(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 933 213 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**21.10.2015 Bulletin 2015/43**

(51) Int Cl.:
***B65H 29/68*** *(2006.01)*

(21) Application number: **14165248.7**

(22) Date of filing: **17.04.2014**

(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**

(71) Applicant: **Goss International Americas, Inc.**
**Durham, NH 03824 (US)**

(72) Inventors:
- **Doucet, Louis John**
  **Salem, NH 03079 (US)**
- **Guaraldi, Glenn Alan**
  **Kingston, NH 03848 (US)**

(74) Representative: **Tischner, Oliver**
**Lavoix Munich**
**Bayerstrasse 83**
**80335 München (DE)**

(54) **Trimmer and method of operating a trimmer**

(57) A trimmer (10) is provided. The trimmer includes an infeed (12) for transporting a sheet material article at a first speed, a trimming station transporter (46) for decelerating the sheet material article for trimming by a trimming device (52), and a decelerator (14) between the infeed and the trimming station transporter. The decelerator forms a deceleration nip (32) for transferring the sheet material article from the infeed to the trimming station transporter. A method of operating a trimmer (10) is also provided.

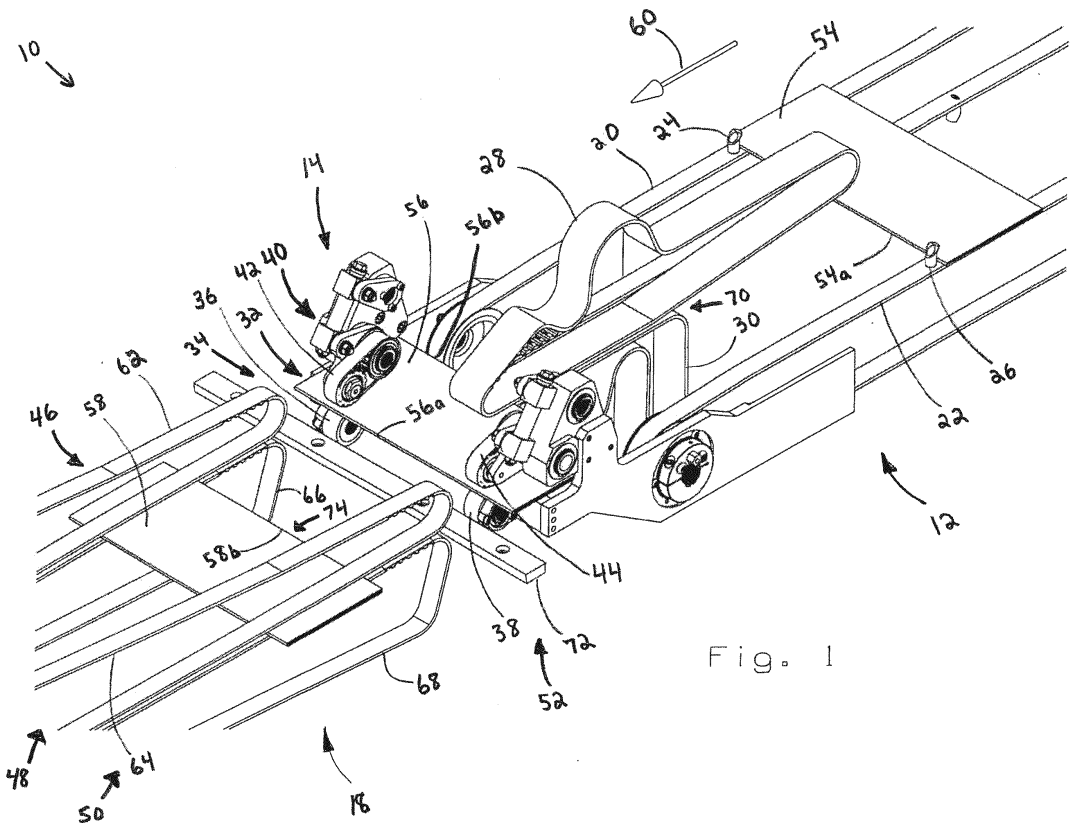


Fig. 1

EP 2 933 213 A1

## Description

**[0001]** The present invention relates generally to sheet material trimmers and more specifically to a transporting sheet material articles in sheet material trimmers.

## BACKGROUND OF INVENTION

**[0002]** U.S. Patent No. 7,555,975 and U.S. Patent No. 8,186,252, which are both hereby incorporated by reference herein, disclose sheet material trimmers.

## BRIEF SUMMARY OF THE INVENTION

**[0003]** A trimmer is provided. The trimmer includes an infeed for transporting a sheet material article at a first speed, a trimming station transporter for decelerating the sheet material article for trimming by a trimmer, and a decelerator between the infeed and the trimming station transporter. The decelerator forms a deceleration nip for transferring the sheet material article from the infeed to the trimming station transporter.

**[0004]** A method of operating a trimmer is also provided. The method includes transporting a sheet material article at an infeed at a first speed and receiving the sheet material article from the infeed at a deceleration nip. A surface speed of the deceleration nip is equal to the first speed as the deceleration nip receives the sheet material article from the infeed. The method also includes decelerating the sheet material using the deceleration nip and passing the sheet material article to a trimming station transporter.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0005]** The present invention is described below by reference to the following drawings, in which:

Fig. 1 shows a trimmer according to an embodiment of the present invention;

Figs. 2a and 2b illustrate the transfer of a book from register belts to forwarding belts at an infeed of the trimmer;

Figs. 3a and 3b are cross-sectional views of the trimmer shown in Fig. 1 operating with a deceleration nip in a closed position;

Figs. 4a and 4b are cross-sectional views of the trimmer shown in Fig. 1 operating with the deceleration nip in an open position;

Fig. 5 shows a graph illustrating the speed of a book during one cycle of the trimmer;

Fig. 6 shows drive components of a decelerator of the trimmer;

Fig. 7 shows a cross-sectional view of an upper decelerator section actuator of the decelerator;

Fig. 8 shows a detailed view of the upper decelerator section actuator in an open position;

Figs. 9 to 13 show deceleration nips in accordance with additional embodiments of the present invention; and

Figs. 14a and 14b show a decelerator according to another embodiment of the present invention.

## DETAILED DESCRIPTION

**[0006]** Fig. 1 shows a trimmer 10 according to an embodiment of the present invention. Trimmer 10 includes an infeed 12, a decelerator 14 downstream of infeed 12 and a trimming station 18 downstream of decelerator 14. In this embodiment, trimming station 18 trims a front or face of sheet material articles (i.e., an edge opposite the spine) and trimmer 10 includes a side trimming station downstream of trimming station 18. Sheet material articles are sequentially fed from infeed 12 at a constant infeed speed to decelerator 14. At infeed 12, sheet material articles are registered with infeed register belts 20, 22 at register pins 24, 26 and passed to forwarding belts 28, 30. Infeed register belts 20, 22 and forwarding belts 28, 30 run at the same infeed speed. The sheet material articles leave infeed 12 at the outlet of forwarding belts 28, 30 and are received by decelerator 14 at a deceleration nip 32, which in this embodiment is formed by a lower decelerator section 34 of fixed position lower deceleration rollers 36, 38 and an upper decelerator section 40 of actuating upper deceleration belts 42, 44. In a closed position of deceleration nip 32, upper deceleration section 40 contacts an upper side of the sheet material article and lower deceleration section 34 contacts a lower side of the sheet material article. In an open position of deceleration nip 32, upper deceleration section 40 is spaced away from the sheet material article and does not contact the upper side of the sheet material article.

**[0007]** As deceleration nip 32 receives the sheet material article from infeed 12, a trailing edge of the sheet material article is still in contact with forwarding belts 28, 30 and a surface speed of the deceleration nip 32 is equal to the infeed speed (i.e., the surface speed of belts 20, 22, 28, 30). After the sheet material exits infeed 12, i.e., after a trailing edge of the sheet material article is no longer in contact with forwarding belts 28, 30, the surface speed of deceleration nip 32 is decreased, decelerating the sheet material article using deceleration nip 32. As sheet material enters into trimming station 18, i.e., when a leading edge of the sheet material articles contacts a trimming station transporter 46, which is formed by an upper transport conveyor 48 for contacting the upper side of the sheet material article and a lower transport conveyor 50 for contacting the lower side of the sheet ma-

terial article, the surface speed of deceleration nip 32 is equal to a surface speed of trimming station transporter 46. Deceleration nip 32 and trimming station transporter 46 then decelerate the sheet material article together until the sheet material article exits deceleration nip 32, i.e., when a trailing edge of the sheet material articles is no longer in contact with lower decelerator section 34 and upper decelerator section 40.

**[0008]** After the sheet material article exits deceleration nip 32, trimming station transporter 46 continues to decelerate the sheet material article until the sheet material article comes to a complete stop. Once the sheet material article is stopped, a trimming device 52 trims an edge of the sheet material article. In this embodiment, decelerator 14 and trimming station transporter 46 are driven by a common drive, such that the surface speed of trimming station transport 46 is always equal to the surface speed of deceleration nip 32. In order to avoid problems for a following sheet material article entering deceleration nip 32 while the surface speed of deceleration nip 32 is lower than the infeed speed (i.e., the surface speed of the following sheet material article), deceleration nip 32 is opened after the sheet material article exits deceleration nip 32 (as shown with respect to book 58 in Fig. 4a). Accordingly, while lower decelerator section 34, upper decelerator section 40, upper transport conveyor 48 and lower transport conveyor 50 are driven to have a lower surface speed than the infeed speed and a following sheet material article has entered into deceleration nip 32, upper decelerator section 40 is actuated to be spaced away from lower decelerator section 34 such that upper decelerator section 40 does not contact the upper side of the following sheet material article and nip 32 is in the open position. Once the sheet material article is trimmed by trimming device 52, lower decelerator section 34, upper decelerator section 40, upper transport conveyor 48 and lower transport conveyor 50 are accelerated such that conveyors 48, 50 accelerate the trimmed sheet material article away from trimming device 52 and sections 34, 40 are accelerated to have a surface speed is again equal to the infeed speed. After the surface speed of deceleration nip 32 reaches the infeed speed, deceleration nip 32 is closed to grip the subsequent sheet material article, by actuating upper decelerator section 40 back toward lower decelerator section 34.

**[0009]** Fig. 1 shows three sheet material articles 54, 56, 58, which are for example books traveling in a direction 60, at their relative positions when infeed 12 and trimming station transporter 46 (along with decelerator 14) are running at matched speed. First book 54 is shown at infeed register belts 20, 22 with a leading edge spine 54a of book 54 against register pins 24, 26. Second book 56 is shown with its trailing edge 56b in a nip 70 formed by upper forwarding belt 28 and lower forwarding belt 30. Leading edge 56a of book 56 is shown in deceleration nip 32 being gripped and transported by decelerator sections 34, 40. Third book 58 has already been trimmed by trimming device 52 and is shown between upper trimmer transport belts 62, 64 of upper transport conveyor 48 and lower trimmer transport belts 66, 68 of lower transport conveyor 50 being transported at the infeed speed. A lower knife 72 of trimming device 52, which made a face cut 74 at trailing edge 58b of book 58, is shown at the entrance to trimming station 18, just ahead of trimmer transport belts 62, 64, 66, 68.

**[0010]** Figs. 2a and 2b illustrate the transfer of book 56 from register belts 20, 22 to forwarding belts 28, 30. In Fig. 2a, pins 24, 26 register leading edge 56a, which in this embodiment is the spine, prior to entering forward belt nip 70. Forwarding belts 28, 30 run at the same speed as pins 24, 26. Once book 56 is under control of forwarding belts 28, 30, pins 24, 26 rotate away from leading edge 56a and travel in a return path 76. (similar to register and control disclosed in Fig. 4 of incorporated by reference U.S. Patent 8,186,252).

**[0011]** Figs. 3a and 3b are cross-sectional views of Fig. 1. Instead of transporting books 54, 56, 58 as in Fig. 3a, trimmer 10 is transporting books 78, 80, 82, which are larger than books 54, 56, 58, in Fig. 3b. Books 78, 80, 82 are a little more than twice the length of books 54, 56, 58. Additionally, an upper knife 84 of trimming device 52, which was omitted from Fig. 1 for clarity, is in its raised position above lower knife 72. Both Figs. 3a and 3b show books at similar points in the transport cycle, when infeed 12 and trimming station transporter 46 (and thus also decelerator 14) are running at matched speed (zone A of Fig. 5). In this embodiment, trailing edge 56b of book 56 in Fig. 3a and trailing edge 80b of book 80 in Fig. 3b will be in the same position relative to front knives 72, 84 at any point in the cycle, regardless of the book length. As shown in Figs. 3a and 3b, longer books may be gripped by all of forwarding belts 28, 30, decelerator section 34, 40 and conveyors 48, 50 at the same time, while shorter books exit forwarding belts 28, 30 before being gripped by conveyors 48, 50. Similarly, in this embodiment, cut edge 58b of book 58 in Fig. 3a and cut edge 82b of book 82 in Fig. 3b will be at the same position (zone D of Fig. 5) relative to front knives 72, 84 at any point in the cycle, as well.

**[0012]** Figs. 4a and 4b are cross section views similar to Figs. 3a and 3b, but show books 54, 56, 58 and books 78, 80, 82, respectively, at an earlier point in the transport cycle. The face cut on trailing edges 58b, 82b have just been completed and books 58, 82 have started to move away from knives 72, 84 (zone D of Fig. 5). Upper knife 84 is starting to rise and transport conveyors 48, 50 have started to accelerate books 58, 82 from stationary state (zero speed), which existed when the front cut was made by trimming device 52. Books 54, 56 in Fig. 4a and books 78, 80 in Fig. 4b are traveling at a constant infeed speed (zone A of Fig. 5). Because fixed position lower deceleration rollers 36, 38 and actuating deceleration upper belts 42, 44 are running at the transport speed of trimming station 18, deceleration nip 32 is opened by raising belts 42, 44 to allow book 80, which is traveling at a faster

speed than a surface speed of belts 42, 44, to pass through nip 32.

**[0013]** Fig. 5 shows a graph illustrating the speed E of a book during one cycle. In a zone A, the book is in forwarding belts 28, 30 and travels at an infeed speed F. Deceleration nip 32 begins gripping the book in zone A, when a surface speed of nip 32 matches the infeed speed F. In a zone B, the book is in deceleration nip 32 initially and is transferred at match speed to trimmer transport belts 62, 64, 66, 68 while being decelerated to zero speed. The book is released by deceleration nip 32 in zone B before the book reaches zero speed. In a zone C, the book is stopped and trimming by trimming device 52 occurs. In a zone D, the book is still captured by trimmer transport belts 62, 64, 66, 68 and accelerated back to infeed speed F. When the book is in forwarding belts 28, 30, its speed matches the infeed speed F, which is constant. After the book exits the forwarding belts 28, 30, it is decelerated to zero speed in zone B. When at zero speed in zone C, a trailing edge of the book is cut by trimming device 52. When the cut is completed the book is accelerated D back up to the infeed speed F.

**[0014]** Fig. 6 shows drive components 86 of lower deceleration rollers 36, 38 and upper deceleration belts 42, 44. Also shown is a cam arrangement 88, which together with actuator 92 (Figs. 7 and 8) actuates upper deceleration belts 42, 44. Deceleration rollers 36, 38 and belts 42, 44 are driven by a common belt 90. This drive is connected to the same motor that drives the trimmer transport belts 62, 64, 66, 68, resulting in a speed match between trimmer transport belts 62, 64, 66, 68 and deceleration rollers 36, 38 and belts 42, 44. Upper decelerator section actuators 92, 94 and lower deceleration rollers 36, 38 are connected by mounting structures 96, 98. Drive shafts 100, 102 are splined so that upper decelerator section actuators 92, 94 and lower deceleration rollers 36, 38 can be moved in and out to accommodate different book widths. Upper drive shaft 102 passes through the upper belt pivot. This allows upper belts 42, 44 to rotate around the centerline of upper drive shaft 102 to open and close deceleration nip 32.

**[0015]** A cam 104 is driven by a chain 106 connected to the mechanism that also raises and lowers upper knife 84. Cam 104 rotates once per cycle just as upper knife 84 moves up and down once per cycle to cut each book. A cam follower bearing 108 rotates on cam 98 and is mounted to a lever 110, pivoting on a stud 112. Lever 110 is loaded against cam 104 by a spring 114. A connecting rod 116 connects cam lever 110 to a drive lever 118 mounted on the end of a belt actuating shaft 120. Belt actuating shaft 120 is also splined to allow adjustment of upper decelerator section actuators 92, 94 for different book width.

**[0016]** Fig. 7 shows a cross-section view of upper decelerator section actuator 92 and Fig. 8 shows a detailed view of upper decelerator section actuator 92 in an open position. Upper deceleration section actuator 92 moves upper decelerator section 40 away from lower decelerator section 34 to open and close nip 32. Belt actuating shaft 120 pivots a splined sleeve 122 mounted in a housing 124. Connected to sleeve 122 is a lift lever 126. Lift lever 126 is connected to a deceleration belt lever 128 with a compression spring 130 and spring cups 132, 134. Deceleration belt lever 128 is mounted to a sleeve 136 which also pivots in housing 124. The arrangement of the levers 126, 128 results in a four bar mechanism. Spring 130 is a flexible connection between levers 126, 128, allowing deceleration nip 32 to self adjust for varying book thickness.

**[0017]** A timing belt pulley 138 is mounted on a splined bore sleeve 140 that is connected to deceleration belt lever 128 and sleeve 136 by a bearing 142 which allows deceleration belt lever 128 to pivot up and down while timing belt pulley 138 spins upper deceleration belt 42. Splined bore sleeve 140 is driven by splined upper drive shaft 102. Upper deceleration belt 42 wraps an idler pulley 144 mounted on bearings 146 to the end of deceleration belt lever 128. Upper deceleration belt 42 is positioned directly above lower deceleration roller 36 and deceleration nip 32 is created between belt 42 and roller 36 as deceleration belt lever 128 and belt 42 pivot downward.

**[0018]** Fig. 9 shows a deceleration nip 148 in accordance with another embodiment of the present invention. In contrast to deceleration nip 32, where upper deceleration belts 42, 44 form deceleration nip 32 with lower deceleration rollers 36, 38, deceleration nip 148 is formed by lower deceleration rollers 36, 38 and upper deceleration rollers 150, 151, which are mounted adjacent to respective upper deceleration belts 42, 44 and are driven by respective upper deceleration belts 42, 44.

**[0019]** Fig. 10 shows a deceleration nip 152 in accordance with another embodiment of the present invention. In contrast to deceleration nip 32, upper deceleration belts 42, 44 have been replaced by undriven idler rolls 154, 155, mounted to and actuated by levers 156, 157. Lever 156 is actuated by upper decelerator section actuators 92, 94 forming the previously described four bar mechanism. In another embodiment, upper decelerator section actuators 92, 94 may be eliminated and lever 156 may be actuated directly with an actuating shaft passing through a pivot center 158.

**[0020]** Fig. 11 shows a deceleration nip 160 in accordance with another embodiment of the present invention. In this embodiment, width-adjustable lower deceleration rolls 36, 38 have been replaced by a driven full width roll assembly 162.

**[0021]** Fig. 12 shows a deceleration nip 164 in accordance with another embodiment of the present invention. In this embodiment, upper deceleration belts 42, 44 have been replaced by a driven full width roll assembly 166, which forms deceleration nip 164 with driven full width roll assembly 162. Full width roll assembly 166 is driven by gears 168, connected to a belt 170 and is actuated by a cam mechanism 172.

**[0022]** Fig. 13 shows a deceleration nip 174 in accord-

ance with another embodiment of the present invention. In this embodiment, upper deceleration belts 42, 44 have been replaced by axially-adjustable upper wheels 176, 177 which forms deceleration nip 174 with driven full width roll assembly 162.

**[0023]** Figs. 14a and 14b show a decelerator 178 according to another embodiment of the present invention. In this embodiment, a non-reciprocating segmented wheel 178 is provided for opening and closing a deceleration nip 180 formed by wheel 178 and a roller 182. Wheel 178 includes an outer circumferential surface of two different radial heights. A larger circumferential surface 184 having a greater radial height decreases the size of nip 180 and contacts a book 188 and a smaller circumferential surface 186 having a lesser radial height than larger circumferential surface 184 opens up nip 180 such that wheel 178 does not contact book 188 when the surface speed of wheel 178 (and the surface speed of trimmer station transporter 46) is less than the infeed speed. Wheel 178 and roller 182 may be connected to the same drive as trimmer station transport 46 so that the surface speed of larger circumferential surface 184 is equal to the surface speed of trimmer station transporter 46. Fig. 14a shows a book 188 traveling at infeed speed while wheel 178 has a surface speed less than the infeed speed. In Fig. 14b, book 188 has been transferred at matched speed from forwarding belts 28, 30 to wheel 178 and a roller 182 and deceleration nip 180 begins to decelerate book 188.

**[0024]** In the preceding specification, the invention has been described with reference to specific exemplary embodiments and examples thereof. It will, however, be evident that various modifications and changes may be made thereto without departing from the broader spirit and scope of invention as set forth in the claims that follow. The specification and drawings are accordingly to be regarded in an illustrative manner rather than a restrictive sense.

## Claims

**1.** A trimmer comprising:

an infeed for transporting a sheet material article at a first speed;
a trimming station transporter for decelerating the sheet material article for trimming by a trimmer; and
a decelerator between the infeed and the trimming station transporter, the decelerator forming a deceleration nip for transferring the sheet material article from the infeed to the trimming station transporter.

**2.** The trimmer as recited in claim 1 wherein the deceleration nip receives the sheet material article from the infeed at the first speed and decelerates the sheet material article with the trimming station transporter.

**3.** The trimmer as recited in claim 1 or 2 wherein the decelerator includes a first decelerator section contacting a first side of the sheet material article and a second decelerator section contacting a second side of the sheet material article.

**4.** The trimmer as recited in claim 3 wherein the first decelerator section is movable away from the second decelerator section such that the first decelerator section does not contact the first side of the sheet material article.

**5.** The trimmer as recited in claim 4 wherein the decelerator includes an actuator moving the first decelerator section away from the second decelerator section after the sheet material article is released from the decelerator nip.

**6.** The trimmer as recited in any one of claim 3 to 5 wherein the first decelerator section includes at least one belt or at least one roller contacting the first side of the sheet material article.

**7.** The trimmer as recited in any one of claims 1 to 6 wherein the infeed includes a pair of forwarding belts for releasing the sheet material article to the decelerator.

**8.** The trimmer as recited in any one of claims 1 to 7 wherein the trimming station transporter includes a first transport conveyor for contacting a first side of the sheet material article and a second transport conveyor for contacting a second side of the sheet material article, the first transport conveyor and the second transport conveyor decelerating the sheet material article for trimming.

**9.** The trimmer as recited in any one of claims 1 to 8 wherein the decelerator contacts both sides of the sheet material article before the sheet material article is released from the infeed and contacts both sides of the sheet material article after the sheet material article has been received by the trimmer station.

**10.** The trimmer as recited in claim 9 wherein a surface speed of the decelerator is equal to a surface speed of the infeed while both the decelerator and the infeed contact the sheet material article and the surface speed of the decelerator is equal to a surface speed of the trimming station transporter while both the decelerator and the trimming station transporter contact the sheet material article.

**11.** A method of operating a trimmer comprising:

transporting a sheet material article at an infeed at a first speed;
receiving the sheet material article from the infeed at a deceleration nip, a surface speed of the deceleration nip being equal to the first speed as the deceleration nip receives the sheet material article from the infeed; and
decelerating the sheet material using the deceleration nip and passing the sheet material article to a trimming station transporter.

**12.** The method as recited in claim 11 further comprising receiving the sheet material article from the deceleration nip at a trimming station transporter, a surface speed of the trimming station transporter being equal to the surface speed of the deceleration nip as the trimming station transporter receives the sheet material article from the deceleration nip.

**13.** The method as recited in claim 12 wherein the trimming station transporter includes a first conveyor for contacting a first side of the sheet material article and a second conveyor for contacting a second side of the sheet material article.

**14.** The method as recited in claim 13 wherein the deceleration nip is formed by a first decelerator section contacting the first side of the sheet material article and a second decelerator section contacting the second side of the sheet material article, the first decelerator section and the second decelerator section transporting the sheet material article together with the first transport conveyor and second transporter conveyor after the infeed releases the sheet material article.

**15.** The method as recited in claim 14 wherein the receiving the sheet material article from the infeed at a deceleration nip includes moving the first decelerator section toward the second decelerator section to contact the first side of the sheet material article.

**16.** The method as recited in any one of claims 12 to 15 wherein a surface speed of the deceleration nip is varied during sequential cycles, each cycle including accelerating the deceleration nip to match the first speed of the infeed and decelerating the deceleration nip to slow down a corresponding sheet material article for trimming.

**17.** The method as recited in claim 16 wherein the surface speed of the trimming station transporter is equal to the surface speed of the deceleration nip throughout each cycle.

**18.** The method as recited in any one of claims 11 to 17 further comprising opening the deceleration nip after the decelerating step before a following sheet material article enters the deceleration nip, the deceleration nip have a surface speed greater than a surface speed of the following sheet material article as the following sheet material article enters the deceleration nip.

**19.** The method as recited in claim 18 further comprising increasing surface speed of the deceleration nip after the opening step.

**20.** The method as recited in claim 19 further comprising closing the deceleration nip when the surface speed of the deceleration nip equals the surface speed of the following sheet material article.

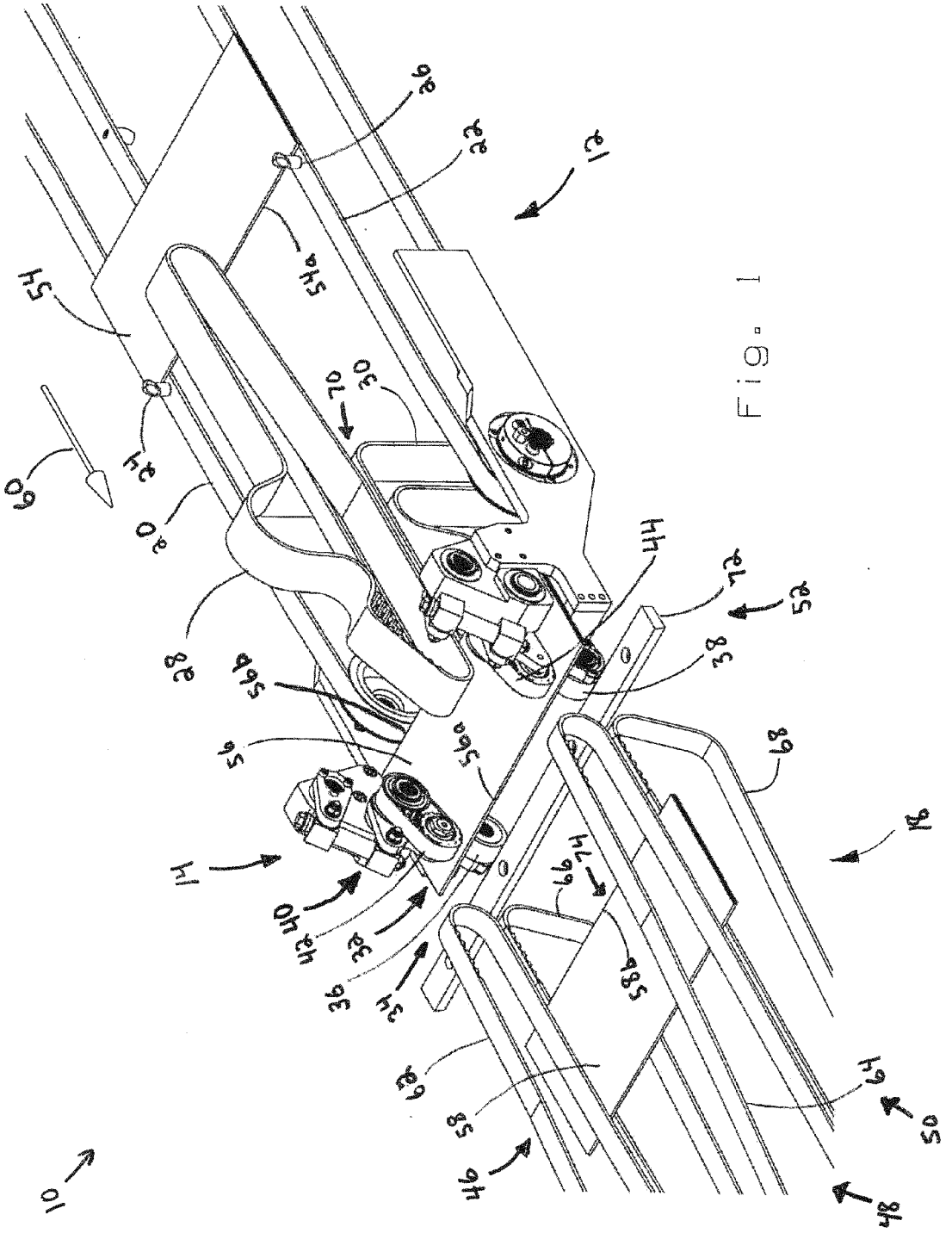
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56a
56b
58
60
62
64
66
68
70
72
74

Fig. 1

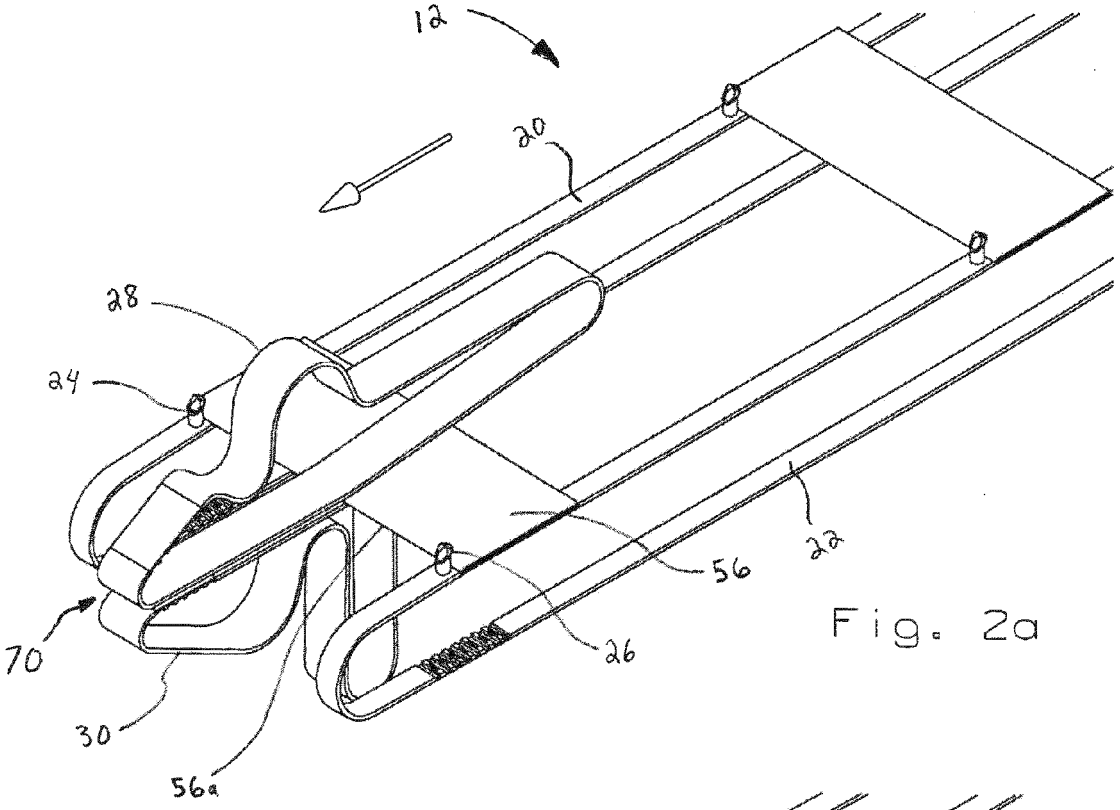


Fig. 2a

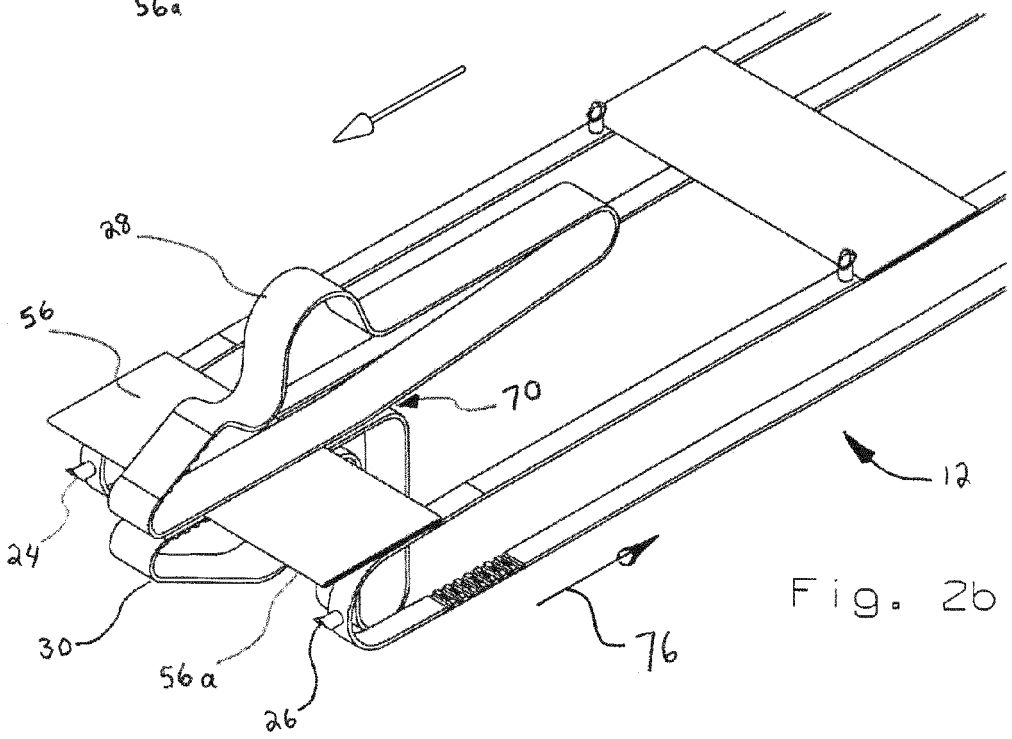


Fig. 2b

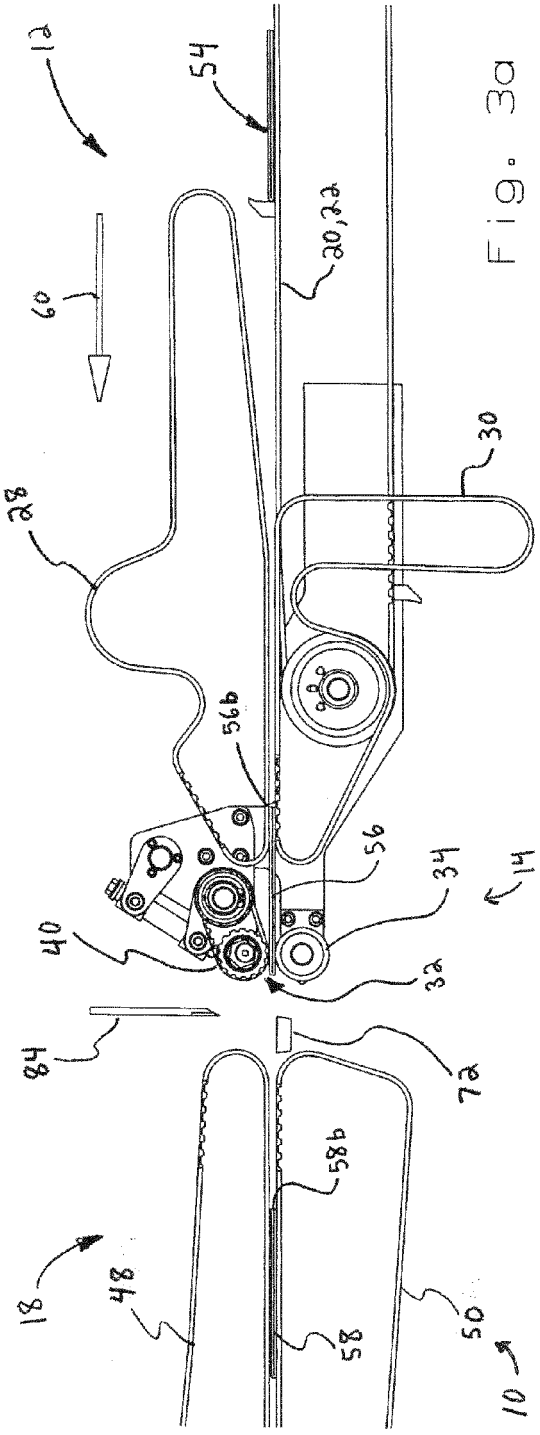
12
54
20,22
60
30
28
56b
56
34
14
40
32
84
72
58b
18
48
58
50
10

Fig. 3a

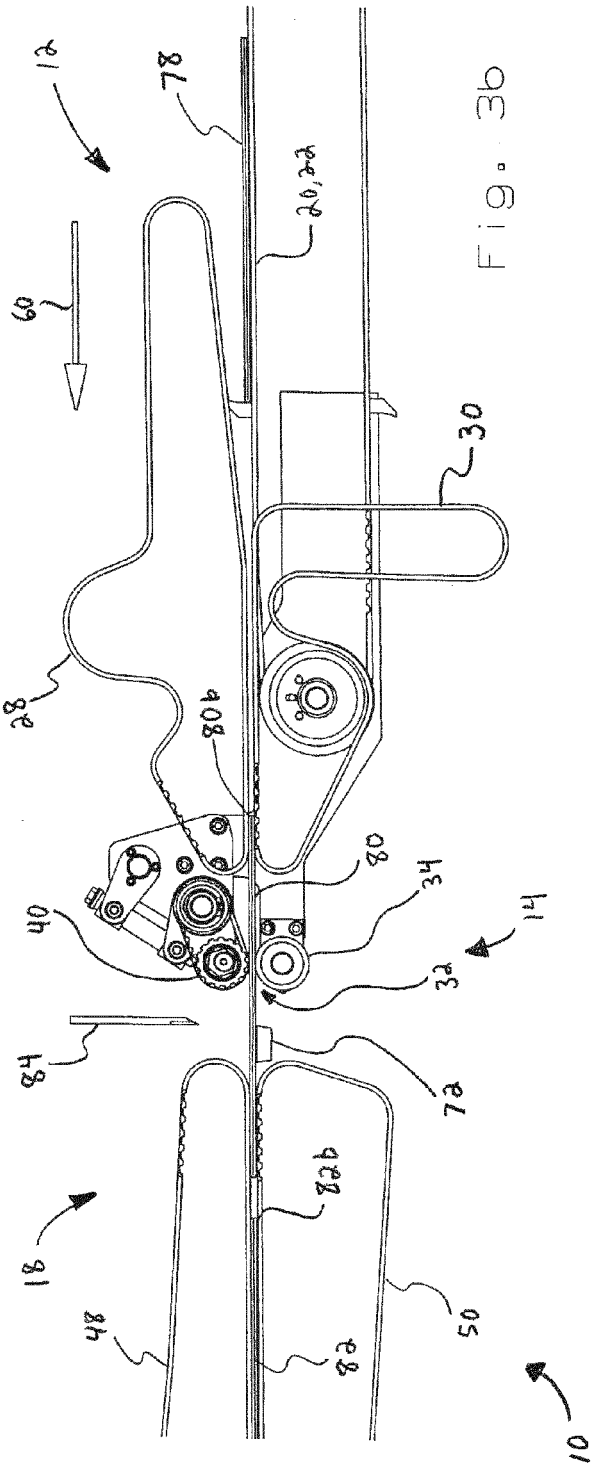
12
78
20,22
60
30
28
80b
80
34
14
40
32
84
72
82b
18
48
82
50
10

Fig. 3b

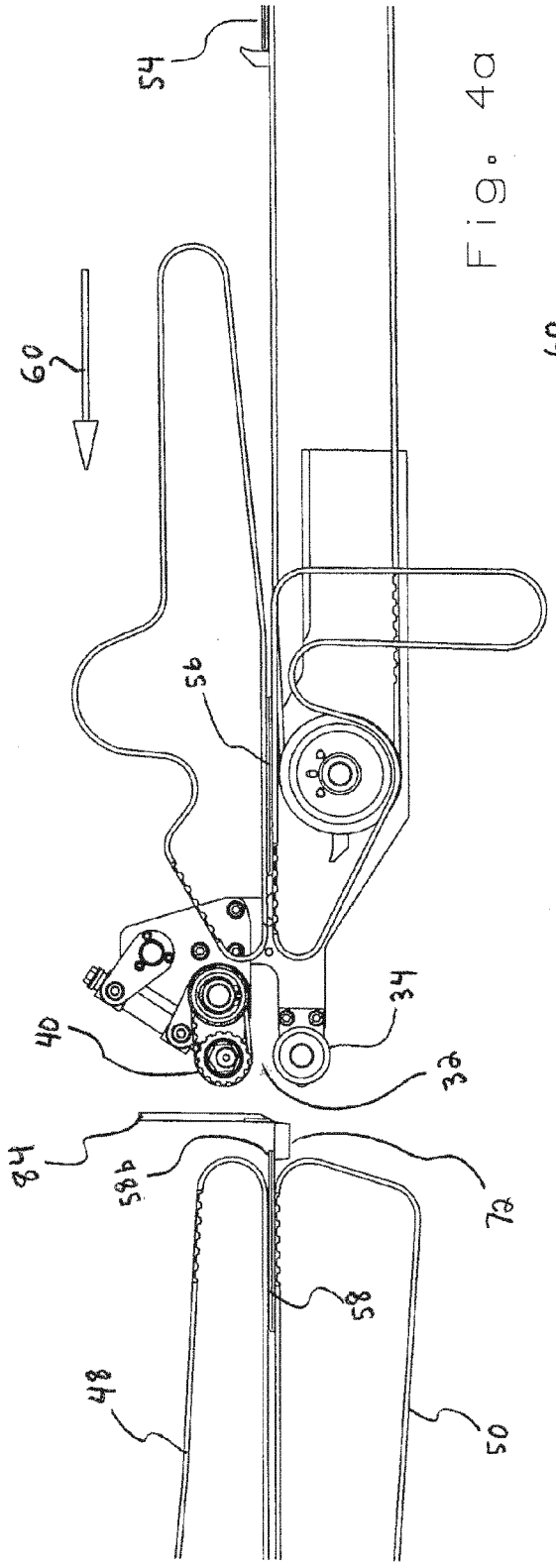
54
60
56
34
40
32
84
58b
72
58
48
50

Fig. 4a

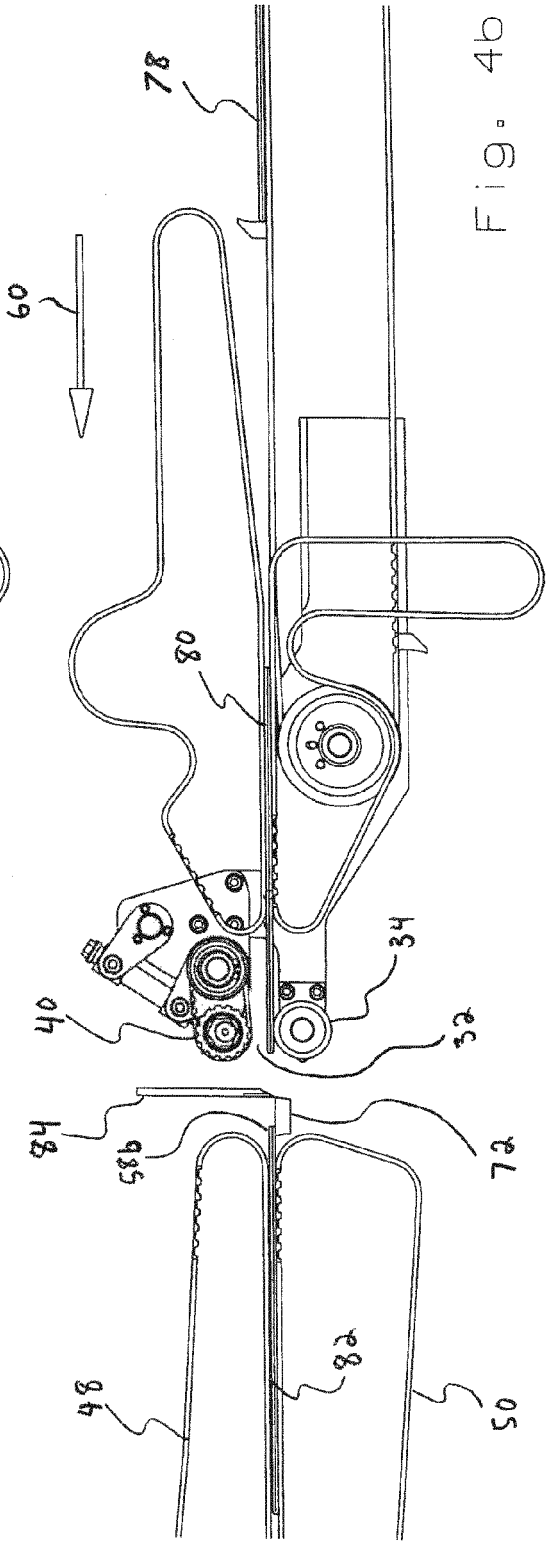
78
60
80
34
40
32
84
58b
72
82
48
50

Fig. 4b

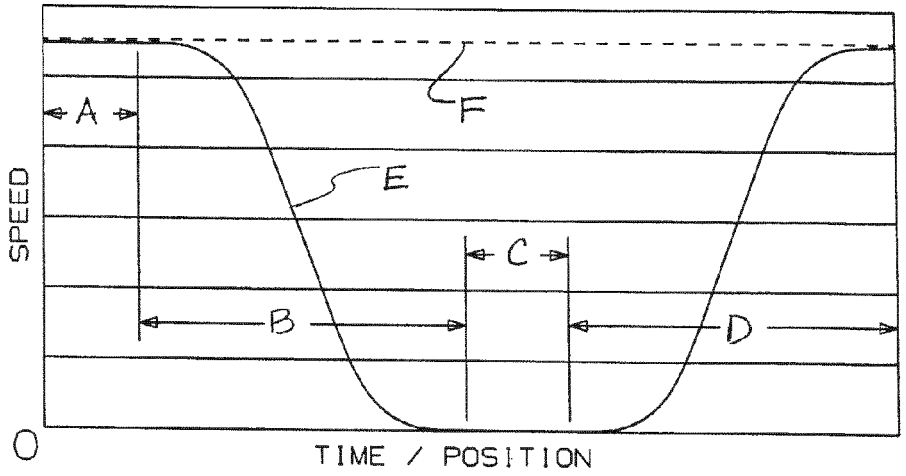
A
F
E
C
B
D
SPEED
0
TIME / POSITION

Fig. 5

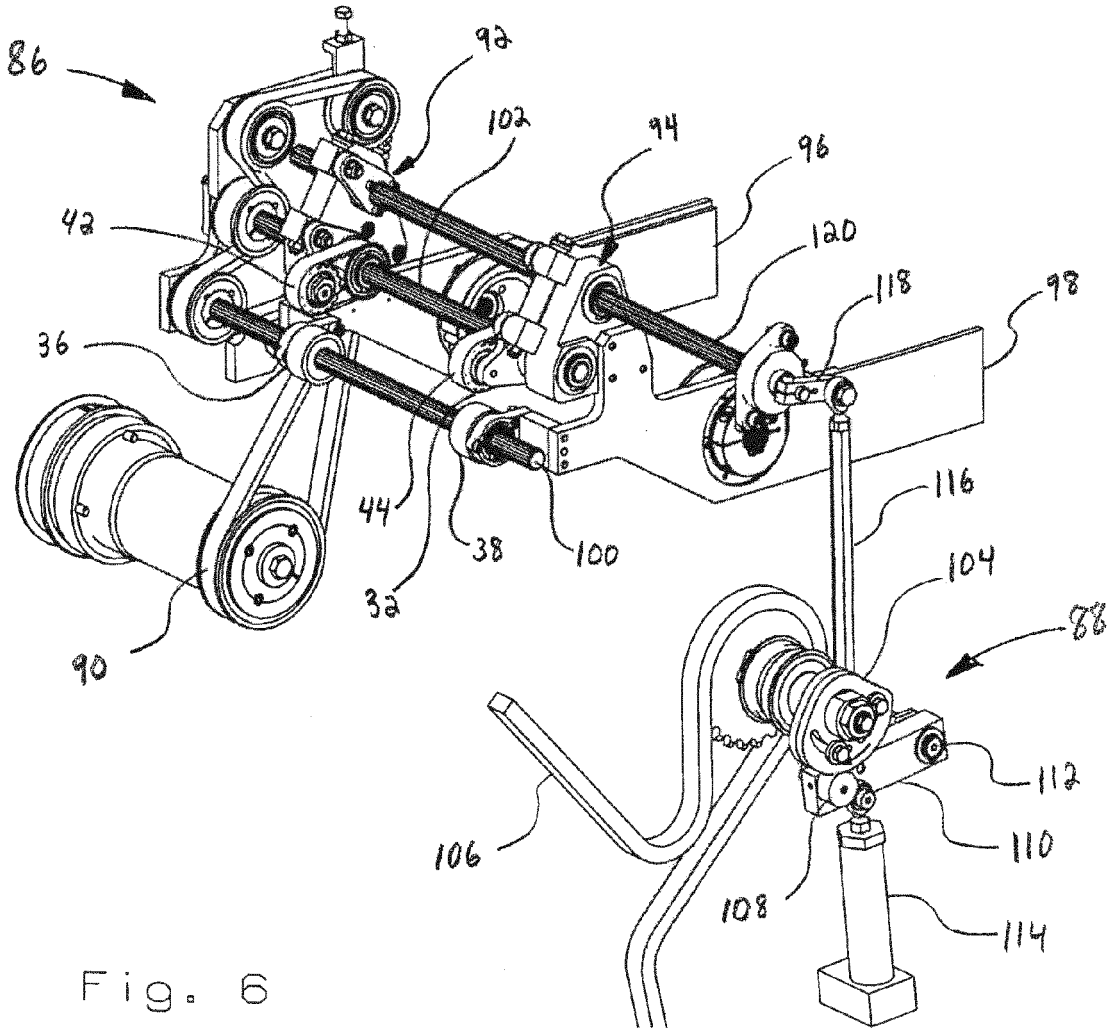
86
92
102
94
96
42
120
118
98
36
116
44
38
100
104
32
88
90
112
110
106
108
114

Fig. 6

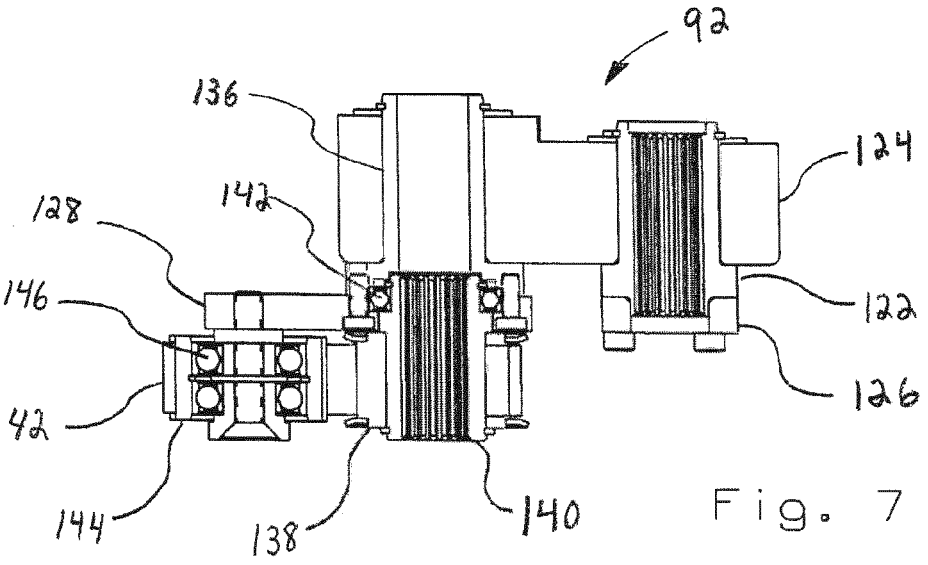
92
136
124
142
128
122
146
126
42
144
138
140

Fig. 7

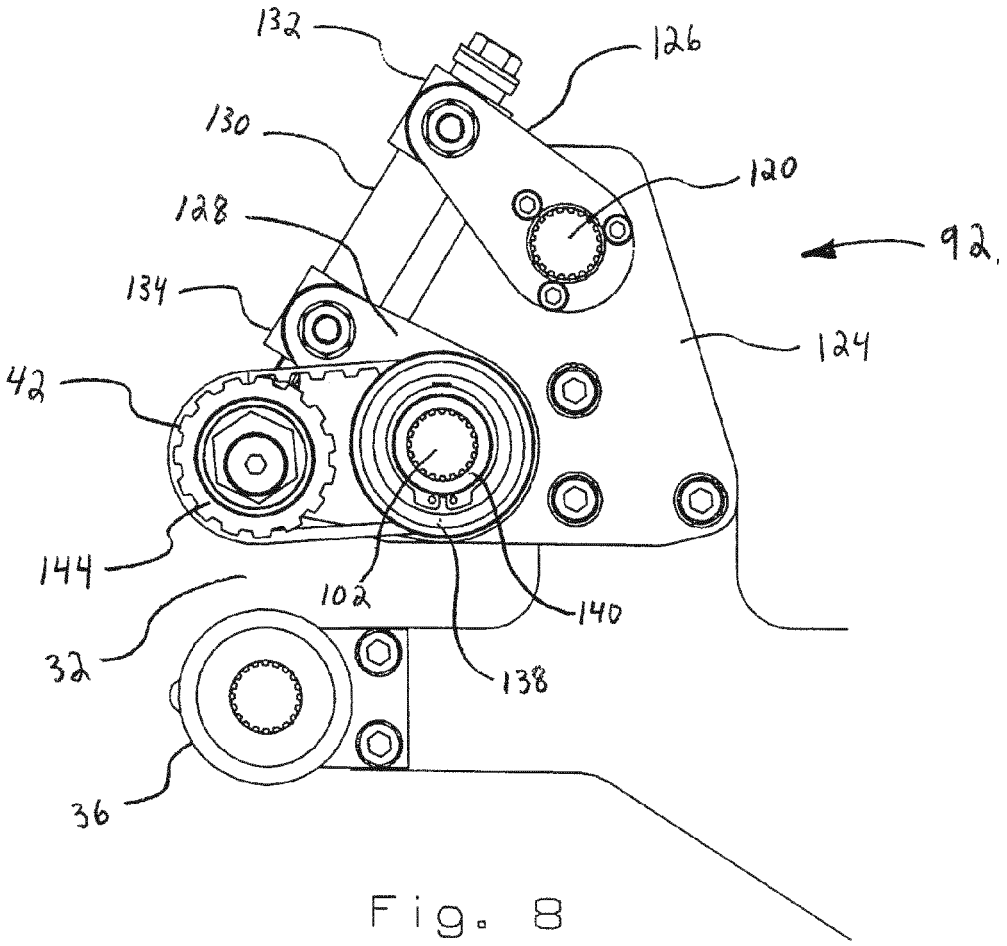
132
126
130
120
128
92
134
124
42
144
102
140
32
138
36

Fig. 8

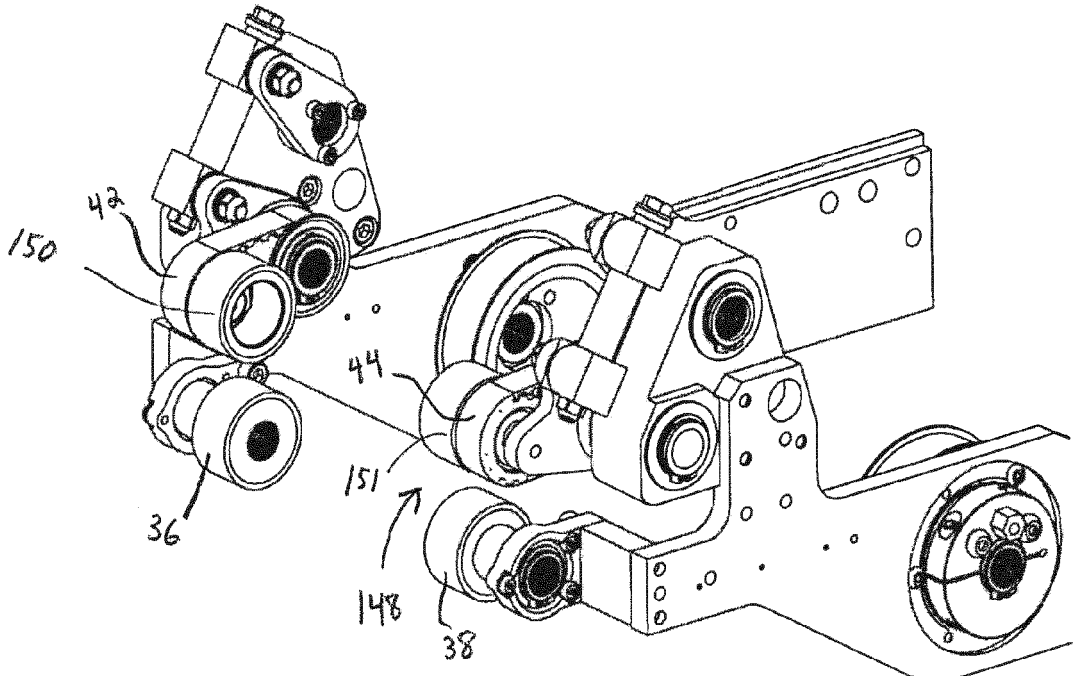


Fig. 9

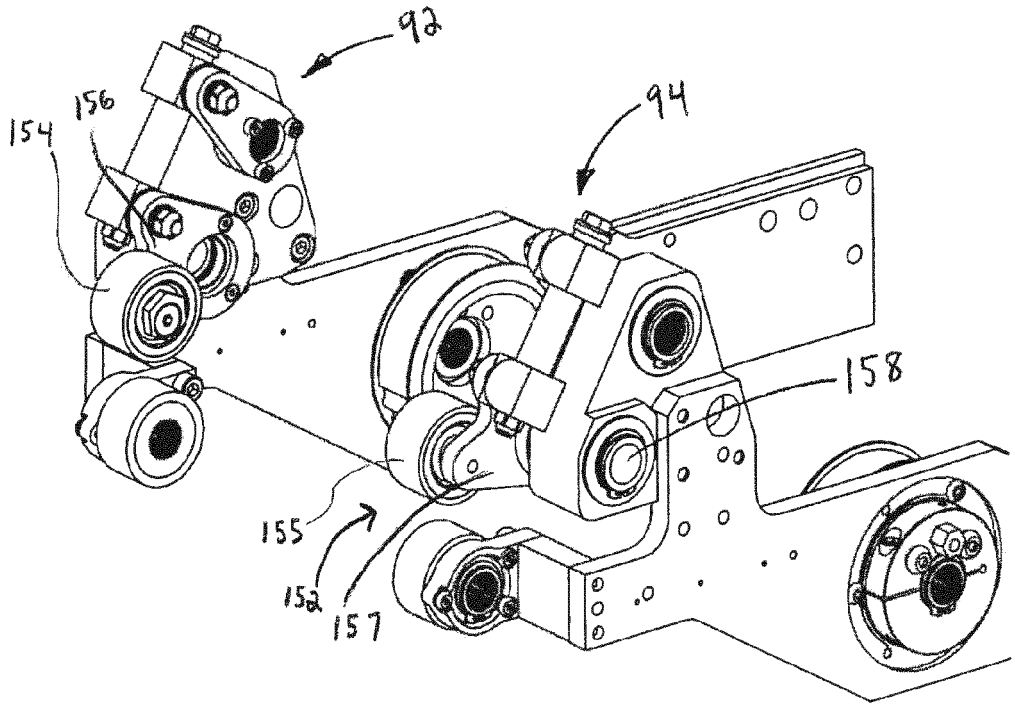


Fig. 10

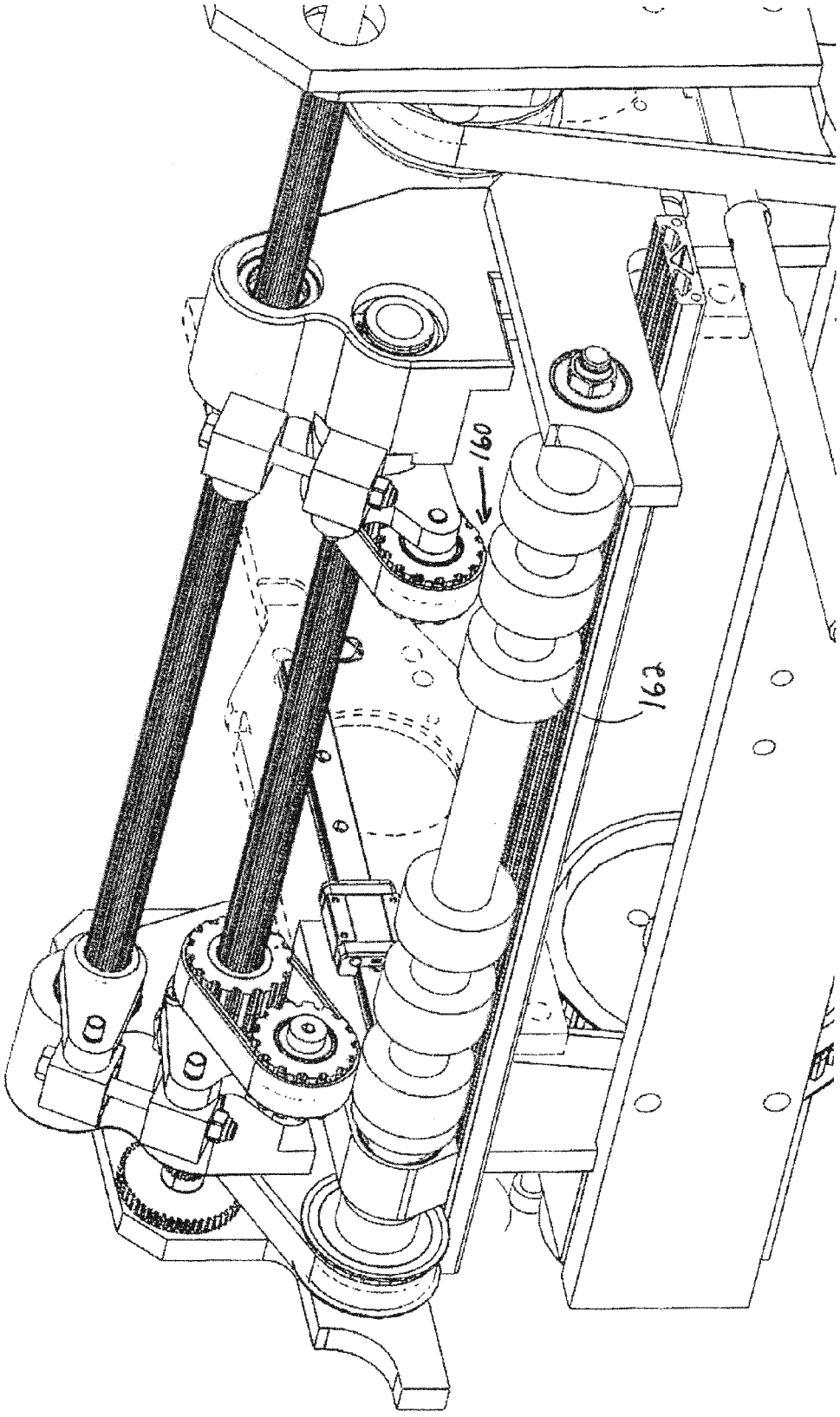


Fig. 11

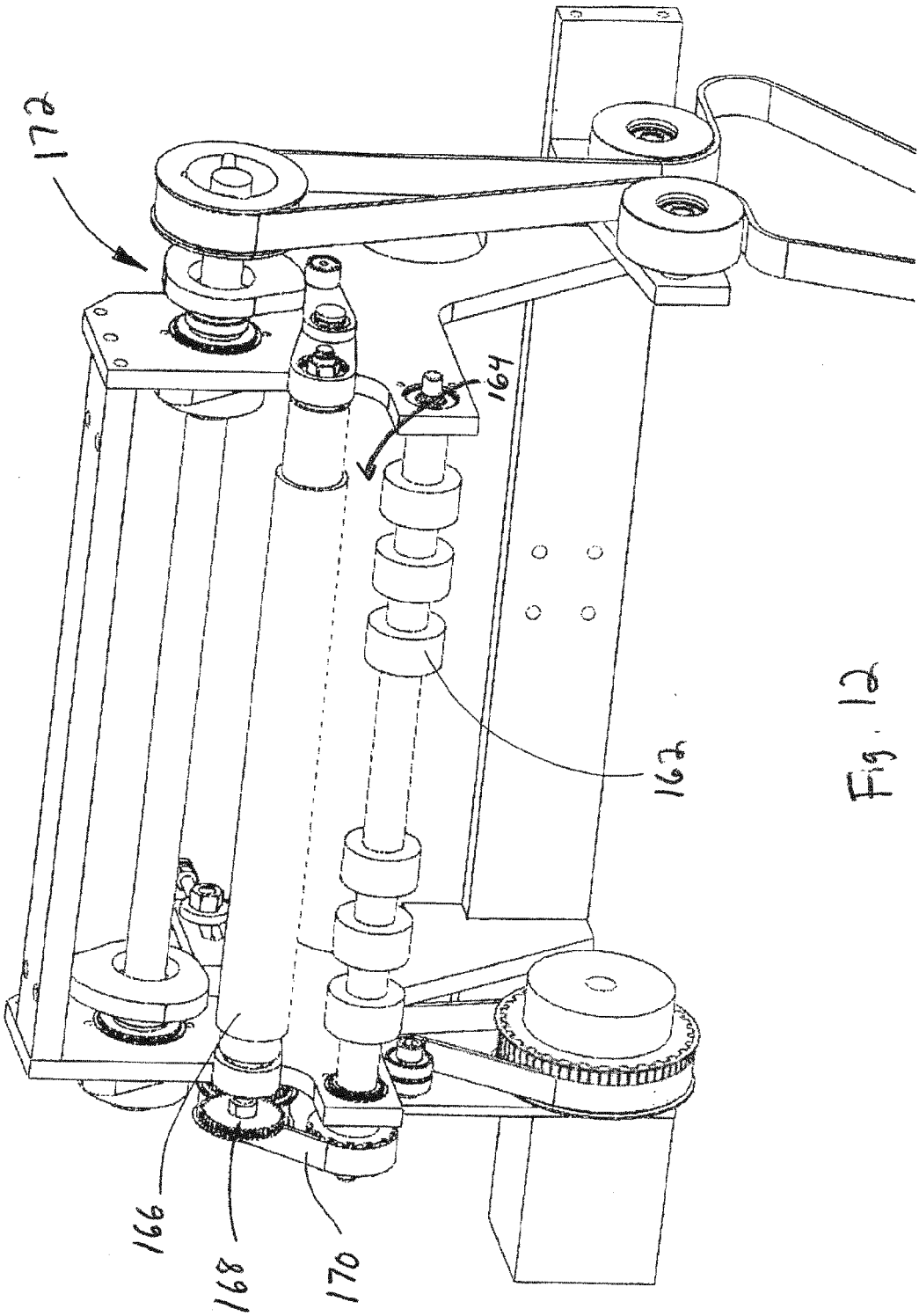


Fig. 12

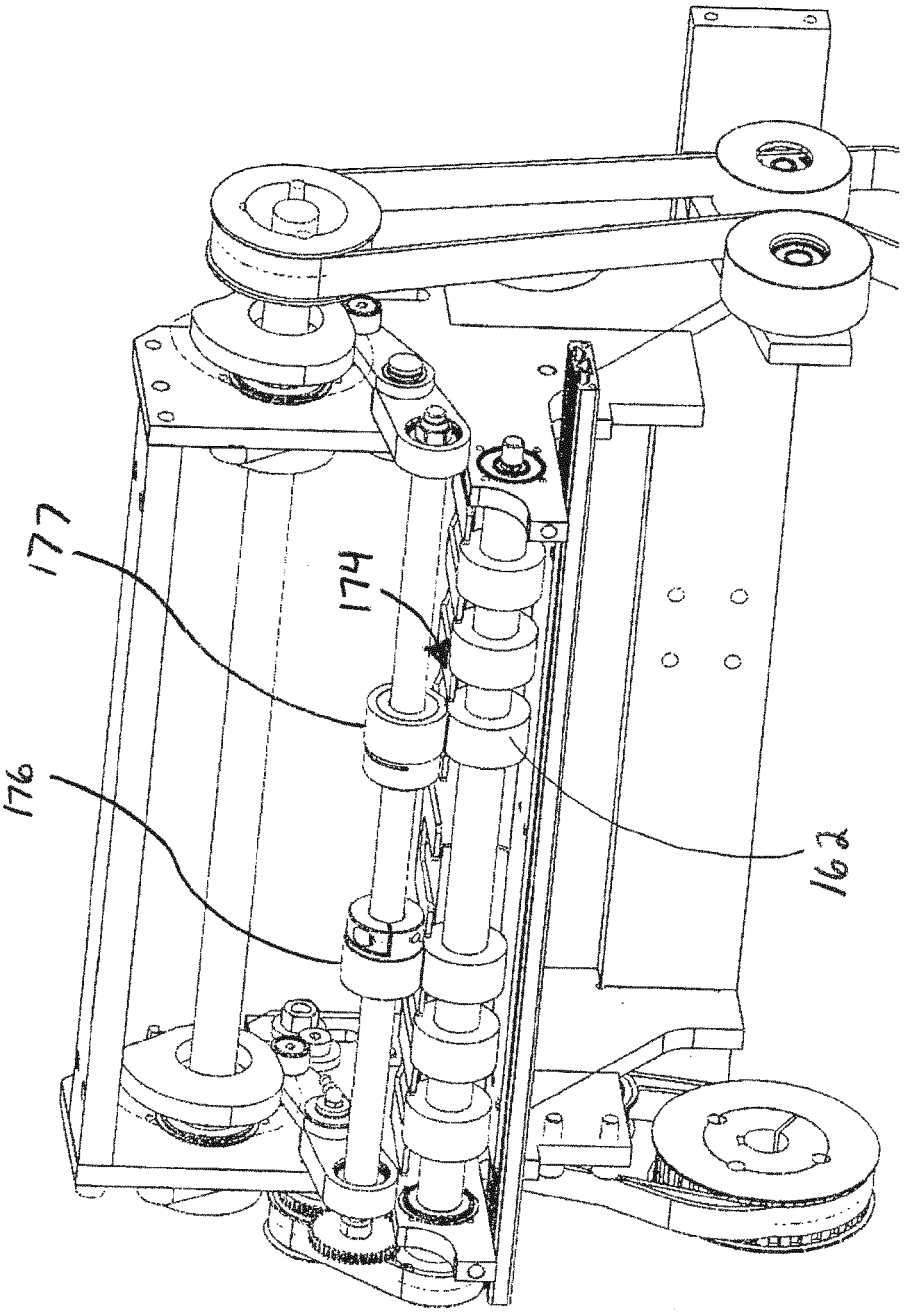


Fig. 13

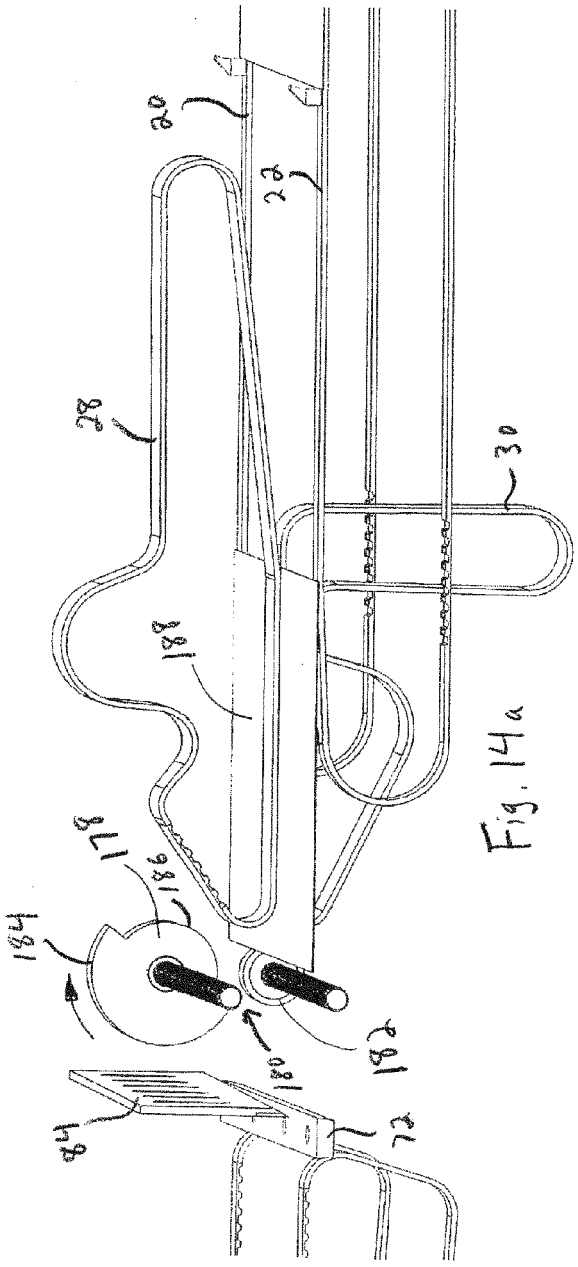


Fig. 14a

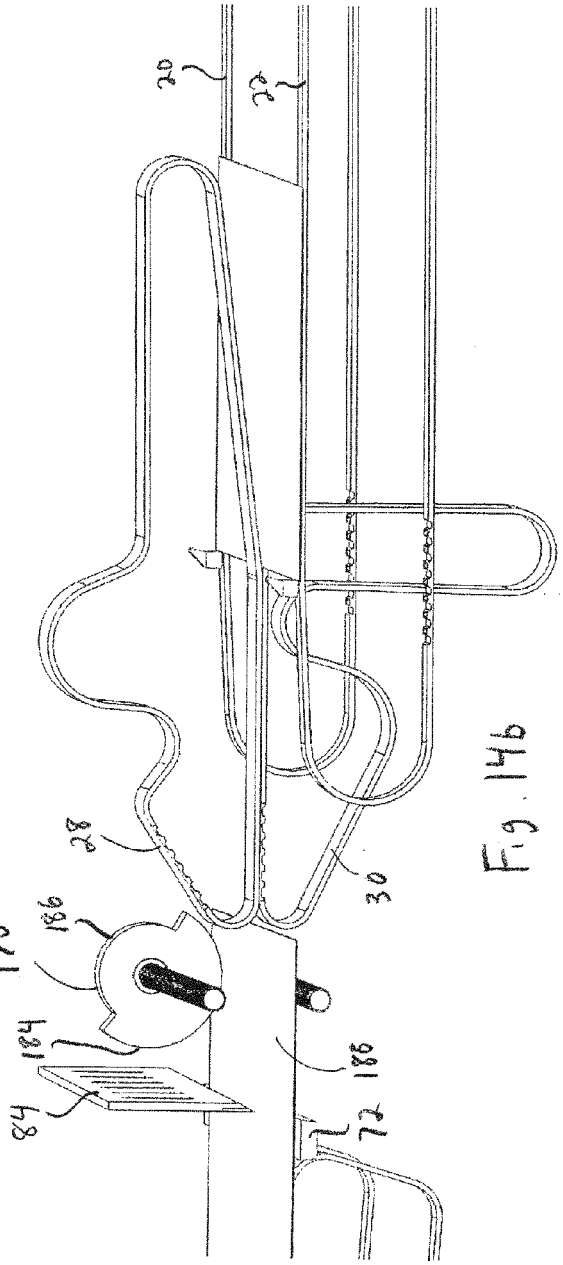


Fig. 14b

Europäisches Patentamt
European Patent Office
Office européen des brevets

# EUROPEAN SEARCH REPORT

Application Number
EP 14 16 5248

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X | US 2009/000440 A1 (GRAUSHAR WILLIAM T [US] ET AL) 1 January 2009 (2009-01-01)<br>* the whole document *<br>----- | 1-4,6-14 | INV.<br>B65H29/68 |

TECHNICAL FIELDS SEARCHED (IPC)

B65H
B26D

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 13 August 2014 | Ureta, Rolando |

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 14 16 5248

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-08-2014

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 2009000440 A1 | 01-01-2009 | US 2009000440 A1 | 01-01-2009 |
| | | US 2010269651 A1 | 28-10-2010 |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description


- US 7555975 B **[0002]**
- US 8186252 B **[0002] [0010]**