. The opposite end **236** of the tube **234** is threaded into a radially extending manifold **238** that is fastened to the bottom plate **226**. This manifold **238** has pipe nipple connections for connection to three hoses **260**.

[0034] The central truncated conical hub **228** and shaft **240** of the rotary swivel **230** rotate with the shell **222** about a vertical axis through the swivel **230** on the bearing supported tubular shaft **240** of the swivel **230**. This shaft **240** of the joint **230** is carried by bearings **242** in a stem **244** that slides vertically into the socket **206** of the support base **202**. This stem **244** has a central passage **246** that communicates with a hose fitting **248**, shown in FIG. **6**, for connecting a high pressure water source to the apparatus **200**.

[0035] When the stem **244** of the swivel **230** is inserted into the socket **206** of the support base **202**, the stem **244** is captured therein and the stem **244** does not rotate. Instead, the tubular shaft **240** of the joint **230** rotates in the bearings **242**. High pressure seals **250** at the top and bottom of the shaft **240** of the joint **230** prevent water leakage and seal the bearings **242** from fluid pressure.

[0036] Preferably a series of axially extending guide posts **252** spaced radially inward from the rim **224** extend upward from the bottom plate **226**. These posts **252** serve as internal hose guides around which the three hoses wrap inside the outer shell **222**. The radial manifold **238** fastened to the bottom plate **226** serves as an attachment point for either one end of each of three flexible lance hoses **260** or one end of each of three flexible stub hoses which are in turn fastened to the lance hoses **260**. The other end of each of the flexible lance hoses **160** (not shown in FIGS. **7**-**11**) extends out of the apparatus **200** and feeds into the hose drive apparatus **10**.

[0037] The base **202** of the apparatus **200** is preferably stationary and oriented such that the drum assembly **220** can rotate about a vertical axis through the socket **206** of the base **202**. This socket **206** essentially is a stationary C shaped sleeve sized for receiving the stem **244**. The base **202** has an L shaped support arm **270** that has one end fastened to one of the legs **204**. This support arm **270** extends laterally out from the leg **204** beyond the shell **222** and up alongside the cylindrical shell **222** to a position just above the rim **224**. A hose guide tube support **272** is telescopically fastened into the distal end of the support arm **270**. This support **272** joins and supports a curved guide tube **274** sized to carry three hoses **160** oriented essentially tangent to the inside of the shell **222**. The hoses **160** are each routed out of the shell **222** through the hose guide tube **274** into a protective

sleeve snout **276**. The opposite end of the snout **276** is fastened to the inlet side of the lance drive apparatus **10**.

[0038] This protective sleeve snout **276** primarily confines the path that the three lance hoses **260** can take as they are withdrawn by the lance drive apparatus **10** from tubes or other piping being cleaned, and vice versa. By confining the path of the hoses **260** to the take-up drum **220** of the apparatus **200**, the sleeve or snout **276** essentially pushes the hoses **260** into and through the guide tube **274** and into the shell **222**. This hose movement is what causes the shell **222** and the tubular shaft **240** of the rotary swivel **230** of the drum assembly **220** to rotate on the bearings **242** such that the hoses **160** are deposited into the shell **222** around its periphery in an orderly and consistent manner. As in the first embodiment shown and described above with reference to FIGS. **2-6**, this protective snout **276** may also be configured to direct pneumatic and/or electric power to the flexible lance drive apparatus **10**.

[0039] During operation of apparatus **200**, high pressure lance hoses **160** that are being withdrawn from tubes being cleaned are fed by the drive apparatus **10** back through the sleeve **276**, the stub tube **274**, and into the shell **222** of the take-up apparatus **200**. The drum assembly **220** is thus pushed around by the advancing hoses **160** into the shell **222** such that the hoses **160** wrap cleanly around the inside of the shell **222**. The guide posts **252** help ensure that the hoses **160** do not cross over the hub **228** and instead wrap around the inside of the shell **222**. Conversely, when the drive motor withdraws the lance hoses **160**, the drum assembly **220** rotates oppositely to permit the hoses **160** to exit through the guide tube **274** into the snout **276.**

[0040] Referring now specifically to FIG. **10**, a close-up view of the hose manifold **238** is shown, which supports three hose nipples **278** fastened into the manifold **238**. Each of these nipples **278** has a novel fitting lock **280** slidably lodged around each nut portion **282** of each of the nipples **278**. Each fitting lock **280** is an elongated flat plate **284** with a hexagonal passage therethrough sized to receive the nut portion **282** of the nipple **278** therethrough and a separate closed slot **286** through which a locking screw **288** fastens the lock plate **284** to the manifold **238**. The lock **280** prevents the nipple **278** from rotating thus ensuring that the hose nipple **278** is securely fastened to the manifold **238**. In order to remove one of the

nipples **278**, first the screw **288** must be removed and the lock plate **284** slipped off of the nipple **278**. The length of the closed slot **286** is sized to accommodate a 1/6 turn of the nipple **278** so that a pre-drilled hole for the screw **288** will align somewhere within the slot **286**.

[0041] The apparatuses **100** and **200** are scalable such that additional hoses may be simultaneously accommodated, limited mainly by the hose capacity of the hose drive apparatus **10**. If less than three hoses are utilized in the apparatus **200**, a suitable plug must be installed on the hose nipple **278** for the missing hose.

[0042] Preferably the snout **276** has a bushing **290** installed at its proximal end that separates and guides each of the three hoses as they enter and exit the snout **276**. This bushing also is sized so as to freely pass hose but stop a lance end, stinger, or nozzle from passing into the drum assembly **220**. Similarly, this bushing **290** also interacts with a hose stop (not shown) clamped to each of the hoses to limit the amount of or length of hose that may be withdrawn from the drum assembly **220**.

[0043] Many changes may be made to the apparatuses **100** and **200** without departing from the scope of the disclosure. For example, the drum shell side wall **122**, **222**, rim **124**, **224**, bottom plate **126**, **226** and hub **128**, **228** may be fabricated from a single sheet metal of polymer material rather than separate structures fastened together. The hose guide posts **152**, **252** may be replaced with a circular inner sheet metal wall fastened to the bottom plate **126**, **226**. The base 102 may be designed to be supported by any rigid structure or surface, not just a flat floor. For example, one or more of the legs **104** of the base **102** may be clamped to a rail or pre-existing frame member near an object to be cleaned via operation of a lance hose **160** and drive apparatus **10** rather than having the three legs resting on a floor. Finally, in close quarter applications the take-up drum apparatus **100** or **200** could be directly fastened to the drive apparatus such as drive **10** rather than requiring a snout **176** as shown. Therefore, all such changes, alternatives and equivalents in accordance with the features and benefits described herein, are within the scope of the present disclosure. Such changes and alternatives may be introduced without departing from the spirit and broad scope of this disclosure as defined by the claims below and their equivalents.

CLAIMS

What is claimed is:

1. A take-up drum apparatus for a plurality of flexible high pressure fluid cleaning lance hoses comprising:

a base;

a hollow take-up drum assembly rotatably supported from the base via a rotary swivel, wherein the drum assembly includes a hollow cylindrical shell having a bottom plate, a cylindrical side wall, a high pressure fluid supply connection and a manifold positioned on the bottom plate of the shell for connection of one end of each of a plurality of flexible lance hoses to the high pressure fluid supply connection;

a support arm extending from the base outside of and across the side wall of the shell; and

one or more guide tubes supported by the support arm for guiding flexible lance hoses into and out of the take-up drum assembly.

2. The apparatus according to claim 1 wherein the base comprises a central socket for receiving a portion of the swivel and a set of three or more legs supporting the socket.

3. The apparatus according to claim 1 wherein the high pressure fluid supply connection is fastened to a stem of the swivel mounted in the socket.

4. The apparatus according to claim 1 wherein the take-up drum shell has a peripheral rim parallel to the bottom plate

5. The apparatus according to claim 1 further comprising an inverted shaped tube connecting the swivel to the manifold in the shell.

6. The apparatus according to claim 5 wherein the swivel comprises a bearing supported tubular shaft in a housing forming a stem adapted to be carried in the socket of the base.

7. The apparatus according to claim 6 wherein the bottom plate has a hub fastened to the tubular shaft of the swivel.

8. The apparatus according to claim 1 wherein the base has a central socket receiving a portion of the swivel, a plurality of legs radially extending from the socket, and the support arm positions the one or more guide tubes tangent to the cylindrical shell of the drum assembly.

9. The apparatus according to claim 8 wherein the swivel has a tubular shaft fastened to a hub on the bottom plate of the drum assembly and an inverted U shaped tube extends axially from the tubular shaft and radially to the manifold fastened to the bottom plate.

10. The apparatus according to claim 8 wherein the hub has a truncated conical shape.

11. A take-up drum apparatus for receiving, storing and dispensing a plurality of high pressure cleaning fluid hoses to and from a flexible lance drive apparatus, the drum apparatus comprising:

a base having three or more legs radiating from a central socket and a support arm extending from one of the legs;

a hollow take-up drum assembly rotatably supported from the base by a rotary swivel, wherein the drum assembly includes a hollow cylindrical shell having a cylindrical side wall merging with a bottom plate having a central hub, a peripheral annular rim around the side wall parallel to the bottom plate, and a manifold fastened to the bottom plate of the shell for connection of one end of each of a plurality of flexible lance hoses to a high pressure fluid supply connector through the swivel; and

one or more guide tubes carried by the support arm and directed tangent to the cylindrical shell.

12. The apparatus according to claim 11 wherein the high pressure fluid supply connection is fastened to a stem of the swivel mounted in the socket.

13. The apparatus according to claim 11 further comprising an inverted U shaped tube connecting the swivel to the manifold in the shell.

14. The apparatus according to claim 13 wherein the swivel comprises a bearing supported tubular shaft in a housing forming a stem adapted to be carried in the socket of the base.

15. The apparatus according to claim 14 wherein the shaft is fastened to one end of the inverted U shaped tube.

16. The apparatus according to claim 14 wherein the bottom plate has a hub fastened to the tubular shaft of the swivel.

17. The apparatus according to claim 11 wherein the swivel has a tubular shaft fastened to a hub on the bottom plate of the drum assembly and an inverted U

shaped tube extends axially from the tubular shaft and radially to the manifold fastened to the bottom plate.

18. The apparatus according to claim 17 wherein the hub has a truncated conical shape.

19. A high pressure flexible lance cleaning apparatus comprising:

a pneumatic drive motor operating a plurality of drive rollers to move one or more flexible lance hoses into and out of a conduit to be cleaned; and

a take-up drum apparatus for receiving, storing and dispensing each of flexible lance hoses to and from the drive apparatus, the drum apparatus comprising:

a base having three or more legs radiating from a central socket and a support arm extending from one of the legs;

a hollow take-up drum assembly rotatably supported from the base by a rotary swivel, wherein the drum assembly includes a hollow cylindrical shell having a cylindrical side wall merging with a bottom plate having a central hub, a peripheral annular rim around the side wall parallel to the bottom plate, and a manifold fastened to the bottom plate of the shell for connection of one end of each of a plurality of flexible lance hoses to a high pressure fluid supply connector through the swivel;

one or more guide tubes carried by the support arm and directed tangent to the cylindrical shell; and

a protective sleeve snout adapted to be connected between the one or more guide tubes and the drive motor for confining a path of the lance hoses between the drum assembly and the drive motor.

20. The apparatus according to claim 19 wherein the high pressure fluid supply connection is fastened to a stem of the swivel mounted in the socket.

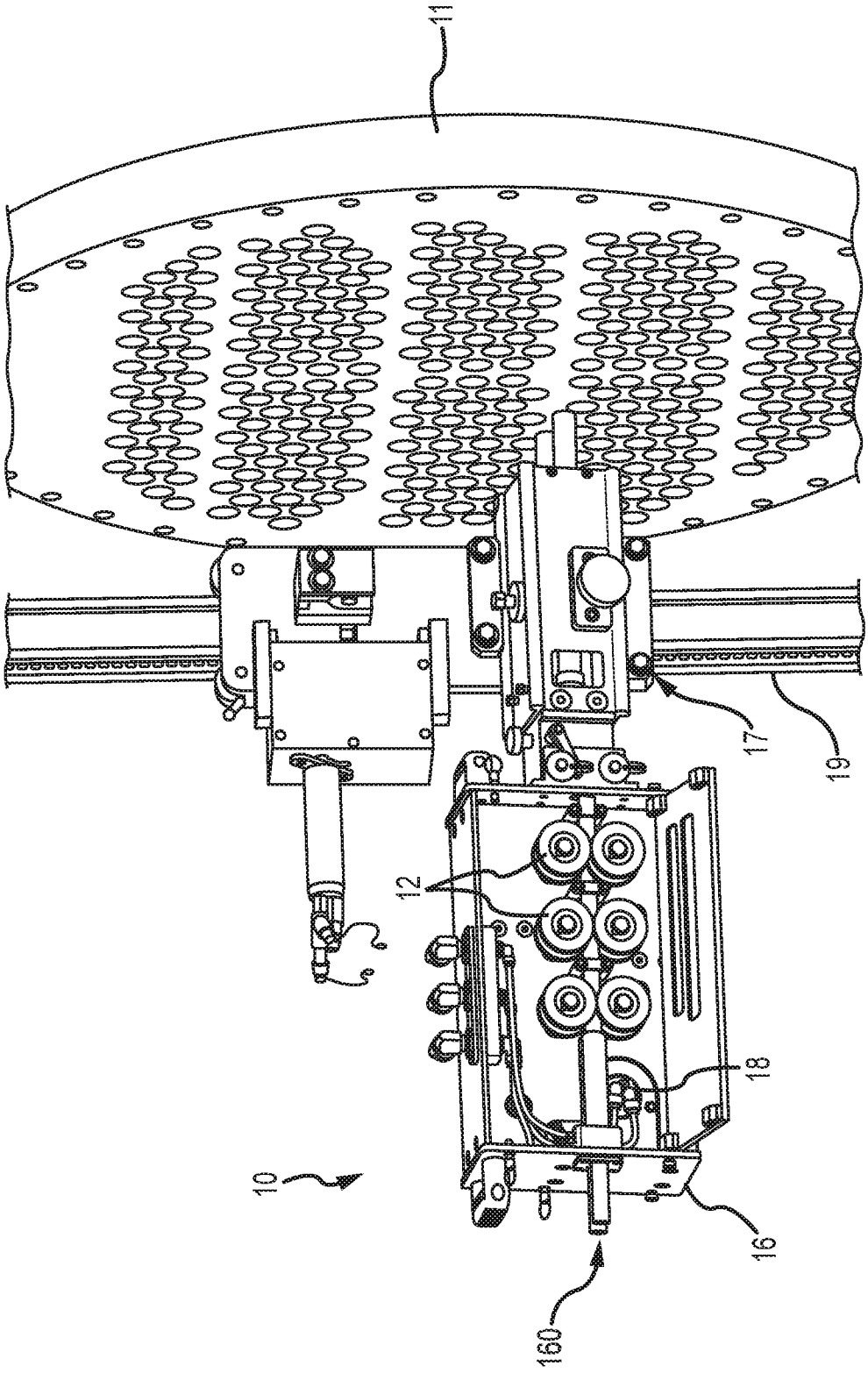


FIG. 1

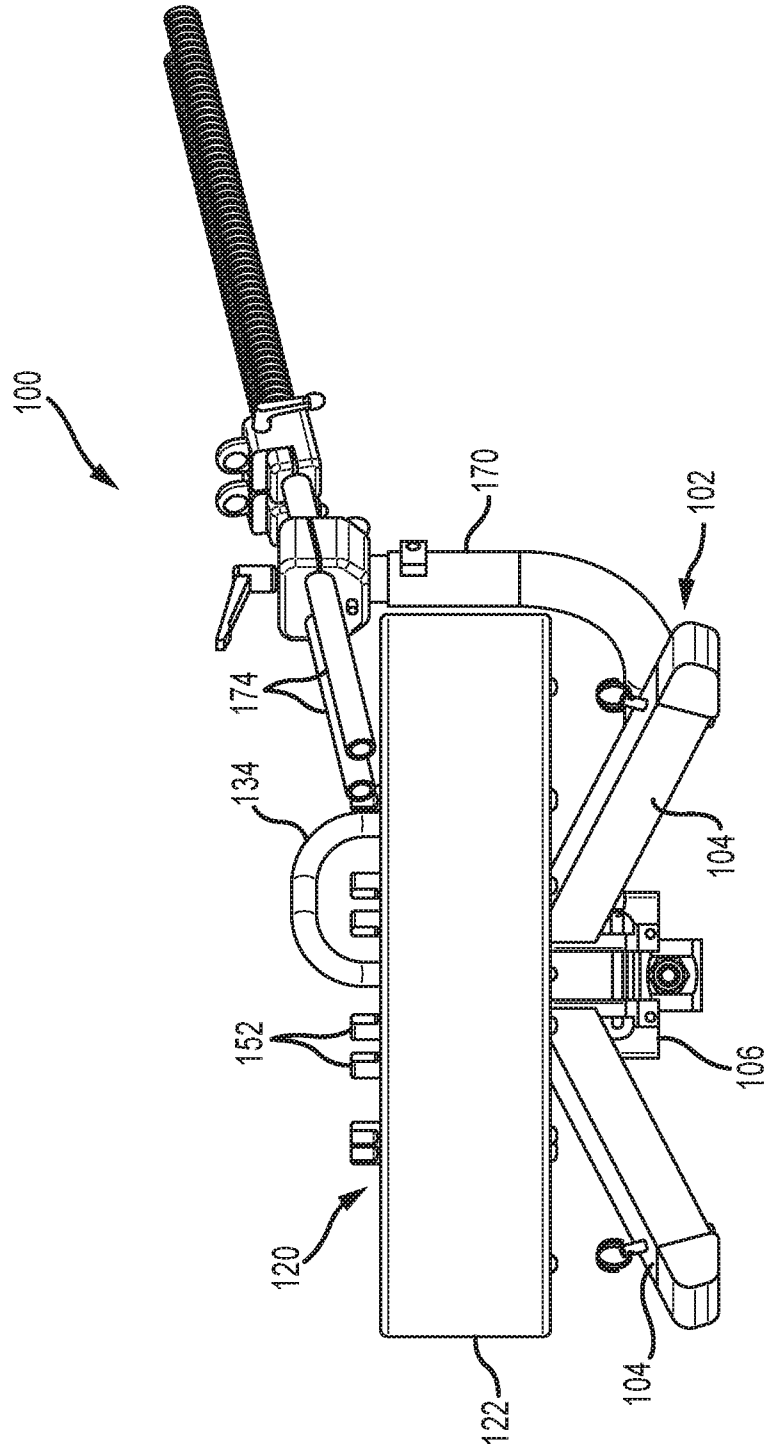


FIG.2

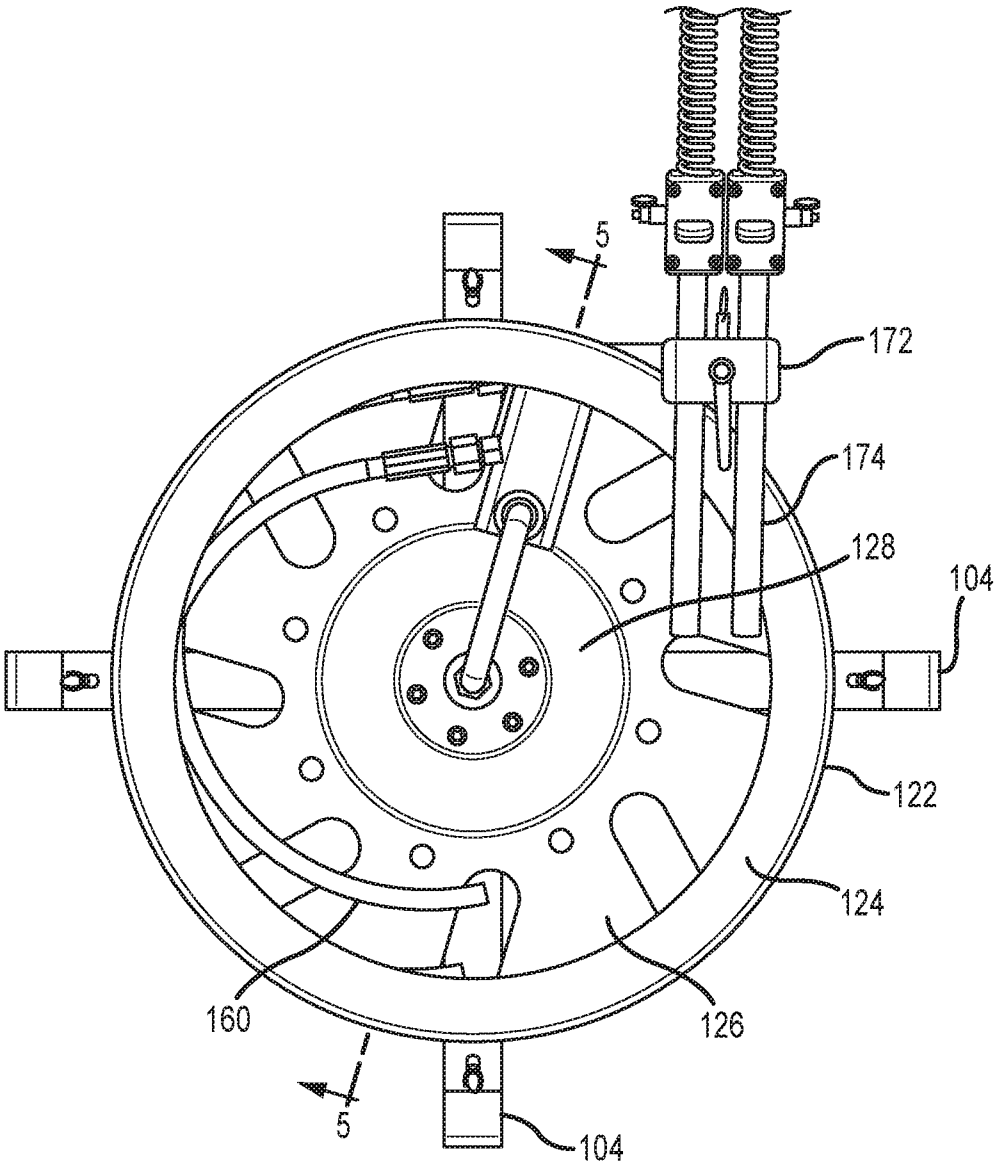


FIG.3

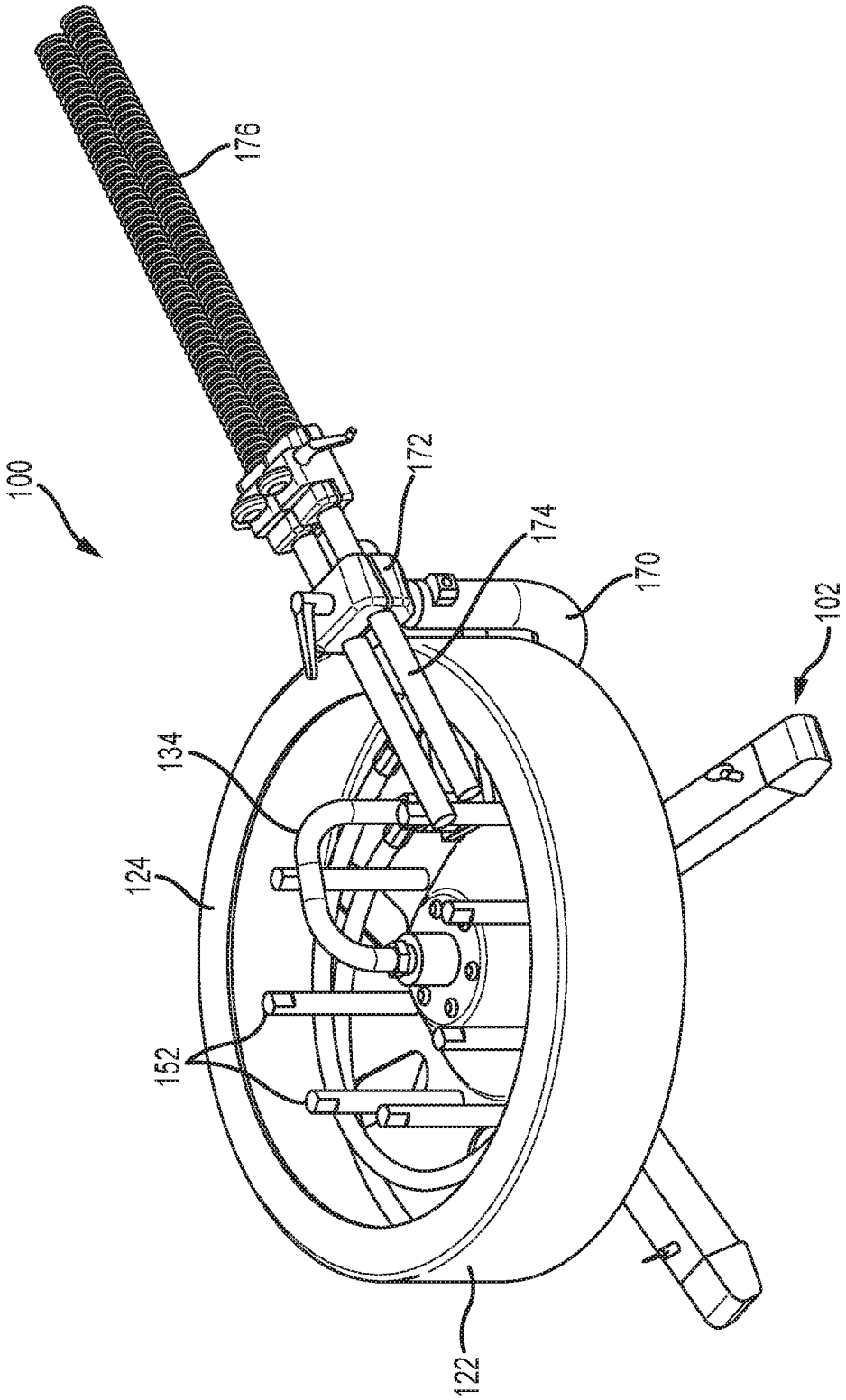
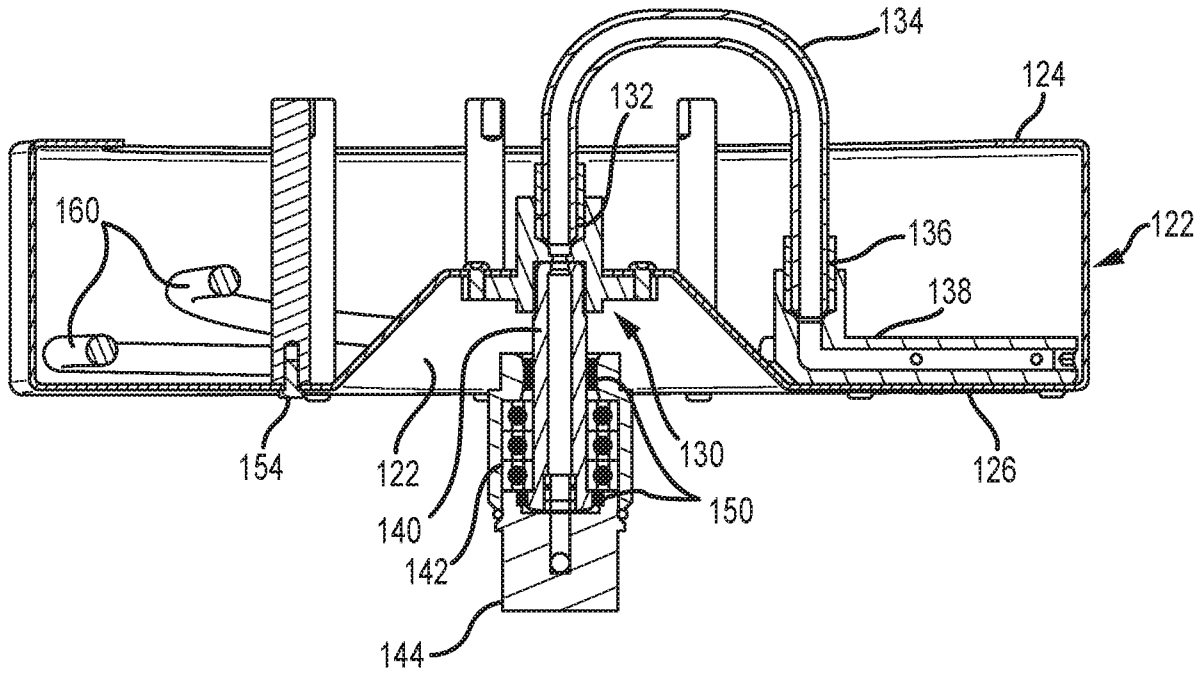


FIG.4



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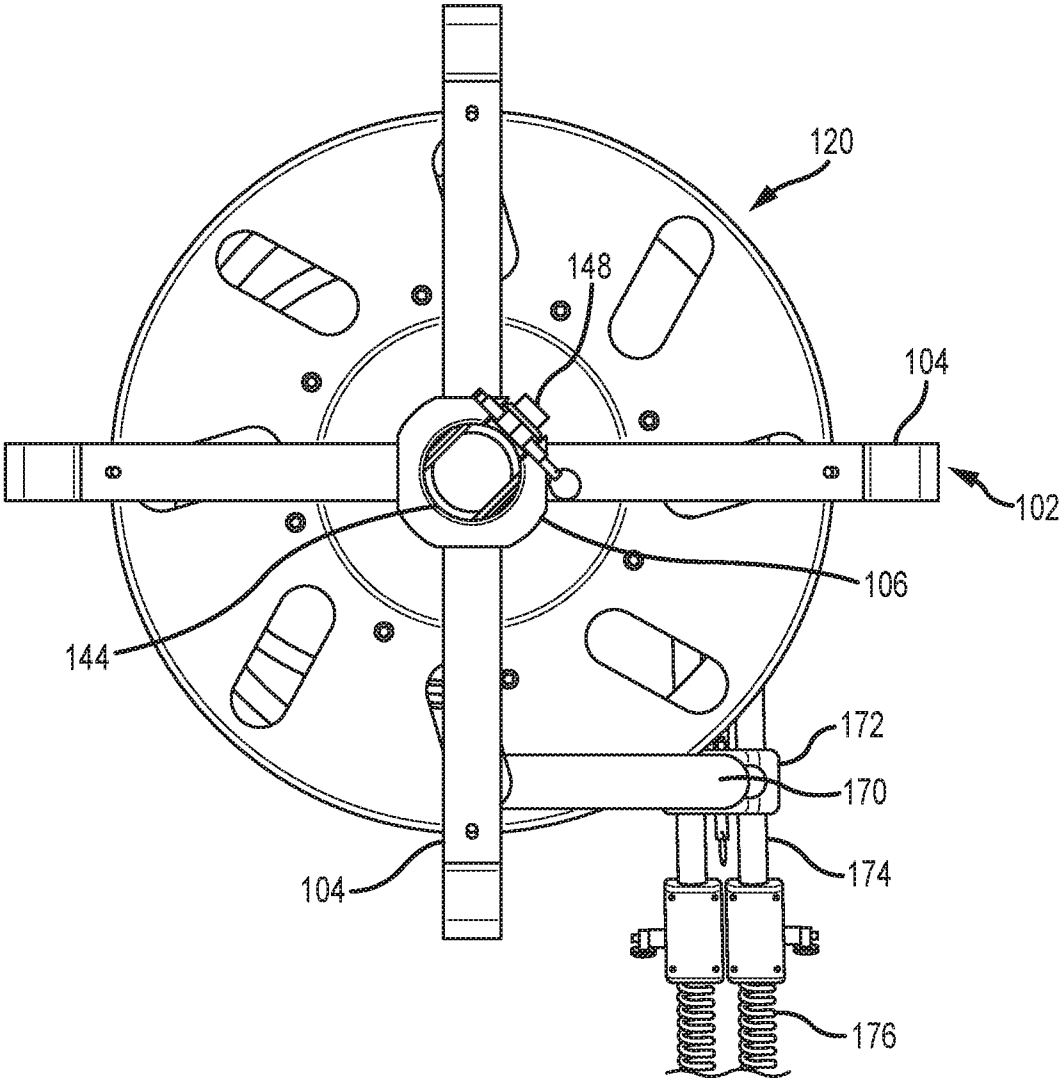

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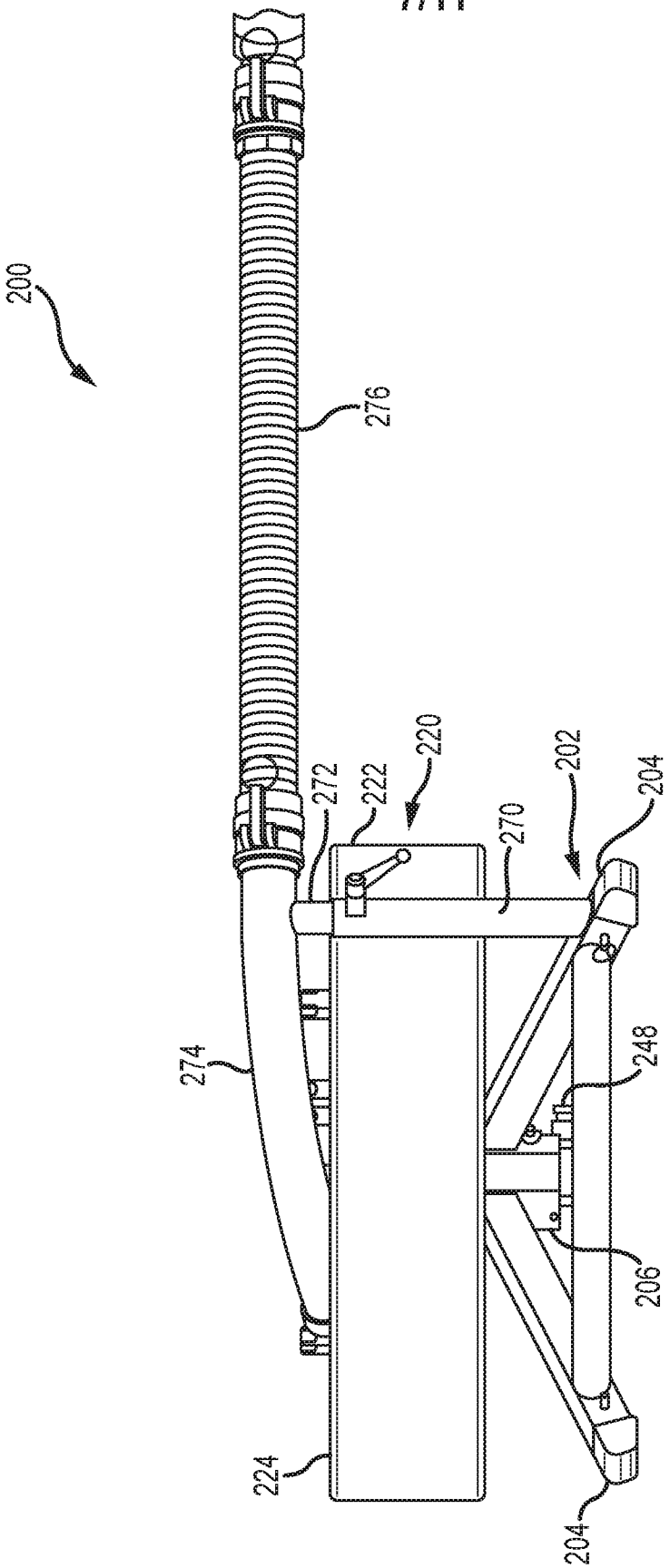

FIG.7

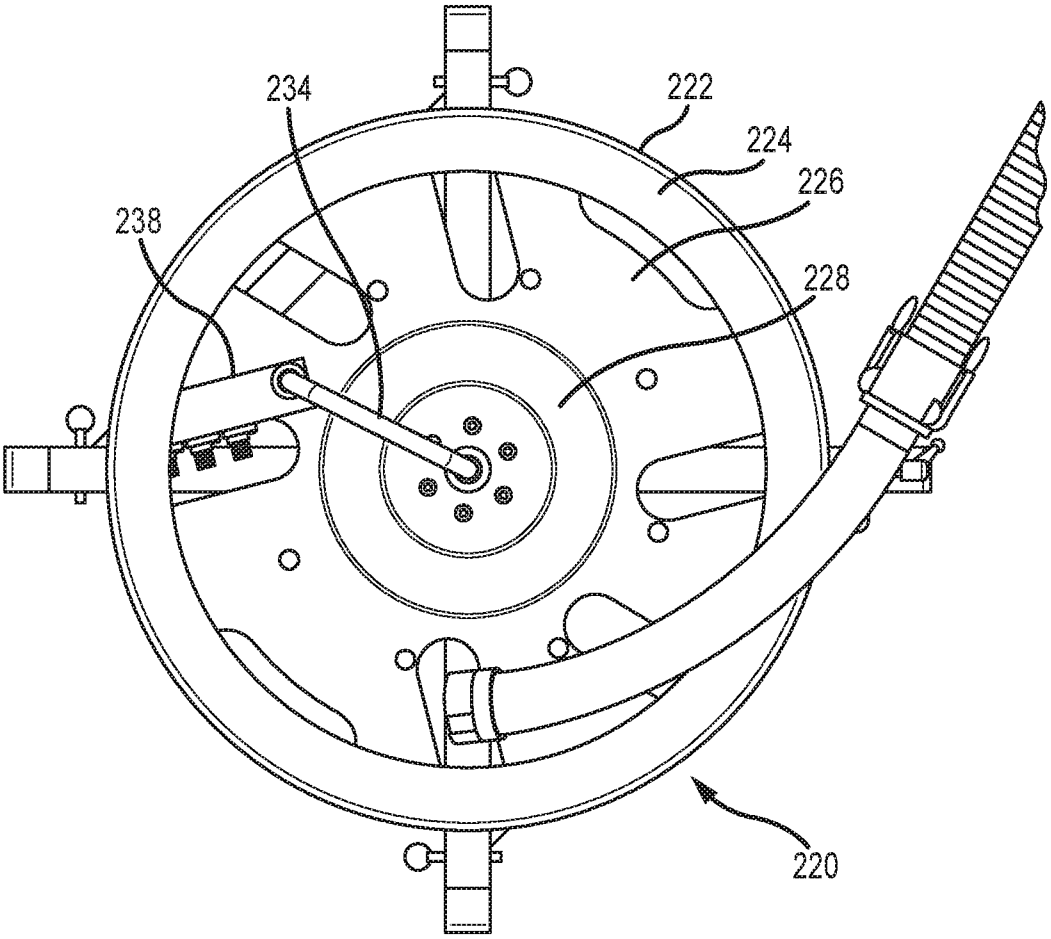

FIG.8

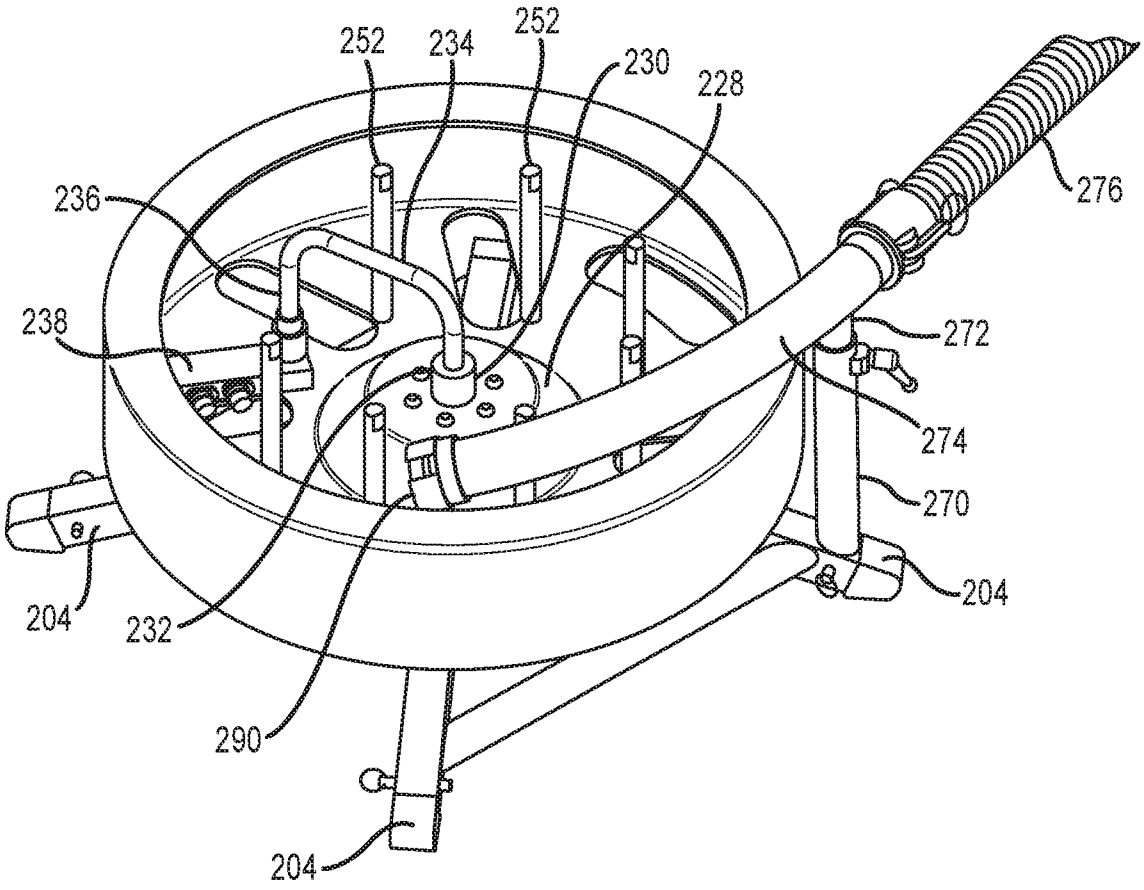

FIG.9

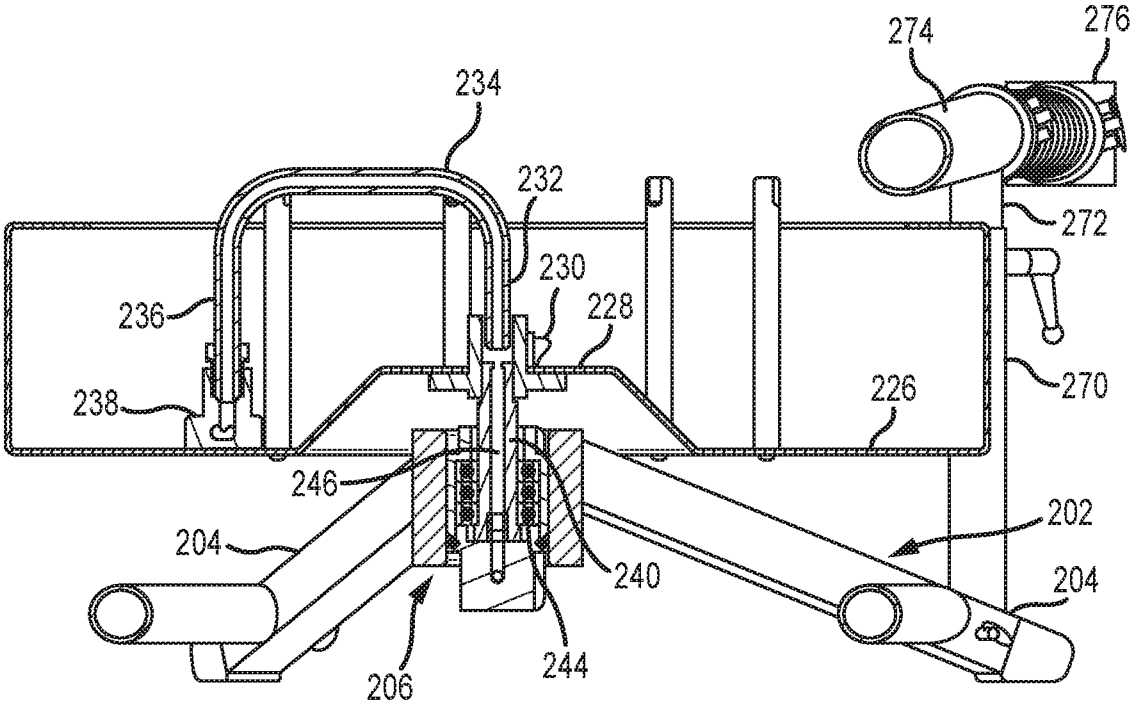
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FIG.10

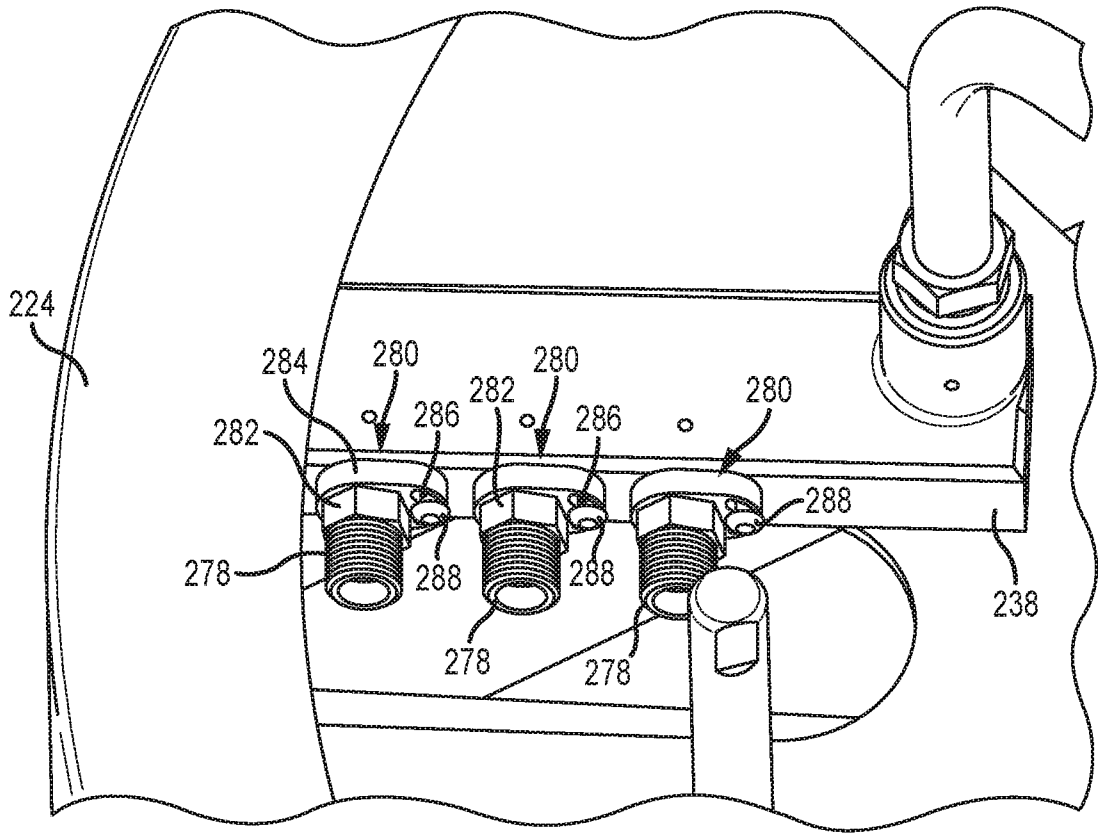

FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/055672

A. CLASSIFICATION OF SUBJECT MATTER

B65H 75/38(2006.01)i, B65H 75/44(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65H 75/38; B08B 9/02; B65H 75/44; E03B 1/00; B65H 75/48; B08B 3/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: stretcher, medical device, stabilizer, motor, patient, transfer, bed, display, surgical tool and stabilization foot

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5184636 A (VAN DER WOUDE, MEINO JAN) 09 February 1993 See column 1, lines 5-6; column 2, line 21 - column 3, line 63; column 4, lines 30-33 and figures 1, 3.	1-20
Y	US 2595655 A (HANNAY, CLIFFORD B.) 06 May 1952 See column 3, lines 38-42; column 4, lines 1-66 and figures 1-2.	1-20
Y	US 5787923 A (SHEA et al.) 04 August 1998 See column 3, lines 13-32 and figures 1-4.	5-7,9-20
A	JP 2719107 B2 (NISSHIN KIKO K.K.) 25 February 1998 See paragraphs [0024]-[0031] and figures 1-3, 5.	1-20
A	US 2013-0299621 A1 (STONEAGE, INC.) 14 November 2013 See paragraphs [0032]-[0044] and figures 3-6.	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 January 2017 (24.01.2017)	**24 January 2017 (24.01.2017)**

Name and mailing address of the ISA/KR
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2016/055672

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5184636 A	09/02/1993	EP 0473234 A1	04/03/1992
		EP 0473234 B1	02/11/1994
		JP 04-227488 A	17/08/1992
US 2595655 A	06/05/1952	None	
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		US 2012-025002 A1	02/02/2012
		US 8505845 B2	13/08/2013

(19)中华人民共和国国家知识产权局

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B65H 75/38(2006.01)
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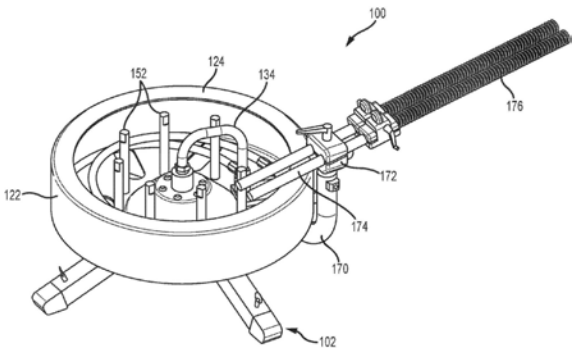
权利要求书2页 说明书5页 附图10页

(54)发明名称

多个高压柔性喷枪软管的卷收鼓

(57)摘要

根据本发明的多个柔性喷枪软管的卷收鼓设备或装置包括具有三个或更多个支撑腿的基座及可旋转地支撑在基座上的中空卷收鼓组件；卷收鼓组件包括中空圆筒形外壳、紧固到外壳的底板、高压流体供应连接器以及歧管，歧管沿着外壳的底板径向定位以用于连接到多个柔性喷枪软管中每一个的一端；基座包括从基座沿着外壳旁边延伸的L形支撑臂；多个引导管由支撑臂支撑并且在外壳的边缘上对齐，以用于引导柔性喷枪软管进出卷收鼓组件。



CN 108137263 A

1.一种用于多个柔性高压流体清洁喷枪软管的卷收鼓设备,包括:

基座;

中空的卷收鼓组件,其可旋转地经由旋转接头支撑在基座上,其中,卷收鼓组件包括中空圆筒形外壳,外壳具有底板、圆筒形侧壁、高压流体供应连接器以及歧管,歧管定位在外壳的底板上以用于将每一个柔性喷枪软管的一端连接到高压流体供应连接器;

支撑臂,从基座延伸到外壳的侧壁之外并且横跨外壳的侧壁延伸;以及

一个或多个引导管,由支撑臂支撑,以用于引导柔性喷枪软管进入和离开卷收鼓组件。

2.根据权利要求1的卷收鼓设备,其中,基座包括用于接收旋转接头一部分的中心插槽和支撑插槽的一组三个或更多个支腿。

3.根据权利要求1的卷收鼓设备,其中,高压流体供应连接器紧固到安装在插槽中的旋转接头的杆上。

4.根据权利要求1的卷收鼓设备,其中,卷收鼓外壳具有平行于底板的周边边缘。

5.根据权利要求1的卷收鼓设备,还包括倒形管,倒形管将旋转接头连接到外壳中的歧管。

6.根据权利要求5的卷收鼓设备,其中,旋转接头包括由轴承支撑的管状轴,其设于构成杆的壳体中,杆适于承载在基座的插槽中。

7.根据权利要求6的卷收鼓设备,其中,底板具有紧固到旋转接头的管状轴上的毂。

8.根据权利要求1的卷收鼓设备,其中,基座具有接收旋转接头一部分的中心插槽和从插槽径向延伸的多个支腿,并且支撑臂将所述一个或多个引导管定位成与卷收鼓组件的圆筒形外壳相切。

9.根据权利要求8的卷收鼓设备,其中,旋转接头具有紧固到卷收鼓组件底板上的毂上的管状轴,并且倒U形管从管状轴沿轴向伸出并且在径向延伸到紧固到底板上的歧管。

10.根据权利要求8的卷收鼓设备,其中,毂为截头圆锥形。

11.一种用于相对于柔性喷枪驱动设备来接收、存放和分发多个高压清洁流体软管的卷收鼓设备,卷收鼓设备包括:

基座,具有从中心插槽向外呈辐射状延伸的三个或更多个支腿和从支腿中的一个支腿延伸的支撑臂;

中空的卷收鼓组件,其可旋转地经由旋转接头支撑在基座上,其中,卷收鼓组件包括中空圆筒形的外壳,外壳具有与具有中心毂的底板汇合的圆筒形侧壁、平行于底板且围绕侧壁的周边环形边缘、以及紧固到外壳的底板上的歧管,歧管用于通过旋转接头将每个柔性喷枪软管的一端连接到高压流体供应连接器;以及

一个或多个引导管,由支撑臂承载并且与圆筒形外壳相切。

12.根据权利要求11的卷收鼓设备,其中,高压流体供应连接器紧固到安装在插槽中的旋转接头的杆上。

13.根据权利要求11的卷收鼓设备,还包括倒U形管,倒U形管将旋转接头连接到外壳中的歧管。

14.根据权利要求13的卷收鼓设备,其中,旋转接头包括由轴承支撑的管状轴,其设于构成杆的壳体中,杆适于承载在基座的插槽中。

15.根据权利要求14的卷收鼓设备,其中,管状轴紧固到倒U形管的一端。

16.根据权利要求14的卷收鼓设备，其中，底板具有紧固到旋转接头的管状轴上的毂。

17.根据权利要求11的卷收鼓设备，其中，旋转接头具有紧固到卷收鼓组件底板上的毂上的管状轴，并且倒U形管从管状轴沿轴向伸出并在径向延伸至紧固到底板上的歧管。

18.根据权利要求17的卷收鼓设备，其中，毂为截头圆锥形。

19.一种高压柔性喷枪清洁设备，包括：

气动的驱动马达，其操作多个驱动辊，以将一个或多个柔性喷枪软管移入和移出待清洁的管道；以及

卷收鼓设备，用于相对于所述驱动设备来接收、存放和分发每个柔性喷枪软管，卷收鼓设备包括：

基座，具有从中心插槽向外呈辐射状延伸的三个或更多个支腿和从支腿中的一个支腿延伸的支撑臂；

中空的卷收鼓组件，其可旋转地通过旋转接头支撑在基座上，其中，卷收鼓组件包括中空圆筒形的外壳，外壳具有与具有中心毂的底板汇合的圆筒形侧壁、平行于底板且围绕侧壁的周边环形边缘、以及紧固到外壳的底板上的歧管，歧管用于通过旋转接头将每个柔性喷枪软管的一端连接到高压流体供应连接器；

一个或多个引导管，由支撑臂承载并且与圆筒形外壳相切；以及

保护套管，适于连接在所述一个或多个引导管与驱动马达之间，以用于限定喷枪软管在卷收鼓组件与驱动马达之间的路径。

20.根据权利要求19的高压柔性喷枪清洁设备，其中，高压流体供应连接器紧固到安装在插槽中的旋转接头的杆上。

多个高压柔性喷枪软管的卷收鼓

技术领域

[0001] 本发明涉及高压流体处理系统。具体地，本发明的实施例涉及一种用于相对于驱动设备收集和供应两个或更多个管清洁柔性喷枪同时维持软管有序布置的设备，驱动设备用于相对于换热器管束内的换热管或者其他多管子或多管道装置来插入和抽出喷枪。

背景技术

[0002] 一种常规的管吹洗设备由旋转卷筒式柔性喷枪软管卷收和分发设备组成，其载有围绕卷收鼓外部卷绕的预定长度的柔性喷枪软管。通过气动马达来使卷收鼓旋转，以将一个或多个柔性喷枪从卷收鼓推离，并推入一个或两个换热管中。为了适应卷收鼓和气动马达设备的尺寸，卷收鼓设备必须一定程度地远离换热器管板定位。

[0003] 随着设计成直接安装到换热器管板上的小型柔性喷枪驱动设备的出现(诸如在2015年4月22日提交的美国专利申请14/693,259中公开的驱动设备)，柔性喷枪软管通常散乱地放于驱动设备周围的地板上。它们会缠结在一起，从而会破坏顺畅馈送。因此，需要一种能够同时容纳两个或更多个软管同时维持多个柔性喷枪软管有序存放的存放和转运设备。

发明内容

[0004] 根据本发明用于多个柔性喷枪软管的卷收鼓设备或装置直接满足了上述需要。根据本发明的柔性喷枪卷收鼓设备的一个实施例包括用于多个柔性喷枪软管的卷收鼓设备。卷收鼓设备包括具有三个或更多个支腿的基座和可旋转地支撑在基座上的中空卷收鼓组件。

[0005] 卷收鼓组件包括中空圆筒形外壳、紧固到外壳的底板、高压流体供应连接器以及歧管，歧管沿着外壳的底板径向定位以用于连接到每个柔性喷枪软管的一端。基座的一个实施例包括从基座沿着外壳旁边延伸的L形支撑臂。多个引导管由支撑臂支撑并且在外壳的边缘上方对齐，以用于引导柔性喷枪软管进出卷收鼓组件。

[0006] 根据本发明用于多个柔性高压流体清洁喷枪软管的卷收鼓设备的一个实施例包括基座和可旋转地经由旋转接头支撑在基座上的中空卷收鼓组件。卷收鼓组件包括中空圆筒形外壳，外壳具有底板、圆筒形侧壁、高压流体供应连接器以及歧管，歧管定位在外壳的底板上以用于将每个柔性喷枪软管的一端连接到高压流体供应连接器。基座包括从基座延伸的支撑臂，支撑臂延伸到外壳的侧壁之外并且横跨外壳的侧壁延伸。一个或多个引导管由支撑臂支撑，并且定位成引导柔性喷枪软管进出卷收鼓组件。

[0007] 基座具有用于接收旋转接头一部分的中心插槽和支撑插槽的一组三个或更多个支腿。旋转接头还具有由轴承支撑的管状轴，其设于构成杆的壳体中，杆适于承载在基座的插槽中。底板具有紧固到旋转接头的管状轴上的毂。高压流体供应连接器紧固到安装在插槽中的旋转接头的杆上。卷收鼓外壳具有平行于底板的周边边缘。卷收鼓组件还优选地包括倒U形管，倒U形管将旋转接头连接到外壳中的歧管。

[0008] 根据本发明用于相对于柔性喷枪驱动设备来接收、存放和分发多个高压清洁流体软管的卷收鼓设备的一实施例包括:基座,其具有从中心插槽向外呈辐射状延伸的三个或更多个支腿和从支腿中的一个延伸的支撑臂;以及通过旋转接头可旋转地支撑在基座上的中空卷收鼓组件。

[0009] 卷收鼓组件包括中空圆筒形外壳,外壳具有与具有中心毂的底板汇合的圆筒形侧壁。外壳具有平行于底板且围绕侧壁的周边环形边缘。歧管集成块紧固到外壳的底板上,以用于通过旋转接头将每个柔性喷枪软管的一端连接到高压流体供应连接器。卷收鼓组件包括一个或多个柔性喷枪引导管,柔性喷枪引导管由支撑臂承载并且通过支撑臂使其与圆筒形外壳相切。

[0010] 通过结合附图阅读以下详细描述,本发明实施例的其他特征、优点和特性将变得明显。

附图说明

[0011] 图1是紧固到与换热器管板相邻的框架上的柔性喷枪驱动设备的立体图。

[0012] 图2是根据本发明的柔性喷枪卷收鼓设备的一个实施例的侧视图。

[0013] 图3是图2所示设备的俯视图。

[0014] 图4是图2所示设备的上部立体图。

[0015] 图5是在图3中的线5-5上截取的设备剖视图。

[0016] 图6是图2所示设备的仰视图。

[0017] 图7是根据本发明的柔性喷枪卷收鼓设备的另一个实施例的侧视图。

[0018] 图8是图7所示设备的俯视图。

[0019] 图9是图7和8所示设备的上部立体图。

[0020] 图10是在图3中的线5-5上截取的设备剖视图。

[0021] 图11是图7所示设备中的软管歧管的放大立体图。

具体实施方式

[0022] 在图1中示出了示例性柔性喷枪驱动设备10,侧盖打开,从而示出了布置用于驱动两个柔性高压喷枪软管160的一组三对驱动辊12。设备10包括壳体16,在壳体16中,驱动马达18驱动六个驱动辊12中的每个驱动辊。图1示出的驱动设备10支撑成用于将一个或多个柔性喷枪软管160引导进出换热器管板11中的换热管。驱动设备10一般安装在柔性喷枪引导件17上,柔性喷枪引导件17紧固到框架19上,框架19使驱动设备10与穿透管板11的换热管对齐。

[0023] 根据本发明第一实施例的示例性卷收鼓设备100设计用来当把柔性喷枪软管160供应到所要清洁的管道系统(诸如图1所示换热器11中的换热管)中或者从中抽出时来分发和卷收柔性喷枪软管160。在图2中以侧视图示出了卷收鼓设备100的示例性实施例。卷收鼓设备由基座102和卷收鼓组件120组成,基座102具有三个或四个支腿104以用于将卷收鼓设备搁置在大致平坦表面(未示出)上,卷收鼓组件120可旋转地支撑在基座102的中心凹部或插槽106中。

[0024] 如图3所示,卷收鼓组件120具有中空圆筒形外壳122,中空圆筒形外壳122具有上

环形边缘124和环状盘形底板126。环形边缘124平行于底板126围绕外壳122延伸。盘形底板用螺栓连接到中心截头圆锥形毂128的基部。截头圆锥形毂128的顶部紧固到高压旋转接头130的管状轴140上。旋转接头130的轴140通过螺纹连接到倒U形管134的一端132。倒U形管134的另一端136通过螺纹拧入到紧固到底板126上的径向延伸歧管138中。中心截头圆锥形毂128和旋转接头130的管状轴140与外壳122一起围绕穿过旋转接头130的竖直轴线旋转。旋转接头130的管状轴140由轴承142承载在杆144中，杆144竖直滑入到支撑基座102的插槽106中。杆144具有与图6所示软管接头148连通的中心通道146，以用于将高压水源连接到卷收鼓设备100。

[0025] 当旋转接头130的杆144插入到支撑基座102的插槽106中时，杆144被卡固在其中并且杆144不旋转。相反，旋转接头130的管状轴140在轴承142中旋转。旋转接头130的轴140的顶部和底部处的高压密封件150防止漏水并且把轴承142与流体压力隔绝开。

[0026] 优选地，一系列轴向延伸的导柱152围绕外壳122的内部彼此间隔开，并且从底板126向上延伸。这些导柱152用作软管引导件，并且可为拧到螺栓154上的细长螺母，从而将毂128与底板126联接起来。这些导柱152可由金属板套或者其他引导结构来代替，以确保软管160存放或包绕在外壳122的内周边周围。

[0027] 紧固到底板126上的径向歧管138作为用于附接两个或更多个柔性喷枪软管160中每一个柔性喷枪软管的一端的附接点。每个柔性喷枪软管160的另一端延伸出卷收鼓设备100并且馈送到高压柔性喷枪驱动设备10中。

[0028] 卷收鼓设备100的基座102是不动的。基座102具有L形支撑臂170，支撑臂170的一端紧固到一个支腿104上。支撑臂170从支腿104横向向外延伸超出外壳122，并且挨着圆筒形外壳122旁边向上弯曲到在边缘124恰上方与边缘124相切的位置。软管引导管支撑件172紧固到支撑臂170的远端，并且承载着定向成与外壳122相切的两个或更多个软管引导短接管174。每个软管160分别穿过这些软管引导短接管174中的一个，进入到连接到喷枪驱动设备(诸如图1所示喷枪驱动设备10)的保护套管176中。

[0029] 保护套管176主要限定了喷枪软管160在由喷枪驱动设备10从所清洁的换热管或其他管道中抽出时可采取的路径。通过将软管160的路径限定到卷收鼓设备100的卷收鼓120，保护套管基本上将软管160推入并穿过引导短接管174并且推入外壳122中。软管的这种移动导致卷收鼓组件120的外壳122和毂106在轴承142上旋转，使得软管均匀地放置在外壳122中。保护套管176也可配置成将气动动力和/或电力引导至柔性喷枪驱动设备。

[0030] 在操作过程中，从所清洁的换热管中抽出的高压喷枪软管160由驱动设备送回穿过保护套管176、短接管174并进入卷收鼓设备100的外壳122中。这样，卷收鼓组件120由前进进入外壳122中的软管160推动转动，使得软管整齐地围绕外壳122的内侧卷绕。导柱152有助于确保软管160不会横越过毂128，而是围绕外壳122的内侧卷绕。

[0031] 歧管138可配置成接纳一个、两个或更多个软管。因此，两个、三个、四个或更多个软管160可连接到歧管138，并且同时地抽出或返回到如上所述的卷收鼓设备100。如果需要用于特定应用，可添加驱动马达(未示出)以旋转中空卷收鼓组件120。

[0032] 图7以侧视图示出了根据本发明第二实施例用于同时操纵三个柔性喷枪软管的示例性卷收鼓设备200。卷收鼓设备200包括：基座202，其具有三个或四个支腿204以用于将卷收鼓设备200搁置在大致平坦表面(未示出)上；以及卷收鼓组件220，其可旋转地支撑在基

座202的中心凹部或插槽206中。插槽206可为以焊接或其他方式牢固地附接到支腿204上的C形管状套筒。

[0033] 如图8所示，卷收鼓组件220包括中空圆筒形外壳222，中空圆筒形外壳222具有上环形边缘224和一体的盘形底板226。盘形底板226优选地具有中心截头圆锥形毂228。截头圆锥形毂228的顶部紧固到高压旋转接头230的管状轴240的上端。旋转接头230的上部是通过螺纹连接到倒U形管234一端232的管状轴240。倒U形管234的另一端236通过螺纹拧入到紧固到底板226上的径向延伸歧管238中。歧管238具有用于连接到三个软管260的管接嘴。

[0034] 中心截头圆锥形毂228和旋转接头230的轴240与外壳222一起在由轴承支撑的旋转接头230的管状轴240上围绕穿过旋转接头230的竖直轴线旋转。旋转接头230的轴240由轴承242承载在杆244中，杆244竖直滑入支撑基座202的插槽206中。杆244具有与图6所示软管接头248连通的中心通道246，以用于将高压水源连接到设备200。

[0035] 当旋转接头230的杆244插入到支撑基座202的插槽206中时，杆244卡固在其中并且杆244不旋转。相反，旋转接头230的管状轴240在轴承242中旋转。旋转接头230的轴240的顶部和底部处的高压密封件250防止漏水，并且把轴承242与流体压力隔绝开。

[0036] 优选地，从边缘224径向向内间隔开的一系列轴向延伸导柱252从底板226向上延伸。这些导柱252用作内部软管引导件，三个软管围绕引导件卷绕在外壳222内侧。紧固到底板226上的径向歧管238用作供三个柔性喷枪软管260中每一个柔性喷枪软管的一个端部附连或者供紧固到喷枪软管260上的三个柔性短接管中每一个柔性短接管的一个端部附接的附接点。每个柔性喷枪软管160的另一端(图7-11中未示出)延伸出卷收鼓设备200并且馈送到软管驱动设备10中。

[0037] 卷收鼓设备200的基座202优选地是不动的，并且定向成使得卷收鼓组件220可围绕穿过基座202的插槽206的竖直轴线旋转。插槽206基本上是固定的C形套筒，其尺寸设计用于接收杆244。基座202具有L形支撑臂270，支撑臂270的一端紧固到一个支腿204上。支撑臂270从支腿204横向向外延伸超过外壳222，并且挨着圆筒形外壳222旁边向上延伸到在边缘224恰上方的位置。软管引导管支撑件272可伸缩地紧固到支撑臂270的远端中。支撑件272联接并支撑弯曲引导管274，引导管274的尺寸允许承载与外壳222内侧基本上相切定向的三个软管160。每个软管160各自穿过软管引导管274从外壳222中引出到保护套管276中。保护套管276的另一端紧固到喷枪驱动设备10的入口侧。

[0038] 保护套管276主要限定了三个喷枪软管260在由喷枪驱动设备10从所清洁的换热管或其他管道中抽出时可采取的路径，反之亦然。通过将软管260的路径限定到卷收鼓设备200的卷收鼓220，保护套管或套管276基本上将软管260推入并穿过引导管274并且推入外壳222中。软管的这种移动导致卷收鼓组件220的外壳222和旋转接头230的管状轴240在轴承242上旋转，使得软管160以有序且紧密的方式围绕外壳周边放置到外壳222中。正如在以上参考图2-6所示和描述的第一实施例中那样，保护套管276还可配置成将气动动力和/或电力引导至柔性喷枪驱动设备10。

[0039] 在卷收鼓设备200的操作过程中，从所清洁的换热管中抽出的高压喷枪软管160由驱动设备10送回穿过保护套管276、短接管274并进入卷收鼓设备200的外壳222中。这样，卷收鼓组件220由前进进入外壳222中的软管160推动转动，使得软管160整齐地围绕外壳222的内侧卷绕。导柱252有助于确保软管160不会横越过毂228，而是围绕外壳222的内侧卷绕。

反之，当驱动马达抽出喷枪软管160时，卷收鼓组件220反向旋转以允许软管160穿过引导管274离开进入套管276中。

[0040] 现在具体参考图10，示出了软管歧管238的放大图，软管歧管238支撑紧固到歧管238中的三个软管接嘴278。这些接嘴278中的每一个都具有围绕每个接嘴278各自的螺母部分282可滑动地卡固的新型装配锁280。每个装配锁280是细长平板284，细长平板284中具有：贯穿的六边形通道，尺寸允许接纳接嘴278的螺母部分282穿过；以及单独的闭合槽286，锁紧螺钉288穿过闭合槽286将锁定板284紧固到歧管238上。锁280防止接嘴278旋转，从而确保了软管接嘴278牢固地紧固到歧管238上。为了移除一个接嘴278，首先必须移除螺钉288，然后将锁定板284从接嘴278滑脱。闭合槽286的长度尺寸设定成适应接嘴278的1/6圈，使得用于螺钉288的预钻孔将在闭合槽286内某处对齐。

[0041] 卷收鼓设备100和200是可扩展的，使得可同时容纳额外的软管，这主要由软管驱动设备10的软管容量所限定。如果在卷收鼓设备200中使用少于三个软管，那么必须在用于缺失软管的软管接嘴278上安装合适的插塞。

[0042] 优选地，套管276的近端安装有衬套290，用于在三个软管进入和离开套管276时分开和引导这三个软管中的每一个软管。衬套的尺寸也设定成能够让软管自由地穿过，但是阻止喷枪末端、插头或喷嘴进入卷收鼓组件220中。类似地，衬套290还与夹紧到每个软管上的软管止动件(未示出)配合，以限制可从卷收鼓组件220抽出的软管的量或长度。

[0043] 在不脱离本发明范围的情况下，可对卷收鼓设备100和200进行许多改变。例如，卷收鼓外壳侧壁122、222、边缘124、224、底板126、226以及毂128、228可由单一的聚合物材料或金属板制成，而不是由紧固在一起的分离结构制成。软管导柱152、252可用紧固到底板126、226上的圆形内金属板壁来代替。基座102可设计成由任何刚性结构或表面而不仅仅是平地板来支撑。例如，基座102的一个或多个支腿104可夹紧到靠近要由喷枪软管160和驱动设备10的操作来清洁的待清洁物的轨道或预先存在的框架构件上，而不是使三个支腿搁置在地板上。最后，在近距离应用中，卷收鼓设备100或200可直接紧固到驱动设备(诸如软管驱动设备10)上，而不需要如图所示的套管176。因此，根据本文所描述特征和优点的所有改变、替代和等同都在本发明的范围内。可在不脱离由以下权利要求及其等同所限定的本发明实质和宽范围的情况下引入此类改变和替代。

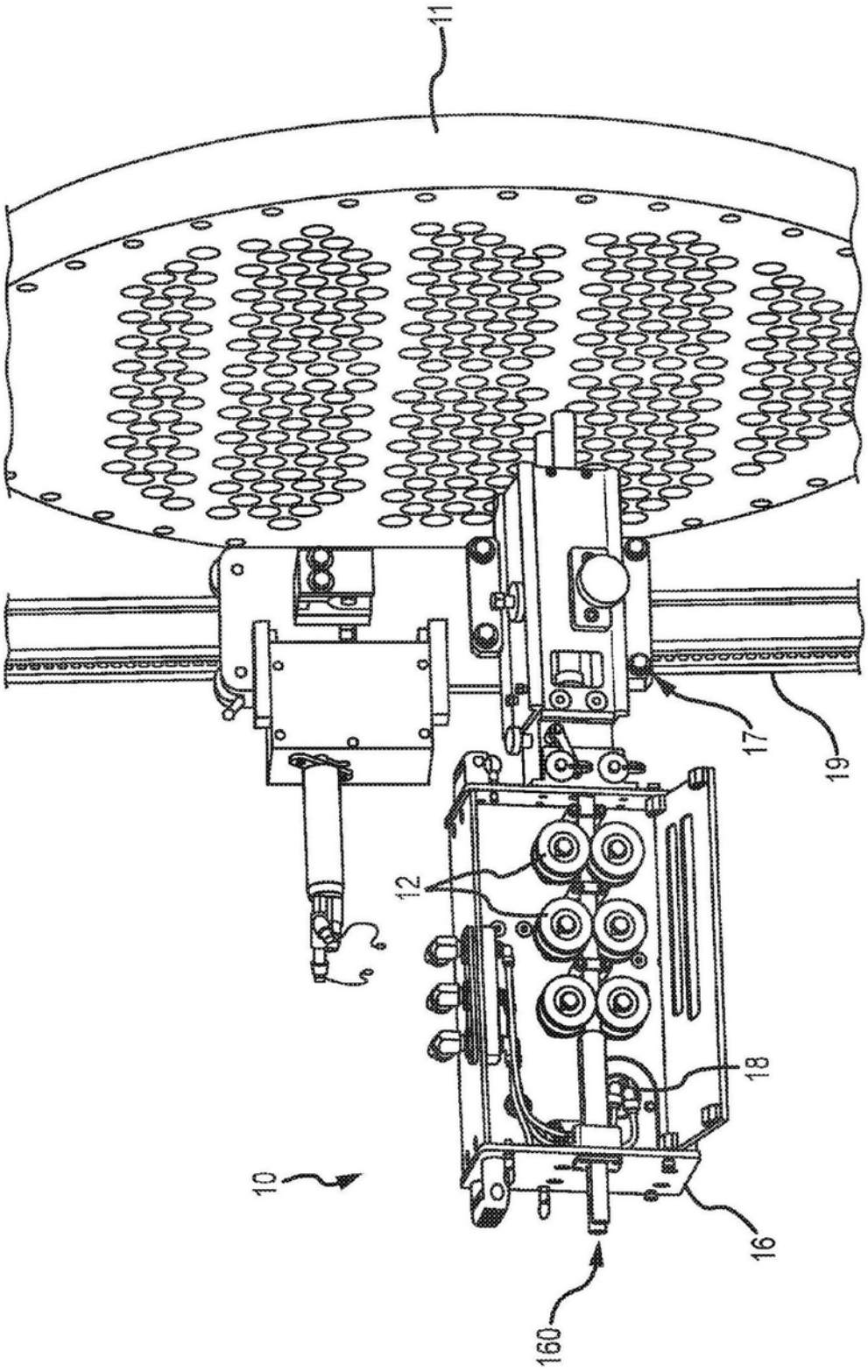


图1

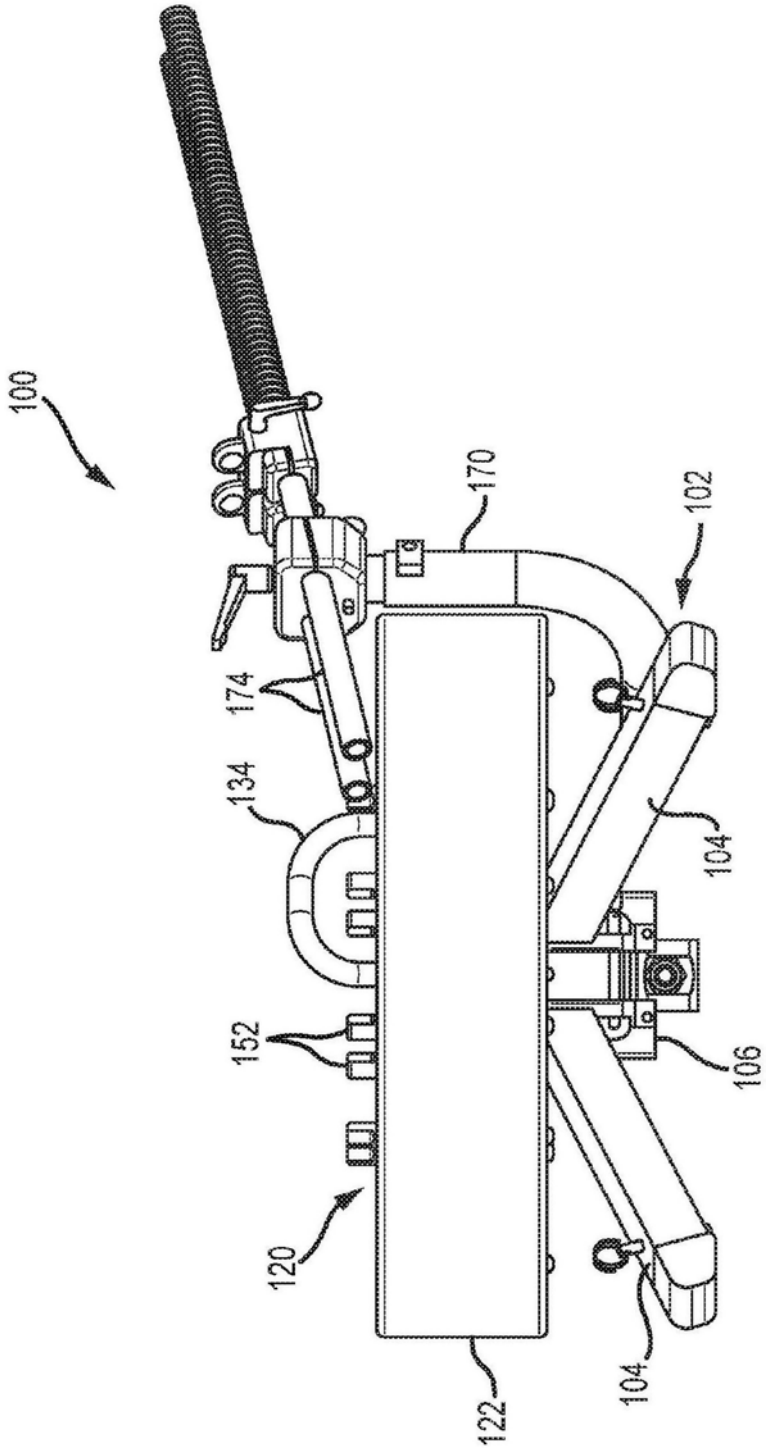


图2

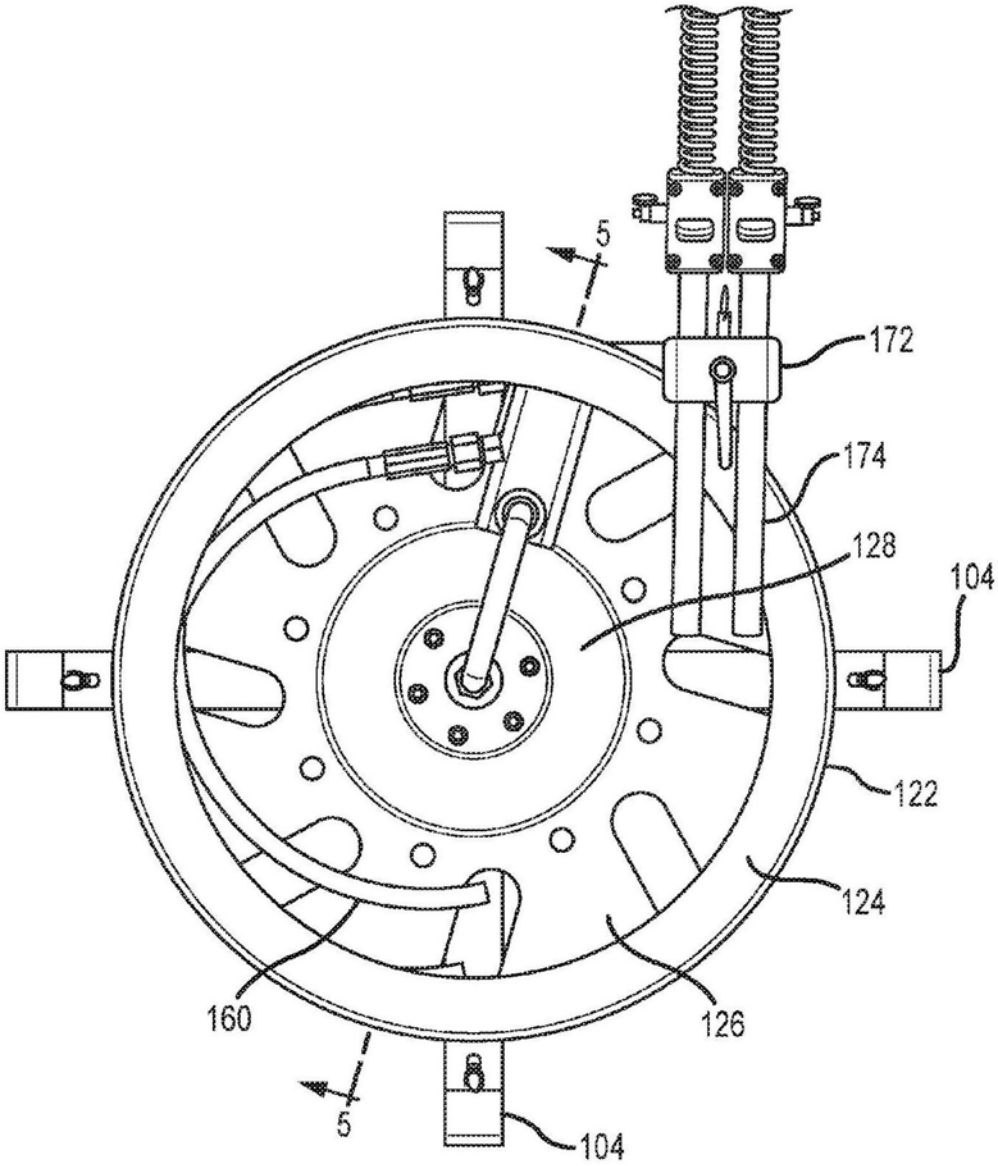


图3

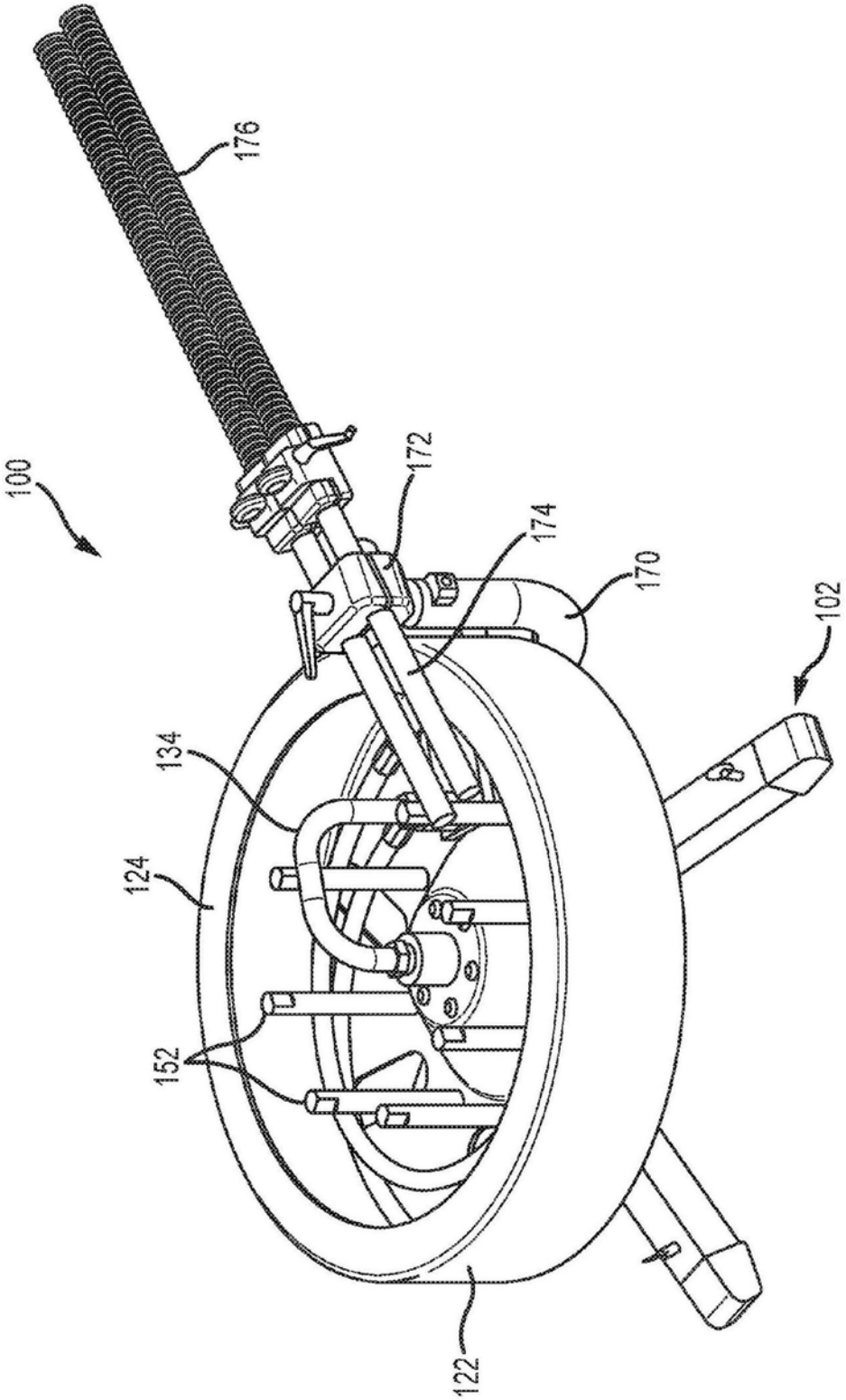


图4

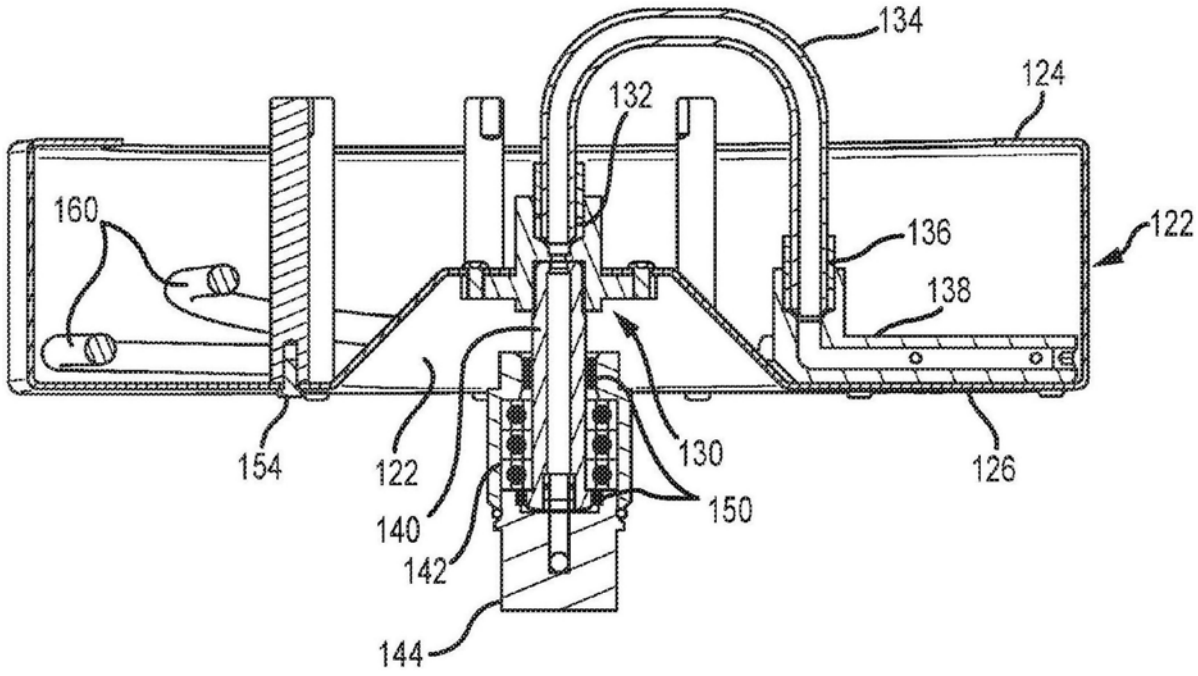


图5

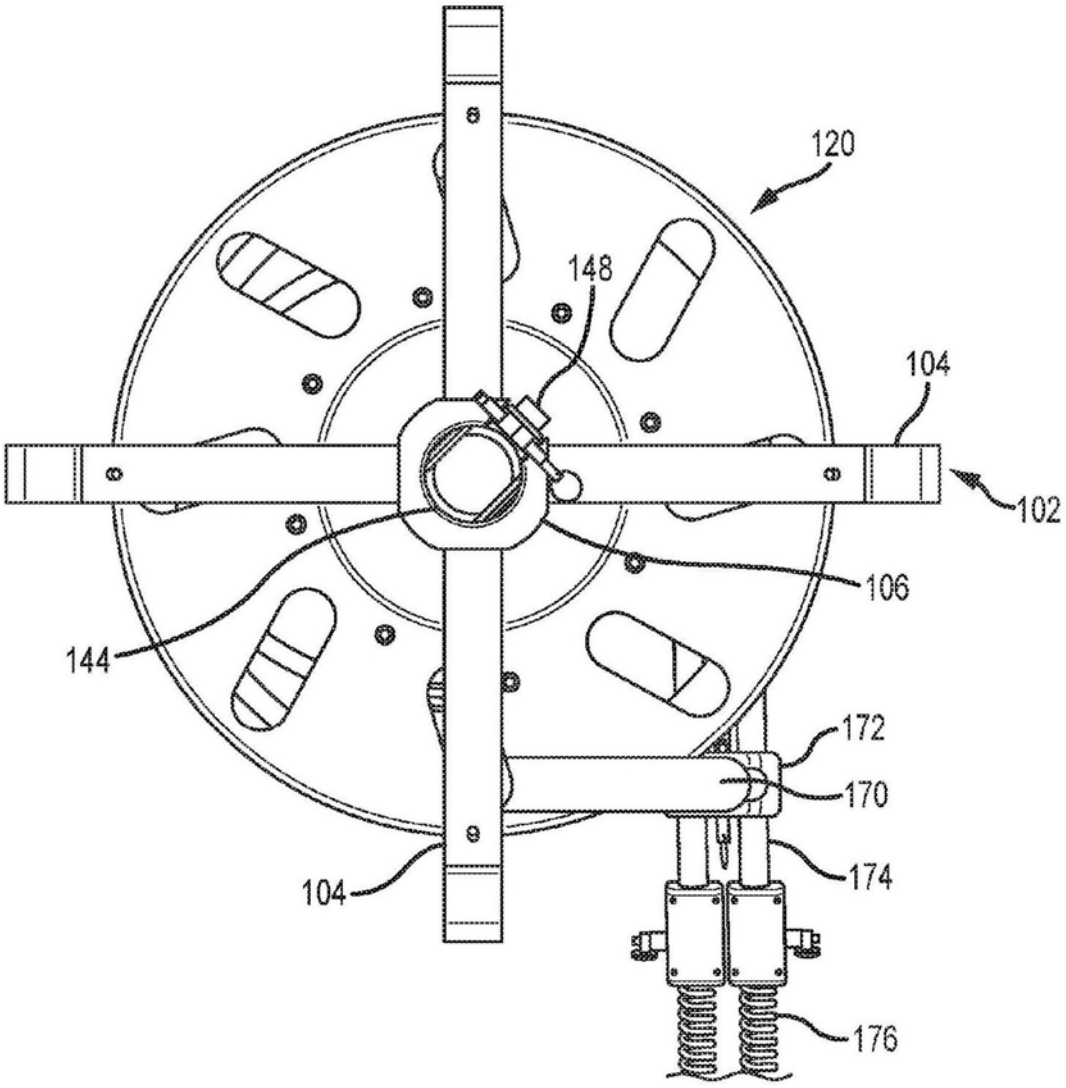


图6

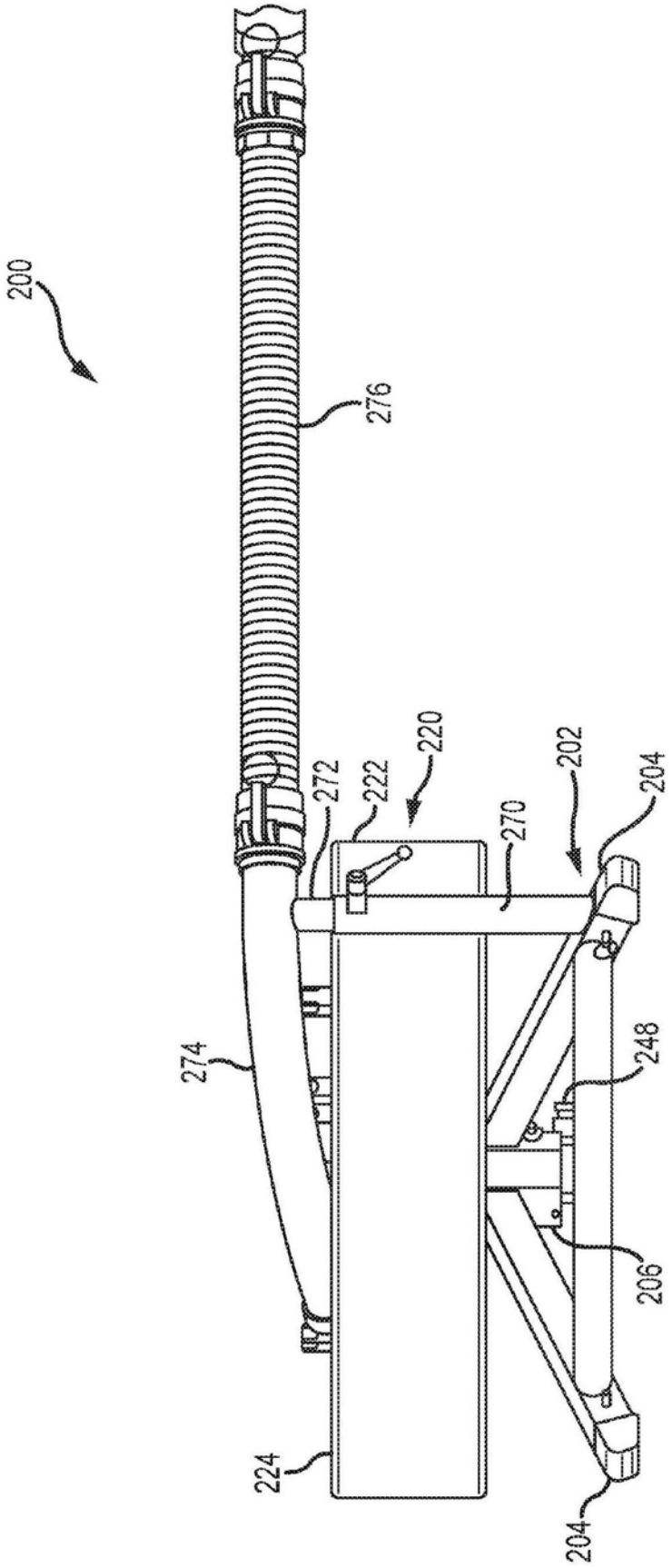


图7

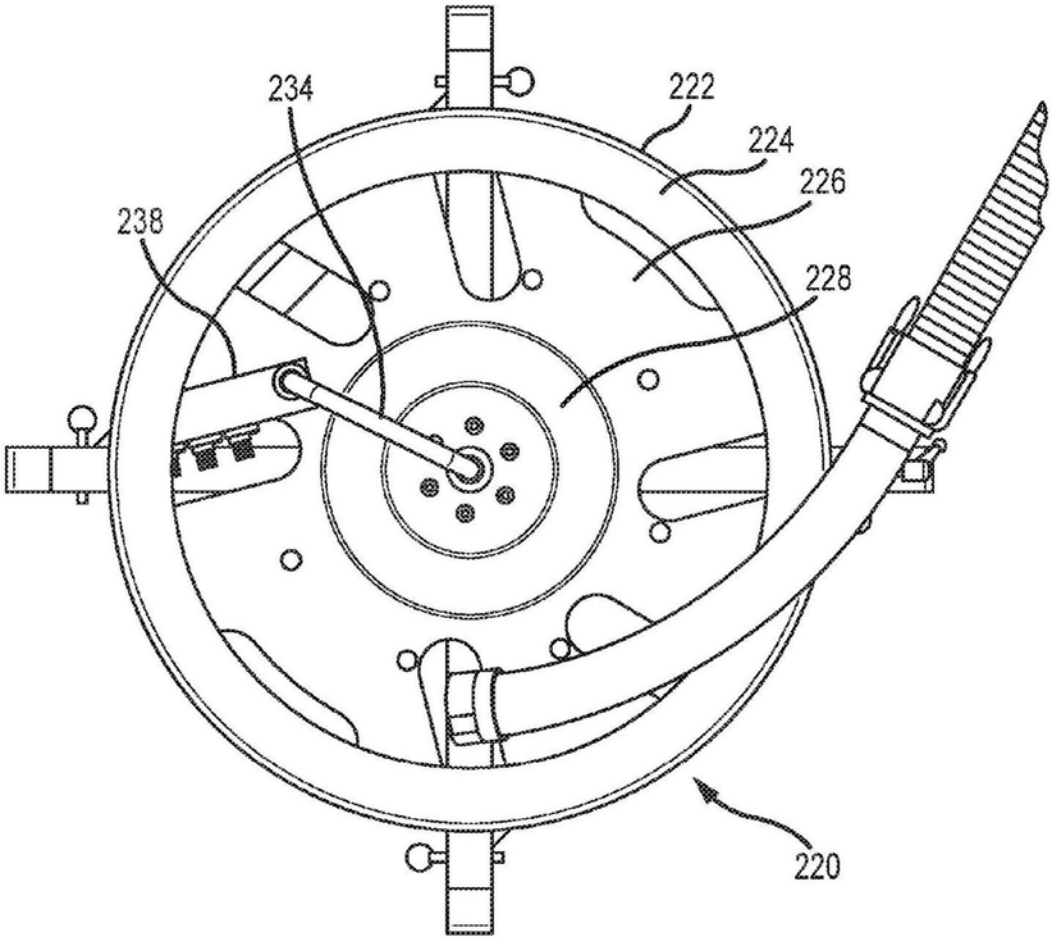


图8

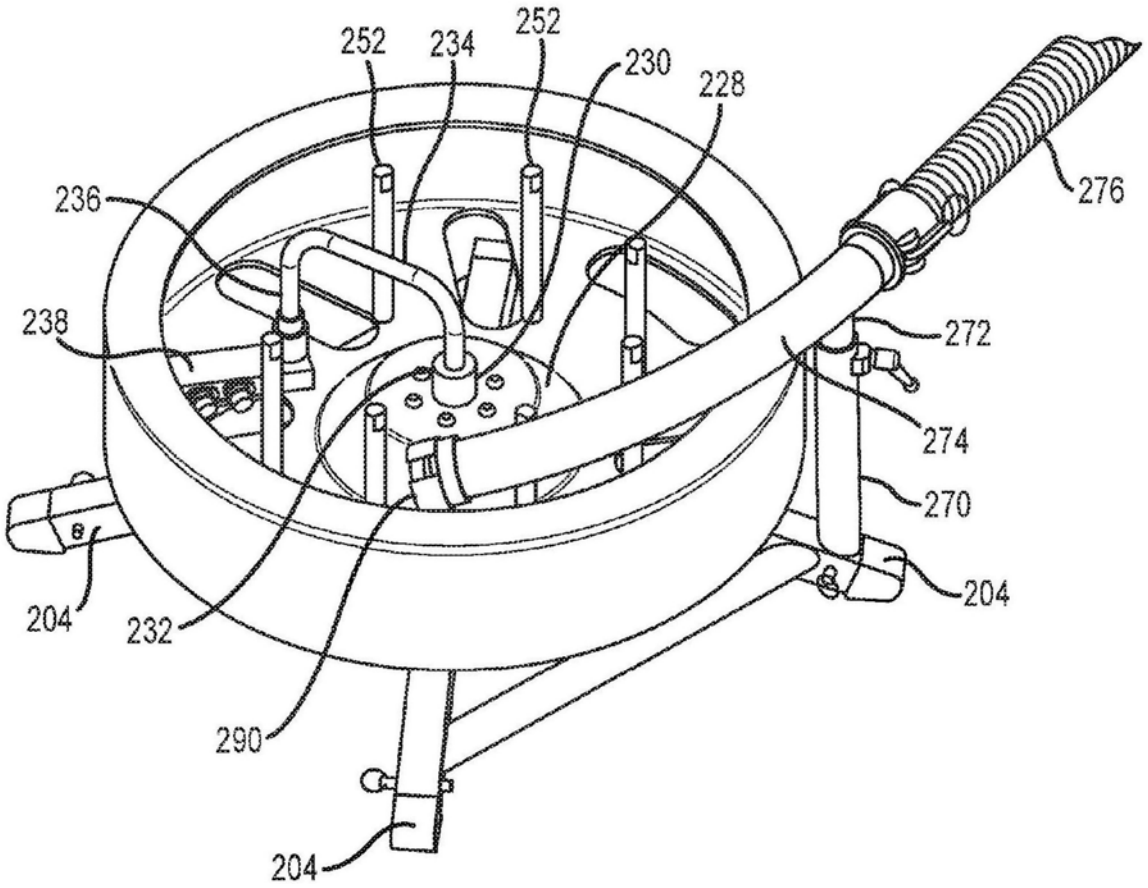

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图9

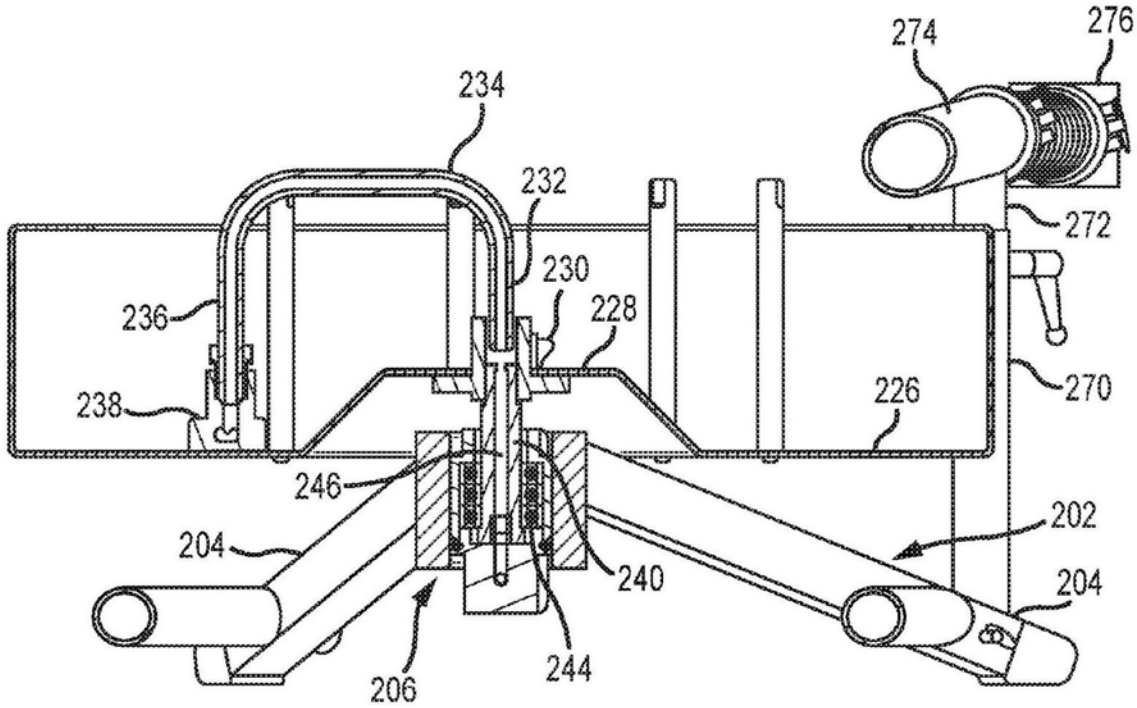
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图10

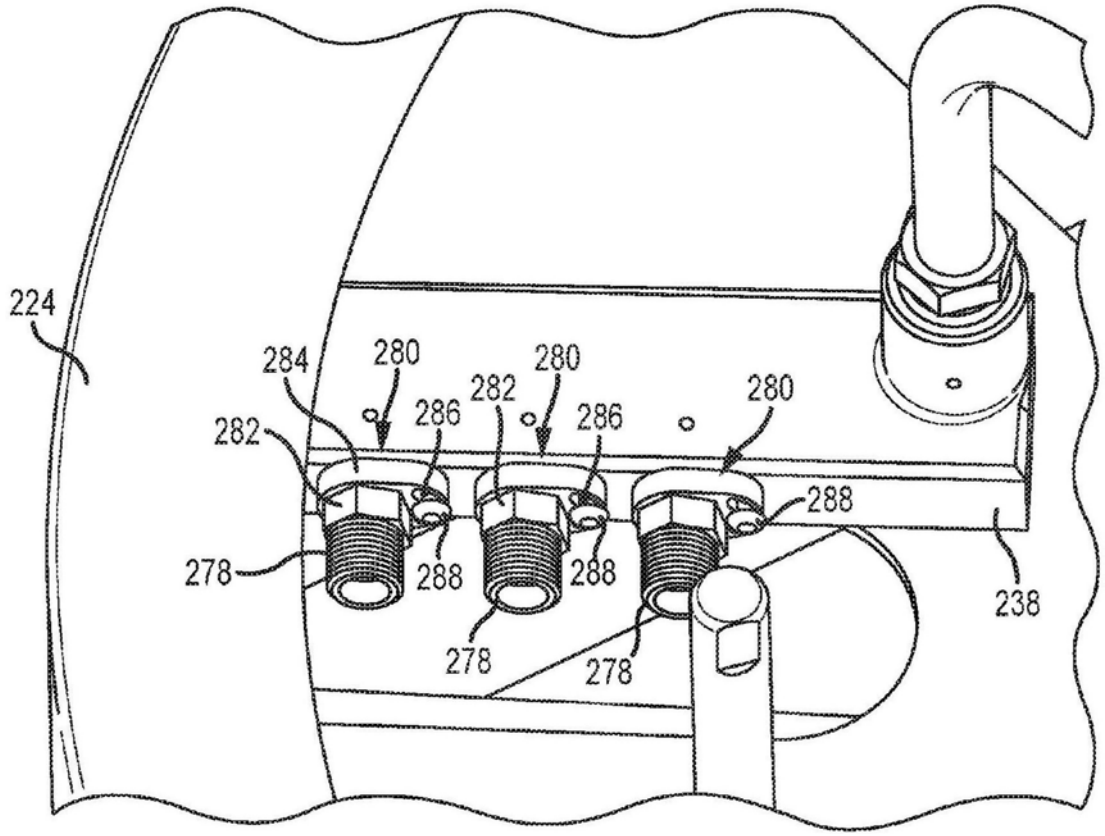

图11