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(54) PACKAGING MACHINE, PACKAGING SYSTEM, AND PACKAGING METHOD

(57) A wrapping machine 90 of the present invention is the wrapping machine 90 configured to wrap a large batch that consists of a plurality of stacked small batches B of paper sheets, with a wrapping sheet S, each of the stacked small batches being bundled. In addition, a wrapping system 10 of the present invention includes a small-batch making machine 12 configured to make a small batch in which a plurality of paper sheets are bundled by a bundling member P, and a wrapping machine 90 configured to wrap a large batch, in which a plurality of small batches B made by the small-batch making machine 12 are stacked, with a wrapping sheet S, wherein the wrapping machine 90 is configured to wrap the large batch with the wrapping sheet S without bundling the large batch. In addition, a wrapping method of the present invention includes making a small batch B in which a plurality of paper sheets are bundled by a bundling member P, and wrapping a large batch, in which a plurality of the made small batches B are stacked, with a wrapping sheet S, wherein in wrapping the large batch, the large batch is wrapped with the wrapping sheet S without being bundled.

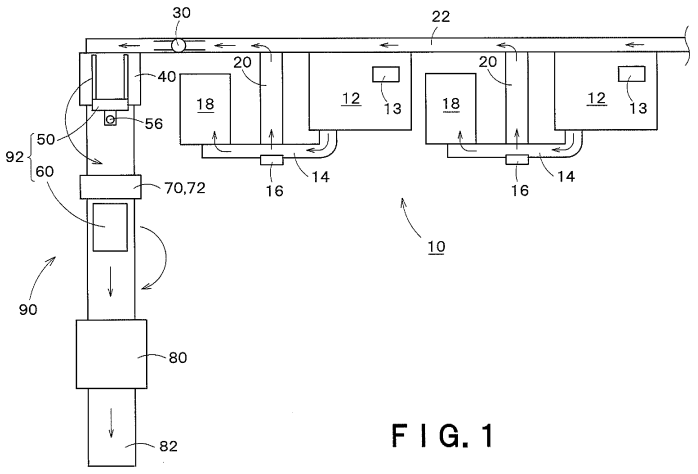

FIG. 1

EP 2 860 116 A1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a wrapping machine, a wrapping system and a wrapping method for wrapping a large batch that consists of a plurality of stacked small batches of paper sheets with a wrapping sheet, each of the stacked small batches being bundled.

BACKGROUND ART

[0002] There has been conventionally known a method of making sealed valuable securities by making a small batch formed by bundling valuable securities, such as a plurality of (e.g., one hundred) banknotes, with a first bundling paper, and by making a large batch by bundling, e.g., ten small batches, which are stacked on one another like layers, with a second bundling paper. Such a method of making sealed valuable securities is disclosed in, for example, JP2003-237726A. In accordance with the aforementioned method of making sealed valuable securities, a large batch in which valuable securities, such as one thousand banknotes, are sealed, can be obtained.

SUMMARY OF THE INVENTION

[0003] However, in the above-described conventional method of making sealed valuable securities, since the large batch is made by stacking a plurality of small batches like layers, and by bundling the stacked small batches with the second bundling paper, there are many bundling steps using bundling papers, which increases a running cost for the bundling papers. In addition, when the large batch is opened, an operator has a trouble to remove the bundling paper from the large batch, and the bundling paper removed from the large batch is disposed of as trash. Further, the second bundling paper bundling the large batch may cover the first bundling paper bundling the small batch to make invisible data (e.g., a bank name, a date of bundling and so on) printed on the first bundling paper. In this case, an operator cannot see the data printed on the first bundling paper.

[0004] The present invention has been made in view of the above circumstances. The object of the present invention is to provide a wrapping machine, a wrapping system and a wrapping method, in which, since a large batch is wrapped with a wrapping sheet without being bundled, a bundling member such as a bundling paper for bundling the large batch is no more needed whereby a running cost for the bundling member can be decreased, and a step of bundling a plurality of small batches with the bundling member is no more needed whereby the machine can have a smaller size.

[0005] The wrapping machine according to the present invention is a wrapping machine configured to wrap a large batch that consists of a plurality of stacked small batches of paper sheets, with a wrapping sheet, each of the stacked small batches being bundled, wherein the large batch is wrapped with the wrapping sheet without being bundled.

[0006] According to such a wrapping machine, since the large batch is wrapped with a wrapping sheet without being bundled, a bundling member such as a bundling paper for bundling the large batch is no more needed whereby a running cost for the bundling member can be decreased, and a step of bundling the plurality of small batches with the bundling member is no more needed whereby the machine can have a smaller size.

[0007] The wrapping machine according to the present invention may include a holding mechanism configured to hold the large batch, wherein the large batch is wrapped with the wrapping sheet, while the large batch is being held by the holding mechanism.

[0008] In this case, the holding mechanism may include a first holding mechanism and a second holding mechanism, a part of the large batch held by the first holding mechanism and a part of the large batch held by the second holding mechanism may differ from each other, and the large batch may be delivered from the first holding unit to the second holding unit.

[0009] In addition, the large batch held by the first holding unit may be delivered, in a wrapped condition with the wrapping sheet, from the first holding unit to the second holding unit.

[0010] In addition, the wrapping machine may further include an adhering unit configured to thermally adhere the wrapping sheet wrapping the large batch, wherein the adhering unit is configured to thermally adhere the wrapping sheet wrapping the large batch having been delivered from the first holding unit to the second holding unit.

[0011] The wrapping machine according to the present invention may further include a heating unit configured to heat the large batch wrapped with the wrapping sheet, wherein the heating unit is configured to heat the wrapping sheet wrapping the large batch to thermally shrink the wrapping sheet.

[0012] In the wrapping machine according to the present invention, the small batch may be a batch that consists of a plurality of paper sheets bundled by a bundling member, and an adjusting mechanism configured to adjust a position of the bundling member on the small batch may be provided.

[0013] In this case, the adjusting mechanism may include a reversing unit configured to reverse the small batch to vary the position of the bundling member on the small batch.

[0014] In the wrapping machine according to the present invention, the wrapping sheet for wrapping the large batch may be transparent or translucent.

[0015] The wrapping system according to the present invention is a wrapping system including: a small-batch making machine configured to make a small batch that consists of a plurality of paper sheets bundled by a bundling member; and a wrapping machine configured to

wrap a large batch that consists of a plurality of stacked small batches each made by the small-batch making machine, with a wrapping sheet; wherein the wrapping machine is configured to wrap the large batch with the wrapping sheet without bundling the large batch.

[0016] According to such a wrapping system, since the large batch is wrapped with a wrapping sheet without being bundled, a bundling member such as a bundling paper for bundling the large batch is no more needed whereby a running cost for the bundling member can be decreased. In addition, since a step of bundling the plurality of small batches with the bundling member is no more needed, the machine can have a smaller size.

[0017] The wrapping method according to the present invention is a wrapping method including: making a small batch that consists of a plurality of paper sheets bundled by a bundling member; and wrapping a large batch, in which a plurality of the made small batches are stacked, with a wrapping sheet; wherein, in wrapping the large batch with the wrapping sheet, the large batch is wrapped with the wrapping sheet without being bundled.

[0018] According to such a wrapping method, since the large batch is wrapped with a wrapping sheet without being bundled, a bundling member such as a bundling paper for bundling the large batch is no more needed whereby a running cost for the bundling member can be decreased. In addition, since a step of bundling the plurality of small batches with the bundling member is no more needed whereby a machine used for carrying out the wrapping method of the present invention can have a smaller size.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Fig. 1 is a schematic structural view (plan view) showing a schematic structure of a wrapping system in one embodiment of the present invention;

Fig. 2 is a perspective view showing an appearance of a large batch wrapped with a wrapping sheet, which is made by the wrapping system shown in Fig. 1;

Fig. 3 is a perspective view showing detailed structures of a third transport path, an adjusting mechanism, and so on, in the wrapping system shown in Fig. 1;

Fig. 4 is a perspective view showing a detailed structure of a batch stacking unit in the wrapping system shown in Fig. 1;

Fig. 5A is a perspective view showing a detailed structure of a first holding unit in the wrapping system shown in Fig. 1;

Fig. 5B is a top view of the first holding unit shown in Fig. 5A;

Fig. 6 is a perspective view showing a detailed structure of a second holding unit in the wrapping system shown in Fig. 1;

Fig. 7 is a side view showing an operation that is performed when a large batch is delivered from the first holding unit to the second holding unit, in the wrapping system shown in Fig. 1;

Fig. 8 is a side view showing the operation that is performed when the large batch is delivered from the first holding unit to the second holding unit, in the wrapping system shown in Fig. 1;

Fig. 9A is a side view showing the operation that is performed when the large batch is delivered from the first holding unit to the second holding unit, in the wrapping system shown in Fig. 1;

Fig. 9B is a top view of the second holding unit, the large batch held by the second holding unit and the adhering units, which are shown in Fig. 9A, seen from above;

Fig. 10 is a side view showing the operation that is performed when the large batch is delivered from the first holding unit to the second holding unit, in the wrapping system shown in Fig. 1;

Fig. 11 is a side view showing the operation that is performed when the large batch is delivered from the first holding unit to the second holding unit, in the wrapping system shown in Fig. 1; and

Fig. 12 is a side view showing an operation that is performed when the large batch, which has been delivered to the second holding unit, is heated by a heating unit.

MODE FOR CARRYING OUT THE INVENTION

[0020] An embodiment of the present invention will be described herebelow with reference to the drawings. Figs. 1 to 12 are views showing a structure of a wrapping system according to this embodiment. Fig. 1 is a schematic structural view (plan view) showing a schematic structure of a wrapping system in one embodiment of the present invention, and Fig. 2 is a perspective view showing an appearance of a large batch wrapped with a wrapping sheet, which is made by the wrapping system shown in Fig. 1. Fig. 3 is a perspective view showing in detail structures of a third transport path, an adjusting mechanism, and so on, in the wrapping system shown in Fig. 1, and Fig. 4 is a perspective view showing a detailed structure of a batch stacking unit in the wrapping system shown in Fig. 1. Figs. 5A and 5B are views showing a detailed structure of a first holding unit in the wrapping system shown in Fig. 1, and Fig. 6 is a perspective view showing a detailed structure of a second holding unit in the wrapping system shown in Fig. 1. In addition, Figs. 7 to 11 are side views respectively showing an operation that is performed when a large batch is delivered from the first holding unit to the second holding unit, in the wrapping system shown in Fig. 1, and Fig. 12 is a side view showing an operation that is performed when the large batch, which has been delivered to the second holding unit, is heated by a heating unit.

[0021] A wrapping system 10 according to this embod-

iment is configured to wrap a large batch that consists of a plurality of stacked small batches of banknotes with a wrapping sheet S, each of the stacked small batches being bundled with a bundling paper P. Fig. 2 shows an appearance of the large batch wrapped with the wrapping sheet S. In the wrapping system 10 in this embodiment, a transparent or translucent resin film or the like is used as the wrapping sheet S. As shown in Fig. 2, in this embodiment, when the large batch is wrapped with the wrapping sheet S by the wrapping system 10, the large batch is wrapped with the wrapping sheet S without being bundled.

[0022] As shown in Fig. 1, the wrapping system 10 according to this embodiment includes one or more banknote handling machine(s) 12. Each banknote handling machine 12 is configured to perform various processes such as a banknote depositing process, a banknote dispensing process and so on. Each banknote handling machine 12 is equipped with a recognition and transport unit (not shown) that feeds set banknotes, one by one, into a machine body and recognizes the banknotes, and a small-batch making unit 13 that makes a small batch B by bundling a plurality of (e.g., one hundred) banknotes with a bundling paper P. The small batch B made by the small-batch making unit 13 is dispensed outside the machine body of the banknote handling machine 12. A first transport path 14 and a second transport path 20 are disposed correspondingly to each banknote handling machine 12.

[0023] As shown in Fig. 1, the first transport path 14 is connected to each banknote handling machine 12. The small batch B dispensed outside the machine body of the banknote handling machine 12 is transported along the first transport path 14. At this time, the small batch B is transported in a standing condition in the first transport path 14. In addition, the second transport path 20 is diverged from a mid part of the first transport path 14. A diverter 16 is disposed on a divergent position where the second transport path 20 is diverged from the first transport path 14. The diverter 16 is configured to selectively send the small batch B from the first transport path 14 to the second transport path 20, depending on a type of banknotes constituting the small batch B which has been dispensed outside the machine body of the banknote handling machine 12. More specifically, information showing as to whether the banknotes constituting the small batch B, which has been dispensed outside the machine body of the banknote handling machine 12, are fit banknotes or unfit banknotes, is transmitted to a control unit (not shown) that controls the diverter 16. When the banknotes constituting the small batch B, which has been dispensed outside the machine body of the banknote handling machine 12, are not fit banknotes but unfit banknotes, the small batch B is not transported from the first transport path 14 to the second transport path 20, but is transported to a stacking unit 18, which is connected to a downstream end of the first transport path 14, so as to be stacked in the stacking unit 18. On the other hand, when the banknotes constituting the small batch B, which has been dispensed outside the machine body of the banknote handling machine 12, are fit banknotes, the small batch B is diverged by the diverter 16 from the first transport path 14 so as to be transported to the second transport path 20. In the second transport path 20, the small batch B is transported by a transport conveyor (not shown) not in the standing condition but in a laterally lying condition.

[0024] As shown in Fig. 1, the wrapping system 10 has a third transport path 22 that is shared by the respective banknote handling machines 12. The small batch B transported along each second transport path 20 is sent to the third transport path 22. The third transport path 22 is configured to transport the small batch B in the left direction in Fig. 1. Fig. 3 shows a detailed structure of the third transport path 22. As shown in Fig. 3, the third transport path 22 is provided with a transport conveyor 22a. The transport conveyor 22a is configured to transport the small batch B in the standing condition. Although not shown in Fig. 3, the third transport path 22 has a guide unit that maintains the batch B in the standing condition while the batch B is transported by the transport conveyor 22a.

[0025] In addition, as shown in Fig. 1, an adjusting mechanism 30 is located on a position in the vicinity of a downstream end of the third transport path 22. The adjusting mechanism 30 is configured to adjust a position of the bundling paper P on the small batch B. In more detail, the bundling paper P, which is wound around the small batch B made by the small-batch making unit 13 of each banknote handling machine 12, is wound around the small batch B not at a central position of the small batch B, but at a position displaced rightward or leftward from the central position. Thus, when the plurality of (e.g., ten) small batches B are stacked to make a large batch, it is preferable that the positions of the bundling papers P are aligned along right positions or left positions. For this reason, the adjusting mechanism 30 for adjusting the position of the bundling paper P on the small batch B is provided.

[0026] As shown in Fig. 3, the adjusting mechanism 30 disposed on the third transport path 22 includes: a pair of holding arms 32 for holding the small batch B; a holding-arm support unit 33 supporting the respective holding arms 32; and a reversing unit 34 that rotates the holding-arm support unit 33 about a vertically extending axis in a direction shown by the arrow in Fig. 3. The position of the bundling paper P on the small batch B is adjusted by the adjusting mechanism 30 in the following manner. The pair of holding arms 32 firstly hold the small batch B from the right and left sides, and the reversing unit 34 rotates the holding-arm support unit 33 at 180 degrees to reverse the small batch B at 180 degrees, so that the position of the bundling paper P on the small batch B is varied. Namely, if the bundling paper P on the small batch B, which has not yet reached the adjusting mechanism 30, is slightly displaced leftward from the

central position of the small batch B, for example, the small batch B is reversed at 180 degrees by the reversing unit 34 of the adjusting mechanism 30, so that the position of the bundling paper P on the reversed small batch B is slightly displaced rightward from the central position of the small batch B.

[0027] In addition, as shown in Fig. 3, an imaging camera 36 is disposed on a position on the upstream side with respect to the adjusting mechanism 30 in the transport direction of the small batch B by the transport conveyor 22a. A side surface of the small batch B, which is transported in the standing condition by the transport conveyor 22a, is imaged by the imaging camera 36. Due to such an imaging camera 36, the position of the bundling paper P on the small batch B can be detected. In addition, data (e.g., a bank name, a date of bundling and so on), which are printed on the bundling paper P wound around the small batch B, can be read by the imaging camera 36. When the position of the bundling paper P on the small batch B, which is detected by the imaging camera 36, is reverse to a desired bundling position, the reversing unit 34 of the adjusting mechanism 30 reverses the small batch B at 180 degrees, so as to adapt the position of the bundling paper P on the small batch B to the desired bundling position. On the other hand, when the position of the bundling paper P on the small batch B, which is detected by the imaging camera 36, is the desired bundling position, the adjusting mechanism 30 does not rotate the small batch B at 180 degrees.

[0028] As shown in Fig. 1, a batch stacking unit 40 is disposed on a position in the vicinity of the downstream end of the third transport path 22. In the batch stacking unit 40, the small batches B transported from the third transport path 22 are stacked in the standing condition to align with each other in a horizontal direction. Fig. 4 shows a detailed structure of the batch stacking unit 40 disposed on a position in the vicinity of the downstream end of the third transport path 22. As shown in Fig. 4, the transport conveyor 22a of the third transport path 22 is equipped with a pusher member 24. The pusher member 24 is configured to push the small batch B on the transport conveyor 22a toward the batch stacking unit 40. In addition, the batch stacking unit 40 has a pair of presser plates 42 and 44. The presser plates 42 and 44 are configured to stack therebetween a plurality of (e.g., ten) small batches B in the standing condition to align with each other. More specifically, the presser plate 42 of the pair of presser plates 42 and 44, which is located nearer to the third transport path 22, includes two presser plates 42 that are linearly separated from each other. As shown by the arrows in Fig. 4, the presser plates 42 are configured to be movable in a width direction of the batch stacking unit 40 (in the right and left direction in Fig. 4). On the other hand, the presser plate 44 of the pair of presser plates 42 and 44, which is located farther from the third transport path 22, is configured to be movable in a depth direction of the batch stacking unit 40 (see the arrows in Fig. 4). In conjunction with a motion of the small batch B that is pushed by the pusher member 24 into the batch stacking unit 40, the presser plates 42 are opened and closed and the presser plate 44 is moved in the depth direction, so that the small batches B are sequentially stacked in the batch stacking unit 40. Herebelow, the plurality of (e.g., ten) small batches B stacked in the batch stacking unit 40 is also referred to as "large batch".

[0029] A first holding unit 50 is provided in the vicinity of the batch stacking unit 40. The first holding unit 50 is configured to hold the large batch stacked in the batch stacking unit 40. Figs. 5A and B show a detailed structure of the first holding unit 50. As shown in Figs. 5A and 5B, the first holding unit 50 includes a pair of holding arms 52 for holding the large batch (e.g., ten small batches B) from the right and left sides, a holding-arm support unit 54 supporting the pair of holding arms 52, and a vertically extending rotating shaft 56 provided on the holding-arm support unit 54. Each holding arm 52 has a bent portion 52a that is formed by bending inward its distal end portion (a left end portion in Figs. 5A and 5B). The rotating shaft 56 is configured to be rotated in a direction shown by the arrow in Fig. 5A, whereby the large batch held by the pair of holding arms 52 is rotated about the rotating shaft 56. In addition, the rotating shaft 56 is configured to be movable in the up and down direction of Fig. 5A, whereby the large batch held by the pair of holding arms 52 can be moved in the up and down direction. Between the pair of holding arms 52, there are provided a piston mechanism 58, which is attached to the holding-arm support unit 54, and a presser member 57, which is attached to a distal end (a left end in Fig. 5B) of the piston mechanism 58. When the piston mechanism 58 is expanded or contracted in the right and left direction in Fig. 5B, the presser member 57 is moved in the right and direction in Fig. 5A and Fig. 5B. The first holding unit 50 is configured to hold the large batch stacked in the batch stacking unit 40 in the following manner. The first holding unit 50 is moved to cover the large batch stacked in the batch stacking unit 40 from above, and then the piston mechanism 58 is expanded leftward in Fig. 5B so that the presser member 57 is moved toward the bent portions 52a of the respective holding arms 52. Thus, the large batch is sandwiched between the bent portions 52a of the respective holding arms 52 and the presser member 57.

[0030] In addition, as shown in Fig. 1, a second holding unit 60 is provided in addition to the first holding unit 50. The large batch held by the first holding unit 50 is delivered to the second holding unit 60. Fig. 6 shows a detailed structure of the second holding unit 60. As shown in Fig. 6, the second holding unit 60 includes a pair of holding arms 62 configured to hold the large batch from the up and down sides, and a holding-arm support unit 64 configured to support the pair of holding arms 62. The holding-arm support unit 64 is configured to be horizontally movable as shown by the arrows in Fig. 6. In addition, the pair of holding arms 62 are configured to be movable in the up and down direction in Fig. 6, with respect to the holding-arm support unit 64. The holding-arm support

unit 64 is equipped with a vertically extending rotating shaft 66. When the rotating shaft 66 is rotated, the holding-arm support unit 64 and the pair of holding arms 62, which are supported by the holding-arm support unit 64, are integrally rotated about the rotating shaft 66. As shown by the arrow in Fig. 1, when the holding-arm support unit 64 is rotated from the state shown in Fig. 6, about the rotating shaft 66 at 180 degrees, the pair of holding arms 62 and the large batch held by the holding arms 62 can be directed rightward in Fig. 6. The second holding unit 60 is movable both in the up and down direction and in the right and left direction in Fig. 6.

[0031] A method of delivering the large batch from the first holding unit 50 to the second holding unit 60 is explained with reference to Figs. 7 to 11. As shown in Fig. 4, the plurality of (e.g., ten) small batches B stacked in the batch stacking unit 40 are held all together as the large batch, by the first holding unit 50 from the right and left sides. Then, as shown by the arrow in Fig. 1, the rotating shaft 56 of the first holding unit 50 is rotated at 180 degrees, so that the direction of the large batch held by the first holding unit 50 is varied at 180 degrees. Thereafter, the large batch is delivered from the first holding unit 50 to the second holding unit 60.

[0032] As shown in Fig. 7 and the like, the wrapping sheet S, such as a resin film, is stretched along a vertical plane between the first holding unit 50 and the second holding unit 60. In more detail, as shown in Fig. 7 and the like, two wrapping sheet rolls 72 around which the wrapping sheet S is wound are arranged away from each other in the up and down direction. The wrapping sheet S is stretched along the vertical plane between the pair of wrapping sheet rolls 72. Although Fig. 7 and so on illustrate the wrapping sheet S stretched between the pair of wrapping sheet rolls 72 as a linear line, the wrapping sheet S extends actually planarly along a plane perpendicular to a sheet plane of Fig. 7 and so on. Adhering units 70 and 71 are disposed in the vicinity of the pair of wrapping sheet rolls 72. Structures of these adhering units 70 and 71 will be described in detail below.

[0033] In order that the large batch is delivered from the first holding unit 50 to the second holding unit 60, as shown in Fig. 5, the pair of holding arms 52 of the first holding unit 50, which hold therebetween the large batch, are firstly moved toward the second holding unit 60. At this time, the first holding unit 50 and the large batch held by the first holding unit 50 are moved to run through the wrapping sheet S stretched between the pair of wrapping sheet rolls 72. Thus, as shown in Fig. 8, upon arrival of the first holding unit 50 at the second holding unit 60, the large batch held by the first holding unit 50 is wrapped with the wrapping sheet S. Then, the large batch held by the first holding unit 50 is delivered, in the wrapped condition with the wrapping sheet S, from the first holding unit 50 to the second holding unit 60. After the large batch has been delivered from the first holding unit 50 to the second holding unit 60, the first holding unit 50 is moved leftward in Fig. 8 away from the second holding unit 60 (see Fig. 9A).

[0034] As shown in Figs. 9A and 9B, while the large batch wrapped with the wrapping sheet S is held by the second holding unit 60, the wrapping sheet S wrapping the large batch is thermally adhered by the adhering units 70 and 71. As described above, Fig. 9B is a top view of the second holding unit 60, the large batch held by the second holding unit 60, and the adhering units 70 and 71, which are shown in Fig. 9A, seen from above. As shown in Fig. 9A and so on, the adhering unit 70 includes a pair of up and down adhering units. The respective adhering units 70 are configured to thermally adhere rear ends of the wrapping sheet S covering the large batch (see Fig. 10), to separate this wrapping sheet S from a succeeding wrapping sheet S, and to join ends of the succeeding wrapping sheet S (see Fig. 11). To be more specific, as shown in Fig. 10, the pair of adhering units 70 sandwich therebetween the wrapping sheet S to cut the wrapping sheet S wrapping the large batch. In addition, the pair of adhering units 70 thermally adhere the rear ends of the wrapping sheet S completely wrapping the large batch. At this time, the pair of adhering units 70 also thermally adhere the wrapping sheets S reeled out from the respective wrapping sheet rolls 72. Thus, as shown in Fig. 11, the wrapping sheet S is again stretched along the vertical plane between the pair of wrapping sheet rolls 72. In addition, as shown in Figs. 9A and so on, the adhering unit 71 includes a pair of up and down adhering units 71. As shown in Fig. 9B, each of the pair of up and down adhering units 71 is composed of a pair of portions 71a and 71b that are separated from each other to sandwich therebetween the large batch held by the second holding unit 60 along the horizontal plane. The pair of portions 71a and 71b extend in a width direction of the large batch held by the second holding unit 60. These adhering units 71 are configured to thermally adhere both sides of the wrapping sheet S covering the large batch. As to the large batch held by the second holding unit 60, a front end of the wrapping sheet S is continuous from the beginning. Thus, by adhering the rear ends of the wrapping sheet S by means of the adhering units 70 and by adhering the right and left sides of the wrapping sheet S by means of the adhering units 71, the large batch is wrapped with the wrapping sheet S like a pouch. Fig. 2 shows the large batch (in which ten small batches B are stacked) completely wrapped with the wrapping sheet S.

[0035] Thereafter, as shown in Fig. 11, the large batch, which is completely wrapped with the wrapping sheet S, is held by the second holding unit 60, and the second holding unit 60 is moved so that the large batch is transported. More specifically, as shown in Fig. 1, the wrapping system 10 includes a heating unit 80 for heating the large batch wrapped with the wrapping sheet S. The heating unit 80 has a pair of up and down heating portions 81 that are separated from each other. Hot air is blown from the respective heating portions 81 to the large batch transported between the heating portions 81, so that the

large batch is heated. In addition, the heating unit 80 is equipped with a large-batch transport conveyor 82. The large-batch transport conveyor 82 is configured to transport the large batch to an area between the pair of up and down heating portions 81. Then, the holding-arm support unit 64 and the pair of holding arms 62 are rotated from the state shown in Fig. 11, about the rotating shaft 66 at 180 degrees. Thus, as shown in Fig. 12, the pair of holding arms 62 and the large batch held by these holding arms 62 are directed rightward, and thereafter the large batch held by the pair of holding arms 62 is placed on the large-batch transport conveyor 82. After that, the large-batch transport conveyor 82 is moved in a direction shown by the arrows in Fig. 12, so that the large batch is heated between the pair of up and down heating portions 81. Thus, the wrapping sheet S wrapping the large batch is thermally shrunk to conform to the shape of the large batch. In addition, after the large batch has been placed on the large-batch transport conveyor 82, the holding-arm support unit 64 and the pair of holding arms 62 are further rotated about the rotating shaft 66 at 180 degrees, so that the pair of holding arms 62 are directed leftward, so as to be ready for receiving a succeeding large batch. The large batch with the wrapping sheet S, which has been thermally shrunk by the heating unit 80, is conveyed by the large-batch transport conveyor 82, and is unloaded as a final product from the wrapping system 10.

[0036] In the present invention, a holding mechanism 92 for holding the large batch is composed of the first holding unit 50 and the second holding unit 60. In addition, a wrapping machine 90 for wrapping the large batch with the wrapping sheet S is composed of the adhering units 70, the adhering units 71, the wrapping sheet rolls 72, the holding mechanism 92 and the heating unit 80. In addition, in the present invention, each banknote handling machine 12 functions as a small-batch making machine for making a small batch B in which a plurality of banknotes are bundled by a bundling paper P.

[0037] As can be understood from above, according to the wrapping machine 90 and the wrapping system 10 in this embodiment, a large batch is wrapped with the wrapping sheet S without being bundled. Thus, since a bundling member such as a bundling paper P for bundling the large batch is no more needed, a running cost for the bundling member can be decreased. In addition, since a step of bundling the plurality of small batches B with the bundling member is no more needed, the machine can have a smaller size.

[0038] In addition, the wrapping machine 90 in this embodiment is provided with the holding mechanism 92 for holding a large batch. While the holding mechanism 92 holds a large batch, the large batch is wrapped with the wrapping sheet S. In addition, the holding mechanism 92 includes the first holding unit 50 and the second holding unit 60. A part of the large batch held by the first holding unit 50 and a part of the large batch held by the second holding unit 60 differ from each other. To be more specific, the first holding unit 50 is configured to hold the large batch from the right and left sides. On the other hand, the second holding unit 60 is configured to hold the large batch from the up and down sides. Thus, when the large batch is delivered from the first holding unit 50 to the second holding unit 60, the first holding unit 50 and the second holding unit 60 can be prevented from interfering with each other.

[0039] In addition, as shown in Figs. 8 and 9, in the wrapping machine 90 in this embodiment, the large batch held by the first holding unit 50 is delivered, in the wrapped condition with the wrapping sheet S, from the first holding unit 50 to the second holding unit 60. Then, the adhering units 70 and 71 thermally adhere the wrapping sheet S wrapping the large batch, which has been delivered from the first holding unit 50 to the second holding unit 60.

[0040] In addition, in the wrapping machine 90 in this embodiment, there is provided the heating unit 80 for heating the large batch wrapped with the wrapping sheet S. The heating unit 80 is configured to heat the wrapping sheet S wrapping the large batch to thermally shrink the wrapping sheet S.

[0041] In addition, in the wrapping machine 90 in this embodiment, a small batch B includes a plurality of banknotes that are bundled by a bundling paper P, and there is provided the adjusting mechanism 30 for adjusting a position of the bundling paper P on the small batch B. The adjusting unit 30 includes the reversing unit 34 that reverses the small batch B so as to vary the position of the bundling paper P on the small batch B.

[0042] In addition, as described above, the wrapping sheet S for wrapping the large batch is transparent or translucent. Thus, the respective small batches B constituting the large batch wrapped with the wrapping sheet S are visible. In addition, data (e.g., a bank name, a date of bundling and so on) printed on the bundling paper P on each small batch B can be confirmed.

[0043] The wrapping machine and the wrapping system according to the present invention are not limited to the above embodiment, and can be variously modified. For example, the small batch B constituting the large batch is not limited to a batch in which a plurality of banknotes are bundled by the bundling paper P. The small batch B constituting the large batch may be a batch in which a plurality of paper sheets (e.g., checks, coupons) other than banknotes are bundled by the bundling paper P. In addition, a member other than the bundling paper P may be used as the bundling member for bundling a plurality of paper sheets. In addition, the wrapping sheet S for wrapping the large batch is not limited to a transparent or translucent resin film. Another kind of sheet (such as paper) may be used, as long as it can reliably wrap the large batch.

[0044] In addition, in the wrapping system of the present invention, the banknote handling machine 12, which performs various processes such as a banknote depositing process, a banknote dispensing process and

so on, is not necessarily provided. A mere apparatus, which is configured to make a small batch B by stacking a plurality of (e.g., one hundred) banknotes and by bundling the banknotes by a bundling paper P, may be provided in place of the banknote handling machine 12.

Claims

1. A wrapping machine configured to wrap a large batch that consists of a plurality of stacked small batches of paper sheets, with a wrapping sheet, each of the stacked small batches being bundled,
wherein the large batch is wrapped with the wrapping sheet without being bundled.

2. The wrapping machine according to claim 1 comprising a holding mechanism configured to hold the large batch,
wherein the large batch is wrapped with the wrapping sheet, while the large batch is being held by the holding mechanism.

3. The wrapping machine according to claim 2, wherein the holding mechanism includes a first holding mechanism and a second holding mechanism,
a part of the large batch held by the first holding mechanism and a part of the large batch held by the second holding mechanism differ from each other, and
the large batch is delivered from the first holding unit to the second holding unit.

4. The wrapping machine according to claim 3, wherein the large batch held by the first holding unit is delivered to the second holding unit, in a wrapped condition with the wrapping sheet.

5. The wrapping machine according to claim 4 further comprising an adhering unit configured to thermally adhere the wrapping sheet wrapping the large batch,
wherein the adhering unit is configured to thermally adhere the wrapping sheet wrapping the large batch having been delivered from the first holding unit to the second holding unit.

6. The wrapping machine according to any one of claims 1 to 5 further comprising a heating unit configured to heat the large batch wrapped with the wrapping sheet,
wherein the heating unit is configured to heat the wrapping sheet wrapping the large batch to thermally shrink the wrapping sheet.

7. The wrapping machine according to any one of claims 1 to 6, wherein
the small batch is a batch that consists of a plurality of paper sheets bundled by a bundling member, and
an adjusting mechanism configured to adjust a position of the bundling member on the small batch is provided.

8. The wrapping machine according to claim 7, wherein the adjusting mechanism includes a reversing unit configured to reverse the small batch to vary the position of the bundling member on the small batch.

9. The wrapping machine according to any one of claims 1 to 8, wherein
the wrapping sheet for wrapping the large batch is transparent or translucent.

10. A wrapping system comprising:

a small-batch making machine configured to make a small batch that consists of a plurality of paper sheets bundled by a bundling member; and
a wrapping machine configured to wrap a large batch that consists of a plurality of stacked small batches each made by the small-batch making machine, with a wrapping sheet;
wherein the wrapping machine is configured to wrap the large batch with the wrapping sheet without bundling the large batch.

11. A wrapping method comprising:

making a small batch that consists of a plurality of paper sheets are bundled by a bundling member; and
wrapping a large batch, in which a plurality of the made small batches are stacked, with a wrapping sheet;
wherein, in wrapping the large batch with the wrapping sheet, the large batch is wrapped with the wrapping sheet without being bundled.

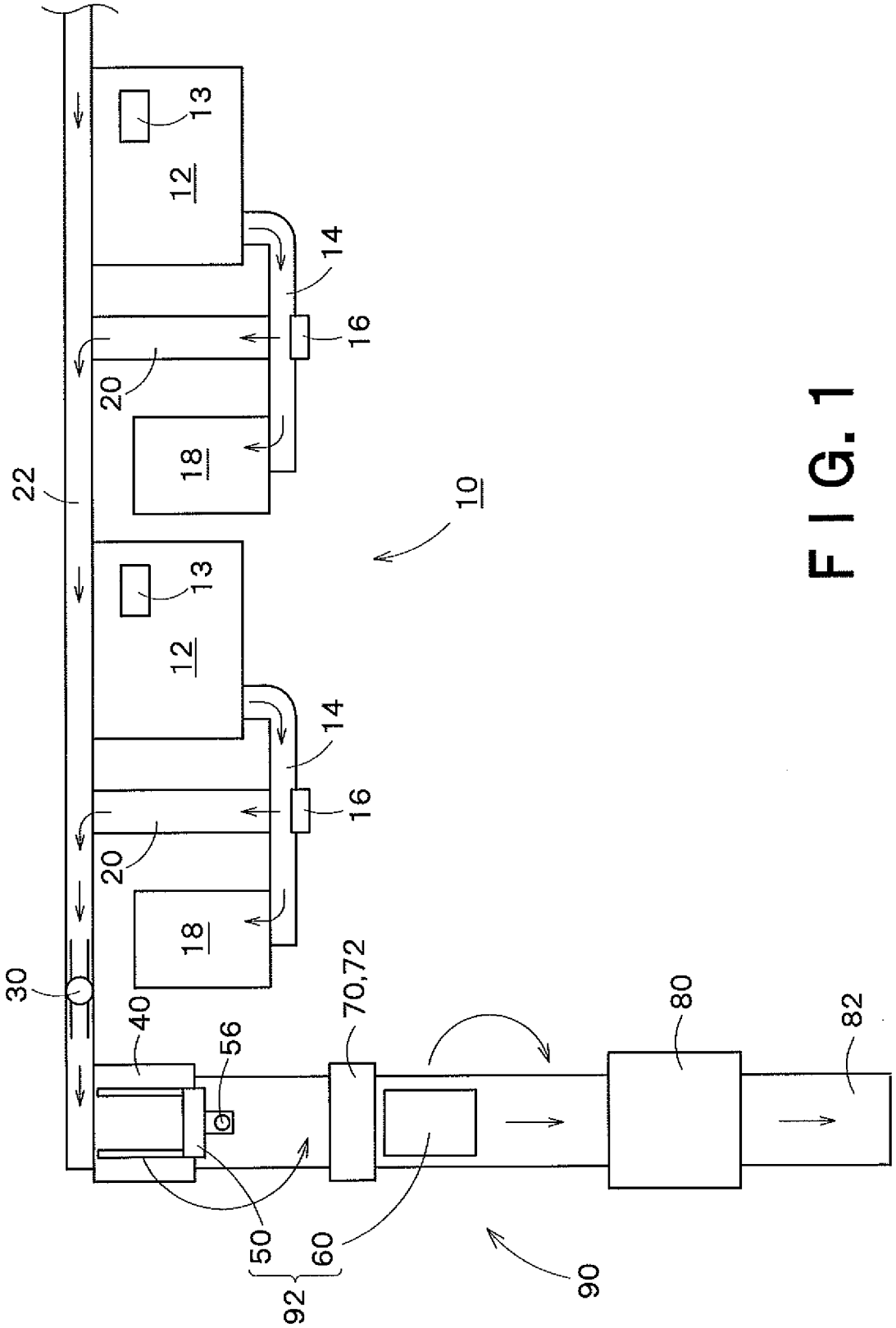

FIG. 1

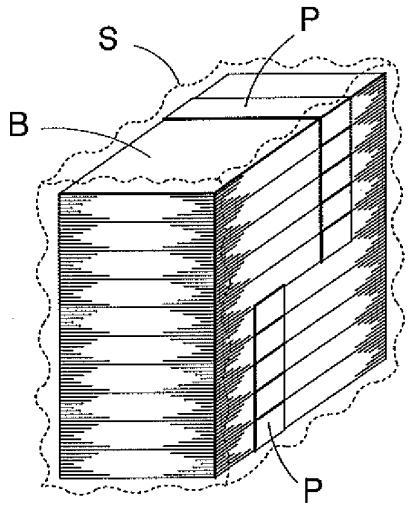

FIG. 2

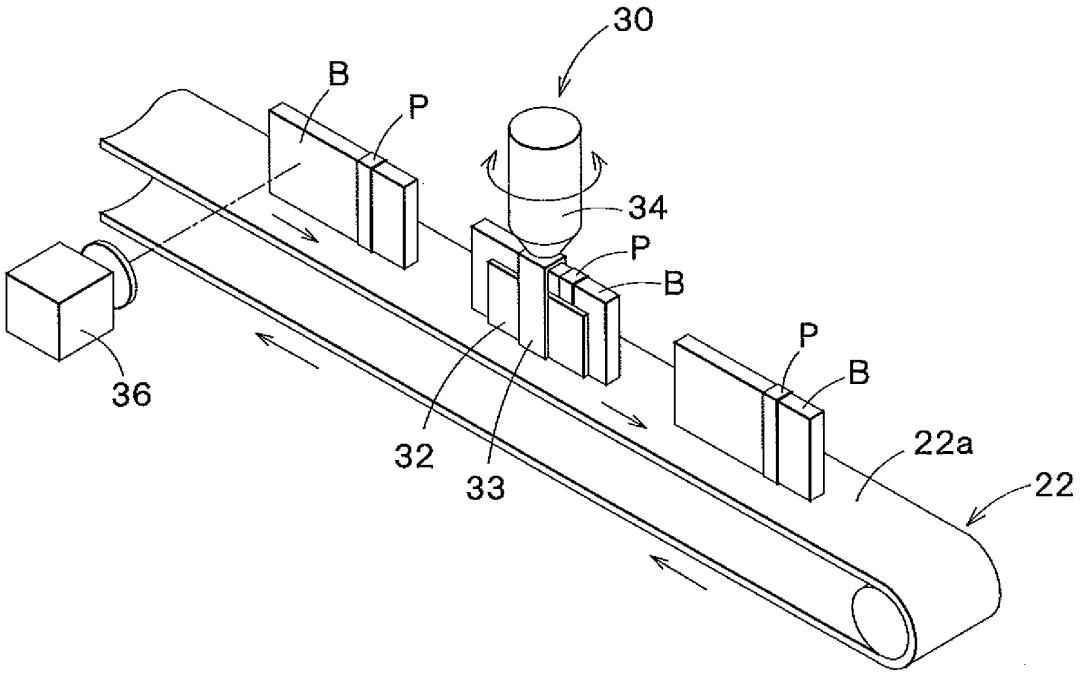

FIG. 3

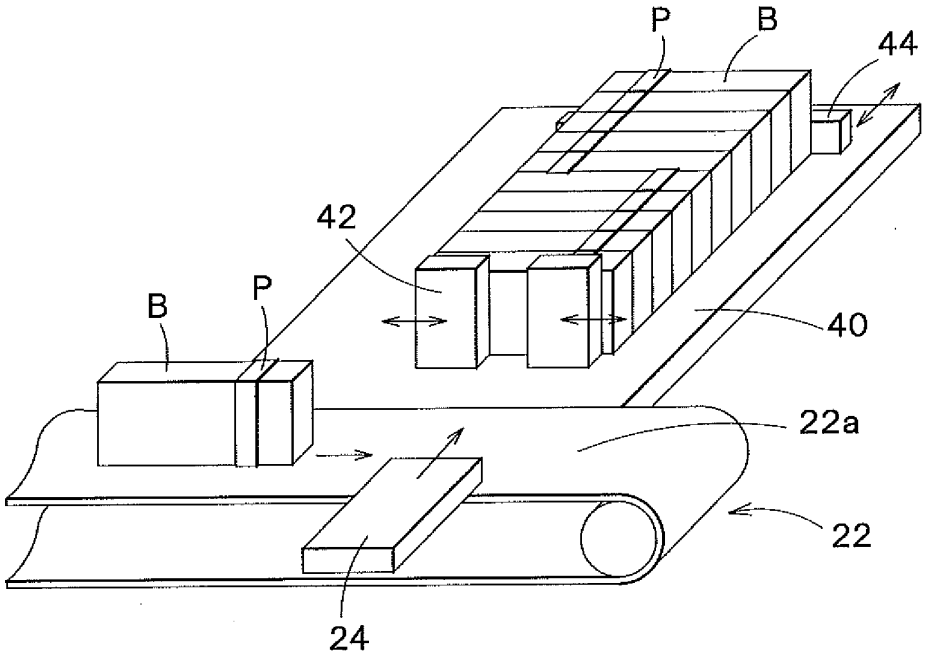

FIG. 4

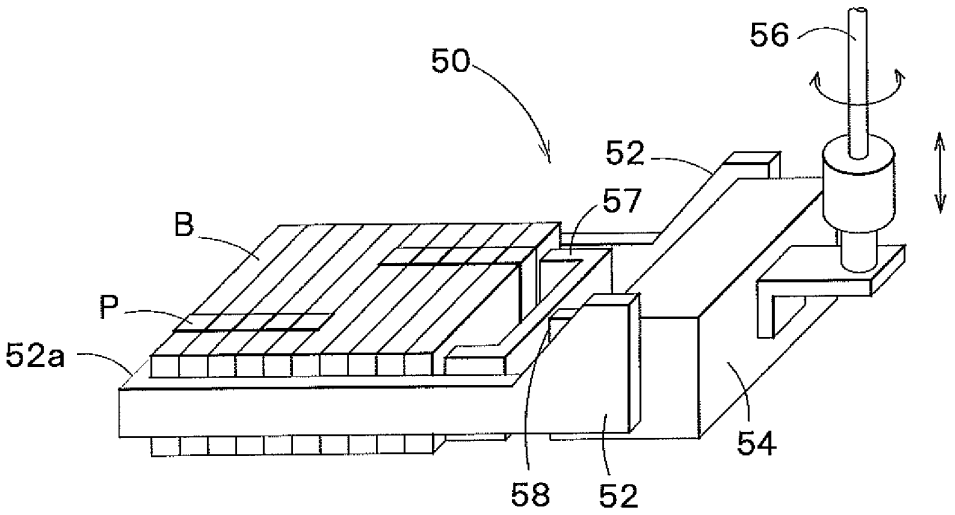

FIG. 5A

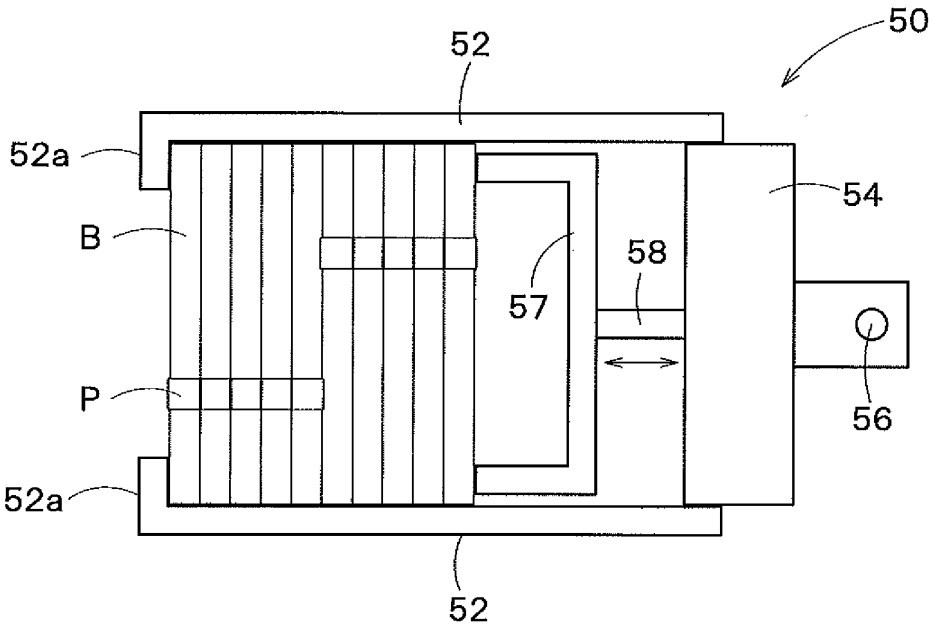

FIG. 5B

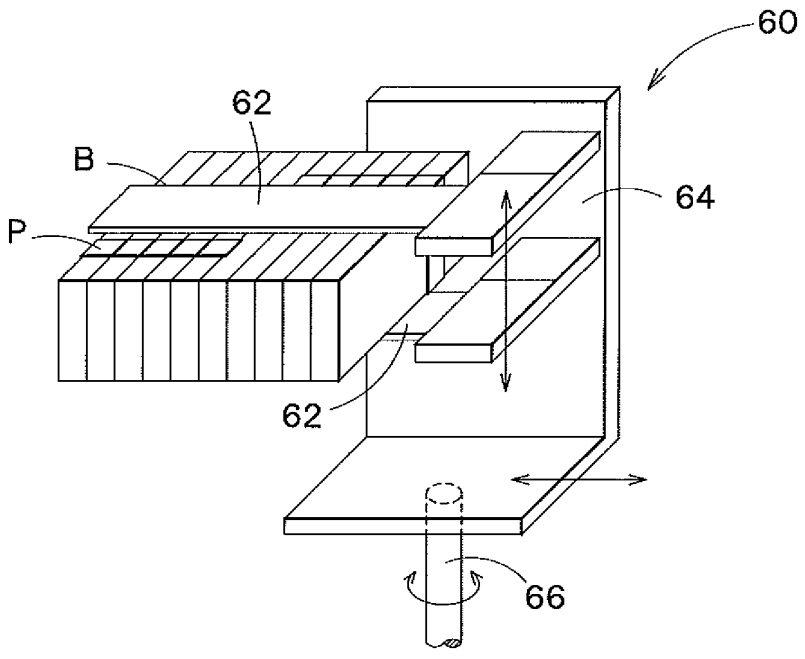

FIG. 6

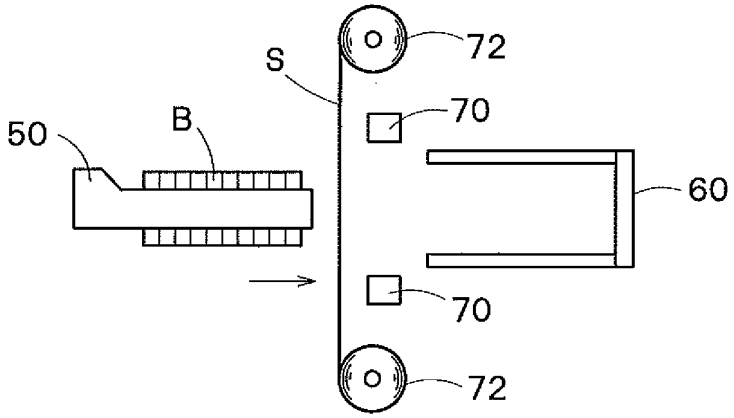

FIG. 7

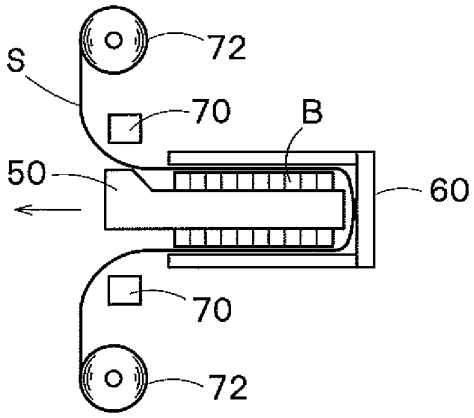

FIG. 8

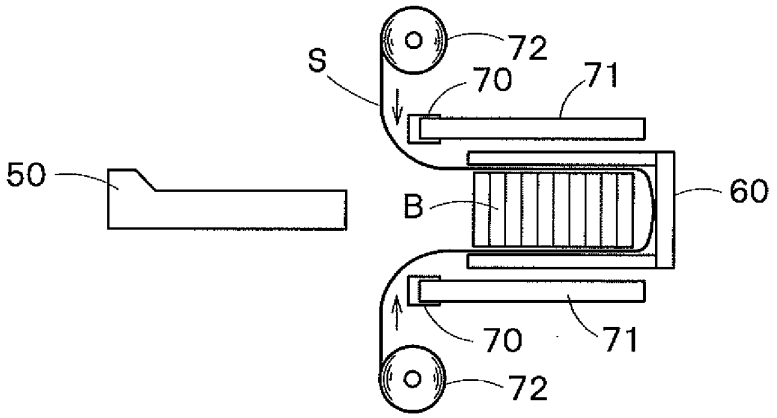

FIG. 9A

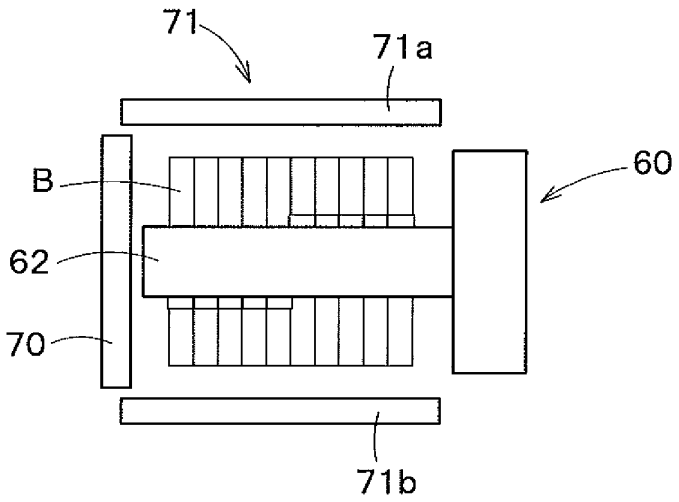

FIG. 9B

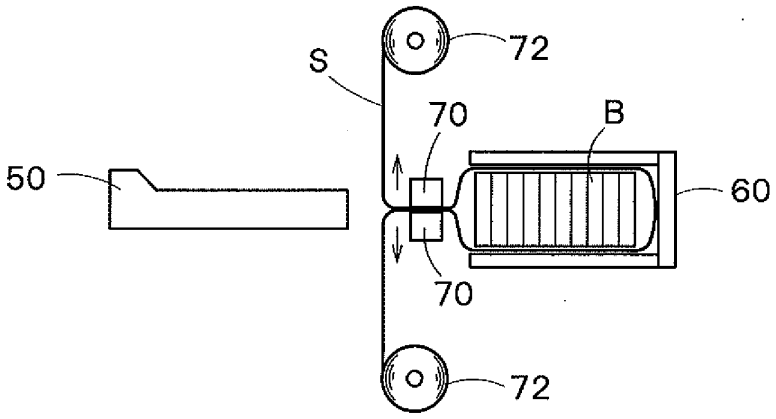

FIG. 10

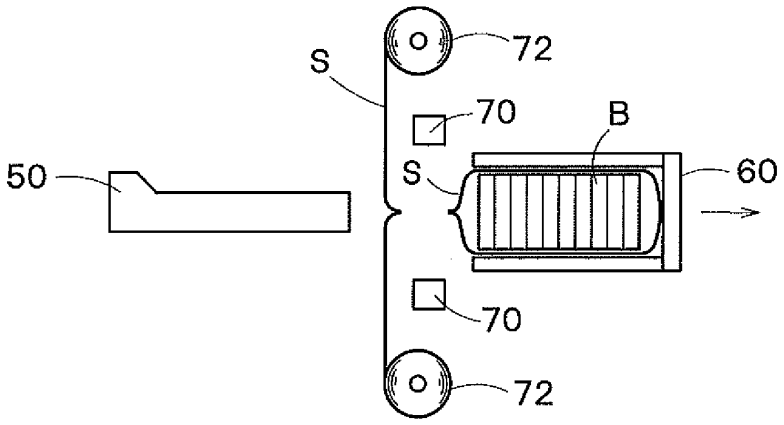

FIG. 11

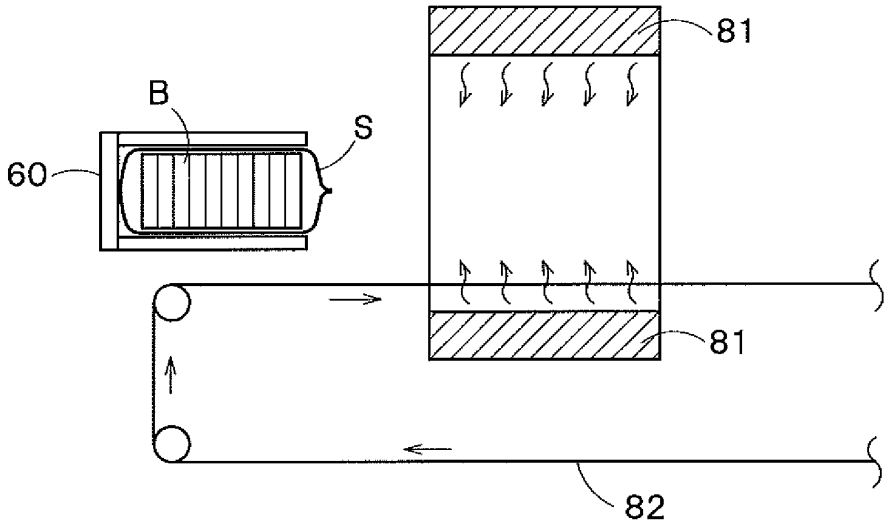

FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/064826

A. CLASSIFICATION OF SUBJECT MATTER
B65B11/10(2006.01)i, *B65B41/10*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65B11/10, B65B41/10

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2012
Kokai Jitsuyo Shinan Koho	1971-2012	Toroku Jitsuyo Shinan Koho	1994-2012

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 2001-199407 A (Toshiba Corp.), 24 July 2001 (24.07.2001), entire text; all drawings (Family: none)	1,6,10,11 2,3,7-9 4,5
Y A	JP 2011-113151 A (Glory Ltd.), 09 June 2011 (09.06.2011), entire text; all drawings & CN 102074068 A	2,3,7-9 4,5
A	JP 11-198912 A (Toshiba Corp.), 27 July 1999 (27.07.1999), paragraphs [0016], [0028]; fig. 8 to 13 (Family: none)	4,5

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 June, 2012 (25.06.12)	03 July, 2012 (03.07.12)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/064826

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 10-143710 A (Toshiba Corp.), 29 May 1998 (29.05.1998), entire text; all drawings (Family: none)	1-11

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2003237726 A **[0002]**