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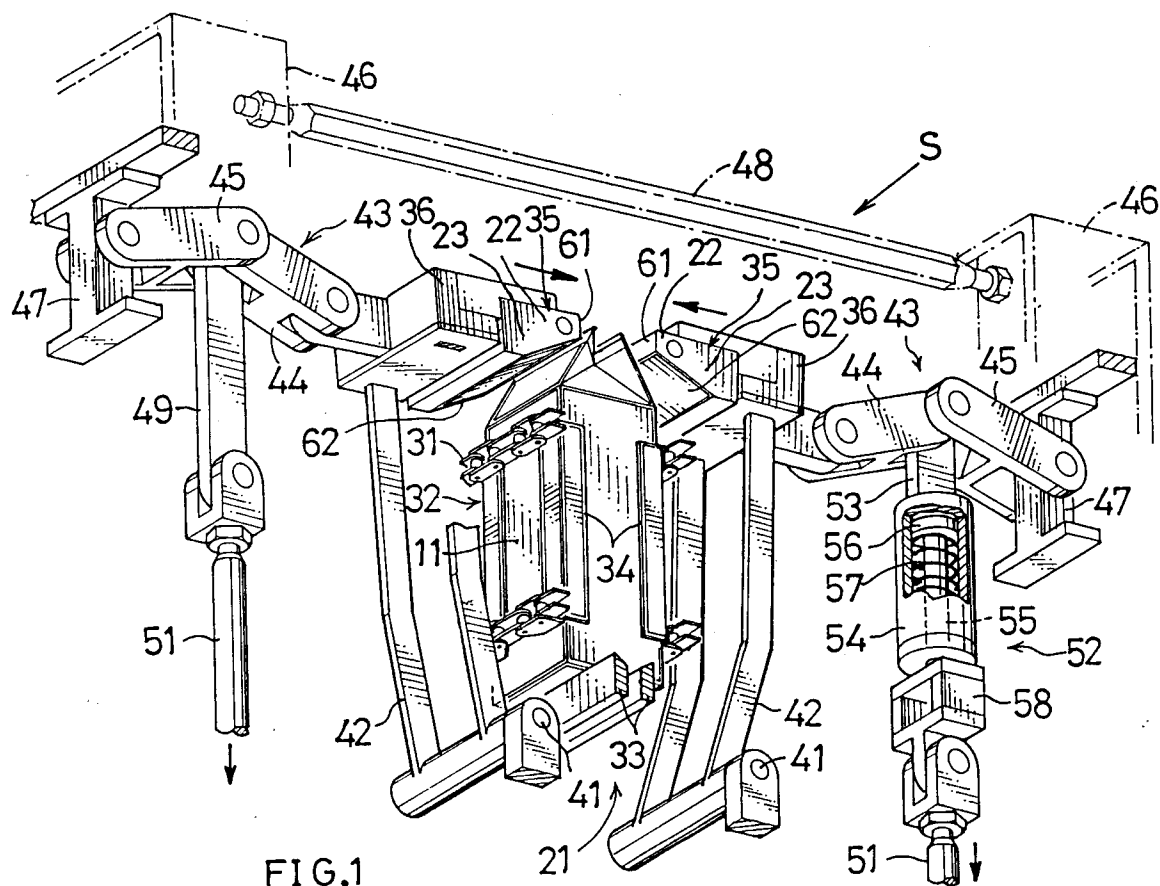
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(54) **Apparatus for bonding top portions of containers.**

(57) An apparatus for bonding top portions of containers to form at the top of each container a gabled roof having a sealed top rib by a pair of outer top panels (15), a pair of outer rib (17) panels extending from the upper ends of the respective top panels, a pair of inner top panels (16) foldable inward between the outer top panels, and a pair of inner rib panels (8) extending from the upper ends of the respective inner top panels and foldable in two and holdable between the outer rib panels. The apparatus is adapted to bond the pair of outer rib panels (17) to

the pair of inner rib panels (18) under pressure and comprises a pair of pressure members (22) arranged at opposite sides of a path of travel of container tops and movable toward and away from each other, and a pair of correcting members (23) movable with the respective pressure members (22) toward and away from each other and adapted to act on required portions of the container before the pressure members (22) are moved toward each other to correct the position of the outer rib panels (17) and the inner rib panels (18).

EP 0 466 271 A1



BACKGROUND OF THE INVENTION

The present invention relates to packaging machines for preparing containers having a top in the form of a gabled roof with a top rib, and more particularly to an apparatus for use in the machine for bonding with pressure the top portions of each container to be folded into the gabled roof.

Apparatus of this type are already known which comprise a pair of pressure members arranged on opposite sides of a path of transport of containers formed by a conveyor.

FIG. 7 shows a container 11 having top portions to be joined together by bonding with application of pressure (hereinafter referred to merely as "bonding"). The container 11 has a trunk 12 having a square horizontal cross section, a closed bottom 13 formed by folding the lower end of the trunk flat, and a top 14. The top 14 of the container to be formed into a gabled roof comprises a pair of outer top panels 15, and a pair of inner top panels 16 foldable inward between the pair of outer top panels 15. A rib 19 is formed by a pair of outer rib panels 17 extending from the upper ends of the respective outer top panels 15, and a pair of inner rib panels 18 extending from the upper ends of the respective inner top panels 16 and foldable in two and holdable between the outer rib panels 17. The container is made of a paper-base laminate (not shown) having a thermoplastic synthetic resin film coating on the inner and outer surfaces thereof.

FIG. 8 shows the container 11 as bonded at its top rib 19 improperly by the above apparatus. More specifically, the rib panels 17 and 18 forming the rib 19 are bonded out of register.

The cause of this faulty bonding is as follows. FIG. 9 shows the container 11 and a holder H therefor. The holder H comprises four vertical pieces L-shaped in cross section and extending along the respective four corners of the container externally thereof. The two pairs of vertical pieces are attached to a pair of opposed horizontal endless chains L, respectively. If the chain L becomes stretched or if the vertical piece is attached as improperly adjusted in position, the two pairs will become displaced from each other longitudinally of the chains L.

The container held by the vertical pieces thus displaced deforms to a slightly flattened rhombic form from a square indicated in a broken line when seen from above, with the rib panels 17 and 18 for forming the rib 19 positioned out of register in the longitudinal direction. If the container top 14 is bonded in this state, a faulty joint will result as seen in FIG. 8.

SUMMARY OF THE INVENTION

The main object of the present invention is to provide an apparatus for bonding top portions of containers without producing such faulty joints.

The present invention provides an apparatus for bonding top portions of containers with pressure which comprises a pair of pressure members disposed at opposite sides of a path of travel of container tops and movable outward and away from each other, and a pair of correcting members movable with the respective pressure members toward and away from each other and adapted to act on required portions of the container before the pressure members are moved toward each other to correct the position of the outer rib panels and the inner rib panels.

When these rib panels for forming a rib are out of register, the correcting members of the bonding apparatus of the invention eliminate the misregister.

Accordingly, the outer and inner rib panels are bonded in register by the pressure members. Thus, the invention obviates faulty bonding due to misregister of the rib panels.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an apparatus embodying the present invention;

FIG. 2 is a view in vertical cross section of the apparatus;

FIG. 3 is a plan view for illustrating container top folding operation and bonding operation;

FIG. 4 includes side elevations for illustrating the container top bonding operation;

FIG. 5 is a perspective view corresponding to FIG. 1 and showing another embodiment;

FIG. 6 is a plan view corresponding to FIG. 3 and illustrating the container top folding and bonding operations to be performed by the second embodiment;

FIG. 7 is a perspective view of a container to be bonded at its top;

FIG. 8 is a perspective view of a container having a faulty joint; and

FIG. 9 is a plan view of a container and a holder for illustrating the cause of the faulty joint.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will be described below with reference to FIGS. 1 to 6.

In the specification, the term "front" refers to the direction toward which containers are transported (leftward in FIG. 2), the term "rear" to the opposite direction, and the terms "right" and "left" are used as the apparatus is seen toward the front as shown in FIG. 2.

Containers 11 the same as the container 11

already described are used for the packaging machine including the bonding apparatus of the invention.

With reference to FIGS. 1 and 2, the packaging machine has a container conveyor 21 for transporting containers 11 in succession so as to stop each container at a bonding station S, a pair of pressure members 22 arranged at opposite sides of a path of transport of container tops at the bonding station S, and a pair of correcting members 23 integral with the pair of pressure members 22, respectively.

With reference to FIG. 3, a pair of folding guides 24 is disposed immediately upstream from the bonding station S with respect to the direction of transport of containers, and a pair of cooling members 25 are disposed immediately downstream from the station and movable toward or away from each other.

Although not illustrated, disposed upstream from the bonding station S are a breaker for prefolding the top 14 of the container 11 so as to be finally foldable to the shape of a gabled roof, and a heater for applying hot air to the rib panels 17, 18 at the prefolded top 14 to melt the thermoplastic synthetic resin film.

The container conveyor 21 comprises a pair of opposed horizontal endless chains 31, a multiplicity of container holders 32 attached to these chains 31, and rails 33 for supporting the bottom of the container 11 held by each holder 32 for guiding the container. The holder 32 comprises four vertical pieces 34 L-shaped in cross section and attached to the pair of chains 31, two pieces on each chain. The container 11 is held by the holder 32 with its upper portion including the upper end of the trunk 12 projecting upward beyond the holder and also with the rib panels 17 positioned longitudinally of the conveyor. With reference to FIG. 3, a small clearance C is provided inside the four vertical pieces 34 around the container 11 as held by the holder 32, such that the container 11 is deformable to an extent corresponding to the clearance C.

The pressure member 22 and the correcting member 23 on each side of the path are formed by a block 35, which is held by a bonding head 36.

The pair of blocks 35 are respectively provided with a pair of vertical pressing faces 61 for bonding the outer rib panels 17 and the inner rib panels 18 of the top 14, and with a pair of downwardly slanting faces 62 extending from the lower ends of the respective vertical faces 61 and conforming to the gabled roof of the top 14 to be formed.

The pair of bonding heads 36 are fixed to the upper ends of a pair of opposed pivotal arms 42, respectively, so as to oppose to each other and are movable toward or away from each other by toggle link mechanisms 43. The pair of pivotal arms 42 are supported at their lower ends respectively by a

pair of parallel horizontal pivots 41 arranged at the respective sides of the path of transport of containers and extending in the longitudinal direction. Each of the toggle link mechanisms 43 comprises a first link 44 and a second link 45 which are interconnected each at its one end. The other end of the first link 44 is connected to the pressure member 22, and the other end of the second link 45 is connected to a support 46 by a bracket 47. The opposed supports 46 are interconnected by a horizontal tie rod 48. By a connecting rod 49, the upper end of a lift rod 51 is connected to the interconnected ends of the links of the toggle link mechanism 43 at the left side. The interconnected link ends of the toggle link mechanism 43 at the right side has connected thereto the upper end of a lift rod 51 by a pressure adjusting mechanism 52. This mechanism 52 comprises a cylinder 54 having an upward lug 53 which is pivoted at its upper end to the interconnected link ends of the toggle link mechanism, a piston 56 housed in the cylinder 54 and having a piston rod 55 which extends through the bottom wall of the cylinder, a compression spring 57 provided between the piston 56 and the cylinder bottom wall, and a member 58 connecting the lower end of the piston rod 55 to the upper end of the lift rod 51.

With reference to FIG. 3, the portion of the container 11 to be made into its top 14, although pre-folded, is in an unfolded state when positioned upstream from the bonding station S, and is generally closed by the time it is transported to the bonding station S.

The opposed pressure members 22 remain away from each other until the container 11 is brought to the bonding station S (FIG. 4, (a)), but upon the container 22 reaching the station S, the pressure members 22 start to approach each other, bringing the boundaries between the vertical faces 61 and the slanting faces 62 into contact with the container top (FIG. 4, (b)). As the pressure members 22 further approach, the slanting faces 62 of the members 22 are brought into contact with the respective outer top panels 15 of the top 14, which in turn is folded to the predetermined shape of the gabled roof. Even if the outer rib panels 17 and the inner rib panels 18 are out of register longitudinally of the conveyor, the above movement eliminates the misregister. When the pressure members 22 are finally moved toward each other to a closed position (FIG. 4, (c)), the outer rib panels 17 and the inner rib panels 18 are pressed by the vertical faces 61 of the pressure members 22, forming a satisfactory rib 19 free from misregister.

FIGS. 5 and 6 show modified pressure members 71 and correcting members 72. In FIGS. 5 and 6, the parts corresponding to those shown in FIGS. 1 to 4 are each designated by the same

corresponding reference numeral and will not be described again.

Each pressure member 71 and each correcting member 72 are made of separate members. The pressure member 71 is in the form of a horizontal flat plate of large thickness. The opposed faces of the pair of pressure members 71 serve as pressing faces 73. The two correcting members 72 are each U-shaped in horizontal section and are secured to the bottom sides of the respective pressure members 71 so as to oppose to each other. The distance between the parallel portions of each U-shape correcting member 72 is equal to the length of the container trunk 12 along the longitudinal direction, and the opposed faces of the parallel portions serve as correcting faces 74. The opposed forward ends of the correcting member 72 are flared to serve as guide portions 75.

When the opposed correcting members 72 are moved toward each other along with the pressure members 71, the correcting members 72 fit to the upper end portion of the container trunk 12, whereby the trunk upper end portion, rhombic in horizontal cross section, is corrected to a square horizontal cross section. This eliminates the misregister of the outer rib panels 17 and the inner rib panels 18.

Claims

1. An apparatus for bonding top portions of containers to form at the top of each container a gabled roof having sealed top rib by a pair outer top panels, a pair of outer rib panels extending from the upper ends of the respective top panels, a pair of inner top panels foldable inward between the outer top panels, and a pair of inner rib panels extending from the upper ends of the respective inner top panels and foldable in two and holdable between the outer rib panels, the apparatus being adapted to bond the pair of outer rib panels to the pair of inner rib panels under pressure, the apparatus comprising:

a pair of pressure members arranged at opposite sides of a path of travel of container tops and movable toward and away from each other, and

a pair of correcting members movable with the respective pressure members toward and away from each other and adapted to act on required portions of the container before the pressure members are moved toward each other to correct the position of the outer rib panels and the inner rib panels.

2. A bonding apparatus as defined in claim 1 wherein the pair of pressure members are fixed to the upper ends of a pair of pivotal

arms respectively and opposed to each other, each of the pivotal arms being supported at its lower end by a horizontal pivot extending in parallel to the direction of travel of the container, a pair of toggle link mechanisms being connected each at its one end to the pair of pressure members respectively and each having the other end thereof connected to a support member, a movable rod being connected to the interconnected ends of two links of each toggle link mechanism.

3. A bonding apparatus as defined in claim 1 wherein the pressure member and the correcting member on each side of the path are formed by a block, and the pair of blocks are respectively provided with a pair of opposed vertical pressing faces and a pair of downwardly slanting correcting faces extending from the lower ends of the respective pressing faces and conforming to the gabled roof to be formed.
4. A bonding apparatus as defined in claim 1 wherein each of the correcting members has a pair of opposed vertical correcting faces perpendicular to the direction of travel of the container and spaced apart by a distance equal to the length of the trunk of the container along the direction of travel, and the vertical correcting faces are fittable to the upper end portion of the container trunk when the correcting members are moved toward each other.

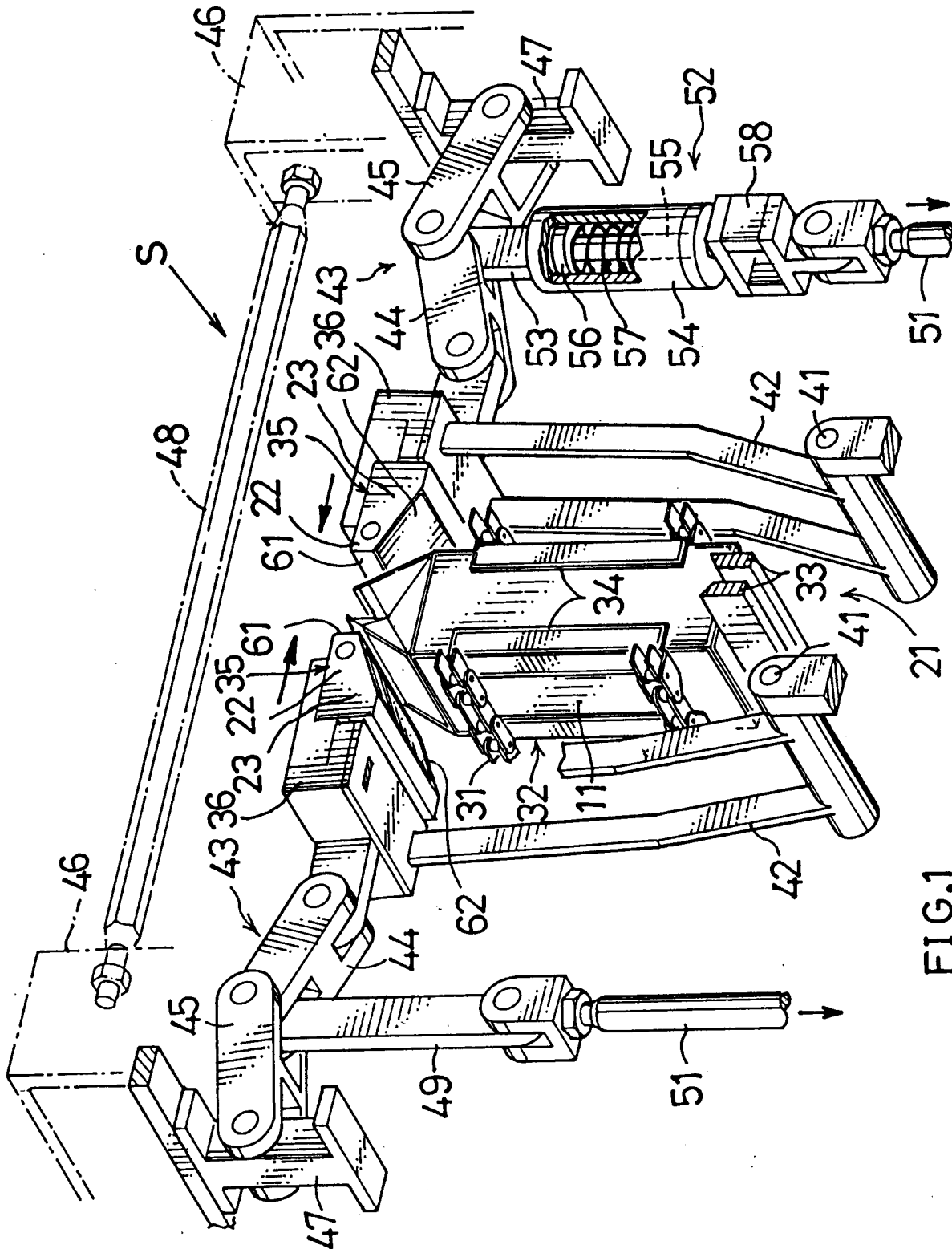


FIG.1

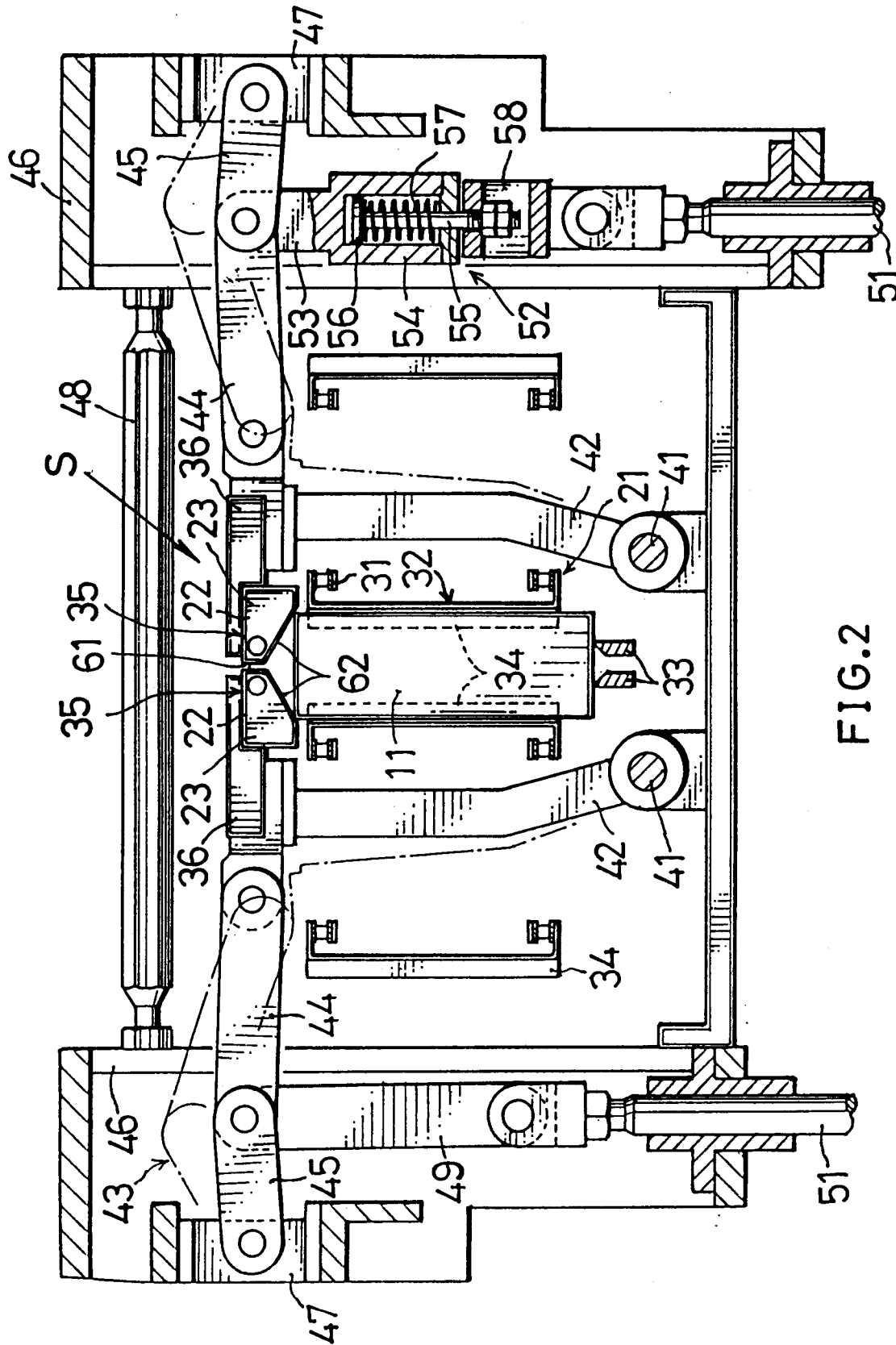


FIG.2

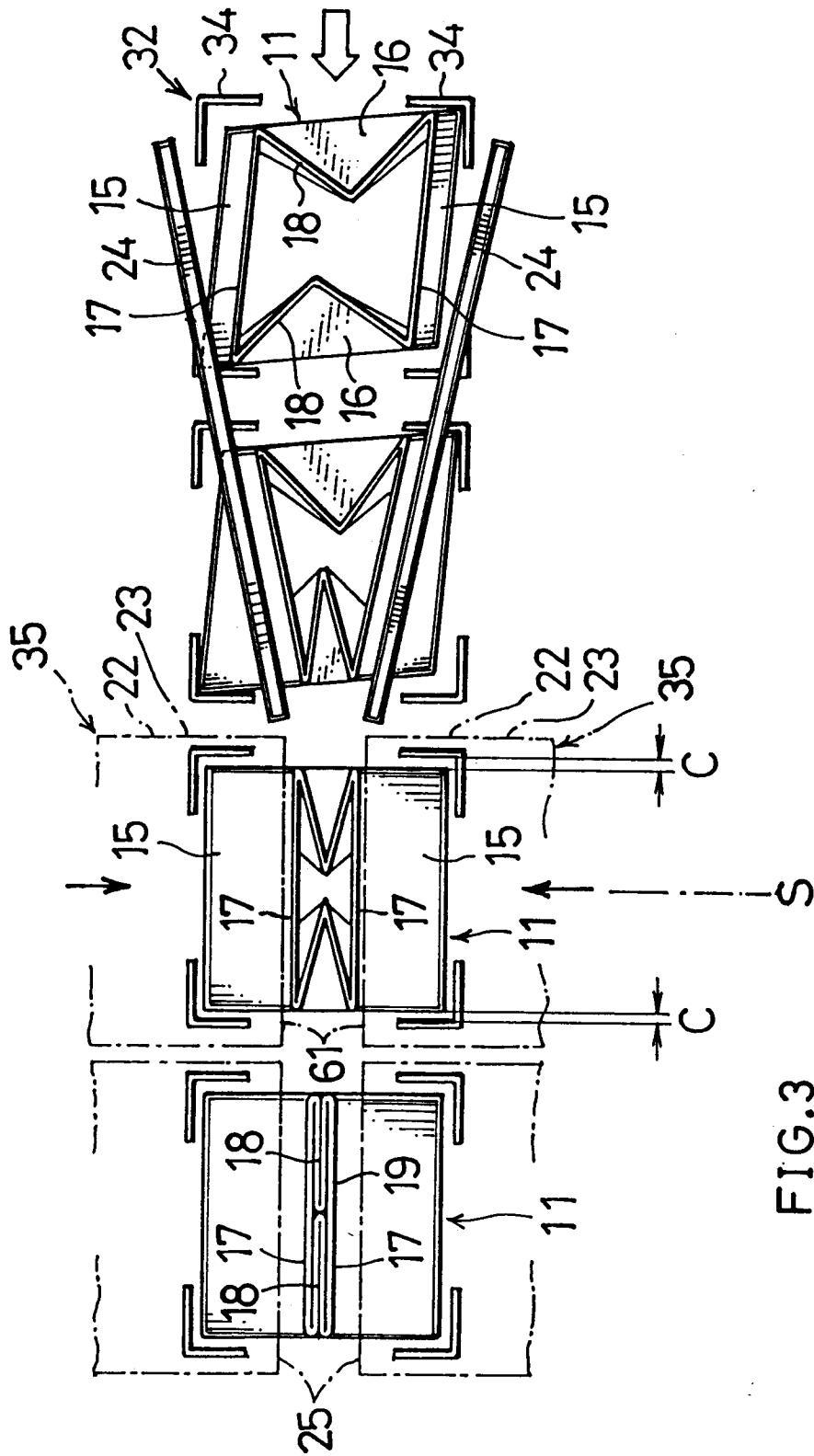


FIG.3

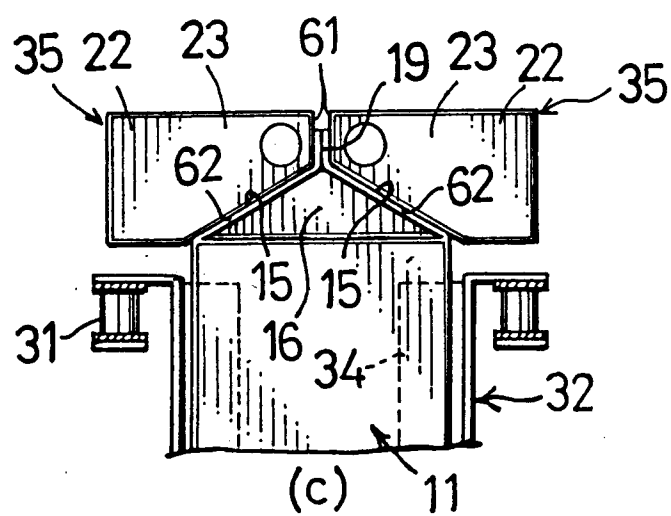
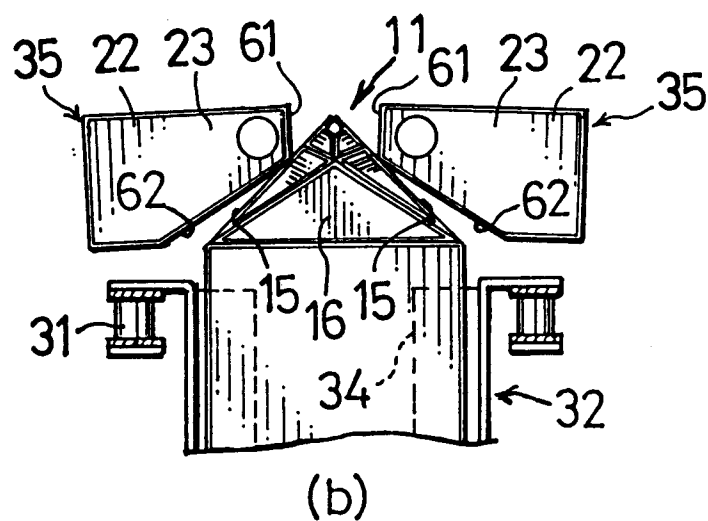
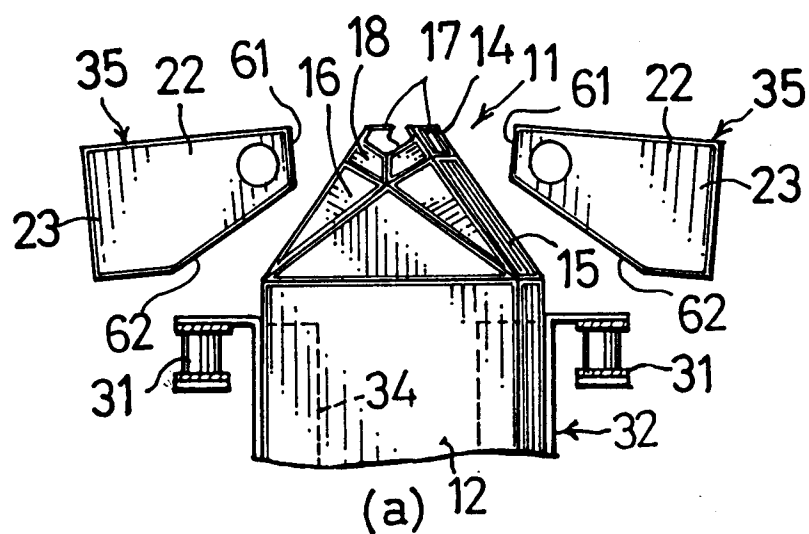


FIG.4

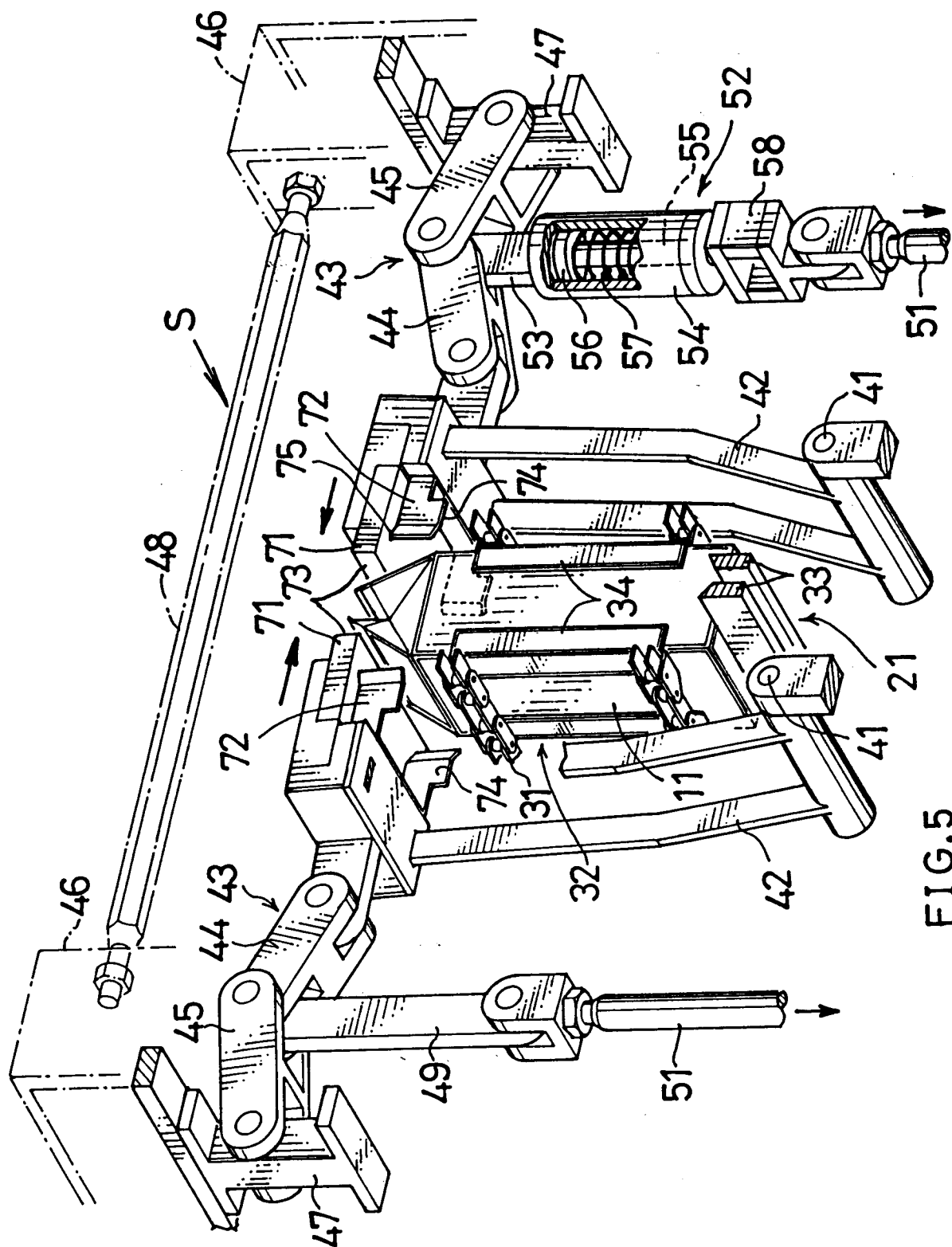


FIG. 5

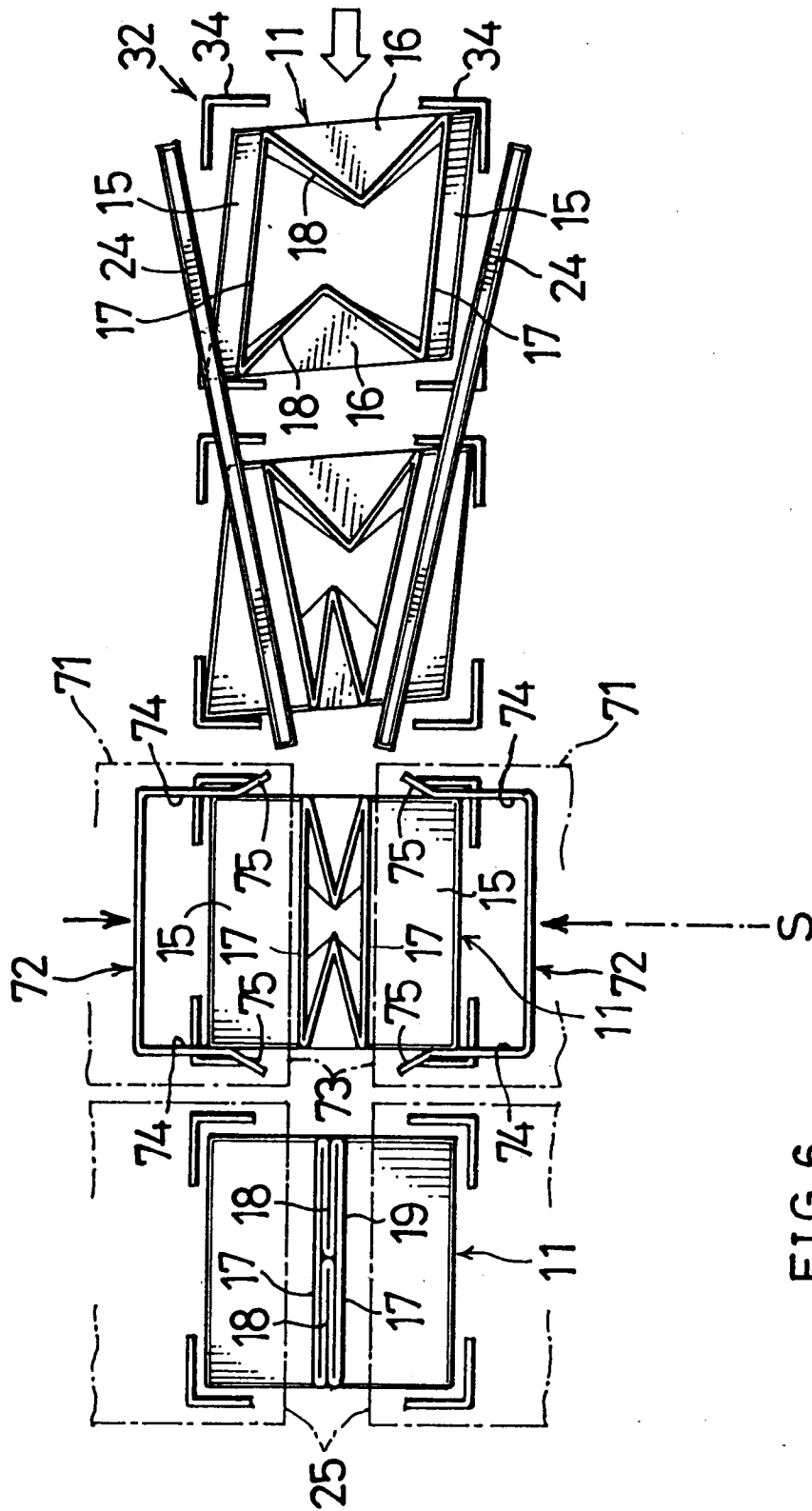


FIG.6

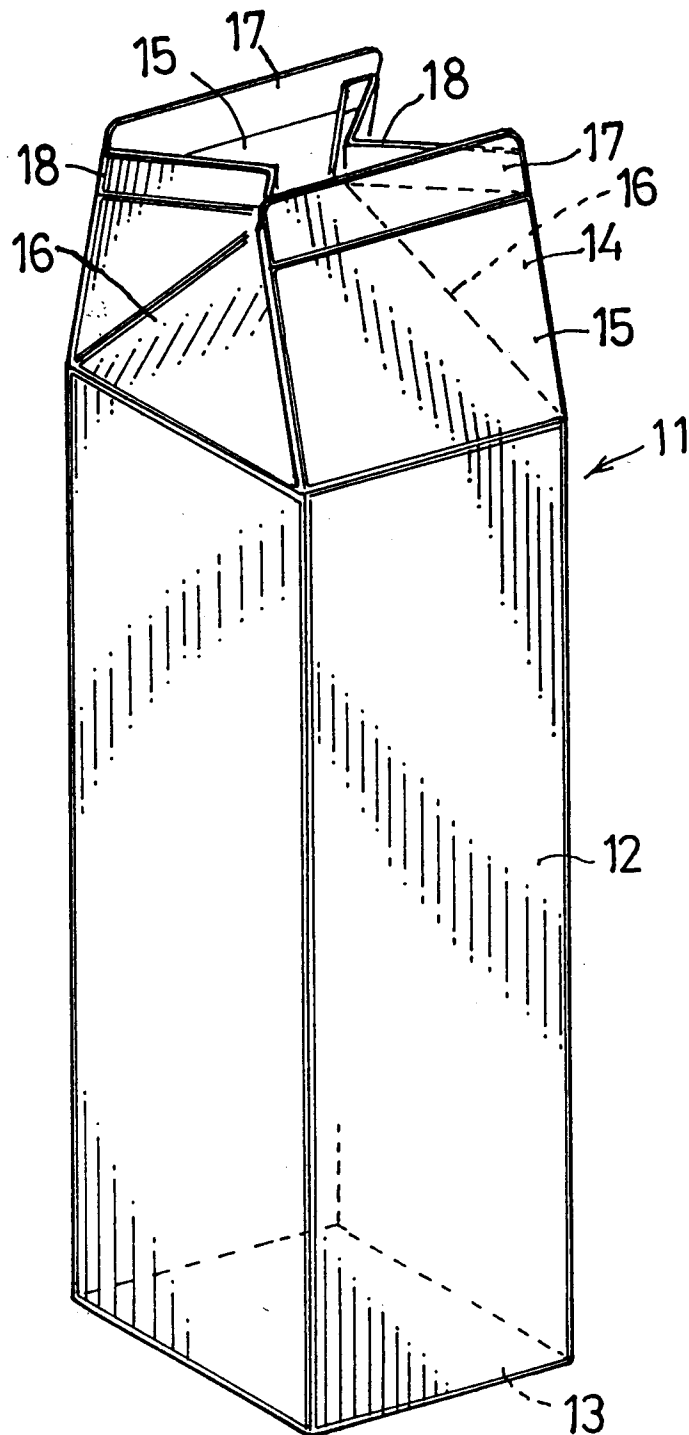
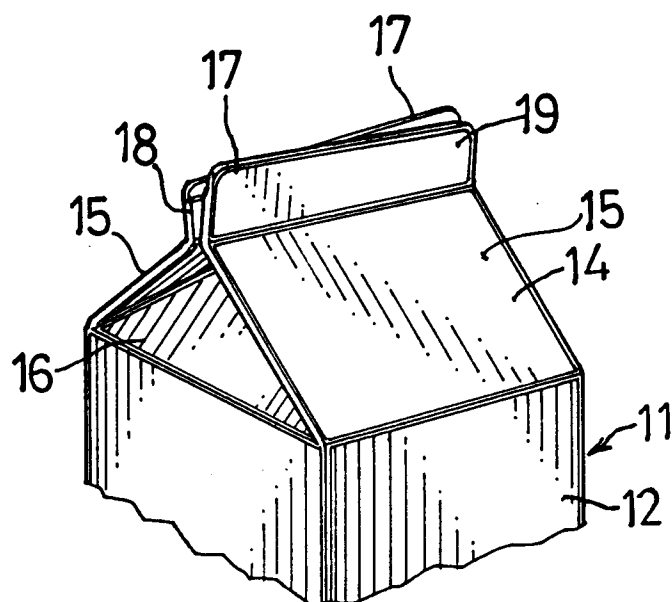
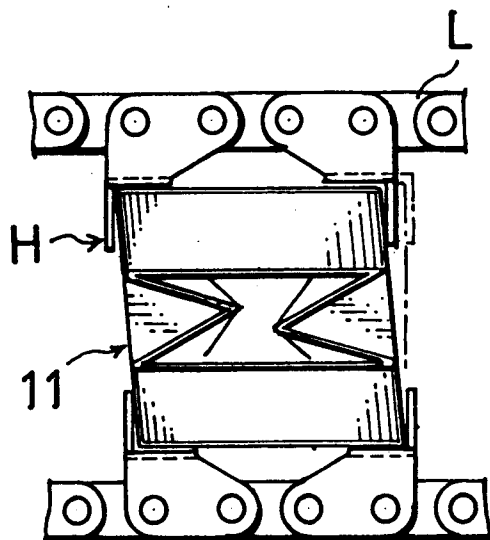


FIG.7





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EUROPEAN SEARCH REPORT

Application Number

EP 91 20 1782

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-0 203 572 (CONTAINER DEVELOPMENT CO.) * the whole document * - - -	1	B 65 B 7/18
A	EP-A-0 247 249 (SHIKOKU KAKOOKI CO.) * the whole document * - - -	1	
A	GB-A-2 017 041 (JAGENBERG-WERKE) * the whole document * - - - - -	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 B
Place of search		Date of completion of search	Examiner
The Hague		04 October 91	NGO SI XUYEN G.
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