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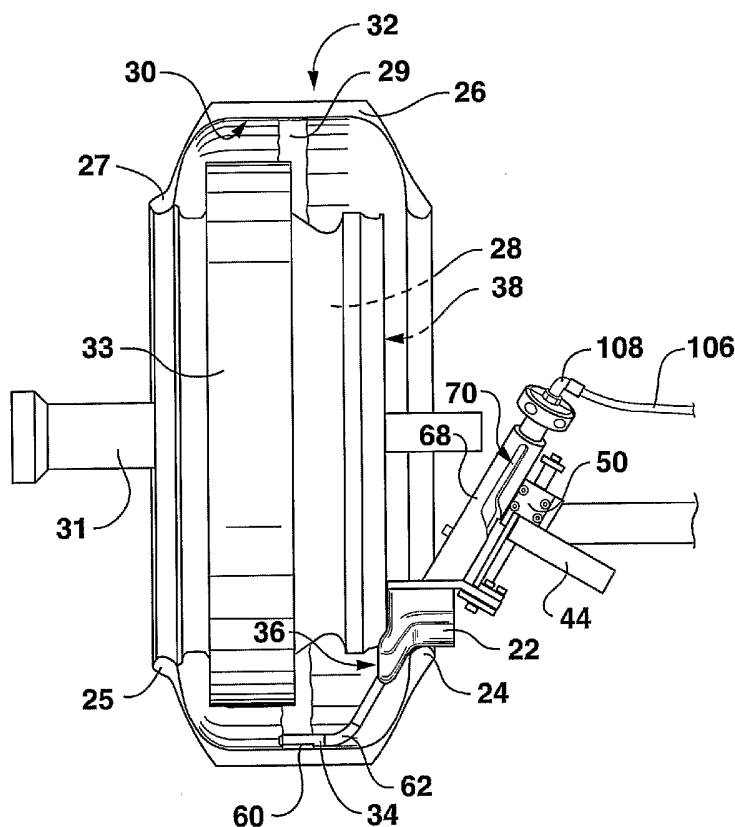
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(54) Title: FLUID APPLICATION TOOL AND METHOD FOR TIRE ASSEMBLIES



(57) Abstract: A tool and method for applying a fluid to an interior surface of a tire is provided. The invention may be used, for example, to apply a thin film of lubricant to the interior surface of a tire at the summit where contact with a support ring may occur during run-flat conditions. In certain embodiments, the tool includes a derailer (22) for placement between the tire (26) and wheel (28), an extension arm for selective deployment of the derailer into the tire, and a wand (34) for deployment of the derailer. The wand includes an aperture (60) through which fluid may be deposited onto the interior surface of the tire. In certain embodiments, a fluid supply mechanism is provided for supplying fluid to the wand.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

TITLE**FLUID APPLICATION TOOL AND METHOD FOR TIRE ASSEMBLIES****TECHNICAL FIELD OF THE INVENTION**

[0001] The present invention relates to a tool and method for applying a fluid to an interior surface of a tire. The invention may be used, for example, to apply a thin film of lubricant to the interior surface of a tire at the summit where contact with a support ring may occur during run-flat conditions.

BACKGROUND OF THE INVENTION

[0002] Solutions have been proposed for assemblies that allow extended operation of a vehicle after a partial or total loss of air pressure. Many of these systems include multiple components that are complicated and time consuming to use or assemble. U.S. Patent No. 5,891,279, which is incorporated herein in its entirety by reference, overcomes some of these difficulties. Such patent describes an assembly that includes a tire, a rim with a unique profile designed to accept the tire, and a deformable, but preferably circumferentially inextensible, run-flat support ring that is mounted over an essentially cylindrical bearing surface of the rim. The base of the support ring includes essentially inextensible, circumferentially oriented reinforcement elements to create an interference fit between the support and bearing surface of the rim.

[0003] As described in U.S. Patent No. 5,891,279, during run-flat operation, the support ring will contact an interior surface of the tire adjacent to the summit. For certain applications, extended operation of a run-flat tire assembly can generate heat as a result of the friction from the movement of the support ring relative to the interior surface of the tire. To minimize this

frictional effect, a lubricant or other fluid can be placed on the interior surface of the tire where contact with the support ring is anticipated.

[0004] Difficulties exist, however, with manual techniques for applying the lubricant to a run-flat tire assembly. For example, using a typical example of a tire mounting process, lubricant is manually applied to the tire, and the support ring is placed into the tire cavity. The support ring and tire are then mounted onto the wheel by first seating the support ring and then seating the beads of the tire. During these steps, the application of lubricant onto the surfaces of the wheel where the support ring or tires will be mounted is undesirable. For example, it is particularly desirable to avoid placement of lubricant upon the tire bead area. Preventing such contamination, however, is difficult because the tire must be slightly deformed in order to insert the support ring, the tire cavity is a confined space that becomes even more difficult to manipulate once the support ring is inserted, and there is a potential for unrestrained movement of the inserted support ring relative to the tire before mounting onto the wheel. These factors and others can contribute to the misapplication of the lubricant.

[0005] Therefore, a process and apparatus that simplifies the application of lubricant or other fluid to the interior of the tire is needed. A means for applying the lubricant that also helps to prevent placement of the lubricant on improper surfaces of the tire assembly is also desirable. An apparatus that also assists with applying the proper amount of lubricant to the intended surfaces is also desirable.

SUMMARY OF THE INVENTION

[0006] Objects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention. The present invention provides a tool for applying a fluid to an interior surface of a tire, and a method for applying a fluid to an interior surface of a tire. The invention may be used, for example, to apply a thin film of lubricant to the interior surface of a tire at the summit where contact with a support ring may occur during run-flat conditions.

In one exemplary embodiment, the present invention provides a device for applying a fluid to an interior surface of a tire to be mounted on a wheel, where the tire has at least one

bead. The device includes a derailer for placement between the bead of the tire and the wheel. A guide element is provided that is configured with the derailer for selectively positioning the derailer within the interior of the tire at a position that is adjacent to the bead. A wand, in mechanical communication with the derailer, is provided that has an end adapted for application of the fluid. The wand is configured for deployment from the derailer towards the interior surface of the tire. The derailer can be configured with a recess for the receipt of the wand. To provide for the proper positioning of the wand relative to the tire, the present invention may include a cam housing the wand. The cam defines a groove and that is connected to the wand and is positioned within the groove such that the follower moves along the groove so as to cause the wand to rotate into position for the application of the fluid to the interior surface of the tire. This embodiment preferably includes a fluid supply mechanism in fluid communication with the wand and configured for the delivery of the fluid. By way of example, the fluid supply mechanism may be constructed from a cartridge containing the fluid to be applied, a magazine for the receipt of the cartridge, and a piston for applying pressure to the fluid in the cartridge. A motor can be provided that is connected to the piston and is configured for powering the piston. The motor can be constructed from a solenoid, an electric motor, a hydraulic cylinder, a pneumatic cylinder, or other power source. If desired, the fluid supply mechanism can be constructed such that only a predetermined amount of fluid is applied to the interior surface of the tire. For connection to, for example a tire-mounting machine, the device may be equipped with an extension arm that is connected to the derailer, and a rotatably-mounted support arm to which the extension arm is connected. In this way, the derailer may be selectively positioned adjacent to the tire by operation of the support arm and the extension arm. Finally, a mechanism can be provided for selectively locking the derailer into a position adjacent the tire for application of the fluid or into a position retracted from the tire.

[0007] In another exemplary embodiment of the present invention, a tool is provided for applying a fluid to an inner surface of a tire that is to be mounted on a wheel, the wheel having a bead. The tool is constructed to include a guide element and a separator movably mounted with the guide element such that the separator may be selectively positioned within the tire between the bead and the wheel. The separator defines a recess for at least partial receipt of

an applicator connected to the separator. The applicator has at least one aperture located along one end for the delivery of fluid to the interior surface of the tire. A fluid supply mechanism is connected to the applicator such that the fluid may be delivered to the inner surface of the tire.

[0008] In yet another embodiment, the present invention provides a device for the application of a lubricant to an inner surface of a tire. The tire is configured for mounting on a wheel and has an inboard bead, an outboard bead, and a summit. This exemplary embodiment of the present invention includes a derailleur for insertion between the outboard bead of the tire and the wheel. The derailleur is configured for maintaining separation between the tire and wheel as such are rotated. Also included are a pair of guides, with the derailleur being connected to the pair of guides and slidable such that the derailleur may be selectively positioned into the interior of the tire between the outboard bead and the wheel. A wand is provided in mechanical communication with the derailleur. A wand includes at least one aperture at a first end whereby the lubricant may be applied to the inner surface of the tire. The wand also includes at least one inlet at a second end whereby the lubricant may be supplied to the wand. A lubricant supplier is also provided that is in fluid communication with the inlet at the second end of the wand. The present invention also provides a method for applying a fluid to an inner surface of a tire having a support ring. In one exemplary example of this method, a support ring is inserted into a tire having a first bead, a second bead, and a summit. The tire and support ring are mounted onto a wheel. The first bead is positioned onto the first bead seat of the wheel. A derailleur is inserted between the second bead and the wheel. A wand is lowered from the derailleur and into the interior of the tire at a position adjacent to the interior surface of the tire at the summit. The tire and wheel are rotated while a predetermined amount of gel is expelled onto the interior surface of the tire along the summit. The wand is retracted and the derailleur is then removed from the interior of the tire.

[0009] These and other features, aspects and advantages of the present invention will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in this specification, which makes reference to the appended figures, in which:

[0011] FIG. 1 is a perspective view of an exemplary embodiment of the present invention, illustrated in a retracted position, and including an exemplary derailer.

[0012] FIG. 2 is a perspective view of certain components of the exemplary embodiment of FIG. 1, illustrated in a retracted position and viewed from the side used to address a tire.

[0013] FIG. 3A is a perspective view of an exemplary embodiment of a fluid cartridge, magazine, and pneumatic cylinder as may be used with the present invention.

[0014] FIG. 3B is a side view of the components illustrated in FIG. 2A with phantom lines illustrating operation as will be described below.

[0015] FIG. 4A is a top view of the exemplary embodiment of the present invention shown in FIG. 1, illustrated in a retracted position.

[0016] FIG. 4B is a top view of the exemplary embodiment of the present invention shown in FIG. 1, illustrating movement from the retracted position towards a deployed position.

[0017] FIG. 4C is a top view of the exemplary embodiment of the present invention shown in FIG. 1, illustrated in a fully rotated position.

[0018] FIG. 4D is a top view of the exemplary embodiment of the present invention shown in FIG. 1, illustrating extension of the derailer towards the deployed position.

[0019] FIG. 4E is a top view of the exemplary embodiment of the present invention shown in FIG. 1, illustrating the down position of the derailer, which is the position the derailer would occupy when inserted into a tire.

[0020] FIG. 4F is a top view of the exemplary embodiment of the present invention shown in FIG. 1, illustrating the fully deployed position of the derailer, including the deployed position of an exemplary wand.

[0021] FIG. 5A is a bottom view of an exemplary embodiment of the present invention, illustrating the position of an exemplary wand prior to deployment.

[0022] FIG. 5B is a bottom view of an exemplary embodiment of the present invention shown in FIG. 5A, illustrating deployment of the wand.

[0023] FIG. 5C is a bottom view of an exemplary embodiment of the present invention shown in FIG. 5A, illustrating the fully deployed position of the wand.

[0024] FIG. 6 is a partial cross-sectional view of an exemplary embodiment of the present invention, illustrating the application of a layer of fluid to an interior surface of a tire assembly having a wheel, tire, and support ring.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] The present invention provides a tool for applying a fluid to an interior surface of a tire, and a method for applying a fluid to an interior surface of a tire. The invention may be used, for example, to apply a thin film of lubricant to the interior surface of a tire at the summit where contact with a support ring may occur during run-flat conditions. The invention may also be used, in certain embodiments, to provide for application of a predetermined amount of fluid to an interior surface of a tire. Reference will now be made in detail to embodiments of the present invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, and not meant as a limitation of the invention. For example, features illustrated or described as part of one embodiment can be used with another embodiment to yield still a third embodiment. It is intended that the present invention include these and other modifications and variations.

[0026] An exemplary embodiment of a fluid application tool 20 is depicted in FIG. 1. As shown in FIG. 1, tool 20 is in a retracted or non-deployed position. FIG. 2 illustrates portions of tool 20 in the retracted position, as viewed from the side that would face a tire. FIG. 4A illustrates a top view of tool 20 in the retracted position. Tool 20 is mounted to pole 12 of a typical tire mounting station (not shown) using clamp 14. A pair of support arms 16 and 18 are pivotally mounted to clamp 14 so that tool 20 can be selectively rotated towards or away from a tire. Rotating movement towards a tire is illustrated by FIGS. 4A through 4C and by arrow A in

FIG. 4B. A handle 21 is provided for manually rotating tool 20 as described. Various assemblies can be used to support tool 20 and provide for its positioning towards and away from a tire; the use of guide arms 16 and 18 is by way of example only.

[0027] As illustrated in FIG. 1, FIG. 3, and FIG. 6, fluid application tool 20 includes a separator or derailer 22 that is shaped for insertion between the outboard bead 24 of a tire 26 and a wheel 28 onto which tire 26 will be mounted. During the application of a lubricant 29 or other fluid to an interior surface of tire 26, such as surface 30 adjacent to summit 32 of tire 26, derailer 22 rides along outboard bead 24 and immediately adjacent to wheel 28 as tire 26 and wheel 28 are rotated. As such, derailer 22 maintains separation between wheel 28 and outboard bead 24 for the insertion of an applicator or wand 34 that applies lubricant 29.

[0028] Support arms 16 and 18 are configured with clamp 14 so that tool 20 may only be rotated 90 degrees towards tire 26. This ensures that derailer 22 is properly oriented relative to tire 26. More specifically, derailer 22 may be rotated into a position such that forward surface 36 (FIG. 4A) of derailer 22 is substantially parallel to outboard surface 38 (FIG. 6) of wheel 28.

[0029] As illustrated by arrow B in FIG. 4D, extension arms 40 and 41 allow derailer 22 to be slid towards tire 26 to close the distance remaining between tire 26 and derailer 22 after the rotation illustrated in FIG. 4B. Extension arms 40 and 41 are received within an extension arm housing 42, which guides and supports arms 40 and 41. Handle 44 may be used to slide the derailer 22 towards tire 26. Housing 42 is rotatably connected to support arms 16 and 18 to enable the rotation previously described with regards to FIG. 4B.

[0030] After being positioned adjacent to tire 26 as previously described, derailer 22 must be inserted downwardly into the space between tire 26 and wheel 28 such that the derailer maintains a separation between wheel 28 and outboard bead 24. A pair of guide elements 46 and 48 provide for and direct this movement. As shown, for example, in FIG. 4D, guide block 50 is connected to extension arms 40 and 41. Guide block 50 also defines a pair of apertures 52 and 54, which are shown in FIGS. 5A, 5B, and 5C. Guide elements 46 and 48 extend through guide block 50 and are slidably movable within apertures 52 and 54. A retainer 56 is attached to the ends of guide elements 46 and 48 to assist in maintaining their relative positions and to provide a hard stop for the movement of elements 46 and 48. Using handle 44, guide elements 46 and 48

may be selectively slid up or down within so as to allow for the selective positioning of derailer 22 within tire 26. A magnet 57, or other magnetized material, is positioned on guide block 50. As such, derailer 22 may be selectively held in place, up and away from tire 26, as magnet 57 attaches itself to retainer 56. Other mechanisms can be envisioned, using the teachings disclosed herein, for securing derailer 22 into place. For example, a latch could also be used.

[0031] Once derailer 22 is placed within tire 26, wand 34 is deployed as shown in FIG. 4F, FIGS. 5A through 5C, and FIG. 6. Wand 34 includes a slot-shaped aperture 60 through which lubricant 29 is expelled. Aperture 60 is located along L-shaped end 62, which is deployed from a recess 64 in the bottom surface 66 of derailer 22. Recess 64 serves to safely house L-shape end 62 and thereby prevent wand 34 from obstructing the insertion or removal of derailer 22 relative to tire 26.

[0032] Wand 34 is received within a cam 68 attached to derailer 22. Cam 68 defines a groove 70 for the receipt of a cam follower 72 attached to wand 58. Accordingly, referring specifically to FIGS. 5A, 5B, and 5C, as wand 34 is deployed downwardly into the interior of tire 36 after proper placement of derailer 22, cam follower 72 moves along groove 70 to cause L-shaped end 62 to rotate into the proper position for the application of lubricant 29. Similarly, after lubricant 29 has been applied, wand 58 is retracted into the derailer. The action of cam follower 72 along groove 70 causes L-shaped end 62 to rotate into the proper position for receipt into recess 64.

[0033] Certain embodiments of the present invention include a lubricant supply assembly 100 (FIGS. 3A and 3B) for supplying lubricant 29 (or another selected fluid) to wand 34. Assembly 100 includes magazine 102 for the receipt of a replaceable cartridge 104 containing the desired lubricant 29. Magazine 102 is connected to wand 34 by means of a connecting supply hose 106 and fittings 108 and 110 (FIG. 1 and FIG. 3B). Accordingly, lubricant 29 travels from cartridge 104, through fitting 110, supply hose 106, fitting 108, and then into wand 34 where it is eventually expelled through aperture 60.

[0034] In order to supply pressure to force lubricant 29 from cartridge 104, a motor 112 is provided. As shown in FIGS. 3A and 3B, for example, motor 112 is an air-operated cylinder that is connected to a pressurized air supply through air supply lines 114 and 116. However,

multiple other types of motors or power sources may be used including, by way of example only, solenoids, electric motors, or hydraulic cylinders.

[0035] Motor 112 is rotatably connected at one end to a stationary bracket 118. The output shaft 120 is attached to rocker arm 122, which rotates about its pivot connection 124 as indicated by arrow C. Rocker arm 122 is also in mechanical communication with piston rod 126, which in turn is attached to piston 128. As air is supplied to motor 112, output shaft 120 is forced out, which in turn pushes upon rocker arm 122. As rocker arm 122 rotates about pivot connection 124, piston rod 126 is depressed so as to cause piston 128 to apply pressure upon lubricant 29 in cartridge 104 (movement is demonstrated by the phantom lines in FIG. 3B). As rocker arm 122 depresses piston rod 126, eventually limit switch actuator 125 makes contact with limit switch 130. Upon such contact, switch 130 signals the end of the stroke cycle for piston 128 and motor 112 is then signaled to reset by retracting shaft 120. During such retraction, a pawl 132 eventually locks the rocker arm 122 into the ready position for the next cycle by resting upon one of the plurality of ridges 134 defined by piston rod 126.

[0036] The speed of rocker arm 122 is adjusted so that the stroke cycle of piston rod 126 corresponds to one revolution of tire 26. More specifically, tire 26 is rotated as lubricant 29 is applied. To effect the application of a substantially uniform layer to the interior surface of tire 26, the speed of rocker arm 122 is adjusted so that one stroke of piston rod 126 occurs over the time for one revolution of tire 26. Other timing sequences may be utilized, however, as will be appreciated by one of ordinary skill in the art using the teachings disclosed herein.

[0037] The dosage of lubricant 29 applied to tire 26 is adjusted through manipulation of T-pin 136. For the exemplary embodiment of the invention being described, rocker arm 122 includes a series of apertures 138, 140, and 142 (FIG. 1) for the insertion of T-pin 136. Different apertures provide a different overall stroke length for the cycle of piston rod 126 and, therefore, a different amount of lubricant 29 may be selected for application to the interior of tire 26. By way of example only, dosages of 60cc, 80cc, or 100 cc may be selected using T-pin 136 and one of apertures 138, 140, or 142.

[0038] Using the fluid application tool 20 described above, an exemplary process according to the present invention for applying a fluid to the interior of tire 26 is now more

particularly described. First, fluid application tool 20 is placed into the retracted position. Next, wheel 28 is mounted onto the spindle 31 of a tire-mounting machine. If not already present, a support ring 33 is placed within the interior of tire 26. Tire 26 and support ring 33 are then mounted onto wheel 28, and support ring 33 is seated into its position on wheel 28. Inboard bead 25 is then mounted onto inboard bead seat 27 of wheel 28, which is secured to the spindle 31 of the tire-mounting machine. Using handle 21, derailer 22 is then rotated towards tire 26 as illustrated by arrow A in FIG. 4B. Using handle 44, derailer 22 is then slid towards tire 26 as illustrated by arrow B in FIG. 4D until derailer 22 is substantially adjacent to tire 26 and wheel 28. Derailer 22 is then inserted to a position that is between the outboard bead 24 of tire 26 and wheel 28 as shown in FIG. 6. Wand 34 is then lowered from aperture 60 until it firmly rests on the interior surface 30 of tire 26. As it is being lowered, the L-shaped end 62 of wand 34 rotates into position for the application of lubricant 29. The tire 26 and wheel 28 assembly are then rotated while lubricant 29 is expelled from wand 34 at a uniform rate. Wand 34 is then retracted into recess 64 in derailer 22, and derailer 22 may be then removed from tire 26.

[0039] The above method of applying lubricant 29 is exemplary only. Other methods and techniques for applying a fluid, such as lubricant 29 or a gel, will be understood by one of ordinary skill in the art using the teachings disclosed herein. Similarly, fluid application tool 20 described above serves only as an illustrative, exemplary embodiment of the present invention set forth the claims that follow.

[0040] Tool 20 can be provided in conjunction with a standard tire mounting machine or sold as an after-market add-on to such machine. The tool 20 may be used by original equipment manufacturers or in the after-market service environment. Other features, such as the automation of the rotation of support arms 16 and 19 or the extension of arms 40 and 41 may be added as will be appreciated by one of ordinary skill in the art using the teachings disclosed herein.

[0041] As demonstrated above with the exemplary embodiment of tool 20, the present invention allows for the application of a fluid or other lubricant 29 to tire 26 at or near the end of the tire mounting process. As such, the risk of undesirable contamination of tire mounting surfaces such as the bead seats of wheel 28 is minimized or even avoided. Furthermore, tires can

be shipped with support rings already placed within the tire because tool 20 allows for application of a fluid to the interior surface of a tire even when the ring is present. Pre-inserted support rings would also help to minimize improper orientation of a support ring within the tire by, for example, service technicians or other after-market personnel.

[0042] In addition, the present invention allows for the consistent and even application of a predetermined amount of lubricant to the interior surface of tire 30. This provides a substantial improvement over applying lubricant 29 by hand. Also, cartridge 104 of lubricant supply assembly 100 is readily replaceable, which allows for easily replenishing spent cartridges or substitution of different fluids as needed or desired. Using the teachings disclosed herein, one of ordinary skill in the art will also appreciate the other assemblies may be used for supplying fluid including, by way of example only, metering from drums or tote bins if desired.

[0043] The above description is provided by way of illustration and not limitation of the present invention. It should be understood that the present invention includes various modifications that can be made to the exemplary embodiment of fluid application tool 20 and the process for applying a lubricant to an interior surface of a tire as described herein and as set forth within the scope of the appended claims that follow and their equivalents.

WHAT IS CLAIMED IS:

1. A device for applying a fluid to an interior surface of a tire to be mounted on a wheel, the tire having at least one bead, the device comprising:
 - a derailleur for placement between the bead of the tire and the wheel;
 - a guide element configured with said derailleur for selectively positioning said derailleur
 - 5 within the interior of the tire and adjacent to the bead; and
 - a wand in mechanical communication with said derailleur, said wand having an end adapted for application of the fluid, said wand configured for deployment from said derailleur towards the interior surface of the tire.
2. A device for applying a fluid to an interior surface of a tire as in claim 1, further comprising a fluid supply mechanism in fluid communication with said wand and configured for the delivery of the fluid.
3. A device for applying a fluid to an interior surface of a tire as in claim 2, wherein said fluid supply mechanism comprises:
 - a supply of fluid; and
 - a means for applying pressure to said supply of fluid so as to deliver a predetermined
 - 5 volume of fluid to the interior surface of the tire.
4. A device for applying a fluid to an interior surface of a tire as in claim 3, further comprising a motor connected to said piston and configured for powering said piston.
5. A device for applying a fluid to an interior surface of a tire as in claim 4, wherein said motor is selected from the group consisting of a solenoid, an electric motor, a hydraulic cylinder, or a pneumatic cylinder.

6. A device for applying a fluid to an interior surface of a tire as in claim 1, wherein said fluid supply mechanism comprises means for applying a predetermined amount of fluid to the interior surface of the tire.
7. A device for applying a fluid to an interior surface of a tire as in claim 1, wherein said derailer defines a recess for the receipt of said wand.
8. A device for applying a fluid to an interior surface of a tire as in claim 1, further comprising
- a cam for the receipt of said wand, said cam defining a groove; and
 - a follower connected to said wand and positioned within said groove;
- 5 wherein said groove is configured such that as said wand is deployed, said follower moves along said groove so as to cause said wand to rotate into position for the application of the fluid to the interior surface of the tire.
9. A device for applying a fluid to an interior surface of a tire as in claim 1, further comprising a
- an extension arm connected to said derailer; and
 - a rotatably-mounted support arm to which said extension arm is connected;
- 5 whereby said derailer may be positioned adjacent to the tire by operation of said support arm and said extension arm.
10. A device for applying a fluid to an interior surface of a tire as in claim 1, further comprising means for selectively locking said derailer into a position adjacent the tire for application of the fluid or into a position retracted from the tire.
11. A tool for applying a fluid to an inner surface of a tire that is to be mounted on a wheel, the wheel having a bead, the tool comprising:
- a guide element;

5 a separator movably mounted with said guide element such that said separator may be selectively positioned within the tire between the bead and the wheel, said separator defining a recess;

an applicator connected to said separator, said applicator having at least one aperture located along one end for the delivery of fluid to the interior surface of the tire, said end being received at least partially within said recess of said separator when said applicator is not
10 deployed; and

a fluid supply mechanism connected to said applicator such that the fluid may be delivered to the inner surface of the tire.

12. A tool for applying a fluid to an inner surface of a tire as set forth in claim 11, wherein said fluid supply mechanism comprises:

a magazine configured for the receipt of a cartridge containing the desired fluid; and

a piston movably mounted upon said magazine and adapted for applying pressure to the
5 fluid within the cartridge.

13. A tool for applying a fluid to an inner surface of a tire as set forth in claim 12, wherein said fluid supply mechanism further comprises an air cylinder in mechanical communication with said piston and configured for moving said piston along said magazine.

14. A tool for applying a fluid to an inner surface of a tire as set forth in claim 12, wherein said fluid supply mechanism further comprises a solenoid in mechanical communication with said piston and configured for moving said piston along said magazine.

15. A tool for applying a fluid to an inner surface of a tire as set forth in claim 12, further comprising:

at least one follower attached to said applicator; and

a cam configured for receipt of said applicator, said cam defining a groove for receipt of
5 said follower;

whereby as said applicator is deployed away from said separator, said follower moves
along said groove and causes said applicator to rotate into a position such that said end of said
applicator is adjacent to the inner surface of the tire.

16. A tool for applying a fluid to an inner surface of a tire as set forth in claim 12, further
comprising:

a pair of extension arms connected to said separator; and
a rotatably-mounted pair of support arms to which said extension arms are connected;
5 whereby said separator may be positioned adjacent to the tire.

17. A device for the application of a lubricant to an inner surface of a tire; the tire being
configured for mounting on a wheel; the tire having an inboard bead, an outboard bead, and a
summit; the device comprising:

a derailleur for insertion between the outboard bead of the tire and the wheel, said derailleur
5 configured for maintaining separation between the tire and wheel as such are rotated;

a pair of guides, said derailleur being connected to said pair of guides and slidable such that
said derailleur may be selectively positioned into the interior of the tire between the outboard bead
and the wheel;

a wand in mechanical communication with said derailleur, said wand including at least one
10 aperture at a first end whereby the lubricant may be applied to the inner surface of the tire, said
wand including at least one inlet at a second end whereby the lubricant may be supplied to said
wand; and

a lubricant supplier in fluid communication with said inlet.

18. A device for the application of a lubricant to an inner surface of a tire as in claim 17,
wherein said wand is slidably received within an aperture defined by said derailleur; and
wherein said derailleur also defines a recess for the receipt of said first end of said wand.

19. A device for the application of a lubricant to an inner surface of a tire as in claim 18, further comprising:
- a cam follower located upon said wand;
 - a cam connected to said derailleur and in mechanical communication with said follower,
 - 5 said cam configured such that as said first end of said wand slides out of said recess and towards the inner surface of the tire, said wand rotates so that said first end is in a predetermined position for the application of the lubricant to the inner surface of the tire located at the summit.
20. A device for the application of a lubricant to an inner surface of a tire as in claim 19, wherein said lubricant supplier comprises:
- a cartridge containing the lubricant;
 - a magazine for the receipt of said cartridge; and
 - 5 a motor in mechanical communication with said magazine and configured for powering said magazine so that a predetermined amount of lubricant may be expelled through said first end of said wand and onto the inner surface of the tire.
21. A device for the application of a lubricant to an inner surface of a tire as in claim 20, wherein said motor is selected from the group consisting of an electric motor, a solenoid, a hydraulic cylinder, or a pneumatic cylinder.
22. A tool for applying a fluid to an inner surface of a tire as set forth in claim 21, further comprising:
- a slidable arm connected to said derailleur; and
 - a rotatably-mounted guide arm to which said slidable arm is connected;
 - 5 whereby said derailleur may be positioned adjacent to the tire.
23. A method for applying a fluid to an inner surface of a tire having a support ring; the tire having a first bead, a second bead, and a summit; the method comprising the steps of:

- inserting a support ring into the tire;
mounting the tire and support ring onto a wheel;
5 positioning the first bead onto a first bead seat of the wheel;
inserting a derailleur between the second bead and the wheel;
lowering a wand from the derailleur, into the interior of the tire, and adjacent the interior
surface of the tire at the summit;
rotating the tire and wheel;
10 expelling a predetermined amount of gel onto the interior surface of the tire along the
summit;
retracting the wand; and
removing the derailleur from the interior of the tire.

24. A method for applying a fluid to an inner surface of a tire as in claim 23, wherein said fluid is a lubricant.

25. A method for applying a fluid to an inner surface of a tire as in claim 24, further comprising the step of applying a coating of mounting lube to the derailleur.

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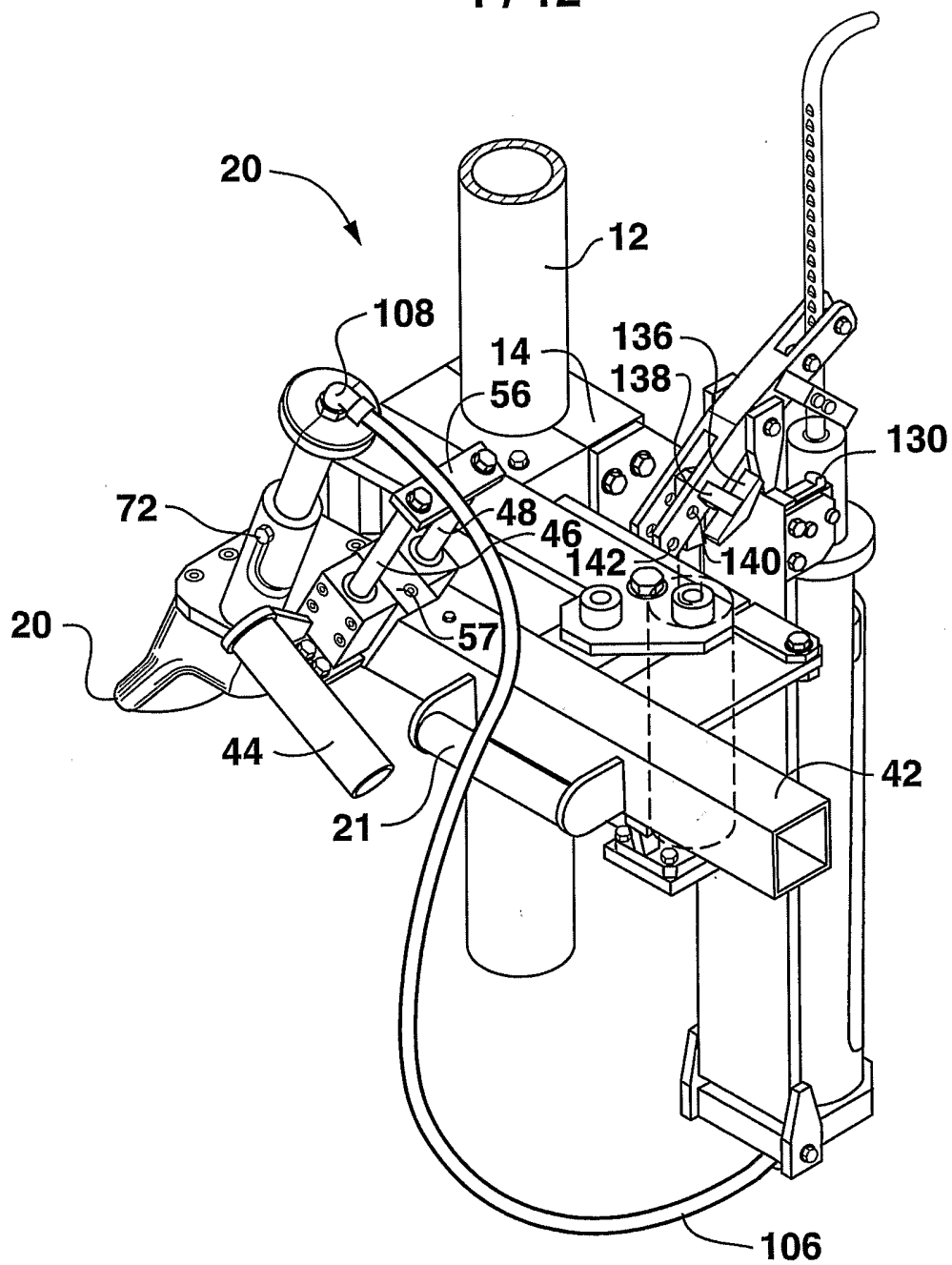
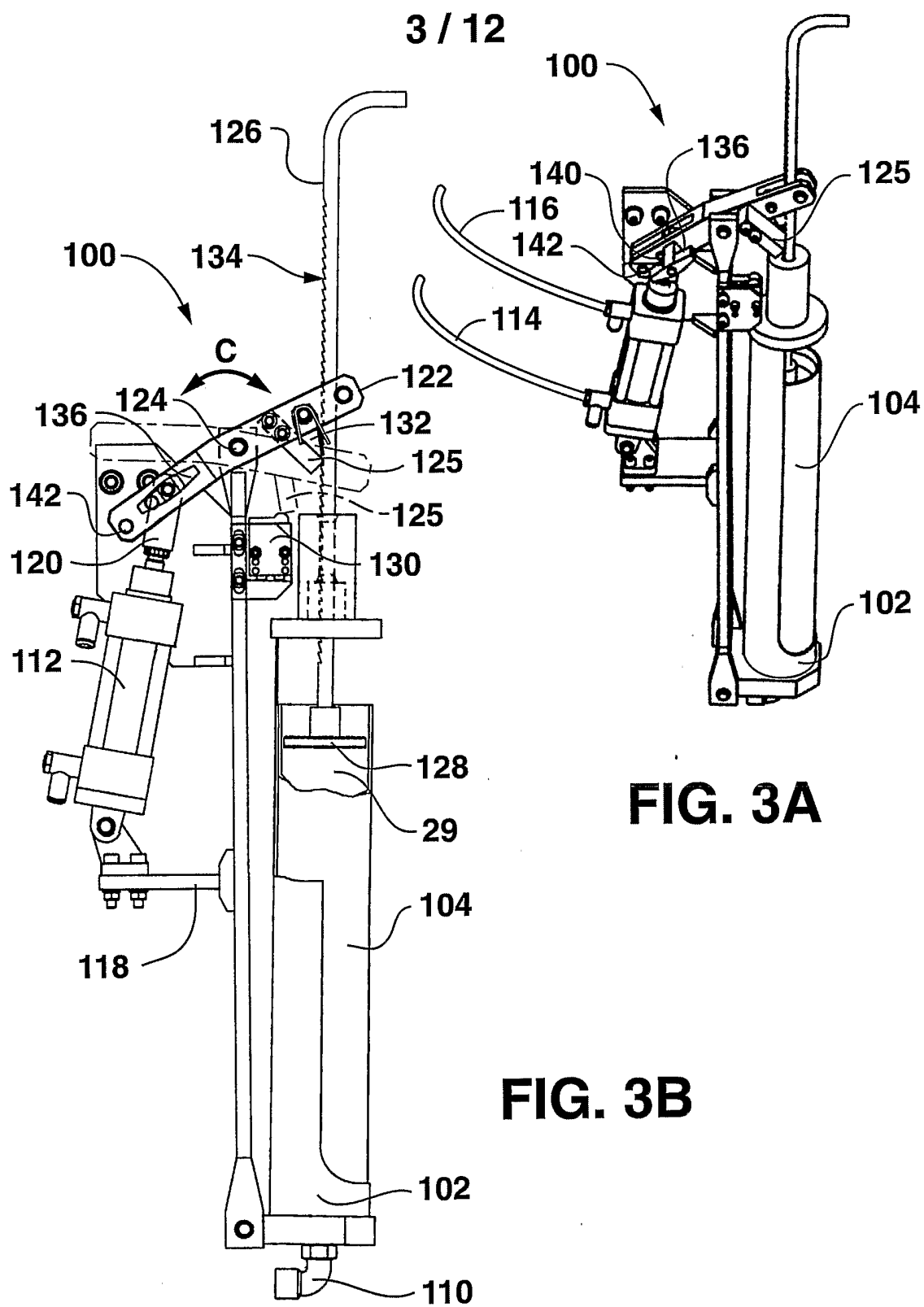


FIG. 1



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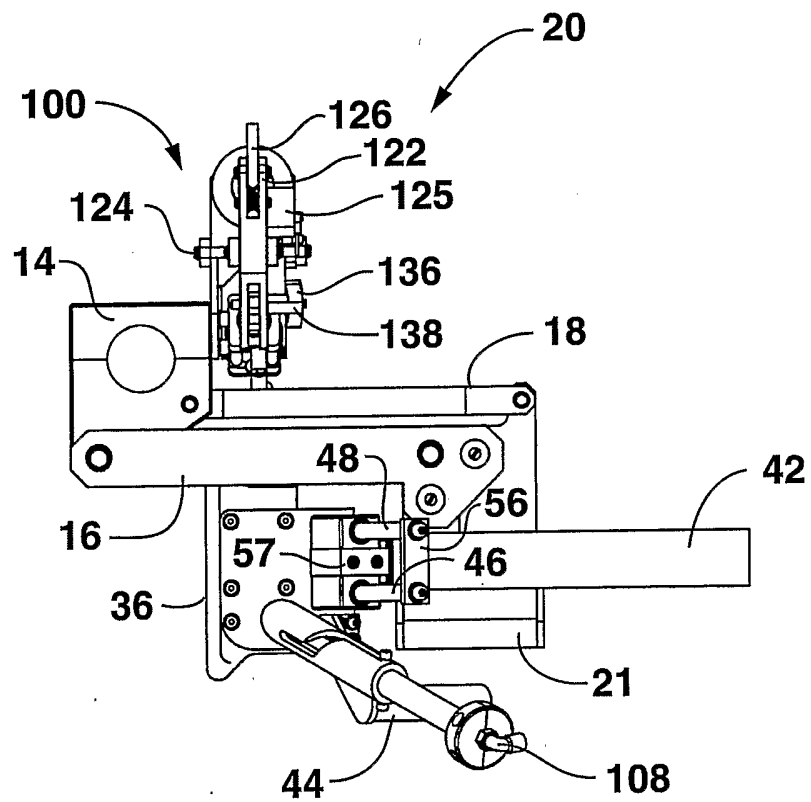


FIG. 4A

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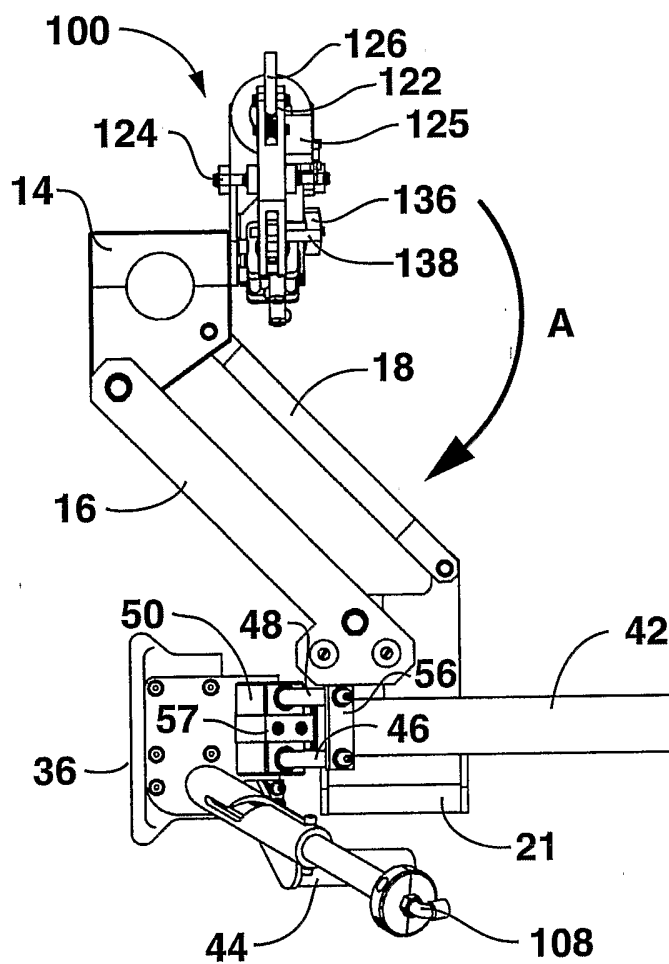


FIG. 4B

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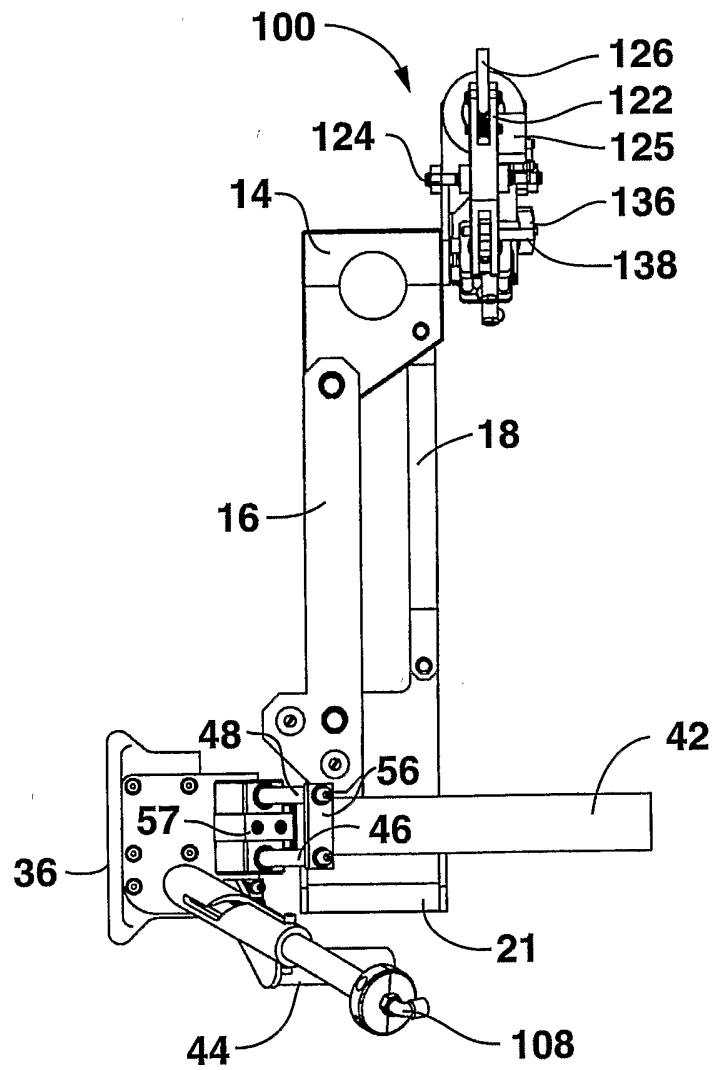


FIG. 4C

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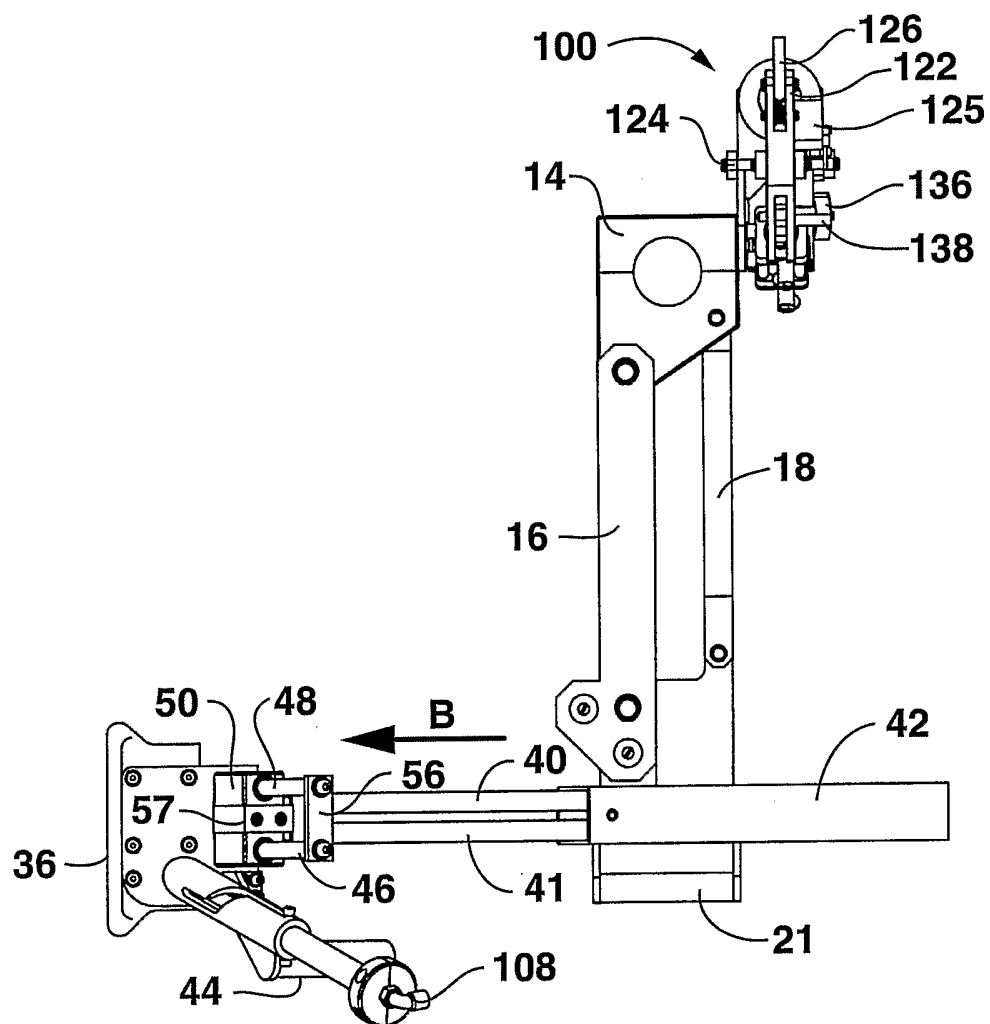


FIG. 4D

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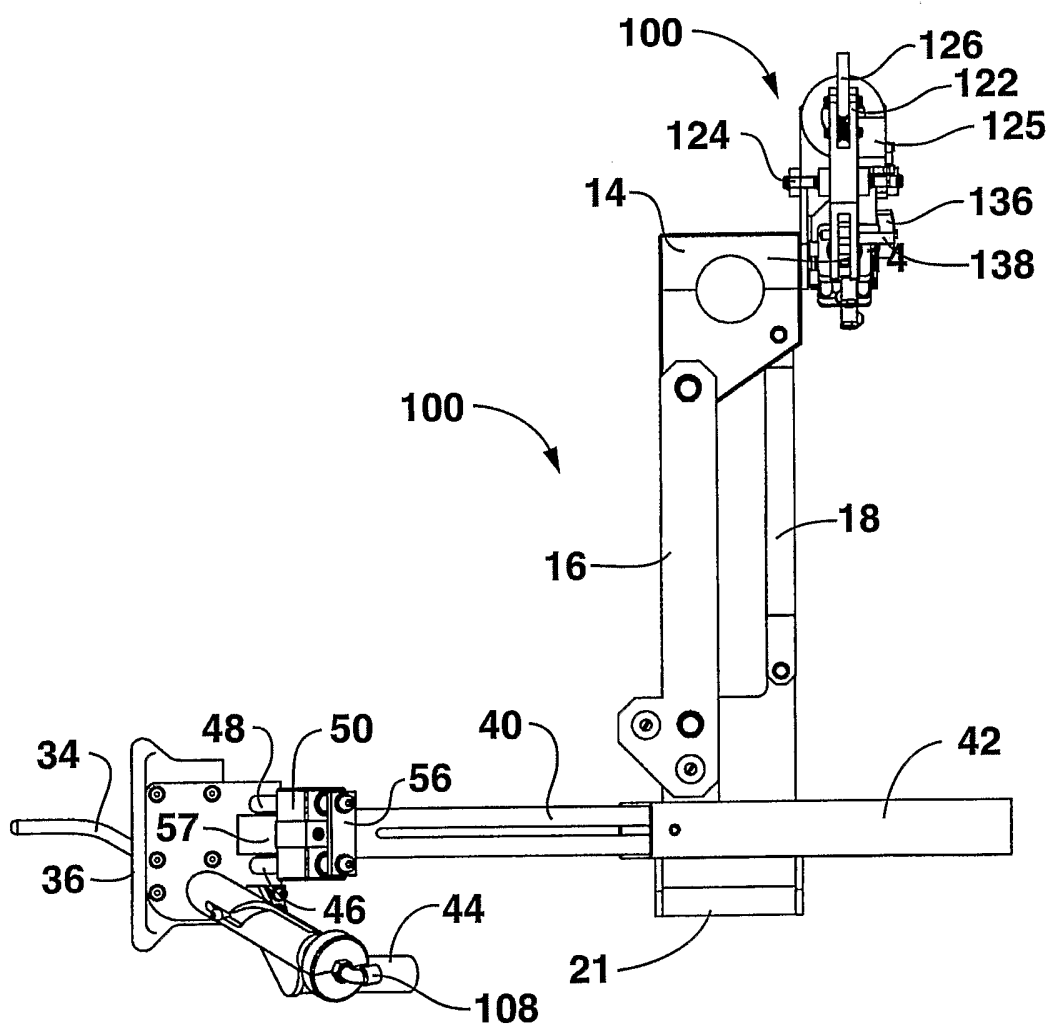
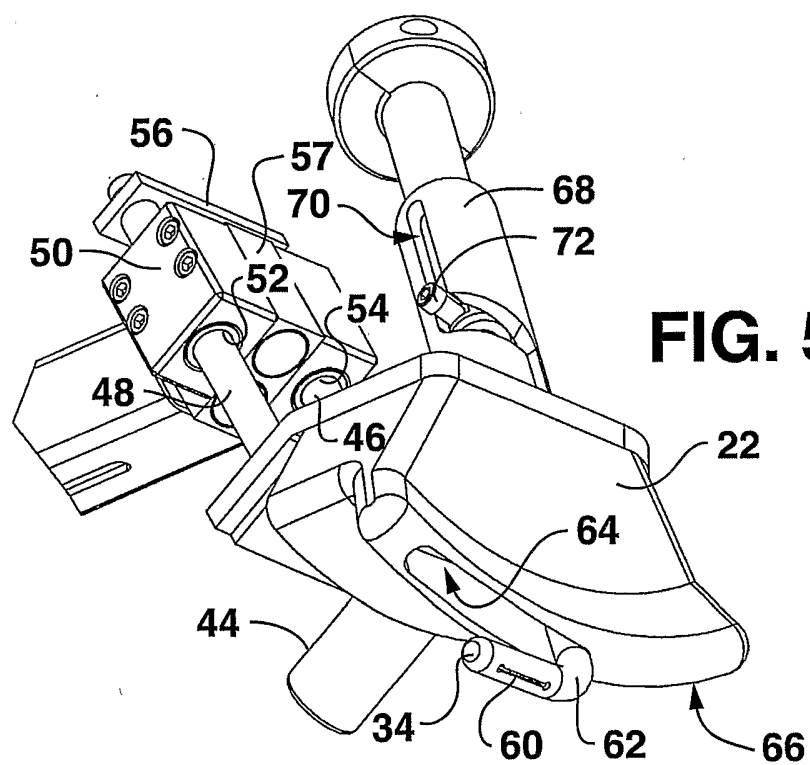
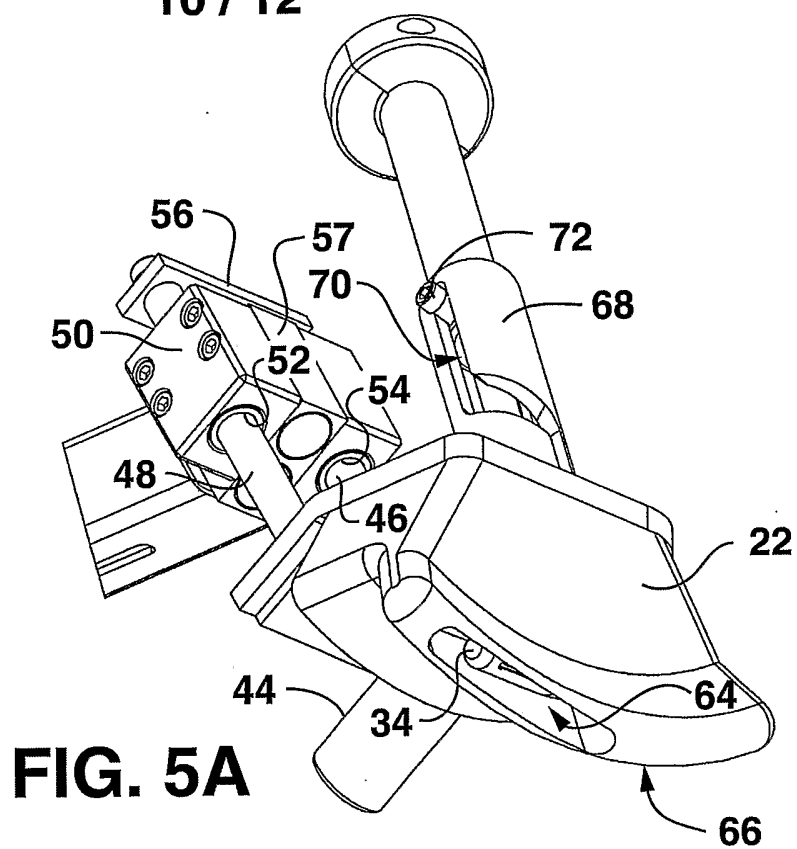


FIG. 4F

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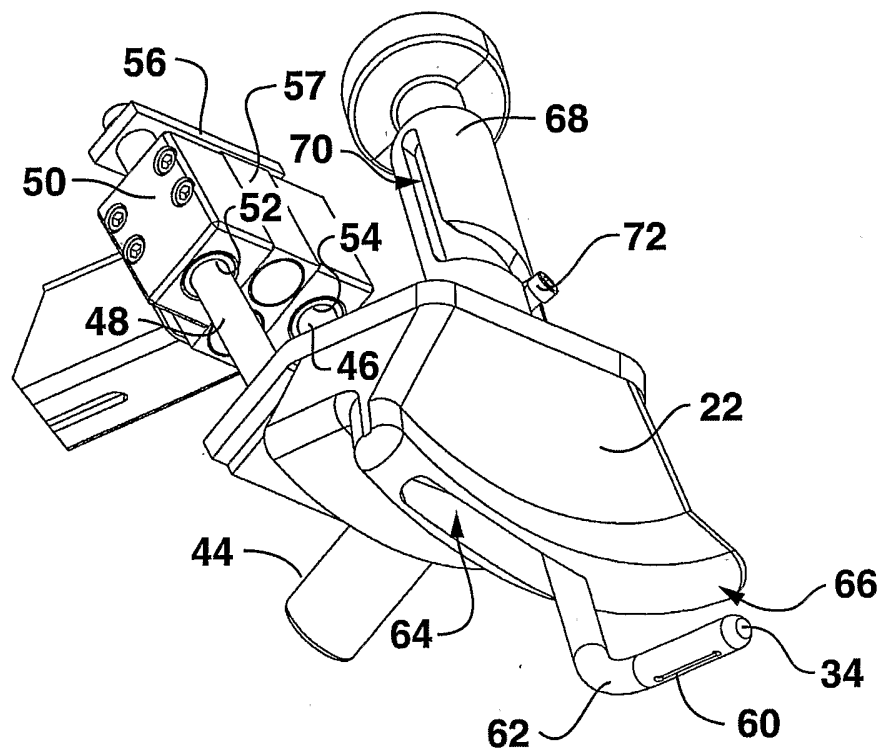


FIG. 5C

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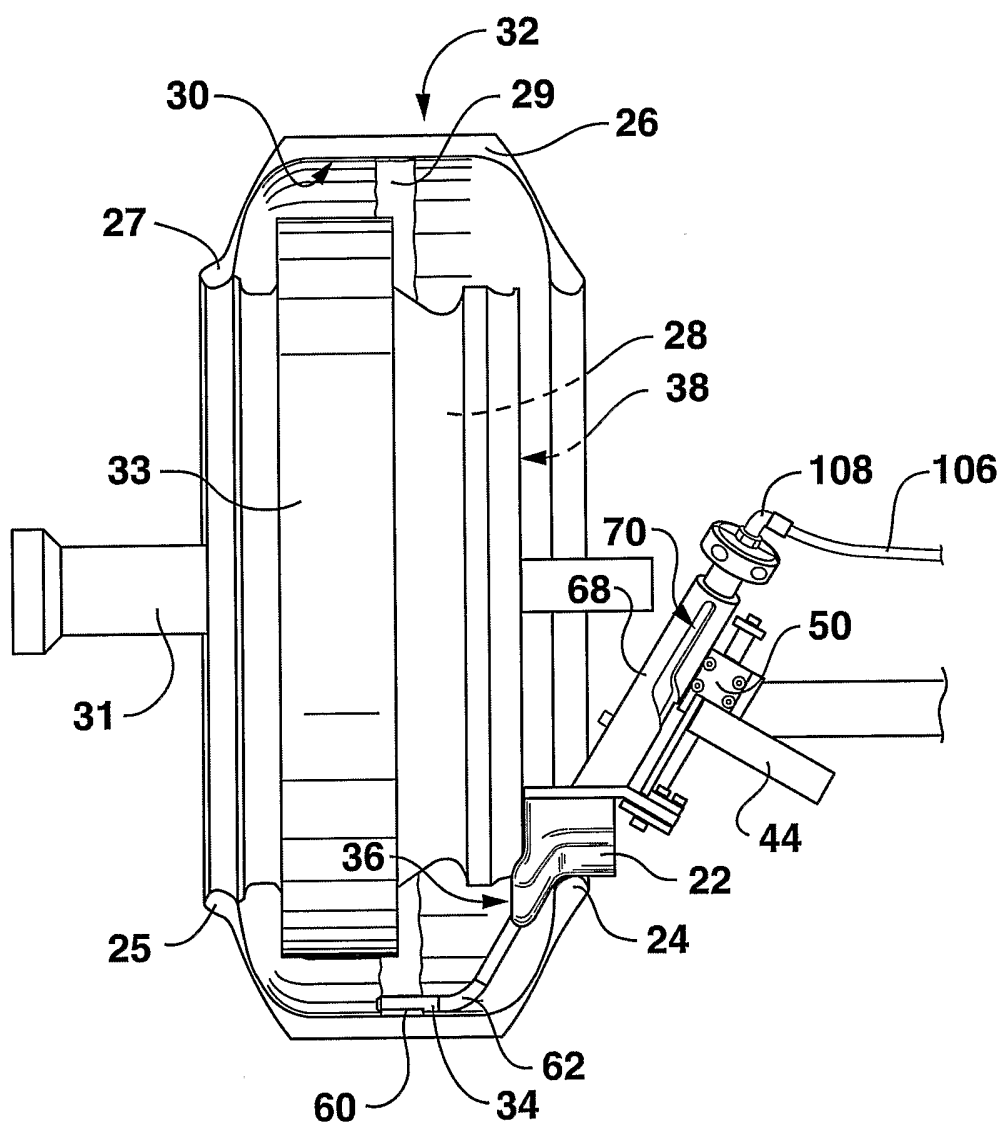
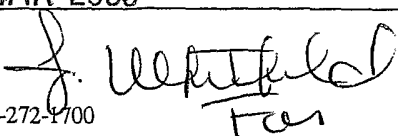


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/23264

A. CLASSIFICATION OF SUBJECT MATTER IPC(7) : B05C 5/02; B60B 29/00; B61K 5/00 US CL : 118/323, 410, 500; 157/1.1; 184/3.1, 3.2 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) U.S. : 118/323, 410, 500; 157/1.1; 184/3.1, 3.2 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EAST		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,728,220 A (CURCURI ET AL) 17 March 1998 (17.03.98), col. 4, lines 43-61.	1-25
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents:		
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"E"	earlier application or patent published on or after the international filing date	"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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"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	
Date of the actual completion of the international search 09 February 2005 (09.02.2005)		Date of mailing of the international search report 02 MAR 2005
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230		Authorized officer Laura Edwards  Telephone No. 571-272-1700