(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 450 195 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
19.06.2013 Bulletin 2013/25

(51) Int Cl.:
B42C 1/10 *(2006.01)* ***B42B 4/00*** *(2006.01)*

(21) Application number: **11187812.0**

(22) Date of filing: **04.11.2011**

(54) **Bookbinding machine with transport and binding movable saddle**

Buchbindeeinrichtung mit bewegbaren Transport- und Bindesattel

DISPOSITIF DE RELIURE DE LIVRE AVEC SELLE MOBILE DE TRANSPORT ET RELIURE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **05.11.2010 IT MI20102057**

(43) Date of publication of application:
09.05.2012 Bulletin 2012/19

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(56) References cited:
EP-A1- 0 893 275
EP-A1- 0 916 514
EP-A1- 1 013 470
GB-A- 1 425 974
US-A- 3 658 318
US-A1- 2008 036 133

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Description

[0001] The solution according to one or more embodiments of the present invention relates to the bookbinding field. More specifically, this solution relates to binding machines.

[0002] The binding machines are commonly used to make books from corresponding blocks of signatures. Particularly, in a bookbinding sewing machine (or simply sewing machine), the signatures of each block are sewn together to form a sewn book.

[0003] Typically, the sewing machine comprises a feeding station, which extracts the signatures in succession from a hopper, opens them and deposits them onto a fixed saddle - at an end thereof facing the feeding station. The fixed saddle transports the signatures to a movable saddle, which is open so as to be aligned with the fixed saddle - at an opposite end thereof. The movable saddle is then closed so as to take it close to a sewing station, wherein the signature loaded on the movable saddle is sewn to a forming book block. For example, a sewing machine of this type is described in EP-A-1013470. In this specific case, the movable saddle is split into a feeding device from which a sewing saddle may be extracted. An acceleration device (formed by two transport belts) carries the signature towards a sewing position while the feeding device (with the sewing saddle inside it) is closing. The sewing saddle is then extracted from the feeding device, which opens to start receiving a new signature coming from the fixed saddle. As soon as the preceding signature has been sewn to the forming book block, the sewing saddle as well opens thereby penetrating into the feeding device for receiving the new signature.

[0004] However, the sewing machine with the above-described structure takes up considerable room - because of the presence of the fixed saddle. Moreover, in this way the feeding station and the sewing station are spaced apart (according to the length of the fixed saddle). This makes it awkward the management of the sewing machine by an operator, which should continuously move between the feeding station (for loading the signatures) and the sewing station (for collecting the book blocks); moreover, the operator has difficulty to control the correct operation of the sewing machine visually.

[0005] Sewing machines with different structures have also been proposed.

[0006] For example, GB-A-1,425,974 describes a sewing machine wherein the feeding station deposits the signatures directly onto the movable saddle; particularly, the sewing machine has a twofold structure for processing two signatures in parallel. In this case, however, the signatures are loaded into the sewing machine and the book blocks are collected therefrom at opposite sides of the sewing station, so that the management of the sewing machine is very difficult, and the visual control of its correct operation is practically impossible. Moreover, this structure makes the access to the sewing station laborious (for example, for restoring the sewing machine after a stop thereof).

[0007] Alternatively, US-A-2010/0117286 describes a sewing machine wherein the signatures supplied from the feeding station are made to pass over or under the sewing station for loading them onto the movable saddle; consequently, the sewing station is arranged in plant view between the feeding station and the movable saddle. In this case, however, the feeding station (for loading the signatures) and the sewing station (for collecting the book blocks) are at different heights (with the feeding station below and the sewing station above); therefore, the collection of the book blocks from the sewing station is in any case inconvenient (since the operator should lean inwards the sewing machine over the feeding station).

[0008] Moreover, in both cases the direct loading of the signatures onto the movable saddle is rather critical. Indeed, the movable saddle should be relatively wide for housing various sewing members inside it; therefore, the signature may not fall correctly onto the movable saddle when it is only partially opened. Such problem may occur frequently, especially when the signatures have a structure that makes their opening difficult.

[0009] In its general terms, the solution according to one or more embodiments of the present invention is based on the idea of using two movable saddle elements to load and to sew, respectively, the signatures.

[0010] Particularly, one or more aspects of the solution according to specific embodiments of the invention are set out in the independent claims, with advantageous features of the same solution that are set out in the dependent claims, whose wording is herein incorporated *verbatim* by reference (with any advantageous feature provided with reference to a specific aspect of the invention that applies *mutatis mutandis* to every other aspect thereof).

[0011] More specifically, an aspect of the solution according to an embodiment of the invention provides a binding machine (for example, a sewing machine). The binding machine comprises a feeding station for feeding a signature in succession (for example, by extracting it from a hopper, opening it and depositing it astride a saddle element), and a binding station (for example, a sewing station). The binding machine also comprises a binding movable saddle element for receiving the signature. Driving means (for example, a cam) is provided for maintaining the binding movable saddle element stationary at a binding position for binding the signature to a forming block of signatures in the binding station (for example, starting a new book block if the signature is the first one thereof, or adding it to a book block already existing otherwise); the same driving means is also used for moving the binding movable saddle element between the binding position and a releasing position for releasing the signature being bound to the forming block of signatures. The binding machine further comprises loading means, which is used for loading the signature from the feeding station onto the binding movable saddle element. In the solution

according to an embodiment of the invention, the loading means includes a loading movable saddle element arranged at a side of the binding movable saddle element (for example, with the two movable saddle elements that are defined by corresponding portions of a double movable saddle, or by corresponding independent movable saddles). The driving means is further adapted to maintain the loading movable saddle element stationary at a loading position for loading the signature from the feeding station (for example, wherein the loading movable saddle element is aligned with the sewing movable saddle element at the sewing position or at the releasing position); the same driving means is also adapted to move the loading movable saddle element integrally with the binding movable saddle element at least in part while the binding movable saddle element moves from the releasing position to the binding position. Transferring means (for example, a pushing peg mounted on the loading movable saddle element or on a frame of the binding machine, and a square register mounted on the binding movable saddle element) is used for transferring the signature from the loading movable saddle element to the binding movable saddle element while the binding movable saddle element and the loading movable saddle element move integrally.

[0012] Another aspect of the solution according to an embodiment of the invention provides a corresponding method of operating the sewing machine.

[0013] The solution according to one or more embodiments of the invention, as well as further features and the advantages thereof, will be best understood with reference to the following detailed description, given purely by way of a non-restrictive indication, to be read in conjunction with the accompanying drawings (wherein, for the sake of simplicity, corresponding elements are denoted with equal or similar references and their explanation is not repeated). In this respect, it is expressly intended that the figures are not necessary drawn to scale (with some details that may be exaggerated and/or simplified) and that, unless otherwise indicated, they are merely used to conceptually illustrate the structures and procedures described herein. Particularly:

FIG. shows a principle block diagram of a sewing machine according to an embodiment of the invention,

FIG.2 shows a schematic representation of a detail of the sewing machine according to an embodiment of the invention,

FIG.3A-FIG.3E show the main working phases of the sewing machine according to an embodiment of the invention,

FIG.4 shows a corresponding phase diagram according to an embodiment of the invention,

FIG.5 shows a schematic representation of a detail of the sewing machine according to another embodiment of the invention,

FIG.6A-FIG.6F show the main working phases of the sewing machine according to another embodiment of the invention, and

FIG.7 shows a corresponding phase diagram according to an embodiment of the invention.

[0014] With reference in particular to FIG.1, a principle block diagram of a (bookbinding) sewing machine 100 according to an embodiment of the invention is shown. The sewing machine 100 is used to sew signatures 105 together for the production of sewn books (not shown in the figure); each signature 105 is formed by a printed sheet, which is folded one or more times for defining different pages of the books.

[0015] Particularly, the sewing machine 100 includes a bearing frame 110 for its components (generally provided with a covering bodywork). In particular, a hopper 115 is used for loading a stack of signatures 105 (ordered in blocks, each one for a corresponding book). The signatures 105 are extracted in succession from the hopper 115 (for example, from the bottom by means of pliers). The signatures 105 are provided from the hopper 115 to a feeding station 120, which opens the signatures 105 in the middle (for example, by means of a sucker-based system) and it feeds them in succession to a sewing station 125 (as described in the following). The sewing station 125 (for example, provided with a series of needles and crochet) sews each signature 105 to a forming book block 130 through continuous threads (i.e., starting a new book block 130 if the signature 105 is the first one thereof, or adding it to a book block 130 already existing otherwise); after the book block 130 has been completed, the threads are cut to separate it from the next signatures 105. The book blocks so obtained are deposited in succession onto an unloading platform 135, in order to be output from the sewing machine 100 (where they are denoted with the reference 140). The operation of the sewing machine 100 is managed by a control system 145 - for example, a Programmable Logic Controller (PLC); generally, the control system 145 is provided with a Central Control Unit (CPU), a working volatile memory (RAM), a non-volatile memory (for example, an EEPROM) for storing programs and data, and a control panel (for example, of the touch-screen type).

[0016] In the solution according to an embodiment of the present invention (as described in detail in the following), the sewing machine 100 is provided with two movable saddle elements being side-by-side (for example, implemented by corresponding portions of a double movable saddle or by two distinct movable saddles), denoted as loading movable saddle element 140c and sewing movable saddle element 140s; each movable saddle element 140c,140s is used for receiving a signature 105, deposited astride it. A driving system 145 (for example, a cam mechanism) drives the movable saddle elements 140c,140s (for example, by making them to oscillate around a rotation shaft, not shown in the figure, mounted on the frame 110).

[0017] As usual, the sewing movable saddle element

140s is maintained stationary at a sewing position (adjacent to the sewing station 125) for the time necessary to sew the signature 105 loaded thereon to the forming book block 130. The sewing movable saddle element 140s is then moved from the sewing position to a releasing position (remote from the sewing station 125) for releasing the signature 105 sewn to the forming book block 130. The loading movable saddle element 140c is instead maintained stationary at a loading position (for example, corresponding to the sewing position or to the releasing position of the sewing movable saddle element 140s) for the time necessary to load the signature 105 that is deposited thereon directly from the feeding station 120. The loading movable saddle element 140c is then moved integrally with the sewing movable saddle element 140s, while the latter moves from the releasing position to the sewing position (or at least for a part of such movement). During the integral movement of the movable saddle elements 140c,140s, a transferring system 150 transfers the signature 105 from the loading movable saddle element 140c to the sewing movable saddle element 140s.

[0018] The above-described structure allows making the sewing machine 100 very compact (thanks to the removal of the fixed saddle).

[0019] Particularly, in the specific embodiment at issue, the hopper 115 (for loading the signatures 105 to be supplied to the feeding station 120) and the unloading platform 135 (for collecting the book blocks 140 provided by the sewing station 125) may be arranged side-by-side (along parallel moving directions of the loading movable saddle element 140c and of the sewing movable saddle element 140s, respectively). This makes it very practical the management of the sewing machine by an operator, who may access both the hopper 115 and the unloading platform directly without practically moving; moreover, in this way the operator may control the correct operation of the whole sewing machine 100 visually in an easy way.

[0020] Moreover, the time saved for carrying the signature 105 from the loading movable saddle element 140c to the sewing movable saddle element 140s (while they move integrally towards the sewing position of the latter) allows speeding-up the sewing cycle.

[0021] In addition or in alternative, it is also possible to exploit (at least in part) the time during which the signature 105 on the sewing movable saddle element 140s is sewn to the forming book block 130 for loading another signature 105 onto the loading movable saddle element 140c (thereby further speeding-up the sewing cycle).

[0022] The above-described result may be achieved with different implementations of the movable saddle elements 140c and 140s.

[0023] For example, a schematic representation of a detail of such sewing machine according to an embodiment of the invention is shown in FIG.2.

[0024] In this case, the sewing machine is provided with a single movable saddle 240, which is extended (along a longitudinal axis thereof corresponding to a back of the signatures resting thereon, not shown in the figure) so as to define a double movable saddle; a portion of the double movable saddle 240 (a half on the right in the figure) defines the loading movable saddle element, while another portion of the double movable saddle 240 (a half on the left in the figure) defines the sewing movable saddle element. Particularly, the loading movable saddle element is formed by a loading saddle plate 240c (wedge-shaped, like an upturned V) for resting each signature astride it, with its back at a vertex of the loading saddle plate 240c; the loading saddle plate 240c has an opening angle being relatively small (for example, 30°-50°, and preferably 35°-45°, such as 40°). Likewise, the sewing movable saddle element is formed by a sewing saddle plate 240s (wedge-shaped, like an upturned V as well) for resting each signature astride it, with its back at a vertex of the sewing saddle plate 240s; the sewing saddle plate 240s has an opening angle being relatively large (for example, 55°-75°, and preferably 60°-70°, such as 65°); in any case, the opening angle of the loading saddle plate 240c is lower than the opening angle of the sewing saddle plate 240s (for example, equal to 0.5-0.7, and preferably equal to 0.55-0.65, such as equal to 0.6 times the latter).

[0025] Particularly, in the implementation shown in the figure, a back face of the loading saddle plate 240c and a back face of the sewing saddle plate 240s are aligned with each other, so that a front face of the sewing saddle plate 240s projects outwards a front face of the loading saddle plate 240c (by an angle equal to the difference of their opening angles); a connection plate 243 (triangle-shaped) connects the front face of the sewing saddle plate 240s to the front face of the loading saddle plate 240c.

[0026] The above-described solution allows making the sewing saddle plate 240s with the large opening angle, as required for housing various sewing members inside it (for example, punches of the signatures), and at the same time making the loading saddle plate 240c with the small opening angle. This facilitates the loading of the signature from the feeding station (not shown in the figure) onto the loading saddle plate 240c; indeed, in this way the signature may fall correctly onto the loading saddle plate 240c even when it is only partially opened. In any case, the opening of the signature is completed while it is transferred from the loading saddle plate 240c to the sewing saddle plate 240s (through the connection plate 243).

[0027] Moreover, in the particular implementation shown in the figure, the transferring system (of the signatures from the loading saddle plate 240ca to the sewing saddle plate 240s) comprises a pushing peg 250ca; the pushing peg 250ca is arranged on the front face of the loading saddle plate 240c, so as to project above its vertex. The pushing peg 250ca is mounted, through a corresponding longitudinal slit on the front face of the loading saddle plate 240c, on a belt transmission system 250cb, which is fixed inside the loading saddle plate 240c; in this way, the pushing peg 250ca moves alternately back and

forth along the vertex of the loading saddle plate 240c (for pushing the signature from the loading saddle plate 240c to the sewing saddle plate 240s when it moves towards it, from the right to the left in the figure).

[0028] The transferring system also comprises a square register 250s (known *per se*), which is mounted on the front face of the sewing saddle plate 240s for regulating the signature at a sewing position thereon (for the sewing of the signature to the forming book block, not shown in the figure). For example, the square register 250s comprises a pair of friction belts (one being powered and the other being free so as to be dragged in rotation when in contact with the first one); the friction belts (in contact to each other) slow down the signature being pushed onto the sewing saddle plate 240c by the pushing peg 250ca, and they drag it until it abuts against an end-of-stroke wall; at this point, the friction belts are spaced apart, so that the idle friction belt stops thereby maintaining the signature stationary at this position on the sewing saddle plate 240s. The position of the square register 250s along the sewing saddle plate 240s (and then that at which the signature is maintained stationary) may be regulated according to the size of the signature, by sliding the square register 250s along a regulation guide.

[0029] The main working phases of the sewing machine (with this double movable saddle 240) according to an embodiment of the invention are shown in FIG.3A-FIG.3E.

[0030] Starting from the FIG.3A, the double movable saddle 240 has a signature, denoted with the reference 305a, loaded on the sewing saddle plate 240c at the sewing position (maintained stationary by the square register 250s); at the same time, the pushing peg 250ca is at an end-of-stroke position thereof distal from the sewing saddle plate 240s (on the right in the figure). The double movable saddle 240 has just reached a closed position thereof corresponding to the sewing position of the sewing saddle plate 240s (adjacent to the sewing station 125); the closed position of the double movable saddle 240 also defines the loading position of the loading saddle plate 240c, wherein it is adjacent to the feeding station 120. In such condition, the signature 305a is sewn to the forming book block 130 (starting it if the first one thereof, or adding to it otherwise).

[0031] Meantime, as shown in the FIG.3B, a next signature, denoted with the reference 305b, is loaded from the feeding station 120 onto the loading saddle plate 240c; in this way, the pushing peg 250ca is arranged at the side of the signature 305b opposite the sewing saddle plate 240s (on the right in the figure).

[0032] Passing to the FIG.3C, once the sewing of the signature 305a has been completed, the double movable saddle 240 moves from the closed position to an opened position corresponding to the releasing position of the sewing saddle plate 240s (remote from the sewing station 125). In such phase, the signature 305b is transported with the double movable saddle 240, while the signature 305a (sewn to the forming book block 130) slips off the sewing saddle plate 240s.

[0033] When the double movable saddle 240 reaches the opened position, as shown in the FIG.3D, the signature 305a has completely released the sewing saddle plate 240s, so that it is now free to receive the signature 305b from the loading saddle plate 240c. Meantime, the pushing peg 250ca has moved towards the sewing saddle plate 240s (to the left in the figure), so as to approach the signature 305b.

[0034] With reference at the end to the FIG.3E, the double movable saddle 240 returns towards the closed position. Meantime, the signature 305b is transferred from the loading saddle plate 240c to the sewing saddle plate 240s. Particularly, the pushing peg 250ca moves fast towards the sewing saddle plate 240s (to the left in the figure), so as to push the signature 305b towards it. When the pushing peg 250ca has reached an end-of-stroke position thereof proximal to the sewing saddle plate 240s (on the left in the figure), it reverses its movement returning towards the distal end-of-stroke position. The signature 305b instead continues its travel by inertia until reaching the square register 250s, which maintains it stationary at such position. When the double movable saddle 240 reaches the closed position, the signature 305b is loaded on the sewing saddle plate 240c at the sewing position and the pushing peg 250ca is at the distal end-of-stroke position, thereby returning to the same situation of the FIG.3A.

[0035] A corresponding phase diagram according to an embodiment of the invention is shown in FIG.4. Particularly, the phase diagram comprises a curve 405, which traces a position H of the double movable saddle (on the axis of the ordinates) against a phase Φ of a sewing cycle (on the axis of the abscissas). More in detail, the phase Φ is expressed in degrees - with the sewing cycle that is defined by a complete rotation of 360° of a driving shaft of the sewing machine; the position H of the double movable saddle is expressed in arbitrary units with respect to the frame, from a value H=0 for the closed position to a value H=-1 for the opened position.

[0036] As it may be noticed, the double movable saddle moves from the opened position (H=-1) to the closed position (H=0) from the phase Φ=0° to the phase Φ=120°, it remains at the closed position (H=0) from the phase Φ=120° to the phase Φ=240°, and it moves from the closed position (H=0) to the opened position (H=-1) from the phase Φ=240° to the phase Φ=360°; in this case, the double movable saddle instantaneously reverses its movement direction at the opened position (*i.e.*, it remains stationary at such position for a phase Φ being negligible in practice - for example, lower than 2°, and preferably lower than 1°).

[0037] The above-described solution eliminates the phase, necessary in the sewing machines known in the art with fixed saddle, for loading the signature onto the movable saddle (since the movable saddle should be maintained opened, aligned with the fixed saddle, until

the signature has not been completely loaded thereon). Such advantage may be exploited in several ways (either individually or in combination to each other). For example, it is possible to reduce the length of the sewing cycle for the same speed of working of the sewing machine - *i.e.*, of movement of the double movable saddle (with an increase of its yield). For the same length of the sewing cycle, it is instead possible to reduce the working speed of the sewing machine (with an increase of its reliability); always for the same length of the sewing cycle, it is also possible to increase a distance between the opened position and the closed position of the double movable saddle - for example, with a corresponding rotation angle of 30°-40° (thereby facilitating the release of signatures very wide).

[0038] Moreover, in this way it is also possible to avoid maintaining the double movable saddle stationary at the opened position (thanks to the fact that the signature is already loaded on the loading saddle plate, and the transferring system moves together with the double movable saddle).

[0039] A schematic representation of a detail of the same sewing machine according to another embodiment of the invention is shown in FIG. 5.

[0040] In this case, the sewing machine is provided withy two movable saddles, which are arranged side-by-side with a common rotation axis; a loading movable saddle 540c (on the right in the figure) defines the loading movable saddle element, while a sewing movable saddle 540s (on the left in the figure) defines the sewing movable saddle element. As above, the loading movable saddle 540c is formed by a loading saddle plate having an opening angle relatively small (for example, 30°-50°, and preferably 35°-45°, such as 40°). Likewise, the sewing movable saddle 540s is formed by a sewing saddle plate having an opening angle relatively large (for example, 55°-75°, and preferably 60°-70°, such as 65°); in any case, the opening angle of the loading movable saddle 540c is lower than the opening angle of the sewing movable saddle 540c (for example, equal to 0.5-0.7, and preferably equal to 0.55-0.65, such as equal to 0.6 times the latter). Particularly, in the implementation shown in the figure, when the loading movable saddle 540c and the sewing movable saddle 540s are aligned (*i.e.*, their vertexes are arranged along a same line), a back face of the loading movable saddle 540c and a back face of the sewing movable saddle 540s are aligned with each other, so that a front face of the sewing movable saddle 540s projects outwards a front face of the loading movable saddle 540c (by an angle equal to the difference of their opening angles). The sewing movable saddle 540s also comprises a connection plate 543 (triangle-shaped) that extends inwards from an edge of its front face to the loading movable saddle 540c; in this way, when the loading movable saddle 540c and the sewing movable saddle 540s are aligned, the connection plate 543 connects the front face of the sewing movable saddle 540s to the front face of the loading movable saddle 540c.

[0041] As above, this allows making the sewing movable saddle 540s large (for housing the various sewing members inside it), and at the same time making the loading movable saddle 540c narrow (for facilitating the loading of the signature, not shown in the figure, from the feeding station thereon), with the opening of the signature that completes while it is transferred from the loading movable saddle 540c to the sewing movable saddle 540s through the connection plate 543.

[0042] Moreover, in the particular implementation shown in the figure, the transferring system (of the signatures from the loading movable saddle 540c to the sewing movable saddle 540s) comprises a pushing peg 550ca; the pushing peg 550ca is arranged on the frame of the sewing machine (not shown in the figure) above the loading movable saddle 540c, so as to rest against its front face when the loading movable saddle 540c is at the position corresponding to the releasing position of the sewing movable saddle 540s, at a height such as to project above its vertex (while the pushing peg 550ca is spaced apart from the loading movable saddle 540c otherwise). The pushing peg 550ca is mounted on a belt transmission system 550cb, which is fixed to the frame; in this way, the pushing peg 550ca moves alternately back and forth along the vertex of the loading movable saddle 540c (for pushing the signature from the loading movable saddle 540c to the sewing movable saddle 540s when it moves towards it). Moreover, the transferring system comprises a throwing wheel 550cc, which rotates continuously towards the sewing movable saddle 540s (clockwise in the figure); the throwing wheel 550cc is arranged on the frame above the loading movable saddle 540c, so as to be at an end of its vertex, proximal to the sewing movable saddle 540s, when the loading movable saddle 540c is at the position corresponding to the releasing position of the sewing movable saddle 540s. The throwing wheel 550cc is mounted on a cam transmission system 550cd, which is fixed to the frame; in this way, the throwing wheel 550cd is lowered and raised alternately (for throwing the signature on the sewing movable saddle 540s when lowered in contact with the loading movable saddle 540c). As above, the transferring system also comprises a square register 550s, which is mounted on the front face of the sewing movable saddle 540s for regulating the signature at a sewing position thereon (for example, comprising a pair of friction belts and a regulation guide).

[0043] The main working phases of the sewing machine (with such two movable saddles 540c and 540s) according to an embodiment of the invention are shown in FIG.6A-FIG.6F.

[0044] Starting from FIG.6A, the sewing movable saddle 540s has a signature, denoted with the reference 605a, loaded thereon at the sewing position (maintained stationary by the square register 550s); at the same time, the pushing peg 550ca is at an end-of-stroke position thereof distal from the sewing movable saddle 540s (on the right in the figure), and the throwing wheel 550cc is

raised. The sewing movable saddle 540s has just reached the sewing position (adjacent to the sewing station 125); the loading movable saddle 540c is at a rest position thereof, aligned with the sewing movable saddle 540s (adjacent to the feeding station 120). In such condition, the signature 605a is sewn to the forming book block 130 (starting it if the first one thereof, or adding to it otherwise).

[0045] Meantime, as shown in the FIG.6B, the loading movable saddle 540c moves away from the feeding station 120, until reaching a position at which it will be aligned with the sewing movable saddle 540s at the releasing position (as described in the following), which defines its loading position. Such movement occurs in a very fast way, thanks to the low inertia of the loading movable saddle 540c (being small, light, and unloaded).

[0046] Passing to the FIG.6C, a next signature, denoted with the reference 605b, is loaded from the feeding station 120 onto the loading movable saddle 540c; this may occur without any problem (even in this case in which the loading movable saddle 540c is remote from the feeding station 120), by simply providing a slightly greater throwing of the signature 605b. In this way, the pushing peg 550ca is arranged at the side of the signature 605b opposite the sewing movable saddle 540s (on the right in the figure).

[0047] As shown in the FIG.6D, once the sewing of the signature 605a is completed, the sewing movable saddle 540s moves from the sewing position to the releasing position (remote from the sewing station 125). In such phase, the signature 605a (sewn to the forming book block 130) slips off the sewing movable saddle 540s; when the sewing movable saddle 540s reaches the releasing position, the signature 605b has completely released the sewing movable saddle 540s, so that it is now free to receive the signature 605b from the loading movable saddle 540c (aligned therewith). Meantime, the pushing peg 550ca has moved slowly towards the sewing movable saddle 540s (to the left in the figure), so as to carry the signature 605b, always completely on the loading movable saddle 540c, under the throwing wheel 50cc (thus reversing its movement for returning towards the distal end-of-stroke position).

[0048] With reference now to the FIG.6E, the signature 605b may be transferred from the loading movable saddle 540c to the sewing movable saddle 540s. For this purpose, the throwing wheel 550cc is lowered against the loading movable saddle 540c, thereby entering in contact with the signature 605b below it; consequently, the signature 605b is thrown towards the sewing movable saddle 540s.

[0049] Passing at the end to the FIG.6F, the throwing wheel 550cc is raised (so as to detach from the loading movable saddle 540c). The sewing movable saddle 540s and the loading movable saddle 540c move integrally towards the sewing position and the resting position, respectively. Meantime, the signature 605b continues its travel by inertia until reaching the square register 550s, which maintains it stationary at such position. When the sewing movable saddle 540s reaches the sewing position, the signature 605b is loaded thereon at the sewing position, thereby returning to the same situation of the FIG.6A.

[0050] A corresponding phase diagram according to an embodiment of the invention is shown in FIG.7. Particularly, the phase diagram comprises a curve 705s (dark line) and a curve 705c (light line), which trace the position H of the sewing movable saddle and of the loading movable saddle, respectively (on the axis of the ordinates, from H=0 for the sewing position and the resting position, respectively, to H=-1 for the releasing position and the loading position, respectively) against the phase Φ (on the axis of the abscissas).

[0051] Considering the curve 705s firstly, the sewing movable saddle moves from the releasing position (H=-1) to the sewing position (H=0) from the phase Φ=0° to the phase Φ=120°, it remains at the sewing position (H=0) from the phase Φ=120° to the phase Φ=240°, and it moves from the sewing position (H=0) to the releasing position (H=-1) from the phase Φ=240° to the phase Φ=360°. Passing instead to the curve 705c, the loading movable saddle moves integrally with the sewing movable saddle from the loading position (H=-1) to the resting position (H=0) from the phase Φ=0° to the phase Φ=120°, it moves from the resting position (H=0) to the loading position (H=-1) from the phase Φ=120° to the phase Φ=210°, and it remains at the loading position (H=-1) from the phase Φ=210° to the phase Φ=360°. In this case, the sewing movable saddle instantaneously reverses its movement direction at the releasing position, and the loading movable saddle instantaneously reverses its movement direction at the resting position (i.e., they remain stationary at such positions for a phase Φ being negligible in practice - for example, lower than 2°, and preferably lower than 1°).

[0052] In this case as well, there is eliminated the phase required in the sewing machines known in the art with fixed saddle wherein the movable saddle is maintained stationary for loading the signature thereon. As above, this allows reducing the length of the sewing cycle (for the same working speed of the sewing machine), of reducing the working speed of the sewing machine and/or increasing a distance between the sewing position and the releasing position of the sewing movable saddle (for the same length of the sewing cycle).

[0053] Moreover, in this way it is also possible to avoid maintaining the sewing movable saddle stationary at the releasing position (thanks to the fact that the signature is already loaded on the loading movable saddle, and it has already been thrown towards the sewing movable saddle by the transferring system that interacts with the loading movable saddle at the loading position).

[0054] Naturally, in order to satisfy local and specific requirements, a person skilled in the art may apply to the solution described above many logical and/or physical modifications and alterations. More specifically, although

this solution has been described with a certain degree of particularity with reference to one or more embodiments thereof, it should be understood that various omissions, substitutions and changes in the form and details as well as other embodiments are possible (for example, with reference to process parameters, materials and sizes). Particularly, different embodiments of the invention may even be practiced without the specific details (such as the numerical values) set forth in the preceding description to provide a more thorough understanding thereof; conversely, well-known features may have been omitted or simplified in order not to obscure the description with unnecessary particulars. Moreover, it is expressly intended that specific elements and/or method steps described in connection with any embodiment of the disclosed solution may be incorporated in any other embodiment as a matter of general design choice.

[0055] For example, similar considerations apply if the sewing machine has a different structure or comprises equivalent components, or it has other operative characteristics. In any case, every component thereof may be separated into more elements, or two or more components may be combined together into a single element; moreover, each component may be replicated to support the execution of the corresponding operations in parallel. It is also pointed out that (unless specified otherwise) any interaction between different components generally does not need to be continuous, and it may be either direct or indirect through one or more intermediaries.

[0056] More generally, although in the preceding description specific reference has been made to a sewing machine, the same solution may also find application in other binding machines (for example, wherein the signatures are bound together with metal staples). Likewise, each signature may have a different structure (for example, formed in part by non-printed sheets), and it should be intended in the broadest meaning of the term (for example, including either simple signatures or overlapped signatures); moreover, the signatures may be bound into blocks to obtain other bookbinding products (such as pamphlets, booklets, and the like). Similar considerations apply if the two movable saddle elements are driven by equivalent driving means (for example, dedicated motors), and if equivalent transferring means is provided for transferring the signature from the loading movable saddle element to the sewing movable saddle element (for example, with the pushing peg, arranged inside the loading movable saddle element, which projects across a slit made along its vertex).

[0057] The two embodiments described above are not exhaustive (with their features that may be combined in any way).

[0058] For example, nothing prevents arranging the feeding station and/or the sewing station at different positions.

[0059] Moreover, the possibility of loading the signature onto the loading movable saddle element at any other instant (independently of the sewing operation as well) is not excluded.

[0060] The sewing and loading saddle plates (either in the version with double movable saddle or in the version with two movable saddles) may be arranged in different way (for example, symmetrically to their longitudinal axis), and they may have different opening angles (even equal to each other).

[0061] The structure with double movable saddle may also be made with a different extent thereof (for example, for loading three or more signatures).

[0062] In this case, the possibility is not excluded of loading the signature onto the loading saddle plate at a different position of the double movable saddle (theoretically, even when it is opened).

[0063] The transferring means may move integrally with the loading movable saddle even without being mounted thereon; in any case, nothing prevents arranging the transferring means on the frame of the sewing machine (possibly providing a short stop of the double movable saddle at the opened position for allowing the transferring means to act on the signature placed on the loading saddle plate).

[0064] The structure with two movable saddles may also be implemented providing different strokes for such movable saddles (for example, with the loading movable saddle at the loading position that goes beyond the sewing movable saddle at the sewing position).

[0065] In a different embodiment of the invention, the loading movable saddle at the loading position is aligned with the sewing movable saddle at the sewing position (or it goes beyond it towards the feeding station); in this case, the signature may be loaded onto the loading movable saddle while the sewing movable saddle is stationary at the sewing position and in part also while it moves towards the releasing position (with the loading movable saddle that reaches the sewing movable saddle in any case before it arrives to the releasing position thanks to its higher speed).

[0066] Similar considerations apply if the pushing peg and/or the throwing wheel are replaced by equivalent pushing means (for example, even without any throwing wheel); in any case, such pushing means may move integrally with the loading movable saddle (for example, being mounted thereon).

[0067] The solution described above may be implemented with an equivalent method (by using similar steps with the same functions of more steps or portions thereof, removing some steps being non-essential, or adding further optional steps); moreover, the steps may be performed in a different order, concurrently or in an interleaved way (at least in part).

[0068] Moreover, it is possible to implement the proposed solution as a stand-alone module, as a plug-in for the control program of the sewing machine, or even directly in the control program itself. Alternatively, the same solution may be applied in a system comprising a sewing machine and a distinct computer (or any equivalent data-processing system). Similar considerations apply if the

program (which may be used to implement each embodiment of the invention) has any other form suitable to be used by a data-processing system or in connection therewith; moreover, it is possible to provide the program on any computer-usable medium (for example, of magnetic type).

Claims

1. A binding machine (100) including a feeding station (115,120) for feeding a signature (105) in succession, a binding station (125,135), a binding movable saddle element (140s) for receiving the signature, driving means (145) for maintaining the binding movable saddle element stationary at a binding position for binding the signature to a forming block of signatures (130) in the binding station and for moving the binding movable saddle element between the binding position and a releasing position for releasing the signature being bound to the forming block of signatures, and loading means (140c,150) for loading the signature from the feeding station onto the binding movable saddle element,
characterized in that
the loading means includes a loading movable saddle element (140c) arranged at a side of the binding movable saddle element, the driving means (145) being further adapted to maintain the loading movable saddle element stationary at a loading position for loading the signature from the feeding station and to move the loading movable saddle element integrally with the binding movable saddle element at least in part while the binding movable saddle element moves from the releasing position to the binding position, and transferring means (150) for transferring the signature from the loading movable saddle element to the binding movable saddle element while the binding movable saddle element and the loading movable saddle element move integrally.

2. The binding machine (100) according to claim 1, wherein the driving means (145) is adapted to drive the binding movable saddle element (140s) along a first moving direction and to drive the loading movable saddle element (140c) along a second moving direction parallel to the first moving direction, the binding station (125,135) being arranged along the first moving direction and the feeding station (115,120) being arranged along the second moving direction at a side of the binding station.

3. The binding machine (100) according to claim 1 or 2, wherein the driving means (145) is adapted to maintain the loading movable saddle element (140c) stationary at the loading position at least in part while the binding movable saddle element (140s) is stationary at the binding position.

4. The binding machine (100) according to any claim from I to 3, wherein the binding movable saddle element (140s) includes a first saddle plate (240s; 540s) for depositing the signature (305a,405b;605a, 605b) astride and the loading movable saddle element (140c) includes a second saddle plate (240c; 540c) for depositing the signature astride, the first saddle plate being wedge-shaped with a first opening angle and the second saddle plate being wedge-shaped with a second opening angle lower than the first opening angle.

5. The binding machine (100) according to any claim from 1 to 4, wherein the binding machine includes a double movable saddle (240) having a first portion (240s) and a second portion (240c) along a longitudinal axis thereof perpendicular to a moving direction of the double movable saddle, the first portion defining the binding movable saddle element (140s) and the second portion defining the loading movable saddle element (140c).

6. The binding machine (100) according to claim 5, wherein the loading position of the loading movable saddle element (240c) corresponds to the binding position of the binding movable saddle element (240s).

7. The binding machine (100) according to claim 5 or 6, wherein the transferring means (150) moves integrally with the double movable saddle (240), the driving means (145) being adapted to reverse a moving direction of the double movable saddle at the releasing position of the binding movable saddle element (240s) substantially instantaneously.

8. The binding machine (100) according to any claim from 1 to 4, wherein the binding movable saddle element (140s) and the loading movable saddle element (140c) are a binding movable saddle (540s) and a loading movable saddle (540c) separate from the binding movable saddle, respectively, the driving means (145) being adapted to drive the binding movable saddle and the loading movable saddle independently.

9. The binding machine (100) according to claim 8, wherein the loading movable saddle (540c) at the loading position is aligned with the binding movable saddle (540s) at the releasing position, the driving means (145) being adapted to move the loading movable saddle from a position corresponding to the binding position of the binding movable saddle to the loading position while the binding movable saddle is stationary at the binding position, and wherein the binding machine includes a support frame (105) for supporting the feeding station (115,120), the binding station (125,135), the binding movable saddle (540s)

and the loading movable saddle (540c), the transferring means (150) including pushing means (550ca-550cd) mounted on the support frame independently of the binding movable saddle and the loading movable saddle for pushing the signature from the loading movable saddle at the loading position to the binding movable saddle at the releasing position, and regulation means (550s) moving integrally with the binding movable saddle for regulating a position of the signature (510a,510b) on the binding movable saddle.

10. A method for operating a binding machine (100), the method including the steps of:

feeding a signature (105) in succession from a feeding station (115,120),
loading the signature onto a binding movable saddle element (140s),
maintaining the binding movable saddle element stationary at a binding position for binding the signature to a forming block of signatures (130), and
moving the binding movable saddle element from the binding position to a releasing position for releasing the signature being sewn to the forming block of signatures,
characterized in that
the step of loading the signature includes:
maintaining a loading movable saddle element (140c), arranged at a side of the binding movable saddle element, stationary at a loading position for loading the signature from the feeding station,
moving the loading movable saddle element integrally with the binding movable saddle element at least in part while the binding movable saddle element moves from the releasing position to the binding position, and
transferring the signature from the loading movable saddle element to the binding movable saddle element while the binding movable saddle element and the loading movable saddle element move integrally.

Patentansprüche

1. Bindemaschine (100) mit einer Zuführstation (115, 120) zum Zuführen jeweils einer Signatur (105) nacheinander, einer Bindestation (125, 135), einem beweglichen Bindevorgang-Sattelelement (140s) zum Empfangen der Signatur, einer Antriebseinrichtung (145), um das bewegliche Bindevorgang-Sattelelement in einer Bindeposition zum Binden der Signatur an einen sich bildenden Block von Signaturen (130) in der Bindestation stationär zu halten und um das bewegliche Bindevorgang-Sattelelement zwischen der Bindeposition und einer Freigabeposition zum Freigeben der Signatur zu bewegen, die an den sich bildenden Block von Signaturen gebunden ist, und mit einer Ladeeinrichtung (140c, 150) zum Laden der Signatur von der Zuführstation auf das bewegliche Bindevorgang-Sattelelement
dadurch gekennzeichnet, dass
die Ladeeinrichtung ein bewegliches Ladevorgang-Sattelelement (140c) aufweist, das seitlich von dem beweglichen Bindevorgang-Sattelelement angeordnet ist, wobei die Antriebseinrichtung (145) ferner dazu ausgebildet ist, das bewegliche Ladevorgang-Sattelelement in einer Ladeposition zum Laden der Signatur von der Zuführstation stationär zu halten und das bewegliche Ladevorgang-Sattelelement zumindest teilweise in integraler Weise mit dem beweglichen Bindevorgang-Sattelelement zu bewegen, während sich das bewegliche Bindevorgang-Sattelelement von der Freigabeposition in die Bindeposition bewegt, sowie eine Übertragungseinrichtung (150) aufweist zum Übertragen der Signatur von dem beweglichen Ladevorgang-Sattelelement zu dem beweglichen Bindevorgang-Sattelelement, während sich das bewegliche Bindevorgang-Sattelelement und das bewegliche Ladevorgang-Sattelelement in integraler Weise bewegen.

2. Bindemaschine (100) nach Anspruch 1,
wobei die Antriebseinrichtung (145) dazu ausgebildet ist, das bewegliche Bindevorgang-Sattelelement (140s) entlang einer ersten Bewegungsrichtung antriebsmäßig zu bewegen und das bewegliche Ladevorgang-Sattelelement (140c) entlang einer zweiten Bewegungsrichtung parallel zu der ersten Bewegungsrichtung antriebsmäßig zu bewegen, wobei die Bindestation (125, 135) entlang der ersten Bewegungsrichtung angeordnet ist und die Zuführstation (115, 120) entlang der zweiten Bewegungsrichtung an einer Seite der Bindestation angeordnet ist.

3. Bindemaschine (100) nach Anspruch 1 oder 2,
wobei die Antriebseinrichtung (145) dazu ausgebildet ist, das bewegliche Ladevorgang-Sattelelement (140c) zumindest teilweise an der Ladeposition stationär zu halten, während das bewegliche Bindevorgang-Sattelelement (140s) an der Bindeposition stationär ist.

4. Bindemaschine (100) nach einem der Ansprüche 1 bis 3,
wobei das bewegliche Bindevorgang-Sattelelement (140s) eine erste Sattelplatte (240s; 540s) zum rittlings erfolgenden Ablegen der Signatur (305a, 405b; 605a, 605b) aufweist, und wobei das bewegliche Ladevorgang-Sattelelement (140c) eine zweite Sattelplatte (240c; 540c) zum rittlings erfolgenden Ablegen der Signatur aufweist, wobei die erste Sattelplatte keilförmig mit einem ersten Öffnungswinkel

ausgebildet ist und die zweite Sattelplatte keilförmig mit einem zweiten Öffnungswinkel ausgebildet ist, der kleiner ist als der erste Öffnungswinkel.

5. Bindemaschine (100) nach einem der Ansprüche 1 bis 4,
wobei die Bindemaschine einen doppelten beweglichen Sattel (240) mit einem ersten Bereich (240s) und einem zweiten Bereich (240c) entlang einer Längsachse desselben senkrecht zu einer Bewegungsrichtung des doppelten beweglichen Sattels aufweist, wobei der erste Bereich das bewegliche Bindevorgang-Sattelelement (140s) bildet und der zweite Bereich das bewegliche Ladevorgang-Sattelelement (140c) bildet.

6. Bindemaschine (100) nach Anspruch 5,
wobei die Ladeposition des beweglichen Ladevorgang-Sattelelements (240c) der Bindeposition des beweglichen Bindevorgang-Sattelelements (240s) entspricht.

7. Bindemaschine (100) nach Anspruch 5 oder 6,
wobei sich die Übertragungseinrichtung (150) in integraler Weise mit dem doppelten beweglichen Sattel (240) bewegt, wobei die Antriebseinrichtung (145) dazu ausgebildet ist, eine Bewegungsrichtung des doppelten beweglichen Sattels in der Freigabeposition des beweglichen Bindevorgang-Sattelelements (240s) im Wesentlichen unmittelbar umzukehren.

8. Bindemaschine (100) nach einem der Ansprüche 1 bis 4,
wobei es sich bei dem beweglichen Bindevorgang-Sattelelement (140s) und dem beweglichen Ladevorgang-Sattelelement (140c) um einen beweglichen Binde-Sattel (540s) bzw. einen beweglichen Lade-Sattel (540c) getrennt von dem beweglichen Binde-Sattel handelt, wobei die Antriebseinrichtung (145) dazu ausgebildet ist, den beweglichen Binde-Sattel und den beweglichen Lade-Sattel voneinander unabhängig antriebsmäßig zu bewegen.

9. Bindemaschine (100) nach Anspruch 8,
wobei der bewegliche Lade-Sattel (540c) in der Ladeposition mit dem beweglichen Binde-Sattel (540s) in der Freigabeposition ausgerichtet ist, wobei die Antriebseinrichtung (145) dazu ausgebildet ist, den beweglichen Lade-Sattel von einer Position, die der Bindeposition des beweglichen Binde-Sattels entspricht, zu der Ladeposition zu bewegen, während der bewegliche Binde-Sattel in der Bindeposition stationär ist, und wobei die Bindemaschine einen Abstützrahmen (105) aufweist, um die Zuführstation (115, 120), die Bindestation (125, 135), den beweglichen Binde-Sattel (540s) und den beweglichen Lade-Sattel (540c) abzustützen, wobei die Übertragungseinrichtung (150) eine Drückeinrichtung (550ca-550cd) beinhaltet, die an dem Abstützrahmen unabhängig von dem beweglichen Binde-Sattel und dem beweglichen Lade-Sattel angebracht ist, um die Signatur von dem beweglichen Lade-Sattel in der Ladeposition auf den beweglichen Binde-Sattel in der Freigabeposition zu schieben, und wobei sich eine Reguliereinrichtung (550s) in integraler Weise mit dem beweglichen Binde-Sattel bewegt, um eine Position der Signatur (510a, 510b) auf dem beweglichen Binde-Sattel zu regulieren.

10. Verfahren zum Betreiben einer Bindemaschine (100), wobei das Verfahren folgende Schritte aufweist:

Zuführen jeweils einer Signatur (105) nacheinander von einer Zuführstation (115, 120),
Laden der Signatur auf ein bewegliches Bindevorgang-Sattelelement (140s);
Halten des beweglichen Bindevorgang-Sattelelement stationär in einer Bindeposition zum Binden der Signatur an einen sich bildenden Block von Signaturen (130), und
Bewegen des beweglichen Bindevorgang-Sattelelements von der Bindeposition zu einer Freigabeposition zur Freigabe der Signatur, die mit dem sich bildenden Block von Signaturen vernäht ist,
dadurch gekennzeichnet, dass der Schritt des Ladens der Signatur beinhaltet:

Halten eines beweglichen Ladevorgang-Sattelelements (140c), das seitlich von dem beweglichen Bindevorgang-Sattelelement angeordnet ist, stationär in einer Ladeposition zum Laden der Signatur von der Zuführstation,
Bewegen des beweglichen Ladevorgang-Sattelelements in integraler Weise mit dem beweglichen Bindevorgang-Sattelelement zumindest teilweise, während sich das bewegliche Bindevorgang-Sattelelement von der Freigabeposition in die Bindeposition bewegt, und
Übertragen der Signatur von dem beweglichen Ladevorgang-Sattelelement zu dem beweglichen Bindevorgang-Sattelelement, während sich das bewegliche Bindevorgang-Sattelelement und das bewegliche Ladevorgang-Sattelelement in integraler Weise bewegen.

Revendications

1. Une machine à relier (100) comprenant une station d'alimentation (115,120) pour alimenter une signa-

ture (105) en succession, une station de reliure (125,135), un élément à selle mobile de reliure (140s) pour recevoir la signature, des moyens de conduction (145) pour maintenir l'élément à selle mobile de reliure stationnaire à une position de reliure pour relier la signature à un bloc de signatures en formation (130) dans la station de reliure et pour déplacer l'élément à selle mobile de reliure entre la position de reliure et une position de libération pour libérer la signature étant reliée au bloc des signatures en formation, et des moyens de chargement (140c,150) pour charger la signature de la station d'alimentation sur l'élément à selle mobile de reliure, **caractérisé en ce que**

les moyens de chargement comprennent un élément à selle mobile de chargement (140c) disposé sur un côté de l'élément à selle mobile de reliure, les moyens de conduction (145) étant en outre adaptés pour maintenir l'élément à selle mobile de chargement stationnaire à une position de chargement pour charger la signature de la station d'alimentation et pour déplacer l'élément à selle mobile de chargement intégralement avec l'élément à selle mobile de reliure au moins en partie tandis que l'élément à selle mobile de reliure se déplace de la position de libération à la position de reliure, et des moyens de transfert (150) pour transférer la signature de l'élément à selle mobile de chargement à l'élément à selle mobile de reliure tandis que l'élément à selle mobile de reliure et l'élément à selle mobile de chargement se déplacent intégralement.

2. La machine à relier (100) selon la revendication 1, dans laquelle les moyens de conduction (145) sont adaptés pour conduire l'élément à selle mobile de reliure (140s) le long d'une première direction de déplacement et pour conduire l'élément à selle mobile de chargement (140c) le long d'une deuxième direction de déplacement parallèle à la première direction de déplacement, la station de reliure (125,135) étant disposée le long de la première direction de déplacement et la station d'alimentation (115,120) étant disposée le long de la deuxième direction de déplacement d'un côté de la station de reliure.

3. La machine à relier (100) selon la revendication 1 ou 2, dans laquelle les moyens de conduction (145) sont adaptés pour maintenir l'élément à selle mobile de chargement (140c) stationnaire à la position de chargement au moins en partie tandis que l'élément à selle mobile de reliure (140s) est stationnaire à la position de reliure.

4. La machine à relier (100) selon l'une quelconque des revendications de 1 à 3, dans laquelle l'élément à selle mobile de reliure (140s) comprend une première plaque de selle (240s;540s) pour déposer la signature (305a,405b;605a,605b) à califourchon, et l'élément à selle mobile de chargement (140c) comprend une deuxième plaque de selle (240c;540c) pour déposer la signature à califourchon, la première plaque de selle étant en forme de coin avec un premier angle d'ouverture et la deuxième plaque de selle étant en forme de coin avec un deuxième angle d'ouverture inférieur au premier angle d'ouverture.

5. La machine à relier (100) selon l'une quelconque des revendications de 1 à 4, dans laquelle la machine à relier inclut une selle mobile double (240) ayant une première partie (240s) et une deuxième partie (240c) le long d'un axe longitudinal de celle-ci perpendiculaire à une direction de déplacement de la selle mobile double, la première partie définissant l'élément à selle mobile de reliure (140s) et la deuxième partie définissant l'élément à selle mobile de chargement (140c).

6. La machine à relier (100) selon la revendication 5, dans laquelle la position de chargement de l'élément à selle mobile de chargement (240c) correspond à la position de reliure de l'élément à selle mobile de reliure (240s).

7. La machine à relier (100) selon la revendication 5 ou 6, dans laquelle les moyens de transfert (150) se déplacent intégralement avec la selle mobile double (240), les moyens de conduction (145) étant adaptés pour inverser la direction de déplacement de la selle mobile double à la position de libération de l'élément à selle mobile de reliure (240s) substantiellement instantanément.

8. La machine à relier (100) selon l'une quelconque des revendications de 1 à 4, dans laquelle l'élément à selle mobile de reliure (140s) et l'élément à selle mobile de chargement (140c) sont une selle mobile de reliure (540s) et une selle mobile de chargement (540c) séparée de la selle mobile de reliure, respectivement, les moyens de conduction (145) étant adaptés pour conduire la selle mobile de reliure et la selle mobile de chargement de façon indépendante.

9. La machine à relier (100) selon la revendication 8, dans laquelle la selle mobile de chargement (540c) à la position de chargement est alignée avec la selle mobile de reliure (540s) à la position de libération, les moyens de conduction (145) étant adaptés pour déplacer la selle mobile de chargement d'une position correspondant à la position de reliure de la selle mobile de reliure à la position de chargement tandis que la selle mobile de reliure est stationnaire à la position de reliure, et dans laquelle la machine à relier inclut un châssis de support (105) pour supporter la station d'alimentation (115 120), la station de reliure (125 135), la selle mobile de reliure (540s) et la

selle mobile de chargement (540c), les moyens de transfert (150) comprenant des moyens de poussée (550ca-550cd) montés sur le châssis de support indépendamment de la selle mobile de reliure et de la selle mobile de chargement pour pousser la signature de la selle mobile de chargement à la position de chargement à la selle mobile de reliure à la position de libération, et des moyens de régulation (550s) se déplaçant intégralement avec la selle mobile de reliure pour réguler une position de la signature (S10a,510b) sur la selle mobile de reliure.

10. Une méthode pour faire fonctionner une machine à relier (100), la méthode comprenant les étapes de:

alimenter une signature (105) en succession d'une station d'alimentation (115,120),
charger la signature sur un élément à selle mobile de reliure (140s),
maintenir l'élément à selle mobile de reliure stationnaire à une position de reliure pour relier la signature à un bloc de signatures en formation (130), et
déplacer l'élément à selle mobile de reliure de la position de reliure à une position de libération pour libérer la signature étant reliée au bloc des signatures en formation,
caractérisé en ce que
l'étape de charger la signature inclut:
maintenir un élément à selle mobile de chargement (140c), disposé sur un côté de l'élément à selle mobile de reliure, stationnaire à une position de chargement pour charger la signature de la station d'alimentation,
déplacer l'élément à selle mobile de chargement intégralement avec l'élément à selle mobile de reliure au moins en partie tandis que l'élément à selle mobile de reliure se déplace de la position de libération à la position de reliure, et
transférer la signature de l'élément à selle mobile de chargement à l'élément à selle mobile de reliure tandis que l'élément à selle mobile de reliure et l'élément à selle mobile de chargement se déplacent intégralement.

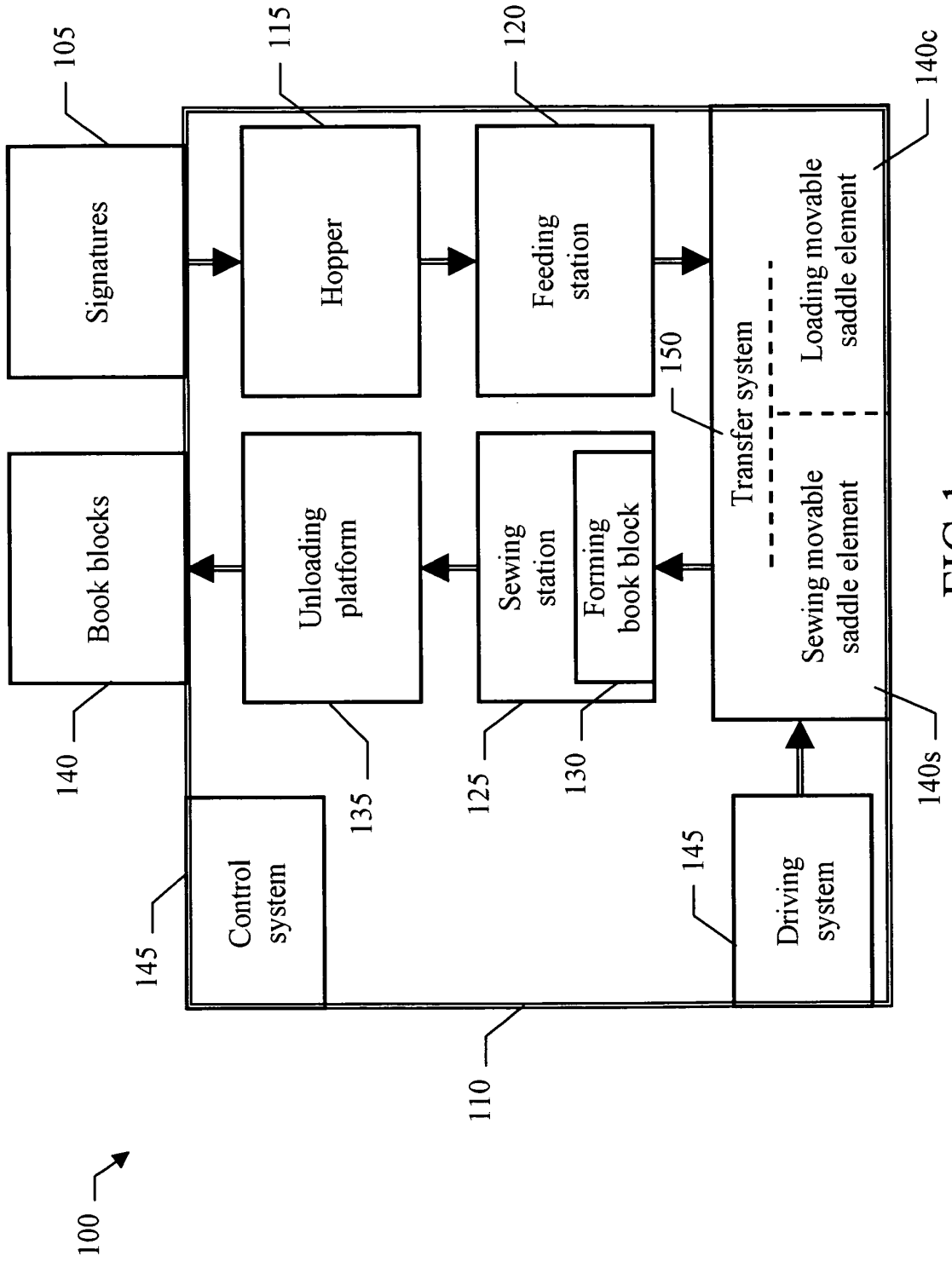

105
115
120
140c
Signatures
Hopper
Feeding station
Loading movable saddle element
150
Transfer system
Sewing movable saddle element
Book blocks
Unloading platform
Sewing station
Forming book block
140
135
125
130
140s
Control system
Driving system
145
145
110
100

FIG.1

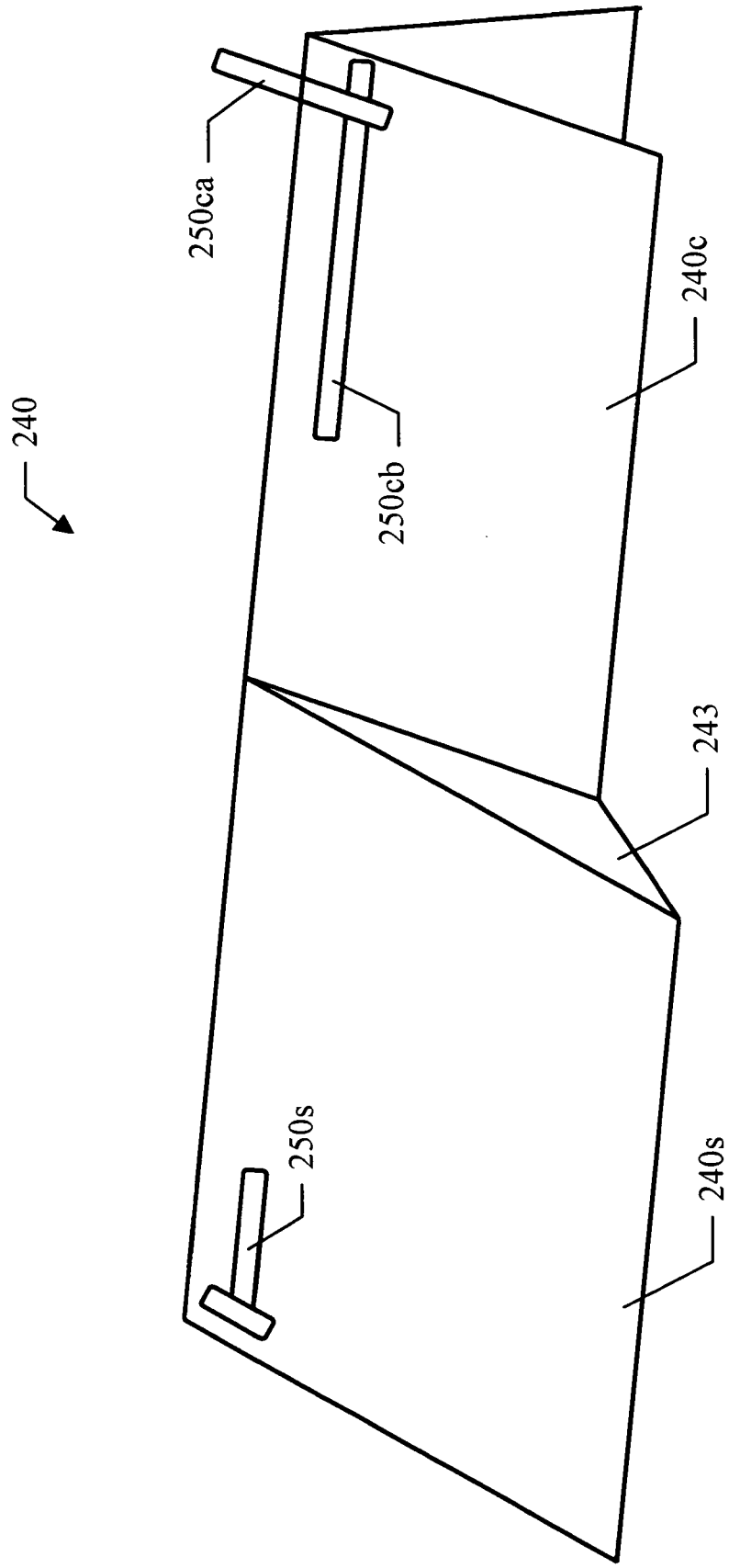


FIG.2

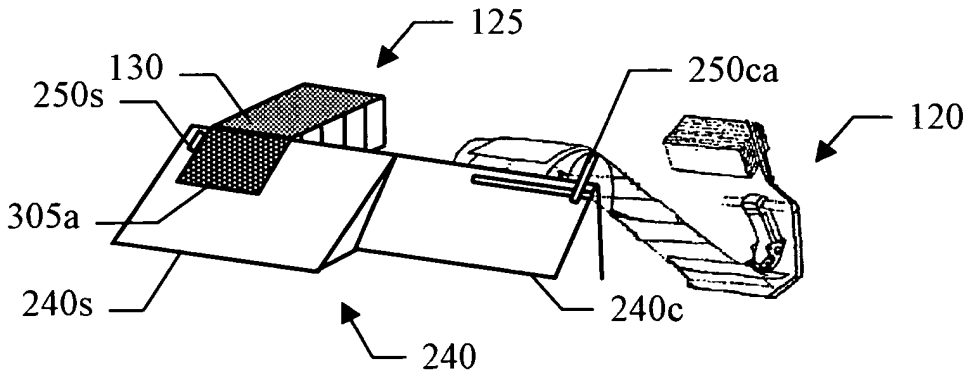


FIG.3A

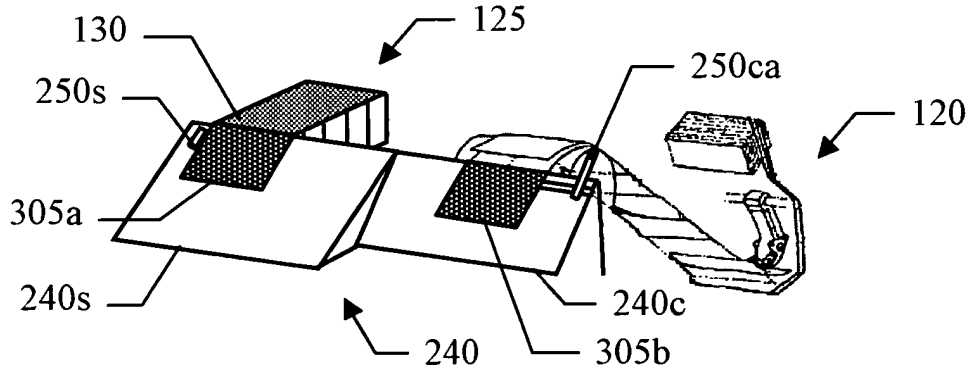


FIG.3B

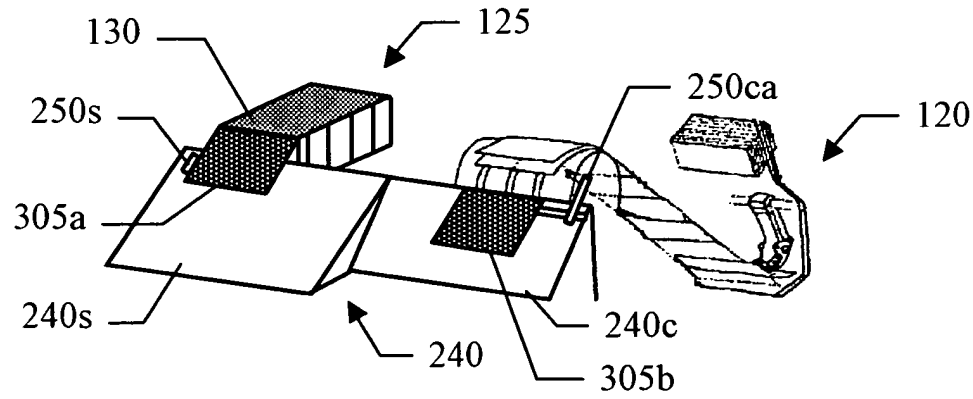


FIG.3C

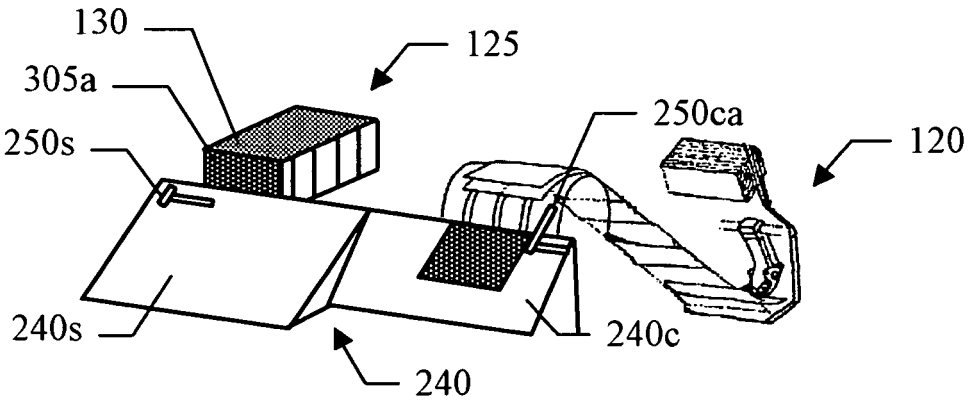

130
125
305a
250ca
250s
120
240s
240c
240

FIG.3D

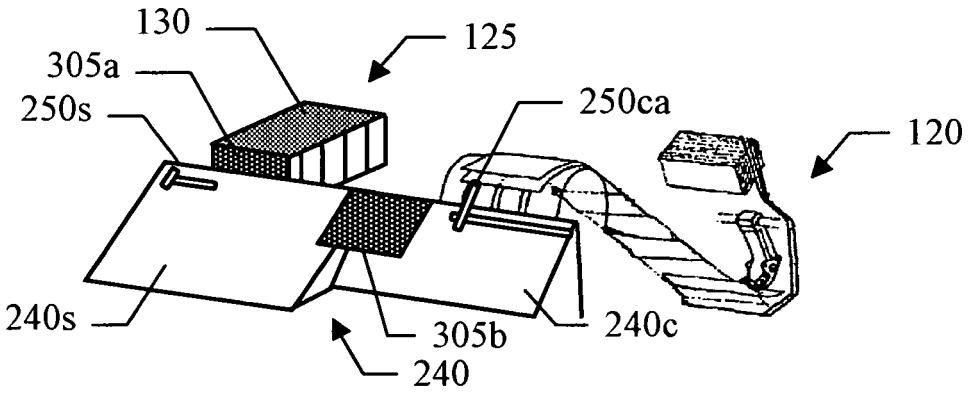

130
125
305a
250ca
250s
120
240s
305b
240c
240

FIG.3E

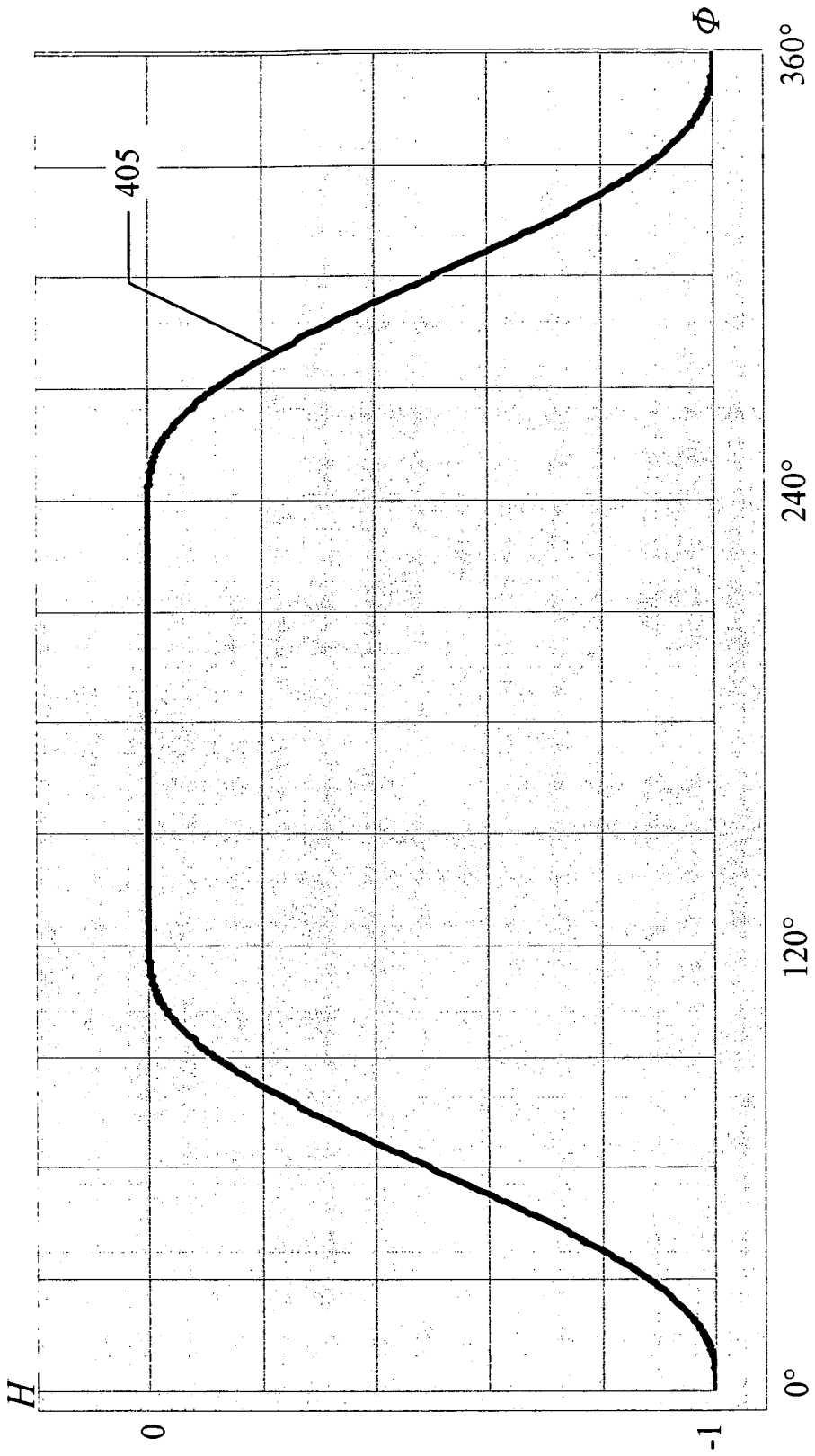


FIG.4

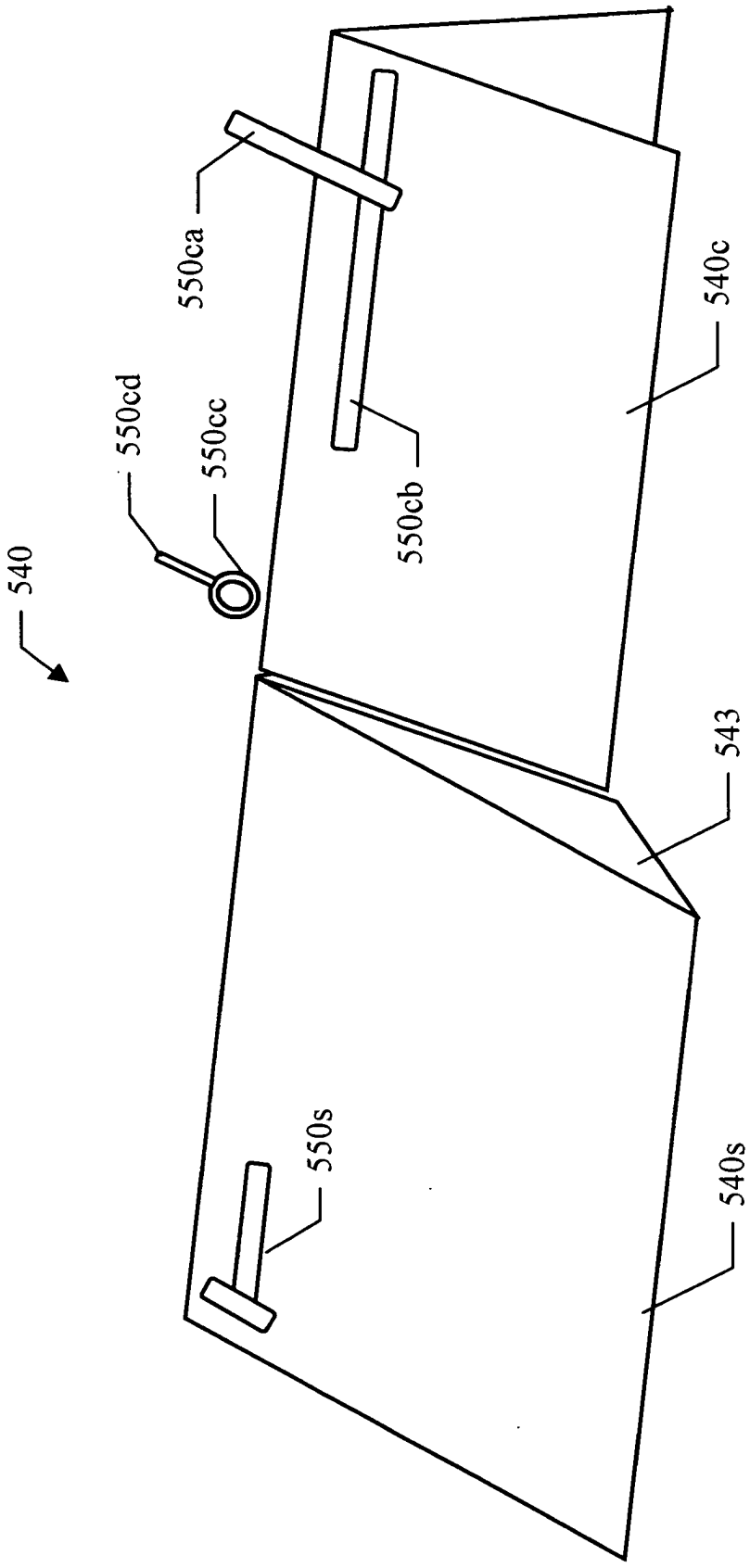


FIG.5

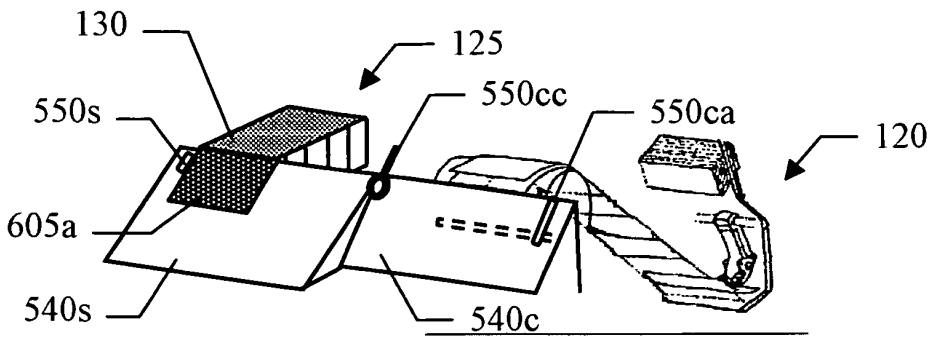


FIG.6A

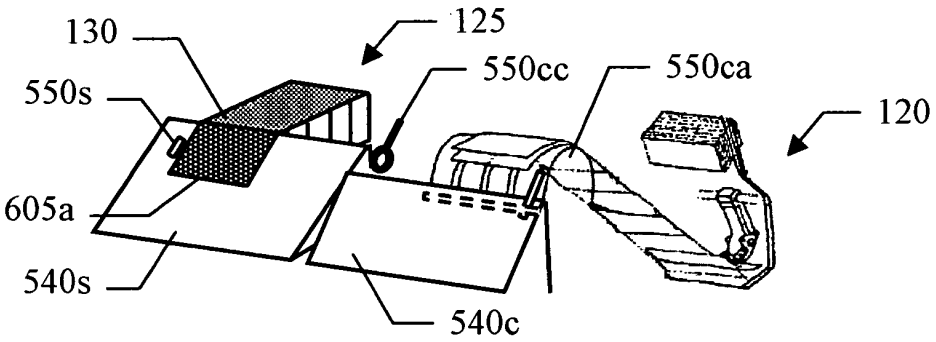


FIG.6B

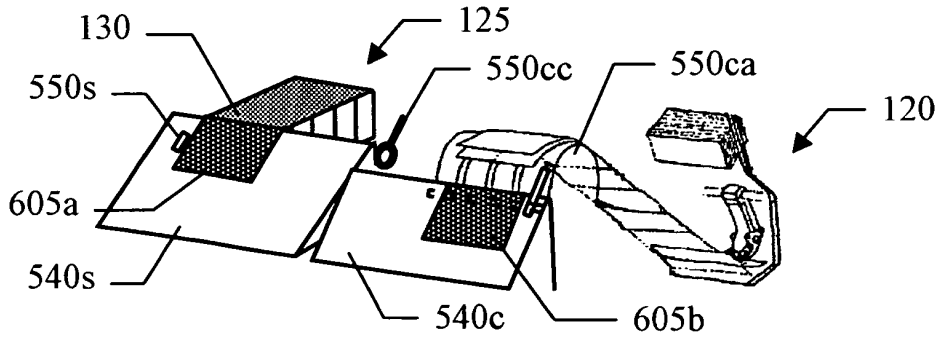


FIG.6C

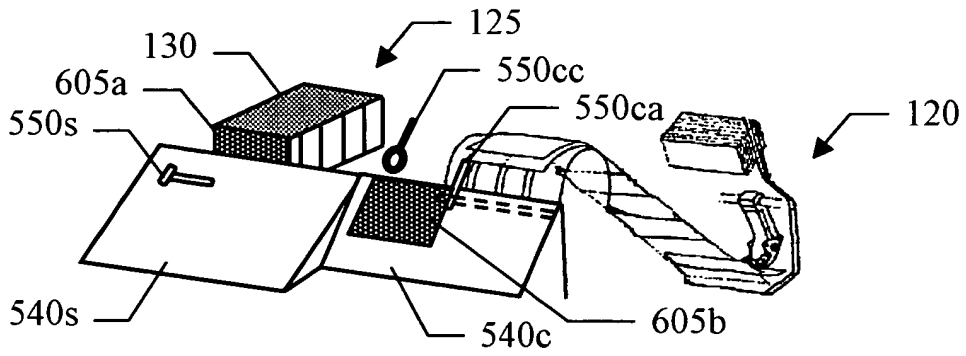


FIG.6D

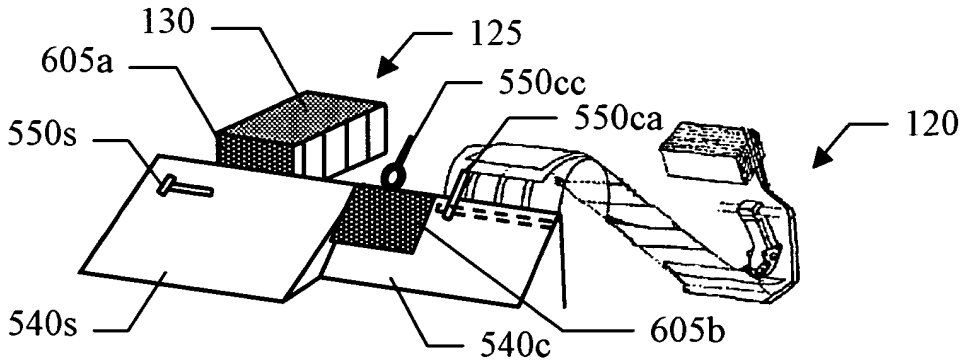


FIG.6E

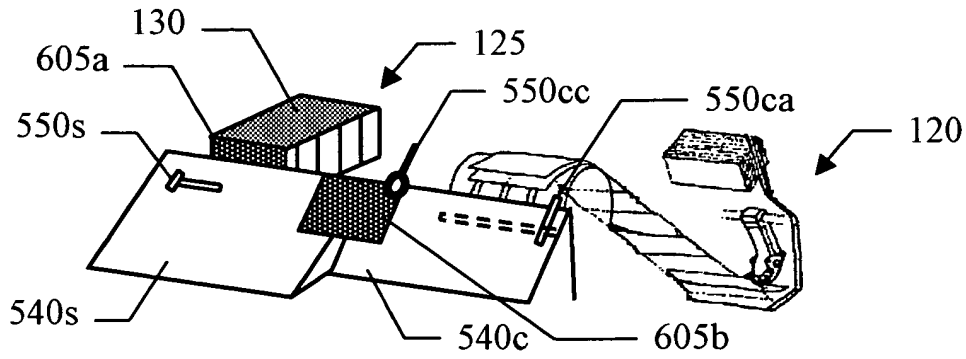


FIG.6F

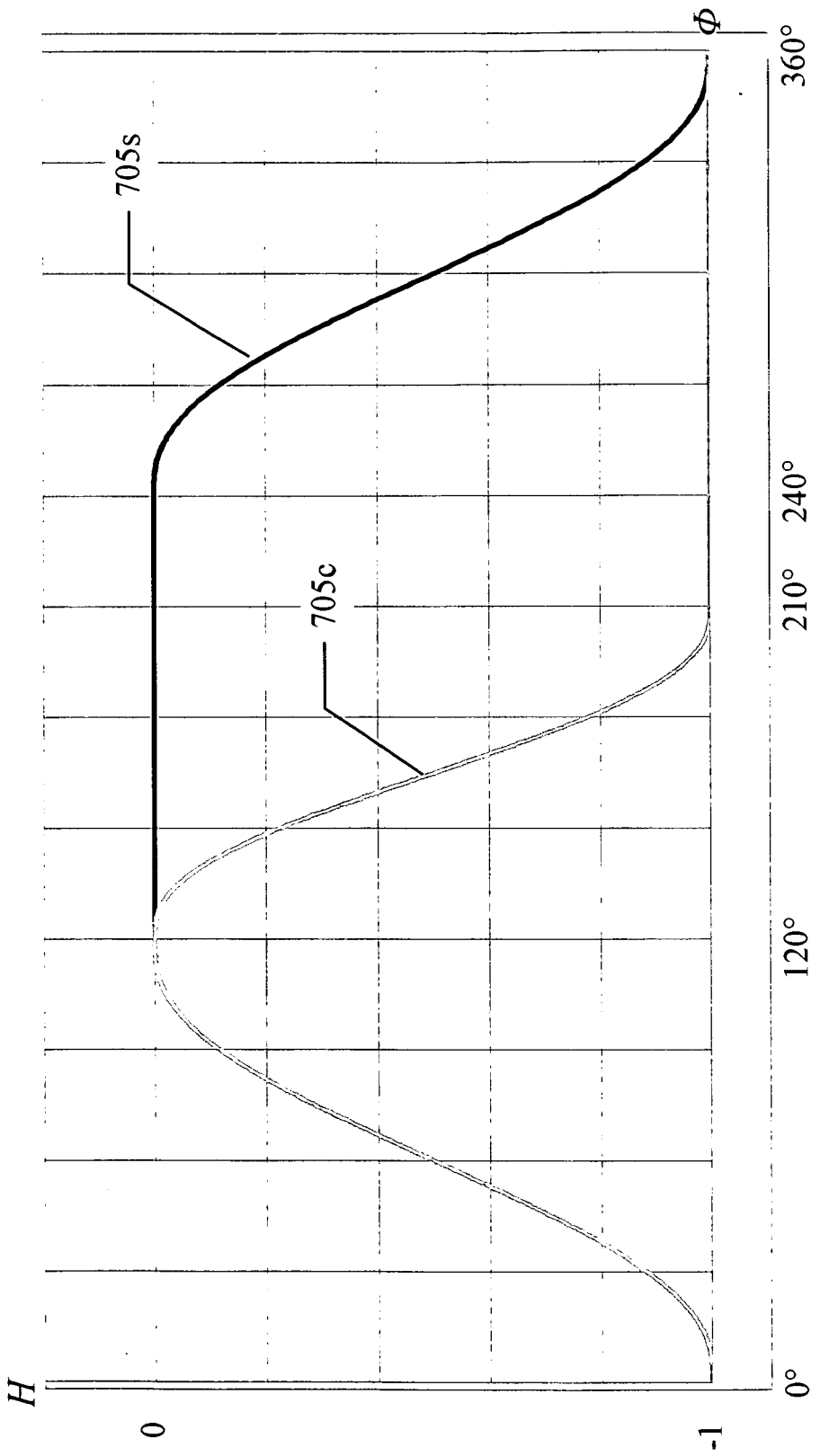


FIG.7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1013470 A **[0003]**
- GB 1425974 A **[0006]**
- US 20100117286 A **[0007]**