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(54) **Method and apparatus for transporting sheet like products**

(57) Method for transporting sheet like products, wherein a number of lifting means is positioned on an upper side of a sheet like product and at least one backside of the product is lifted from an underlying sheet like product over a distance which is relatively small, whereby first pushing means (18) are forced against

said lifted backside of said product and the product is pushed onto pulling means present underneath the front side of the product, after which the first pushing means are released and the product is pulled further with said pulling means to a processing area.

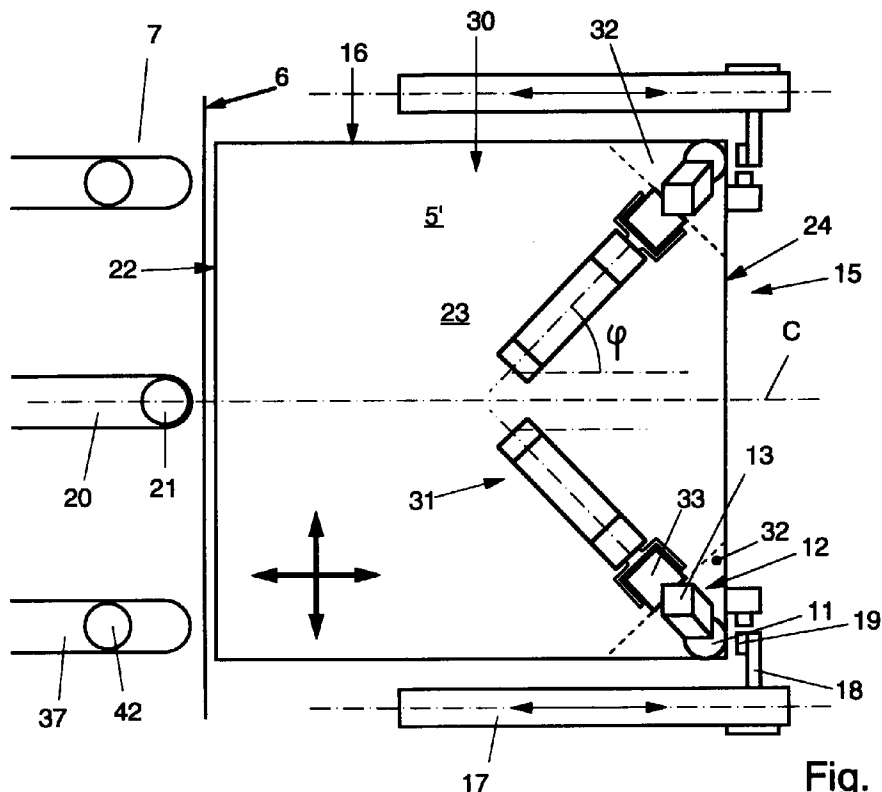


Fig. 2

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Description

[0001] The invention relates to a method for transporting sheet like products with or without cover sheets. The invention furthermore relates to apparatus for transporting sheet like products with or without cover sheets.

[0002] It is generally known to transport sheet like product from a stack to devices further down a process line by positioning suction pads on the upper side of the top product in the stack and lifting said top product of the stack onto a transport surface. The weight of the product is thereby fully supported by the suction pads. This has the disadvantage that the upper side of the product can be easily bent or otherwise damaged as a result of the sucking of the pads. After positioning the product on the transport surface, the product is released by the suction pads and pushed over the transport surface over a relatively long path of travel by pushing means engaging the relatively low back side of the product. These pushing means will easily damage the product as a result of the pushing force, while deformation of the product can occur. Furthermore, these pushing means make an accurate positioning of the products difficult, since for example differences in friction between the transport surface and the bottom side of the product can influence the path of travel of the product. Accuracy of positioning of the product is important, especially when further process steps have to be performed with high accuracy on the product, during or after transport.

[0003] One object of the invention is to provide a method as described hereabove, whereby the mentioned disadvantages of damage to the products are avoided. A further object of the invention is to provide a method for transporting sheet like products, enabling accurate transport and positioning of said products, without deformation thereof, which can be performed in a continuous and a semi-continuous as well as in an intermitting process, with relatively stiff products as well as with relatively flexible sheet like products.

[0004] These and other objects of the invention are achieved with a method according to claim 1.

[0005] For a clear understanding of the invention the following definitions are used. The upper side of a product is the side facing upward during transport, the bottom side the side facing downward. The backside of the product is the side lying at the trailing side of the product, seen in the direction of movement during displacement thereof onto the transport surface, the front side being the side of the product opposite the backside. The longitudinal sides are any sides of the product connecting directly or indirectly the back side and front side. The product is preferably but not necessarily rectangular.

[0006] By use of lifting means on the upper side of the product to be transported and lifting at least the backside of the product over a relatively small distance preferably at two corners thereof, the pushing means can be positioned under the backside of the product, thus carrying part of the weight of the product. The distance

over which the backside is lifted is small relative to the length and width of the product. Since the pushing means are positioned partly under the bottom side and partly against the back side of the product, damage to the back and upper side due to pushing forces is easily avoided since the pushing means can not skid over the upper side, as can occur by the known process. The product is pushed over a relatively short distance, until the front side is positioned over the pulling means. Then the product can be pulled further, the pulling means engaging the bottom side, while the lifting means and pushing means are released. Since the pulling means engage the bottom side of the product, the upper side of the product is free during further transport, while damage of the upper side by transporting means is avoided. Protection of the upper side is especially important for coated products and the like.

[0007] In an advantageous embodiment a method according to the invention is further characterised by the features of claim 3.

[0008] By tilting the product slightly over the front side, a major part of the weight of the product is carried by said front side during lifting of the back side of the product. Therefore the lifting means only carry a small part of the weight of the product, thus further avoiding damage to the upper side thereof. Furthermore, only the front side of the product is in contact with the surface over which the product is to be pushed, which reduces the contact surfaces and friction. Damage to for example the upper side of an underlying product is thereby avoided and resistance to movement reduced, especially when the products are relatively flexible and bent lengthways during lifting of the back side.

[0009] In a further advantageous embodiment a method according to the invention is characterised by the features of claim 7.

[0010] For still further protection of the upper side of the products to be transported and for avoiding clinging together of the products in for example a stack, cover sheets are provided over said upper side. This however impairs the possibility of engaging the upper side with the suction means without further measures.

[0011] When, according to the present invention the lifting of the top product is carried out at both backside corners the underlying next protective cover sheet will remain at the stack as the necessary air entrainment in this case is much smaller than for a whole sheet or one sheet side. This is especially accomplished when the sheet like product can bend slightly between the said corners. The method has also the advantage that independent upon the size and dimensions of the sheet like products lifting at the two backside corners is easily accomplished which is not valid for the known methods.

[0012] By temporarily forcing, preferably pulling away the cover sheet there where the sucking means are to be positioned, the upper side of the sheet like product is well protected while the sucking means can be positioned on the upper side, in direct engagement there-

with. Since the sucking means cover most of the part of the upper side from which the cover sheet is forced away and the sucking forces are relatively small, damage to these parts is also avoided. Since the cover sheet is positioned over the full upper side once the sucking means are released, the upper side of the product is kept covered and protected during further handling of the product or parts thereof.

[0013] A protective cover sheet may be provided for certain applications at the upper side of each sheet like product for protection against damages during transport and/or avoiding clinging together of the products in a stack and/or damages during transport to the customer and during handlings at the customer etc. These protective cover sheets comprise paper materials with or without a laminated polyethylene top layer.

[0014] In such embodiment a method according to the invention is especially, though not exclusively suitable for offset printing sensitive sheet like products and the like, since these need to be protected against direct contact as well as against environmental influences such as light and humidity.

[0015] In a further advantageous embodiment a method according to the invention is characterized by the features of claim 9. In case a top product at a stack is lifted in the known method with suction pads over the whole area of the product or at one side of the sheet like product the protective cover sheet of the next sheet like product will usually also be lifted due to the large volume of air required to fill the volume between the bottom side of the top product and the protective cover sheet of the next sheet like product. In case the sheet like products have small dimensions at the stack the lifting performance is usually satisfactory because the small formed underpressure can easily be compensated with a small volume of air. However the large underpressure between a sheet like product with large sizes and the next protective cover sheet will be much more difficult due to the requirement of much more air. Thus the cover sheet of the next sheet like product is frequently also lifted when the top product is lifted by the suction pads. As a consequence when the protective cover sheet is finally released from the bottom side of the sheet like product it frequently wrinkled, folded etc.

[0016] In a preferred embodiment a method according to the present invention is further characterised by the features of claim 11.

[0017] Stacking the products near an end of the guide means enables easy and efficient storage of a large number of sheet like products, which are ready for use. By movement of the products such that at least an edge, especially the front side of the product remains in contact with the underlying product, the weight of the product lifted is distributed partly over and can not fall on the upper side of said underlying product, while the product is guided by said underlying product. When a cover sheet is interposed between the respective products, the upper side of said underlying product is even better

protected.

[0018] The invention further relates to an apparatus for transporting sheet like products, characterized by the features of claim 12.

[0019] With an apparatus according to the invention sheet like products can easily and accurately be de-stacked and transported to a processing area further down a transporting path, thereby preventing damage to the products. Furthermore, such apparatus enables accurate positioning of said products in said processing area, both during (semi) continuous and during intermittent feeding thereof.

[0020] In an advantageous embodiment an apparatus according to the present invention is characterised by the features of claim 16.

[0021] The advantages of providing a cover sheet on the upper side of the products are described here above. By providing displacement means for forcing, preferably pulling the cover sheet away from the upper side of the product it is made possible to position suction pads or like means on the upper side for engagement therewith. Designing the displacement means as rollers, more specifically as sucking rollers, being movable over the product in a direction from two opposite corners of the back side towards the center and front side of the product and vice versa enables the apparatus to effectively pull away the cover sheet almost exclusively from said two corners. This provides the possibility to position said suction means in said corners for optimal engagement with the sheet like product.

[0022] Sucking means such as suction pads and the like have the advantage that sheet like products of different material, shape and dimensions can be engaged in a quick and reliable fashion. Damages can be easily avoided since only relatively small pressure differences and relatively few, small suction pads can be used in an apparatus and method according to the invention since the full weight of the sheet like product will not have to be borne by these suction means.

[0023] In a further advantageous embodiment an apparatus according to the present invention is characterised by the features of claim 18.

[0024] By the pushing means the sheet like product is pushed into a processing area such as slitting or cutting means while the pulling means are released back to its initial position in order to pull the next sheet like product into the alignment area. With the different pulling and pushing means the cycle time for the transfer of each sheet like product is minimised in order to design for the maximum speed capacity. Furthermore such apparatus has the advantage that the upper side and the peripheral edge (back, front and longitudinal sides) are free for engagement with for example alignment means, processing means and the like.

[0025] The invention further relates to the use of a method or apparatus according to the invention for de-stacking and transporting pre-sensitized sheet like products during cutting operations.

[0026] Further advantageous embodiments of a method and apparatus according to the invention are given in the sub claims and the description.

[0027] For a better understanding of the invention an apparatus and method according to the invention will be elucidated hereafter, with reference to the accompanying drawing. These are only given by way of an example and in no way limit the invention.

Fig. 1 shows schematically a top view of an apparatus according to the present invention;
fig. 2 shows schematically a top view of a de-stacking and transfer area of an apparatus according to fig. 1;
fig. 3 shows schematically a side view of a de-stacking and transfer area according to fig. 2;
fig. 4 shows schematically a back view of a de-stacking and transfer area according to fig. 2; and
fig. 5 shows schematically a perspective view of a de-stacking and transfer area according to fig. 2.

[0028] In the drawing corresponding parts have corresponding reference numbers. In the drawing sheet like products are shown having a rectangular form. However, the product can have any other shape. The product can be of different materials, such as cardboard, plastic, metal. Sheet like is to be understood as having a thickness which is relatively small compared to the length and/or width of the product. In the shown embodiment the sheet like product is a pre-sensitised product, more specifically an offset printing plate, such as master sheets to be slit into a number of smaller sheet like products.

[0029] The apparatus 1 according to fig. 1 comprises a de-stacking area 2, a processing area 3 and a re-stacking area 4. In the embodiment as shown in fig. 1 a stack of products 5 is brought into position near a first end 6 of transporting means 7, within the de-stacking area 2, with a forklift truck 8 or the like. Roller means or the like (not shown) are provided for proper adjustment of the position of the stack of products 5, which position can be detected by detection means (not shown), such as optical sensors. Pallet lifting means can then adjust the vertical position of the stack of products 5, especially of the top product 5' relative to the de-stacking means 9 to be described hereafter. A possible path of travel of the products 5 to be processed through the apparatus 1 is shown as a broken line 10.

[0030] The de-stacking means 9 in the de-stacking area 2 are more specifically shown in fig. 2 - 5.

[0031] In the de-stacking area 2 a number of suction pads 11 is provided on guide means 12 above the top product 5' of the stack of products 5. In the disclosed embodiment two suction pads 11 are provided. The guide means 12 comprises a first linear guide element 13 enclosing an angle α with the vertical in side view (fig. 3) and an angle β with the vertical in back view (fig. 4), such that the suction pad 11 can be moved by

means of the first guide element 13 upwards and in the direction of the center line of the stack of products 5, seen in top view, and in the direction of the first end 6 of the transporting means 7. The guide means 12 are preferably mounted on positioning means (not shown) for positioning of the guide means 12 relative to the top product 5', such that the suction pads 11 can be positioned near and preferably exactly at the corners 14 of the back side 15 of the top product 5'. The suction pads are preferably vacuum operated.

[0032] At each side 16 of the stack of products 5 a second linear guide means 17 is provided for guiding a pushing means 18 against the back side 15 of the top product 5' in a manner to be described hereafter. The pushing means 18 comprises a notch 19 which can be brought in alignment with a corner 14 of the top product and can be positioned such that it extends just above the upper side of the product 5 underlying the top product 5'.

[0033] From the first end 6 of the transporting means 7 a first guide track 20 extends along the center line of the transporting means in the direction of the processing area. On the first guide track a pulling means 21 is provided, the upper side thereof being in alignment with the plane of the transporting means 7. The pulling means 21 are preferably suction means and can be pulled along the first guide track 20. The distance between the pulling means 21 positioned near the first end 6 of the transporting means 7 and the front side 22 of the top product 5' is relatively small compared to the outer dimensions of the products 5.

[0034] The top product 5' can be de-stacked and positioned on the transporting means 7 as follows.

[0035] The suction pads 11 are positioned in the respective corners 14 of the top product 5' by means of the first guide means 12 and are then activated in order to engage both upper corners 14 of the upper side 23 of the top product 5'. The back corners 14 of the top product 5' are then pulled upward over a relatively small distance compared to the outer dimensions of the product 5' by means of the first guide means 12 bending the back side 15 slightly to roll off the underlying sheet like product or cover sheet thereof, overcoming clinging together of the sheet like product and said cover sheet or underlying sheet like product. Then at least the notch 19 of the pushing means 18 is moved forward, such that the notch engages the bottom side 24 at both back side corners 14 of the top product 5', the pushing means 18 further engaging the back side 15 of said top product 5'. Then the suction pads 11 are disengaged of the upper side 23 and the top product 5' can be pushed forward, such that the front side 22 thereof is moved over the pulling means 21 on the first guide track 20. Since at least the corners of the back side 15 of the top product 5' is lifted, only the weight of said product 5 is mainly concentrated at the front side 22 of said product 5', in contact with the underlying stock of products 5. This means that the product 5' can be pushed forward easily.

If necessary air can be blown in between the lifted top product 5' and the underlying stack of products 5 in case no cover sheet is applied, such that the product 5' somewhat floats on a cushion of air. Since only the backside 15 is lifted by means of the suction pads 11 part of the weight of said top product 5' is carried by the front side 22, resulting in a relatively small weight to be carried by the suction pads 11. Partly separation of the top product 5' from the underlying stack of products 5 before forward movement of the top product 5' prevents damage to the upper side 23 of the underlying product 5'.

[0036] When the pulling means 21 are firmly engaged with the bottom side 24 of the front side 22 of said product, for example by means of suction, the top product 5' is pulled further onto the transporting means 7 by moving the pulling means 21 forward. During this forward movement the pushing means 18 and notch 19 are disengaged and brought to their initial position in order to pick up the next sheet like product. The product is thus moved forward by a pulling action. When the product 5' is positioned sufficiently on the transporting means 7 the pushing means 18 are disengaged and moved back to their initial position. The de-stacking means can then be operated for de-stacking a further product.

[0037] In the aforementioned embodiment de-stacking of a product is described which product can be directly engaged on the upper side by means of the suction pads 11. However, the products 5 can be covered on the upper side 23 by means of a cover sheet 30. The cover sheet can for example be made of plain paper, PE laminated paper or plastic and is loosely positioned on the upper side 23, for protection. When the suction pads 11 would then be positioned on top of a PE laminated or plastic cover sheet 30 these will be unable to lift the back side of the top product 5' properly. To avoid this problem displacement means 31 are provided above the cover sheet 30 for displacement of both cover sheet corner parts 32 thereof above the respective corners 14 of the back side 15 of the top product 5'. The displacement means 31 are for example suction roller means 33 moveable in a direction 34 enclosing an angle φ with the direction of movement 10 of the top product 5'.

[0038] During use the suction roller means 33 are positioned at the respective corners 14 on top of the corner parts 32 and then activated, thereby engaging the corner parts 32. The suction roller means 33 are then directed towards the center line C of said product, thereby forcing the corner parts 32 away from said corners 14. The upper side 23 of the top product 5' near the corners 14 is then free of the cover sheet 30 and can be engaged by the pads 11 in a manner described here above. The suction roller means 33 can then be disengaged and moved out of the way. After the pushing means 18 and notches 19 are brought into position and the suction pads 11 are disengaged the corner parts 32 will be repositioned, such that the upper side 23 of the top product 5' is once again fully covered by said cover

sheet 30.

[0039] It will be clear that the suction means can be replaced by appropriate different means. For example, when the products can be magnetized the suction means can be replaced by (electro)magnetical means.

[0040] When the product 5 is pulled and/or pushed fully onto the transporting means 7 alignment means 35 are brought into contact with at least one, preferably both longitudinal sides 16 of said product 5, front stopper means 36 being positioned against the front side 22 thereof. The stopper means 36 are provided with sensor means (not shown) for assessment of the alignment of said product 5 relative to said direction of movement 10. This alignment is necessary for proper processing of said product in at least the processing area 3, which will be described hereafter.

[0041] In the embodiment shown in fig. 1 slitting means 38 are provided for slitting the product 5 into a number of plates 39, in the embodiment shown three plates 39. The slitting means 38 comprises to this end for example two rotatable knives positioned in a vertical plane parallel to the direction of movement 10. The axis 41 of rotation of said knives 40 extends parallel to the surface of the front side of the sheet like product 5, perpendicular to the direction of transport 10. The alignment by means of said alignment means 35 and stopper means 36 has to be such that the front side 22 of said product 5 is preferably exactly parallel to said axis 41 of said knives 40.

[0042] After proper alignment of the product 5 second pushing means 42, movable along the second guide tracks 37 are brought into position and connected to the bottom side of the product 5 near the back side 15 thereof, engaged by underpressure. The stopper means 36 are then released, as are the pulling means 21, after which the product is pushed forward by means of the second pushing means 42, through the slitting means 38. The rotational speed of the knives 40 is adjusted to the forward speed of the product or vice versa, such that the relative movement of the knives 40 corresponds to the relative forward movement of the product 5. Herewith proper cutting of the products is obtained without damage to the knives and/or the product.

[0043] The plates 39 are, behind the slitting means 38, released by the second pushing means 42 are moved onto a conveyor belt 44 forming part of the transporting means 7, transferring the plates 39 into the re-stacking area 4 for stacking the plates 39 in proper stacks. During movement of the plates 39 on the second conveyor belt 44 the plates 39 can move apart in a direction perpendicular to the direction of movement 10 for easy handling in the re-stacking area 4. Stacking of the plates 39 is provided for by means well-known to a person skilled in the art, which means are not described in detail.

[0044] The apparatus 1 as shown in the drawing is used for de-stacking, slitting and re-stacking of presen-

sitized sheet like products such as master sheets to be used in offset printing processes. The de-stacking means 9 in the de-stacking area 2 are especially convenient for such products since all chances of damage to the presensitized upper side of the products 5 is hereby avoided. However, it will be clear that an apparatus and a method according to the present invention can be used for de-stacking and processing different kind of sheet like products.

[0045] The apparatus 1 according to fig. 1 further comprises a central control unit 50 for control of the different parts of the apparatus, such as positioning means, pushing, pulling and alignment means, stopper means, slitting means, transporting means, de-stacking means and re-stacking means. The possible lay-out and use of such control unit depends on the lay-out and use of the apparatus to be used and will be directly apparent to a person skilled in the art, as will be any modifications thereto. The control unit 50 enables automatic adjustment of the aforementioned means and the apparatus in general based on the properties of the products to be treated, for example to size, material or the presence of a cover sheet.

[0046] The present invention is not limited to the embodiments described here above and shown in the drawings. Many variations are considered to fall within the scope of the present invention.

[0047] For example, in the processing area different processing means can be provided, such as means for applying a substance to the sheet like products such as ink or glue or for positioning or removing a cover sheet. The conveyor belts can be left out, while different transporting means can be provided. A stack of products can be provided near the first end of the transporting means other than with a fork lift truck, while similar means can be positioned at the downstream side of the processing area for re-stacking of the plates. Furthermore, the second pushing means can be of a different design, whereby a different number of first and/or second tracks can be provided with a relevant number of second pushing means and stopper means. One second pulling means can have the advantage that rotation of the product 5 over the transporting surface is possible during alignment thereof, while at least two pulling and/or pushing means provide the advantage that such rotation is prevented, thereby maintaining proper alignment. The direction of movement of the suction pads 11 and the number thereof as well as the direction of movement of the displacement means and the number thereof can be chosen differently, according to the form, type and dimensions of the products to be de-stacked and processed.

[0048] These and similar alterations and variations are considered to fall within the scope of the present invention.

Claims

1. Method for transporting sheet like products, wherein a number of lifting means is positioned on an upper side of a sheet like product and at least one backside of the product is lifted from an underlying sheet like product over a distance which is relatively small, whereby first pushing means are forced against said lifted backside of said product and the product is pushed onto pulling means present underneath the front side of the product, after which the first pushing means are released and the product is pulled further with said pulling means to a processing area.
2. Method according to claim 1, wherein said pushing means are forced partly under said backside of said product, such that the product is partly carried and pushed over a relatively small distance by the pushing means onto the pulling means.
3. Method according to claim 1 or 2, wherein the product is lifted by the lifting means only at said backside, such that the product is tilted slightly upwards compared with the opposite front side edge.
4. Method according to any one of claims 1 - 3, wherein said lifting means are sucking means which are positioned on the upper side of said product to be lifted.
5. Method according to anyone of claims 1-4, wherein said pulling means are facilitated with sucking means for guidedly pulling said product linearly forward into the processing area.
6. Method according to anyone of claims 1-5, wherein second pushing means are provided, equipped with sucking means, for guidedly pushing said product linearly forward into the processing area.
7. Method according to anyone of claims 1-6, each product being covered by a protective cover sheet, wherein part of the cover sheet near said backside of the product to be transported is forced away from the upper side of the product, whereafter said sucking means are positioned on said upper side of the product at a position where the cover sheet has been forced away and whereby the cover sheet is repositioned on said upper side of the product after release of said sucking means.
8. Method according to claim 7, wherein said part of said cover sheet is forced away by rolling means, preferably rolling sucking means.
9. Method according to claim 7 or 8, wherein the cover sheet is pulled away from at least one corner, pref-

erably two opposite corners of the product near the backside thereof, whereby means for pulling away said cover sheet are moved from the or each said corner in a direction towards the centre line of said product.

10. Method according to anyone of claims 1-9, wherein side alignment means are positioned at the front side edge of said product after the product is transferred to the begin of the processing area by the guiding pulling means and at least one of the longitudinal edges of the product, perpendicular to the back- and front side of the product.

11. Method according to anyone of claims 1-10, wherein the products are stacked near one end of the guide means preceding said transporting a product onto the guide means, whereby each top product is moved such that it remains in contact with the upper side of the next product, preferably a cover sheet of said next product during movement of the product onto the guide means into an alignment area.

12. Apparatus for transporting sheet like products, comprising de-stacking means and guide means for de-stacked products near at least one side of said de-stacking means, the de-stacking means comprising lifting means, pushing means and alignment means, the lifting means designed for attachment at the upper side of a top product in the de-stacking means and lifting at least a backside thereof, the pushing means designed for abutment with at least said backside of the product and pushing the product onto the begin of the guide means designed for pulling the product forward into a processing area.

13. Apparatus according to claim 12, wherein the said lifting means comprises sucking pads, movable in a direction enclosing an angle with the flat plane of the top product to be transported.

14. Apparatus according to claim 13, wherein the lifting means comprises at least two pads, each positioned during use in an opposite corner near the backside of the product to be transported.

15. Apparatus according to any one of claims 12 - 14, wherein displacement means are provided for gripping part of a cover sheet covering said upper side of said product, the or each displacement means being movable over the product in a direction from the centreline of the product to the or each backside corner and visa versa.

16. Apparatus according to claim 15, wherein the or each displacement means is a roller means, espe-

cially a sucking roller, designed for pulling away the cover sheet from at least two opposite corners at the backside of the product.

5 17. Apparatus according to any one of claims 12 - 16, wherein the or each pushing means comprises a first surface for abutment with the backside edge of the product and a second surface for abutment with the bottom side of the product near said side edge.

10 18. Apparatus according to anyone of claims 12-17, wherein the de-stacking area comprises an alignment area comprising alignment means which are designed for abutment against the front side and against at least one of the longitudinal sides of the product for alignment thereof before being guidedly pushed into the cutter means with the pushing means.

15 19. Apparatus according to at least claim 18, wherein the pulling means comprise at least one guide track facilitated with suction means underneath the front side of each sheet like product which pulls said product to the processing area, the alignment means and guide means being designed for exact alignment of the sheet like products relative to cutting means for cutting each sheet like product into a number of smaller sized sheet like products.

20 20. Apparatus according to anyone of claims 12-19, wherein the guiding pushing means comprise a number of guide tracks facilitated with suction means underneath at the bottom side of the backside of each sheet like product for pushing said product from an alignment section into the processing area.

21. Use of a method according to any one of claims 1 - 11 or an apparatus according to any one of claims 12 - 20 for de-stacking and transporting pre-sensitized sheet like products during cutting operations.

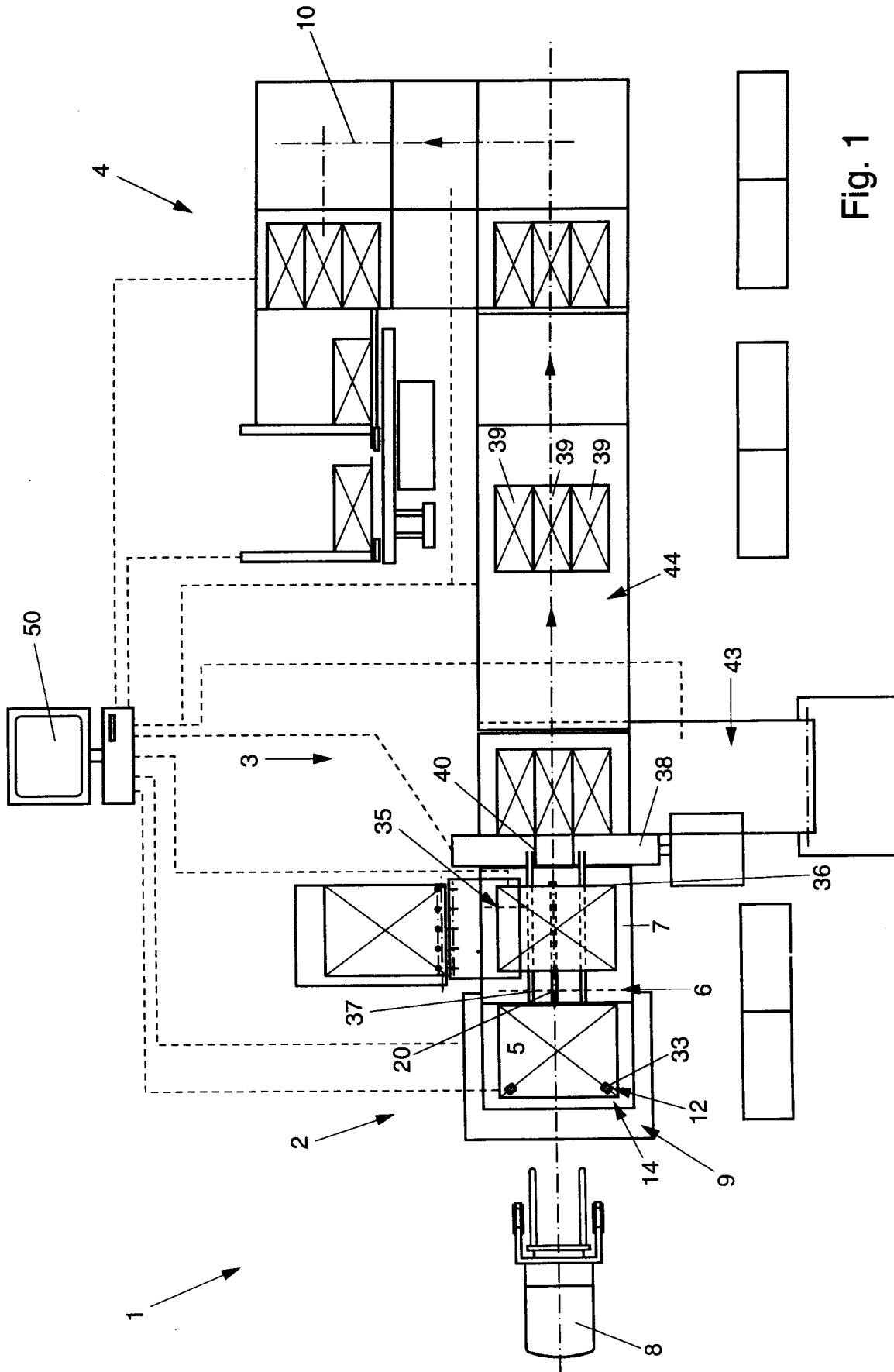


Fig. 1

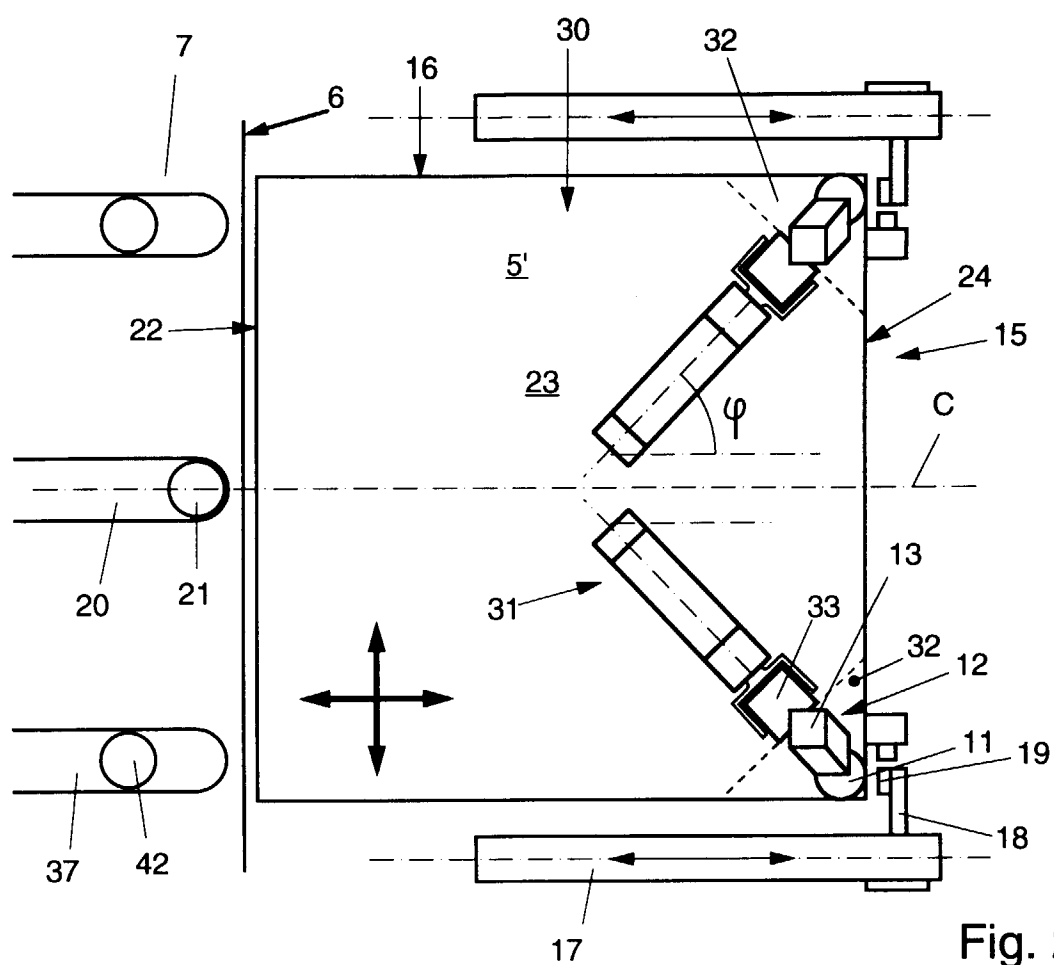


Fig. 2

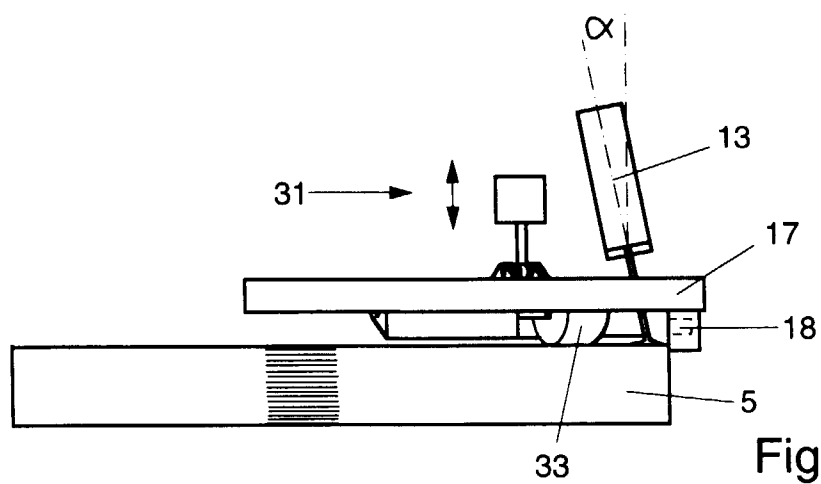


Fig. 3

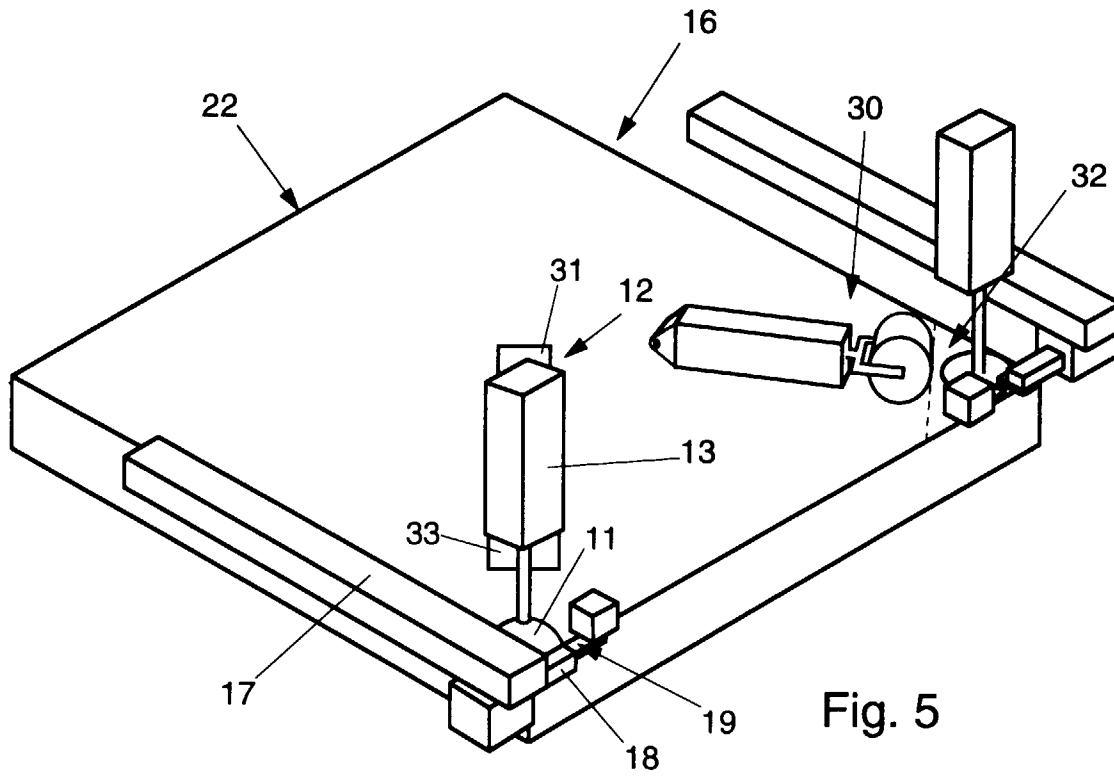


Fig. 5

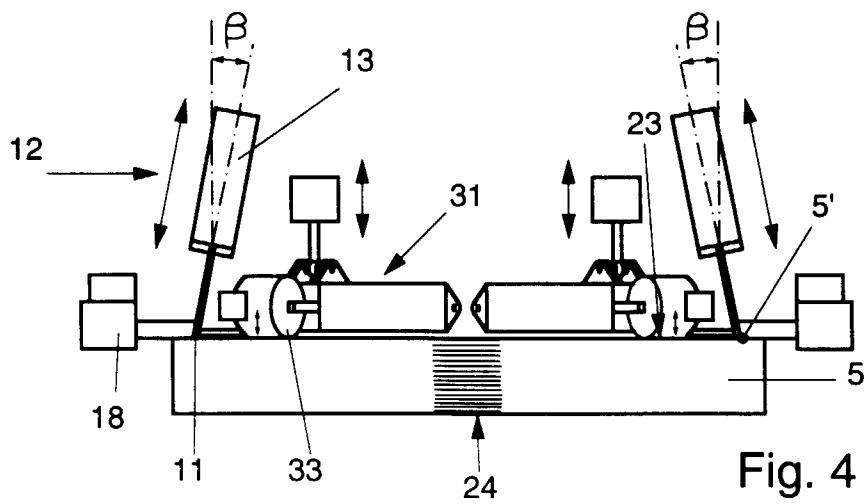


Fig. 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 20 2752

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.6)
X	US 2 282 224 A (CHARLES W. HARROLD) 5 May 1942	1, 3, 4, 12-14	B65H3/08 B65H3/24
A	* the whole document *	2, 6-11, 15-21	
A	US 4 311 304 A (HAMADA SHINJI ET AL) 19 January 1982 * column 1, line 27 - column 2, line 6; figure 13 *	1-21	
A	DE 42 17 299 A (SIEMENS AG) 9 December 1993 * the whole document *	1-21	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		30 November 1998	Henningsen, O
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 20 2752

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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