



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.09.2015 Bulletin 2015/40

(51) Int Cl.:
B65H 29/42 (2006.01)

(21) Application number: **15156803.7**

(22) Date of filing: **26.02.2015**

(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

(72) Inventor: **YANAGIDA, Hiroshi**
Inagi-shi, Tokyo 206-8555 (JP)

(74) Representative: **Wilding, Frances Ward**
Haseltine Lake LLP
Lincoln House, 5th Floor
300 High Holborn
London WC1V 7JH (GB)

(30) Priority: **28.03.2014 JP 2014069991**

(71) Applicant: **FUJITSU FRONTECH LIMITED**
Inaga-shi,
Tokyo 206-8555 (JP)

(54) **PAPER SHEET STACKING APPARATUS**

(57) A paper sheet stacking unit (paper sheet stacking apparatus) (54) includes a coil (70) provided in a stacking space with an axis (71) of the coil intersecting an expected stacking surface and a bottom end of the coil being in proximity to the expected stacking surface. The coil (70) spins about the coil axis, while holding a rim of an entering bill, to move the entering bill toward the expected stacking surface, and then releases the hold of the rim of the entering bill to stack the bill on the expected stacking surface. The coil (70) also presses the bills stacked on the expected stacking surface. That is, the coil (70) has both functions of guiding unit and pressing unit of bills.

FIG.3

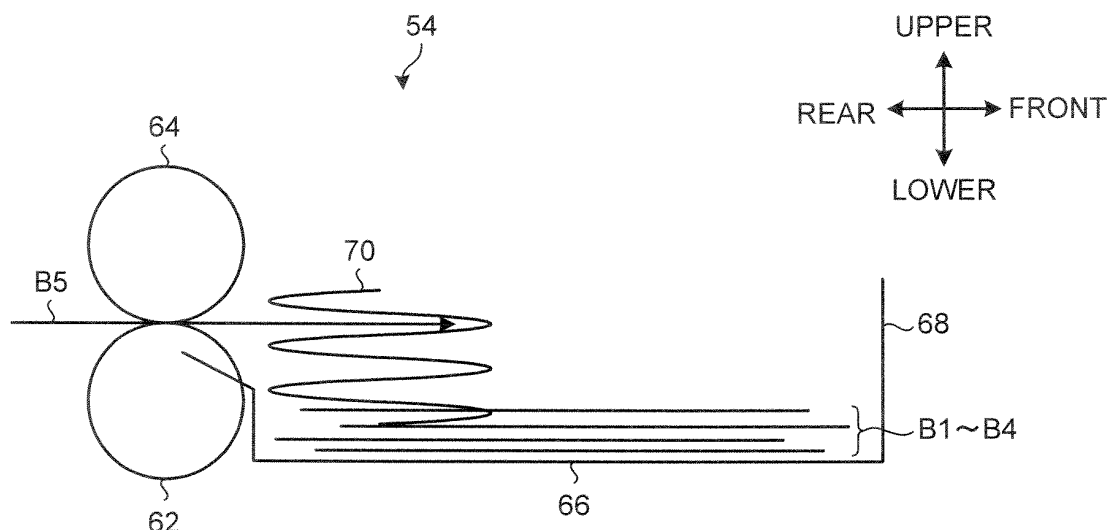
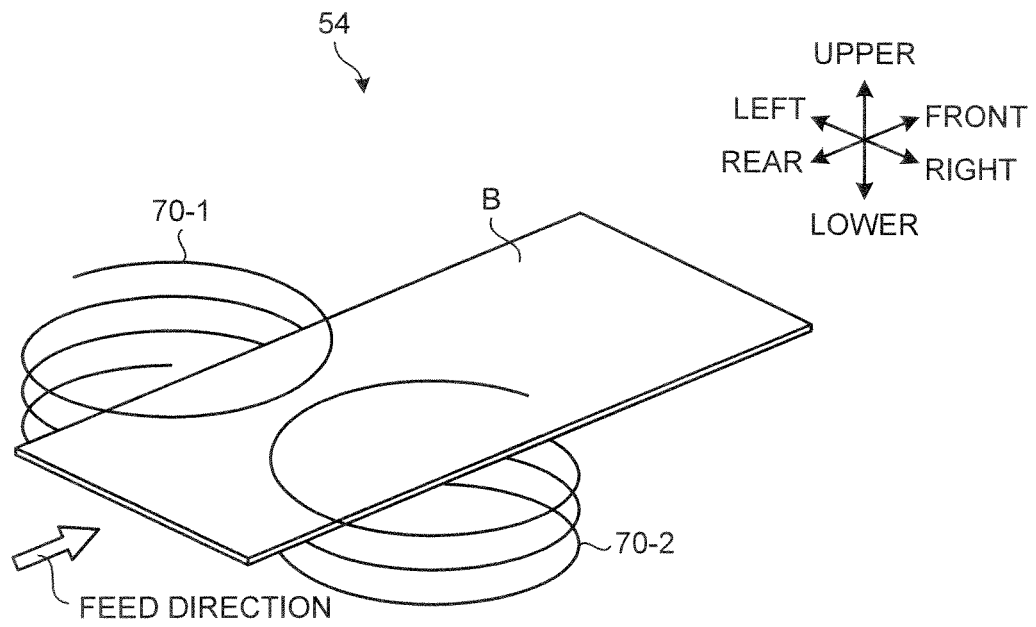


FIG.5



Description

[0001] The embodiments of aspects of the invention discussed herein are related to a paper sheet stacking apparatus.

[0002] There are conventional paper sheet handling apparatuses such as an automated teller machine (ATM), a teller machine for bills installed in a bank counter, and a self-checkout register installed in supermarkets to be used by a purchaser.

[0003] Some paper sheet handling apparatuses include a "paper sheet stacking unit (or paper sheet stacking apparatus)" configured, for example, to stack a plurality of paper sheets (e.g., bills) to be returned in a space (hereinafter may be referred to as "stacking space") for stacking paper sheets therein and dispense a plurality of stacked paper sheets from the dispensing outlet. Conventional examples are described in Patent Literature 1: Japanese Laid-open Patent Publication No. 2001-143128

[0004] However, when a first paper sheet having a tendency to curl is fed in the paper sheet stacking unit, the first paper sheet may be folded by the weight of other paper sheets fed after the first paper sheet. In another case, when the first paper sheet having a tendency to curl is fed in the paper sheet stacking unit, the rear end of the first paper sheet stacked in the stacking space may curl up toward a feeding port and may collide with the front end of a second paper sheet fed after the first paper sheet. This collision may disturb collection of paper sheets in the paper sheet stacking unit. Such folds of paper sheets and disturbed collection of paper sheets may cause trouble such as jamming and make the paper sheet handling apparatus unserviceable, which may result in inconvenience to the user.

[0005] The disclosed art is made in view of such problem. It is desirable to provide a paper sheet stacking apparatus that can improve convenience to a user.

[0006] According to an embodiment of one aspect of the invention, a PAPER SHEET STACKING APPARATUS includes a feeding unit that feeds a paper sheet into a space for stacking paper sheets therein; and a guiding unit that moves the fed paper sheet, while holding a rim of the fed paper sheet, toward an expected stacking surface where the fed paper sheet is stacked and releases the hold of the rim of the fed paper sheet to stack the paper sheet on the expected stacking surface, wherein the guiding unit includes a first coil provided in the space so as that an axis of the coil intersects the expected stacking surface and one of ends of the coil is in proximity to the expected stacking surface.

[0007] The invention is described, by way of example only, with reference to the drawings, in which:

FIG. 1 illustrates an external view of a paper sheet handling apparatus including a paper sheet stacking apparatus according to a first embodiment;

FIG. 2 is a schematic view illustrating a paper sheet

handling apparatus according to the first embodiment;

FIG. 3 is a schematic view illustrating a paper sheet stacking unit according to the first embodiment;

FIG. 4 is a schematic view illustrating a coil according to the first embodiment;

FIG. 5 illustrates a configuration of the paper sheet stacking unit according to the first embodiment;

FIG. 6 illustrates a configuration of the paper sheet stacking unit according to the first embodiment;

FIG. 7 illustrates a configuration of the paper sheet stacking unit according to the first embodiment;

FIG. 8 is an explanatory view of the operation of a bill sheet stacking unit;

FIG. 9 is an explanatory view of the operation of the bill sheet stacking unit;

FIG. 10 is an explanatory view of the operation of the bill sheet stacking unit;

FIG. 11 is a schematic view illustrating a paper sheet stacking unit according to another embodiment; and

FIG. 12 is a schematic view illustrating a paper sheet stacking unit according to another embodiment.

[0008] Preferred embodiments of the present invention will be explained with reference to accompanying drawings. Note that the paper sheet stacking apparatus disclosed by the present application is not limited by the embodiments. In the embodiments, the component having the same function is appended with the same reference sign and repeated description is omitted. The following description will be made for a case where the paper sheet handling apparatus including a paper sheet stacking apparatus is a self-checkout register, which however should not limit the embodiment of the present invention. The following description will be made for a case where the paper sheet stacking apparatus is a bill stacking unit to dispense cash provided in the paper sheet handling apparatus, which however should not limit the embodiment of the present invention.

[a] First Embodiment

Configuration of Paper Sheet Handling Apparatus

[0009] FIG. 1 illustrates an external view of a paper sheet handling apparatus including a paper sheet stacking apparatus according to a first embodiment. A paper sheet handling apparatus 10 in FIG. 1 includes an apparatus housing 12. In FIG. 1, the paper sheet handling apparatus 10 is viewed from diagonally right above. In FIG. 1, a touch panel 14 is attached to the "front" side of the paper sheet handling apparatus 10.

[0010] A touch panel 14 is provided in the left upper region on the front face of the apparatus housing 12. The touch panel 14 displays various types of information to a user, and a user gives commands through the touch panel 14.

[0011] A scanner 16 is provided in the region below

the touch panel 14 on the front face of the apparatus housing 12. When a customer desires to purchase a product (that is, a product to be purchased) and places a code symbol attached to the product in front of the scanner 16, the scanner 16 reads information from the code symbol and outputs the information to a controller (not illustrated). The code symbol is, for example, a one-dimensional bar code or a two-dimensional bar code.

[0012] A scale 18 protruding from the front face of the apparatus housing 12 and facing upward is provided below the scanner 16. The scale 18 measures the weight of the product to be purchased placed on the scale 18 by the user, and outputs the information on the measured weight to the controller (not illustrated). The controller (not illustrated) can then perform "checking process" to determine whether the product whose information is read by the scanner 16 and the product whose weight is measured is identical.

[0013] Further, a bill insertion inlet 20 and a coin insertion inlet 22, which are horizontally arrayed, are provided in the right upper region on the front face of the apparatus housing 12. A customer makes payment through the bill insertion inlet 20 and the coin insertion inlet 22. When making payment, bills are inserted in the bill insertion inlet 20 and coins are inserted in the coin insertion inlet 22.

[0014] A card reader 24 is provided in the region below the bill insertion inlet 20 and the coin insertion inlet 22 on the front face of the apparatus housing 12.

[0015] A receipt issue outlet 26 and a coin-return outlet 28 are provided in the region below the card reader 24 on the front face of the apparatus housing 12. A receipt is issued from the receipt issue outlet 26 when payment is finished. When payment is finished or a payment process is aborted, coins for change or coins to be returned are dispensed from the coin-return outlet 28.

[0016] A bill-return outlet 30 is provided in the region below the receipt issue outlet 26 and the coin-return outlet 28 on the front face of the apparatus housing 12. When payment is finished or a payment process is aborted, bills for change or bills to be returned is dispensed from the bill-return outlet 30.

[0017] A coupon insertion inlet 32 is provided in the region below the bill-return outlet 30 on the front face of the apparatus housing 12. A door 34 is provided below the coupon insertion inlet 32. For example, an administrator opens the door 34 to take out bills collected in a collecting unit 52 which will be described later.

[0018] FIG. 2 is a schematic view illustrating a paper sheet handling apparatus according to the first embodiment. FIG. 2 illustrates main components of the paper sheet handling apparatus 10, particularly components related to receiving and ejecting bills. The paper sheet handling apparatus 10 illustrated in FIG. 2 includes a paper sheet receiver 42, a conveyer 44, a distinguisher 46, a temporary container 48, a circulating unit 50, the collecting unit 52, and a paper sheet stacking unit (bill stacking apparatus) 54.

[0019] The paper sheet receiver 42 receives bills inserted through the bill insertion inlet 20 and sends out the bills to the conveyer 44.

[0020] The conveyer 44 is coupled to the paper sheet receiver 42, the distinguisher 46, the temporary container 48, the circulating unit 50, the collecting unit 52, and the paper sheet stacking unit 54. The conveyer 44 includes a plurality of different types of conveyance path constructing parts such as a conveyance guide, a roller, a driving motor, and a route switching gate. The plurality of different types of the conveyance path constructing parts forms a conveyance path. For example, the conveyer 44 conveys bills inserted through the bill insertion inlet 20 to the temporary container 48 one at a time via the distinguisher 46. When a customer aborts a payment process, the conveyer 44 conveys the bill stored in the temporary container 48 to the circulating unit 50 one at a time.

[0021] The distinguisher 46 distinguishes whether the bill being conveyed is an acceptable bill or a "reject bill". For example, the acceptable bill is temporarily stored in the temporary container 48 via the conveyer 44, while the "reject bill" is ejected through the bill-return outlet 30 via the paper sheet stacking unit 54. The "reject bill" is, for example, a dirty or damaged bill or a bill with folds that is not recognized as an acceptable bill.

[0022] The temporary container 48 temporarily stores (contains) bills conveyed by the conveyer 44 and sends out the temporarily stored bills to the conveyer 44.

[0023] A bill inserted through the bill insertion inlet 20 travels through the paper sheet receiver 42, the distinguisher 46, the temporary container 48, and the conveyer 44 to be received by the circulating unit 50 and contained therein. For example, on receiving a cash dispense command from the controller (not illustrated), the circulating unit 50 sends out bills to the conveyer 44 according to types and numbers of bills instructed by the cash dispense command. The bills sent out from the circulating unit 50 travel through the conveyer 44, the distinguisher 46, the temporary container 48, and the paper sheet stacking unit 54 to be ejected from the bill-return outlet 30. In this manner, the circulating unit 50 can use inserted bills as bills to be dispensed. The circulating unit 50 thus enables the circulation of bills.

[0024] The collecting unit 52 receives and stores the bill sent out from the circulating unit 50 via the conveyer 44 during the process of collecting bills. An administrator can easily collect bills stored in the collecting unit 52.

[0025] For example, the paper sheet stacking unit (paper sheet stacking apparatus) 54 stacks bills for dispensing in a "stacking space" and ejects (outputs) the stacked bills through the bill-return outlet 30.

[0026] FIG. 3 illustrates a paper sheet stacking unit according to the first embodiment. In a schematic view illustrated in FIG. 3, the paper sheet stacking unit 54 is viewed from the left side of the transparent paper sheet handling apparatus 10. Hereinafter, the left hand side in FIG. 3 is the "rear" side of the paper sheet stacking unit,

the right hand side in FIG. 3 is the "front" side of the paper sheet stacking unit, the upper side in FIG. 3 is the "upper" side of the paper sheet stacking unit, and the lower side in FIG. 3 is the "lower" side of the paper sheet stacking unit.

[0027] A roller 62 is provided in the rear end of the paper sheet stacking unit 54. A roller 64 is provided above the roller 62. The roller 62 and the roller 64 successively send out the bills conveyed by the conveyer 44 from the side above the "stacking space". That is, the roller 62 and the roller 64 function as a "feeding unit (feeding port)" to feed bills into the "stacking space".

[0028] A bottom plate 66 is provided in the forward side of the roller 62 and the roller 64 at the bottom of the paper sheet stacking unit 54. Bills fed through the feeding unit are stacked on the top face of the bottom plate 66. That is, the space above the bottom plate 66 is the "stacking space". Illustrated in FIG. 3 are bills B1 to B4 stacked on the top face of the bottom plate 66 and the bill B5 being fed through the feeding unit. Hereinafter, the bill being fed through the feeding unit may be referred to as "entering bill".

[0029] A front wall 68 is provided at the front end of the paper sheet stacking unit 54. The front wall 68 is vertically provided on the top face of the bottom plate 66. The bill fed through the feeding unit collides against the front wall 68 by the forward end and stops. That is, the front wall 68 works as a "stopper" to stop fed bills.

[0030] A coil 70 is provided in the forward side of the roller 62 and the roller 64, that is, above the rear end of the bottom plate 66. The coil 70 is provided in the stacking space so as that the axis of the coil 70 (hereinafter, also referred to as "coil axis") intersects an "expected stacking surface" and an end (that is, the bottom end) of the coil 70 is in proximity to the "expected stacking surface". The "expected stacking surface" is a face (region) on which the entering bill is stacked. That is, the expected stacking surface of the first entering bill is the top face of the bottom plate 66, and for the entering bills fed secondly and after, the expected stacking surface is the top face of the bill which has been fed immediately before the entering bill.

[0031] FIG. 4 is a schematic view illustrating a coil according to the first embodiment. As illustrated in FIG. 4, the coil 70 is formed with a spirally wound linear member. That is, the coil 70 is formed in a spring. The distance between a coil axis 71 and the coil 70, that is, the "coil radius" is expressed in "r", and the "coil pitch" of the coil 70 is expressed in "p". For example, p is 3 to 10 mm. For example, the coil 70 has at least three to five wounds.

[0032] Referring back to FIG. 3, the coil 70 moves the entering bill toward the "expected stacking surface" while holding a rim of the entering bill, and then releases the hold of the rim of the entering bill, thereby stacking the entering bill on the expected stacking surface. Specifically, the coil 70 spins about the coil axis 71 to move the rim of the entering bill to the end of the coil 70 and then releases the hold of the rim of the entering bill. That is, the coil 70 functions as a "guiding unit" to guide the en-

tering bill to the expected stacking surface. In addition, the coil 70 presses the bill stacked on the expected stacking surface by the end (that is, the bottom end) with the elastic force of the coil 70. That is, the coil 70 also functions as a "pressing unit". This prevents the bill stacked in the stacking space from curling up.

[0033] FIGS. 5 to 7 illustrate configurations of the paper sheet stacking unit according to the first embodiment. For example, the paper sheet stacking unit 54 includes the coil 70-1 and the coil 70-2 as illustrated in FIG. 5. In FIG. 5, when viewing the paper sheet stacking unit 54 from backward above (that is, from the left upper side in FIG. 5), the coil 70-1 is wound clockwise and the coil 70-2 is wound counterclockwise. The entering bill B travels through each first "pitch space" of the coil 70-1 and the coil 70-2 to collide against the front wall 68 by the forward tip thereof. The "pitch space" is a space formed between two portions of the coil 70 separated with a distance of one pitch in between. The right and left rims of the rear portion of the entering bill B is held by portions of the coil 70-1 and the coil 70-2 in the region below the first pitch space. The entering bill B is sandwiched between the portions of the coil 70-1 and the coil 70-2 in the region above the first pitch space and the portions of the coil 70-1 and the coil 70-2 in the region below the first pitch space. This prevents the entering bill B from curling up, even if the entering bill B has a tendency to curl.

[0034] As illustrated in FIG. 6, when viewing the paper sheet stacking unit 54 from backward above (that is, from the left upper side in FIG. 6), the coil 70-1 spins counterclockwise about a coil axis 71-1, and the coil 70-2 spins clockwise about a coil axis 71-2. These rotations moves the rear portion of the entering bill toward the expected stacking surface. That is, the entering bill moves to a second pitch space closer to the expected stacking surface than the first pitch space. This prevents the first entering bill to collide against a second entering bill which is fed before the first entering bill and has moved to the second pitch space.

[0035] As illustrated in FIG. 7, with regard to the width w of the bill B, the distance d between the coil axis 71-1 of the coil 70-1 and the coil axis 71-2 of the coil 70-2 is larger than the value calculated by subtracting the sum of the radius r1 of the coil 70-1 and the radius r2 of the coil 70-2 from the width w, that is, $w - (r1 + r2)$, though the distance d is smaller than the width w. That is, the coil 70-1 and the coil 70-2 are arranged in the stacking space so as that the coil axis 71-1 of the coil 70-1 and the coil axis 71-2 of the coil 70-2 both intersect the expected stacking surface. In other words, the trajectory of the entering bill B (that is, an "expected moving path curve") from the start of the feeding to the collision against the front wall 68 by the forward tip thereof intersects both the coil axis 71-1 of the coil 70-1 and the coil axis 71-2 of the coil 70-2. By using the coil 70-1 and the coil 70-2 both having no axial core, the distance d can be provided smaller than the width w, whereby the paper sheet stacking unit 54 can be downsized.

Operation of Paper Sheet Handling Apparatus

[0036] An operation of the paper sheet handling apparatus having aforementioned configuration will be described. Specifically, an operation of the paper sheet stacking unit 54 will be described. FIGS. 8 to 10 are explanatory views of the operation of a bill sheet stacking unit.

[0037] When the stacking process of bills first starts in the paper sheet stacking unit 54, the feeding unit including the roller 62 and the roller 64 feeds the first bill B1 into the stacking space.

[0038] The fed bill B1 travels through the first pitch space of the coil 70 and a rim of the rear portion of the bill B1 is held by the portion of the coil 70 in the region below the first pitch space.

[0039] The coil 70 then spins about the coil axis 71. By this spin, the rear portion of the bill B1 moves to the second pitch space closer to the expected stacking surface than the first pitch space.

[0040] The second bill B2 is then fed into the stacking space through the feeding unit as illustrated in FIG. 8. The second bill B2 travels through the first pitch space of the coil 70. At this time, the coil 70 has already moved the first bill B1 to the second pitch space. Therefore, the collision between the first bill B1 and the second bill B2 can be avoided. Further, as illustrated in FIG. 9, the expected moving path curve of the entering bill B runs across the first pitch space and intersects the coil axis 71 of the coil 70. A large overlap can therefore be provided between the expected moving path curve and the coil 70, whereby the paper sheet stacking unit 54 can be downsized.

[0041] The coil 70 continues to spin about the coil axis 71 to move the rim of the first bill B1 to the bottom end of the coil 70, and then releases the bill B1 on the expected stacking surface (that is, the bottom plate 66). The bottom end of the coil 70 presses the first bill B1, released on the expected stacking surface, toward the bottom plate 66.

[0042] By repeating these feeding, moving, releasing, and pressing of bills, bills are stacked in the stacking space. Illustrated in FIG. 10 are bills B1 to B4 stacked on the top face of the bottom plate 66, the bill B5 being moved toward the expected stacking surface by the coil 70, and the bill B6 being fed through the feeding unit.

[0043] When the process of stacking bills is finished, the process of ejecting (outputting) bills starts. When the process of ejecting bills starts, the stacked bills are ejected (output) through the outlet port (not illustrated) of the paper sheet stacking unit 54.

[0044] According to the embodiment disclosed above, the paper sheet stacking unit (paper sheet stacking apparatus) 54 includes the coil 70, or the "guiding unit" of bills, provided in the stacking space so as that the coil axis 71 intersects the expected stacking surface and the bottom end is in proximity to the expected stacking surface. That is, the coil 70 has both functions of the "guiding

unit" and the "pressing unit".

[0045] Since the paper sheet stacking unit (paper sheet stacking apparatus) 54 is configured that the coil 70 always presses the stacked bills in the stacking space, folds on bills and disturbed collection of bills caused by curls of bills can be prevented. Consequently, the chances of jamming can be reduced and thereby the chances of the paper sheet handling apparatus 10 being unserviceable can be reduced, thereby improving convenience to the user. Moreover, since the coil 70 is provided in the stacking space, the vertical dimension of the paper sheet stacking unit (paper sheet stacking apparatus) 54 can be reduced. That is, the paper sheet stacking unit (paper sheet stacking apparatus) 54 can be downsized. In addition, since the coil 70 contracts as the number of stacked bills and therefore the thickness thereof increases, a sufficient volume can be secured for the stacking space.

[0046] In the paper sheet stacking unit (paper sheet stacking apparatus) 54, the feeding unit including the roller 62 and the roller 64 feeds a bill so as that the "expected moving path curve" runs through the first pitch space of the coil 70.

[0047] In the paper sheet stacking unit (paper sheet stacking apparatus) 54 configured as described above, the coil 70 functioning as the "guiding unit" can avoid the disturbance to the movement of the fed bill, disturbed collection of bills can be prevented.

[0048] Further, the "expected moving path curve" intersects the coil axis 71 of the coil 70.

[0049] In the paper sheet stacking unit (paper sheet stacking apparatus) 54 configured as described above, a large overlap can be provided between the expected moving path curve and the coil 70, whereby the paper sheet stacking unit 54 can be downsized.

[0050] Further, the paper sheet stacking unit (paper sheet stacking apparatus) 54 includes the coil 70-1 and the coil 70-2 and the "expected moving path curve" intersects both the coil axis 71-1 of the coil 70-1 and the coil axis 71-2 of the coil 70-2. That is, the distance d between the coil axis 71-1 of the coil 70-1 and the coil axis 71-2 of the coil 70-2 is larger than the value calculated by subtracting the sum of the radius $r1$ of the coil 70-1 and the radius $r2$ of the coil 70-2 from the width w , that is, $w - (r1 + r2)$, though the distance d is smaller than the width w .

[0051] In the paper sheet stacking unit (paper sheet stacking apparatus) 54 configured as described above, the dimension in the right-and-left direction of the paper sheet stacking unit 54 can be reduced. That is, the paper sheet stacking unit (paper sheet stacking apparatus) 54 can be downsized.

[b] Other Embodiments

[0052]

[1] As described above in the first embodiment, the

paper sheet stacking unit (paper sheet stacking apparatus) 54 is provided with the coil 70-1 and the coil 70-2, although the number of coils 70 is not limited. FIG. 11 is a schematic view illustrating a paper sheet stacking unit according to another embodiment. For example, as illustrated in FIG. 11, the paper sheet stacking unit (paper sheet stacking apparatus) 54 may be provided with a coil 70-3 and a coil 70-4 arranged in the forward side of the coil 70-1 and the coil 70-2, that is, arranged far from the feeding unit including the roller 62 and the roller 64. This configuration provides pressing on the whole surface of the bill and further prevents the bill from curling up. [2] In the description on the first embodiment, the coil 70 vertically moves a bill and, at the same time, presses the bill, although the embodiment is not limited to such configuration. FIG. 12 is a schematic view illustrating a paper sheet stacking unit according to another embodiment. For example, as illustrated in FIG. 12, the paper sheet stacking unit (paper sheet stacking apparatus) 54 may be configured that the coil 70 moves a bill and, at the same time, presses the bill along an approximately horizontal direction. [3] The configuration of the paper sheet stacking unit (paper sheet stacking apparatus) 54 described in the first embodiment can be applied to any unit functioning to stack paper sheets. That is, the configuration of the paper sheet stacking unit (paper sheet stacking apparatus) 54 described in the first embodiment can be applied to the temporary container 48 or the like.

[0053] The disclosed embodiment improves convenience to the user.

Claims

1. A paper sheet stacking apparatus (54) comprising:

a feeding unit (62, 64) that feeds a paper sheet into a space for stacking paper sheets therein; and

a guiding unit (70) that moves the fed paper sheet, while holding a rim of the fed paper sheet, toward an expected stacking surface where the fed paper sheet is stacked and releases the hold of the rim of the fed paper sheet to stack the paper sheet on the expected stacking surface, wherein

the guiding unit (70) includes a first coil (70-1) provided in the space so as that an axis of the coil intersects the expected stacking surface and one of ends of the coil is in proximity to the expected stacking surface.

2. The paper sheet stacking apparatus (54) according to claim 1, wherein

the guiding unit (70) is configured that an other end of the first coil (70-1) holds a rim of the fed paper sheet with the axis of the coil intersecting the rim of the fed paper sheet, the rim of the fed paper sheet is moved to the end of the first coil (70-1) by the coil spinning about the axis, the hold of the rim of the fed paper sheet is then released, and the other end of the first coil (70-1) presses paper sheet stacked on the expected stacking surface with an elastic force of the first coil (70-1).

3. The paper sheet stacking apparatus (54) according to claim 1 or 2, wherein the guiding unit (70) includes a second coil (70-2) wound in an opposite direction to the first coil (70-1) to hold an other rim of the fed paper sheet, and a distance between the axis of the first coil (70-1) and an axis of the second coil (70-2) is larger than a value calculated by subtracting a sum of a radius of the first coil (70-1) and a radius of the second coil (70-2) from a width of the paper sheet to be stacked, though the distance is smaller than the width of the paper sheet to be stacked.

FIG.1

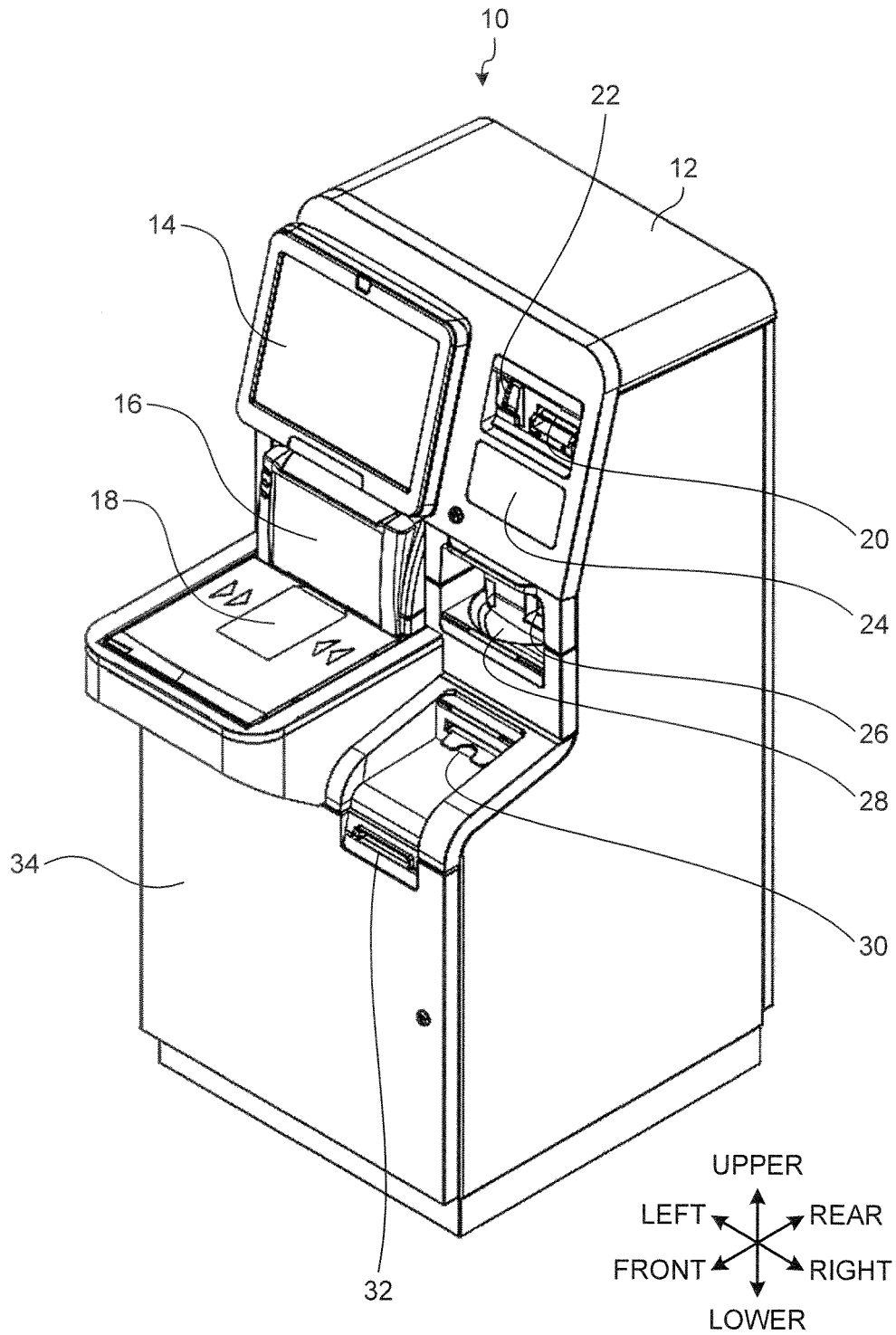


FIG.2

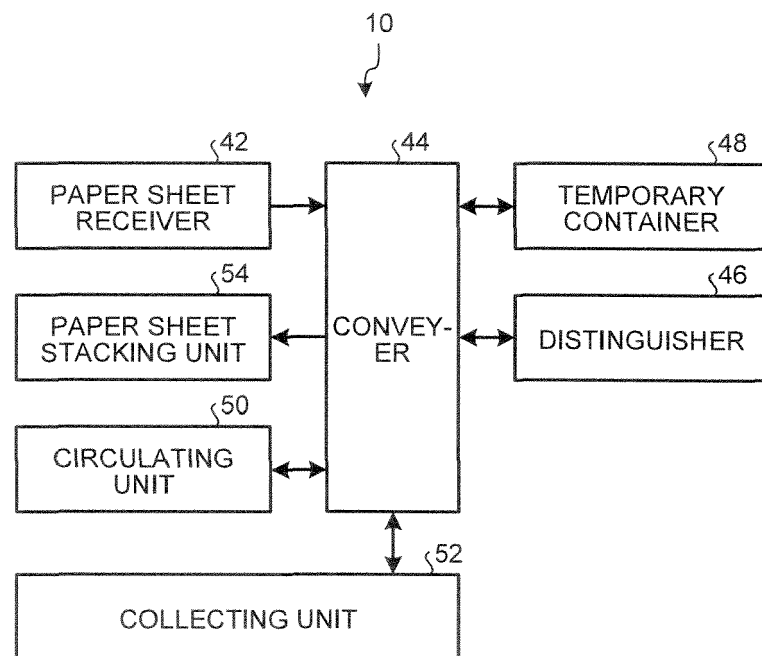


FIG.3

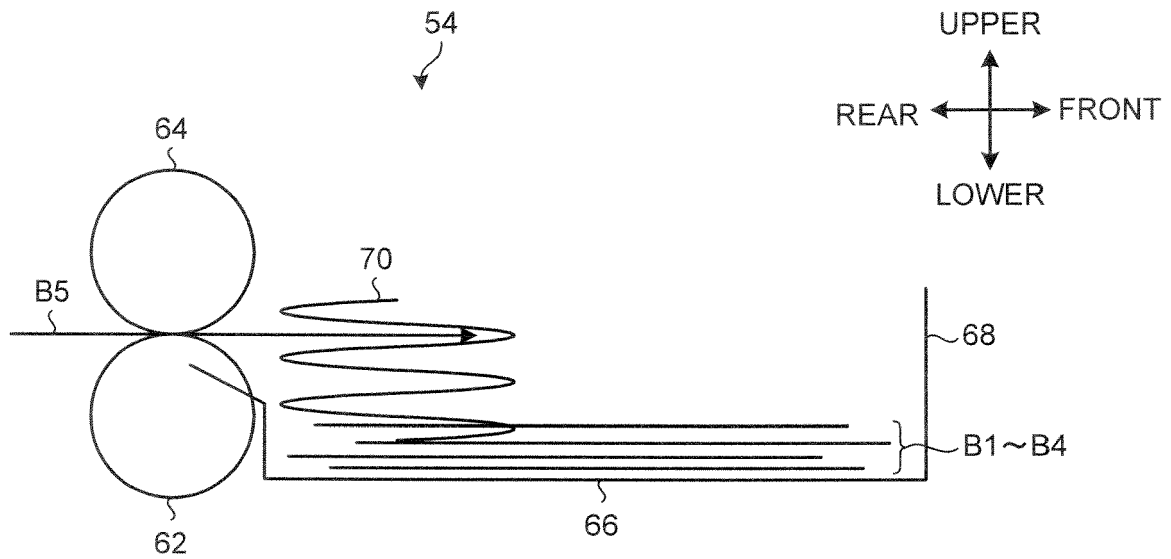


FIG.4

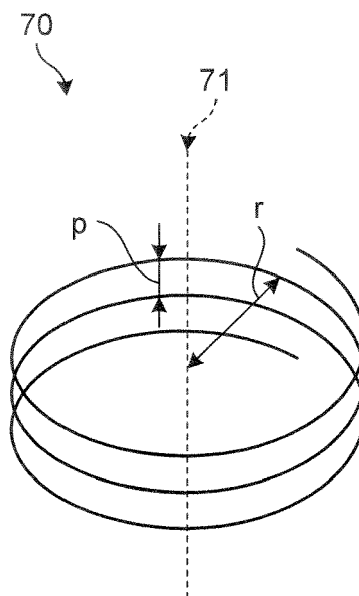


FIG.5

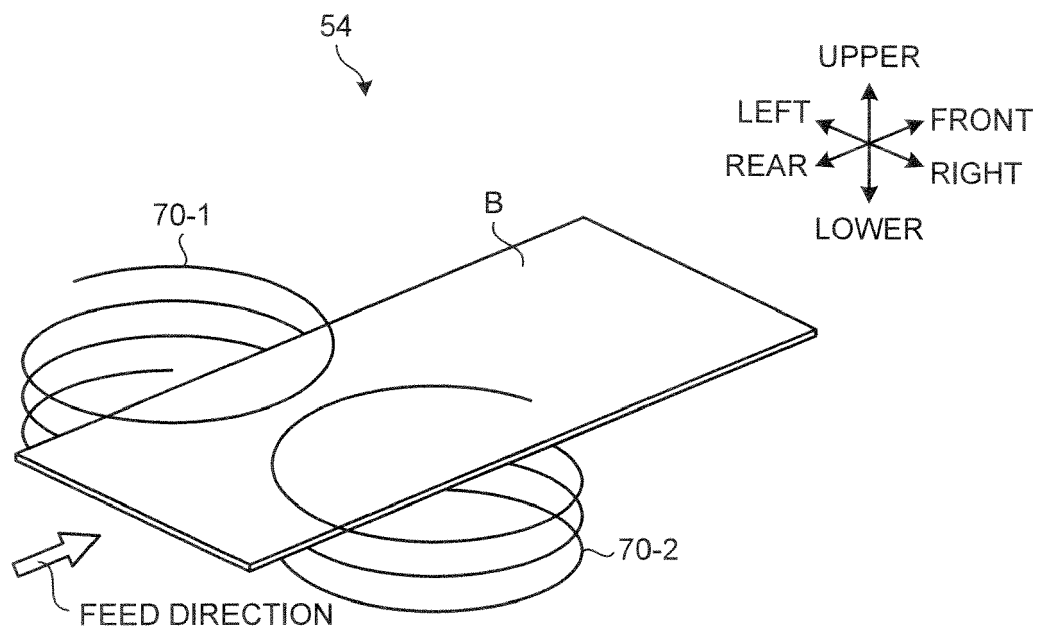


FIG.6

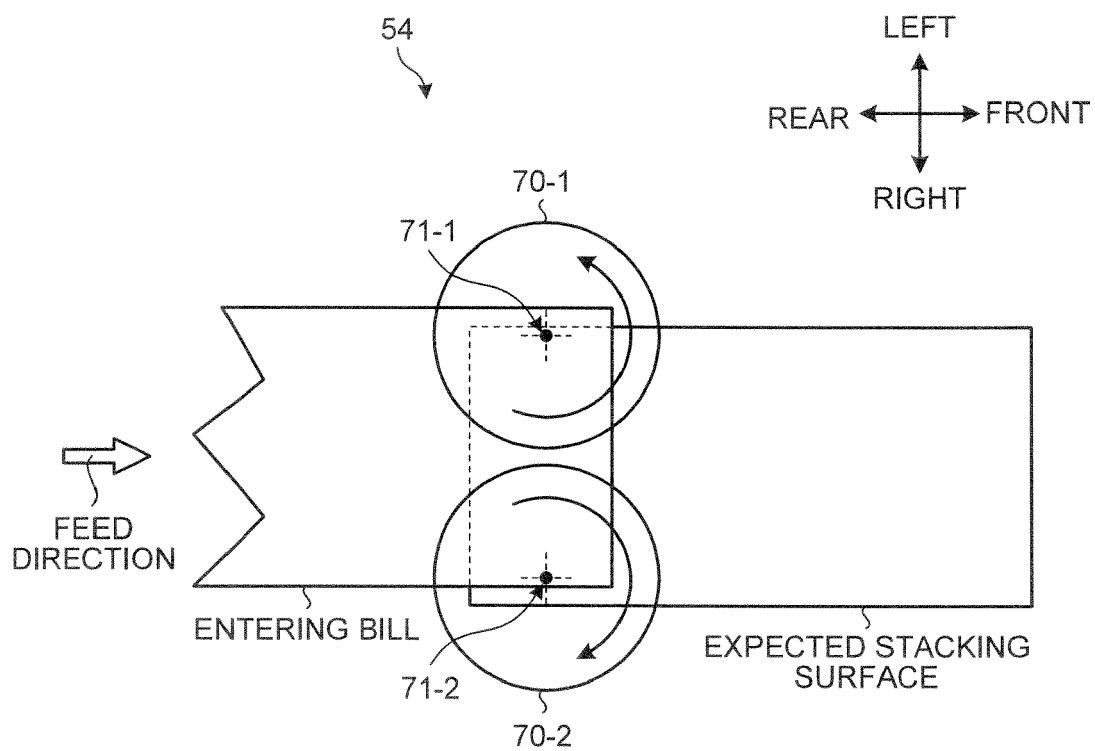


FIG.7

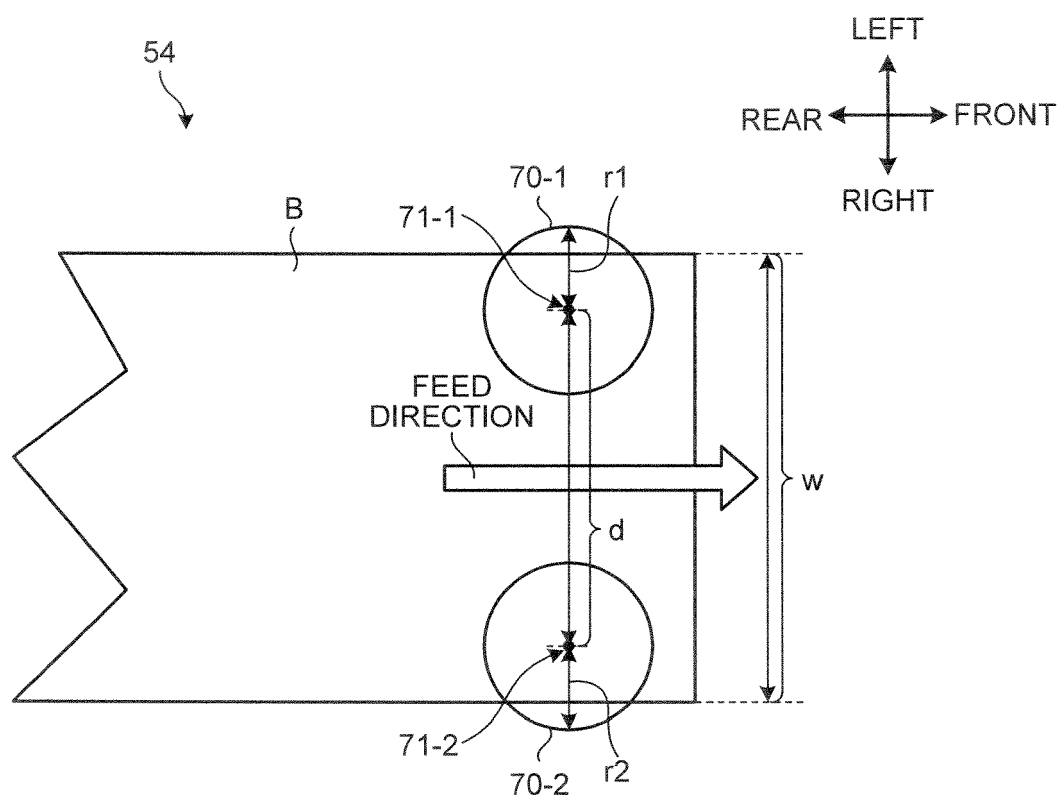


FIG.8

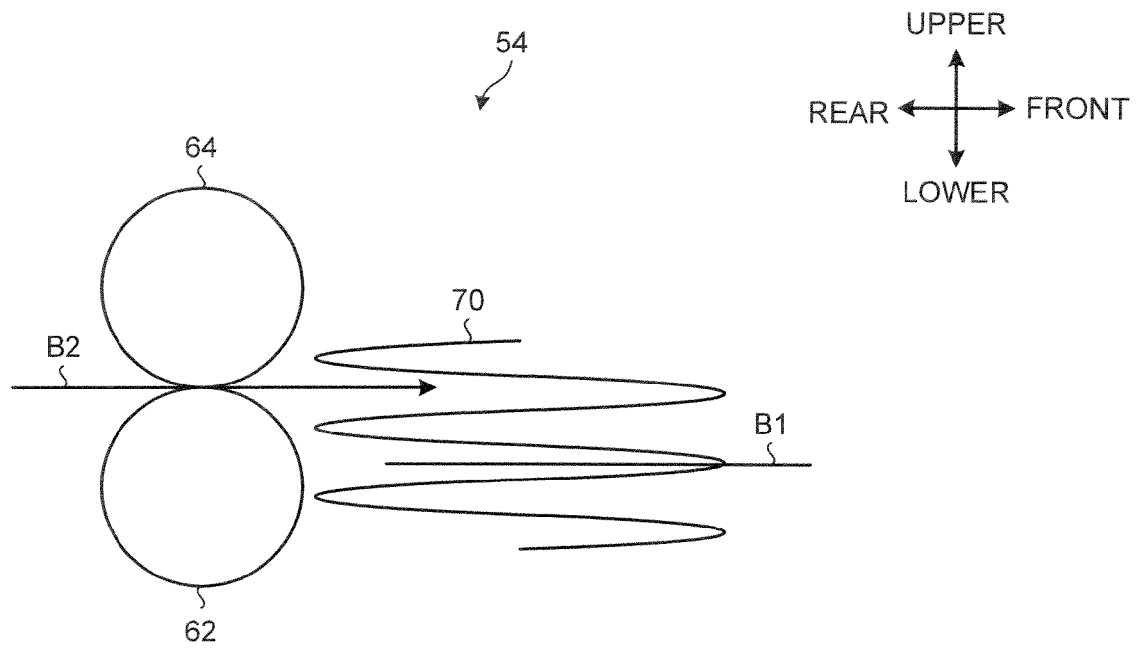


FIG.9

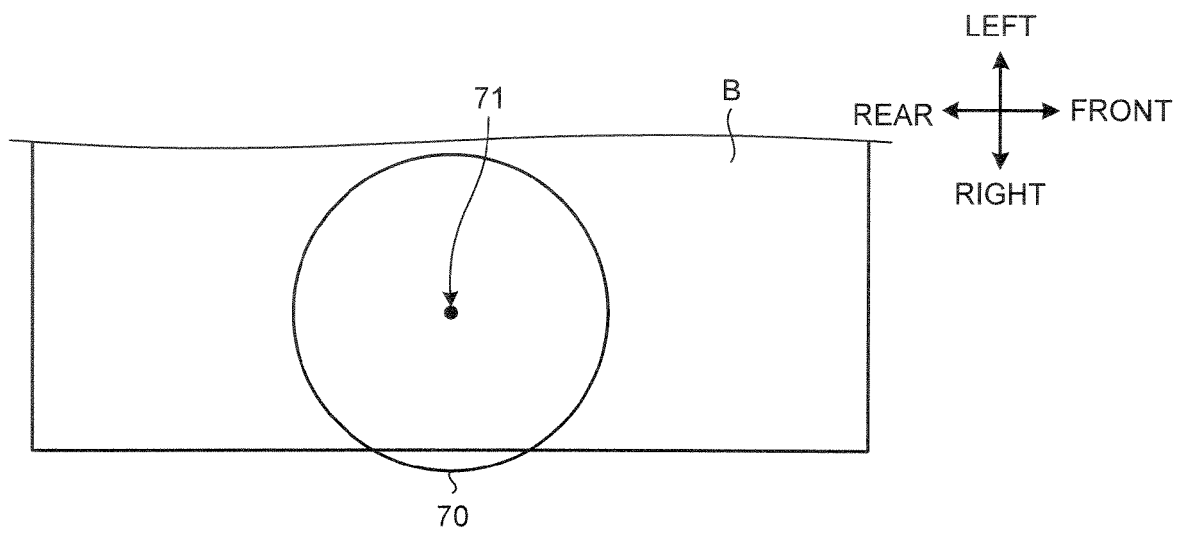


FIG.10

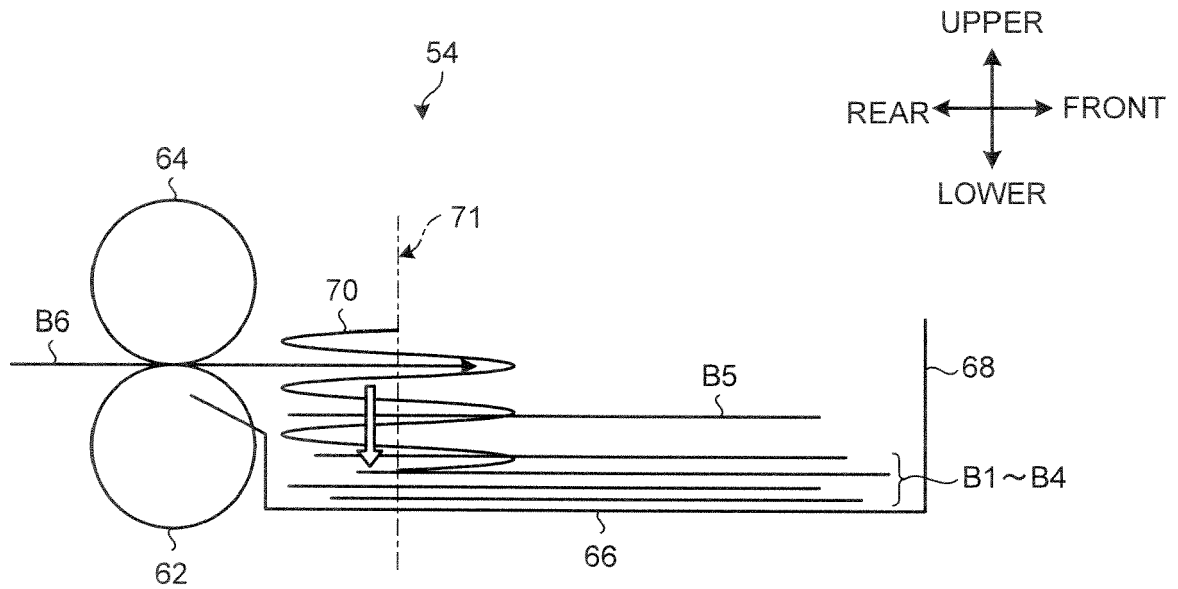


FIG.11

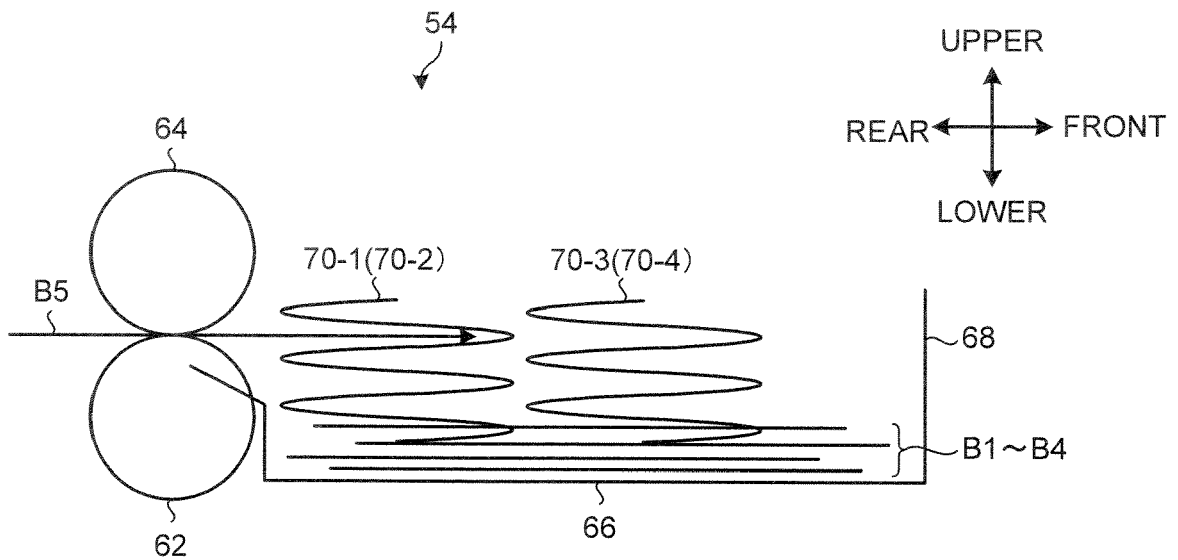
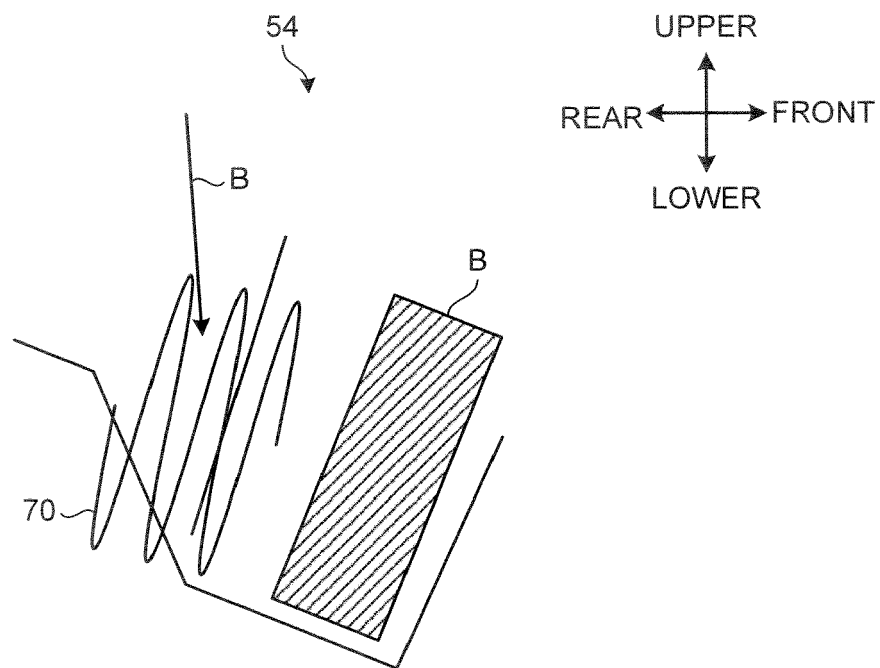


FIG.12





EUROPEAN SEARCH REPORT

Application Number
EP 15 15 6803

5

10

15

20

25

30

35

40

45

50

55

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	US 2009/184458 A1 (BISONE DARIO [IT] ET AL) 23 July 2009 (2009-07-23) * the whole document *	1,2	INV. B65H29/42
X	JP S53 37592 U (.) 1 April 1978 (1978-04-01) * the whole document *	1,3	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 August 2015	Examiner Ureta, Rolando
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			

EPO FORM 1503 03.82 (P04C01)

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

EP 15 15 6803

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.

24-08-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009184458 A1	23-07-2009	AT 482898 T	15-10-2010
		AU 2007213682 A1	16-08-2007
		CA 2641848 A1	16-08-2007
		CN 101378980 A	04-03-2009
		EP 1989138 A1	12-11-2008
		ES 2354914 T3	21-03-2011
		JP 5199127 B2	15-05-2013
		JP 2009526298 A	16-07-2009
		US 2009184458 A1	23-07-2009
		WO 2007090899 A1	16-08-2007

JP S5337592 U	01-04-1978	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2001143128 A [0003]