Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2577023 A1 2006/03/16

(21) 2 577 023

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) Date de dépôt PCT/PCT Filing Date: 2005/09/02
(87) Date publication PCT/PCT Publication Date: 2006/03/16
(85) Entrée phase nationale/National Entry: 2007/02/12
(86) N° demande PCT/PCT Application No.: US 2005/031587
(87) N° publication PCT/PCT Publication No.: 2006/029102
(30) Priorité/Priority: 2004/09/02 (US60/606,617)

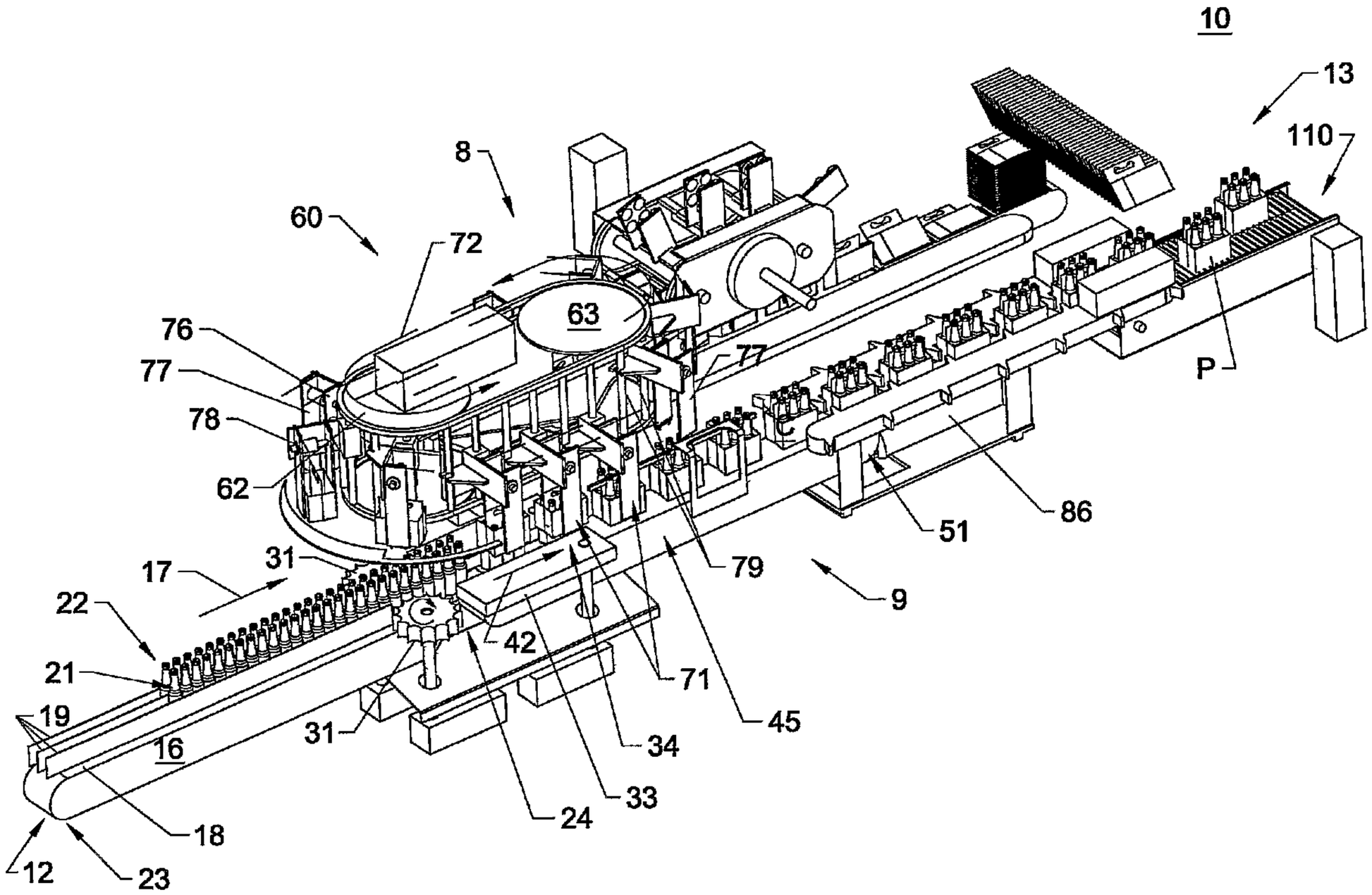
(51) Cl.Int./Int.Cl. *B65B 21/06* (2006.01), *B65B 21/24* (2006.01), *B65B 43/26* (2006.01), *B65B 43/50* (2006.01), *B65B 65/00* (2006.01)

(71) Demandeur/Applicant:
GRAPHIC PACKAGING INTERNATIONAL, INC., US

(72) Inventeur/Inventor:
FORD, COLIN P., US

(74) Agent: MACRAE & CO.

(54) Titre : SYSTEME DE CONDITIONNEMENT COMPRENANT UN CARROUSEL DE CHARGEMENT
(54) Title: PACKAGING SYSTEM HAVING LOADING CAROUSEL



(57) Abrégé/Abstract:
A packaging system utilizes two sides of a loading carousel, which reduces both the height and footprint of the packaging system. Mass and inertia are also reduced, allowing higher operational speeds. The loading carousel receives opened cartons on a first side and lowers them over product groups on a second side.

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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 March 2006 (16.03.2006)

PCT

(10) International Publication Number
WO 2006/029102 A1

(51) International Patent Classification[7]: B65B 21/06, 21/24, 43/26, 43/50, 65/00

(21) International Application Number:
PCT/US2005/031587

(22) International Filing Date:
2 September 2005 (02.09.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/606,617 2 September 2004 (02.09.2004) US

(71) Applicant *(for all designated States except US)*: **GRAPHIC PACKAGING INTERNATIONAL, INC.** [US/US]; 814 Livingstone Court, Marietta, GA 30067 (US).

(72) Inventor: **FORD, Colin, P.**; 510 Old Field Cove, Woodstock, GA 30189 (US).

(74) Agents: **ISAF, Louis, T.** et al.; Womble Carlyle Sandridge & Rice, PLLC, P.O. Box 7037, Atlanta, GA 30357-0037 (US).

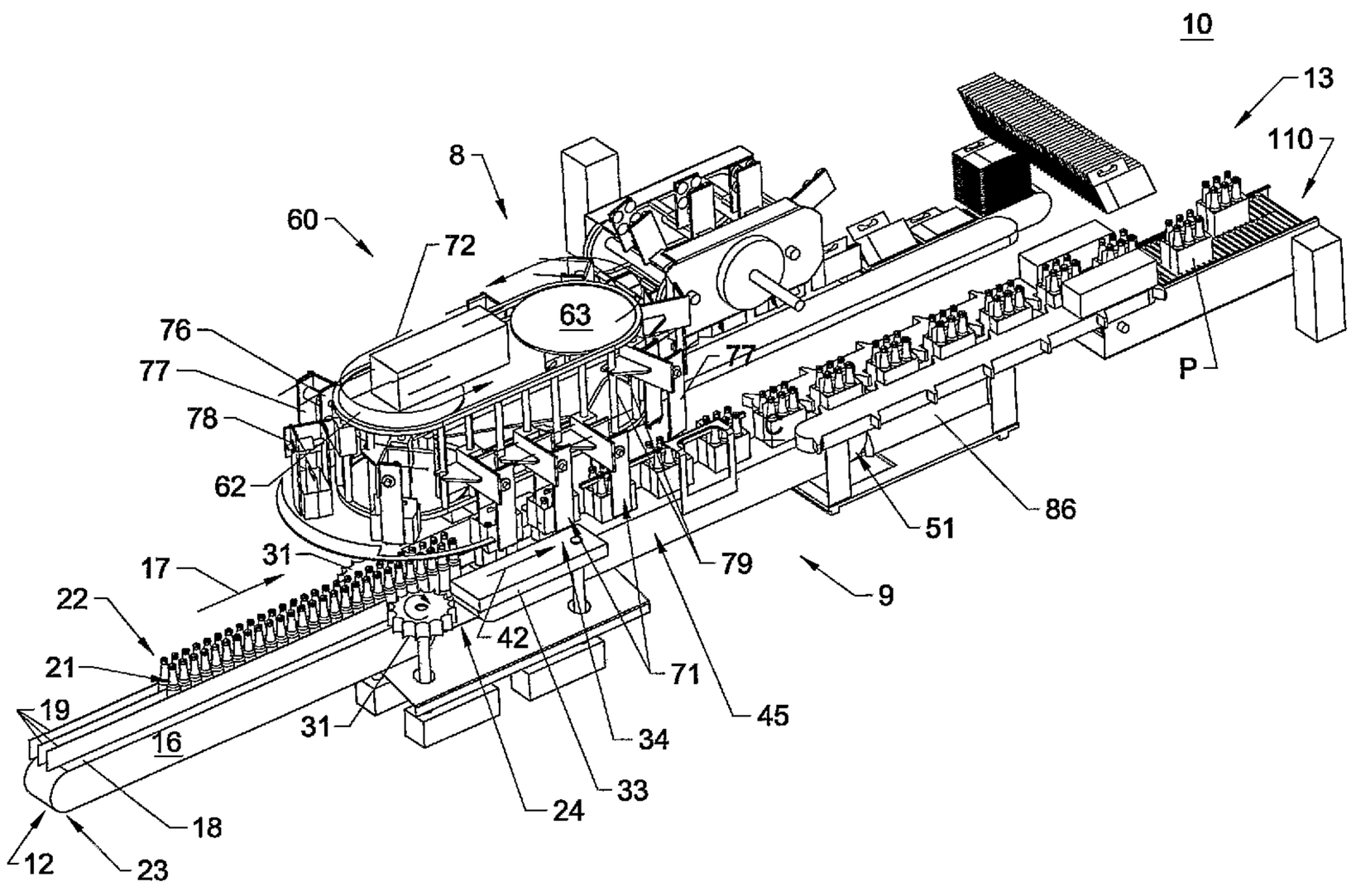
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, 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, HU, IE, IS, IT, LT, LU, LV, MC, NL, 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:
— *with international search report*

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

(54) Title: PACKAGING SYSTEM HAVING LOADING CAROUSEL



(57) Abstract: A packaging system utilizes two sides of a loading carousel, which reduces both the height and footprint of the packaging system. Mass and inertia are also reduced, allowing higher operational speeds. The loading carousel receives opened cartons on a first side and lowers them over product groups on a second side.

WO 2006/029102 A1

PACKAGING SYSTEM HAVING LOADING CAROUSEL

TECHNICAL FIELD

[0001] The present invention relates generally to a high speed packaging machine having a loading carousel.

BACKGROUND

[0002] The packaging of articles such as bottles, cans, and other similar articles in cartons or other containers is a highly automated process, with conventional automated packaging equipment generally being run at high packaging speeds in order to maximize output. In a typical packaging machine for packaging articles such as bottles, cans and the like, articles to be packaged are fed into the packaging machine in a line or series of lines along an infeed conveyor, after which the articles are grouped together in various standard configurations or groupings, such as four, six, eight, twelve, or twenty-four pack configurations. The groups of articles are then packaged into a box, a carton, or other type of container. The placement of the articles within a container can be done in a variety of ways, depending upon the type of package in which the articles are to be placed. For example, the bottoms of cartons can be opened and the cartons then placed over selected groups of articles as the articles are moved along a transport path.

[0003] A conventional packaging machine is shown in **FIG. 1**. The machine functions generally are performed in a line extending through the machine. As shown in **FIG. 1**, product metering is operated by star wheels at Station **1**. At Station **2**, product selection blocks separate the product into groups to be loaded into individual cartons. At Station **3**, a carousel pick-up selects individual cartons for loading. At Station **4**, a carton transport controls the carton through plows and an opening assembly. At Station **5**, the carton opener opens the cartons between

pairs of vacuum manifold assemblies. At Station **6**, the carousel vertically lowers the opened cartons over and onto the product groups. At Station 7, a closing section closes the carton base about the bottle group contained therein and compression is applied on the underside of the discharge belt to secure the carton in a closed position.

[0004] Given the high speeds at which the packaging machine is operated, the linear footprint of the machine must be large in order to ensure that the path of travel of the cartons is sufficient to ensure that the cartons are fully opened before being placed over a group of articles. However, plant space often is at a premium and it is not always possible to extend machinery to an optimal size. To prevent jams or misfeeds, the speed at which the articles are packaged must then typically be reduced in order to ensure that the cartons are fully opened prior to packaging the articles therein. Output is accordingly reduced.

[0005] Even in cases where the linear extent of the packaging machine is not limited, a large loading carousel necessarily has a large mass of moving parts, which entails a correspondingly large inertia during operation. Drive mechanisms must therefore be larger, and high speed operation of the larger machine may result in higher maintenance costs, higher rates of failure, and other manufacturing problems.

[0006] The conventional packaging machine also has a large vertical height. As shown in **FIG. 1**, cartons are picked up at Station **3** at a raised position and lowered onto the bottles at Station **6**. Because the carton pickup and carton loading steps are performed along a line, the height of the carousel must be sufficient to accommodate the highest point of the stroke (i.e., before pickup), and the lowest point of the stroke (i.e., at loading).

SUMMARY OF THE INVENTION

[0007] Briefly described, an aspect of the present invention generally is directed to a high speed packaging system for packaging various types of articles in a variety of different configurations of containers or cartons. The articles, such as bottles, cans, or the like, generally will be fed into and through the packaging system of the present invention along a path of travel on an infeed conveyor on an upstream side of the packaging system. The articles can be separated in one or more lanes of products, in side by side or in staggered configurations.

[0008] As the articles are fed into the upstream or receiving end of the packaging system, the articles pass through a selector station for selecting and grouping the articles into groups. As the articles are separated into their packaging groups, the groups of articles are further transferred to a packaging line along which the groups of articles are placed into containers. The packaging line may generally extend along a path substantially parallel to the path of travel of the articles along the infeed conveyor, although other orientations are possible.

[0009] A carton loading carousel may be positioned adjacent to and extend parallel to the packaging line, and includes a series of carton carriers. In accordance with one aspect of the present invention, the carriers are moved about the carousel from a carton pickup point along a first side of the carousel, and subsequently moved into a loading position along a second side of the carousel. The carriers may be mounted on a cam track that extends about the periphery of the carousel so that as the cartons are moved to the loading position, they are engaged with a selected group of articles moving along the packaging line.

[0010] The cartons may be provided by a carton infeed system and opened in a carton opener. The opening and pickup of the cartons may be accomplished along a path that is substantially parallel to but extending opposite or spaced from the packaging line so that two sides of the loading carousel are utilized.

[0011] According to one aspect of the present invention, use of two sides of the loading carousel allows the packaging system to open and load cartons with groups of articles in a significantly reduced length, space, and/or footprint, without reducing packaging speed. Also, because the pickup stroke can occur on one side of the carousel, and the loading stroke can occur on the opposite side, the loading carousel can be significantly shorter in height than conventional carousels. In addition, the relatively small size of the loading carousel reduces the mass of moving parts in the carousel, meaning a smaller inertia during operation.

[0012] Various objects, features and advantages of the present invention will become apparent to those skilled in the art upon reading the following detailed description and taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0013] **FIG. 1** is a perspective view of a conventional article packaging system.

[0014] **FIG. 2** is a top plan schematic view of a packaging system according to an embodiment of the present invention.

[0015] **FIG. 3** is a perspective partial schematic view of the packaging system.

[0016] **FIG. 4A** is a perspective partial schematic view of the packaging system.

[0017] **FIG. 4B** is a partial perspective view showing the operation of a loading carousel according to an embodiment of the present invention.

[0018] **FIG. 5** is a perspective partial schematic view of the packaging system illustrating a carton infeed system.

[0019] **FIG. 6** is a side elevational partial schematic view of the packaging system.

[0020] **FIG. 7** is a partial perspective view showing the operation of the loading carousel.

DETAILED DESCRIPTION

[0021] **FIGS. 2–7** illustrate a high speed packaging system **10** according to an embodiment of the present invention. The packaging system **10** generally is designed to provide a substantially continuous motion system for high speed packaging of various types of articles in a variety of configurations of containers, including, for example, six-pack, four-pack, or eight-pack cartons, as well as smaller or larger configurations. For the purposes of illustration and simplicity of description, the packaging system embodiment discussed in detail below is described as loading bottles **B** into cartons **C** to form packages **P**.

[0022] Referring to **FIG. 2**, the packaging system **10** has a first, upstream or inlet end **12** and a second, downstream or outlet end **13**. The packaging system **10** comprises the following general components: a carton infeed system **90** having an opener **93** for providing opened cartons **C** in the system **10**, a loading carousel **60** for loading bottles **B** in the cartons **C**, an article transport or infeed conveyor **16** for providing bottles **B** in the system **10**, a selector station **30** for metering the flow of bottles **B** into the loading carousel **60**, a packaging line **45** for moving the cartons **C** and bottles **B** during loading, a closing mechanism **86** for engaging and closing the bottoms of the cartons **C**, and a outlet mechanism **110** for forwarding the packs **P** down the conveyor line for further handling and/or packaging. The packaging system **10** generally will also include a frame (not shown) or support housing. The frame can include, for example, one or more bays or doors to enable access to the packaging machine **10**. The outlet mechanism **110** can be, for example, a two-way divider, as shown in **FIG. 2**.

[0023] As generally shown in **FIG. 2**, the loading carousel **60** has a first side **8** and a second side **9**, both of which are used for opening and loading of cartons **C**. Using two sides **8, 9** of the carousel **60** for opening and loading has the effect of reducing both the required stroke and the number of flights or carriers required for opening and loading the cartons **C**. The required stroke and number of flights

can be reduced, for example, by about half, when compared to conventional packaging machines having similar output capabilities. The reduction of flight or carrier number accordingly reduces the plan area or footprint of the packaging system **10**. For example, when compared with conventional packaging systems, the footprint of the packaging system **10** can be reduced by a 15' x 17' area. The reduction in footprint conserves valuable shop space. The reduction in stroke reduces the vertical height of the packaging system **10**, in particular the height of the loading carousel **60**.

[0024] As shown in **FIG. 2**, the carton infeed system **90** having the opener **93** is located on the first side **8** of the loading carousel **60**. The article transport conveyor **16**, the selector station **30**, and the packaging line **45** are located on the second side **9** of the loading carousel **60**. The structure and operation of the packaging system **10** are discussed in detail below with reference to **FIGS. 2-7**.

[0025] Referring to **FIGS. 3, 4A** and **4B**, the article transport conveyor **16** provides a supply of bottles **B** to the loading carousel **60**. The article transport conveyor **16** generally is positioned at the upstream end **12** of the packaging system **10** for receiving the bottles **B** and moving them along an infeed path of travel indicated by arrow **17**. The article transport conveyor **16** generally may be a belt, chain or other conventional type of conveyor having an upper surface **18** along which the bottles **B** are moved. The article transport conveyor **16** can include, for example, dividers **19** for separating the bottles **B** into one or more lanes **21, 22**. The article transport conveyor **16** further includes a first or proximal end **23** where the bottles **B** are received from an upstream production line (not shown), and a second or distal end **24** where the bottles **B** are engaged and transferred from the article transport conveyor **16** by the selector station **30**.

[0026] Referring to **FIGS. 4A** and **4B**, the selector station **30** meters the flow of bottles **B** into the loading carousel **60** by ordering the bottles **B** into groups that are conveyed along the packaging line **45**. The selector station **30** generally may include a series of metering or star wheels **31** having product receiving recesses

32 formed thereabout. The star wheels **31** engage and meter the flow of bottles **B** moving along the article transport conveyor **16**, and redirect the lanes **21**, **22** of bottles **B** toward a pair of selectors **33**.

[0027] The selectors **33** may be conventional and are schematically illustrated in **FIGS. 3, 4A** and **4B**. The selectors **33** may generally include upper and lower support plates and a series of pairs or sets of selector arms mounted therebetween. Each selector arm may include an article engaging or separating plate mounted at a front or proximal end thereof, with each separating plate having a series of teeth defining a series of recesses therebetween. The selector arms can be moveable radially from a retracted, initial position for engaging and moving a series of bottles **B**, e.g., 2, 3, 4, etc., depending upon how many bottles **B** are metered to carousel **60**, as the selector arms are rotated with the rotation of the selectors **33**. The selectors **33** can be configured to place bottles **B** into any desired configuration group, and typically will move at a different rate as they engage their respective groups of bottles **B** so as to create a separation or stagger between the groups of bottles to form a desired package grouping configuration. In the illustrated embodiment, the bottle groups have a 2x3 configuration.

[0028] Referring to **FIGS. 5** and **6**, the carton infeed system **90** and the opener **93** provide a supply of cartons to the loading carousel **60**. Cartons **C** are initially fed into the packaging system **10** at the carton infeed system **90**. The cartons **C** can be infed at a variety of points or locations, for example. The infeed system **90** can include, for example, a carton infeed conveyor **97** that provides an initial supply of cartons **C**, and a carton transport conveyor **96** that transports the cartons **C** through the opener **93** and along the first side **8** of the carousel **60**. The carton infeed system **90** may be positioned slightly downstream from the loading carousel **60** and opposite to the closing mechanism **86**, and provides a substantially continuous flow or line of opened cartons **C** to the loading carousel **60**. The carton infeed system **90** may be positioned in a vertically raised arrangement above the outlet mechanism **110**.

[0029] The opener **93** can include a carton opening apparatus or mechanism such as disclosed in U.S. Patent No. 6,240,707, the entire disclosure of which is incorporated herein by reference. In general, the opener **93** can include a frame **94** having a guide slot or track. A series of carton opening assemblies **98** are transported about the frame **94**, moving between a carton pickup or engaging position **99** and a discharge position **101**, in which the opened cartons **C** are released and further conveyed along the carton transport conveyor **96**. The opening assemblies **98** are conveyed about the opener **93** for picking up flat folded cartons **C** and opening the cartons to an opened position before release at the discharge position **101**.

[0030] The loading carousel **60** loads the bottles **B** supplied by the selector station **30** into the opened cartons **C** provided by the opener **93**. Two sides **8**, **9** of the loading carousel **60** are utilized in the packaging system **10**. The structure and operation of the loading carousel **60** are discussed in detail below.

[0031] Referring to **FIGS. 3, 4A** and **4B**, the loading carousel **60** is mounted adjacent to and extends along the upstream or inlet end **49** of the packaging line **45**. The loading carousel **60** includes upstream and downstream rotating supports **62** and **63**, respectively, that are engaged with upper and lower chains or belts **64** and **66**, respectively, that are moved about a substantially elliptical path by the rotation of the upstream and downstream supports **62** and **63**. Rotation can be effected by motors or other drive mechanisms, for example. The rotating supports **62** and **63** may be sprockets having teeth that engage the chains **64**, **66**, respectively, for example. The rotating supports **62**, **63** may alternatively be gear or belt-driven. The carton transport conveyor **96** on the first side **8** of the loading carousel **60** may be spaced from and extend parallel to the packaging line **45** on the second side **9** of the carousel **60**. The second side **9** of the loading carousel **60** may extend from a point slightly upstream from the inlet end **49** of the packaging line **45** approximately to the discharge end **51** of the packaging line **45**.

[0032] **FIGS. 6** and **7** illustrate the first side **8** of the loading carousel **60**, where the carousel **60** receives and picks up the opened cartons **C** from the carton transport conveyor **96**. The loading carousel **60** includes a series of carton carriers **71** that are carried along an elliptical path in the direction of arrows **72** (**FIG. 3**) by the rotation of the loading carousel **60**. The rotation conveys the carriers **71** to first, lowered pickup position **73**, where the carriers **71** pick up the cartons **C**. The carriers **71** subsequently transport the cartons **C** to a second, lowered loading or article receiving position **74** (**FIG. 4B**) along the second side **9** of the carousel **60**, where the cartons **C** are placed about groups of bottles **B**. Each of the carriers **71** generally will include a spaced pair of arms **76** and **77** extending vertically downwardly from a laterally extending support plate **78**. Each support plate **78** is attached to and is carried by a pair of vertically extending support rods **79** so as to transport the carriers **71** about the periphery of the loading carousel **60**, while also allowing for vertical translation of the carriers **71**. Each support plate **78** may be connected to a block **81**, which may be connected to one of each pair of the support rods **79** by an angled plate **82**.

[0033] A cam follower or guide **83** may be attached to each of the blocks **81** or to the support plates **78**. Each cam follower **83** will generally engage and move along a cam track **84** in the loading carousel **60** as the carriers **71** are moved about the carousel **60**. The cam track **84** generally has a first, pickup cam profile or side **84A** extending along the first side **8** of the carousel **60**, and a second or loading side profile **84B** extending along the second side **9** of the carousel **60**. As a result, the carriers **71** are moved between the lowered and raised positions shown in **FIGS. 4B** and **7**, respectively, during the transport of the cartons **C** from the pickup position **73** (**FIG. 7**) to the article loading or engaging position **74** (**FIG. 4B**). As the cartons **C** are moved along their path of travel from the pickup position **73** to the article loading position **74**, the cartons **C** will be raised to an intermediate, raised position **75** (**FIG. 4B**). Referring to **FIG. 4A**, the cartons **C** are then conveyed into alignment with the bottle groups being formed therebeneath along the packaging line **45**, and then lowered in timed relation to

the movement of the groups of bottles **B** along the packaging line **45** so that each carton **C** is matched with a group of bottles **B** and thereafter progressively lowered down over the bottles at the article loading position **74**. The cartons **C** may have channels, cavities or other compartments in which the bottles **B** are received, as illustrated in **FIG. 4B**. A plow **80** may be included to manipulate base flaps of the cartons **C**, if present, and may function to hold the flaps outwardly so that the cartons **C** are more easily lowered over the bottles **B**. For the purposes of clarity of illustration, the opened bottom flaps of the bottles **B** are not shown in the Figures.

[0034] Referring to **FIG. 4B**, after the bottles **B** are received in the channels of the cartons **C**, the arms **76** and **77** of the carriers **71** can be raised out of engagement with the loaded cartons **C** as the cartons **C** are engaged by the closing mechanism **86** (**FIG. 3**). The closing mechanism **86** may be conventional in operation and can include a flap tucking mechanism that engages and tucks locking tabs or flaps along the bottom surfaces of the cartons into a locked arrangement. Alternatively, the closing mechanism **86** can include a folder/gluer mechanism that applies a bead of glue between the bottom flaps of the cartons and thereafter presses the bottom flaps into engagement with one another to seal them together. The finished, closed cartons **C** are then fed further downstream for transfer to the discharge or outlet mechanism **110**.

[0035] As illustrated in **FIG. 4A**, the packaging line **45** extends in the direction of arrow **46**, and may be spaced from and substantially parallel to the path of travel **17** of the flow of products on the infeed conveyor **16**. The packaging line **45** may include, for example, a conveyor belt **47**, although other, similar types of conveying mechanisms also can be used, for transport of the groups of bottles **B**. The conveyor belt **47** moves about a substantially elliptical path between the upstream end **49** and the downstream end **51**, at which point the loaded packages **P** are delivered to the outlet mechanism **110**.

[0036] The system **10** detailed herein can utilize a variety of drives, including servo-motors, stepper motors, AC or DC motors, pneumatic or hydraulic drives that operate, or are connected to, the following operative elements: the loading carousel, the opener, the closing mechanism, the starwheels, the selector station, the container infeed, etc. Other units can be mechanically or servo driven or can slave off of existing drives (e.g., carton feeding could drive off of the carousel drive).

[0037] The opener **93** can include an adjustable internal opener cam that generally reduces the maximum height of the cartons **C**, which reduces the opener head mast/radius. Further, an adjustable internal opener cam can be provided for enabling opening of varying size cartons.

[0038] The carousel flights or carriers **71** are typically operated without a back wall to allow better carton side guides at the pick up position **73**. The carousel carriers **71** can be adjusted by a screw, or otherwise, for example, to accommodate various container sizes.

[0039] The packaging system **10** described herein can utilize a standard two lane infeed conveyor arrangement as illustrated. The system **10** layout can also be widened with bottles **B** infeeding alongside the carton feed and around the outside of the carousel **60** head shaft. The starwheels **31** and selectors **33** may be of a design and construction as found in the Autoflex 1500 as manufactured by Graphic Packaging International, Inc.

[0040] Although two sides of the packaging system **10** could be tended by an operator, the packaging system **10** can account for any missed cartons in the loading function on the first side of the carousel **60** to be set up or corrected along the second side at the packaging line.

[0041] The loading carousel **60** illustrated in the Figures has a two-sided configuration achieved by two rotating supports. An alternative loading carousel can have, for example, three sides formed by three rotating supports. The functions of pickup and loading can be performed, for example, along two or

more of the three sides of the carousel. Another alternative loading carousel could be rectangular in shape, with the functions of pickup and loading performed along two or more of the four sides of the carousel.

[0042] The present invention is suitable for loading a variety of articles in a variety of containers. Suitable articles include, for example, bottles as shown in the drawings, cans or similar articles. Suitable containers can include, for example, paperboard cartons and basket type containers or carriers. The containers used with the packaging system **10** can include, for example, a glued base, locking tabs, and/or other types of carton closures. The packaging system **10** further can utilize existing style basket containers or can operate with alternative base hole patterns for engagement by a transport conveyor. The base crease hole pattern of the cartons **C** can be configured or created with an existing Graphic Packaging International, Inc. "A-B Ruff-Rider" die, or a similar die, with base crease holes added. Two pairs of base crease holes can be added, one for use by the container infeed and one for use by the carousel **60**. The two pairs of base crease holes provide a larger transfer target and eliminate lug/finger interference, as well as allow the possibility of repitching the input or carton transport conveyor to between a 12.5" paper feed and a 10" pitch carousel for higher packaging per minute at lower linear speeds. The packaging system **10** further generally can allow for a surge requirement of up to at least 250 packages formed per minute.

[0043] It will be understood by those skilled in the art that while the invention has been discussed above with reference to preferred embodiments, various changes, modifications and additions can be made thereto without departing from the spirit and scope of the invention as set forth in the following claims.

What is claimed is:

1. A packaging system for packaging articles into containers, comprising:

a container infeed system;

a loading carousel having a first side and a second side, wherein the container infeed system feeds containers to the first side of the loading carousel;

an article infeed system positioned to feed articles to the loading carousel; and

a packaging line disposed along the second side of the loading carousel, wherein the loading carousel loads the articles into the containers along the packaging line.

2. The packaging system of claim 1, wherein the container infeed system comprises:

at least one container conveyor; and

at least one container opener.

3. The packaging system of claim 1, wherein the article infeed system comprises an article conveyor having at least one lane along which articles are conveyed.

4. The packaging system of claim 1, further comprising a selector station positioned to group articles from the article infeed system into article groups.

5. The packaging system of claim 4, wherein the selector station is adjacent to the packaging line and provides the article groups to the packaging line.

6. The packaging system of claim 1, further comprising a closing mechanism positioned to receive containers loaded with articles from the packaging line and close bottoms of the containers.

7. The packaging system of claim 6, wherein the closing mechanism is spaced from and adjacent to the container infeed system.

8. The packaging system of claim 1, wherein the loading carousel comprises:

a first rotatable support;

a second rotatable support; and

a plurality of carriers arranged around the rotatable supports.

9. The packaging system of claim 8, wherein the carriers are disposed on the loading carousel to carry the containers from a pickup position at the first side of the loading carousel where the containers are picked up, to a loading position at the second side of the loading carousel where the containers are lowered onto the articles.

10. The packaging system of claim 9, wherein the carriers are conveyed along a cam track of the loading carousel, the cam track having an elevated position adjacent to the first rotatable support.

11. The packaging system of claim 9, wherein the container infeed system provides cartons having individual compartments, and wherein the article infeed system provides beverage containers, each beverage container sized to be received in one of the compartments.

12. The packaging system of claim 1, wherein the packaging line comprises a packaging conveyor extending along the second side of the loading carousel.

13. The packaging system of claim 1, wherein the container infeed system provides cartons having individual compartments, and wherein the article infeed system provides beverage containers, each beverage container sized to be received in one of the compartments.

14. A packaging system for packaging articles into containers, comprising:

a container infeed system;

a loading carousel having at least a first side and a second side, wherein the container infeed system provides containers to the first side of the loading carousel, and wherein the loading carousel comprises a first rotatable support, a second rotatable support, and a plurality of carriers arranged around the rotatable supports;

an article infeed system positioned adjacent to the loading carousel to feed articles to the loading carousel;

a packaging line disposed along the second side of the loading carousel; and

a selector station positioned upstream of and adjacent to the packaging line to arrange articles from the article infeed system into article groups and forward the article groups to the packaging line, wherein

the loading carousel loads the article groups into the containers along the packaging line, and wherein

the carriers are disposed on the loading carousel to carry the containers from a pickup position at the first side of the loading carousel where the containers are picked up, to a loading position at the second side of the loading carousel where the containers are lowered onto the article groups.

15. The packaging system of claim 14, wherein the carriers are conveyed along a cam track of the loading carousel, the cam track conveying the carriers to an elevated position adjacent to the first rotatable support.

16. The packaging system of claim 14, wherein the packaging line comprises a packaging conveyor extending along the second side of the loading carousel.

17. The packaging system of claim 14, wherein the container infeed system comprises:

at least one container conveyor; and

at least one container opener.

18. The packaging system of claim 14, further comprising a closing mechanism for receiving containers loaded with articles from the packaging line and closing bottoms of the containers.

19. The packaging system of claim 18, wherein the closing mechanism is spaced from and adjacent to the container infeed system.

20. The packaging system of claim 14, wherein the container infeed system provides cartons having individual compartments, and wherein the article infeed system provides beverage containers, each beverage container sized to be received in one of the compartments.

21. A method of forming packages, comprising:

conveying articles along a first path of travel;

conveying cartons along a second path of travel in a direction substantially parallel to and opposite from the first path of travel;

opening the cartons to a configuration for receiving the articles therein;
conveying the opened cartons into alignment with the articles; and
packaging the articles within the cartons to form packages.

22. The method of claim 21, further comprising grouping the articles into article groups before packaging the articles within the cartons.

23. The method of claim 22, wherein the conveying of the opened cartons comprises engaging each carton with a carrier moving about a loading carousel.

24. The method of claim 23, further comprising:
picking up the cartons with the carriers along the second path of travel;
raising the cartons after pickup; and
after raising the cartons, lowering the cartons onto the article groups.

25. The method of claim 23, wherein the packaging of the articles within the cartons comprises placing the cartons over the article groups.

26. The method of claim 23, wherein the packaging of the articles within the cartons comprises closing bottoms of the cartons.

27. The method of claim 23, wherein the articles are beverage containers.

28. A method of forming packages, comprising:
providing cartons to a first side of a loading carousel;
conveying the cartons from the first side to a second side of the loading carousel;
providing article groups to the loading carousel;

loading the article groups into the cartons along the second side of the loading carousel; and

closing the cartons to form packages.

29. The method of claim 28, wherein the conveying of the cartons from the first side to the second side of the loading carousel comprises:

picking up the cartons at a pickup position; and

raising the cartons to a raised location.

30. The method of claim 29, wherein the loading of the article groups into the cartons comprises lowering the cartons onto the article groups.

31. The method of claim 30, wherein the closing of the cartons comprises closing bottoms of the cartons.

32. The method of claim 30, wherein the articles are beverage containers.

33. The method of claim 30, wherein the conveying of the cartons from the first side to the second side of the loading carousel comprises conveying carriers along a cam track with the containers being supported by the carriers.

34. The method of claim 29, wherein:

the picking up of the cartons comprises picking up cartons traveling along a first direction;

the loading of the article groups into the cartons comprises loading article groups moving along a second direction; and

the first direction is substantially opposite to the second direction.

35. A loading carousel having a first side and a second side, comprising:

a first rotatable support;

a second rotatable support;

a cam track comprising:

a pickup cam profile on the first side of the loading carousel; and

a loading cam profile on the second side of the loading carousel; and

a plurality of carriers mounted around the first and second rotatable supports, the carriers being mounted for moving about a periphery of the loading carousel and for vertical translation defined by the cam track, wherein

the pickup cam profile defines a low pickup position on the first side of the loading carousel, and

the loading cam profile defines a low loading position on the second side of the loading carousel.

36. The loading carousel of claim 35, wherein the cam track defines a first raised position for the carriers between the pickup position and the loading position and adjacent to the first rotatable support.

37. The loading carousel of claim 36, wherein the cam track defines a second raised position for the carriers between the pickup position and the loading position and adjacent to the second rotatable support.

38. The loading carousel of claim 35, wherein each carrier is mounted on at least one upright rod and is operatively connected to a cam follower engaged with the cam track.

39. The loading carousel of claim 35, wherein the carriers comprise spaced arms sized to receive cartons.

40. The loading carousel of claim 35, wherein the rotatable supports are rotated in unison by at least one chain, belt, or gear.

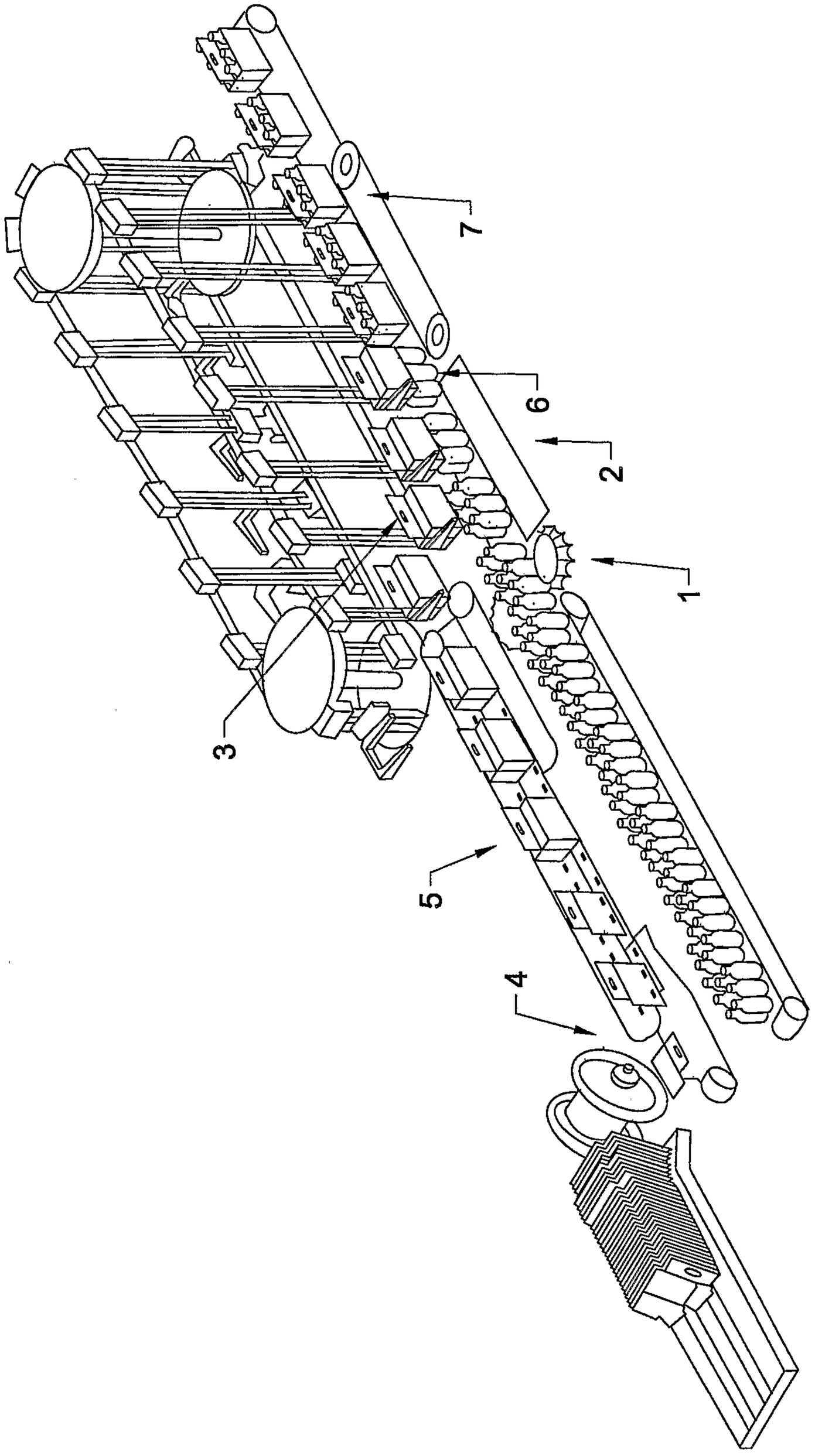


Fig. 1

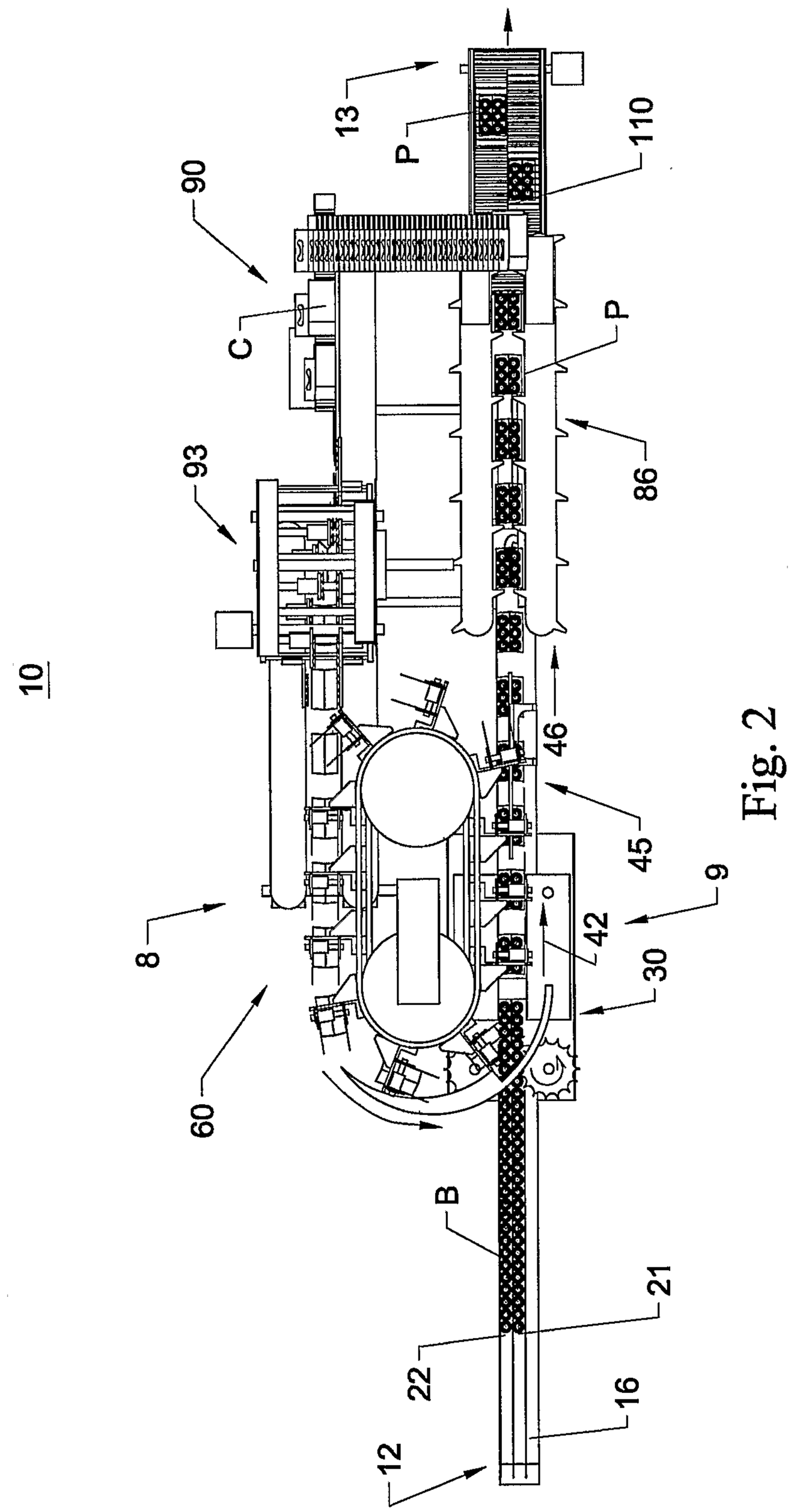


Fig. 2

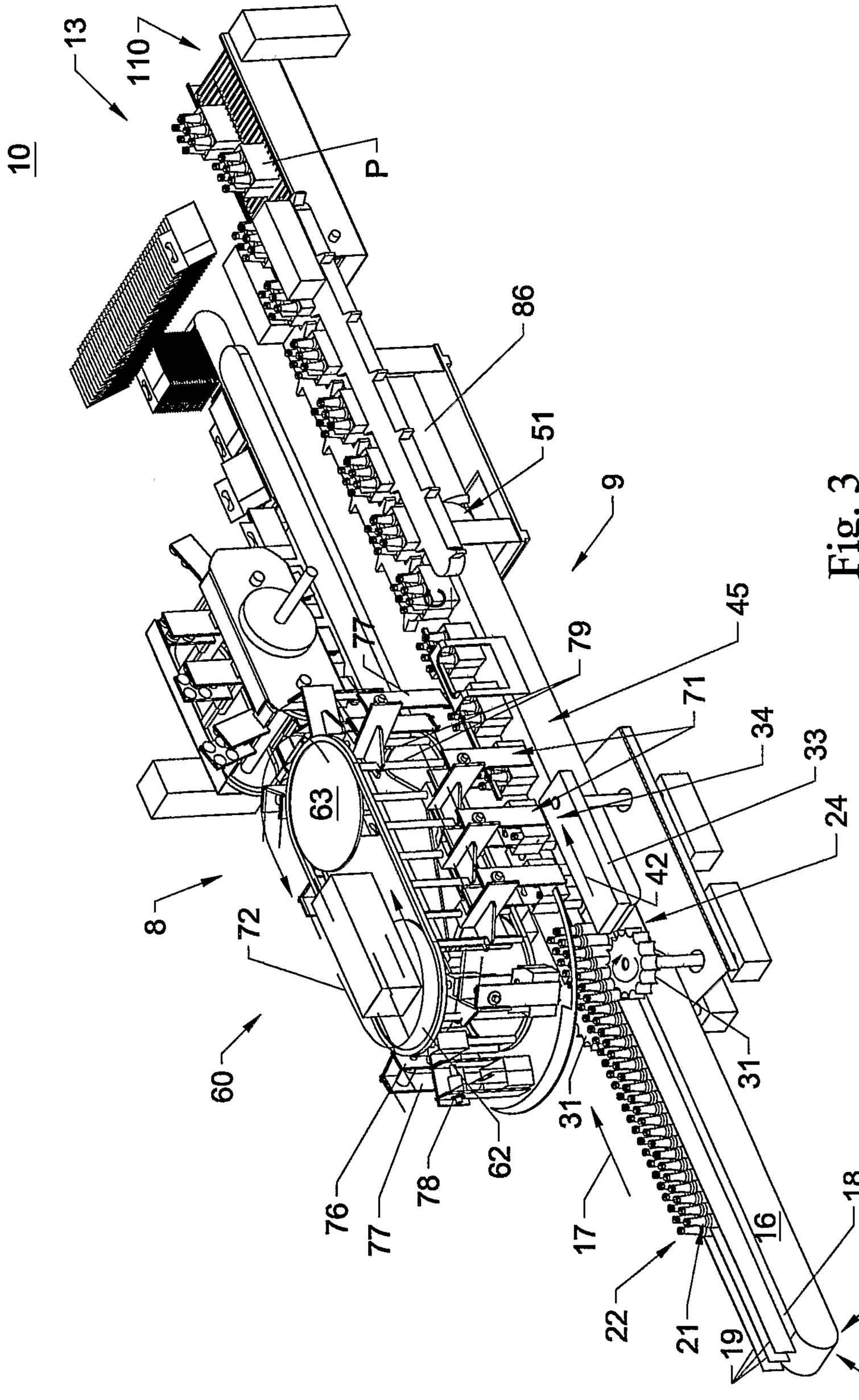

10
13
110
P
θ
86
51
9
45
79
77
71
34
33
24
63
42
8
72
60
31
62
76
77
78
17
16
18
23
22
21
19
12

Fig. 3

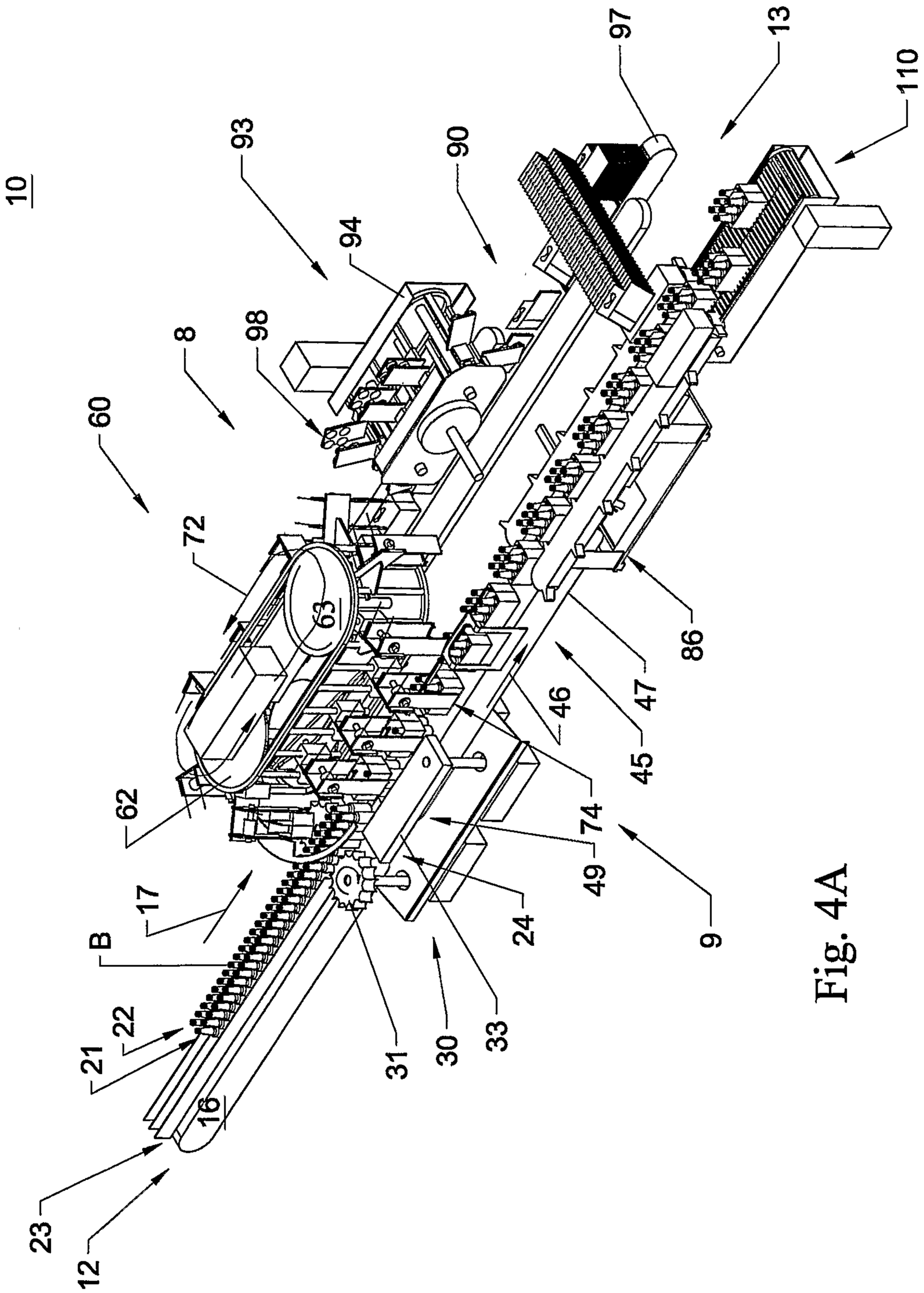

10
60
8
98
93
94
90
97
13
110
72
63
62
17
B
22
21
23
12
16
31
30
33
24
74
49
9
46
47
45
86

Fig. 4A

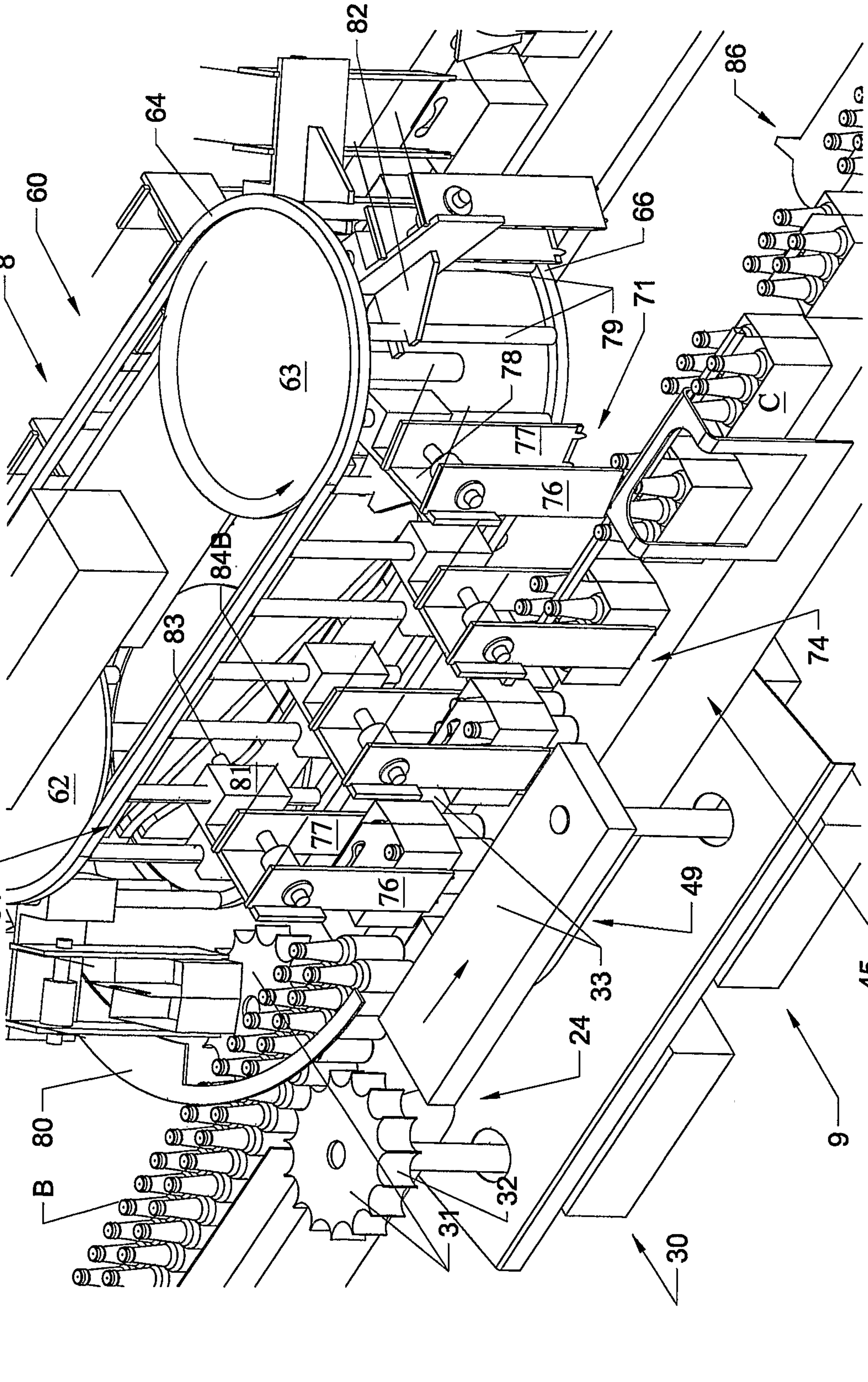

8
60
64
82
86
66
71
79
78
63
77
76
C
84B
83
62
81
84
74
45
49
33
24
9
80
B
32
31
30

Fig. 4B

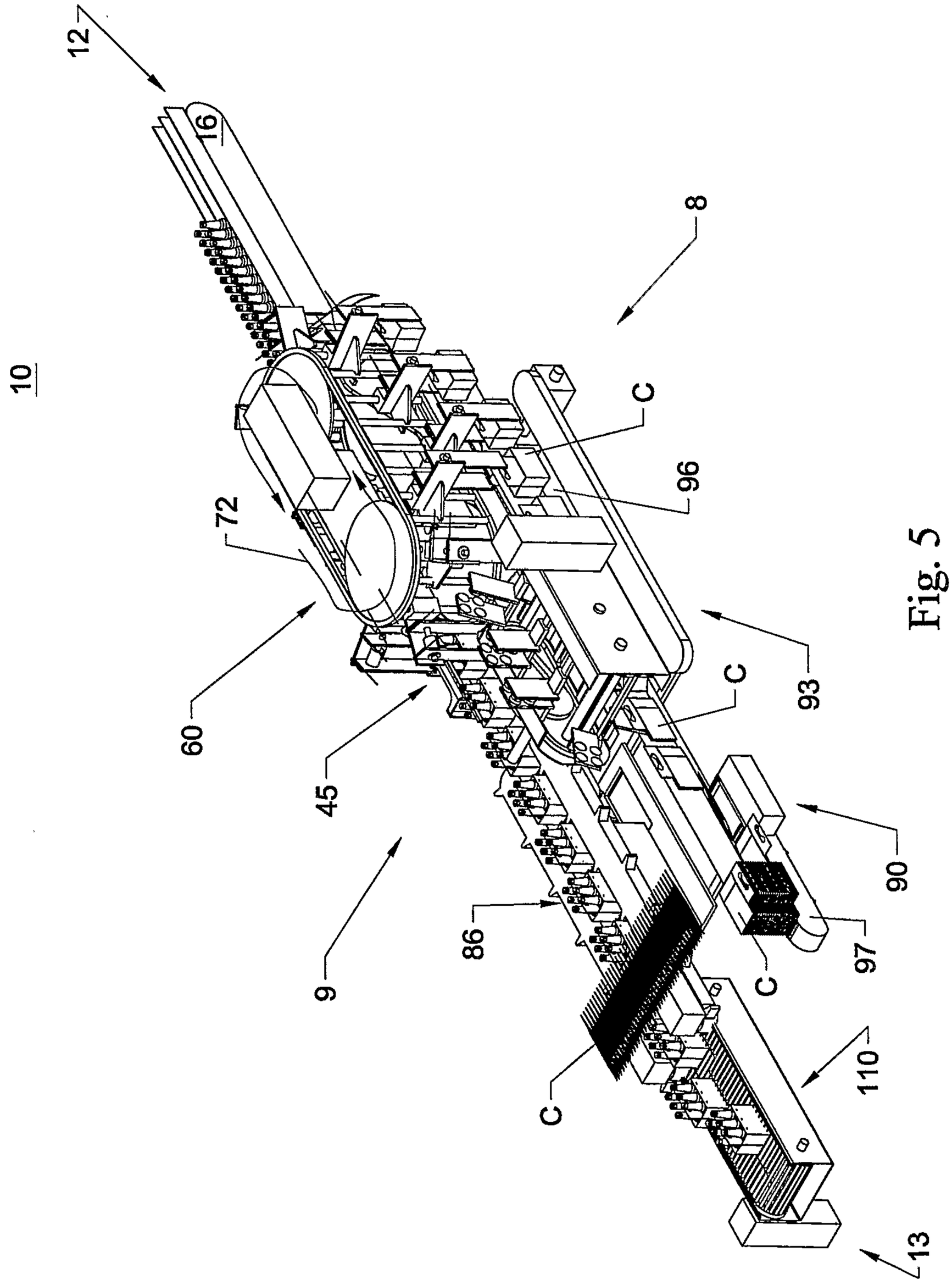


Fig. 5

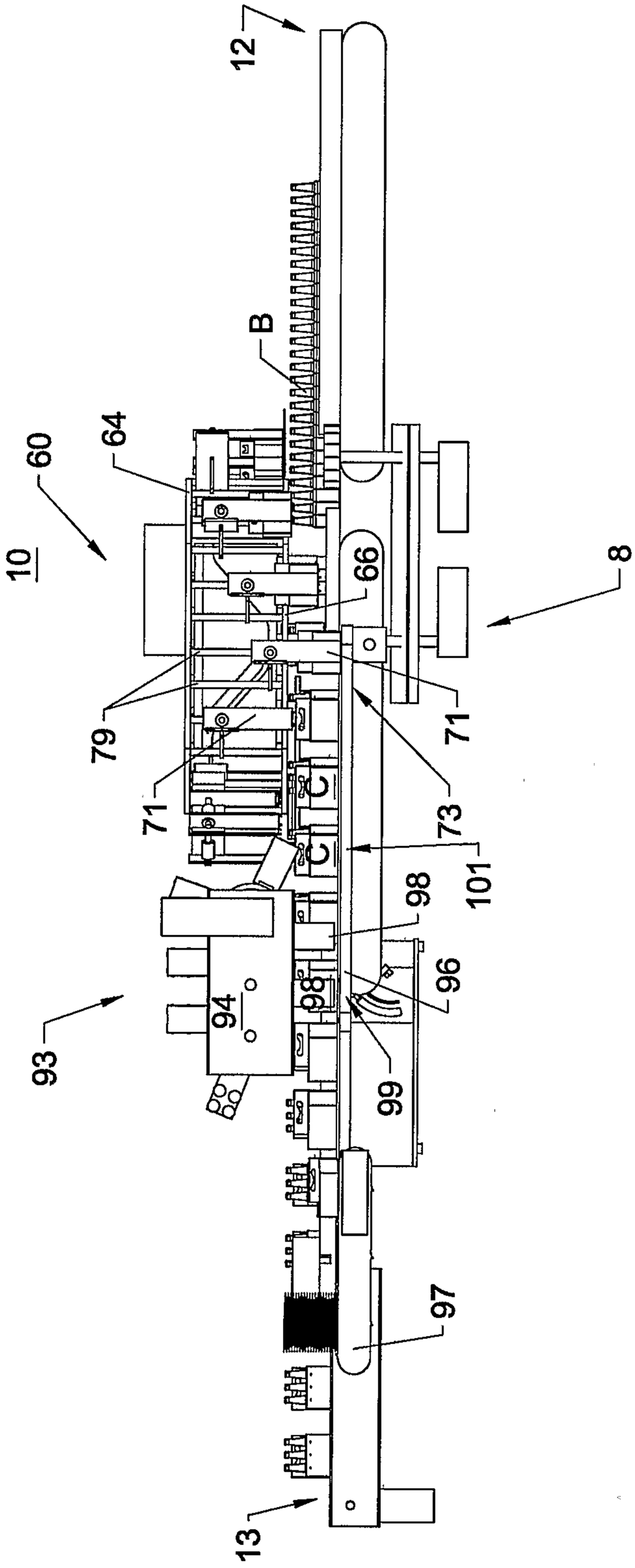


Fig. 6

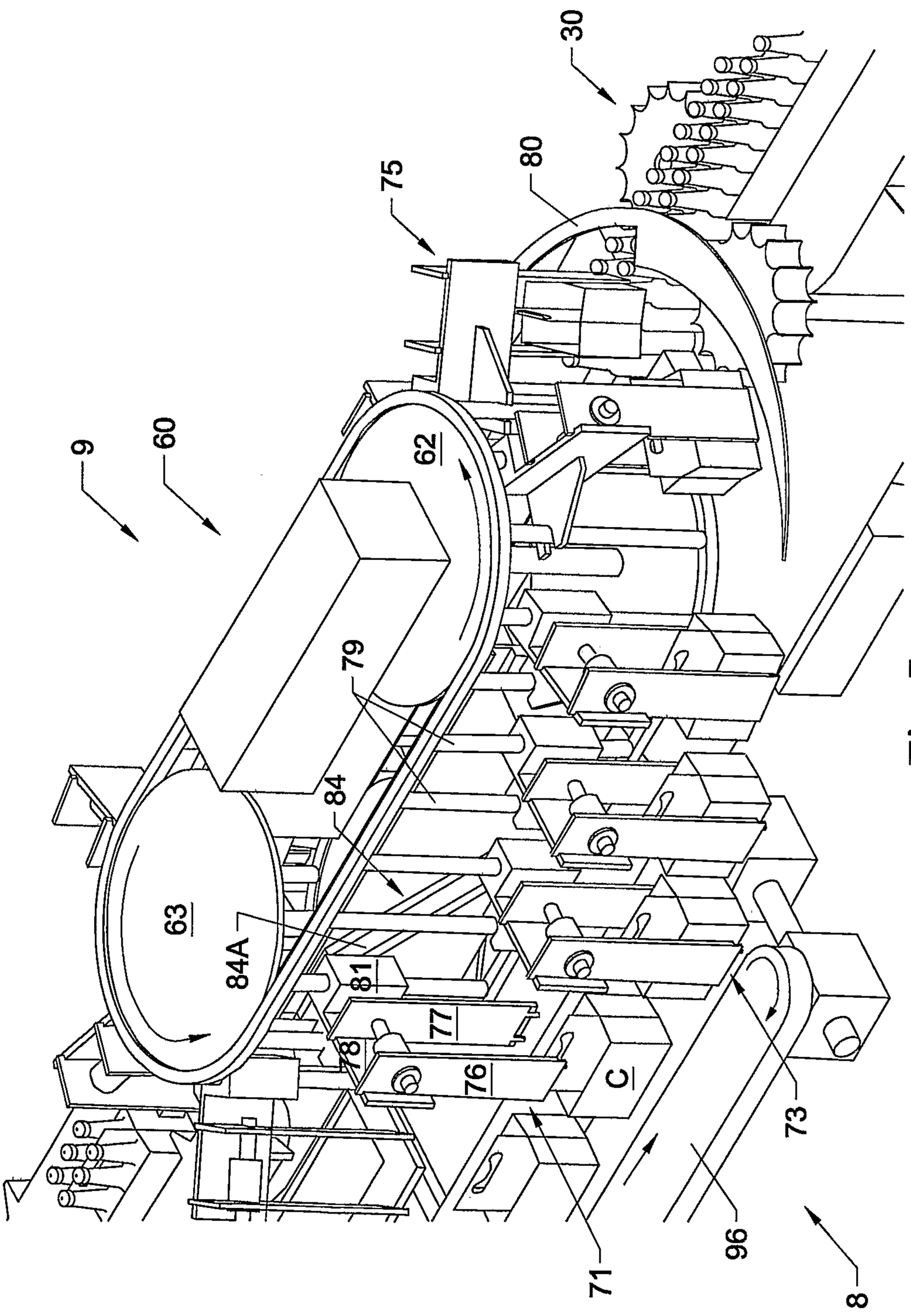
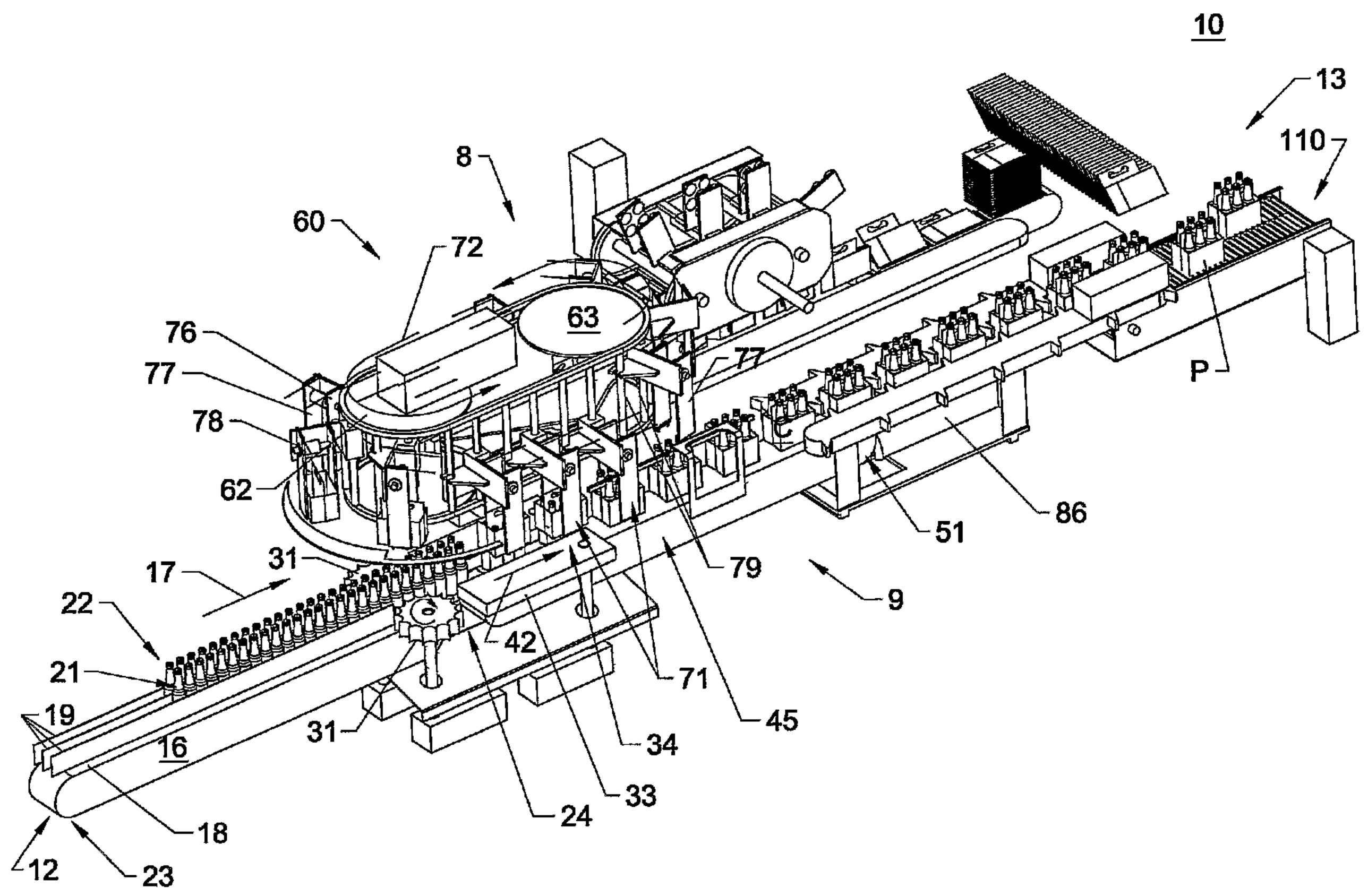


Fig. 7


10
13
110
8
60
72
63
76
77
78
62
77
P
86
51
79
9
31
17
22
42
21
71
19
45
16
31
34
33
24
18
12
23