

⑫ **EUROPEAN PATENT APPLICATION**

published in accordance with Art. 158(3) EPC

⑰ Application number: **85905104.7**

⑤① Int. Cl.⁴: **B 65 H 5/34, B 65 G 47/31**

⑱ Date of filing: **09.10.85**

Data of the international application taken as a basis:

⑧⑥ International application number:
PCT/JP 85/00559

⑧⑦ International publication number:
WO 87/02341 (23.04.87 87/9)

④③ Date of publication of application: **11.11.87**
Bulletin 87/46

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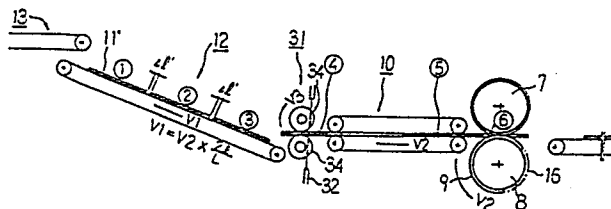
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⑧④ Designated Contracting States: **CH DE FR GB LI**

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⑤④ **TRANSFER APPARATUS FOR PLATE TYPE MATERIALS.**

⑤⑦ A transfer apparatus for plate type materials is provided with a means (32) for detecting the position of an end portion of a plate type material (11'') sent from a preceding stage, members (34) or (44), (45) for feeding the plate type material (11'') while pinching the same, and means (37) or (38), (39) for varying the feed speed of the feed means (34) or (44), (45) on the basis of signal from the detecting means (32) so that the feed speed meets the time requirements for carrying out a subsequent step. Even when a longitudinally double punching sheet is fed, a stacking conveyor (12) in a subsequent stage can be operated by reducing the speed thereof to $V_1 = 2 l/L$. Accordingly, a flaw does not occur in a front portion of the plate type material (11'') on the stacking conveyor (12) in the stage, nor is the plate type material (11'') irregularly stacked. In this apparatus, only a pair of feed members (34) or (44), (45) are driven for feeding the plate type material (11''). To drive these feed members, a small-capacity driving motor of a small inertia of GD^2 may be used. This prevents an increase in the equipment cost. This apparatus can also be applied to a double sheet, and used advantageously as a multi-purpose carton manufacturing machine.



SPECIFICATIONFIELD OF THE ART

The present invention relates to a conveyor system for carrying
5 planar objects by way of a conveyor belt and the like.

BACKGROUND OF THE INVENTION

Corrugated cardboard boxes have been designed with a variety of
sizes, shapes and in a variety of multicolor printings these days, and in
coping with such designs, there have been presented a variety of functions of
10 the machine for manufacturing the corrugated cardboard boxes, accordingly.
Now, referring to the conventional construction of the corrugated cardboard
box manufacturing machine with reference to FIGS. 1 through 4, there are
shown provided a blank board supply station 1, a first printing machine 2, a
second printing machine 3, printing cylinders 4, a transfer conveyor 5, a
15 rotary die cutting station 6, a anvil cylinder 7, a die-cut cylinder 8, a die
element 9, a board delivery conveyor (a scrap conveyor; a conveyor for a
planar object) 10, a sheet of corrugated board 11, a died board 11' (through
the single-cutting process), a died board 11" (through the double-cutting
process), a stacker-conveyor 12, a counter-stacker 13, a board stopper 14, a
20 spacing 16, a lifter 17, and a counting photoelectric tube 18, wherein a
sheet of corrugated cardboard 11 is fed for printing by the board supply
station 1 with such a rate of delivery of a sheet per single rotation of the
printing cylinders 4 in the printing machines 2, 3, thereafter is delivered
outwardly by the transfer conveyor 5 for having the printing ink put in the
25 surface of a cardboard 11 dried up, and then is died to a shape of cardboard
box by way of the rotary die cutter 6. The die element 9 comprises a cutting
knife edge or the like implanted around the circumferential surface of a
curved veneer board of a specified thickness, which is to be mounted onto the

die-cut cylinder 8 by using bolts, and is adapted to cut and die a sheet of cardboard 11 to be fed from the foregoing step into the nip with the anvil cylinder 7, which is wrapped with a layer of urethane rubber or the like for making the cutting easier and preventing the wear of cutting edge, with a
5 predetermined timing of cutting and dieing. The delivery conveyor (scrap conveyor) 10 is formed by a plurality of such carrier members as V-shaped belts or ropes having a circular section in an attempt to promote the dropping of chippings and cuttings from the product at the area where there is provided a specific means such as an air blower or a vibrator, and is
10 constructed in a duplex structure for carrying the died board 11' in a sandwiched relationship over to a stacker-conveyor 12. There is provided a suction equipment in the stacker-conveyor 12, which is adapted to attract by sucking and deliver the died cardboard 11' at a slow speed in the attempt to reduce a impact shock of the board against the cardboard stopper 14 provided
15 in the counter-stacker 13 when hit, thus obviating a possibility of damages and/or irregular stacking of the cardboards from occurring when stacked upon the lifter 17. Also, the cardboard stopper 14 is designed shiftable back and forth by way of a hydraulic cylinder or the like in accordance with a given width of the died board 11' as schematically shown in FIGS. 1 and 2.

20 The cardboard box manufacturing machine is of the type that a sheet of cardboard 11 may be set either for one-piece cutting or for longitudinal double-piece cutting according to the size of a box to be died by using the die element 9 of the rotary die cutter 6. FIG. 3(III) shows the case of the single-piece cutting process, FIG. 4(III) shows the longitudinal double-piece
25 cutting, and FIG. 4(IV) shows the four-piece cutting process (double-cuttings in the transversal and longitudinal ways making four pieces of boards), respectively. The die element 9 is to be set in the circumferential surface of the die cut cylinder 8, with a single-piece or double-piece cutting knife element implanted in working position in accordance with the size of a
30 product box to be manufactured, and with a spacing 16. This spacing 16 is

provided for the reduction of conveying speed in consideration of a too great shock to be given to the died cardboard 11' when hit against the cardboard stopper 14, which is taken in the following manner; when a series of died cardboards 11' after being died by the die cut cylinder 8 are stacked upon the lifter 17 by using the stacker-conveyor 12, as the carrying speed of the stacker-conveyor 12 will, when the single-piece cutting is conducted (FIG. 3(III)), bring a too large shock on the died sheet 11' when hit against the cardboard stopper 14, if $V_1 \neq V_2$ (the circumferential speed of the die cut cylinder 8 and the carrying speed of the delivery conveyor 10 are V_2 , and the carrying speed of the stacker-conveyor 12 is V_1 , as shown in FIG. 3(I)), the speed V_1 of the stacker-conveyor 12 is then reduced by using the spacing 16 as shown in FIG. 3(II) to:

$$V_1 = V_2 \times \frac{\ell \text{ (Sheet length for single-cutting)}}{L \text{ (Die cut cyl. circumferential length)}}$$

However, in the case of the double-piece cutting process (FIG. 4(III)), when the carrying speed V_1 of the stacker-conveyor 12 is reduced down to $V_1 = V_2 \times \ell / L$ as shown in FIG. 4(II), since the sheet 11" died for the double-cutting process is cut to the shape in which the foregoing piece and the following piece are left connected with each other by the die cutter, it would not be feasible to have normal cutting operation as these died sheets 11" may come to overlap one upon the other, and consequently, the carrying speed V_1 of the stacker-conveyor 12 is forcibly made $V_1 \neq V_2$ as shown in FIG. 4(I) (identical with FIG. 3(I)), then resulting in such undesirable problems that the leading edges of the died sheet 11" would be damaged by a too large shock load when hit against the cardboard stopper 14 in stacking, or the died sheets 11" would be stacked irregularly.

DISCLOSURE OF THE INVENTION

In consideration of the problems noted above, it is an object of the present invention to provide an improved conveyor system for planar objects which can obviate such a possibility of damages to be received while being

stacked or an inconvenience of irregular stacking in the step following the die-cutting process.

In the conveyor system according to the present invention, there are provided a detecting device adapted to detect the current end position of a planar object fed from the preceding step, a delivery member adapted to deliver the planar object while having it sandwiched therebetween, and a speed change device adapted to change the delivery speed of the delivery member in accordance with the timing of the following step on the basis of the signal from the detecting device, and as the conveying speed of the following stacker-conveyor can be made as slow as $V_1 = 2\ell/L$ even with the died sheet processed in the double-piece cutting operation, there is attained such advantageous effects as avoiding the risk of damaged rendered at the leading edge of a died sheet or the inconveniences of irregular stacking while being stacked upon the stacker-conveyor in the following step, accordingly.

In addition, there are required only such simple delivery members as two small-diametered sandwiching rolls to be driven for the delivery of the processed sheets, which would have a relatively small inertia value GD^2 and therefore require a relatively small capacity driving motor, thus contributing to the curtailment of cost, and which is proven to be adaptable to the double-sheet cutting operation and so useful in the application to the general purpose machine for manufacturing the corrugated cardboard boxes.

The present invention will now be described taking the reference to preferred embodiments thereof shown in the accompanying drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 5 is a schematic diagram illustrating the mutual relationship of a series of planar objects aligned on the delivery to the delivery member according to the present invention;

FIG. 6 is a side elevational view showing a preferred embodiment of the conveyor system for the planar objects according to the present invention;

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FIG. 7 is an illustrative diagram for depicting the function of the conveyor system;

FIG. 8 is a front elevational view showing the speed change device and parts relative thereto of the conveyor system;

5 FIG. 9 is a front elevational view showing the same speed change device and parts relative thereto by way of another embodiment; and

FIG. 10 is a general side elevational view showing the delivery member construction by way of another embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 Shown in FIG. 6 are an anvil cylinder 7, a die-cut cylinder 8, a die element 9, a sheet delivery conveyor (scrap conveyor) 10, a died sheet (through the double-piece cutting process) 11", a stacker-conveyor 12, a counter-stacker 13, a spacing 16, an photoelectric tube 32, and a sandwiching roll section 31, and shown in FIG. 8 are sandwich (rubber) roll elements 34, 34, a bearing 35, gears 36, and a DC (variable speed) motor 37. Also, FIG. 5 is a schematic diagram showing a series of died sheets ① through ⑥ before delivered from the sandwich roll elements 34, 34, in which L depicts the circumferential length of the die-cut cylinder 8. Also in FIG. 7 there is shown a timing chart showing the changes of rotating speed of the sandwich roll elements 34, 34. The sandwich roll elements 34, 34 shown in FIG. 8 are fixed in operative position on a single roll shaft 33 disposed with a given gap, and are arranged opposedly to respectively form a pair of rolls in the sandwiching roll section 31. Each of these sandwich roll elements 34 is formed with a layer of soft rubber sheet in its circumference so that it may not squeeze and crush the corrugated cardboard sheets while passing therethrough, and also may be worked with slitting. The upper and lower roll shafts 33 are held rotatably by using the bearings 35 and operatively in such a manner that the cardboard sheet may be carried in a sandwiching manner by the engagement of the sandwich roll elements 34, 34, and on one sides of 25 these roll shafts 33 there are fitted the gears 36 meshing with each other at 30

the ratio of 1:1. On the extension of one end of the roll shaft 33 there is installed a pulley, which is connected operatively to another pulley on the DC motor 37 by using a V-shaped belt or the like; with this arrangement, any change in the rotating speed of the sandwich roll elements 34, 34 may be
 5 accomplished by detecting the current edge position of a cardboard sheet to be fed at or near the central portion of the upper and lower sandwich roll elements 34, 34, and by feeding thus-obtained signal into the DC motor 37, and thus changing the rotating speed of the DC motor 37, accordingly.

Next, referring to the operation of the delivery conveyor 10 according
 10 to FIG. 5 which shows the state before the died cardboard 11' reaches the sandwich roll elements 34, the sheets ①, ②; ③, ④; ⑤, ⑥ depicts respectively the state of sheets fed from the blank cardboard supply station 1, or in other words the state that these sheets are disposed in a discrete relationship with each other. The spaces between the sheets ② and ③, and
 15 between ④ and ⑤ represent a difference in the circumferential length of the die cut cylinder 8 and the overall extension of the died sheets ① and ②. Δl represents a small gap produced between each of the adjacent died sheets. The rotating speed (the circumferential speed of the roll surface) V_3 of the sandwich roll element 34 (or the rotating speed of the DC motor
 20 37), which may be known by detecting the timing that the edge of the died cardboard 11' passes by using the photoelectric tube 32, is changed as shown in the timing chart of FIG. 7. FIG. 7 shows the relationship between the timing of detecting the passage of the died cardboard 11' by the photoelectric tube 32 (that is, the case that the gap between the adjacent
 25 sheets is detected is defined to be the light receiving state, while the case that a sheet is detected being defined to be the light blocking state.) and the current rotating speed of the sandwich roll element 34. The sandwich roll element 34 is driven at the rate $V_3 = V_2$ while the sheet ① passes the photoelectric tube 32, and then, upon the blocking of the photoelectric tube
 30 32 by the leading edge of the sheet ②, is reduced down to $V_3 = V_1$, or the

level of $2\ell/L \times V_2$. Thereafter, the photoelectric tube 32 functions to detect the gap between the sheets ② and ③, and the sandwich roll element 34 are again driven with an increased speed of $V_3 = V_2$. With the repetition of such operation, a series of died cardboard 11' may be delivered
5 on the stacker-conveyor 12 at a generally equal interval of $\Delta\ell'$ one after another, accordingly. The driving speed of the upper and lower sandwich roll elements 34, 34 is increased or reduced with the same speed rate in proportion to the rotating speed V_2 of the die cut cylinder 8.

FIG. 9 shows another embodiment of the invention wherein the rotating
10 speed of the sandwich roll element 34 is changed by shifting a first electromagnetic clutch 40, etc. incorporated or installed otherwise in a motor 38 and a pulley and a second electromagnetic clutch 41, etc. incorporated or installed otherwise in a second motor 39 and a pulley, with which embodiment there is attainable an equivalent effect and function to
15 that of the previous embodiment.

FIG. 10 shows a further embodiment of the invention, wherein the sandwich roll elements and the speed change device are replaced with a conveyor belt 44, a conveyor roll 45 and a motor 42, with which there is also attainable an equivalent effect and function to that of the embodiment
20 described hereinbefore.

CLAIMS

1. A conveyor system for carrying planar objects characterized by a detecting means adapted to detect the leading edge of said planar object to be fed from the preceding step, a delivery member adapted to deliver said
5 planar object while holding in sandwiching relationship, and a speed change means adapted to change the speed of delivery of said delivery member in accordance with the timing of operation of the following step on the basis of signals fed from said detecting means.

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FIG. 1

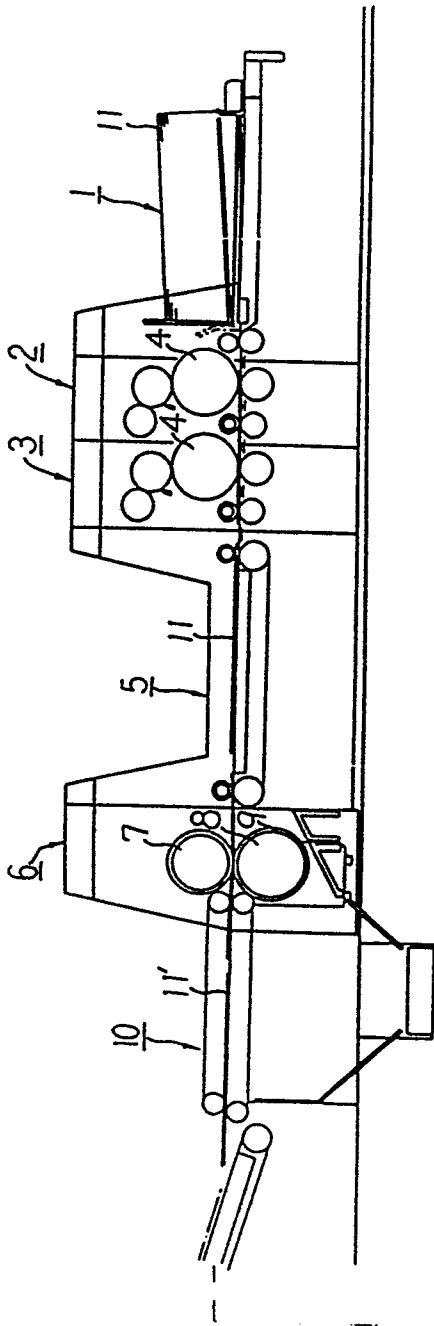


FIG. 2

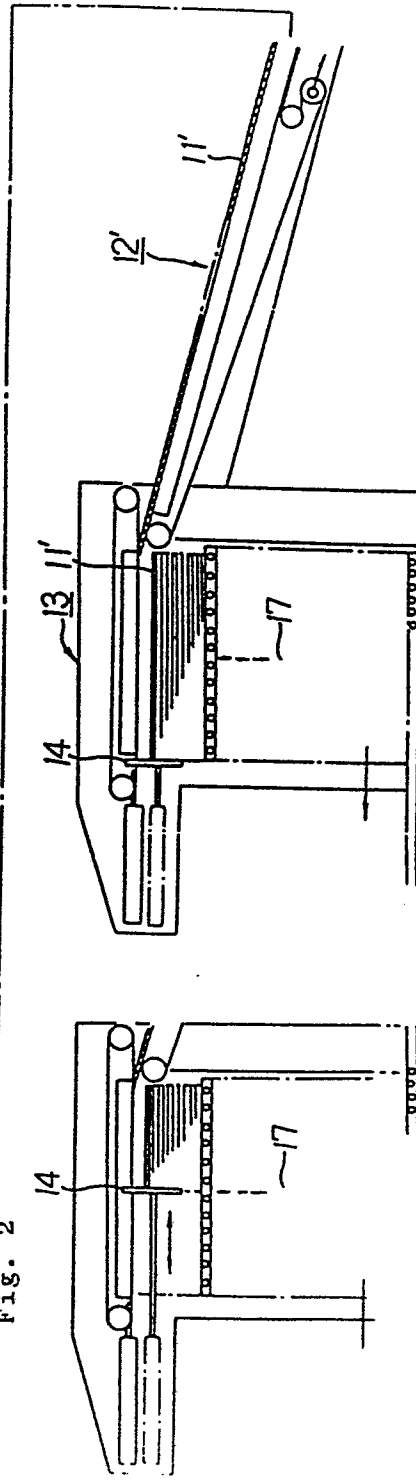


FIG. 3 (I)

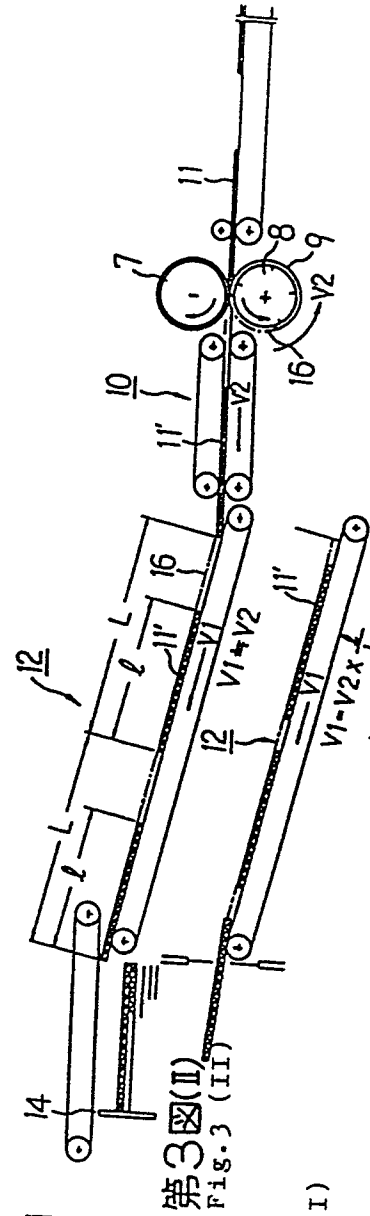


FIG. 4 (I)

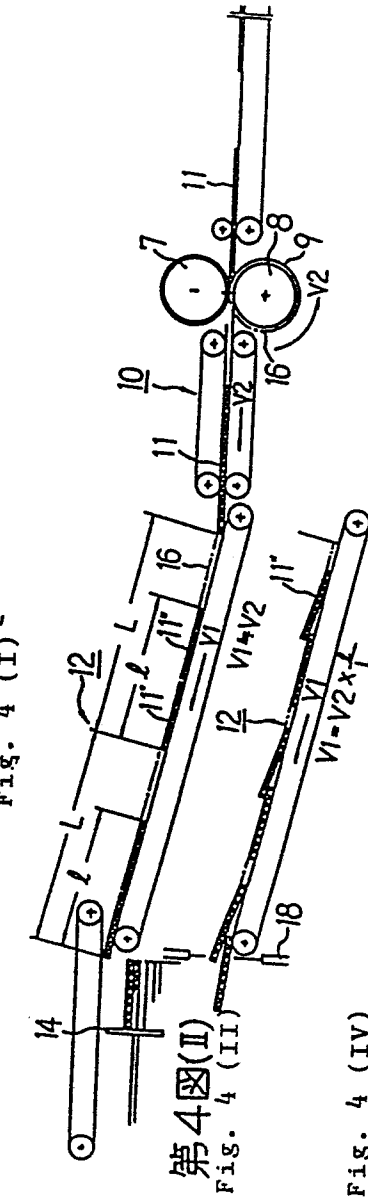


FIG. 3 (III)

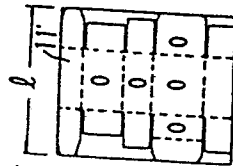


FIG. 4 (III)

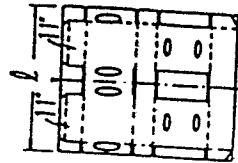


FIG. 4 (IV)

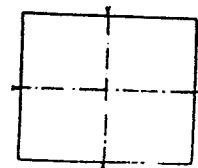


Fig. 5

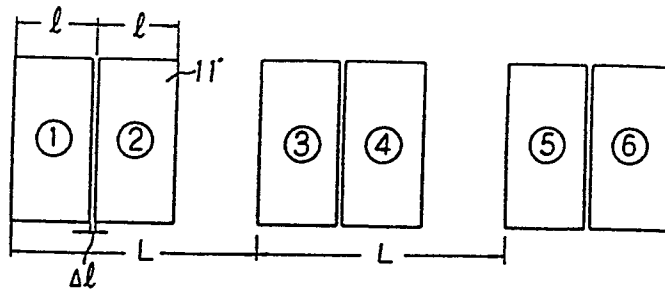


Fig. 6

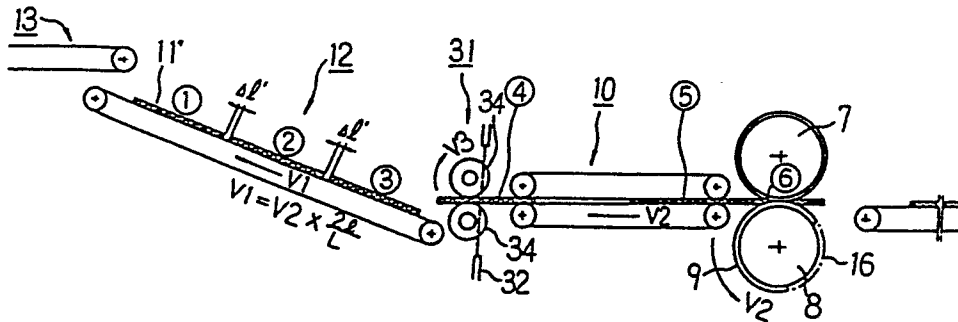


Fig. 7

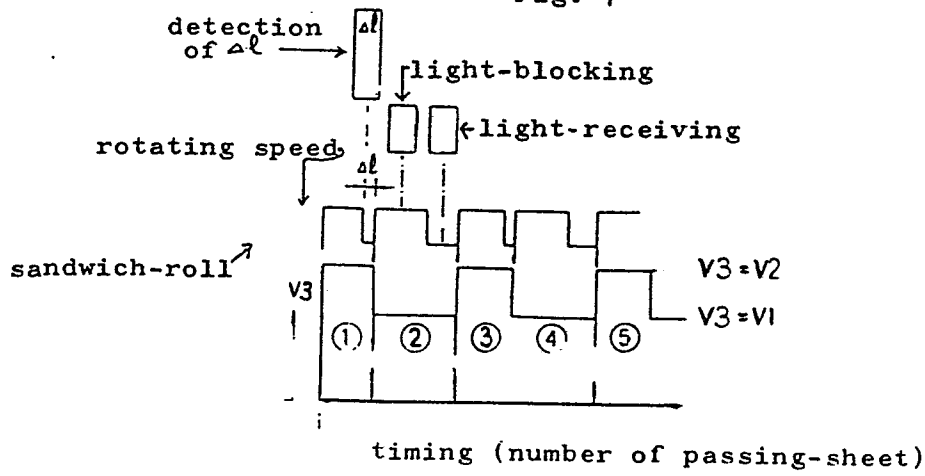


Fig. 8

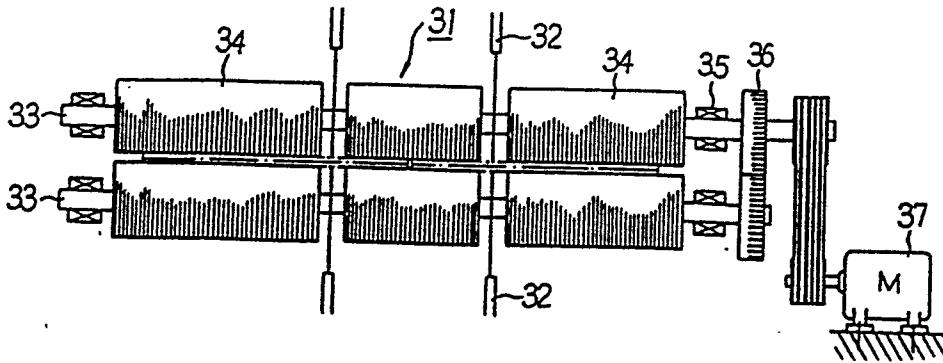


Fig. 9

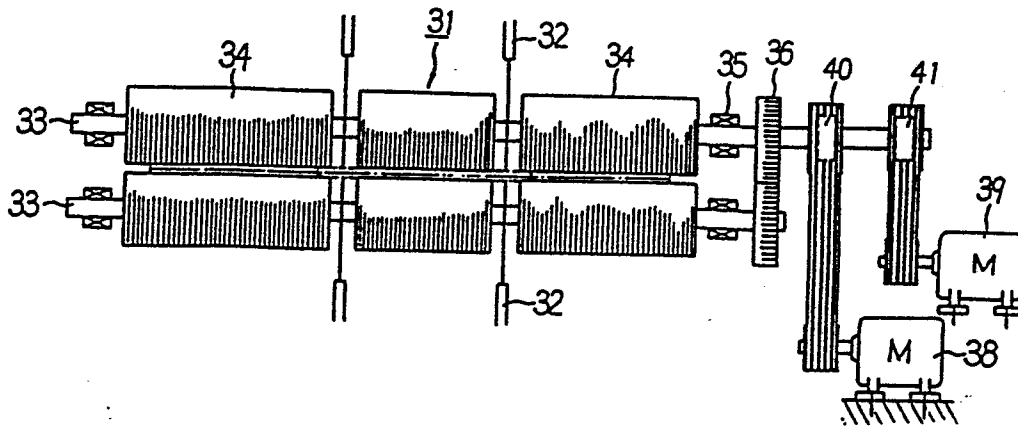
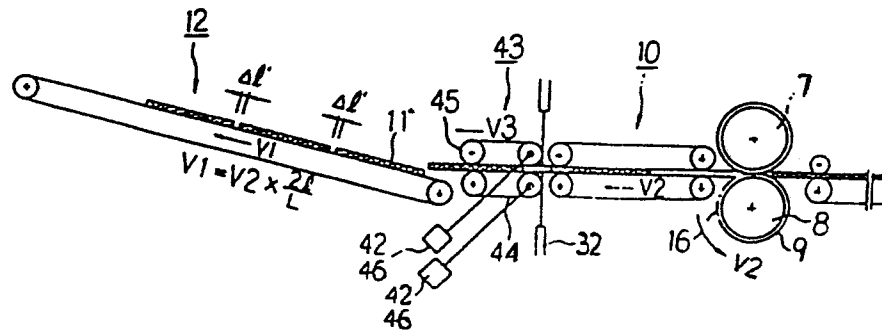


Fig. 10



0244484

INTERNATIONAL SEARCH REPORT

International Application No. PCT/JP85/00559

| | | |
|---|--|-------------------------------------|
| I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ¹ | | |
| According to International Patent Classification (IPC) or to both National Classification and IPC | | |
| Int.Cl ⁴ B65H5/34, B65G47/31 | | |
| II. FIELDS SEARCHED | | |
| Minimum Documentation Searched ⁴ | | |
| Classification System | Classification Symbols | |
| IPC | B65H5/34, B65G47/30-47/31 | |
| Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁴ | | |
| Jitsuyo Shinan Koho | 1967 - 1985 | |
| Kokai Jitsuyo Shinan Koho | 1971 - 1985 | |
| III. DOCUMENTS CONSIDERED TO BE RELEVANT¹¹ | | |
| Category ⁸ | Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹² | Relevant to Claim No. ¹⁴ |
| Y | JP, A, 50-124362 (Tsubakimoto Chain Co.) 30 September 1975 (30. 09. 75) (Family: none) | 1 |
| A | JP, Y2, 52-42538 (Kubota, Ltd.) 27 September 1977 (27. 09. 77) (Family: none) | 1 |
| A | Jp, B2, 56-20250 (Kyodo Denshi Kogyo Kabushiki Kaisha) 12 May 1981 (12. 05. 81) (Family: none) | 1 |
| Y | JP, B2, 56-27409 (Omori Kikai Kogyo Kabushiki Kaisha) 24 June 1981 (24. 06. 81) (Family: none) | 1 |
| Y | JP, A, 59-97918 (Kyoto Seisakusho Kabushiki Kaisha) 6 June 1984 (06. 06. 84) (Family: none) | 1 |
| <p>¹³ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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</p> <p>"&" document member of the same patent family</p> | | |
| IV. CERTIFICATION | | |
| Date of the Actual Completion of the International Search ² | Date of Mailing of this International Search Report ² | |
| December 18, 1985 (18. 12. 85) | January 13, 1986 (13. 01. 86) | |
| International Searching Authority ¹ | Signature of Authorized Officer ¹⁰ | |
| Japanese Patent Office | | |