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(72) Inventor: **Mescoli, Giuliano**  
**41043 Formigine (MO) (IT)**

(74) Representative: **Gotra, Stefano**  
**BUGNION S.p.A.**  
**No. 25, Via Emilia Est**  
**41100 Modena (IT)**

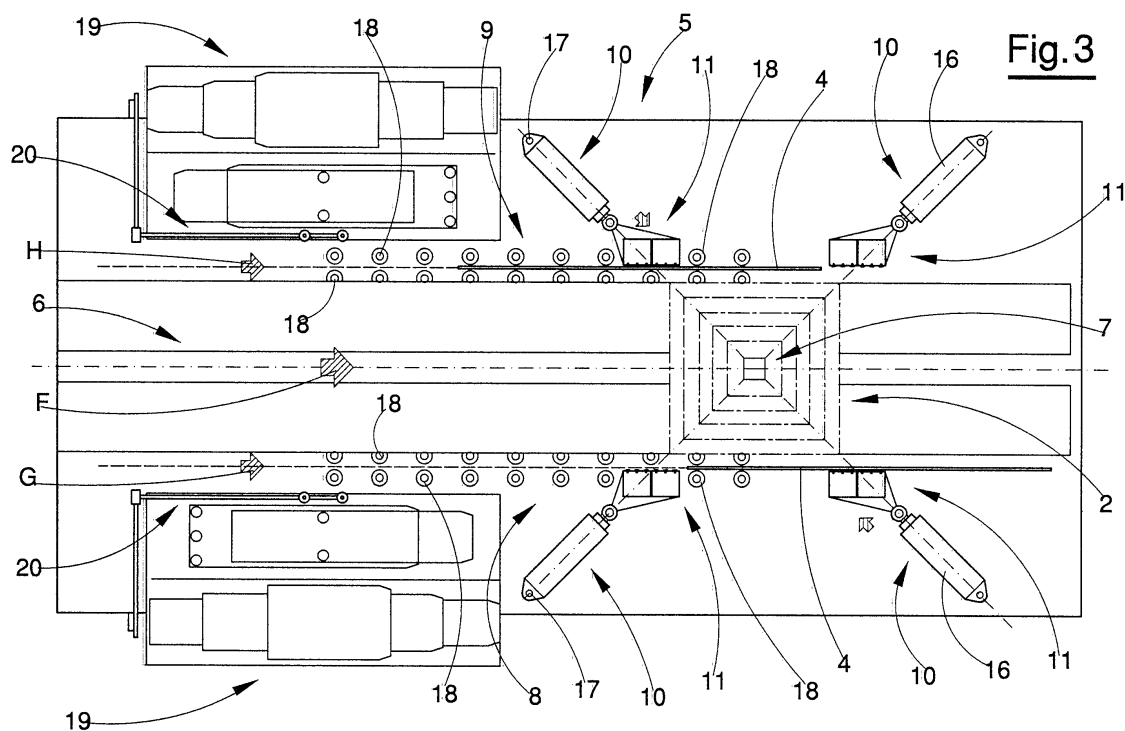
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(71) Applicant: **Gomes Technology S.p.A.**  
**41042 Fiorano Modenese (MO) (IT)**

(54) **Process and apparatus for packaging stacks of flat objects**

(57) A process and apparatus for packaging packs (2) of flat objects (3) piled one on top of another, using a package (1) formed by two cardboard half-blanks (4), in which the packs and the half-blanks (4) are supplied to a packaging station (7) in which the half-blanks (4) are arranged on two opposite flanks of a pack. Four operative units (10), each acting on a corner of a pack, are provided with gripping organs (11) which are moved in

directions according to diagonals of the pack (2) of objects (3), nearing and distancing from the corners of the pack (2). The operative units (10) fold the half-blanks (4) so as to envelop the flanks of the pack (2), as well as a peripheral zone of a topmost and bottom-most face of the pack (2). The invention is particularly applicable to packs made of ceramic tiles stacked one on top of another.



**Fig. 3**

## Description

**[0001]** Specifically, though not exclusively, the invention can be used for packaging ceramic tiles piled one on top of another.

**[0002]** The prior art teaches packages for ceramic tiles comprising a single elongate cardboard blank having four side-flaps connected by fold lines, which side-flaps are conformed and arranged such as to create a snug fit for edges of a pack of tiles. Two further flaps, destined for the top and bottom of the pack of tiles, and each of a long and narrow strip-shape and one arranged superiorly and the other inferiorly, are associated to each flap by means of fold lines along the long sides of the side-flaps. The top and bottom flaps will protect a part of the two faces, upper and lower, of the tile pack. The protected part of the two faces will be narrow and arranged along the edge zone of the tiles. When the package is made up, the four top and four bottom flaps will frame the topmost and bottom-most tile surfaces of the pack of tiles. Obviously suitable glue points for closure and stability of the package are included.

**[0003]** Normally these known-type packages are applied on tile packs using automatic packaging machines comprising at least one device for successively feeding the packs in an advancement direction, and a device for singly obtaining the cardboard packaging blanks from a store before positioning them in a work station in a perpendicular position to the advancement direction of the tile packs.

**[0004]** During operation, the packs are supplied, one by one, to the work station, where a pusher acts singly on each pack to push the front side thereof against an opened-out cardboard blank, which latter is then folded by suitable guide means against the right and left sides of the pack in such a way that the pack itself is enveloped on three sides. Then a device completely closes the package on the remaining fourth side, bringing the open ends together ready for gluing. Finally, the top and bottom flaps are folded about the top and bottom faces of the pack. The final result is a package which is protected on all four lateral flanks with the top and bottom faces being framed along the perimeter thereof.

**[0005]** The use of packages of this type does however involve some drawbacks.

**[0006]** Firstly, the packages are not particularly suitable for large-format tile packs (for example 60x60 cm.) since the scored cardboard blanks needed would be considerably large, especially length-wise, and therefore rather massive and quite complicated for the packaging machines to handle.

**[0007]** Secondly, the operations necessary for setting up the packaging machines to the specifications required in a change of tile format would be relatively long and laborious. Further, when setting up a change of format, the machines themselves are rather complex to re-set, making these operations all-in-all considerably expensive.

**[0008]** Another packaging machine for ceramic tiles is known, which uses a different type of package and which, in practice, is used for relatively large-format packs of ceramic tiles (for example, 50x50 cm, and above). Normally packages for large-format tiles comprise a single blank having a base flap of the same dimensions as a flat face of the tile pack, to which are connected (by fold lines) lateral flaps which fold-wrap around the lateral sides of the tile pack, finishing with at least a perimetral top surface flap to cover at least a perimetral edge and part of the topmost tile face. In this case the plan surface of the blank is relatively large, especially because of the dimensions of the base flap.

**[0009]** During operation, this second type of packaging machine orders each tile pack one by one on a horizontally-arranged blank, the bottom face of the pack being made to coincide with and superposed on the base flap. Then the side flaps are folded first to cover the flanks of the pack and then to obtain a perimetral frame on the topmost face of the pack.

**[0010]** In this second system a whole surface of a tile pack is covered, and not only a perimeter zone of the face, as in the first system. This leads to a large consumption of base materials (cardboard), with a consequent considerable increase in overall packaging costs.

**[0011]** A further drawback in the prior art is the need to predispose at least two machines of different types, so that tiles of both small and large format can be packaged, all of which leads to an obvious increase in packaging costs.

**[0012]** The main aim of the present invention is to obviate the above-mentioned drawbacks in the prior art by providing a process for simply and economically packaging packs of objects, in particular ceramic tiles, both small and large.

**[0013]** An advantage of the invention is to provide an apparatus which is constructionally simple and economic and which is able to actuate the process of the invention.

**[0014]** A further advantage of the invention is to provide a packaging machine which can be simply and rapidly adjusted for a change of format in the objects being packaged.

**[0015]** A still further advantage of the invention is to provide a packaging machine having a relatively high operating velocity, and one which is extremely reliable.

**[0016]** The technical characteristics of the present invention, according to the above aims and advantages, can be clearly evinced from the contents of the appended claims.

**[0017]** Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of a preferred but non-exclusive embodiment of the invention, illustrated purely by way of nonlimiting example in the accompanying figures of the drawings, in which:

figure 1 is a schematic perspective view of a pack-

age made according to the present invention, as it is being applied to a pack of ceramic tiles;  
 figure 2 is a schematic plan view of one of two half-blanks which together make up the package of figure 1;  
 figure 3 is a schematic plan view from above of a packaging machine which can be used to apply the packaging of figure 1 to a tile pack;  
 figures from 4a to 4d are schematic views of a detail of figure 3, during four successive operating phases of the machine;  
 figure 5 shows an enlarged detail of figure 4d;  
 figure 6 shows a lateral view from below of figure 5.

**[0018]** With reference to the above-mentioned figures 1 and 2, the number 1 denotes in its entirety a package for packs 2 of flat objects piled one on top of another.

**[0019]** Each object exhibits in plan view a polygon shape, preferably rectangular. In this particular example the objects to be packaged are ceramic tiles 3, either square or rectangular in shape.

**[0020]** The package 1 comprises two half-blanks 4 made of cardboard and destined to be coupled one to another. In the present example the half-blanks 4 are identical to each other, so as to make savings in manufacturing the packages 1. Figure 2 shows one of the two half-blanks 4. Each half-blank comprises two flaps 40, each substantially rectangular and elongate, united at a fold-line 41 at one of their short ends. Each flap 40 is destined to be arranged at a corresponding flank of a pack 2 of tiles.

**[0021]** In a case where the objects to be packaged have more than four sides, the half-blanks 4 can still be two in number but presenting more than two flaps each; or more than two half-blanks 4 can be used, opportunely coupled one to another.

**[0022]** In the illustrated embodiment, each half-blank 4 comprises, for each flap 40, two more flaps 42, namely a top flap and a bottom flap, both narrow and elongate. Each of the top-and-bottom flaps 42 is joined by a fold line 43 to a long side of the relative flap 40. The top-and-bottom flaps 42 will in use be applied to protect respectively the topmost face and the bottom-most face of the tile pack 2 to be packaged.

**[0023]** Each half-blank 4 further comprises, at one end, at least one tongue 44, joined by a fold line 45 to a short side of one of the two flaps 40. The tongue 44 of a half-blank 4 is destined in use to tuck over an end of the other half-blank 4.

**[0024]** With reference to the above-mentioned figures from 3 to 6, 5 denotes in its entirety an apparatus for packaging packs 2 of flat objects piled one on top of another. In particular the apparatus 5 can be used for packaging ceramic tiles 3 using the package 1 illustrated in figures 1 and 2.

**[0025]** The apparatus 5 comprises a supply line 6 supplying the packs 2 one-by-one in an advancement direction F to a packaging station 7 where each pack 2 is

blocked in a predetermined position. Further, known-type means are provided in the packaging station 7 for adjusting the height of the tile pack 2.

**[0026]** The apparatus 5 further comprises two parallel supply lines 8 and 9, predisposed to supply the half-blanks 4 one-by-one to the packaging station 7 at a position corresponding to two opposite flanks of a pack 2 located in the packaging station.

**[0027]** The apparatus 5 is provided with a plurality of operating units 10, each predisposed to operate on a corner of a pack 2 arranged in the packaging station 7. In the illustrated example, where the objects to be packaged exhibit four corners, four of these operating units 10 are predisposed, each of which has at least one gripping organ 11 with which it will carry out operations on a half-blank 4.

**[0028]** Each gripping organ 11 is mobile on command and can near and distance to and from the interested corner. Each gripping organ 11 is guided to make the above-described movements in a direction coinciding with that of the diagonal of the pack 2 of objects passing through the corner of said pack, with reference to a plan view of the pack of tiles positioned in the packaging station 7. The gripping organs 11 are operatively situated in two opposite pairs. Two opposite gripping organs 11 can be moved in a same direction (as mentioned above, a direction coinciding with a diagonal drawn through the plan view of the pack), and indeed during operation are normally commanded to move in opposite senses in this same direction.

**[0029]** The gripping organs 11 are provided with a plurality of suckers 12, arranged side-by-side, which can grip a half-blank 4. Each gripping organ 11 comprises two parts 11a and 11b, each provided with suckers and being able to rotate on command one with respect to another about a vertical-axis pivot 13.

**[0030]** Two of the oppositely-positioned gripping organs 11 have the primary task of folding the half-blanks 4 about two opposite corners of the tile pack, while the other two gripping organs 11, also positioned opposite one another, have the principal task of realising the coupling of the tongues 44 of the half-blanks 4 with the relative ends of the other half-blanks 4.

**[0031]** The apparatus 5 comprises means for folding the top and bottom flaps 42 on to the topmost and bottom-most faces of the pack 2. The means for folding comprise, for each gripping organ 11, two pushers 14 solidly connected to the relative gripping organ 11. Each pusher 14 is mobile on command according to an advancement direction which, during operation, is perpendicular to an edge of a top or bottom face of the tile pack and is also parallel and proximal to the plan of the top or bottom face. By virtue of these movements the pusher 14 can selectively assume at least one inactive position (represented by the broken line in figure 5), external to the edge of the face, and an active position (represented by a continuous line in figure 5) which is internal to the edge. During the movement from the inactive into the

active positions the pusher 14 interacts contactingly with a vertically-disposed top or bottom flap 42 in order to fold it down on to the corresponding topmost or bottom-most face of the tile pack.

**[0032]** As shown in figures 5 and 6, each operative unit 10 comprises, for each operative side, a top and a bottom pusher 14, which logically are destined to act on a top flap and a bottom flap respectively. Each pusher 14 is frontally provided with a horizontal platelet 15 which interacts contactingly with a top/bottom flap 42 to fold it onto the relative top or bottom face of the tile pack 2.

**[0033]** Each gripping organ 11 is mobile on command of a linear actuator 16, preferably hydraulic, which exhibits an end which bears the relative gripping organ 11, while another end is hinged to a vertical-axis pivot 17. The actuators 16 are positioned so that their axis of action is in line with the diagonals of the tile pack 2 situated in the packaging station 7.

**[0034]** The supply lines 8 and 9 of the half-blanks 4 each comprise a conveyor device having a plurality of roller pairs 18 for drawing the half-blanks 4. The roller pairs 18 are arranged on two opposite sides of the supply line 6 of the tile packs 2, and are aligned one after another in respective half-blank 4 advancement directions G and H. A flexible organ, of known type and not illustrated, and constituted for example by a belt, is wound about at least one line of roller pairs 18 so that it runs, drawn by the rollers themselves, in the advancement direction G or H, in contact with the half-blank 4.

**[0035]** Each supply line 8 and 9 comprises a store 19 of half-blanks 4, in which the half-blanks are piled one on another, and a transfer device 20 able to collect the half-blanks 4 one at a time from the store 19 and send them one-by-one to the relative roller conveyor device 18. Each transport device 20 comprises at least one moving arm, equipped with suckers, for gripping the half-blank 4 located horizontally at the top of the store pile, rotate it by 90° and insert it vertically between two parallel lines of rollers 18.

**[0036]** During operation the apparatus 5 carries out the packaging operation as follows.

**[0037]** An ordered succession of tile packs 2 is supplied to the packaging station 7. Each pack 2 is located at a predetermined point at the station 7 under the control of means for positioning of known type and not illustrated. The supply of the packs 2 is synchronically coordinated with that of two lines of half-blanks 4 in positions corresponding to two opposite flanks of a pack 2 positioned in the packaging station 7. The half-blanks 4 are taken one-by-one from the relative stores 19 and inserted into the roller conveyor 18.

**[0038]** In the illustrated case, with reference to the plan view of figure 3, the half-blank 4 which advances, drawn by the rollers 18, along the right-hand side (with reference to advancement direction G), is stopped at a predetermined position in which it can be gripped by the relative suckers 12 of the operative unit 10 which in figure 3 is illustrated low down on the right. The half-blank 4 which advances on the left side (with reference to advancement direction H) is gripped by the diametrically-opposite operative unit 10, illustrated high up on the left.

The two operative units 10 act along the same diagonal of the pack 2. The operative units 10 grip the two half-blanks 4 and near them to the corners of the pack 2 in the packaging station 7. The position of the pack 2 in a vertical direction can be regulated in order to make sure the half-blanks 4 fit perfectly against the flanks of the tile pack 2. The half-blanks 4 are neared by direct movements according to the diagonal of the tile pack 2. When the half-blanks 4 are gripped by the gripping organ 11, the two parts 11a and 11b are positioned such as to have their axis of rotation very close to the fold line 41 between the two flaps 40. A first half-blank 4 (for example, the one advancing on the right side) is neared to the first corner (for example the corner low down on the right in figure 3) so as to near a flap 40 to a first flank (the right flank, with reference to advancement direction F) of the tile pack 2, so that the fold line 41 between the two flaps 40 more-or-less coincides with the first corner. The second half-blank 4 (the one which advances on the left side) is neared to the second corner (the one high up on the left in figure 3) so as to near a flap 40 to a second flank (the left flank, with reference to advancement direction F) of the pack opposite the first, so that the fold line 41 between the two flaps more-or-less coincides with the second corner, diametrically opposite to the first. Figure 4a shows the above-described situation, in which flaps 40 of the half-blanks 4 are brought into contact with two opposite flanks of the tile pack 2.

**[0039]** Subsequently (figure 4b) the other flaps 40 of the half-blanks 4 are folded about their respective fold lines 41 so that the flaps are brought into contact with the other two flanks of the tile pack 2. The flaps are folded by means of a 90° rotation (in anticlockwise direction with reference to figure 4b) of a rotatable part 11b of the gripper organs. The pushers 14 of the two operating units 10 gripping the half-blanks 4 are then commanded to advance in order to fold the top and bottom flaps 42 down onto the topmost and bottom-most faces of the tile pack 2. This phase is schematically illustrated in figure 4c. The two other operative units 10 are then neared to the two other corners by means of a displacement along the diagonal of the tile pack 2 passing through the corners of the pack 2 itself. During and by effect of the nearing action the tongue 44 of a half-blank 4 is folded by 90° and brought into contact with an end of the other half-blank 4. Then the rotatable part 11b of the gripping elements 11 is rotated by 90° and the pushers 14 are commanded to advance in order to complete the folding operation on the top and bottom flaps 42. On completion of the above all four corners of the pack 2 are interested by the gripper elements 11.

**[0040]** At this point the operative units 10 are commanded to retreat, once more moving along the diagonals. The packaged tile pack 2 continues along the sup-

ply line 6 while the next pack 2 and the relative half-blanks 4 are transported towards the packaging station 7 so that a new work cycle can begin.

[0041] The apparatus 5 enables tiles of various format to be packaged. To reset the apparatus for a change of format, only a few simple operations are needed. In particular, the four operative units 10 can carry out their function on tiles 3 of any format; for this purpose the tile packs 2 must be positioned at the centre of the packaging station 7 so that the four corners of a pack 2 are situated along the lines of action of the operative units 10, that is, with the diagonals of the tile pack 2 coinciding with the above-mentioned lines of action. Suitable means for positioning are required, of known type and not illustrated, which can stop the pack 2 in a correct position, i.e. when it is centred with respect to the operative units 10. Figure 3 schematically shows (in mixed broken lines) the correct positions for packs 2 of various format. In the various evidenced positions, the packs 2 of tiles, whatever their formats, can in any case be located in a centred position with respect to the operative units 10, so that the nearing movement of the units 10 occurs along the same lines of action in each case.

[0042] Experiments have shown that the use of oppositely-situated coupled operative units improves the stability of the tile pack 2 during the various phases of the packaging process. During apparatus functioning, the action of an operative unit 10 is in part contrasted by a contemporaneous action of the opposite operative unit 10, so that together the two units 10 contribute to blocking the tile pack 2 during the packaging process.

## Claims

1. A process for packaging packs (2) of flat objects piled one on top of another, each object (3) having a polygonal shape, preferably rectangular; a package (1) being formed by at least two half-blanks (4) made of cardboard, each of which half-blanks (4) comprises:

at least two flaps (40), each rectangular and elongate, joined together along a fold line (41) at a short side thereof, a total number of flaps (40) in a package being equal to a number of sides of the objects (3) which make up the pack (2) to be packaged;  
a top and a bottom flap (42) associated to each said flap (4), said top and bottom flaps (42) being narrow and elongate and each being joined by a fold line (42) to a long side of a flap (40);  
at least one tongue (44), joined by a fold line (45) to a short side of one of the at least two flaps (40), which short side is opposite a short side at which the at least two flaps (40) are joined;  
the process being characterised in that it com-

prises the following operations: feeding an ordered succession of packs (2) to a packaging station (7);

feeding two ordered successions of half-blanks (4) to the packaging station (7) into a position corresponding to two opposite flanks of a pack (2) of objects (3) positioned in said packaging station (7);

nearing a first flap (40) of a first half-blank (4) to a first flank of the pack (2) in order that the fold line (41) between the two flaps of the first half-blank (4) is aligned with a first corner of the pack (2);

nearing a first flap (40) of a second half-blank (4) to a second flank, opposite to the first flank, of the pack (2) in order that the fold line (41) between the two flaps of the second half-blank (4) is aligned with a second corner of the pack (2), opposite to the first corner thereof;

folding a second flap (40) of the first half-blank (4) about a fold line (41) in order that the second flap is superposed on a third flank of the pack (2), adjacent to the first flank and delimited laterally by the first corner;

folding a second flap (40) of the second half-blank (4) about a fold line (41) in order that the second flap is superposed on a fourth flank of the pack (2), opposite to the third flank, adjacent to the second flank and delimited laterally by the second corner;

coupling the tongue (44) of the first half-blank (4) with an end of the second half-blank (4) and the tongue (44) of the second half-blank with an end of the first half-blank;

folding the top and bottom flaps (42) on to the respectively topmost and bottom-most faces of the pack (2).

2. The process of claim 1, characterised in that the objects (3) are constituted by ceramic tiles (3).
3. The process of claim 1 or 2, characterised in that each object (3) is a rectangular quadrilateral and in that the second corner is the corner which is diametrically opposite the first corner.
4. The process of any one of the preceding claims, characterised in that the operations of nearing a first flap of a first half-blank to a first flank of the pack and nearing a first flap of a second half-blank to a second flank of the pack are achieved by movement of the half-blanks in coincidental directions to a direction of diagonals of the pack when seen in plan view.
5. The apparatus for actuating the process of the preceding claims, characterised in that it comprises:

a supply line (6) supplying one pack at a time to the packaging station (7);

two supply lines (8 and 9) supplying two half-blanks (4) at a time to the packaging station (7) into positions corresponding to two opposite flanks of a pack (2) located in the packaging station (7);

a plurality of operative units (10), each predisposed to act on a corresponding corner of a pack (2) located in the packaging station (7); each operative unit (10) being provided with at least one gripping organ (11) able to act on a half-blank (4), the gripping organ (11) being mobile on command and able to near and distance from the corner; each gripping organ (11) exhibiting at least one part (11b) which is rotatable on command about a vertical rotation axis; at least two gripping organs (11), one opposite another, being provided for folding the half-blanks (4) about two opposite corners of the pack (2); at least two other gripping organs (11), one opposite another, being provided for bringing the tongues (44) of the half-blanks (4) into contact with ends of the half-blanks (4);

means for folding the top and bottom flaps (42) onto the topmost and bottom-most faces of the pack (2).

6. The apparatus of claim 5, characterised in that the gripping organs (11) are provided with at least one sucker (12) able to grip a half-blank (4).

7. The apparatus of claim 5 or 6, characterised in that each gripping organ (11) is guided to near and distance from a corner of the pack (2) in a direction which coincides with a direction of a diagonal of the pack (2), seen in plan view, which diagonal passes through the corners of the pack (2).

8. The apparatus of any one of claims from 5 to 7, characterised in that the means for folding the flaps (42) comprise at least one pusher (14), solidly constrained to an operative unit (10), which pusher (14) is mobile on command in an advancement direction which is perpendicular to an edge of a top or bottom face of the pack (2) and is parallel and proximal to a plan of the face, so that the pusher (14) can selectively assume at least one inactive position, external of the edge of the face, and an active position, internal to the edge; the pusher (14) being able both in the inactive position and in the active position to interact with a flap (42) arranged vertically in order to fold said flap (42) until the flap (42) is superposed on the face of the pack (2).

9. The apparatus of claim 8, characterised in that each operative unit (10) comprises two pushers (14), one upper and one lower, destined to act on a topmost

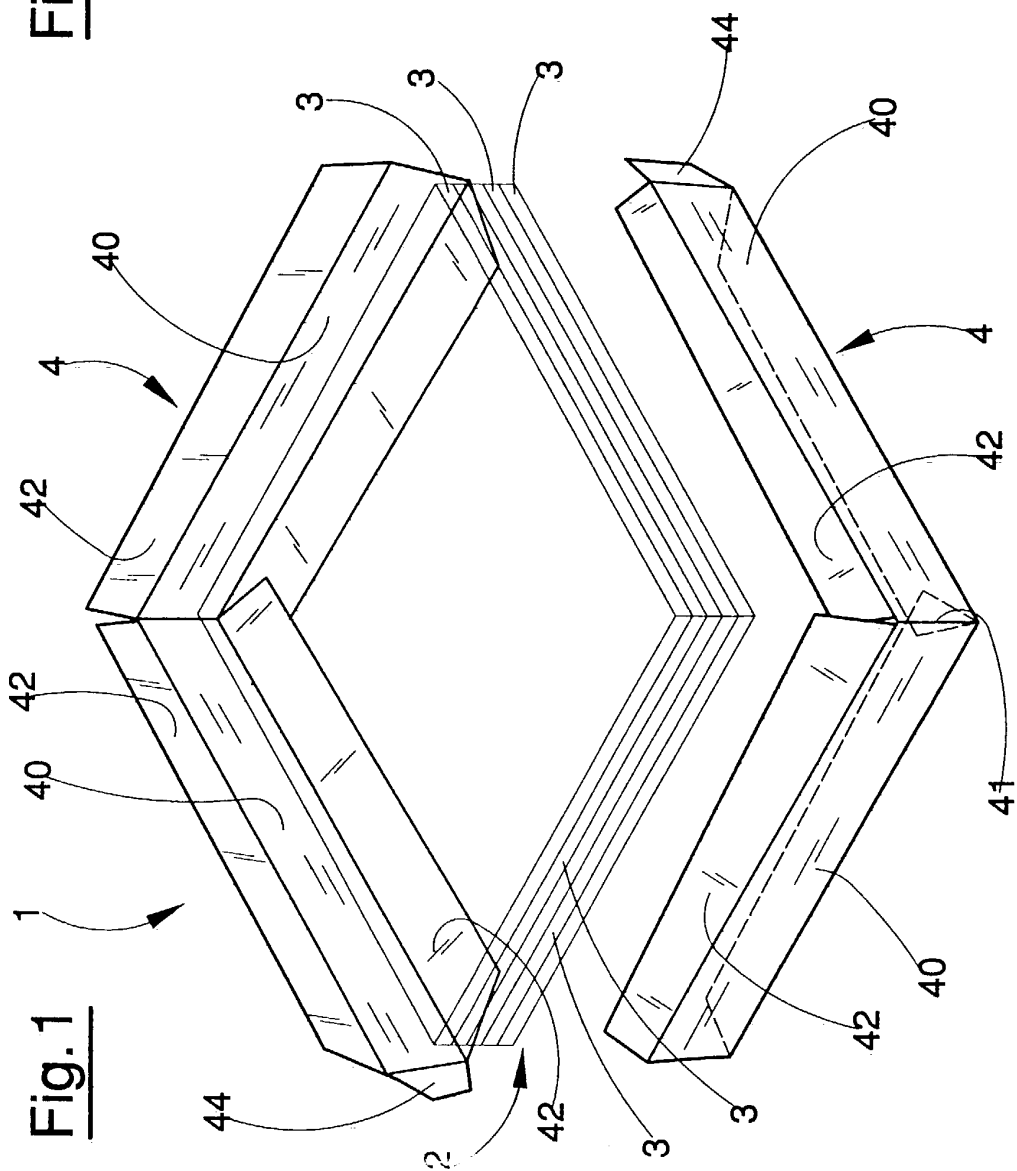
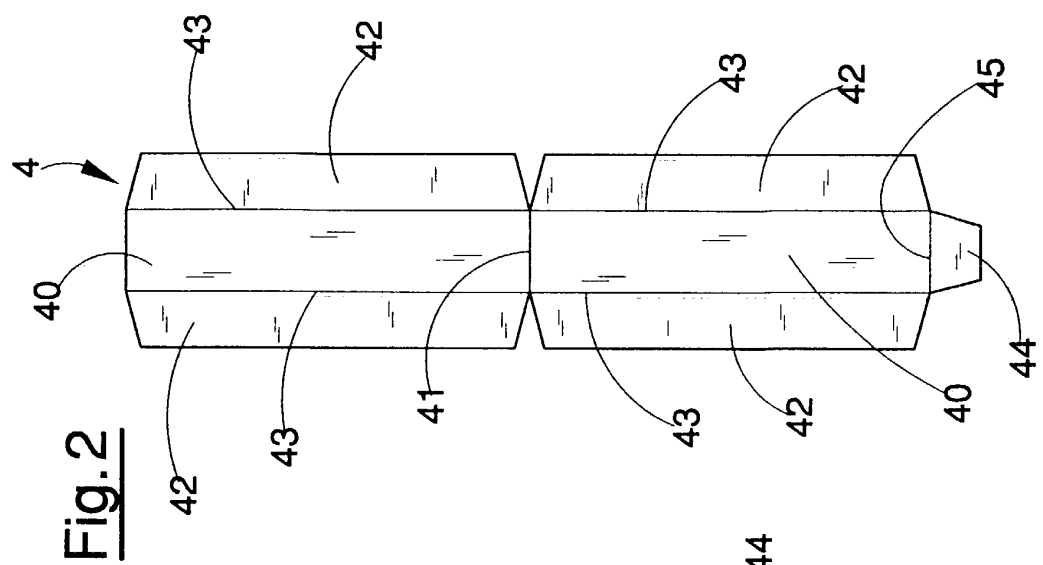
or bottom-most flap (42) of a half-blank (4).

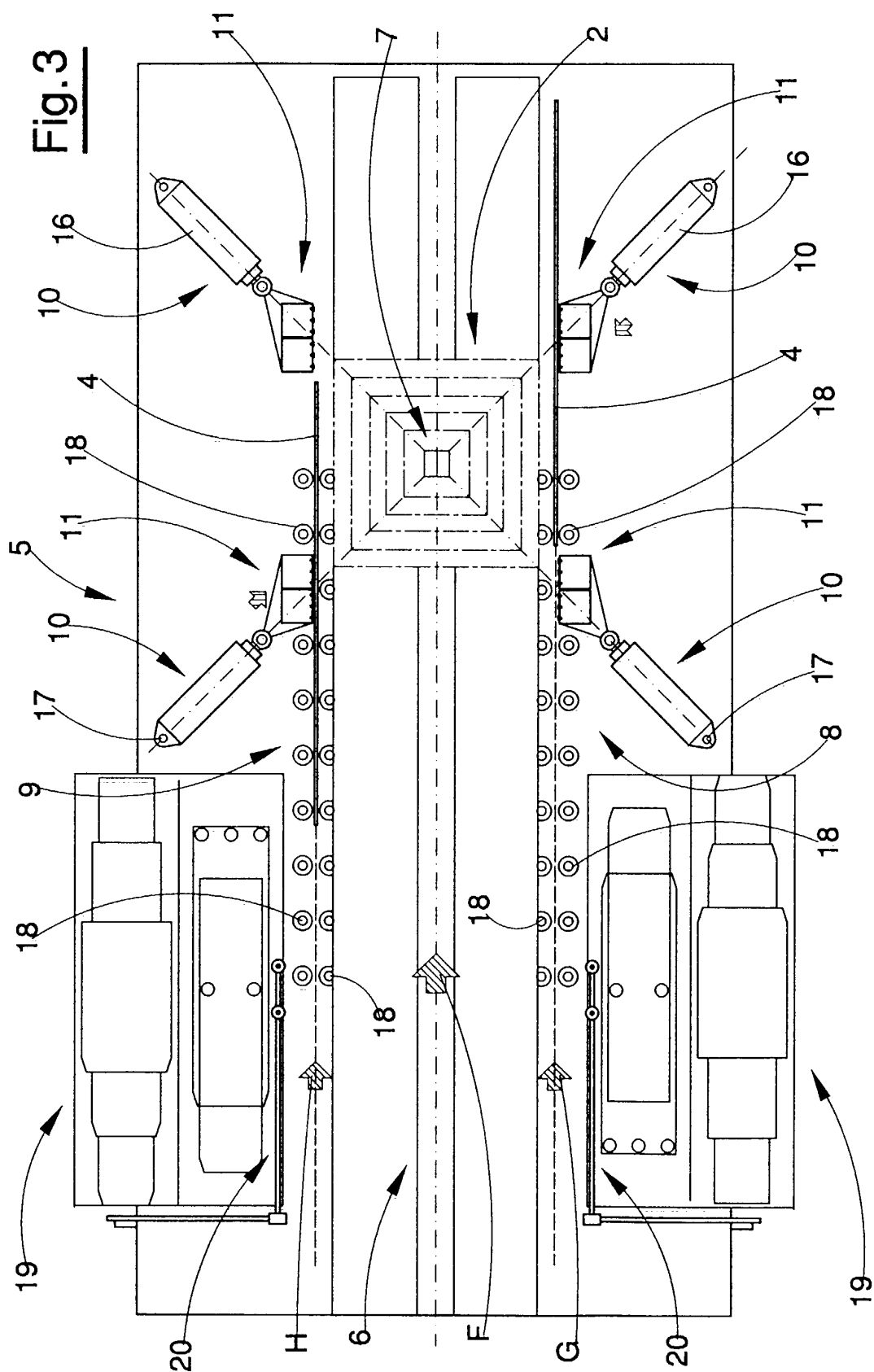
10. The apparatus of claim 8 or 9, characterised in that the pusher (14) is frontally provided with a horizontal platelet (15) destined to interact contactingly with a topmost or bottom-most flap (42).

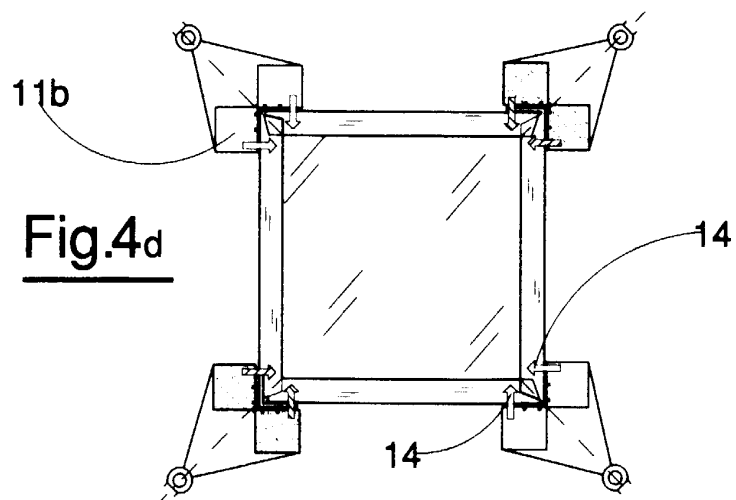
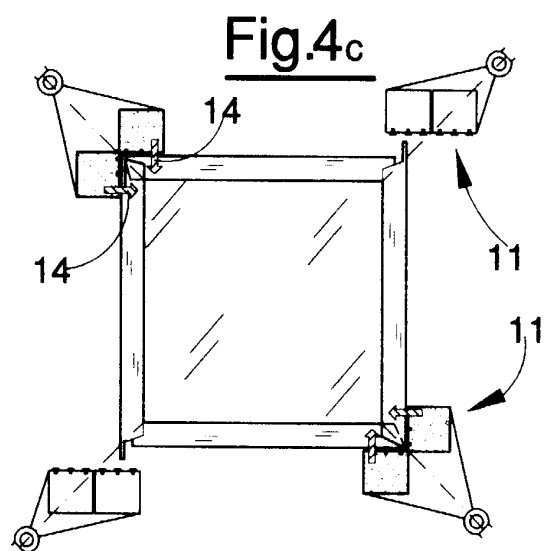
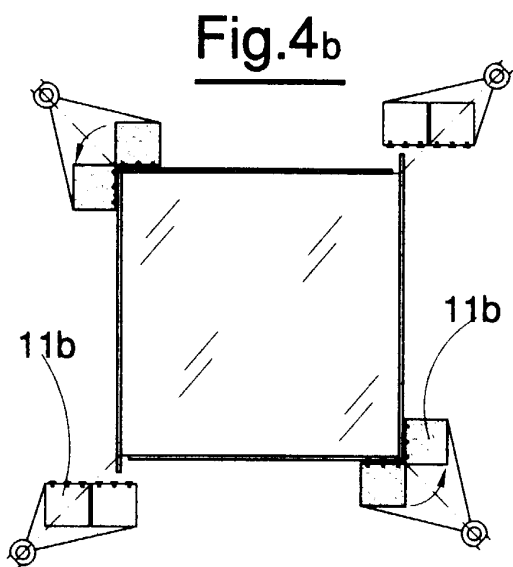
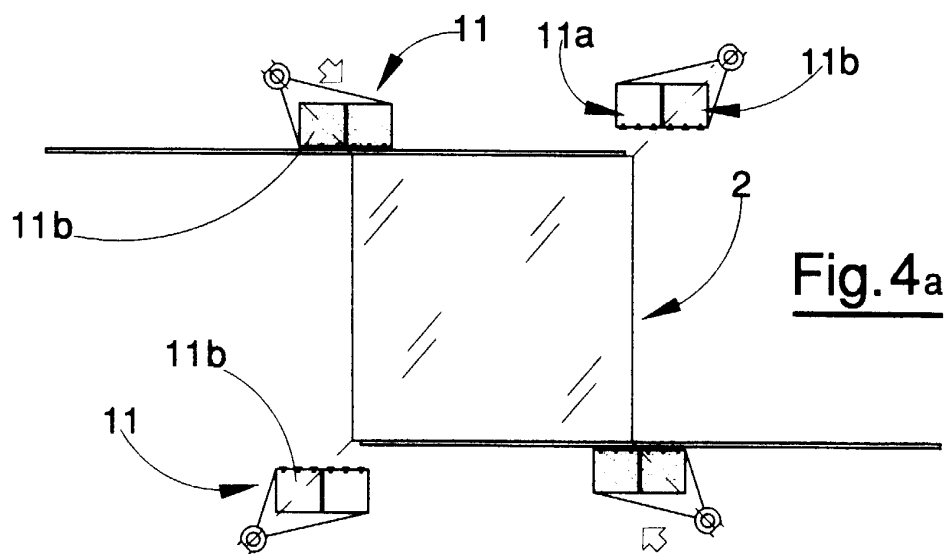
11. The apparatus of any one of claims from 5 to 10, characterised in that each gripping organ (11) is mobile on command of a linear actuator (16), preferably a hydraulic actuator, which exhibits one end bearing the gripping organ (11) and another end hinged about a vertical-axis pivot (17).

12. The apparatus of any one of claims from 5 to 11, characterised in that each supply line of the half-blanks (4) comprises a plurality of roller pairs (18) between which the half-blanks (4) are drawn, the roller pairs (18) being arranged on two opposite sides of the pack supply line (6), and being aligned one to the other along two advancement directions (G and H).

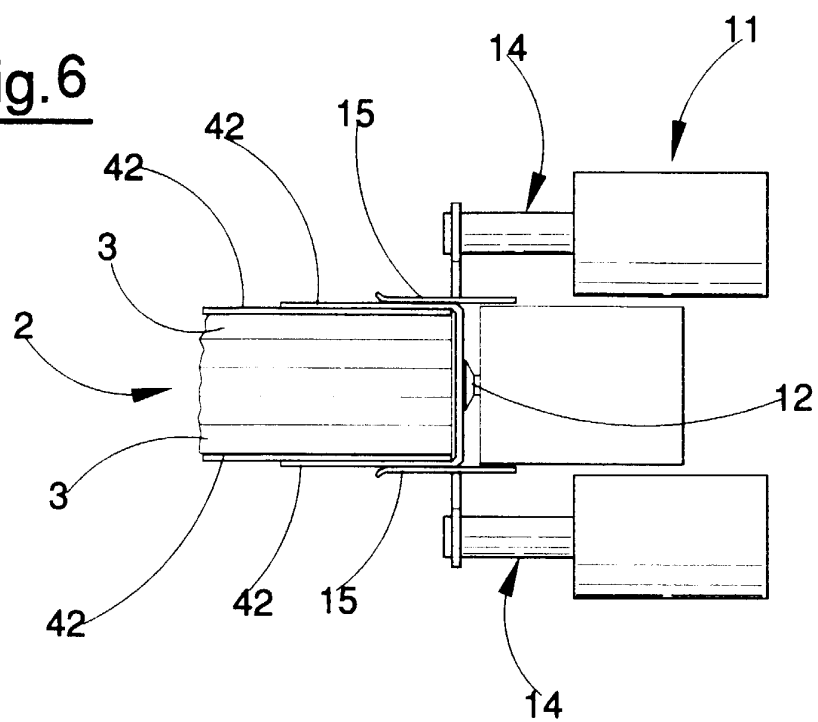
13. The apparatus of any one of claims from 5 to 12, characterised in that it comprises, for each supply line (6) of the half-blanks (4), a store (19) of half-blanks (4) in which said half-blanks (4) are arranged in piles, and a transfer device (20) able to remove the half-blanks (4) one-by-one from the store (19) and deliver them in succession to a relative supply line (8 and 9).



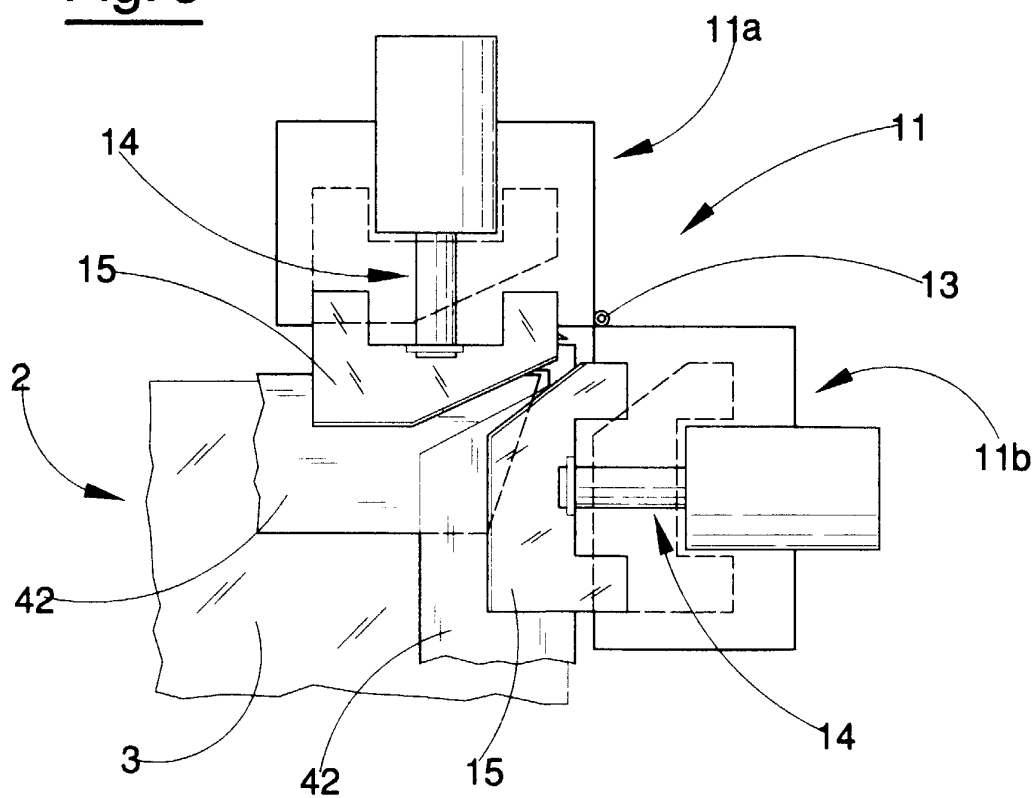




**Fig. 6**



**Fig. 5**





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 99 83 0603

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.7)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>24 January 2000</b>	Examiner <b>Jagusiak, A</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 99 83 0603

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24-01-2000

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