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(54) **Method and device for making books from a stack of sewn signatures**

(57) A method for making books from a stack of mutually sewn signatures (10), with sewing thread being interrupted at each group (12) of signatures making up a book, comprises the step of opening the signatures (10) and feeding them sequentially to a moving saddle (22) of a sewing machine (14), said moving saddle (22) being adapted to travel between a signature-receiving

position and a signature-sewing position; sew the sequences of signatures (10) of a group (12) making up the book. Furthermore, it provides the step of anchoring the sewing thread after a last signature (10a) of the group by carrying out an empty stitch during the steps of opening of the moving saddle (22) from the sewing position to the receiving position of the signatures (10).

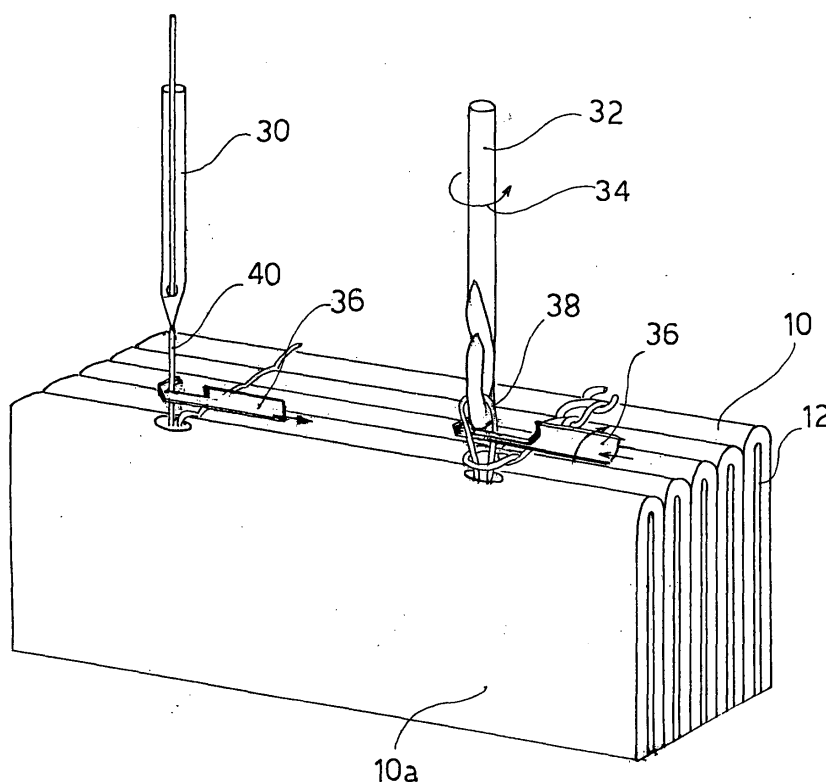


FIG. 6

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Description

[0001] The object of the present invention is a method and a device to make books from a stack of mutually sewn signatures, with a sewing thread being interrupted at each group of signatures making up a book.

[0002] In the bookmaking field it is known to first make a signature stack by constantly adding one signature at a time. The signatures in the stack are mutually sewn on board of a sewing machine and the sewing is interrupted at each group of signatures having a preset number of signatures in order to make a book. The sewing machine generally comprises a moving saddle upon which the open signature to be sewn is arranged. The moving saddle performs a motion according to the following steps: closed saddle (where the sewing takes place), opening, open saddle (where the moving saddle is aligned with a stationary saddle to receive a new signature to be sewn) and closure.

[0003] This preset number may also be small, such as three or four signatures, for example as in case of children's books.

[0004] Downstream of the sewing machine, the signature groups in the stack are picked up one by one from the stack to be sent to subsequent working.

[0005] In the bookmaking field, there is the need to ensure that each signature group making up a book maintains its integrity and compactness when passing from the sewing machine to subsequent working. In other words, the need that the signature group does not for example loose the last signature along the way.

[0006] In order to meet the above need, it is currently known, during the sewing step, to carry out an empty stitch, which serves the purpose of anchoring the cut thread end and avoiding that the sewing may become slack, thereby preventing that the last signature in the group may release. This method, though being widely used, has the drawback of lengthening the sewing time, an empty cycle being required to make the empty stitch. This drawback is most felt with small books, such as in the case of children's books. In fact, the percentage of the empty stitches out of total stitches will increase as the number of signatures making up the book decreases.

[0007] It has been suggested to coat the penultimate signature in the group with glue. The thus-coated glue ensures that the last signature is adhered to the other signatures in the group. This procedure however is not exempt from a slight prolongation of working time, and furthermore it causes several drawbacks, among which the sophistication of the glue dispensing units and the difficulty of keeping the machine clean.

[0008] In patent application CH19920003770, it has been also suggested for the sewing to use a thread made in a suitable material capable of melting at a preset temperature, and to heat the thread itself upon sewing of the last signature in the group such as to ensure that the stitch is anchored by the thread melting and ad-

hering to signatures. A drawback of this procedure is that it requires, for the sewing, to leave the conventionally used threads and adopt an entirely particular thread. Furthermore, this procedure is difficult to put in practice, particularly in terms of control of the thread heating means.

[0009] Patent application IT1998MI01878 illustrates a further procedure wherein each signature group making up a book is secured on the spine with a piece of adhesive tape before the group itself leaves the sewing machine. This procedure also entails several drawbacks because suitable devices are required to distribute and cut the adhesive tape, the practice of which is rather laborious. Furthermore, the tape characteristics are not constant, particularly its adhesive power depends, inter alia, on the climate. Finally, despite the moderate thickness, the presence of lengths of adhesive tape on the book spine is not always welcomed by the bookbinders, since they may not be completely hidden by the following bookmaking steps.

[0010] The problem at the heart of the present invention is to provide a method to make books starting from a stack of mutually sewn signatures, the characteristics of which are such to meet the above requirement, and in the meantime to overcome the drawbacks mentioned above with reference to the prior art.

[0011] This problem is resolved by a method for making books from a stack of mutually sewn signatures in accordance with claim 1.

[0012] Further characteristics and the advantages of the method for making books from a stack of mutually sewn signatures, according to the invention, will become apparent from the description below of preferred embodiments thereof, which should be intended as being merely illustrative and non-limiting, for example with reference to the annexed figures, in which:

figure 1 illustrates a schematical view of a sewing machine for carrying out the method according to the present invention;

figures 2 - 10 illustrate steps of an embodiment of the method for sewing the signatures in a group making up a book according to the present invention.

[0013] With reference to the figures above, with 10 has been indicated a signature belonging to a group 12 of signatures to make up a book.

[0014] The signatures 10 are mutually sewn along their spines within a sewing machine 14, such as schematically illustrated in Figure 1.

[0015] With reference to Figure 1, by way of example, the sewing machine 14 comprises a signature feeding device 16, a signature opening device 18 adapted to unload the open signature astride a stationary saddle 20 along which the signatures are caused to slide. From the stationary saddle 20, the signatures are transferred to a moving saddle 22 belonging to the actual sewing

machine. The moving saddle 22 is adapted to perform a motion according to arrows 24 to approach a sewing device, not completely illustrated in Figure 1.

[0016] The sewing device is schematically illustrated in the subsequent figures and comprises a series of awls 26 arranged inside the moving saddle 22 in a lower portion of the device itself such that the pointed ends face the inside of the signature being sewn. The sewing device further comprises a shuttle 28 also arranged in a lower portion of the sewing device and adapted to translate horizontally. Finally, an alternate series of needles 30 and sewing crochets 32 assembled in an upper portion or carriage of the sewing device is provided. The crochets 32 are assembled to the sewing device such as to be caused to rotate around a longitudinal axis thereof according to what will be for example described herein below.

[0017] Figure 2 illustrates a first step of signature sewing where the awls 26 punch the signature spine for the needles 30 and the sewing crochets 32 to be driven therethrough.

[0018] Figure 3 illustrates a subsequent step where the needles 30 and the sewing crochets 32 are lowered and driven at the perforations provided by the awls 26. At the same time, the sewing crochets 32 start rotating slightly around the longitudinal axis thereof.

[0019] Figure 4 illustrates a subsequent step of the signature sewing where the shuttles 28 perform a horizontal movement inside the signature being sewn by gripping the loop formed between the needles 30 and the signature spine and widening it until reaching the adjacent sewing crochet 32. In the meantime, the sewing crochet 32 will complete its rotation around the longitudinal axis and grip the thread.

[0020] In figure 5 the final step of signature sewing is shown where the upper portion of the sewing device is raised and taken off from the signature. When exiting, the sewing crochets 32 pull the respective thread and cause it to pass through the chain stitch formed during the previous sewing cycle. The shuttle 28 goes back to the starting position to start another cycle.

[0021] Figure 6 illustrates the step where the last sewing cycle has been completed by sewing the last signature in the group 12 making up the book. The last signature is designated with the numeral 10a.

[0022] At this point, the sewing crochet 32 rotates by about 90° as indicated by the arrow 34 and a secondary, horizontally arranged crochet 36 translates towards the needle 30 and is inserted in the chain stitch on the sewing crochet 32. The chain stitch on the sewing crochet 32 is designated with the numeral 38.

[0023] While translating to the needle 30, the secondary crochet 36 rotates around its own axis and grips a thread portion 40 that emerges from the last signature 10a and is inserted in the needle 30. In figure 6 two moments of these steps are illustrated at the same time. The secondary crochet 36 is illustrated both on the right in figure 6, at the moment when it is inserted in the chain

stitch 38 at the sewing crochet 32, and on the left in figure 6 at the moment when after rotating around its own axis it grips the thread portion 40.

[0024] The secondary crochet 36 then returns to the starting position by rotating in the opposite direction to the outward stroke. The secondary crochet 36 pulls the thread portion 40 through the chain stitch 38 such as illustrated in Figure 7. The thread portion 40 stretches, thus forming a lower length 40a from the signature 10a to the chain stitch 38 and an upper length 40b from the chain stitch 38 to the needle 30. A cutting device 42 is advantageously provided between the needle 30 and the crochet 32 and is adapted to be inserted below the upper length 40b of thread portion 40.

[0025] Figure 8 illustrates the subsequent step where the upper portion or carriage of the sewing device has been lowered to sew the first signature in the next group, which is indicated with the numeral 10b. The lower length 40a extends from the signature 10a to the secondary crochet 36 passing through the chain stitch 38. The upper length 40b extends from the secondary crochet 36 to the needle eye 30 which has been lowered into the first signature 10b of the next group. Furthermore, the upper length 40b passes through the chain stitch 38 and over the cutting device 42 while being lowered into the signature 10b. The crochet 32 leaves the corresponding chain stitch 38 close to that formed by the secondary crochet 36 and rotates before being lowered.

[0026] According to a possible embodiment, the cutting device 42 can be of the active type, e.g. comprising shears to cut the upper portion 48b in response to a preset command. According to an alternate embodiment, the cutting device 42 is of the passive type, e.g. such as comprising a knife. In the latter case, the thread fitted on the knife is cut due to the backward movement of the signatures as further signatures are sewn.

[0027] Finally, according to what has been illustrated in Figure 9, by unthreading the secondary crochet 36 the empty stitch as well as the anchorage of the thread are obtained to prevent that the last signature 10a of a group 12 may be lost.

[0028] Figure 10 illustrates a schematic top view of the last step where, while the next signature group is being carried out from a thread portion 44, the previous group has a chain stitch 38 where the thread portion 40 is inserted. Both adjacent signature groups are mutually independent, and hence they are not connected by the thread.

[0029] According to a possible variant embodiment, the method for making books starting from a stack of mutually sewn signatures provides that, after the moving saddle has moved away from the sewing device and the last signature 10a of the group has been forced back for example by a spine-pushing bar to the sewing machine outlet, the needles and the sewing crochets are lowered again below a so-called sewing comb while the moving saddle aligns with the stationary saddle. The ex-

change of the thread from the needle to the crochet to make the empty stitch can take place in several ways. A first embodiment provides that a needle is used which can turn to the direction of the respective sewing cro-
chet. A different embodiment provides for several shut-
tles to be housed in the spine-pushing bar of the sewing
machine. A further embodiment provides that the pas-
sage from the needle to the crochet takes place by a jet
of air forcing the thread according to the teachings of
the patent application CH19960002331, herein incorpo-
rated by reference.

[0030] In other words, the present invention provides a method for making books from a stack of mutually sewn signatures, with the sewing thread being interrupted at each group of signatures making up a book, wherein a step of carrying out an empty stitch is provided to anchor the thread end to the last signature in the group and wherein this step is advantageously carried out when the moving saddle is not in the closed position below the sewing device. In other words, the step of making an empty stitch at the last signature in a group is carried out making use of the three steps of opening, open saddle and closure performed by the moving saddle to receive another signature to be sewn from the stationary saddle.

[0031] It should be appreciated from the above that providing a method according to the present invention allows to meet the above-mentioned requirement of securing the last signature in the group making up the book, thus eliminating the risk of loosing it during the subsequent working steps. This is achieved reliably and without prolongation of the manufacturing time, namely in the case of books with a small number of signatures in which the time to make the so-called empty stitch would sensibly weigh on the manufacturing time.

[0032] It should be understood that variants and/or additions may be provided to what has been described and illustrated above.

[0033] To the preferred embodiment of the method such as described above, those skilled in the art, aiming at satisfying contingent and specific needs, may carry out a number of modifications, variants and replacements of elements with others functionally equivalent, without departing from the scope of the claims below.

Claims

1. A bookmaking method from a stack of mutually sewn signatures (10), with sewing thread being interrupted at each group (12) of signatures making up a book, comprising the steps of:

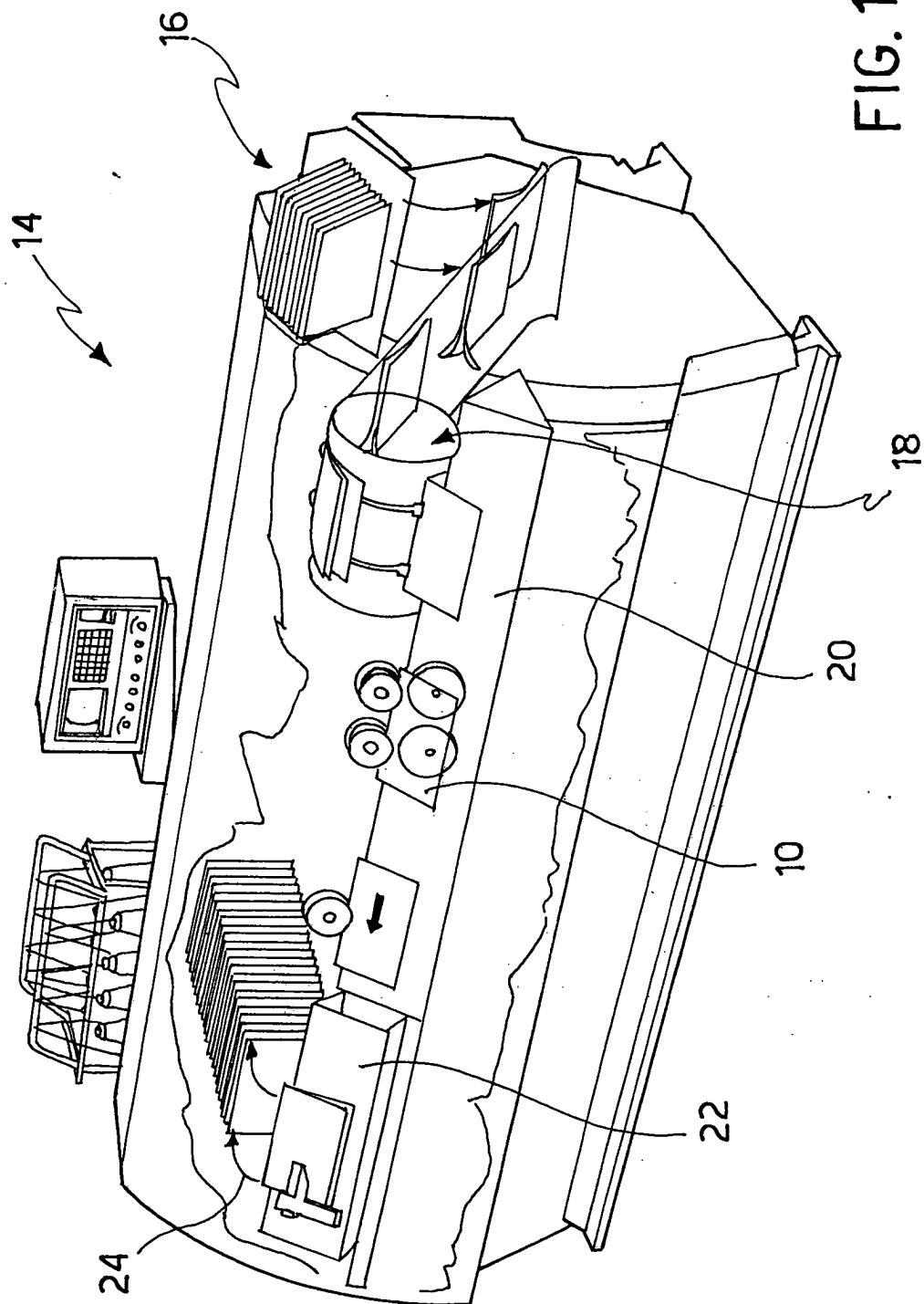
opening the signatures (10) and sequentially feeding them to a moving saddle (22) of a sewing machine (14), said moving saddle (22) being adapted to travel between a signature-receiving position and a signature-sewing posi-

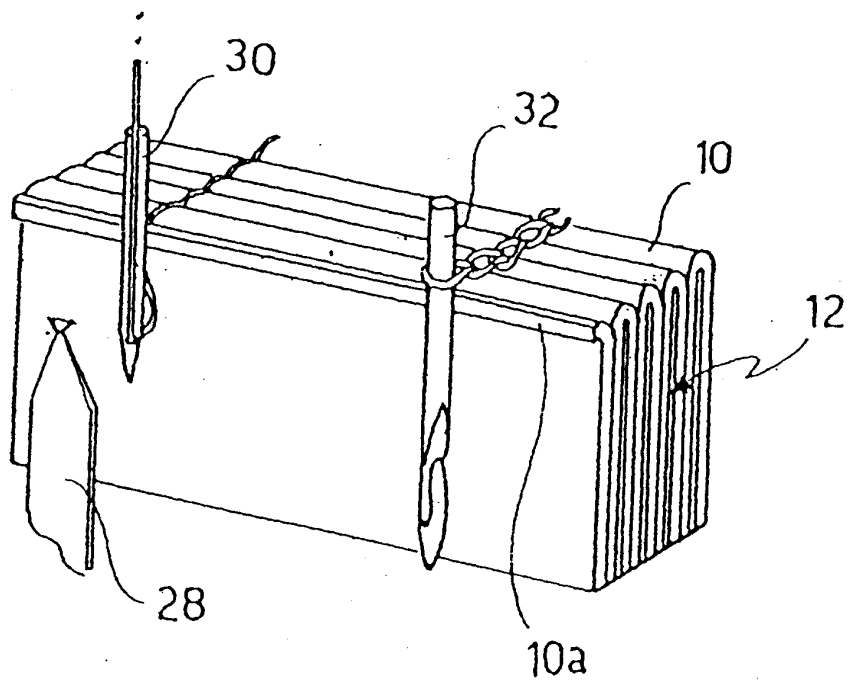
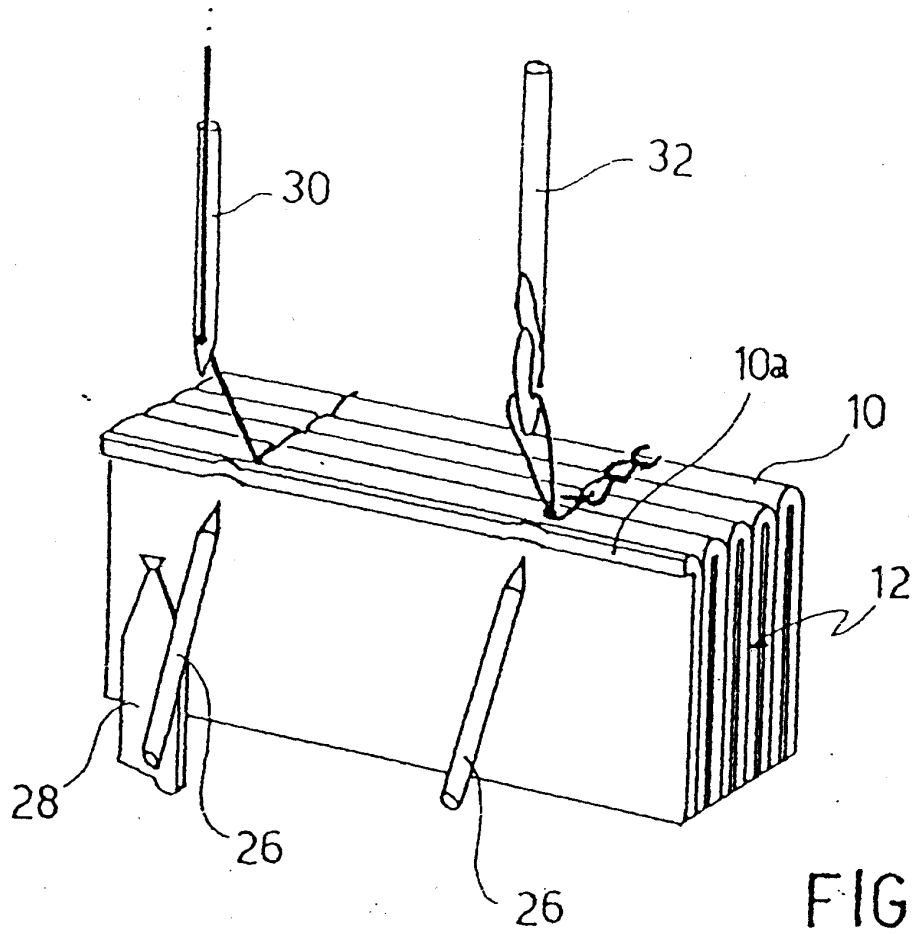
tion;
sewing the sequence of signatures (10), in a group (12) making up the book;
anchor the sewing thread after a last signature (10a) in the group by carrying out an empty stitch,

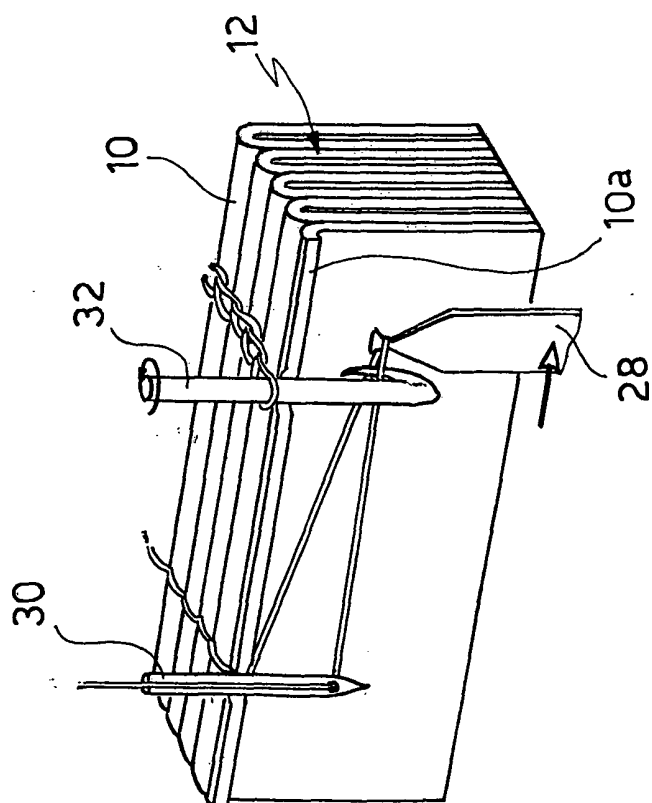
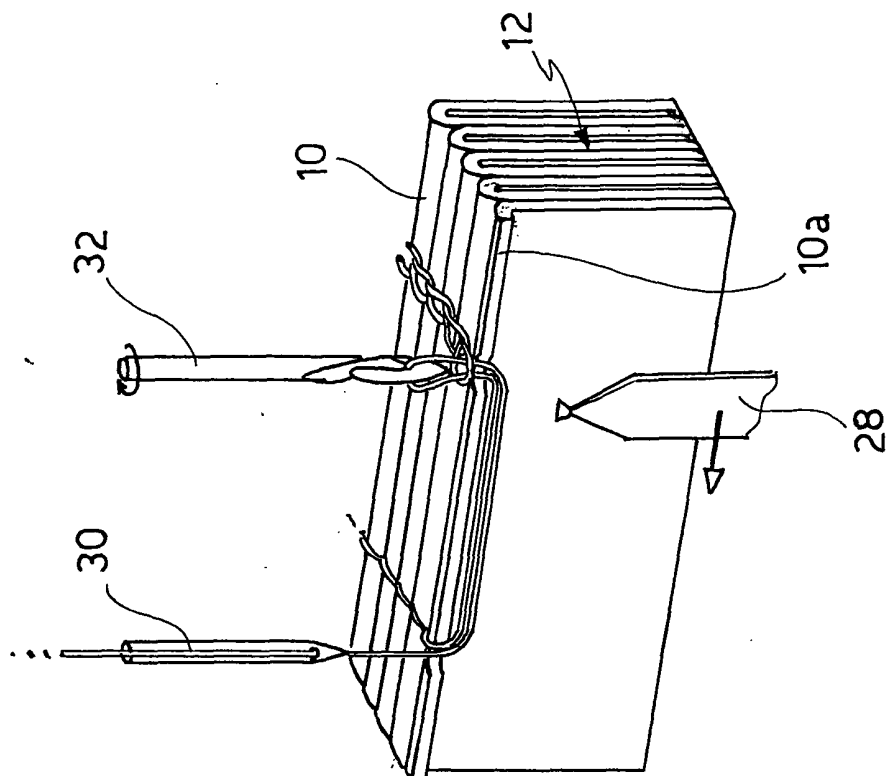
characterized in that said step in which an empty stitch is carried out is performed within an interval during three moving steps of the moving saddle (22) from the sewing position to the receiving position of the signatures (10) and vice versa corresponding to the steps of: opening of the moving saddle, open moving saddle and closure of the moving saddle.

2. The bookmaking method according to claim 1, wherein said empty stitch is made when an upper portion or carriage of a sewing device comprising needles (30) and sewing crochet (32) is in the raised position.
3. The bookmaking method according to claim 2, wherein said empty stitch is made by means of a secondary crochet (36) suitable to be inserted in a last chain stitch (38) emerging from a last signature (10a) in the group and grip a thread portion (40) that emerges from the last signature (10a) and is inserted in the respective needle (30).
4. The bookmaking method according to claim 3, wherein said empty stitch is made by cutting said thread portion (40) and further unthreading said secondary crochet (36) from the last chain stitch (38).
5. The bookmaking method according to claim 4, wherein said thread portion (40) is cut at a length (40b) extending from the secondary crochet (36) to the needle (30).
6. The bookmaking method according to claim 4, wherein said thread portion (40) is cut at an upper length(40b) of the same.
7. The bookmaking method according to claim 4, wherein said thread portion (40) is cut by operating an active cutting device.
8. The bookmaking method according to claim 4, wherein said thread portion (40) is cut by means of a passive cutting device (42) following the translation of the signature group.
9. The bookmaking method according to claim 1, wherein said empty stitch is made by lowering an upper portion or carriage of a sewing device comprising needles (30) and sewing crochet (32).

10. The bookmaking method according to claim 9, wherein said empty stitch is made by means of a needle that can turn to the direction of the respective sewing crochet. 5
11. The bookmaking method according to claim 9, wherein said empty stitch is made by means of shuttles housed in a spine-pushing bar of the sewing machine. 10
12. The bookmaking method according to claim 9, wherein said empty stitch is made by exchanging the thread between the needle (30) and the respective sewing crochet (32) with an air jet pushing the thread. 15
13. A bookmaking device from a stack of signatures sewn to one another, with the sewing thread being interrupted at each group of signatures making up a book, comprising a moving saddle (22) to transfer the open signatures from a stationary saddle to a sewing device provided with an alternate series of needles (30) and sewing crochets (32), **characterized by** comprising empty stitch making means during an interval comprised between three moving steps of the moving saddle (22) from the sewing position to the signature-receiving position (10) and vice versa corresponding to the steps of: opening of the moving saddle, moving saddle open and closure of the moving saddle. 20 25 30
14. The bookmaking device according to claim 13, wherein said empty stitch making means comprise at least one secondary crochet (36) which is movable relative to a corresponding sewing crochet (32) in order to grip a thread portion (40) at the needle (30) and insert it in a last chain stitch (38) emerging from a last signature (10a). 35
15. The bookmaking device according to claim 14, wherein said means to make an empty stitch comprise at least one cutting device (42) to cut a length (40b) of the thread portion (40). 40
16. The bookmaking device according to claim 15, wherein said cutting device (42) is of the passive type performing the cutting following the displacement of the sewn signature groups. 45
17. The bookmaking device according to claim 15, wherein said cutting device (42) is of the active type performing the cutting following a preset command. 50
18. The bookmaking device according to claim 13, wherein said empty stitch making means comprise a needle adapted to turn in the direction of a corresponding sewing crochet. 55
19. The bookmaking device according to claim 13, wherein said empty stitch making means comprise shuttles housed in a spine-pushing bar of the sewing machine.
20. The bookmaking device according to claim 13, wherein said empty stitch making means comprise means to create an air jet forcing the thread from the needle (30) to the sewing crochet (32).







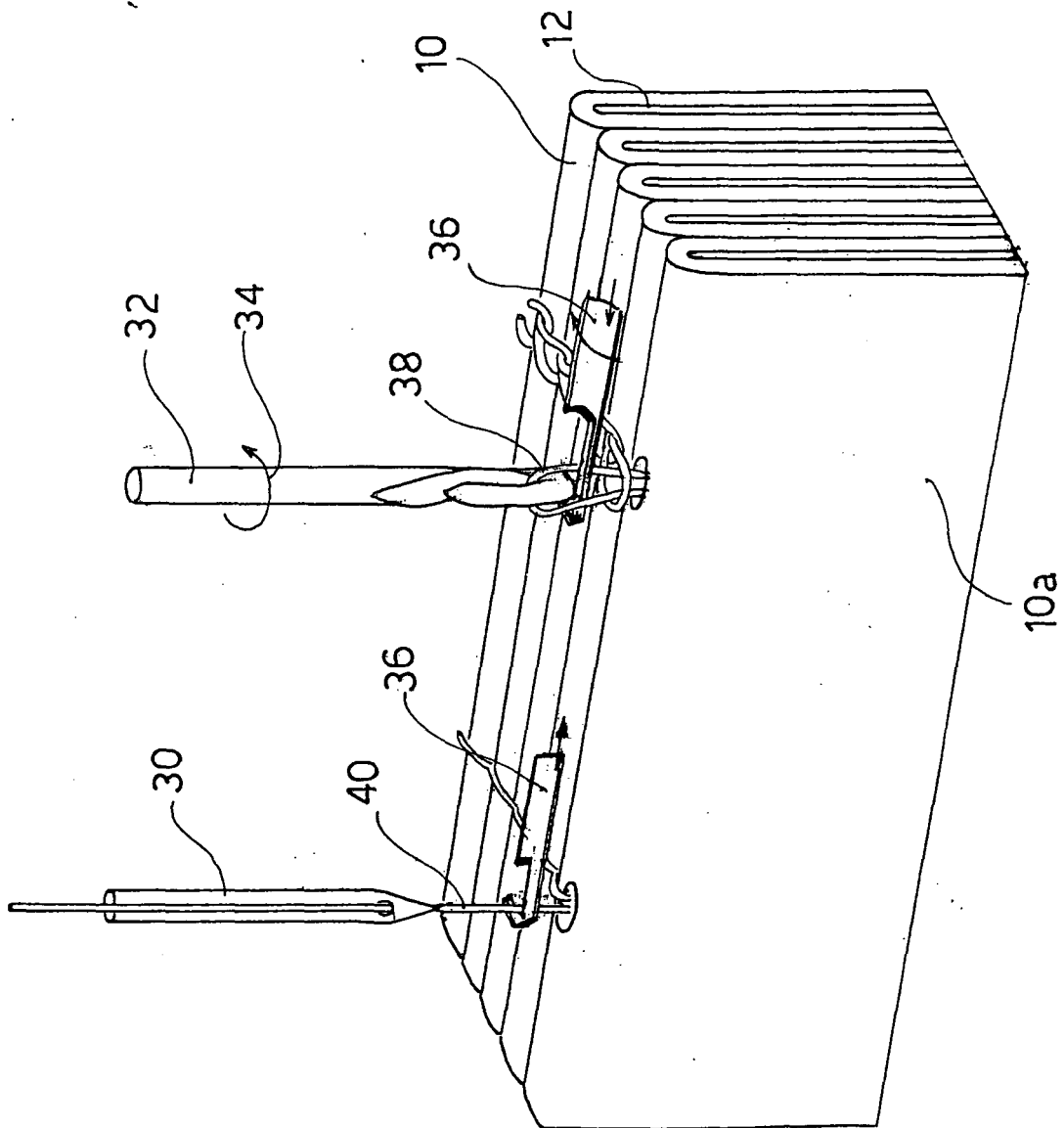


FIG. 6

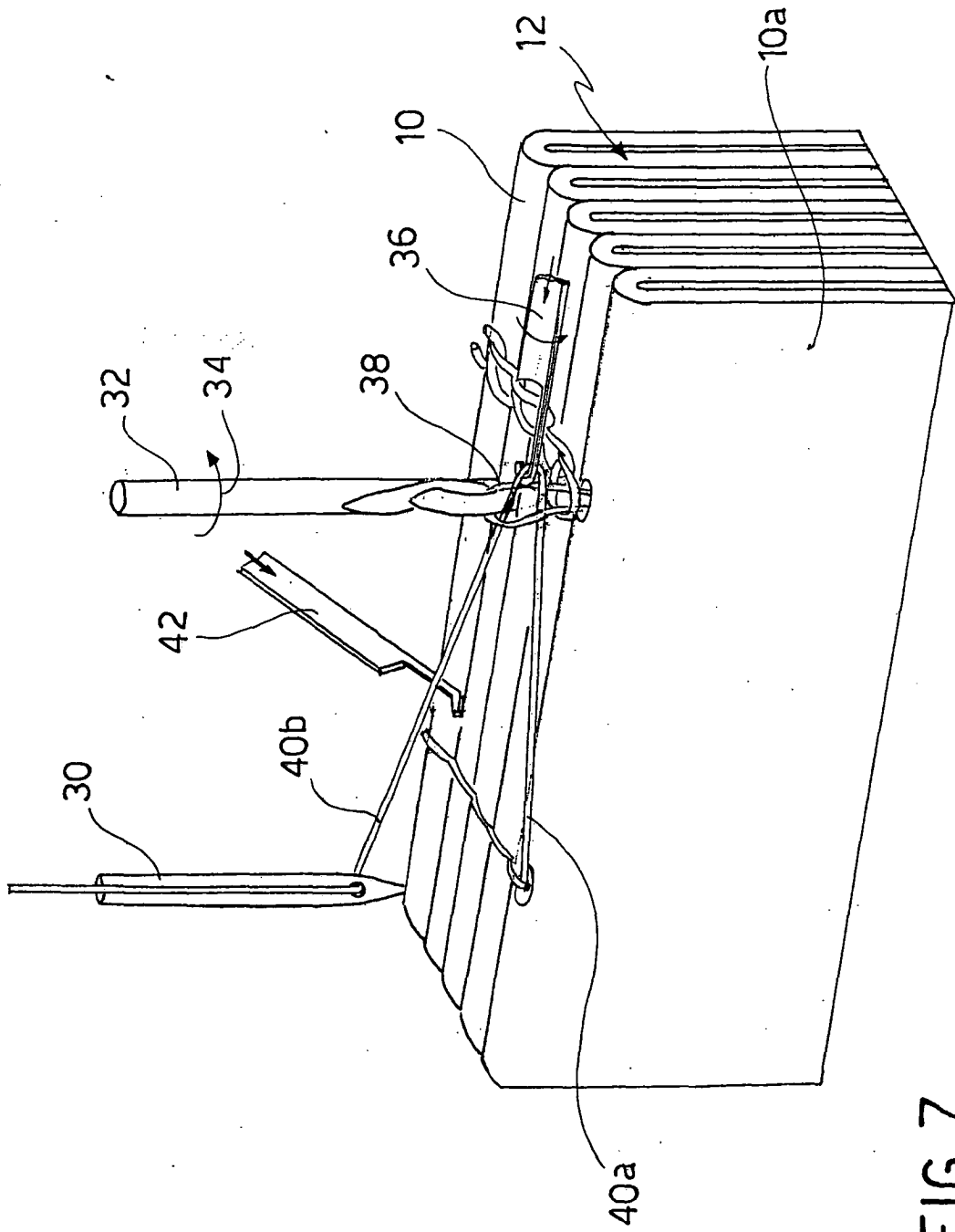


FIG. 7

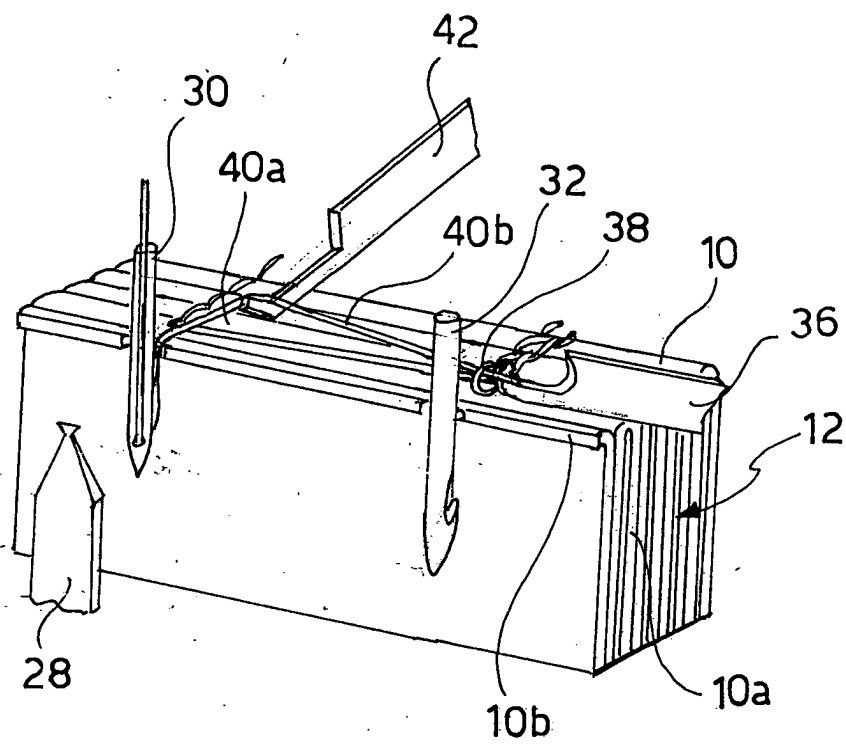


FIG. 8

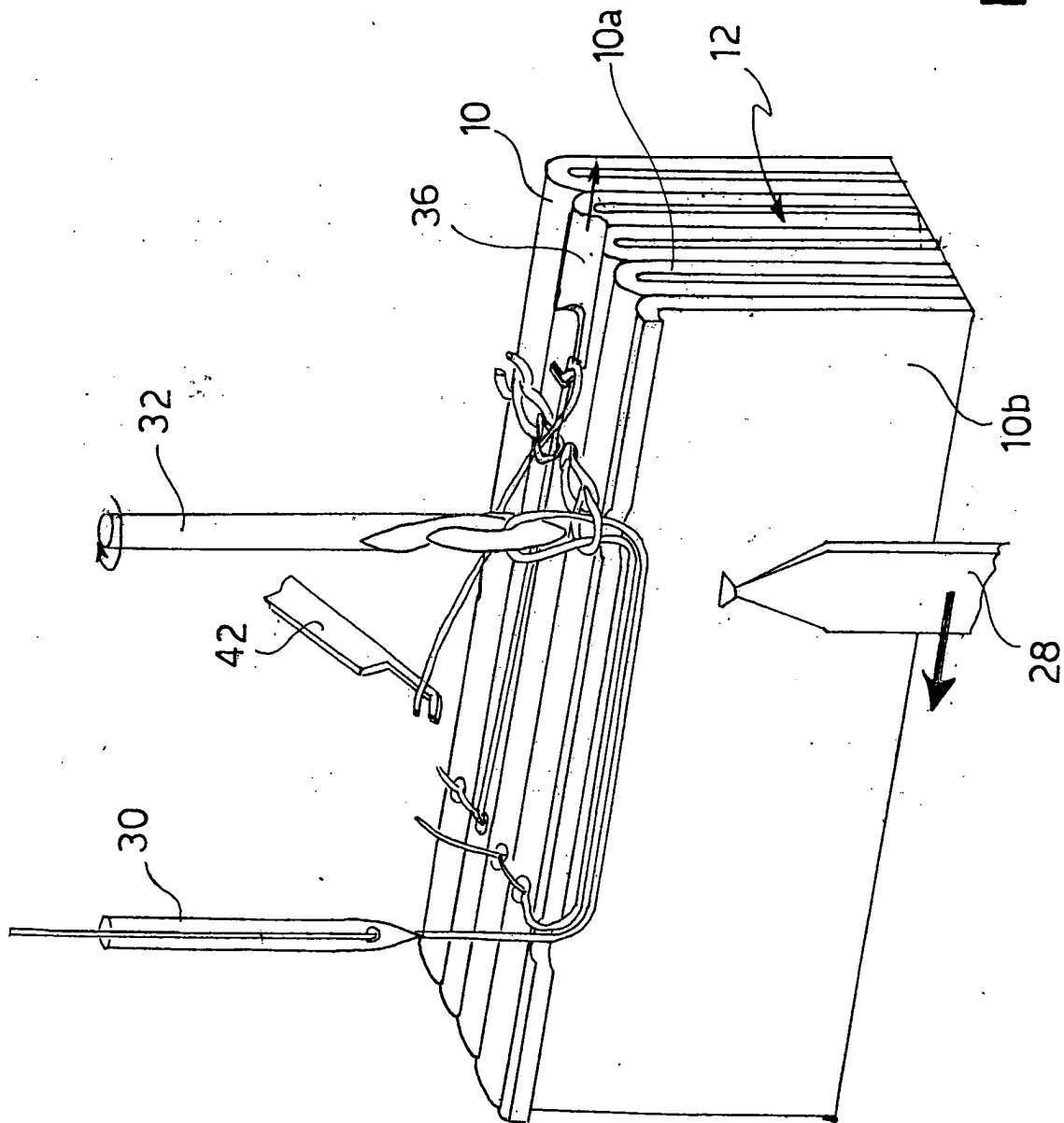


Fig. 9

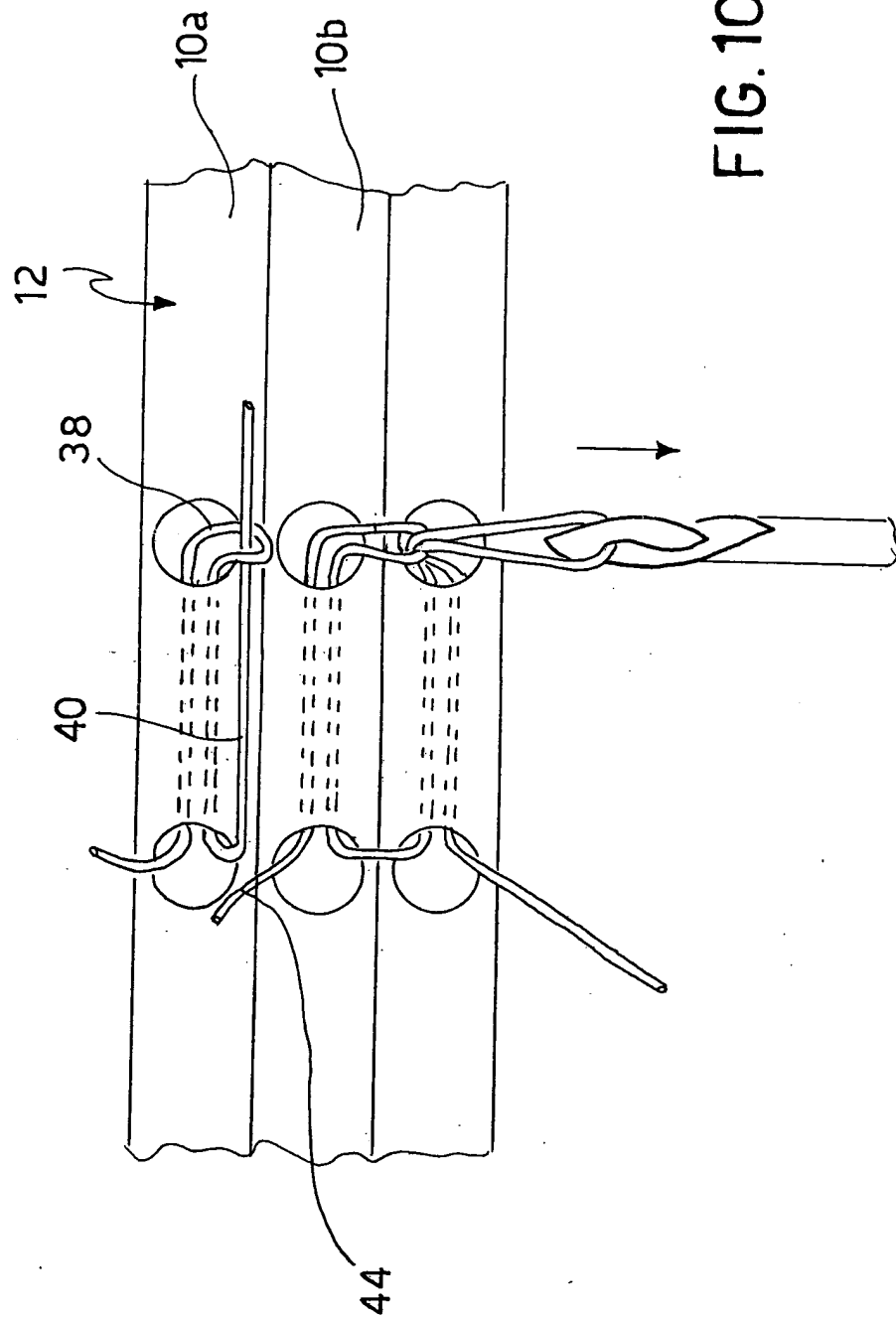


FIG. 10



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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5315

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 645 932 C (MARTINI BUCHBINDEIREIMASCHINEN) 5 June 1937 (1937-06-05) * page 3, line 20 - page 3, line 79; figures 3,6 *	1-20	B42B2/02
A	DE 632 910 C (MARTINI BUCHBINDERMASCHF) 20 July 1936 (1936-07-20) * page 2, line 54 - page 2, line 89; figure 1 *	1-20	
A	DE 656 058 C (BREHMER GEB) 28 January 1938 (1938-01-28) * page 1, line 8 - page 1, line 41; figure 1 *	1-20	
A	DE 644 071 C (BREHMER GEB) 24 April 1937 (1937-04-24) * page 1, line 45 - page 2, line 28; figures 1,2 *	1-20	
A	CH 536 724 A (MARTINI BUCHBINDERMASCHF) 15 May 1973 (1973-05-15) * column 2, line 23 - column 2, line 62; figures 1,2 *	1-20	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B42B
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 27 July 2004	Examiner Sartor, M
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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27-07-2004

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