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(71) Applicant: **MATSUSIMA ELECTRICAL MACHINERY CO. LTD.**
1-12 Ohtemon-1-chome,
Chuo-ku
Fukuoka-shi,
Fukuoka-ken 810 (JP)
Applicant: **S.S.A. PACKAGING ENGINEERING & CONSULTANT PTY. LTD.**
3 Church Street
Woolooware, N.S.W. 2230 (AU)

(72) Inventor: **AKO, Shigeichi**
3/7 Whitewood Place
Caringbah, NSW 2229 (AU)
Inventor: **HIRASHIMA, Masaji , Ohshima Factory of Matsusima Electrical Machinery Co., Ltd.,**
1813, Ohshima-cho
Nishisonogi-gun,
Nagasaki 857-24 (JP)
Inventor: **MORITA, Masaharu**
5-9, Honta 3-chome
Urawa-shi,
Saitama 336 (JP)

(74) Representative: **Jones, Andrée Zena et al**
CRUIKSHANK & FAIRWEATHER
19 Royal Exchange Square
Glasgow, G1 3AE
Scotland (GB)

(54) **METHOD OF AND AN APPARATUS FOR STORING BAGGED OR BOXED ARTICLES IN PACKING BOXES.**

(57) The invention provides a method of and an apparatus for storing commodities such as snack food or dry food in a packing box in a manner of vertical packing, said method and apparatus serving as a measure for preventing breakage of the commodities during physical distribution such as transportation and storage. In the method and apparatus, bagged or boxed articles conveyed in succession in a horizontal posture are arranged one by one in a longitudinal direction (vertical direction) at a feed end of an alignment conveyor while being successively changed in a posture to stand vertical. Then a predetermined number of the lined-up articles are pushed together laterally away from the conveyor, and the pushed articles are caught at the front and the rear to be vertically stored in a packing box as they are kept in such a posture.

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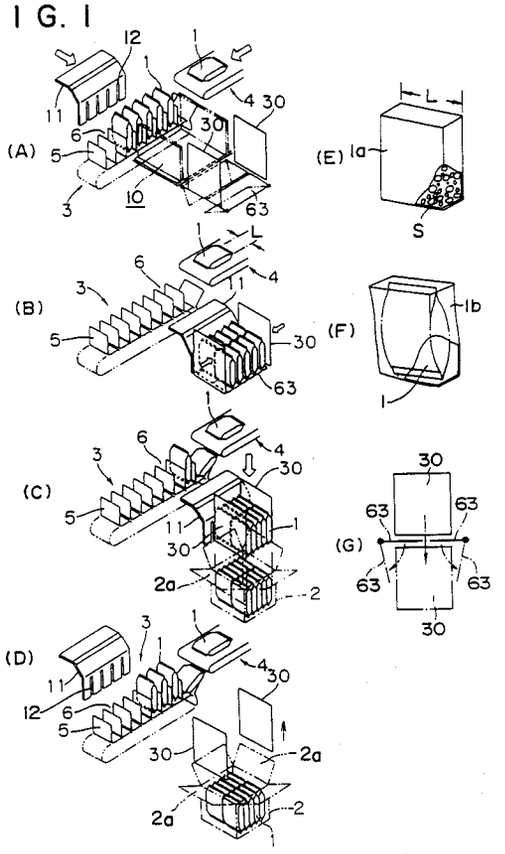
FIG. 1



TECHNICAL FIELD

The present invention relates to the method and apparatus for packing bagged or boxed products (commodities) or more precisely the method and apparatus for automatically packing some of the so called flexible bags or small cardboard made boxes (carton) containing snack foods or the like, such as potato chips or popcorn and so on, together into containers such as a corrugated carton or a dozen box (referred to as a display case in English spoken zone) while bags or boxes are in a condition to be aligned in an orderly way and especially the method and apparatus for packing the above mentioned bagged or boxed products into the cartons in the condition of or ranging them in a column (vertically).

BACKGROUND OF THE INVENTION

Before the transportation, storage or dealing with the bagged or boxed products (hereinafter they may simply be referred to as "products" or "the related product") such as the above, it obtains a wide circulation to pack the specified number of the products together into the containers such as a corrugated carton or a dozen case or the like. In other words, for example, the dry snack foods such as potato chips, popcorn, corn snacksand so on or the dry foods such as powdered soup squares or seasoned dry spaghetti and so on are generally packed in a flexible plastic bag first and then some of the bags are packed together into a corrugated carton and are shipped. However, since the above snack foods originally have the undesirable featare of being easily broken, they are apt to be broken with ease by receiving an external shock so as to lose their product value. This tendency does not change even if the above foods are packed into a flexible bag. Furthermore, in the case of the snack foods being packed into a cardboard carton, they become a little bit hard to be broken but there is no essential or substantial difference in the tendency to be broken easily.

Since the above snack foods originally have the featare of being easily broken as already mentioned, the snack foods or dry foods inside the bag are protected from being broken by external pressure or the like by usually sealing air or nitrogen gas in together with the contents at the time of packing them. Furthermore, there is a case that the contents of products are protected from being broken by packing the softly packed bags like the above into a cardboard carton again. However, there are the following problems for packing the bagged or boxed products of the specified number together into containers such as a corrugated carton case or the like, transporting, delivering, storing or handling of them. Namely, if corrugated cartons are piled up, they may gradually be deformed by their deadweight as time passes, which affects the related products and damages the snack foods themselves packed in the cartons. Moreover, the gas which has been sealed in the bags leaks as time passes or the temperature decreases from that at the time of sealing gas as time passes so that the reoccurs non-conformance such as the breakage of products in the bags to be affected by the external pressure due to their shrinkage. Therefore,the problem of reducing the product value because of the damage of the products often occurs.

[Object of the invention]

The present invention aims at the prevention of the above mentioned various problems from occurring in advance and to be more detailed, aims at the avoidance of damage due to the deformation,shock and vibration of cartons during the physical distribution such as transportation, storage and so on of products such as snack foods, dry foods or the like.

Incidentally, the damage seems to be reduced by the following reasons if the products concerned are packed in condition of standing up straight (hereinafter referred to as "vertical packing") inside the carton.If the bagged or boxed snack foods are packed in condition of vertical packing, the fragile snackfoods or dry foods or the like get together at the bottom of bags or boxes so that some space is generated at their top which works as a buffer zone against the shock from the upperside. Accordingly, their damage seems to be reduced. In other words, this is the idea that less damage occurs by vertical packing than that when packing in a horizontal condition(horizontal packing).

The method (or apparatus) of vertical packing of the products concerned into the carton based on this way of thinking has been tried to be applied for some time and this method itself has already been known from the past but no satisfactory result has yet been obtained so far. The detailed description on this will be made in the following.

So far as the inventor of the present invention knows, the invention described in Japan Patent Disclosure Heisei No.5-193602 and the apparatus exhibited by the U.S. Woodman Corp. at the Packing Machinery Exhibition sponsored by Packaging Machinery Manufacture Institute are some examples to be cited for the conventional method or the conventional type. As shown in FIG.16(A), the former is the method and apparatus in which the bagged or boxed product 1 is transmitted to the specified transferring location a with belt-conveyor 4 in lying condition (horizontal condition) where

the above product is adhered by suction with vacuum pad b , moved over cage c which is a little smaller than the inside dimension of carton 2, piled up in a lying condition of multiple stages inside the cage and then the piled-up products are pushed with cage piercing pusher d into carton 2 which stands by with its cover opened and in condition of lying sideways [refer to FIG.16(A)].After packing the products into the carton in this way, the "vertical packing" of products can be realized by turning the carton by 90 °

As shown in FIG.16(B), the latter is the method and apparatus in which the bagged or boxed product is also transmitted to the specified location with belt-conveyor 4 in a horizontally lying condition, accumulated until the products increase to the specified number which are adhered with vacuum chamber f standing by over them, turned by 90 ° to the direction shown with an arrow mark while being held by suction and placed into cage c in vertical packing condition and then the products are accumulated in multi-rows by repeating the same operation. In addition to the above, the latter method also includes the operation in which the product group of the specified number is taken out of the cage by lifting them up with pusher d provided below the above mentioned cage and at the same time the above mentioned product group is held with the chuckstanding by over them and packed into the carton in the vertical packing condition.

In either methods or apparatuses mentioned above,judging from the standpoint of packing efficiency until the completion of packing the product group into the carton, the results are not always satisfactory because of some problems like the time until the completion of packing is comparatively too long or the number of processes until the completion of packing is too many and they can not deal with changes to the size of the above products.

Furthermore, as for the packing condition of products, they are not closely packed to each other but comparatively loosely. In other words, since the products can not be tightly packed but they are just inserted into the carton, more contents than the desirable amount come down to the bottom to cause a loss of product shape so that there occurs non-conformance.Resulting in their exhibition effect is deteriorated when they are displayed in the showcase of shops.

Moreover, in the case of either conventional methods and apparatuses mentioned above,since the products are transmitted to the cage for a time and then forwarded to the carton, it is impossible to closely pack the products to each other(in tight condition) into the carton. Therefore, the problem of breakage of snack foods inside t he product bags or boxes by hitting each other during their transportation oeews and needs to be solved. In addition to the above, since it is required to place the products into the cage for a time before they are packed into the carton which is the final physical distribution form, the number of processes is another problem that a part of the products may fall from their group while taking them out of the cage. Furthermore, due to the above problems, it is impossible to place so many products in multiple stages inside the cage. Accordingly,due to the various reasons mentioned above, there is non-conformance in that the dimensions of the carton in the conventional method can not be increased.

One of the purposes of the present invention is to settle and remove the non-conformance mentioned above and additionally the problem of losing the product group shape can be solved by softly pressing and holding the product bags of several numbers together with the holding plates in their front and rear when tightly packing the products concerned into the carton as the details which will be described later.

In the case of the conventional method, since it is required to adhere either products by suction with the vacuum pads or a suction blower as mentioned above, the problem that noise is easily generated is pointed out.However, the present invention eliminates the source of noise and furthermore, it provides the method and apparatus for packing the product group into the carton in significantly high speed.

DISCLOSURE OF THE INVENTION

In order to achieve the purpose mentioned above, the present invention is to solve and eliminate the non-conformance by inventing a method in which the bagged or boxed products (hereinafter also referred to as product)transmitted one after another are lined on the collating conveyor a in vertical direction (perpendicular direction), accumulated to the specified number of products, pushed together to the lateral direction from the conveyor and then vertically packed into the carton while holding the products together in the front and rear.

The following is the description of the apparatus to realize the present invention. First of all, as for the structural description of the main parts of the whole apparatus, the apparatus has the feature in combination with various mechanisms such as the collating conveyor which sorts and positions upright the bagged products of several number to be supplied one after another, the pusher mechanism which pushes the lined bagged-products of plural number together onto the damper plates by keeping them in a line, the holding plate mechanism which can raise or lower the bagged products

of several number placed onto the above mentioned damper plates by holding them together in their front and rear and the opening and closing mechanism which opens downward when the above mentioned holding plates descend and closes upward when these holding plates finish rising.

For the enforcement of the present invention, the following enforcement conditions can apply as the details will be described later.

(1) The products shall be protected from bounding and/or being disordered by decreasing the peripheral velocity at the product supply side to increase the sprocket wheel diameter there as compared with that at the other end in the collating conveyer.

(2) In addition to the oscillating motion through the link mechanism operated by the motor rotation to describe the circular arc-shaped locus for driving the pusher, it is possible to use the box motion mechanism with racks and pinions and in this case, the stroke for the upward and downward motion of the above mentioned pusher can freely be changed.

(3) In the case of products of comparatively small dimensions, it is possible to hold the product concerned one by one with the pantograph mechanism to be built-in between two holding plates mentioned above.

(4) For the equipment to reduce or increase the distance between a pair of two holding plates,it is possible to use the width adjusting mechanism provided with either ball screws or racks and pinions.

(5) The products which contact the holding plates shall be prevented from being lifted up together with them by providing cylinders having discharge clicks which moves upward and downward for both sides of the holding plates mentioned above when they return upward.

(6) Before holding the lined-up products with the holding plates mentioned above, the products concerned are provisionally kept on the damper plates which are closed. For the driving mechanism to open or close these damper plates,the crank mechanism which consists of a motor,a connecting rod and a crank plate can be used and besides rack and pinion mechanism can be built in. The stroke for upward and downward movement is constant for the former but it is advantageous that the stroke mentioned above can freely be changed for the latter.

(7) It is better to provide stoppers at the side of the lower or upper surface of roller conveyor for provisionally stopping to transmit the cartons. In the case that the stoppers mentioned above are provided on the side of conveyor, since the lifter which freely comes out of or in the transmitting surface of the conveyor can be provided, it is possible to handle cartons of various dimensions and sizes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG.1 (A) to (G) are graphical representations of the feature of the invention and among them (A) to (D) and (G) are bird's eye view figures to show the process of making the products in line on the damper plates which freely open and close by pushing the products of the specified number out of the side of conveyor after positioning them upright with the collating conveyor. FIG.1 (E) to (F) are the bird's eye view figures of a bagged or a boxed product.

FIG.2 is the front view of the whole apparatus rich is the embodiment of the present invention.

FIG.3 is the side view of the above and FIG.4 is the plane view of the same.

FIG.5 (A) is the magnified side view of collating conveyor in the apparatus mentioned above and FIG.5 (B) is the magnified side view which shows another embodiment of the same conveyor.

FIG.6 (A) to (D) show the driving mechanism of pusher and among them, (A) shows the side view, (B) shows the front view, (C) shows the plane view and (D) shows bird's eye view.

FIG.7 shows the driving mechanism for the pusher, the same pusher as the above mentioned which is another embodiment and (A) is the side view, (B) is the front view and (C) is the illustrative figure to show the movement of the plates by the mechanism concerned with arrows.

FIG.8 (A) to (C) show the holding plate mechanism to hold the products in a line and (A) is the front view, (B) is the side view and (C) is the plane view.

FIG.9 (A) to (C) show the pantograph mechanism provided between the holding plates and (A) is the side view when the pantograph expands, (B) is the side view when it contracts and(C) is the plane view.

FIG.10 (A) to (D) show another embodiment of holding plate mechanism and (A) is the magnified side view of its main part, (B) is the side view to show the case that the cylinder mechanism to push down the products to the outside of the plates mentioned above is provided, (C) is the front view of apart of the above and (D) is the plane view.

FIG.11(A) to (C) show the driving mechanism to raise or lower the holding plates mentioned above and (A) is the front view, (B) is the side view and (C) is the front view.

FIG.12 (A) to (D) show the damper mechanism and its driving part provided directly below the holding plates mentioned above and (A) is the front view, (B) is the side view, (C) is the plane view and

(D) is the bird's eye view to show the outline of the mechanism.

FIG.13 is another embodiment to show the driving part of the same damper mechanism and (A) is the magnified front view to show a part of it and (B) is the side view of the above.

FIG.14 (A) to (C) show the conveyor mechanism to carry in the cartons directly under the damper mechanism mentioned above and (A) is the side view, (B) is the front view and (C) is the plane view.

FIG.15 (A) to (C) show another embodiment to show the stopper mechanism in the transmitting equipment mentioned above and (A) is the front view, (B) is the plane view and (C) is the side view.

Both FIG.16 (A) and (B) are the sketches to show the conventional packing apparatus of vertical type and (A) is the side view of the vertical type packing apparatus which has previously been proposed by the inventor et al. of the present invention and (B) is the bird's eye view to show the outline of the apparatus exhibited at the Packaging Machinery Exhibition held in Chicago.

THE BEST FORM TO PRACTICE THE INVENTION

The following is the substantial description of the present invention based on the attached figures.

FIG.1 (A) to (D) are the sketches to describe the outline of the packing process of vertical type which is the main feature of the present invention. Symbol 1 in the figures shows the bagged products, 1a is the boxed product [FIG.1 (E)] and 1b is also the boxed product but shows the condition that one bagged product is contained in the box (refer to (F) in FIG.1).Furthermore, the product shown by symbol s in the figure is snack foods or dry foods. As already mentioned, the present invention proposes and relates to the method and apparatus for packing bagged product 1 or boxed product 1a ,1b or the like mentioned above into carton 2.

The following is the description mainly by giving an example of bagged product 1. However, the description will apply to the case of packing boxed products 1a and 1b as shown in FIG.1 (E) and (F). Symbol 3 in FIG.1 shows the collating conveyor, the supply conveyor shown by symbol 4 is connected to conveyor 3 and bagged product 1 is transmitted to collating conveyor 3 with conveyor 4 concerned. In other words, bagged products 1 transmitted with conveyor 4 mentioned above are supplied one by one into each gap 6 formed by a lot of fins 5 which are provided on the transmitting surface of collating conveyor 3 and moreover are placed in the perpendicular position to the transmitting surface of conveyor, namely in upright position. Bagged products 1 are supplied one after another to each gap 6 on collating conveyor 3 as mentioned above, whose speed is synchronized with that of supply conveyor 4 and are lined up on collating conveyor 3 in the upright condition.

In practice, collating conveyor 3 is controlled to always make an intermittent operation which is set to supply respective bagged products 1 transmitted with supply conveyor 4 to each gap 6.Furthermore, the collating conveyor mentioned above may be operated not only intermittently but also continuously and on the other hand, even in the case of intermittent operation, a servo motor other than Geneva stop mechanism can be used.

Secondly, when the bagged products of the specified number have been lined up on collating conveyor 3, bagged products 1 on collating conveyor 3 are pushed out with pusher 11 having slits 12 to avoid the interference with fins 5 mentioned above and supplied to damper plate 63 which freely opens and closes to be described later via U-shaped relay plate shown by symbol 10. In other words, pusher 11 mentioned above is slid to the direction which is at right angles to the conveyor concerned on collating conveyor 3 with the link mechanism or box motion mechanism, by which product group 1 on the conveyor is pushed onto the relay plate 10 and then moved onto damper 63 by pushing it forward with the succeeding product group.

This operation will be described in more detail. For example, the bagged products are lined on damper 63 mentioned above in condition of two lines for vertical packing by the operation first to make the operational stroke of pusher 11 mentioned above twice the width of L of bagged product 1 [refer to FIG.1 (B) and (E)], then to make the next operational stoke the same as the width of L and then to make the succeeding operational stroke three times the width of L. In other words,after pushing the first line of bagged products into the inner part of the relay plate 10, the second line of bagged products is transmitted to the space before the first line.In this way, two lines of bagged products are laid on the relay plate side by side and then when the third line of bagged products is forwarded with pusher 11 to push the whole two lines,two lines of bagged products will be transmitted and lined onto damper 63 side by side [FIG.1 (B)]. Moreover, the sliding motion to push bagged products with pusher 11 is controlled to be carried out only while collating convey 3 provisionally stops due to its intermittent operation.

Incidentally, it is needless to say that the operation of pusher 11 mentioned above is not only restricted to the above mentioned but freely adjusted by changing the stroke etc. on according to

the number of lines of bagged products to be packed in carton 2 and so on.

When bagged products 1 are pushed out with pusher 11 to the specified location on the damper 63 which freely opens and closes as mentioned above, the pusher concerned slides in reverse direction to the pushing-out direction and returns to the original position not to interfere with the next lining bagged products on the collating conveyor and waits there until the start of the next operation [refer to FIG.1 (A)].

Incidentally, the bagged products of seveal number are pushed onto damper 63 in the upright condition as shown in FIG.1 (B) go on to the next operation to be held together with holding plates 30 in front and rear of bagged products which are vertically installed. In other words, when the bagged products of the specified number are lined on damper 63, holding plates 30 will push and hold them in their front and rear. Moreover,in the case that the size of bagged products are comparatively small, it is better to hold and pick up the top of bagged products 1 with the pantograph mechanism to be installed between two holding plates as shown in FIG.9 (A) to (C). However, if the size of the bagged products is comparatively large or of boxed products, it is not required to attach the pantograph mechanism as it is possible to hold them by the holding pressure of only holding plates 30.

After holding the bagged products by the holding pressure of only the holding plates 30 as mentioned above, damper 63 which is located directly below them opens as shown in FIG.1 (G) and then the bagged products will be inserted into a waiting corrugated carton 2 under the damper by holding them with holding plates 30 or the pantograph mechanism attached to the holding plates. Corrugated cartons 2 which have been transported with roller conveyors as described later are waiting at the specified location. Symbol 2a shows the flaps attached to the opening of the carton.

After inserting bagged products into a corrugated carton 2 by holding them with holding plates 30, the holding pressure is released by slightly opening and moving plates 30 a little in reverse to the direction mentioned above.(Furthermore, the holding pressure with the pantograph mechanism attached to holding plates 30 is also released from the bagged products when the plates 30 mentioned above open.) Accordingly, the packing operation of bagged products 1 into a corrugated carton 2 is completed. It is needless to say however the holding plates 30 are lifted up, then the operation returns to the initial stage by closing damper 63 and the packing operation process of bagged products is automatically repeated.

The following is the detailed description of each item of the equipment mentioned above by referring to the attached figure.

Since the object of the present invention relates to the method and apparatus for packing multiple bagged or boxed products into a corrugated carton in a vertical position, the description will be made in the following order. Namely, the first description is for both the supply and collating conveyors, the second is for the pusher mechanism, holding plates and pantograph mechanism, width adjusting mechanism of holding plates and its raising and lowering mechanism and so on, then the third is for the opening and closing mechanism of damper plates and the last is for the conveyor for transporting cartons such as a corrugated carton and so on.

[Supply and collating conveyors]

The following description is for both supply conveyor 4 and collating conveyor 3 mainly based on FIG.2 to 5. The supply conveyor shown by symbol 4 generally consists of beltconveyors, transports the products in the present invention at regular intervals and supplies the products to collating conveyor 3 which is connected to the supply conveyor.

Collating conveyor 3 , for example, consists mainly of chain conveyors 3a which have lots of collating and aligning fins 5 on chains 3a . FIG.5 is the magnified side view of collating conveyor which clearly indicates that fins 5 which consist of reverse L-shaped metal plate are installed and assembled at right angle to the progressing direction of chain,namely to the upper surface of chain 3a mentioned above so that gaps 6 are made at the intervals between respective fins 5. These intervals are made a little larger than the thickness of products 1 so that the products can be held in upright condition with a slight looseness. Furthermore, the supply opening 6a for bagged products 1 is provided at the conveyor end where the gap between fins 5 radially widens (the location of driven sprocket shown by symbol 3b) and the discharge end of supply conveyor 4 mentioned above is set nearby the supply opening 6 and also at the location of one step higher up so that as soon as the product 1 is discharged it slides into funnel-shaped supply opening 6a.

To be more concrete, since the gap between fins 5 radially widens nearby driven sprocket 3b in collating conveyor 3 as shown in FIG.5 (A), the product 1 is supplied into widened gap 6a from the supply conveyor. Incidentally,driven sprocket 3c which is provided at the other end of conveyor 3, is intermittently operated with driving motor 7 through Geneva stop mechanism 8 which is connected to

the sprockets with belts. Furthermore, it is possible to reduce the peripheral velocity accordingly by increasing the diameter of driven shaft 3b which is located at the supply side of products 1 as shown in FIG.5 (B). Therefore, this applies when either the adjustment of the supply speed of products or appropriate speed suitable to the size of products is required. Moreover, by reducing peripheral velocity, it is useful to prevent the products from bounding or being disordered at the time of positioning them upright.

Incidentally, since products 1 are transmitted by keeping their bottom forward on supply conveyor 4, the products of which each one is inserted into each gap are lined up on the collating conveyor 3 in on upright position by keeping their bottom downward.

[Pusher mechanism]

FIG.6 (A) to (D) show pusher 11 and its driving unit.As shown in these figures, the pusher consists of metal plates of L-shaped section in a handstand and the slits 12 of the width to avoid the interference with fins 5 provided on collating conveyor 3 are made at equal intervals in its pushing face which pushes out the products 1. Pusher 11 is driven with the driving mechanism which consists of link mechanism of a parallelogram 19, plate support frame 18 which is a part of the link mechanism, ball screws 15 attached to the support frame and so on as shown in FIG.6 (D). To describe in more detail, nut 14 is provided for ball screw 15 and servo motor 25 to drive the ball screw is installed at the end of the ball screw as shown in the figure mentioned above.

On the other hand, support shafts 20 which sling down link mechanism 19 mentioned above are supported with hold down brackets in their free rotation and lever 23 whose one end is connected to support shaft 20 and disk 22 for the up and down movement which is driven with a motor M are tied with rod 23a so that pendulum motion is given to plate support frame 18 mentioned above in the specified timing.

Incidentally, after connecting the end of rod 23a to a lower dead point between upper and lower dead points shown by symbols 22a and 22b respectively on disk 22 mentioned above, disk 22 is rotated to the direction shown with an arrow in FIG.6 (D). Then, pusher 11 mentioned above moves as shown by ①, ②, ③ and ④ in the same figure. In other words, when lever 23 is at lower dead point 22 of disk 22, servo motor 25 starts to rotate ball screw 15 and then nut 14 is moved forward to move pusher 11 forward so that the product 1 is pushed from the location of symbol ① to that of symbol ②. Then, with driving motor M,disk 22 is rotated in the direction as shown with an arrow so that lever 23 is rotated from lower dead poin 22b to upper dead point 22a. Then, since pusher 11 moves from location ② to location ③ mentioned above, then servo motor 25 starts to operate to retract the pusher with ball screw 15 so that the pusher mentioned above is retracted from location ③ to location ④. Then, if lever 23 mentioned above is moved from upper dead point to lower dead point which is lower location by half a circle by turning disk 22, pusher 11 returns to the initial location shown by symbol ①.

As described above, pushers 11 carry out the specified operation by oscillating to trace the locus of circular arc as shown with an arrow in the figure.

Furthermore, the equipment shown in FIG.6 (A) to (C) is the example of substantial design to realize the fundamental operation mentioned above and to describe the parts other than the parts mentioned above by symbols, symbol 16 shows the rails installed below support frame 18 mentioned above and guides 17 which guide the forward and backward movement of pusher 17 are connected to the rails.

Incidentally, if the sensor detects that the products (bagged products) 1 of the specified number are lined up on collating conveyor 3, by the detected signal, pushers 11 which are waiting beside the conveyor push the products out of the conveyor 3 according to the operational sequence mentioned above [refer to FIG.1 (A) to (B)].

In other words, after lowering plate support frame 18 which is a part of the link mechanism 19 to the specified position as mentioned above,ball screw 15 is rotated by the start up of driving motor 25 attached to plate support frame 18 so that pushers 11 which are connected to nut 14 set on the ball screw are slid forward along rails 16 to push out products 1. By this way, pushers 11 are laterally slid on collating conveyor 3 to the direction perpendicular to the conveyor concerned so that the products of the specified number which are accumulated on conveyor 3 mentioned above are transmitted to the side of the conveyor and onto damper 63 through relay plate 10 [refer to FIG.1 (B)]. Furthermore, as it is clear in illustrations,even while the transmitting work of the products onto damper 63 is in operation, the succeeding products are continuously lined up on collating conveyor 3 and the operation mentioned above is repeated from the beginning by detecting the lined-up position of the products.

Incidentally, the sliding operation which pushers 11 push out products 1 is controlled to be done only while collation conveyor 3 provisionally stops due to its intermittent operation.

As described above, FIG.6 shows the example that the link mechanism makes pushers 11 go forward or backward. However,the structure shown in FIG.7 (A) and (B) is the example that the box motion as shown with arrows in (C) of the same figure is carried out using rack and pinion mechanism as well as ball screw and servo motor. In the same figure,symbol 100 shows the raising and lowering frame which moves up and down by two racks 101 vertically installed at the right and left ends of the frame, pinion 102 geared with the racks and gear 103 to drive pinion 102 mentioned above (this gear is connected to driving motor 104). The ball screw mechanism which is completely the same as that described based on FIG.6 (D), namely, the mechanism which consists of screw rod 15, nut 14, motor 25 and so on is provided for raising and lowering frame 100 mentioned above and pushers 11 attached to nut 14 mentioned above laterally push out products 1 so that products 1 are transmitted onto damper 63 through the relay plate in the same way as that mentioned above.

If the embodiment shown in FIG.7 is compared with that in FIG.6, since it is possible to freely change the stroke of up and down movement in the former, there is the advantage of being is easy to keep up with changes in the size of products 1.

As mentioned above in general figures, FIG.1 (A) to (D), the case for packing products 1 into carton 2 in two lines has been described. However, the number of the products which come in a line and also the number of lines of products to be packed can freely be selected and set. Incidentally, FIG.2 shows the case that the products 1 are packed in four lines. If the products are lined and packed in several lines like this, as the edge of bags of the next line is inserted between respective bags in the first line like a wedge, the lines of products are not disordered.

[Width adjusting mechanism of holding plates and pantograph mechanism]

FIG.8 shows holding plates 30 which are located on damper 63 mentioned above and their driving unit. Since holding plates 30 which are symmetrically installed in the same figure need to hold products 1 in four rows, they are made of the metal plates whose width is four times that of the bag width of L and are supported in position of free movement toward both left and right directions in FIG.8 (B) (front and rear directions of bags) through the width adjusting mechanism of the following structure. In other words, the holding plates mentioned above hold and lift up products 1 by hugging them from the left and right side in FIG.8 or release hugged products 1 into carton 2 by enlarging the interval between two holding plates 30.

The following is the description of both width adjusting mechanism 30a and guide members 30b.

As clearly shown in FIG.8 (A) to (C), holding plates 30 are installed and assembled below with brackets 31 and are supported in condition of free movement by width adjusting mechanism 30a which connects both brackets 31 in their center and guide members 30b which are installed at both sides of width adjusting mechanism 30a. First, to describe width adjusting mechanism 30a, as shown in FIG.8 (B), this mechanism consists of motor 38 which is provided in the mechanism center, gear 39 which is attached to the drive shaft of motor, another gear 40 which engages with gear 39,screw rod 34 which is driven with gear 40 and nut 32 which is in gear with screw rod 34. If motor 38 mentioned above is driven, the screw rods 34 which are threaded in a reverse direction each other rotate accordingly so that two holding plates 30 come closer or apart from each other with nuts 32 which are in gear with screw rods 34. Then, the products mentioned above are placed into the carton by holding and lifting products 1a between both holding plates mentioned above or releasing the products downward to enlarge the interval between both holding plates so that the products mentioned above are placed into the specified carton. Incidentally,the members shown by symbol 33 are the sleeves fitted on with some play gap at both ends of the guide rods 35 and intermediate frame 36 is connected to the guide rods 35 with some gap for sliding.

Secondly, pantograph mechanism 41 which is set between the holding pates mentioned above will be described. When picking up the products 1 one by one to put them into the carton in cases where their size is small and so on, this mechanism is used as described above. FIG.9 (A) to (C) are the embodiment and two respective support metal fittings 42 of U-shaped section are provided at both ends of the pantograph mechanism inside each holding plate 30. There are slits 43 at the upper part of the support metal fittings 42, in which moveable bolts 44 with some play gap are set and supported. Furthermore, the position of the bottom bolts 44a which are attached to support metal fittings 42 mentioned above will be decided to be the same as the height of bagged products 1, namely the same as the top of bags in their upright position.

The expansion frame which is a main part of the pantograph mechanism 41 is installed between the level of moveable bolts 44 mentioned above and that of fixed bolts 44a , symbol 46 shows the upper joint and symbol 47 shows the holding spongeroller attached to the lower joints with their shaft, with which products 1 are picked up. Incidentally,

the number of both holding rollers 47 and joints 46 are decided according to the number of bagged products which must be held.

[Another embodiment of the width adjusting mechanism]

Next, the width adjusting mechanism of the holding plates shown in FIG. 10 (A) to (D) will be described in the following. The embodiment shown in these figures is the application of the rack and pinion mechanism 30c in stead of ball screw mechanism 30a shown in FIG.8 mentioned above to drive holding plates 30. In other words,the rotation of driving motor 110 is transmitted to pinion 112 through transmission gear 111 and then a pair of racks which are symmetrically set at both sides with respect to pinion 112 engage in this pinion so that the interval between a pair of holding plates 30 which are fixed to the racks using brackets 31 is widened or narrowed. Symbol 115 shows dust proof bellows.

Incidentally , the following structure is added to the embodiment shown in FIG.10 (B) to (D). Namely, the holding pressure with holding plates 30 can be made adjustable using springs 116 set at the end of the respective gear racks 113 and 114 in compressed condition. Furthermore, as clearly shown in FIG.10 (B), air cylinders 117 are provided at the outside of the brackets 31 to which holding plates are fixed and the discharge clicks are attached to the working top of the rods of air cylinders 117 which prevent products 1 from coming up together with the holding plates 30 while the latter is lifted up. In other words, products 1 are often lifted up together withholding plates when the latter returns upward from the lower position as shown by chain line in FIG.10 (B) so that the products may not be packed into a carton 2 in an orderly line.

It is better to provide discharge click 118 mentioned above in order to prevent the non-conformance like this from occurring and the clicks 118 are horizontally projected inside through slits 12 in holding plates 30 so that the product bags are prevented from coming up by lowering the clicks while the holding plates are lifted up.In other words, while the holding plates are lifted up, clicks 118 are lowered with cylinders 117 so that the product bags are prevented from coming up together with the holding plates.

[Lifter for holding plate]

FIG.11 shows lifter 50 for holding plates. Spur gear 52 attached to the drive shaft of lifting motor 51 which is installed on the ceiling plate of the apparatus engages with another spur gear 53 set at the end of driving shaft 54 and pinion 55 is provided in the middle of driving shaft 54 mentioned above. The rotation of motor 51 is transmitted to rack 57 by pinion 55 engaged with rack 57 which is fitted to rod 56 and then both support frame 59 which is installed below the rod mentioned above and intermediate frame 37 of holding plates 30 which is connected to the support frame are lifted up. In this way, holding plates 30 are lifted up with lifting motor 51, pinion 55, rack 57 and so on through rod 56. Furthermore, the lifted position of holding plates 30 is detected for their control by rotary encoder 58 connected at the other end of driving shaft 54 mentioned above. Moreover, symbol 61 shows the guide rods which are provided parallel to lifting rod 56 mentioned above and connected to guide rails 62 and the guide rods slide according to the movement of lifting rod 56.

Incidentally, when bagged products 1 of the specified number are lined up on damper 63,holding plate driving motor 38 shown in FIG.8 (or motor 110 shown in FIG.10) starts to operate with the control unit provided in control panel 9 to rotate ball screw 34 in the example shown in FIG.8 and to press and hold bagged products 1 in line together by a pair of left and right holding plates 30 in their front and rear [at their left and right in FIG.8 (B)]. Furthermore, in the embodiment that pantograph mechanism 41 is provided between holding plates 30, the pantograph contracts according to the pressing behavior of the holding plates mentioned above and holds and picks up the top edge of bags with holding rollers 47. In other words, holding rollers 47 provided for the bottom shaft which is a part of the expansion frame come closer and almost contact each other to hold the top of respective bagged products 1 and pick them up. Then, holding plates 30 mentioned above are lowered with the lifter mentioned above to keep holding bagged products 1 and release the holding (nipping) force of the bagged products after placing them into carton 2. However, damper plates 63 which are provided below the holding plates must be opened in advance to allow them to come down. The following is its description.

[Opening and closing mechanism of damper plate]

As it is already clear, as long as damper plates 63 are not opened [refer to FIG.1 (G)], holding plates 30 can not come into a lowering operation. Therefore, based on FIG.12 (A) to (D), the opening and closing mechanism of damper plates 63 will be described in the following. As it is clear in the general figure, FIG.12 (D), as for the mechanism of a pair of left and right damper plates 63 which are made of metal plates, for example, the longer sides are fixed to respective shafts 64, oscillating arms

69 to rotate the shafts 64 are connected to the end of the shafts and furthermore two damper plates 63 mentioned above are turned from the horizontal position to the vertical position by the oscillating mechanism to be described later as shown with arrows in FIG.(G). Namely,as shown in FIG.12 (D), cam followers 70 are projected out of the free end of oscillating arms 69 mentioned above and are set into sliding grooves 72 for connection at both ends of reverse T-shaped lifting plate 71. Furthermore, lifting plate 71 is connected to the driving mechanism which consists of a rod 75, a crank plate 76 and a motor 77 so that the rotation of the motor mentioned above is transmitted and converted to the intermittent up and down motion of lifting plate 71. This up and down motion is transmitted to shaft 64 via both cam followers 70 and sliding grooves 72 and then damper plates 63 which are fixed to the shaft are opened downward or closed.

Guide 74 to fit with rail 73 which is fixed to the apparatus is provided for the back face of lifting plate 71,on the other hand, pivots 65 which are perpendicular to the shafts are provided for shafts 64 mentioned above at both sides of damper plates 63 and pivots 65 and shafts 64 are relationally connected with mitre gears 66 and 67 which consist of bevelgears. In other words, two flap kickers 68 which are connected to pivots 65 mentioned above also come into operation at the same time by transmitting the rotation of shafts 64 at the drive side to pivots 65 at the driven side through mitre gears 66 and 67. Namely, when damper plates 63 open by the rotation of shafts 64, kickers 68 mentioned above come into operation at the same time so that flaps 2a of the carton [refer to FIG.12 (B)] which is below damper plates 63 are forcefully opened. Furthermore, The members shown by symbol 64a are the pillow blocks which have bearings built in them.

FIG.13 (A) and (B) show the embodiment to use rack and pinion mechanism for opening and closing damper plates 63. Symbol 120 in these figures shows vertical rack. The rack is engaged with pinion 121 attached to the rotating shaft of driving motor 122 and lifting plate 71 mentioned above is fixed to the bottom end of the rack so that when rack 120 moves up and down by the rotation of motor 122 mentioned above, lifting plate 71 also moves up and down accordingly to open and close damper plates 63 and to operate flap kickers 68 for opening flaps 2a of the carton as well. Furthermore, all the common members in both FIG.12 and FIG.13 are shown by the same symbols.

In the opening and closing mechanism of damper plates of the above structure, when the bagged products 1 of the specified number are pushed onto the closed damper plates 63, holding plates 30 mentioned above do the width adjusting operation (pantograph mechanism 41 also comes into operation to be linked with the holding plates) and products 1 of plural number are held together with the holding plates mentioned above accordingly. Then, in the embodiment shown in FIG.12, driving motor 77 comes into operation, connecting rod 75 which waits at upper dead point is pushed down with crank plate 76, lifting plate 71 connected to the rod is lowered, cam followers 70 which are connected to both ends of the plate in a moveble condition are pushed down to rotate shafts 64,a pair of damper plates 63 fixed to the shafts are released downward (opened downward like opening outward a set of folding doors) as it is clear in FIG.1 (G) and then, the apparatus is in the position to allow holding plates 30 to go downward.

If shafts 64 rotate as mentioned above, flap kickers 68 are also turned downward with miter gears 66 and 67 which are attached to shafts 64 to push outward flaps 2a of corrugated carton 2 to open. In other words,carton 2 is transported and waiting directly below the location where the damper plates are installed as described later and four flaps 2a at the top opening of the carton are forcefully opened by the operation of both two flap kickers 68 and two damper plates 63 mentioned above. In the way such as this, since the condition not to prevent holding plates 30 from coming downward is made, bagged products 1 which are held with holding plates 30 mentioned above are placed into corrugated carton 2 which is waiting below. After the completion of placing them into the carton, the holding pressure is released from holding plates and then only holding plates are lifted up to complete the placing operation of the bagged products into the carton. Furthermore, at the time of placing bagged products into carton 2 as mentioned above, since the holding pressure is released from holding plates 30, respective bagged products expand a little due to the reaction force of air or nitrogen gas filled in the bags which is one of the reasons why the bagged products can be packed into corrugated carton 2 in comparatively tight condition. Furthermore, holding plates 30 are lifted up as mentioned above, then damper plates 63 return to the location shown by the full line in FIG.12 (D) by the operation of driving motor 77 or pinion 112 via lifting plate 71 and flap kickers 68 are lifted up to return to the original waiting position.

[Carrying in and out mechanism of carton]

FIG.14 (A) to (C) illustrate the example of the mechanism to carry in carton 2 directly below damper plates 63 and to carry it out after bagged products are packed. Symbol 80 shows the roller conveyor for carrying in or out the carton, which is

installed parallel to supply conveyor 4 of bagged products 1 as it is clear in FIG.2 to 4. Before the bagged products are placed into corrugated carton 2 with holding plates 30, the carton mentioned above must be carried in directly below the plates in advance and made to be waiting. The example of a conveyor for this is the roller conveyor shown by symbol 80 and the embodiment regarding the stoppers to provisionally stop the transportation of the carton mentioned above in the two locations along the proceeding direction of the conveyor as well as the installation of driving unit for the stoppers is shown in the figure,

This side stopper 82 in proceeding direction is for accumulating carton 2, that side stopper 81 is for stopping carton 2 which is carried in directly below holding plates 30 to hold bagged products 1 while they are placed into carton 2 and the respective stoppers mentioned above are provided between rollers of roller conveyor 80. Furthermore, as for the structure, slide plates 87 are attached to the bottom part of the stoppers,rack gears 86 are fitted to the side of the slide plates 83, pinion gears 87 engage with these racks and further connected to spur gear 89 which is provided in the middle of the shaft via shaft 88 and furthermore, spur gear 89 engages with another spur gear 90 attached to the rotating shaft of driving motor 91 so that the rotation of motor 91 mentioned above raises or lowers both stoppers 81 and 82 at the same time. Moreover, guide rails 84 shown in FIG.14 (C) are connected to guide plates 85 which are attached to the bottom of slide plates 83 mentioned above so that it is designed that the stoppers mentioned above moves smoothly up and down.

Incidentally, as for the operation, corrugated carton 2 is carried in directly below damper plates 68 with roller conveyor 80, then driving motor 91 starts to rotate to raise respective stoppers 81 and 82 between rollers via rack gears 86 and pinion 87, to provisionally stop the carried-in carton 2 directly below the holding plates and to provisionally accumulate the following corrugated cartons 2 with this side stopper 82. After the completion of placing bagged products into corrugated carton, both stoppers mentioned above are lowered by the reverse rotation of driving motor 91 and the operation to carry out the corrugated carton filled with bagged products is completed. Moreover, after the carton filled with bagged products is carried out, a new empty corrugated carton is carried in and then the above operation is repeated.

FIG.15 (A) to (C) show another embodiment of the transmission mechanism mentioned above, Symbols 130 and 131 are stoppers and these stoppers are different from those mentioned above and are attached to the side of transmitting conveyor 80. Although the stoppers in the embodiment mentioned above are the type coming out of the bottom face of conveyor 80, FIG.15 shows the embodiment of the stoppers 130 and 131 attached to the side of the conveyors for stopping and releasing cartons. Furthermore, symbol 132 is the driving cylinders for respective stoppers mentioned above and the stoppers are projected out of the transmitting surface of conveyor 80 by turning stoppers 90 mentioned above by 90° via rotating units 133 which are connected to the cylinders so that the progress of cartons 2 is interrupted and if required, the operation to allow the transmission of cartons is done by making the stoppers parallel to the transmitting direction.

As mentioned in the embodiment shown in FIG.15 (A) to (C), since the stopper mechanism is not attached to the bottom face of the conveyor 80 but to its side, it is possible to install lifter 134 which lifts up the carried-in cartons in the receiving location of bagged products on the bottom face of conveyor 80 in this type of structure. Lifter 134 mentioned above is of the structure to be lifted up with an air cylinder 135 provided at the bottom and symbol 136 shows the lifting plate to directly contact carton 2. Since it is possible to install lifter 134 on the bottom of conveyor 80 in the embodiment shown in FIG.15 (A) to (C), the carried-in carton 2 to the specified position can be lifted up or lowered down with the lifter mentioned above. Therefore, it is possible to handle the cartons of different height with the same apparatus so that there is an advantage to be able to easily deal with the size change of cartons.

[Embodiment other than the above]

It is possible to put the present invention into practice in other various forms not to deviate from its intention and main feature. For example, not only is it possible to freely select the number of horizontal rows of bagged or boxed products but also any multiple stages of products such as two, three stages and so on other than one stage in height direction can be vertically packed. However,in this case, the loading operation of products into the carton with holding plates 30 mentioned above may only be repeated by the same times as the number of desire stages of products.

To sum up the above,the embodiment mentioned above is only an example in every imaginable point and must not be construed to limit the functions of the invention. The scope of the present invention shall be referred to for the scope of claim and shall not be restricted at all by the description in the specifications.

[Effect of the invention]

Since the present invention comprises a method of holding the products together with holding plates in their front and rear by the holding pressure possible to hold them and of packing them into a corrugated carton, it is possible to pack the products into a carton in a comparatively tight position by this method. Therefore,there are no gaps between product boxes or bags so that the chance for the product boxes or bags to jump up and bump against each other inside the carton during transportation and to break snack foods is fairly-reduced.

Since it is possible to securely hold the products with holding plates in the present invention and as the lines of product group are not disordered during the packing operation, not only can stable operation be maintained but also contribution to the increase in operating efficiency can be expected.

Furthermore, since any conventional cage, vacuum unit and so on to relay the products is not used in the present invention, it is possible to make the apparatus not only smaller and simpler but also less noisy. In addition to the above,there are the merits that both the rate of failure and production costs of the apparatus are low due to the comparatively simple structure.

INDUSTRIAL APPLICABILITY

The products such as snack foods, dry foods and so on are often damaged due to the deformation, shock, vibration, etc. of cartons during the physical distribution such as transportation,storage, etc. and consequently have their value decreased. To avoid this, it seems to us that the products are less damaged by packing them into cartons in a vertical condition rather than horizontal condition. However, the conventional method, type and apparatus to put the above into practice required too many processes or the conventional apparatus is too complicated.In addition to the above,there is non-conformance, in that it is difficult for the conventional method and apparatus to deal with a change of product size.On the contrary, the present invention is significant from the industrial point of view as it can not only settle every non-conformance mentioned above without fail but also provide a simple and compact mechanism of apparatus.

Claims

1. A method for packing bagged or boxed products into a carton comprising the steps of;

   transmitting the bagged or boxed products (hereinafter also referred to as "products") one after another in a horizontal position;

   lining up the bagged or boxed products one by one in a vertical position (perpendicular direction) by changing their position to their vertical position one after another at the supply end of a collating conveyor;

   pushing a certain number of the lined-up products together out of the conveyor to its side;

   holding the pushed- out products together in their front and rear to lift them up; and

   packing the bagged or boxed products into a carton while keeping them in a lifted up.

2. An apparatus for packing bagged or boxed products into a carton comprising;

   means for changing the packing products which are supplied in the horizontal position via a supply conveyor to their vertical position while supplying them one by one into the gaps which are formed by the multiple fins fixed to the transmitting face of the conveyor with pivots,

   a mechanism pushing out the multiple products of the specified number to the side of the conveyor with their position changed to the vertical position,

   a freely opening and closing damper mechanism provisionally keeping the pushed-out products which is installed at the side of said conveyor,

   a product holding plate mechanism which is located above the damper mechanism, and

   an equipment to elevate the whole of said holding plate mechanism.

3. The apparatus for packing bagged or boxed products into a carton according to claim 2, in which the collating conveyor has a sprocket wheel of a larger diameter at the roduct supply side than that at the other side.

4. The apparatus according to claim 2, in which the box motion mechanism using racks and pinions in addition to the oscillating motion to describe the locus of circular arc by the rotation of motor via link mechanism when driving the pusher.

5. The apparatus according to claim 2, in which a pantograph mechanism is assembled between two holding plates to hold the products of comparatively small dimensions.

6. The apparatus for packing bagged or boxed products into a carton according to claim 2, in which either of a width adjusting mechanism

provided with ball screw or which provided with racks and pinions is used as the device to narrow or widen the interval between a pair of holding plates.

7. The apparatus for packing bagged or boxed products into a carton according to claim 2 or claim 6, in which cylinders move upward or downward at both outsides of the holding plates and the discharge clicks connected to the top of the cylinders.

8. The apparatus for packing bagged or boxed products into a carton according to claim 2, in which either of a crank mechanism consisting of a connecting rod and a crank plate built in or rack and pinion mechanism is assembled in a motor as a driving mechanism to open or close the damper plates after the products are provisionally kept on the closed damper plates to hold the lined-up products with said holding plates.

9. The apparatus for packing bagged or boxed products into a carton according to any of claims 2 to 7 , in which stoppers are installed on either the upper face or the side of the carton transmitting roller conveyor to stop the transmission of cartons provisionally.

10. Apparatus for packing bagged or boxed products into a carton according to any of claims 2 to 8, in which stoppers are assembled in an upper side of the carton transmitting roller conveyor to provisionally stop the carton transmission and a lifter is mounted on an under surface of said conveyor in freely comming out of the transmitting surface thereof.

FIG. 1

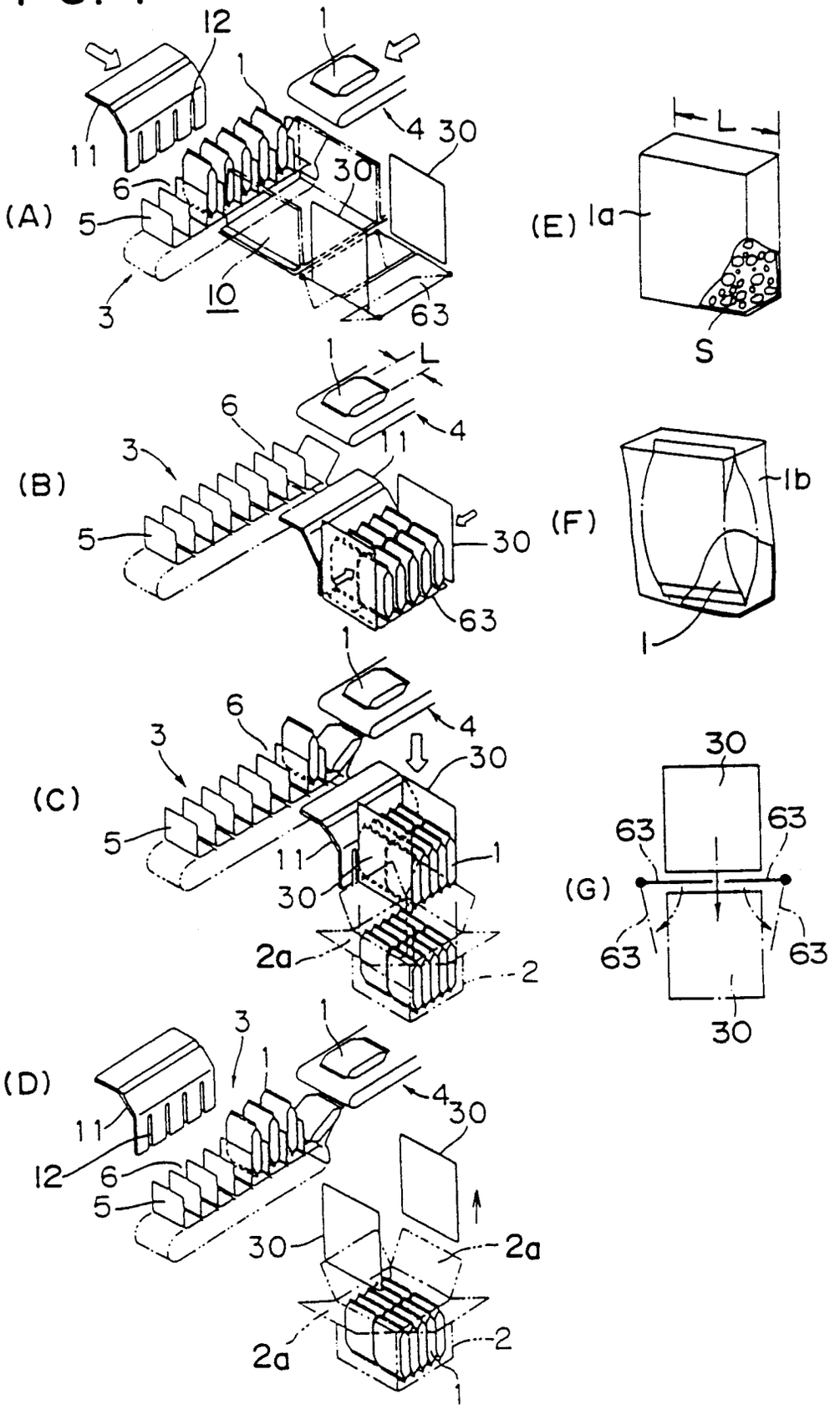


FIG. 2

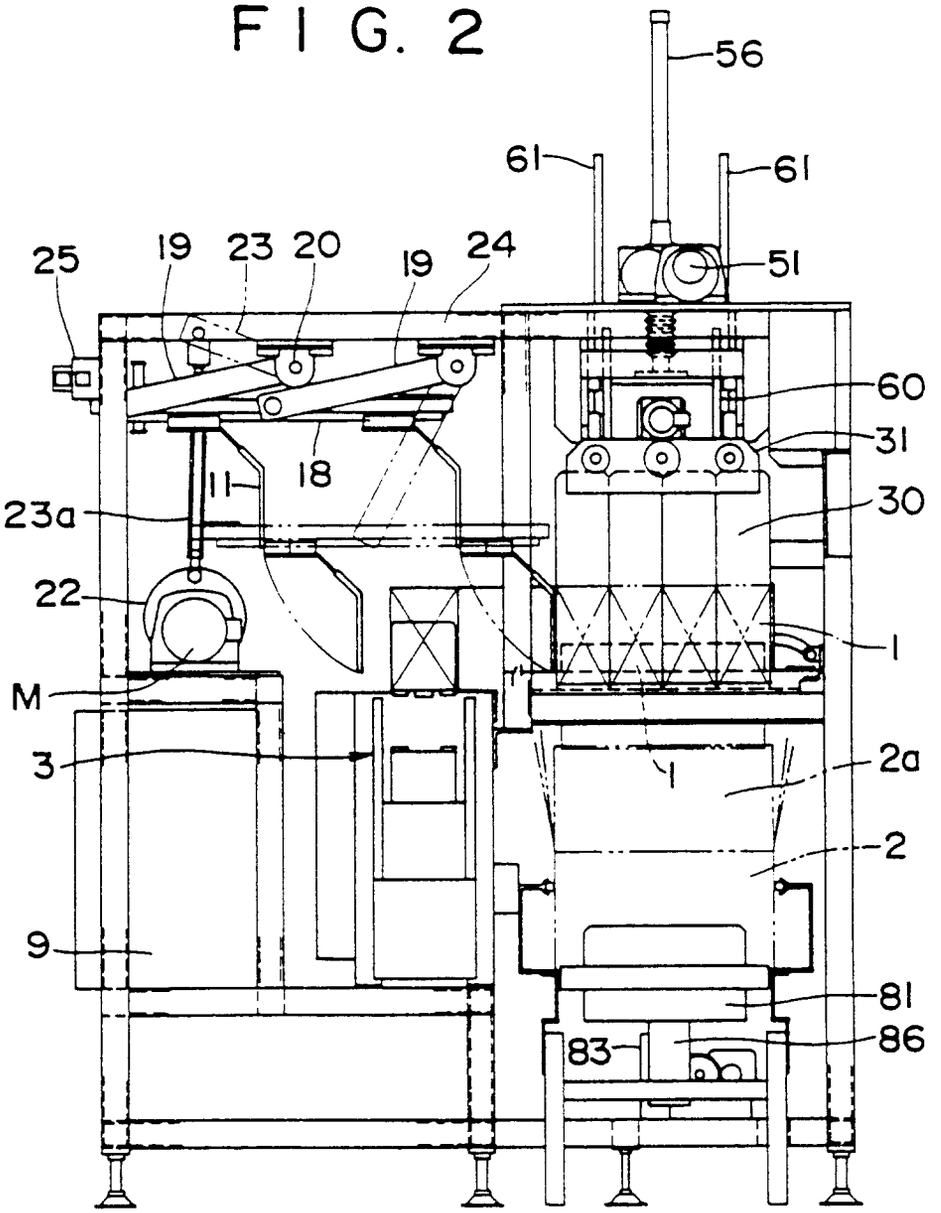
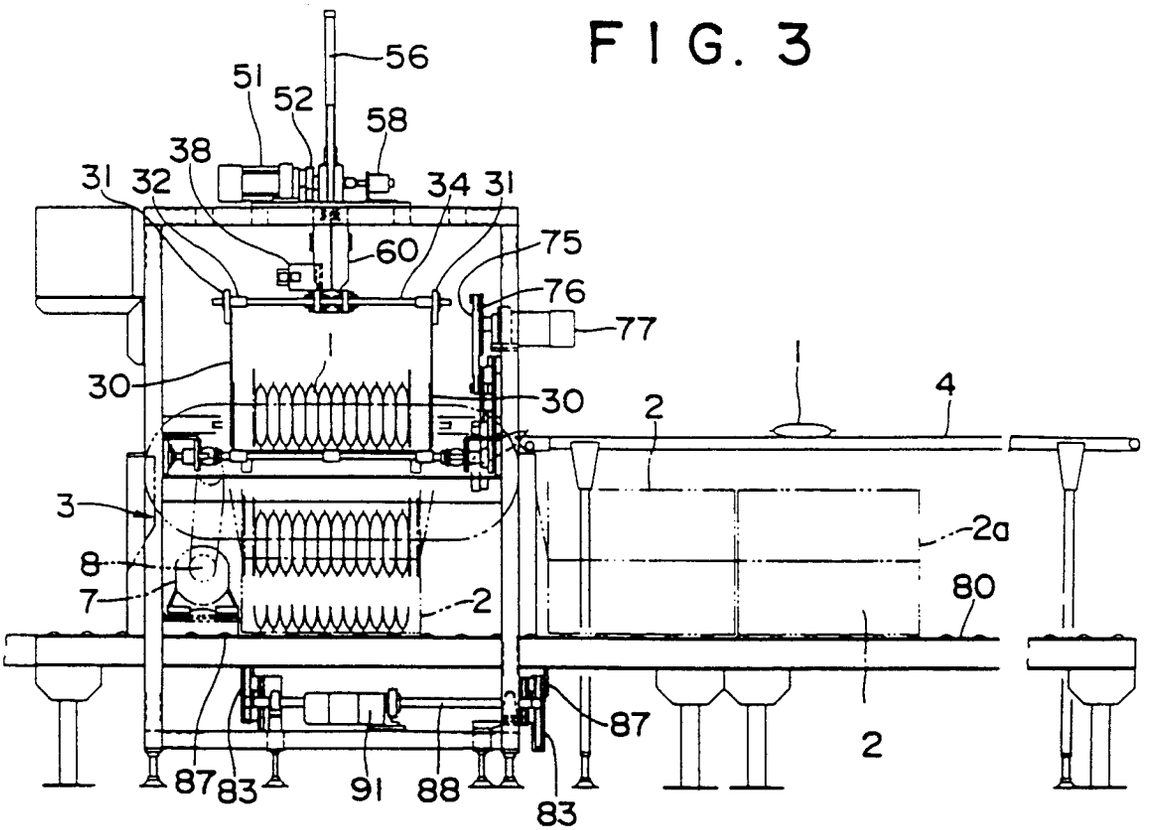


FIG. 3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76
77
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8
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83
2

FIG. 4

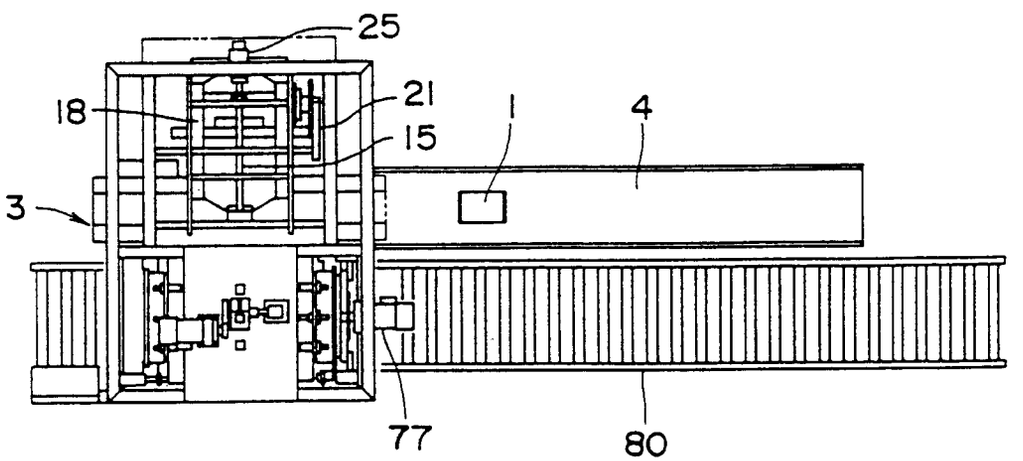
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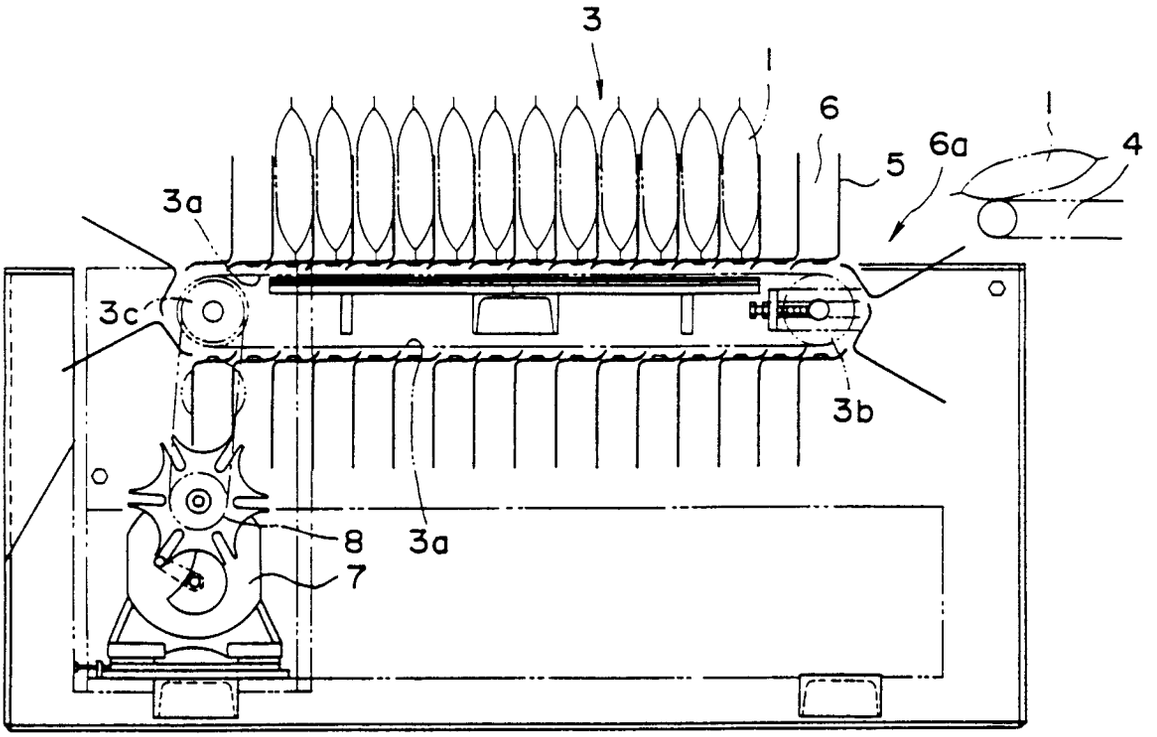
FIG. 5

(A)



(B)

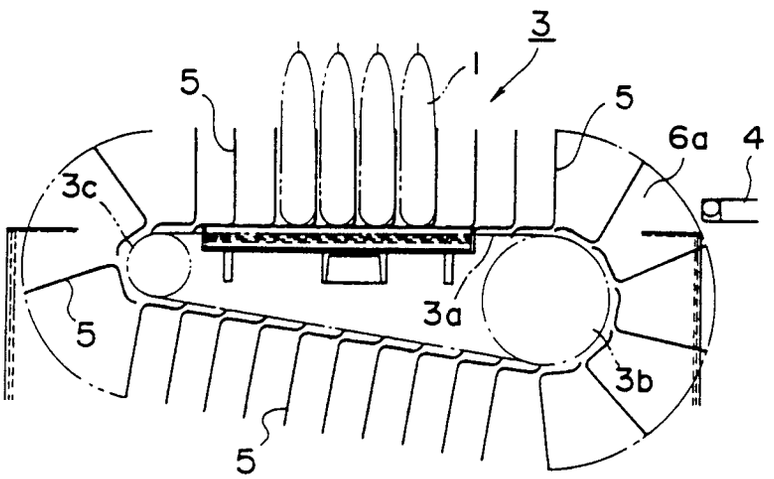
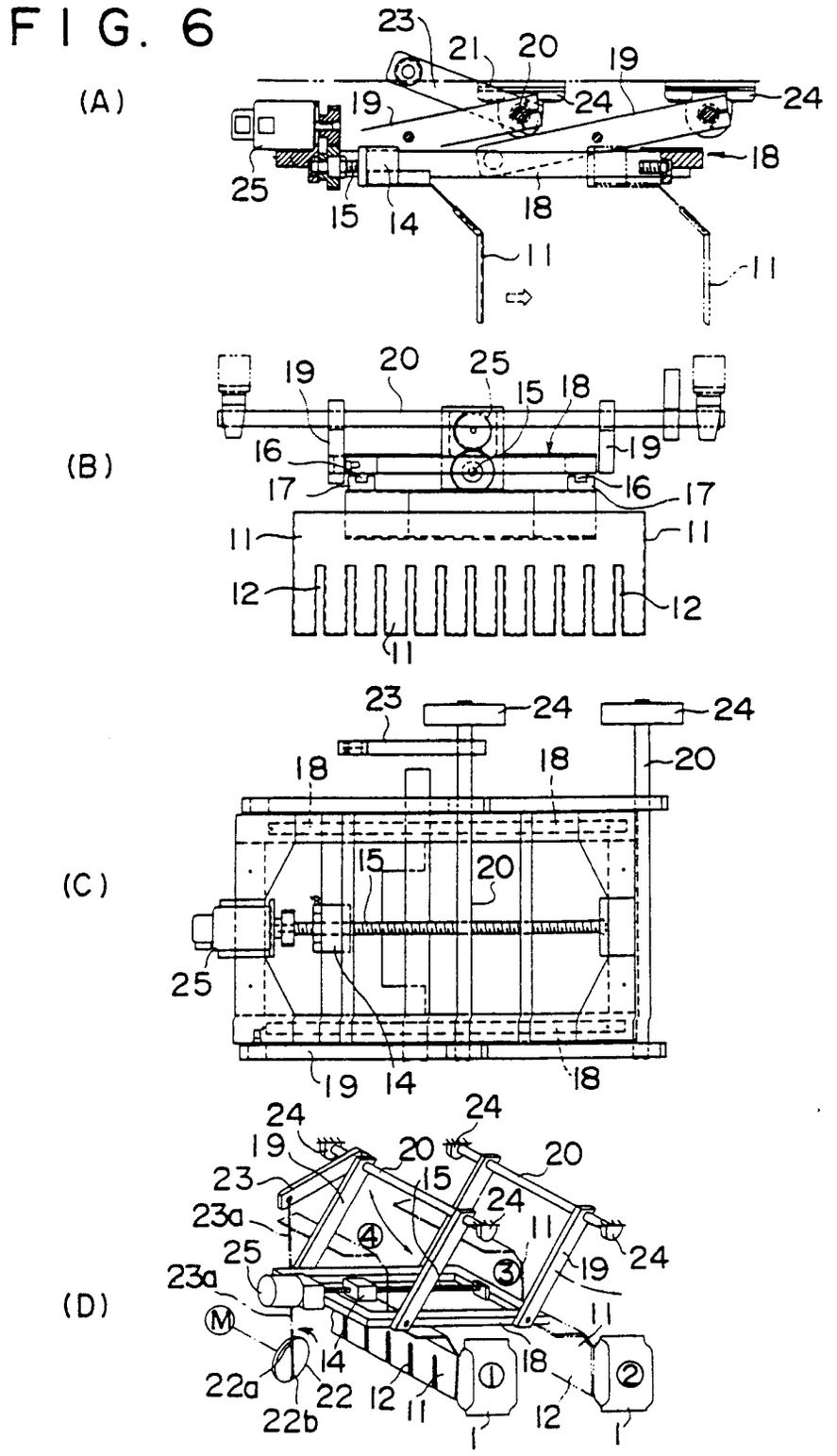


FIG. 6


(A)
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14
18
11
11
(B)
19
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25
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18
19
16
17
16
17
11
11
12
12
11
(C)
23
24
24
18
18
20
15
20
25
19
14
18
(D)
24
24
19
20
20
23
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18
12

FIG. 7(B)

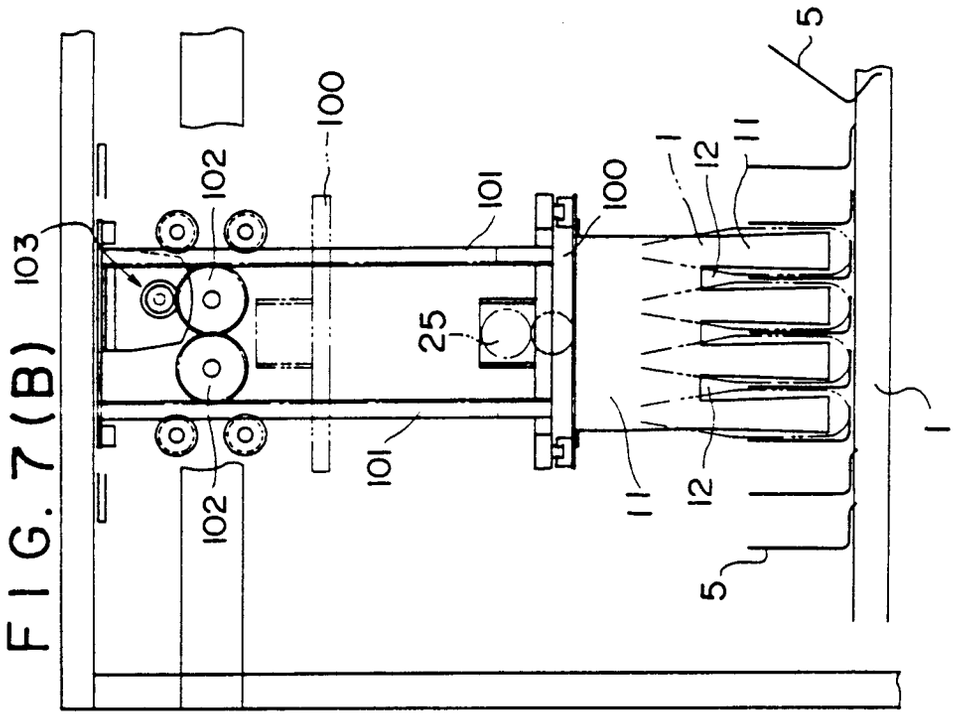


FIG. 7(A)

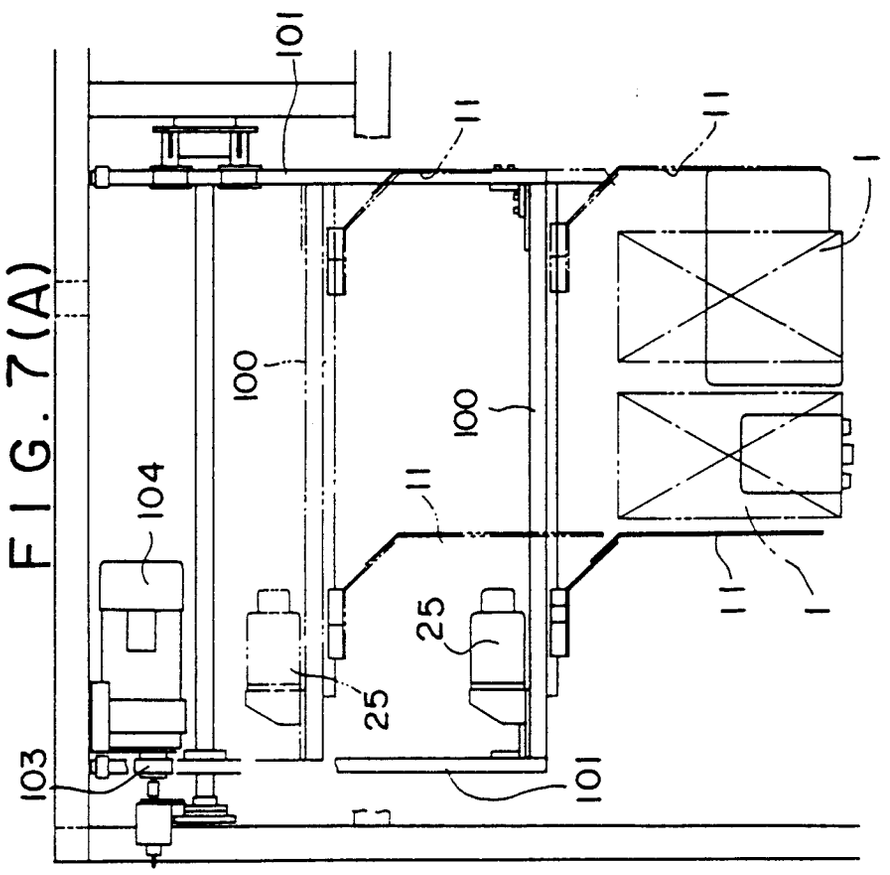


FIG. 7(C)

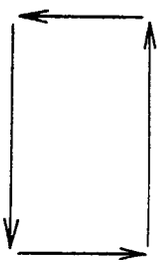
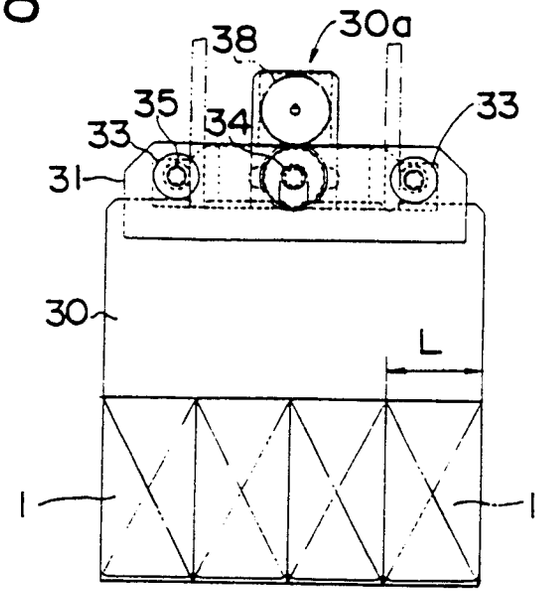


FIG. 8

(A)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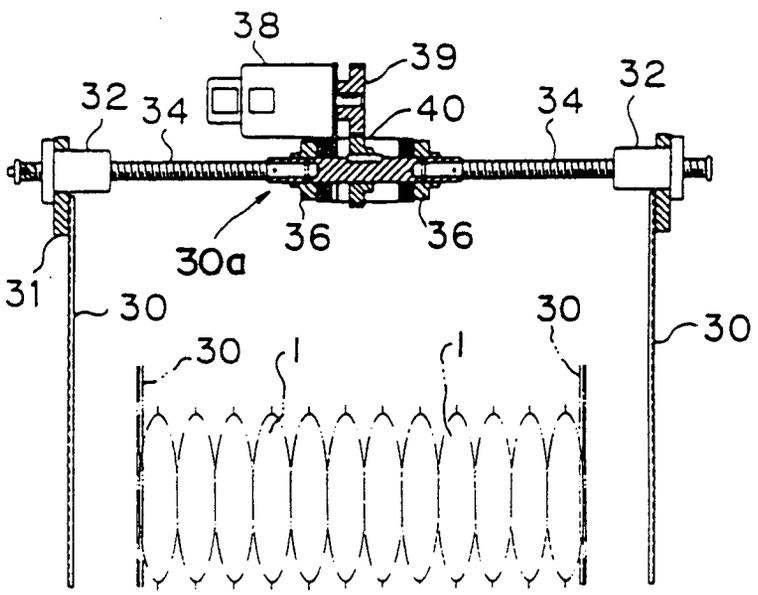
(B)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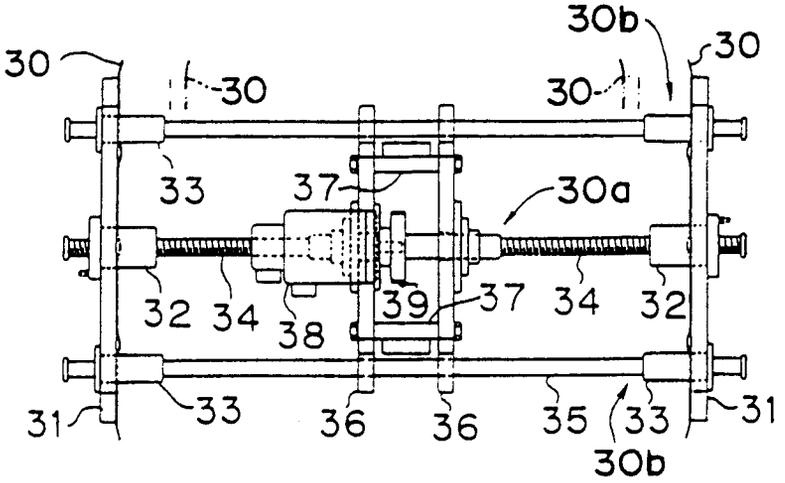
30

(C)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30b

FIG. 9 (A)

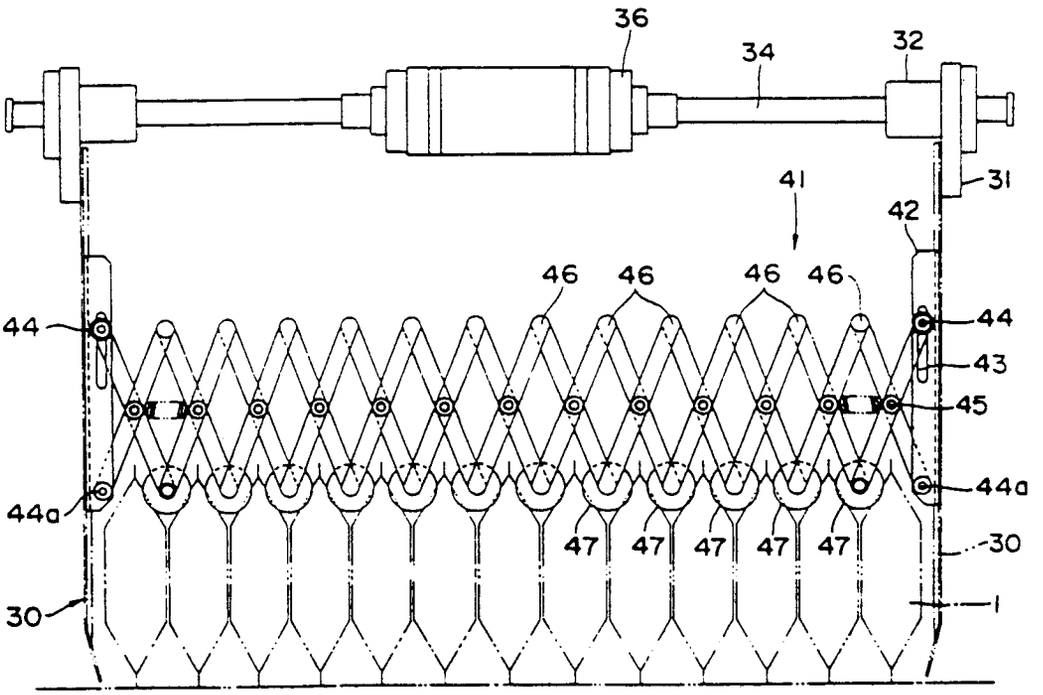
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FIG. 9(B)

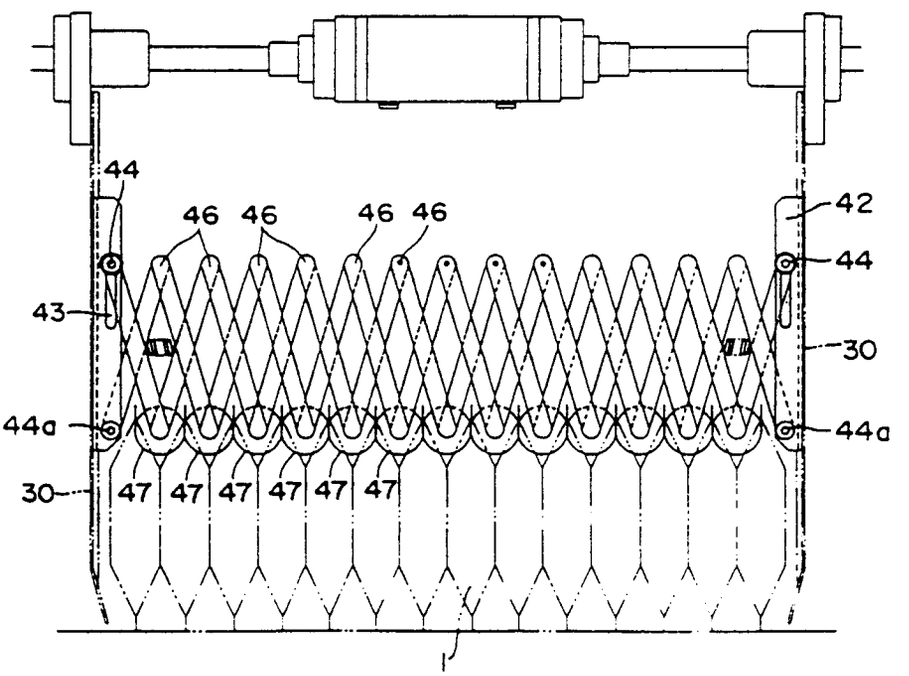
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FIG. 9(C)

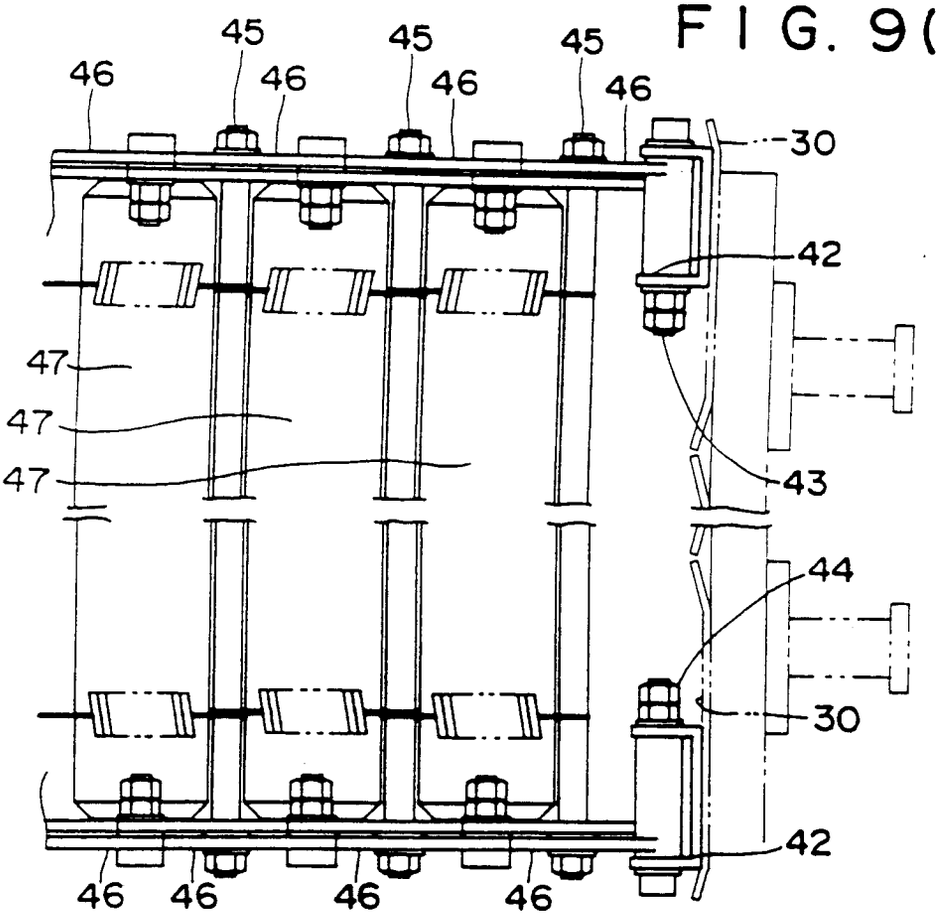


FIG. 10(A)

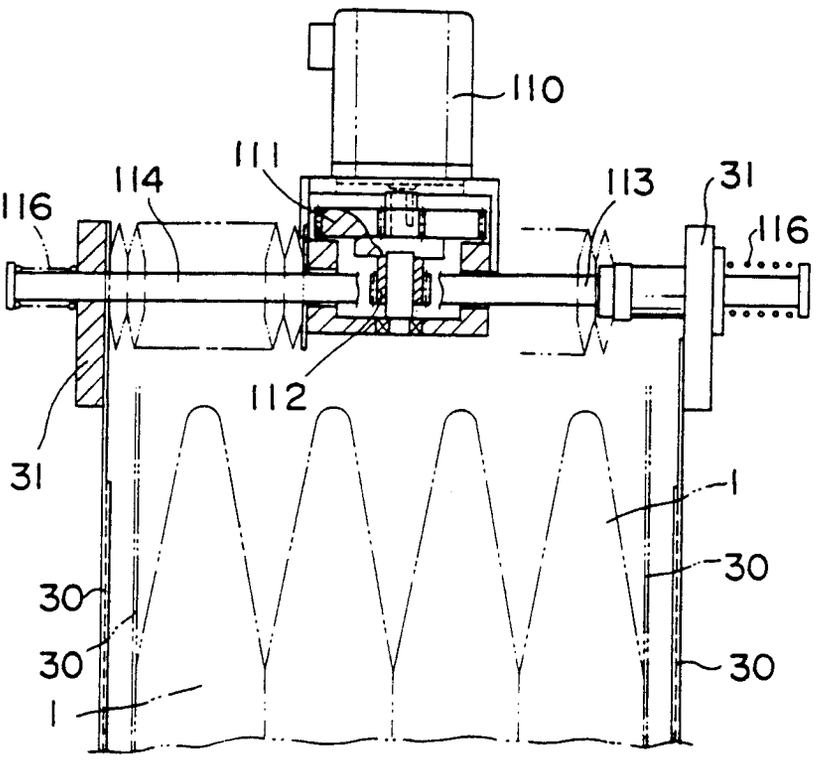


FIG. 10(B)

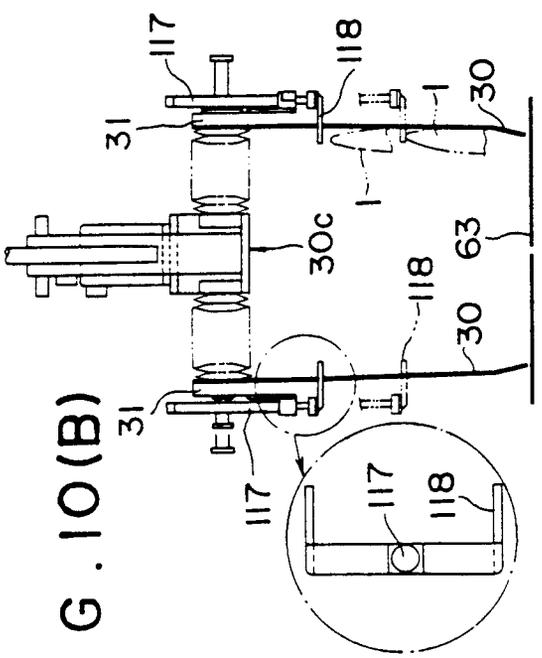


FIG. 10(C)

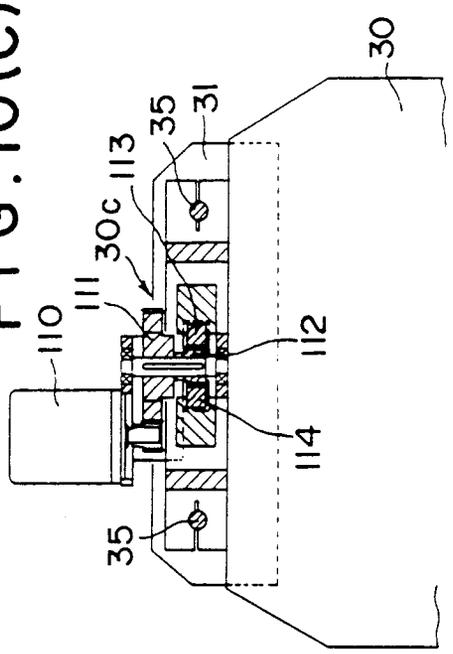


FIG. 10(D)

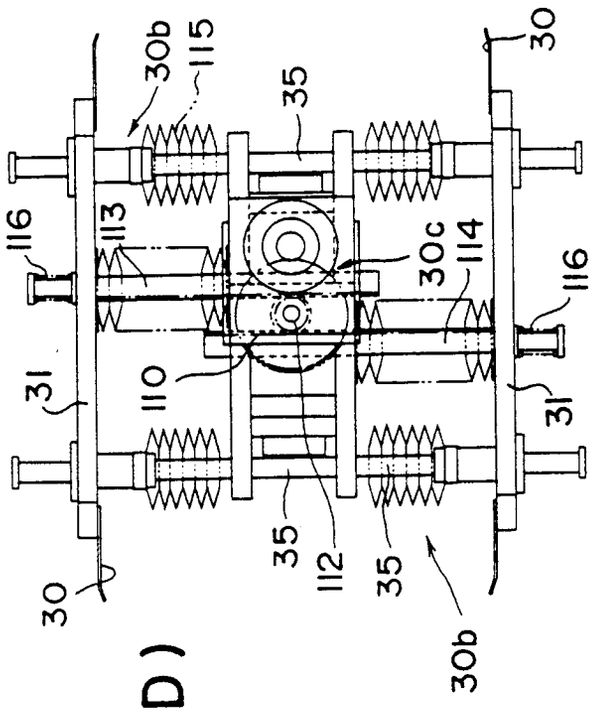
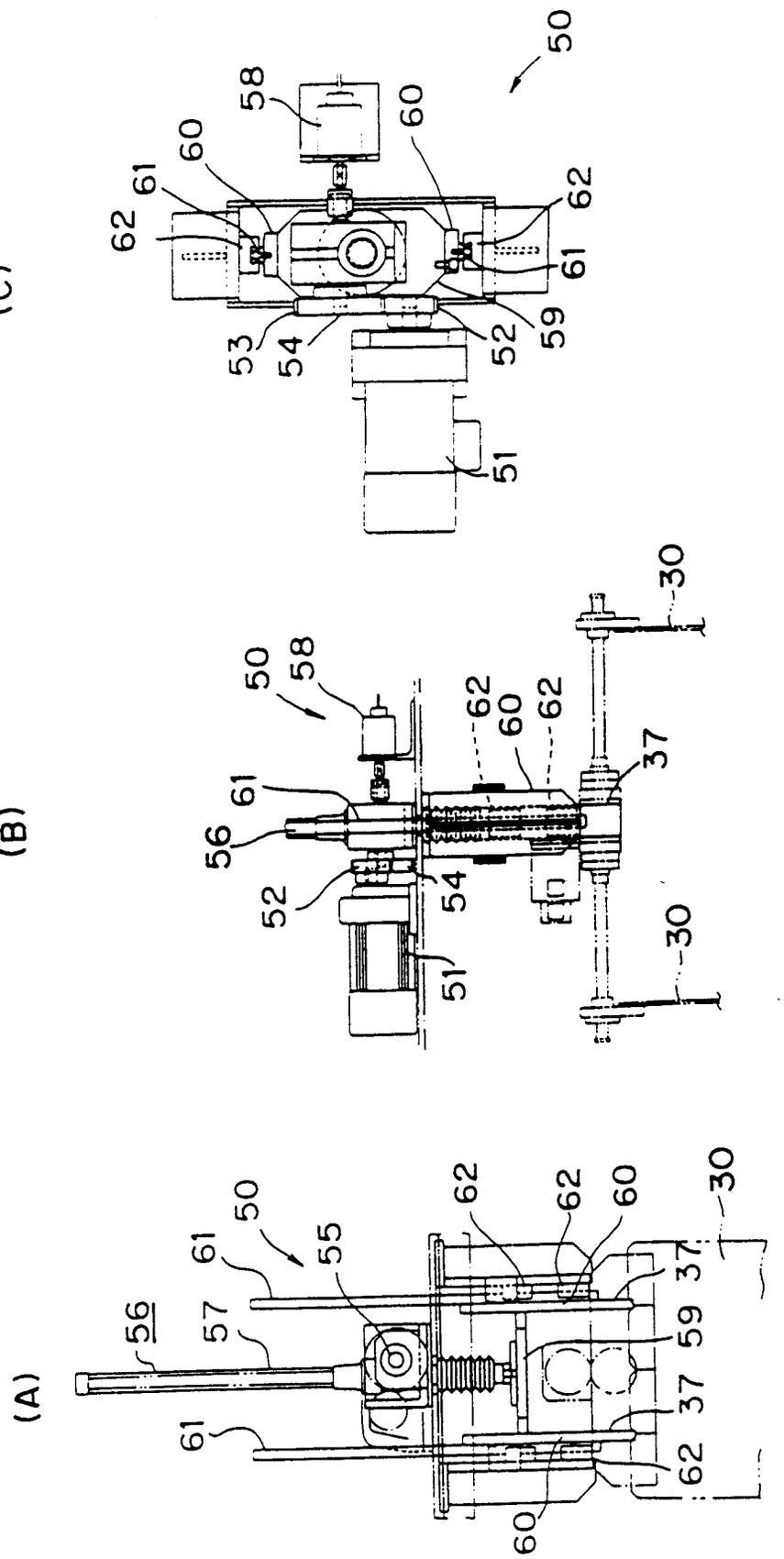


FIG. 11



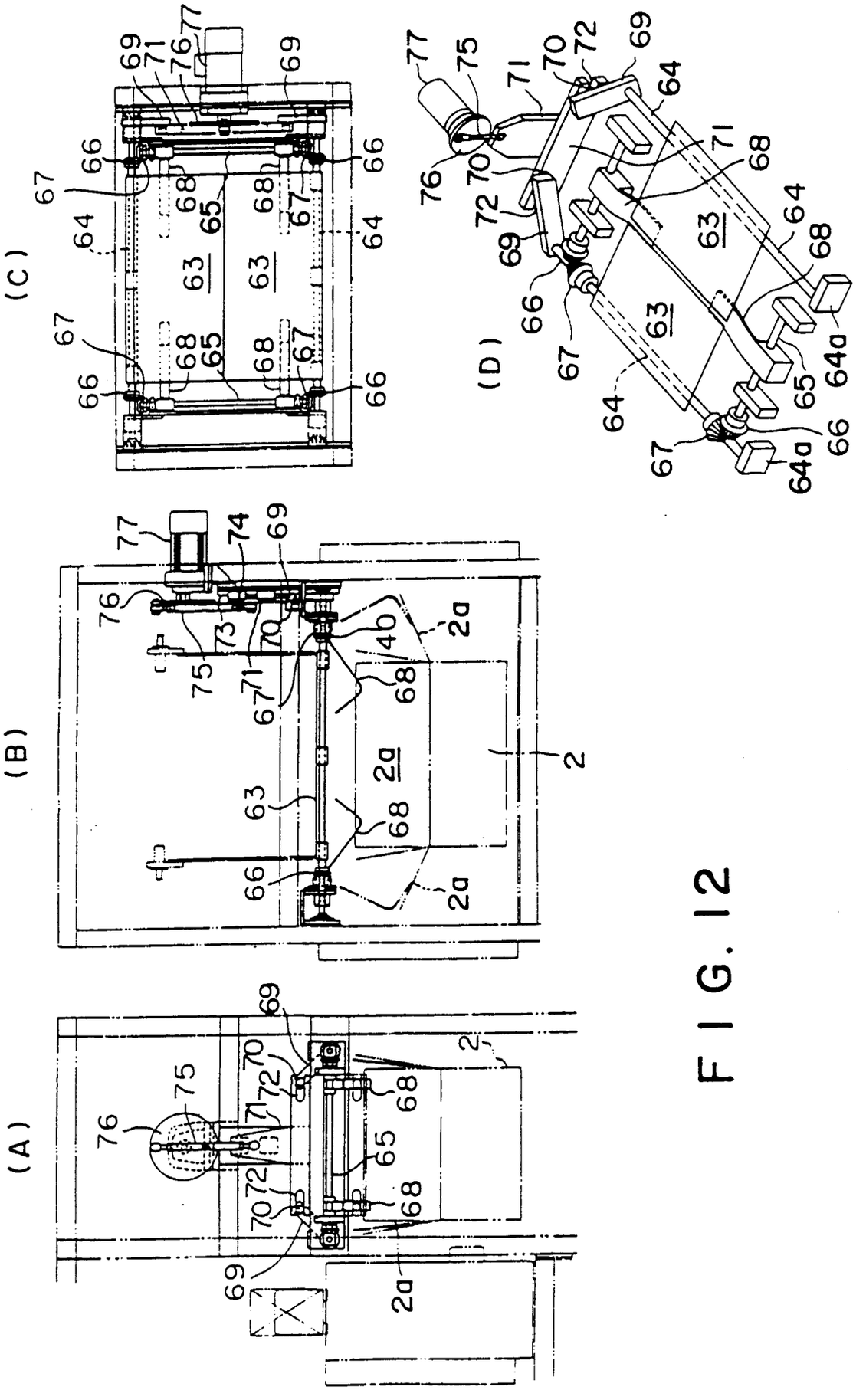


FIG. 12

FIG. 13(B)

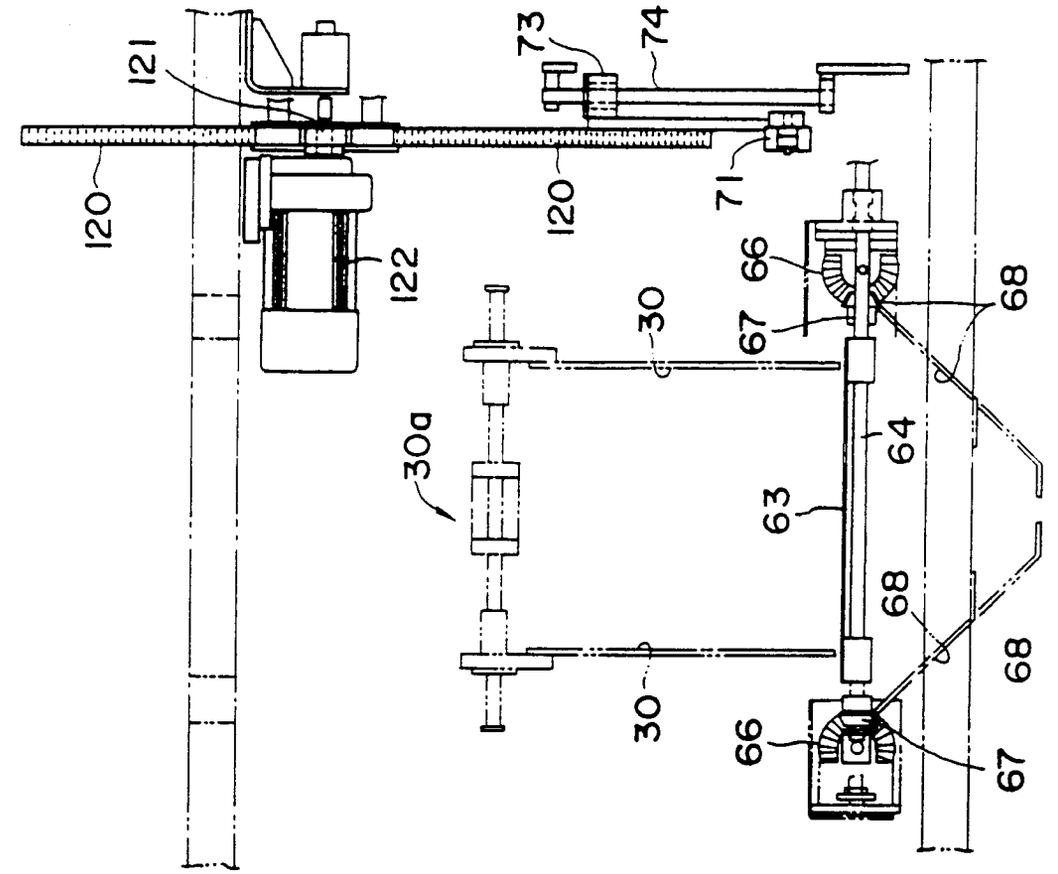


FIG. 13(A)

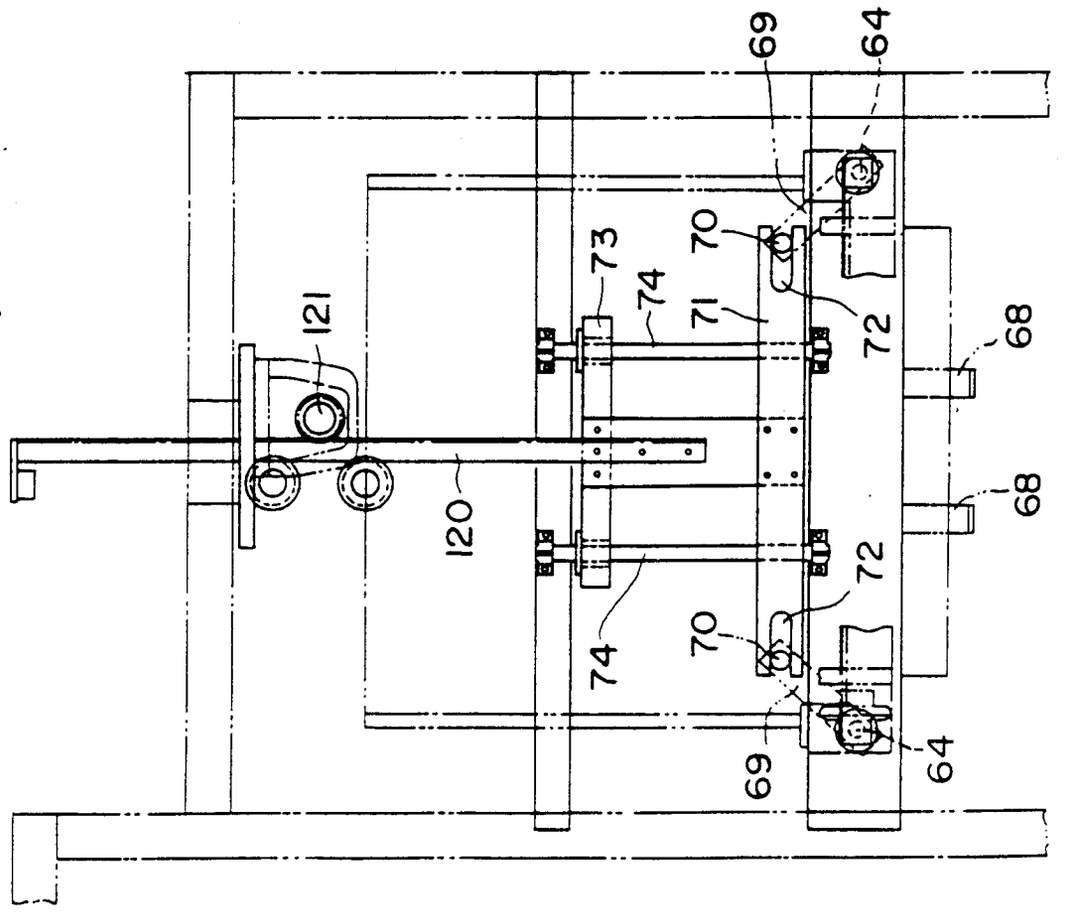
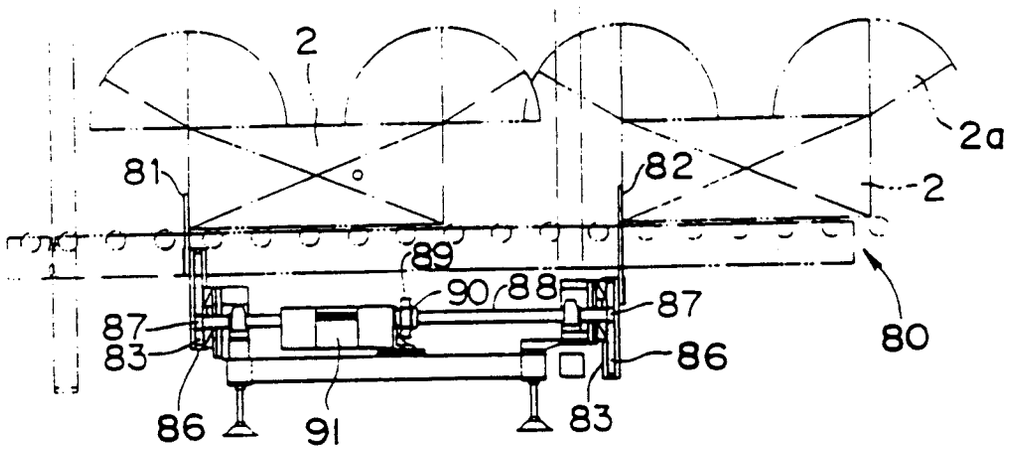


FIG. 14

(A)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2a
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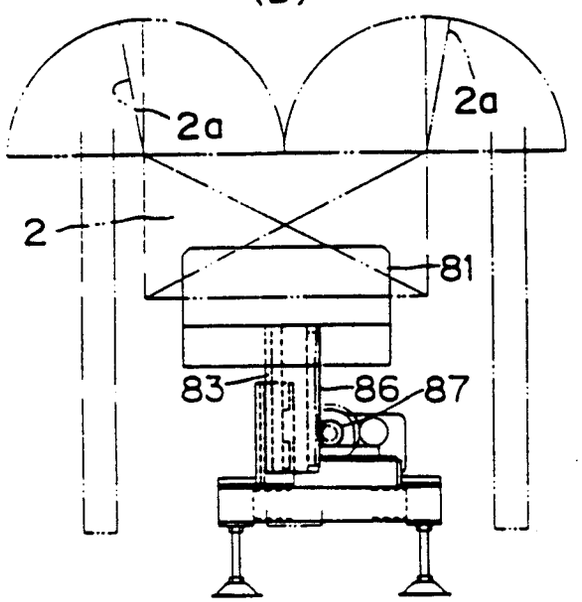
80
86
91
83

(B)


2a
2a
2
81
83
86
87

(C)

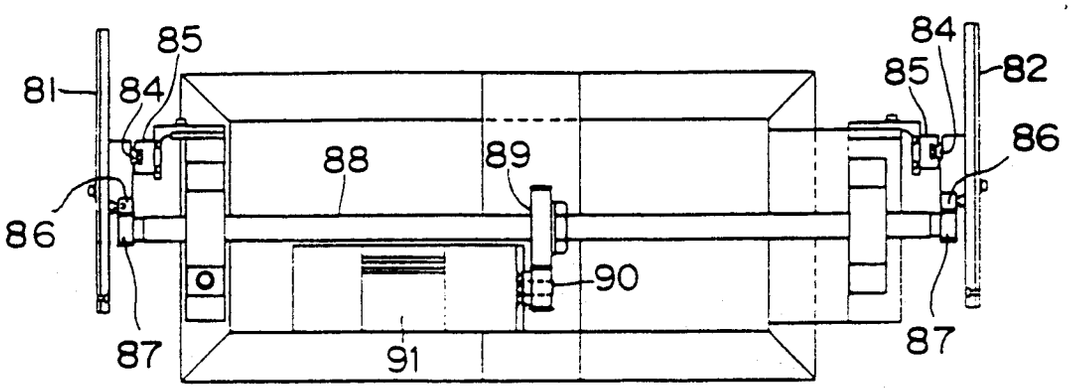

85
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FIG. 15

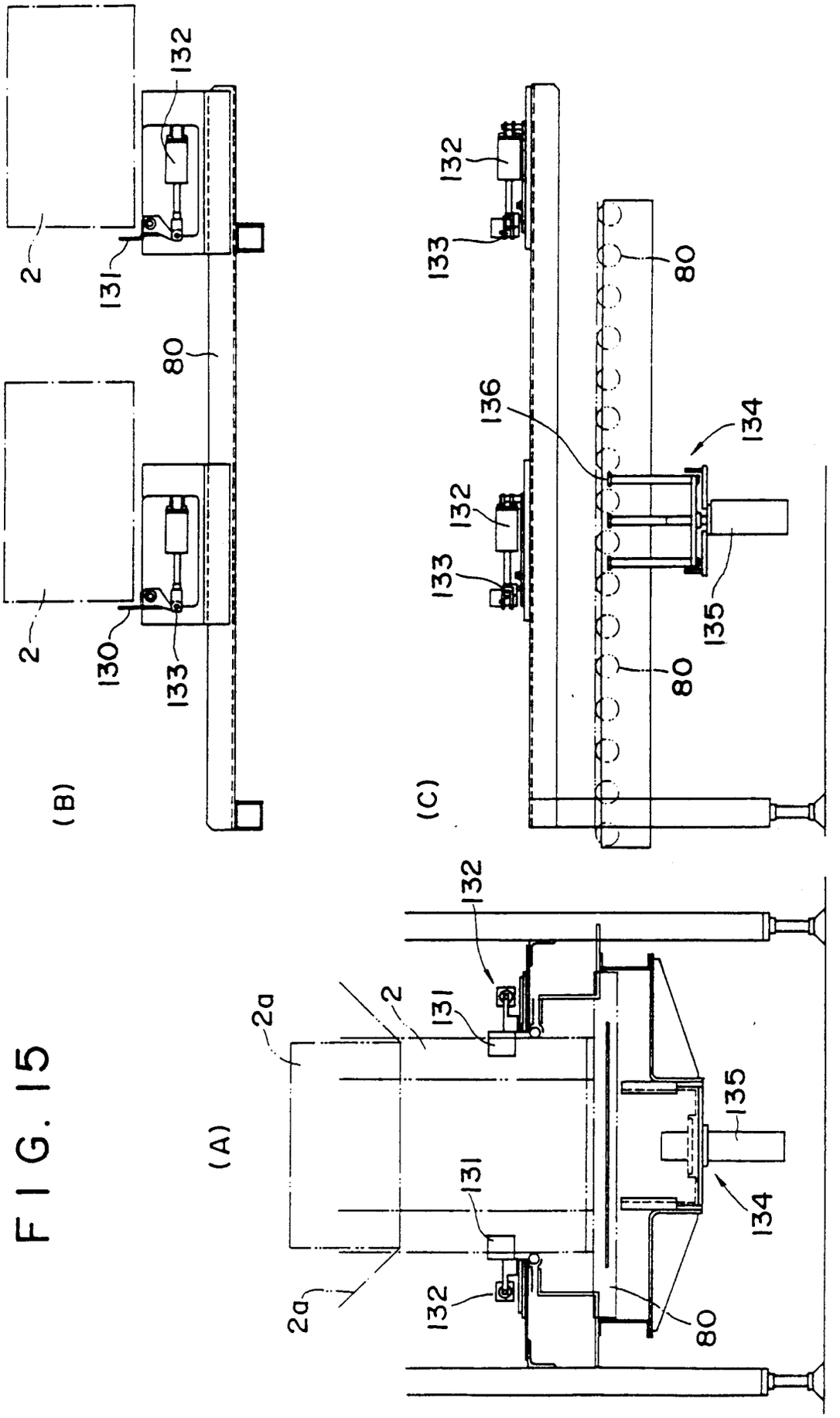


FIG. 16(A)

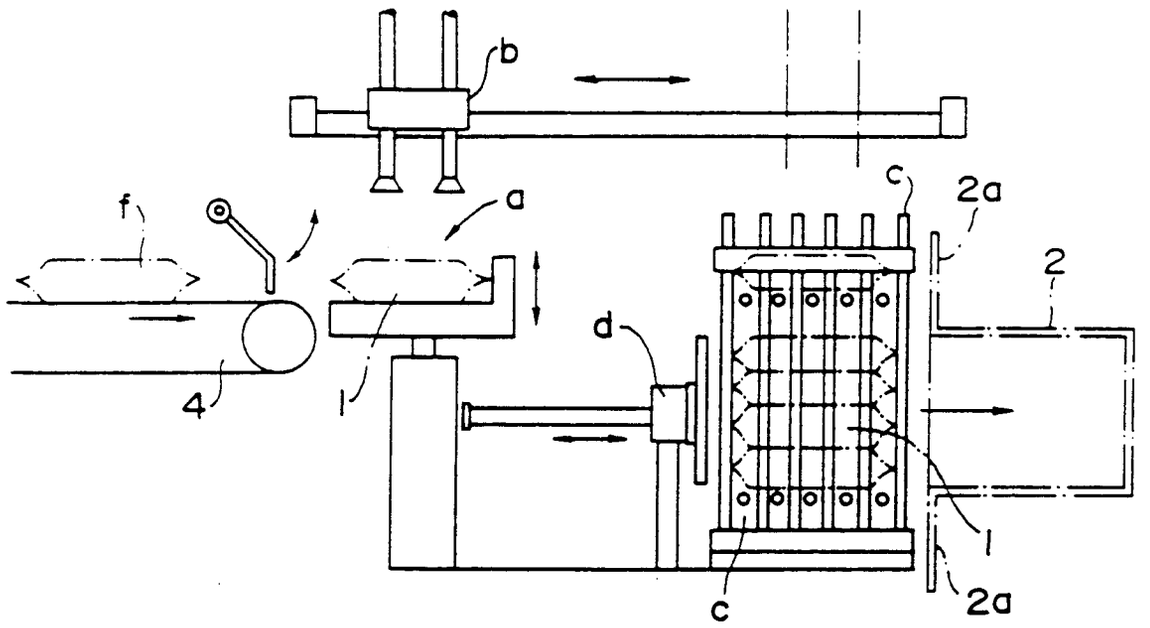
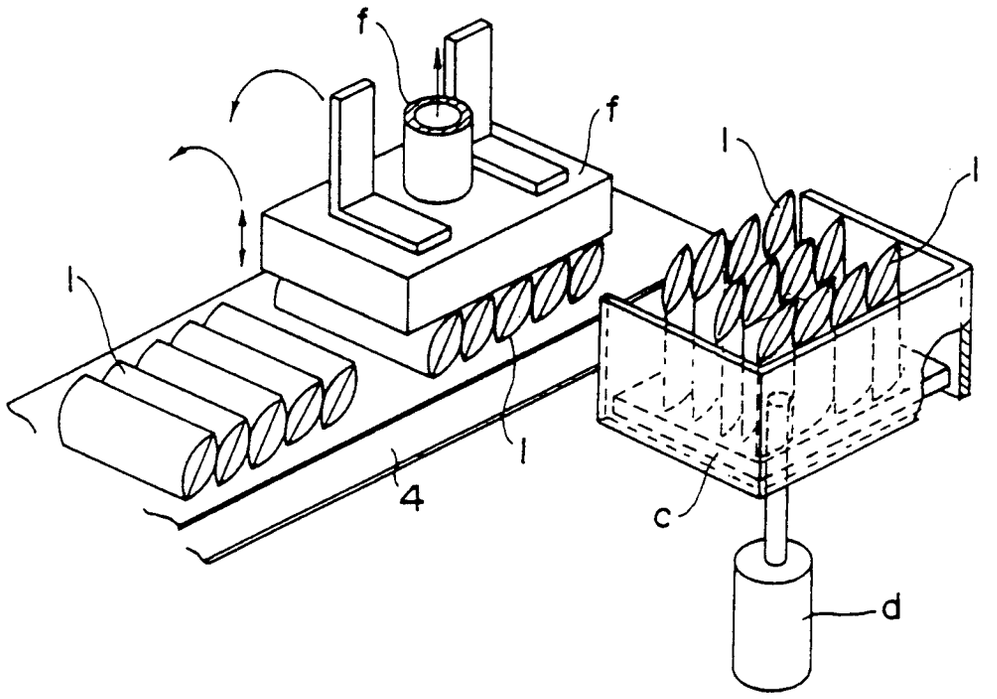


FIG. 16(B)



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP94/00662

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl^5 B65B5/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl^5 B65B5/06, B65B35/44, B65G17/32

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1926 - 1994
Kokai Jitsuyo Shinan Koho 1971 - 1994

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP, A, 48-55094 (Shozo Omori), August 2, 1973 (02. 08. 73), (Family: none)	1, 2, 6 3-5, 7-10
Y	JP, B1, 48-25119 (Gebrüder Heller GmbH.), July 26, 1973 (26. 07. 73) & US, A, 3,655,180 & DE, C3, 1,786,161 & FR, A5, 2,016,336	1, 2
Y	JP, U, 48-103474 (Hitachi, Ltd.), December 4, 1973 (04. 12. 73), (Family: none)	8
Y	JP, B2, 59-13366 (Mitsubishi Heavy Industries, Ltd.), March 29, 1984 (29. 03. 84), (Family: none)	9, 10

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
July 15, 1994 (15. 07. 94)	August 9, 1994 (09. 08. 94)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)