

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 December 2011 (08.12.2011)

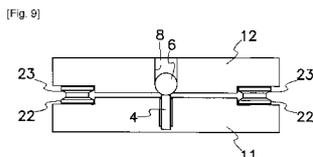
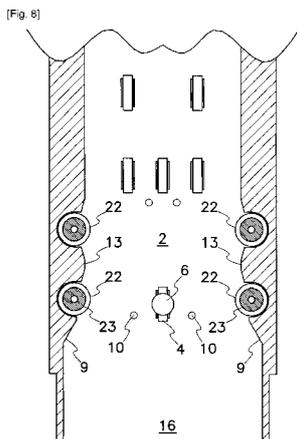
(10) International Publication Number
WO 2011/151984 A1

- (51) **International Patent Classification:**
B65H 9/00 (2006.01) *B65H 5/06* (2006.01)
- (21) **International Application Number:**
PCT/JP2011/002767
- (22) **International Filing Date:**
18 May 2011 (18.05.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
2010-129462 4 June 2010 (04.06.2010) JP
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- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report (Art. 21(3))

(54) **Title:** DOCUMENT TRANSPORTER



(57) **Abstract:** A document transporter has a roller or conveyor belt (4) for driving a bill (1) and a weighting device (7) for pressing the bill (1) against the roller/belt (4). The weighting device (7) includes a ball (6) weighting the bill (1) and a holder (8) rotatably holding the ball (6). The device (7) may further include a spring (15) pressing the ball (6) against the roller/belt (4). The passageway (2) into which the bill (1) is inserted is enclosed by a bottom wall (11), a top wall (12) and side walls (13). The side walls (13) have tapered surfaces (9) at the inlet (16) to the passageway (2). A pair of guide rollers (22) rotatably mounted on the side walls (13) guides the bill (1) by engaging the side edges of the bill (1). The bill (1) fed to the transporter is automatically centered.

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Description

Title of Invention: DOCUMENT TRANSPORTER

Technical Field

[0001] This invention relates to a document transporter for transporting a document such as a bill along and in alignment with a passageway.

Background Art

[0002] One of known bill transporters comprises an aligning or a centering device that may automatically bring a bill into alignment with a passageway when the bill is inserted into the passageway in the deviated or inclined condition of the bill from a longitudinal central axis of the passageway. For example, Patent Document 1 below listed discloses a self aligning transport apparatus for variable media that comprises a passageway and a plurality of rotors aligned substantially parallel to side walls of the passageway, wherein at least one of the rotors has a surface shaped to drive the media in an intermittent fashion in a direction longitudinal to the passageway so as to align the media substantially with the side walls when the media is free to rotate about each rotor. In this mechanism, the media is intermittently driven to intermittently bring the surface of the rotor into contact to the media, and at the point where the rotor becomes disengaged from the media, the distorted media releases its strain energy accumulated upon contact to a side wall of the passageway to automatically bring the media in alignment with the passageway so that the media may be transported along the passageway. However, the apparatus of Patent Document 1 naturally needs the mechanism for intermittently bringing the rotor into contact to valuable media while resulting in increased abrasion in rotor which therefore must be exchanged for new one at fixed intervals.

[0003] Patent Document 2 undermentioned represents a banknote drive system that comprises a series of drive rollers located in a banknote guide channel and an associated passive roller positioned opposite to drive rollers and having a flattered or notched portion to transport a banknote while gripping it between the drive roller and passive roller wherein flattered or notched portion defines a gap to pass the banknote through the gap during the stoppage of the passive roller's rotation so as to allow alignment of the banknote with a guide channel in the system. The banknote drive system shown in Patent Document 2 disadvantageously requires a stop mechanism made up of a spiral cam surface formed with a stop face and a spring latch with which stop face of the cam surface is brought into engagement to stop rotation of the passive roller. This stop mechanism undesirably prevents continuous and smooth rotation of the passive roller and leads to complicated structure in the system.

[0004] The following Patent Document 3 demonstrates a banknote centering device that comprises an enlarged slot for receiving a banknote longitudinally, side engaging members associated with the slot and movable from an open position either side of the slot to a narrow position defining a minimum position between the side engaging members, a banknote drive mechanism for driving a banknote from an insert position to a centering position where the banknote is freely centered within the slot, a side engaging member drive arrangement for moving the side engaging members in a controlled manner towards one another and equally spaced either side of a centerline of the slot. The side engaging member drive arrangement includes a motor for accelerating the side engaging members from the open position towards the narrow position until further inward movement of the side engaging members is opposed by the sides of a banknote being parallel therewith and contacting the side engaging members over a substantial length thereof centering the banknote in the slot. The drive arrangement of the side engaging members includes a screw drive in drive connection with the side engaging members, and the screw drive includes a second shaft parallel to the common shaft to maintain the side engaging members appropriately spaced by the screw drive during movement between the open and narrow positions. The banknote centering device of Patent Document 3 unfavorably demands the side engaging members and the side engaging member drive arrangement for moving the side engaging members towards one another.

[0005] Patent Document 4 below exhibits an aligning and reading apparatus for a bill that comprises first transporters for laterally conveying a bill along a passageway when one kind of bills having their different longitudinal length is supplied into the passageway, an alignment arrangement for centering the bill toward a longitudinal center of the passageway by urging inwardly the opposite ends of the bill conveyed by the first transporters, second transporters located on quarto lines of the bill for further conveying the centered bill, and a reading head located away from the quarto lines of the bill for detecting features of the bill. The apparatus shown in Patent Document 4 disadvantageously has the increased number of assembled elements and cannot be cut down the cost for manufacture because it calls for the alignment arrangement for centering the bill toward a longitudinal center of the passageway by urging inwardly the opposite ends of the bill.

Citation List

Patent Literature

- [0006] PTL 1: U.S. Patent No. 6,712,356
PTL 2: U.S. Patent No. 6,860,480
PTL 3: U.S. Patent No. 6,149,150

PTL 4: Japanese Patent Disclosure No. 55-115891

Summary of Invention

Technical Problem

[0007] Thus, prior art apparatuses utilize an alignment or centering device of its complicated structure that undesirably leads to costly processes for manufacture with limited reduction in cost for manufacture. Accordingly, an object of the present invention is to provide a document transporter of the simplified structure capable of aligning a transported document with a passageway for the bill.

Solution to Problem

[0008] The document transporter according to the present invention comprises a passageway (2) and a conveyor (3) for transporting a document (1) along passageway (2). Conveyor (3) comprises a frictional carrier (4) rotatably mounted in passageway (2), a drive device (5) for driving frictional carrier (4) and a weighting device (7) for urging document (1) against frictional carrier (4). Weighting device (7) comprises a holder (8) adjacent to passageway (2), and a sphere (6) rotatably maintained in holder (8) to be in contact to frictional carrier (4) to grip document (1) between sphere (6) and frictional carrier (4). When document (1) is inserted into passageway (2) with the deviated or inclined central axis of document (1) relative to a longitudinal central axis of passageway (2), document (1) is gripped between sphere (6) and frictional carrier (4), and at the time, either side edge (1a) of document (1) comes into contact to a side wall (13) of passageway (2), and side wall (13) of passageway (2) causes flexible document (1) to elastically deform while emerging a restoring force in deformed document (1) to turn back to its original undeformed flat shape. This restoring force in document (1) may produce a reactive force that tends to separate the side edge (1a) of document (1) off from side wall (13) of passageway (2) so as to move and bring document (1) into alignment with a longitudinal central axis of passageway (2). At that time, as sphere (6) in contact to moving document (1) rotates or makes a spherical motion within holder (8) depending on document (1) moving in any planar radial direction from a contact point with sphere (6) within passageway (2), a frictional force of sphere (6) on document (1) is very small, while the resultant reactive force is greater than the frictional force to sphere (6). Accordingly, document (1) can freely move within a two-directional plane containing the contact point with sphere (6) to release the reactive force so that document (1) moves to come into alignment with a longitudinal central axis of passageway (2) for automatic centering.

Advantageous Effects of Invention

[0009] The present invention can provide an inexpensive document transporter of its simplified structure capable of automatically aligning a transported document with a

passageway to certainly validate the aligned document by means of a discrimination sensor mounted in the back of the passageway.

Brief Description of Drawings

- [0010] [fig.1]A partial section view of a bill transporter as a first embodiment according to the present invention and a sectional view of a drive device for use in the bill transporter along a longitudinal direction of a passageway;
- [fig.2]A plan view of the bill transporter shown in Figure 1;
- [fig.3]A sectional view of the bill transporter along a transverse central line of a ball shown in Figure 1;
- [fig.4]A sectional view showing a contact between the ball and frictional carrier in Figure 1;
- [fig.5]A plan view of a passageway for receiving a bill inserted on the angle;
- [fig.6]A plan view of the passageway wherein the bill of Figure 5 is moved further slightly inwardly of the passageway;
- [fig.7]A sectional view showing a variation of the contact structure shown in Figure 4;
- [fig.8]A plan view of a first varied embodiment of a passageway in the bill transporter according to the present invention;
- [fig.9]A sectional view of the bill transporter taken along a transverse central line of a ball shown in Figure 8;
- [fig.10]A sectional view of the bill transporter shown in Figure 8 taken along its longitudinal central line;
- [fig.11]A plan view of the passageway shown in Figure 8 for receiving a bill on the angle;
- [fig.12]A plan view of the inclined bill further moved slightly inwardly of the passageway by a frictional carrier;
- [fig.13]A plan view of the bill slightly aligned with the passageway from the condition shown in Figure 12 during forward movement of the bill;
- [fig.14]A plan view of the bill slightly aligned with the passageway from the condition shown in Figure 13 during forward movement of the bill;
- [fig.15]A plan view of the bill perfectly aligned with the passageway during forward movement of the bill; and
- [fig.16]A plan view of the bill further moved inwardly of the passageway from the condition shown in Figure 15.

Description of Embodiments

- [0011] Embodiments of the document transporter according to the present invention will be described hereinafter in connection with Figures 1 to 16 of the drawings. A word "document" used herein means a bill, a banknote, a coupon, a security, tender, scrip of

money equivalence or one of all economically valuable papers.

[0012] Figures 1 to 7 illustrate a first embodiment of the bill transporter according to the present invention. As shown in Figure 1, the bill transporter comprises a passageway 2 and a conveyor 3 for transporting a bill 1 as a document inserted into passageway 2. Passageway 2 comprises a bottom wall 11, a top wall 12 and side walls 13 all formed of plastic or metallic materials. Conveyor 3 comprises a frictional carrier 4 rotatably mounted in passageway 2, a drive device 5 for driving frictional carrier 4 and a weighting device 7 for urging or pressing bill 1 against a conveyor belt of frictional carrier 4. While the shown embodiments instantiate frictional carrier 4 utilizing a conveyor belt, however, it may utilize a conveyor roller or conveyor rollers accessible to bill 1 in lieu of conveyor belt.

[0013] Weighting device 7 comprises a holder 8 formed adjacent to passageway 2, and a sphere or ball 6 rotatably maintained in holder 8 to be accessible to or in contact to conveyor belt of frictional carrier 4 to grip bill 1 between ball 6 and conveyor belt of frictional carrier 4. As seen in Figures 1 and 3, frictional carrier 4 is drivingly mounted within a chamber 14 formed in a bottom wall of passageway 2. Drive device 5 comprises a drive motor 20 that is drivingly connected to frictional carrier 4 through a power transmission device 21 of a desired reduction gear ratio. Power transmission device 21 may comprise a gear train, a belt transmission or their combination.

[0014] Holder 8 is formed in a top wall 12 of conveyor 3 for defining passageway 2 to arrange ball 6 in holder 8 that comprises a vertically formed cylindrical hole 8b, an inner bearing surface 8a formed at a lower portion of cylindrical hole 8b into a partially spherical shape and an opening 8c formed at the bottom of holder 8 for communicating inner bearing surface 8a with passageway 2. Ball 6 is in contact to inner bearing surface 8a to freely rotate, roll, make a spherical motion or slide in all or any directions within inner bearing surface 8a when in contact to bill 1, and also to vertically move in holder 8 toward and away from passageway 2. When bill 1 is inserted between ball 6 and conveyor belt of frictional carrier 4, it comes into contact to ball 6 urged downwardly by its own gravity, and ball 6 may freely rotate within inner bearing surface 8a in accordance with the moving direction of bill 1 that may be easily and smoothly moved in any and all radial directions of 360 angular degrees in a planar surface from a contact point between ball 6 and bill 1 even though bill 1 is gripped between ball 6 and conveyor belt of frictional carrier 4. Also, ball 6 may be in contact to bill 1 at its any and all spherical outer surfaces to urge bill 1 on conveyor belt of frictional carrier 4 under a constant pressure by its own gravity. Ball 6 may freely rotate and slide within holder 8 with an extremely less amount of resultant frictional force between ball 6 and bill 1 compared to a case of the sliding contact only, and also, ball 6 may upwardly move within holder 8 when any external force is applied

to ball 6 from the bottom.

- [0015] Conveyor belt in frictional carrier 4 is formed of any plastic material with its outer surface covered with rubber materials of larger friction coefficient in contact to moved bill 1 and ball 6. Even where frictional carrier 4 comprises a conveyor roller in place of conveyor belt, such a conveyor roller may have its outer surface coated with a rubber material of larger friction coefficient. Ball 6 is made of a material selected from the group of corrosive-resistant materials such as stainless steel, iron or ferric alloy, and in a structure of ball 6 resiliently urged toward frictional carrier 4 by a spring 15, ball 6 may be made of a relatively light metal such as copper, titanium, aluminum or their alloy or wear-resistant plastic materials.
- [0016] An inner diameter of opening 8c in holder 8 is smaller than an outer diameter of ball 6 to keep ball 6 within holder 8 without downward drop of ball 6 that however can move upwardly within holder 8. As shown in Figure 4, a bottom portion of ball 6 retained in holder 8 projects into passageway 2 through opening 8c of holder 8 and makes contact to conveyor belt of frictional carrier 4 that upwardly projects into passageway 2 from bottom wall thereof so that bottom portion of ball 6 also makes contact to bill 1 in touch with conveyor belt of frictional carrier 4 while bill 1 moves between ball 6 and conveyor belt of frictional carrier 4 within passageway 2.
- [0017] Opposite side walls 13 define passageway 2 and have inwardly tapered surfaces 9 at the front to form an inlet 16. A pair of inlet sensors 10 are arranged in bottom and top walls 11 and 12 in the vicinity of and on the opposite sides of conveyor belt of frictional carrier 4 to detect bill 1 inserted into passageway 2. Not shown in the drawings, but, each of inlet sensors 10 may have a photo-coupler of light emitting and receiving elements for detecting light-interruption between these elements by bill 1 moving through passageway 2. When any inlet sensor 10 detects light-interruption by passage of bill 1, it produces a detection signal to a control device (not shown) that in turn effects a trigger signal to drive device 5 to activate drive device 5 and thereby drive frictional carrier 4. At that moment, ball 6 makes contact to rotating conveyor belt of frictional carrier 4 and thereby rotates within inner bearing surface 8a of holder 8, and when ball 6 makes spherical contact to bill 1 inserted into passageway 2, it may freely rotate within inner bearing surface 8a of holder 8 in accordance with movement of bill 1 through passageway 2 if bill 1 moves in any planar direction in passageway 2.
- [0018] The embodiment shown in Figure 4 illustrates an example of the structures wherein ball 6 makes contact to conveyor belt of frictional carrier 4 or bill 1 under its own weight in other words at a given pressure, and this structure has the feature capable of maintaining a constant pressure on bill 1 by ball 6 without effecting any change to pressure by ball 6 on conveyor belt of frictional carrier 4 and on bill 1 even though ball 6 rotates within inner bearing surface 8a of holder 8. If rotating ball 6 has any frictional

force on bill 1, it is smaller than a frictional force by bill 1 on frictional carrier 4.

[0019] When bill 1 is inserted into passageway 2 with the deviated or inclined central axis of bill 1 relative to a longitudinal central axis of passageway 2 on a plane surface as shown in Figure 5, bill 1 is gripped between ball 6 and conveyor belt of frictional carrier 4, and at the time at least one or both of side edges 1a of bill 1 come into contact to either or both side walls 13 of passageway 2, side wall or walls 13 cause flexible bill 1 to elastically deform while inducing a restoring force in deformed bill 1 to turn back to its original undeformed flat shape. This restoring force in bill 1 may produce a reactive force that tends to separate side edge or edges 1a of bill 1 off from side wall or walls 13 of passageway 2 so as to move and bring bill 1 into alignment with a longitudinal central axis of passageway 2. At that time, as ball 6 in contact to moving bill 1 rotates or makes a spherical action within holder 8 depending on bill 1 moving in any planar radial direction from a contact point with sphere 6 within passageway 2, a frictional force of ball 6 on bill 1 is very small, while the resultant reactive force is greater than frictional force to ball 6. Accordingly, bill 1 can freely move within a two-directional plane containing the contact point with ball 6 to release the reactive force in bill 1 in contact to ball 6 so that bill 1 moves to come into alignment with a longitudinal central axis of passageway 2 for automatic aligning or centering of bill's attitude. In this way, this invention may provide an inexpensive bill transporter of its simplified structure capable of automatically aligning a transported bill with a passageway.

[0020] Figure 7 illustrates a variation from the embodiment in Figure 4 with the vertically inverted structure of ball 6 and frictional carrier 4 wherein frictional carrier 4 is rotatably arranged in chamber 14 of top wall 12 in conveyor 3; holder 8 is formed in bottom wall 11 of conveyor 3; and ball 6 is disposed in holder 8 to upwardly and elastically urge ball 6 toward conveyor belt of frictional carrier 4 by a resilient force of a spring 15 as an elastic material so that ball 6 makes contact to bill 1 moving between ball 6 and frictional carrier 4. In the embodiment shown in Figure 7, as ball 6 is arranged under conveyor belt of frictional carrier 4 without exerting ball's own gravity on bill 1, spring 15 is used to upwardly and elastically urge ball 6 to produce a predetermined elastic force on bill 1 toward conveyor belt of frictional carrier 4. However, if any downward external force is applied to ball 6, it can downwardly move against resilient force of spring 15. Even this embodiment can produce its performance and effect equivalent to those of the structure shown in Figures 1 to 6 because spring 15 may exert an unchanged pressing force of a constant level on bill 1 through ball 6 at any spherical outer surface of ball 6 in contact to bill 1.

[0021] Figures 8 to 16 represent a second embodiment of the invention wherein two pairs of guide rollers 22 are rotatably arranged face-to-face each other and attached to opposite

side walls 13 of passageway 2 shown in Figures 1 to 7. In the second embodiment, each guide roller 22 has an outer rim formed with a V- or U-shaped annular groove 23 into which a side edge of bill 1 may be fit, and each of side walls 13 of passageway 2 has an intermediate surface formed into an arcuate shape between anterior and posterior guide rollers 22.

[0022] As shown in Figures 11 to 16, when bill 1 is inserted into passageway 2 with the deviated bill's longitudinal axis from longitudinal central line of passageway 2, side edges of bill 1 come into contact with guide rollers 22 which therefore are rotated upon contact with bill 1 so that guide rollers 22 may smoothly modify the moving direction of bill 1 to bring bill 1 into alignment with passageway 2. Then, as shown in Figures 15 and 16, bill 1 is finally easily rendered aligned and coaxially with passageway 2 during movement of bill 1.

Industrial Applicability

[0023] This invention is applicable to document transporters of various types for transporting documents in alignment with a passageway.

Reference Signs List

[0024] (1) a bill (a document), (1a) side edges, (2) a passageway, (3) a conveyor, (4) a frictional carrier, (5) a drive device, (6) a ball (a sphere), (7) a weighting device, (8) a holder, (8a) an inner bearing surface, (8b) a cylindrical hole, (8c) an opening, (9) tapered surfaces, (10) inlet sensors, (11) a bottom wall, (12) a top wall, (13) side walls, (14) a chamber, (15) a spring, (16) an inlet, (20) a drive motor, (21) a power transmission device, (22) guide rollers, (23) an annular groove,

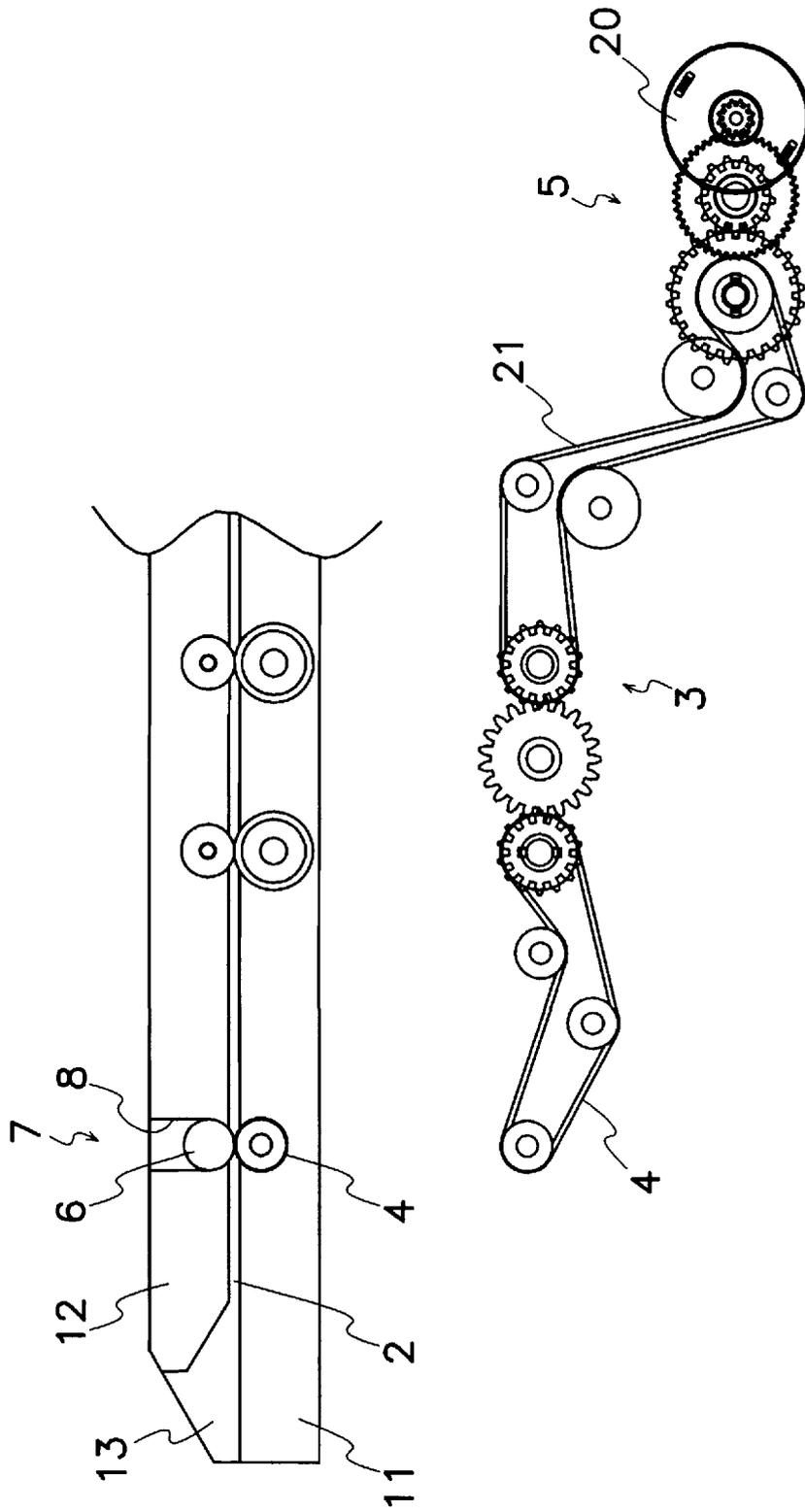
Claims

- [Claim 1] A document transporter comprising a passageway and a conveyor for transporting a document along the passageway, wherein the conveyor comprises a frictional carrier rotatably mounted in the passageway, a drive device for driving the frictional carrier and a weighting device for urging the document against the frictional carrier, the weighting device comprises a holder adjacent to the passageway, and a sphere rotatably maintained in the holder to be in contact to the frictional carrier to grip the document between the sphere and frictional carrier.
- [Claim 2] The document transporter of claim 1, wherein the holder comprises a vertically formed cylindrical hole, an inner bearing surface formed into a partially spherical shape in the cylindrical hole and an opening for communicating the inner surface with the passageway, a bottom portion of the sphere in the holder projects into the passageway through the opening of the holder.
- [Claim 3] The document transporter of claim 1, wherein the document is transported along the passageway while the document is gripped between the frictional carrier and sphere.
- [Claim 4] The document transporter of claim 2, wherein the sphere is freely rotatable or spherically movable on the inner bearing surface to allow the document to move in any planar radial direction of 360 angular degrees from a contact point of the sphere on the document.
- [Claim 5] The document transporter of claim 1, wherein the sphere is vertically movable toward and away from the frictional carrier or document.
- [Claim 6] The document transporter of claim 2, wherein the sphere is rotatable or spherically movable within the inner bearing surface of the holder depending on the document moving in any planar radial direction within the passageway.
- [Claim 7] The document transporter of claim 2, wherein the sphere produces a pressing force on the document against the frictional carrier, the pressing force by the sphere is unchanged even if the sphere rotates or spherically moves within the inner bearing surface of the holder to press the document against the frictional carrier at a constant pressure even though any spherical outer surface of the sphere is in contact to the document.
- [Claim 8] The document transporter of claim 1, wherein the sphere freely rotates

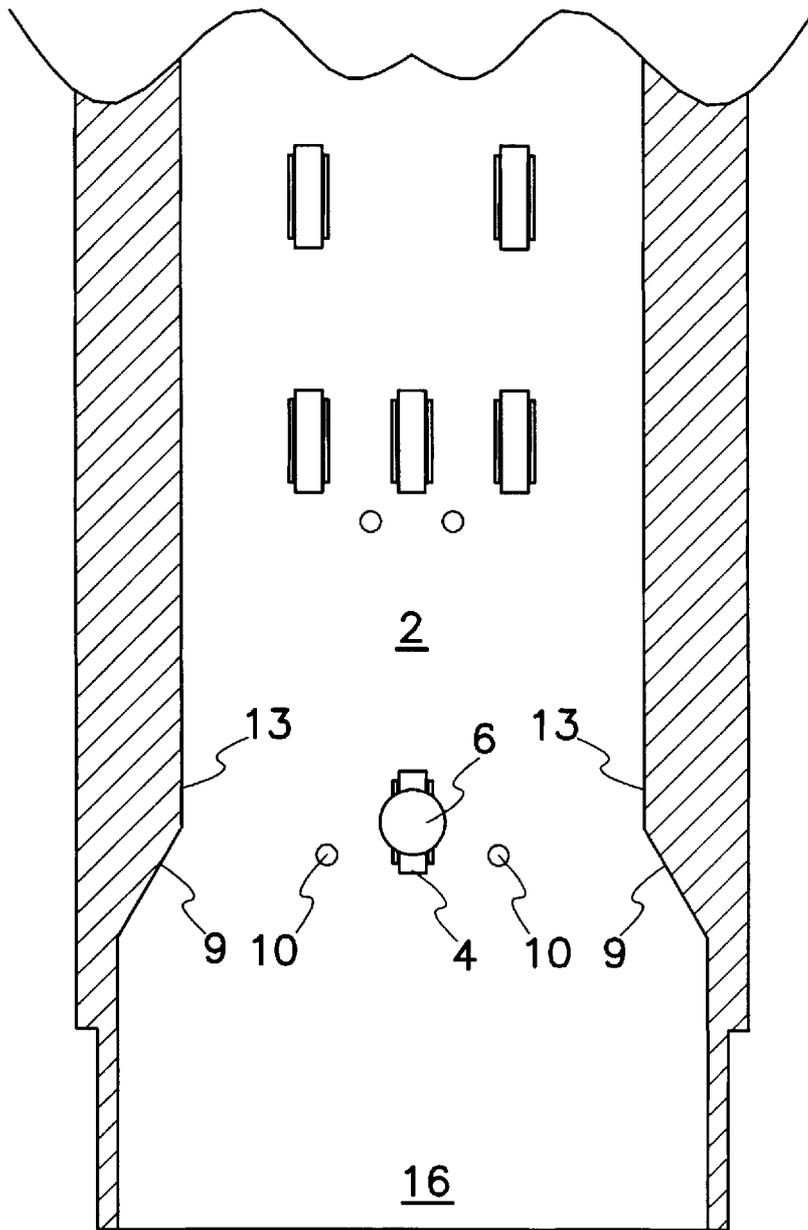
or spherically move depending on movement of the document, a frictional force of the sphere on the document is smaller than that of the frictional carrier on the document.

- [Claim 9] The document transporter of claim 1, wherein the sphere is in a spherical contact to the document.
- [Claim 10] The document transporter of claim 1, wherein the sphere is in contact to the document by its own gravity or by a resilient force of an elastic material.
- [Claim 11] The document transporter of claim 1, wherein the friction carrier is disposed in a chamber formed in a bottom wall of the passageway, and the sphere is disposed in the holder formed in a top wall of the passageway.
- [Claim 12] The document transporter of claim 1, wherein the frictional carrier is rotatably mounted in a chamber formed in a top wall of the passageway, and the sphere is disposed in the holder formed in a bottom wall of the passageway to elastically urge the sphere toward the frictional carrier by a spring.
- [Claim 13] The document transporter of claim 1, wherein the frictional carrier comprises a conveyor belt or a roller.
- [Claim 14] The document transporter of claim 1, wherein at least one pair of guide rollers are rotatably attached to side walls of the passageway to cause either side edge of the document to come into contact the guide rollers when the document is inserted into the passageway with the deviated central axis of the document from a longitudinal central axis of the passageway.
- [Claim 15] The document transporter of claim 14, wherein the side walls comprise inwardly tapered surfaces to form an inlet in the passageway.

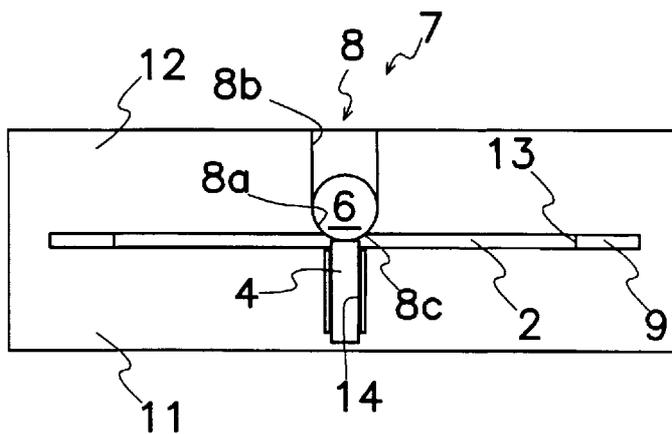
[Fig. 1]



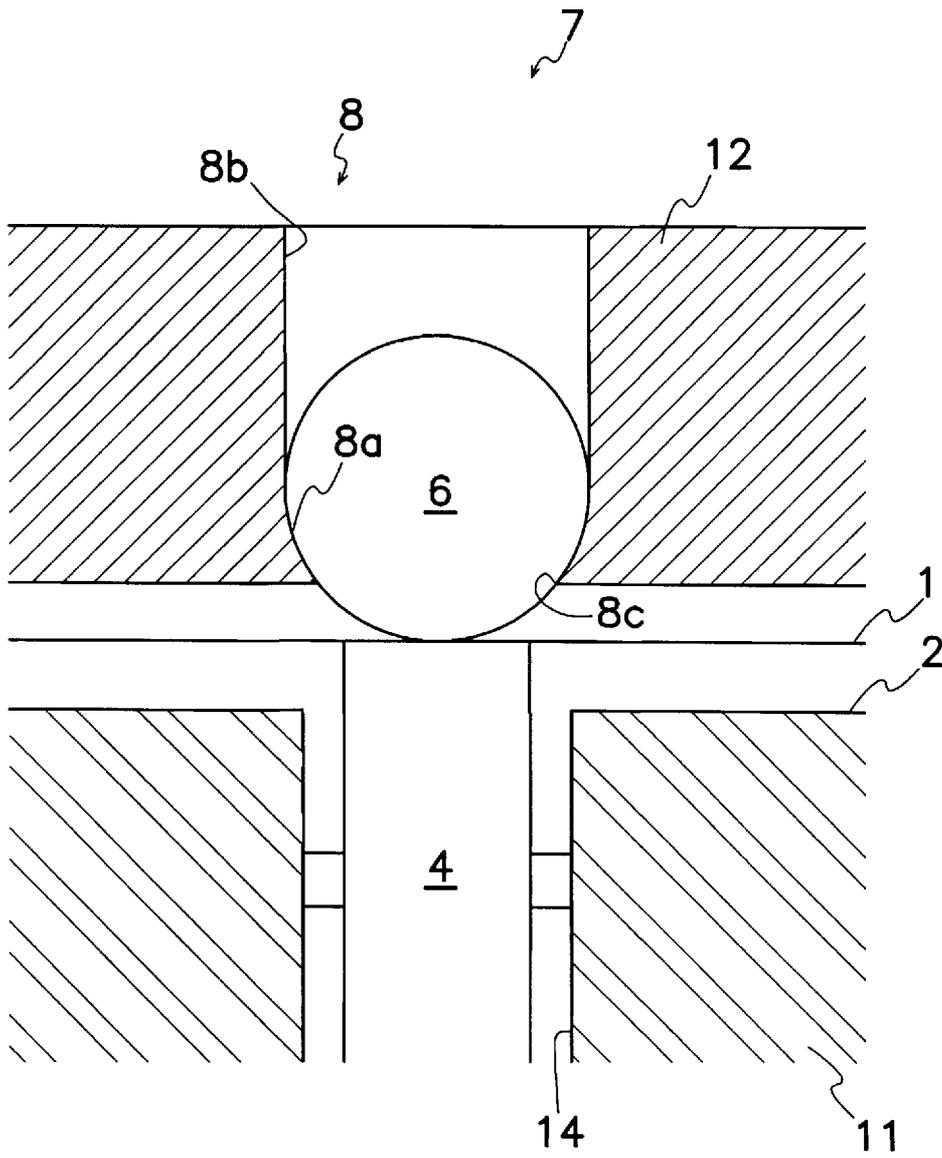
[Fig. 2]



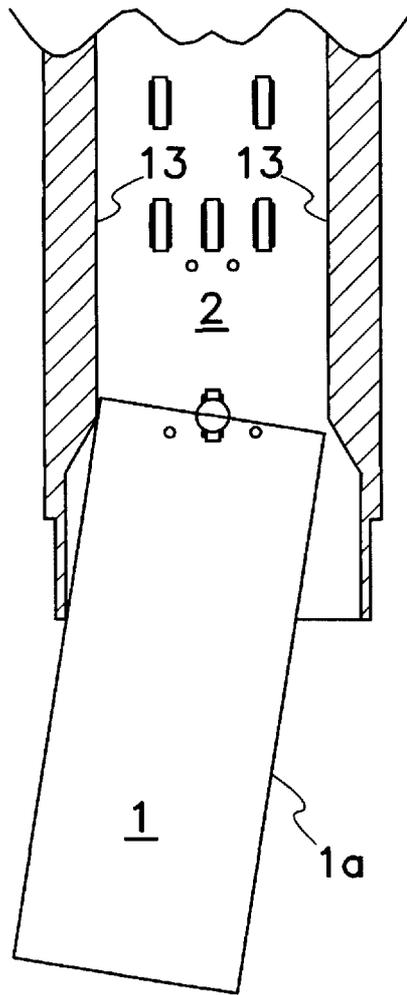
[Fig. 3]



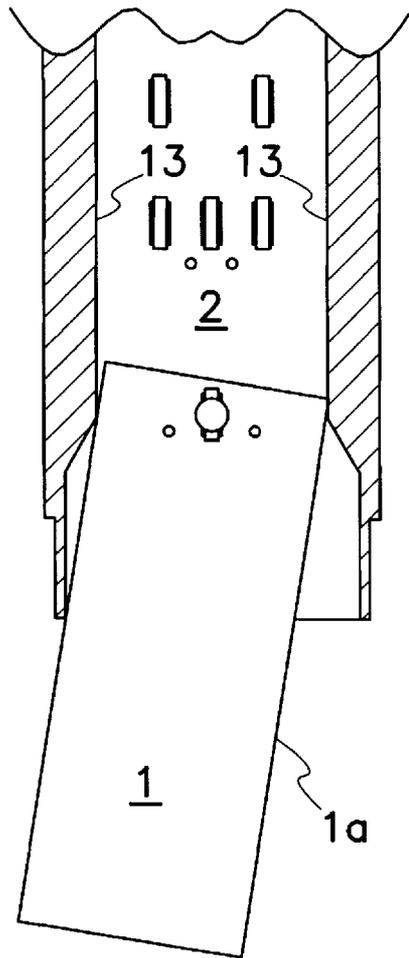
[Fig. 4]



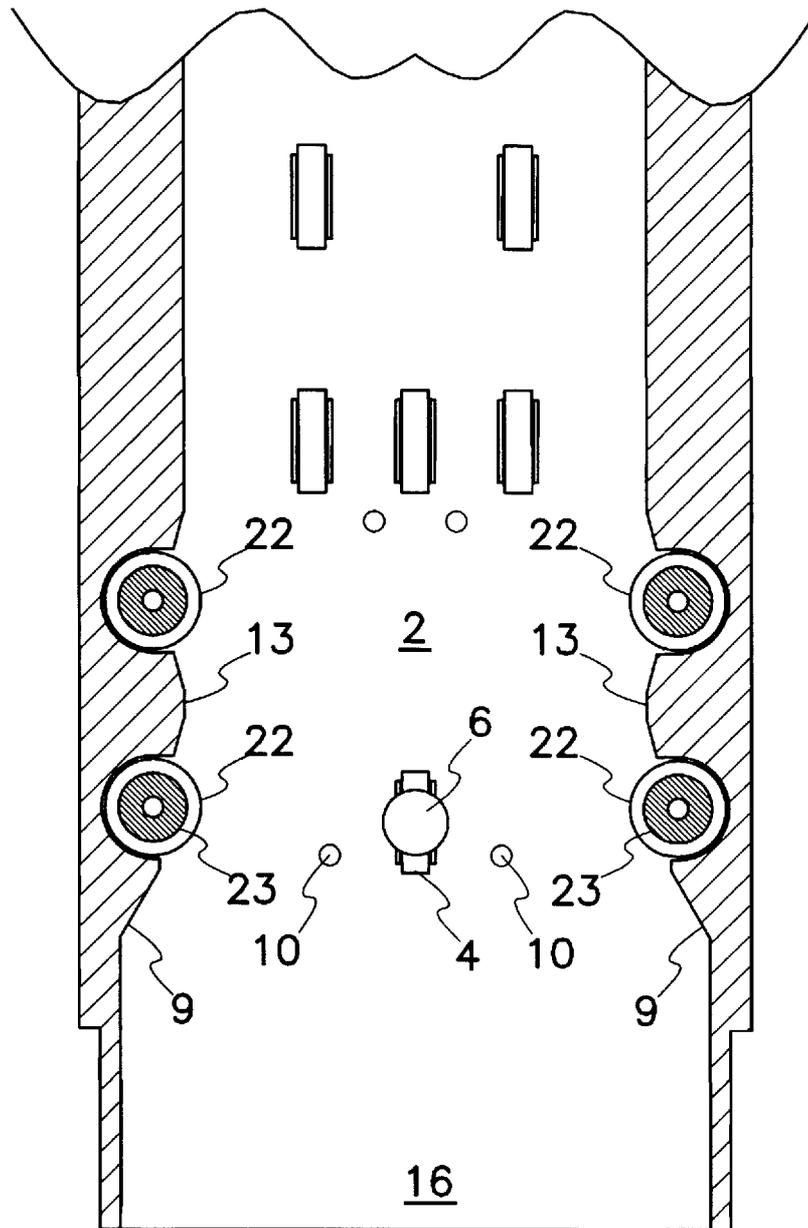
[Fig. 5]



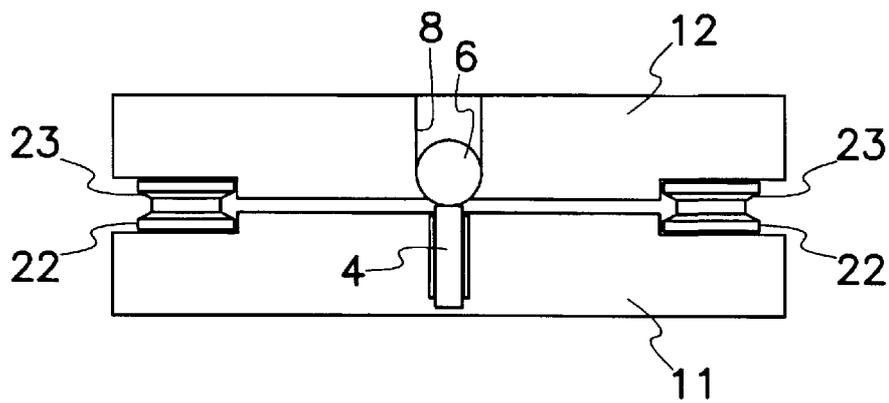
[Fig. 6]



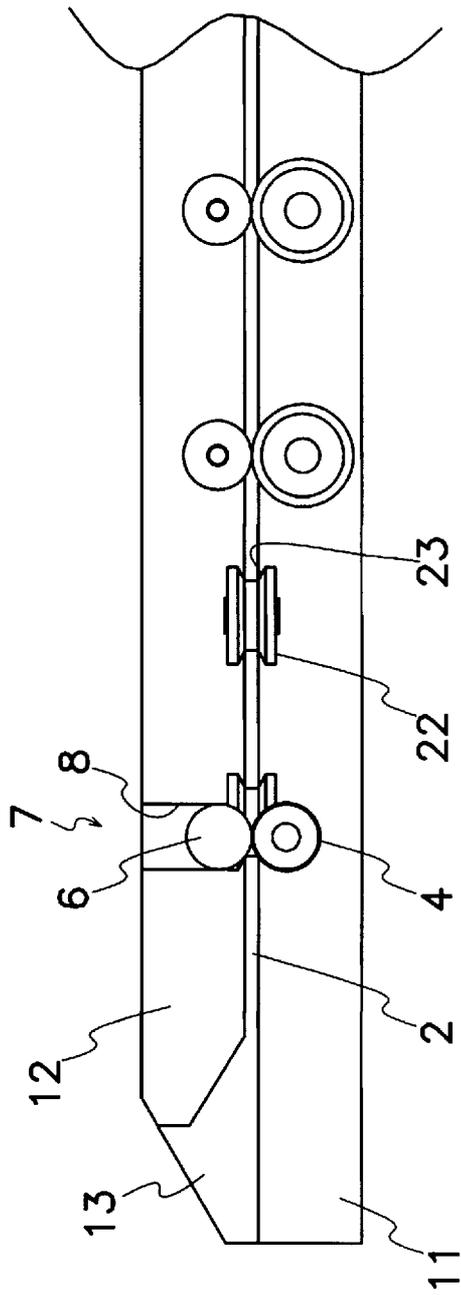
[Fig. 8]



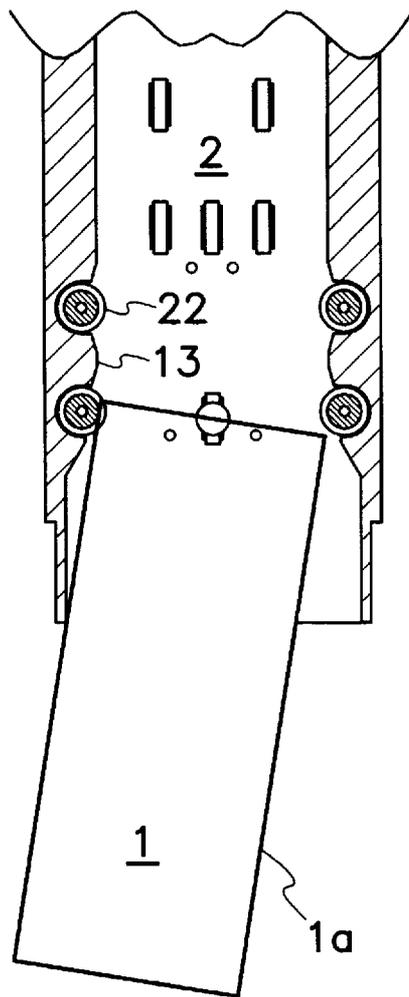
[Fig. 9]



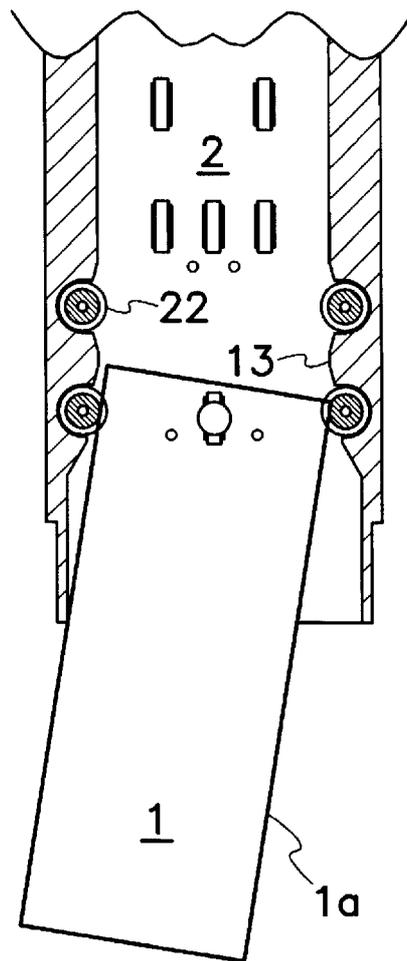
[Fig. 10]



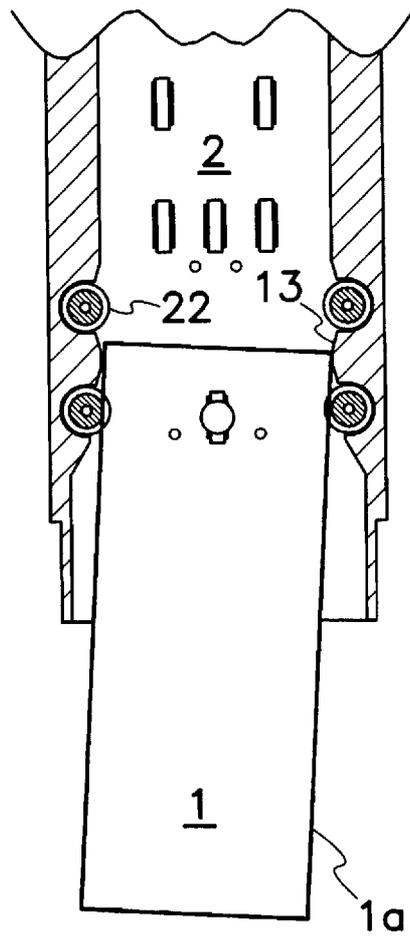
[Fig. 11]



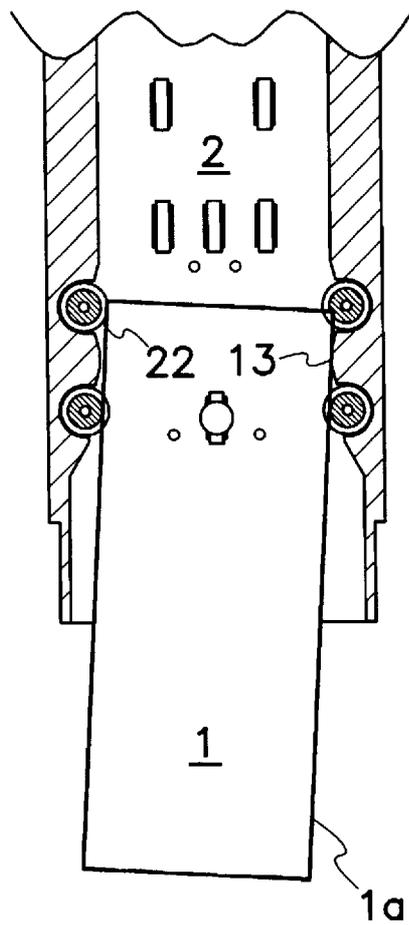
[Fig. 12]



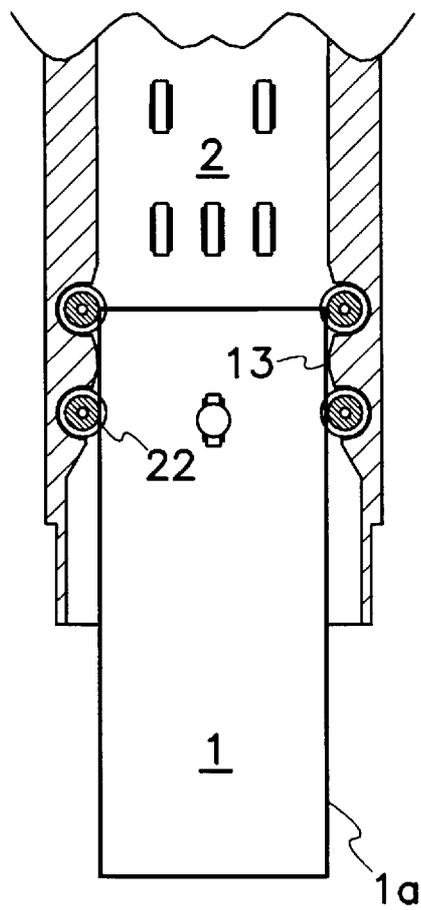
[Fig. 13]



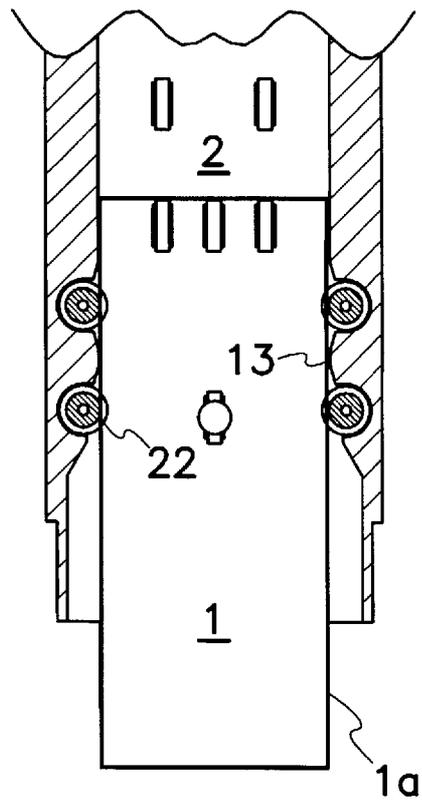
[Fig. 14]



[Fig. 15]



[Fig. 16]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/002767

A. CLASSIFICATION OF SUBJECT MATTER		
Int.Cl. B65H9/00 (2006.01) i, B65H5/06 (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)		
Int.Cl. B65H5/02, B65H5/06, B65H9/00-9/20		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2011 Registered utility model specifications of Japan 1996-2011 Published registered utility model applications of Japan 1994-2011		
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	US 5577719 A (NCR CORP) 1996.11.26, column 4, line 49 - column 6, line 40; figs. 3-6 & DE 69418972 T2 & EP 0653367 A1 & EP 0653367 B1 & ES 2133498 T3 & JP 7-187454 A	1-2, 4-11, 13 3, 12, 14-15
Y	JP 2007-314344 A (KDK KK) 2007.12.06, page 5, lines 28-41; figs. 5-9 (no family)	3
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
07.06.2011		21.06.2011
Name and mailing address of the ISA/JP		Authorized officer
Japan Patent Office		Tatsuto Kimura
3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan		3B 3616
		Telephone No. +81-3-3581-1101 Ext. 3320

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/002767

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 51-048317 Y1 (TATEISHI ELECTRIC CO LTD) 1976.11.20, page 1, right column, lines 15-34; page 2, left column, lines 16-17; figs. 1-2 (no family)	12
Y	Microfilm of the specification and drawings annexed to the written application of Japanese Utility Model Application No. 182457/1982 (Laid-open No. 088047/1984) (RICOH CO LTD) 1984.06.14, specification, page 3, line 16 - page 8, line 5; fig. 3 & JP 59-088047 U	14-15
A	EP 0300095 A1 (AGFA-GEVAERT NV) 1989.01.25, page 3, left column, line 57 - page 5, left column, line 53; figs. 1-2 (no family)	1-15
A	JP 61-041709 Y2 (TOYO COMMUNICATION EQUIPMENT CO LTD) 1986.11.27, page 2, right column, lines 19-22; fig. 3 & JP 57-165634 U	1-15

INTERNATIONAL SEARCH REPORT

International application No.

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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The subject matters of claims 1, 5, 8-11, and 13 are disclosed in US 5577719 A (NCR CORP) 1996.11.26, column 4, line 49 - column 6, line 40; figs. 3-6 & DE 69418972 T2 & EP 0653367 A1 & EP 0653367 B1 & ES 2133498 T3 & JP 7-187454 A. Therefore, the common technical feature among claims 1-15 does not make a contribution over the prior art and hence the subject matters of claims 1-15 are not so linked as to form a single general inventive concept.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.