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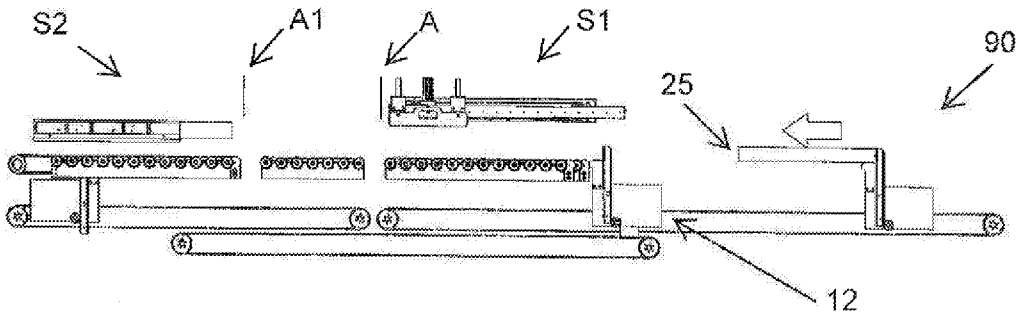

Fig.1A

(57) Abstract: The described method for packaging at least a flat article comprises following steps: a) positioning of an article (2), at an inlet of a first station (S1) which comprises first folding means (3) and a first blank (4) the first blank (4) comprising a central region (40) to which a plurality of lower flaps (42) and upper flaps (41) are hinged, the central region (40) comprising a front portion (43) to which two opposite lateral portions (44) are hinged; b) movement of the article (2) in an advancement direction (W1) for conveying into the first station (S1) up to passing beyond the first blank (4) arranged in a first position (A) located at a higher level with respect to the flat article (2); c) movement of the flat article (2) in a retracting direction (W2), opposite the advancement direction (W1), realised in phase with the movement of the first blank (4) from the first position (A) to a second position (B), so as to enable a preliminary intercepting of the front portion (43) of the central region (40) of the first blank (4) by a first lateral flank (20) of the article (2); the subsequent intercepting of the lateral portions (44) of the central region (40) of the first blank (4) by the first folding means (3), up to the folding of the lateral portions (44) against the lateral flanks of the article (2) adjacent to the first flank (20), so as to enable at least a partial covering thereof; e) movement in the advancement direction (W1) of the half-package (100) for conveying thereof into a second station (S2) comprising second folding means (5) and a second blank (6); the second blank (6); comprising a central region (60) to which a plurality of lower flaps (62) and upper flaps (61) are hinged; the central region (60) comprising a front portion (63) to which two opposite lateral portions (64) are hinged; movement enabling a preliminary intercepting of the front portion (63) of the central region (60) of the second blank (6) by a second lateral flank (25) of the article (2), opposite the first lateral flank (20); the subsequent

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intercepting of the lateral portions (64) of the central region (60) of the second blank (6) by the second folding means (5), up to the folding of the lateral portions (64) against the lateral flanks of the article (2) adjacent to the second flank (25), so as to superpose the ends (64a) of the lateral portions (64) of the second blank (6) on the ends (44a) of the lateral portions (44) of the first blank (4), enabling the peripheral covering of the lateral flanks of the flat article (2) in cooperation with the first blank (4); e) movement in the advancement direction (W1) for conveying the packaging (101) distancingly from the second station (S2).

A METHOD AND A MACHINE FOR PACKAGING FLAT ARTICLES AND A PACKAGE OBTAINED WITH THE METHOD AND MACHINE

FIELD OF THE INVENTION

The present invention relates to the technical sector relating to packing of flat articles, in particular ceramic articles, with particular reference to a packaging method of the flat articles.

The invention relates to flat articles having a polygonal shape, in particular rectangular, such as for example slabs and ceramic tiles, as well as materials that can also be arranged stacked.

DESCRIPTION OF THE PRIOR ART

Document WO 2013/144805, in the name of the present Applicant, discloses a method for packaging at least a flat article, the flat article comprising two opposite faces, upper and lower, and a plurality of lateral flanks, comprising following operating steps:

- the positioning of a flat article at an inlet of a first station comprising first folding means and a first blank interposed between the first folding means and the flat article; the first blank comprising a central region to which a plurality of lower flaps and upper flaps are hinged, the central region comprising a front portion to which two opposite lateral portions are hinged;
- conveying the flat article into the first station for enabling a preliminary intercepting of the front portion of the central region of the first blank by a first lateral flank of the article, the subsequent intercepting of the lateral portions of the central region of the first blank by the first folding means, up to the folding of the lateral portions against the lateral flanks of the

article adjacent to the first flank, so as to enable at least a partial covering thereof;

- the positioning of the half-package obtained, comprising the flat article and the first blank folded thereon, at the inlet of a second station included in-line with respect to the first station, which comprises second folding means and a second blank interposed between the second folding means and the half-package; the second blank comprising a central region to which a plurality of lower flaps and upper flaps are hinged, the central region comprising a front portion to which two opposite lateral portions are hinged;

- the positioning of the semi-packaging at the inlet of the second station comprising a 180° rotation of the half-package with respect to an axis perpendicular to the upper and lower faces of the flat article, so as to orientate the second lateral flank of the flat article facing the second blank;

- the conveying of the half-package into the second station for enabling the preliminary intercepting of the front portion of the central region of the second blank by a second lateral flank of the article, opposite the first lateral flank; the subsequent intercepting of the lateral portions of the central region of the second blank by the second folding means, up to the folding of the lateral portions against the lateral flanks of the article adjacent to the second flank, so as to superpose the ends of the lateral portions of the second blank on the ends of the lateral portions of the first blank, enabling the peripheral covering of the lateral flanks of the flat article in cooperation with the first blank;

- the conveying of the package, comprising the flat article and the blanks folded thereon, in outlet from the second station.

The half-package is set in rotation solidly with the first folding means and this leads to a series of drawbacks.

Firstly, the apparatus setting the half-package in solid rotation with the first folding means is extremely unwieldy and has a high inertia level during the step of activation in rotation.

The apparatus is particularly expensive, both as regards production costs and as regards maintenance costs.

The need to set the half-package in rotation involves limitations of the maximum dimensions of the flat article to be packaged and long packaging times so as to position the half-package in inlet to the second station.

Generally the flat article comprises a tile or ceramic slab, or alternatively a stack of tiles and/or ceramic slabs, preferably having a quadrangular geometry.

SUMMARY OF THE INVENTION

The aim of the present invention is therefore to provide a method which enables packaging flat articles, able to obviate the above-mentioned drawbacks.

A further aim of the present invention is to provide a packaging that enables obtaining maximum protection of the flat article contained therein, thus significantly reducing the packaging times.

The above-indicated aims are obtained by means of a method for packaging at least a flat article, made according to claim 1.

In further embodiments, the method of the invention comprises one or more of the following characteristics, considered singly or in combination:

- in the second station the second blank is arranged in a third position located higher than the flat article, and wherein in phase with the third movement of the half-package in the advancement direction the second blank is moved from the third position to a fourth position, so as to enable the preliminary intercepting of the front portion of the central region of the second blank by the second lateral flank of the article;

- the movement of the second blank from the third position to the fourth position realised in phase with the third movement of the half-package is carried out in a vertical plane;

- in phase with the third movement of the half-package in the advancement direction, activation is made of the stabilising means slidable in the advancement direction and which are able to maintain the upper flaps or lower flaps of the first blank in contact against the respective upper and lower faces of the flat article, thus to maintain the lateral portions of the first blank against the lateral flanks of the article;

- during the third movement step of the half-package the stabilising means translate in the advancement direction with the same velocity as the half-package;

- the third movement of the half-package in the advancement direction and the fourth movement of the package in the same advancement direction, are realised in a continuous mode;

- the first and the second movement of the flat article, the third movement of the half-package and the fourth movement of the package are realised by means of translation along the same axis;

- the positioning of the first blank is made in the first station, interposed between the first folding means and the flat article, with respect to the

retracting direction;

- the first blank is arranged in the first position in phase with the first movement of the flat article in the advancement direction, so that the first blank does not interfere with the advancing flat article;
- the movement of the first blank from the first position to the second position, realised in phase with the second movement of the flat article, is carried out in a vertical plane;
- the first station is arranged in line with the second station;
- the first movement of the flat article in the advancement direction is carried out by first pusher means; the second movement of the flat article in the retracting direction is carried out by second pusher means; the third movement of the half-package in the advancement direction and the fourth movement of the package in the same advancement direction are carried out by third pusher means; the pusher means being activated in phase relation.
- the flat article of the packaging can comprise a tile or ceramic slab, i.e. a stack of tiles and/or ceramic slabs, the flat article preferably having a quadrangular geometry.

The aims of the invention are further attained with a machine for packaging at least a flat article, made according to claim 12.

In further embodiments, the machine comprises one or more of the following characteristics, considered singly or in combination:

- first pusher means for the movement of the flat article through the first station in an advancement direction, second pusher means for the movement of the flat article through the first station in a retracting

direction, contrary to the advancement direction, third pusher means for the movement of the half-package, comprising the flat article and the first blank folded on the article, in the advancement direction; the pusher means being activated in phase relation;

- stabilising means can be provided, activatable in phase with the wrapping of the first blank on the flat article, so as to maintain the upper flaps or lower flaps of the first blank in contact against the respective upper and lower faces of the flat article; the stabilising means translating in the advancement direction;

- the stabilising means translate in the advancement direction with the same velocity as the half-package;

- the stabilising means are positioned bilaterally to the flat article and each comprise a plate that is slidable in the advancement direction and activatable for lowering/raising between a non-operative configuration and an operative configuration in which it intercepts the upper flaps or lower flaps, of the first blank to maintain them in contact against the respective upper and lower faces of the flat article; the plate being activated from the operative configuration to the non-operative configuration in phase with the intercepting of the front portion of the central region of the second blank by the half-package;

- the stabilising means are positioned bilaterally to the flat article and each comprise an abutting member that is slidable in the advancement direction, supported by the third pusher means and activatable for lowering/raising between a non-operative configuration and an operative configuration in which it intercepts the upper flaps or lower flaps, of the first blank to maintain them in contact against the respective upper and lower faces of the flat article; the abutting member being activated from

the non-operative configuration to the operative configuration in phase with the enveloping of the first blank on the flat article; the abutting member preferably extending parallel to the upper face of the flat article;

- the longitudinal extension of the lateral portions of the central region of the first blank is smaller than the longitudinal extension of the lateral portions of the central region of the second blank;
- the flat article of the packaging can comprise a tile or ceramic slab, i.e. a stack of tiles and/or ceramic slabs, the flat article preferably having a quadrangular geometry.

The aims of the invention are further attained with a packaging for at least a flat article, made according to claim 18.

In further embodiments, the packaging comprises one or more of the following characteristics, considered singly or in combination:

- the longitudinal extension of the lateral portions of the central region of the first blank is smaller than the longitudinal extension of the lateral portions of the central region of the second blank;
- the flat article of the packaging can comprise a tile or ceramic slab, i.e. a stack of tiles and/or ceramic slabs, the flat article preferably having a quadrangular geometry;
- the package is realised with the packaging method according to any one of claims from 1 to 11, being made using the packaging machine according to any one of the preceding claims from 12 to 17.

BRIEF DESCRIPTION OF THE DRAWINGS

The characteristics of the invention are specified in the following with

particular reference to some preferred, but not exclusive, embodiments, with reference to the accompanying tables of drawings, in which:

- figures from 1 to 6 illustrate six perspective views of the machine of the invention which uses a first type of blank, in successive operating steps of the packaging method of the invention;
- figures from 1A to 6A are six lateral views corresponding to figures from 1 to 6;
- figure 7 illustrates a first type of blank in a flat configuration utilisable in the packaging method of the invention;
- figure 8 shows a second type of blank in a flat configuration in the packaging method of the invention;
- figure 7A, 8A are corresponding perspective views of packages obtained with the blanks illustrated in figures 7, 8;
- figures from 9 to 11 illustrate three perspective views, corresponding to the steps indicated in figures from 3 to 5, in which a second type of blank is used;
- figures from 9A to 11A are three lateral views corresponding to figures from 9 to 11;
- figures from 12 to 17 illustrate schematic plan views of operating steps of the packaging method of the invention in which a first type of blank is used;
- figures from 18 to 23 illustrate six plan views of operating steps of the packaging method of the invention in which a second type of blank is used;

- figures from 24 to 28 illustrate five perspective views of a portion of the machine, illustrated in figures 1-6, in successive particularly significant operating steps;

- figures from 29 to 33 illustrate five lateral views of a portion of the machine in successive particularly significant operating steps;

- figures from 29A to 31A, 33A are larger-scale views of the details highlighted in figures from 29 to 31, 33.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the above-mentioned tables of drawings, general reference numeral (2) denotes a flat article comprising two opposite faces, upper and lower, and a plurality of lateral flanks (20, 25).

The flat article (2) preferably has a quadrangular geometry and comprises a tile or ceramic slab, i.e. a stack of tiles and/or ceramic slabs.

The method for packaging at least a flat article (2) comprises following steps:

a) the positioning of a flat article (2), at an inlet of a first station (S1) which comprises first folding means (3) and a first blank (4) (figures 1, 1A), the first blank (4) comprising a central region (40) to which a plurality of lower flaps (42) and upper flaps (41) are hinged, the central region (40) comprising a front portion (43) to which two opposite lateral portions (44) are hinged (figures 7, 8);

b) the first movement of the flat article (2) in an advancement direction (W1) for conveying into the first station (S1) up to passing beyond the first blank (4) arranged in a first position (A) located at a higher level with respect to the flat article (2) so that the first blank (4) does not

interfere with the advancing flat article (2) (figures 2, 2A, 12, 18);

c) the second movement, in the first station (S1), of the flat article (2) in a retracting direction (W2), opposite the advancement direction (W1), realised in phase with the movement of the first blank (4) from the first position (A) to a second position (B), so as to enable: a preliminary intercepting of the front portion (43) of the central region (40) of the first blank (4) by a first lateral flank (20) of the article (2), the subsequent intercepting of the lateral portions (44) of the central region (40) of the first blank (4) by the first folding means (3), up to the folding of the lateral portions (44) against the lateral flanks of the article (2) adjacent to the first flank (20), so as to enable at least a partial covering thereof, the folding of the lower and upper flaps (42, 41), of the first blank (4) against the lower and upper faces of the article (2) being realised by the first folding means (3) in phase with the intercepting of the front portion (43) of the first blank (4) by the first lateral flank (20) of the article (2) (figures 3, 4, 9, 10, 3A, 4A, 9A, 10A, 13-15, 19-21);

d) the third movement in the advancement direction (W1) of the half-package (100), comprising the flat article (2) and the first blank (4) folded on the article (2), for conveying into a second station (S2) provided in cascade to the first station (S1) and comprising second folding means (5) (figures 5, 5A) and a second blank (6); the second blank (6) comprising a central region (60) to which a plurality of lower flaps (62) and upper flaps (61) are hinged, the central region (60) comprising a front portion (63) to which two opposite lateral portions (64) are hinged (figures 7, 8); the third movement enabling a preliminary intercepting of the front portion (63) of the central region (60) of the second blank (6) by a second lateral flank (25) of the article (2), opposite the first lateral flank (20); the subsequent intercepting of

the lateral portions (64) of the central region (60) of the second blank (6) by the second folding means (5), up to the folding of the lateral portions (64) against the lateral flanks of the article (2) adjacent to the second flank (25), so as to superpose the ends (64a) of the lateral portions (64) of the second blank (6) on the ends (44a) of the lateral portions (44) of the first blank (4), enabling the peripheral covering of the lateral flanks of the flat article (2) in cooperation with the first blank 4 (figures 6, 6A, 16, 17, 22, 23); with the folding of the lower and upper flaps (62, 61), of the second blank (6) against the lower and upper faces of the flat article (2) being realised by the second folding means (5) in phase with the intercepting of the front portion (63) of the second blank (6) by the second lateral flank (25) of the article (2), so that the flaps (61, 62) of the lateral portions (64) of the central region (60) of the second blank (6) superpose at least partially on the flaps (41, 42) of the lateral portions (44) of the central region (40) of the first blank (4);

e) the fourth movement in the advancement direction (W1) of the package (101), comprising the flat article (2) and the blanks (4, 6) folded on the article (2), for conveying distancingly from the second station (S2).

The first station (S1) is preferably arranged in line with the second station (S2) (figures 1-6, 12-23).

In phase with the third movement d) of the half-package (100) in the advancement direction (W1), activation is advantageously made of the stabilising means (70, 80) slidable in the advancement direction (W1) and which are able to maintain the upper flaps (41) or lower flaps (42) of the first blank (4) in contact against the respective upper and lower faces of the flat article (2), thus to maintain the lateral portions (44) of the first blank (4) against the lateral flanks of the article (2).

During the third movement step d) of the half-package (100) the stabilising means (70. 80) preferably translate in the advancement direction (W1) with the same velocity as the half-package (100).

In figures from 24 to 28, five perspective views are given of a portion of the machine (90), illustrated in figures 1-6, in successive particularly significant operating steps, in which the functioning of a first embodiment of the stabilising means (70) is highlighted.

In figures from 29 to 33, and from 29A to 31A, 33A, several lateral views are likewise given of the machine (90), in successive operating steps, in which the functioning of a second embodiment of the stabilising means (80) is highlighted.

In a preferred actuation of the method of the invention, the third movement of the half-package (100) in the advancement direction (W1) and the fourth movement of the package (101) in the same advancement direction (W1), can be realised in a continuous mode.

In the same way, the first and the second movement of the flat article (2), the third movement of the half-package (100) and the fourth movement of the package (101) can be realised by means of translations along the axis (figures 12-23).

In a preferred actuation of the packaging method, the second station (S2) the second blank (6) can be arranged in a third position (A1) located higher than the flat article (2), and wherein in phase with the third movement of the half-package (100) in the advancement direction (W1) the second blank (6) can be moved from the third position (A1) to a fourth position (B1), so as to enable the preliminary intercepting of the front portion (63) of the central region (60) of the second blank (6) by the second lateral flank (25) of the

article (2) (figures 1A-6A).

By way of example, the height corresponding to the first position A assumed by the first blank (4) can be substantially alike to the height corresponding to the third position A1 of the second blank 6 (figures 1A, 2A).

In a preferred actuation of the packaging method, the movement of the second blank (6) from the third position (A1) to the fourth position (B1), realised in phase with the third movement of the half-package (100), can be carried out in a vertical plane (figures 4A, 5A).

Likewise, the movement of the first blank (4) from the first position (A) to the second position (B), realised in phase with the second movement of the flat article (2), can be carried out in a vertical plane (figures 2A, 3A).

The positioning of the first blank (4) is advantageously made in the first station (S1), interposed between the first folding means (3) and the flat article (2), with respect to the retracting direction (W2) (figures 3A, 13, 19).

The first blank (4) can be arranged in the first position (A) already in the step a) of positioning the flat article (2) at the inlet of the first station S1 (figure 1A).

Alternatively, the first blank (4) is arranged in the first position (A) in phase with the first movement of the flat article (2) in the advancement direction (W1), so that the first blank (4) does not interfere with the advancing flat article (2).

In a preferred actuation of the packaging method, the first movement of the flat article (2) in the advancement direction (W1) is carried out by first pusher means (10) (figures 1, 2, 1A, 2A); the second movement of the flat article (2) in the retracting direction (W2) is carried out by second pusher

means (11) (figures 3-4A, 9-10A); the third movement of the half-package (100) in the advancement direction (W1) and the fourth movement of the package (101) in the same advancement direction (W1) are carried out by third pusher means (12) (figures 5, 6, 5A, 6A).

The pusher means (10, 11, 12) advantageously act bilaterally on the flat article (2) on the half-package (100) and on the package (101), and are mutually activated in phase relation.

Figures 1-6A, 12-17 illustrate the packaging of a flat article (2) using two blanks, a first (4) and a second (6), dimensionally identical and illustrated for the sake of simplicity in figure 7.

Figures 9-11, 18-23 illustrate the packaging of a flat article (2) using two blanks, a first (4) and a second (6), dimensionally different and illustrated for the sake of simplicity in figure 8.

In the case of a flat article (2) having a quadrangular geometry (square, rectangular etc.), it can be advantageous for the front portion (43) of the central region (40) of the first blank (4), intercepted by the first lateral flank (20) of the article (2), to be dimensionally identical to the front portion (63) of the central region (60) of the second blank (6), intercepted by the second lateral flank (25) of the article (2) (figures 7, 8).

On the contrary, the lateral portions (44) of the central region (40) of the first blank (4) can also have different dimensions with respect to the corresponding lateral portions (64) of the central region (60) of the second blank (6).

In the case of the packaging method of the invention, it is advantageous for the longitudinal extension of the lateral portions (44) of the central region (40) of the first blank (4) to be smaller than the longitudinal extension of the

lateral portions (64) of the central region (60) of the second blank (6) (figure 8).

In this way the inserting of the flat article (2) between the first folding means (3) of the first station (S1) is lower (figures 9-10A, 21) than the case in which the lateral portions (44, 64) of the central regions (40, 60) of the blanks (4, 6) have identical longitudinal extensions (figure 15).

In figure 15, reference D denotes the greatest longitudinal insertion of the flat article (2) between the first folding means (3), while in figure 21 reference D denotes the smallest longitudinal insertion of the flat article (2) between the first folding means (3).

The smallest insertion of the flat article (2) between the first folding means (3) both during the retraction and during the advancing travel leads to shorter realising times of the half-package 100a and therefore of the package (101a).

The Applicant has estimated an average saving in terms of time of the order of 10%.

The package 101a comprises, in known ways:

- at least a flat article, the flat article comprising two opposite faces, upper and lower, and a plurality of lateral flanks (20, 25);
- a first blank (4) made of a packaging material comprising a central region (40) to which a plurality of lower flaps (42) and upper flaps (41) are hinged; the central region (40) comprising a front portion (43) to which two opposite lateral portions (44) are hinged, each of which identifies a free end (44a) opposite the front portion (43);
- a second blank (6) made of a packaging material comprising a central

region (60) to which a plurality of lower flaps (62) and upper flaps (61) are hinged; the central region (60) comprising a front portion (63) to which two opposite lateral portions (64) are hinged, each of which identifies a free end (66a) opposite the front portion (63);

- two opposite lateral flanks (20, 25) of the article (2) being covered by the central region (43) of the first blank and by the central region (63) of the second blank (6);

- the remaining lateral flanks opposite the article (2) being covered by the lateral portions (44) of the central region (40) of the first blank (4) and by the lateral portions (64) of the central region (60) of the second blank (6), so as to superpose the free ends (44a, 66a) of the corresponding lateral portions (44, 64) of the central regions (43, 63) of the blanks (4, 6) so as to define two first lateral superposing zones (L1);

- with the opposite faces, upper and lower, of the article (2) being partly covered by the lower flaps (42) and upper flaps (41) of the central region (40) of the first blank (4) and by the lower flaps (62) and upper flaps (61) of the central region (60) of the second blank (6), so as to define for each face of the article (2): four corner superposing zones (A) in which the flaps (42, 41) of the central region (40) of the first blank (4) and the flaps (62, 61) of the central region (60) of the second blank (6) are superposed on one another, and two second lateral superposing zones (L2) adjacent to the first lateral superposing zones (L1), wherein the flaps (42, 41) of the lateral portions (44) of the first blank (4) are superiorly arranged, i.e. inferiorly of the corresponding flaps (62, 61) of the lateral portions (64) of the second blank (6);

- stabilising means of the superposing zones, corner (A) and lateral (L1, L2).

A package (101) realised with the lateral portions (44, 64) of the dimensionally-identical central regions (40, 60) of the dimensionally-identical blanks (4, 6) (figure 7A) is described in document WO 2012/172485 in the name of the same Applicant.

On the contrary, and in an entirely novel way, in the case of the present invention the lateral portions (44) of the central region (40) of the first blank (4) are dimensioned with a longitudinal extension that is different with respect to the longitudinal extension of the corresponding lateral portions (64) of the central region (60) of the second blank (6).

In the case of the packaging method of the invention, it is advantageous for the longitudinal extension of the lateral portions (44) of the central region (40) of the first blank (4) to be smaller than the longitudinal extension of the lateral portions (64) of the central region (60) of the second blank (6) (figure 8, 8A).

This enables a smaller insertion of the flat article (2) between the first folding means (3) both during the retraction and during the advancing travel, leading to shorter realising times of the half-package (100a) and therefore of the package (101a) (figures 9-10A, 17-22).

The machine (90) for packaging at least a flat article, able to actuate the present packaging method, comprises, in a known way:

a) a first station (S1) which comprises first folding means (3) and a first blank (4), the first blank (4) comprising a central region (40) to which a plurality of lower flaps (42) and upper flaps (41) are hinged, the central region (40) comprising a front portion (43) to which two opposite lateral portions (44) are hinged;

the first blank (4) being movable from a first position (A) located at a

greater height than the flat article (2), to a second position (B) that enables intercepting of the front portion (43) of the central region (40) of the first blank (4) by a first lateral flank (20) of the article (2);

b) a second station (S2) provided in cascade to the first station (S1), which comprises second folding means (5) and a second blank (6); the second blank (6) comprising a central region (60) to which a plurality of lower flaps (62) and upper flaps (61) are hinged,

the central region (60) comprising a front portion (63) to which two opposite lateral portions (64) are hinged;

the second blank (6) being movable from a first position (A1) located at a greater height than the flat article (2), to a second position (B1) which enables intercepting of the front portion (63) of the central region (60) of the second blank (6) by a second lateral flank (25) of the article (2);

In a novel way, the machine comprises pusher means (10, 11, 12) for enabling:

- the movement of the flat article (2) through the first station (S1) in an advancement direction (W1);
- the movement of the flat article (2) through the first station (S1) in a retracting direction (W2), contrary to the advancement direction (W1);
- the movement of the half-package (100), comprising the flat article (2) and the first blank (4) folded on the article (2), through the second station (S2) in the advancement direction (W1);

the first blank (4) being arranged in such a way that in the second position (B) it is intercepted by the flat article (2) moved through the first station (S1) in the retracting direction (W2);

the second blank (6) being arranged in such a way that in the second position (B1) it is intercepted by the half-package (100) moved through the second station (S2) in the advancement direction (W1).

In a second preferred embodiment of the machine (90) of the invention, the following are included:

- first pusher means (10) for the movement of the flat article (2) through the first station (S1) in an advancement direction (W1);
- second pusher means (11) for the movement of the flat article (2) through the first station (S1) in a retracting direction (W2), contrary to the advancement direction (W1);
- third pusher means (12) for the movement of the half-package (100), comprising the flat article (2) and the first blank (4) folded on the article (2), in the advancement direction (W1);

the pusher means (10, 11, 12), which are activated in phase relation with respect to one another.

In a further embodiment of the packaging machine (90) of the invention, stabilising means (70, 80) can be included which translate in the advancement direction (W1) and are activatable in phase with the wrapping of the first blank (4) on the flat article (2), so as to maintain the upper flaps (41) or lower flaps (42) of the first blank (4) in contact against the respective upper and lower faces of the flat article (2).

The stabilising means (70, 80) advantageously translate in the advancement direction (W1) with the same velocity as the half-package (100).

In a first embodiment, the stabilising means are positioned bilaterally to the

flat article (2) and each comprise a plate (70) that is slidable in the advancement direction and activatable for lowering/raising between a non-operative configuration (figures 1-4, 9-10) and an operative configuration (figures 5-6, 11) in which it intercepts the upper flaps (41) or lower flaps (42), of the first blank (4) to maintain them in contact against the respective upper and lower faces of the flat article (2).

The plate 70 is activated from the operative configuration to the non-operative configuration in phase with the intercepting of the front portion (63) of the central region (60) of the second blank (6) by the half-package (100).

With reference to figure 6, it can be observed that the plate (70) can remain in the operative configuration while the half-package (101), sliding from the plate (70), is brought into the second station (S2) by action of the third presser means (12).

The plate (70) can alternatively remain in the non-operative configuration, while the half-package (101) is brought into the second station (S2).

Figures from 24 to 28 illustrate the operation of the first embodiment of the stabilising means.

In a second embodiment (figures 29-33, 29A-31A, 33A) of the invention, the stabilising means are positioned bilaterally to the flat article (2) and each comprise an abutting member (80) that is slidable in the advancement direction, supported by the third pusher means (12) and activatable for lowering/raising between a non-operative configuration (CI) and an operative configuration (CO) in which it intercepts the upper flaps (41) or lower flaps (42), of the first blank (4) to maintain them in contact against the respective upper and lower faces of the flat article (2).

first blank (4) on the flat article (2).

The abutting member 80 can remain in the operative configuration CO up to complete wrapping of the second blank 6 on the half-package 100.

As can be observed in the accompanying tables of drawings, the abutting member 80 can be extended parallel to the upper face of the flat article 2.

From the above it can easily be understood how the method and the machine of the invention enable packaging of flat articles having relatively large dimensions, without encountering mechanical yielding of the blanks used.

The packaging method comprises operating steps that do not include rotation movements which can require the use of large apparatus and high levels of inertia.

In particular the half-package is exclusively subjected to a translation movement in transit from the first station (in which the half-package is realised) to the second station (in which the packaging is completed).

The use of movement exclusively in translation consequently enables reducing the actuating costs of the method of the invention, both during the packaging step and during the maintenance step.

The method is particularly advisable for packaging stacks of tiles having medium/large dimensions as the limited longitudinal extension of the blanks facilitates the folding operations on the lateral flanks of the tiles, while providing a continuous peripheral protection on the lateral flanks.

Note that the use of lateral portions (44) of the central region (40) of the first

blank (4) having different longitudinal dimensions, in particular smaller, with respect to the longitudinal dimensions of the lateral portions (64) of the central region (60) of the second blank (6), advantageously enables reducing the times for realising the half-package and thus of the final package.

CLAIMS

1) A method for packaging at least a flat article, the flat article comprising two opposite faces, upper and lower, and a plurality of lateral flanks, characterised in that it comprises following steps:

a) the positioning of a flat article (2), at an inlet of a first station (S1) which comprises first folding means (3) and a first blank (4) the first blank (4) comprising a central region (40) to which a plurality of lower flaps (42) and upper flaps (41) are hinged, the central region (40) comprising a front portion (43) to which two opposite lateral portions (44) are hinged;

b) a first movement of the flat article (2) in an advancement direction (W1) for conveying into the first station (S1) up to passing beyond the first blank (4) arranged in a first position (A) located at a higher level with respect to the flat article (2) so that the first blank (4) does not interfere with the advancing flat article (2);

c) a second movement, in the first station (S1), of the flat article (2) in a retracting direction (W2), opposite the advancement direction (W1), realised in phase with the movement of the first blank (4) from the first position (A) to a second position (B), so as to enable a preliminary intercepting of the front portion (43) of the central region (40) of the first blank (4) by a first lateral flank (20) of the article (2); the subsequent intercepting of the lateral portions (44) of the central region (40) of the first blank (4) by the first folding means (3), up to the folding of the lateral portions (44) against the lateral flanks of the article (2) adjacent to the first flank (20), so as to enable at least a partial covering thereof; with the folding of the lower and upper flaps (42,41), of the first blank (4) against the lower and upper faces of the

article (2) which is realised by the first folding means (3) in phase with the intercepting of the front portion (43) of the first blank (4) by the first lateral flank (20) of the article (2);

d) a third movement in the advancement direction (W1) of the half-package (100), comprising the flat article (2) and the first blank (4) folded on the article (2), for conveying into a second station (S2) provided in cascade to the first station (S1) and comprising second folding means (5) and a second blank (6); the second blank (6) comprising a central region (60) to which a plurality of lower flaps (62) and upper flaps (61) are hinged, the central region (60) comprising a front portion (63) to which two opposite lateral portions (64) are hinged; the third movement enabling a preliminary intercepting of the front portion (63) of the central region (60) of the second blank (6) by a second lateral flank (25) of the article (2), opposite the first lateral flank (20); the subsequent intercepting of the lateral portions (64) of the central region (60) of the second blank (6) by the second folding means (5), up to the folding of the lateral portions (64) against the lateral flanks of the article (2) adjacent to the second flank (25), so as to superpose the ends (64a) of the lateral portions (64) of the second blank (6) on the ends (44a) of the lateral portions (44) of the first blank (4), enabling the peripheral covering of the lateral flanks of the flat article (2) in cooperation with the first blank 4; with the folding of the lower and upper flaps (62, 61), of the second blank (6) against the lower and upper faces of the flat article (2) being realised by the second folding means (5) in phase with the intercepting of the front portion (63) of the second blank (6) by the second lateral flank (25) of the article (2), so that the flaps (61, 62) of the lateral portions (64) of the central region (60) of the second blank (6) superpose at least

partially on the flaps (41, 42) of the lateral portions (44) of the central region (40) of the first blank (4);

e) a fourth movement in the advancement direction (W1) of the package (101), comprising the flat article (2) and the blanks (4, 6) folded on the article (2), for conveying distancingly from the second station (S2).

2) The method of claim 1, wherein in the second station (S2) the second blank (6) is arranged in a third position (A1) located higher than the flat article (2), and wherein in phase with the third movement of the half-package (100) in the advancement direction (W1) the second blank (6) is moved from the third position (A1) to a fourth position (B1), so as to enable the preliminary intercepting of the front portion (63) of the central region (60) of the second blank (6) by the second lateral flank (25) of the article (2).

3) The method of claim 2, wherein the movement of the second blank (6) from the third position (A1) to the fourth position (B1), realised in phase with the third movement of the half-package (100), is carried out in a vertical plane.

4) The method of one of claims from 1 to 3, wherein in phase with the third movement d) of the half-package (100) in the advancement direction (W1), activation is made of the stabilising means (70, 80) slidable in the advancement direction (W1) and which are able to maintain the upper flaps (41) or lower flaps (42) of the first blank (4) in contact against the respective upper and lower faces of the flat article (2), thus to maintain the lateral portions (44) of the first blank (4) against the lateral flanks of the article (2).

5) The method of claim 4, wherein during the third movement step d) of the

half-package (100) the stabilising means (70. 80) translate in the advancement direction (W1) with the same velocity as the half-package (100).

6) The method of one of claims from 1 to 5, wherein the third movement of the half-package (100) in the advancement direction (W1) and the fourth movement of the package (101) in the same advancement direction (W1), are realised in a continuous mode.

7) The method of one of claims from 1 to 6, wherein the first and the second movement of the flat article (2), the third movement of the half-package (100) and the fourth movement of the package (101) are realised by means of translation along the axis.

8) The method of one of claims from 1 to 7, wherein the positioning of the first blank (4) is made in the first station (S1), interposed between the first folding means (3) and the flat article (2), with respect to the retracting direction (W2).

9) The method of one of claims from 1 to 7, wherein the first blank (4) is arranged in the first position (A) in phase with the first movement of the flat article (2) in the advancement direction (W1), so that the first blank (4) does not interfere with the advancing flat article (2).

10) The method of one of claims from 1 to 9, wherein the movement of the first blank (4) from the first position (A) to the second position (B), realised in phase with the second movement of the flat article (2), is carried out in a vertical plane.

11) The method of one of claims from 1 to 10, wherein the first movement of the flat article (2) in the advancement direction (W1) is carried out by first pusher means (10); the second movement of the flat article (2) in the

retracting direction (W2) is carried out by second pusher means (11); the third movement of the half-package (100) in the advancement direction (W1) and the fourth movement of the package (101) in the same advancement direction (W1) are carried out by third pusher means (12); the pusher means (10, 11, 12) being activated in phase relation.

12) A machine for packaging at least a flat article, the flat article comprising two opposite faces, upper and lower, and a plurality of lateral flanks, the machine comprising:

a) a first station (S1) which comprises first folding means (3) and a first blank (4), the first blank (4) comprising a central region (40) to which a plurality of lower flaps (42) and upper flaps (41) are hinged, the central region (40) comprising a front portion (43) to which two opposite lateral portions (44) are hinged;

the first blank (4) being movable from a first position (A) located at a greater height than the flat article (2), to a second position (B) that enables intercepting of the front portion (43) of the central region (40) of the first blank (4) by a first lateral flank (20) of the article (2);

b) a second station (S2) provided in cascade to the first station (S1), which comprises second folding means (5) and a second blank (6); the second blank (6) comprising a central region (60) to which a plurality of lower flaps (62) and upper flaps (61) are hinged, the central region (60) comprising a front portion (63) to which two opposite lateral portions (64) are hinged;

the second blank (6) being movable from a first position (A1) located at a greater height than the flat article (2), to a second position (B1) which enables intercepting of the front portion (63) of the central

region (60) of the second blank (6) by a second lateral flank (25) of the article (2);

the machine being characterised in that it comprises pusher means (10, 11, 12) for enabling:

- the movement of the flat article (2) through the first station (S1) in an advancement direction (W1);
- the movement of the flat article (2) through the first station (S1) in a retracting direction (W2), contrary to the advancement direction (W1);
- the movement of the half-package (100), comprising the flat article (2) and the first blank (4) folded on the article (2), through the second station (S2) in the advancement direction (W1);

the first blank (4) being arranged in such a way that in the second position (B) it is intercepted by the flat article (2) moved through the first station (S1) in the retracting direction (W2);

the second blank (6) being arranged in such a way that in the second position (B1) it is intercepted by the half-package (100) moved through the second station (S2) in the advancement direction (W1).

13) The machine of claim 12, characterised in that it comprises:

- first pusher means (10) for the movement of the flat article (2) through the first station (S1) in an advancement direction (W1);
- second pusher means (11) for the movement of the flat article (2) through the first station (S1) in a retracting direction (W2), contrary to the advancement direction (W1);
- third pusher means (12) for the movement of the half-package (100),

comprising the flat article (2) and the first blank (4) folded on the article (2), in the advancement direction (W1);

the pusher means (10, 11, 12), which are activated in phase relation with respect to one another.

14) The machine of claim 12 or 13, characterised in that it comprises stabilising means (70, 80) activatable in phase with the wrapping of the first blank (4) on the flat article (2), so as to maintain the upper flaps (41) or lower flaps (42) of the first blank (4) in contact against the respective upper and lower faces of the flat article (2); the stabilising means (70, 80) translating in the advancement direction (W1) with the same velocity as the half-package (100).

15) The machine of claim 14, characterised in that the stabilising means are positioned bilaterally to the flat article (2) and each comprise a plate (70) that is slidable in the advancement direction (W1) and activatable for lowering/raising between a non-operative configuration and an operative configuration in which it intercepts the upper flaps (41) or lower flaps (42), of the first blank (4) to maintain them in contact against the respective upper and lower faces of the flat article (2); the plate (70) being activated by the operative configuration to the non-operative configuration in phase with the intercepting of the front portion (63) of the central region (60) of the second blank (6) by the half-package (100).

16) The machine according to claim 14, characterised in that the stabilising means are positioned bilaterally to the flat article (2) and each comprise an abutting member (80) that is slidable in the advancement direction (W1), supported by the third pusher means (12) and activatable for lowering/raising between a non-operative configuration (CI) and an operative configuration (CO) in which it intercepts the upper flaps (41) or

lower flaps (42), of the first blank (4) to maintain them in contact against the respective upper and lower faces of the flat article (2); the abutting member (80) being activated from the non-operative configuration (CI) to the operative configuration (CO) in phase with the wrapping of the first blank (4) on the flat article (2); the abutting member (80) preferably extending parallel to the upper face of the flat article (2).

17) The machine according to one of claims from 12 to 16, characterised in that the longitudinal extension of the lateral portions (44) of the central region (40) of the first blank (4) is smaller than the longitudinal extension of the lateral portions (64) of the central region (60) of the second blank (6).

18) A package for at least a flat article, the flat article comprising two opposite faces, upper and lower, and a plurality of lateral flanks, the package comprising:

- a first blank (4) made of a packaging material comprising a central region (40) to which a plurality of lower flaps (42) and upper flaps (41) are hinged; the central region (40) comprising a front portion (43) to which two opposite lateral portions (44) are hinged, each of which identifies a free end (44a) opposite the front portion (43);
- a second blank (6) made of a packaging material comprising a central region (60) to which a plurality of lower flaps (62) and upper flaps (61) are hinged; the central region (60) comprising a front portion (63) to which two opposite lateral portions (64) are hinged, each of which identifies a free end (66a) opposite the front portion (63);
- two opposite lateral flanks (20, 25) of the article (2) being covered by the central region (43) of the first blank and by the central region (63)

of the second blank (6);

- the remaining lateral flanks opposite the article (2) being covered by the lateral portions (44) of the central region (40) of the first blank (4) and by the lateral portions (64) of the central region (60) of the second blank (6), so as to superpose the free ends (44a, 66a) of the corresponding lateral portions (44, 64) of the central regions (43, 63) of the blanks (4, 6) so as to define two first lateral superposing zones (L1);

- with the opposite faces, upper and lower, of the article (2) being partly covered by the lower flaps (42) and upper flaps (41) of the central region (40) of the first blank (4) and by the lower flaps (62) and upper flaps (61) of the central region (60) of the second blank (6), so as to define for each face of the article (2): four corner superposing zones (A) in which the flaps (42, 41) of the central region (40) of the first blank (4) and the flaps (62, 61) of the central region (60) of the second blank (6) are superposed on one another, and two second lateral superposing zones (L2) adjacent to the first lateral superposing zones (L1), wherein the flaps (42, 41) of the lateral portions (44) of the first blank (4) are superiorly arranged, i.e. inferiorly of the corresponding flaps (62, 61) of the lateral portions (64) of the second blank (6);

- stabilising means of the superposing zones, corner (A) and lateral (L1, L2);

the package being characterised in that the longitudinal extension of the lateral portions (44) of the central region (40) of the first blank (4) is smaller than the longitudinal extension of the lateral portions (64) of the central region (60) of the second blank (6).

19) The package of claim 18, realised using the packaging method according to any one of the preceding claims from 1 to 11, being made using the packaging machine according to any one of the preceding claims from 12 to 17.

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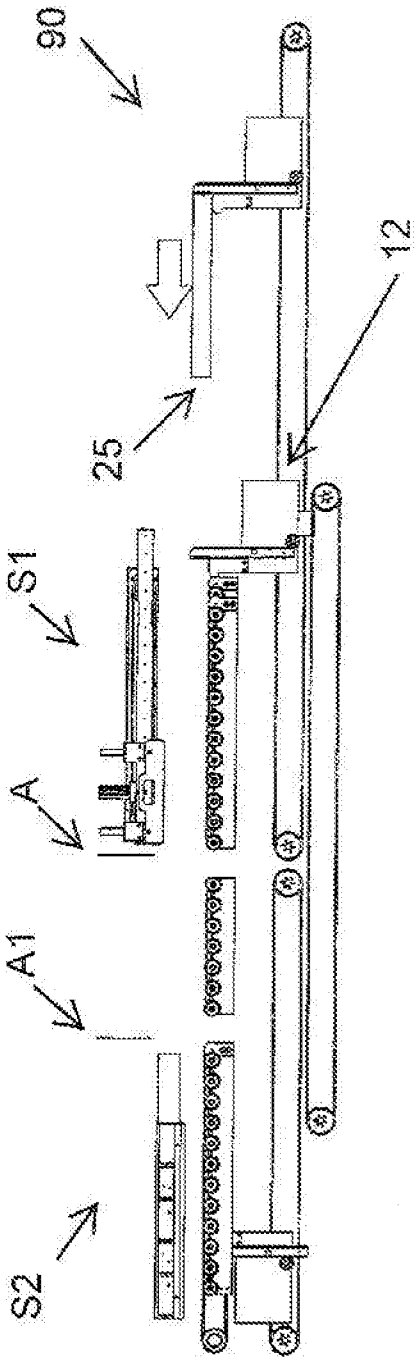
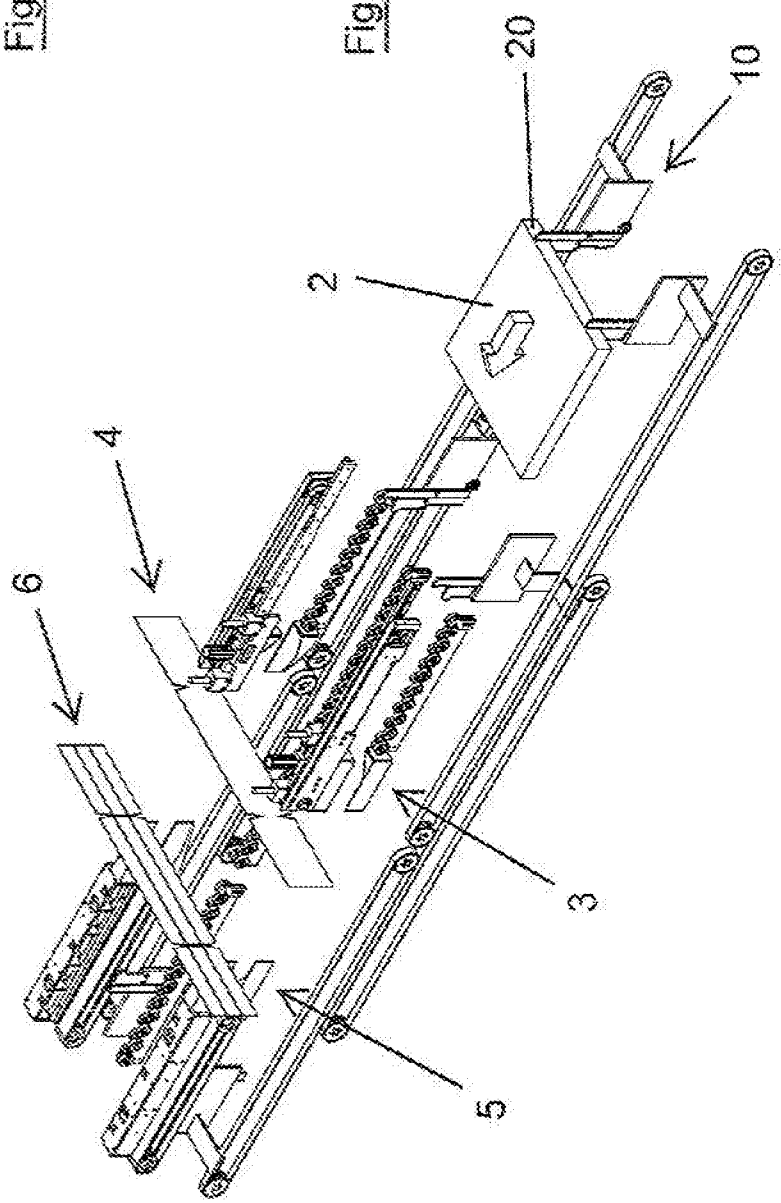


Fig.1A

Fig.1



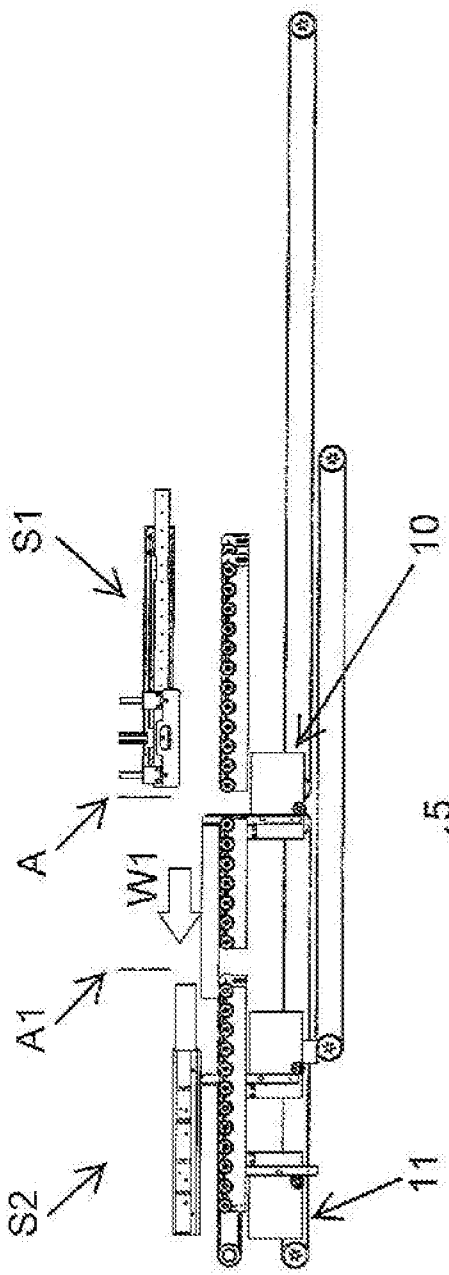


Fig.2A

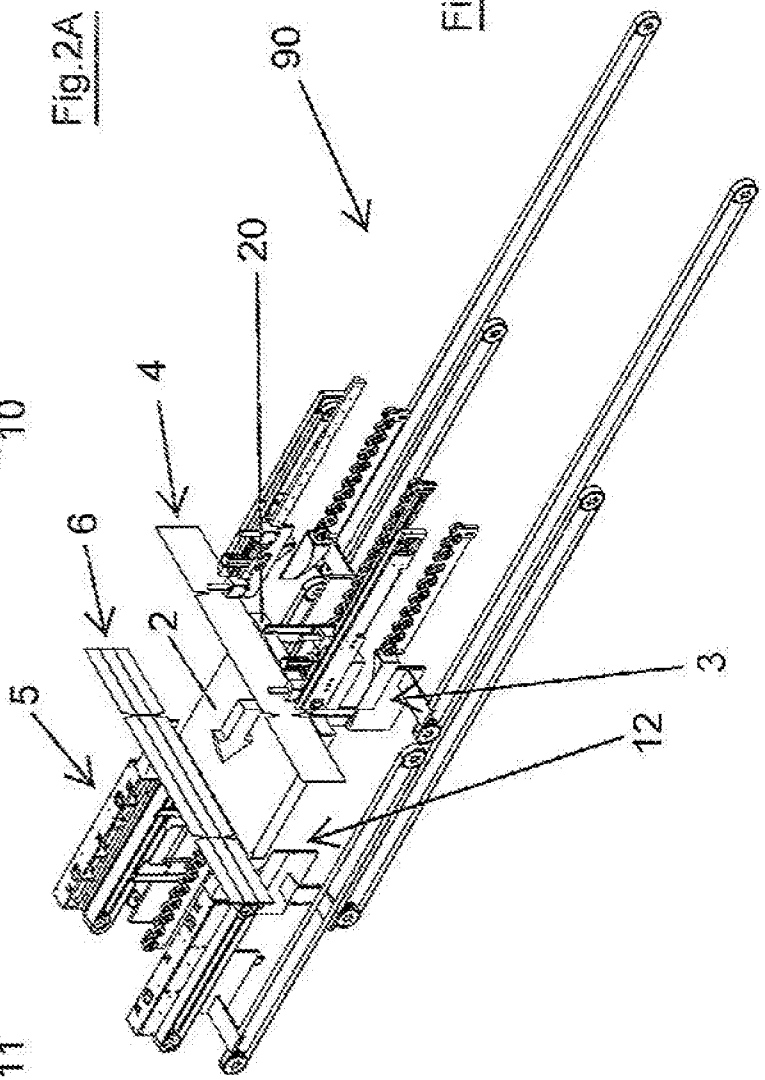


Fig.2

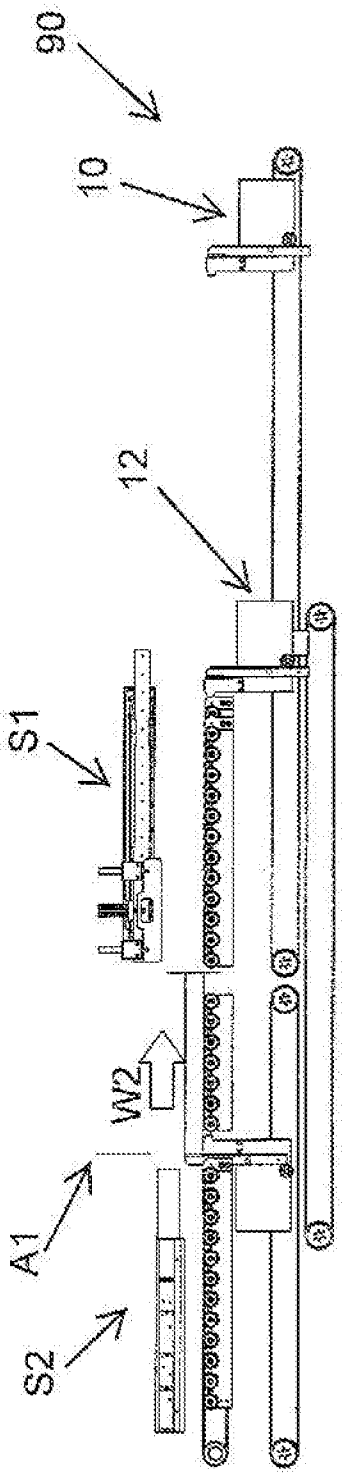


Fig.3A

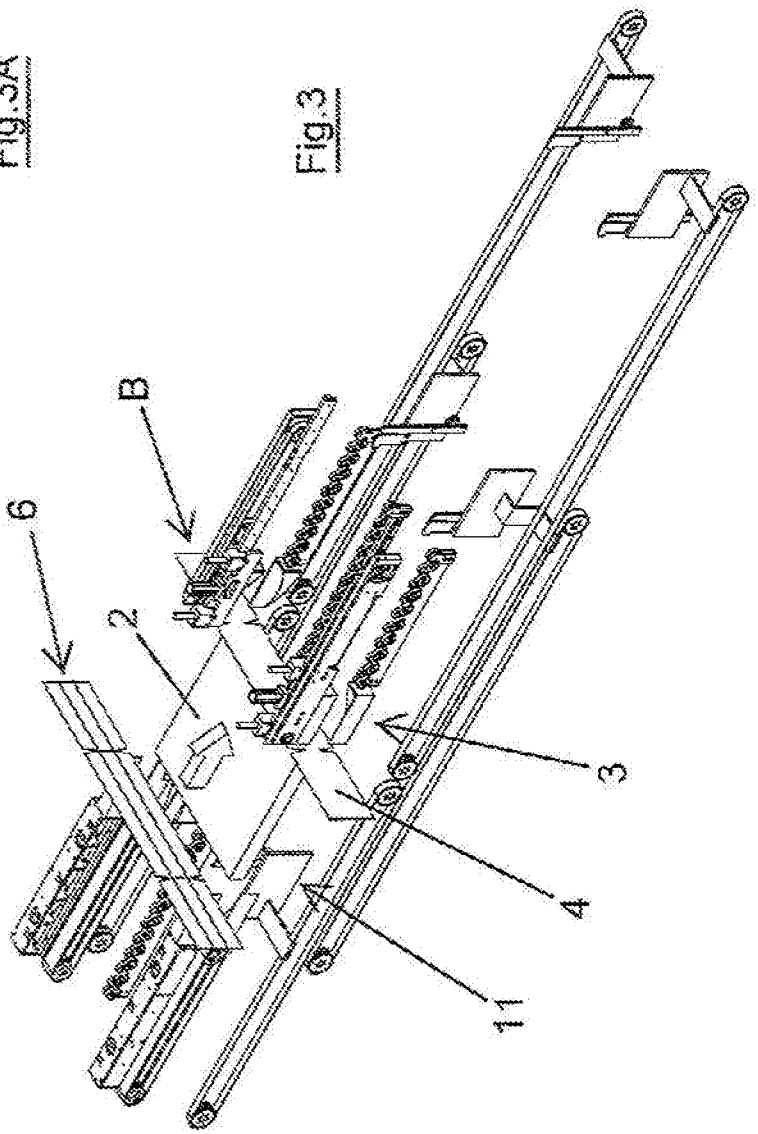


Fig.3

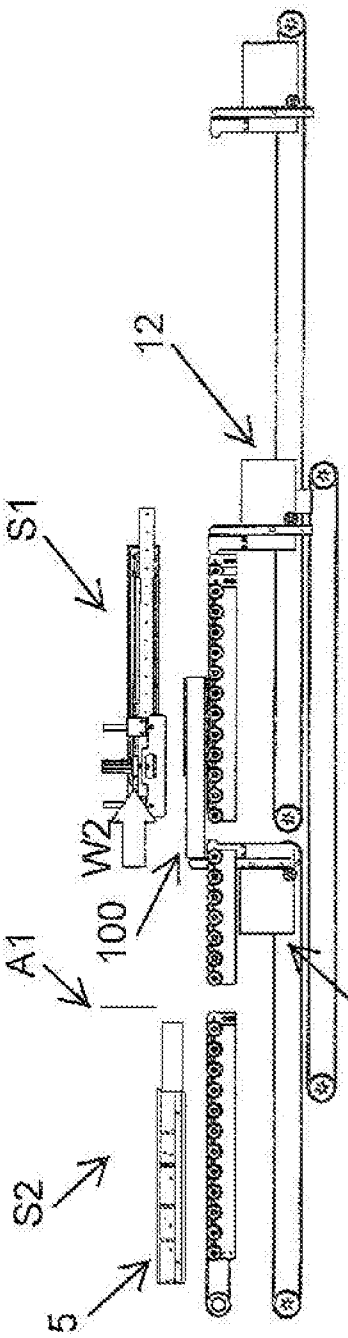


Fig.4A

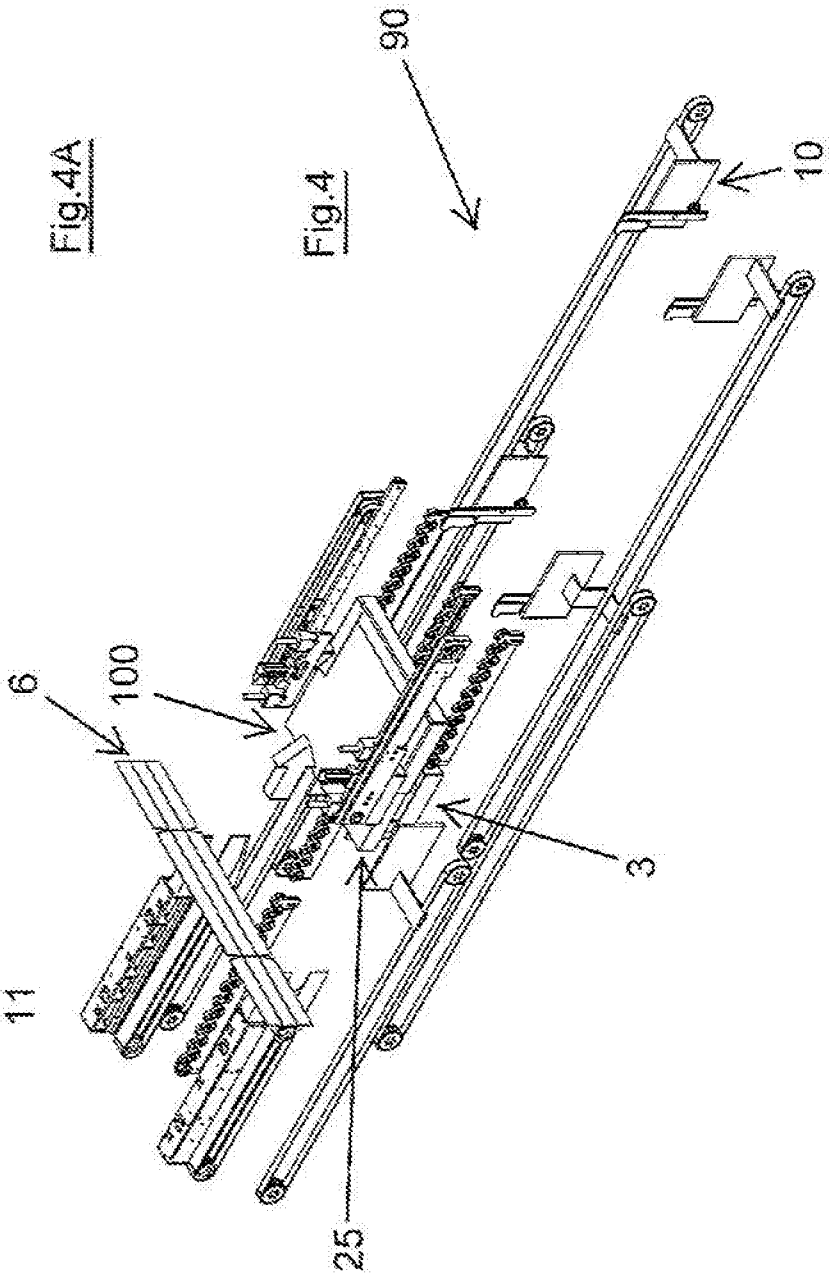


Fig.4

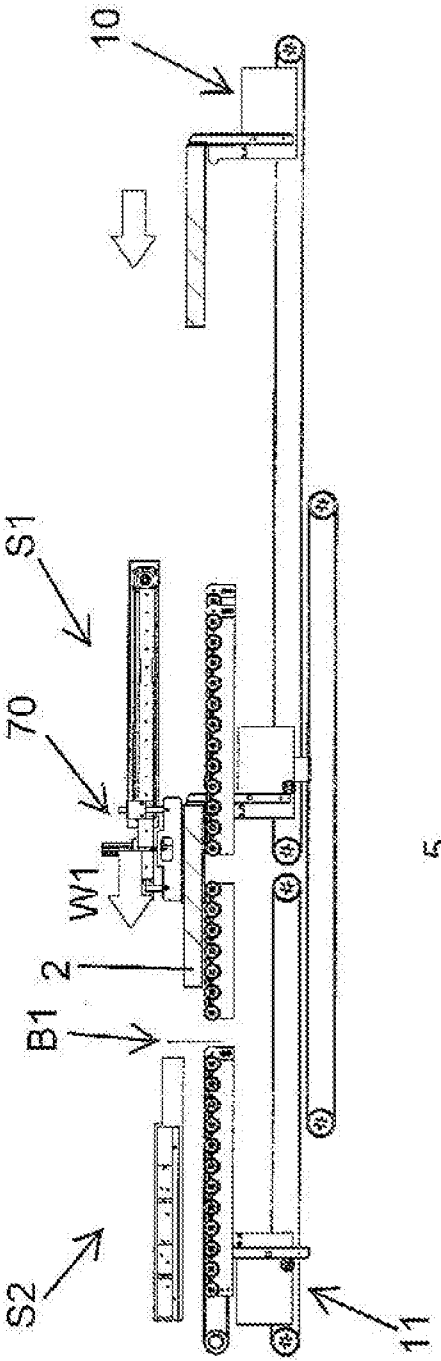


Fig.5A

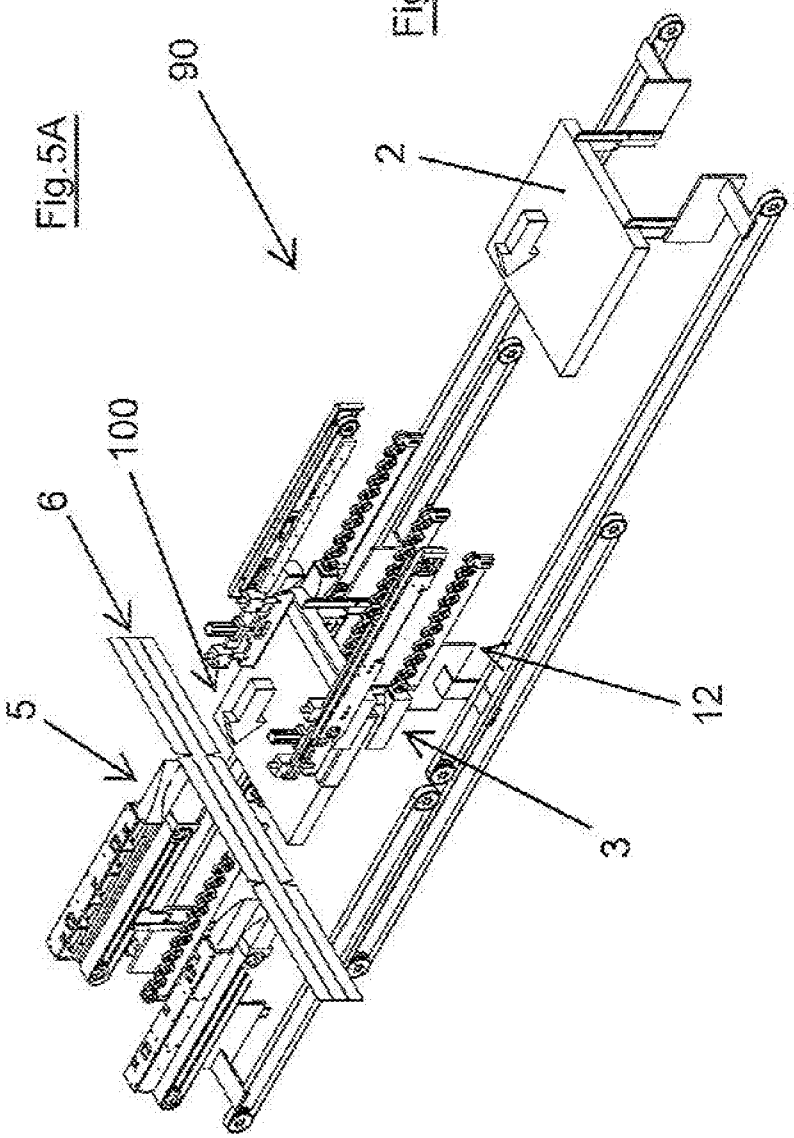


Fig.5

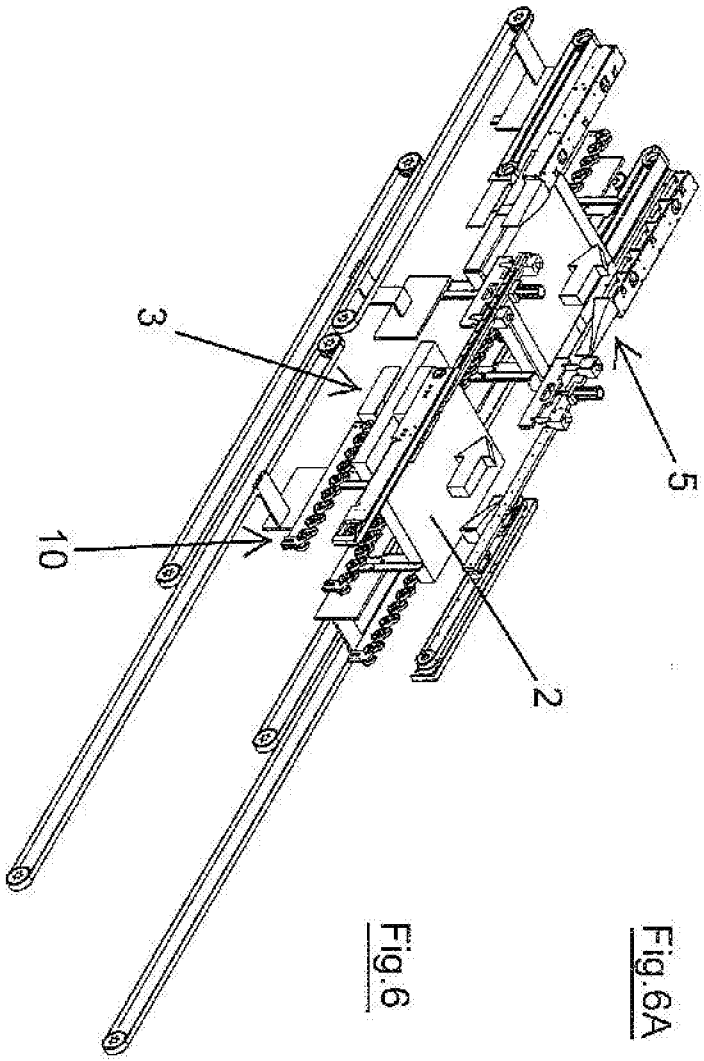


Fig.6

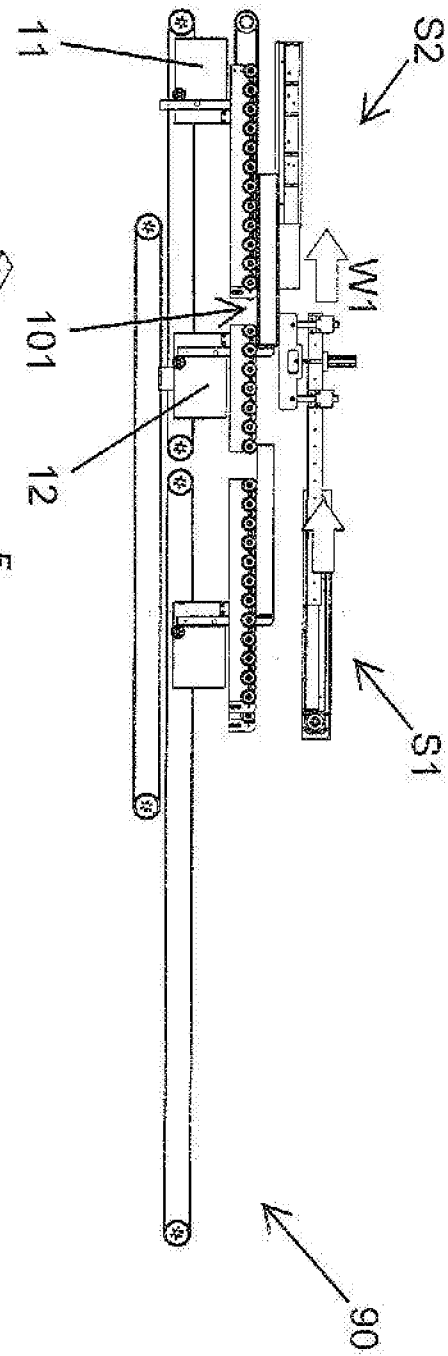
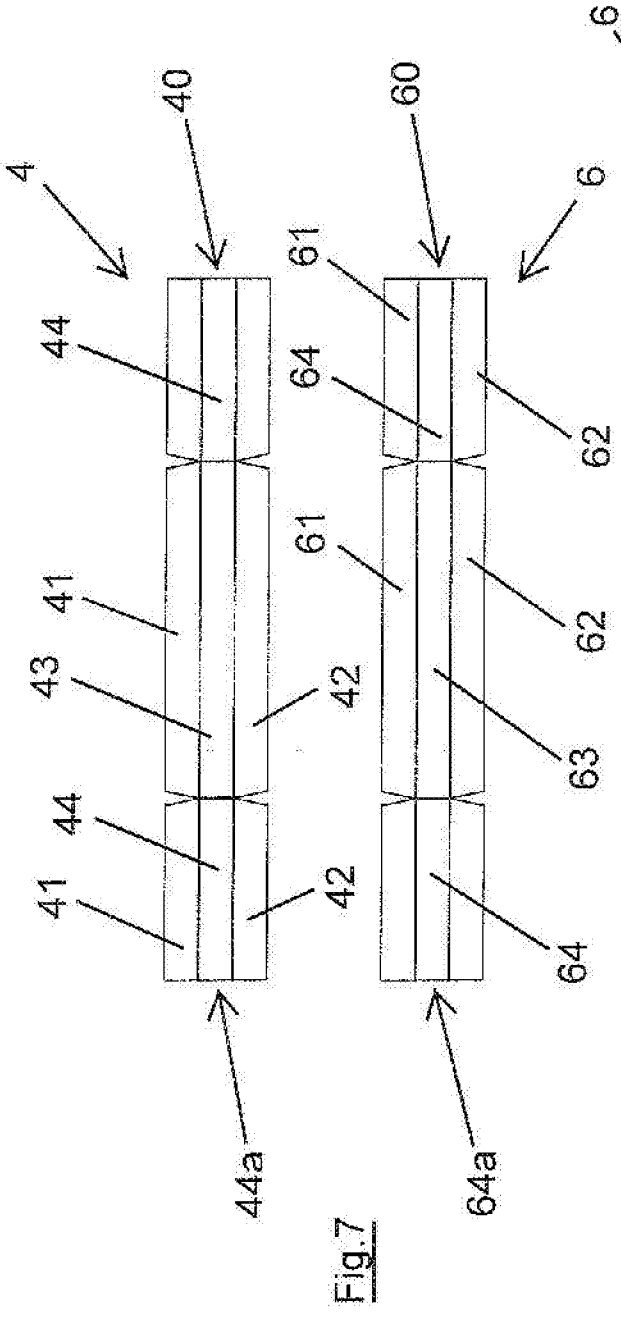


Fig.6A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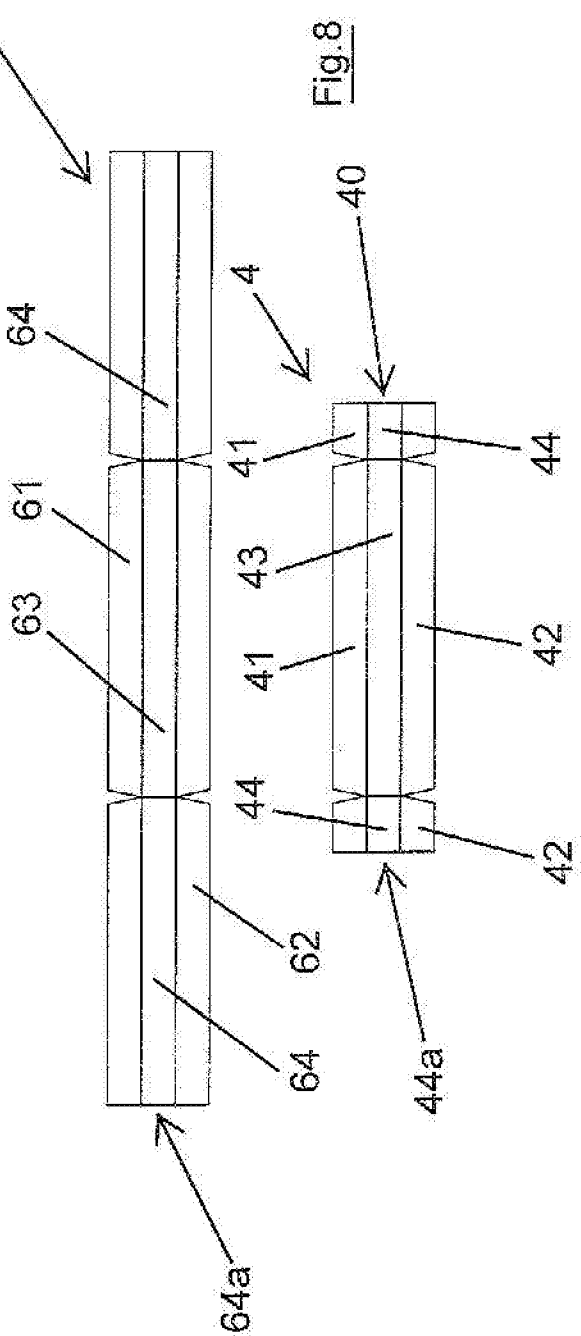
63
64
64a

Fig.7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44a

Fig.8

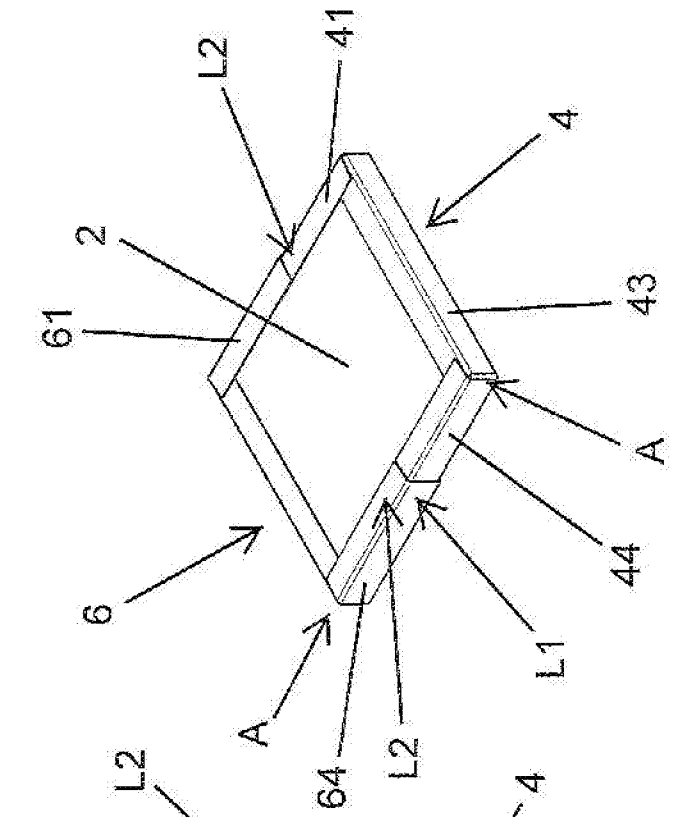

Fig.7A

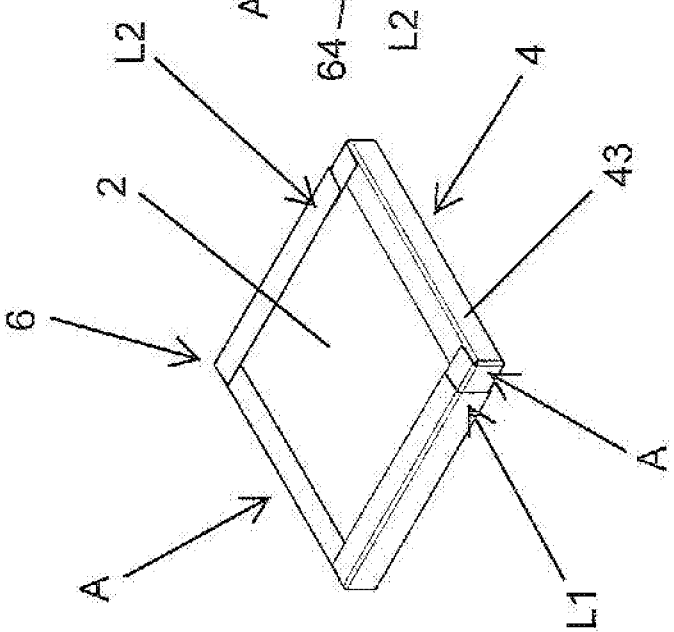

Fig.8A

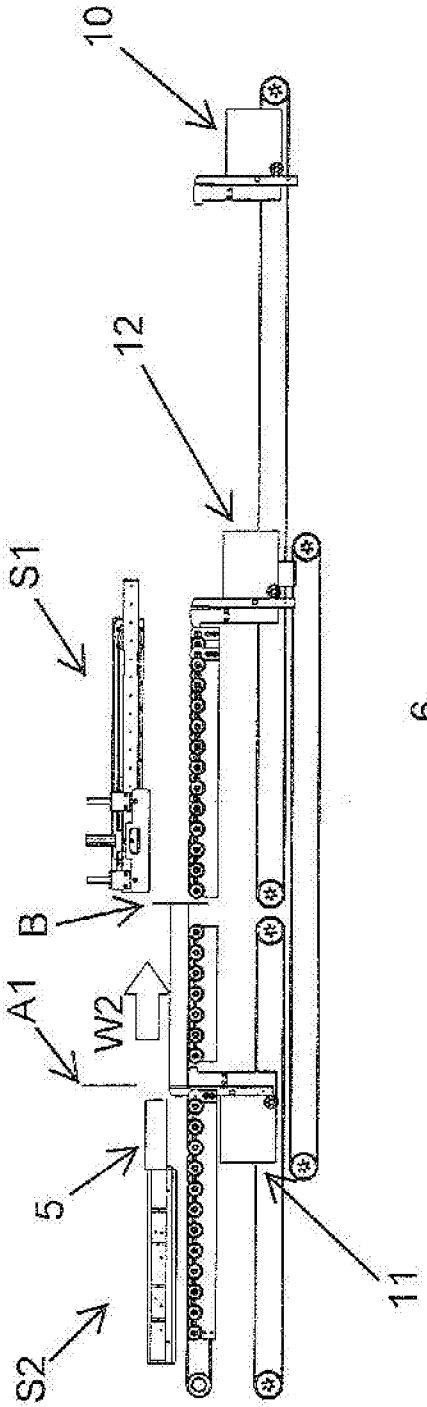

Fig.9A

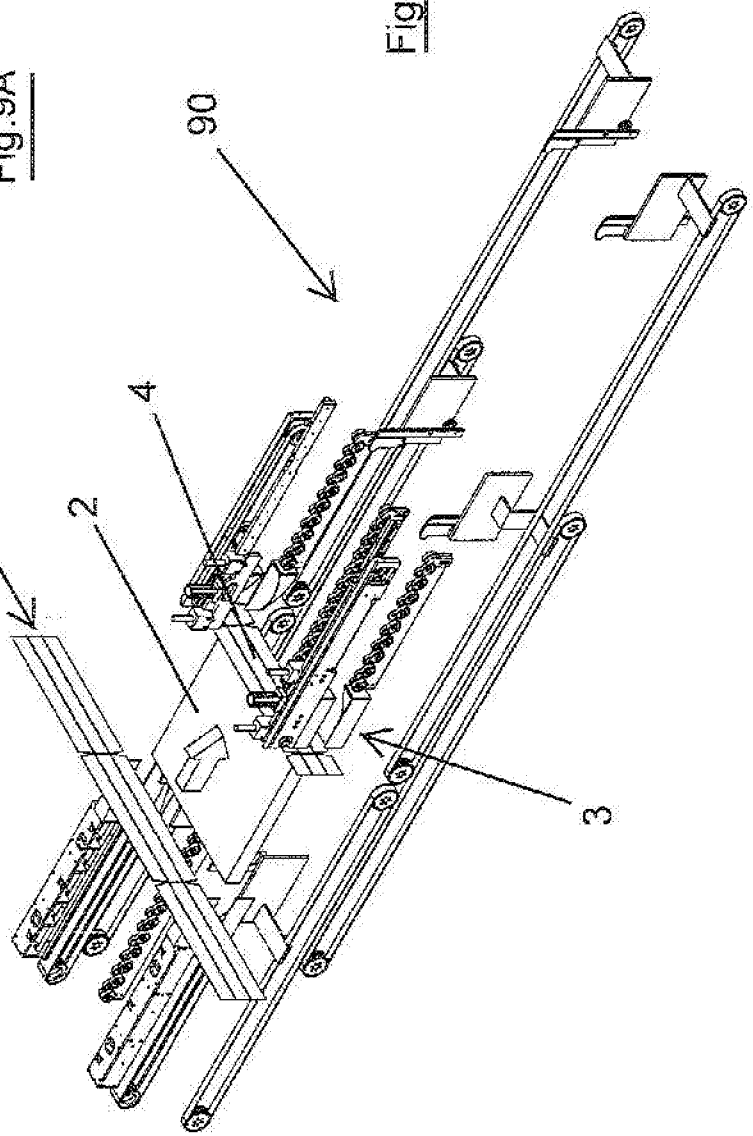

Fig.9

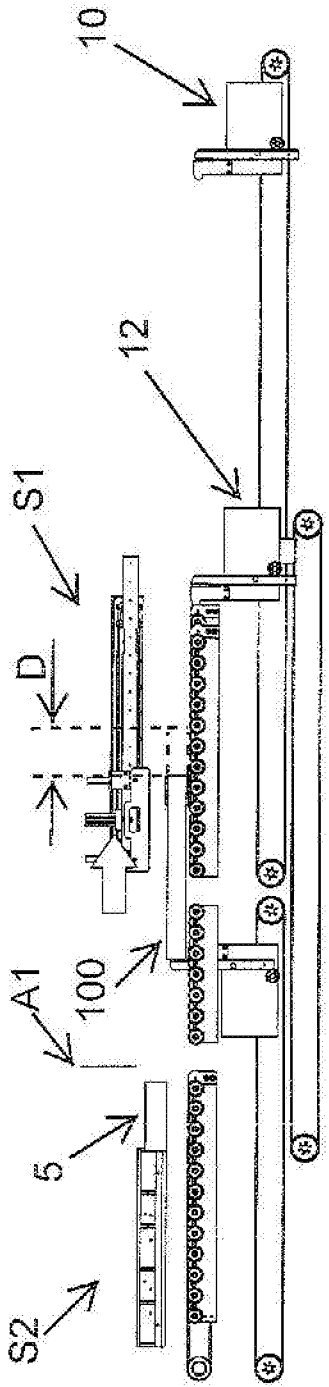

Fig.10A

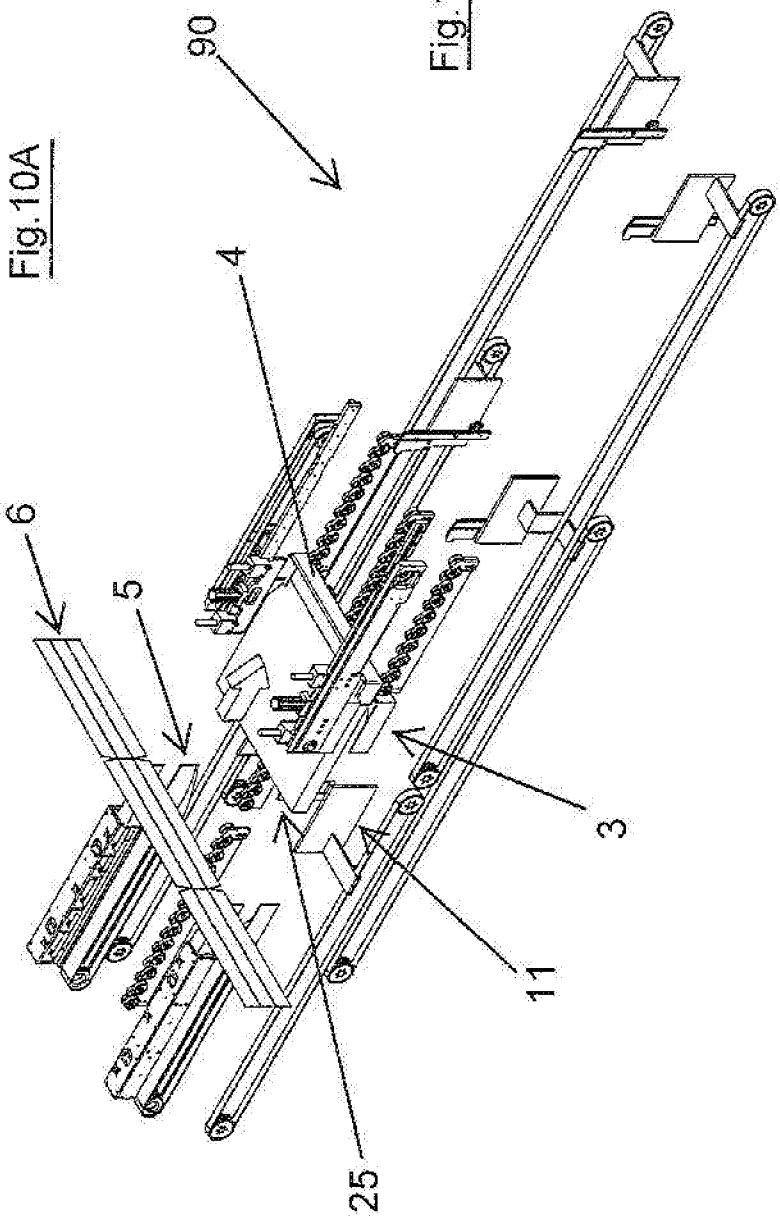

Fig.10

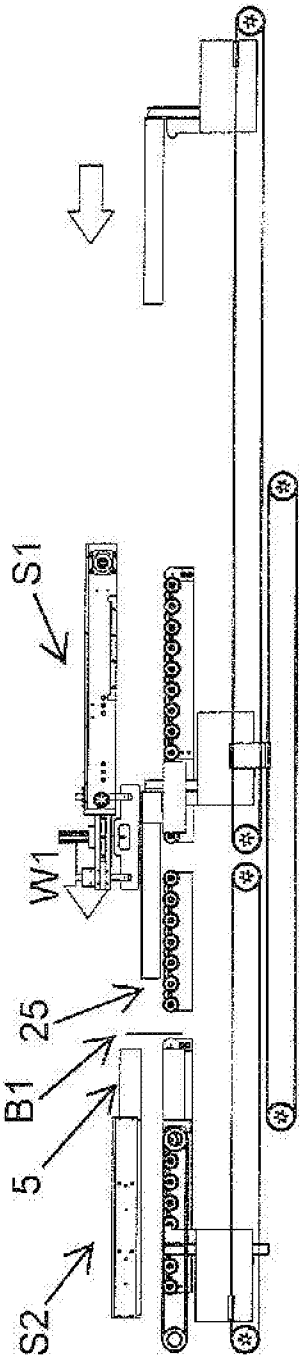

Fig.11A

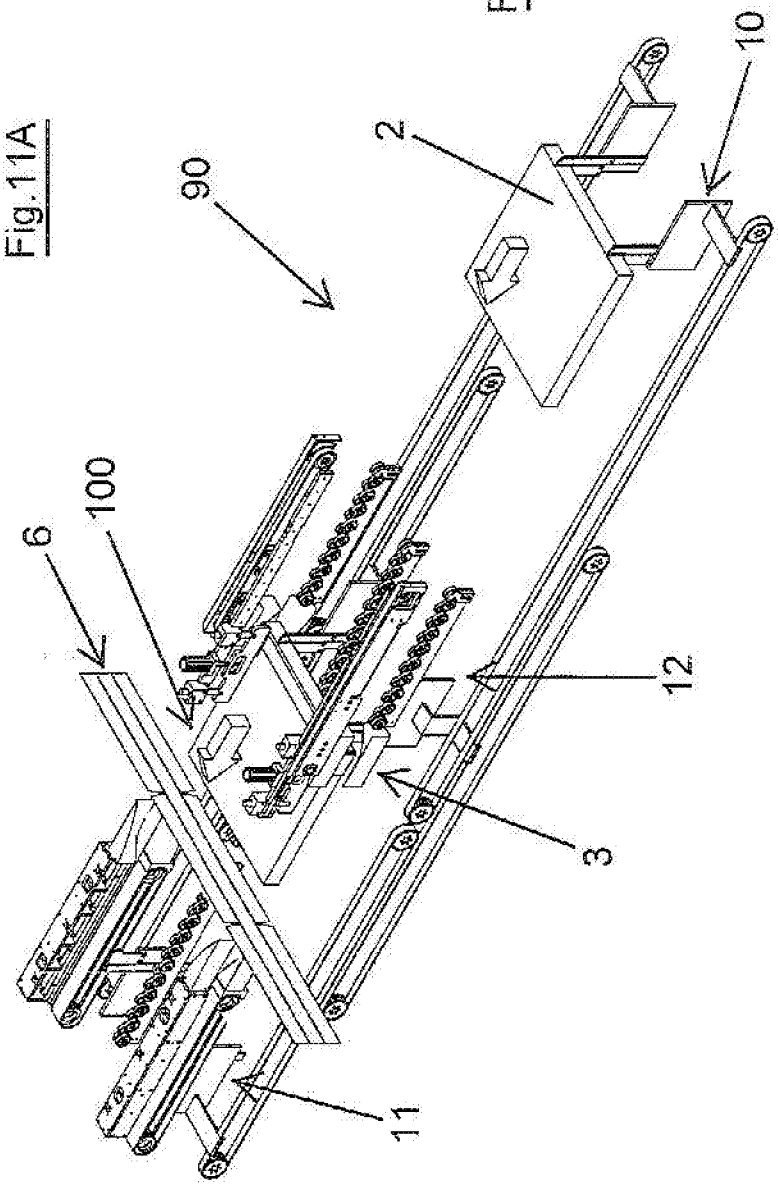

Fig.11

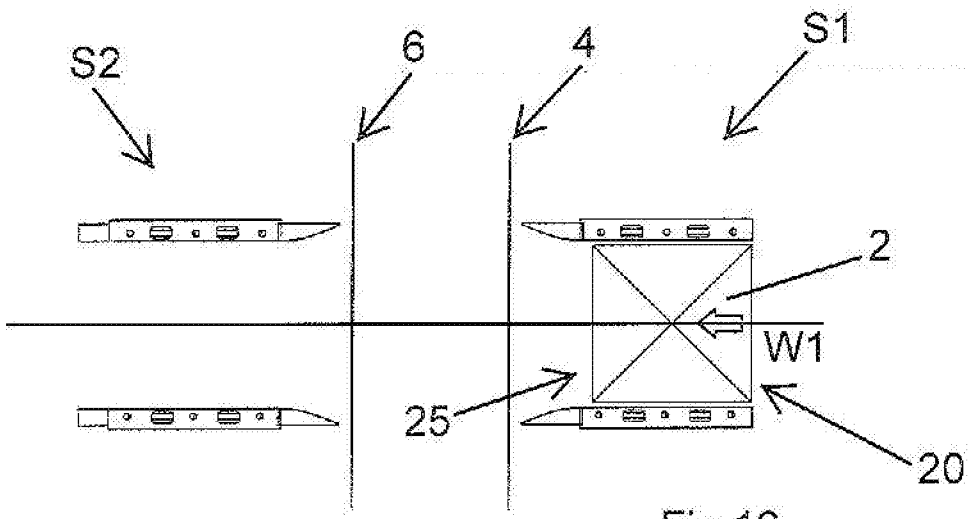

Fig.12

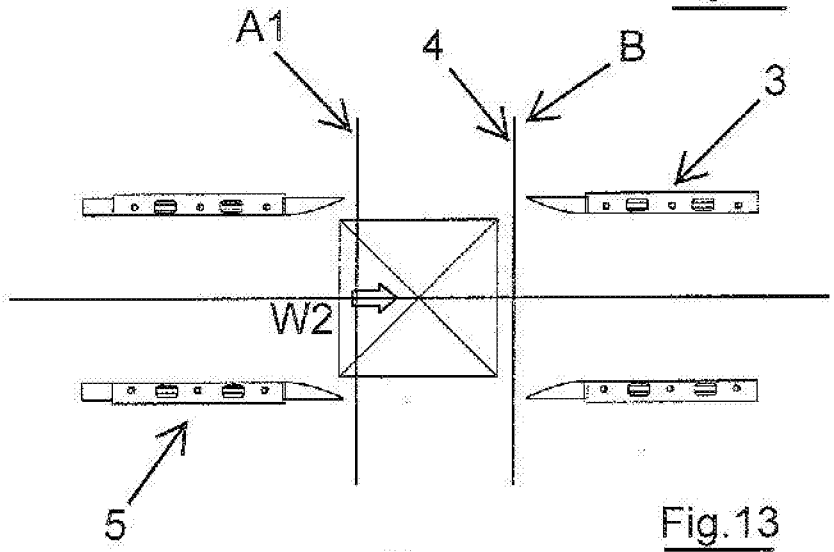

Fig.13

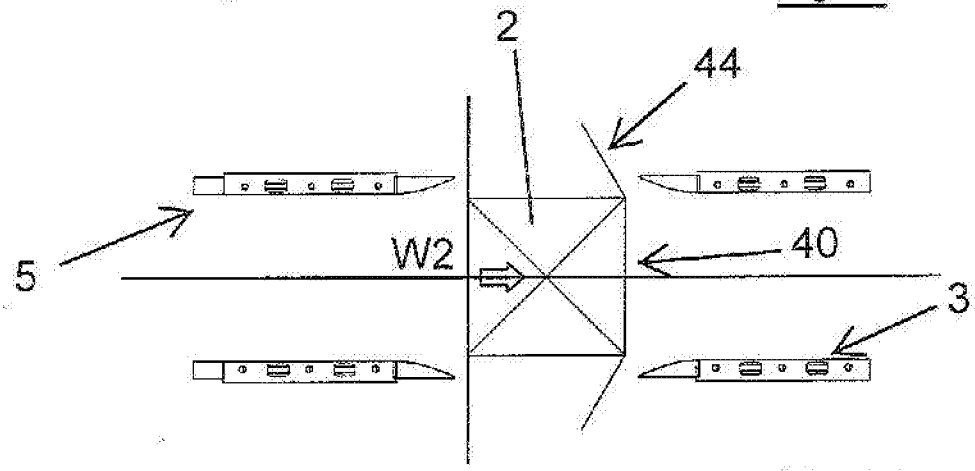

Fig.14

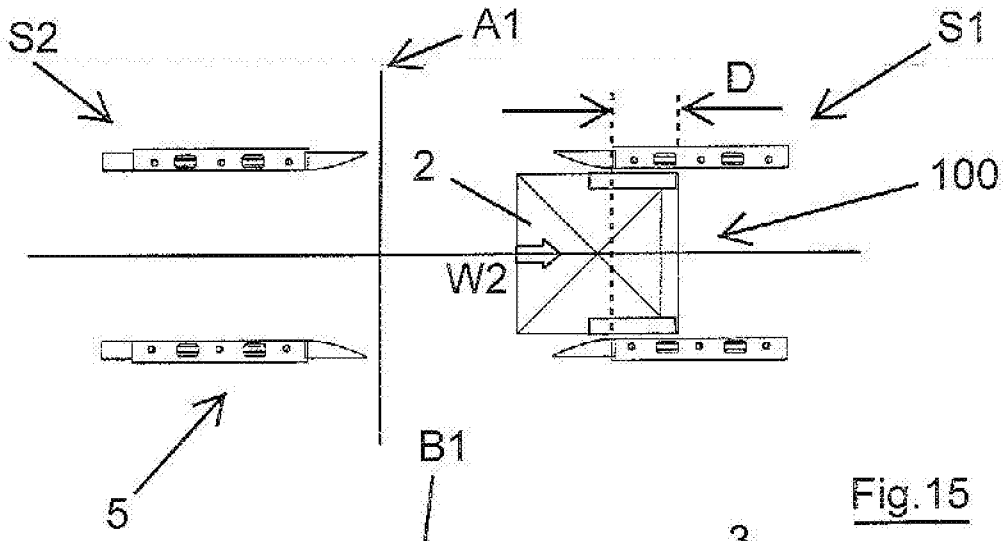

Fig.15

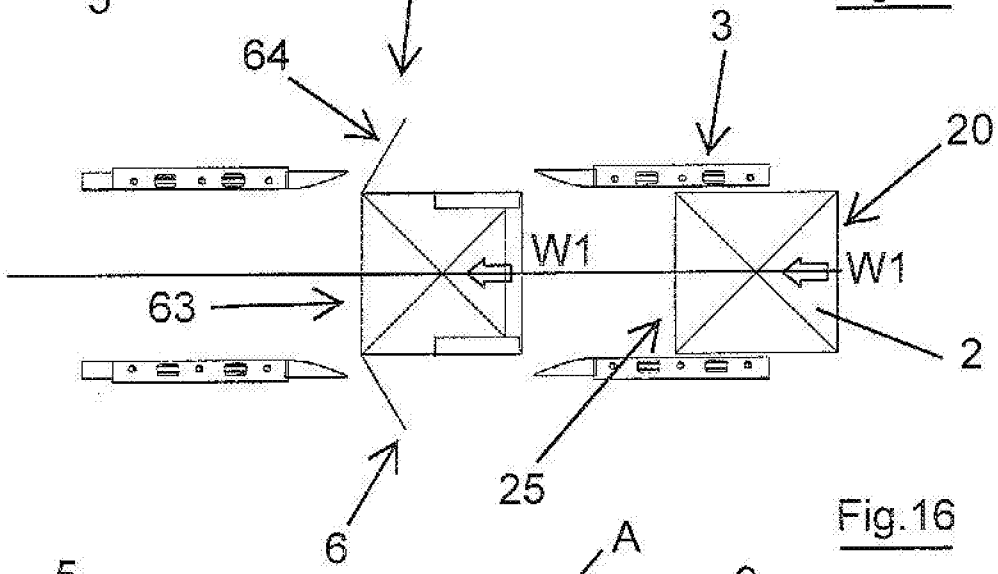

Fig.16

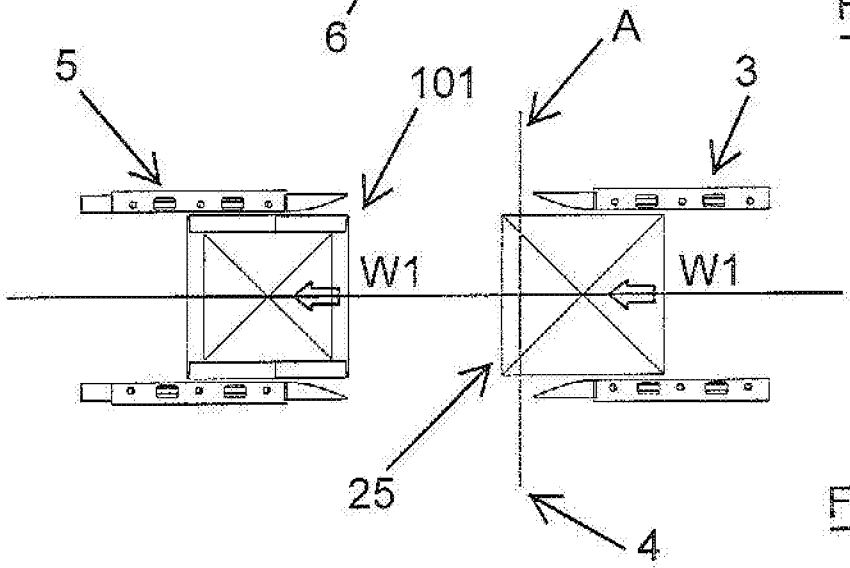

Fig.17

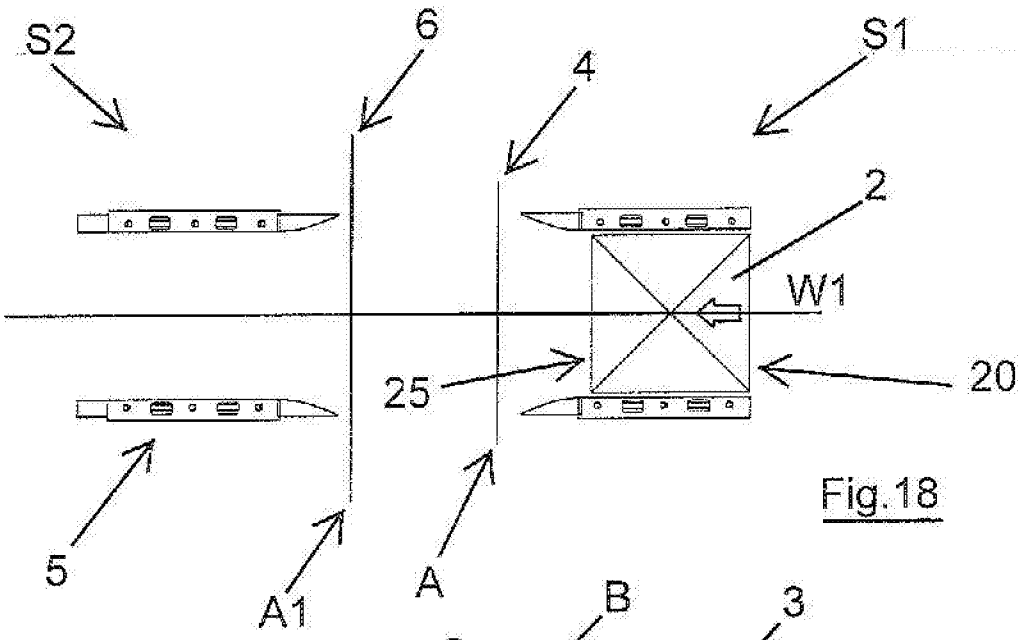

Fig.18

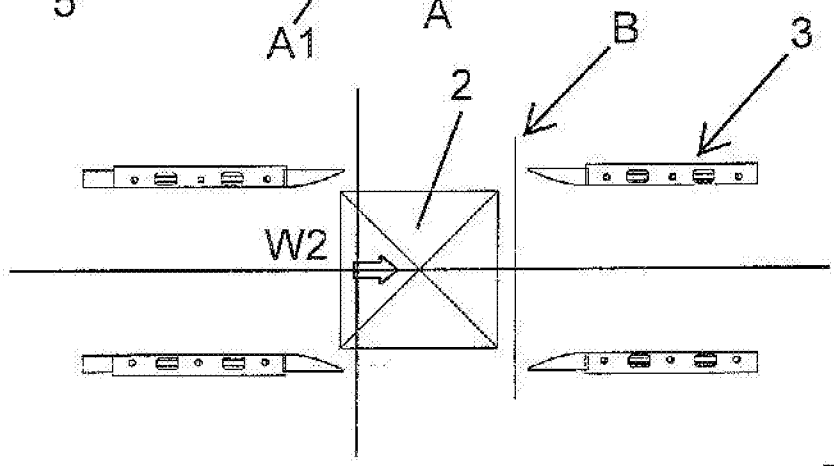

Fig.19

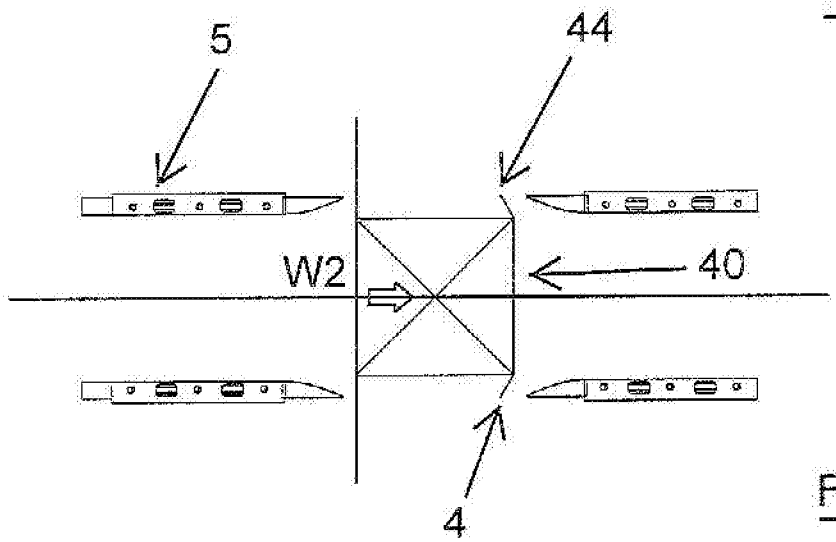

Fig.20

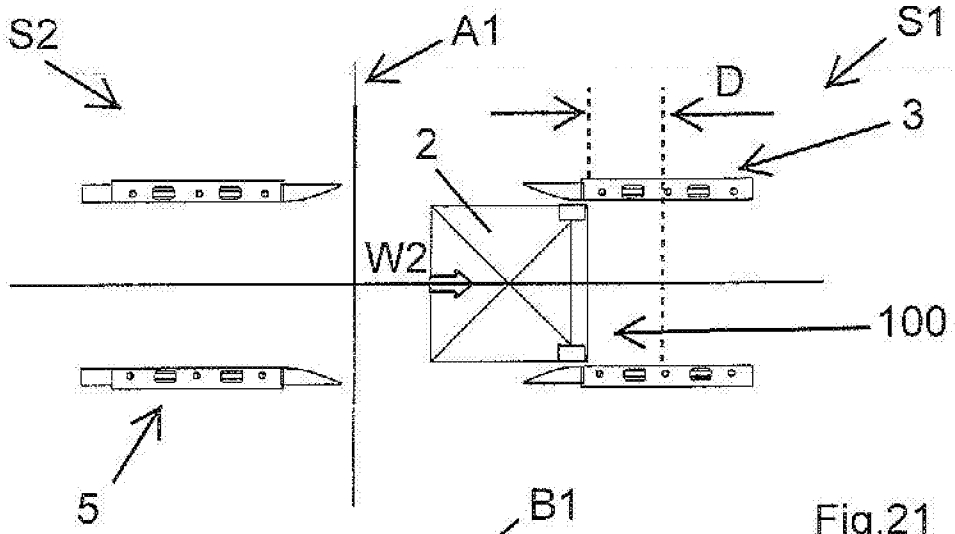

Fig.21

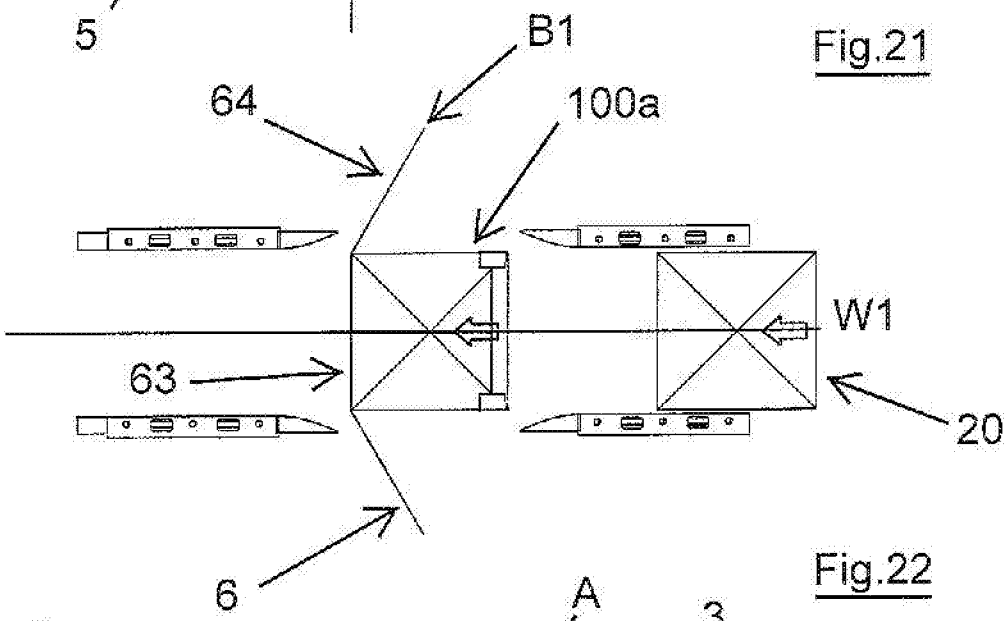

Fig.22

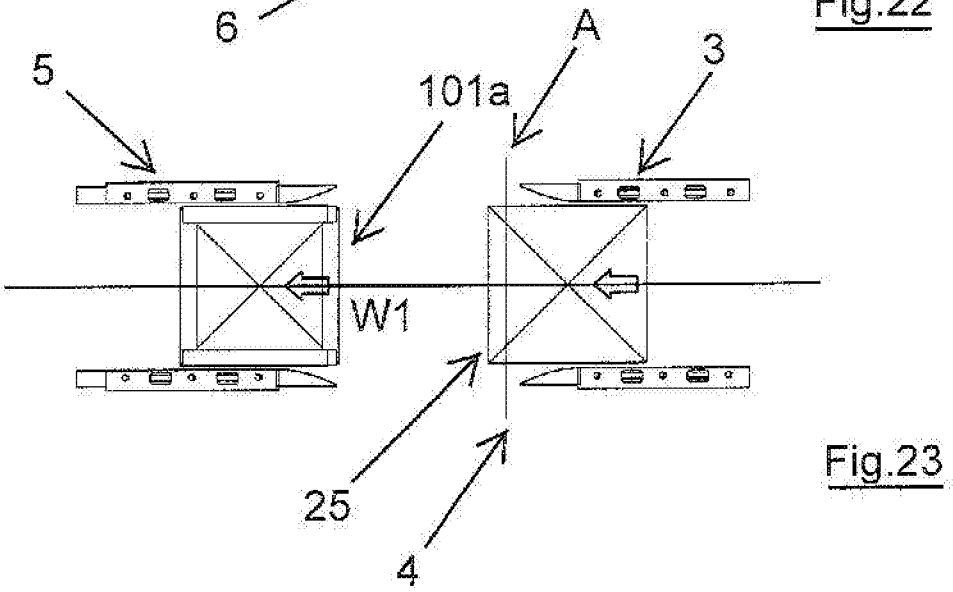

Fig.23

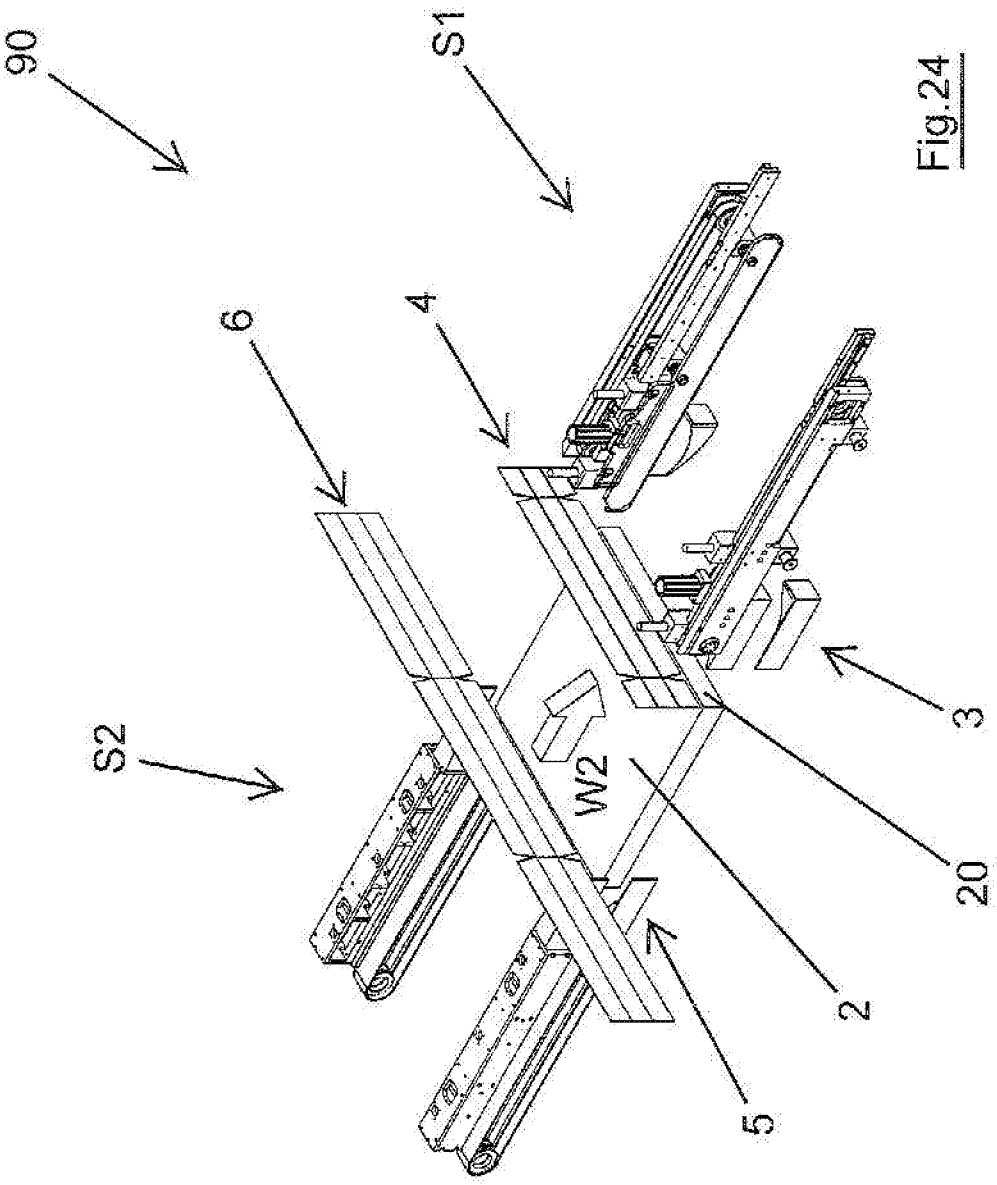

Fig.24

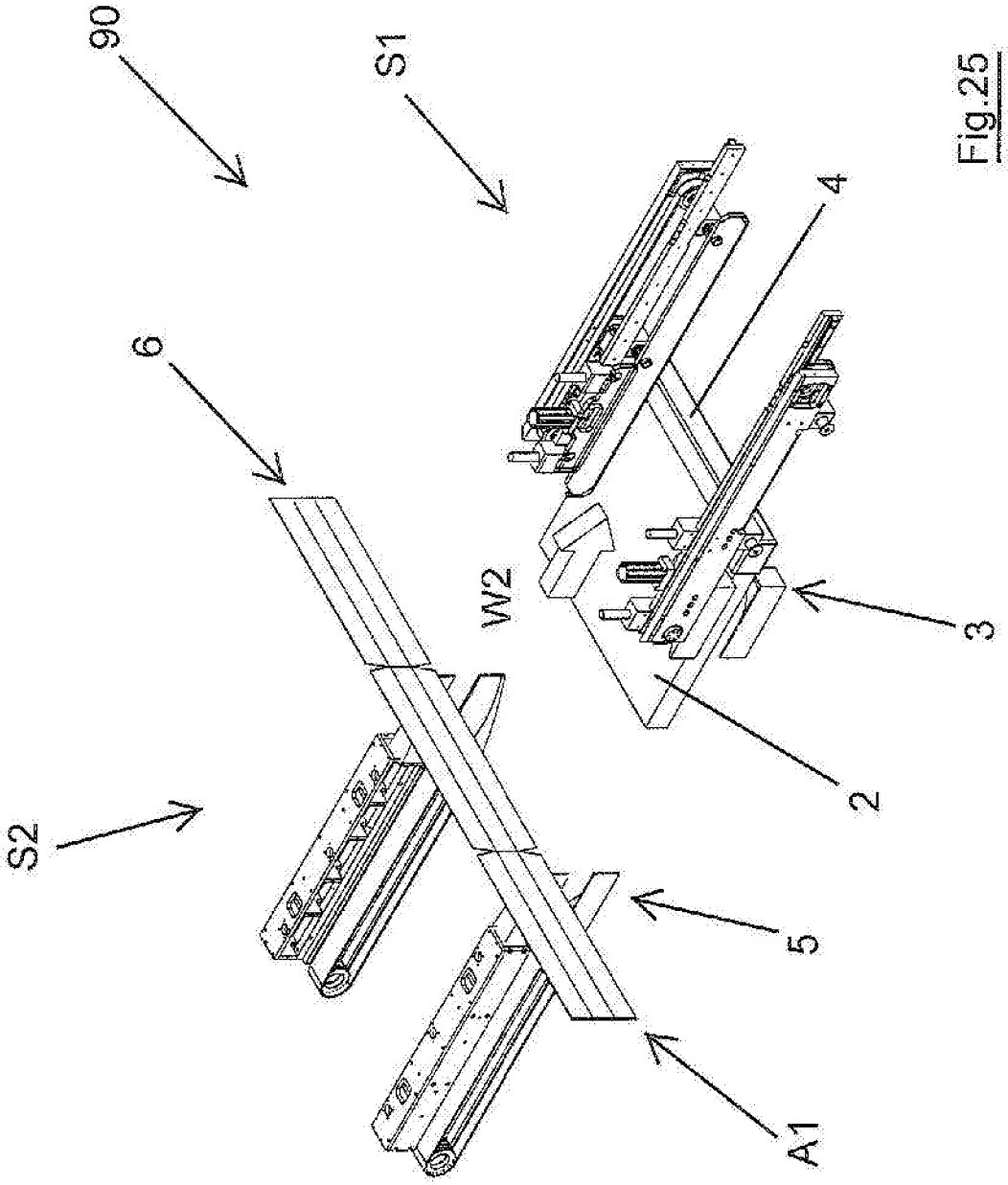

Fig.25

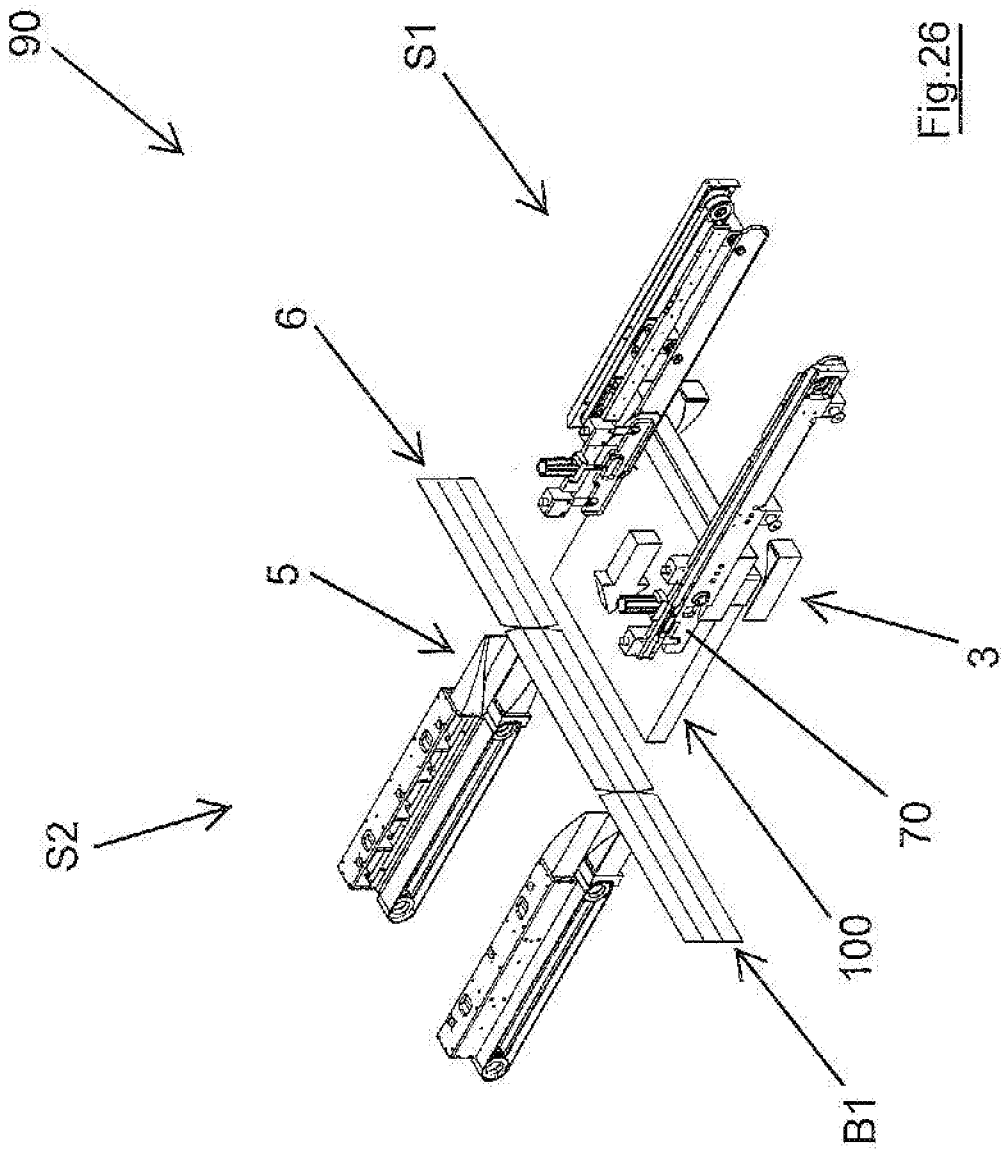

Fig.26

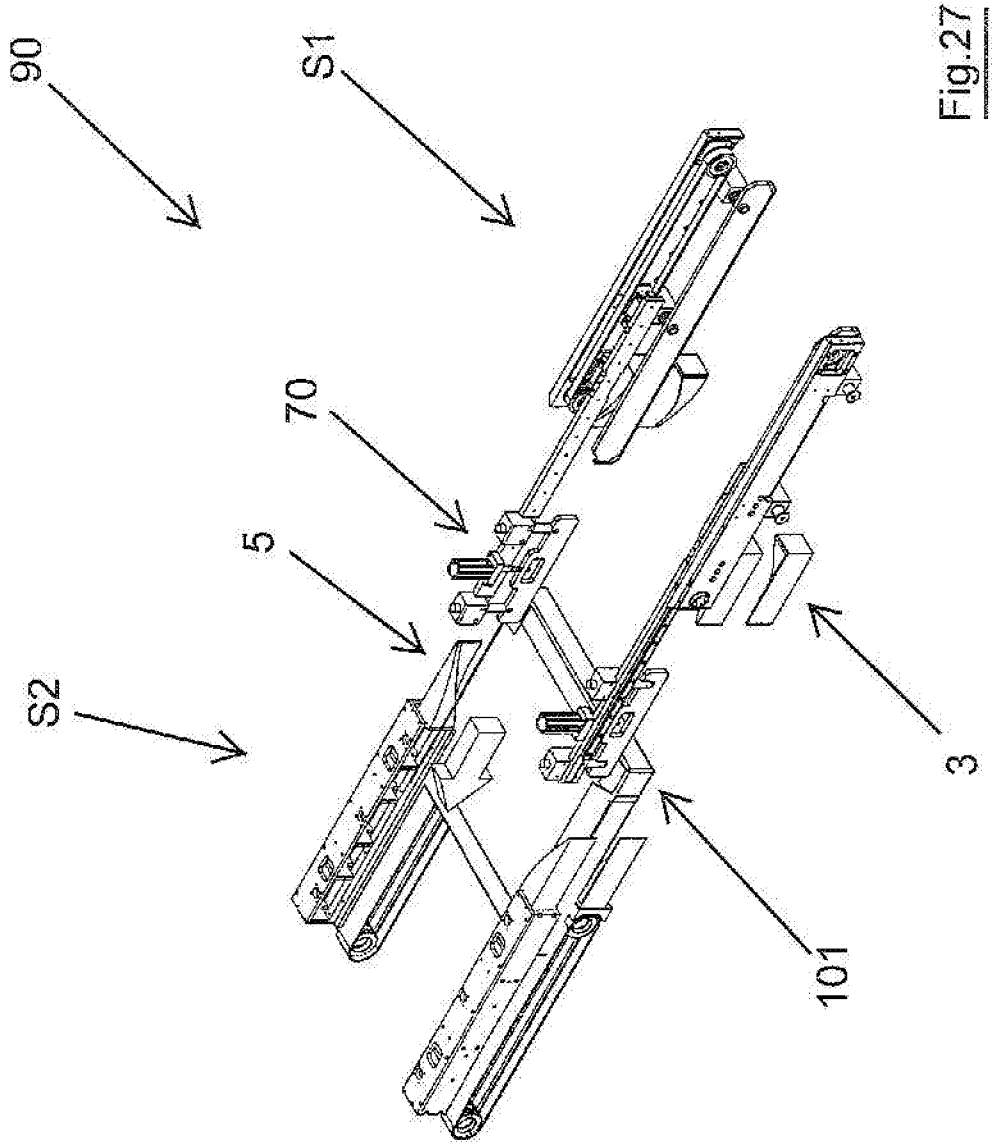

Fig.27

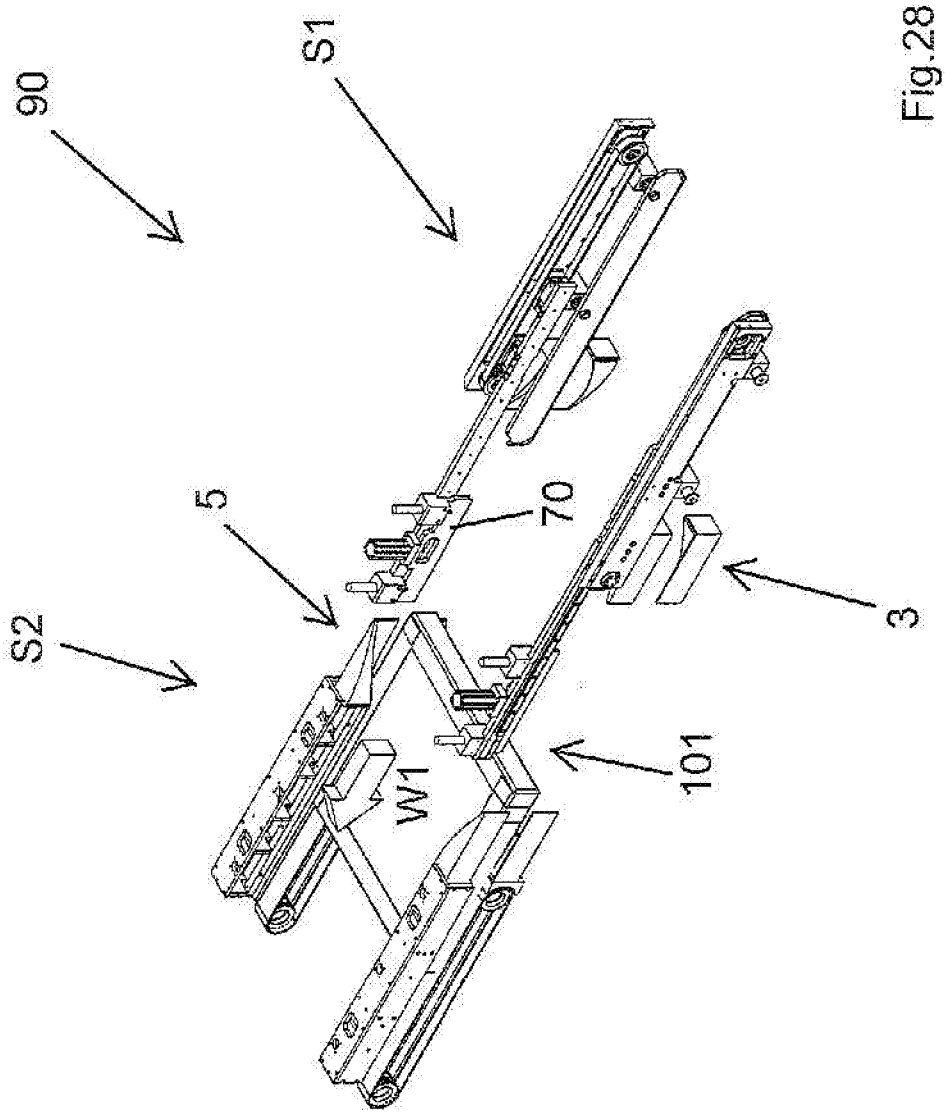

Fig.28

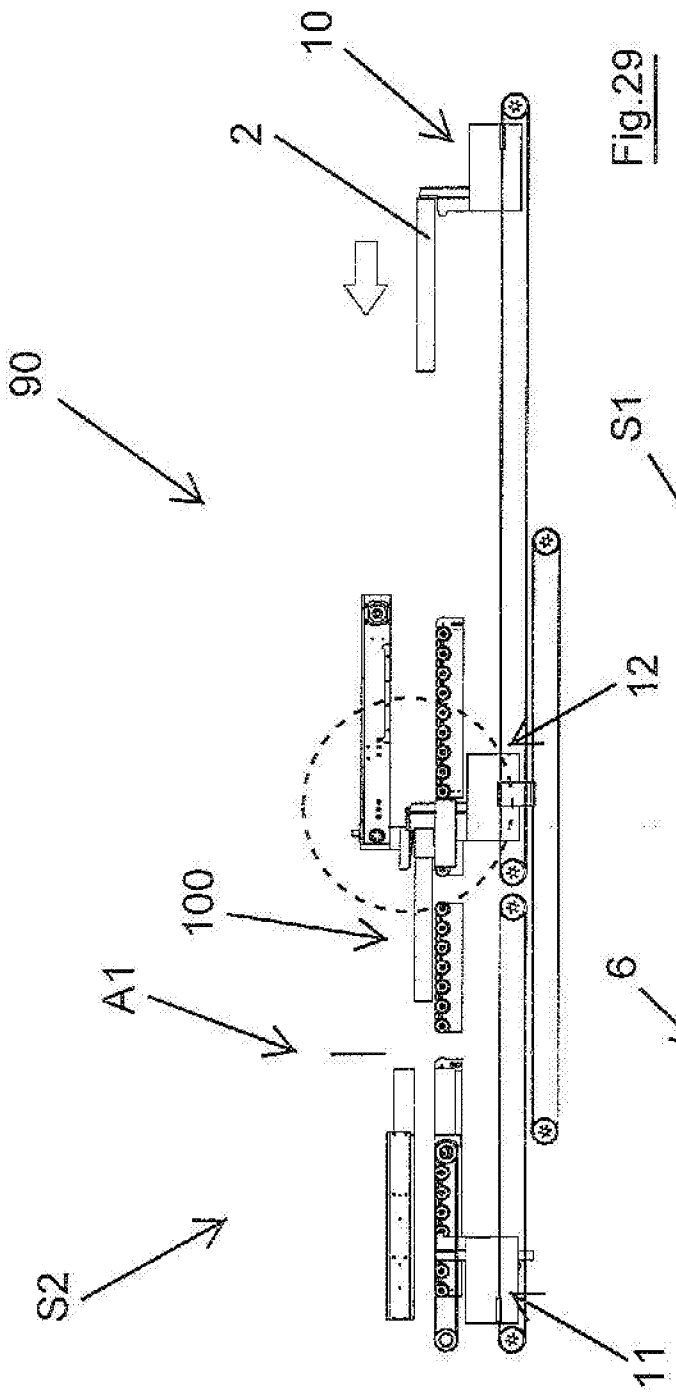

Fig.29

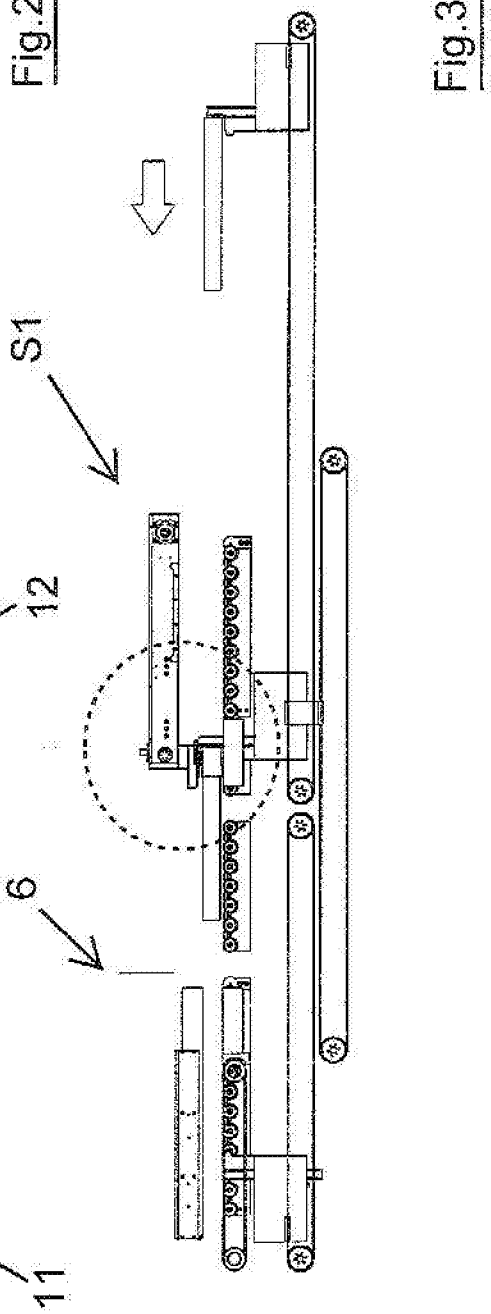

Fig.30

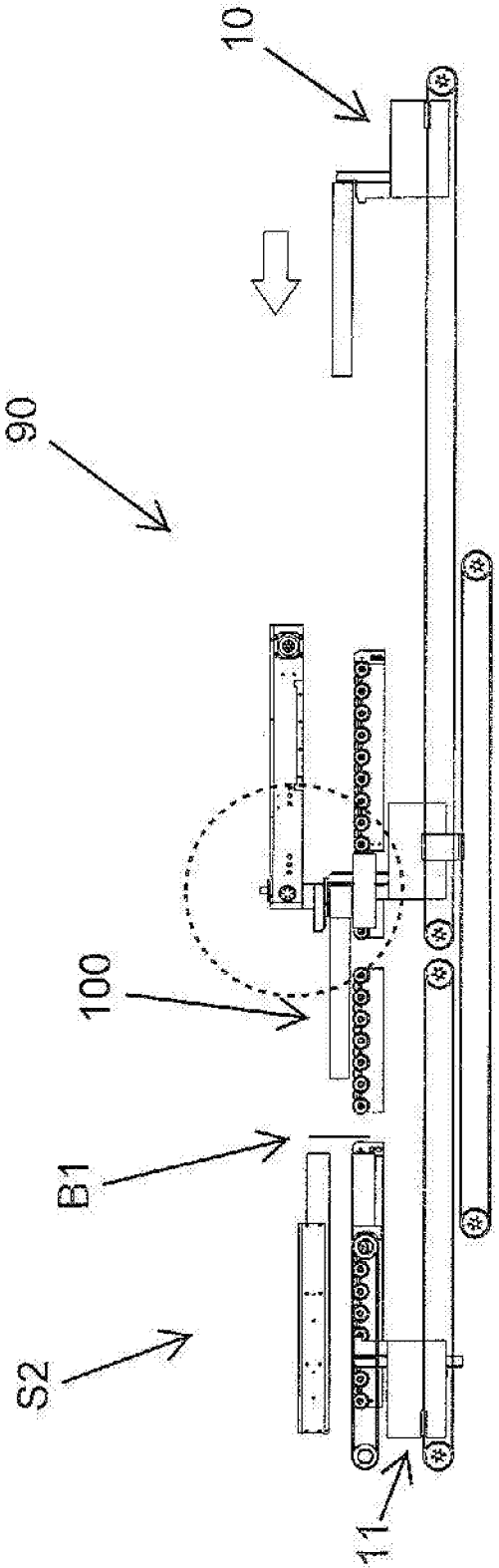

Fig.31

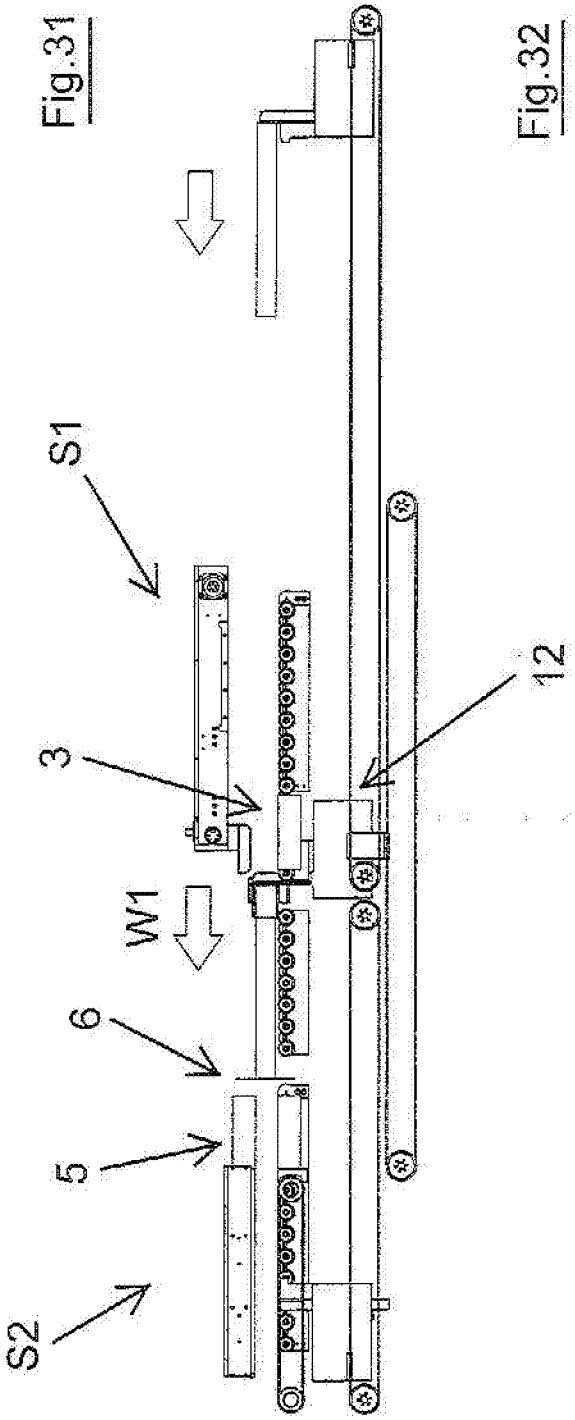

Fig.32

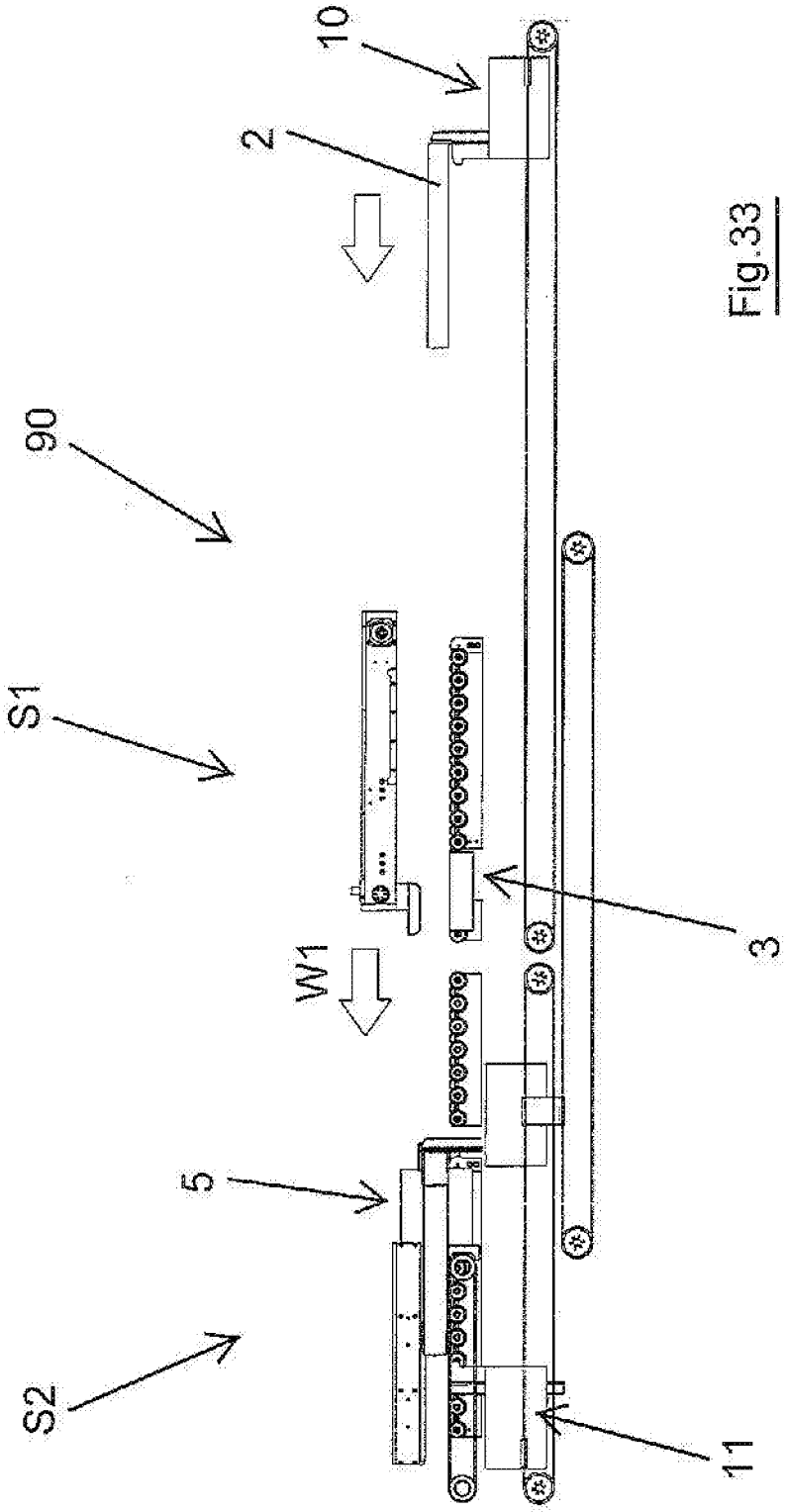

Fig.33

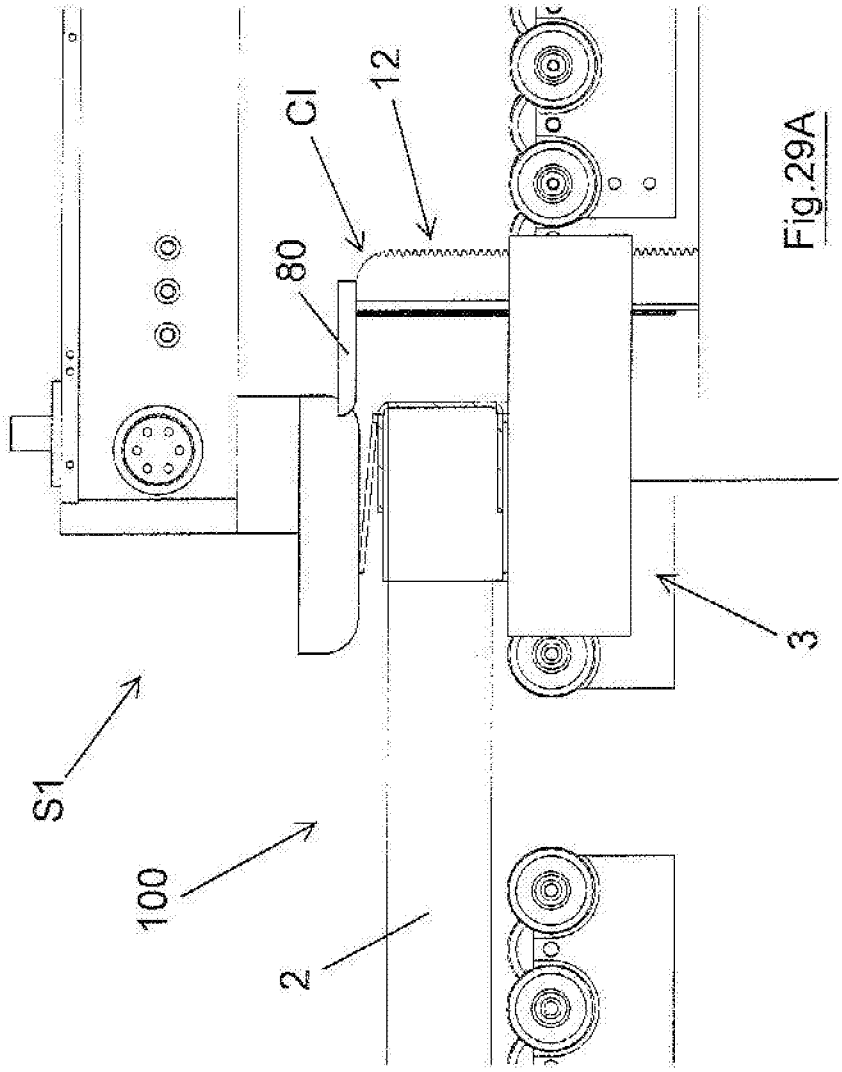

Fig.29A

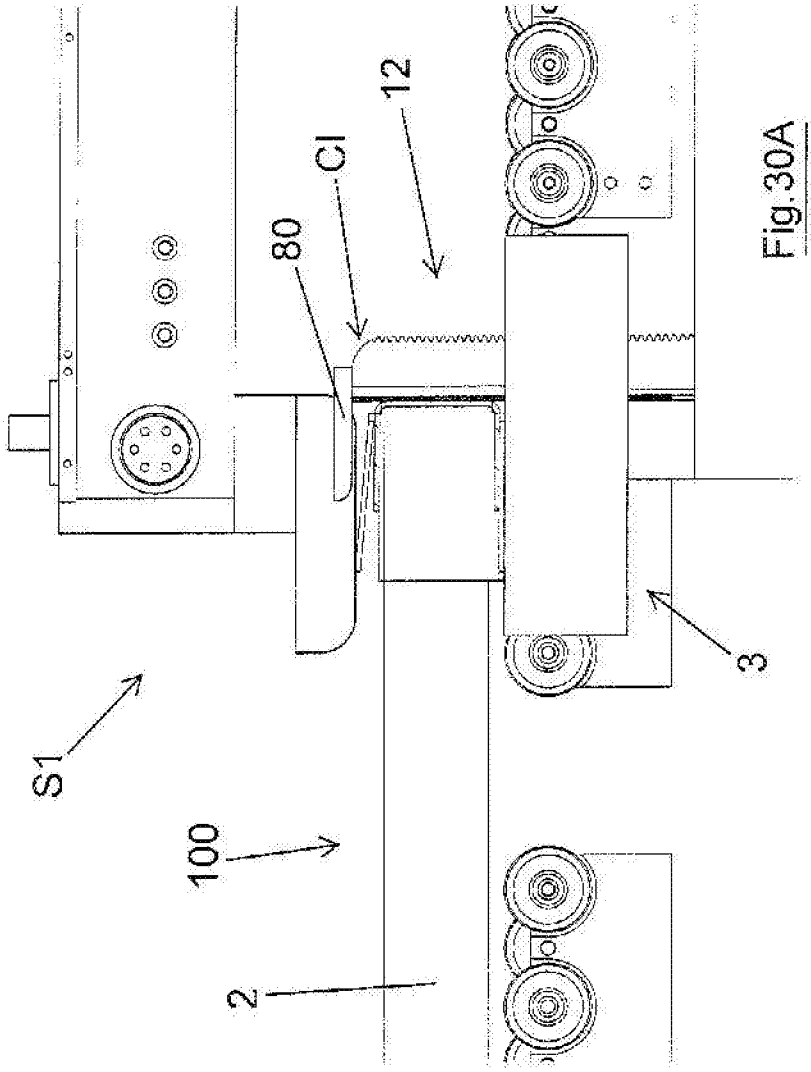

Fig.30A

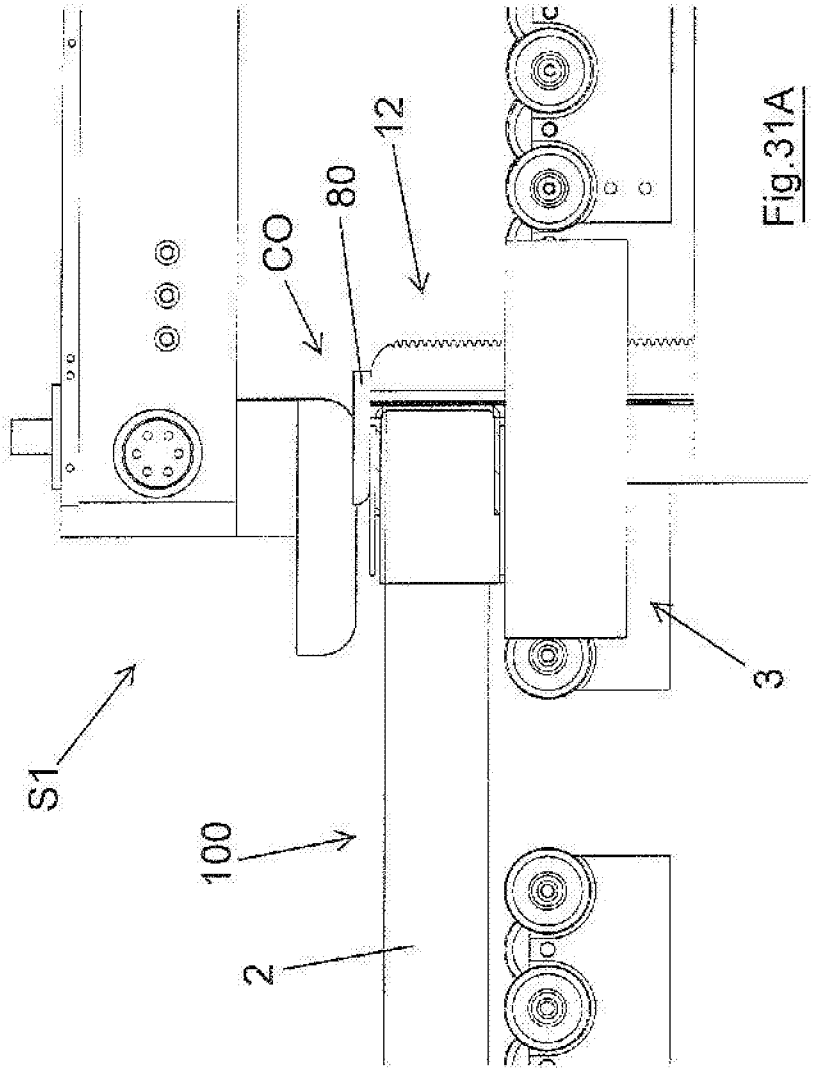

Fig.31A

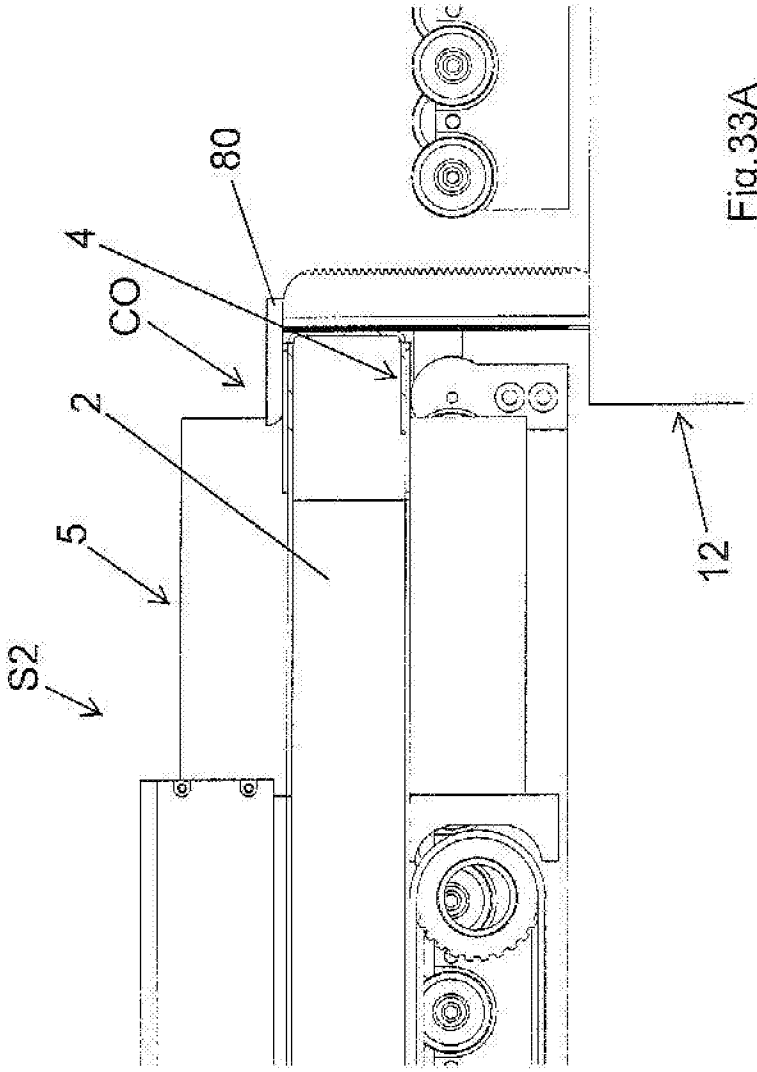

Fig.33A

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2017/055389

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65B11/58 B65B23/20 B65B11/00
ADD.

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)
B65B

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2013/144805 A1 (NUOVA SIMA SPA [IT]) 3 October 2013 (2013-10-03)	18,19
A	the whole document	1-17

Y	US 4 373 320 A (OLIVIERSE JAN [NL] ET AL) 15 February 1983 (1983-02-15) the whole document	18,19

A	WO 2014/091320 A1 (NUOVA SIMA SPA [IT]) 19 June 2014 (2014-06-19) the whole document	1-19

Y	EP 2 952 437 A1 (FERRARI PAOLA [IT]) 9 December 2015 (2015-12-09)	18,19
A	the whole document	1-17

Y	WO 2013/171692 A1 (NUOVA SIMA SPA [IT]) 21 November 2013 (2013-11-21)	18,19
A	the whole document	1-17

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 November 2017	01/12/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Yazici, Baris

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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