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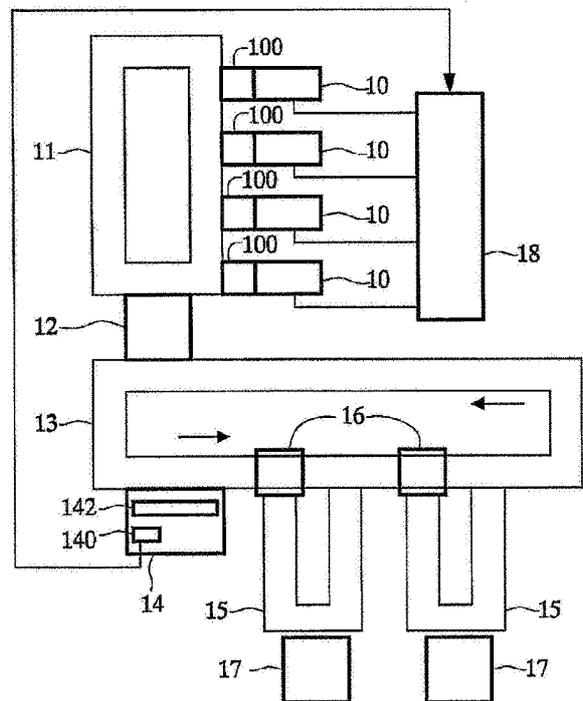
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54 Small batch book production.

57 Small batches of books are produced. Each book comprises a cover and pages bound within the cover. Covers are produced first. Supply of the covers to a cover storage and supply station along a conveyor line is detected and used to trigger printing of the pages. Thus the average time that blocks of unbound pages are in existence is reduced, which minimizes the risk loss of blocks of pages. Triggering of printing may be adapted dependent on available binding capacity, to reduce average time that blocks of unbound pages are in existence. Carriers are provided on the conveyor line, each for the pages and cover of a respective one of the books. The carriers have a plurality of vertical levels, for pages and cover respectively and wider level is provided for the cover than for the pages.



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Dit octrooi is verleend ongeacht het bijgevoegde resultaat van het onderzoek naar de stand van de techniek en schriftelijke opinie. Het octrooischrift komt overeen met de oorspronkelijk ingediende stukken.

Title: Small batch book production

Field of the invention

The invention relates to a production system for producing books in small batches and a method of producing books that each comprise a cover and pages bound within the cover.

Background

Production of books in small batches, even in batches of one book, mixing the production of books with different content, has become important to serve demand from Internet orders. Like conventional large batch book production this involves separate printing of the pages and the cover of the book, followed by binding blocks of pages of the book within the cover. However, the cost per book is usually much higher, even if one discounts the fact that more costly flexible printing techniques are used.

In conventional printing shops that produce books in small batches, large numbers of covers and pages can usually be seen to accumulate awaiting binding. This may be due to the fact that printing and handling of covers and pages can be error and damage prone, especially for the first copies of a book, necessitating interventions or even reprinting. Once covers and blocks of pages of a sufficient number of books are available, they are taken to a binding machine. There the blocks of pages of the books are bound in the covers, except possibly for those books for which no damage and error free pair of a cover and pages is available. The usable covers or pages for these books are laid aside for the next binding run, when a batch with a sufficient number of covers and pages are available.

Uncertainty about errors translates into a longer average time between printing and binding and therefore in a larger amount of work in progress. Moreover, longer waiting times translate into higher loss of blocks of pages and covers. Blocks of pages of a book are especially vulnerable. The longer they are left waiting, the greater the risk that something will go wrong that necessitates a costly correction or even complete reprinting.

This may be contrasted with mass manufacture of large edition books, for which the continuous flow of identical covers and blocks of pages may enable production line processing, discarding a damaged or erroneous cover or block of pages in favor of the next cover or block of pages in the line, with little or no additional waiting time. This does not work for small batch printing, wherein the production of books with different covers and different content is mixed. Comparing mass production with small batch production, this has the effect that the ratio of intermediate production stock to produced books can be much higher for small batch book production than for mass production, which significantly contributes to higher costs per book, longer time before an instance of the book is ready, losses of blocks of pages or covers and more required shop floor space. It is a problem to deal with the uncertainty of cover and page production in a way that reduces the average volume of existing blocks of unbound pages for work in progress.

Summary

Among others, it is an object to provide for a production system for books with pages bound in a cover wherein overhead due to small batch sizes is reduced.

A production system is provided for producing small batches of books with pages bound in a cover. The system comprises one or more printers, a

binding machine, a conveyor line for transporting the pages of a book between the one or more printers and the binding machine, in groups that each comprise the cover and pages of a respective one of the books along at least part of the conveyor line, a cover storage station, for example a cover storage and supply station of the conveyor line, for storage of covers for supply of covers to the conveyor line, the cover storage station comprising an identification label reader, for reading identification labels on the covers at the cover storage station and a control computer coupled to the identification label reader and the one or more printers and configured to trigger printing of the pages of individual ones of the books by the printer or a selected one of the printers, for each individual book in response to reading of an identification label identifying a respective individual one of the covers. Other factors may also affect the triggering of printing in response to reading of an identification label, for example by delaying the response to reading of the identification label until sufficient binding capacity is available.

This minimizes the time that book pages will be present between the time of printing and the time of binding, which in turn minimizes the risk of loss of blocks of pages. A possible increased time the covers are present leads to a smaller increase in the risk of loss. As will be appreciated, the cover based triggering has the effect that printing of the pages of a book will be triggered only after a cover has become physically available at the cover storage station .

Triggering in response to availability at the cover storage station should be contrasted with centrally coordinated triggering of printing of the cover and the pages or only loosely coordinated printing of pages and covers. In the case of centrally coordinated triggering, damage to the cover would cause a situation wherein the pages would have to be placed in store until a new cover has been printed, or the damage has been repaired, which would lead to increased risk of loss of the pages and an overall average increase in stock.

With loosely coordinated printing of pages and covers, covers or pages would need to be stored until both are available, also which increases the risk of error. In contrast, when the arrival of the cover is used to trigger printing, only covers need to be stocked awaiting printing, which takes up much less space and capital and the duration of existence of blocks of unbound pages is minimized, which minimizes loss of blocks of pages.

The cover storage station may be located downstream along the conveyor line from where the pages are supplied to the conveyor line. In this case the cover of each book may be added to the pages of the book that are already on the conveyor line to form a group. Alternatively, the cover of each book could be supplied to the conveyor line in advance of supply of the pages of the book, for example in response to a signal that the pages will be ready for supply to the conveyor line. Supply of the cover of a book to the conveyor line after the pages have been supplied may reduce the average time that the pages are needed in production. In an embodiment the identification label of the cover is read only after the cover has been stored in storage device of the supply station. This may reduce possible increases in average times that unbound pages exist due to accidents with covers between reading and storing.

The label per se may identify only a class of books for which the cover can be used, the individual one of the covers being identified by the label in combination with the fact that the label is read. Alternatively, labels may be used that distinguish individual physical covers by themselves. This has the advantage that errors due to repeated reading of the label of the same physical cover can be avoided. The fact that the conveyor line is provided between the one or more printers and the binding machine means that groups of pages and covers are transported on the conveyor line along at least part of the distance from the printer or printers and the binding machine, preferably up until the binding machine, but it does not exclude that another part of the transport

between the one or more printers and the binding machine can be effected by other means, for example via another conveyor line.

5 In an embodiment wherein a plurality of binding machines, for a plurality of types of binding methods is used, triggering of printing of the pages of the individual ones of the books is enabled or disabled dependent on the indicator for the binding method required for the individual ones of the books. Thus less time will occur on average between printing of the pages and binding.

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In an embodiment a plurality of carriers are transported by the conveyor line, each comprising a cover support surface and a pages support surface for the cover and the pages of a respective one of the books. Thus waiting for separate arrival of pages and cover at the binding station is
15 avoided. In an embodiment the cover support surface and the pages support surface are vertically stacked. The cover support surface may be at least twice as wide as the pages support surface. This makes it possible to transport unfolded covers taking up no additional horizontal space for the pages.

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In an embodiment a transfer device with a set of conveyor belts and a lifting mechanism coupled to the set of conveyor belts may be used for raising and lowering the set of conveyor belts. The carriers may be provided with slots, sizes and distances of the conveyor belts in the set allowing the conveyor belts to be raised and/or lowered through the slots. Thus, pages of
25 the books can be moved into and/or out of the carriers with a minimum risk of damage. This type of transfer device may be used along a conveyor line that transports pages from the printer or printers and/or at a cutter, or binding station. Instead of set of conveyor belts a fork may be used that can be moved vertically through the slots. Use of a set of conveyor belts makes it easier to
30 control position of the pages on the carrier.

In an embodiment the transfer device comprises a further set of conveyor belts and a further lifting mechanism coupled to the further set of conveyor belts, the lifting mechanism and the further lifting mechanism being
5 configured to raise and/or lower the further set of conveyor belts and the set of conveyor belts independently of one another. In this way pages of books can be entered and output to and from the transfer device independently.

In an embodiment the transfer device comprises a moveable fork,
10 moveable to substitute for support by set of conveyor belts when the set of conveyor belts is lowered to the level of the further set of conveyor belts. No complex movement of the fork with pages on it is needed. The fork only needs to capture sheets when the set of conveyor belts is temporarily absent. When the set of conveyor belts is moved back up through the fork, the set of conveyor
15 belts takes over the pages from the fork and the fork can be withdrawn to allow later downward movement of the set of conveyor belts with sheets of pages.

In an embodiment a cutter is functionally located between the one or
20 more printers and the cover storage station , for cutting sheets produced by the printer with the pages. In an embodiment, two stages of cutting may be used, before and after binding. The cutter before binding may be configured to cut sheets only according to a selectable one of a predetermined number of standard cutting patterns. The control computer being configured to cause the
25 one or more printers to select positions of the pages on printed sheets at positions selected dependent on the cutting pattern.

Brief description of the drawings

binding streets 15. Different types of binding stations 17 may be present along different ones of binding streets 15. Thus for example gluing binders may be present at a plurality of binding streets 15 and sewing binders may be present at another binding street 15.

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Grouping station 14 is located along second conveyor line 13 between cutter 12 and conveyor switches 16 of binding streets 15. Grouping station 14 serves as a cover storage and supply station, or at least as a storage station, for storing covers that will be supplied covers onto the second conveyor line 13. In an embodiment no further processing of the covers occurs between their storage at grouping station and their supply to the second conveyor line 13. Grouping station 14 comprises a bar code reader 140 and a storage device 142 for storing covers. Control computer 18 has an input coupled to bar code reader 140 and outputs coupled to printers 10. Instead of a bar code reader, any other reader for reading any other type of identification label may be used. Control computer 18 may have further inputs and outputs (not shown) coupled to cutter 12 and binding stations 17.

In operation, book covers are printed on a book cover printer (not shown). Optionally printed covers are attached to hard cover. The covers are provided with a bar code printed on the cover that distinguishes at least covers of different books. Instead of a bar code printed on the cover, other types of identification label may be used, including printed symbols or RFID tags attached to the cover, for example. All these, however attached to or printed on the cover will be referred to as identification labels on the cover. The covers are transported to grouping station 14, where the label is read out and a result of reading of the label is fed to control computer 18. In an embodiment the covers may be transported in a batch, for use for different instances (copies) of the same book (title). In this case, the label of one of the covers of the batch may be read and a count of usable covers in the batch may be entered. Alternatively,

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labels of individual covers may be read. The cover or covers is or are stored in storage device 142. Preferably, the label is read only after storage in storage device 142.

5 A plurality of carriers for covers and pages of books are circulated on second conveyor line 13. Preferably, carriers are used that can be made to stop on second conveyor line 13 or binding streets 15 without stopping transport along the entire conveyor line. Cutter 12 places the pages of the books on the carriers, thereby assigning books to respective carriers. When a carrier arrives
10 at grouping station 14, the covers of the book that is assigned to the carrier is moved from storage device 142 to the carrier. Conveyor switches 16 redirect the carriers from second conveyor line 13 to selected binding streets 15. At binding stations 17 the pages from the carrier are bound in the cover from the carrier. From the binding station the carrier proceeds through the binding
15 street 15 back to the second conveyor line and from there back to cutter 11, where another book may be assigned to the carrier.

Figure 2 shows a flow chart of control processes executed by control computer 18. In a first process a first step 21 is executed, wherein control
20 computer 18 receives a result of reading the label from a cover and creates a stored record with information derived from the label in a table of books that are scheduled for printing. The information derived from the label may link the record to a further record in a table of book definitions, with records that indicate information representing the printable content of the pages of a class
25 of books, the type of required binding, the number of instances still to be made etc. First step 21 is repeated in the first process each time when the label of a new cover is read. When a batch of covers for instances of the same book is received and a count of usable covers in the batch is entered, a plurality of stored records corresponding to the count may be created, each for an
30 individual instance of the book.

In a second process control computer 18 controls printing. In a second step 22, control computer 18 determines whether a printer 10 is free to print pages of a book, or will become free to do so. In an optional third step 23, control computer 18 determines indicator values of dynamically available capacity levels of binding streets 15. In a fourth step 24, control computer 18 searches for a stored record in the table of books that are scheduled for printing, optionally limited to books with a type of required binding that is supported by a binding machine 17 in a binding street 15 for which the indicator value satisfies a predetermined criterion. In a fifth step 25 control computer 18 assigns the book to the free printer 10 and removes the record from the table of table of books that are scheduled for printing. Optionally control computer 18 transmits a file defining the printed content of the book, or an identifier defining this file, to the free printer 10. From fifth step 25 the second process returns to first step 21.

As will be appreciated, this has the effect of minimizing the duration of the average period during which unbound blocks of pages are present. Thus the risk of loss of such blocks, due to separation of the pages for example, is minimized. This is a major contributor to production loss.

As will be appreciated, the effect is that printing of the pages of a book will be triggered only when a cover has become physically available at grouping station 14 and preferably only once it has been stored in storage device. This should be contrasted with centrally coordinated triggering of printing of the cover and the pages or only loosely coordinated printing of pages and covers. In the case of centrally coordinated triggering, damage to the cover would cause a situation wherein the pages would have to be placed in store until a new cover has been printed, or the damage has been repaired, which would lead to an overall average increase in stock. With loosely

coordinated printing of pages and covers, covers or pages would need to be stored until both are available. In contrast, when the arrival of the cover is used to trigger printing, only covers need to be stocked awaiting printing, which takes up much less space and capital.

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In an embodiment, the identification label on the cover may be unique to the physical cover, i.e. using distinct labels for different physical covers for different physical instances of the same book. In this case, the labels of all covers are preferably scanned. Alternatively, the same identification label may be used for different physical instances. This may make it possible to scan the label of only one cover of a batch when a batch of the same covers arrives. Thus it may still be open which cover of the book will be used for which block of printed pages of the book. When identification labels on the cover are unique to the physical cover, control computer 18 may be configured to impose that no more than one printing action of the pages of the book is triggered in response to each distinct information label. This has the advantage that erroneous repeated reading of the identification label of the same physical cover cannot erroneously trigger printing of multiple blocks of pages for different instances of a book.

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Optionally, triggering of printing is delayed until there is sufficient available capacity to bind the pages in the cover. When dynamic variations of available binding capacity can be a limiting factor, this further decreases the need to keep pages in store. In the illustrated embodiment, dynamically available binding capacity is not used to delay printing of covers. Instead arrival of covers is used to trigger printing of pages when binding capacity is available. This means that delays between printing of covers and their arrival at the conveyor line, including delays due to damage to a cover or a need to reprint do not affect utilization of binding capacity. This comes at the disadvantage that on average more covers may need to be kept stored, but the

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average time that blocks of unbound pages need to be in existence is minimized. The resulting reduction in loss of pages outweighs longer storage of covers. It should be noted that non-dynamic binding capacity factors, such as a breakdown of a binding machine or a lack of working material of such a machine or an overload of orders for books, may be used to disable printing of covers as well.

In a simple approximation, the indicator value for available capacity may be a difference between a predetermined threshold for a type of binding and a count of instances of books for which pages have been placed on second conveyor line 13 and that require this type of binding. When the count is equal to or greater than the threshold triggering of printing of a book that requires this type of binding may be delayed. The thresholds may be set manually, for example to a value in a range with a lower bound equal to a product of the number of binding streets for a type of binding times a ratio of an average a time needed for transport from a printer to a binder (300 seconds for example) and an average time needed for the type of binding (30 seconds for example) and an upper bound equal to the lower bound plus a maximum number of carriers that can be kept waiting in the binding streets for the binding type. In another embodiment the determination of indicator values for dynamically available capacity levels of binding streets 15 in third step 23 may use a prediction of the numbers of other books that will be bound, or waiting for binding, at the time when the book selected in fourth step 24 will need to be bound. Such a prediction can easily be derived given respective counts of books that require the respective types of binding and of which printing has been triggered, and respective machine capacities (in books per hour) for respective types of binding, summed over machine capacities of binding machines In third step 23 selection of a binding type may be disabled if its predicted waiting time exceeds a threshold value.

Control computer 18 may have a program to control operation of conveyor switches 16 dependent on the type of binding required by the book assigned to the carrier, the type of binding supported by the binding machine 17 of the binding street 15 that is connected to the conveyor switch and the numbers of carriers that await handling in the respective binding streets 15. 5
Optionally, a carrier may be passed for another round along second conveyor line 13 with the cover and pages of a book when all suitable binding streets 15 for the book are full.

10 Optionally, the paper of a top page of each book may be provided with a machine readable identification label and a further reader may be provided to read these labels at or before arrival at grouping station 14. In this case control computer may register the assignment of a carrier to a book dependent on the reading of the label of the pages that are placed on the 15
carrier. The identification label may be placed on a part of a sheet with the pages that is cut off at cutter 11 for example, in which case the further reader may be placed at the input of cutter 11. Alternatively the identification label may be placed on a page, in which case it can be read at the output of cutter 11, or when the pages are on a carrier. Each carrier may also be provided with 20
its own unique machine readable label. Reading of this label may be used to control routing of the carrier and registration of the book assigned to the carrier.

 Optionally, the identification label of the cover may be read again 25
and signalled to control computer 18 when the cover is placed on the carrier. This makes it possible to detect erroneous mismatches between pages and a cover on a carrier. Control computer 18 may be configured to signal a need for correction in this case and/or to keep the carrier from entering a binding street 15.

Figure 3a shows an embodiment of a carrier 30 in side view. Carrier 30 has first and second support surfaces 32, 34 at mutually different heights, for covers and pages of a book respectively. The first support surface 32 has a width that corresponds to a maximum length of any cover in its unfolded state.

5 Typically this width is at least twice the maximum page width plus the maximum thickness of the books. The second support surface 34 has a width that is less than half that of the first support surface 32, equal to at least the maximum width of a sheet with a single page of any book. Alternatively, the width of second support surface may be equal to at least the maximum height

10 of a sheet with a single page of any book. In an embodiment carrier 30 may have more than two levels at mutually different vertical heights. In operation a cover, a block of pages and an additional soft cover of an instance of a book may be transported on respective ones of the levels.

15 Figure 3b shows a top view of carrier 30. Second support surface 34 has slots 36 open to the side of the second support surface. Slots 36 allow a set of conveyor belts or forks for supporting the pages during transfer to be lowered through second support surface 34 when pages are placed or removed from carrier 30. First support surface 32 may also have slots, but when covers

20 are moved by hand or by means of suction devices for example, slots may not be needed in first support surface 32.

Carriers may also be circulated on first conveyor line 11, along printers 10 to cutter 11 and back to printers 10. Preferably, carriers are used

25 that can be held up on first conveyor line 11 without stopping transport along the entire conveyor line. The carriers on first conveyor line 11 may be of the same design as those on second conveyor line 13, but alternatively carriers without the first support surface 32 may be used on first conveyor line 11.

Figure 4a shows a transfer device in side view. This device may be used for transferring pages from a printer 10 to carriers on first conveyor line 11 for example. The transfer device comprises a collection tray wall 40, a fork 42 and a first and second set of conveyor belts 44a,b and a first and second
5 lifting mechanism 46, 48. First and second set of conveyor belts 44a, b are shown by solid and dashed lines at different heights to which they can be moved by first and second lifting mechanism 46, 48.

Figure 4b shows a set of conveyor belts in top view. A plurality of
10 parallel conveyor belts is provided in the set, which fit within the slots (not shown) of the carrier 30 or between the teeth of fork 11. First lifting mechanism 46 carries first set of conveyor belts 44a, located to raise the top surface of first set of conveyor belts 44a to within collection tray wall 40 and to lower first set of conveyor belts 44a to the level of second set of conveyor belts
15 44b. Second set of conveyor belts 44b is located to form a continuation of first set of conveyor belts 44a when they are at the same level. Second lifting mechanism 48 carries second set of conveyor belts 44b, located to raise the top surface of first set of conveyor belts 44a to a level above the second support surface of carrier 30 and to lower it below that level.

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In operation printer 10 successively prints sheets with all pages of a book. The sheets with printed pages that emerge from printer 10 are fed to a collection tray with a wall formed by collection tray wall 40 and a floor formed by first set of conveyor belts 44a. When sheets with all printed pages have
25 been printed, first lifting mechanism 46 lowers first set conveyor belts 44a. Fork 42 is temporarily moved into the space within collection tray wall 40, to form the floor of a temporary collection tray, for collecting the first one or more sheets with pages of a next book. When first lifting mechanism 46 has lowered first set conveyor belts 44a to the level of second set of conveyor belts 44b,
30 transport of first and second set conveyor of belts 44a, b are set in motion to

transport the sheets from first set conveyor belts 44a to second set of conveyor belts 44b. Subsequently, first lifting mechanism 46 raises first set conveyor belts 44a back to a level within collection tray wall 40, moving the top surface of first set conveyor belts 44a through the teeth of fork 42, so that the top
5 surface of first set conveyor belts 44a takes over support of the sheets with pages of the new book from fork 42.

Second set conveyor of belts 44b is set in motion to transport sheets towards from first set conveyor of belts 44b. Second lifting mechanism 48 is
10 arranged to lower and raise second set conveyor belts 44b. Initially second lifting mechanism 48 is at a high level, so that a carrier 30 can be transported underneath it. When the carrier 30 has been positioned under second set conveyor belts 44b, with slots in carrier 30 aligned with conveyor belts of second set conveyor belts 44b, second lifting mechanism 48 lowers second
15 lifting mechanism 48 through the slots in the second support surface 34 of carrier 30. As a result the sheets remain on the carrier 30 supported by the second support surface 34. Once the carrier 30 has moved on, second lifting mechanism 48 raises second set conveyor belts 44b to a level above the second support surfaces 34 of carriers 30.

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It may be noted that the use of a first and second set of conveyor belts 44a,b makes it possible to decouple waiting for the completion of printing of the pages of a book and waiting for the arrival of carriers 30. When no waiting is needed one set of conveyor belts may suffice. Alternatively more sets
25 may be used, for example three, to transfer the pages from the first set to the second set via an intermediate set of conveyor belts. Thus a further decoupling can be realized.

Similar transfer devices may be used at cutter 11 and binding stations 17 to move pages from and to carriers 30. If no decoupling of waiting is needed, fewer sets of conveyor belts may be used in those transfer devices.

5 In an embodiment, cutter 11 is configured to cut the sheets with printed pages according to a predetermined cutting pattern or a selectable one of a predetermined set of cutting patterns. In this embodiment a further cutter, or further cutters are provided at, or following binding stations 17. Thus, in operation the books may be cut to final size, which may be adjustable
10 for different books, after cutting at the binding station 17. In this way, standardized handling of the books in cutter 12 and along second conveyor line 13 is facilitated.

Figure 5a,b show cutting patterns, with cut positions indicated by
15 dashed lines 50. By way of example cutting patterns for halving and quartering the sheets are shown. In addition cutter 11 may be configured to pass sheets without cutting, which could formally be said to correspond to a cutting pattern without cuts.

20 Grouping station 14 may be manually operated, an operator activating label reader 140, moving the covers in and out of storage device 142 and to carrier 30. Alternatively, robot may be provided to automated part of these operations. Label reader 140 may be mounted on storage device, so that labels are read automatically when the covers are inserted in storage device
25 142. Similarly, binding machine 17 may be manually operated, an operator taking the cover and pages from carrier 30 and placing them in binding machine 17. Alternatively, a robot may be used for this.

The records for respective book definitions in the table of book
30 definitions in control computer 18 may comprise information representing the

type of cutting pattern to be used for the book. Control computer 18 may be configured to control cutter 11 for respective books to apply the cutting pattern dependent on this information for the respective books. In addition, control computer 18 may be configured to control printers 10 to select the positions of page content on the printed sheets dependent on this information. Positions at standard relative positions to the edges of the cut parts of the sheets are shown, as illustrated by pages 52 in figure 5a,b, so that the pages are located on top of one another when the cut part of the sheets are placed on top of one another without rotation. This simplifies binding and later cutting after binding.

Control computer 18 may be realized as a single processor or as a system of cooperating processors. It may comprise a storage device or devices for storing tables of records of books that are scheduled for printing and book definitions, as well as a computer program or computer programs to control production of the books. When it is stated herein that control computer 18 is configured to perform an action or performs an action, this should be understood to mean that the control computer has a computer readable storage device that contains a program of instructions that, when executed by control computer 18, will cause control computer to execute the action.

Although only processing up to binding has been described, it should be appreciated that the bound books may be subjected to further processing steps, such as addition of a loose jackets folded around the covers, addition of address labels for mailing and packaging. In an embodiment carriers 30 may be provided with a third support surface for the jackets. An additional grouping station may be added for adding jackets to the carriers 30, or grouping station may be configured to add both jackets and covers to the carriers. In an embodiment control computer 18 may enable triggering of printing of the pages only when both covers and jackets are available. In an

embodiment part or all of the processing steps may be performed along second conveyor line 13, or a third conveyor line may be provided for this purpose.

When second conveyor line 13 is used, the bound books may be returned to the carriers 30, optionally after reading their identification labels to exclude mix-ups, and transported along second conveyor line 13 to stations for the further processing steps.

It may be noted that in the described embodiment on one hand arrival of a carrier 30 with pages of a book at the grouping station 14 is needed to trigger placement of the cover of that book on the carrier 30 and on the other hand arrival of the cover of the book at the grouping station 14 is needed to trigger printing of the pages of the book. Thus, only covers need to be stored, and needless occupation of carriers on second conveyor line 13 by as yet unusable covers is kept at a minimum. In an alternative embodiment, placement of the cover of a book on a carrier 30 may be triggered before the placement of the pages of the book on the carrier 30, for example by arrival of the sheets with the pages at cutter 11, or even the completion of printing of the sheets with the pages.

In this case the covers may even be supplied to (carriers on) the second conveyor line 13 before cutter 11, by a grouping station located along the second conveyor line 13 in advance of cutter 11, or more generally a station that places the pages on (carriers on) the second conveyor line 13. In this case, the pages of the book may need to be placed on a selected carrier 30 that already contains the cover of the book. Strictly such a grouping station only provides for future grouping, so that it could more properly be called a cover storage and supply station only. The subsequent placement of pages may have the disadvantage that additional storage of pages may be needed, for example at cutter 11, to wait for the arrival of the carrier with the cover on the second conveyor line 13. This may complicate the printing process and/or the cutting

process. Also, errors in the production of the pages that occur after placement of the covers can lead to needless occupation of second conveyor line.

Although an embodiment with a plurality of printers 10, a plurality of binding stations 17, a single grouping station 14 and a single cutter 11 has been described, it should be appreciated that instead a single printer 10 and/or a single binding station 17, and/or a plurality of grouping stations 14 in parallel and/or a plurality of cutters 11 in parallel may be used. Although an embodiment has been shown wherein grouping station 14 is located along second conveyor line 13, it should be appreciated that in addition a detour may be provided around grouping station, with a conveyor switch from the second conveyor line 13. Thus, excess carriers can be circulated around the grouping station 14 when too many carriers 30 accumulate waiting for processing at grouping station. Although an application to books has been described, wherein pages are bound within cover, it should be appreciated that the process may also be applied to loose pages that are inserted into a folder instead of a cover. In this case no binding is required. However, the problem of reducing average time of existence of unbound blocks of pages makes it especially advantageous to apply the process to books with bound pages.

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As will be appreciated a book production is provided wherein arrival of a cover triggers printing of book block and consequently binding of the book. The system preferable uses one book as a standard transport unit on a carrier for the cover and pages of one book, and as a standard process unit, but alternatively standard units with a larger number of books may be used. The system may be constructed to cover all printing, binding and packing activities. One or more parallel book block printing resources may be used, as opposed to only 1-1 coupling between printing and binding. One or more parallel or dedicated binding resources may be used. Standardized sheet page size and cutting book blocks to standard sizes may be used, differentiation as

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late as possible in the process, for example by trimming book blocks at the binding stage. Dispatching rules for printing may be based on business rules and minimization of stocks for work in progress. Only a fraction of the work in progress and throughput time of conventional printing systems is needed. Full automation of the binding processes is possible. Quality feedback to process units is much quicker. Centralized preparation and addition of generic materials (kitting) is made possible.

Conclusies

1. Een productiesysteem voor het produceren van boeken, waarbij elk boek een omslag omvat en pagina's die binnen de omslag zijn gebonden, welk systeem is voorzien van
 - één of meer printers
 - 5 - een bindmachine;
 - een transportlijn voor het transporteren van de pagina's van een boek tussen de één of meer printers en de bindmachine, in groepen die elk langs tenminste een deel van de transportlijn de omslag en de pagina's van een respectievelijk exemplaar van de boeken bevatten;
 - 10 - een omslag opslagstation voor opslag van omslagen voor toevoer van omslagen aan de transportlijn, waarbij het omslag opslagstation een identificatielabellezer omvat, voor het lezen van identificatielabels op de omslagen bij het omslag opslagstation; en
 - een besturingscomputer gekoppeld aan de identificatielabellezer en de één of
 - 15 meer printers en ingericht om afdrucken van de pagina's van individuele boeken door de printer of een geselecteerde printer voor elk boek te triggeren in response op het lezen van een identificatielabel dat een omslag van het boek identificeert.
2. Een systeem volgens conclusie 1, waarin de besturingscomputer
 - 20 ingericht is om toevoer van de omslag van elk boek uit het omslag opslagstation naar de transportlijn te triggeren in response op detectie van de aankomst de pagina's van dat boek bij de transportlijn of het omslag opslagstation.
3. Een systeem volgens conclusie 2, voorzien van een veeltal soorten
 - 25 bindmachines, voor een veeltal soorten manieren van binden, waarbij elk boek een voorafbepaalde manier van binden vereist, waarin de besturingscomputer is ingericht om indicatoren van dynamisch beschikbare capaciteiten voor de respectieve manieren van binden te bepalen en het triggeren van het

afdrukken van de pagina's van de individuele boeken toe te staan afhankelijk van de indicatoren voor de voor de individuele boeken benodigde manieren van binden.

4. Een systeem volgens één der voorafgaande conclusies, voorzien van een
5 veeltal draageenheden voor vervoer door de transportlijn, waarbij elke draageenheid voorzien is van een omslagondersteuningsoppervlak en een pagina's-ondersteuningsoppervlak voor respectievelijk de omslag en pagina's van een respectief boek.
5. Een systeem volgens conclusie 4, waarin het
10 omslagondersteuningsoppervlak en het pagina's ondersteuningsoppervlak een verticale stapel vormen en waarin het omslagondersteuningsoppervlak tenminste twee keer zo breed is als het pagina's ondersteuningsoppervlak.
6. Een systeem volgens conclusie 4 of 5 waarin het pagina's
15 ondersteuningoppervlak een veeltal sleuven bevat die openingen hebben naar een zijkant van de draageenheid.
7. Een systeem volgens één der voorgaande conclusies, voorzien van een
20 veeltal draageenheden voor transport door de transportlijn of een verdere transportlijn langs de één of meer printers, waarbij elke dragereenheid een ondersteuningoppervlak heeft met een veeltal sleuven die openingen hebben naar een zijkant van de dragereenheid en
- een overbrengingsinrichting met een stelsel transportbanden en een hefmechanisme dat aan het stelsel transportbanden gekoppeld is voor het heffen en laten zakken van het stelsel transportbanden, waarbij de groottes en afstanden tussen transportbanden in het stelsel het mogelijk maken om de
25 transportbanden door de sleuven heen te heffen en/of te laten zakken.
8. Een systeem volgens conclusie 1, waarin de overbrengingsinrichting
voorzien is van een verder stelsel transportbanden en een verder hefmechanisme dat aan het verdere stelsel transportbanden gekoppeld is, waarbij het hefmechanisme en het verdere hefmechanisme ingericht zijn om

het stelsel transportbanden en het verdere stelsel transportbanden onafhankelijk van elkaar te heffen en/of te laten zakken.

9. Een systeem volgens conclusie 8, waarin de overbrengingsinrichting een beweegbare vork omvat, die beweegbaar is om de plaats in te nemen van
5 ondersteuning door het stelsel transportbanden wanneer het stelsel transportbanden zakt naar het niveau van het verdere stelsel transportbanden.
10. Een systeem volgens één der voorafgaande conclusies voorzien van een snijmachine die functioneel tussen de één of meer printers en het omslag opslagstation geplaatst is, voor het snijden van vellen met de pagina's die door
10 de printer geproduceerd worden.
11. Een systeem volgens conclusie 10, waarin de snijmachine ingericht is om de vellen te snijden volgens een selecteerbare keuze uit een voorafbepaald aantal snijpatronen, waarbij de besturingscomputer ingericht is om de één of meer printers posities van de pagina's op bedrukte vellen te laten selecteren op
15 posities die afhankelijk van het snijpatroon geselecteerd worden. ‘
12. Een werkwijze voor het produceren van boeken die elk een omslag en binnen de omslag gebonden pagina's omvatten, welke werkwijze omvat
- de omslagen op respectieve tijstippen aan een omslag opslagstation toevoeren;
- registreren van toevoer van respectievelijke omslagen aan het omslag
20 opslagstation;
- triggeren van afdrucken van de pagina's van tenminste een deel van de boeken voor elk van het tenminste ene deel van de boeken in response op registratie van de aanvoer van de omslag van dat boek.
13. Een werkwijze volgens conclusie 12, omvattende het triggeren van
25 toevoer van de omslag van elk boek uit het omslag opslagstation aan de transportlijn in response op detectie van aankomst van de pagina's van dat boek bij de transportlijn of het omslag opslag station.
14. Een werkwijze volgens conclusie 12 of 13, omvattende het gebruiken van een transportlijn om de pagina's van de boeken boek-voor-boek gegroepeerd te
30 transporteren na het afdrucken, opslaan van de omslagen op het omslag

opslagstation van de transportlijn waar de pagina's en de omslagen van individuele boeken gecombineerd worden, waarbij de aanvoer van elke omslag voor het genoemde triggeren geregistreerd wordt bij aankomst van de omslag op het omslag opslagstation.

- 5 15. Een werkwijze volgens conclusie 14, waarin de omslagen elk voorzien zijn van een machinaal leesbaar identificatielabel, en de werkwijze het lezen van de identificatielabels omvat bij aankomst bij genoemde station en registratie van de omslag voor het genoemde triggeren in response op informatie die uit het informatielabel gelezen wordt.

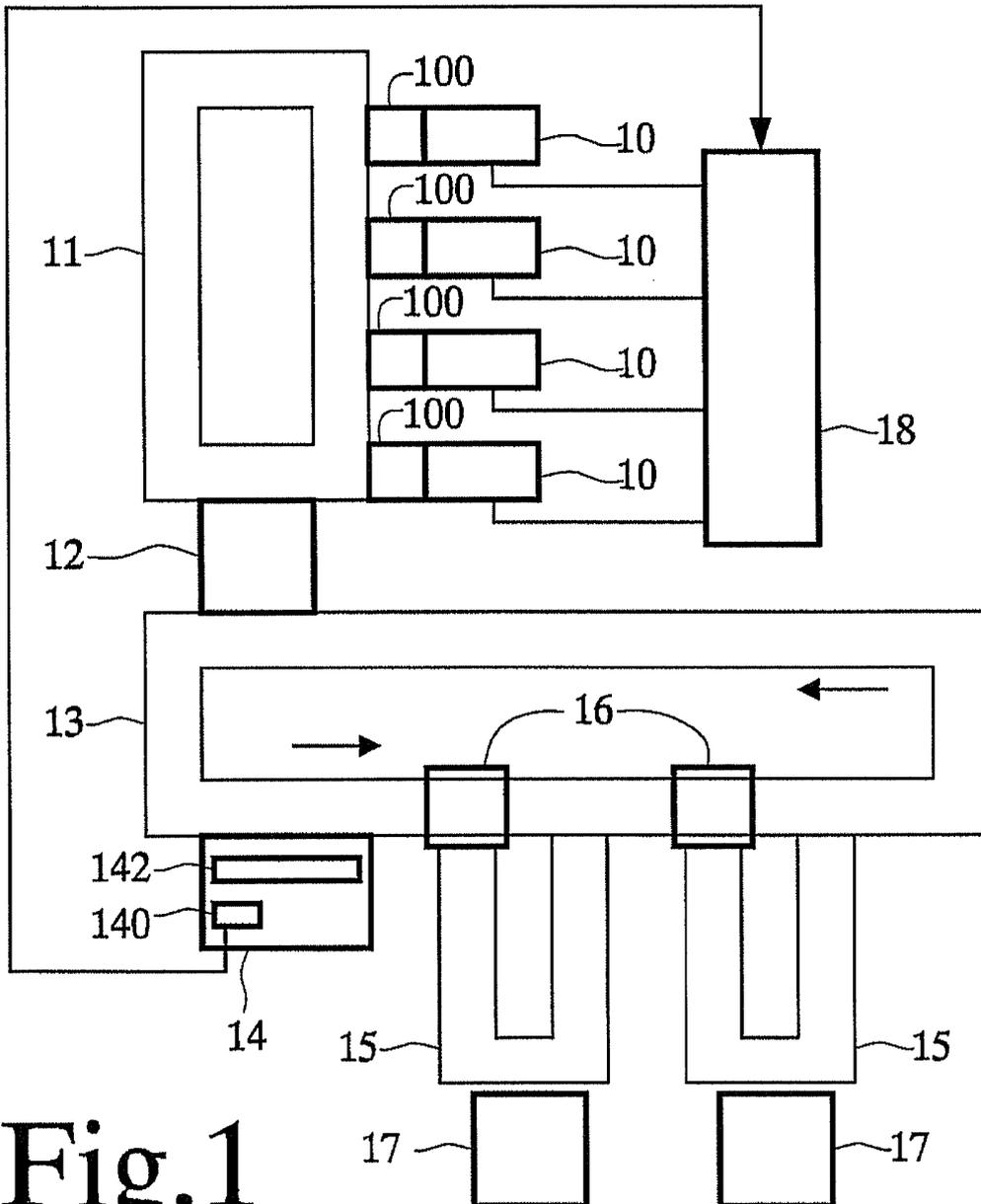
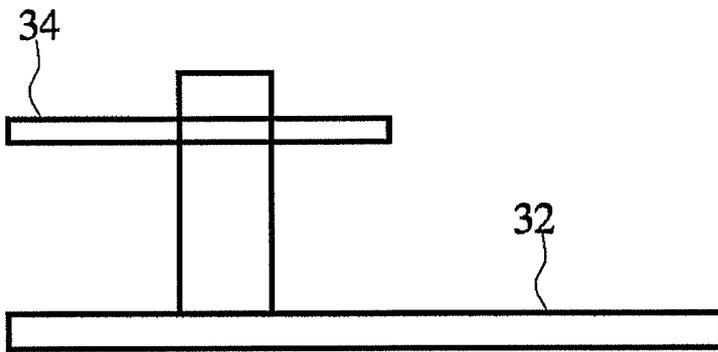
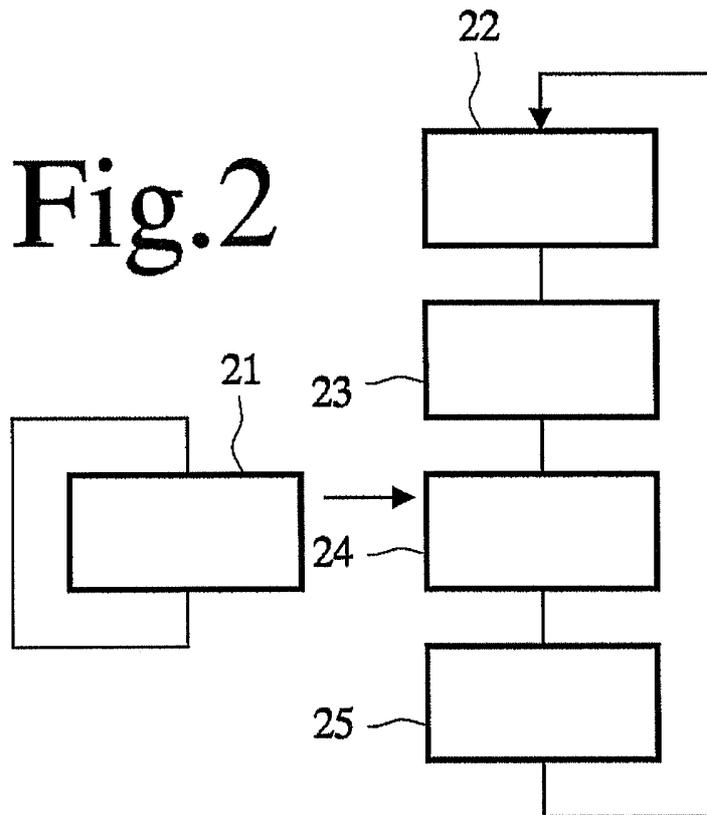
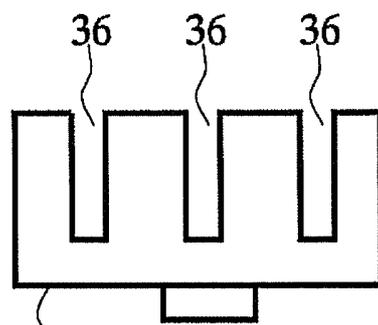


Fig.1

Fig.2



30 Fig.3a



34 Fig.3b

Fig.4a

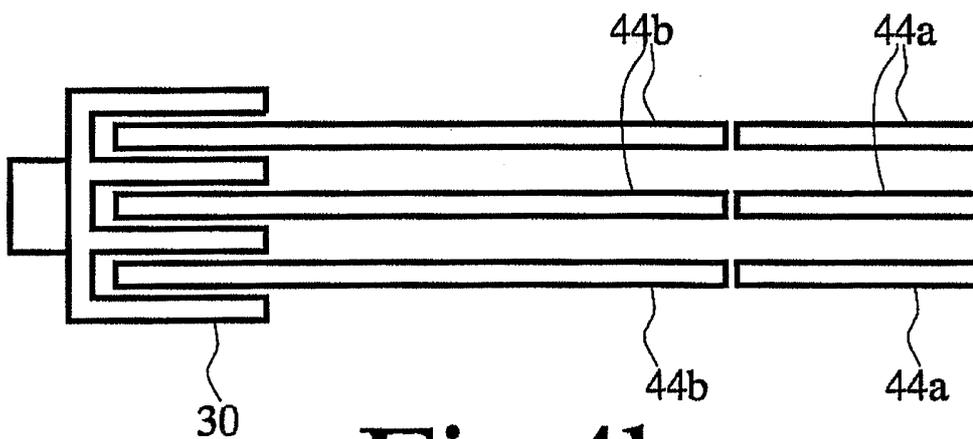
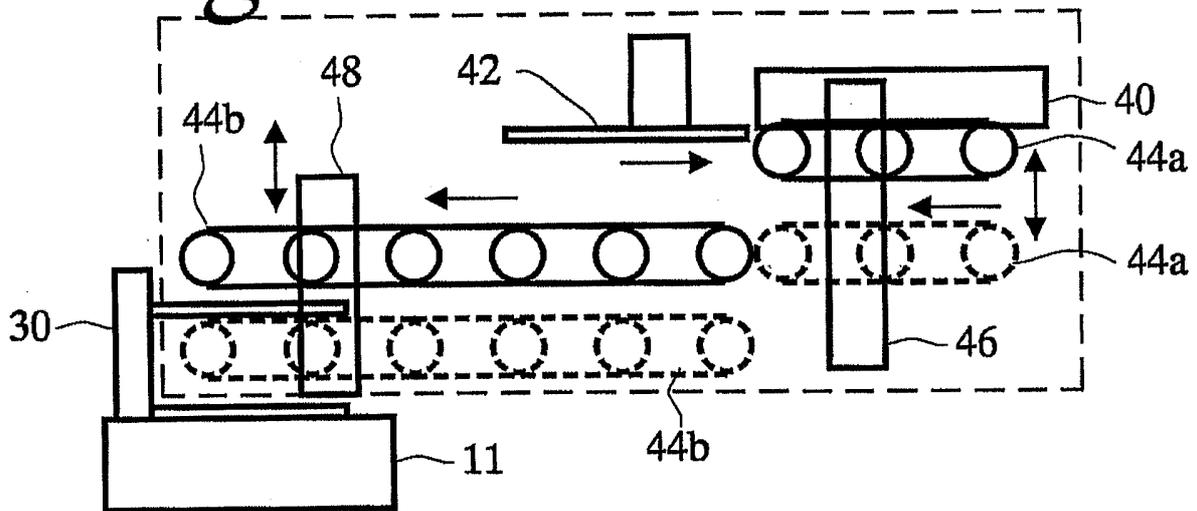


Fig.4b

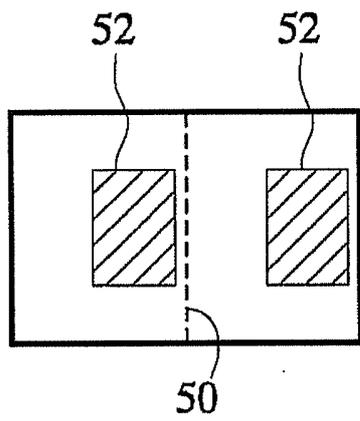


Fig. 5a

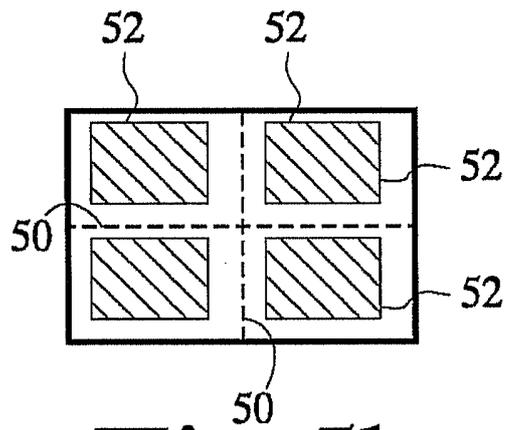


Fig. 5b

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE P89258NLOO
Nederlands aanvraag nr. 2004352	Indieningsdatum 05-03-2010
	Ingeroepen voorrangdatum
Aanvrager (Naam) Book Factory Systems	
Datum van het verzoek voor een onderzoek van internationaal type 21-08-2010	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. SN 54744
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC) B42C11/04 B42C19/02 B42C19/08	
II. ONDERZOCHETE GEBIEDEN VAN DE TECHNIEK	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
IPC 8	B42D B42C
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen	
III. <input type="checkbox"/>	GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)
IV. <input type="checkbox"/>	GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek
NL 2004352

A. CLASSIFICATIE VAN HET ONDERWERP
INV. B42C11/04 B42C19/02 B42C19/08
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)
B42D B42C

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)
EPO-Internal, WPI Data, PAJ

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	US 2006/210379 A1 (KEARNS RYAN [US]) 21 september 2006 (2006-09-21) * samenvatting; figuur 1 * * alineas [0005] - [0015] *	1-15
X	US 2008/138170 A1 (STURNICK GERARD R [US] ET AL) 12 juni 2008 (2008-06-12) * samenvatting; figuur 3 * * alineas [0008] - [0010], [0018], [0043] *	1-15
X	US 2006/028662 A1 (DOBROVOLSKY SASHA [US]) 9 februari 2006 (2006-02-09) * samenvatting * * alineas [0018], [0028] - [0033] *	1-15
A	US 2004/098665 A1 (KASAHARA SEITARO [JP] ET AL) 20 mei 2004 (2004-05-20) * alineas [0092], [0095], [0120] *	1-15

Verdere documenten worden vermeld in het vervolg van vak C.

Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

A niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

D in de octrooiaanvraag vermeld

E eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

L om andere redenen vermelde literatuur

O niet-schriftelijke stand van de techniek

P tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

T na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

X de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

Y de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

& lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

18 oktober 2010

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
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De bevoegde ambtenaar

Callan, Feargel

**ONDERZOEKSRAPPORT BETREFFENDE HET
 RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
 VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar
 de stand van de techniek

NL 2004352

In het rapport genoemd octrooigescrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
US 2006210379	A1	21-09-2006	GEEN

US 2008138170	A1	12-06-2008	GEEN

US 2006028662	A1	09-02-2006	AU 2005274080 A1 23-02-2006
		BR PI0514192 A 03-06-2008	
		CA 2575795 A1 23-02-2006	
		CN 101389490 A 18-03-2009	
		EP 1815405 A2 08-08-2007	
		JP 2008511468 T 17-04-2008	
		KR 20070052293 A 21-05-2007	
		NZ 553090 A 31-07-2009	
		WO 2006020501 A2 23-02-2006	
		ZA 200701110 A 29-10-2008	

US 2004098665	A1	20-05-2004	JP 4442083 B2 31-03-2010
			JP 2004155152 A 03-06-2004
			US 2008030776 A1 07-02-2008



OCTROOICENTRUM NEDERLAND

WRITTEN OPINION

File No. SN54744	Filing date (day/month/year) 05.03.2010	Priority date (day/month/year)	Application No. NL2004352
International Patent Classification (IPC) INV. B42C11/04 B42C19/02 B42C19/08			
Applicant Book Factory Systems B.V.			

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

	Examiner Callan, Feargel
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WRITTEN OPINION

Application number
NL2004352

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - a sequence listing
 - table(s) related to the sequence listing
 - b. format of material:
 - on paper
 - in electronic form
 - c. time of filing/furnishing:
 - contained in the application as filed.
 - filed together with the application in electronic form.
 - furnished subsequently for the purposes of search.
3. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	
	No: Claims	1, 10, 12, 15
Inventive step	Yes: Claims	
	No: Claims	1-15
Industrial applicability	Yes: Claims	1-15
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:

D1: US 2006/210379 A1 (KEARNS RYAN [US]) 21 september 2006 (2006-09-21);

D2: US 2008/138170 A1 (STURNICK GERARD R [US] ET AL) 12 juni 2008 (2008-06-12);

D3: US 2006/028662 A1 (DOBROVOLSKY SASHA [US]) 9 februari 2006 (2006-02-09); and

D4: US 2004/098665 A1 (KASAHARA SEITARO [JP] ET AL) 20 mei 2004 (2004-05-20).

2 The present application does not meet the criteria of patentability, because the subject-matter of the independent claims is not new. The reasons are as follows:

2.1 Document D1 discloses all of the features of claim 1. Document D2 also discloses the called for features. The relevant document passages are given in the Search Report (SR). Consequently, independent claim 1 lacks novelty.

2.2 The same reasoning applies, mutatis mutandis, to the subject-matter of corresponding independent claim 12; and therefore, it is also considered not novel.

2.3 Dependent claims 2-11 & 13-15 do not appear to contain any features which, in combination with the features of any claim to which they refer, meet the requirements of novelty and/or inventive step, because they only concern minor modifications which must be regarded as normal implementation steps for the skilled person. A combination of any of these features with claims 1 or 12 does not appear to add anything inventive.