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(54) **AUTOMATIC CUTTING AND STACKING DEVICE FOR SHAPED BLANKS AND METHOD OF USE**

AUTOMATISCHE SCHNEID- UND STAPELVORRICHTUNG FÜR GEFORMTE WERKSTÜCKE UND VERFAHREN ZUR VERWENDUNG DERSELBEN

DISPOSITIF AUTOMATIQUE DE DECOUPE ET D'EMPILAGE D'EBAUCHES FAçONNEES ET PROCEDE D'UTILISATION

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Description

[0001] This invention relates to an automatic cutting and stacking device for cut shaped blanks and method of use. The equipment is beneficially suitable for the manufacture and handling of cut shaped interlayer blanks. The equipment of this invention comprises: a feeding mechanism generally embodying a surface that feeds accurately a film under a set angle along a set arc into the cutting unit; a cutting unit that cuts the shaped film squarely accross its circular contours; and a stacking system that stacks, in a single planar movement, the blanks at their cut positions.

[0002] Cut shaped blanks are used in automobile windshields, in particular windshields having a tinted band along the upper side. To that effect, the originally straight web, of for example polyvinyl butyral interlayer, is stretched into a curved web that fits the shape of the windshield. The so curved web is subsequently cut to produce the appropriate cut shaped blanks which can be used as interlayer between two sheets of glass for the manufacture of laminated windshields. The cutting and the stacking of such blanks is generally performed manually, chiefly because of the non-linear shape of the blanks in casu two (opposite) sides are circular whereas the (opposite) cut sides are generally straight but not parallel.

[0003] EP-A-0.317.545 discloses a process for forming plasticized sheets by means of PVB melt extrusion combined with sheet distortion by leading the extruded sheets over frusto-conical pull rolls followed by high pressure water cutting.

[0004] The prior art, including industrial practice , relating to the manufacture of shaped blanks is well established and known to be economically marginal. Because of difficulties attached to the non-linear shape of the blanks, the cutting and/or stacking of the blanks is generally done, in total or partially, manually. Past efforts to automate the cutting and/or stacking operations of blanks have led to an equipment outlay whereby a series of individual machines were installed to subsequently perform the: feeding operation; cutting operation; removal of the cut blanks; and the stacking of the cut blanks. Such known manufacturing arrangements are capital intensive, require large amounts of clean room, floor space and operator's assistance and are, inherently, subject to substantial model change-over difficulties.

[0005] It is therefore a first object of this invention to make available equipment capable of automatically cutting arcuately shaped film and stacking of the cut blanks. It is another object of this invention to provide equipment capable of continously and automatically, substantially non-manually, cutting and stacking circularly contoured cut-shaped blanks. It is still another object of this invention to generate a method for the continuous manufacture and automatic stacking of cut shaped blanks. The foregoing and other objects of this invention can now be met by means of a machine comprising: a feeding table; a cutting device; and an indexing table.

[0006] The invention herein thus relates to an automatic cutting and stacking device for arcuately shaped blanks comprising:

(a) a feeding table capable of feeding a set length of arcuately shaped film to a cutting device;
(b) a device that cuts the shaped film into blanks; and
(c) a stacking device comprising an indexing table with an attached slide plate and a base plate.

[0007] The feeding mechanism is, in a preferred embodiment, operated by means of a feeding wheel 12 which propels a set length of film to the cutting device. The cutting device 2 can be represented by a stationary bed knife 21 combined with a traversing rotating knife 22. The angle between the bed knife and the centerline of the feeding wheel shall be adjustable to thus achieve perpendicular cuts for any selected radius. Indexing table 33, provided with base plate 3, is lowered, in a manner synchronized to the operation of the cutting device, by increments substantially corresponding to the thickness of the cut shaped blanks. The base plate supporting the formed stack of cut blanks can be rolled of the indexing table and thus serve for whatever application and/or treatment can be in order.

[0008] In describing the invention, reference will be made to the accompanying drawings wherein:

Fig. 1 is a plan view representing the automatic cutting and stacking device in accordance with the invention herein;

Fig. 2a; 2b; 2c; 2d; 2e; and 2f represent sectional views of the invention with respect to the operational sequence of the cutting and stacking device herein. Fig. 2a represents starting position with empty base plate 3. Fig. 2b shows the first cut blank 41. Fig. 2c shows a stack of cut blanks accumulated on slide plate 31 and on the base plate. Fig. 2d shows the removal of the base plate with stack of cut blanks. Fig. 2e shows the stack on the base plate after being removed from the slide plate. Fig. 2f shows the automatic stacking device after removal of the base plate carrying the stack of cut blanks.

[0009] The invention is described and explained under particular reference to the drawings. The feeding table, Fig. 1, 1 is equipped with a system that positions the advancing forward edge of the shaped film in such a way into the cutting device that the cut will produce a blank of the desired size. Feeding wheel 12 propels a set length of film along a guide 11 to the cutting device. Pressure roller 13 presses the shaped film against the feeding wheel to thus prevent slippage which could alter the set angle for the blank. A separate guide shall be

used for each radius.

[0010] The cutting device 2 can be represented by any type of cutting mechanism which is generally known to be suitable for the automatic cutting of plastic films. The cutting mechanism generally comprises a stationary bed knife and a knife, for example a guillotine knife, or preferably a rotating knife, which runs along the bed knife to thus perform a scissors cut. In a preferred execution, one can use a stationary bed knife 21 combined with a traversing rotating knife 22. The position, particularly the rotational orientation, of the cutting unit comprising the stationary bed knife and the counter-knife can be adjusted independently of and in relation to the feeding table by means of any suitable mechanism routinely available such as a vertical axis. The angle between the bed knife and the center line of the feeding wheel is adjustable consequently to allow a perpendicular cut for all radii. In a preferred adjustment of the cutting unit, the said angle is, for shaped films having a radius between 1 and 8 meters, from 0° to about 18°. Differently expressed, the cutting angle is such that the cut is effected to yield a cut perpendicular to the edges of the contoured film. The feeding wheel 12 is located as close as practical to the bed knife i.e. the exit border of the feeding table 1.

[0011] The blanks as they are cut from the contoured film are collected on base plate 3. In more detail, the contoured film is passed through the cutting device via the slide plate 31 to the base plate until the selected length to be cut is reached. The cut separates the blank from the contoured film. The cut blanks are then superposed on the base plate. To control the height of the cut blanks to avoid obstruction to oncoming blanks, the indexing table 33 is lowered in a manner synchronized to the operation of the cutting device. The indexing increments substantially correspond to the thickness of the cut shaped films. The increments can correspond to the thickness of one or more cut shaped blanks. It was found that (individual) indexing increments corresponding to two to ten times the thickness of the cut shaped blanks can be preferred.

[0012] The slide plate 31 serves to overcome the height difference between bed knife 21 and base plate 3. The slide plate is permanently attached to the indexing table 33. The top of the indexing table is equipped with rollers 32 to thus facilitate the handling of the base plate, in particular the base plate onto which the cut blanks are stacked. While removing the base plate with the blanks, the small section of the blanks resting on the slide plate, follow the movement of the base plate to thus form a square stack of blanks after having left the slide plate.

[0013] The base plate carrying the stack of cut blanks is now ready for use on the laminating line or whatever application may be in order.

[0014] A very preferred feeding table herein can be represented by the treatment table in accordance with copending European patent application EP-A-97870135.7, filed September 12, 1997. The shaped films which can be handled by means of the automatic cutting and stacking device herein are preferably represented by plasticized polyvinyl butyral interlayer films. Such films can be shaped by known manufacturing techniques most preferably in accordance with the dual umbrella shaper technology as described in EP-A-0.685.316.

Claims

1. Automatic cutting and stacking device for arcuately shaped blanks comprising:

   (a) a feeding table (1), provided with a feeding wheel (12), capable of feeding a set length of arcuately shaped film to cutting device;
   (b) a device (2) that cuts the shaped film into blanks; and
   (c) a stacking device comprising an indexing table (33) with an attached slide plate (31) and a base plate (3).

2. The device in accordance with claim 1 wherein the feeding table 1 is provided with a pressure roller (13) and the cutting unit comprises a stationary bed knife (21) combined with a traversing rotating knife (22).

3. The device in accordance with claim 2 wherein the feeding table is, in addition, provided with a guide (11).

4. The device in accordance with claim 2 wherein the cutting unit is independently adjustable in relation to the feeding table over a domain represented by an angle from 0° to 18°.

5. The device in accordance with claim 1 wherein the indexing table can be lowered in synchronization to the cutting operation by indexing increments corresponding to two to ten times the thickness, of a cut shaped blank.

6. Use of the automatic cutting and stacking device in accordance with any one of claims 1 through 5 for the manufacture of cut shaped blanks from a shaped plasticized polyvinyl butyral film.

Patentansprüche

1. Automatische Schneid- und Stapelvorrichtung für gebogen geformte Rohlinge enthaltend:

   a) einen Zuführtisch (1), der mit einem Zuführrad (12) versehen ist, und mit dem eine vorge-

gebene Länge einer gebogen geformten Folie einer Schneidevorrichtung zugeführt werden kann;
b) eine Vorrichtung (2), mit der die geformte Folie in Rohlinge geschnitten wird; und
c) eine Stapelvorrichtung, die einen Schalttisch (33) mit daran angefügter Gleitplatte (31) und einer Basisplatte (3) enthält.

2. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet,
dass der Zuführtisch (1) mit einer Andruckrolle (13) versehen ist und die Schneideeinheit ein stationäres Tischmesser (21) enthält, das mit einem querverlaufenden rotierenden Messer (22) kombiniert ist.

3. Vorrichtung nach Anspruch 2,
dadurch gekennzeichnet,
dass der Zuführtisch zusätzlich mit einer Führung (11) versehen ist.

4. Vorrichtung nach Anspruch 2,
dadurch gekennzeichnet,
dass die Schneideeinheit über einen Bereich, der durch einen Winkel von 0° bis 18° definiert ist, unabhängig in Relation zu dem Zuführtisch einstellbar ist.

5. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet,
dass der Schalttisch synchron zu dem Schneidevorgang um Schalteinheiten erniedrigt werden kann, die der zwei- bis zehnfachen Dicke eines geschnittenen geformten Rohlings entsprechen.

6. Verwendung der automatischen Schneid- und Stapelvorrichtung gemäß einem der Ansprüche 1 bis 5, zur Herstellung von geschnittenen geformten Rohlingen aus einer geformten plastifizierten Folie aus Polyvinylbutyral.

Revendications

1. Dispositif de découpage et d'empilage automatique pour des flans en forme d'arc, comprenant:

(a) une table de chargement (1), munie d'un rouleau de chargement (12), capable de charger une longueur fixe de film en forme d'arc vers le dispositif de découpage;
(b) un dispositif (2) qui coupe le film formé en flans; et
(c) un dispositif d'empilage comprenant une table d'indexation (33) avec un glissoir (31) fixé et une plaque de base (3).

2. Dispositif suivant la revendication 1, dans lequel la table de chargement (1) est munie d'un rouleau de pression (13) et l'unité de découpage comprend un couteau fixe stationnaire (21) combiné avec un couteau rotatif transversal (22).

3. Dispositif suivant la revendication 2, dans lequel la table de chargement est munie, en plus, d'un guide (11).

4. Dispositif suivant la revendication 2, dans lequel l'unité de découpage est ajustable indépendamment par rapport à la table de chargement sur un domaine représenté par un angle allant de 0° à 18°.

5. Dispositif suivant la revendication 1, dans lequel la table d'indexation peut être descendue de manière synchrone avec l'opération de découpage par des incréments d'indexation correspondant à de deux à dix fois l'épaisseur d'un flan découpé et formé.

6. Utilisation du dispositif de découpage et d'empilage automatique suivant l'une quelconque des revendications 1 à 5, pour la fabrication de flans coupés et formés à partir d'un film de polyvinylbutyral plastifié et formé.

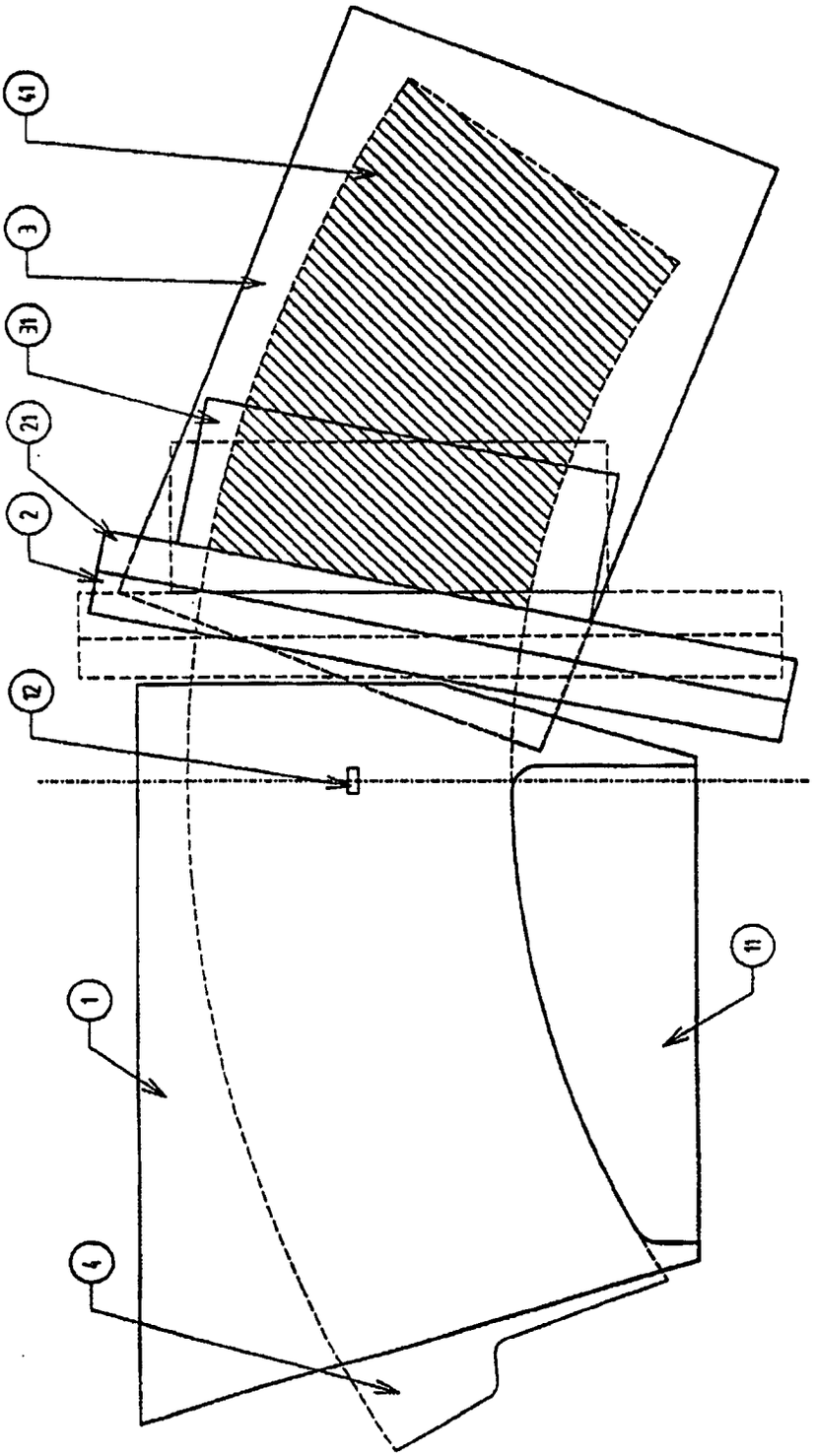

FIG. 1

FIG. 2a

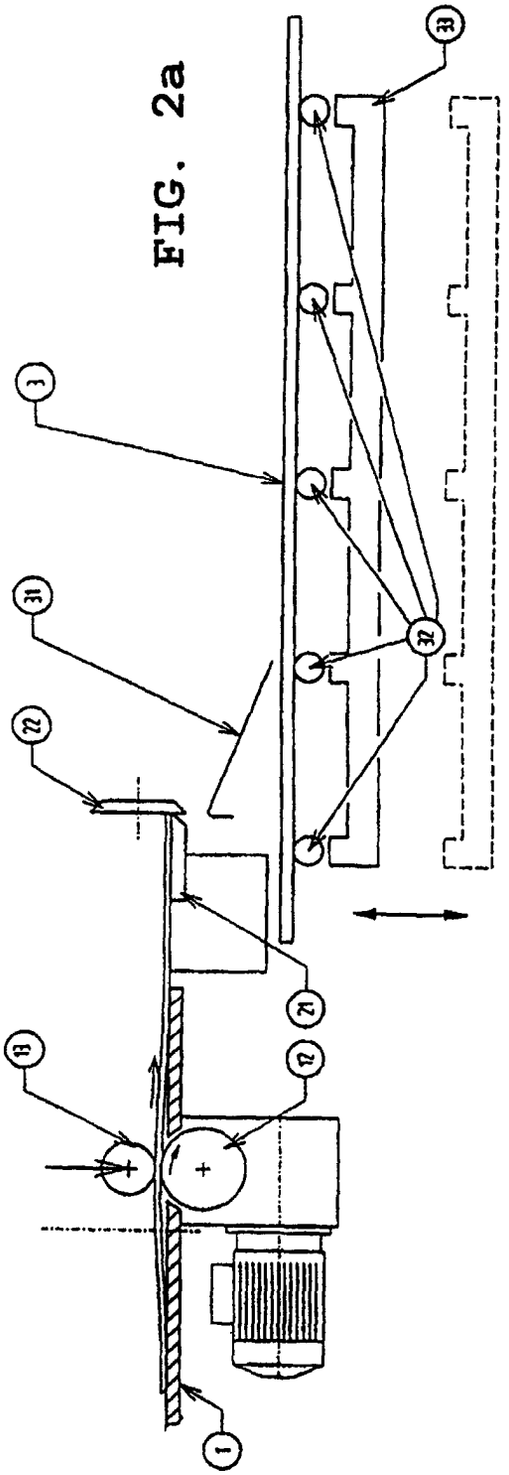

FIG. 2b

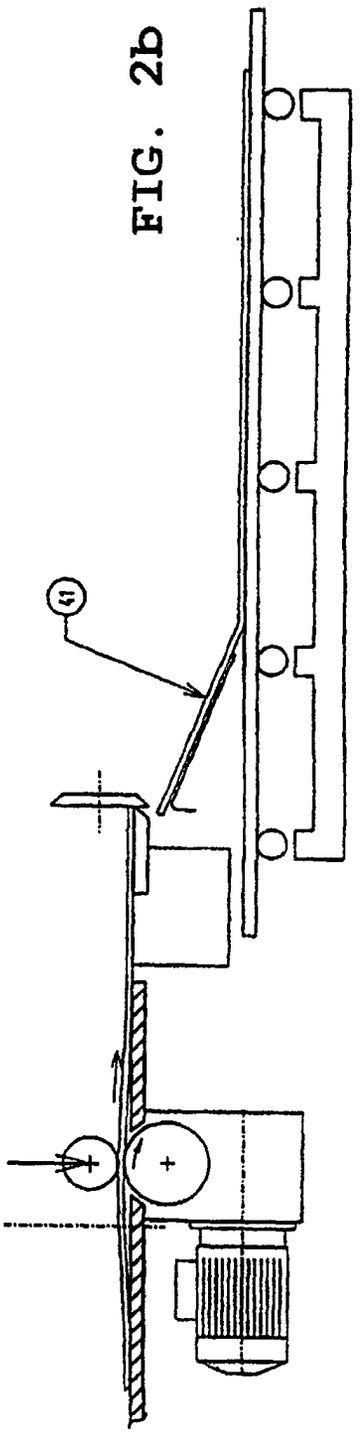

FIG. 2c

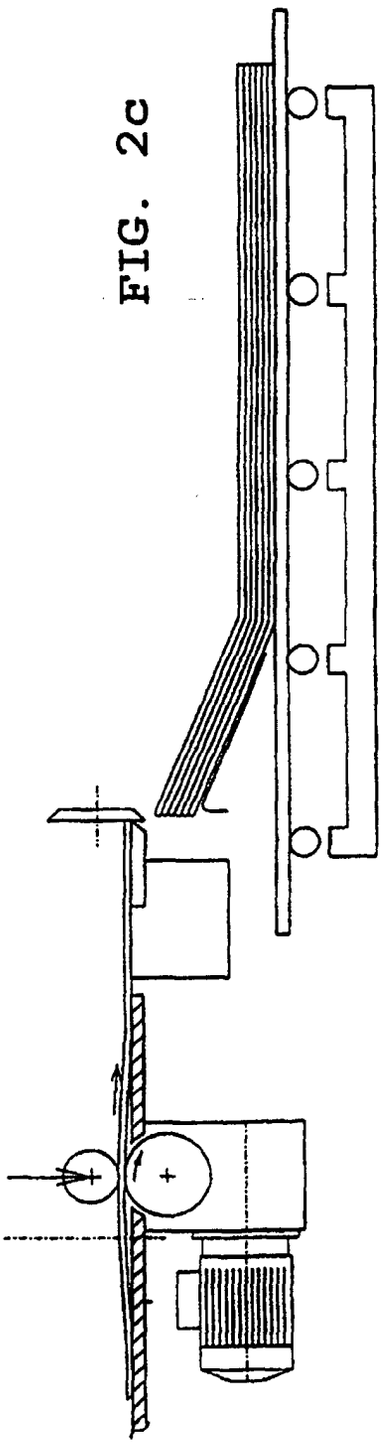

FIG. 2d

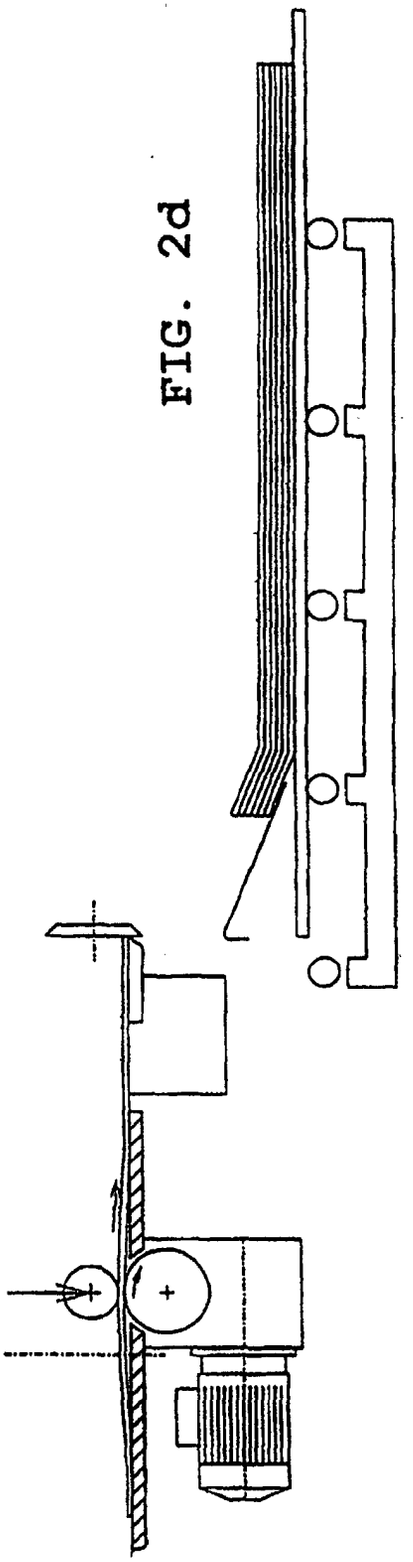

FIG. 2e

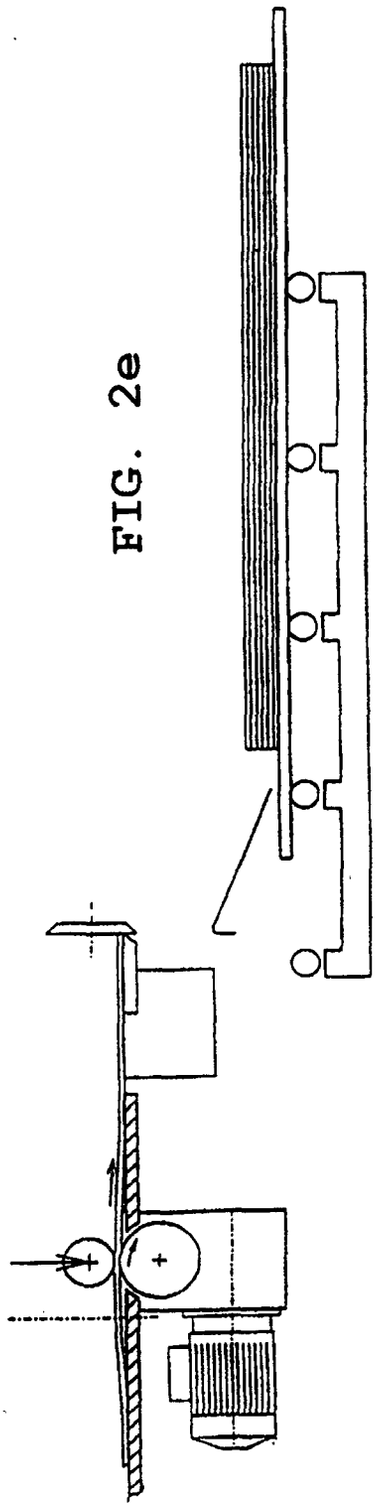

FIG. 2f