



(51) International Patent Classification:
B65B 5/04 (2006.01)

(21) International Application Number:
PCT/DK2010/050240

(22) International Filing Date:
21 September 2010 (21.09.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PA 2009 70118 21 September 2009 (21.09.2009) DK

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report (Rule 48.2(g))

(54) Title: APPARATUS FOR PLACING THREE DIMENSIONAL OBJECTS IN ENVELOPES

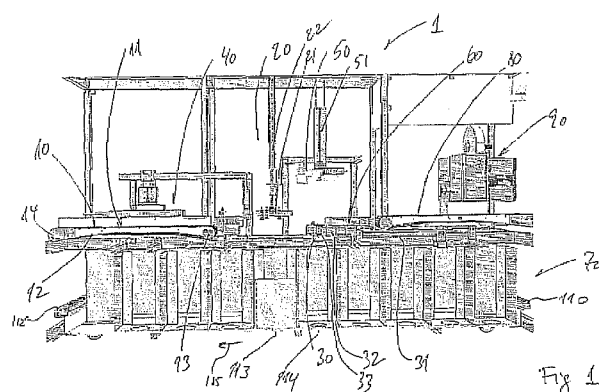


Fig. 1

(57) Abstract: Apparatus for placing three dimensional objects in envelopes, where said envelopes have two opposing sides, connected along three side edges, defining a space between said two sides, and at a fourth edge one of the sides extends beyond the second side, thereby providing a closing flap, where said apparatus comprises the following stations: m) a first station where the objects are arranged in an array on a first conveyor providing a transport path for said object; n) a second station where means are provided for collecting an envelope from an envelope storage facility, and placing said envelope in the transport path, where the envelopes opening is facing the object; o) a third station superposed the second station, where said third station comprises means for separating the envelopes sides enough for the object to be introduced into said envelope; p) a fourth station comprising means for pushing said object into said envelope; q) a fifth station comprising means for either removing a cover foil exposing an adhesive on said closing flap, or means for moistening a dry adhesive on said closing flap, and means for closing said flap onto a side of said envelope; r) a sixth station for transferring the closed and sealed envelope onto a second conveyor.

Apparatus for placing three dimensional objects in envelopes

Field of the Invention

5 The present invention relates to apparatus for placing three dimensional objects in envelopes as well as an envelope storing magazine suitable to be used in connection with such an apparatus. Furthermore, the invention is also directed to a method according to which method the objects are placed in the envelopes.

10 Initially it is important to realise that the invention provides an automatic solution to placing three dimensional objects in envelopes. It is recognized that a multitude of apparatuses exists, which are suitable to place single or a few sheets of paper or the like in envelopes. It is true that a piece of paper has three dimensions, the relatively thin thickness of paper, however, requires special means, whereas three dimensional objects, as used within the present invention, require other means. Within the terminol-
15 ogy of the present invention the term “three dimensional objects” shall be construed as boxes or other similar objects having a thickness substantially thicker than paper or even a multitude of sheets. The prototype of the present apparatus was developed in order to automatically pack DVDs and smaller mail-order items in envelopes. Tests with existing equipment, and in this connection also installations to insert sheets into
20 envelopes, proved not to function, as there are distinct differences between sheets and boxes.

Background of the Invention

In the art numerous apparatuses have been developed in order to insert thin leaflets and alike into newspapers, magazines etc. Furthermore apparatuses have been developed in
25 order to insert letters/sheets into envelopes see for example US 2008 302068, US 20040108643, US 20040172923, US 20050060966, US 5560185, US 20030088552, EP 1275523, GB1045671, and EP 0781671. Common for all these prior art systems/apparatuses is the fact that they are developed to at high speed place one or a few sheets in an envelope. As all the items to be placed in the envelope have a very thin

thickness (are substantially two-dimensional), it is only necessary to open the envelope slightly in order to introduce the contents.

When it comes to three dimensional objects such as for examples CDs, DVDs, medicines, make-up and other small packages, no automated system exists for inserting these objects into envelopes and furthermore for closing and making the envelopes ready for being distributed to the consumer. The prior art devices placing sheets in envelopes are designed to only open the envelopes slightly. The envelopes themselves are typically simple one- layer constructions, which therefore may be opened very easily and quickly in order to insert the sheet(s), whereas when it comes to three-dimensional objects, the envelopes are typically made from a heavier material, often with interior padding (bubble wrap and the like).

With the ever increasing popularity of buying merchandise over the internet more and more objects will need to be distributed by mail. As there is a significant reduction in cost by sending the merchandise as regular mail as opposed to packages, there is a desire to provide an automated system for packaging such items which are suitable to be packaged in ordinary envelopes or padded envelopes. Until now this packaging has been carried out manually i.e. personnel has been inserting the objects to be packaged into the envelopes and after inserting the objects, having sealed the envelopes.

These types of envelopes are typically characterized by being two rather heavy sheets of a paper or polymer like material or polymer and may be provided with a bubble plast on the inside thereby providing a padding such that the objects to be posted within the envelopes are protected from the forces occurring during handling of the envelopes. The envelope opening is typically closed by folding a flap created by one of the two sheets extending further than the other sheet and by folding the flap onto the outside of the opposite sheet. An adhesive provided either on the flap or on the envelope maintains the flap in a closed position thereby closing the envelope. Typically, the adhesive is provided on the flap and protected by a removable foil which foil is removed immediately before closing of the envelope after having inserted the objects into the interior of the envelope.

Description of the Invention

The automated packaging apparatus

In order to address the need for automated packaging of ever increasing amounts of objects suitable to be posted in regular envelopes the present invention provides a solution to this need in the shape of an apparatus for placing three dimensional objects in envelopes, where said envelopes are characterised in having two opposing sides, connected along three side edges, defining a space between said two sides, and at a fourth edge one of the sides extends beyond the second side, thereby providing a closing flap, where said apparatus comprises the following stations:

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- a) a first station where the objects are arranged in an array on a first feeding means providing a transport path for said object;
- b) a second station where means are provided for collecting an envelope from an envelope storage facility, and placing said envelope in the transport path, where the envelopes opening is facing the object;
- c) a third station superposed the second station, where said third station comprises means for separating the envelopes sides enough for the object to be introduced into said envelope;
- d) a fourth station comprising means for pushing said object into said envelope;
- e) a fifth station comprising means for either removing a cover foil exposing an adhesive on said closing flap, or means for moistening a dry adhesive on said closing flap, and means for closing said flap onto a side of said envelope;
- f) a sixth station for transferring the closed and sealed envelope onto a second conveyor.

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The apparatus comprising means through six stations provides for a unique possibility of keeping track of the products during the packaging into envelopes. By arranging the objects in a single file it becomes possible to handle the objects regardless of the shape and size in the same machinery as long as they will fit into the same type of envelopes. In some practical embodiments objects are placed one by one, often separated in time,

such that the apparatus will handle one object at a time only. The term “array” shall therefore be construed as meaning that the objects to be handled by the apparatus are arranged in the first section in a manner suitable to be transferred into the second station and further in the apparatus.

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The feeding means in the first station will typically be a conveyor, a slide or the like. Any means which are suitable to receive an object to be packaged and forward it to the second station may be used in the first station.

10 The critical part here is therefore to package objects fitting into the same size of envelopes whereas once the objects have been sorted and guided to the first station the machine will package all objects carried on the conveyor in the same type of envelopes. The means for opening the envelopes and placing them at the same level as the first conveyor will provide an opening of the envelope which is large enough to accommodate the objects. By providing means for pushing the objects into the envelope it is
15 avoided that the object as such may freely move about in that the means for pushing will push the object from the conveyor and into the envelope which is arranged in open ended relationship directly in prolongation of the first conveyor. That in turn means that the object once it is placed on the first conveyor will remain more or less stationary at the same level and will not be turned or overturned in order to be placed in the
20 envelope but directly linearly pushed into the open envelope.

As the object is placed in the open envelope the next step of closing the envelope is carried out while the envelope is still stationary such that in the applications where envelopes comprising a removable foil covering adhesive the means for removing the
25 adhesive foil is brought into a position from which the foil may be removed without moving the envelope as such. After the foil has been removed the flap is turned in relation to the envelope such that the envelope during this process is still in a stationary state. The envelope is hereby closed and the object can only be removed from the envelope by tearing up the envelope. From here the envelope is transferred to a second
30 conveyor for further processing as for example attaching address labels, postage etc. may be attached to the outside of the envelope. The transferral may be either linearly or by tilting of the envelope onto the second conveyor.

In the applications where envelopes having a dry adhesive arranged on the flap which only exhibits adhesive properties after being moisturised, means for moisturising the adhesive may be arranged in place of the means for removing the removable foil.

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In a further advantageous embodiment said means in the second station comprises first suction means, where said means are arranged on a reciprocating member, such that the suction means may be brought into contact with an envelope in the envelope storage facility.

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By using suction means for example in the shape of resilient or flexible suction caps it is possible to engage the envelope without leaving traces afterwards and at the same time get a firm hold of the envelope in order to provide the opening needed in order to insert the object. In this particular embodiment the suction means are arranged on a reciprocating member whereby the member is arranged to be moved between a position where it is lowered in order to get into contact with the top envelope in the envelope store's facility after which the member is elevated into position where the envelope is placed in the first station such that the means for separating the envelope may be engaged. For separating and thereby providing the opening in the envelope additional suction means may be provided on the side of the envelope opposite to the suction means and the reciprocating member such that the envelope is opened by arranging suction means on both sides of the envelope and displacing the suction means relative to each other whereby an opening in the envelope is provided. This function is provided by the further embodiment where the third station comprises a reciprocating tray comprising second suction means, where said tray is brought into contact with the side of the envelope opposite to the side where the first suction means are engaged, after which the first and second suction means are separated in order to open the envelope.

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The reciprocating tray is necessary in order to move the tray out of the way as the reciprocating member with the envelope needs to be brought into a position substantially in the same plane as the first conveyor such that after the reciprocating tray has been brought in underneath the envelope and the suction means engaged in order to open

the envelope the pushing means may push the object from the first conveyor directly into the open envelope.

5 With the prior art mentioned above the accumulated energy (moment of inertia) in one or more sheets is negligible, which accounts for the fast packaging speed of these machines. The low energy stored in a piece of paper is so small that even at high speeds it will not damage itself or the envelope when injected into the open envelope. For packages/boxes as for example DVDs, CDs, make-up articles and the like, the moment of inertia is substantially greater due to the increased weight. This fact requires special
10 considerations which are not interesting for the prior art devices for packaging sheets in envelopes.

In a still further advantageous embodiment the fifth stations' means for removing a cover foil comprises a source of vacuum mounted on a moveable member, which
15 moveable member is brought from a rest position away from the envelope, and into an active position adjacent the envelope's flap, where the airflow created by the source of vacuum is sufficient to suck the foil away from the flap, thereby exposing the adhesive, where optionally the moveable member may be provided with one or more teeth extending from the moveable member, suitable to be brought into contact with the flap
20 and foil, thereby assisting in removing and/or loosening said foil.

Tests have shown that by placing a heavy suction device such as an industrial vacuum cleaner in a position immediately adjacent the flap, the movable foil for most standard envelopes will be sucked off. The advantage by not having to physically engage the
25 envelope is the fact that the envelope is not crumbled and that it is fully assured that the entire removable foil is removed. It might be advantageous as indicated by the optional feature of providing one or more teeth in order to just lift part of the removable foil from the flap such that the air flow from the suction device will get a larger surface to attack the removal foil whereby the foil tears right off.

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In an alternative embodiment to the embodiment mentioned above where a source of vacuum is used in order to remove the removable foil, the fifth stations means for removing the cover foil comprises a fork member having one or more projecting teeth,

mounted on a moveable member, where said teeth are brought into contact with the envelope's flap at the edge of said cover foil, whereby the teeth's movement separates and removes the foil from the flap.

5 As this embodiment is based on a mechanical removal of the cover foil, the apparatus is less sensitive to the adhesive strength between the cover foil and the envelope as such and especially for heavy duty applications it might be advantageous to use this embodiment.

10 In a further embodiment one or more air nozzles are arranged on a moveable member, such that said air nozzles may be brought into a position relative to the removable foil, where air jets issuing from the nozzles, will loosen the removable foil from the flap.

15 When the air nozzles are combined with suction means for example as already mentioned above, or other suction means having less vacuum (or suction force) in that the foil is already lifted up from the flap, and the suction means will only have to collect the removed foil.

20 The arrangement for removing the cover foil may be a completely separate member, which may be arranged in connection with other installations where it is desirable to remove the cover foil, such as for example prior art envelope filling systems and the like. The arrangement will typically comprise a plurality of air nozzles, for example 3 to 5. The suction means arranged for collecting the loose foil may have a funnel shaped member at the bottom of which the suction means is connected.

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In the embodiments of the invention where for one reason or the other it is desirable to use an adhesive on the flap which needs to be moisturised in order to obtain the adhesive properties, the fifth stations means for moisturising the adhesive on the flap is either one or more nozzles arranged on a moveable member, where said member may be brought into a position above the flap, and into a parked position away from the flap, where said nozzles are in fluid communication with a reservoir, such that when the nozzles are above the flap, liquid will issue from the nozzles or where a sponge in connection with a reservoir is arranged on a moveable member, where said moveable

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member may bring the sponge into contact with the flap, and move the sponge away from the flap.

5 In the same manner as the source of vacuum may be brought into a position adjacent the flap, the moisturising means may likewise be arranged in the apparatus such that the means may be moved into the vicinity and away from the vicinity of the flap.

10 For some industrially used adhesives, the adhesive properties of the adhesive are not developed by moisturising with water but a chemical needs to be sprinkled on in order to activate the adhesive. In these embodiments it is advantageous to use a nozzle creating a fine mist of the activating chemical such that the adhesive properties are developed before the flap is turned in the following station. In other applications where water is used in order to develop the adhesive properties, a sponge in connection with the reservoirs is provided such that the sponge is constantly moist where said sponge may
15 be mounted on a reciprocating member moving back and forth between a position where it moisturises the flap and another position where it is out of the way allowing the reciprocating member to collect envelopes.

20 In a still further advantageous embodiment of the invention means for closing said flap onto a side of the envelope is provided in the fifth station where said means is a section of the bottom of said tray, which section is pivotably arranged in relation to the bottom of the tray, such that when an envelope is positioned in the tray and held by the suction means, the flap of the envelope is superposed the pivotable section, whereby when activating a pivot mechanism, the flap is folded onto the side of the envelope.

25 As it is evident from the explanations above the envelope with the object is kept in the same plane and more or less stationary through out the process such that the control of the object and the envelope is maintained at all times. This is also the case where closing the envelope in that by providing part of the tray as a rotatable member the object and the envelope as such remains fixed in the tray while the flap is turned over by
30 means of the pivotable member until the adhesive engage the outside of the envelope. As suction means are provided in the tray, these suction means may be activated in order to fixate the envelope during the closing operation.

In this manner a safe and secure closing of the envelope is achieved with a high degree of certainty that a completely full contact is achieved between the flap and the outside of the envelope creating a proper closing of the envelope.

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Objects to be packaged with an apparatus according to the invention may be computer games, CDs, small boxes/glass bottles containing contact lenses, medication, smaller items of hardware etc. etc.

The envelope storing magazine

10 The invention is also directed to an envelope storing magazine suitable to be used in connection with an apparatus as discussed above where said magazine comprises a plurality of envelope cartridges, where said cartridges are arranged in a rectangular frame system whereby two rows of cartridges constitute an array with one opening in the array substantially corresponding to one cartridge, where pushing means for push-
15 ing the cartridges are arranged in each corner of the frame system, and where means are provided for activating said pushing means, when the cartridge from which envelopes are collected by the apparatus, is empty or near empty.

A prerequisite for making the apparatus discussed above operate in a substantially continuous mode, i.e. automatically packaging objects into envelopes is the fact that a substantial amount of envelopes are available. For this purpose the invention also provides an envelope storing magazine which has a substantial storing capacity such that when the invention for example is arranged in a larger computer based storage and packaging facility it will be able to operate substantially unattended for a long period of time due
20 to the availability of envelopes. By storing the envelopes in cartridges a number of advantages are achieved. First it is relatively easy to change the size of envelopes simply by replacing one or more cartridges with envelopes of one size by envelopes of a different size.

30 As the envelope storage magazine is provided with means for detecting when a particular cartridge is empty or near empty, the pushing means may be activated such that between two cycles where the envelope collecting means is collecting envelopes, the

cartridges may be replaced such that a new full cartridge is in position underneath the reciprocating collecting means.

Typically the area of the frame system will correspond to the area of the apparatus as discussed above, such that the envelope storing magazine may be constructed underneath the apparatus as such whereby the overall installation doesn't take up more floor space than the apparatus as such. The pushing means may advantageously be in the shape of actuators having a piston rod where the piston rod has means at the end for engaging the cartridges thereby pushing them forward in order to arrange a full cartridge underneath the reciprocating envelope collecting means.

In a still further advantageous embodiment each cartridge comprises a bottom and at least three upstanding walls from said bottom, where an aperture is provided in the bottom, and that two sensing means are arranged below the cartridges path in the frame system, where said two sensing means will detect an empty cartridge.

The upstanding walls are naturally provided in order to keep the envelopes in a neat stack whereas the aperture provided in the bottom serves to allow the sensing means to "look" up into the cartridge. The sensing means may be for example a laser or light beam or a mechanical arm provided with a weighing cell.

In the embodiment where the sensing means is a laser or light beam or photocell installation, the sensors will detect that the cartridge is empty when the beam is unbroken. In the embodiment where a mechanical arm is provided which will be inserted through the aperture in the bottom of the cartridge, the arm will weigh the weight of the envelopes and as soon as the weight passes below a certain predefined limit, it will be an indication to the system that the cartridge is near empty or empty depending on the predefined weight limits.

By providing two sensing means arranged below the cartridge path and next to each other such that the sensing means will detect the presence of envelopes in two adjacent cartridges important information may be obtained. The sensing means positioned immediately underneath the reciprocating collecting arm from the envelope collector i.e.

the second station will detect and provide information to the envelope storing magazine and in particular the pushing means on when to push such that an empty cartridge is removed from underneath the second station and a full cartridge pushed into its position. The second sensing means arranged upstream underneath an adjacent cartridge
5 will detect whether or not there are envelopes present in this cartridge. If the sensing means detects that the adjacent cartridge is empty, the entire magazine will be empty and an alarm will be sounded whereby an operator will be required to fill the entire magazine. If on the other hand the second detector upstream from the first detector
10 senses that the cartridge is full of envelopes, the pushing means will be activated and the cartridge positioned underneath the second station. In this manner it is possible to assure that a full cartridge is always placed underneath the second station and when the entire envelope magazine has been emptied, the apparatus will be stopped in order to refill the magazine. By providing a substantial number of cartridges containing a substantial amount of envelopes the apparatus in practice with a cycle of time of approxi-
15 mately fourteen seconds from an object is placed on the first conveyor to the object is delivered to the second conveyor, the envelope magazine will be able to provide enough envelopes for the continuous running of up to 20 to 22 hours.

In a still further advantageous embodiment of the invention a pushing arm is arranged
20 in the frame system below and in the position where the cartridge from which envelopes are being collected, such that the pushing arm extends through an aperture in the bottom of the cartridge, thereby lifting the envelopes nearer to the means for collecting envelopes from an envelope storage facility, where means are provided for detecting the arms position.

25 This embodiment is particularly useful where the cartridges are especially high and the packaging cycle times for the apparatus are very short. By pushing the envelopes towards the means for collecting an envelope, the travelling distance for the envelope collection means is shorter and may therefore be carried out faster. By furthermore
30 providing the means for detecting the arm's position the remaining amount of envelopes in the cartridge may be determined in that if the arm is at the very bottom of the cartridge, the cartridge will be substantially full with envelopes whereas if the arm is more or less fully extended, the cartridge will be more or less empty.

The invention is also directed towards a method for automated packaging of three-dimensional objects utilising an apparatus and an envelope storing magazine as discussed above.

5 **Description of the Drawing**

Fig. 1 illustrates a side overview of the apparatus

Fig. 2-12 illustrates various stages in the process of packaging an envelope

Fig. 13 illustrates the envelope magazine.

Detailed Description of the Invention

10 In fig. 1 is illustrated an overview of an apparatus 1 according to the invention. The apparatus 1 in this embodiment comprises a first station 10 where the objects are arranged in an array on a first conveyor 11. In this embodiment, the conveyor 11 is in the shape of an endless belt 12 arranged for rotation around two cylinders 13, 14. The conveyor 11 will transport the objects from left towards right which is the travelling direction through the apparatus. Downstream from the conveyor 11 is arranged a second station 20 comprising means 21, 22 for collecting envelopes from an envelope storing facility 70. The means for collecting envelopes comprises a suction head 21 and a telescopic arm 22 which may be extended and retracted in order to collect envelopes from the envelope store 70 and arranging the envelope in the path of the object to be packaged.

25 The third station comprises a telescopic cylinder 31 which is capable of being extended and retracted in the same direction as the envelope travels through the apparatus. At the free end of the telescopic part of the third station 30 is provided a tray 32. The tray also comprises suction means 33. The function will be explained below with reference to especially fig. 6, 7 and 8.

30 The means for removing a cover foil in the fifth station 50 is also mounted on a retractable member 51 such that the means 50 may be brought from a parking position as illustrated in fig. 1 and into an operative position as illustrated with reference to figures 7, 8 and 9. The details of the fifth station will be explained below with reference to figures 7 to 9.

The tray 32 furthermore comprises a part which may be turned together with the flap of the envelope such that the envelope may be closed. This is explained below with reference to figures 8, 9, 10, 11 and 12.

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After the envelope has been closed, the tray 32 will pivot and place the envelope onto a second conveyor 80. Adjacent the second conveyor 80 may be arranged a labelling machine 90 which will print the appropriate address for the receiver of the package and place the label on the front of the envelope. Furthermore, a postage machine may also
10 be arranged in the same unit such that the envelope as it passes and leaves the second conveyor 80 is ready for posting.

Turning to fig. 2 a more detailed view of fig. 1 is illustrated where an object 100 has been placed at a position where it is just about to leave the first conveyor belt 11.
15 Means for pushing, in this example a plate member 41, is provided above and behind the object. When the apparatus registers that an object 100 has been placed in the depicted position, the means 40 for placing the object in the envelope will be brought into a position where the plate member 41 may be brought into contact with the object 100. When an envelope is in the position as depicted in fig. 6, an electrical motor (not illustrated) will be activated whereby the carriage 42 will move linearly along the rail 43
20 whereby the plate member 41 will engage the object 100 and push it into the inside of the envelope. In this position the envelope collection means 20 has begun its travel towards the envelopes 71 stored in a cartridge 72 below the apparatus 1. As may be seen in fig. 3, the collection means 20 has passed the path of the object 100 on its way to collect an envelope 71. In fig. 4 the suction means 23 arranged on the head part 21
25 of the envelope collection means has engaged the envelope and the suction is activated whereby an envelope is attached to the suction nozzles 23. By retracting the member 22, the envelope will be brought into a position as illustrated with reference to fig. 5 and 6 where the envelope in the position depicted in fig. 6 is in the same plane as the
30 object 100 and the surface of the first and second conveyors 10, 80.

As the envelope passes the position depicted in fig. 5, the tray 32 will be activated whereby the telescopic member 31 will begin to extend. As the envelope passes into

the position depicted in fig. 6 the telescopic member 31 is fully extended whereby the tray 32 is positioned below the envelope 71 which is still attached to the suction nozzles 23. In this position the suction means 33 on the tray 32 is activated and brought into contact with the envelope 71. By further displacing the suction means 23 relative to the suction means 33 which both are in firm engagement with the envelope, the envelope's opening 71' will be split thereby allowing access for the object 100. In fig. 7 is the same position illustrated from a different angle where it may be seen that the suction means 23, 33 are arranged on either side of the opening 71' of the envelope 71. The object 100 is provided with guiding means 101 on either side of the path in order to position the object correctly relative to the envelope such that as the insertion means 40, 41 are activated, the object is placed correctly inside the envelope.

In this context it should be noted that in the illustration the object has a three dimensional size corresponding to the plastic boxes in which DVDs and CDs are typically stored. For this purpose the pushing member 41 has been designed with an appropriate shape securing that the object 100 is placed correctly into the envelope. For other objects having different three-dimensional shapes, the pushing member 41 may have a different configuration as well as the travelling distance and path of the insertion means 40 and guide means 101. These are trivial details which the skilled person will recognize within the inventive concept.

Turning to fig. 8, the object has been placed inside the envelope 71 and the envelope collection means 20 has been released and retracted back to the position as illustrated in fig. 1. Instead the fifth station means has been brought into position where the foil 73 covering the flap 74 of the envelope 71 is to be removed. The flap usually extends from the sides of the envelope such that the flap may be folded around the opening 71' in order to close and seal the envelope. The removable foil 73 usually covers an adhesive which during manufacturing of the envelope has been placed on the flap and in order to avoid the adhesive becoming non-adhesive, the protective foil 73 is placed. In order to seal the envelope this foil needs to be removed and the flap folded back on the side of the envelope 71. By positioning the foil removing means 50 adjacent the foil 73, this is carried out. In this instance the foil removing means includes suction means 53 where only the opening of the suction means is illustrated but the pipe 54 is connected to

means for creating a vacuum for example an industrial vacuum cleaner. Additionally a series of air jets 55' are arranged such that as the suction is activated and the air jets are activated, the protective foil 73 will be airlifted off the flap 74 of the envelope 71 and collected by the suction means 53, thereby secure removal of the foil 73 is achieved. In fig. 9 is illustrated a cross section through the apparatus depicted in fig. 8 illustrated. As is clear the tray 32 at the end of the telescopic member 31 is still positioned such that the suction means 33 in the tray are forcing the envelopes 71 into a fixed position with the tray 32. By activating the air jet nozzles 55' and the suction means 53 the protective foil 73 will be removed from the flap 74 of the envelope. Once the protective foil 73 has been removed from the envelope 71, the folding mechanism as illustrated with reference to fig. 10-12 will be activated.

A part of the tray 32 is pivotally mounted by means of the hinges 34, 35. The part of the tray 32' pivoting relative to the tray 32 substantially corresponds to the flap 74. As the hinges are brought to pivot as illustrated in fig. 11 and 12, the flap 74 with the adhesive side will be turned and eventually be brought into contact with the side of the envelope 71. In this manner the envelope has now been opened, filled with an object and closed and sealed and made ready for further processing as for example the attachment of an address label, postage etc. and being ready for distribution.

In fig. 13 the envelope storing facility 70 is illustrated as such. In the facility 70, nineteen cartridges 72 are arranged. It is clear that more or less cartridges may be used depending on the size of the envelope storing facility and the size of the cartridges 72. Each cartridge comprises three full upstanding walls 73, 74, 75 and in this embodiment a fourth wall 76', 76'' covering part of the fourth side. The bottom 77 is provided with a relatively large aperture 78.

All the cartridges 72 are arranged in an array within a frame structure 110. In this embodiment the frame structure 110 has a rectangular shape. Pushing means 112 are arranged adjacent each corner in the rectangle. Underneath the cartridges two sensors 113, 114 are provided see also fig. 1. In the situation as depicted in fig. 1 the cartridge superposed the sensor 113 detects that there are envelopes 71 present in the cartridge. However, as the sensor 114 detects that the cartridge superposed the sensor 114 is

empty, the last envelope in the cartridge superposed the sensor 113 will when removed from the cartridge generate an alarm that the entire storage facility needs to be refilled with envelopes. If however all the cartridges had been filled with envelopes, the last envelope removed from the cartridge superposed the sensor 113 would activate the
5 pushing means 112 in turn such that first the pushing means 112' would move the cartridge 72' into the empty spot as indicated by the arrow 115. Thereafter the pushing means 112' would move the cartridge 72'' into the empty spot just created by the first movement. Thereafter the pushing means 112''' would move the cartridge 72''' into the empty spot created by pushing the cartridge 72'' etc. In this manner the cartridges
10 will successively be moved past the sensors 113, 114 which due to the sensing means and the aperture 78 provided in the bottom of the cartridges will be able to detect whether or not envelopes are present in the cartridges. As explained above when both sensors register empty cartridges, an alarm will be generated such that an operator may refill or replace the cartridges with cartridges full of envelopes. For the sake of clarity
15 all the cartridges have been illustrated without envelopes.

CLAIMS

1. Apparatus for placing three dimensional objects in envelopes, where said envelopes are characterised in having two opposing sides, connected along three side edges, defining a space between said two sides, and at a fourth edge one of the sides extends
5 beyond the second side, thereby providing a closing flap, where said apparatus comprises the following stations:

- 10 g) a first station where the objects are arranged in an array on a first conveyor providing a transport path for said object;
- h) a second station where means are provided for collecting an envelope from an envelope storage facility, and placing said envelope in the transport path, where the envelopes opening is facing the object;
- 15 i) a third station superposed the second station, where said third station comprises means for separating the envelopes sides enough for the object to be introduced into said envelope;
- j) a fourth station comprising means for pushing said object into said envelope;
- 20 k) a fifth station comprising means for either removing a cover foil exposing an adhesive on said closing flap, or means for moistening a dry adhesive on said closing flap, and means for closing said flap onto a side of said envelope;
- l) a sixth station for transferring the closed and sealed envelope onto a second conveyor.

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2. Apparatus according to claim 1 wherein where said means in the second station comprises first suction means, where said means are arranged on a reciprocating member, such that the suction means may be brought into contact with an envelope in the envelope storage facility.

30

3. Apparatus according to claim 1 or 2 wherein the third station comprises a reciprocating tray comprising second suction means, where said tray is brought into contact

with the side of the envelope opposite to the side where the first suction means are engaged, after which the first and second suction means are separated in order to open the envelope.

5 4. Apparatus according to claim 1 wherein the fifth stations means' for removing a cover foil, comprises a source of vacuum mounted on a moveable member, which moveable member is brought from a rest position away from the envelope, and into an active position adjacent the envelope's flap, where the airflow created by the source of vacuum is sufficient to suck the foil away from the flap, thereby exposing the adhesive,
10 where optionally the moveable member may be provided with one or more teeth extending from the moveable member, suitable to be brought into contact with the flap and foil, thereby assisting in removing and/or loosening said foil.

15 5. Apparatus according to claim 1 wherein the fifth stations means for removing a cover foil, comprises a fork member having one or more projecting teeth, mounted on a moveable member, where said teeth are brought into contact with the envelope's flap at the edge of said cover foil, whereby the teeth's movement separates and removes the foil from the flap.

20 6. Apparatus according to claim 1 wherein the fifth stations means for removing a cover foil, comprises one or more air nozzles arranged on a moveable member, such that said air nozzles may be brought into a position relative to the removable foil, where air jet(s) issuing from the nozzles, will loosen and lift the removable foil from the flap.

25 7. Apparatus according to claim 1 wherein the fifth stations means for moisturizing the adhesive on the flap is either one or more nozzles arranged on a moveable member, where said member may be brought into a position above the flap, and into a parked position away from the flap, where said nozzles are in fluid communication with a reservoir, such that when the nozzles are above the flap, liquid will issue from the nozzles
30 or where a sponge in connection with a reservoir is arranged on a moveable member, where said moveable member may bring the sponge into contact with the flap, and move the sponge away from the flap.

8. Apparatus according to claim 3 wherein the means for closing said flap onto a side of the envelope in the fifth station is a section of the bottom of said tray, which section is pivotably arranged in relation to the bottom of the tray, such that when an envelope is positioned in the tray and held by the suction means, the flap of the envelope is superposed the pivotable section, whereby when activating a pivot mechanism, the flap is folded onto the side of the envelope.

9. Envelope storing magazine suitable to be used in connection with an apparatus according to any of claims 1 to 7, where said magazine comprises a plurality of envelope cartridges, where said cartridges are arranged in a rectangular frame system whereby two rows of cartridges constitute an array with one opening in the array substantially corresponding to one cartridge, where pushing means for pushing the cartridges are arranged in each corner of the frame system, and where means are provided for activating said pushing means, when the cartridge from which envelopes are collected by the apparatus, is empty or near empty.

10. Envelope storing magazine according to claim 8, characterised in that each cartridge comprises a bottom and at least three upstanding walls from said bottom, where an aperture is provided in the bottom, and that two sensing means are arranged below the cartridges path in the frame system, where said two sensing means will detect an empty cartridge.

11. Envelope storing magazine according to claim 8, characterised in that a pushing arm is arranged in the frame system below and in the position where the cartridge from which envelopes are being collected, such that the pushing arm extends through an aperture in the bottom of the cartridge, thereby lifting the envelopes nearer to the means for collecting envelopes from an envelope storage facility, where means are provided for detecting the arms position.

12. Method for automated packing of three dimensional objects in envelopes of the type having a closing flap, where the objects to be packaged are placed in spaced relationship and in a single file on a conveyor, where said envelopes are collected from an

envelope storing magazine and oriented with their opening facing the object to be packaged, where suction means engage either side of the envelope, thereby opening the envelope, after which means pushes the object into the envelope, where the suction means arranged underneath the envelope are provided in a tray, where a part of said

5 tray pivots thereby forcing the closing flap to be folded onto the side of the envelope, and that means are provided for removing a protective foil from an adhesive arranged on the flap, or means are provided for moisturizing an adhesive placed on said flap, prior to said flap being folded, after which the envelope is transferred onto a second conveyor.

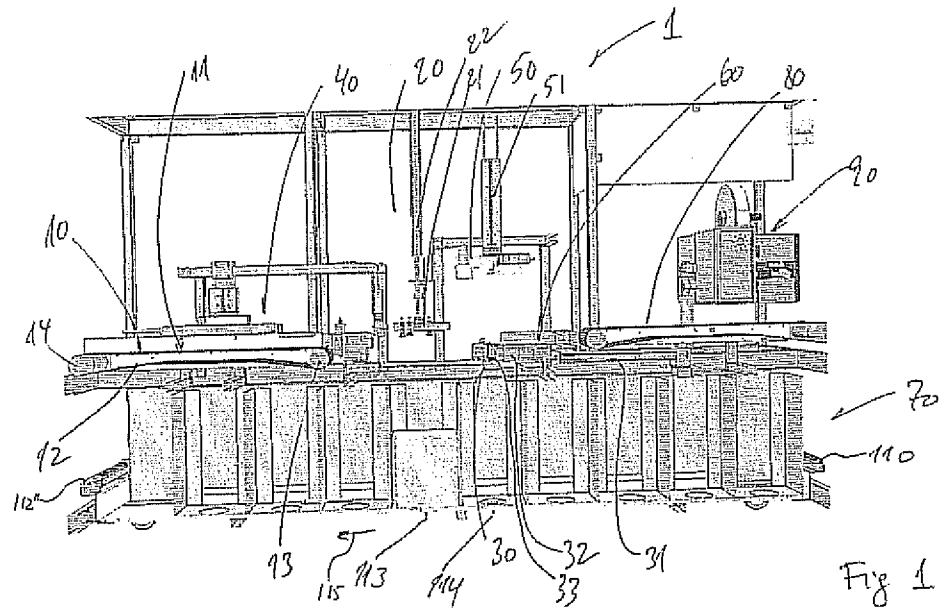


Fig 1

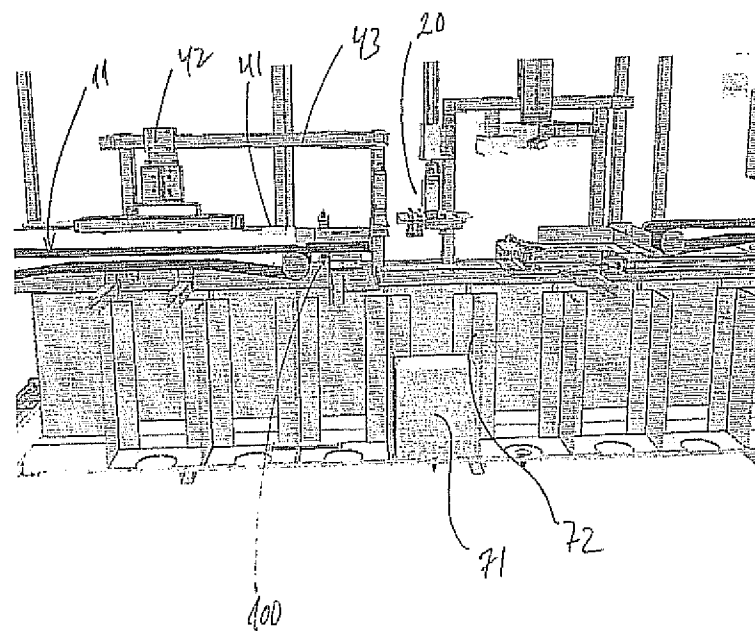


Fig 2

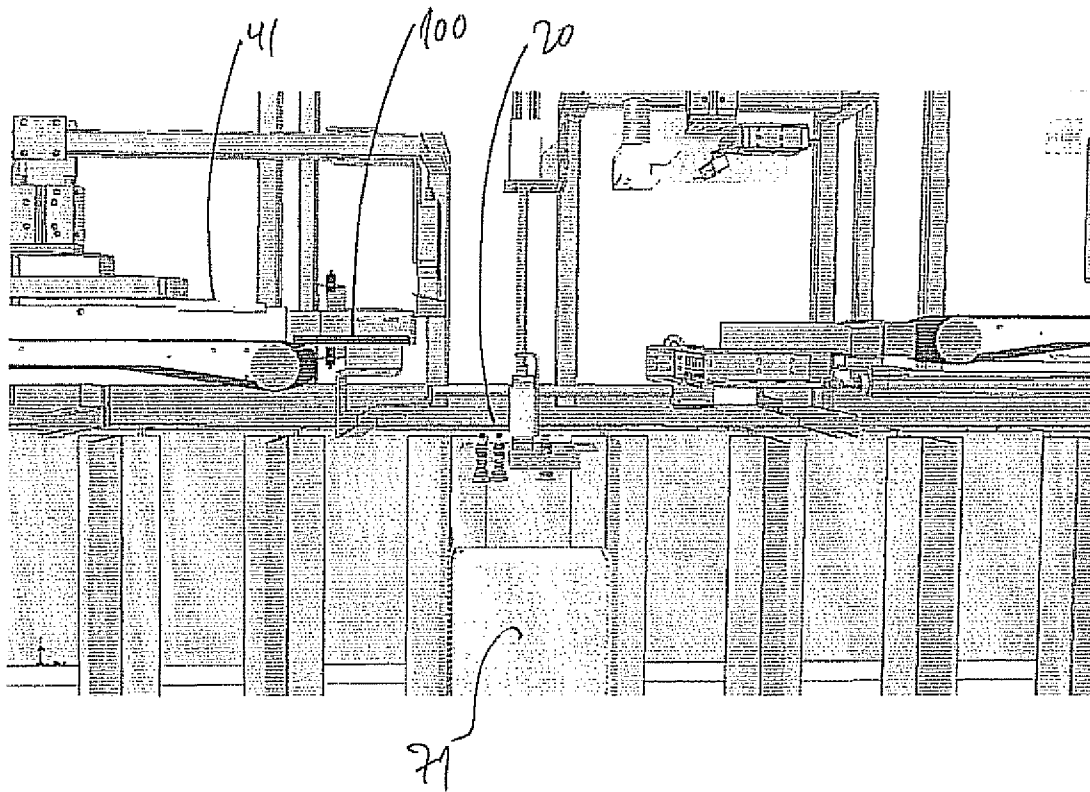


Fig 3

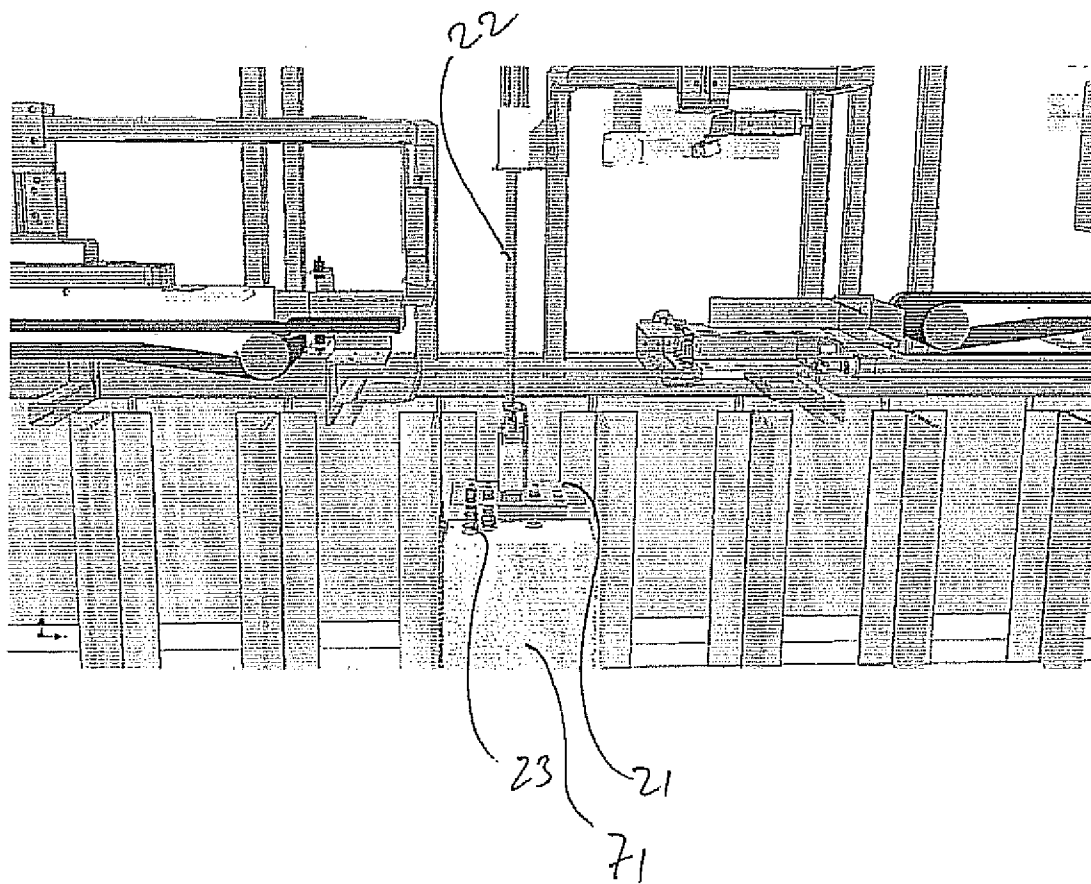


Fig 4

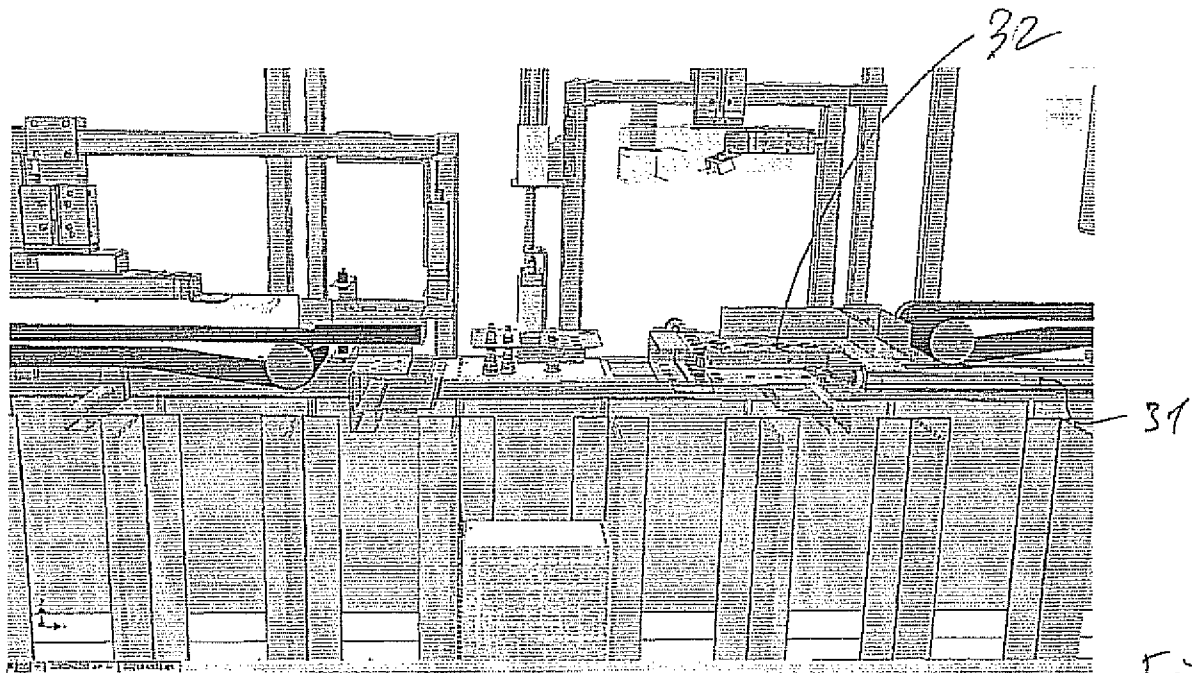


Fig 5

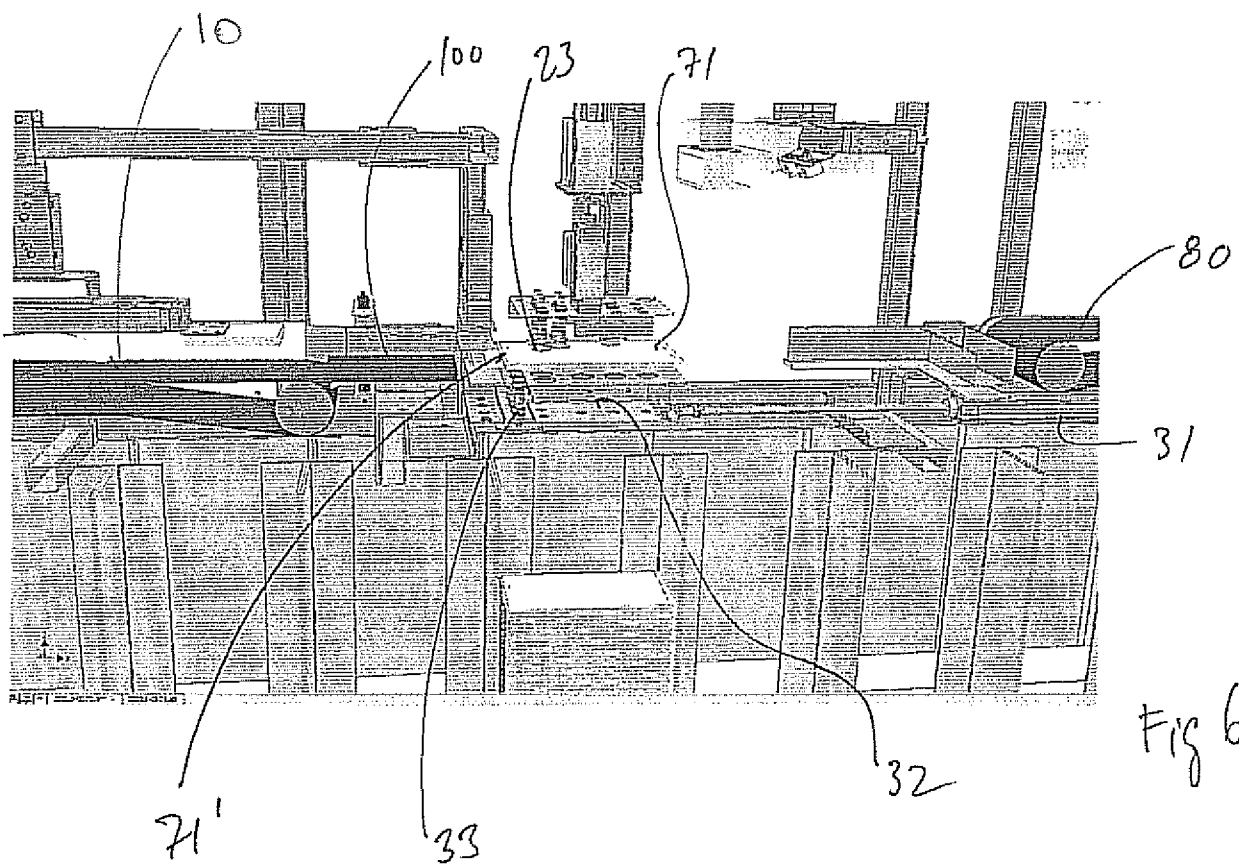


Fig 6

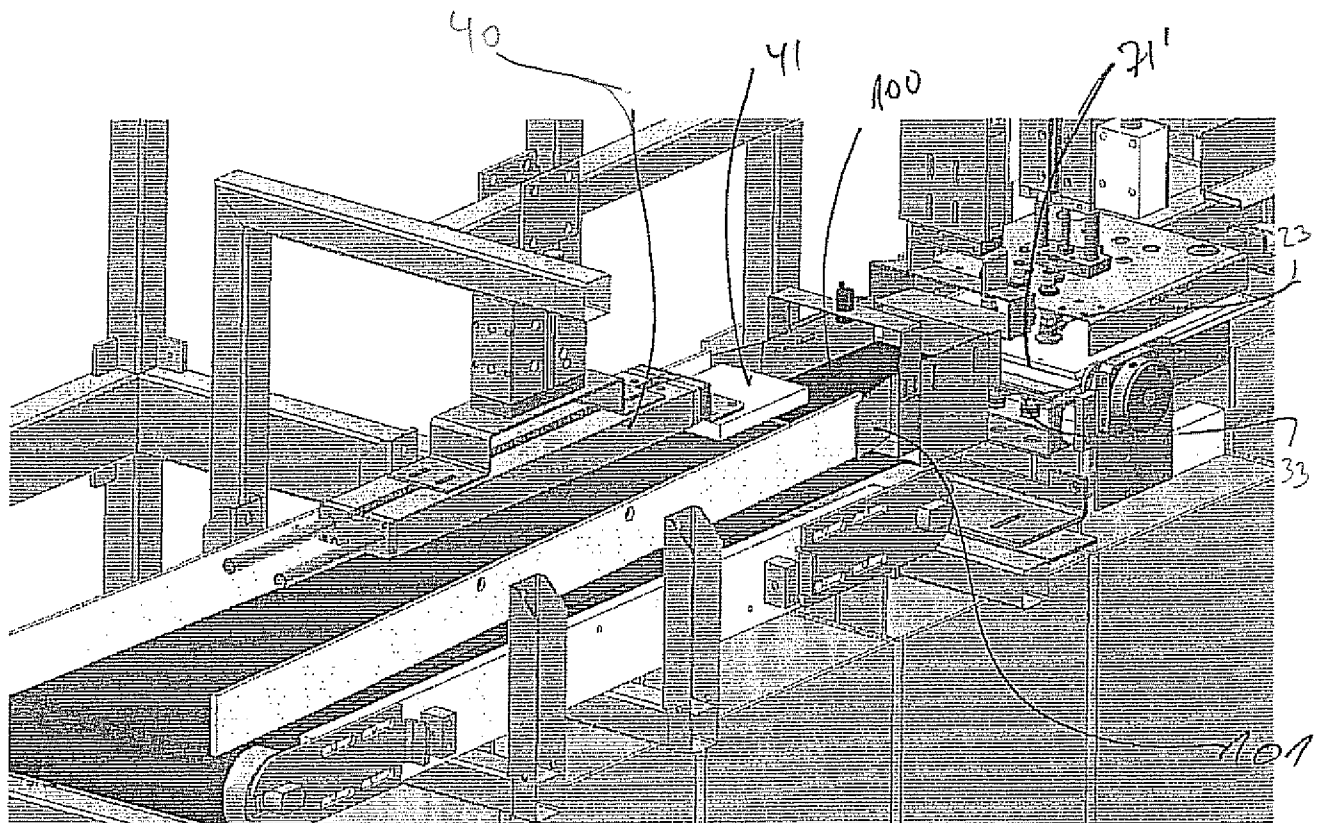


Fig 7

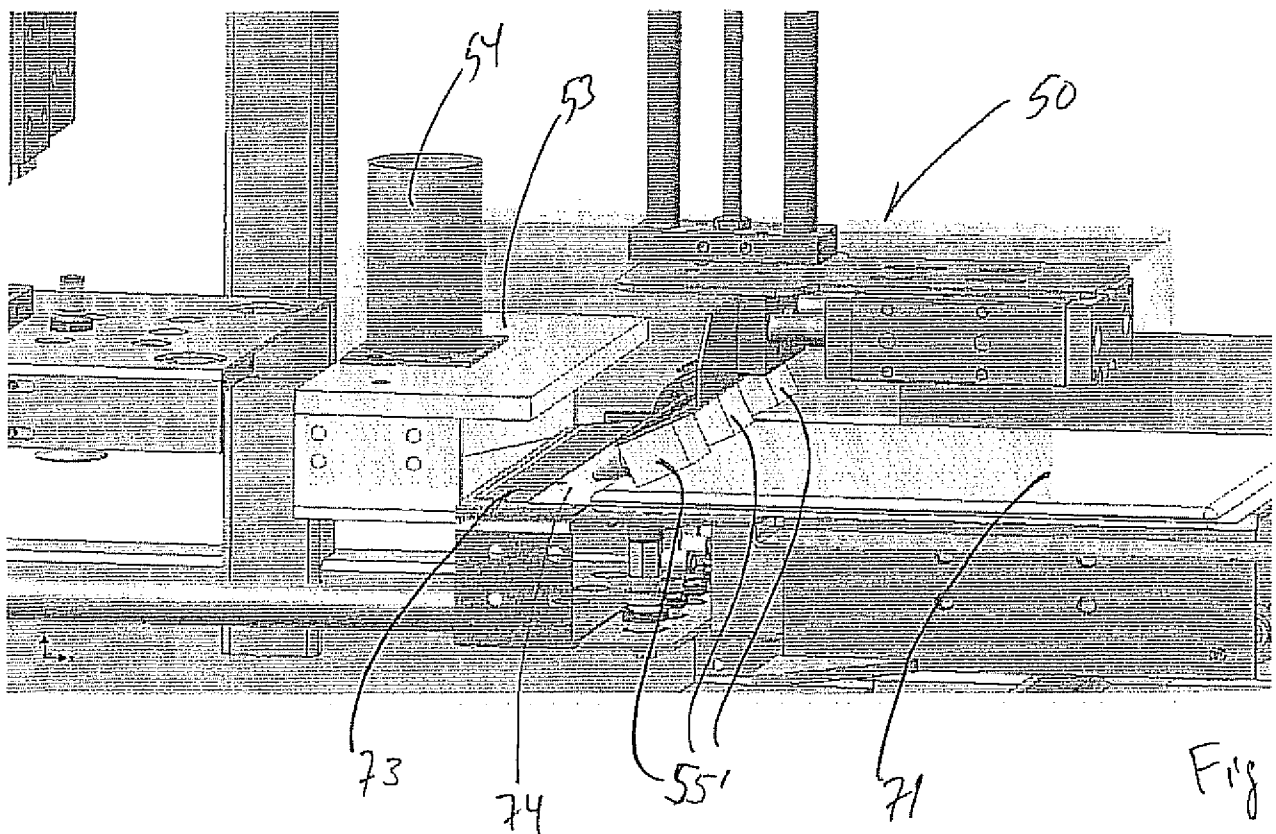
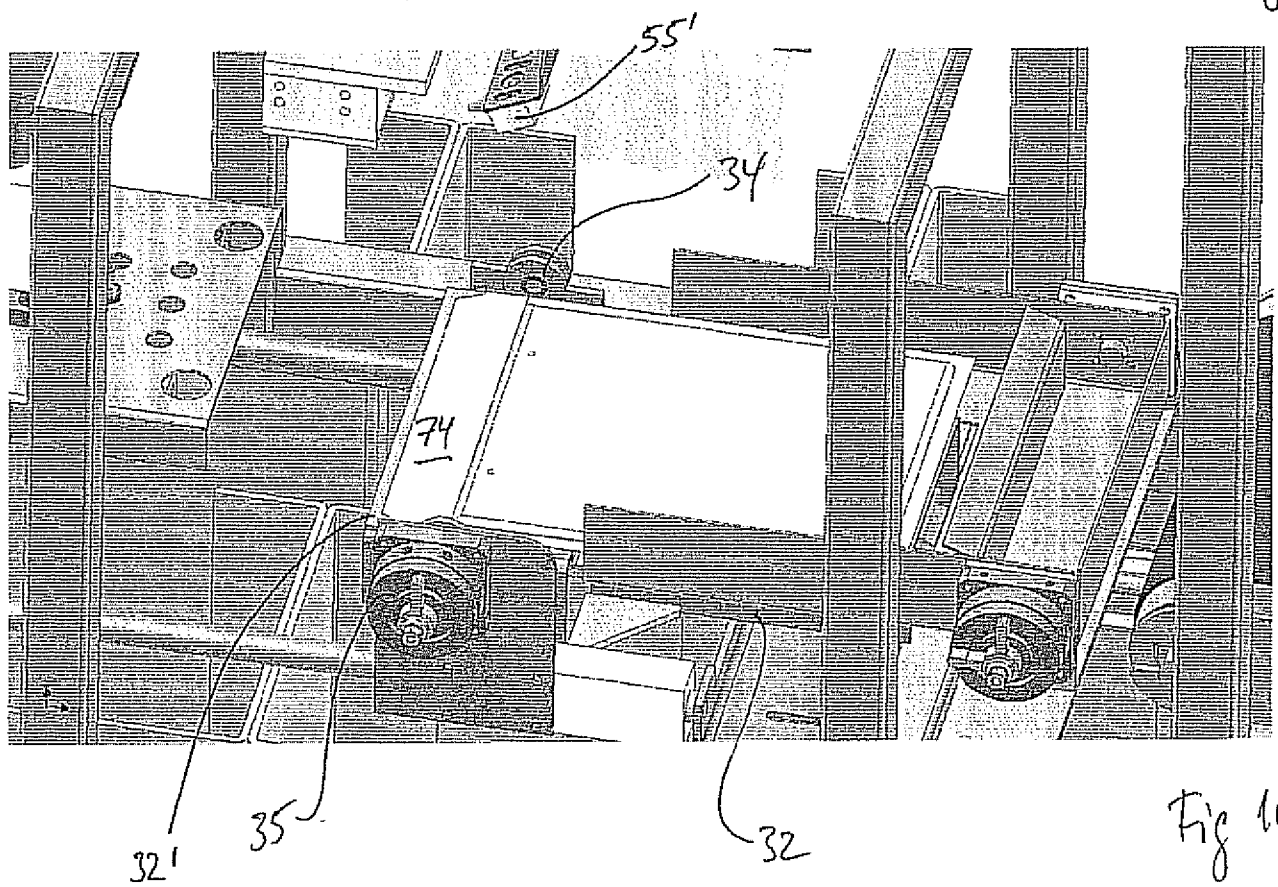
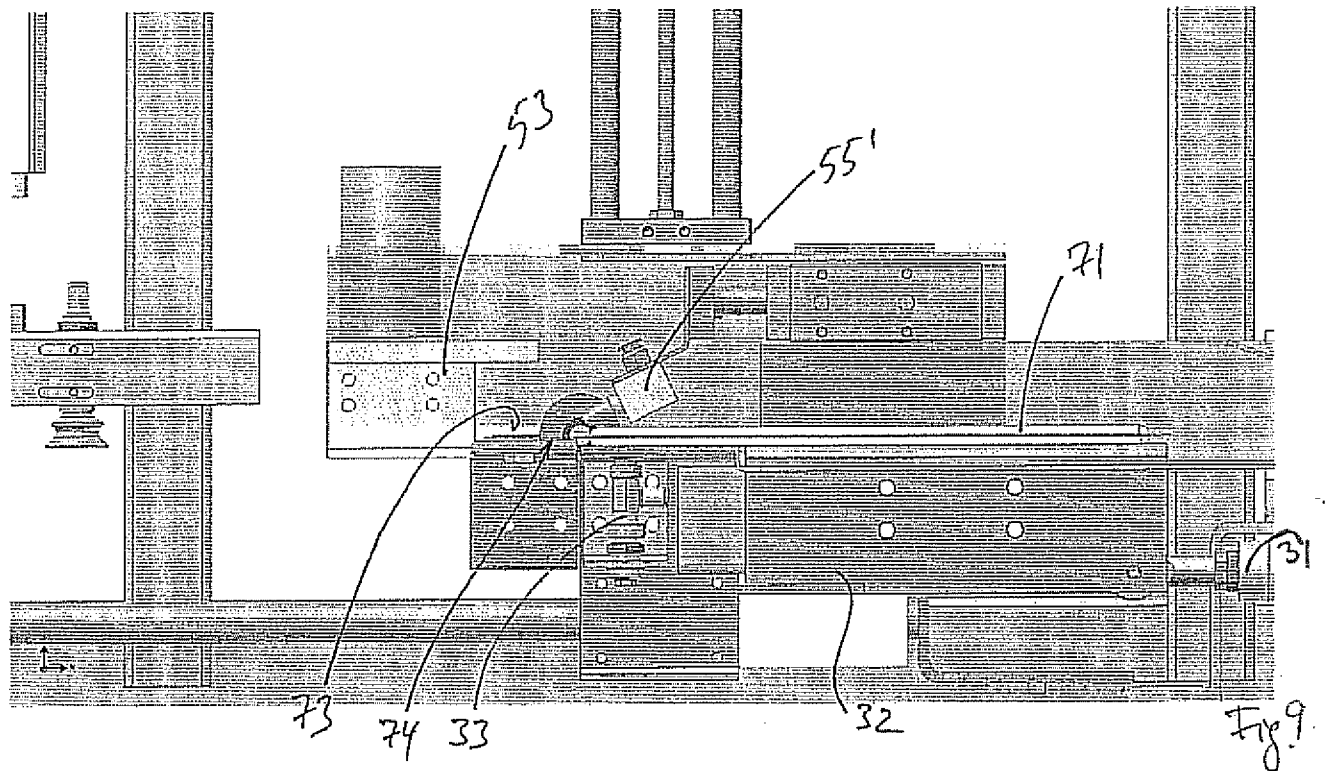


Fig 8



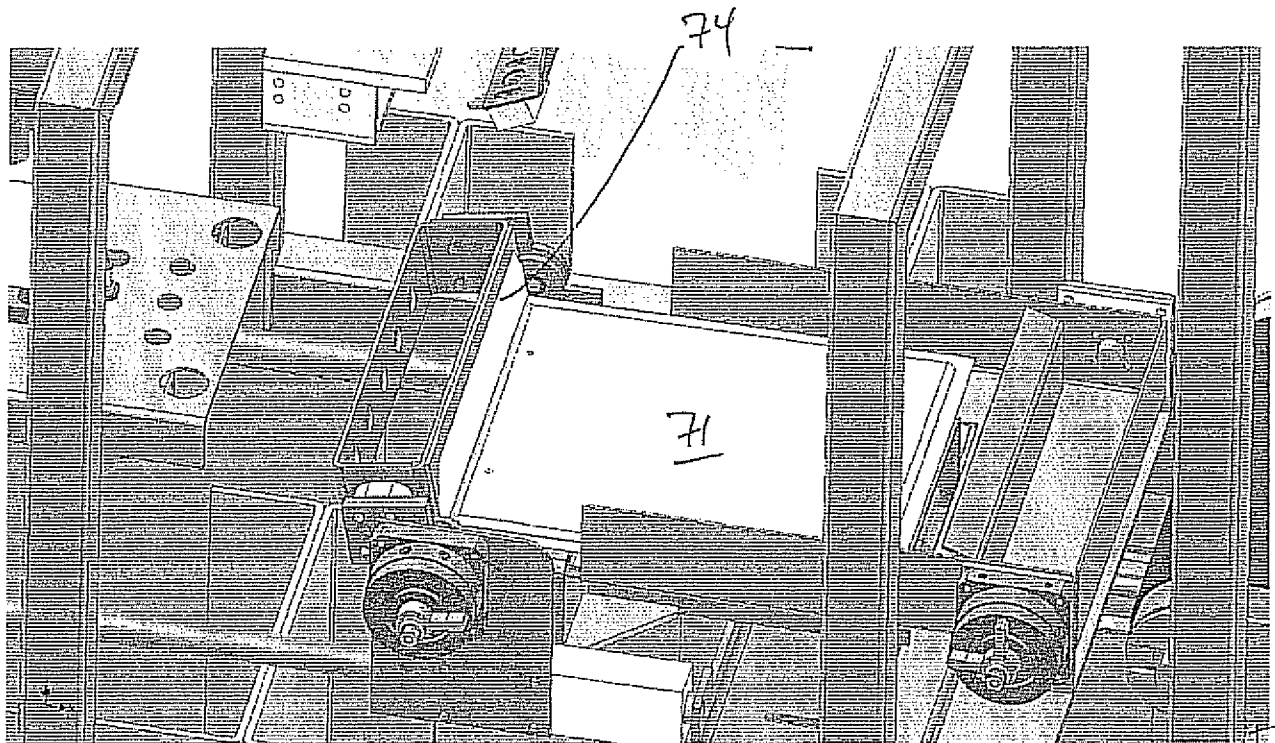


Fig 11

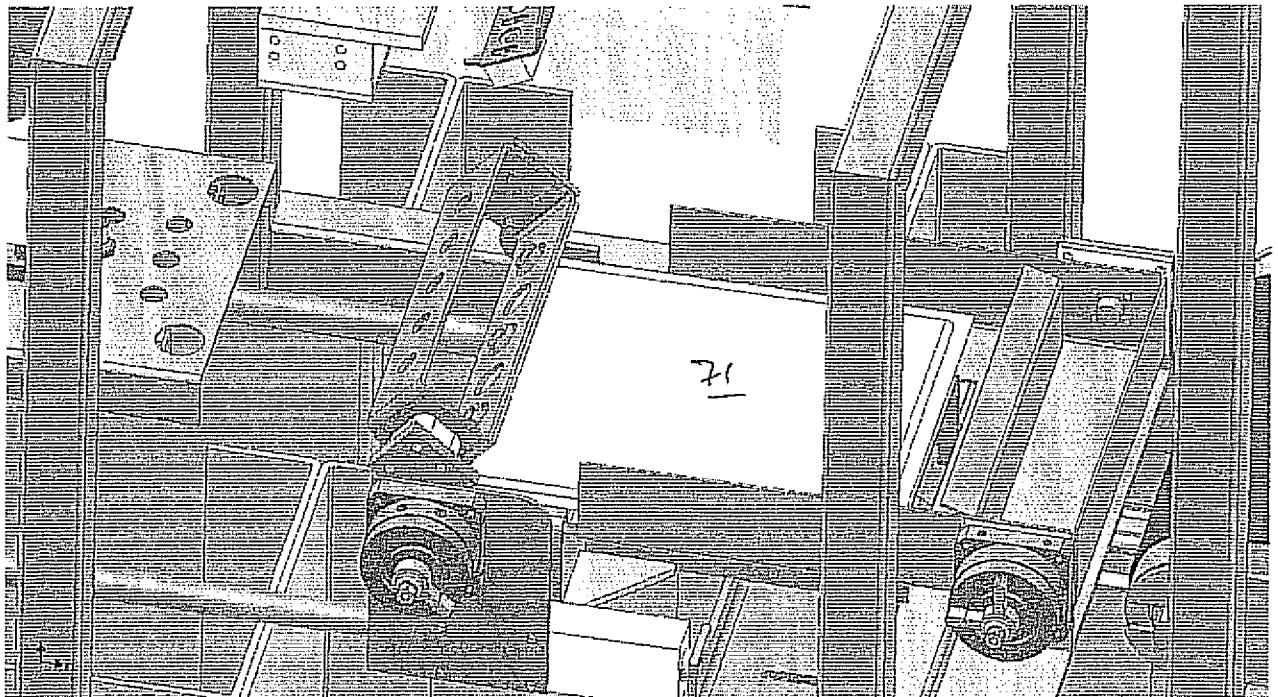


Fig 12

