(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 December 2009 (23.12.2009)

PCT

(10) International Publication Number
WO 2009/155503 A2

(51) International Patent Classification:
B60C 25/12 (2006.01) *B60C 25/00* (2006.01)
B60C 25/05 (2006.01)

(21) International Application Number:
PCT/US2009/047933

(22) International Filing Date:
19 June 2009 (19.06.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/074,414 20 June 2008 (20.06.2008) US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

WO 2009/155503 A2

(54) **Title**: VERTICAL STACK PRESENTER FOR PRESENTING INFLATOR RING

(57) **Abstract**: An apparatus (10) for processing a tire-wheel assembly (TW) including a tire (T) and a wheel (W) is disclosed. The apparatus (10) includes an inflating portion (108) including an indexing rack (28) including a plurality of inflator heads (38) removably-secured to the indexing rack; and an inflator platen (20), wherein one or more inflator heads (38a-38c) of the plurality of inflator heads (38) are selectively interfacable with the inflator platen (20). A method is also disclosed.

VERTICAL STACK PRESENTER FOR PRESENTING INFLATOR RING

FIELD OF THE INVENTION

[0001] The disclosure relates to tire-wheel assemblies and to a method and apparatus for processing a tire-wheel assembly.

DESCRIPTION OF THE RELATED ART

[0002] It is known in the art that a tire-wheel assembly is processed in several steps. Usually, conventional methodologies that conduct such steps require a significant capital investment and human oversight. The present invention overcomes drawbacks associated with the prior art by setting forth a device utilized for processing a tire-wheel assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] The disclosure will now be described, by way of example, with reference to the accompanying drawings, in which:

[0004] Figure 1A illustrates a side view of an apparatus for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0005] Figure 1B illustrates a front view of an apparatus for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0006] Figure 2A illustrates another side view of the apparatus of Figure 1A for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0007] Figure 2B illustrates another front view of the apparatus of Figure 1B for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0008] Figure 3A illustrates a top view of the apparatus of Figures 1A-2B for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0009] Figure 3B illustrates another top view of the apparatus of Figure 3A for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0010] Figure 3C illustrates another top view of the apparatus of Figure 3B for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0011] Figure 3D illustrates another top view of the apparatus of Figure 3C for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0012] Figure 4A illustrates a side view of the apparatus of Figures 1A-3D for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0013] Figure 4B illustrates a front view of the apparatus of Figures 1A-3D for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0014] Figures 5A-5F illustrate a portion of an inflator assembly in accordance with an exemplary embodiment of the invention;

[0015] Figure 6A illustrates another side view of the apparatus of Figure 4A for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention;

[0016] Figure 6B illustrates another front view of the apparatus of Figure 4B for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention; and

[0017] Figure 7 illustrates a perspective view of an apparatus and method for processing a tire-wheel assembly in accordance with an exemplary embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The Figures illustrate an exemplary embodiment of an apparatus and method for processing a tire-wheel assembly in accordance with an embodiment of the invention. Based on the foregoing, it is to be generally understood that the nomenclature used herein is simply for convenience and the terms used to describe the invention should be given the broadest meaning by one of ordinary skill in the art.

[0019] Referring initially to Figures 1A-1B, an apparatus for processing a tire-wheel assembly is shown generally at 10 according to an embodiment. Functionally, the apparatus 10 inflates a non-inflated tire-wheel assembly, which is shown generally at TW_{NI}.

[0020] According to an embodiment, the apparatus 10 may include one or more of an inflator portion 12 and a tire-wheel assembly support portion 14. According to an embodiment, the inflator portion 12 may be generally defined to include a plurality of leg portions 16 that supports one or more overhead beams 18. According to an embodiment, the

one or more overhead beams 18 may support an inflator platen, which is shown generally at 20. According to an embodiment, the support portion 14 may be generally referred to as a cart including a support surface 22 connected to a plurality of legs 24 and wheels 26.

[0021] It will be appreciated, however, that the apparatus 10 is not limited to include a cart 14. As will be described in the foregoing disclosure at Figure 7, in an embodiment, an apparatus 100 for processing a tire-wheel assembly may include a robotic arm 152 that interfaces with a tire-wheel assembly.

[0022] As seen in Figures 1A-2B, one or more of the plurality of legs 16 of the inflator portion 12 may interface with a vertically-adjustable indexing rack, which is shown generally 28. In an embodiment, the indexing rack 28 may be connected to an indexing screw 30 and a motor 32 for driving the screw 30. In an embodiment, the one or more overhead beams 18 support the indexing screw 30 and the motor 32.

[0023] According to an embodiment, one or more of the plurality of legs 16 of the inflator portion 12 may include a plurality of rollers 34. Functionally, the rollers 34 guide the indexing rack 28 as it is vertically adjusted by the indexing screw 30.

[0024] In an embodiment, the indexing rack 28 may include a plurality of slots, which are shown generally at 36, for retaining a plurality of inflator heads 38. Each slot of the plurality of slots 36 retains one inflator head of the plurality of inflator heads 38. According to an embodiment, three inflator heads are shown generally at 38a-38c. Functionally, each inflator head 38a-38c may be selectively-coupled with the inflator platen 20 (see, e.g., Figures 4A-4B).

[0025] In an embodiment, the plurality of legs 16 of the inflator portion 12 may also include a horizontally-adjustable towing portion, which is shown generally at 40. According to an embodiment, the towing portion 40 may be slidably-disposed upon a track 42.

[0026] In an embodiment, the track 42 may include a first end, which is shown generally at 44a, and a second end, which is shown generally at 44b. According to an embodiment, the first end 44a of the track 42 may be supported by a first leg 46a of a first pair of legs 48a of the plurality of legs 16. According to an embodiment, the second end 44b of the track 42 may be supported by a first leg 46b of a second pair of legs 48b of the plurality of legs 16.

[0027] According to an embodiment, towing portion 40 is horizontally adjustable between the first legs 46a, 46b of each of the first and second pair of legs 48a, 48b.

According to an embodiment, the rollers 34 are disposed upon the second pair of legs 48b such that the indexing rack 28 is vertically-adjustable relative the second pair of legs 48b.

[0028] As seen in Figures 1B and 2B, each inflator head 38a-38c is designed to include a different diameter, D1-D3. The different diameters, D1-D3, associated with each inflator head 38a-38c permit the inflator platen 20 to interface with a plurality of tire-wheel assemblies having tire and wheels defined by different diameters. As is known in the art, wheels, for example, are not limited to include a fixed shape, size or dimension and may include, for example, diameters ranging from, for example, 13-inches to 30-inches. As such, the inflator portion 12 may include any desirable number of inflator heads 38a-38c for inflating any particular tire-wheel assembly having any particular size, shape or dimension. Although three inflator heads 38a-38c defined by three different diameters, D1-D3, are shown, it will be appreciated that the inflator portion 12 is not limited to include three inflator heads 38a-38c and that any desirable number of inflator heads 38a-38c having any number of diameters may be included as desired.

[0029] Referring now to Figures 1B and 2B, a method for operating the inflator portion 12 is described according to an embodiment. In a first step, the indexing rack 28 is vertically adjusted from a retracted position (see, e.g., Figure 1B) to a deployed position (see, e.g., Figure 2B) according to the direction of arrow, V1. According to an embodiment, movement to/from the retracted and deployed position is conducted by actuating the motor 32 such that the motor 32 moves the indexing screw 30 to/from a withdrawn position (see. e.g., Figure 1B) and an extended position (see, e.g., Figure 2B).

[0030] As seen in Figure 2B, the indexing rack 28 is moved such that a first inflator head 38a of the plurality of inflator heads 38 is disposed in a loading position. According to an embodiment, a "loading position" is generally a location where an inflator head 38a-38c of the plurality of inflator heads 38 is substantially aligned with the track 42.

[0031] In an embodiment, a user may provide an instruction to a controller 50 that causes the motor 32 to adjust the indexing rack 28 for positioning an inflator head 38a-38c of the plurality of inflator heads 38 in the loading position. Alternatively, the indexing rack 28 may locate an inflator head 38a-38c of the plurality of inflator heads 38 in a loading position by default (see, e.g., inflator head 38c in Figure 1B), such that no movement of the indexing rack 28 is conducted.

[0032] Referring to Figure 3A, one of the plurality of inflator heads 38 is shown disposed in the loading position. According to the illustrated embodiment of Figures 3A-3D, it is shown that the first inflator head 38a of the plurality of inflator heads 38 disposed in the loading position according to a referenced view of Figure 2B. Although the first inflator head 38a is described to be located in the loading position, it will be appreciated that the foregoing movement of the first inflator head 38a described in Figures 3A-3D may be equally applied to the second or third inflator heads 38b, 38c should the second or third inflator heads 38b, 38c be moved to the loading position.

[0033] Initially, as seen in Figure 3A, the towing portion 40 is shown to be disposed in a retracted position, ready for movement to an engaged position (see, e.g., Figure 3B) according to a substantially horizontal movement in the direction of arrow, H. In an embodiment, the towing portion 40 may include a locking pin 52. As illustrated, the locking pin 52 is shown to be initially located in retracted position.

[0034] In an embodiment, movement of the towing portion 40 according to the direction of the arrow, H, may be commenced when an operator sends an instruction to the controller 50. As such, in an embodiment, the controller 50 may cause, for example, the motor 32 to cause movement of the towing portion 40 in the direction according to the arrow, H.

[0035] As seen in Figure 3B, once the towing portion 40 has been moved to an engaged position, a finger 54 of the towing portion 40 may be disposed substantially adjacent an outer surface 56 of a hitch portion 58. In an embodiment, the hitch portion 58 extends from the first inflator head 38a. Although not shown in Figures 3A-3D, each inflator head 38a-38c of the plurality of inflator heads 38 may include a hitch portion 58.

[0036] Once the towing portion 40 has been positioned substantially proximate the hitch portion 58 as described above, the locking pin 52 may be extended from the retracted position to an extended position such that the locking pin 52 is disposed substantially adjacent one or more of an inner surface 60 and a side surface 62 of the hitch portion 58. In an embodiment, movement of the locking pin 52 may be conducted, for example, by an instruction from a user to the controller 50, or, in an alternative embodiment, movement of the locking pin 52 to the extended position may be conducted automatically upon the finger 54 of the towing portion 40 being positioned substantially proximate the outer surface 56 of the hitch portion 58.

[0037] As seen in Figures 3B-3C, once the locking pin 52 has been extended as described above, the towing portion 40 may be said to be selectively coupled to the first inflator head 38a for shuttling the first inflator head 38a from the indexing rack 28 and about the track 42 according to the direction of arrow, H', which is substantially opposite the direction of the arrow, H. As seen in Figure 3D, movement of the inflator head 38a in the direction of arrow, H', is ceased when the first inflator head 38a is located in a coupling position. In an embodiment, the "coupling position" may be said to be an orientation of the first inflator head 38a that is axially aligned with the non-inflated tire-wheel assembly, TW_{NI}, and the inflator platen 20 according to an axis, A-A (see, e.g., Figures 3D and 4B).

[0038] Although movement of a locking pin 52 is described above in Figures 3A-3D, it will be appreciated that towing portion 40 is not limited to include a locking pin 52. For example, in an embodiment, the finger 54 of the towing portion 40 and the outer surface 56 of the hitch portion 58 may be magnetically coupled; accordingly, upon locating the finger 54 substantially proximate the hitch portion 58, the towing portion 40 and the first inflator head 38a may be said to be selectively magnetically coupled. When it is later desired to release the towing portion 40 from the inflator head 38a, the magnetic field provided by one or more of the towing portion 40 and hitch portion 58 may be ceased.

[0039] Referring to Figures 4A and 4B, once the first inflator head 38a has been located in the coupling position, the inflator platen 20 is moved from a retracted position (see, e.g., Figures 1A-2B) to an interfaced position according to the direction of arrow, V2. Movement of the inflator platen 20 in the direction of arrow, V2, is provided by a plunger 64 supported by the one or more overhead beams 18. In an embodiment, movement of the inflator platen 20 from the retracted position to the interfaced position may be conducted, for example, responsive an instruction from an operator to the controller 50 such that the controller causes the motor 32 to move the plunger 64.

[0040] Movement of the inflator platen 20 in the direction according to arrow, V2, results in the inflator platen 20 being selectively-coupled with / interfaced with the first inflator head 38a. Once the inflator platen 20 is selectively-coupled with / interfaced with the first inflator head 38a, the inflator platen 20 and first inflator head 38a generally define an inflator assembly, which is shown generally at 75 in Figures 5A-5F, for inflating the non-inflated tire-wheel assembly, TW_{NI}. In an embodiment, each inflator head 38a-38c of the plurality of

inflator heads 38 includes a flip seal, FS, having a unique diameter substantially equal to the diameters, D1-D3, that correspond to a particular diameter of a wheel, W.

[0041] Referring now to Figure 5A, operation of the inflator assembly 75 comprising the inflator platen 20 and the first inflator head 38a is described according to an embodiment. Firstly, in an embodiment, the flip seal, FS, generally interfaces with an outer surface, W_O, of the wheel, W, as the plunger 64 moved the inflator assembly 75 according to the direction of arrow, V2. In embodiment, continued movement of the inflator assembly 75 in the direction of the arrow, V2, may be provided by the motor 32 connected to the controller 50. Then, as seen in Figure 5B, as movement of the inflator assembly 75 persists in the direction of arrow, V2, the flip seal, FS, is located substantially adjacent the side surface, W_S, of the wheel, W.

[0042] Then, as seen in Figure 5C, the flip seal, FS, is moved past the side surface, W_S, of the wheel, W, such that pressurized fluid, P, may be provided by the inflator assembly 75. The pressurized fluid, P, causes the inflator assembly 75 to not only inflate the non-inflated tire-wheel assembly, TW_{NI}, but also, to move the inflator assembly 75 in a direction, V2', which is substantially opposite the direction of the arrow, V2. Accordingly, as seen in Figure 5D, the flip seal, FS, is caused to be located adjacent a bead seat, W_B, of the wheel, W.

[0043] Then, as seen in Figure 5E, the inflator assembly 75 may be retracted in the direction of the arrow, V2'. The retraction of the inflator assembly 75 may be conducted by the motor 32, or, alternatively, by utilizing the pressurized fluid, P, to cause the inflator assembly 75 to "lift off" from the tire-wheel assembly. Accordingly, the flip seal, FS, is shown to be disposed adjacent the side surface, W_S, of the wheel, W, as the pressurized fluid retained by the tire, T, and wheel, W, causes a bead, T_B, of the tire, T, to be moved toward the bead seat, W_B, of the wheel, W. Then, as seen in Figure 5F, the pressurized fluid, P, causes the bead, T_B, of the tire, T, to be seated in the bead seat, W_B, of the wheel, W, as the inflator assembly 75 is further moved away from the tire-wheel assembly in the direction of the arrow, V2'. Once the inflator assembly 75 is moved away as described above, the tire-wheel assembly may be said to be an inflated tire-wheel assembly, TW_I.

[0044] Referring now to Figures 6A-6B, after the inflated tire-wheel assembly, TW_I, has been prepared, the inflator platen 20 may be withdrawn from the first inflator head 38a in the direction of arrow, V2', such that the towing portion 40 may shuttle the first inflator head 38a in the direction of arrow, H, for depositing the first inflator head 38a back in the indexing

rack 28. Once the first inflator head 38a is located in the indexing rack 28, the cart 14 may remove the inflated tire-wheel assembly, TW_I, from the inflator portion 12.

[0045] Referring now to Figure 7, an apparatus for processing a tire-wheel assembly is shown generally at 100 according to an embodiment. In an embodiment, the apparatus may be referred to as a "single-cell" workstation. In the forgoing disclosure, it will be appreciated that term "single-cell" indicates that the workstation 100 provides a tire-wheel assembly, TW, without requiring a plurality of successive, discrete workstations that may otherwise be arranged in a conventional assembly line. Rather, the single cell workstation 100 provides one workstation having a plurality of subs-stations 102-108, each performing a specific task in the processing of a tire-wheel assembly. As such, the novel single-cell workstation 100 significantly reduces the cost, investment and maintenance associated with a conventional tire-wheel assembly line located on a relatively large real estate footprint. Thus, capital investment and human oversight is significantly reduced when a single cell workstation 100 is employed in the processing of tire-wheel assemblies.

[0046] In an embodiment, the single-cell workstation 100 cooperates with a device 150. In operation, the device 150 interfaces with a wheel, W, in order to prepare a tire-wheel assembly. The ability of the device 150 to interface with the wheel, W, eliminates the need to "hand-off" one or more of a wheel, W, and tire, T, to a subsequent workstation of a plurality of workstations in a conventional assembly line.

[0047] In an embodiment, the device 150 associated with the single-cell workstation 100 may include a robotic arm 152 that may be located in a substantially central position relative a plurality of sub-stations. In an embodiment, a plurality of sub-stations is shown generally at 102-108.

[0048] In operation, a wheel, W, is removably-attached to the robotic arm 152. In an embodiment, the robotic arm 152 interfaces with the wheel, W, throughout some or all of the steps associated with the preparation of the tire-wheel assembly, TW. In an embodiment, the robotic arm 152 may include, for example, a base portion 154, a body portion 156 connected to the base portion 154, an arm portion 158 connected to the body portion 156, and a claw portion 160 connected to the arm portion 158.

[0049] In an embodiment, the body portion 156 is rotatably-connected to the base portion 154 such that the body portion 156 may be pivoted 360^0 relative the base portion 154. Further, in an embodiment, the body portion 156 may be generally hinged to the base portion

154 having, for example, hinged, scissor-style arms such that the body portion 156 may be articulated vertically upward or downward relative the base portion 154.

[0050] In an embodiment, the arm portion 158 may be connected to the body portion 156 such that the arm portion 158 may be articulated in any desirable upward or downward position relative the body portion 156. Similar to the rotatable connection of the base portion 154 and body portion 156, the claw portion 160 may be rotatably-connected to the arm portion 158 such that the claw portion 160 may be rotated, pivoted or otherwise spun more or less than 360^0 relative the arm portion 158. In an embodiment, movement of the portions 154-160 may be controlled manually with a joystick (not shown), or, alternatively, automatically by way of logic stored on a controller having a processor (not shown).

[0051] In the following description, it will be appreciated that prescribed movements of the body portion 156 relative the base portion 154 may have occurred before, during or after movement of the arm portion 158 and/or claw portion 160. For example, the body portion 156 may have been rotated, articulated or the like in order to locate the arm and claw portions 158, 160 to a desired position at or proximate a particular sub-station.

[0052] Regarding the general movement of the device 150 relative the sub-stations 102-108, in an embodiment, the robotic arm 152 is manipulated such that it 1) obtains a wheel, W, at a wheel repository sub-station 102, 2) lubricates / "soaps" the wheel, W, at a soaping sub-station 104, 3) mounts the soaped wheel, W, to a tire, T, at a mounting/indexing sub-station 106 to define a non-inflated tire-wheel assembly, and 4) locates the non-inflated tire-wheel assembly at an inflating sub-station 108 for inflating the non-inflated tire-wheel assembly. Subsequent to the inflating step at the inflating sub-station 108, an inflated tire-wheel assembly, TW_I, may be formed. The inflated tire-wheel assembly, TW_I, may be discharged from the single-cell workstation 100 for further processing by a balancing sub-station or the like.

[0053] In an embodiment, the inflating sub-station 108 substantially defines an inflating portion including; accordingly, the inflating sub-station 108 may include an indexing rack 28 supporting a plurality in inflator heads 38 and a platen 20 as similarly described above in Figures 1A-6B. However, in an embodiment, as illustrated in Figure 7, the platen 20 may be independently arranged relative the one or more overhead beams 18. Accordingly, the plurality of leg portions 16 may be arranged proximate the independently-orientated platen 20

such that the towing portion 40 may move one or more of the inflator heads 38a-38c proximate the independently-orientated platen 20.

[0054] In view of the arrangement of the single-cell workstation 100 and robotic arm 152, it will be appreciated that a tire, T, and wheel, W, may not necessarily be supported upon a cart, 14. Accordingly, in an embodiment, one or more of the tire, T, and wheel, W, may be interfaced with the robotic arm 152 in order to present the non-inflated tire-wheel assembly, TW, to the inflating sub-station 108.

[0055] The present invention has been described with reference to certain exemplary embodiments thereof. However, it will be readily apparent to those skilled in the art that it is possible to embody the invention in specific forms other than those of the exemplary embodiments described above. This may be done without departing from the spirit of the invention. The exemplary embodiments are merely illustrative and should not be considered restrictive in any way. The scope of the invention is defined by the appended claims and their equivalents, rather than by the preceding description.

CLAIMS

What is claimed is:

1. An apparatus (10) for processing a tire-wheel assembly (TW) including a tire (T) and a wheel (W), comprising:

an inflating portion (108) including

an indexing rack (28) including

a plurality of inflator heads (38) removably-secured to the indexing rack (28); and

an inflator platen (20), wherein one or more inflator heads (38a-38c) of the plurality of inflator heads (38) are selectively interfacable with the inflator platen (20).

2. The apparatus (10) according to claim 1, wherein each inflator head (38a-38c) of the plurality of inflator heads (38) defines a different tire-wheel assembly interfacing diameter (D1-D3).

3. The apparatus (10) according to claim 1, wherein the inflating portion (108) further comprises:

a plurality of leg portions (16), wherein the indexing rack (28) is supported by one or more of the plurality of leg portions (16); and

one or more beams (18) connected to the plurality of leg portions (16), wherein the inflator platen (20) is supported by one or more of the one or more beams (18).

4. The apparatus (10) according to claim 3, further comprising:

means for

moving the indexing rack (28) relative the plurality of leg portions (16) for positioning an inflator head (38a-38c) of the plurality of inflator heads (38) in a loading position.

5. The apparatus (10) according to claim 3, further comprising:

means for

removing an inflator head (38a-38c) of the plurality of inflator heads (38) from the indexing rack (28), and

moving the removed inflator head (38a-38c) into a coupling position aligned with the inflator platen (20).

6. The apparatus (10) according to claim 5, wherein the means for removing and moving includes:

a track (42) supported by one or more of the plurality of leg portions (16); and

a towing portion (40) movably-disposed upon the track (42).

7. The apparatus (10) according to claim 6, wherein each inflator head (38a-38c) of the plurality of inflator heads (38) further comprises:

a hitch portion (58), wherein the hitch portion (58) is permitted to be releasably-coupled with the towing portion (40).

8. The apparatus (10) according to claim 3, further comprising:

means for

moving the inflator platen (20) relative the one or more beams (18) for

interfacing the inflator platen (20) with an inflator head (38a-38c) of the plurality of inflator heads (38).

9. The apparatus (10) according to claim 8, wherein the means for moving and interfacing includes:

a plunger (64) connected to the inflator platen (20), wherein the plunger (64) is supported by said one or more beams (18).

10. A method for processing a tire-wheel assembly (TW) including a tire (T) and a wheel (W), comprising the steps of:

providing an inflator platen (20);

providing an indexing rack (28) including a plurality of inflator heads (38) removably-secured to the indexing rack (28); and

selectively interfacing an inflator head (38a-38c) of the plurality of inflator heads (38) with the inflator platen (20).

11. The method according to claim 10, further comprising the step of:

supporting the indexing rack (28) upon a plurality of leg portions (16), wherein the selectively interfacing step further comprises the steps of

moving the indexing rack (28) relative the plurality of leg portions (16) for positioning an inflator head (38a-38c) of the plurality of inflator heads (38) in a loading position.

12. The method according to claim 10, wherein the selectively interfacing step further comprises the steps of:

removing the inflator head (38a-38c) of the plurality of inflator heads (38) from the indexing rack (28), and

moving the removed inflator head (38a-38c) into a coupling position aligned with the inflator platen (20).

13. The method according to claim 12, further comprising the step of:

providing a towing portion (40), wherein the removing step further comprises the step of

disposing the towing portion (40) proximate the inflator head (38a-38c); and

releasably-coupling the towing portion (40) with the inflator head (38a-38c).

14. The method according to claim 12, further comprising step of:

interfacing the inflator platen (20) with the inflator head (38a-38c).

15. An apparatus (10) for processing a tire-wheel assembly (TW) including a tire (T) and a wheel (W), comprising:

a tire-wheel assembly support portion (14); and

an inflating portion (108) including

an indexing rack (28) including

a plurality of inflator heads (38) removably-secured to the indexing rack (28), and

an inflator platen (20), wherein one or more of the inflator heads (38a-38c) are selectively interfacable with the inflator platen (20).

16. The apparatus (10) according to claim 15, wherein the tire-wheel assembly support portion (14) is a cart.

17. The apparatus (10) according to claim 15, wherein the tire-wheel assembly support portion (14) is a robotic arm (152), wherein the inflating portion (108) is an inflating sub-station of a plurality of sub-stations (102-108) of a single-cell workstation (100).

18. The apparatus (10) according to claim 15, wherein each inflator head (38a-38c) of the plurality of inflator heads (38) defines a different tire-wheel assembly interfacing diameter (D1-D3).

19. The apparatus (10) according to claim 15, wherein the inflating portion (108) further comprises:

a plurality of leg portions (16), wherein the indexing rack (28) is supported by one or more of the plurality of leg portions (16); and

one or more beams (18) connected to the plurality of leg portions (16), wherein the inflator platen (20) is supported by one or more of the one or more beams (18).

20. The apparatus (10) according to claim 19, further comprising:

means for

moving the indexing rack (28) relative the plurality of leg portions (16) for positioning an inflator head (38a-38c) of the plurality of inflator heads (38) in a loading position.

21. The apparatus (10) according to claim 19, further comprising:

means for

removing an inflator head (38a-38c) of the plurality of inflator heads (38) from the indexing rack (28), and

moving the removed inflator head (38a-38c) into a coupling position aligned with the inflator platen (20).

22. The apparatus (10) according to claim 21, wherein the means for removing and moving includes:

a track (42) supported by one or more of the plurality of leg portions (16); and

a towing portion (40) movably-disposed upon the track (42).

23. The apparatus (10) according to claim 22, wherein each inflator head (38a-38c) of the plurality of inflator heads (38) further comprises:

a hitch portion (58), wherein the hitch portion (58) is permitted to be releasably-coupled with the towing portion (40).

24. The apparatus (10) according to claim 19, further comprising:

means for

moving the inflator platen (20) relative the one or more beams (18) for interfacing the inflator platen (20) with an inflator head (38a-38c) of the plurality of inflator heads (38).

25. The apparatus (10) according to claim 24, wherein the means for moving and interfacing includes:

a plunger (64) connected to the inflator platen (20), wherein the plunger (64) is supported by said one or more beams (18).

26. An apparatus (10) for processing a tire-wheel assembly (TW) including a tire (T) and a wheel (W), comprising:

a single-cell workstation (100) including a plurality of subs-stations (102-108), wherein each sub-station of the plurality of sub-stations (102-108) performs a specific task in the processing of the tire-wheel assembly (TW);

a device (150) that interfaces with a wheel (W) of the tire-wheel assembly (TW), wherein the device (150) includes a robotic arm (152) that moves the wheel (W) to each sub-station of the plurality of sub-stations (102-108), wherein one sub-station of the plurality of sub-stations (102-108) includes an inflation sub-substation (108), wherein the inflation sub-station (108) includes

an inflating portion including

an indexing rack (28) including

a plurality of inflator heads (38) removably-secured to the indexing rack (28); and

an inflator platen (20), wherein one or more of the inflator heads (38a-38c) are selectively interfacable with the inflator platen (20).

27. The apparatus (10) according to claim 26, wherein each inflator head (38a-38c) of the plurality of inflator heads (38) defines a different tire-wheel assembly interfacing diameter (D1-D3).

28. The apparatus (10) according to claim 26, wherein the inflating portion further comprises:

a plurality of leg portions (16), wherein the indexing rack (28) is supported by one or more of the plurality of leg portions (16); and

one or more beams (18) connected to the plurality of leg portions (16), wherein the inflator platen (20) is supported by one or more of the one or more beams (18).

29. The apparatus (10) according to claim 28, further comprising:

means for

moving the indexing rack (28) relative the plurality of leg portions (16) for positioning an inflator head (38a-38c) of the plurality of inflator heads (38) in a loading position.

30. The apparatus (10) according to claim 28, further comprising:

means for

removing an inflator head (38a-38c) of the plurality of inflator heads (38) from the indexing rack (28), and

moving the removed inflator head (38a-38c) into a coupling position aligned with the inflator platen (20).

31. The apparatus (10) according to claim 30, wherein the means for removing and moving includes:

a track (42) supported by one or more of the plurality of leg portions (16); and

a towing portion (40) movably-disposed upon the track (42).

32. The apparatus (10) according to claim 31, wherein each inflator head (38a-38c) of the plurality of inflator heads (38) further comprises:

a hitch portion (58), wherein the each hitch portion (58) is permitted to be releasably-coupled with the towing portion (40).

33. The apparatus (10) according to claim 28, further comprising:

means for

moving the inflator platen (20) relative the one or more beams (18) for interfacing the inflator platen (20) with an inflator head (38a-38c) of the plurality of inflator heads (38).

34. The apparatus (10) according to claim 33, wherein the means for moving and interfacing includes:

a plunger (64) connected to the inflator platen (20), wherein the plunger (64) is supported by said one or more beams (18).

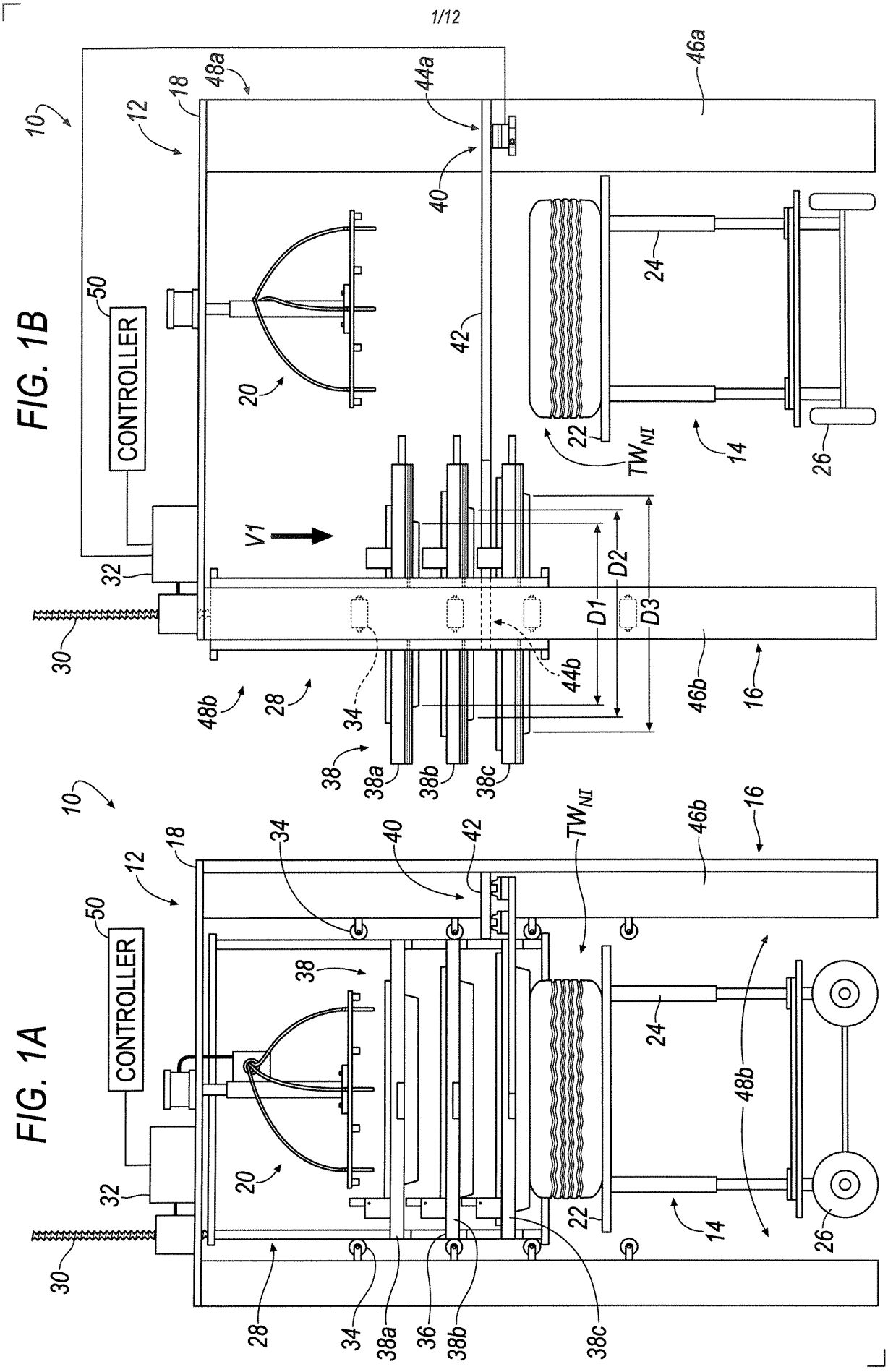


FIG. 1B
FIG. 1A
CONTROLLER
CONTROLLER
10
12
18
20
22
24
26
28
30
32
34
36
38
38a
38b
38c
40
42
44a
44b
46a
46b
48a
48b
50
V1
D1
D2
D3
TW_NI
TW_NI
14
16

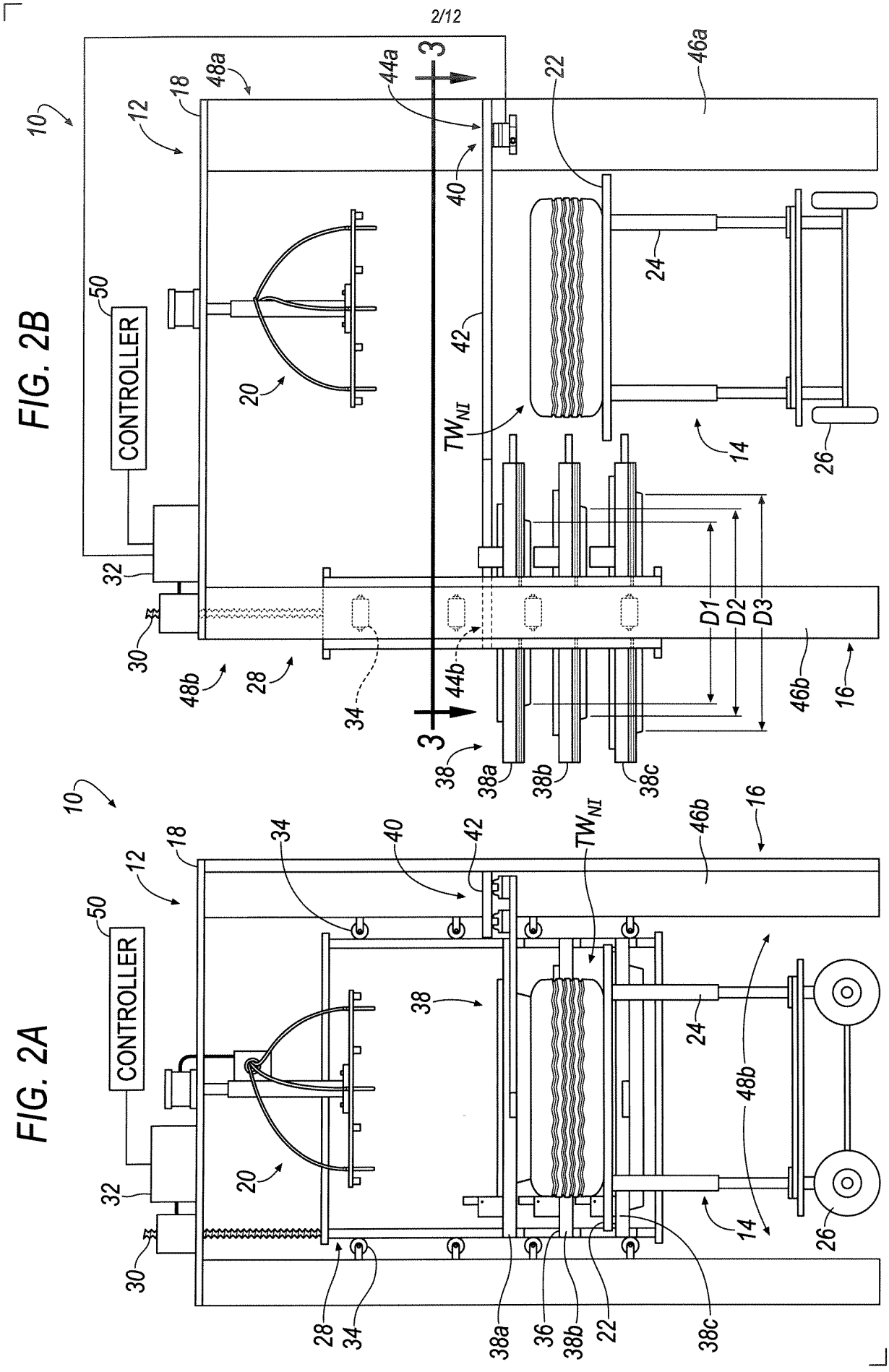


FIG. 2B
FIG. 2A
CONTROLLER
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
38a
38b
38c
40
42
44a
44b
46a
46b
48a
48b
50
D1
D2
D3
TW_NI
3

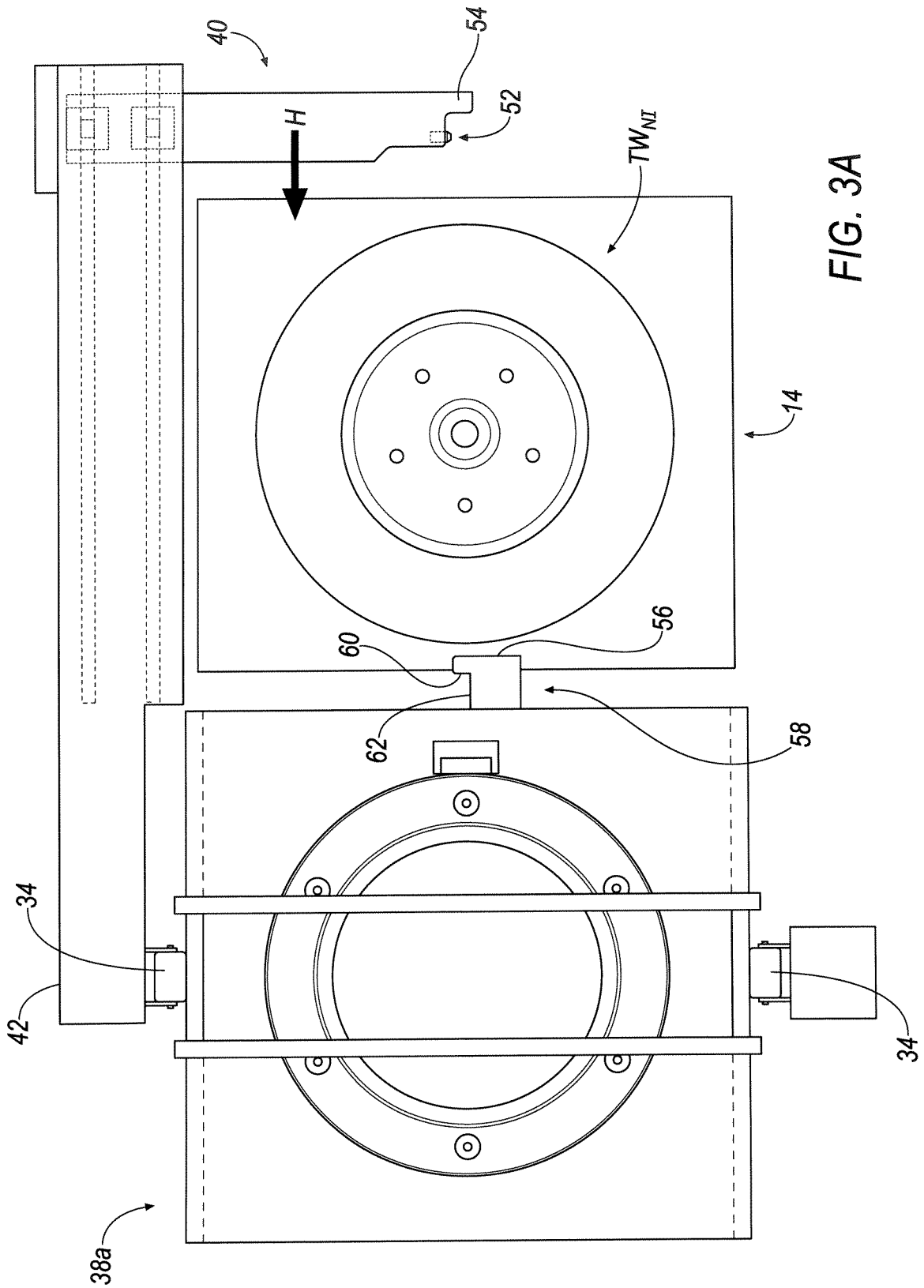


FIG. 3A

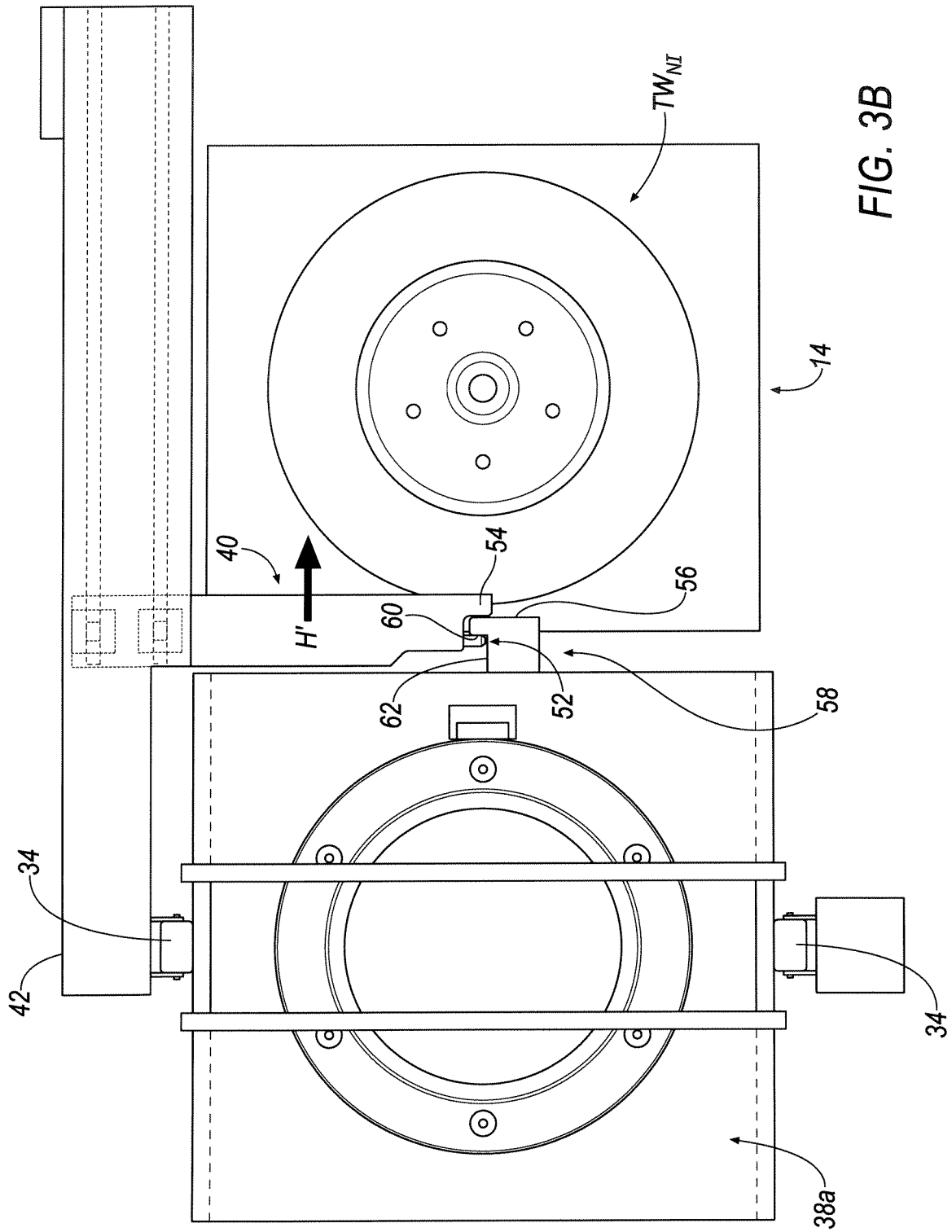


FIG. 3B

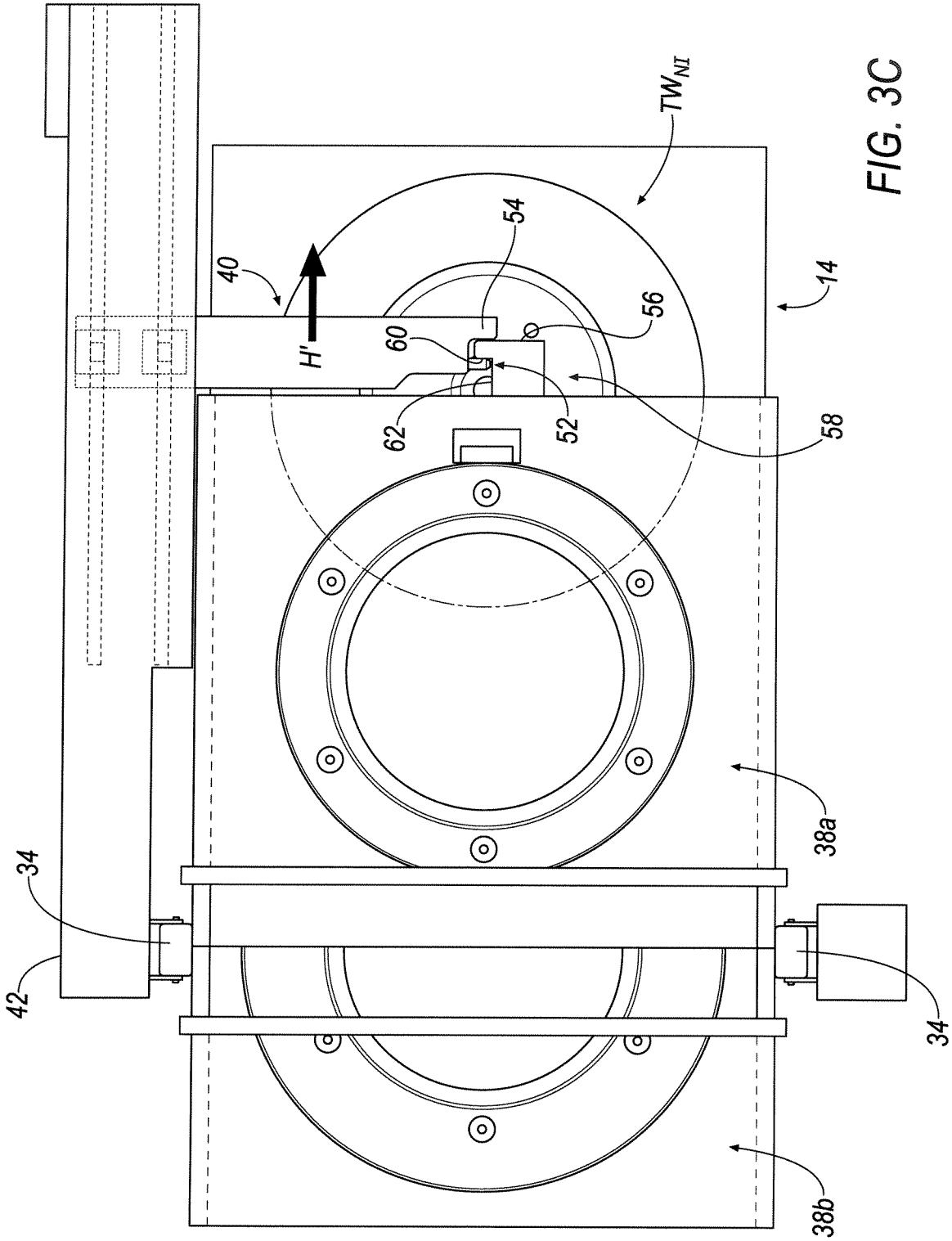


FIG. 3C

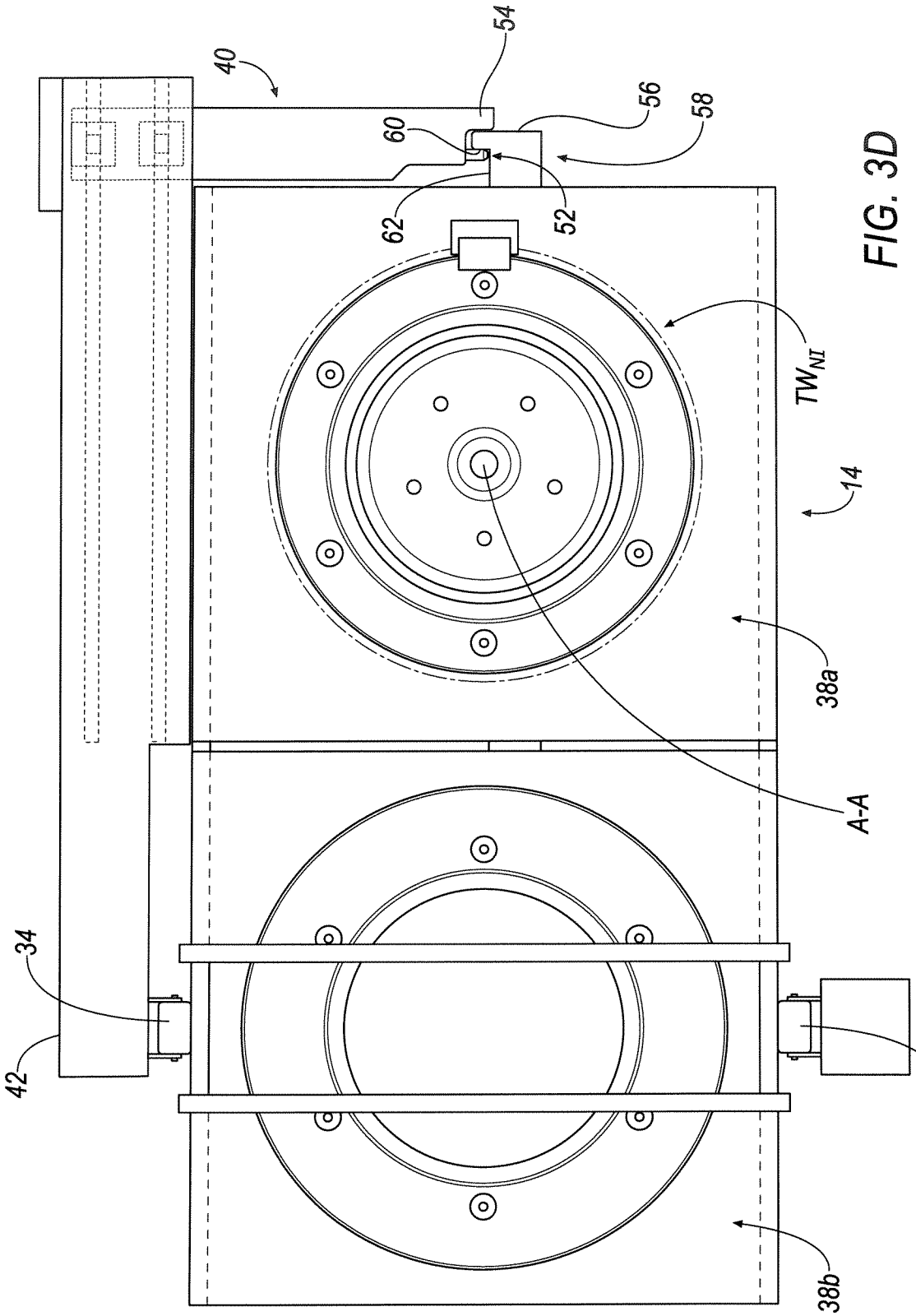


FIG. 3D

FIG. 4B

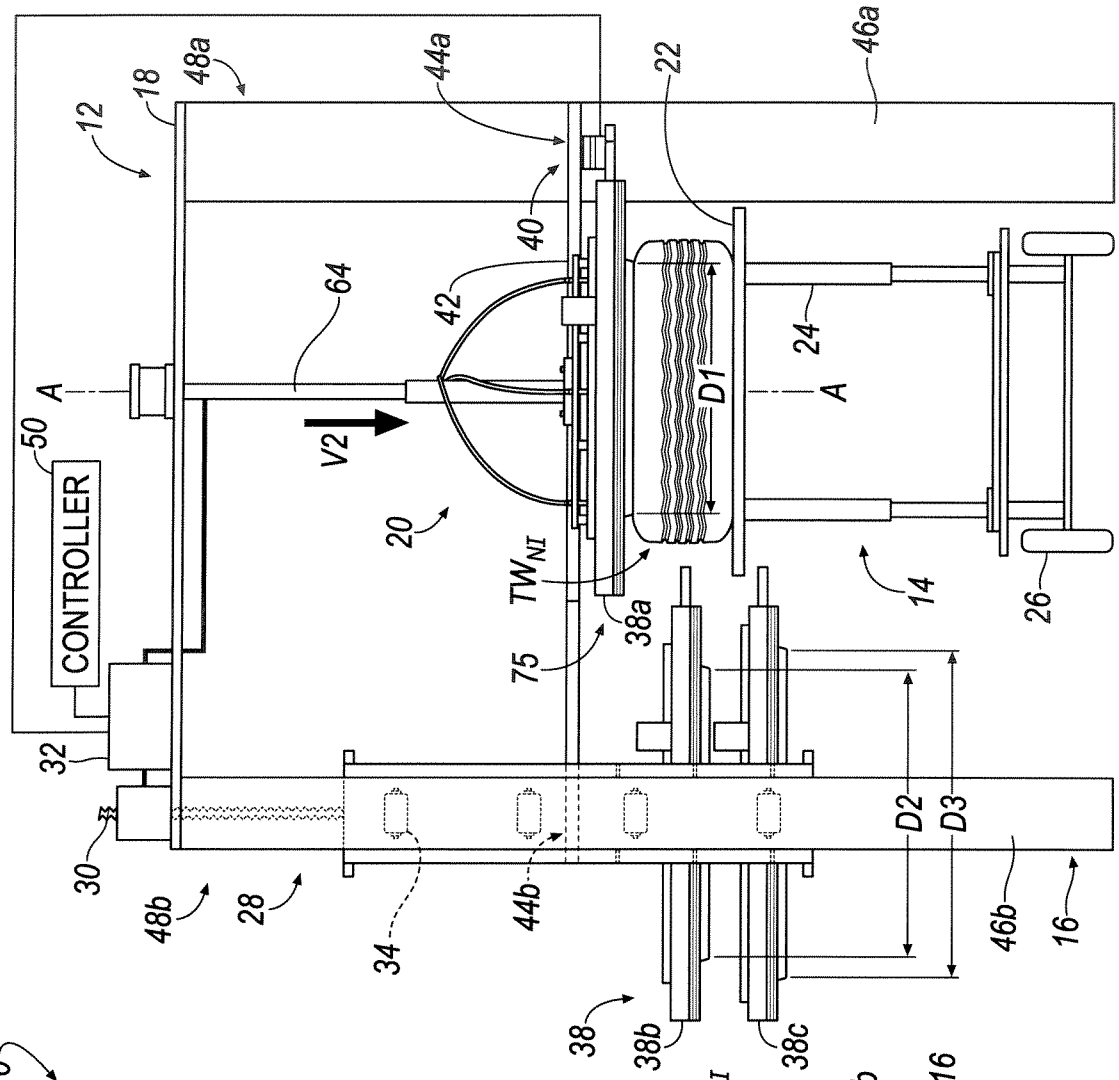
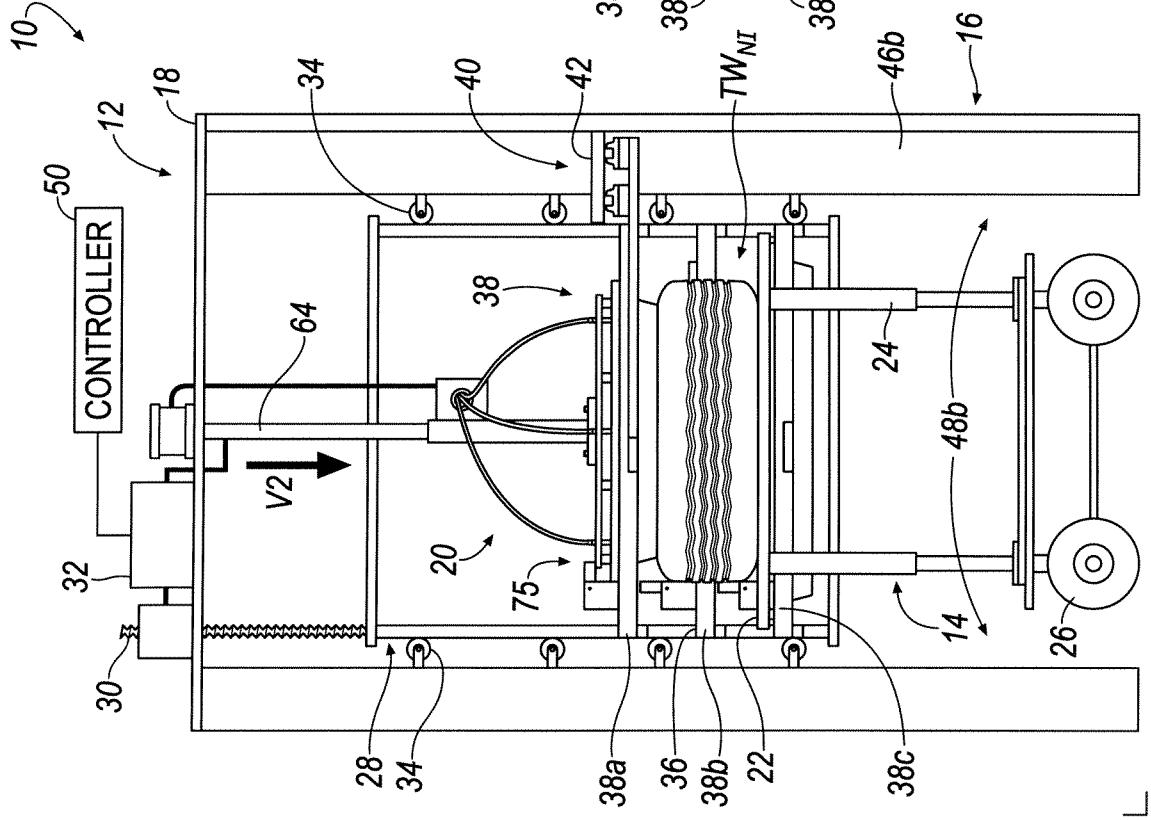

10
12
18
48a
44a
22
46a
40
42
64
24
A
D1
A
50
CONTROLLER
V2
20
TW_{NI}
38a
75
14
26
32
30
48b
28
34
44b
D2
D3
46b
16
38
38b
38c

FIG. 4A


10
18
34
40
42
TW_{NI}
46b
16
12
50
CONTROLLER
38
64
24
48b
V2
20
75
14
26
32
30
28
34
38a
36
38b
22
38c

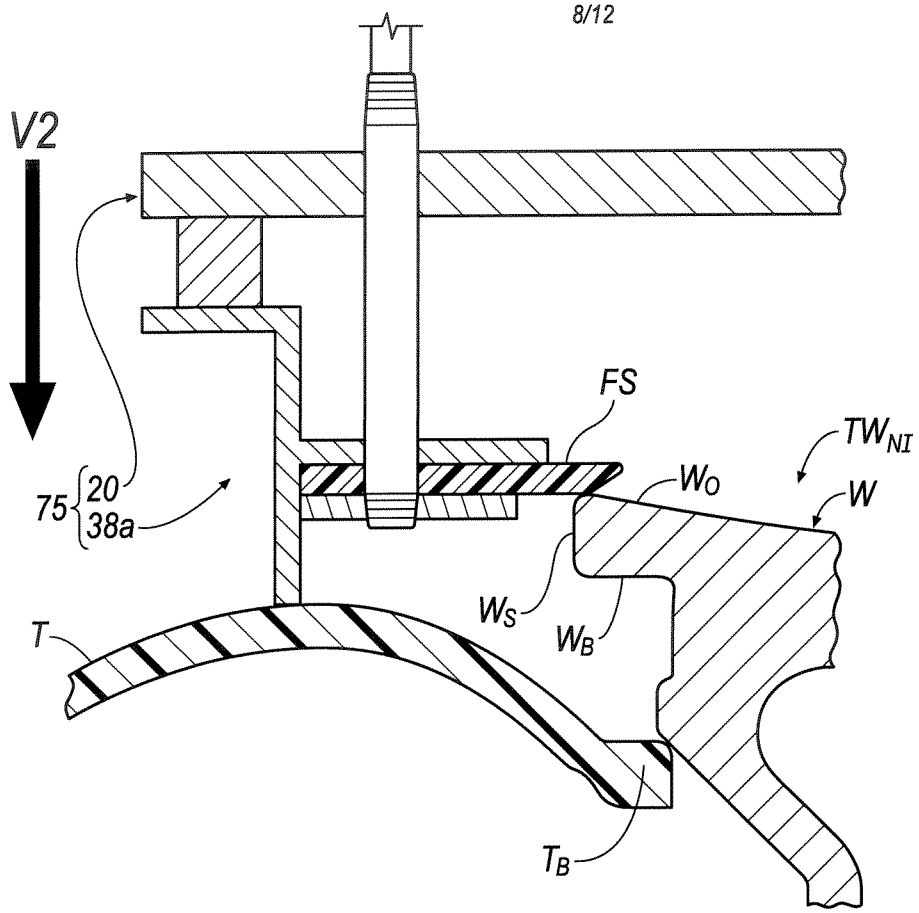

V2
75
20
38a
FS
TW_{NI}
W_O
W
W_S
W_B
T
T_B

FIG. 5A

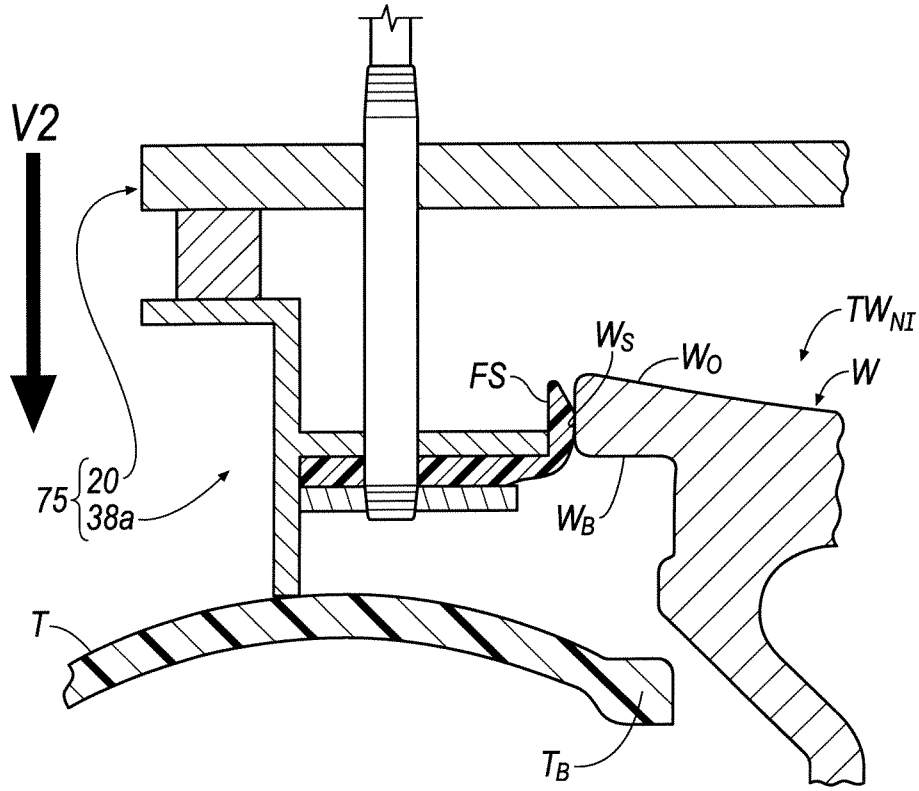

V2
75
20
38a
W_S
W_O
TW_{NI}
FS
W
W_B
T
T_B

FIG. 5B

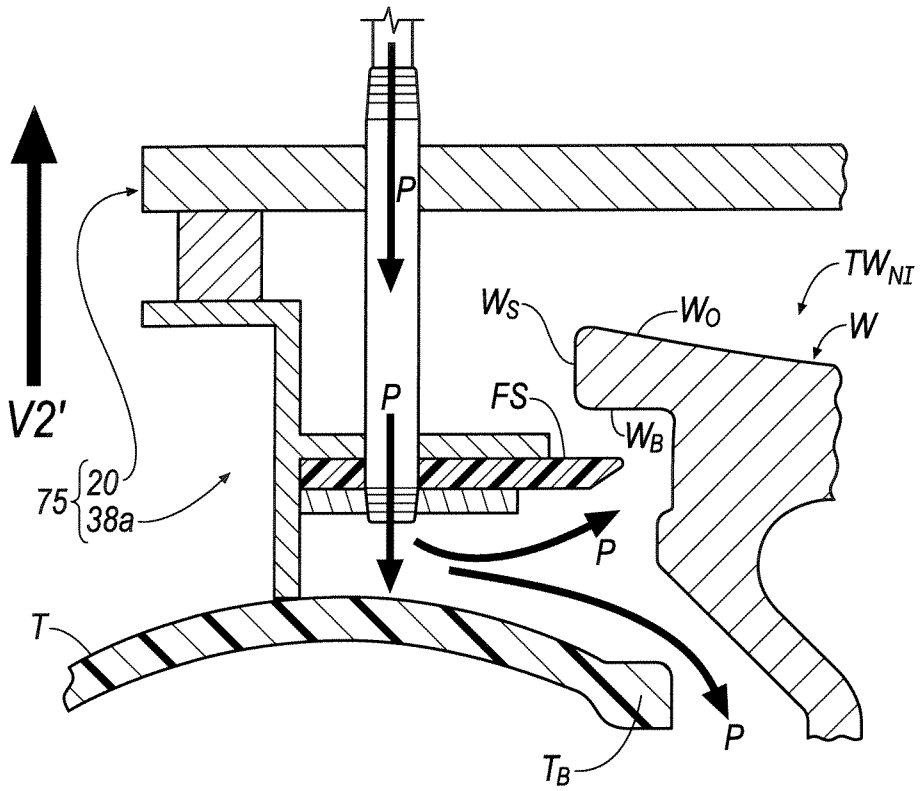

V2'
75
20
38a
P
P
P
P
FS
W_S
W_O
W_B
TW_{NI}
W
T
T_B

FIG. 5C

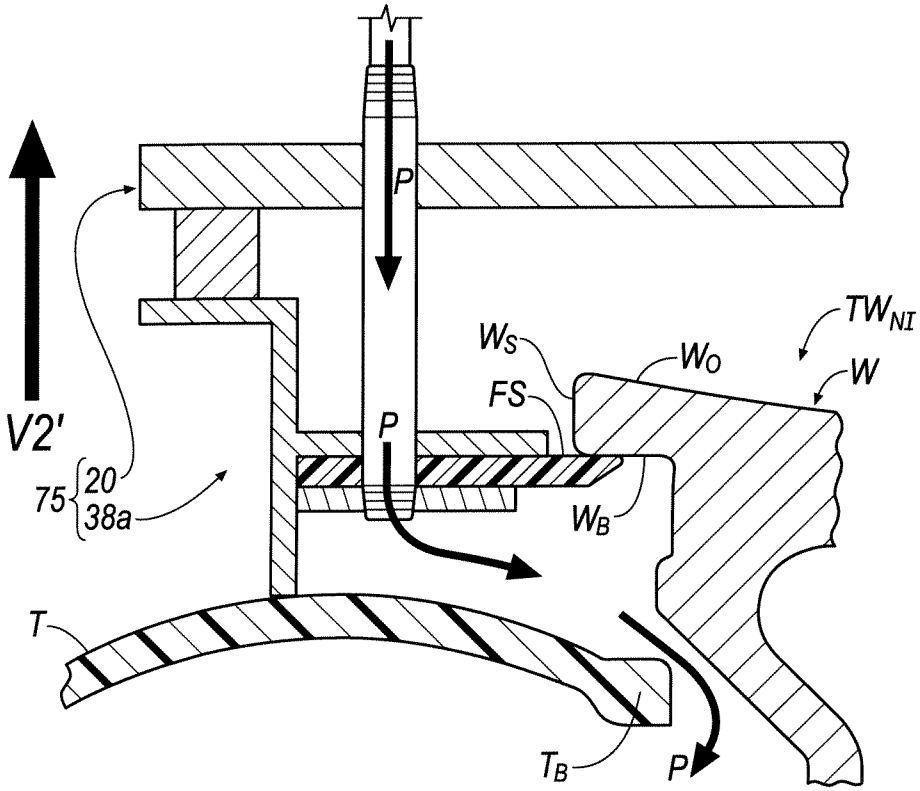

V2'
75
20
38a
P
P
P
FS
W_S
W_O
W_B
TW_{NI}
W
T
T_B

FIG. 5D

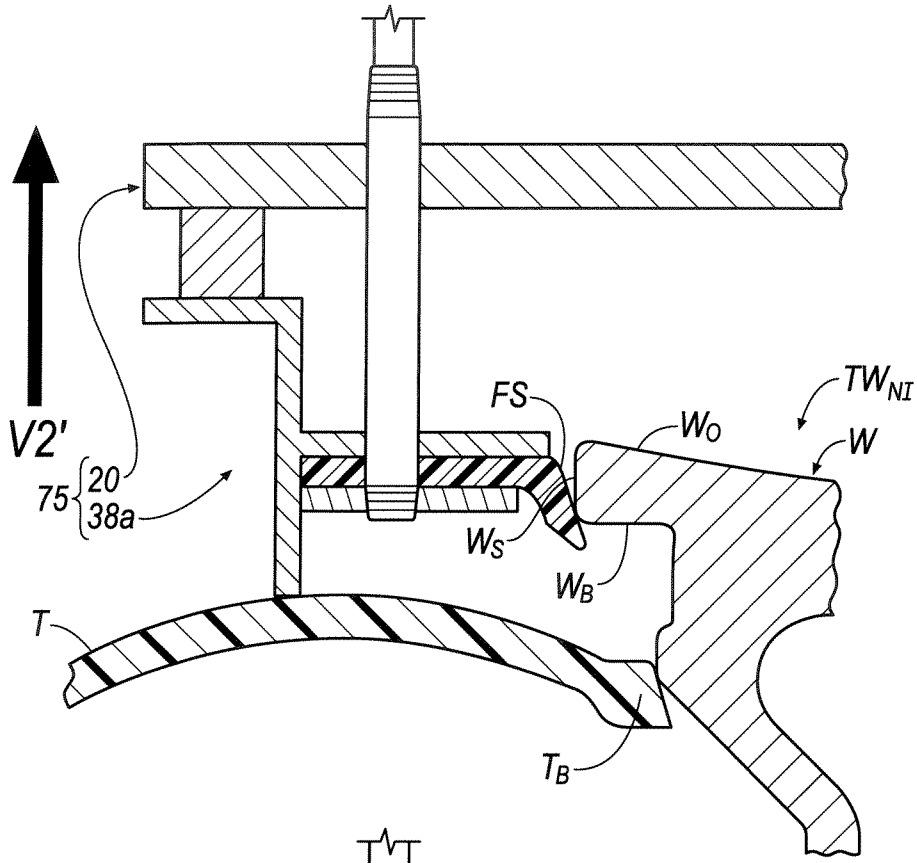

V2'
75
20
38a
FS
W_O
TW_{NI}
W
W_S
W_B
T
T_B

FIG. 5E

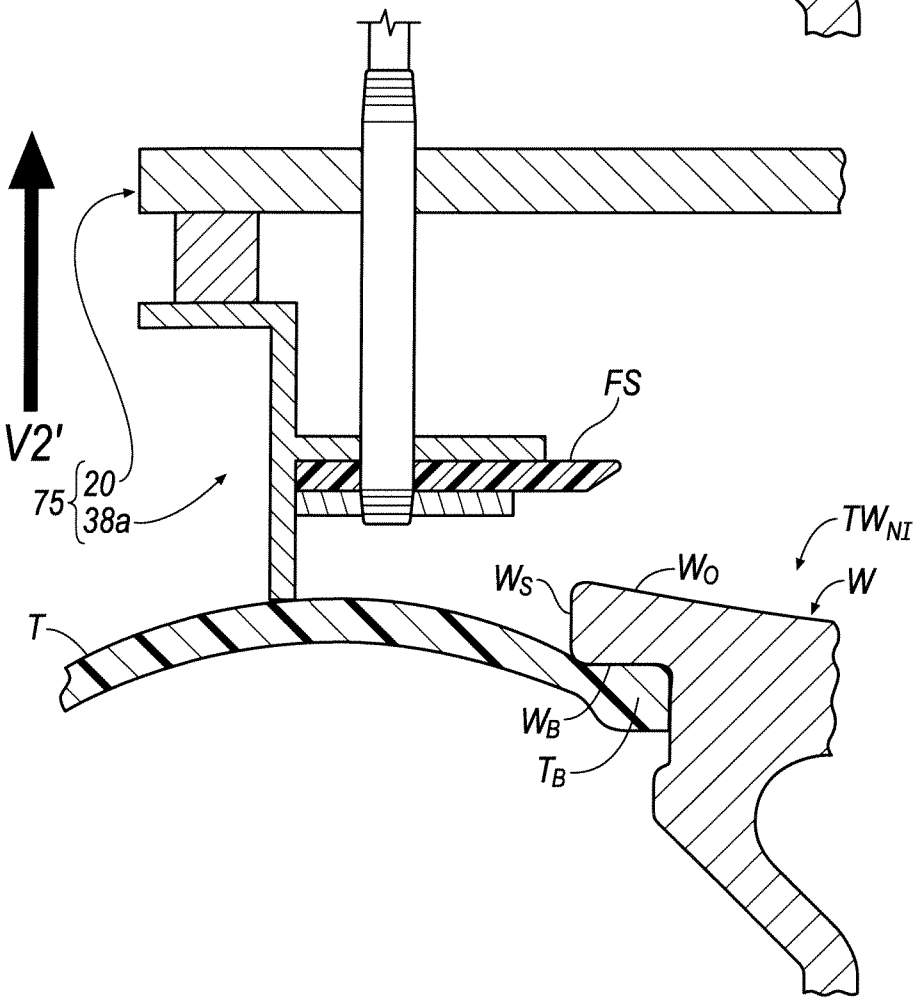

V2'
75
20
38a
FS
TW_{NI}
W_S
W_O
W
T
W_B
T_B

FIG. 5F

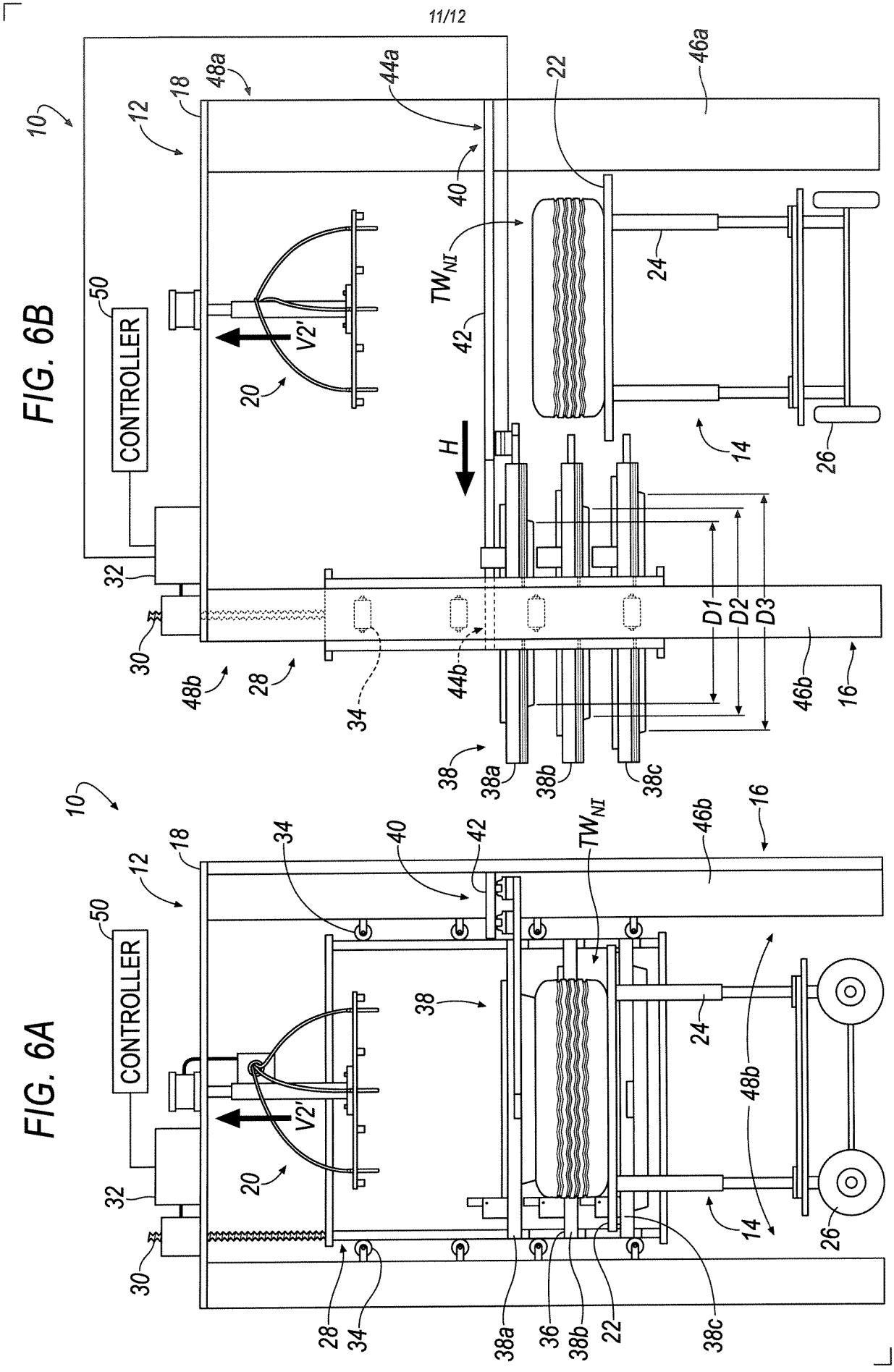


FIG. 6B
FIG. 6A
CONTROLLER
V2'
H
D1
D2
D3
TW_NI

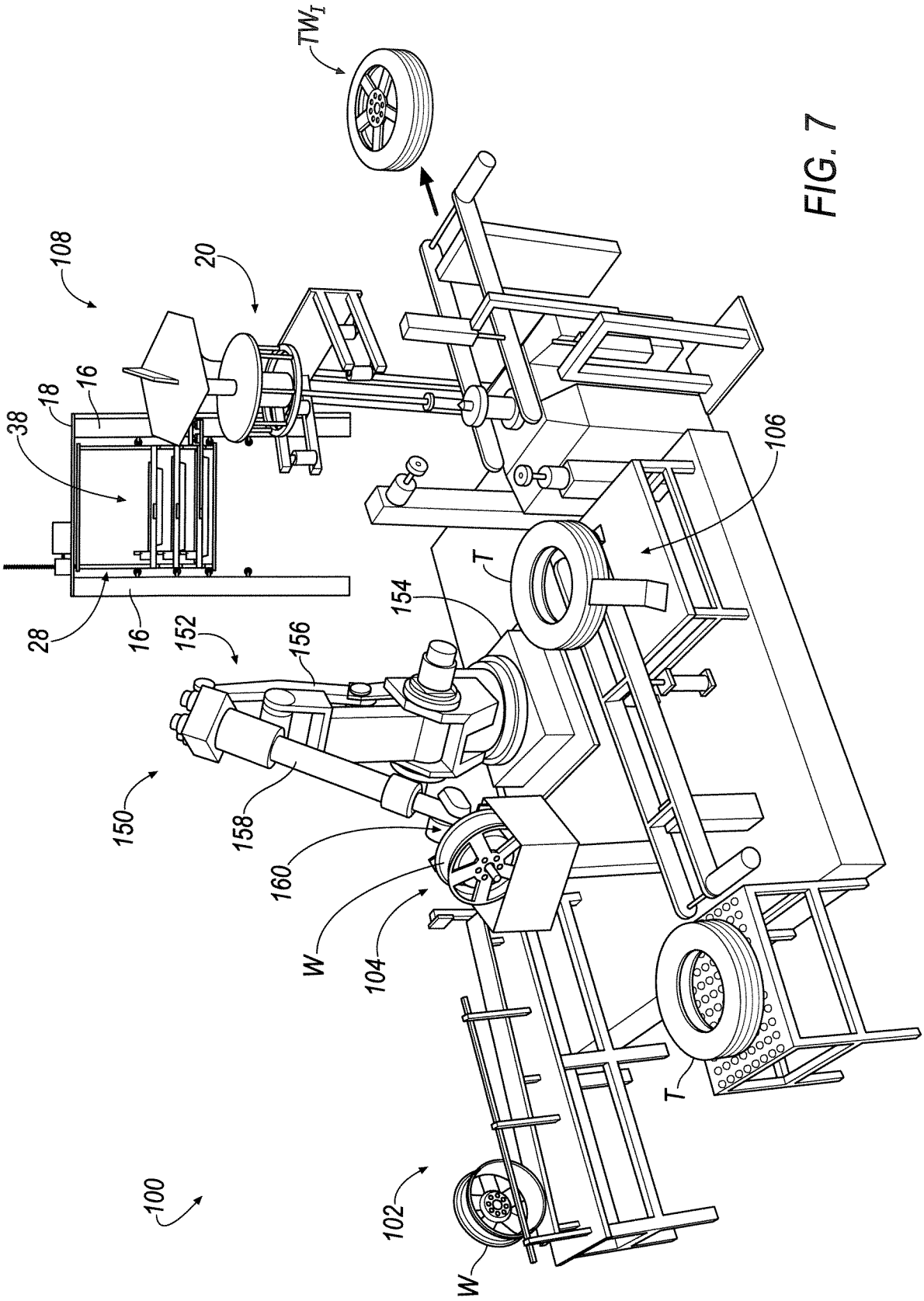

TW_I
108
20
16
18
38
28
16
152
156
154
T
106
150
158
160
W
104
T
100
102
W

FIG. 7