(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 584 088 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.04.2013 Bulletin 2013/17

(51) Int Cl.:
D06F 67/04 *(2006.01)*

(21) Application number: **11380096.5**

(22) Date of filing: **25.11.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **17.10.2011 EP 11380080**

(71) Applicant: **Girbau Robotics**
73100 Gresy sur Aix (FR)

(72) Inventors:
- **Garrone, Dominique**
  73100 Gresy sur Aix (FR)
- **Duplouy, Sylvain**
  73100 Gresy sur Aix (FR)
- **Gorriz, Manuel**
  73100 Gresy sur Aix (FR)

(74) Representative: **Torner Lasalle, Elisabet et al**
Torner, Juncosa I Associats, S.L.
C/Gran Via de les Corts Catalanes, 669 bis 1r 2a
08013 Barcelona (ES)

(54) Machine for spreading out and loading flat articles of clothing

(57) Machine for spreading out and loading flat articles of clothing (A) comprising a conveyor belt (30) and loading clamps (24a, 24b) which receive contiguous corners (A1, A2) of a flat article of clothing (A) manually loaded by an operator (P) in a loading station (1) and transfer them to spreading clamps (4a, 4b), whereby each of said loading clamps (24a, 24b) has a loading jaw (51) driven by an actuator (52) and an auxiliary loading jaw (53) with yielding and recovery capacity for catching parts of the corners (A1, A2) against opposite sides of said loading support (50), and an air blowing nozzle (55) producing an airflow capable of pushing a portion of said corners (A1, A2) released from the auxiliary loading jaw (53) and introducing said portion of sad corners (A1, A2) between the jaws of a corresponding spreading clamp (4a, 4b) driven by an actuator (58) for catching the portions of th corners (A1, A2) previously released.

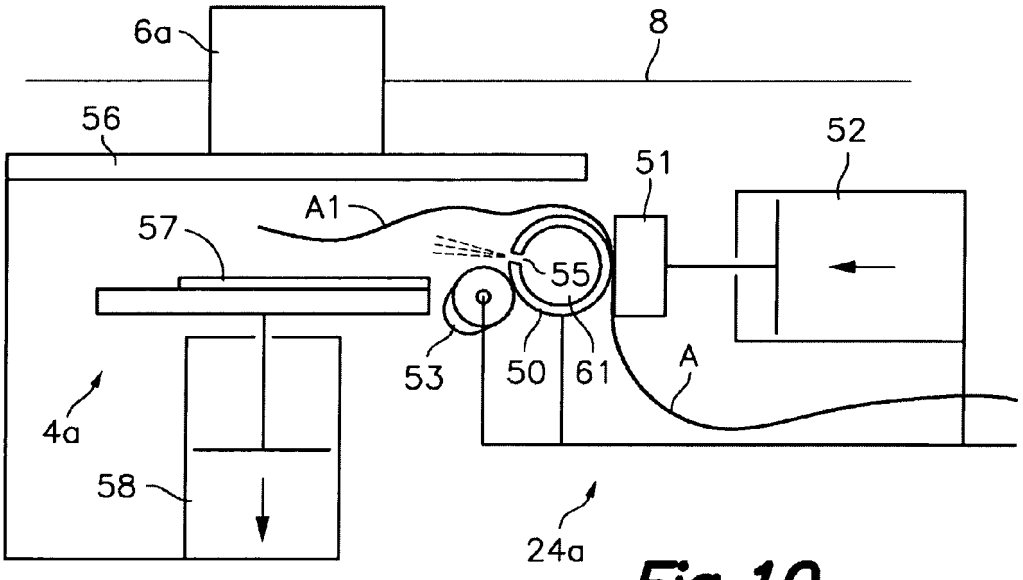

Fig. 10

EP 2 584 088 A1

Description

Technical Field

[0001] The present invention relates to a machine for spreading out and loading flat articles of clothing such as sheets or tablecloths, useful for loading such articles to a laundry processing unit, such as an ironing machine, dryer or the like.

Background of the invention

[0002] Machines for spreading out and loading flat articles of clothing comprising a frame supporting a conveyor belt and several loading stations served by respective operators in a semiautomatic loading mode are known. Each loading station comprises a pair of loading clamps in which the corresponding operator secures two contiguous corners of a large flat article of clothing, for example a sheet or a tablecloth. These loading clamps are moved from a loading position to a transferring position in which the loading clamps transfer the contiguous corners of the flat article of clothing to spreading clamps. The spreading clamps are then moved in a direction transverse to the forward direction of the conveyor belt such that they unfold the flat article of clothing, position it facing a loading end of the conveyor belt and smoothen it. Deposition means then deposit an upper end of the flat article of clothing on the conveyor belt and the movement of the conveyor belt loads the flat article of clothing thereon and transfers it to the laundry processing unit.

[0003] In some of these known machines, each of the loading clamps comprises a fixed loading support and a loading jaw driven by an actuator to catch and maintain a part of one of the corners of the flat article of clothing against one side of said loading support. One drawback of clamps of this type is the fact that the contiguous corners of the flat article of clothing are transferred from the loading clamps to the spreading clamps in conditions which do not assure a correct attachment of the corners in the spreading clamps, and this causes folds and wrinkles in the flat article of clothing when the same is subsequently deposited on the conveyor belt by the deposition means.

Disclosure of the Invention

[0004] The present invention contributes to solve the foregoing and other drawbacks by providing a machine for spreading out and loading flat articles of clothing comprising at least one conveyor belt moving in a loading direction, at least one pair of spreading clamps independently driven for moving along a guide rail transverse to said loading direction of the conveyor belt, and a plurality of loading stations, each of which is provided with a pair of loading clamps adjacent to one another driven for moving between a loading position, in which said loading clamps are located and arranged to catch respective contiguous corners of a flat article of clothing manually loaded by an operator in said loading station, and a delivery position, in which the loading clamps transfer said corners of said flat article of clothing to said pair of spreading clamps which are then moved along said guide rail for spreading out the flat article of clothing in front of a loading end of the conveyor belt.

[0005] Each of the loading clamps comprises a loading support and a loading jaw driven by a first actuator to catch and maintain a proximal portion of one of the corners of the flat article of clothing against one side of said loading support and an auxiliary loading jaw with yielding and recovery capacity to catch and maintain a distal portion of the corner of the flat article of clothing against an opposite second side of said loading support. The loading support is associated to an air blowing nozzle arranged for blowing an airflow against the flat article of clothing between said loading jaw and said auxiliary loading jaw.

[0006] Each of the spreading clamps comprises a pair of jaws, at least one of which is driven for moving between an open position and a closed position. Said distal portion of the corner, when it is released from said auxiliary loading jaw is pushed by said airflow and introduced between said pair of jaws of the spreading clamp so that it can be caught by the spreading clamp before the loading jaw opens.

[0007] This construction assures a reliable transfer of the contiguous corners of the flat article of clothing from the loading clamps to the spreading clamps in conditions which prevent the formation of folds and wrinkles in the flat article of clothing when it is subsequently spread out and positioned by the spreading clamps and deposited on the conveyor belt by the deposition means.

[0008] In an embodiment, the loading support is in the form of a substantially vertical bar having an upper end fixed to a frame and a free lower end, and the loading jaw and the auxiliary loading jaw are adjacent to an upper portion of the loading support.

[0009] In an embodiment, said auxiliary loading jaw is pushed by an elastic element to press against said opposite second side of the loading support, and the spreading clamp includes a releasing stop positioned for interfering said auxiliary loading jaw and make it yield when the loading clamp moves towards the spreading clamp and thereby releasing the distal portion from the corner of the flat article of clothing. The distal end of the corner of the flat article of clothing is caught by deforming said elastic element when the operator arranges the corner of the flat article of clothing partially surrounding a lower portion of the loading support and manually slides it to said upper portion. A control system includes an article detector, such as for example a photoelectric cell, positioned such that it detects the presence of the flat article of clothing when the latter reaches the upper portion of the loading support and controlling means activating the first actuator and thereby moving the loading jaw to a closed position to catch the proximal portion of the corner of the flat article of clothing between the loading

jaw and the loading support.

[0010] In another embodiment, said auxiliary loading jaw is suspended such that it can freely swing and is pushed by gravity to press against said opposite second side of the loading support. The distal end of the corner of the flat article of clothing is caught and retained by the effect of the weight of the auxiliary loading jaw when the operator arranges the corner of the flat article of clothing partially surrounding a lower portion of the loading support and manually slides it to said upper portion. The airflow produced by said blowing nozzle is strong enough for making the auxiliary loading jaw yield and thereby releasing the distal portion of the corner of the flat article of clothing.

[0011] In an embodiment, the loading support has an inner duct connected to a pressurized air supply source and said air blowing nozzle is in the form of a lateral opening formed in the loading support in communication with said inner duct.

[0012] In an embodiment, in each loading station there is an access protection screen driven by driving means for moving between an open position, in which the access protection screen allows the access of the operator to the loading clamps, and a closed position, in which the access protection screen prevents the access of the operator to the loading clamps, and an intermediate protection screen driven by driving means for moving between an open position, in which the intermediate protection screen allows the movement of the loading clamps between their loading and delivery positions, and a closed position, in which the intermediate protection screen prevents the access of the operator to the spreading clamps when the access protection screen is in its open position.

[0013] In an embodiment, the movements of the loading clamps between their loading positions and their delivery positions are driven by driving means controlled by controlling means configured for stopping said driving means in the event that the loading clamps encounter a resistance above a predetermined threshold during their movements between the loading positions and the delivery positions. This eliminates or minimizes the risk of injury for the operator in the event that he/she puts his/her hands between the loading clamps and the spreading clamps. With this control system for controlling the movements of the loading clamps, the function of the access protection screens may be unnecessary, thereby they can be omitted.

Brief Description of the Drawings

[0014] The foregoing and other features and advantages will be better understood from the following detail description of exemplary embodiments with reference to the attached drawings, in which:

Figure 1 is a schematic plan view of a machine for spreading out and loading flat articles of clothing according to an embodiment of the present invention;

Figure 2 is a schematic plan view of an enlarged detail showing a loading station of the machine for spreading out and loading flat articles of clothing of Figure 1;

Figure 3 is a schematic front view of a loading clamp of the loading station of Figure 2; and

Figures 4 to 8 are schematic plan views showing a sequence of actions during the transfer of a flat article of clothing from a loading clamp to a spreading clamp.

Figure 9 is a schematic front view of a loading clamp according to an alternative embodiment; and

Figures 10 to 12 are schematic plan views showing the action of transferring a flat article of clothing from the loading clamp of Figure 9 to several spreading clamps according to different embodiments.

Detailed Description of Exemplary Embodiments

[0015] First, referring to Figure 1, there is shown a machine for spreading and loading flat articles of clothing according to an embodiment of the present invention, which comprises a frame 10 supporting a conveyor belt 30 having a substantially horizontal or slightly inclined upper section moving in a loading direction D. The conveyor belt 30 has a loading end 30a on which there is deposited a duly spread out and positioned upper portion of flat articles of clothing A, and an unloading end 30b from which the flat articles of clothing A1, A2 spread out on the conveyor belt are transferred to a laundry processing unit 33, such as an ironing machine or a folding machine, schematicall depicted by means of dashed lines in Figure 1. Flat articles of clothing is understood as table linen elements and other clothing for use in the home, hospitals, hotels, restaurants, etc., such as tablecloths, napkins, sheets and towels, among others.

[0016] The mentioned loading end 30a of the conveyor belt 30 is frontally covered by a protective cover 11, and the machine includes three loading stations 1, two of which are adjacent to lateral ends of said protective cover 11, beyond corresponding lateral ends 30c, 30d of the conveyor belt 30, and a third loading station 1 is located in a central position between the other two loading stations 1, and facing an opening of the protective cover 11. The three loading stations 1 are used by respective operators P.

[0017] All along the width of the conveyor belt 30 and of the two loading stations 1 located at the lateral ends thereof a guide rail 8 arranged in a direction transverse to said loading direction D of the conveyor belt 30 is extended. Two pairs of spreading clamps 4a, 4b are installed on corresponding carriages 6a, 6b which are independently moved by driving means along said guide rail 8 between a receiving position, in which said pairs of spreading clamps 4a, 4b are adjacent to one another in one of the loading stations 1 (loading station 1 to the right of Figure 1), and a spreading out position, in which the

spreading clamps 4a, 4b of the corresponding pair are separated from one another and positioned facing the loading end of the conveyor belt 30.

[0018] Each loading station 1 includes a pair of loading clamps 24a, 24b moved by driving means in a direction substantially perpendicular to the guide rail 8 between a loading position and a transferring position. In said loading position, the pair of loading clamps 24a, 24b are in a position adjacent to a window of the loading station 1 accessible by the operator P, such that the loading clamps 24a, 24b can receive contiguous corners of the flat article of clothing A loaded manually by the corresponding operator P. In said transferring position, the pair of loading clamps 24a, 24b are adjacent to the spreading clamps 4a, 4b when the latter are in their receiving position and transfer the contiguous corners A1, A2 of the flat article of clothing A to the pair of spreading clamps 4a, 4b.

[0019] Each loading station 1 comprises a movable access protection screen 13 and a movable intermediate protection screen 27. The access protection screens 13 are driven by driving means for moving between an open position (shown by means of dashed lines) and a closed position (shown by means of thick lines) to allow or prevent the access of the operators P to the loading clamps 24a, 24b, respectively. The intermediate protection screens 27 are driven by driving means for moving between an open position (shown by means of dashed lines) to allow the movements of the loading clamps 24a, 24b between their loading and spreading out positions, and a closed position (shown by means of thick lines) to prevent the access of the operator P to the spreading clamps 4a, 4b when the access protection screen 13 is in its open position.

[0020] The two end loading stations 1 further include respective movable inner protection screens 15 substantially perpendicular to the guide rail 8. Each inner protection screen 15 is driven by driving means for moving between an open position, in which the inner protection screen 15 allows the movements of the spreading clamps 4a, 4b between their receiving and spreading out positions, and a closed position, in which the inner protection screen 15 is interposed between the corresponding loading station 1 and the spreading clamps 4a, 4b when the same are not in the loading station 1.

[0021] The machine includes an additional safety element consisting of controlling means which control driving means driving the movements of the loading clamps 24a, 24b, between their loading positions and their delivery positions such that the controlling means stop said driving means in the event that the loading clamps 24a, 24b encounter a resistance above a predetermined threshold during their movements between the loading positions and the delivery positions, for example in the event that an operator P puts a hand between the loading clamps 24a, 24b and the spreading clamps 4a, 4b.

[0022] Figure 2 shows one of the loading stations 1 with its loading clamps 24a, 24b in the loading position securing the contiguous corners A1, A2 of a flat article of clothing A manually loaded by an operator, and the spreading clamps 4a, 4b in the receiving position. Figure 2 also shows the corresponding access protection screen 13 in the closed position, the corresponding intermediate protection screen 27 in the open position, and the corresponding inner protection screen 15 in the closed position.

[0023] Now in relation with Figures 3 to 8, they describe the construction of one of the loading clamps 24a and one of the spreading clamps 4a, as well as the operation of the same for transferring one of the corners A1 of the flat article of clothing A from one to the other, with the understanding that the construction and the operation of the other loading clamps 24b and of the other spreading clamps 4b is symmetrical and completely similar.

[0024] As is better shown in Figure 3, each of the loading clamps 24a comprises a loading support 50 in the form of a substantially vertical bar having an upper end fixed to a frame 10 of the machine and a free lower end. Adjacent to an upper portion 50a of the loading support 50 there are a loading jaw 51 and an auxiliary loading jaw 53. The loading jaw 51 is movable and is driven by a first actuator 52 to catch and maintain a proximal portion of one of the corners A1 of the flat article of clothing A against one side of said loading support 50 (see also Figures 4 to 8) whereas the auxiliary loading jaw 53 is supported by an elastic element 54 such that the elastic element 54 pushes the auxiliary loading jaw 53 to catch and maintain a distal portion of the corner A1 of the flat article of clothing A against an opposite second side of said loading support 50.

[0025] To secure the corner A1 of the flat article of clothing A in the loading clamp 24a, the operator first arranges the corner A1 of the flat article of clothing A partially surrounding a lower portion 50b of the loading support 50 and then slides the corner A1 manually to said upper portion 50a of the loading support 50. When the corner A1 of the flat article of clothing A reaches said upper portion 50a of the loading support 50, the distal end of the corner A1 of the flat article of clothing A is immediately caught by elastic deformation of said elastic element 54, whereas the first actuator 52 of the loading jaw 51 is activated by a control system comprising an article detector 60, such as photoelectric cell, provided for detecting the presence of the flat article of clothing A in the upper portion 50a of the loading support 50 and controlling means activating the first actuator 52 when the flat article of clothing A is detected by the article detector 60, and thereby moving the loading jaw 51 to a closed position catching the corner A1 of the flat article of clothing A between the loading jaw 51 and the loading support 50.

[0026] The vertical bar forming the loading support 50 has an inner duct 61 connected to a pressurized air supply source (not shown) and a lateral opening in communication with said inner duct 61 forming an air blowing nozzle 55 the function of which is explained below.

[0027] As are better shown in Figures 4 to 8, the jaws of each of the spreading clamps 4a comprise a spreading support 56 fixed with respect to the corresponding carriage 6a (Figure 1), a movable spreading jaw 57 driven by a second actuator 58 for pressing the spreading jaw 57 against said spreading support 56, and a release stop 59 located in the path of the auxiliary loading jaw 53 when the loading clamp 24a moves from its loading position to its transferring position. In the embodiment shown, this release stop 59 is fixed to the spreading jaw 57 and moves therewith, although alternatively it could be arranged in a fixed position.

[0028] In relation with Figures 4 to 8, the operation of the loading clamps 24a, 24b in cooperation with the spreading clamps 4a, 4b to transfer the corners A1, A2 of the flat article of clothing A from one to another is described.

[0029] As shown in Figure 4, once the corner A1 of the flat article of clothing A is secured in the loading clamp 24a, with the proximal portion of the corner A1 caught by the loading jaw 51 against one side of the loading support 50 and the distal portion of the corner A1 caught by the auxiliary loading jaw 53 against an opposite second side of the loading support 50, the loading clamp moves towards the corresponding spreading clamp 4a, the spreading jaw 57 thereof is in an open position with respect to the spreading support 56.

[0030] The Figure 5 shows how, by virtue of the specific positioning of the release stop 59 of the spreading clamp 4a when its spreading jaw 57 is in the open position, the release stop 59 stops the auxiliary loading jaw 53 of the loading clamp 24a. An elastic deformation of the elastic element 54 allows keeping the auxiliary loading jaw 53 stopped by the release stop 50 while the loading clamp 24a continues moving forward until reaching its end of travel, which is reached in the embodiment illustrated when the loading support 50 of the loading clamp 24a abuts the spreading support 56 of the spreading clamp 4a.

[0031] In this position, the elastic deformation of the elastic element 54 makes the auxiliary loading jaw 53 open and the distal portion of the corner A1 of the flat article of clothing A is released while the proximal portion of the corner A1 continues to be caught between the loading support 50 and the loading jaw 51 of the loading clamp 24a and additionally between the loading support 50 of the loading clamp 24a and the spreading support 56 of the spreading clamp 4a. Then, an airflow blown from said air blowing nozzle 55 against the flat article of clothing A between said loading jaw 51 and said auxiliary loading jaw 53 pushes the distal portion of the corner A1 such that this distal portion is introduced between the spreading support 56 and the spreading jaw 57 of the spreading clamp 4a.

[0032] Next, as shown in Figure 6, the second actuator 58 is activated for moving the spreading jaw 57 of the spreading clamp 4a to its closed position, whereby the distal portion of the corner A1 of the flat article of clothing A is caught between the spreading support 56 and the spreading jaw 57 of the spreading clamp 4a.

[0033] From this position, as shown in Figure 7, the first actuator 52 is activated for moving the loading jaw 51 of the loading clamp 24a to its open position, whereby the proximal portion of the corner A1 of the flat article of clothing A is released from the loading clamp 24a while the distal portion continues to be caught by the spreading clamp 24a.

[0034] Finally, as shown in Figure 8, once the proximal portion of the corner A1 of the flat article of clothing A has been released from the loading clamp 24a, the latter is again moved by its driving means to the loading position while the corner A1 of the flat article of clothing A remains transferred to the spreading clamp 4a in such conditions which assure subsequent deposition on the conveyor belt 30 without folds or wrinkles.

[0035] Figure 9 shows one of the loading clamps 24a according to an alternative embodiment which, similarly to that described above in relation with Figure 3, comprises a loading support 50 in the form of a substantially vertical bar having an upper end fixed to the frame 10 of the machine and a free lower end. A loading jaw 51 and an auxiliary loading jaw 53 are adjacent to the upper portion 50a of the loading support 50. The loading jaw 51 is driven by a first actuator 52 to catch and maintain a proximal portion of one of the corners A1 of the flat article of clothing A against one side of said loading support 50, whereas the auxiliary loading jaw 53 is configured and arranged such that it has yielding and recovery capacity. The loading support 50 includes an inner duct 61 and a blowing nozzle 55 (Figures 10 to 12). An article detector 60, such as a photoelectric cell is arranged for detecting the presence of the flat article of clothing A in the upper portion 50a of the loading support 50.

[0036] The difference of this embodiment shown in Figure 9 lies in the operation of the auxiliary loading jaw 53 which is suspended from the frame 10 such that it can freely swing and is pushed by gravity to press against said opposite second side of the loading support 50 and thereby catch and maintain the distal portion of the corresponding corner A1 of the flat article of clothing A against the opposite second side of the loading support 50. Another difference is that the loading support 50 has an externally cylindrical shape (Figures 10 to 12).

[0037] In the embodiment shown in Figure 9, the auxiliary loading jaw 53 is conical-shaped with a relatively low degree of tapering and is arranged with a broadest end 53a on the upper side and a narrowest end 53b on the lower side. A rod inserted loosely through a hole 62 of the frame 10 extends upwards from said broadest end 53a and a stop 63 fixed to the rod keeps the auxiliary loading jaw 53 hanging from the frame 10 with a certain play. The distance between the shaft of the auxiliary loading jaw 53 at the point of connection with the frame 10 and the outer cylindrical surface of the loading support 50 is slightly less than the radius of the broadest part 53a of the auxiliary loading jaw 53, such that when the aux-

iliary loading jaw 53 hangs freely by gravity this broadest end 53a contacts the loading support 50 and the narrowest end 53b is sufficiently separated from the loading support 50 to facilitate the manual introduction of the flat article of clothing A between the auxiliary loading jaw 53 and the loading support 50.

[0038] The auxiliary loading jaw 53 has a mass selected on purpose so that the pressure exerted by the auxiliary loading jaw 53 against the loading support 50 is sufficient to catch and retain the distal portion of the corner A1, A2 of the flat article of clothing A when the blowing nozzle 55 is inactive. Nevertheless, when the blowing nozzle 55 is activated (Figures 10 to 12), the airflow produced by the same is strong enough for making the auxiliary loading jaw 53 yield and thereby releasing the distal portion of the corner A1, A2 of the flat article of clothing A.

[0039] Figure 10 shows the loading clamp 24a of Figure 9 interacting with a spreading clamp 4a similar to that described above in relation with Figures 4 to 8 which comprises a spreading support 56 fixed with respect to the corresponding carriage 6a (Figure 1), and a movable spreading jaw 57 driven by a second actuator 58 for moving between open and closed positions. When the loading clamp 24a is in the transferring position (Figure 10) and the spreading jaw 57 is in an open position, the airflow produced by the blowing nozzle 55 releases the distal portion of the corner A1 of the flat article of clothing A and introduces it between the spreading support 56 and the spreading jaw 57 of the spreading clamp 4a. Then the spreading jaw 57 is moved to the closed position, the loading jaw 51 of the loading clamp 24a is moved to the open position and the loading clamp 24a is moved again to the loading position (not shown).

[0040] Figure 11 shows the loading clamp 24a of Figure 9 interacting with a spreading clamp 4a according to another alternative embodiment which comprises a fixed spreading support 56 and a movable spreading jaw 57 driven by a second actuator 58 for moving between open and closed positions. The only difference with respect to the spreading clamp 4a described in relation with Figure 10 is that the spreading jaw 57 is provided with a pivoting movement about a pivot shaft 64 instead of a linear movement.

[0041] Figure 12 shows the loading clamp 24a of Figure 9 interacting with a spreading clamp 4a according to yet another alternative embodiment which comprises a fixed spreading support 56 and a moveable spreading jaw 57 driven by a second actuator 58 for moving between open and closed positions, where the spreading jaw 57 is provided with a pivoting movement about a pivot shaft 64. The only difference with respect to the spreading clamp 4a described in relation with Figure 11 is that the spreading support 56 and the spreading jaw 57 are in reverse positions, i.e., the fixed spreading support 56 is located on the side facing the loading station and the movable spreading jaw 57 is located on the inner side of the machine.

[0042] Figure 12 further shows a small screen 65 fixed to the frame 10 and arranged to prevent the distal portion of the corner A1 of the flat article of clothing A from leaving the space between the spreading support 56 and the spreading jaw 57 of the spreading clamp 4a in the open position once released and propelled by the airflow produced by the blowing nozzle 55.

[0043] Modifications, variations and combinations will readily occur to a person skilled in the art from the embodiments shown and described without departing from the scope of the present invention as defmed in the attached claims.

Claims

1. A machine for spreading out and loading flat articles of clothing, comprising:

at least one conveyor belt (30) moving in a loading direction (D);
at least one pair of spreading clamps (4a, 4b) independently driven for moving along a guide rail (8) transverse to said loading direction (D); and
a plurality of loading stations (1), each provided with a pair of loading clamps (24a, 24b) driven for moving between a loading position, wherein said loading clamps (24a, 24b) are arranged to catch respective contiguous corners (A1, A2) of a flat article of clothing (A) manually loaded by an operator (P) in said loading station (1), and a delivery position, wherein the loading clamps (24a, 24b) transfer said corners (A1, A2) of said flat article of clothing (A) to said pair of spreading clamps (4a, 4b), which are then moved along said guide rail (8) for spreading out the flat article of clothing (A1) in front of a loading end (1a) of the conveyor belt (30);

wherein each of the loading clamps (24a, 24b) comprises a loading support (50) and a loading jaw (51) driven by a first actuator (52) to catch and maintain a proximal portion of one of the corners (A1, A2) of the flat article of clothing (A) against one side of said loading support (50); and each of the spreading clamps (4a, 4b) comprises a pair of jaws at least one of them driven for moving between an open position and a closed position;

characterized in that each of the loading clamps (24a, 24b) further comprises:

an auxiliary loading jaw (53) with yielding and recovery capacity to catch and maintain a distal portion of the corner (A1, A2) of the flat article of clothing (A) against an opposite second side of said loading support (50); and
an air blowing nozzle (55) associated to the loading support (50) and arranged for blowing an

airflow against the flat article of clothing (A) between said loading jaw (51) and said auxiliary loading jaw (53), wherein said distal portion of the corner (A1, A2) released from said auxiliary loading jaw (53) is pushed by said airflow and introduced between said pair of jaws of the spreading clamp (4a, 4b) so that it can be caught by the spreading clamp (4a, 4b) before the loading jaw (51) is opened.

2. The machine for spreading out and loading flat articles of clothing according to claim 1, **characterized in that** said auxiliary loading jaw (53) is pushed by an elastic element (54) to press against said opposite second side of the loading support (50), and the spreading clamp (4a, 4b) includes a release stop (59) positioned for interfering said auxiliary loading jaw (53) and make it yield when the loading clamp (24a, 24b) moves towards the spreading clamp (4a, 4b) and thereby releasing the distal portion of the corner (A1, A2) of the flat article of clothing (A).

3. The machine for spreading out and loading flat articles of clothing according to claim 1, **characterized in that** said auxiliary loading jaw (53) is suspended such that it can swing and is pushed by gravity against said opposite second side of the loading support (50) and the airflow produced by said blowing nozzle (55) is strong enough for making the auxiliary loading jaw (53) yield and thereby releasing the distal portion of the corner (A1, A2) of the flat article of clothing (A).

4. The machine for spreading out and loading flat articles of clothing according to claim 1, 2 or 3, **characterized in that** said pair of jaws of each of the spreading clamps (4a, 4b) comprises a spreading support (56) and a spreading jaw (57) driven by a second actuator (58) for pressing against said spreading support (56).

5. The machine for spreading out and loading flat articles of clothing according to any one of the preceding claims, **characterized in that** the loading support (50) is in the form of a substantially vertical bar having an upper end fixed to a frame (10) and a free lower end, and the loading jaw (51) and the auxiliary loading jaw (53) are adjacent to an upper portion (50a) of the loading support (50).

6. The machine for spreading out and loading flat articles of clothing according to claim 5, **characterized in that** the distal end of the corner (A1, A2) of the flat article of clothing (A) is caught by deforming said elastic element (54) when the operator (P) arranges the corner (A1, A2) of the flat article of clothing (A) partially surrounding a lower portion (50b) of the loading support (50) and manually slides it to said upper portion (50a).

7. The machine for spreading out and loading flat articles of clothing according to claim 5, **characterized in that** the distal end of the corner (A1, A2) of the flat article of clothing (A) is caught by the effect of the weight of the auxiliary loading jaw (53) against the loading support (50) when the operator (P) arranges the corner (A1, A2) of the flat article of clothing (A) partially surrounding a lower portion (50b) of the loading support (50) and manually slides it to said upper portion (50a).

8. The machine for spreading out and loading flat articles of clothing according to claim 6 or 7, **characterized in that** a control system comprises an article detector (60) provided for detecting the presence of the flat article of clothing (A) in the upper portion (50a) of the loading support (50) and controlling means for activating the first actuator (52) and thereby moving the loading jaw (51) to a closed position.

9. The machine for spreading out and loading flat articles of clothing according to claim 8, **characterized in that** said article detector (60) comprises a photoelectric cell.

10. The machine for spreading out and loading flat articles of clothing according to claim 1, **characterized in that** the loading support (50) has an inner duct (61) connected to a pressurized air supply source and said air blowing nozzle (55) is in the form of a lateral opening formed in the loading support (50) in communication with said inner duct (61).

11. The machine for spreading out and loading flat articles of clothing according to any one of the preceding claims, **characterized in that** the movements of the loading clamps (24a, 24b) between their loading positions and their delivery positions are driven by driving means controlled by controlling means configured for stopping said driving means in the event that the loading clamps (24a, 24b) encounter a resistance above a predetermined threshold during their movements between the loading positions and the delivery positions.

12. The machine for spreading out and loading flat articles of clothing according to any one of the preceding claims, **characterized in that** each loading station (1) comprises a intermediate protection screen (27) driven for moving between an open position to allow the movements of the loading clamps (24a, 24b) between their loading and spreading out positions, and a closed position to prevent the access of the operator (P) to the spreading clamps (4a, 4b) when the access protection screen (13) is in its open position.

13. The machine for spreading out and loading flat articles of clothing according to any one of the preceding claims, **characterized in that** each loading station (1) comprises an access protection screen (13) driven for moving between an open position and a closed position to allow or prevent the access of the operator (P) to the loading clamps (24a, 24b), respectively.

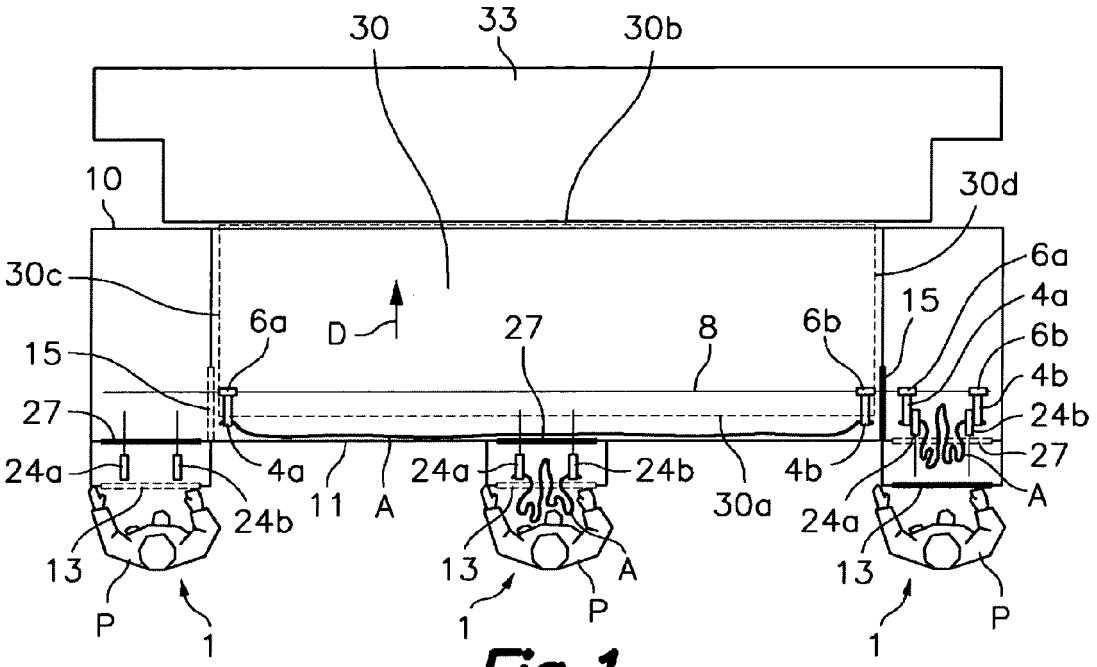
30
33
30b
10
30d
30c
6a
D
27
8
6b
15
4a
6b
4b
24b
27
A
15
27
24a
4a
11
A
24a
24b
30a
4b
24a
24b
13
P
1
13
A
P
1
13
P
1

Fig. 1

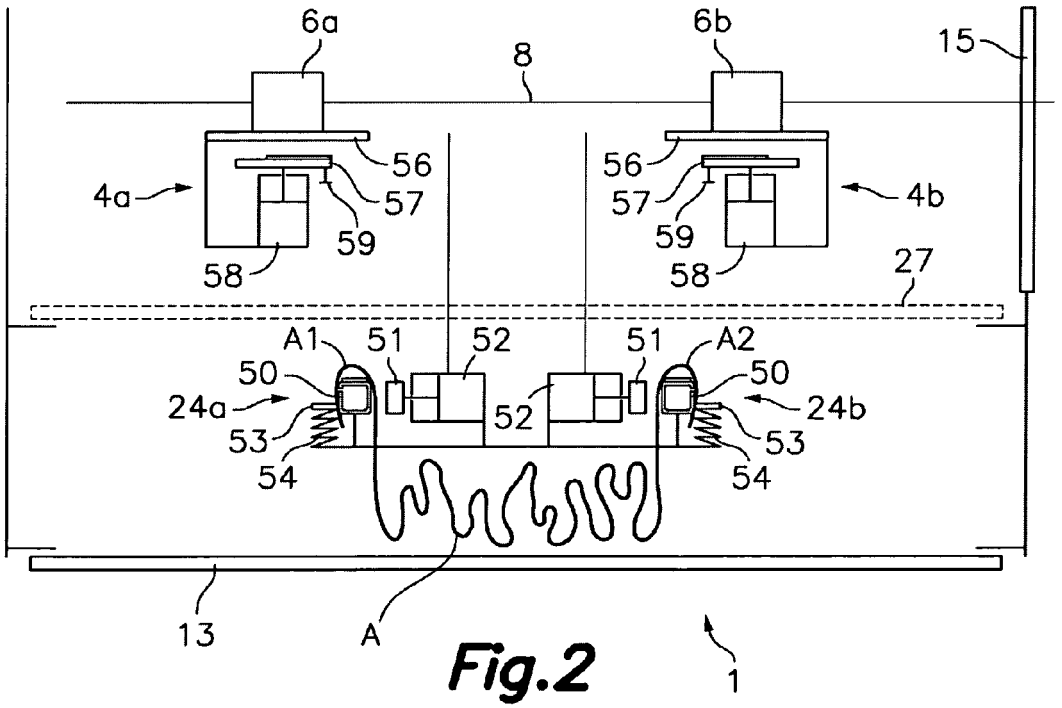
6a
8
6b
15
56
4a
57
59
58
56
57
59
58
4b
27
A1
51
52
51
A2
50
50
24a
52
24b
53
53
54
54
13
A
1

Fig. 2

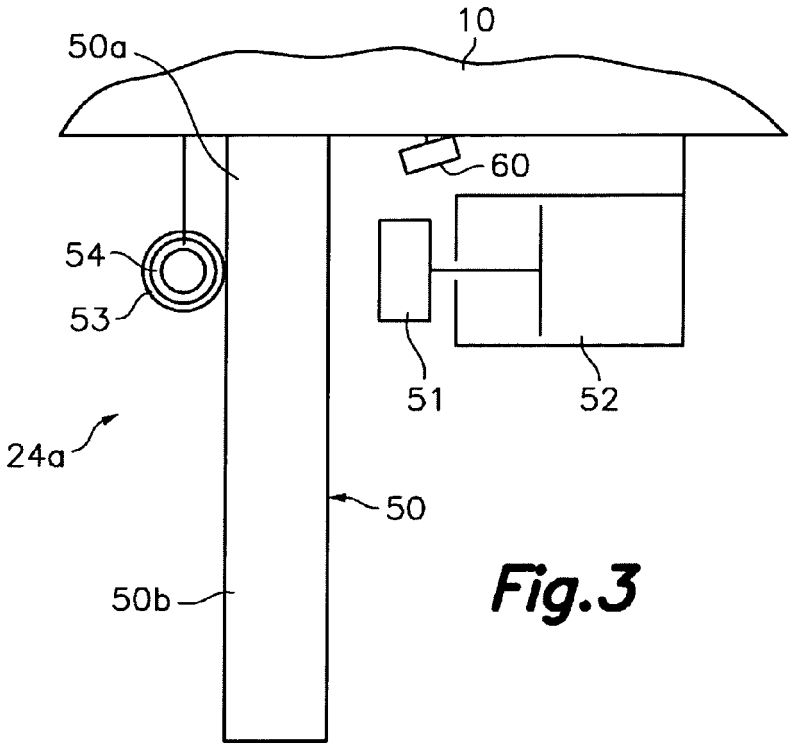
10
50a
60
54
53
51
52
24a
50
50b

Fig.3

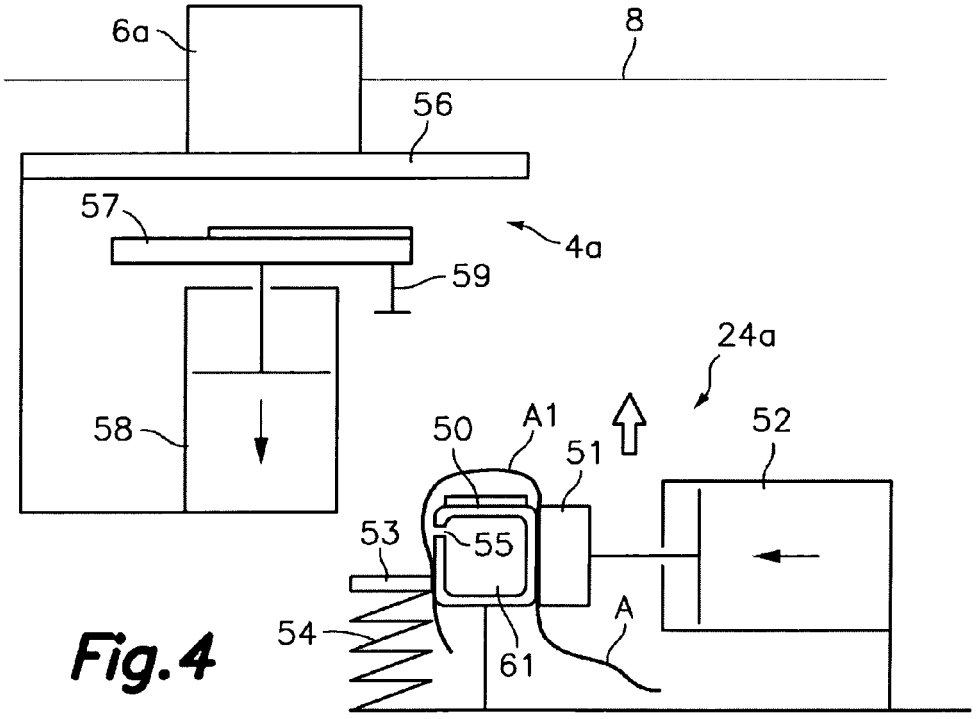
6a
8
56
57
4a
59
24a
58
50
A1
51
52
53
55
54
61
A

Fig.4

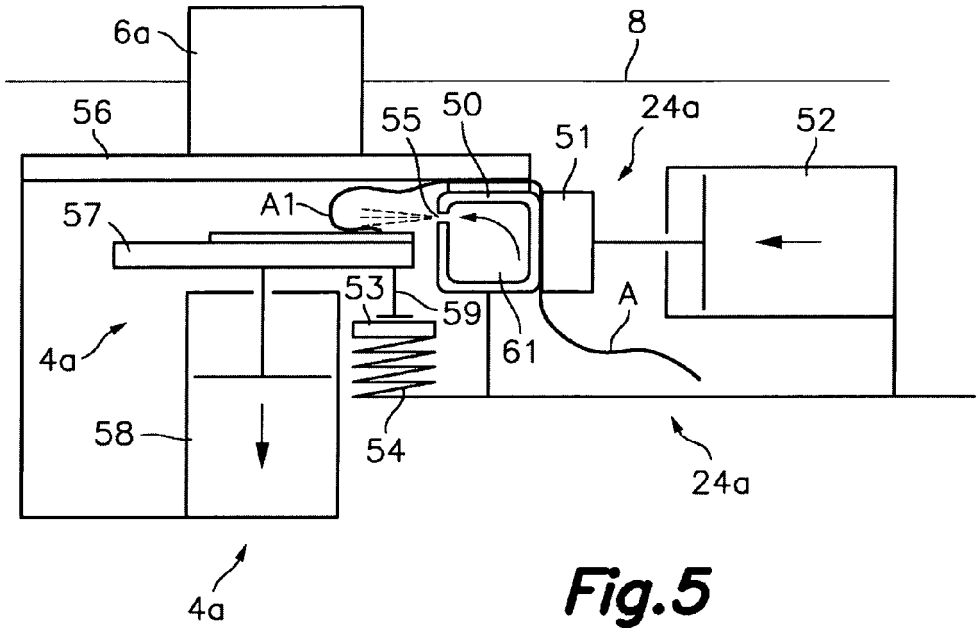
6a
8
56
55
50
24a
52
51
A1
57
53
59
A
4a
61
58
54
24a
4a

Fig.5

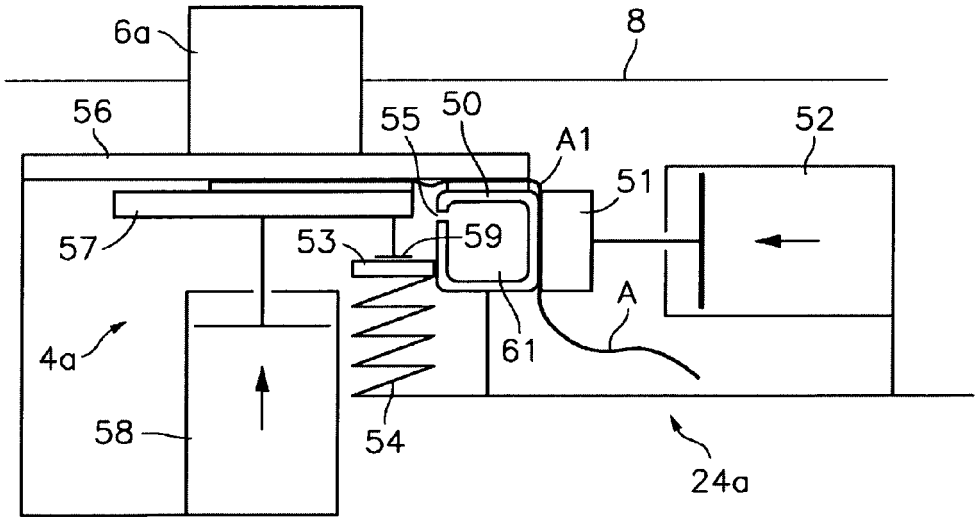
6a
8
56
55
50
A1
52
51
57
53
59
A
4a
61
58
54
24a

Fig.6

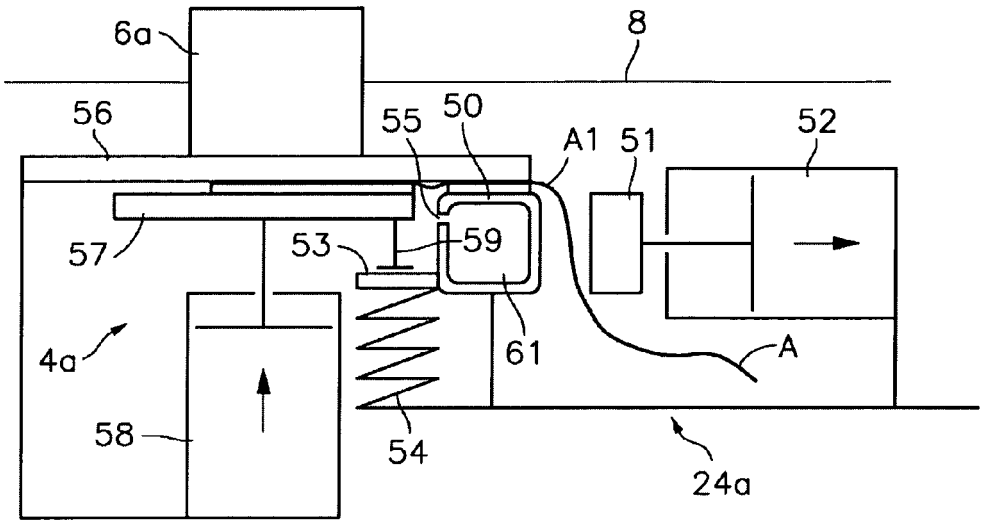
6a
8
56
55
50
A1
51
52
57
53
59
4a
61
A
58
54
24a

Fig.7

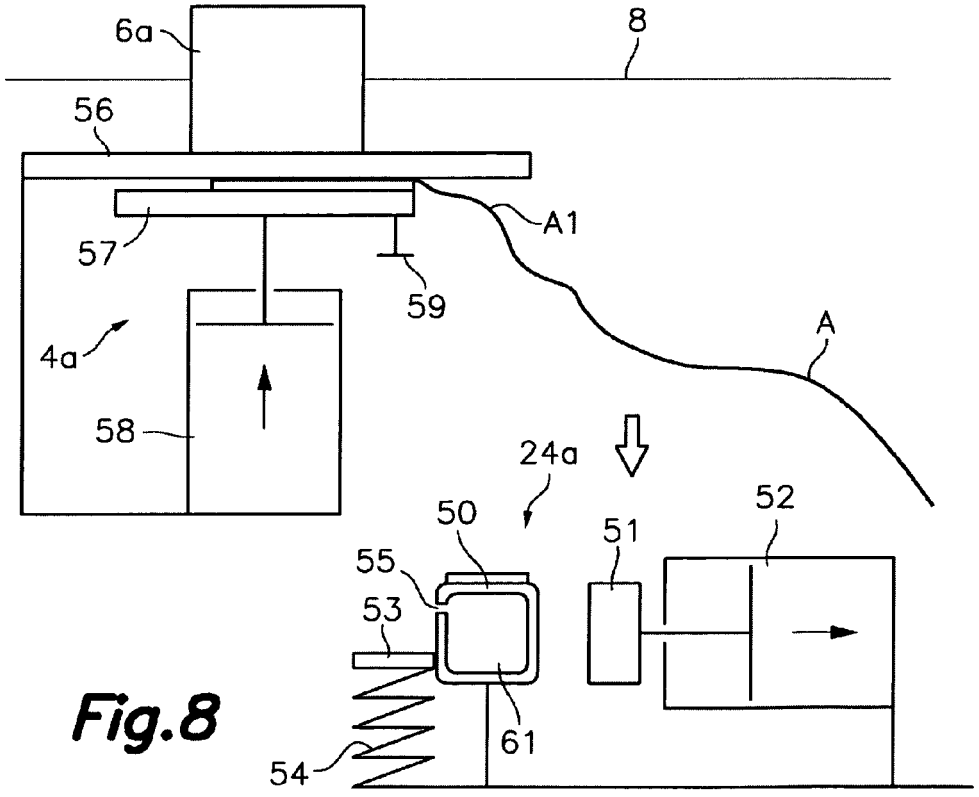
6a
8
56
A1
57
59
4a
A
58
24a
50
51
52
55
53
61
54

Fig.8

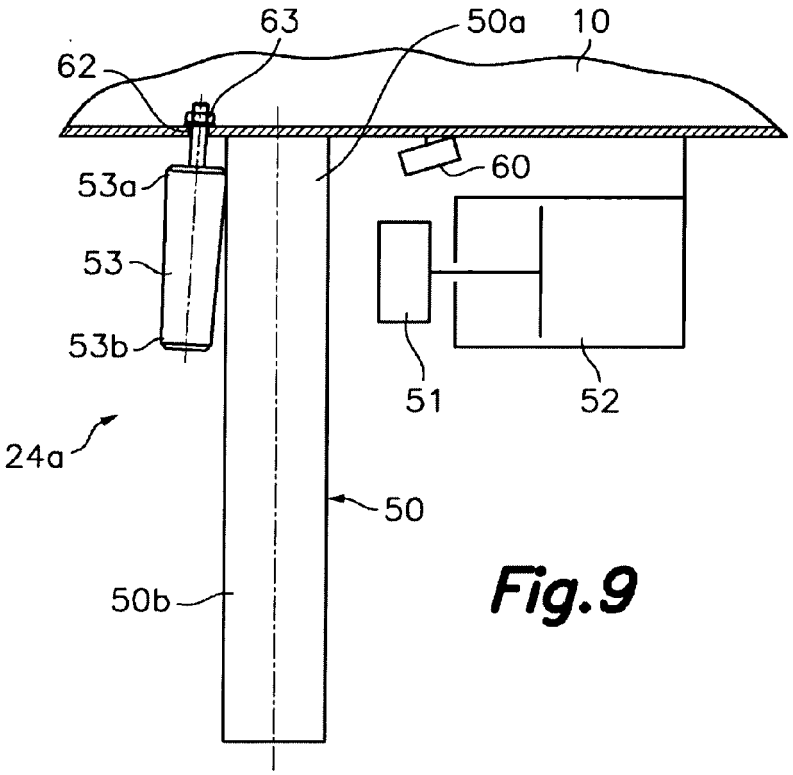
63
50a
10
62
60
53a
53
53b
51
52
24a
50
50b

Fig.9

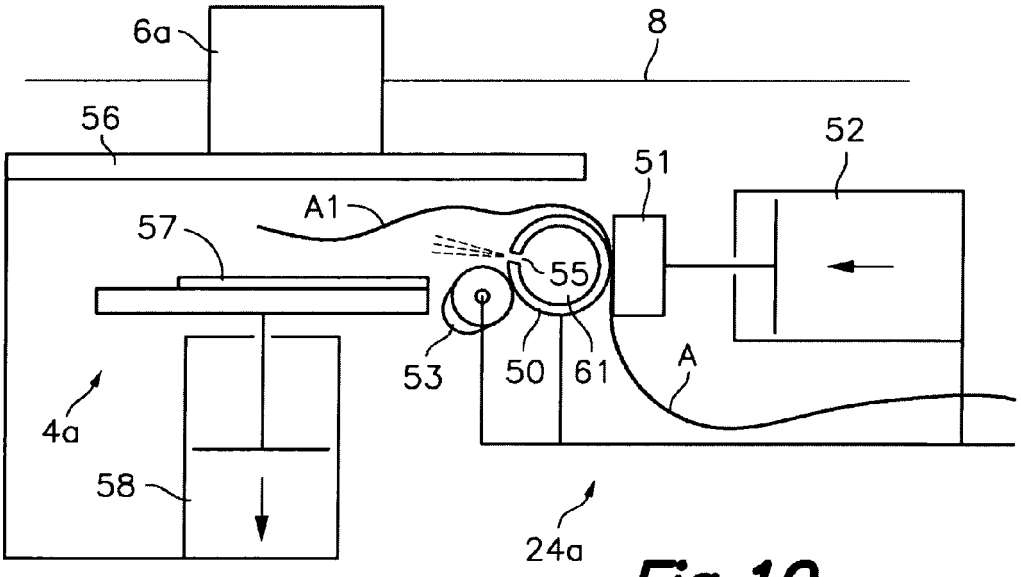
6a
8
56
52
51
A1
57
55
53
50
61
A
4a
58
24a

Fig.10

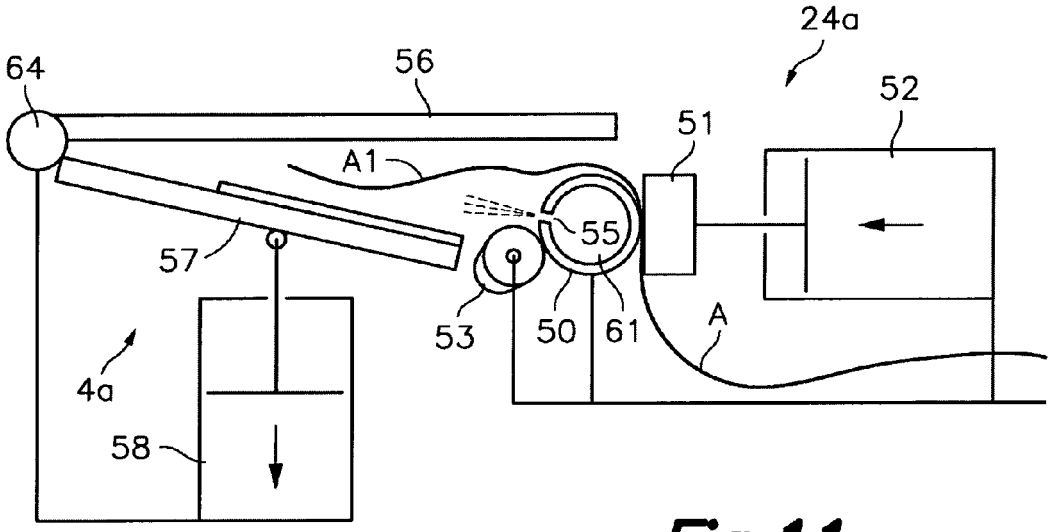
24a
64
56
52
51
A1
55
57
53
50
61
A
4a
58

Fig.11

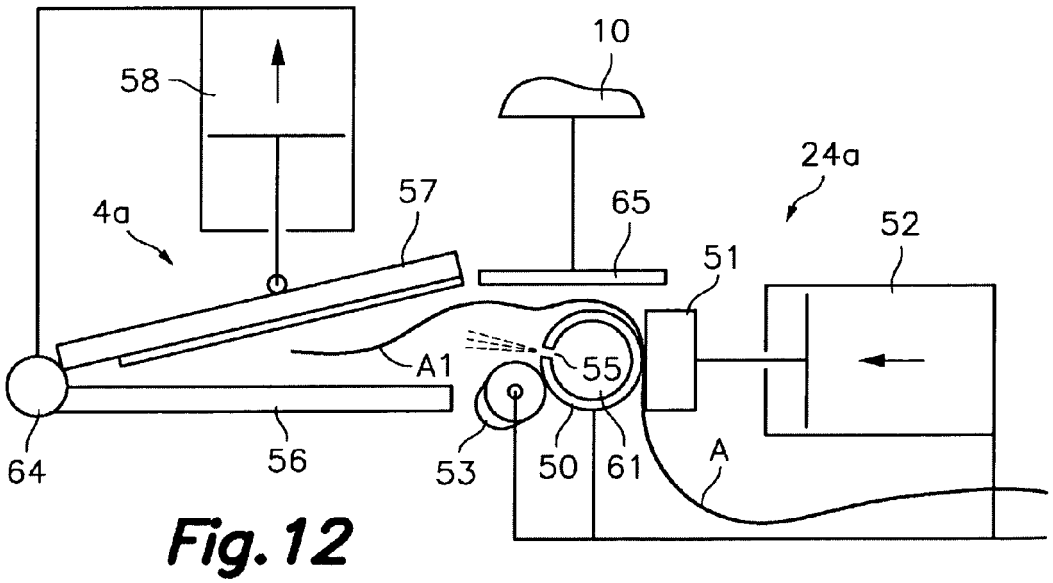
10
58
24a
4a
57
65
52
51
A1
55
64
56
53
50
61
A

Fig.12

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 11 38 0096

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	EP 0 523 872 A1 (WECOTEC LTD [GB]) 20 January 1993 (1993-01-20) * page 1, lines 1-11; page 5, line 13 - page 7, line 16; claims; figures *	1,4-6,8, 9 12,13 2,3,7, 10,11	INV. D06F67/04
Y A	FR 2 810 347 A1 (JEAN MICHEL SOC [FR]) 21 December 2001 (2001-12-21) * page 6, lines 17-28; claims 1-4; figures *	12,13 1-11	
A	EP 1 690 976 A1 (JENSEN AG BURGDORF [CH]) 16 August 2006 (2006-08-16) * paragraphs [0001], [0015] - [0021], [0026] - [0034]; figures *	1-13	
A	DE 10 2005 024801 A1 (KANNEGIESSER H GMBH CO [DE]) 30 November 2006 (2006-11-30) * the whole document *	1-13	
			TECHNICAL FIELDS SEARCHED (IPC) D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 March 2013	Clivio, Eugenio

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

1 EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 38 0096

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-03-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0523872 A1	20-01-1993	DE 69209390 D1	02-05-1996
		EP 0523872 A1	20-01-1993
		EP 0637643 A2	08-02-1995
		US 5333402 A	02-08-1994
FR 2810347 A1	21-12-2001	FR 2810347 A1	21-12-2001
		WO 0196649 A1	20-12-2001
EP 1690976 A1	16-08-2006	EP 1690976 A1	16-08-2006
		US 2006191171 A1	31-08-2006
DE 102005024801 A1	30-11-2006	DE 102005024801 A1	30-11-2006
		WO 2006125656 A1	30-11-2006

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82