



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.09.2016 Bulletin 2016/37

(51) Int Cl.:
F01D 25/28 (2006.01) **B66F 7/00** (2006.01)
F16M 5/00 (2006.01) **F16M 9/00** (2006.01)

(21) Application number: **16159455.1**

(22) Date of filing: **09.03.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(30) Priority: **13.03.2015 PL 41155015**

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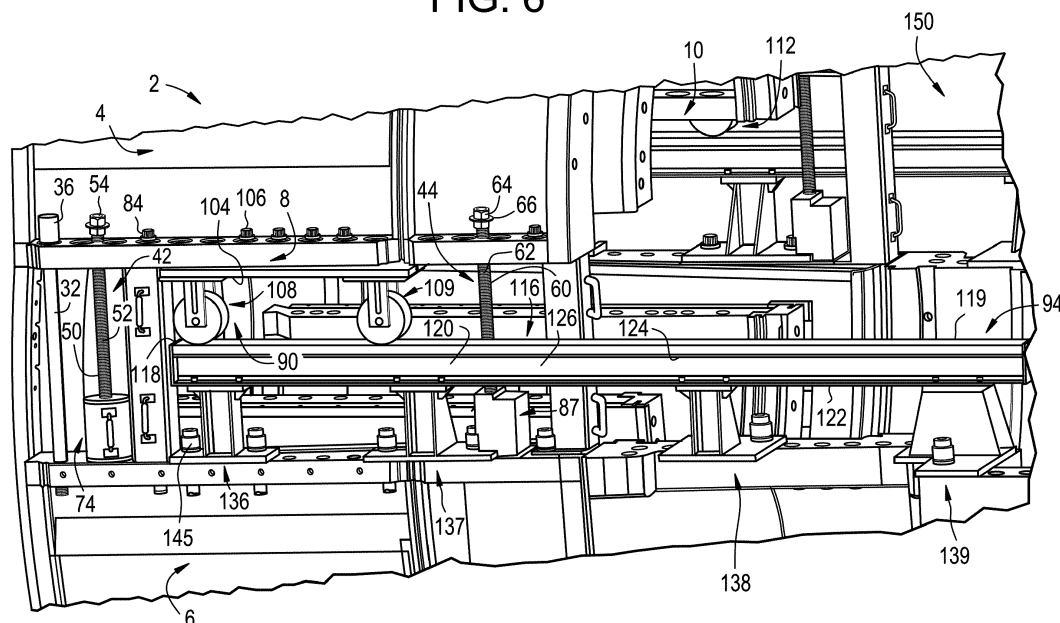
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(54) **TURBOMACHINE EXHAUST FRAME LIFTING SYSTEM AND METHOD**

(57) An exhaust frame (2) includes a first shell portion (4) including a flange portion (8,10), and a second shell portion (6) including a flange section configured to be joined to the flange portion (8,10). The second shell portion (6) is spaced from the first shell portion (4) a desired distance. A rail system (94) is mounted to the flange portion (8,10), and a trolley (90) is mounted to the flange

section (14,16). The second shell portion (6) is axially shiftable along the rail system (94) to expose an internal portion of the exhaust frame (2). A method of lifting and shifting the first shell portion comprises installing and operating one or more lift members (42, 44) to separate the first shell portion from the second shell portion.

FIG. 6



Description

BACKGROUND OF THE INVENTION

[0001] The subject matter disclosed herein relates to the art of turbomachines and, more particularly to a turbomachine exhaust frame lifting system and method of lifting an exhaust frame.

[0002] Turbomachine systems typically include a compressor portion coupled to a turbine portion through a combustor assembly. An exhaust frame may be coupled to an outlet of the turbine portion. The exhaust frame serves as an interface with an exhaust system. The exhaust frame typically includes a lower shell portion and an upper shell portion. The upper shell portion is coupled to the lower shell portion through first and second bolted joints. Occasionally it is desirable to separate the upper shell portion from the lower shell portion to access internal components for maintenance, repair and/or replacement. Separation of the upper shell portion from the lower shell portion to access the internal components requires a crane.

BRIEF DESCRIPTION OF THE INVENTION

[0003] According to one aspect of an exemplary embodiment, an exhaust frame includes a first shell portion including a flange portion, and a second shell portion including a flange section configured to be joined to the flange portion. The second shell portion is spaced from the first shell portion a desired distance. A rail system is mounted to the flange section, and a trolley is mounted to the flange portion. The first shell portion is axially shiftable along the rail system to expose an internal portion of the exhaust frame.

[0004] According to another aspect of an exemplary embodiment, a method of lifting and shifting a shell portion of an exhaust frame includes installing one or more lifting members through a flange portion of a first shell portion to a flange section of a second shell portion of the exhaust frame, operating the one or more lifting members separating the first shell portion from the second shell portion a desired distance, installing a trolley on the flange portion of the first shell portion, mounting a rail system to the flange section of the second shell portion, and shifting the first shell portion relative to the second shell portion upon the rail system.

[0005] These and other advantages and features will become more apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0006] The subject matter, which is regarded as the invention, is particularly pointed out and distinctly claimed in the claims at the conclusion of the specification. The foregoing and other features, and advantages of the invention are apparent from the following detailed descrip-

tion taken in conjunction with the accompanying drawings in which:

FIG. 1 depicts an exhaust frame prior to being separated, in accordance with an exemplary embodiment;

FIG. 2 depicts a first shell portion of the exhaust frame being lifted relative to a second shell portion of the exhaust frame through one or more lifting members;

FIG. 3 depicts the first shell portion being further lifted relative to the second shell portion;

FIG. 4 depicts the first shell portion being still further lifted through the use of spacers;

FIG. 5 depicts the first shell portion being lifted to a desired height;

FIG. 6 depicts a trolley mounted to a flange portion of the first shell portion and a rail system mounted to a flange section of the second shell portion;

FIG. 7 depicts the rail system of FIG. 6; and

FIG. 8 depicts an end view of the rail system of FIG. 7.

[0007] The detailed description explains embodiments of the invention, together with advantages and features, by way of example with reference to the drawings.

DETAILED DESCRIPTION OF THE INVENTION

[0008] An exhaust frame for a turbomachine, in accordance with an exemplary embodiment, is indicated generally at 2, in FIG. 1. Exhaust frame 2 includes a first shell portion 4 and a second shell portion 6. First shell portion 4 is shown as an upper shell while second shell portion 6 is shown as a lower shell. Of course, it should be understood that the terms "first" and "second" should not be understood to be limited to upper and lower. First shell portion 4 includes a first flange portion 8 and a second flange portion 10 (FIG. 6). Similarly, second shell 6 includes a first flange section 14 and a second flange section 16 (FIG. 3). During operation, first flange portion 8 is joined to first flange section 14 to form a first bolted joint (not separately labeled) and second flange portion 10 is joined to second flange section 16 to form a second bolted joint (also not separately labeled).

[0009] Reference will now follow to first flange portion 8 and first flange section 14 with an understanding that second flange portion 10 and second flange section 16 may include similar structure. First flange portion 8 includes a plurality of threaded openings, one of which is indicated at 20, and a plurality of unthreaded openings, one of which is indicated at 22. Similarly, first flange sec-

tion 14 includes a plurality of threaded openings, one of which is indicated at 25, and a plurality of unthreaded openings 26. Generally, mechanical fasteners (not shown) pass through unthreaded openings 22 of first flange portion 8 and engage with threaded openings 25 of first flange section 14 to join first shell portion 4 to second shell portion 6. However, occasionally, it is desirable to lift first shell portion 4 away from second shell portion 6 to expose an internal chamber (not separately labeled) of exhaust frame 2 for maintenance and/or repair.

[0010] In accordance with an aspect of an exemplary embodiment, a first guide member 32 is passed through first flange portion 8 and first flange section 14. A second guide member 34 is also passed through first flange portion 8 and first flange section 14 spaced from first guide member 32. First and second guide members 32 and 34 include first and second collars 36 and 38 respectively. Collars 36 and 38 prevent first and second guide members 32 and 34 from passing completely through first flange portion 8. First and second guide members 32 and 34 may pass through unthreaded openings 22 in first flange portion 8 that register with threaded openings 25 in first flange section 14 in order to maintain a desired alignment between first shell portion 4 and second shell portion 6. It should be understood that additional guide members (not shown) may be passed through second flange portion 10 and second flange section 16.

[0011] In further accordance with an exemplary embodiment, a first lifting member 42 is threaded into one of threaded openings 20 in first flange portion 8 and engages with first flange section 14. In the exemplary embodiment shown, first lifting member 42 engages into an unthreaded opening 26 in first flange section 14. A second lifting member 44 is threaded into another one of threaded openings 20 in first flange portion 8 and engages with first flange section 14. In the exemplary embodiment shown, second lifting member 44 engages into another unthreaded opening 26 in first flange section 14. At this point, it should be understood, that first and second lifting members 42 and 44 may simply engage an outer surface (not separately labeled) of first flange section 14.

[0012] First lifting member 42 includes a first end 48, a second end 49 (FIG. 2), and an intermediate portion 50 extending therebetween. Intermediate portion 50 includes a plurality of threads 52 that may engage with one of threaded openings 20. A tool engagement member 54 is arranged at first end 48. Tool engagement member 54 includes a rotating count indicator 56 that enables technicians to determine how many revolutions are imparted to first lifting member 42 during lifting. In this manner, the technicians ensure that first shell portion 4 is lifted evenly to reduce stresses. In a similar manner, second lifting member 44 includes a first end 58 a second end 59 (FIG. 2), and an intermediate portion 60 extending therebetween. A plurality of threads 62 are provided on intermediate portion 60. First end 58 includes a tool engagement member 64 having a rotating count indicator 66.

[0013] Reference will now follow to FIGs. 2-6, wherein like reference numbers represent corresponding parts in the respective views in describing a method of lifting and shifting first shell portion 4 from second shell portion 6. It should also be understood that the discussion will follow describing actions that occur at first flange portion 8 and second flange section 14 with an understanding that similar actions take place at second flange portion 10 and second flange section 16. As shown in FIG. 2, first and second lifting members 42 and 44 are rotated causing first shell portion 4 to begin to lift. Once separated, a cribbing block 70 may be inserted between first flange portion 8 and first flange section 14. Cribbing block 70 may include structure (not shown) that engages with threaded openings 25 and/or unthreaded openings 26. Cribbing block 70 may provide additional support to first flange portion 8 during lifting.

[0014] In FIG. 3, first and second lifting members 42 and 44 may be manipulated to further lift first shell portion 4 and another cribbing block 72 is installed upon cribbing block 70. During lifting, first and second guide members 32 and 34 maintain a desired alignment between first shell portion 4 and second shell portion 6. In FIG. 4, first shell portion 4 is supported on cribbing blocks 70 and 72 and first and second lifting members 42 and 44 are backed out a distance sufficient to allow insertion of first and second spacers 74 and 76. Spacers may be a single height, such as shown in connection with spacer 74, or may include multiple spacer portions, as shown with spacer 76. At this point, first and second lifting members 42 and 44 are threaded back into first flange portion 8 to further lift first shell portion 4 to a desired height, as shown in FIG. 5. In accordance with an aspect of an exemplary embodiment, the desired height is about 24 inches (60.96-centimeters). At the desired height, cribbing blocks 70 and 72 are replaced by final cribbing blocks 81 and 82. Final cribbing blocks 81 and 82 include a length substantially equivalent to the desired height and may be retained through mechanical fasteners 84 and 85 respectively.

[0015] In FIG. 6, first shell portion 4 is shown supported above second shell portion 6 through final cribbing blocks 81 and 82. Further, second spacer 76 may be replaced with a third spacer 87 that provides additional clearance to enhance access and facilitate shifting first shell portion 4. A trolley 90 is installed to first flange portion 8 and a rail system 94 is installed to first flange section 14. Trolley 90 includes a support plate 104 that is coupled to first flange portion 8 by a plurality of mechanical fasteners, one of which is indicated at 106. A first wheel 108 and a second wheel 109 are connected to support plate 104. At this point, it should be understood that while shown with two wheels 108 and 109, the number of wheels may vary. In further accordance with an aspect of an exemplary embodiment, support plate 104 positions first and second wheels 108 and 109 laterally outwardly of first flange portion 8. It should also be understood, that another trolley 112 is coupled to second flange portion 10.

[0016] Reference will now follow to FIGs. 7 and 8 in describing rail system 94 in accordance with an aspect of an exemplary embodiment. Rail system 94 includes a rail member 116 having a first end portion 118, a second end portion 119, and an intermediate portion 120. Rail member 116 includes a base member 122 and a support member 124 joined by an interconnecting web 126. Support member 124 includes a support surface 129 extending between first end portion 118 and second end portion 119. Support member 124 also includes a first blocking tab 132 extending between first and second end portions 118 and 119 on a first lateral side of support surface 129, and a second blocking tab 133 extending between first and second end portions 118 and 119 on a second, opposing side of support surface 129. First and second blocking tabs 132 and 133 create a guide track for first and second wheels 108 and 109.

[0017] Base member 122 is coupled to a plurality of brackets 136-139 that are spaced between first end portion 118 and second end portion 119. Brackets 136-139 are secured to base member 122 through a plurality of mechanical fasteners, one of which is indicated at 142. Additional mechanical fasteners, one of which is indicated at 145, secure brackets 136-139 to first flange section 14. In accordance with an aspect of an exemplary embodiment, brackets 136-139 position rail member 116 laterally outwardly of first flange section 14 such that support surface 129 aligns with first and second wheels 108 and 109. It should also be understood that another rail system 150 is coupled to second flange section 16.

[0018] First and second lifting members 42 and 44 may now be backed out to lower first shell portion 4 onto rail systems 94 and 150. At this point, all lifting members and guide members may be removed and first shell portion 4 shifted along rail systems 94 and 150 to provide access to internal portions of exhaust frame 2. At this point, it should be understood, that the exemplary embodiments provide a system and method for lifting and shifting an exhaust frame shell portion installed in an area that may be inaccessible to cranes or other large lifting devices.

[0019] The term "about" is intended to include the degree of error associated with measurement of the particular quantity based upon the equipment available at the time of filing the application. For example, "about" can include a range of $\pm 8\%$ or 5% , or 2% of a given value.

[0020] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one more other features, integers, steps, operations, element components, and/or groups thereof.

[0021] While the invention has been described in detail

in connection with only a limited number of embodiments, it should be readily understood that the invention is not limited to such disclosed embodiments. Rather, the invention can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate with the spirit and scope of the invention. Additionally, while various embodiments of the invention have been described, it is to be understood that aspects of the invention may include only some of the described embodiments. Accordingly, the invention is not to be seen as limited by the foregoing description, but is only limited by the scope of the appended claims.

Claims

1. An exhaust frame (2) comprising:
 - a first shell portion (4) including a flange portion (8,10);
 - a second shell portion (6) including a flange section (14,16) configured to be joined with the flange portion (8,10), the second shell portion (4) being spaced from the first shell portion a desired distance;
 - a rail system (94) mounted to the flange section (14,16); and
 - a trolley (90) mounted to the flange portion (8,10), the first shell portion (4) being axially shiftable along the rail system (94) to expose an internal portion of the exhaust frame (2).
2. The exhaust frame according to claim 1, wherein the desired distance is about 61 centimeters (24-inches).
3. The exhaust frame according to claim 1 or 2, wherein the trolley (90) includes a support plate (104) and at least one wheel (108,109), the support plate (104) being coupled to the flange portion (8,10).
4. The exhaust frame according to claim 3, wherein the at least one wheel includes a first wheel (108) and a second wheel (109).
5. The exhaust frame according to claim 3 or 4, wherein the at least one wheel (108,109) is positioned laterally outwardly of the flange portion (8,10).
6. The exhaust frame according to any of claims 3 to 5, wherein the rail system (96) includes a rail member (124) having a support surface (129), and at least one support bracket (136-139) coupled to the flange section (14,16).
7. The exhaust frame according to claim 6, wherein the support surface (129) is positioned laterally outward-

ly of the flange section (14,16).

8. The exhaust frame according to claim 6 or 7, wherein the rail member (124) includes a first blocking tab (132) projecting outwardly of the support surface (129) and second blocking tab (133) projecting outwardly of the support surface (129) spaced from the first blocking tab, the at least one wheel (108,109) being supported by the support surface (129) between the first and second blocking tabs (132,133). 5 10
9. The exhaust frame according to any preceding claim, further comprising: a plurality of lifting members (42,44) extending through the flange portion (8,10) to the flange section (14,16), each of the plurality of lifting members (42,44) acting on the flange section (14,16) to raise the first shell portion (4), at least one of the plurality of lifting members (42,44) including a rotating count indicator (66). 15 20
10. The exhaust frame according to any preceding claim, further comprising: a plurality of guide members (32,34) extending through the flange portion (8,10) and the flange section (14,16), the plurality of guide members (32,34) maintaining a desired alignment between the first and second shell portions (4,6). 25
11. A method of lifting and shifting a shell portion (4,6) of an exhaust frame (2) comprising: 30
installing one or more lifting members (42,44) through a flange portion (8,10) of a first shell portion (4) to a flange section (14,16) of a second shell portion (6) of the exhaust frame (2);
operating the one or more lifting members (42,44) separating the first shell portion (4) from the second shell portion (6) a desired distance; 35
installing a trolley (90) on the flange portion (8,10) of the first shell portion (4);
mounting a rail system (94) to the flange section (14,16) of the second shell portion (6); and 40
shifting the first shell portion (4) relative to the second shell portion (6) upon the rail system (94). 45
12. The method of claim 11, wherein operating the one or more lifting members (42,44) includes engaging threads (52) on each of the one or more lifting members (42,44) with corresponding threads (20) in the flange portion (8,10). 50
13. The method of claim 12, further comprising:
installing one or more cribbing blocks (70,72) between the flange portion (8,10) and the flange section (14,16); and 55
supporting the first shell portion (4) on the second shell portion (6) through the one or more

cribbing blocks (70,72).

14. The method of claim 13, further comprising:
installing one or more spacers (74,76) to the flange section (14,16); and
engaging the one or more lifting members (42,44) with corresponding ones of the one or more spacers (74,76) to further lift the first shell portion (4) from the second shell portion (6).
15. The method of any of claims 11 to 14, further comprising: lowering the first shell portion (4) relative to the second shell portion (6) engaging at least one wheel (108,109), on the trolley (90) with a support surface (129) of the rail system (94) and wherein engaging the at least one wheel (108,109) with the support surface (129) includes positioning the at least one wheel (108,109) between first and second blocking tabs (132,133) projecting outwardly of the support surface (129).

FIG. 1

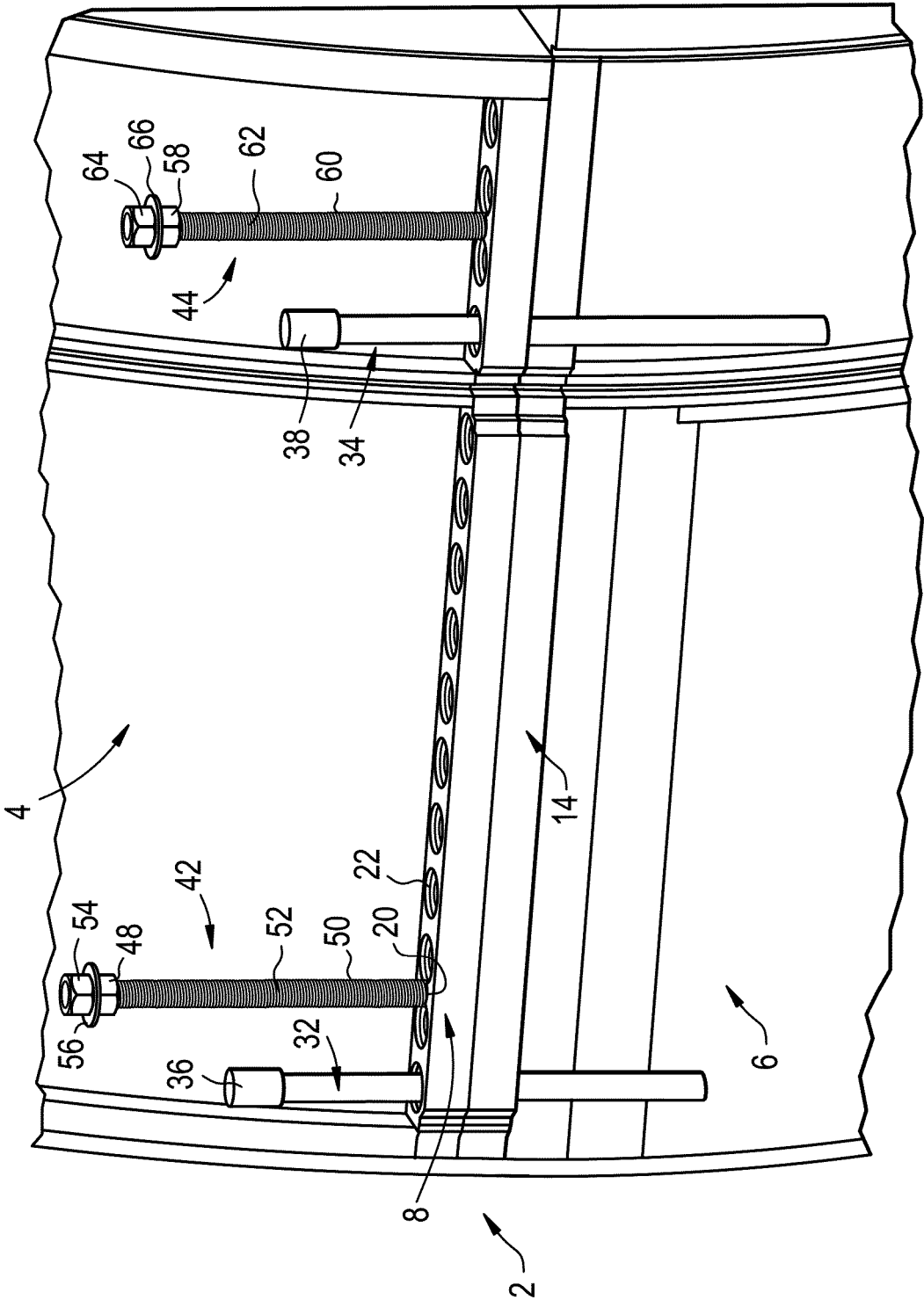


FIG. 2

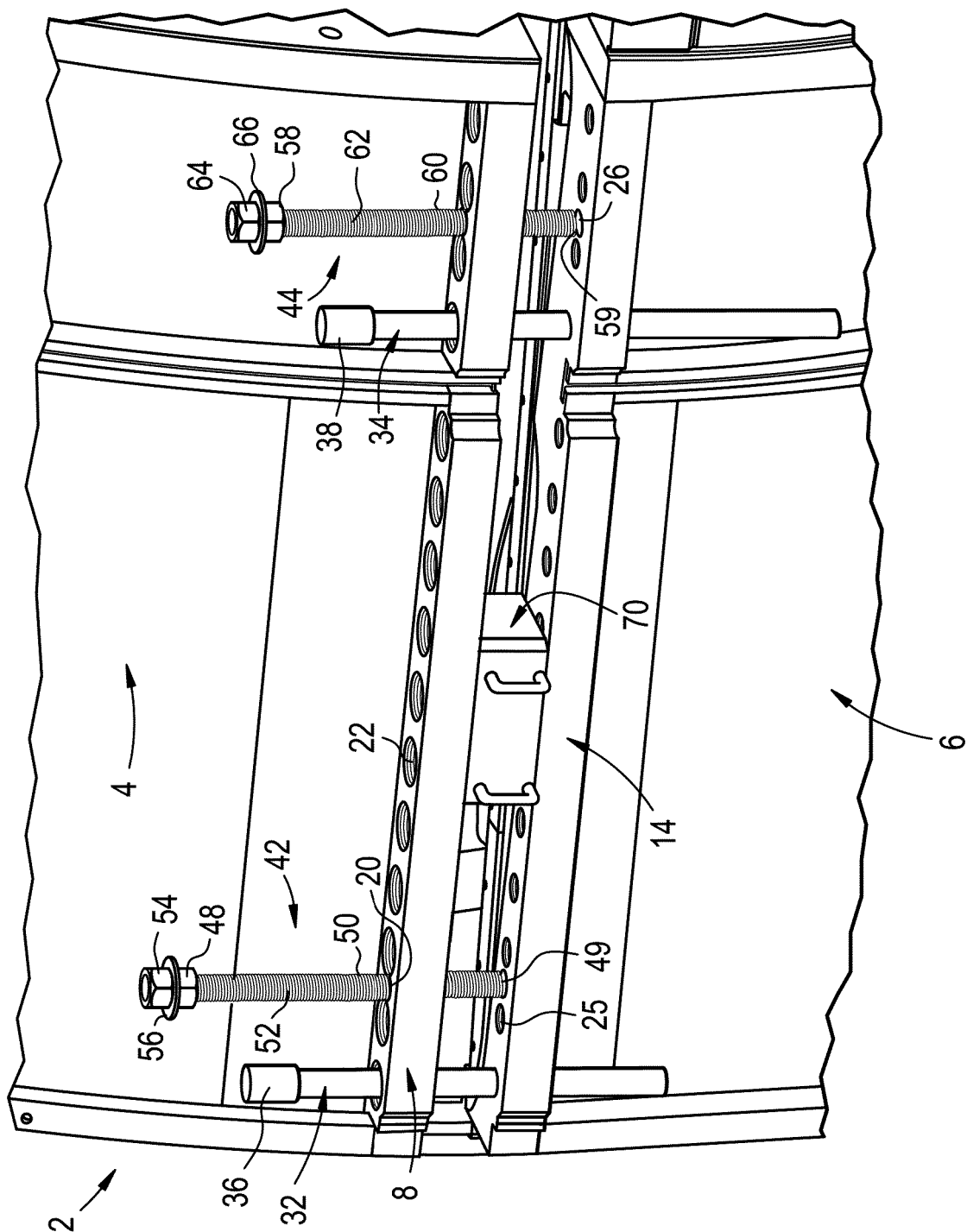
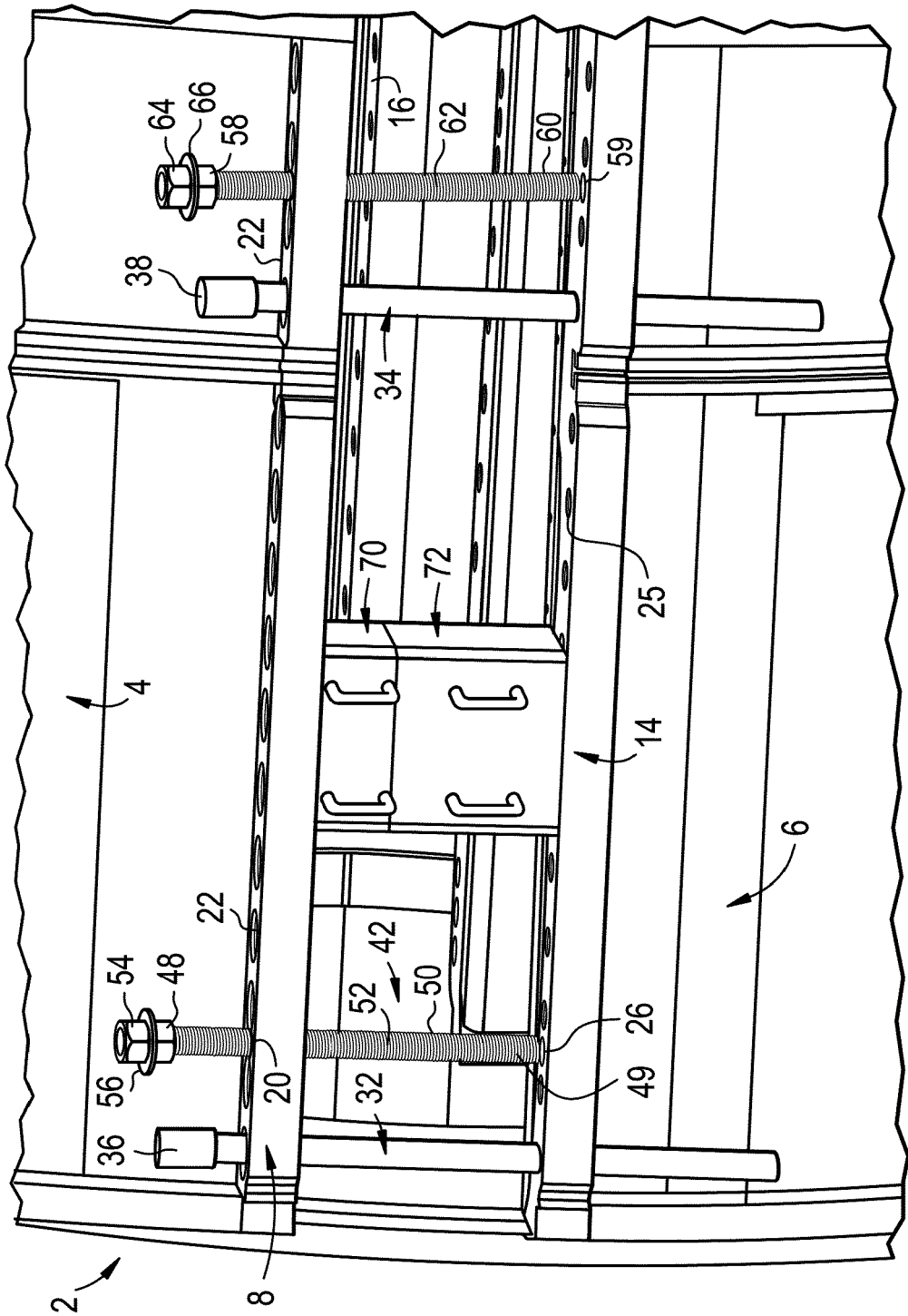


FIG. 3



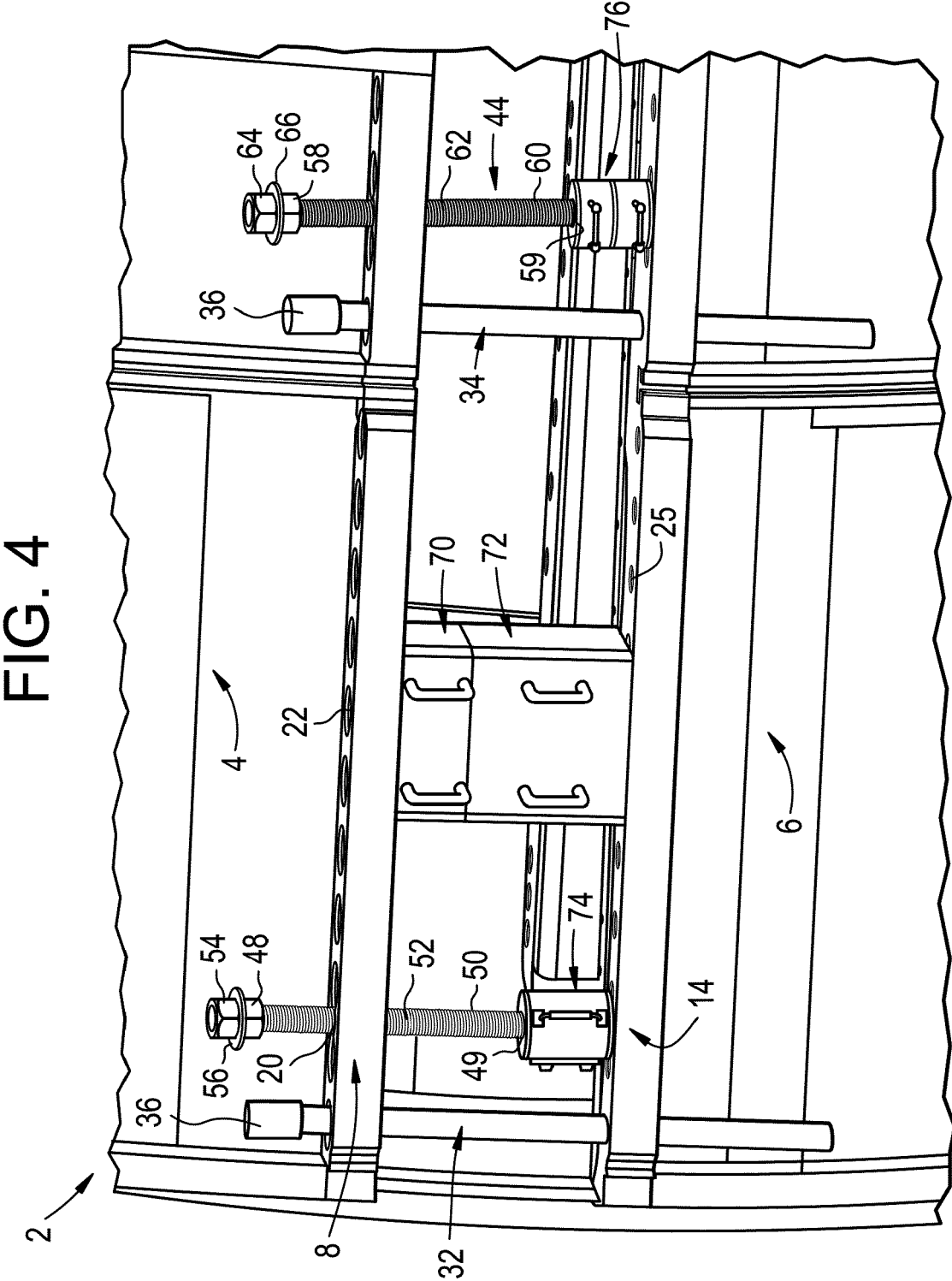


FIG. 5

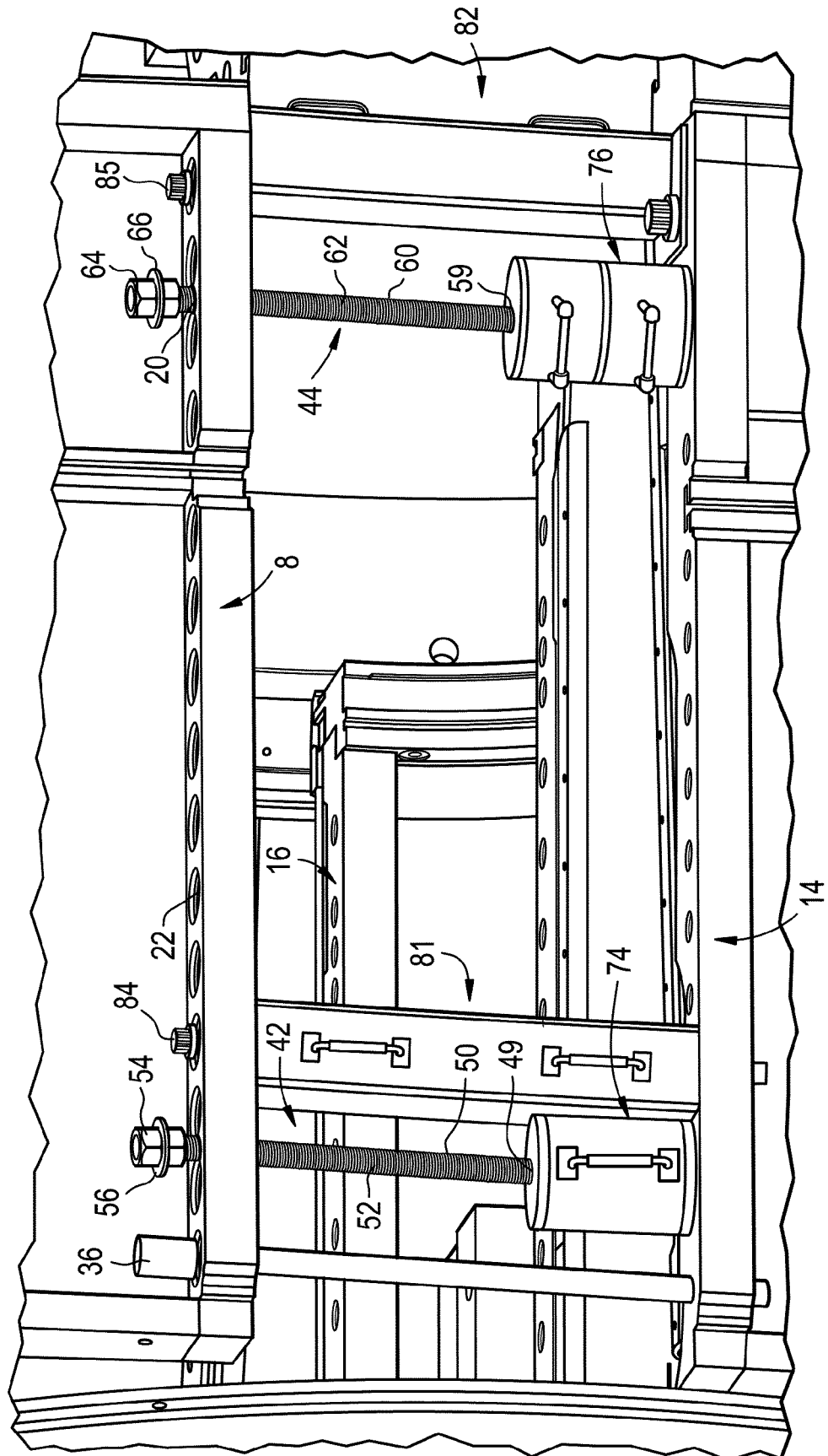


FIG. 6

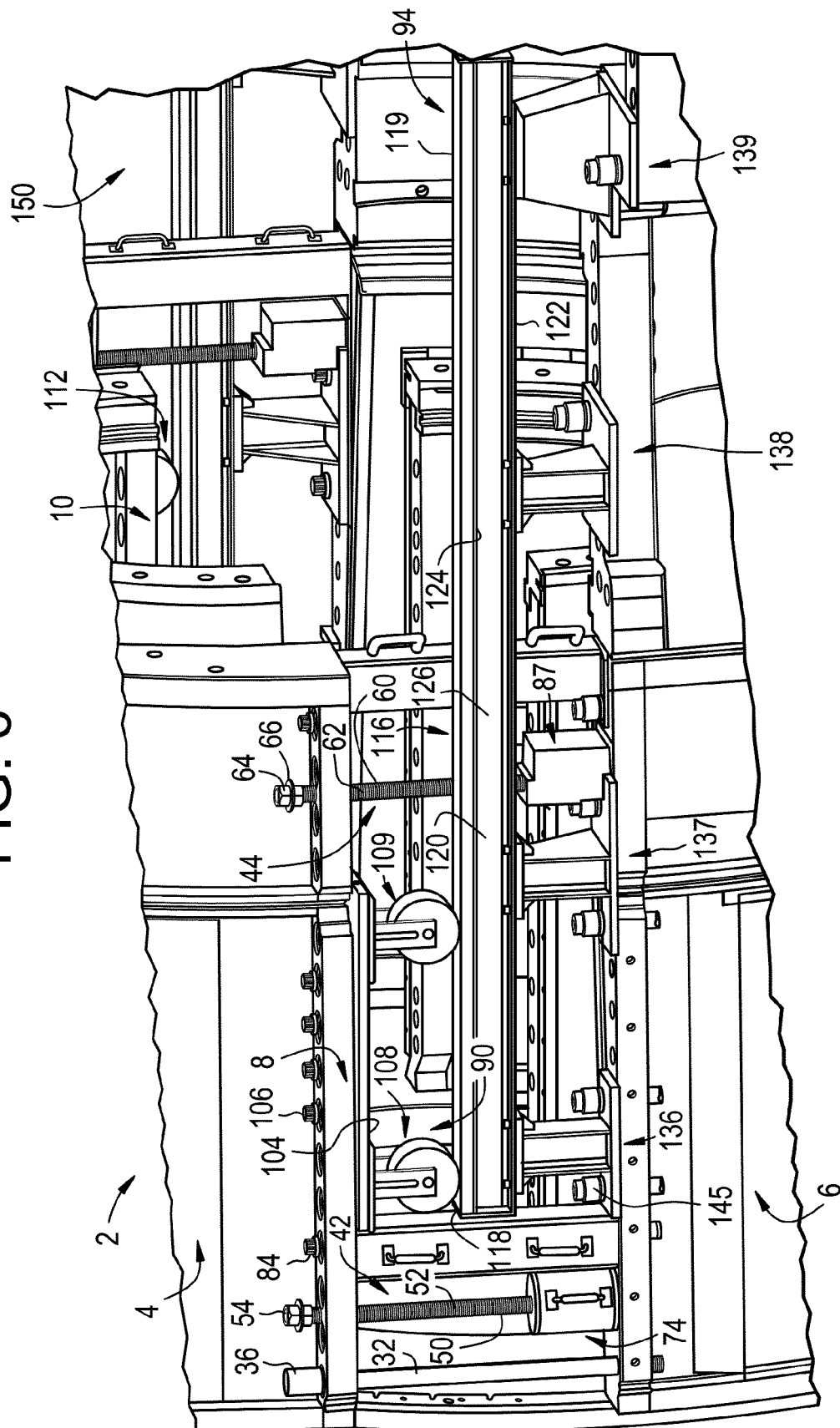


FIG. 7

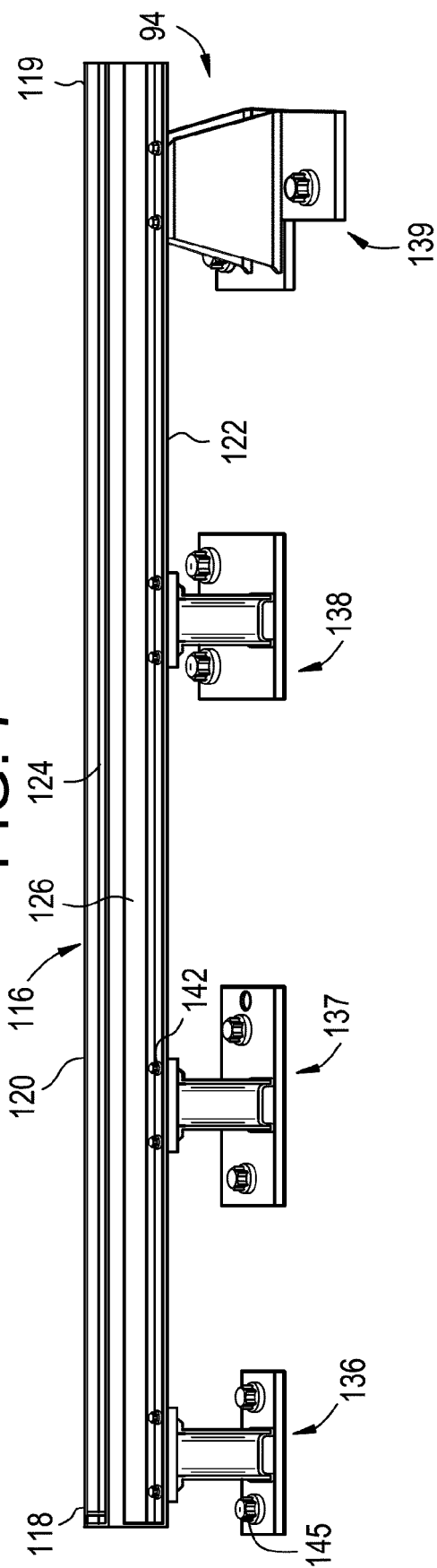
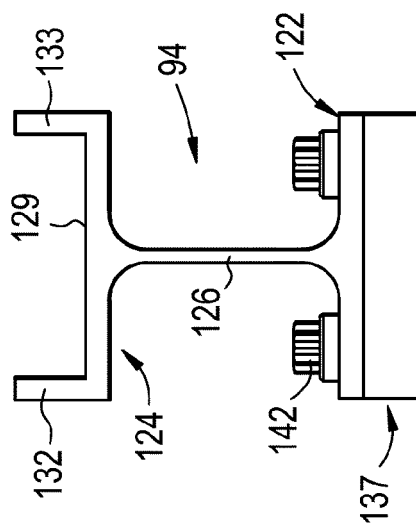


FIG. 8





EUROPEAN SEARCH REPORT

Application Number
EP 16 15 9455

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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Y	* the whole document *	3-10, 12-14	
Y	US 2012/272496 A1 (HERBOLD JOHN WILLIAM [US] ET AL) 1 November 2012 (2012-11-01) * paragraphs [0001] - [0003], [0041] - [0043]; figures 1-5 *	1,2,4, 6-9,11, 12,15	
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Y	KR 101 251 461 B1 (KOREAPLANTSERVICE CO LTD [KR]) 5 April 2013 (2013-04-05) * figure 4 *	10	TECHNICAL FIELDS SEARCHED (IPC) F01D F16M B65G B66F
Y	EP 2 546 475 A2 (GEN ELECTRIC [US]) 16 January 2013 (2013-01-16) * figures 3-5,12 *	1,3-7, 11,15	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 26 July 2016	Examiner Koch, Rafael
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 15 9455

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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26-07-2016

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