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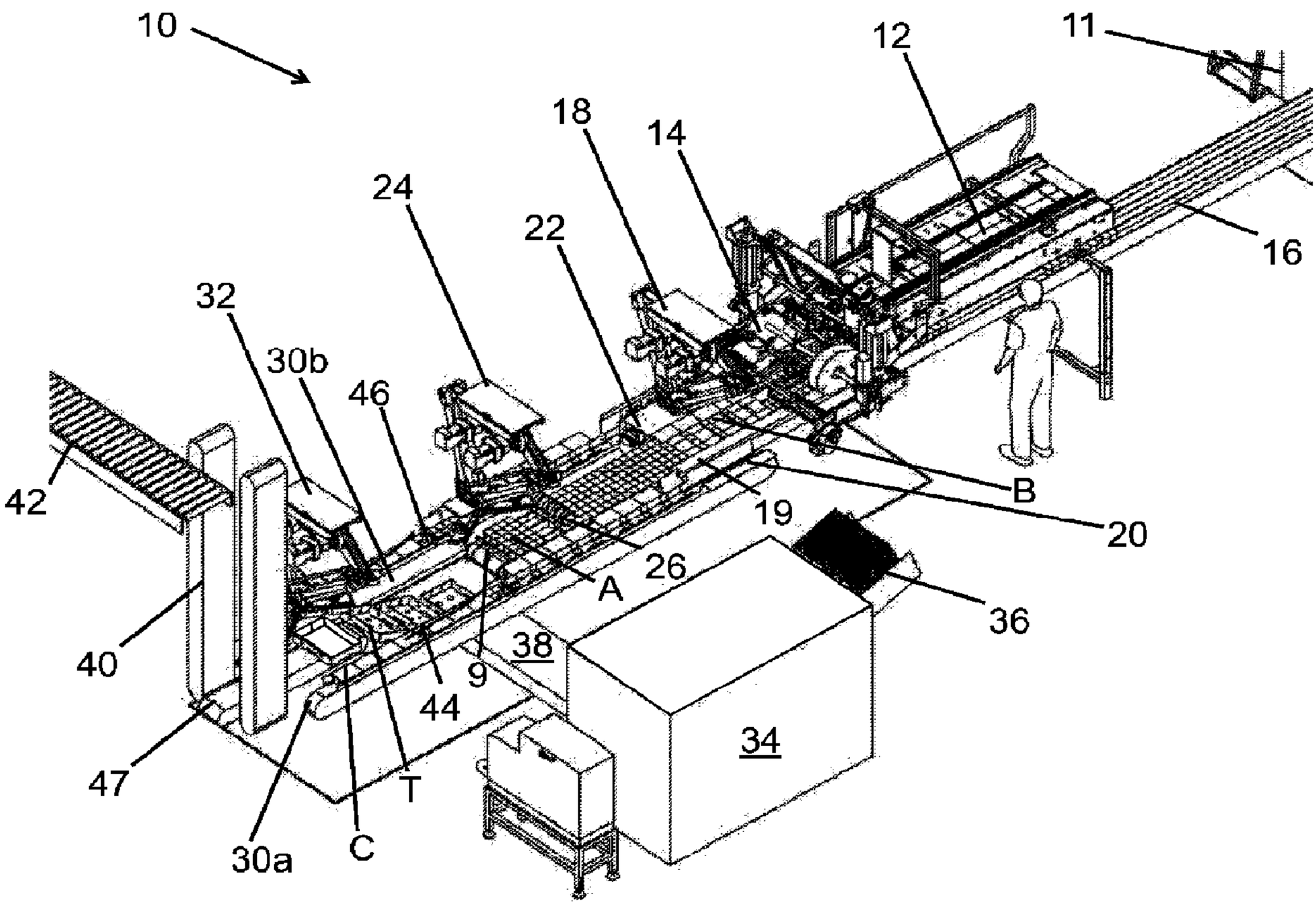

(57) Abrégé/Abstract:
A packaging machine (10) for packaging articles (A) within a carton (C) to form a secondary package and within a tertiary package comprising a first conveyor (16; 116; 316) conveying articles (A) coupled to a filling apparatus (11), a second conveyor (19) conveying carton blanks (B) and being disposed above first conveyor (16; 116; 316), a third conveyor (30a, 30b; 130a, 130b; 330a, 330b) disposed adjacent the first conveyor (16; 116; 316) in partially overlapping relationship with the first conveyor (16; 116; 316), a first transfer mechanism (18) for transferring carton blanks (B) onto the third conveyor (30a, 30b; 130a, 130b; 330a, 330b)

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(57) Abrégé(suite)/Abstract(continued):
either directly or via a fourth conveyor (130c, 130d), the carton blanks (B) are partially assembled on the third conveyor (30a, 30b; 130a, 130b; 330a, 330b), a second transfer mechanism (24) for engaging articles (A) on first conveyor (16; 116; 316) and placing them into the carton blanks (B) which are assembled into a secondary package, a fifth conveyor (47; 147; 347) for conveying second cartons (T) adjacent to said third conveyor (30a, 30b; 130a, 130b; 330a, 330b) and in partially overlapping relationship therewith and a third transfer mechanism (32) for loading the secondary packages into the second cartons (T) to form tertiary packages.

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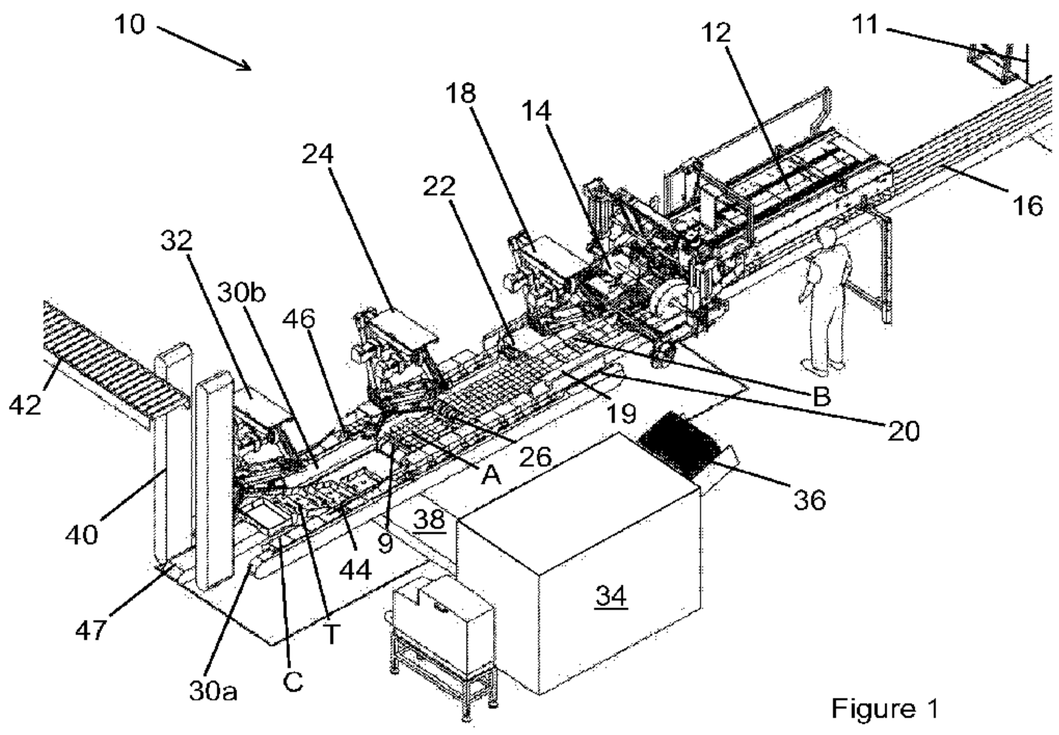

Figure 1

(57) Abstract: A packaging machine (10) for packaging articles (A) within a carton (C) to form a secondary package and within a tertiary package comprising a first conveyor (16; 116; 316) conveying articles (A) coupled to a filling apparatus (11), a second conveyor (19) conveying carton blanks (B) and being disposed above first conveyor (16; 116; 316), a third conveyor (30a, 30b; 130a, 130b; 330a, 330b) disposed adjacent the first conveyor (16; 116; 316) in partially overlapping relationship with the first conveyor (16; 116; 316), a first transfer mechanism (18) for transferring carton blanks (B) onto the third conveyor (30a, 30b; 130a, 130b; 330a, 330b) either directly or via a fourth conveyor (130c, 130d), the carton blanks (B) are partially assembled on the third conveyor (30a, 30b; 130a, 130b; 330a, 330b), a second transfer mechanism (24) for engaging articles (A) on first conveyor (16; 116; 316) and placing them into the carton blanks (B) which are assembled into a secondary package, a fifth conveyor (47; 147; 347) for conveying second cartons (T) adjacent to said third conveyor (30a, 30b; 130a, 130b; 330a, 330b) and in partially overlapping relationship therewith and a third transfer mechanism (32) for loading the secondary packages into the second cartons (T) to form tertiary packages.

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PACKAGING MACHINE

FIELD OF INVENTION

The invention relates to a packaging machine and method of packaging articles. More particularly, but not exclusively, the invention relates to a compact packaging machine.

BACKGROUND OF THE INVENTION

In the field of packaging it is often required to provide consumers with a package comprising multiple primary produce containers, such multi-packs are desirable for shipping and distribution and for display of promotional information.

It is desirable to provide a compact packaging machine, one with a reduced footprint, i.e. one that occupies less area or space within a production facility. It is an object of the present invention to minimise or reduce the linear dimension of a packaging machine assembly line.

SUMMARY OF INVENTION

The present invention seek to overcome or at least mitigate the problems of the prior art.

According to a first aspect of the present invention there is provided a packaging machine capable of packaging groups of articles or primary packages within a carton to form a secondary package and said cartons within a tertiary package, in particular packaging articles within cartons comprising a tubular structure such as a wraparound carton, the packaging machine comprising;

a first conveyor for conveying articles, which first conveyor is directly coupleable to an apparatus for filling said primary packages with a product;

a second conveyor for providing first carton blanks, the second conveyor being disposed above first conveyor;

a third conveyor said third conveyor being disposed adjacent said first conveyor such that it at least partially overlaps with said first conveyor in a direction transverse to the direction of article flow;

a first transfer mechanism for transferring said carton blanks onto the third conveyor either directly from said second conveyor or via a fourth conveyor wherein the carton blanks are partially assembled whilst being conveyed by the third conveyor;

a second transfer mechanism for engaging articles from the first conveyor and placing them into said carton blanks, wherein the carton blanks are assembled into a first carton about a group of one or more articles whilst being conveyed upon the third conveyor to form a secondary package;

a fifth conveyor for conveying second cartons, such as trays, which fifth conveyor is disposed adjacent to said third conveyor and in at least partially overlapping relationship with the third conveyor in said transverse direction;

a third transfer mechanism for loading said secondary packages into the second cartons to form tertiary packages.

Preferably, the third conveyor comprises a folding device for partially assembling the cartons before being loading with articles.

Preferably, the cartons and/or the articles are in continuous motion.

Preferably, the carton and/or the articles are intermittently conveyed.

Preferably, the first, second and third conveyors are arranged in parallel to one another.

Preferably, the fourth conveyor is arranged in parallel to the first, second and third conveyors.

Preferably, the fifth conveyor is arranged, at least in part, in parallel to the first, second and third conveyors.

Preferably, the third conveyor comprises a pair of conveyors disposed on opposing sides of the first conveyor and in parallel thereto.

Preferably, the first transfer device transfers carton blanks from the second conveyor to either of said third conveyors.

Preferably, the second transfer apparatus loads articles into carton blanks disposed on either of said third conveyors.

Preferably, the third transfer device transfers cartons from either of said third conveyors and loads them into a secondary carton upon the fifth conveyor.

Preferably, the articles comprise a flange and preferably are coupled to at least one other flanged article to form an article group.

Preferably, the articles are loadable directly into said second carton blanks wherein said second conveyor and first transfer mechanism are either absent or idle and said third transfer mechanism transfers articles from the third conveyor to the second cartons.

According to a second aspect of the present invention there is provided a packaging machine capable of packaging groups of articles or primary packages within a carton to form a secondary package and said cartons within a tertiary package, in particular packaging articles within cartons comprising a tubular structure such as a wraparound carton, the packaging machine comprising;

a first conveyor for conveying articles, which first conveyor is directly coupleable to an apparatus for filling said primary packages with a product;

a second conveyor for providing first carton blanks,

a third conveyor said third conveyor being disposed adjacent said first conveyor such that it at least partially overlaps with said first conveyor in a direction transverse to the direction of article flow; wherein the second conveyor is disposed at a vertical elevation above the either the first or third conveyors and/or is disposed in a transversely overlapping relationship with the first or third conveyors;

a first transfer mechanism for transferring said carton blanks onto the third conveyor either directly from said second conveyor or via a fourth conveyor wherein the carton blanks are partially assembled whilst being conveyed by the third conveyor;

a second transfer mechanism for engaging articles from the first conveyor and placing them into said carton blanks, wherein the carton blanks are assembled into a first carton about a group of one or more articles whilst being conveyed upon the third conveyor to form a secondary package;

a fifth conveyor for conveying second cartons, such as trays, which fifth conveyor is disposed adjacent to said third conveyor and in at least partially overlapping relationship with the third conveyor in said transverse direction;

a third transfer mechanism for loading said secondary packages into the second cartons to form tertiary packages.

According to a third aspect of the present invention there is provided a packaging assembly line comprising a packaging machine as hereinbefore described and a filling machine for filling primary packages, wherein the first conveyor is directly coupled to an output of said filling machine.

According to a fourth aspect of the present invention there is provided a method of packaging groups of articles or primary packages within a carton to form a secondary package and said cartons within a tertiary package or placing said articles directly into the tertiary package, in particular packaging articles within cartons comprising a tubular structure such as a wraparound carton, the packaging machine comprising;

conveying articles upon a first conveyor, which first conveyor is directly coupleable to an apparatus for filling said primary packages with a product;

conveying first carton blanks on a second conveyor,

transferring said first carton blanks with a first transfer mechanism onto a third conveyor either directly from said second conveyor or via a fourth conveyor

partially assembling the first carton blanks whilst conveying them upon the third conveyor;

wherein the third conveyor is disposed adjacent said first conveyor such that it at least partially overlaps with said first conveyor in a direction transverse to the direction of article flow and wherein the second conveyor is disposed at a vertical elevation above the either the first or third conveyors and/or is disposed in a transversely overlapping relationship with the first or third conveyors;

engaging articles on the first conveyor with second transfer mechanism; and either

placing the articles into the partially assembled first carton blanks and assembling the partially assembled first carton blanks into first cartons about a group of one or more articles whilst conveying them upon the third conveyor to form a secondary package and placing the first cartons with a third transfer mechanism into second cartons, such as trays, on a fifth conveyor to form tertiary packages;

or

placing the articles with a third transfer mechanism into second cartons, such as trays, on a fifth conveyor to form tertiary packages;

wherein the fifth conveyor is disposed adjacent to said third conveyor and in at least partially overlapping relationship with the third conveyor in said transverse direction.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the invention will now be described with reference to the accompanying drawings, in which:

FIGURE 1 is a perspective view from above of a packaging machine according to a first embodiment of the invention;

FIGURE 2 is a perspective view from above the packaging machine of FIGURE 1;

FIGURE 3 is a perspective view from above of the packaging machine of FIGURE 1;

FIGURE 4 is a plan view of the layout of the packaging machine of Figures 1 to 3;

FIGURE 5 is a plan view of the layout of a packaging machine according to a second embodiment;

FIGURE 6 is a plan view of the layout of a packaging machine according to a third embodiment;

FIGURE 7 is a plan view of a typical packaging line layout as know in the prior art; and

FIGURE 8 is a plan view of the packaging line layout according to the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS OF THE PRESENT INVENTION

Referring to FIGURES 1 to 6, in particular Figure 1, there is shown a perspective view of a packaging machine 10 capable of accepting an input of primary product containers, or primary packages containing product such as, but not limited to, bottles or cans, hereinafter referred to as articles A.

The packaging machine 10 is coupled directly to a product filler 11 by a first conveyor 16. The first conveyor 16 acts as a buffer or accumulator for storing or holding articles A produced by the product filler 11.

The articles A are conveyed to an article gate mechanism 26, which is preferably disposed overhead of the articles A upon the first conveyor 16.

The article gate mechanism 26 selectively releases groups of articles A for processing by a transfer robot 24. In Figure 1 a group of 4 x 6 articles A has been released. Figures 2 and 3 show a subsequent group of 4 x 6 articles A being released by the article gate mechanism 26. The subsequently released group of articles A is conveyed to an end stop 9 which prevents the articles A from travelling further downstream. The articles A are picked up from a position adjacent the end stop by the article transfer robot 24.

A hopper or magazine 12 is disposed above the first conveyor 16 upstream of the article gate mechanism 26; hopper 12 stores carton blanks B which are transferred onto a blank conveyor 19 by a feeder mechanism 14. Carton blanks B form first cartons about the articles A; so as to form a secondary package about the product in the primary packages. Feeder mechanism 14 may comprises a vacuum system (not shown) including suction cups which pick up carton blanks B from the hopper 12 and place the carton blanks B upon the blank conveyor 19. In an alternative embodiment it is envisaged that the carton blanks B may be transferred to the blank conveyer 19 by other suitable means.

The feeder mechanism 14 and the blank conveyor 19 are both disposed above the first conveyor 16. Preferably the blank conveyor 19 is orientated in parallel with the first conveyor 16.

A carton transfer robot 18 transfers the carton blanks B from the blank conveyor 19 and places them between a folding guide 20 at an input end of a second conveyor 30a. The second conveyor 30a is disposed adjacent to the first conveyor 16.

The second conveyor 30a is disposed in overlapping relationship, as best illustrated in Figure 4, with both the first conveyor 16 and blank conveyor 19 in a direction transverse to the flow of articles A, such that the carton transfer robot 18 may transfer the carton blanks B from the blank conveyor 19 to the second conveyor 30a in a transverse direction to the second conveyor 30a.

Optionally, the carton transfer robot 18 may also place carton blanks B between folding guides 20 at an input end of a third conveyer 30b which also is disposed in overlapping relationship, as best illustrated in Figure 4, with both the first conveyor 16 and blank conveyor 19 in a direction transverse to the flow of articles A, such that the carton transfer robot 18 may transfer the carton blanks B from the blank conveyor 19 to the third conveyor 30b in a transverse direction to the third conveyor 30b.

Provision of the third conveyor 30b in addition to the second conveyor 30a allows the packaging machine 10 to package articles A at increased rate.

The second conveyor 30a and the optional third conveyor 30b are each disposed in parallel alignment with the first conveyor 16 and more preferably they are disposed in parallel relationship to one another.

Operation of the packaging machine 10 will be described with reference to the second conveyor 30a it will be appreciated that when a third conveyor 30b is provided the operation is substantially the same; the transfer robots 18, 24, 32 alternate between performing their designated function upon the second and third conveyor 30a, 30b respectively. In yet a further alternative embodiment additional transfer robots may be provided such that each of the robots is dedicated to one of the second or third conveyor 30a, 30b.

It is envisaged that in alternative embodiments the carton transfer robot 18 may transfer the carton blanks B in a direction parallel to the flow of articles A in addition to the movement in the transverse direction.

The carton transfer robot 18 comprises a means for picking up the carton blanks B such as a vacuum system comprising suctions cups, however in alternative embodiments, alternative gripping means may be provided.

The tool head 22 of the carton transfer robot 18 may be adapted to, at least partially, fold the carton blanks B. This may be achieved by engaging the carton blank B with one or more suction cups on opposing sides of a fold line, and moving suction cups on a first side of the fold line rotationally with respect to suctions cups disposed on a second opposing side of the fold line. The suction cups on the first side being hingedly mounted on the tool head 22 for rotational movement with respect to the suction cups of the second side. The rotational movement could be effected by a suitably arranged drive means for example an electric motor or pneumatic or hydraulic piston system.

Adapting the tool head 22 to assist folding of the carton has the additional advantage of facilitating placement of the carton blank B in the folding guide 20 since it allows the tool head 22 to be at least partially received by the folding guide 20.

Once the carton blanks B have been placed in the folding guide 20, they take a U-shaped form. The second conveyor 30a conveys the carton blanks B towards an article transfer robot 24. As the carton blanks B are conveyed by the first conveyor 16 they pass fixed guides (not shown). The fixed guides fold a top panel of the carton blank B about a hinged connection to the side panel so as to be substantially perpendicular to the side panel. In doing so an inner side of the top panel faces uppermost. Folding the top panel in this way facilitates loading of the articles A into the carton.

The carton blanks B are subsequently conveyed to an article transfer robot 24.

In the preferred embodiment the second conveyor 30a pauses briefly while the article transfer robot 24 places articles A within the carton blank B. The article transfer robot 24 picks up a group of 4x6 articles and reorganises them into four groups of 2x3. This is achieved by adapting the tool head to be foldable about an axis perpendicular to the direction of article flow and perpendicular to the transverse movement of the articles A between the first conveyor 16 and the second conveyor 30a. Each of the four groups of 2x3 articles A is placed into a respective carton blank B, each of the respective carton blanks B being disposed adjacent one another in a linear series on the second conveyor 30a. The tool head is in folded state when picking up articles A from the first conveyor 16 and is in an unfolded state when placing the articles A into the carton blanks B upon the second conveyor 30a.

In alternative embodiments it is envisaged that the carton blanks B would be in continuous motion during placement of the articles A. In such embodiments a further reduction in the footprint or floor space occupied by the packaging machine 10 could be achieved. This would require more complex transfer robots or tool heads which were capable of moving in a direction parallel to article flow as well as transversely.

Once the carton blanks B are loaded with articles A glue is applied by a gluer 46 to either the top panel or a securing panel. Fixed guides 44 fold the top panel and the securing panel into overlapping relationship to complete construction of the carton C. As the assembled carton C passes under the fixed guide 44, the fixed guide 44 applies compression to the top panel for a period sufficient to secure the top panel in position. In a preferred embodiment the fixed guide applies compression for a least one second. It will be appreciated that the length of the fixed guide is proportional to the speed of the second conveyor 30a.

Each carton C is then transferred to a tray loading station where a carton transfer robot 32 transfers the assembled cartons to a tray T. Trays T form second cartons about the articles A;

so as to form a tertiary package about the product in the primary packages within the secondary packages. The carton transfer robot 32 transfers a group of cartons C from the second conveyor 30a and reorganises the groups into a suitable format for placement in the tray T, in the preferred embodiment the cartons C are group in a 2 x 2 arrangement. This is achieved by picking up four consecutive cartons C from the second conveyor 30a for placement into the tray T. The tool head of the carton transfer robot 32 is adapted to fold such that the cartons C are arranged in the 2x2 formation when placed in the tray T and to be in an unfolded state when picking up cartons C from the second conveyor 30a.

The loaded trays T are then transferred on a fourth conveyor 38 to a stacker 40 which stacks the trays T for placement upon a fifth conveyor 42 for further processing and subsequent shipping such as palletisation.

The trays T are supplied to the tray loading station on fourth conveyor 38. The trays T are assembled from a flat form by a tray former 34 which comprises a hopper 36 for holding trays T in flat blank form.

The tray former 34 is disposed alongside the first conveyor 16 and/or the second conveyor 30a.

The assembled trays T are transferred from the tray former 34 to the end of the first conveyor 16 on a fourth conveyor 38 in a transverse direction to the flow of articles A. The trays T arrive at an elevation below that of the articles A on first conveyor 16. The trays T are passed onto a sixth conveyor 47 which is parallel and co-linear with first conveyer 16. Alternatively, the trays T may remain upon the sixth conveyor 47, which conveyor is arranged in an L shape.

The fourth conveyor 38 comprises an inclined portion which raises the trays T to the same elevation as the cartons C on second conveyor 30a in preparation for loading with cartons C by the carton transfer robot 32.

Optionally, when the containers or primary packages being filled comprise flanges about an upper portion of the articles A, such as yoghurt pots, the packaging machine 10 does not require an apparatus to meter the flow of the articles A in individual lanes to facilitate packaging since the flanges of the articles A, effectively allows the article gate mechanism 26 to control flow of articles in multiple lanes simultaneously. This allows a simpler metering device to be provided which reduces the length of the layout of the packaging machine. The product filler 11 fills the primary containers with product, the primary containers are formed as a continuous stream of individual containers in lanes, each container is joined at the flange one to the next in series and to containers in adjacent lanes. The continuous stream of containers is then divided into groups of articles by cutting or breaking the flange between two articles. Optionally, the flange portions may be formed so as to be frangibly connected to one another. Thus when packaging flanged articles A, an even greater reduction in the foot print of the packaging machine 10 can be achieved.

The packaging machine 10 acts directly upon the stream of articles A as they are output from the container filling machine.

Figure 4 illustrates a plan view of the layout of the packaging machine 10 wherein the carton blanks B are loaded from above, top loaded, and/or top glued according to the Figures 1 to 3. The overlapping arrangement of the second and third conveyors 30a, 30b with the first conveyor 16 can be clearly seen as can the overlapping arrangement of the second and third conveyor 30a, 30b with the sixth conveyor 47. The carton blanks B are transferred to the second and third conveyor 30a, 30b in the region designated with reference sign V. The articles A are transferred to the second and third conveyor 30a, 30b in the region designated with reference sign X. The assembled cartons are transferred from the second and third conveyor 30a, 30b to the tertiary packages T in the region designated by reference sign Z.

Whilst the foregoing embodiment has been described top loading carton blanks B it is envisaged that by provision of a further conveyor parallel to either or both of second and third

conveyors 30a, 30b the packaging machine could be adapted to bottom load the carton blanks B.

Figure 5 illustrates the plan view of the layout of a second embodiment comprising an additional pair of conveyors 130c/130d to facilitate production of a carton C wherein a bottom panel is glued and/or the carton C is loaded from below, bottom loaded. It is envisaged that in those embodiments where third conveyor 30b is not provided then only one additional conveyor 130d need be provided. The carton blanks B are transferred by a transfer robot to the additional conveyor/s 130c/130d. The articles A are then transferred to the second conveyor 130a and optionally to the third conveyor 130b by an article transfer robot. The carton blanks B are partially assembled whilst being conveyed upon the additional conveyor/s 130c/130d and are subsequently transferred to the second conveyor 130a, or third conveyor 130b, by an additional transfer robot and placed about the groups of articles A. Assembly of the cartons is completed upon the second and/or third conveyors 130a, 130b the assembled cartons are then transferred to the tertiary packages.

The overlapping arrangement of the second and third conveyors 130a, 130b and the additional pair of conveyors 130c, 130d with the first conveyor 116 can be clearly seen in Figure 5 as can the overlapping arrangement of the second and third conveyors 130a, 130b and the additional pair of conveyors 130c, 130d with the sixth conveyor 147. The carton blanks B are transferred to a respective one of the additional pair of conveyors 130c, 130d in the region designated with reference sign V'. The carton blanks B are partially assembled into cartons whilst being conveyed upon the additional pair of conveyors conveyor 130c, 130d in the region designated by reference sign W'. The articles A are transferred to the second and third conveyors 130a, 130b in the region designated with reference sign X'. The partially assembled cartons are transferred from the additional pair of conveyors 130c, 130d to the articles A upon the respective one of the second or third conveyors 130a, 130b in the region designated by reference sign Y'. Assembly of the cartons is then completed whilst being conveyed upon

second and third conveyors 130a, 130b and the completed cartons are transferred to the tertiary packages T in the region designated by reference sign Z'.

Figure 6 illustrates the plan view of the layout of a third embodiment wherein a bottom panel is glued and/or the carton is loaded from below, bottom loaded. In this embodiment the articles A are transferred to the second or third conveyors 330a, 330b upstream of the carton hopper 314. The carton blanks B are provided upon a conveyor (not shown) which may be disposed at an elevation above the first conveyor 316 or alternatively at the same elevation as first conveyor 316. The carton blanks B are transferred to the second or third conveyor 330a, 330b by a carton transfer device such as that shown in Figures 1 to 3. The carton blanks B are placed about the groups of articles A being conveyed upon the second and third conveyors 330a, 330b. Assembly of the cartons is completed upon the second and third conveyors 330a, 330b. The assembled cartons are then transferred to tertiary packages by a further transfer device.

The overlapping arrangement of the second and third conveyors 330a, 330b with the first conveyor 316 can be clearly seen, the overlapping region of the second and third conveyors 330a, 330b with the first conveyor 316 is shorter than that of the previous embodiments. The overlapping arrangement of the second and third conveyors 330a, 330b with the fifth conveyor 347 can be clearly seen in Figure 6. The articles A are transferred to the second or third conveyors 330a, 330b in the region designated with reference sign V''. The carton blanks B are transferred to the second or third conveyors 330a, 330b in the region designated with reference sign X''; optionally, the carton blanks B may be partially assembled in the region designated by reference sign X'' prior to transfer to the second or third conveyors 330a, 330b. Assembly of the cartons is then completed whilst being conveyed upon second and third conveyors 330a, 330b and the completed cartons are transferred to the tertiary packages T in the region designated by reference sign Z''.

Figure 7 illustrates a plan view of a typical packaging line as known in the art. A product filler 211 outputs articles A or primary packages containing a product on a conveyor 216 where the

articles A accumulate, prior to being configured by a converging apparatus 203 for being conveyed on a conveyor to a packaging machine 202 which packages the articles A in a secondary package and the secondary package is conveyed to a tertiary packaging system 232 which is supplied with tertiary packages by a tertiary packaging former 234. The tertiary packages are loaded with the secondary packages by tertiary packing system 232. Completed tertiary packages comprising the secondary packages are then supplied to a palletiser 260.

Figure 8 illustrates a packaging machine according to the present invention; in which the product filler 11 outputs articles A on the first conveyor 16 which first conveyor 16 acts as an accumulator or buffer, the secondary packaging machine 2 is configured in overlapping relationship with first conveyor 16 and the tray former 34 supplies articles A to the tertiary packaging apparatus 32, which is itself in overlapping relationship with the secondary packaging machine 2. Completed tertiary packages are then conveyed to a palletiser 60.

One advantage of the packaging machine 10 of the present invention is that it can be coupled directly to the output of a container filling machine 11.

It can be clearly appreciated from comparison of Figures 7 and 8 that the present invention reduces the floor space required to perform the desired packaging operations and that the overall line layout is much shorter or compact than the prior art.

In yet further alternative embodiments the packaging machine 10 may be adapted to package articles A in two or more stacked layers. It is envisaged that additional transfer devices 18, 24 may be provided to transfer a second or subsequent group of articles A and stack them upon a first or previous group of articles A upon the second or third conveyors 30a, 30b. Optionally, it is envisaged that a carton insert may be placed between the layers of stacked articles A, in which case additional hoppers and feeders may be provided along with a transfer robot.

Optionally, the packaging machine 10 may place articles A into the tertiary package T without placing them into the secondary package, in such embodiments the articles A are transferred to the second or third conveyors 30a, 30b by transfer robot 24; carton transfer robot 18, hopper 12 and feeder 14 are idle or may omitted. The articles A are placed directly upon the second or third conveyors 30a, 30b prior to be transferred from the second or third conveyor 30a, 30b to the tertiary package T by transfer robot 32.

It can be appreciated that various changes may be made within the scope of the present invention, for example, the packaging machine may be adjusted to accommodate articles of differing size or shape which are packaged in which having a different format.

It will be recognised that as used herein, directional references such as “top”, “bottom”, “front”, “back”, “end”, “side”, “inner”, “outer”, “upper” and “lower” do not limit the respective panels to such orientation, but merely serve to distinguish these panels from one another. Any reference to hinged connection should not be construed as necessarily referring to a single fold line only; indeed it is envisaged that hinged connection can be formed from one or more of the following, a short slit, a frangible line or a fold line without departing from the scope of the invention.

CLAIMS

1. A packaging machine capable of packaging groups of articles or primary packages within a carton to form a secondary package and said cartons within a tertiary package, in particular packaging articles within cartons comprising a tubular structure such as a wraparound carton, the packaging machine comprising;

a first conveyor for conveying articles, which first conveyor is directly coupleable to an apparatus for filling said primary packages with a product;

a second conveyor for providing first carton blanks, the second conveyor being disposed above first conveyor;

a third conveyor said third conveyor being disposed adjacent said first conveyor such that it at least partially overlaps with said first conveyor in a direction transverse to the direction of article flow;

a first transfer mechanism for transferring said carton blanks onto the third conveyor either directly from said second conveyor or via a fourth conveyor wherein the carton blanks are partially assembled whilst being conveyed by the third conveyor;

a second transfer mechanism for engaging articles from the first conveyor and placing them into said carton blanks, wherein the carton blanks are assembled into a first carton about a group of one or more articles whilst being conveyed upon the third conveyor to form a secondary package;

a fifth conveyor for conveying second cartons, such as trays, which fifth conveyor is disposed adjacent to said third conveyor and in at least partially overlapping relationship with the third conveyor in said transverse direction;

a third transfer mechanism for loading said secondary packages into the second cartons to form tertiary packages.

2. A packaging machine according to claim 1 said third conveyor comprising a folding device for partially assembling the cartons before being loading with articles.

3. A packaging machine according to either of claims 1 or 2 wherein the cartons and/or the articles are in continuous motion.

4. A packaging machine according to either of claims 1 or 2 wherein the carton and/or the articles are intermittently conveyed.

5. A packaging machine according to any one of claims 1 to 4 wherein the first, second and third conveyors are arranged in parallel to one another.

6. A packaging machine according to any one of claims 1 to 5 wherein the fourth conveyor is arranged in parallel to the first, second and third conveyors.

7. A packaging machine according to any one of claims 1 to 5 wherein the fifth conveyor is arranged, at least in part, in parallel to the first, second and third conveyors.

8. A packaging machine according to any one of claims 1 to 7 wherein the third conveyor comprises a pair of conveyors disposed on opposing sides of the first conveyor and in parallel thereto.

9. A packaging machine according to claim 8 wherein said first transfer device transfers carton blanks from the second conveyor to either of said third conveyors.

10. A packaging apparatus according to claims 9 or 10 wherein said second transfer apparatus loads articles into carton blanks disposed on either of said third conveyors.

11. A packaging apparatus according to any one of claims 8 to 10 wherein said third transfer device transfers cartons from either of said third conveyors and loads them into a secondary carton upon the fifth conveyor.

12. A packaging machine according to any one of claims 1 to 11 wherein said articles comprise a flange and preferably are coupled to at least one other flanged article to form an article group.

13. A packaging machine according to any one of claims 1 to 12 wherein said articles are loadable directly into said second carton blanks wherein said second conveyor and first transfer mechanism are either absent or idle and said third transfer mechanism transfers articles from the third conveyor to the second cartons.

14. A packaging machine capable of packaging groups of articles or primary packages within a carton to form a secondary package and said cartons within a tertiary package, in particular packaging articles within cartons comprising a tubular structure such as a wraparound carton, the packaging machine comprising;

a first conveyor for conveying articles, which first conveyor is directly coupleable to an apparatus for filling said primary packages with a product;

a second conveyor for providing first carton blanks,

a third conveyor said third conveyor being disposed adjacent said first conveyor such that it at least partially overlaps with said first conveyor in a direction transverse to the direction of article flow; wherein the second conveyor is disposed at a vertical elevation above the either the first or third conveyors and/or is disposed in a transversely overlapping relationship with the first or third conveyors;

a first transfer mechanism for transferring said carton blanks onto the third conveyor either directly from said second conveyor or via a fourth conveyor wherein the carton blanks are partially assembled whilst being conveyed by the third conveyor;

a second transfer mechanism for engaging articles from the first conveyor and placing them into said carton blanks, wherein the carton blanks are assembled into a first carton about a group of one or more articles whilst being conveyed upon the third conveyor to form a secondary package;

a fifth conveyor for conveying second cartons, such as trays, which fifth conveyor is disposed adjacent to said third conveyor and in at least partially overlapping relationship with the third conveyor in said transverse direction;

a third transfer mechanism for loading said secondary packages into the second cartons to form tertiary packages.

15. A packaging assembly line comprising a packaging machine according to any one of claims 1 to 14 and a filling machine for filling primary packages, wherein the first conveyor is directly coupled to an output of said filling machine.

16. A method of packaging groups of articles or primary packages within a carton to form a secondary package and said cartons within a tertiary package or placing said articles directly into the tertiary package, in particular packaging articles within cartons comprising a tubular structure such as a wraparound carton, the packaging machine comprising;

conveying articles upon a first conveyor, which first conveyor is directly coupleable to an apparatus for filling said primary packages with a product;

conveying first carton blanks on a second conveyor,

transferring said first carton blanks with a first transfer mechanism onto a third conveyor either directly from said second conveyor or via a fourth conveyor

partially assembling the first carton blanks whilst conveying them upon the third conveyor;

wherein the third conveyor is disposed adjacent said first conveyor such that it at least partially overlaps with said first conveyor in a direction transverse to the direction of article flow and wherein the second conveyor is disposed at a vertical elevation above the either the first or third conveyors and/or is disposed in a transversely overlapping relationship with the first or third conveyors;

engaging articles on the first conveyor with second transfer mechanism; and either

placing the articles into the partially assembled first carton blanks and assembling the partially assembled first carton blanks into first cartons about a group of one or more articles whilst conveying them upon the third conveyor to form a secondary package and placing the first cartons with a third transfer mechanism into second cartons, such as trays, on a fifth conveyor to form tertiary packages;

or

placing the articles with a third transfer mechanism into second cartons, such as trays, on a fifth conveyor to form tertiary packages;

wherein the fifth conveyor is disposed adjacent to said third conveyor and in at least partially overlapping relationship with the third conveyor in said transverse direction.

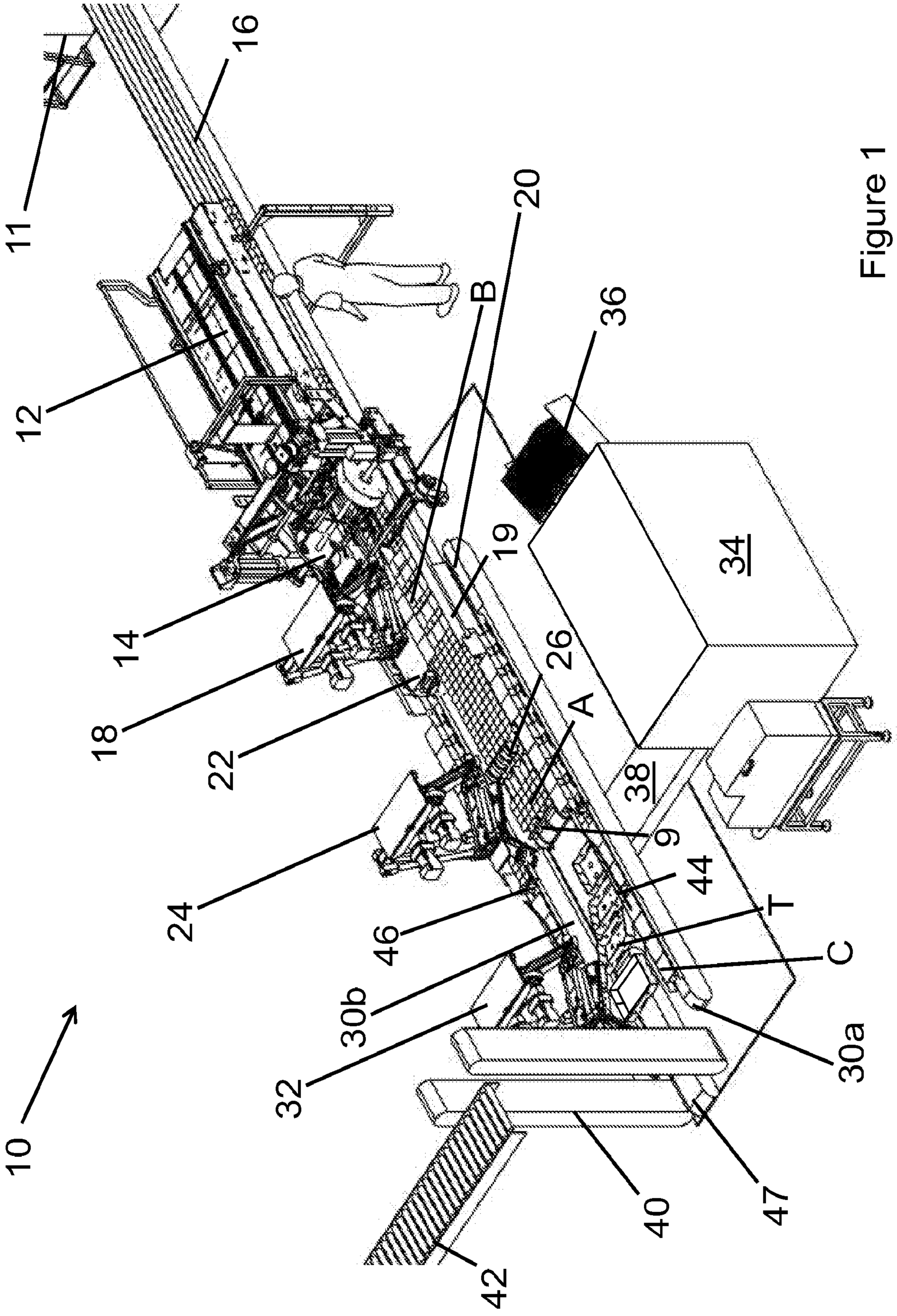
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Figure 1

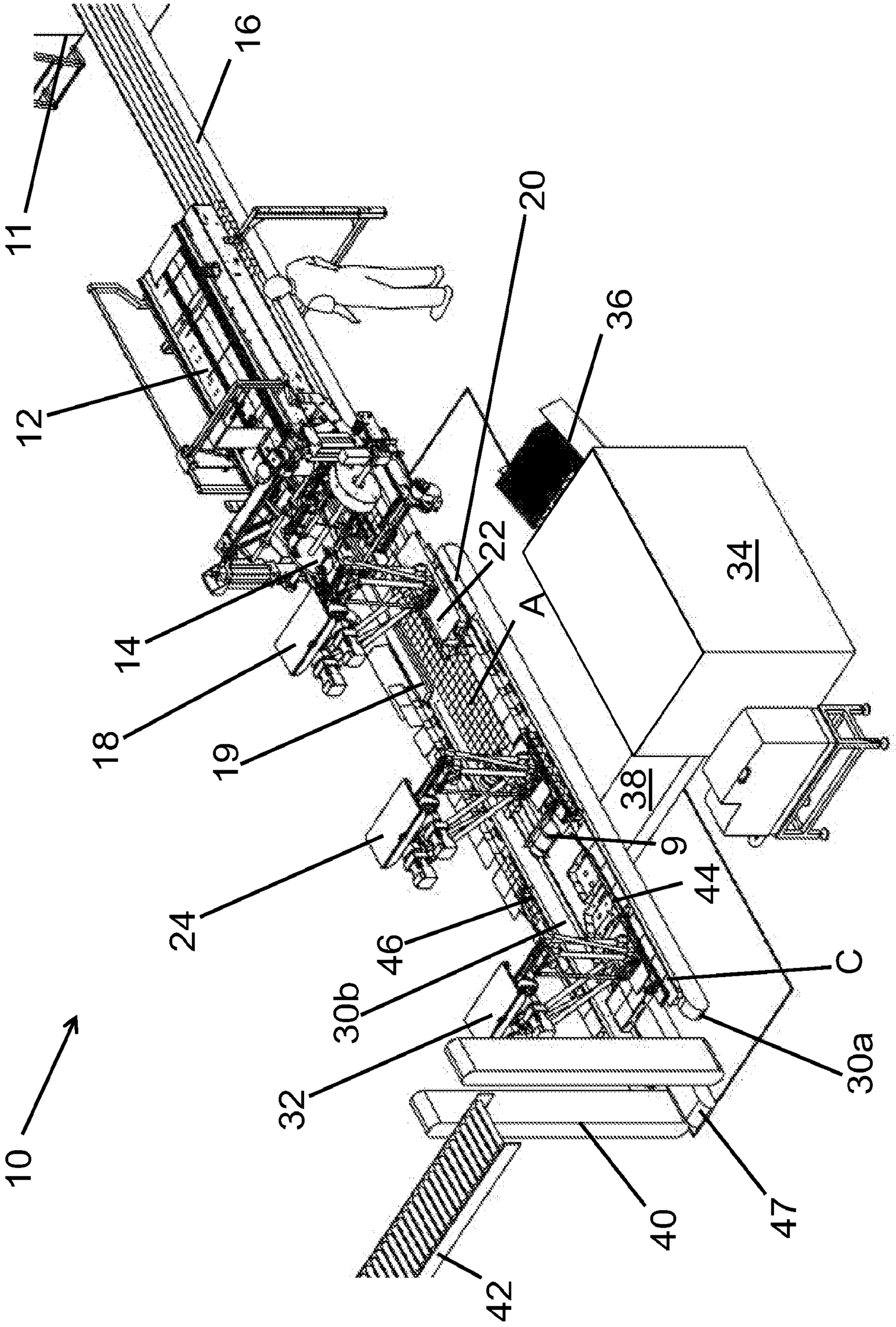

Figure 2

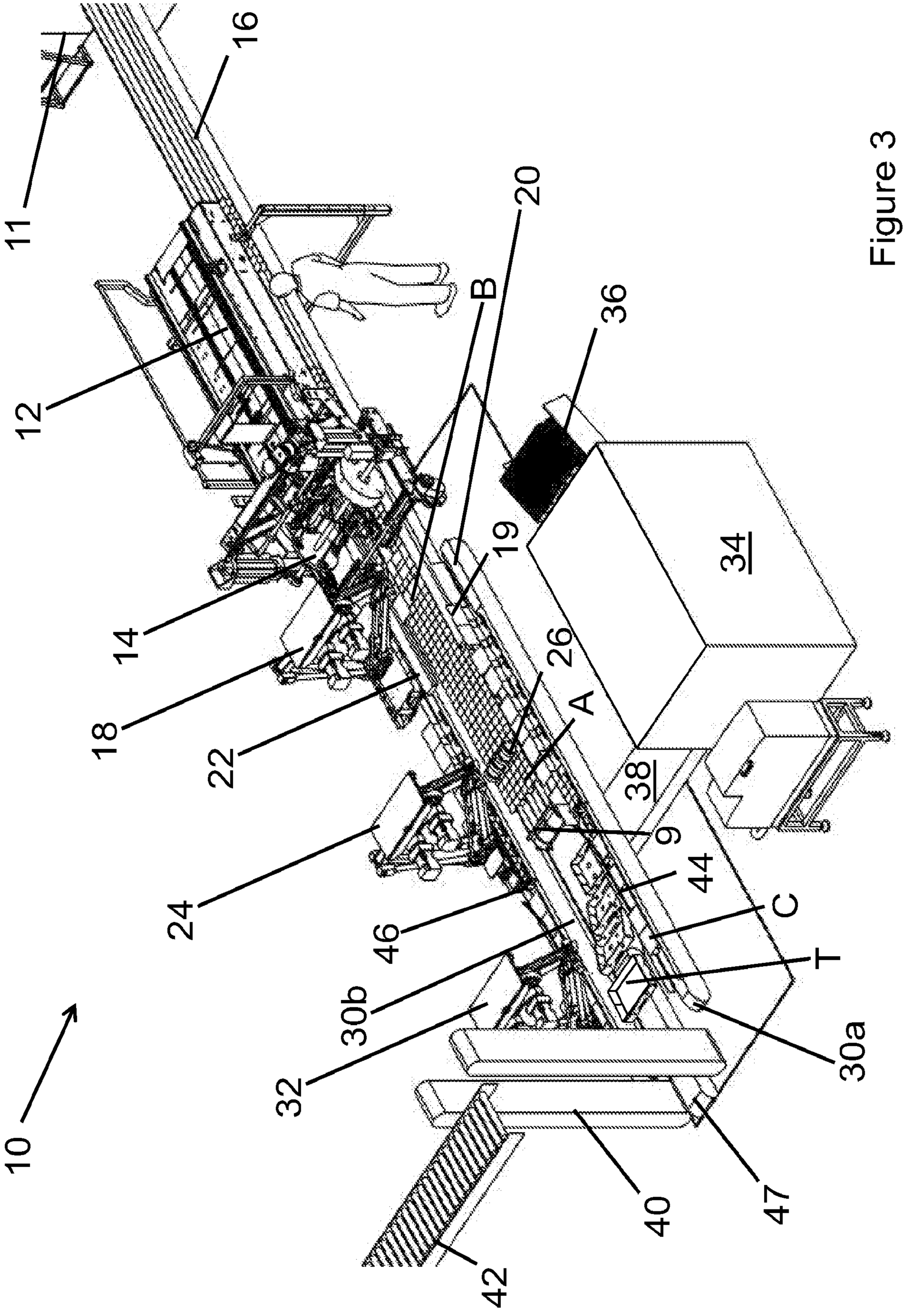
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Figure 3

Figure 4

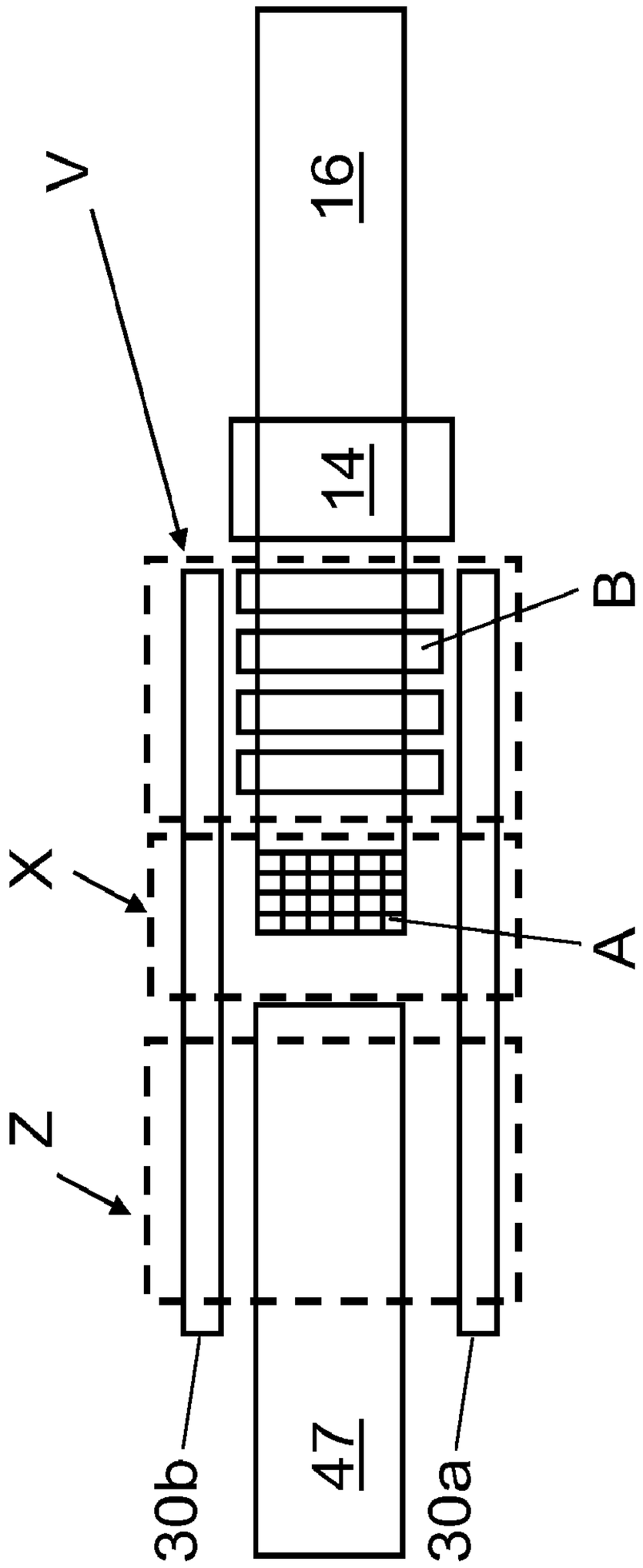
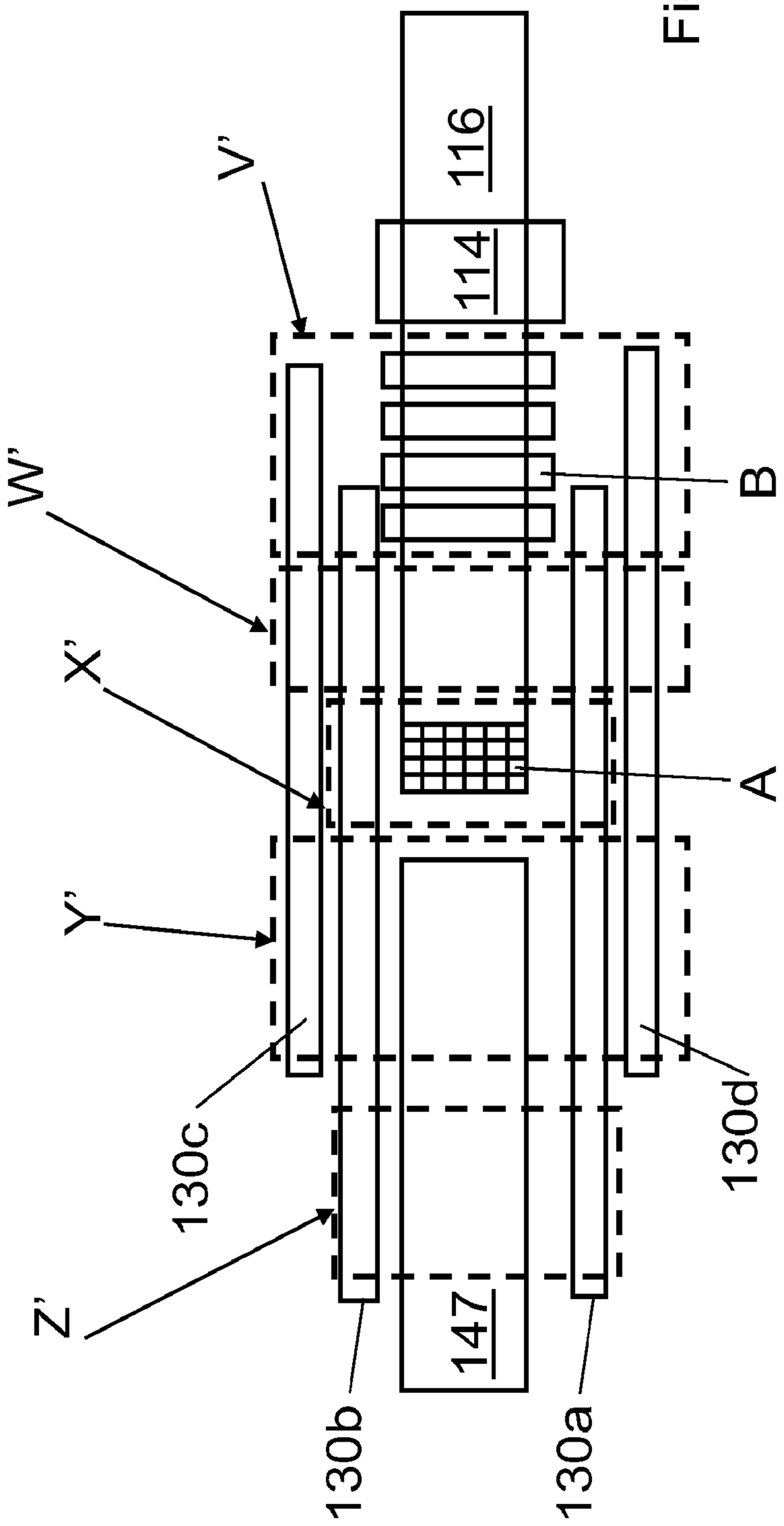


Figure 5



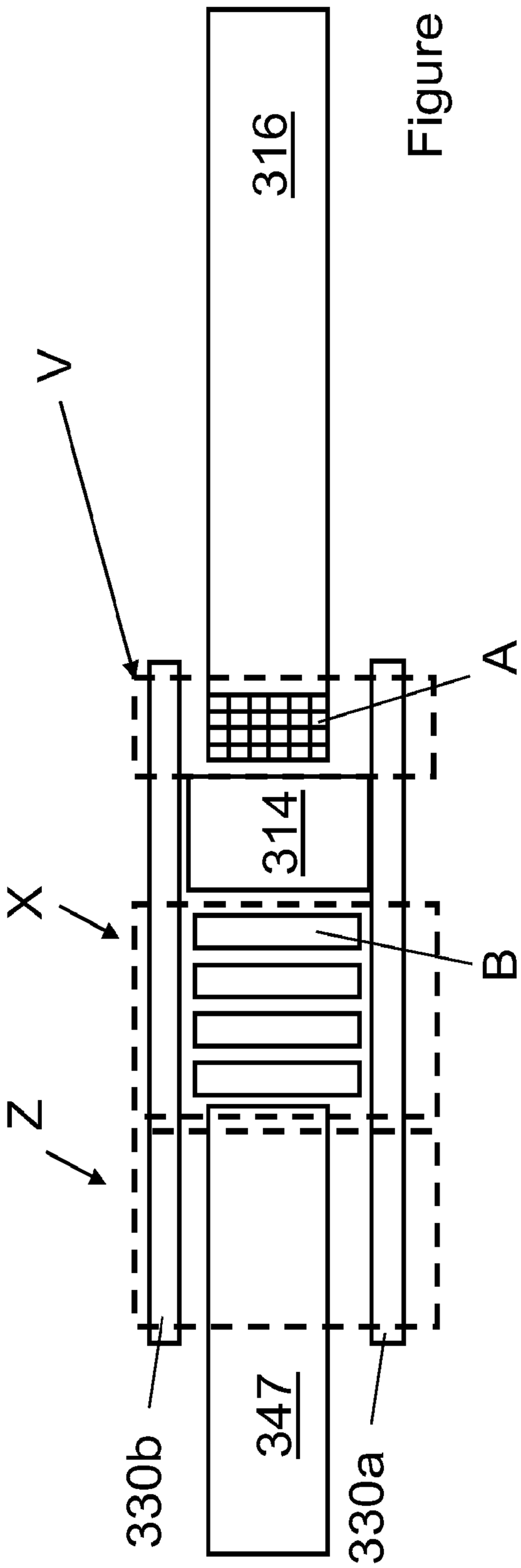


Figure 6

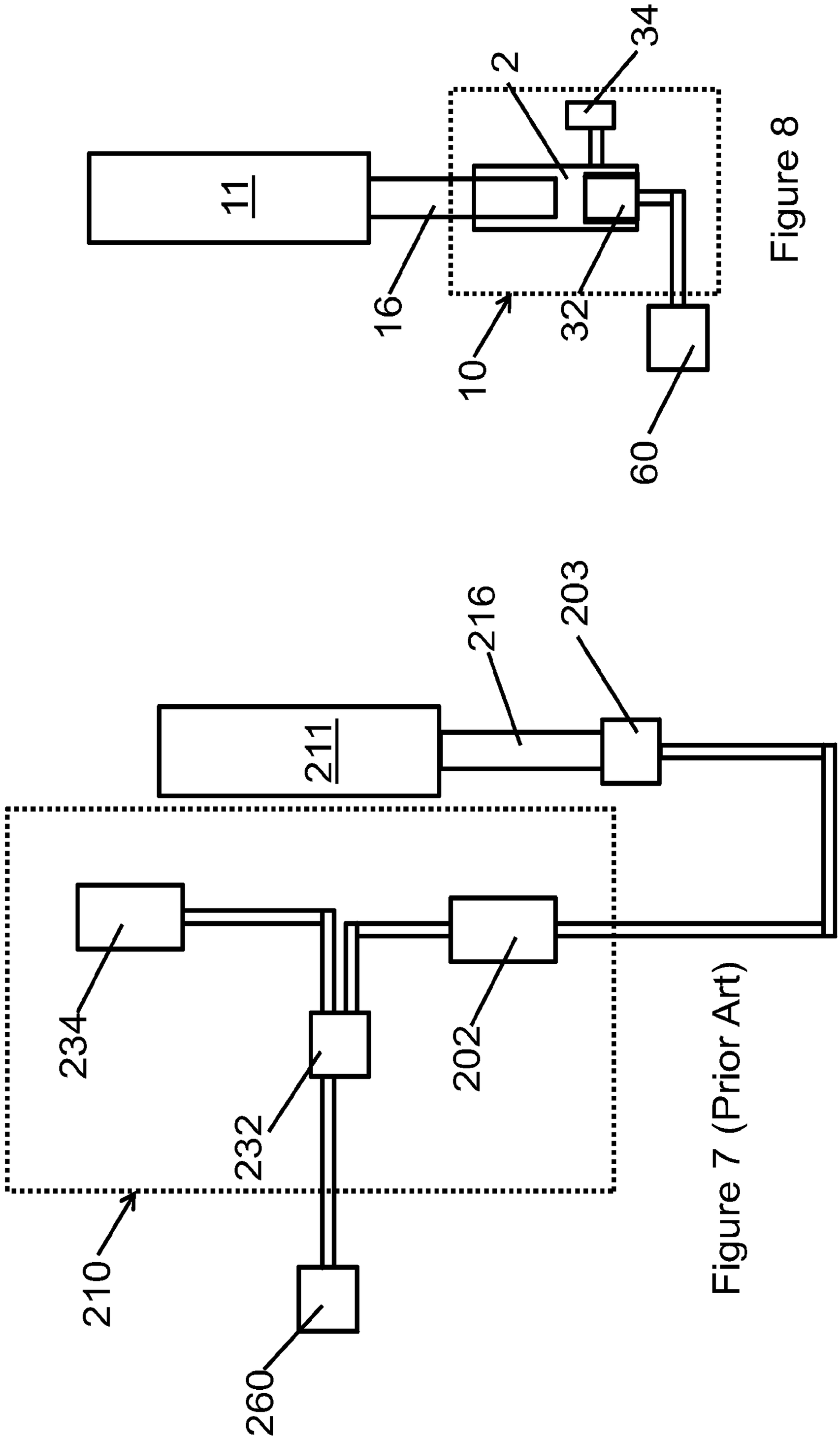
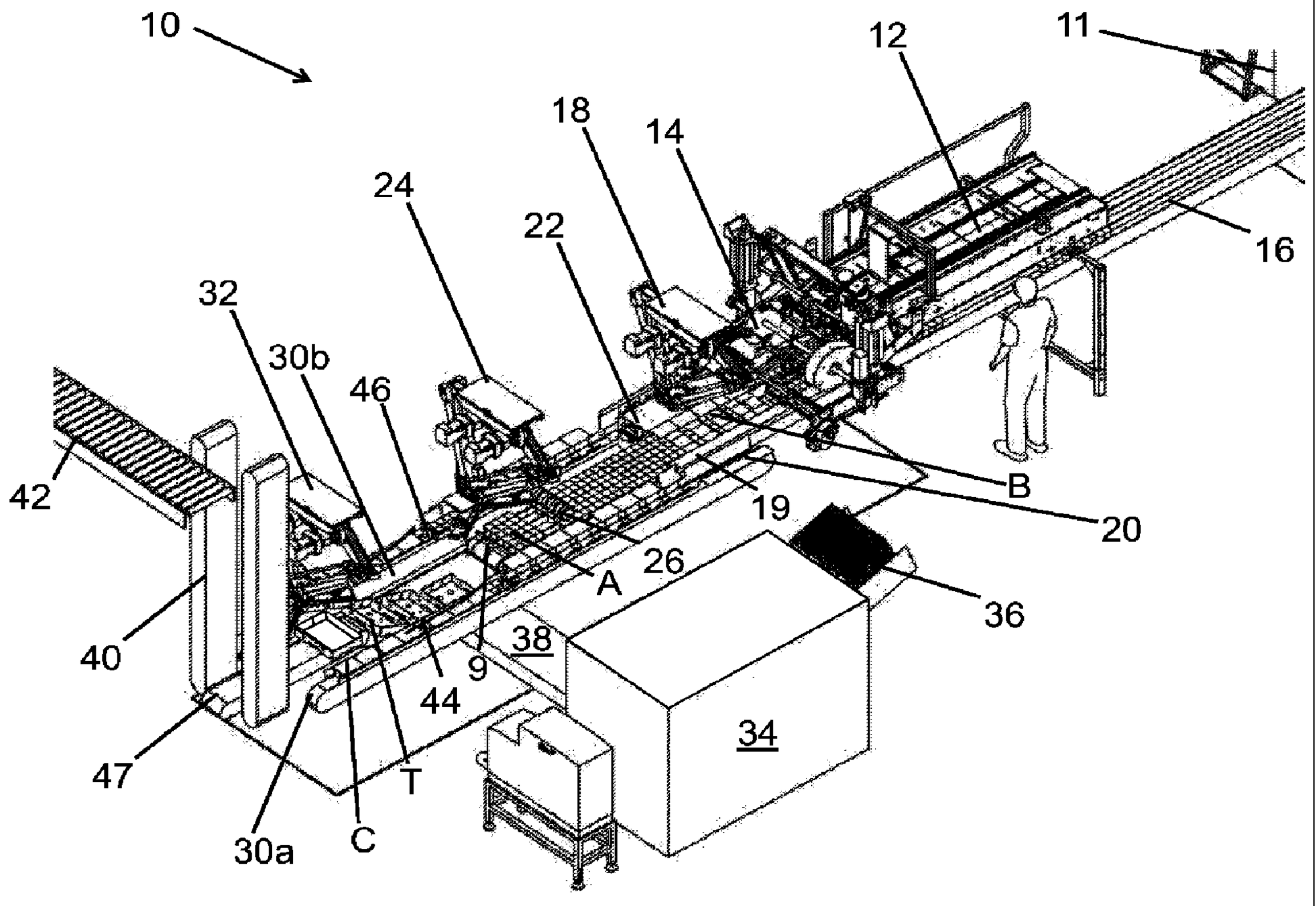


Figure 7 (Prior Art)

Figure 8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