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(54) **A PACKAGING MACHINE**

VERPACKUNGSMASCHINE

MACHINE D'EMBALLAGE

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Description

[0001] This invention relates to a packaging machine for packaging primary articles such as cans and bottles into multiple packaged cartons and in particular to a packaging machine which can package primary articles into cartons selected from two or more sizes or types of carton

[0002] The majority of known packaging machines are dedicated machines which construct only one size of one type of carton. Therefore, modern bottling plants are required to use a plurality of packaging machines to package different carton types, each machine taking up considerable floor space and being expensive to both purchase and operate.

[0003] A limited number of packaging machines are capable of packaging different sizes or types of carton, for example six, eight or twelve packs of a wrap around carton. All such machines require adjustment when switching from one size or type of carton to another. This adjustment includes the manual removal of all of the cartons within the packaging machine and possibly the mechanical adjustment of components in the machine. During this change over period, which can be thirty minutes or more, a machine cannot be used (known as "down time"), which is an expensive delay in a bottling plant. Such a delay may even result in down time for the entire bottling line, not just the packaging machine, if problems arise during the change over procedure.

[0004] It is an object of the present invention to provide a packaging machine which overcomes the technical and commercial disadvantages of known packaging machines.

[0005] It is a further object of the present invention to provide a packaging machine which is capable of switching from one carton type or size to another with a minimal down time.

[0006] According to a first aspect of the present invention there is provided a packaging machine for packaging articles into cartons selected from, at least, a first carton or a second carton, said first and second cartons being of a different type or size, said cartons being stored in at least one hopper, and picked for packing by a carton engaging means arranged to remove cartons from said at least one hopper and transport them sequentially to a first predetermined position, from where the cartons are transferred to a paper feed chain which transports the cartons to a second predetermined position, from where the cartons are combined with said articles,

the paper feed chain comprising a support means carrying a first endless chain from which is depended a first set of guide lugs and a second endless chain from which is depended a second set of guide lugs, said guide lugs being interleaved to produce carton receiving zones, the length of which can be altered, for different carton sizes or types, by altering the relative positions of the first and second set of guide lugs, and the support means being movable such that when the relative positions of the lugs is changed, this change can be compensated for such that the position of the first set of lugs with respect to said first predetermined position is unaltered.

[0007] Preferably, the relative position of the first and second sets of guide lugs is arranged by control of the motor which power one of the first and second endless chains.

[0008] Preferably, the position of said support means is arranged by the control of a pneumatic cylinder which positions said structure.

[0009] Preferably, the packing means comprises a control means which controls the operation of each of the components of the machine during operation and change over between cartons of different type or size.

[0010] Preferably, the packing means comprises a first hopper for storing said first cartons, and a second hopper for storing said second cartons, and transfer means to transfer the cartons from either hopper to said first predetermined position, said carton engaging means being operable in a first position for engaging cartons from the first hopper and a second position for engaging cartons from the second hopper.

[0011] Preferably, the packing means comprises means to place one of said hoppers in an operative position and control means to select the position of carton engagement means corresponding to the operative hopper selected.

[0012] Preferably, said carton pick up and transfer means is rotatable about a fixed axis in an orbital path.

[0013] Preferably, the first and second pick up positions are located at different points on said orbital path.

[0014] Preferably, the packing means comprises means to place one of said hoppers in an operative position in the form of a frame mounted to a second fixed axis and wherein said first and second hoppers are mounted to the frame each hopper being oppositely disposed about the second fixed axis.

[0015] Preferably, said operative hopper is adjacent the orbital path of said carton pick up and transfer means.

[0016] Preferably, the packing means comprises an apparatus for sequentially manipulating out of said at least one hopper collapsed cartons having oppositely disposed face contacting panels and for initiating set up thereof into an open ended condition, said apparatus being operable with said carton engaging means which sequentially engaging one of said face contacting panels and for withdrawing from the hopper a collapsed carton which includes said one of said face contacting panels and transferring orbitally about a rotatable axis from said hopper to said first predetermined position, wherein said apparatus includes panel engagement means disposed outside the path of orbit for engaging the other of said face contacting panels so as to pull said other face contacting panel in a direction away from the carton pick up and transfer means thereby to initiate opening of the

carton.

[0017] Preferably, the panel engaging means is moved in a first plane by a linear servo motor.

[0018] Preferably, said panel engaging means is mounted to a slide member in a substantially perpendicular relationship with a guide rail and wherein said slide member is moveable relative said guide rail whereby said panel engaging means is moveable in two planes.

[0019] Preferably, said panel engaging means is moved in a second plane by a further linear servo motor.

[0020] Preferably, control means are arranged to control the movement of the panel engaging means.

[0021] Preferably, said panel engaging means comprises a suction cup and cup holder mounted onto said slide member, said suction cup being connected to a vacuum supply during said carton opening.

[0022] Preferably, said face contacting panels comprise opposition side walls of the carton.

[0023] Preferably, the packing means has an article feed means arranged to progress articles at a predetermined rate along a feed path for combination with cartons at a measured rate.

[0024] Preferably, the article feed means includes a pair of star wheels which collect articles from a first feed belt and move them to a second feed belt at said predetermined rate.

[0025] Preferably, gripper blocks are arranged on opposite sides of said second feed belt to collect a predetermined number of articles and arrange them as an individual unit for packaging into a carton.

[0026] According to a second aspect of the present invention there is provided a method of packaging articles into cartons comprising the steps of:

a) selecting from, at least, a first carton or a second carton, said first and second cartons being of a different type or size, said cartons being stored in at least one hopper;

b) picking cartons for packing using a carton engaging means arranged to remove cartons from said at least one hopper and transport them sequentially to a first predetermined position;

c) transferring said cartons to a paper feed chain which transports the cartons to a second predetermined position from where the cartons are combined with said articles, the paper feed chain comprises a support means carrying a first endless chain from which is depended a first set of guide lugs and a second endless chain from which is depended a second set of guide lugs, said guide lugs being interposed to produce carton receiving zones, the length of which can be altered, for different carton sizes or types;

d) altering said length by altering the relative positions of the first and second set of guide lugs; and

e) moving the support means when the relative positions of the lugs is changed, so as to compensate for said change, such that the position of the first set of lugs with respect to said first predetermined position is unaltered.

[0027] Preferably, the relative position of the first and second sets of guide lugs is arranged by control of one of the motors which power the first and second endless chains.

[0028] Preferably, the position of said support means is arranged by the control of a pneumatic piston which positions said structure.

[0029] Preferably, the method comprises the use of a control means which controls the operation of each of the components of the machine during operation and change over between cartons of different type or size.

[0030] Preferably, the carton engaging means is positioned for engagement with cartons from a first hopper in a first position and is positioned for engagement with cartons from a second hopper, in a second position, the carton engagement means being movable between said first and second positions.

[0031] Preferably, the method comprises placing one of said hoppers in an operative position and selecting the position of the carton engagement means corresponding to the operative hopper selected.

[0032] Preferably, the method includes rotating said carton pick up and transfer means about a fixed axis in an orbital path.

[0033] Preferably, the first and second pick up positions are located at different points on said orbital path.

[0034] Preferably, the method comprises mounting said first and second hoppers on a frame such that each hopper is oppositely disposed about a second fixed axis.

[0035] Preferably, the method includes the location of said operative hopper adjacent the orbital path of said carton pick up and transfer means, when in use.

[0036] Preferably, the method comprises sequentially manipulating out of said at least one hopper collapsed cartons having oppositely disposed face contacting panels and initiating set up thereof into an open ended condition, by sequentially engaging one of said face contacting panels and withdrawing from the hopper a collapsed carton which includes said one of said face contacting panels and transferring orbitally about a rotatable axis from said hopper to said first predetermined position, wherein panel engagement means is disposed outside the path of orbit for engaging the other of said face contacting panels so as to pull said other face contacting panel in a direction away from the carton pick up means thereby initiating opening of the carton.

[0037] Preferably, the method includes moving the engaging means in the first plane by a linear servo motor.

[0038] Preferably, said method includes mounting said panel engaging means to a slide member in a substantially perpendicular relationship with said guide rail and moving said slide member relative said guide rail whereby said panel, engaging means is moveable in

two planes.

[0039] Preferably, said panel engaging means is moved in a second plane by a linear servo motor.

[0040] Preferably, the method includes the use of control means arranged to control the movement of the panel engaging means.

[0041] Preferably, the method includes the use of said panel engaging means which comprises a suction cup and cup holder mounted onto said slide member, and the connection of said suction cup to a vacuum supply during said carton opening.

[0042] Preferably, said face contacting panels comprise opposite side walls of the carton.

[0043] Preferably, the method comprises the use of article feed means to progress articles at a predetermined rate along a feed path for combination with cartons at a measured rate.

[0044] Preferably, the method comprises the use of a pair of star wheels to collect articles from a first feed belt and move them to a second feed belt at a predetermined rate.

[0045] Preferably, the method comprises the use of gripper blocks on opposite sides of said second feed belt to collect a predetermined number of articles and arrange them as an individual unit for packaging into a carton.

[0046] According to a third aspect of the present invention there is provided a control means for a packaging machine as hereinbefore described, the control means comprising a central processor , a manual input means, and separate means controlled by said central processor for individually positioning the first and second sets of guide lugs and the support means carrying said guide lugs on the paper feed chain.

[0047] Preferably, the means for positioning the support means is a pneumatic cylinder.

[0048] Preferably, the control means is arranged for use with a packaging machine having two hoppers accessed by a single carton engaging means, wherein the control means comprises a means of positioning the carton engaging means in a first position for engaging cartons in said first hopper and a second position for engaging cartons in said second hopper.

[0049] Preferably, the means for positioning the carton engaging means is operable to position the engaging means in a third position, from which the carton engaging means cannot engage cartons in either hopper.

[0050] Preferably, said means is a pneumatic cylinder.

[0051] Preferably, the control means is arranged for use with a packaging machine having an opening means for opening cartons picked from each hopper, wherein the locus of motion of pick means on said opening means can be altered so that the opening means can open cartons picked from either hopper.

[0052] Preferably, control means comprise X and Y oriented servo motors.

[0053] Preferably, the control means is arranged for use with a packaging machine having an article feed means in the form of a star wheel, the control means controlling the speed of rotation of the star wheel.

[0054] Preferably, control means controls a motor which rotates the star wheel.

[0055] According to a fourth aspect of the present invention there is provided a control system for controlling the operation of a packaging machine, in order to change from first cartons in a first hopper to second cartons in a second hopper, comprising the steps of:

a) stopping the carton engaging means from picking any cartons;
b) continuing the paper feed chain until it is empty of cartons;
c) stopping the paper feed chain;
d) stopping the supply of articles;
e) repositioning the carton engaging means and the hoppers to enable picking from the alternative hopper;
f) altering the relative position of the first and second sets of guide lugs in said paper feed chain;
g) altering the position of the support means with respect to said first predetermined position; and
h) re-starting the carton picking and transportation process and the supply of articles.

[0056] Preferably, the instruction to changeover is read from a pre-entered control program.

[0057] Alternatively, the instruction to changeover is manually entered into a control means.

[0058] Preferably, the packaging machine has a means for opening cartons, which is also stopped during the changeover process.

[0059] Preferably, the locus of movement of a pick means in said carton opening means is altered prior to restarting to enable the means to open cartons from said alternative hopper.

[0060] Preferably, the pick-up point and locus of the pick means in the carton engaging means is altered during the changeover to enable picking of cartons from the alternative hopper.

[0061] Preferably, the speed of supply of articles is alterable as required depending on the size or type of cartons in each of said hoppers.

[0062] Preferably, the relative positions and state of motion of each of the movable components is sensed using individual sensors and transmitted to the control means.

[0063] An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURES 1a and 1b are perspective views of a basket type carton suitable for use with the machine according to the invention in its blank and open forms;

FIGURE 2a is a perspective view of a fully enclosed carton blank suitable for use with the machine according to the invention;

FIGURE 2b is a perspective view of an erected and loaded carton of the type illustrated in Figure 2a in its blank form;

FIGURE 3a is a perspective view of a wrap around carton blank suitable for use with the machine according to the invention.

FIGURE 3b is a perspective view of an erected and loaded carton of the type illustrated in Figure 3a in its blank form.

FIGURE 4 is a perspective view of the infeed of a packaging machine illustrating particularly the hopper unit, feed mechanism and paper feed chain;

FIGURE 5 is a perspective view from the opposing side of the packaging machine of Figure 4;

FIGURE 6 is a perspective view illustrating the hopper unit in a first position;

FIGURE 7 is a perspective view illustrating the hopper unit in a second position;

FIGURE 8 is a perspective view of the feeder of Figure 4;

FIGURE 9 is an exploded view of the feeder of Figure 4;

FIGURE 10 is a perspective view of the vacuum feeder, back feeder and paper feed chain of Figure 4;

FIGURES 11, 12 and 13 are further representations of the apparatus of Figure 10;

FIGURES 14 and 15 illustrate graphs showing the position, velocity, acceleration and denied acceleration plotted against time of the X and Y servo motors arranged to move the back feed of Figures 10 to 13;

FIGURE 15 is a plan view of an article feed means;

FIGURE 16 illustrates the downstream end of the packaging machine of Figure 4.

FIGURE 17 is a block diagram of a control means in accordance with the present invention;

FIGURE 18 is a flow diagram of a control system in accordance with the present invention.

[0064] A mechanism according to the present invention is capable of erecting a variety of carton type for example, wraparound, fully enclosed and basket type cartons. Any reference in this specification to carton type includes different sizes of a particular carton style. For example, the mechanism can load fully enclosed cartons for eight or twelve articles.

[0065] Referring to the drawings, and in particular Figures 1a and 1b thereof, carton 10 is a basket type carrier shown in Figure 1b in a set up condition ready for lowering onto articles. The carton 10 includes opposed side wall panels 12, 14 and opposed end wall panels 16, 18 hingeably connected one to the next. The carton further includes a handle structure which inter-connects end wall panels 16, 18 and comprises transverse partition panels 22 inter-connecting each side wall 12, 14. Base panels 24, 26 are hingeably connected to each side wall panel 12, 14 respectively.

[0066] Referring now to Figure 2a and 2b of the drawings there is illustrated a wrap around carton **31**, shown in Figure 2a in its flat collapsed form. The carton blank includes opposed side wall panels 32, 34 and opposed end wall panels 36, 38 hingeably connected one to the next. The carton further comprises top panels 40, 42 and base panels 44, 46 hingeably connected to respective side walls 32, 34. Articles are inserted into the carton from above or, as the case may be, from below and the top and base panels are then secured together to provide a fully enclosed carton.

[0067] As illustrated in Figures 3a and 3b, carton 31 is a wrap around type carton, shown in Figure 3a in its blank form. A carton blank 31 includes first base panel 33, side wall 35, top panel 37, second side panel 39 and base panel 41 hingeably connected one to next. Top panel 37 comprises three pairs of apertures 43, 45 spaced between the side edges of top panel 37 and adapted to receive upper portion of articles A, illustrated in Figure 3b.

[0068] It is envisaged that the cartons can vary depending upon the shape and or quantity of articles to be packaged and accordingly, a machine in accordance with the present invention is adjustable in numerous respects so that it can process a wide variety of such cartons. The principal arrangements which are likely to be varied are shown in Figures 1a, 2a and 3b in which "H" is the overall height of the set up carton equivalent to the distance between the upper edge of the side wall and base panel, and "L" is the overall length of the carton when the base panels have closed.

[0069] Referring to Figures 4 to 7 of the drawings there is shown a packaging machine 50 for processing cartons, for example, of the type outlined above. The upstream end of the machine includes a dual hopper 52 in which a multiplicity of basket type and fully enclosed cartons 10, 30 in a collapsed condition are held ready for processing.

[0070] The hopper unit 52 (Fig 6 and 7) comprises two (or more) separate hoppers 58, 60 in adjacent positions.

Each hopper 58, 60 is mounted onto a frame 62, as shown in Figure 6 and 7. The frame 62 is mounted onto a main shaft 64 which can be rotated about axis X - X. Each hopper 58, 60 is a gravity feed type whereby the carton blanks are held in their respective hoppers at an incline to provide a positive feed. It is envisaged that the hopper units could comprise any number of hoppers adapted to receive different carton types or sizes encircling the rotary feeder hereinafter described.

[0071] In this embodiment, a n pneumatic cylinder (not shown) is used to rotate the frame between two positions: the first position, as shown in Figure 6, with the first hopper 58 placed in an operative position ready for fully enclosed cartons held in the first hopper to be fed into the packaging machine. Figure 7 illustrates the frame 62 in a second position with the second hopper 60, containing the basket type cartons, placed in an operative position.

[0072] The position of the hoppers 58, 60 is controlled by a control means detailed below.

[0073] As shown in Figures 6 and 7, when the first hopper 58 is in an operative position a fully enclosed carton is removed sequentially by a pick up device, preferably in the form of a rotary vacuum feeder 66. The vacuum feeder 66 comprises sets of suction cups 67, 69, for example three sets, each being connected to a drive shaft 70 by a drive rod 72. The drive shaft 70 is supported at its end by a suitable conventional bearing 71, 73, mounted to the side frame 84. Suitable driving mechanism such as a servo motor 75 is provided to rotate the drive shaft. The drive rods 72 are connected to a cam track by a cam rod and follower which provides a uniform path for the suction cups when the drive shaft is rotated. The path of the cam track enables the suction cups to extend towards the hopper to pick up a carton in a flat collapsed condition and thereafter to rotate the suction cups and carton to the infeed end of the machine.

[0074] In order for the blank to be transferred from the inclined position to a vertical plane, it is necessary to offset the axis of rotation of the rotary feeder from the vertical plane, as illustrated in Figures 6 and 7.

[0075] A vacuum is applied to one set of suction cups 67, 69 to remove a carton from the hopper 58, 60, when they come into contact with the side wall 32 of the carton 30. The vacuum is maintained as the carton is rotated to a predetermined position. At the said predetermined position a vacuum break disconnects the supply to release the carton 30 from the feeder 66.

[0076] If it is desired to package a different carton type for example a basket type carton 10 held in the second hoppers, a number of adjustments are made to the machine. The second hopper 60 is moved into an operative position, as described above. As the position of the second hopper relative to the rotary feeder 66 is different to the first hopper 58, it is necessary to move the "pick up" point of the suction cups 67, 69 and to alter the "on" and "off" positions of the vacuum supply. These changes are carried out by moving the cam track and/or the cam controlling the supply of a vacuum to a second position. A servo motor 167, shown in figure 8 controlled by the control system moves these sub-assemblies between the two positions.

[0077] It is preferred to include a third position for the vacuum supply: this position being the "default setting" whereby the vacuum supply is disconnected throughout the rotation of the suction cups. The default position is adopted during carton changeover or if there is a fault in the machine.

[0078] Figure 8 illustrates the pick up device adapted for the withdrawal of the lower most collapsed carton from the hopper unit. As described above, the preferred pick up device is in the form of a vacuum feeder 66 including suction cups 67, 69 which are supported on cup holders 74 and 76 respectively. Cup holders 74 and 76 are preferably fixedly mounted respectively on an elongate support rod 78 which is slidably mounted respectively on a collar structure 80, which collar structure is rigidly secured to a main rotatable shaft 70. The cup holders 74, 76 are mounted onto cam rods 79 extending into the side frame 84 housing a cam track hereinafter described. As illustrated from Figure 8, three sets of carton pick up devices are provided in association with the main rotatable shaft 70. Only one set of such devices are described in detail because all three sets of pick up devices are of the same construction operating in an identical fashion.

[0079] Figure 9 serves to illustrate an exploded view of the rotary vacuum feeder. A fixed cam plate 82 is mounted on the inner surface of side frame 84 and is provided with an aperture 86 through which the drive shaft 70 extends. A cam track 88 is formed in the fixed cam plate 82 with cam followers (not shown) disposed within the cam track 88. The purpose of the cam track 88 is to facilitate the cam rods 79 to be extended away from the main shaft 70 and into contact with the carton thereby to remove one of the cartons from the hopper 58 and to rotate the carton in a uniform path to the paper feed chain 100, discussed below. As the carton is rotated from its hopper a back feeder is used to separate opposing side panels and to assist in the erection of the carton.

[0080] A plurality of vacuum breaks are provided in the feeder mechanism 66 which is used in conjunction with a vacuum supply to set the vacuum connection and cut off points.

[0081] Turning to the process of feeding a carton from the hopper to the paper feed chain, the main shaft rotates the pick up device 66 in the direction indicated by the arrow "Z" in Figures 10 and 11. As the pick up devices rotate, the suction cups 67, 69 are moved into contact with a side wall 32 of the carton 30. A vacuum is then applied to the set of suction cups when the cups come into contact with the side wall 32 of the carton 30. Thus, the carton is withdrawn and then transferred to the paper feed chain 100. The vacuum is maintained

during this transfer state so that the suction cups hold the carton wall. When the carton is deposited at the paper feed chain, a vacuum break disconnects the vacuum supply from the suction cups to release the carton. The speed of operation of the apparatus is thus improved as well as its efficiency and durability.

[0082] As can be seen from Figure 12, the carton is moved from a collapsed position to a fully set up condition at the paperfeed chain 100 . Of course, the final set up operation is due in part to engagement with a back feeder (or carton opening means) 90.

[0083] Turning to the construction of the back feeder 90, shown in Figures 10 to 13, there comprises suitable engagement means for engaging one or more walls of the carton. In the present embodiment, the engagement means comprises a suction cup 92 supported on a cup holder 94 which is mounted onto a slide member 96. Suitable means is provided to move the engagement means in "X" and "Y" directions. For example, the slide member 96 is in turn mounted onto a transverse carriage 98 and is capable of being moved in a direction designated by the letter X. The transverse carriage 98 is preferably connected to a guide rail 99 which is fixed to a support frame (not shown): the transverse carriage being adapted to move the suction cup and slide member in a direction designated by the letter Y. Thus, the suction cup 92, is capable of moving towards or away from the rotary vacuum feeder 66 and in perpendicular direction to the orbital path Z of a carton. If desired, limit stops may be included at the ends of the slide member and/or guide rail.

[0084] It is envisaged that alternative components or configurations can be used to provide an assembly which can move in X-Y directions.

[0085] The slide member 96 is moved by suitable drive means for example a first linear servo motor (not shown) which is controlled by a suitable control system and the transverse carriage 98 is moved by second drive means for example a second linear servo motor (not shown) which is also controlled by the control system. Therefore, the position of the back feeder suction cup 92 can be moved to any desired position. In some embodiments, the control system is programmed to pre-set suitable X-Y co-ordinates and to define the path of the suction cup. More details of the control system are discussed below.

[0086] In use, the back feeder 90, separates one or more of the walls 34 of the carton from the opposing wall 32 held by the rotary feeder 66. In this embodiment, the opposing walls used are the side walls 32, 34. As the rotary feeder 66 transfers the carton, the suction cup 92 of the back feeder 90, is moved forward into contact with a side wall 34 of the collapsed carton 18, shown in Figure 10. Preferably, the point of contact is in a central portion of the wall being separated. Vacuum is applied to the suction cup 92 to hold the side wall 34. As the rotary feeder 66 continues to rotate the carton forward, the back feeder suction cup 92 moves away from the rotary feeder 66 to separate the two side walls, 32, 34 shown in Figure 11.

[0087] In this embodiment, the leading pair of suction cups 67, 69 of the rotary feeder release the leading end panel 46. Thus, the carton is folded into a part erected condition with the side and end walls being placed in substantially trapezoidal relationship. The back feeder vacuum supply is then disconnected and the carton is released from the back feeder shown in Figure 13.

[0088] Whilst it is preferred to use a suction cup to hold one of the walls, some embodiments may adopt alternative components, for example, mechanical connection means.

[0089] As discussed above, the preferred "pick up" position of the back feeder suction cup 92, is at an approximately central point of the carton side panel. This position will vary according to the type of carton, and in particular the dimensional variations of the side and end walls for each carton type and for different carton sizes. Likewise, the path of the suction cup separate the two walls will also vary according to the particular carton type being erected. It is envisaged that the suction cup can follow an oscillatory path similar to that disclosed in WO 92/15450. Alternatively, a rotary path could be used for some cartons. An advantage of the back feeder is the flexibility offered by the system. In particular, the back feeder is able to move the suction cup 92 to any position to adopt any number of paths within the end stop limits of the slide member 96 and the transverse carriage 98. An example of the paths followed together with velocity and acceleration components of the "X" and "Y" driving means is illustrated in Figures 14 and 15.

[0090] By pre-programming the control system, the position and paths of the suction cup 92 can be pre-set, thus reducing the amount of down time when interchanging carton types or styles. According to this invention, the speed of operation of the apparatus is improved as well as its efficiency and durability.

[0091] The carton 30 continues on its orbital path until it comes into contact with the paper feed chain 100. In particular, the leading edge 102 of the carton 30 comes into abutment with the leading lug 104 of the paper feed chain 100. The leading lug 104 guides the leading edge 102 away from the suction cups 67, 69 of the rotary feeder 66, thereby placing the front end panel 46 and side panel 34 in a substantially perpendicular relationship. At the same time, the rear lug 106 moves into contact with the rear end panel to assist in completing the set up. Thereafter, the suction cups 67, 69 of the rotary feeder 66 release the carton 30 and continue to move in direction "Z" and the carton 30 is moved downstream to the loading station by the paper feed chain 100.

[0092] Turning to the construction of the paper feed chain 100 as illustrated in Figures 4 and 10, there comprises upper and lower side lug chains 108 and 110. Each set is of similar construction and includes endless chains having a plurality of leading and trailing lugs 104 and 106. The upper chain 108 includes leading lugs 104

and the lower chain 110 comprises rear lugs 106. Each chain set is moved forward by drive means, for example one or more servo motors controlled by the control system.

[0093] In order to alter the machine set up from one carton type to another, it is necessary to alter the distance D between leading and trailing lugs. Therefore, during changeover, the servo motor controlling the lower chain moves the trailing lugs 106 relative to the leading lug 104 to increase or decrease the distance between the lugs. For example, the side walls of basket type carton are shorter than the fully enclosed carton so that if the carton changeover is from a fully enclosed to a basket type carton, then the distance D is reduced. Likewise, the opposite changeover means the distance D is increased. In this embodiment, the distance between leading and trailing lugs is increased or reduced by 10 cm.

[0094] The relative movement of the trailing lug 106 will alter the position at which the trailing lug 106 comes into contact with the rear end panel of the carton described above. It is necessary for the rear lug 106 to come into contact with the end panel whilst it is being rotated. If the rear lug 106 is moved forward, the point of contact is also moved forward. To restore the point of contact to the correct position, it is necessary to move the paper feed chain 100 backwards by the corresponding distance (i.e. 10 cm). It will be appreciated by those skilled in the art that if the rear lug 106 is moved away from the leading lug to increase distance D, then the paper feed chain will have to be moved forward by a corresponding distance. A pneumatic cylinder (not shown) is used to move the paper feed chain 100.

[0095] The erected carton is moved forward by the paper feed chain 100 and is held in place by a horizontal plate (not shown) and onto the carton lowering module 111. The base panels 46 of the carton are then outwardly folded by guides positioned either side of the carton.

[0096] After the cartons have been set up, they are transferred to the loading station 120. Thus, the cartons leave engagement with the paper feed chain 100 and engagement is gradually transferred as the cartons move downstream to a carton lowering module 111, shown in Figures **4** and **5**.

[0097] The carton lowering module comprises a conveyor, for example, a pair of side lug chain sets 112 mounted on tables 113 respectively which are downwardly inclined towards the point of loading 114. Each side lug chain set 112 is of similar construction includes an endless chain 115 powered by a motor, such as a servo motor. Suitable means connected to the side lug chain sets are provided to periodically engage cartons supplied from the paper feed chain. In this embodiment, the carton engaging means comprises a plurality of guide pin lugs 116 mounted on the endless chain which are operable to engage the opposed base panels 24, 26 of a carton and to retain the base panels 24, 26, side panels 12, 14 and end panels 16, 18 in a set up condition as it moves downstream.

[0098] Each lug 116 is preferably substantially wedge shaped and comprises a support face 117 arranged at an acute angle with respect to a notional vertical plane. A plurality of pins, for example four pins 118 are mounted at spaced intervals along the support face 117. Each pin 116 is positioned on the support face 117 so that during use they are received in corresponding apertures of the base panel being supported thereby to engage the carton. In this embodiment, only the leading three of the four pins are required for the basket type carton. Of course, for the larger cartons such as the fully enclosed cartons, all of the pins are used. Conversely, a smaller carton may only require to be engaged by two of the pins.

[0099] The endless chain is moved by a motor, for example a servo motor. As each lug 64 moves along the path of a cam track (not shown), the cartons 10 are maintained in a horizontal plane by the lugs 116 as they are lowered by the endless chain set 113 towards the loading station 120.

[0100] It is envisaged that the lowering module can be used to load cartons with different configurations of articles, for example two rows or three rows. Accordingly, either or both chain sets and tables are moveable towards or away from each other, by means of a pneumatic cylinder (not shown). Further, the carton lowering module can be raised or lowered by hydraulically powered columns that support the tables. The pneumatic cylinder and/or hydraulically powered columns may be controlled by suitable control means.

[0101] Articles such as bottles 122 are fed into the machine by an end feed conveyor 124 and the line pressure of the bottles is controlled by an infeed star wheel 126, as is well known (Figure 16). The articles are separated into groups of the correct number per carton 30 by means of a series of article grippers 128 which also control the flow of the articles so that they can be introduced to the carton at the same rate as the carton flow.

[0102] Turning to the construction of article gripper assembly 128 positioned either side of the article conveyor, there is provided pairs of four blocks or spacer elements 131 mounted onto separate endless chains. Each block comprises four semi-circular recesses 133 positioned one to the next and capable of receiving part of a bottle or can. The endless chain is mounted on a table. One or both of the gripper assemblies can be moved toward or away from the article conveyor according to whether two or three rows of articles are required. In this embodiment, gripper assembly is moved towards the second gripper assembly when it is desired to package two rows of articles. Thus, each gripper assembly is adapted to grip part of those articles forming each outer row, as shown in Figure 16. The distance between infeed star wheels is also narrowed to ensure that the article flow is restricted to two rows, when required or moved to allow three rows when required. In those cartons which required six articles arranged in two rows of

three articles each, the leading rebate in each gripper block remains empty.

[0103] For those cartons requiring three rows of articles, the central row of articles is moved forward by means of the configuration adopted in Figure 15. Thus, the correct number of articles is selected.

[0104] The articles gradually leave contact with the gripper assembly and are transferred to the loading station by means of article conveyor.

[0105] At loading station 120 illustrated in Figure 4 the cartons are introduced to the group of articles from above as the carton and article group are moved forward in unison. The carton is lowered onto the articles due to the downward incline of the endless chain sets on the carton lowering module, as described above. As illustrated in Figure 3, lateral movement of the carton in the loading station is controlled by a pair of guides positioned above each chain set and adapted to receive the free edges of each base panel. Vertical movement of the carton is minimised by a pressure belt positioned above the endless chain sets and adapted to apply downward pressure to the handle structure or as the case may be the top panel. It is envisaged that in some embodiments, the pressure belt could be replaced by fixed guides or, where appropriate, vertically mounted endless chain and lug sets in accordance with common practice.

[0106] Once the cartons have been loaded with articles, they are transferred by means of the article conveyor and/or pressure belt to a further set of endless chains with side lugs 210 which are used to transfer the carton to the outfeed end of the machine. During this stage, the base panels are folded around to the underside of the carton by suitable folding means for example fixed guides (not shown) and are interconnected by a locking mechanism known in the art. A second pressure belt 212 is provided to prevent unwanted upward movement of the carrier.

[0107] Turning to the construction of wraparound type cartons, as illustrated in Figures 3a and 3b, the machine is first adjusted to receive cartons of this type. Thus, the first and second pressure belts 206, 212 are also mounted on units shown in Figure 17 which are adjustable in a vertical plane by computer controlled servo motors.

[0108] In order to modify the machine to receive wraparound cartons of the type illustrated in Figures 3a and b, the article grouping mechanism is adjusted as described above, to supply the required number of article rows. The hopper 200 illustrated in Figure 17 holds a multiplicity of carton blanks 31 which are held ready for processing. The blanks are then removed sequentially by a rotary vacuum feeder 202. In this embodiment, the vacuum feeder 202 is mounted horizontally and is similar in construction to the feeder outlined above. It is envisaged that suitable feeders known in the art may be used. In this embodiment, the rotary feeder is provided with a cam track which enables the carton being transferred to be placed directly on to the group of articles. Suitable control means is used to control the transfer of cartons and articles so that their movement is coordinated. In other embodiments, the blank is removed from the hopper 200 and is fed one at a time to paper feed chain sets so that the base panels and side panels are supported.

[0109] The articles are introduced to the loading station 204 by the article conveyor in the same way as described above.

[0110] At the loading station 204, upper portions of the articles are inserted through apertures 43, 45 by lowering the cartons. In this embodiment, this process is achieved by the first pressure belt 206 which is positioned in a central region to lower the top panel and enable the neck portions of the articles to pass through the apertures. In this embodiment, the first pressure belt is mounted onto a hydraulic platform 208, which is capable of being raised or lowered according to the carton type. Suitable control means is used to control the level of the platform.

[0111] As the carton is moved downstream by side lug chain sets 210, the side panels 35 are folded into a substantially perpendicular relationship with top panel 39 by fixed guides (not shown) and the part erected carton is transferred to the second set of endless chains which transfer the carton to the outfeed end of the machine. In this embodiment, the second pressure belt 212, used to minimise movement of the top panel/handle structure, can be raised or lowered as appropriate to the carton. Likewise, the set of endless chains 210 are moved apart or brought closer together by means of horizontal adjustment which are controlled and powered by servo motors (not shown). The base is constructed by known means 214 and, where appropriate, article retaining panels are formed by known means 216. Thus, the carton is secured to complete the packaging operation.

[0112] Figure 18 is a block circuit diagram illustrates the electrical and electronic control of the packing machine 50.

[0113] Figure 18 illustrates a control means 130 having a central processor 132, a manual input means 134 through which specific instructions can be programmed, and a display 136 which indicates useful information to the machine operator. The central processor 132 and the display 136 can display operational information, such as, the speed of operation of the machine and its compliance with particular safety requirements, in the normal manner. In addition, the central processor 132 and display 136 can also indicate information specific to the present machine, such as the feeder 58, 60 which is being used, the position of the guide lugs 104 and 106 and support means 112 and the position of the feeder 66 and the back feeder 90. All of this information is provided through sensors shown generally at 138.

[0114] As discussed above, the control means 130 also controls the positions of the moveable components as well as the speed of movement of variable speed components. For example, the central processor 132

controls the motors 140 which power the feed means (drive belt, star wheel and blocks) which move articles 122 to be packed into (the infeed end of) the machine 50.

[0115] The processor 132 also controls the position of the feeder 66 through actuation of a pneumatic cylinder 142 as well as the position of the back feeder 90 through programmed and accurate control of X and Y servo motors 144. In addition the central processor 132 also controls the paper feed chain 100 through control either or both of the servo motors 146 which control the endless chains from which the guide lugs 104 and 106 are depended, as well as the pneumatic cylinder 148 which controls the position of the support structure 112.

[0116] Suitable control means can be included to position the support tables of the carton loading module at the desired location for a particular carton type or size by controlling the pneumatic cylinder and/or the hydraulically powered columns 96, 98. The control means may also control the motors driving each of the endless chains to control and adjust the speed and to synchronise carton throughput according to the carton type and/or size.

[0117] Additionally, the control means may control the wraparound carton feeding and loading apparatus to place the apparatus in operative or inoperative conditions, as described above.

[0118] As will be discussed below the positions and speed of these devices can be input manually or a specific pre-written programme can be loaded into the central processor for control of the packaging machine. Also, for the controlled change over of the machine from one carton type or size to another can be the result of a pre-written program or a manual input signal, as discussed below.

[0119] Regarding Figures 19 the change over process is started (box 150) either due to a manual input request (box 152) or through the machine coming to the end of a pre-programmed run (box 154).

[0120] The first stage in the system is to cause the feeder 66 to stop picking cartons from one of the hoppers 58, 60 (box 156). At this time the back feeder or carton opening means 90 is also stopped (box 158). The paper feed chain 100 is continued to operate until empty of cartons. In the present invention this requires the four cartons placed between the first and second predetermined locations to be removed from the paper feed chain 100.

[0121] However, unlike prior art embodiments this removal is not manual but the paper feed chain 100 is continued to operate until these cartons are removed for filling at the carton filling station 120, in the normal manner (box 160). At this point the paper feed chain 100 is stopped (box 162). Sensors, as discussed above, can provide the central processor 132 with information on a number of articles to be packed so that the article feed means can be stopped at such a point that all of the necessary articles have been forwarded for the packing of the four above mentioned cartons (box 164).

[0122] At this point the guide lugs 104 and 106 on the paper feed chain are repositioned, with respect to each other, as discussed above (box 166), and the support means is repositioned with respect to the first predetermined position, also as discussed above (box 168).

[0123] The feeder 66 is then repositioned for use with the other hopper 58, 60, as discussed above (box 170).

[0124] Also, the program under which the locus of the cup 92 on the back feeder or carton opening apparatus 90 is operating is controlled so that this device will operate with the carton feeder 66 so as to open cartons from the hopper now being used (box 172).

[0125] Finally, the article feed means is controlled so that the appropriate number of articles is provided to the packing station 120 at the appropriate time, as discussed above, (box 174).

[0126] After each of these steps have been taken the packaging machine 50 can be restarted and cartons removed from the newly used hopper for filling in the usual fashion (box 176). It should be noted that the restart of the carton picking process and the article supply process are controlled such that no articles go unpacked and no cartons are supplied to the packing station without corresponding articles.

[0127] Modifications may be made without departing from the scope of the present invention. In particular, alternate sensors and alternate means of positioning each of the moveable articles may be utilised without departing from the scope of the invention as claimed in the accompanying claims.

[0128] In addition, while the preferred embodiment described herein is for loading bottles into cartons, it will be recognised that the invention is not limited to cartons for bottles. The invention may be used with machines for packaging cans, paperboard "bricks" and other containers into cartons. Further, the present invention is able to process cartons comprising numerous configurations of groups of articles covering a range of carton size and shape, for example four, six; eight and twelve bottles without undue time being spent in adjusting the mechanism.

Claims

1. A packaging machine **(50)** for packaging articles into cartons selected from, at least, a first carton **(10)** or a second carton **(30)**, said first and second cartons being of a different type or size, said cartons being stored in at least one hopper **(58, 60)**, and picked for packing by a carton engaging means arranged to remove cartons from said at least one hopper and transport them sequentially to a first predetermined position, from where the cartons are transferred to a paper feed chain **(100)** which transports the cartons to a second predetermined position, from where the cartons are combined with said articles, the paper feed chain **(100)** comprising a

support means carrying a first endless chain **(108)** from which is depended a first set of guide lugs **(104)** and a second endless chain **(110)** from which is depended a second set of guide lugs **(106),** said guide lugs being interleaved to produce carton receiving zones, the length of which can be altered, for different carton sizes or types, by altering the relative positions of the first and second set of guide lugs, and the support means being movable such that when the relative positions of the lugs is changed, this change can be compensated for such that the position of the first set of lugs with respect to said first predetermined position is unaltered.

2. A packaging machine as claimed in Claim 1, wherein the relative position of the first and second sets of guide lugs **(104, 106)** is arranged by control of the motor **(140)** which power one of the first and second endless chains **(108, 110).**

3. A packaging machine as claimed in Claim 1 or Claim 2, wherein the position of said support means is arranged by the control of a pneumatic cylinder **(142, 148)** which positions said structure.

4. A packaging machine as claimed in an preceding claim, comprising a control means **(130)** which controls the operation of each of the components of the machine during operation and change over between cartons of different type or size.

5. A packaging machine as claimed in any preceding claim, comprising a first hopper **(58)** for storing said first cartons **(10)**, and a second hopper **(60)** for storing said second cartons **(30)**, and transfer means **(66)** to transfer the cartons from either hopper to said first predetermined position, said carton engaging means being operable in a first position for engaging cartons from the first hopper and a second position for engaging cartons from the second hopper.

6. A packaging machine as claimed in Claim 5, comprising means to place one of said hoppers **(58, 60)** in an operative position and control means **(130)** to select the position of carton engagement means corresponding to the operative hopper selected.

7. A packaging machine as claimed in Claim 5 or Claim 6, wherein said carton pick up and transfer means **(66)** is rotatable about a fixed axis in an orbital path.

8. A packaging machine as claimed in Claim 8, wherein the first and second pick up positions are located at different points on said orbital path.

9. A packaging machine as claimed in any of Claims 6 to 8, comprising means to place one of said hoppers **(58, 60)** in an operative position in the form of a frame **(62)** mounted to a second fixed axis **(X-X)** and wherein said first and second hoppers are mounted to the frame each hopper being oppositely disposed about the second fixed axis.

10. A packaging machine as claimed in any of Claims 6 to 9, wherein said operative hopper is adjacent the orbital path of said carton pick up and transfer means **(66).**

11. A packaging machine as claimed in any preceding claim comprising an apparatus for sequentially manipulating out of said at least one hopper **(58, 60)** collapsed cartons having oppositely disposed face contacting panels and for initiating set up thereof into an open ended condition, said apparatus being operable with said carton engaging means **(67, 69)** which sequentially engaging one of said face contacting panels (34) and for withdrawing from the hopper **(58, 60)** a collapsed carton which includes said one of said face contacting panels and transferring orbitally about a rotatable axis from said hopper to said first predetermined position, wherein said apparatus includes panel engagement means **(90)** disposed outside the path of orbit for engaging the other of said face contacting panels **(32)** so as to pull said other face contacting panel in a direction away from the carton pick up and transfer means **(66)** thereby to initiate opening of the carton.

12. A packaging machine as claimed in Claim 11, wherein the panel engaging means is moved in a first plane by a linear servo motor.

13. A packaging machine as claimed in Claim 11 or Claim 12, wherein said panel engaging means is mounted to a slide member (96) in a substantially perpendicular relationship with a guide rail (99) and wherein said slide member is moveable relative said guide rail whereby said panel engaging means is moveable in two planes.

14. A packaging machine as claimed in Claim 13, wherein said panel engaging means is moved in a second plane by a further linear servo motor.

15. A packaging machine as claimed in any of Claims 11 to 14, wherein control means (130) are arranged to control the movement of the panel engaging means.

16. A packaging machine as claimed in any of Claims 13 to 15, wherein said panel engaging means comprises a suction cup (92) and cup holder (94) mounted onto said slide member (96), said suction cup being connected to a vacuum supply during said

carton opening.

17. A packaging machine as claimed in any of Claims 11 to 16, wherein said face contacting panels comprise opposing side walls of the carton.

18. A packaging machine as claimed in any preceding claim, having an article feed means arranged to progress articles at a predetermined rate along a feed path for combination with cartons at a measured rate.

19. A packaging machine as claimed in Claim 18, wherein the article feed means includes a pair of star wheels (126) which collect articles from a first feed belt and move them to a second feed belt at said predetermined rate.

20. A packaging machine as claimed in Claim 19, wherein gripper blocks (131) are arranged on opposite sides of said second feed belt to collect a predetermined number of articles and arrange them as an individual unit for packaging into a carton.

21. A method of packaging articles into cartons comprising the steps of:

a) selecting from, at least, a first carton **(10)** or a second carton **(30)**, said first and second cartons being of a different type or size, said cartons being stored in at least one hopper **(58, 60)**;
b) picking cartons for packing using a carton engaging means arranged to remove cartons from said at least one hopper and transport them sequentially to a first predetermined position;
c) transferring said cartons to a paper feed chain **(100)** which transports the cartons to a second predetermined position from where the cartons are combined with said articles, the paper feed chain **(100)** comprises a support means carrying a first endless chain **(108)** from which is depended a first set of guide lugs **(104)** and a second endless chain **(110)** from which is depended a second set of guide lugs, said guide lugs being interposed to produce carton receiving zones, the length of which can be altered, for different carton sizes or types;
d) altering said length by altering the relative positions of the first and second set of guide lugs **(104, 106);** and
e) moving the support means when the relative positions of the lugs is changed, so as to compensate for said change, such that the position of the first set of lugs with respect to said first predetermined position is unaltered.

22. A method claimed in Claim 21, wherein the relative position of the first and second sets of guide lugs **(104, 106)** is arranged by control of one of the motors **(140)** which power the first and second endless chains **(108, 110).**

23. A method as claimed in Claim 21 or Claim 22, wherein the position of said support means is arranged by the control of a pneumatic piston which positions said structure.

24. A method as claimed in Claims 21 to 23 utilising a control means **(130)** which controls the operation of each of the components of the machine during operation and change over between cartons of different type or size.

25. A method as claimed in any of Claims 21 to 24 wherein the carton engaging means is positioned for engagement with cartons from a first hopper **(58)** in a first position and is positioned for engagement with cartons from a second hopper **(60)**, in a second position, the carton engagement means being movable between said first and second positions.

26. A method as claimed in Claim 25, comprising placing one of said hoppers **(58, 60)** in an operative position and selecting the position of the carton engagement means corresponding to the operative hopper selected.

27. A method as claimed in Claim 25 or Claim 26, wherein said carton pick up and transfer means **(66)** is rotatable about a fixed axis in an orbital path.

28. A method as claimed in Claim 25, wherein the first and second pick up positions are located at different points on said orbital path.

29. A method as claimed in any of Claims 26 to 28 comprising mounting said first and second hoppers **(58, 60)** on a frame **(62)** such that each hopper is oppositely disposed about a second fixed axis.

30. A method as claimed in any of Claims 26 to 29, wherein said operative hopper is adjacent the orbital path of said carton pick up and transfer means when in use.

31. A method as claimed in any of Claims 21 to 30 comprising sequentially manipulating out of said at least one hopper **(58, 60)** collapsed cartons having oppositely disposed face contacting panels **(32, 34)** and initiating set up thereof into an open ended condition, by sequentially engaging one of said face contacting panels **(34)** and withdrawing from the hopper a collapsed carton which includes said one of said face contacting panels and transferring orb-

itally about a rotatable axis from said hopper to said first predetermined position, wherein panel engagement means **(90)** is disposed outside the path of orbit for engaging the other of said face contacting panels so as to pull said other face contacting panel **(32)** in a direction away from the carton pick up and transfer means **(66)** thereby initiating opening of the carton.

32. A method as claimed in Claim 31, comprising moving the engaging means in the first plane by a linear servo motor.

33. A method as claimed in Claim 31 or Claim 32, comprising mounting said panel engaging means to a slide member (96) in a substantially perpendicular relationship with said guide rail (99) and moving said slide member relative to said guide rail whereby said panel, engaging means is moveable in two planes.

34. A method as claimed in Claim 33, comprising moving said panel engaging means in a second plane by a linear servo motor.

35. A method as claimed in any of Claims 31 to 34, wherein control means (130) are arranged to control the movement of the panel engaging means.

36. A method as claimed in any of Claims 31 to 35, wherein said panel engaging means comprises a suction cup (92) and cup holder (94) mounted onto said slide member (96), and connects said suction cup to a vacuum supply during said carton opening.

37. A method as claimed in any of Claims 31 to 36, wherein said face contacting panels comprise opposing side walls of the carton.

38. A method as claimed in Claims 31 to 37, comprising arranging article feed means to progress articles at a predetermined rate along a feed path for combination with cartons at a measured rate.

39. A method as claimed in Claim 38, comprising using a pair of star wheels (126) to collect articles from a first feed belt and move them to a second feed belt at a predetermined rate.

40. A method as claimed in Claim 39, comprising arranging gripper blocks (131) on opposite sides of said second feed belt to collect a predetermined number of articles and arrange them as an individual unit for packaging into a carton.

41. A control means **(130)** for a packaging machine as claimed in any of Claims 1 to 20, the control means comprising a central processor **(132)**, a manual input means **(134)**, and separate means controlled by said central processor for individually positioning the first and second sets of guide lugs **(104, 106)** and the support means carrying said guide lugs on the paper feed chain **(100).**

42. A control means as claimed in Claim 41, wherein the means for positioning the support means is a pneumatic cylinder **(142, 148).**

43. A control means as claimed in Claim 41 or Claim 42, for use with a packaging machine having two hoppers **(58, 60)** accessed by a single carton engaging means, wherein the control means **(130)** comprises a means of positioning the carton engaging means in a first position for engaging cartons in said first hopper and a second position for engaging cartons in said second hopper.

44. A control means **(130)** as claimed in Claim 43, wherein the means for positioning the carton engaging means is operable to position the engaging means in a third position, from which the carton engaging means cannot engage cartons in either hopper **(58, 60).**

45. A control means as claimed in Claim 43 or Claim 44, wherein said means for positioning the carton engaging means is a pneumatic cylinder **(142, 148).**

46. A control means as claimed in any of Claims 43 to 45, for use with a packaging machine having an opening means **(90)** for opening cartons picked from each hopper, wherein the locus of motion of pick means on said opening means **(90)** can be altered so that the opening means can open cartons picked from either hopper.

47. A control means as claimed in Claim 46, wherein the control means **(130)** comprise X and Y oriented servo motors.

48. A control means as claimed in any of Claims 41 to 47, for use with a packaging machine having an article feed means in the form of a star wheel **(126)**, the control means **(130)** controlling the speed of rotation of the star wheel.

49. A control means as claimed in Claim 48, wherein the control means **(130)** controls a motor **(140)** which rotates the star wheel **(126)**.

50. A control system for controlling the operation of a packaging machine as claimed in any of Claims 1 to 20, in order to change from first cartons **(10)** in a first hopper **(58)** to second cartons **(30)** in a second hopper **(60),** comprising the steps of:

a) stopping the carton engaging means from picking any cartons;
b) continuing the paper feed chain **(100)** until it is empty of cartons;
c) stopping the paper feed chain **(100)**;
d) stopping the supply of articles;
e) repositioning the carton engaging means and the hoppers to enable picking from the alternative hopper;
f) altering the relative position of the first and second sets of guide lugs **(104, 106)** in said paper feed chain;
g) altering the position of the support means with respect to said first predetermined position; and
h) re-starting the carton picking and transportation process and the supply of articles.

51. A control system as claimed in Claim 50, wherein the instruction to changeover is read from a pre-entered control program.

52. A control means as claimed in Claim 50, wherein the instruction to changeover is manually entered into a control means **(130)**.

53. A control system as claimed in any of Claims 50 to 52, wherein the packaging machine has a means for opening cartons, which is also stopped during the changeover process.

54. A control system as claimed in Claim 53, wherein the locus of movement of a pick means in said carton opening means **(90)** is altered prior to restarting to enable the means to open cartons from said alternative hopper.

55. A control system as claimed in any of Claims 50 to 54, wherein the pick-up point and locus of the pick means in the carton engaging means is altered during the changeover to enable picking of cartons from the alternative hopper.

56. A control system as claimed in any of Claims 50 to 55, wherein the speed of supply of articles is alterable as required depending on the size or type of cartons in each of said hoppers.

57. A control system as claimed in any of Claims 50 to 56, wherein the relative positions and state of motion of each of the movable components is sensed using individual sensors **(138)** and transmitted to the control means **(130).**

Patentansprüche

1. Verpackungsmaschine (50) zum Verpacken von Gegenständen in Schachteln, die aus wenigstens einer ersten Schachtel (10) oder einer zweiten Schachtel (30) ausgewählt sind, wobei die erste und die zweite Schachtel von unterschiedlichem/r Typ oder Größe sind, wobei die Schachteln in wenigstens einem Magazin (58, 60) gelagert werden und zum Verpacken durch eine Schachtel in Eingriff nehmende Einrichtung entnommen werden, die angeordnet ist, um Schachteln aus wenigstens einem Magazin zu entfernen und diese nacheinander zu einer ersten vorgegebenen Position zu transportieren, von wo aus die Schachteln zu einer Papiervorschubkette (100) übertragen werden, welche die Schachteln zu einer zweiten vorgegebenen Position transportiert, von wo aus die Schachteln mit den Gegenständen kombiniert werden, wobei die Papiervorschubkette (100) eine Stützeinrichtung umfasst, die eine erste Endloskette (108) trägt, von welcher ein erster Satz von Führungsnasen (104) abhängig ist, sowie eine zweite Endloskette (110), von welcher ein zweiter Satz von Führungsnasen (106) abhängig ist, wobei die Führungsnasen verschachtelt sind, um Schachtel aufnehmende Zonen zu erzeugen, deren Länge für unterschiedliche Schachtelgrößen oder -typen verändert werden kann, indem die relativen Positionen des ersten und des zweiten Satzes von Führungsnasen verändert werden, und wobei die Stützeinrichtung beweglich ist, so dass dann, wenn die relativen Positionen der Nasen verändert werden, diese Veränderung derart kompensiert werden kann, dass die Position des ersten Satzes von Nasen in Bezug auf die erste vorgegebene Position unverändert bleibt.

2. Verpackungsmaschine nach Anspruch 1, in welcher die relative Position des ersten und des zweiten Satzes von Führungsnasen (104, 106) durch Steuerung des Motors (140) angeordnet wird, welcher eine der ersten und der zweiten Endlosketten (108, 110) antreibt.

3. Verpackungsmaschine nach Anspruch 1 oder 2, in welcher die Position der Stützeinrichtung durch die Steuerung eines pneumatischen Zylinders (142, 148) angeordnet wird, welcher die Struktur positioniert.

4. Verpackungsmaschine nach einem der vorstehenden Ansprüche, die eine Steuereinrichtung (130) umfasst, die den Betrieb jeder der Komponenten der Maschine während des Betriebs und der Umstellung zwischen Schachteln unterschiedlichen/r Typs oder Größe steuert.

5. Verpackungsmaschine nach einem der vorstehenden Ansprüche, welche ein erstes Magazin (58) zum Lagern der ersten Schachteln (10) und ein zweites Magazin (60) zum Lagern der zweiten

Schachteln (30) umfasst sowie Übertragungsmittel (66), um die Schachteln von jedem Magazin zu der ersten vorgegebenen Position zu übertragen, wobei die Schachtel in Eingriff nehmende Einrichtung in einer ersten Position zur Ineingriffnahme von Schachteln aus dem ersten Magazin und einer zweiten Position zur Ineingriffnahme von Schachteln aus dem zweiten Magazin betriebsfähig ist.

6. Verpackungsmaschine nach Anspruch 5, welche Mittel umfasst, um eines der Magazine (58, 60) in eine betriebsbereite Position zu bringen, sowie eine Steuereinrichtung (130), um die Position der Schachtel in Eingriff nehmenden Einrichtung entsprechend dem ausgewählten betriebsbereiten Magazin auszuwählen.

7. Verpackungsmaschine nach Anspruch 5 oder 6, in welcher die Schachtelaufnahme- und Übertragungsmittel (66) um eine feststehende Achse in einer Kreisbahn drehbar sind.

8. Verpackungsmaschine nach Anspruch 8, in welcher die erste und die zweite Aufnahmeposition an unterschiedlichen Punkten der Kreisbahn angeordnet sind.

9. Verpackungsmaschine nach einem der Ansprüche 6 bis 8, welche Mittel umfasst, um eines der Magazine (58, 60) in eine betriebsbereite Position in Form eines Rahmens (62) zu bringen, der an einer zweiten feststehenden Achse (X-X) befestigt ist, und in welcher das erste und das zweite Magazin an dem Rahmen befestigt sind, wobei jedes Magazin um die zweite feststehende Achse herum gegenüber angeordnet ist.

10. Verpackungsmaschine nach einem der Ansprüche 6 bis 9, in welcher das betriebsbereite Magazin angrenzend an die Kreisbahn der Schachtelaufnahme- und Übertragungsmittel (66) liegt.

11. Verpackungsmaschine nach einem der vorstehenden Ansprüche, welche eine Vorrichtung umfasst, um zusammengeklappte Schachteln mit gegenüber angeordneten flächenberührenden Wandflächen aus dem wenigstens einen Magazin (58, 60) nacheinander herauszuheben und deren Aufrichtung in einen offenen Zustand einzuleiten, wobei die Vorrichtung mit der Schachtel in Eingriff nehmenden Einrichtung (67, 69) betriebsfähig ist, welche nacheinander eine der flächenberührenden Wandflächen (34) in Eingriff nimmt, und um aus dem Magazin (58, 60) eine zusammengeklappte Schachtel zu entnehmen, welche die eine der flächenberührenden Wandflächen einschließt, und in einer Kreisbahn um eine drehbare Achse aus dem Magazin zu einer ersten vorgegebenen Position zu übertragen, wobei die Vorrichtung Wandflächen in Eingriff nehmende Mittel (90) einschließt, die außerhalb der Kreisbahn zur Ineingriffnahme der anderen der flächenberührenden Wandflächen (32) angeordnet sind, um so die andere flächenberührende Wandfläche in einer Richtung weg von den Schachtelaufnahme- und Übertragungsmitteln (66) zu ziehen, wodurch das Öffnen der Schachtel eingeleitet wird.

12. Verpackungsmaschine nach Anspruch 11, in welcher die Wandflächen in Eingriff nehmenden Mittel in einer ersten Ebene durch einen linearen Servomotor bewegt werden.

13. Verpackungsmaschine nach Anspruch 11 oder 12, in welcher die Wandflächen in Eingriff nehmenden Mittel an einem Gleitelement (96) in einer im Wesentlichen senkrechten Beziehung mit einer Führungsschiene (99) befestigt sind, und in welcher das Gleitelement relativ zu der Führungsschiene beweglich ist, wodurch die Wandflächen in Eingriff nehmenden Mittel in zwei Ebenen beweglich sind.

14. Verpackungsmaschine nach Anspruch 13, in welcher die Wandflächen in Eingriff nehmenden Mittel in einer zweiten Ebene durch einen weiteren linearen Servomotor bewegt werden.

15. Verpackungsmaschine nach einem der Ansprüche 11 bis 14, in welcher eine Steuereinrichtung (130) angeordnet ist, um die Bewegung der Wandflächen in Eingriff nehmenden Mittel zu steuern.

16. Verpackungsmaschine nach einem der Ansprüche 13 bis 15, in welcher die Wandflächen in Eingriff nehmenden Mittel einen Saugnapf (92) und einen Napfhalter (94) umfassen, die auf dem Gleitelement (96) befestigt sind, wobei der Saugnapf während der Öffnung der Schachtel mit einer Vakuumversorgung verbunden ist.

17. Verpackungsmaschine nach einem der Ansprüche 11 bis 16, in welcher die flächenberührenden Wandflächen gegenüberliegende Seitenwände der Schachtel umfassen.

18. Verpackungsmaschine nach einem der vorstehenden Ansprüche, die eine Gegenstandsvorschubeinrichtung aufweist, die angeordnet ist, um Gegenstände in einer vorgegebenen Rate entlang eines Vorschubweges für die Kombination mit Schachteln in einer gemessenen Rate vorwärts zu treiben.

19. Verpackungsmaschine nach Anspruch 18, in welcher die Gegenstandsvorschubeinrichtung ein Paar von Sternrädern (126) einschließt, welche Gegenstände von einem ersten Beschickband aufsammeln und diese zu einem zweiten Beschick-

band in einer vorgegebenen Rate bewegen.

20. Verpackungsmaschine nach Anspruch 19, in welcher Greiferblöcke (131) auf gegenüberliegenden Seiten des zweiten Beschickbands angeordnet sind, um eine vorgegebene Anzahl von Gegenständen aufzusammeln und diese als eine einzelne Einheit zum Verpacken in einer Schachtel anzuordnen.

21. Verfahren zum. Verpacken von Gegenständen in Schachteln, das die folgenden Schritte umfasst:

a) Auswählen aus wenigstens einer ersten Schachtel (10) oder einer zweiten Schächtel (30), wobei die erste und die zweite Schachtel von unterschiedlichem/r Typ oder Größe sind, wobei die Schachteln in wenigstens einem Magazin (58, 60) gelagert werden;
b) Aufnehmen von Schachteln zum Verpacken unter Verwendung einer Schachtel in Eingriff nehmenden Einrichtung, die angeordnet ist, um Schachteln aus dem wenigstens einen Magazin zu entfernen und diese nacheinander zu einer ersten vorgegebenen Position zu transportieren;
c) Übertragen der Schachteln an eine Papiervorschubkette (100), die die Schachteln zu einer zweiten vorgegebenen Position transportiert, von wo aus die Schachteln mit den Gegenständen kombiniert werden, wobei die Papiervorschubkette (100) eine Stützeinrichtung umfasst, die eine erste Endloskette (108) trägt, von welcher ein erster Satz von Führungsnasen (104) abhängig ist, sowie eine zweite Endloskette (110), von welcher ein zweiter Satz von Führungsnasen abhängig ist, wobei die Führungsnasen eingeschoben sind, um Schachtel aufnehmende Zonen zu erzeugen, deren Länge für unterschiedliche Schachtelgrößen oder -typen verändert werden kann;
d) Verändern der Länge durch Verändern der relativen Positionen des ersten und des zweiten Satzes von Führungsnasen (104, 106); und
e) Bewegen der Stützeinrichtung, wenn die relativen Positionen der Nasen verändert werden, um so diese Veränderung zu kompensieren, so dass die Position des ersten Satzes von Nasen in Bezug auf die erste vorgegebene Position unverändert bleibt.

22. Verfahren nach Anspruch 21, in welchem die relative Position des ersten und des zweiten Satzes von Führungsnasen (104, 106) durch Steuerung eines der Motoren (140) angeordnet wird, welche die erste und die zweite Endloskette (108, 110) antreiben.

23. Verfahren nach Anspruch 21 oder 22, in welchem die Position der Stützeinrichtung durch die Steuerung eines pneumatischen Kolbens angeordnet wird, welcher die Struktur positioniert.

24. Verfahren nach einem der Ansprüche 21 bis 23, welches eine Steuereinrichtung (130) verwendet, die den Betrieb jeder der Komponenten der Maschine während des Betriebs und der Umstellung zwischen Schachteln unterschiedlichen/r Typs oder Größe steuert.

25. Verfahren nach einem der Ansprüche 21 bis 24, in welcher die Schachtel in Eingriff nehmende Einrichtung zur Ineingriffnahme mit Schachteln aus einem ersten Magazin (58) in einer ersten Position positioniert ist und zur Ineingriffnahme mit Schachteln aus einem zweiten Magazin (60) in einer zweiten Position positioniert ist, wobei die Schachtel in Eingriff nehmende Einrichtung zwischen der ersten und der zweiten Position beweglich ist.

26. Verfahren nach Anspruch 25, welches das Bringen eines der Magazine (58, 60) in eine betriebsbereite Position und das Auswählen der Position der Schachtel in Eingriff nehmenden Einrichtung entsprechend dem ausgewählten betriebsbereiten Magazin umfasst.

27. Verfahren nach Anspruch 25 oder 26, in welchem die Schachtelaufnahme- und Übertragungsmittel (66) um eine feststehende Achse in einer Kreisbahn drehbar sind.

28. Verfahren nach Anspruch 25, in welchem die erste und die zweite Aufnahmeposition an unterschiedlichen Punkten auf der Kreisbahn angeordnet sind.

29. Verfahren nach einem der Ansprüche 26 bis 28, welches das Befestigen des ersten und des zweiten Magazins (58, 60) an einen Rahmen (62) umfasst, so dass jedes Magazin um eine zweite feststehende Achse herum gegenüber angeordnet ist.

30. Verfahren nach einem der Ansprüche 26 bis 29, in welchem das betriebsbereite Magazin in Gebrauch angrenzend an die Kreisbahn der Schachtelaufnahme- und Übertragungsmittel liegt.

31. Verfahren nach einem der Ansprüche 21 bis 30, welches umfasst: Herausheben zusammengeklappter Schachteln mit gegenüber angeordneten flächenberührenden Wandflächen (32, 34) nacheinander aus dem wenigstens einen Magazin (58, 60) und Einleiten ihrer Aufrichtung in einen offenen Zustand durch Ineingriffnahme einer der flächenberührenden Wandflächen (34) nacheinander und Entnehmen einer zusammengeklappten Schachtel, welche eine der flächenberührenden Wandflächen einschließt, aus dem Magazin, und Übertragen in

einer Kreisbahn um eine drehbare Achse aus dem Magazin zu der ersten vorgegebenen Position, wobei die Wandflächen in Eingriff nehmenden Mittel (90) außerhalb der Kreisbahn zur Ineingriffnahme der anderen der flächenberührenden Wandflächen angeordnet sind, um so die andere flächenberührende Wandfläche (32) in einer Richtung weg von den Schachtelaufnahme- und Übertragungsmitteln (66) zu ziehen, wodurch das Öffnen der Schachtel eingeleitet wird.

32. Verfahren nach Anspruch 31, welches das Bewegen der in Eingriff nehmenden Mittel in der ersten Ebene durch einen linearen Servomotor umfasst.

33. Verfahren nach Anspruch 31 oder 32, welches das Befestigen der Wandflächen in Eingriff nehmenden Mittel an einem Gleitelement (96) in einer im Wesentlichen senkrechten Beziehung mit der Führungsschiene (99) umfasst sowie das Bewegen des Gleitelements relativ zu der Führungsschiene, wodurch die Wandflächen in Eingriff nehmenden Mittel in zwei Ebenen beweglich sind.

34. Verfahren nach Anspruch 33, welches das Bewegen der Wandflächen in Eingriff nehmenden Mittel in einer zweiten Ebene durch einen linearen Servomotor umfasst.

35. Verfahren nach einem der Ansprüche 31 bis 34, in welchem eine Steuereinrichtung (130) angeordnet ist, um die Bewegung der Wandflächen in Eingriff nehmenden Mittel zu steuern.

36. Verfahren nach einem der Ansprüche 31 bis 35, in welchem die Wandflächen in Eingriff nehmenden Mittel einen Saugnapf (92) und einen Napfhalter (94) umfassen, die auf dem Gleitelement (96) befestigt sind, und welches den Saugnapf mit einer Vakuumversorgung während der Öffnung der Schachtel verbindet.

37. Verfahren nach einem der Ansprüche 31 bis 36, in welchem die flächenberührenden Wandflächen gegenüberliegende Seitenwände der Schachtel umfassen.

38. Verfahren nach einem der Ansprüche 31 bis 37, welches das Anordnen einer Gegenstandsvorschubeinrichtung umfasst, um Gegenstände in einer vorgegebenen Rate entlang eines Vorschubweges für die Kombination mit Schachteln in einer gemessenen Rate vorwärts zu treiben.

39. Verfahren nach Anspruch 38, welches die Verwendung eines Paars von Sternrädern (126) umfasst, um Gegenstände von einem ersten Beschickband aufzusammeln und diese zu einem zweiten Beschickband in einer vorgegebenen Rate zu bewegen.

40. Verfahren nach Anspruch 39, welches das Anordnen von Greiferblöcken (131) auf gegenüberliegenden Seiten des zweiten Beschickbands umfasst, um eine vorgegebene Anzahl von Gegenständen aufzusammeln und diese als eine einzelne Einheit zum Verpacken in eine Schachtel anzuordnen.

41. Steuereinrichtung (130) für eine Verpackungsmaschine nach einem der Ansprüche 1 bis 20, wobei die Steuereinrichtung einen Zentralprozessor (132) umfasst, eine manuelle Eingabeeinrichtung (134) sowie eine getrennte Einrichtung, die durch den Zentralprozessor gesteuert wird, um den ersten und den zweiten Satz von Führungsnasen (104, 106) und die die Führungsnasen tragende Stützeinrichtung auf der Papiervorschubkette (100) einzeln zu positionieren.

42. Steuereinrichtung nach Anspruch 41, in welcher die Einrichtung zum Positionieren der Stützeinrichtung ein pneumatischer Zylinder (142, 148) ist.

43. Steuereinrichtung nach Anspruch 41 oder 42 zur Verwendung mit einer Verpackungsmaschine, die zwei Magazine (58, 60) aufweist, auf die durch eine einzelne Schachtel in Eingriff nehmende Einrichtung zugegriffen wird, wobei die Steuereinrichtung (130) eine Einrichtung zum Positionieren der Schachtel in Eingriff nehmenden Einrichtung in einer ersten Position zur Ineingriffnahme von Schachteln in einem ersten Magazin und einer zweiten Position zur Ineingriffnahme von Schachteln in einem zweiten Magazin umfasst.

44. Steuereinrichtung (130) nach Anspruch 43, in welcher die Einrichtung zum Positionieren der Schachtel in Eingriff nehmende Einrichtung betriebsfähig ist, um die in Eingriff nehmende Einrichtung in einer dritten Position zu positionieren, aus welcher die Schachtel in Eingriff nehmende Einrichtung in keinem Magazin (58, 60) Schachteln in Eingriff nehmen kann.

45. Steuereinrichtung nach Anspruch 43 oder 44, in welcher die Einrichtung zum Positionieren der Schachtel in Eingriff nehmenden Einrichtung ein pneumatischer Zylinder (142, 148) ist.

46. Steuereinrichtung nach einem der Ansprüche 43 bis 45 für die Verwendung mit einer Verpackungsmaschine, die eine Öffnungseinrichtung (90) zum Öffnen von Schachteln, die aus jedem Magazin entnommen werden, in welcher der geometrische Ort der Bewegung der Entnahmemittel auf der Öffnungseinrichtung (90) derart verändert werden

kann, dass die Öffnungseinrichtung aus jedem Magazin entnommene Schachteln öffnen kann.

47. Steuereinrichtung nach Anspruch 46, in welcher die Steuereinrichtung (130) X-und Y-orientierte Servomotoren umfasst.

48. Steuereinrichtung nach einem der Ansprüche 41 bis 47 für die Verwendung mit einer Verpackungsmaschine, die eine Gegenstandsvorschubeinrichtung in Form eines Sternrades (126) aufweist, wobei die Steuereinrichtung (130) die Rotationsgeschwindigkeit des Sternrades steuert.

49. Steuereinrichtung nach Anspruch 48, in welcher die Steuereinrichtung (130) einen Motor (140) steuert, der das Sternrad (126) dreht.

50. Steuersystem zum Steuern des Betriebs einer Verpackungsmaschine nach einem der Ansprüche 1 bis 20, um von ersten Schachteln (10) in einem ersten Magazin (58) zu zweiten Schachteln (30) in einem zweiten Magazin (60) zu wechseln, umfassend die folgenden Schritte:

a) Hindern der Schachtel in Eingriff nehmenden Einrichtung an der Aufnahme jedweder Schachteln;
b) Weiterführen der Papiervorschubkette (100), bis diese von Schachteln entleert ist;
c) Anhalten der Papiervorschubkette (100);
d) Anhalten des Vorschubs von Gegenständen;
e) Umstellen der Schachtel in Eingriff nehmenden Einrichtung und der Magazine, um die Aufnahme aus dem alternativen Magazin zu ermöglichen;
f) Verändern der relativen Position des ersten und des zweiten Satzes von Führungsnasen (104, 106) in der Papiervorschubkette;
g) Verändern der Position der Stützeinrichtung in Bezug auf die erste vorgegebene Position; und
h) Wiedereinschalten des Schachtelentnahme- und Förderverfahrens und des Vorschubs von Gegenständen.

51. Steuersystem nach Anspruch 50, in welchem die Anweisung zur Umstellung aus einem voreingegebenen Steuerprogramm ausgelesen wird.

52. Steuersystem nach Anspruch 50, in welchem die Anweisung zur Umstellung manuell in eine Steuereinrichtung (130) eingegeben wird.

53. Steuersystem nach einem der Ansprüche 50 bis 52, in welchem die Verpackungsmaschine eine Einrichtung zum Öffnen von Schachteln aufweist, welche während des Umstellungsvorganges ebenso angehalten wird.

54. Steuersystem nach Anspruch 53, in welchem der Ort der Bewegung von Entnahmemitteln in der Schachtelöffnungseinrichtung (90) vor dem Wiedereinschalten geändert wird, um der Einrichtung zu ermöglichen, Schachteln aus dem alternativen Magazin zu öffnen.

55. Steuersystem nach einem der Ansprüche 50 bis 54, in welchem der Aufnahmepunkt und der Ort der Entnahmemittel in der Schachtel in Eingriff nehmenden Einrichtung während der Umstellung geändert wird, um die Entnahme von Schachteln aus dem alternativen Magazin zu ermöglichen.

56. Steuersystem nach einem der Ansprüche 50 bis 55, in welchem die Geschwindigkeit des Vorschubs von Gegenständen, falls nötig, abhängig von der Größe oder dem Typ von Schachteln in jedem der Magazine veränderbar ist.

57. Steuersystem nach einem der Ansprüche 50 bis 56, in welchem die relativen Positionen und der Bewegungszustand jeder der beweglichen Komponenten unter Verwendung einzelner Sensoren (138) abgetastet und an die Steuereinrichtung (130) übertragen wird.

Revendications

1. Machine d'emballage (50) pour emballer des articles dans des cartons choisis parmi, au moins, un premier carton (10) ou un deuxième carton (30), lesdits premier et deuxième cartons étant d'un type ou d'une taille différent(e), lesdits cartons étant stockés dans au moins une trémie (58, 60), et saisis en vue du remplissage par un moyen d'accrochage de cartons adapté pour retirer les cartons de ladite au moins une trémie et les transporter séquentiellement jusqu'à une première position prédéfinie, d'où les cartons sont transférés jusqu'à une chaîne d'alimentation de papier (100) qui transporte les cartons jusqu'à une deuxième position prédéfinie, à partir de laquelle les cartons sont combinés avec lesdits articles, la chaîne d'alimentation de papier (100) comprenant un moyen de support portant une première chaîne sans fin (108) à laquelle est suspendu un premier ensemble d'oreilles de guidage (104) et une deuxième chaîne sans fin (110) à laquelle est suspendu un deuxième ensemble d'oreilles de guidage (106), lesdites oreilles de guidage étant interfoliées pour produire des zones de réception de carton, dont la longueur peut être modifiée, pour différent(e)s tailles ou types de cartons, en modifiant les positions relatives des premier et deuxième ensembles d'oreilles de guidage, et le

moyen de support étant mobile de telle manière que lorsque les positions relatives des oreilles sont modifiées, cette modification peut être compensée de telle manière que la position du premier ensemble d'oreilles par rapport à ladite première position prédéfinie n'est pas modifiée.

2. Machine d'emballage selon la revendication 1, dans laquelle la position relative des premier et deuxième ensembles d'oreilles de guidage (104, 106) est adaptée par une commande du moteur (140) qui alimente l'une des première et deuxième chaînes sans fin (108, 110).

3. Machine d'emballage selon la revendication 1 ou 2, dans laquelle la position dudit moyen de support est adaptée par la commande d'un vérin pneumatique (142, 148) qui positionne ladite structure.

4. Machine d'emballage selon l'une quelconque des revendications précédentes, comprenant un moyen de commande (130) qui commande le fonctionnement de chacun des composants de la machine pendant le fonctionnement et le passage entre cartons de différent(e) type ou taille.

5. Machine d'emballage selon l'une quelconque des revendications précédentes, comprenant une première trémie (58) pour stocker lesdits premiers cartons (10), et une deuxième trémie (60) pour stocker lesdits deuxièmes cartons (30), et un moyen de transfert (60) pour transférer les cartons de n'importe quelle trémie jusqu'à ladite première position prédéfinie, ledit moyen d'accrochage de cartons pouvant être actionné dans une première position pour prendre les cartons provenant de la première trémie et une deuxième position pour prendre les cartons provenant de la deuxième trémie.

6. Machine d'emballage selon la revendication 5, comprenant un moyen pour placer l'une desdites trémies (58, 60) dans une position fonctionnelle et un moyen de commande (130) pour choisir la position du moyen d'adaptation de cartons correspondant à la trémie fonctionnelle choisie.

7. Machine d'emballage selon la revendication 5 ou 6, dans laquelle ledit moyen de saisie et de transfert (66) de cartons peut tourner autour d'un axe fixe dans un trajet orbital.

8. Machine d'emballage selon la revendication 8, dans laquelle les première et deuxième positions de saisie sont situées en des points différents du trajet orbital.

9. Machine d'emballage selon l'une quelconque des revendications 6 à 8, comprenant un moyen pour placer l'une desdites trémies (58, 60) dans une position fonctionnelle sous la forme d'un cadre (62) monté sur un deuxième axe fixe (X-X) et où lesdites première et deuxième trémies sont montées sur le cadre, chaque trémie étant placée de manière opposée autour du deuxième axe fixe.

10. Machine d'emballage selon l'une quelconque des revendications 6 à 9, dans laquelle ladite trémie fonctionnelle est adjacente au trajet orbital dudit moyen de saisie et de transfert (66) de cartons.

11. Machine d'emballage selon l'une quelconque des revendications précédentes, comprenant un appareil pour extraire séquentiellement de ladite au moins une trémie (58, 60) des cartons pliés ayant des panneaux de contact de face placés en opposition et pour amorcer la mise en forme de ceux-ci dans un état à extrémités ouvertes, ledit appareil pouvant être actionné avec ledit moyen d'accrochage (67, 69) de cartons qui attrape séquentiellement l'un desdits panneaux de contact de face (34) et pour retirer de la trémie (58, 60) un carton plié qui comporte ledit un desdits panneaux de contact de face et transférer en orbite autour d'un axe fixe de ladite trémie à ladite première position prédéfinie, ledit appareil comportant un moyen d'accrochage de panneau (90) disposé à l'extérieur du trajet d'orbite pour attraper l'autre desdits panneaux de contact de face (32) afin de tirer ledit autre panneau de contact de face dans une direction s'éloignant du moyen de saisie et de transfert (66) de cartons pour amorcer de ce fait l'ouverture du carton.

12. Machine d'emballage selon la revendication 11, dans laquelle le moyen d'accrochage de panneaux est déplacé dans un premier plan par un servomoteur linéaire.

13. Machine d'emballage selon la revendication 11 ou 12, dans laquelle ledit moyen d'accrochage de panneaux est monté sur un élément coulissant (96) en une relation sensiblement perpendiculaire avec un rail de guidage (99) et où ledit élément coulissant est mobile par rapport audit rail de guidage grâce à quoi ledit moyen d'accrochage de panneaux est mobile dans deux plans.

14. Machine d'emballage selon la revendication 13, dans laquelle ledit moyen d'accrochage de panneaux est déplacé dans un deuxième plan par un autre servomoteur linéaire.

15. Machine d'emballage selon l'une quelconque des revendications 11 à 14, dans laquelle un moyen de commande (130) est adapté pour commander le mouvement du moyen d'accrochage de panneaux.

16. Machine d'emballage selon l'une quelconque des revendications 13 à 15, dans laquelle ledit moyen d'accrochage de panneaux comprend une ventouse (92) et un porte-ventouse (94) montés sur ledit élément coulissant (96), ladite ventouse étant reliée à une source de vide pendant ladite ouverture de carton.

17. Machine d'emballage selon l'une quelconque des revendications 11 à 16, dans laquelle lesdits panneaux de contact de face comprennent des parois latérales en opposition du carton.

18. Machine d'emballage selon l'une quelconque des revendications précédentes, comportant un moyen d'alimentation d'articles adapté pour faire avancer les articles à une vitesse prédéfinie le long d'un trajet d'alimentation en vue de la combinaison avec des cartons à une vitesse mesurée.

19. Machine d'emballage selon la revendication 18, dans laquelle le moyen d'alimentation d'articles comporte une paire de roues en étoile (126) qui récupère les articles provenant d'une première courroie d'alimentation et les déplace jusqu'à une deuxième courroie d'alimentation à ladite vitesse prédéfinie.

20. Machine d'emballage selon la revendication 19, dans laquelle des blocs de préhension (131) sont disposés sur les côtés opposés de ladite deuxième courroie d'alimentation pour récupérer un nombre prédéfini d'articles et les agencer en une unité individuelle destinée à être emballée dans un carton.

21. Procédé d'emballage d'articles dans des cartons comprenant les étapes consistant à :

a) choisir parmi, au moins, un premier carton (10) ou un deuxième carton (30), lesdits premier et deuxième cartons étant d'un type ou d'une taille différent(e), lesdits cartons étant stockés dans au moins une trémie (58, 60) ;
b) saisir des cartons en vue du remplissage en utilisant un moyen d'accrochage de cartons adapté pour retirer les cartons de ladite au moins une trémie et les transporter séquentiellement jusqu'à une première position prédéfinie ;
c) transférer lesdits cartons jusqu'à une chaîne d'alimentation de papier (100) qui transporte les cartons jusqu'à une deuxième position prédéfinie, à partir de laquelle les cartons sont combinés avec lesdits articles, la chaîne d'alimentation de papier (100) comprenant un moyen de support portant une première chaîne sans fin (108) à laquelle est suspendu un premier ensemble d'oreilles de guidage (104) et une deuxième chaîne sans fin (110) à laquelle est suspendu un deuxième ensemble d'oreilles de guidage, lesdites oreilles de guidage étant intercalées pour produire des zones de réception de carton, dont la longueur peut être modifiée, pour différent(e)s tailles ou types de cartons ;
d) modifier ladite longueur en modifiant les positions relatives des premier et deuxième ensembles d'oreilles de guidage (104, 106) ; et
e) déplacer le moyen de support lorsque les positions relatives des oreilles sont modifiées, de manière à compenser ladite modification, de telle manière que la position du premier ensemble d'oreilles par rapport à ladite première position prédéfinie n'est pas modifiée.

22. Procédé selon la revendication 21, dans lequel la position relative des premier et deuxième ensembles d'oreilles de guidage (104, 106) est adaptée par une commande de l'un des moteurs (140) qui alimentent les première et deuxième chaînes sans fin (108, 110).

23. Procédé selon la revendication 21 ou 22, dans lequel la position dudit moyen de support est adaptée par la commande d'un vérin pneumatique qui positionne ladite structure.

24. Procédé selon les revendications 21 à 23 utilisant un moyen de commande (130) qui commande le fonctionnement de chacun des composants de la machine pendant le fonctionnement et le passage entre cartons de différent(e) type ou taille.

25. Procédé selon l'une quelconque des revendications 21 à 24, dans lequel le moyen d'accrochage de cartons est positionné en vue d'attraper des cartons provenant d'une première trémie (58) dans une première position et est positionné en vue d'attraper des cartons provenant d'une deuxième trémie (60), dans une deuxième position, le moyen d'accrochage de cartons étant mobile entre lesdites première et deuxième positions.

26. Procédé selon la revendication 25, comprenant le fait de placer l'une desdites trémies (58, 60) dans une position fonctionnelle et de choisir la position du moyen d'accrochage de cartons correspondant à la trémie fonctionnelle choisie.

27. Procédé selon la revendication 25 ou 26, dans lequel ledit moyen de saisie et de transfert (66) de cartons peut tourner autour d'un axe fixe dans un trajet orbital.

28. Procédé selon la revendication 25, dans lequel les première et deuxième positions de saisie sont si-

tuées en des points différents du trajet orbital.

29. Procédé selon l'une quelconque des revendications 26 à 28 comprenant le fait de monter lesdites première et deuxième trémies (58, 60) sur un cadre (62) de telle manière que chaque trémie est placée de manière opposée autour d'un deuxième axe fixe.

30. Procédé selon l'une quelconque des revendications 26 à 29,
dans lequel ladite trémie fonctionnelle est adjacente au trajet orbital dudit moyen de saisie et de transfert de cartons en utilisation.

31. Procédé selon l'une quelconque des revendications 21 à 30 comprenant le fait d'extraire séquentiellement de ladite au moins une trémie (58, 60) des cartons pliés ayant des panneaux de contact (32, 34) de face placés en opposition et d'amorcer la mise en forme de ceux-ci dans un état à extrémités ouvertes, en attrapant séquentiellement l'un desdits panneaux de contact de face (34) et en retirer de la trémie un carton plié qui comporte ledit un desdits panneaux de contact de face et en transférant en orbite autour d'un axe fixe de ladite trémie jusqu'à ladite première position prédéfinie, ledit moyen d'accrochage de panneau (90) étant disposé à l'extérieur du trajet d'orbite pour attraper l'autre desdits panneaux de contact de face afin de tirer ledit autre panneau de contact de face (32) dans une direction s'éloignant du moyen de saisie et de transfert (66) de cartons pour amorcer de ce fait l'ouverture du carton.

32. Procédé selon la revendication 31, comprenant le fait de déplacer le moyen d'accrochage dans le premier plan au moyen d'un servomoteur linéaire.

33. Procédé selon la revendication 31 ou 32, comprenant le fait de monter ledit moyen d'accrochage de panneaux sur un élément coulissant (96) en une relation sensiblement perpendiculaire avec ledit rail de guidage (99) et de déplacer ledit élément coulissant par rapport audit rail de guidage grâce à quoi ledit moyen d'accrochage de panneaux est mobile dans deux plans.

34. Procédé selon la revendication 33, comprenant le fait de déplacer ledit moyen d'accrochage de panneaux dans un deuxième plan au.moyen d'un servomoteur linéaire.

35. Procédé selon l'une quelconque des revendications 31 à 34, dans lequel un moyen de commande (130) est adapté pour commander le mouvement du moyen d'accrochage de panneaux.

36. Procédé selon l'une quelconque des revendications 31 à 35, dans lequel ledit moyen d'accrochage de panneaux comprend une ventouse (92) et un porte-ventouse (94) montés sur ledit élément coulissant (96), et relie ladite ventouse à une source de vide pendant ladite ouverture de carton.

37. Procédé selon l'une quelconque des revendications 31 à 36, dans lequel lesdits panneaux de contact de face comprennent des parois latérales en opposition du carton.

38. Procédé selon l'une quelconque des revendications 31 à 37, comprenant le fait de placer un moyen d'alimentation d'articles pour faire avancer les articles à une vitesse prédéfinie le long d'un trajet d'alimentation en vue de la combinaison avec des cartons à une vitesse mesurée.

39. Procédé selon la revendication 38, comprenant le fait d'utiliser une paire de roues en étoile (126) pour récupérer les articles provenant d'une première courroie d'alimentation et les déplacer jusqu'à une deuxième courroie d'alimentation à une vitesse prédéfinie.

40. Procédé selon la revendication 39, comprenant le fait de disposer des blocs de préhension (131) sur les côtés opposés de ladite deuxième courroie d'alimentation pour récupérer un nombre prédéfini d'articles et les agencer en une unité individuelle destinée à être emballée dans un carton.

41. Moyen de commande (130) pour une machine d'emballage selon l'une quelconque des revendications 1 à 20, le moyen de commande comprenant un processeur central (132), un moyen d'entrée manuelle (134), et un moyen séparé commandé par ledit processeur central pour positionner individuellement les premier et deuxième ensembles d'oreilles de guidage (104, 106) et le moyen de support portant lesdites oreilles de guidage sur la chaîne d'alimentation de papier (100).

42. Moyen de commande selon la revendication 41, dans lequel le moyen pour positionner le moyen de support est un vérin pneumatique (142, 148).

43. Moyen de commande selon la revendication 41 ou 42, destiné à être utilisé avec une machine d'emballage comportant deux trémies (58, 60) auxquelles accède un seul moyen d'accrochage de cartons, dans lequel le moyen de commande (130) comprend un moyen pour positionner le moyen d'accrochage de cartons dans une première position pour attraper des cartons dans ladite première trémie et une deuxième position pour attraper des cartons dans ladite deuxième trémie.

44. Moyen de commande (130) selon la revendication 43, dans lequel le moyen pour positionner le moyen d'accrochage de cartons peut être actionné pour positionner le moyen d'accrochage dans une troisième position, à partir de laquelle le moyen d'accrochage de cartons ne peut attraper de cartons dans aucune des trémies (58, 60).

45. Moyen de commande selon la revendication 43 ou 44, dans lequel ledit moyen pour positionner le moyen d'accrochage de cartons est un vérin pneumatique (142, 148).

46. Moyen de commande selon l'une quelconque des revendications 43 à 45, destiné à être utilisé avec une machine d'emballage comportant un moyen d'ouverture (90) pour ouvrir les cartons pris dans chaque trémie, le lieu de déplacement du moyen de saisie sur ledit moyen d'ouverture (90) pouvant être modifié de sorte que le moyen d'ouverture peut ouvrir des cartons pris dans n'importe laquelle des trémies.

47. Moyen de commande selon la revendication 46, dans lequel le moyen de commande (130) comprend des servomoteurs orientés selon X et Y.

48. Moyen de commande selon l'une quelconque des revendications 41 à 47, destiné à être utilisé avec une machine d'emballage comportant un moyen d'alimentation d'articles sous la forme d'une roue en étoile (126), le moyen de commande (130) commandant la vitesse de rotation de la roue en étoile.

49. Moyen de commande selon la revendication 48, dans lequel le moyen de commande (130) commande un moteur (140) qui fait tourner la roue en étoile (126).

50. Système de commande pour commander le fonctionnement d'une machine d'emballage selon l'une quelconque des revendications 1 à 20, afin de passer de premiers cartons (10) présents dans une première trémie (58) à des deuxièmes cartons (30) présents dans une deuxième trémie (60), comprenant les étapes consistant à :

a) arrêter la saisie de cartons par le moyen d'accrochage de cartons ;
b) faire continuer la chaîne d'alimentation de papier (100) jusqu'à ce qu'elle ne comporte plus de carton ;
c) arrêter la chaîne d'alimentation de papier (100) ;
d) arrêter l'alimentation en articles ;
e) repositionner le moyen d'accrochage de cartons et les trémies pour permettre la saisie dans l'autre trémie ;
f) modifier la position relative des premier et deuxième ensembles d'oreilles de guidage (104, 106) dans ladite chaîne d'alimentation de papier ;
g) modifier la position du moyen de support par rapport à ladite première position prédéfinie ; et
h) redémarrer le processus de saisie et de transport de cartons et l'alimentation en articles.

51. Système de commande selon la revendication 50, dans lequel l'instruction de changement est lue dans un programme de commande préenregistré.

52. Système de commande selon la revendication 50, dans lequel l'instruction de changement est entrée manuellement dans un moyen de commande (130).

53. Système de commande selon l'une quelconque des revendications 50 à 52, dans lequel la machine d'emballage comporte un moyen pour ouvrir les cartons, qui est également arrêté pendant le processus de changement.

54. Système de commande selon la revendication 53, dans lequel le lieu de déplacement d'un moyen de saisie dans ledit moyen d'ouverture (90) de cartons est modifié avant le redémarrage pour permettre au moyen d'ouvrir des cartons provenant de ladite autre trémie.

55. Système de commande selon l'une quelconque des revendications 50 à 54, dans lequel le point de saisie et le lieu du moyen de saisie dans le moyen d'accrochage de cartons est modifié pendant le changement pour permettre la saisie de cartons provenant de l'autre trémie.

56. Système de commande selon l'une quelconque des revendications 50 à 55, dans lequel la vitesse d'alimentation des articles peut être modifiée à volonté en fonction de la taille ou du type de cartons présents dans chacune desdites trémies.

57. Système de commande selon l'une quelconque des revendications 50 à 56, dans lequel les positions relatives et l'état de déplacement de chacun des composants mobiles sont relevés en utilisant des capteurs individuels (138) et transmis au moyen de commande (130).

FIG. 1a

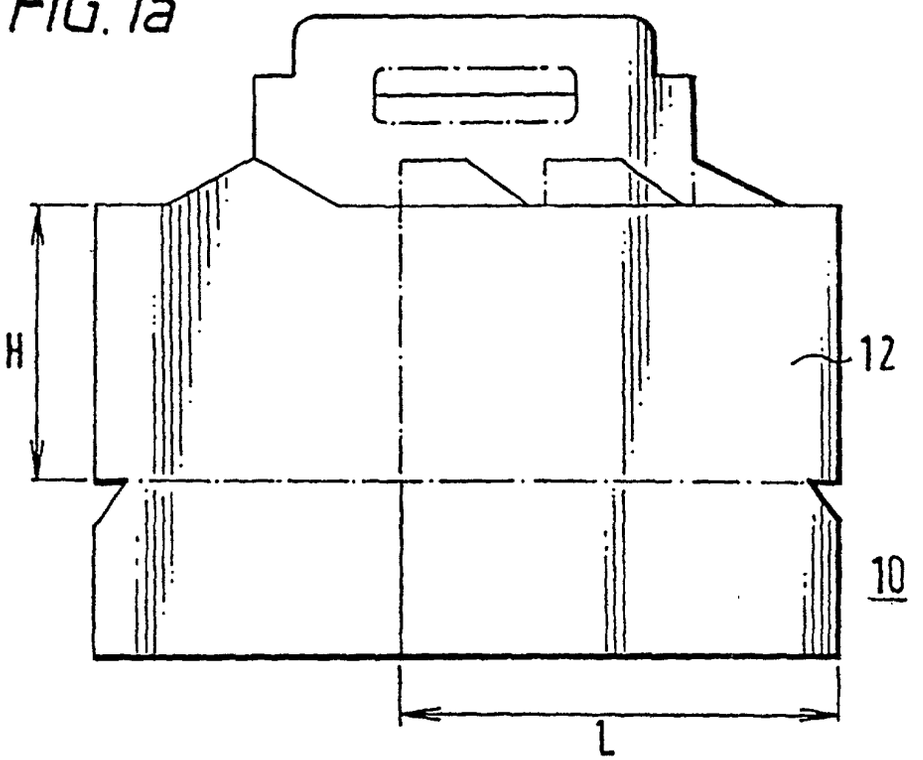


FIG. 1b

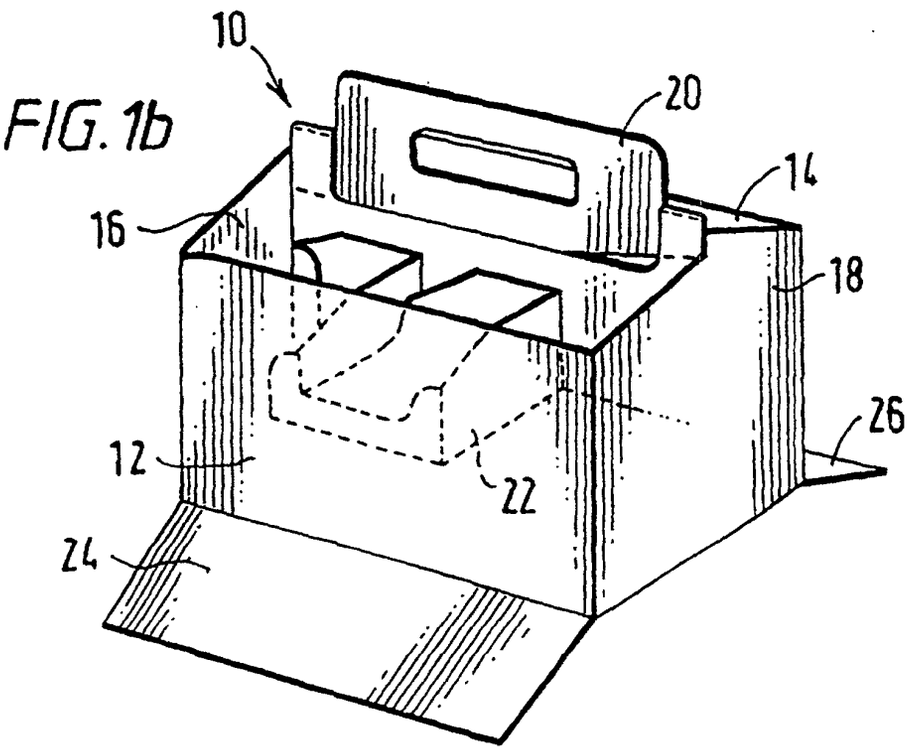


FIG. 2a

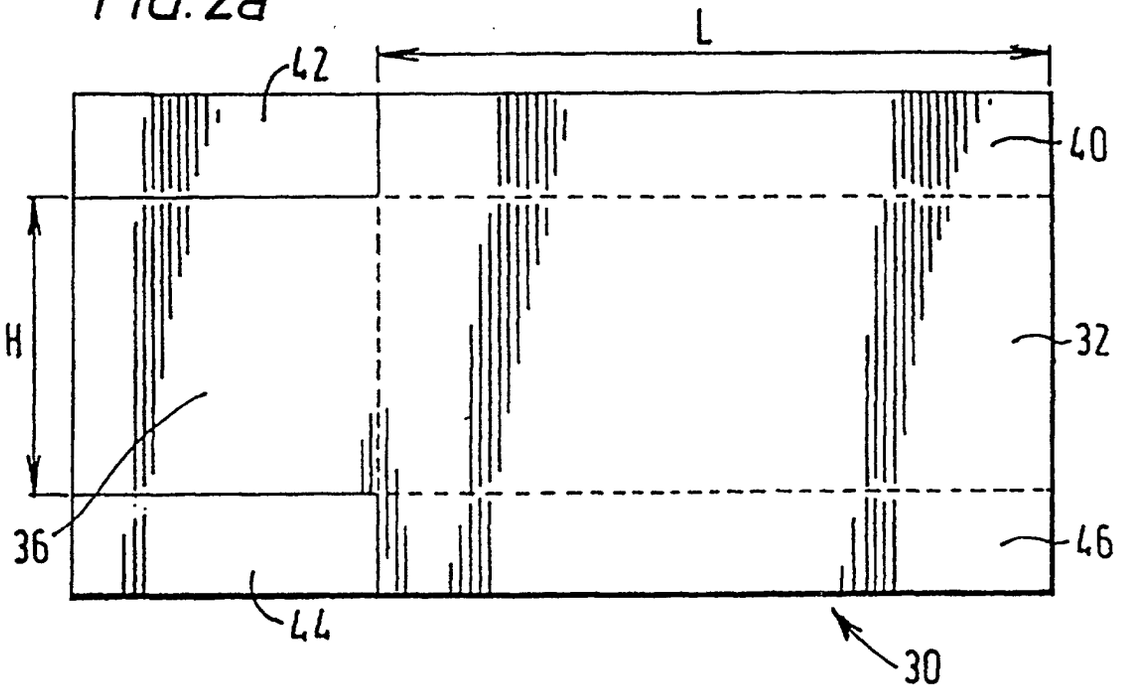


FIG. 2b

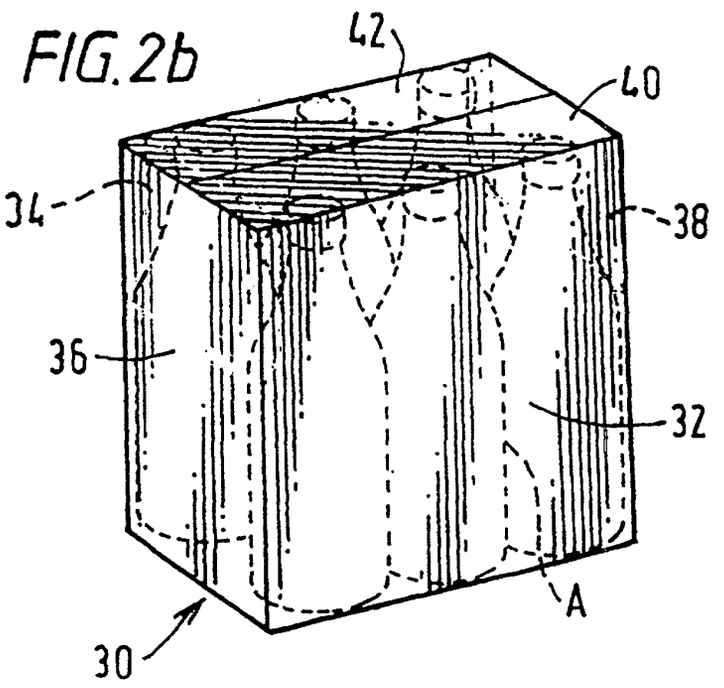


FIG.3a

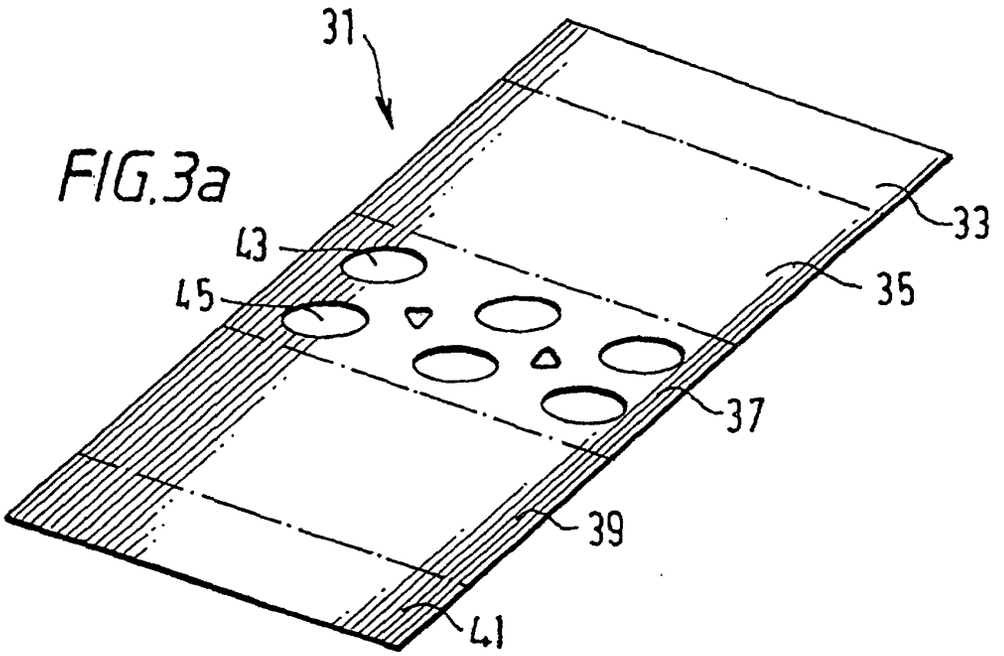
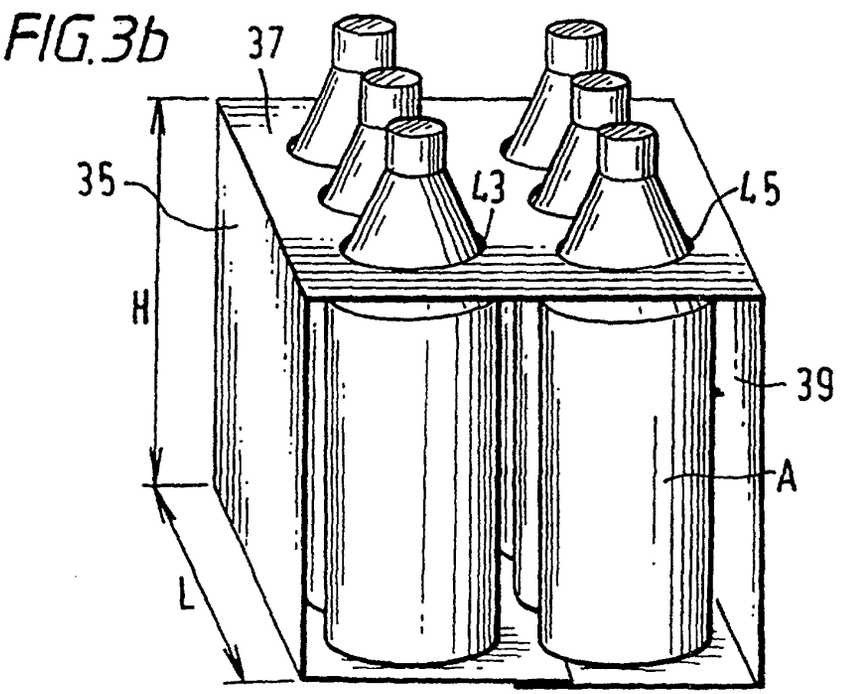
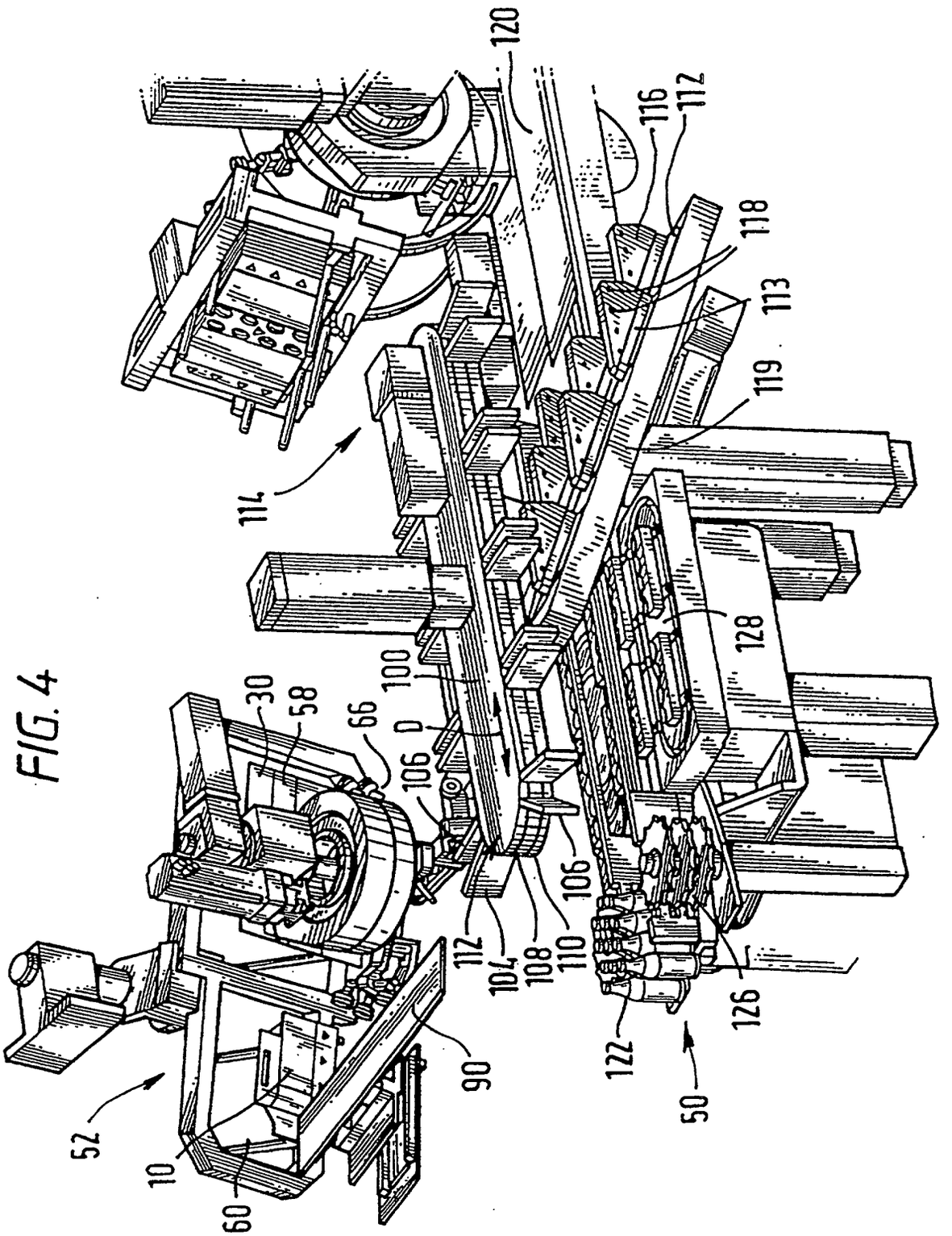


FIG.3b

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116
112
118
113
119
114
128
100
30
58
66
106
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112
104
108
110
126
122
50
90
52
10
60

FIG. 4

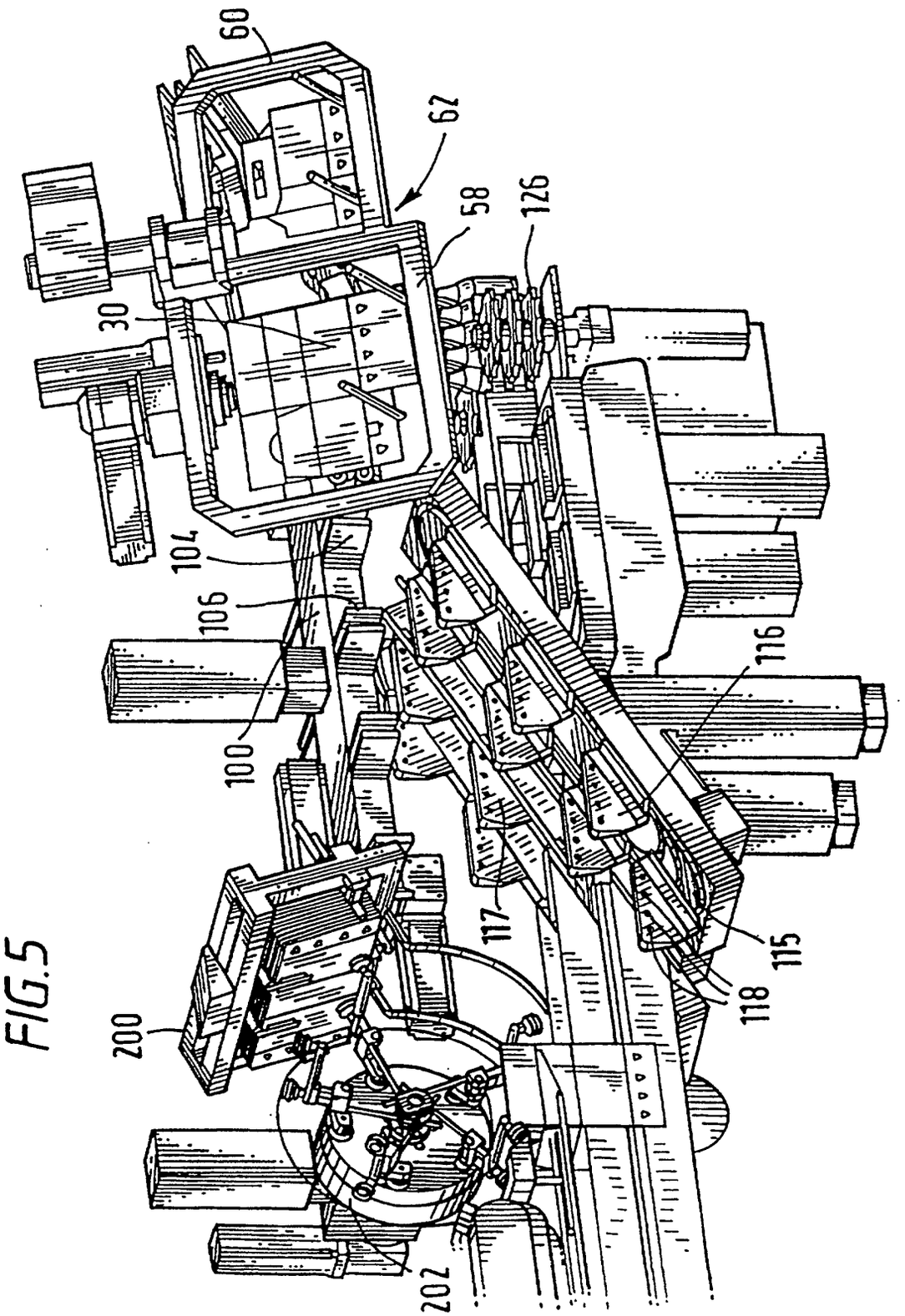


FIG.5

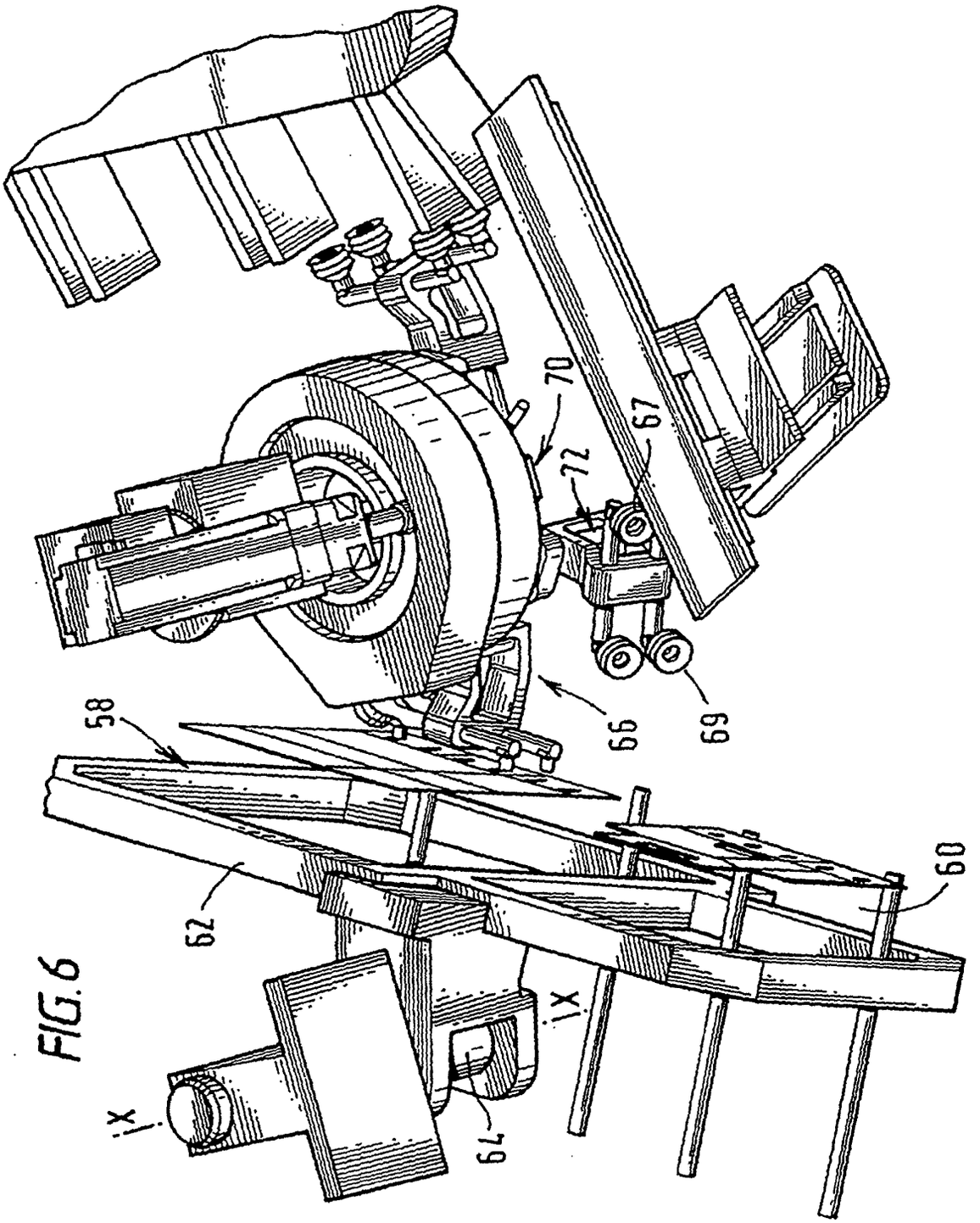


FIG.6

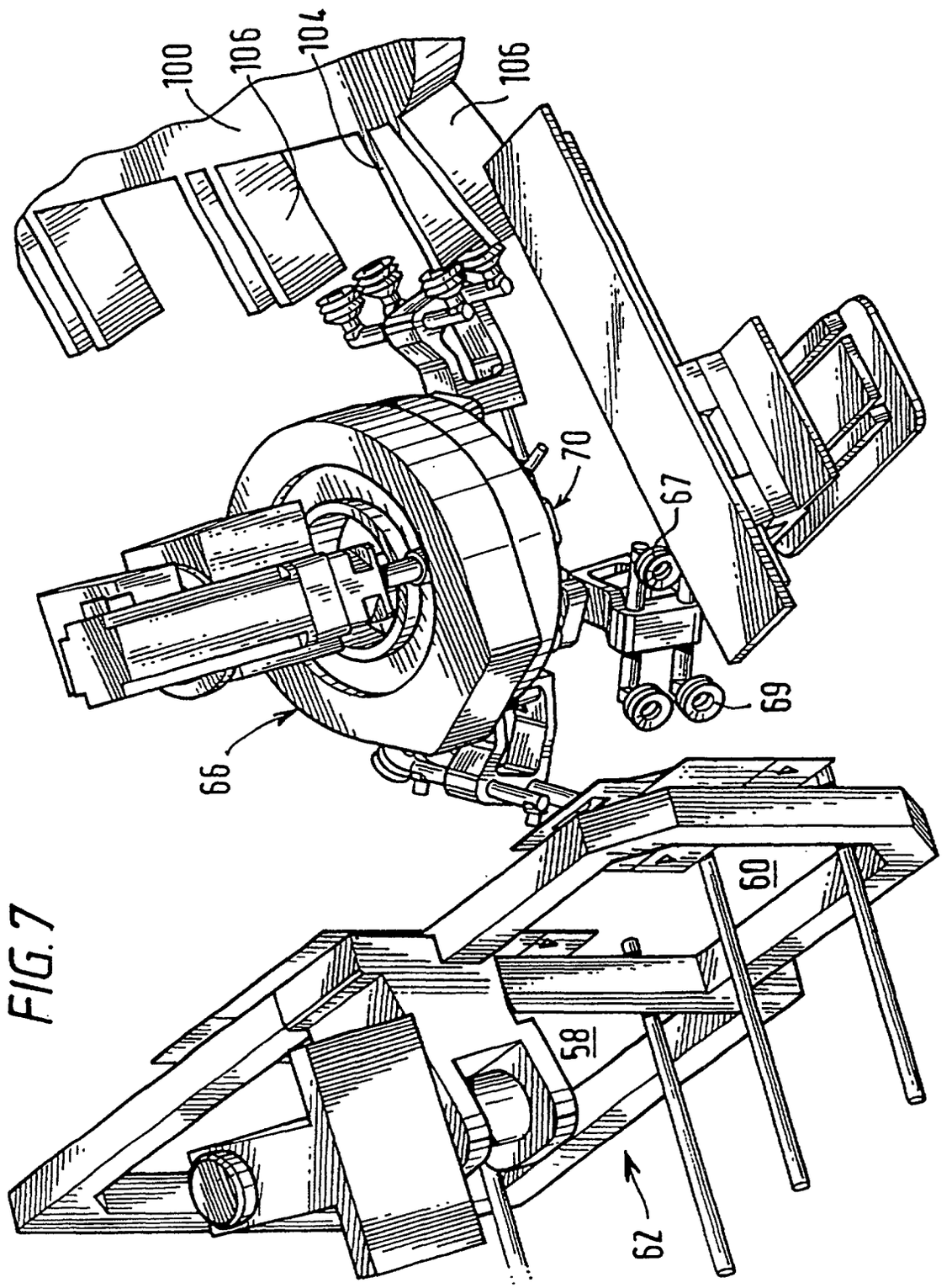


FIG.7

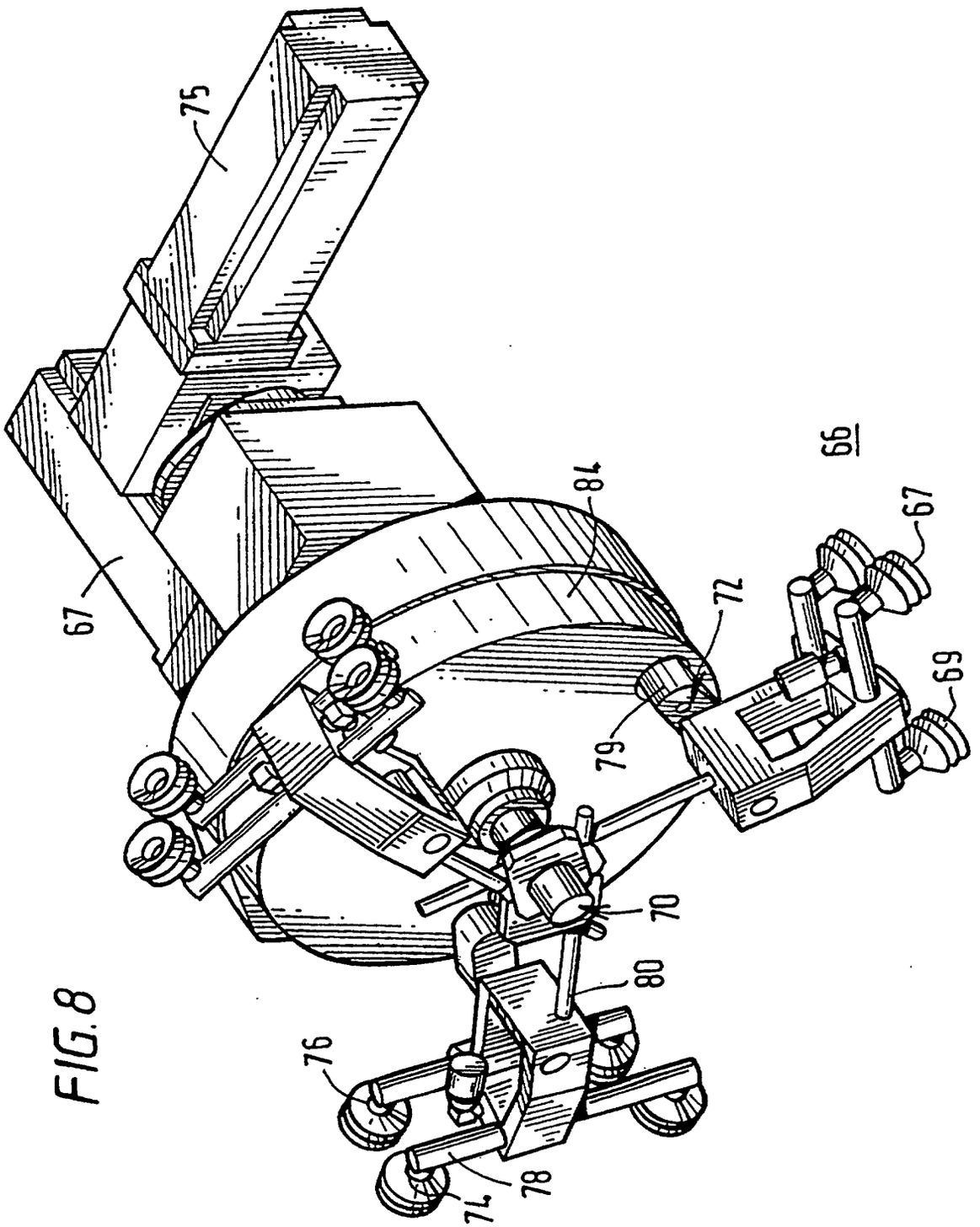
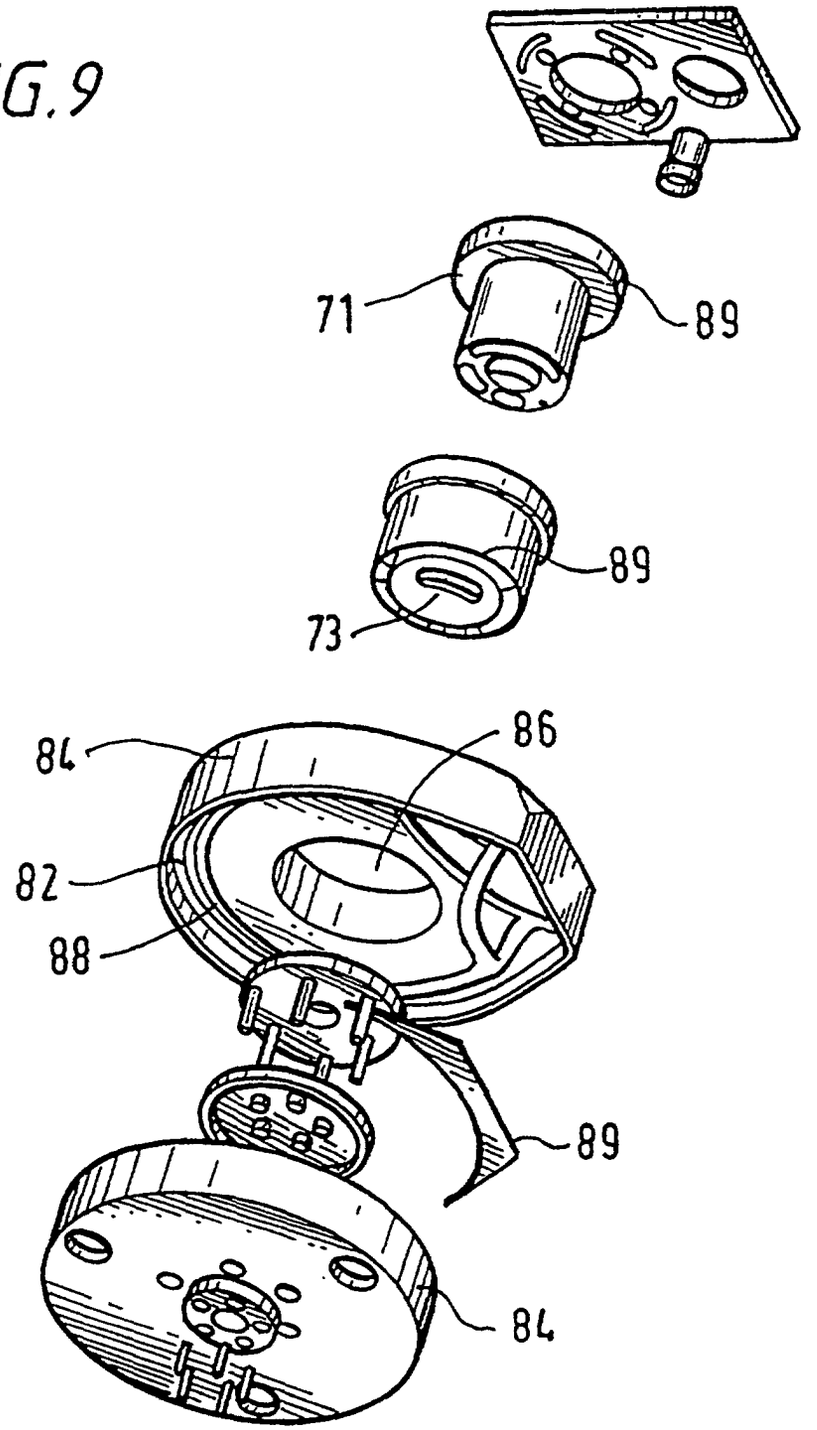


FIG.8

FIG. 9



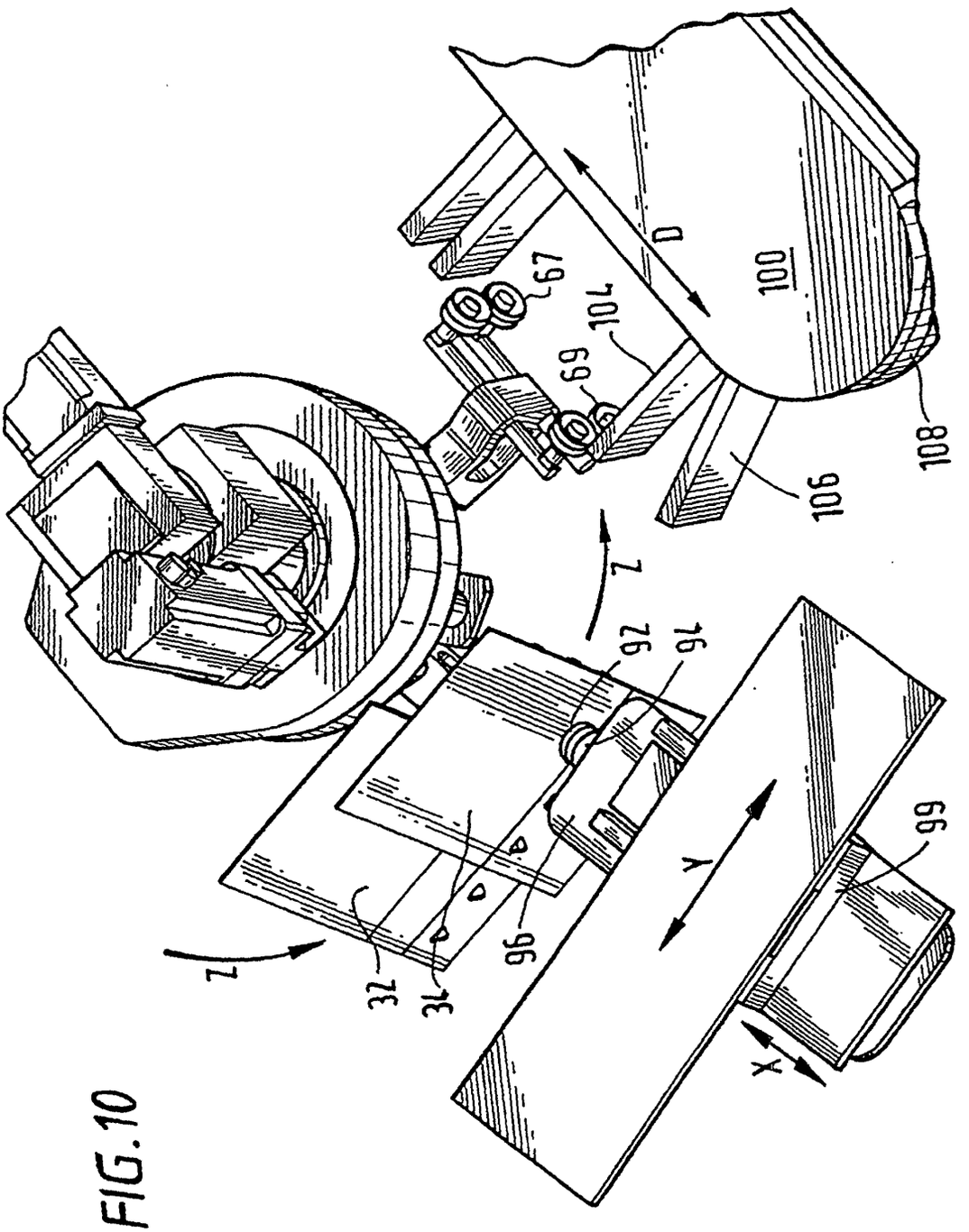


FIG.10

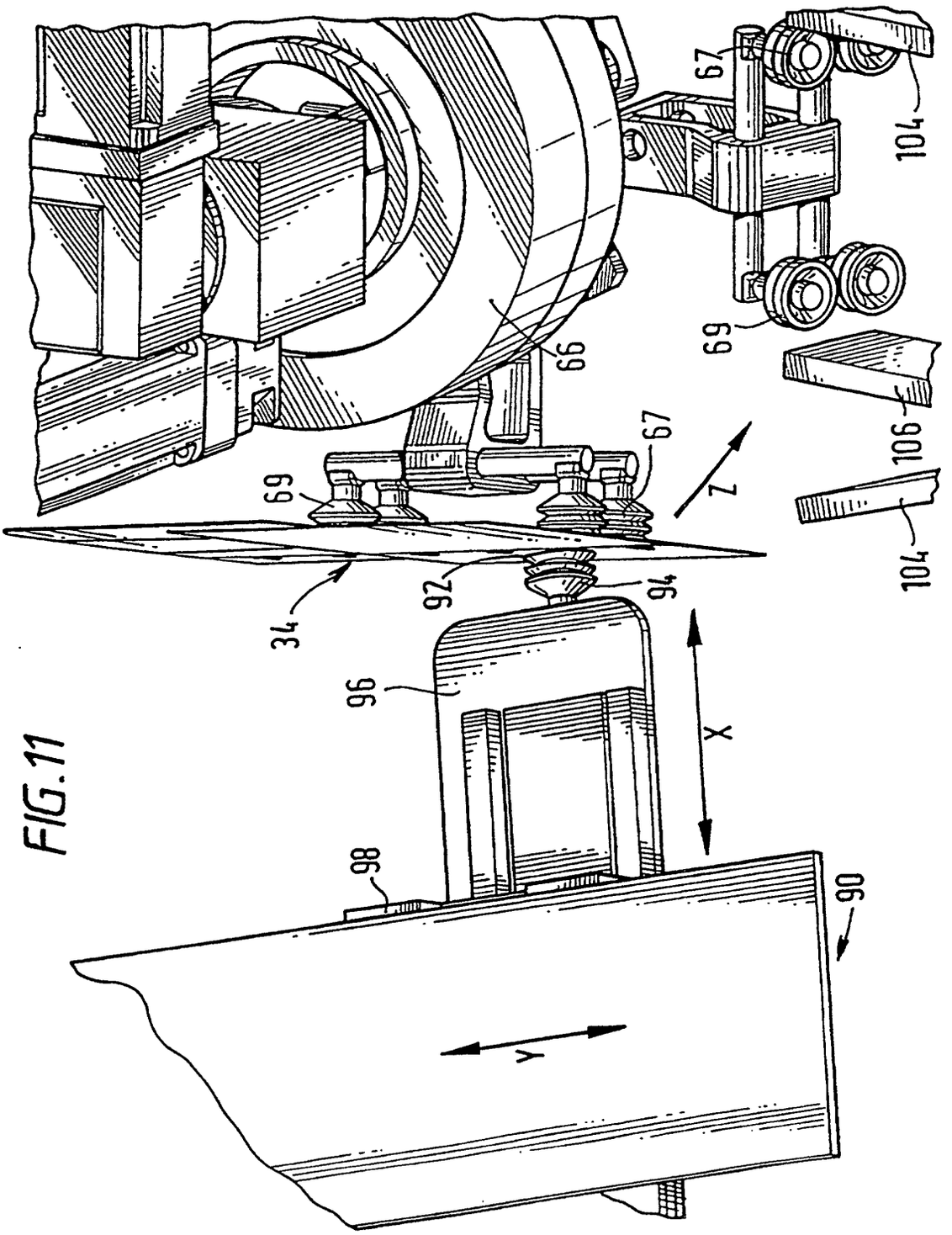


FIG.11

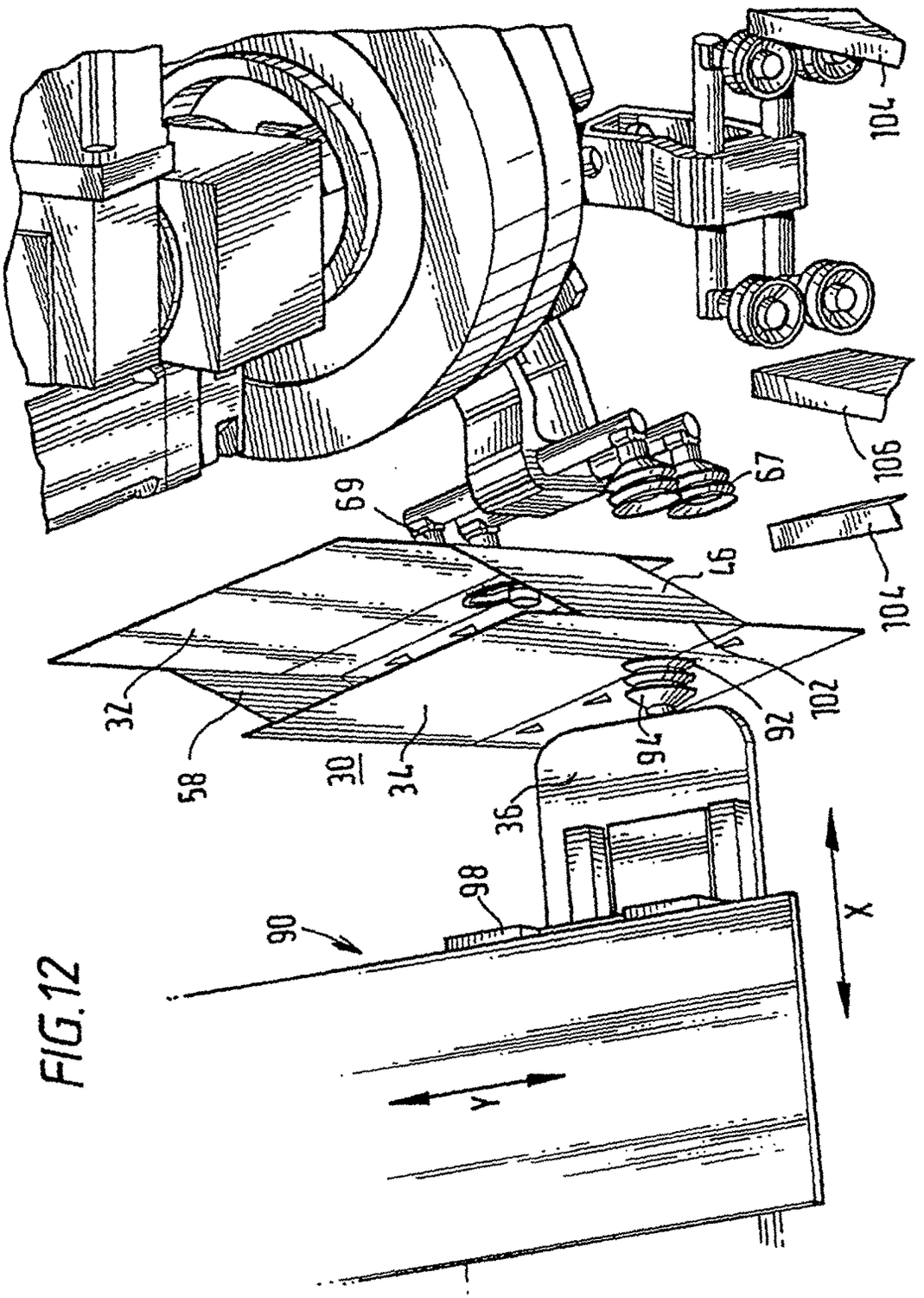


FIG.12

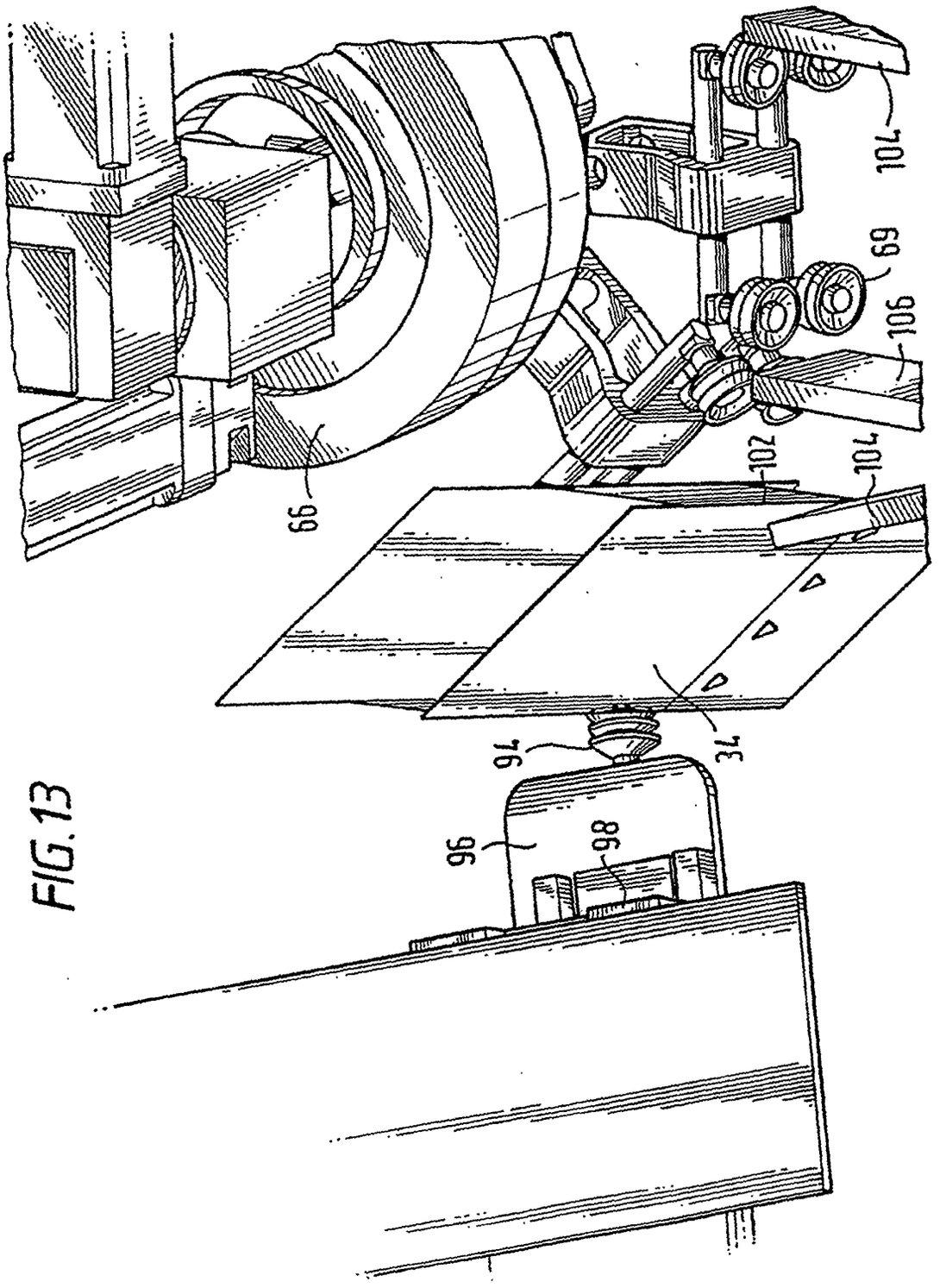
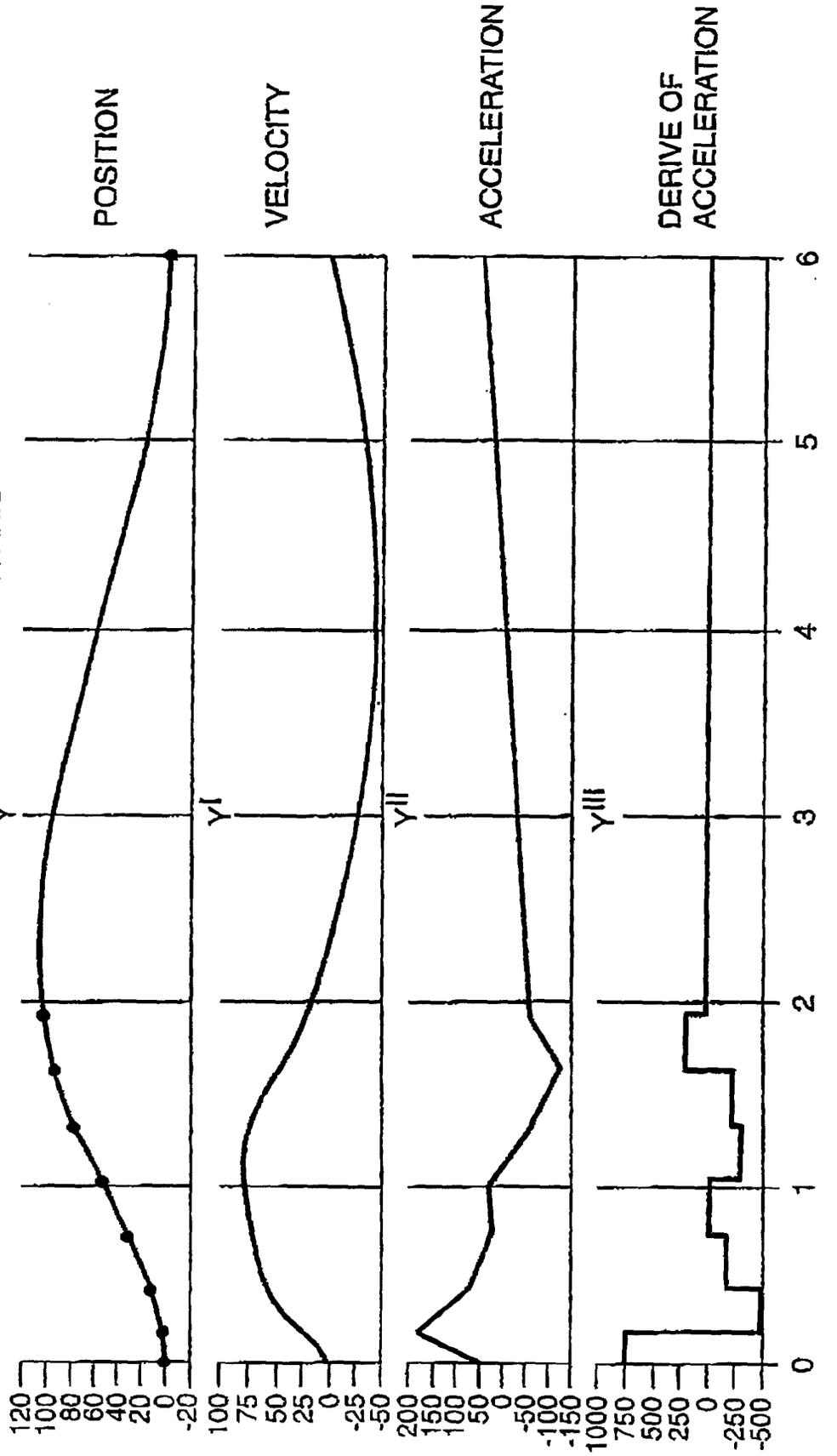


FIG. 13

FIG.14


POSITION
VELOCITY
ACCELERATION
DERIVE OF ACCELERATION
X AXIS
Y
Y'
Y''
Y'''
120
100
80
60
40
20
0
-20
100
75
50
25
0
-25
-50
200
150
100
50
0
-50
-100
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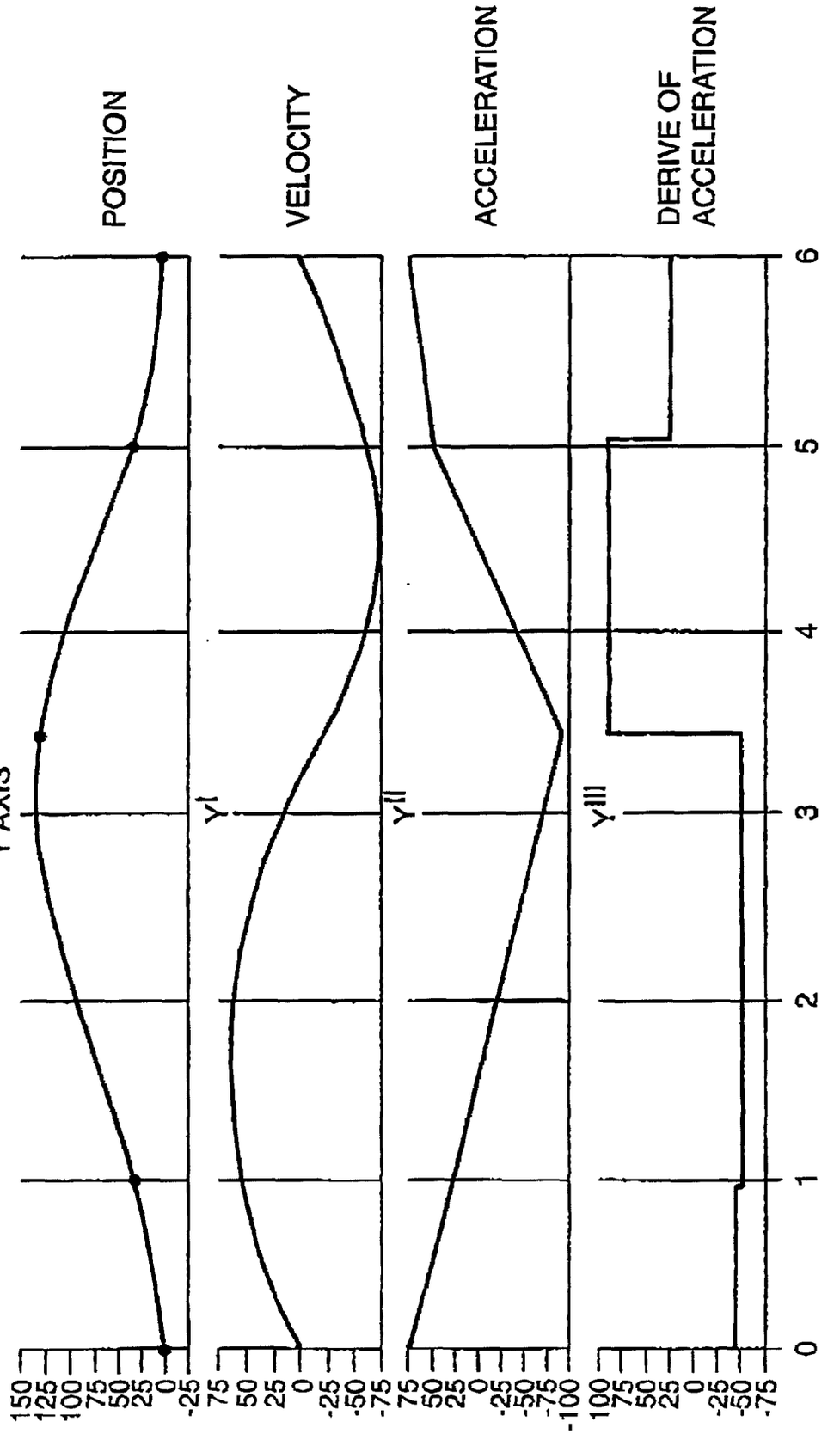
0
1
2
3
4
5
6

FIG.15


POSITION
VELOCITY
ACCELERATION
DERIVE OF ACCELERATION
Y AXIS
Y'
Y''
Y'''
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125
100
75
50
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-25
75
50
25
0
-25
-50
-75
75
50
25
0
-25
-50
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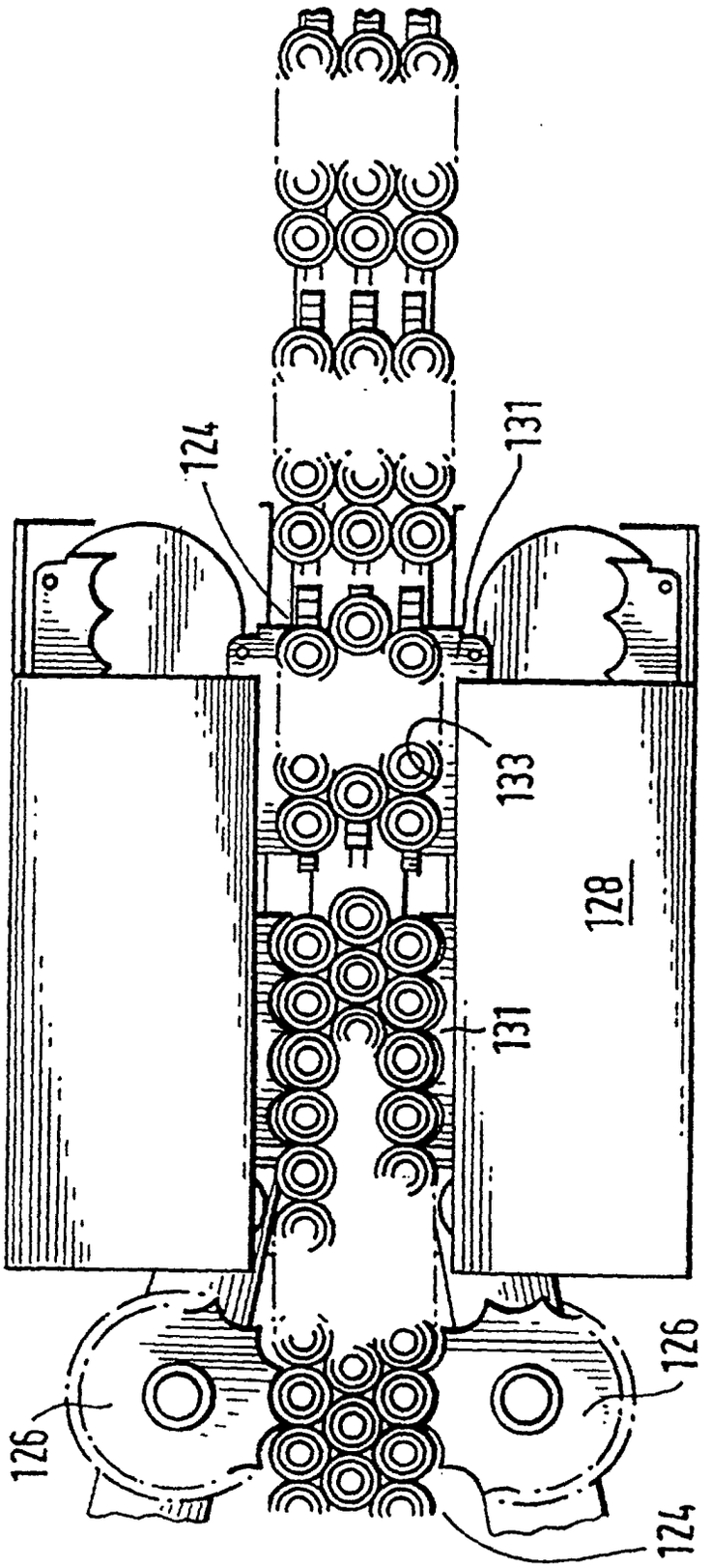
2
3
4
5
6

FIG.16



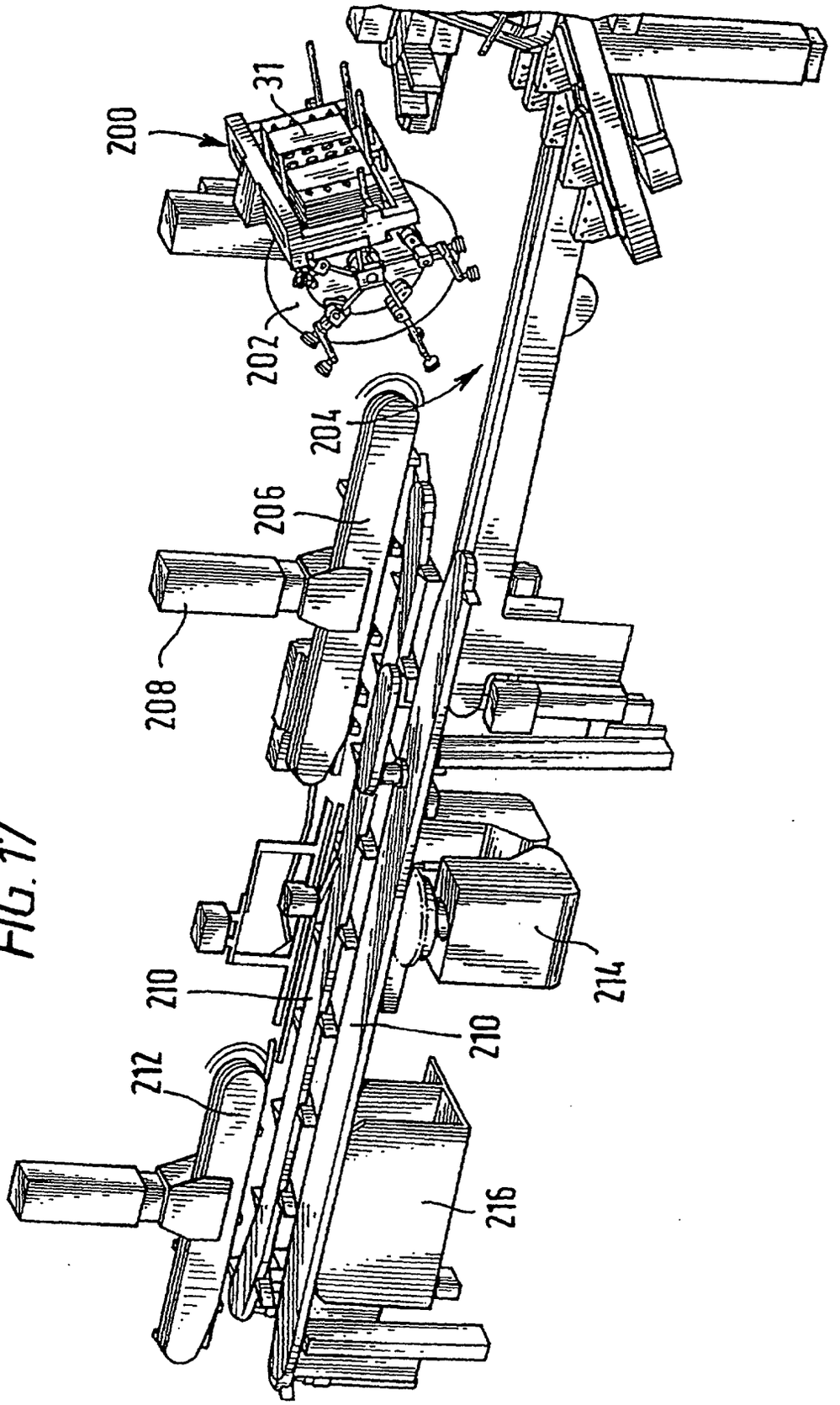


FIG. 17

FIG. 18

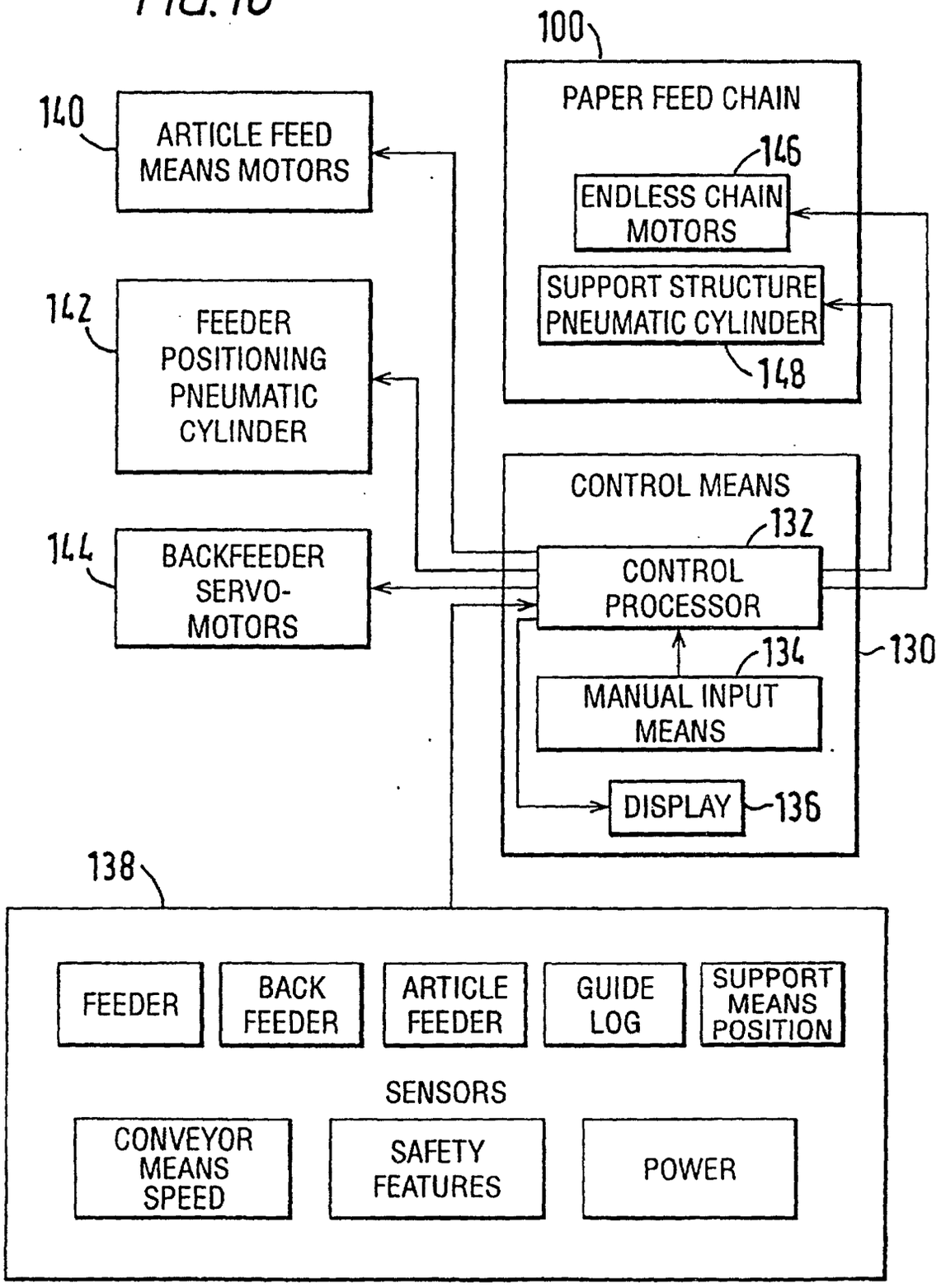
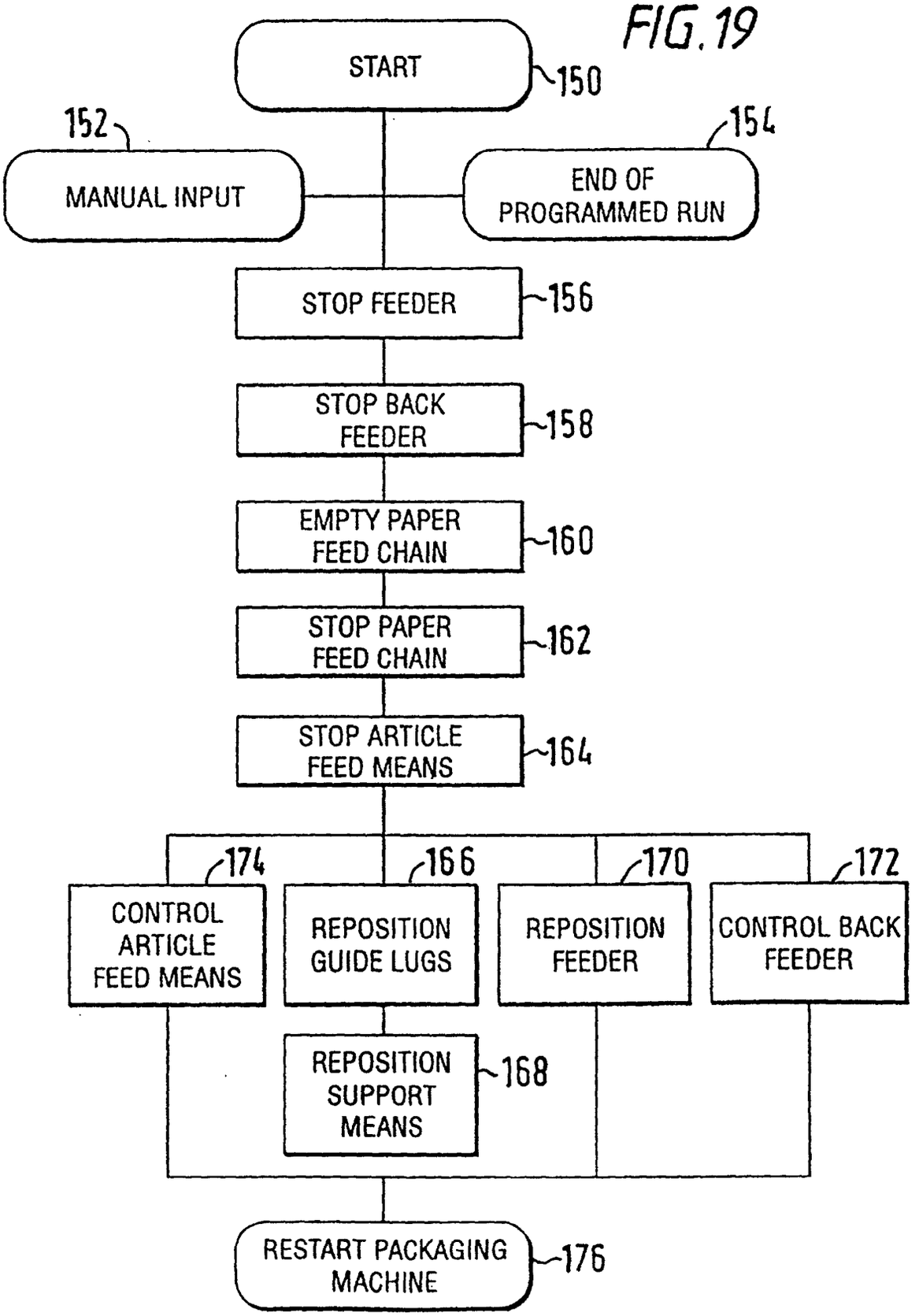

100
PAPER FEED CHAIN
146
ENDLESS CHAIN MOTORS
SUPPORT STRUCTURE PNEUMATIC CYLINDER
148
140
ARTICLE FEED MEANS MOTORS
142
FEEDER POSITIONING PNEUMATIC CYLINDER
144
BACKFEEDER SERVO-MOTORS
CONTROL MEANS
132
CONTROL PROCESSOR
134
MANUAL INPUT MEANS
DISPLAY
136
130
138
FEEDER
BACK FEEDER
ARTICLE FEEDER
GUIDE LOG
SUPPORT MEANS POSITION
SENSORS
CONVEYOR MEANS SPEED
SAFETY FEATURES
POWER

FIG. 19


START
150
152
MANUAL INPUT
154
END OF PROGRAMMED RUN
STOP FEEDER
156
STOP BACK FEEDER
158
EMPTY PAPER FEED CHAIN
160
STOP PAPER FEED CHAIN
162
STOP ARTICLE FEED MEANS
164
174
CONTROL ARTICLE FEED MEANS
166
REPOSITION GUIDE LUGS
170
REPOSITION FEEDER
172
CONTROL BACK FEEDER
REPOSITION SUPPORT MEANS
168
RESTART PACKAGING MACHINE
176