

AUSTRALIA

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PATENTS ACT 1990

PATENT REQUEST : STANDARD PATENT

I/We being the person(s) identified below as the Applicant(s), request the grant of a patent to the person(s) identified below as the Nominated Person(s), for an invention described in the accompanying standard complete specification.

Full application details follow:

[71/70] Applicant(s)/Nominated Person(s):

Goldco Industries, Inc.

of

5605 Goldco Drive, Loveland, Colorado, 80537, United States of America

[54] Invention Title:

Device utilizing fluid for effecting nested alignment of articles having a circular cross-section

[72] Name(s) of actual inventor(s):

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Basic Convention Application(s) Details:

[31] Application Number	[33] Country	Code	[32] Date of Application
733,667	United States of America	US	22 July 1991

DATED this TWENTY FIRST day of JULY 1992



.....
a member of the firm of
DAVIES COLLISON CAVE for
and on behalf of the
applicant(s)

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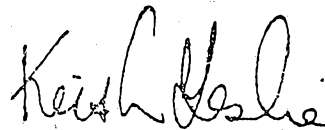
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NOTICE OF ENTITLEMENT

We, **Goldco Industries, Inc.**, the applicant/Nominated Person named in the accompanying Patent Request state the following:-

The Nominated Person is entitled to the grant of the patent because the Nominated Person derives title to the invention from the inventors by assignment.

The Nominated Person is entitled to claim priority from the basic application listed on the patent request because the Nominated Person is the assignee of the applicants in respect of the basic application, and because that application was the first application made in a Convention country in respect of the invention.

DATED this TWENTY FIRST day of JULY 1992



.....
a member of the firm of
DAVIES COLLISON
CAVE for and on behalf
of the applicant(s)

(DCC ref: 1514441)



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(12) PATENT ABRIDGMENT (11) Document No. AU-B-20455/92
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 661322

- (54) Title
DEVICE UTILIZING FLUID FOR EFFECTING NESTED ALIGNMENT OF ARTICLES HAVING A CIRCULAR CROSS-SECTION
- International Patent Classification(s)
(51)⁵ **B65G 047/30 B65G 051/03**
- (21) Application No. : **20455/92** (22) Application Date : **21.07.92**
- (30) Priority Data
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733667 22.07.91 US UNITED STATES OF AMERICA
- (43) Publication Date : **28.01.93**
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- (71) Applicant(s)
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- (56) Prior Art Documents
US 4721419
US 4730955
- (57) Claim

1. A device for effecting nested alignment of articles having a generally circular cross-section, said device comprising:

conveying means for receiving articles having a generally circular cross-section, said conveying means having a discharge end and including an apertured base plate;

first top means positioned slightly above the articles when said articles are not under movement at the conveying means with said first top means being contactable by the top portion of said articles when said articles move through said conveying means;

aligning means adjacent to said discharge end of said conveying means for receiving articles discharged from said conveying means, said aligning means including an apertured base plate and guide means at said base plate for establishing a plurality of guideways each of which is of a width so that articles are moved through each of said guideways only in single file;

second top means having a configuration that is dissimilar to that of said first top means, the second top means being positioned slightly above the articles when said articles are not under movement at the aligning means with said second top means being contactable by the top portion of said articles when said articles move through said aligning means;

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staging means for receiving articles discharged from said guideways of said aligning means; and

fluid inserting means for inserting fluid into said conveying means and said guideways of said aligning means through said apertured base plates to urge movement of articles through said conveying means toward said discharge end and to urge movement of articles through said guideways of said aligning means into said staging means with the articles discharged from said guideways providing a plurality of separate adjacent rows of articles at said staging means and with the articles of said adjacent rows being offset from one another such that the articles are in nested relationship with each article contacting adjacent articles in the same and adjacent rows.

66 15 22

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COMPLETE SPECIFICATION

NAME OF APPLICANT(S):

Goldco Industries, Inc.

ADDRESS FOR SERVICE:

DAVIES COLLISON CAVE
Patent Attorneys
1 Little Collins Street, Melbourne, 3000.

INVENTION TITLE:

Device utilizing fluid for effecting nested alignment of articles having a circular cross-section

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

Field of the Invention

This invention relates to a device for effecting
 5 nested alignment of articles having a substantially, or
 generally, circular cross-section, and, more particularly,
 relates to such a device utilizing fluid (normally air) to
 urge the articles into the nested and aligned relationship.

Background of the Invention

10 It is oftentimes necessary to arrange articles in
 a predetermined pattern in order to effect a desired end.
 Such is the case, for example, where it is desired that the
 articles be in single file (for enabling filling of the
 articles, for example, where the articles are beverage cans)
 15 or be in a plurality of adjacent rows (for storing the
 articles, for example, on a pallet or the like).

Apparatus utilizing air conveyors for causing
 articles (cans), conveyed to the apparatus in a mass flow, to
 be arranged into single file is shown, for example, in U.S.
 20 Patent No. 4,500,229 and U.S. Reissue Patent No. RE. 32,684,
 while apparatus utilizing mechanical conveyors for arranging
 articles (cans) into a plurality of nested and aligned rows
 is shown, for example, in U.S. Patent Nos. 4,834,605 and
 2,535,880.

25 It is now also known that article-size unoccupied
 spaced in a nested and aligned arrangement of articles, such
 as cans, can be eliminated by utilization of movable side
 walls at opposite sides of the rows of articles (see, for
 example, U.S. Patent No. 4,934,508).

30 The use of air has not only been heretofore
 suggested to urge articles, such as cans, to be arranged in
 single file (as brought out above), but has also been
 heretofore suggested for use in urging movement of articles,
 such as cans, along a surface in a mass flow (see, for
 35 example, U.S. Patent No. 4,828,434). Such arrangements
 utilizing fluid have not, however, been heretofore used to
 effect nested alignment of articles.

It is an object of this invention to provide an improved device for effecting nested alignment of articles having a generally circular cross-section.

It is another object of this invention to provide an improved device that utilizes fluid for effecting nested alignment of articles having a generally circular cross-section.

5 It is still another object of this invention to provide an article nesting and aligning device that includes conveying, aligning and staging sections each providing fluid drive for urging articles through the sections.

The invention provides a device for effecting nested alignment of articles having a generally circular cross-section. The device includes conveying means for receiving
10 such articles having a discharge end and including an apertured base plate. First top means is positioned slightly above the articles when the articles are not under movement at the conveying means with the first top means being contactable by the top portion of the articles when the articles move through the conveying means. Aligning means is disposed adjacent to the discharge end of the conveying means for receiving articles
15 discharged from the conveying means. The aligning means includes an apertured base plate and guide means at the base plate for establishing a plurality of guideways each of which is of a width so that articles are moved through each of the guideways only in single file. Second top means has a configuration that is dissimilar to that of the first top means. The second top means is positioned slightly above the articles when the
20 articles are not under movement at the aligning means with the second top means being contactable by the top portion of the articles when the articles move through the aligning means. Staging means is provided to receive articles discharged from the guideways of the aligning means. Fluid inserting means is provided for inserting fluid into the conveying means and the guideways of the aligning means through the apertured base
25 plates to urge movement of articles through the conveying means toward the discharge end and to urge movement of articles through the guideways of the aligning means into the staging means, with the articles discharged from the guideways providing a plurality of separate adjacent rows of articles at the staging means and with the articles of the adjacent rows being offset from one another such that the articles are in nested
30 relationship with each article contacting adjacent articles in the same and adjacent rows.

Preferably the top means comprise readily removable top units.

The article nesting and aligning device may be used in connection with a



palletizer to effect palletizing of nested and aligned articles.

The invention will be further described, by way of example only, with reference to the accompanying drawings, it being understood that changes in the precise embodiment of the herein disclosed invention are meant to be included as come within
5 the scope of the claims.

Brief Description of the Drawings

The accompanying drawings illustrate a complete embodiment of the invention, and in particular:

10 FIGURE 1 is a perspective view of the embodiment of the invention utilized in conjunction with a palletizer;

FIGURE 2 is a top view of the embodiment of this invention as shown in FIGURE 1;

15 FIGURE 3 is a top view of the embodiment of this invention with a reduced number of passageways illustrated and with the top units removed;

FIGURE 4 is a cross-sectional side view of the device shown in FIGURE 1 and 2;

20 FIGURE 5 is a partial cross-sectional side view of the air conveyor section illustrating positioning of the base plate and top unit relative to articles passing therebetween;

FIGURE 6 is a partial perspective view of the guides, or partitions, utilized in the aligning section; and

FIGURE 7 is a top view with portions broken away and particularly illustrating the aligning section (including



positioning of the partitions therein) and the staging section.

Embodiment(s) of
Description of the Invention

Device 9 ~~of this invention~~ is shown in FIGURES 1
5 through 4 to include a receiving section 11 providing a receiving area, an aligning section 12 providing an aligning area, and a staging section 13 providing a staging area, with aligning section 12 being downstream with respect to the direction of article movement from receiving section 11, and
10 with staging section 13 being downstream from aligning section 12 with respect to the direction of article movement.

As also shown in FIGURE 1, a palletizer 15 may be positioned adjacent to, and downstream from, staging section 13, and a stop mechanism 16 is provided to control movement
15 of articles to the palletizer, as is conventional.

Articles 17 having a substantially, or generally, circular cross-section (such as, for example, metal cans to be filled with a beverage or the like), to be arranged in nested and aligned relationship with one another, are received
20 at receiving section 11, and, more particularly, at conveying portion 19.

Conveying portion 19 may be conventional and may be, for example, a mechanical conveyor having rollers 21 rotatably mounted on support structure (generally identified by the
25 numeral 22) with endless belt 23 carried by the rollers, one or more of which rollers is conventionally driven to cause movement of the substantially horizontally extending top surface 24 in the direction of primary intended movement of articles. Top surface 24 contacts the bottoms of received
30 articles 17 to convey the received articles in mass toward dead plate 26 (as shown in FIGURES 1, 2 and 4) which also is a part of receiving section 11.

As shown, dead plate 26 is a substantially horizontally positioned metallic plate about 12 to 16 inches
35 (30 to 40 cm) in length (in the downstream direction) and extending entirely across the width of the device, with the dead plate being connected to supporting structure 22 at the opposite edges of the device. Dead plate 26 receives articles



thereon as the articles are discharged from conveyor portion 19, with the articles being caused to slide across the dead plate due to pressure exerted by additional articles discharged from conveyor portion 19. After sliding across the
5 dead plate, the articles are discharged onto air conveyor portion 28 which is also a part of receiving section 11.

As indicated in FIGURES 3 through 5, air conveyor portion 28 includes substantially horizontally extending base plate 30 having apertures 31 formed therein. Apertures 31 are
10 slanted so that air is injected therethrough in a downstream direction to thus urge articles in the downstream direction (i.e., away from the dead plate). While the apertures may be drilled at a slant in the base plate, the base plate with apertures therein may also be formed as shown and described
15 in U.S. Patent No. 4,828,434.

A solid top cover 33 is provided above dead plate 26 (preferably above the entire dead plate but at least over a portion thereof) and base plate 30. As is illustrated in
FIGURE 4 and 5, top cover 33 is positioned above dead plate
20 26 and base plate 30 a distance slightly greater than the height of the articles to pass therebetween to thereby prevent the articles from tipping.

Top cover 33 may have ancillary structure 34 (as best shown in FIGURE 4) connected therewith, is preferably
25 connected to one side 35 of supporting structure 22 by means of hinges 36 (as shown in FIGURE 2), and is releasably fastened at the other side 37 of the supporting structure by means of conventional releasable fasteners 38. When so
connected, top cover 33 is positioned above and parallel to
30 dead plate 26 and base plate 30 when fastened in operating position and may be rotated about hinges 36 to facilitate ready removal when fasteners 38 are released (as is illustrated in FIGURE 1).

As indicated in FIGURES 1, 2 and 3, side plates (or
35 rods) 39 are provided at (or near) each side of receiving section 11 to maintain the articles on the top surface 24 of belt 23, on dead plate 26, and on (or above with air injected) the top surface of base plate 30.

The articles are discharged in a mass flow from discharge end 40 of receiving section 11 into aligning section 12 where the articles are formed into a plurality of rows by guides, or partitions, 41 forming a plurality of guideways, or passageways, 42, after which the articles are discharged from discharge end 43 of aligning section 12 by rows into staging section 13. At the staging section, the rows discharged from guideways 42 are brought into adjacent positions with the articles of each row offset from one another so that the articles are thereafter in a nested relationship with the adjacent articles of each row in contact with one another and the articles of adjacent rows also in contact with one another with no article-size unoccupied spaces existing between adjacent articles.

Aligning section 12 includes substantially horizontally extending base plate 45 having apertures 47 therein. As indicated, apertures 47 are slanted in the direction of guideways 42 (formed between guides 41) so that fluid (normally air) injected therethrough urges articles through the guideways. As indicated in FIGURES 3 and 7, apertures 47 are preferably centered in the base plate between adjacent guides. The apertures may be drilled in the base plate at a slant, but may also be formed as shown and described in U.S. Patent No. 4,828,434.

As best shown in FIGURE 6, the plurality of substantially vertically extending guides, or partitions, 41 are positioned, and preferably conventionally attached, at bottom edge 49 to base plate 45. As also shown in FIGURE 6, each partition 41 preferably has a height less than the height of articles to pass through aligning section 12 (by about one inch or more [about 2.5 cm or more], for example), and each partition preferably has notches 50 therein at the bottom edge.

Partitions 41 extend upwardly from base plate 45 parallel to one another and are spaced a sufficient distance to allow articles to pass in single file in an upright position through passageways, or guideways, 42 established between adjacent partitions. Thus, for cans to be filled with a beverage (for example cans for packaging twelve ounces of

the beverage), the cans are upright with the circular cross-section parallel to the base plate when passing through the guideways.

As shown in FIGURE 3, partitions 41 are arranged so that each successive partition extends into receiving section 11 a different distance (or not at all) to facilitate loading of articles into the guideways. As shown, partitions 41 are thus grouped into alternate first, second and third groups 52, 53, and 54, with the partitions of first group 52 extending into receiving section 11 a distance about twice as far as to the partitions of second group 53, while the partitions of third group 54 do not extend into the receiving section.

Center partition 56 (i.e., partition 41 that is centrally partitioned) extends in a direction parallel to the primary intended direction of movement of articles in passing downstream through aligning section 12 (as best shown in FIGURES 2 and 7). The remainder 58 of the partitions (i.e., the non-centrally positioned partitions 41) have a leading portion 60 (a major portion) that extends parallel to central partition 56 (with each partition spaced from each adjacent partition by a distance slightly greater than the diameter of articles to pass through the guideways, as brought out above).

Each partition 58 also has a more downstream portion 62 that extends from junction 63 (i.e., the junction established between portions 60 and 62 of each partition 58) through aligning section 12 in a generally downstream direction but at an angle with respect to the direction of primary intended movement of articles downstream through the device, with portions 60 and 62 of each partition 58 forming an obtuse angle at junction 63. The angle of downstream portion 62 is preferably about 20° with respect to the direction of primary intended movement (and hence preferably about 160° with respect to portion 60).

As can be best seen from FIGURE 7, junctions 63 of partitions 58 fall along a plane that extends at an acute angle with respect to the downstream extension of the plane formed by central partition 56 (and hence at an angle from the



primary intended downstream direction of movement of articles) at an angle of about 80°.

Portions 62 of partitions 58 extend a distance greater than does central partition 56 and each successive outwardly spaced portion 62 of partition 58 progressively terminates at free end 65 positioned at a greater distance downstream, with the free ends 65 of the partitions terminating in a plane that extends at an acute angle of about 45° in each direction with respect to the downstream extension of the plane formed by central partition 56 so that the free ends of the partitions form a discharge end 43 of aligning section 12 having a V-shape (therefore, staging section 13 may also be considered to have a V-shape input end 66 as best shown in FIGURES 3 and 7).

As shown in FIGURE 7, partitions 58 extending in one direction (relative to the width of the aligning section) from central partition 56 have junctions 63 that are offset in the downstream direction one-half of the total diameter of the article with respect to partitions 58 extending the opposite direction so that rows of articles discharged from the guideways at opposite sides of center partition 56 are offset from one another by one-half of the distance of the articles when discharged into staging section 13. The number of partitions utilized depends upon the number of rows of articles needed. When used with a palletizer, for example, twenty rows are utilized with twenty-one cans in each row.

A top unit 68 with ancillary structure 69 (as shown in FIGURE 4) also has a plurality of uniformly spaced L-shaped bars 71 extending lengthwise (i.e., in the downstream direction of article movement) parallel to and spaced from one another with one leg of each bar extending across the top of each guideway 42. Top unit 68 is fastened to side 35 of supporting structure 22 by means of hinges 73 and fastened to the other side 37 of the supporting structure by means of readily releasable fasteners 74. When in operating position above and parallel to base plate 45, the bottom surface (provided by bars 71) of top unit 68 is slightly above the top portion of articles to pass through the guideways of the

aligning section (top unit 68 is about one inch from the top edges of partitions 41).

Staging section 13 has an air conveyor portion 75 (including the V-shape input end 66) that includes base plate 5 76 with apertures 77 therein slanted in the downstream direction. Again, apertures 77 may be drilled at a slant, but may also be formed as shown in U.S. Patent No. 4,828,434. As indicated in FIGURE 2, top unit 68 also preferably covers the portion of staging area 13 having base plate 76 (base plate 10 76 may be an extension of base plate 45 of aligning section 12).

As also shown in FIGURE 4, staging section 13 preferably also includes conventional mechanical conveyor 79 positioned downstream from and adjacent to base plate 76 to 15 receive articles discharged from air conveyor portion 75 of the staging section. Conveyor 79 can be conventionally implemented by endless belt 80 carried around rollers 81 (one or more of which may be conventionally driven) to receive the nested and aligned articles from the air conveyor portion 75 20 and convey the articles to a utilization unit such as palletizer 15 (in a manner as shown, for example, in U.S. Patent No. 4,759,673). Side walls, or rods, 82 are provided at (or near) the sides of staging area 13 to maintain the articles on (or above with air injected) base plate 76 and 25 belt 80. As is conventional, conveyor 79 may be of sufficient length to convey sufficient articles to fill one or more pallets and stop mechanism 16 (such as shown, for example, in U.S. Patent No. 3,934,713) allows only enough articles to pass each time to fill a pallet.

Plenum, or chamber, 83 (shown in FIGURE 4) is formed 30 below the base plates (which, of course, could be implemented as a common base plate) to supply fluid (normally air), under pressure, through the apertures in the base plates. While not specifically shown, it is to be realized that plenum 83 is 35 supplied with fluid from an external source, such as, for example a conventional blower through conduit 84.

In operation, articles supplied to receiving section 11 (which articles may, for example, be conveyed to the receiving section from a can decorating unit) are conveyed in

a mass flow through the receiving section and discharged therefrom into the aligning section where the articles are automatically separated and urged in single file through the guideways. The articles are discharged from the guideways into the staging area where the articles are automatically brought into adjacent aligned rows with the aligned rows being in offset adjacent relationship so that the articles in each row are brought into nested relationship with each article in contact with adjacent articles in the row and also in contact with adjacent articles in adjacent rows with substantially no can-size unoccupied spaces between adjacent articles. The thus nested and aligned articles are then conveyed in the downstream direction from the device.

10 In view of the foregoing, it is to be appreciated that this invention provides an improved device utilizing fluid for effecting nested alignment of articles having a substantially circular cross-section.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A device for effecting nested alignment of articles having a generally circular cross-section, said device comprising:

5 conveying means for receiving articles having a generally circular cross-section, said conveying means having a discharge end and including an apertured base plate;

first top means positioned slightly above the articles when said articles are not under movement at the conveying means with said first top means being contactable by the top portion of said articles when said articles move through said conveying means;

10 aligning means adjacent to said discharge end of said conveying means for receiving articles discharged from said conveying means, said aligning means including an apertured base plate and guide means at said base plate for establishing a plurality of guideways each of which is of a width so that articles are moved through each of said guideways only in single file;

15 second top means having a configuration that is dissimilar to that of said first top means, the second top means being positioned slightly above the articles when said articles are not under movement at the aligning means with said second top means being contactable by the top portion of said articles when said articles move through said aligning means;

20 staging means for receiving articles discharged from said guideways of said aligning means; and

fluid inserting means for inserting fluid into said conveying means and said guideways of said aligning means through said apertured base plates to urge movement of articles through said conveying means toward said discharge end and to urge
25 movement of articles through said guideways of said aligning means into said staging means with the articles discharged from said guideways providing a plurality of separate adjacent rows of articles at said staging means and with the articles of said adjacent rows being offset from one another such that the articles are in nested relationship with each article contacting adjacent articles in the same and adjacent rows.

30

2. The device of claim 1 wherein at least one of said top means has hinge means at one side of said top means for allowing said top means to be rotated about said



hinge means to facilitate removal of said top means and releasable fastening means at the side of said top means opposite to said one side having said hinge means thereat.

3. The device of claim 2 wherein one of said top means includes a plurality
5 of spaced bars and the other of said top means includes a solid top plate.

4. The device of claim 3 wherein said one of said top means covers at least
a portion of said aligning means and the other of said top means covers at least a portion
of said conveying means.

10

5. The device of claim 1 wherein said base plate of said aligning means has
said guide means mounted thereon, and wherein said guide means includes a plurality
of spaced walls each of which extends upwardly from said base plate.

15 6. The device of claim 5 wherein each of said spaced walls has at least one
notch therein adjacent to said base plate.

7. The device of claim 1 wherein said guideways established by said guide
means have a first portion extending substantially parallel to a primary intended path of
20 travel of articles in passing through said aligning means with at least some of said
guideways having a second portion extending at an angle with respect to said first
portion, and wherein said fluid inserting means directs fluids into said guideways in a
direction substantially parallel to said guideways to urge movement of said articles
through said guideways.

25

8. The device of claim 1 wherein said guide means includes a plurality of
guides, wherein one of said guides of said plurality of guides is a straight wall that
extends substantially parallel to the direction of movement of articles when in nested
relationship with one another, and wherein the remainder of said plurality of guides have
30 a first wall portion parallel to said one of said guides and a second wall portion
extending at an angle from a junction with said first portion, said angle being about 160°
for each of said remainder of said plurality of guides.



9. The device of claim 8 wherein said junctions of said first and second wall portions of said guide means are progressively spaced from each side of said one guide means and progressively terminate at different positions with respect to the direction of movement of articles when in nested relationship, said junctions being along a plane that extends at an angle of about 80° with respect to the direction of article movement when in nested relationship, and said termination of each of said second wall portions being along a plane that extends at an angle of about 45° with respect to the direction of article movement when in nested relationship.

10. The device of any one of claims 1 to 9 wherein a preselected number of guide means of said aligning means extend into said conveying area.

11. The device of any one of claims 1 to 10 wherein said staging means includes a base plate contactable with the bottom portion of said articles, said base plate having apertures therein through which fluid is injected in a direction to urge movement of articles through said staging means.

12. The device of any one of claims 1 to 11 wherein said device is adapted to convey articles toward palletizing means positioned for receiving articles discharged from said staging means, and wherein said device is also adapted to have stop means positionable between said palletizing means and said staging means for controlling movement of said aligned and nested articles from said staging means toward said palletizing means.

13. A device for effecting nested alignment of articles substantially as hereinbefore described with reference to the drawings.

Dated this 25th day of November, 1994

GOLDCO INDUSTRIES, INC.

By its Patent Attorneys

Davies Collison Cave



DEVICE UTILIZING FLUID FOR EFFECTING NESTED ALIGNMENT
OF ARTICLES HAVING A CIRCULAR CROSS-SECTION

ABSTRACT OF THE DISCLOSURE

5 A device is disclosed that utilizes a fluid
(normally air) to effect nested alignment of articles having
a circular cross-section (such as cans used to package
beverages and the like). A conveying section that includes
a dead plate and a fluid conveyor provides articles in a mass
10 flow to an aligning section having guides therein spaced a
sufficient distance to form guideways through which articles
are fluid driven in single file toward a discharge end having
an adjacently positioned staging section that also includes
a fluid conveyor. The guides, other than a center guide, have
15 first and second portions that are angled with respect to one
another, and fluid injected into the sections through
apertures in a base plate providing section bottoms urges the
articles into a plurality of adjacent rows of aligned articles
at the staging section with the articles of each adjacent row
offset from one another to effect nesting of the articles.
20 Readily removable section top units preclude upward movement
of the articles, and nested and aligned articles discharged
from the staging area are provided to a palletizer or like
apparatus.

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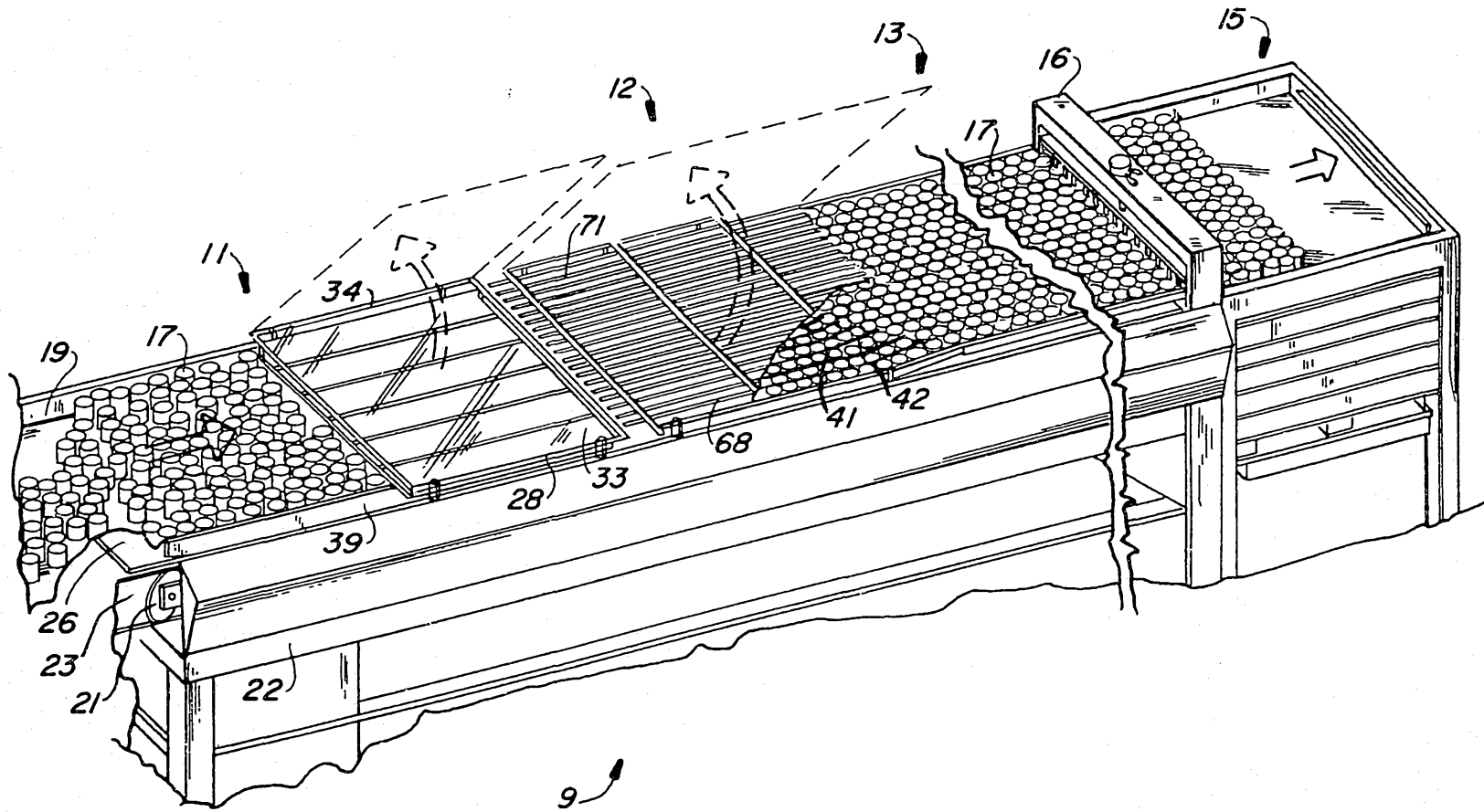


Fig-1

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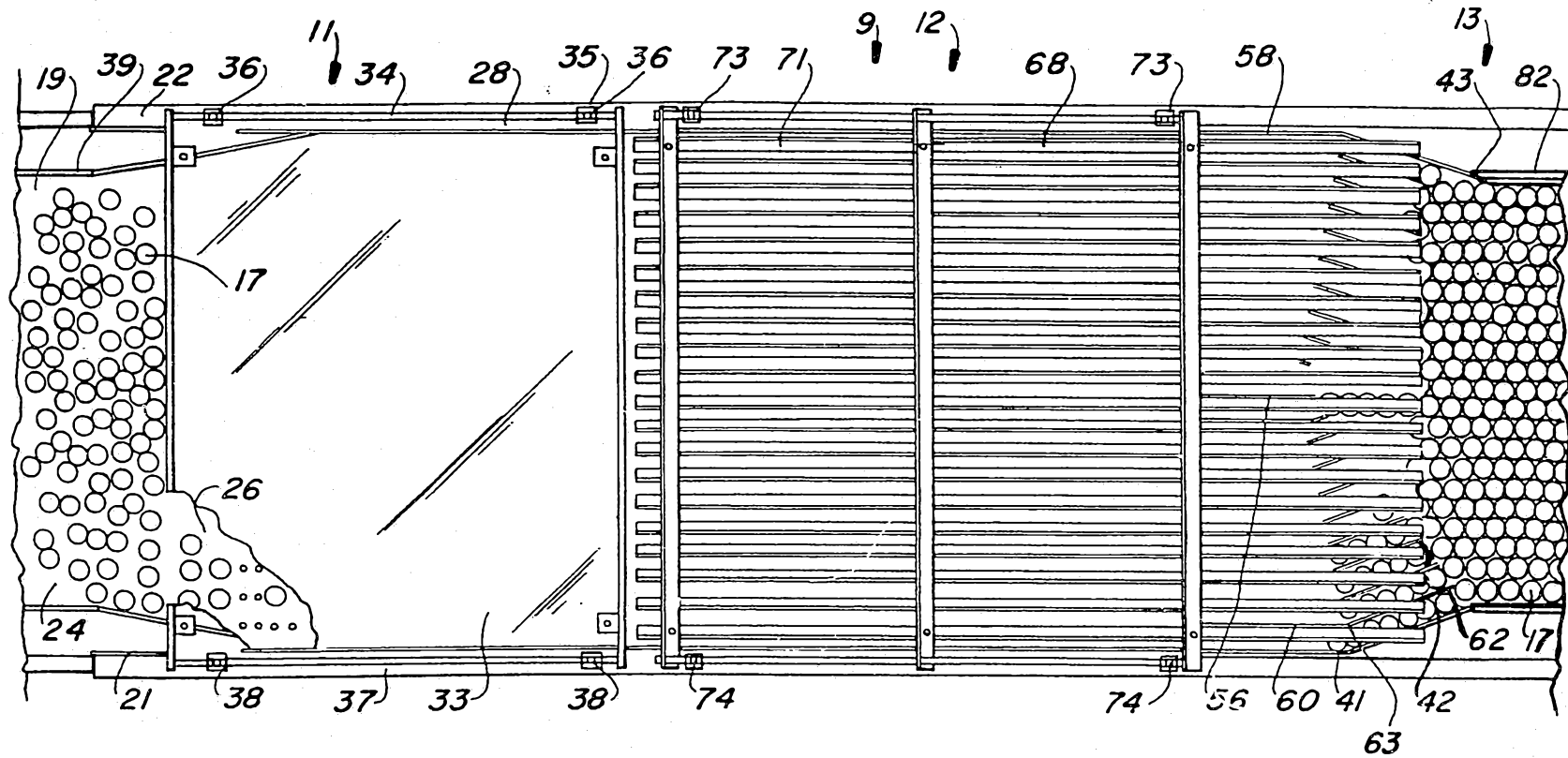
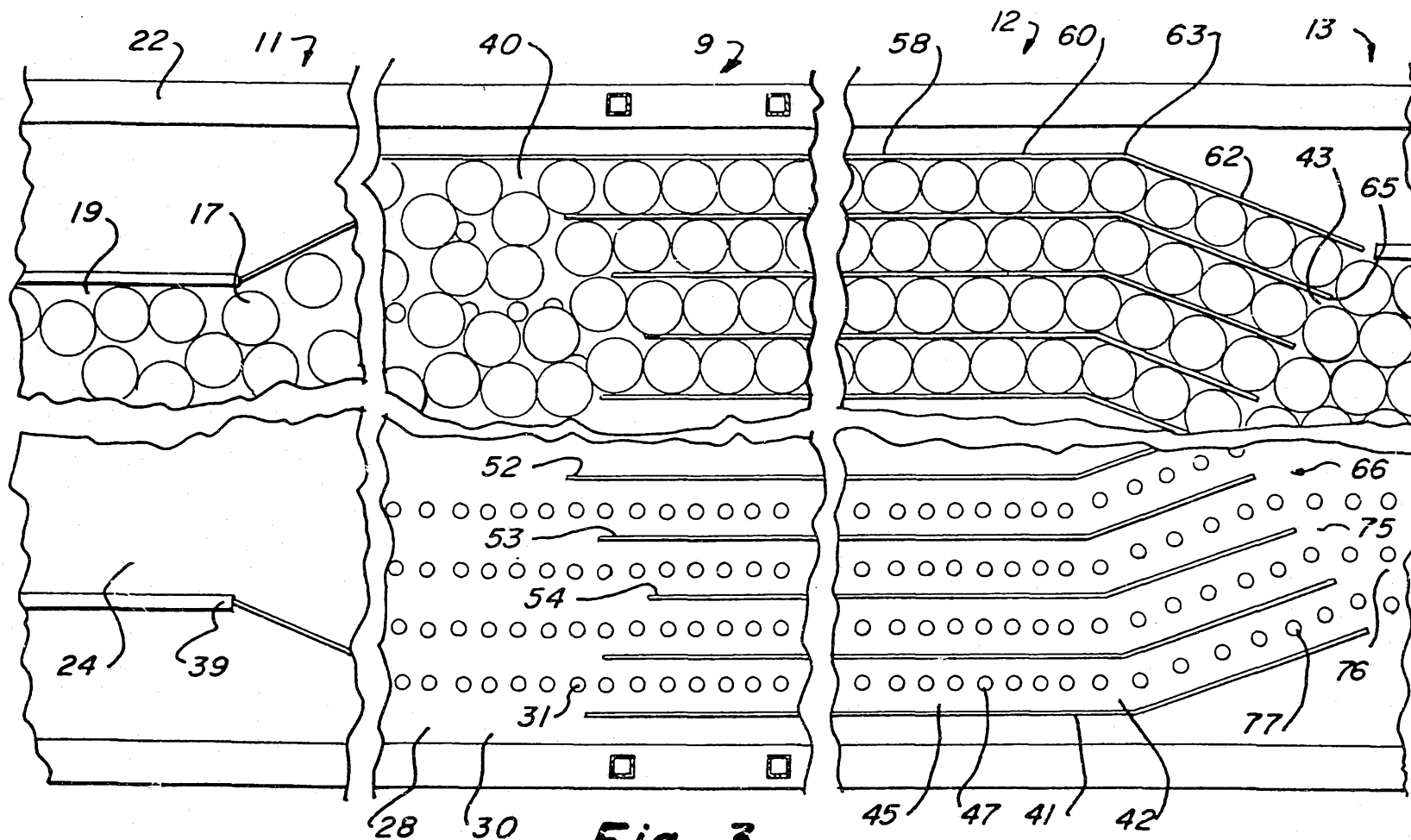


Fig - 2

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Fig_3

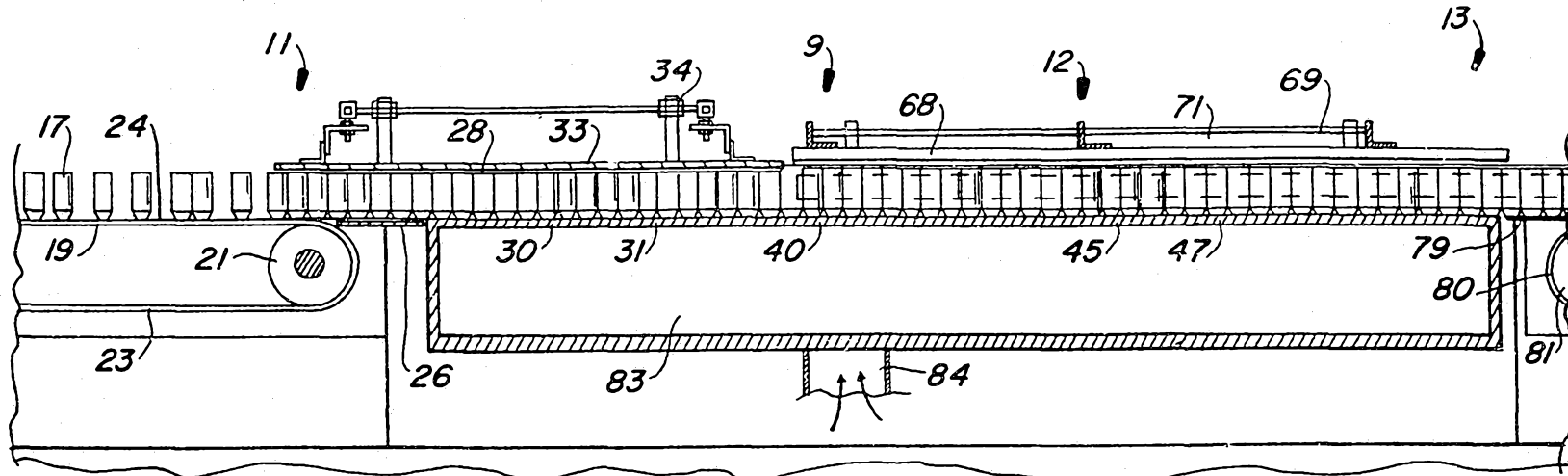


Fig-4

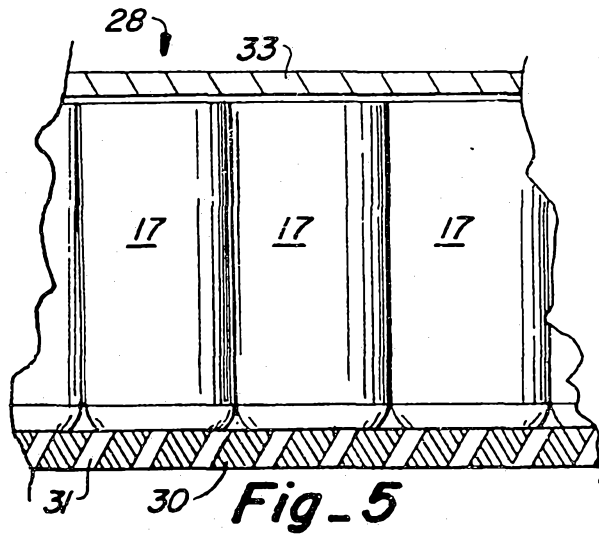


Fig-5

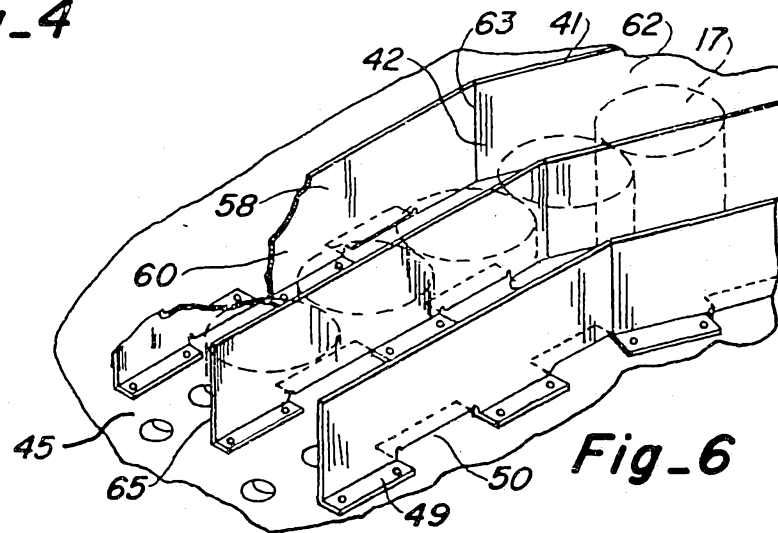


Fig-6

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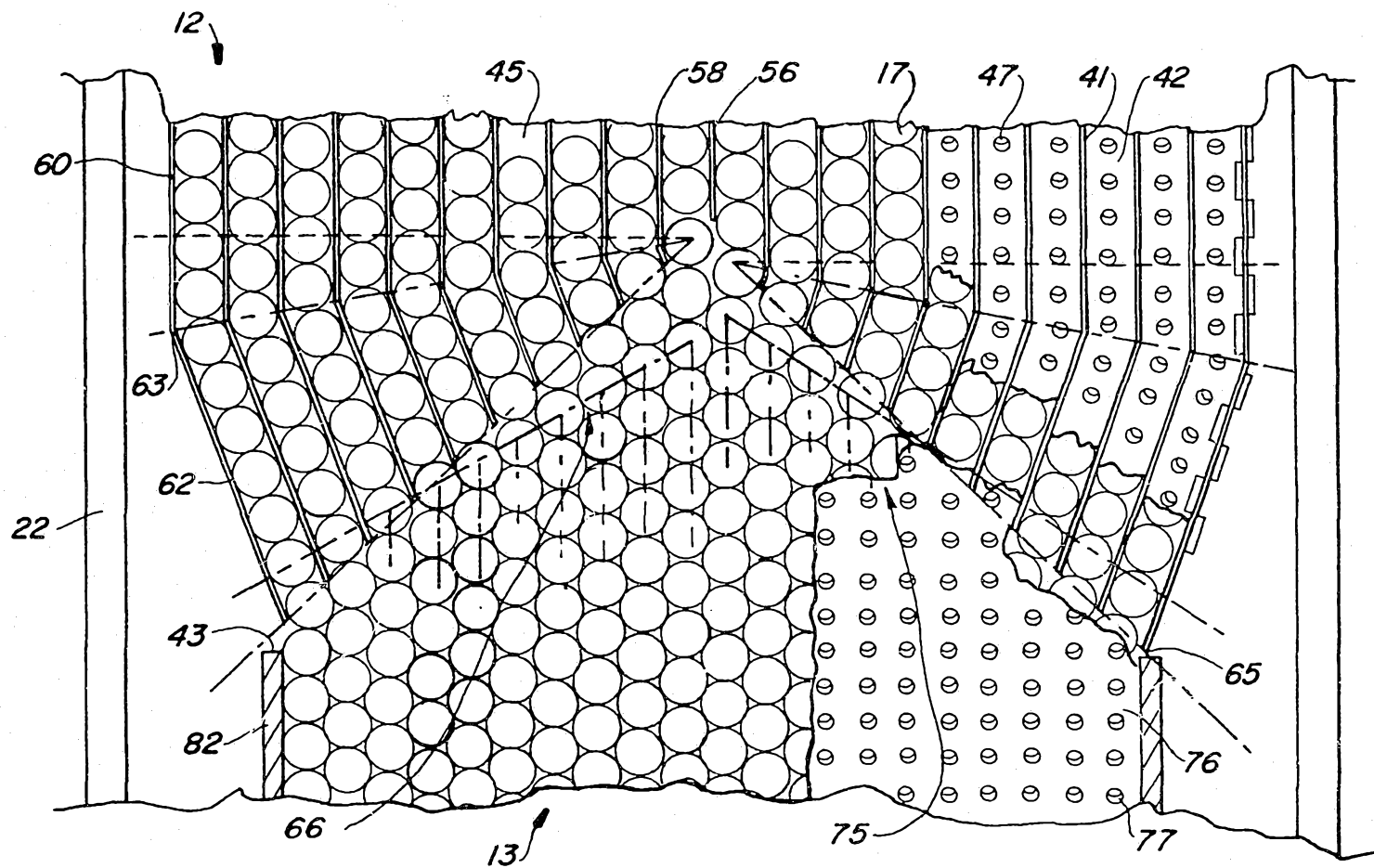


Fig-7