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(54) **Three-sided cutting machine for books**

(57) A three-sided cutting machine (1), for trimming unbound sides of books, allows, in a single solution, the three-sided cutting of a book in its final binding step both in case of covers to be trimmed together with the internal pages, both in the case wherein the front cut should only involve the internal pages and comprises: a first rectilinear path (2) onto which books to be trimmed (B) are sent, having a first longitudinal ledge (7) parallel to the first path (2) against which the books slide leaning in correspondence of an edge (L) thereof; a pair of blades per lateral cut (11, 12) parallel therebetween and parallel or perpendicular to said first path (2), operating thereon and apt to provide a simultaneous trimming on the opposed

side edges (L) of the book to be trimmed (B); a second rectilinear path (20) perpendicular to the first path (2) and jointed thereto at its terminal end, onto which the books (B) translate without rotating, and having a second longitudinal ledge (27) parallel to the second path (20) against which the books (B) slide leaning against an edge thereof; lifting means for lifting the book (23, 24, 25) covers, so that the front edge (F) of the book to be trimmed (B) remains uncovered in association with its sliding motion; deactivating means for deactivating the lifting means of the book covers; a front cutting blade (30) parallel or perpendicular to said second path, operating thereon and apt to provide a trimming on the front edge (F) of the book to be trimmed (B).

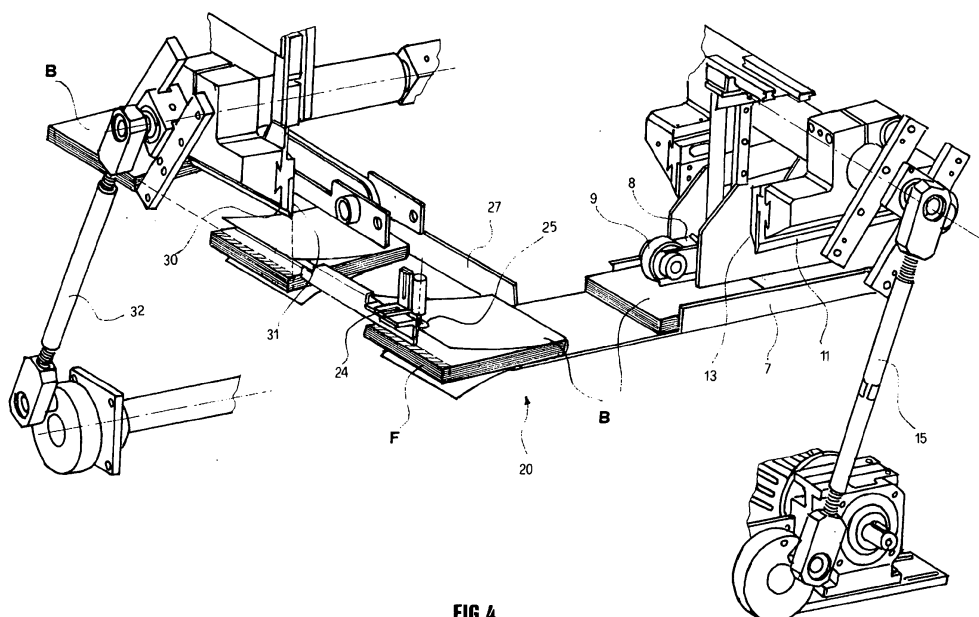


FIG.4

Description

[0001] The present invention relates to a three-sided cutting machine, used in bookbinding for trimming books on the unbound sides. This operation is performed in order to make the side edge of a book even and substantially smooth, removing any overlapping unevenness between pages.

[0002] This operation can be performed by a machine provided with three blades, each operating on an edge of the bound book. Anyhow, the operation of the three blades provides the binding not only of the internal pages of the book but also of the two covers, evening them up with the pages. This effect is required for many kind of books, but not for all.

[0003] In fact, some covers have a internally folded flap, placed at the opposite side of the binding, which edge can be aligned with the internal pages or can be projecting, for making the opening of the cover easier. This arrangement can be used on both covers of the book.

[0004] Accordingly, the simultaneous cut of pages and covers at such side would separate the cover jacket flap, making the previously provided folding fruitless.

[0005] To this regards, cutting machines operating only on the two opposite sides next to the binding have been provided. This arrangement is normally achieved by disassembling or deactivating one blade in three blades machine, in particular the one directed to the cutting of the side opposed to the binding.

[0006] Then, the trimming on said side is performed separately, using a single-side trimming machine, paying attention to shift and/or open the covers for not cutting them.

[0007] It can be easily understood how this operation is extremely complex and how it remarkably slows down the overall binding rate.

[0008] In order to make the book front edge trimming easier without ruining the covers, various solutions have been proposed in order to automatically shift the projecting edges of the covers in combination with a blade suitably arranged for front trimming. Nevertheless, such machines requires to be fed apart from the trimming of the side edges, requiring another cutting machine, and this causes a discontinuity in trimming processes and the use of remarkable bulky machines in the rooms for bookbinding. An example of such front cutting machine is described in the European Patent No. EP1832437.

[0009] The technical problem underlying the present invention is to provide a three-sided cutting machine allowing to overcome the drawbacks mentioned above with reference to the known art.

[0010] Such problem is solved by a three-sided cutting machine as mentioned above, characterized in that it comprises:

- first rectilinear path onto which books to the trimmed are sent, having a first longitudinal ledge parallel to

the first path against which the books slides leaning in correspondence of an edge thereof;

- a pair of lateral cutting blades parallel therebetween and parallel or perpendicular to said first path, operating thereon and apt to provide a simultaneous trimming on the opposed side edges of the book to be trimmed;
- a second rectilinear path perpendicular to the first path and jointed thereto at its terminal end, onto which the books translate without rotating, and having a second longitudinal ledge parallel to the second path against which the books slide leaning against an edge thereof;
- lifting means for lifting the book covers, so that the front edge of the book to be trimmed remains uncovered in association with its sliding motion;
- deactivating means for deactivating the lifting means of the book covers; and
- a front cutting blade parallel or perpendicular to said second path, operating thereon and apt to provide a trimming on the front edge of the book to be trimmed.

[0011] The main advantage of the machine according to the present invention lies in that it allows, in a single solution, the three-sided cutting of a book in its final binding step both in case of covers to be trimmed together with the internal pages, both in the case wherein the front cut should only involve the internal pages.

[0012] According to a preferred version of the machine, the lateral cutting blades and the front cutting blade are parallel to the first and second path, respectively.

[0013] The present invention will be hereby described according to a preferred exemplificative embodiment thereof, given by way of a non-limiting example, with reference to the annexed figures, wherein:

- figure 1 shows a perspective view schematically showing the cutting operations in a three-sided cutting machine according to the present invention;
- figure 2 shows a plan top view, opened in the upper part, of a three-sided cutting machine according to the invention;
- figure 3 shows a perspective view of a detail of the machine of figure 2; and
- figure 4 shows a perspective view connected and cooperating parts of the machine of figure 2.

[0014] With reference to the figures, a three-sided cutting machine is overall indicated with the reference number 1 and it is shown without its external body com-

pletely enclosing the structure of the machine 1, being provided with doors and windows required for the operation and maintenance thereof. Moreover, the machine 1 comprises a substantially conventional supporting frame, supporting all the operative parts of the machine 1, that will be described in the following.

[0015] The cutting machine 1 is directed to books B trimming, the book B comprising a pair of covers, a back providing the binding thereof, and internal pages. The external edges, corresponding to the free ends of pages and covers are identified in the book B. In particular, side edges L, next to the back, and front edge F, opposite to the back, are identified.

[0016] Inside the machine 1, said edges will be subjected to a respective trimming or cutting, in order to make the edges of pages and covers even. In the case hereby described, at said front edge F, the covers have a respective flap folded therein which is integral to the cover itself. Accordingly, in order to preserve the covers integrity, these should not be involved in the front cut, while they should be subjected to the lateral cut.

[0017] In the machine 1, it is defined a first rectilinear path 2 onto which books to be trimmed are sent by a conveyor system formed by a first longitudinal chain 3 provided with suitably spaced pushing members (not shown), passing through a receiving plate 4 receiving single books to be trimmed.

[0018] The first longitudinal chain 3 moves intermittently, in synchronization with the introduction of books.

[0019] At the receiving plate 4, the machine 1 comprises substantially conventional means for introducing books in the machine 1, comprising a roller carpet 5 onto which the books B slides.

[0020] In the present example, the carpet 5 position is such that the books B introduction takes place according to a direction substantially perpendicular to said first path 2.

[0021] In the present exemplificative embodiment, the books B arrive with the front edge facing the motion direction on the first path 2, therefore the pushing members push on the back. On the side of the receiving plate 4 opposed to said roller carpet 5, the machine has a first stopping ledge 6, against which the books B terminates their run from carpet 5 and begin to be pushed along the first path 2.

[0022] Then, the machine 1 has a first longitudinal ledge 7, next to the roller carpet 5 and therefore parallel and next to the first path 2.

[0023] In particular, the first longitudinal ledge 7 is placed at the entry side of the first path 2, in a position opposed to the stopping ledge 6 and projecting therefrom.

[0024] Then, on the opposed side of the first ledge 7 of the first path 2 first reciprocating pressing means are provided, moving the books to be trimmed B against said first longitudinal ledge 7 by operating on the side edge of the book B. In this way, the book B, initially resting against the stopping ledge 6 but without a defined posi-

tion, is precisely aligned with the respective side edge sliding leaning against said first longitudinal ledge 7, for the entire length of the first path 2.

[0025] Always in correspondence of the first path 2 and, next, according to the direction of motion of the books B, at the first pressing means positioning the single books, the machine 1 has a longitudinal belt 8, tightened between two pulleys 9, made of soft material, pressing on the book B for keeping it in a fixed translation position, while the book keeps on moving.

[0026] When the book B is definitively gripped between the belt 8, centrally placed above the first path 2, and the sliding plane 10 passed through by the chain 3, it is subjected to the lateral cut of the edges L (highlighted in figures 1 and 3).

[0027] To this regard, the machine 1 comprises a pair of lateral cutting blades 11, 12 parallel therebetween and parallel, in the present example, to first path 2, operating thereon and apt to provide a simultaneous trimming on the opposed side edges L of the book B to be trimmed.

[0028] The blades 11, 12 operates cooperating with a pair of respective vertically disposed pressing plates 13, 14, the lower edges thereof resting on the upper surface of the book B an instant before the blades 11, 12, running above said plates 13, 14, lower on the book B performing the cut.

[0029] The pressure exerted on the book B by the plates 13, 14 on the cutting area just as the cut is performed, allows to perform a precise vertical cut. Blades 11, 12 are moved according a reciprocating motion along a vertical axis by a suitable crank-connecting rod system 15, operated by an electric motor 16. A brushless electric motor is preferable for the pressing plates 13, 14, as they requires a very precise motion.

[0030] At the end of the cutting operation, the book B is pushed by the pushing members beyond the belt 8, up to the terminal end of the first path 2.

[0031] The machine 1 comprises a second path 20 perpendicular to the first path 2 and jointed thereto at the terminal end thereof, onto which the books translate without rotating, thus being subjected to 90° deflection but without changing his translation position.

[0032] On the second path 20 the machine 1 comprises a further conveyor system formed by a second longitudinal chain provided with suitably spaced pushing members (not shown), passing through a joint area 21 between the path 2 and 20.

[0033] In the present exemplificative embodiment, the books B slide along the second path 20 with the front edge parallel thereto and facing the motion direction on the first path 2. Therefore, the pushing members of the second chain pushes on an already trimmed side edge L. On the side of the joint area 21 opposed to the first path 2, the machine has a second stopping ledge 26, against which books B stops their run from the joint between paths 2, 20, and begin to be pushed along the second path 20.

[0034] Then, the machine 1 has a second longitudinal

ledge 27, next to the terminal end of the first path 2 and therefore parallel and next to the second path 20.

[0035] In particular, the second longitudinal ledge 27 is placed at the entry side of the second path 20, in a position opposed to the second stopping ledge 26 and projecting therefrom.

[0036] Then, on the side of the second path 20 opposed to the second ledge 27, second reciprocating pressing means are provided, moving the books to be trimmed B against said second longitudinal ledge 27 operating on the front edge F of the book B yet to be trimmed. In this way, the book B, which is initially resting against the second stopping ledge 26 but without a precise position, is precisely aligned with the respective back sliding leaning against said second longitudinal ledge 27, for the entire length of the second path 20.

[0037] Always in correspondence of the second path 20 and between the second stopping ledge 26 and the second ledge longitudinal 27, the machine 1 comprises lifting means for lifting the covers of the book, so that the front edge F of the book to be trimmed B remains uncovered in association with its sliding motion.

[0038] In this part of the second path 20, the second conveyor belt cooperates with a sliding carpet 22 placed such that it does not interfere with a portion of the book B in correspondence of the front edges F.

[0039] Moreover, a further belt (not shown) exerting pressure on the upper surface of the book and moving according to the pushing chain of the second path 20 can be provided. Said belt is lifted in correspondence of said second reciprocating pressing means, for allowing the displacement of the book under their operation.

[0040] The means for lifting the covers of the book comprises an opening 23 on said second path 20, such that it provides the downfall displacement of the cover facing downwards of the book to be trimmed.

[0041] Immediately after the opening 23, a longitudinal lower rod is provided, parallel to second path 20, and being interposed between the lower cover and the pages. Accordingly, it moves the lower cover away from the pages and, at the same time, provides a resting base for the front edge F sliding thereon.

[0042] At the opening 23, deactivating means for deactivating the opening of said cover are also provided, formed by a removable covering (not shown) of said opening apt to deactivate such falling and to cover said lower share, that can be supported with the help of said longitudinal rod.

[0043] In the upper part, the means for lifting the book covers comprises a lifter 24 provided with one or more suction cups 25 operating on the upper exposed face of the cover facing upward, a control for potentially deactivating the operation thereof being provided as means for deactivating the lifting means of the book covers.

[0044] Also in this case, an upper longitudinal rod 28 is provided, being inserted between the upper cover and the pages and therefore moving the upper cover away from the pages.

[0045] When covers have been moved away from the pages, a book B portion onto which the front trimming should be performed is left free. Accordingly, it can be subjected to the front cut of the corresponding edge F (highlighted in figures 1 and 3).

[0046] To this regard, the machine 1 comprises a front cutting blade 30 which, in the present example, is parallel to the development of the second path 20. It operates on one side thereof for performing a front edge F trimming of the book B to be trimmed.

[0047] As in the previous cut, the front cutting blade 30 operates cooperating with a respective vertically disposed pressing plate 31, the lower edge thereof being resting on the exposed upper surface of the book B pages an instant before the blade 30, running above said plate 31, lowers on the book B performing the front cut.

[0048] The pressure exerted on the book B by this plate 31 on the cutting area in association with the lower share, just as the cut is performed, allows to perform precise vertical cut. The blade 30 and the respective and pressing plates 31 are moved according to a reciprocating motion along a vertical axis by means of a suitable crank-connecting rod system 32, operated by an electric motor 33.

[0049] At the end of the cutting operation, the operation of the two lower and upper shares stops and, therefore, a guide driving the lower cover back in its position is provided. At the same time, the upper cover falls by gravity in its starting position. Beyond this point of the second path 20, the book B is pushed by the pushing members of the respective chain to a collecting area (not shown) of the machine 1, where the trimmed book can be sent to next steps, e.g. packaging.

[0050] It can be noted that in the present example all blades 11, 12, 30 are disposed parallel to the respective paths: this makes the disposal of waste easier as it occurs for simple lateral falling. Nevertheless, it can be appreciated that also a different disposition of blades is possible, being all perpendicular to the respective paths.

[0051] It should be noted that in the present invention the book is always horizontally placed, which allows it to remain in a stable position on the respective support during the cutting operation.

[0052] Therefore, this machine can be used for trimming this kind of book, with covers provided with jacket flaps. Nevertheless, it is only required to deactivate the covers lifting, with a simple operation, which can also be performed by a remote control unite, in order to obtain a three-sided cutting machine capable of performing the conventional trimming, trimming the covers also on the front edge.

[0053] Accordingly, a bookbinding, with this single machine, can meet both the above mentioned necessities, previously requiring to be equipped with two different machines, one for each type of cut.

[0054] To the above described three-sided cutting machine a person skilled in the art, in order to satisfy further and contingent needs, could effect several further modifications and variants, all however encompassed in the

protective scope of the present invention, as defined by the appended claims.

Claims

1. A three-sided cutting machine (1), for binding books on the unbound sides, comprising:

- a first rectilinear path (2) onto which books to be trimmed (B) are sent, having a first longitudinal ledge (7) parallel to the first path (2) against which the books slide leaning in correspondence of an edge (L) thereof;
- a pair of lateral cutting blades (11, 12) parallel thereto and parallel or perpendicular to said first path (2), operating thereon and apt to provide a simultaneous trimming on the opposed side edges (L) of the book to be trimmed (B);
- a second rectilinear path (20) perpendicular to the first path (2) and jointed thereto at its terminal end, onto which the books (B) translate without rotating, and having a second longitudinal ledge (27) parallel to the second path (20) against which the books (B) slide leaning against an edge thereof;
- lifting means for lifting the book covers (23, 24, 25), so that the front edge (F) of the book to be trimmed (B) remains uncovered in association with its sliding motion;
- deactivating means for deactivating the lifting means of the book covers; and
- a front cutting blade (30) parallel or perpendicular to said second path, operating thereon and apt to provide a trimming on the front edge (F) of the book to be trimmed (B).

2. The three-sided cutting machine (1) according to claim 1, wherein said lateral cutting blades (11, 12) and said front cutting blade (30) are parallel to the first (2) and second path (20), respectively.

3. The three-sided cutting machine (1) according to claim 1, wherein the books are introduced in said first rectilinear path (2) according to a direction substantially perpendicular to said first path (2), said first longitudinal ledge (7) being placed at the entry side of the first path (2), first reciprocating pressing means being provided, moving the books to be trimmed (B) against said first longitudinal ledge (7).

4. The three-sided cutting machine (1) according to claim 1, wherein said second longitudinal ledge (27) is placed at the entry side of the second path (20), second reciprocating pressing means being provided, displacing the books to be trimmed (B) against said second longitudinal ledge (27).

5. The three-sided cutting machine (1) according to claim 1, wherein the lifting means for lifting the covers of the book comprises an opening (23) on said second path (20), so as to provide the downfall displacement of the cover facing downwards of the book to be trimmed (B), and a removable covering of said opening apt to potentially deactivate such falling.

6. The three-sided cutting machine (1) according to claim 1, wherein the means for lifting the covers of the book comprises a lifter (24) provided with one or more suction cups (25) operating on the cover upper exposed face facing upward, a control for potentially deactivating the operation thereof being provided.

7. The three-sided cutting machine (1) according to claim 1, wherein the books to be trimmed (B) are introduced according to a direction substantially perpendicular to said first rectilinear path (2).

8. The three-sided cutting machine (1) according to claim 1, wherein the first rectilinear path (2) has a conveyor system formed by a first longitudinal chain (3), intermittently movable in synchronization with the introduction of books, provided with suitably spaced pushing members, passing through a receiving plate (4) receiving the single books to be trimmed.

9. The three-sided cutting machine (1) according to claims 3, 7 and 8, wherein a first stopping ledge (6) is provided on the side of the receiving plate (4) which is opposed to the entry of the books to be trimmed (B), said first longitudinal ledge (7) being placed at the entry side of the first rectilinear path (2), in a position which is opposed to the stopping ledge (6) and projecting therefrom.

10. The three-sided cutting machine (1) according to claim 1, wherein a longitudinal belt (8) is provided in correspondence of the first rectilinear path (2), the belt (8) being tightened between two pulleys (9) and pressing on the book to be trimmed (B) for keeping it in a fixed translation position, said pair of blades (11, 12) operating in correspondence of said belt (8).

11. The three-sided cutting machine (1) according to claim 1, wherein the lateral cutting blades (11, 12) and the front cutting blade (30) operate cooperating with respective vertically disposed pressing plates (13, 14, 31), the lower edges thereof resting on the upper surface of the book to be trimmed (B) an instant before the blades (11, 12, 30) running above said plates (13, 14, 31) lower on the book to be trimmed (B) performing the cut.

12. The three-sided cutting machine (1) according to claim 4, wherein a second stopping ledge (26) is provided in correspondence of the joint area (21) be-

tween the first (2) and the second path (20), the second longitudinal ledge (27) being placed at the entry side of the second path (20), in a position which is opposed to the second stopping ledge (26) and projecting therefrom.

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13. The three-sided cutting machine (1) according to claim 1, wherein a longitudinal lower rod is provided in correspondence of the book covers lifting means, said longitudinal lower rod moving the lower cover away from the pages and, at the same time, providing a resting base for the front edge (F).

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14. The three-sided cutting machine (1) according to claim 11, wherein the lateral cutting blades (11, 12) and front cutting blade (30) and the respective pressing plates (13, 14, 31) are moved according to a reciprocating motion along a vertical axis by means of a respective crank-connecting rod system (15, 32), operated by an electric motor (16, 33).

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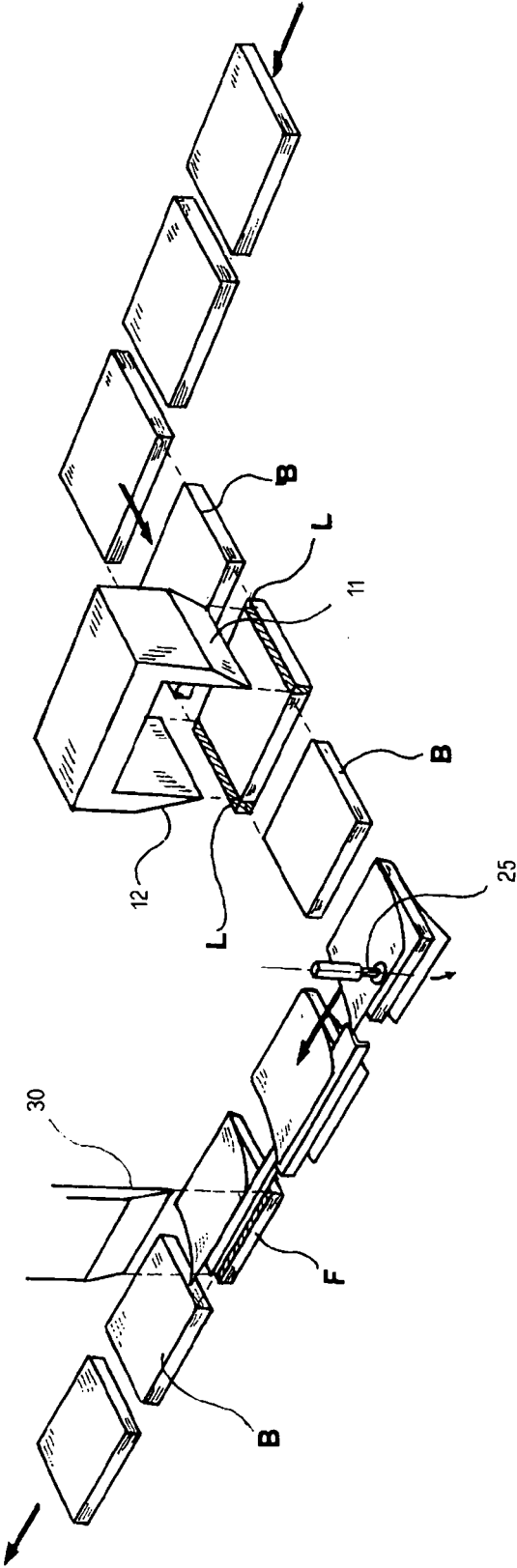


FIG.1

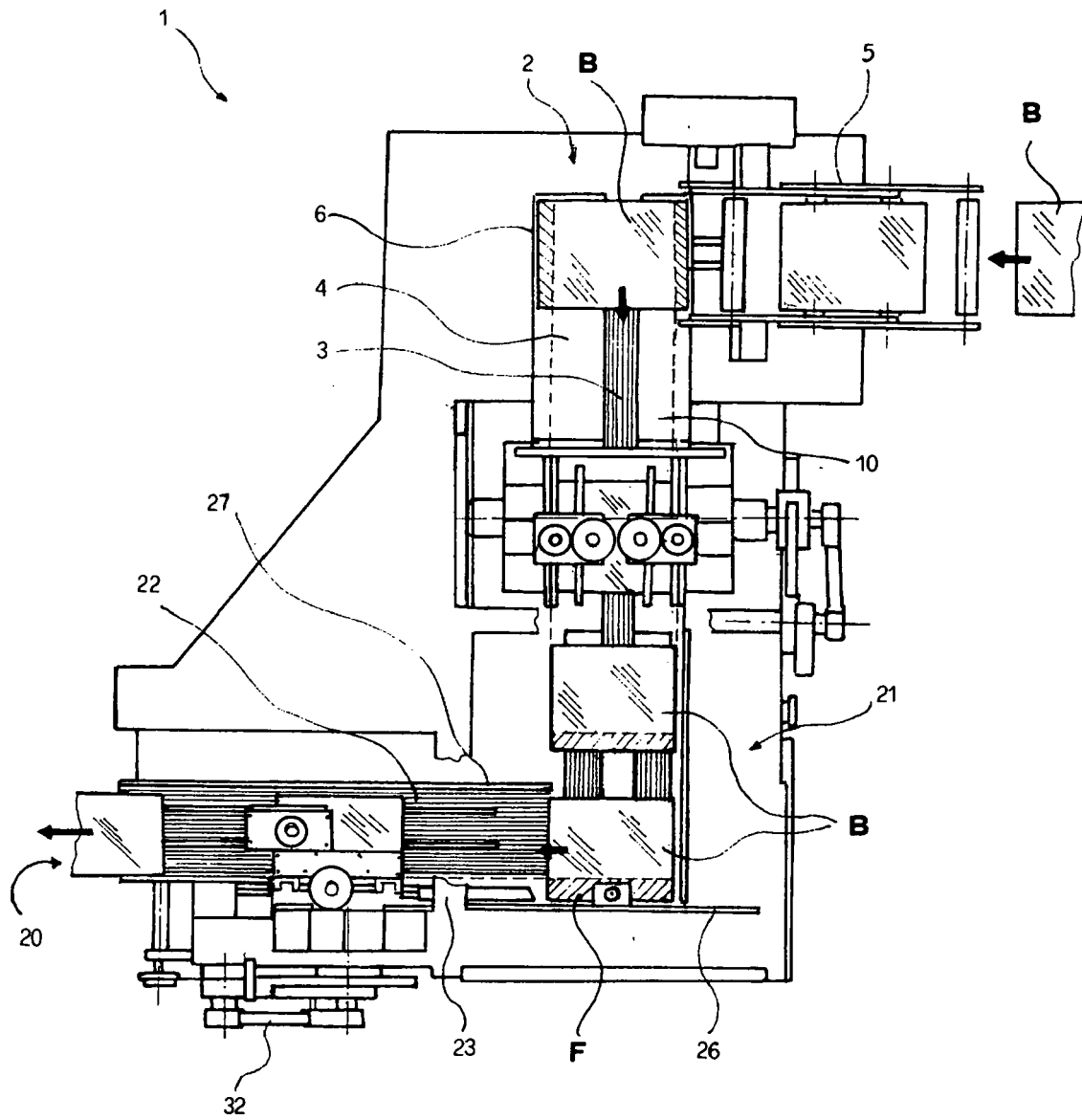


FIG.2

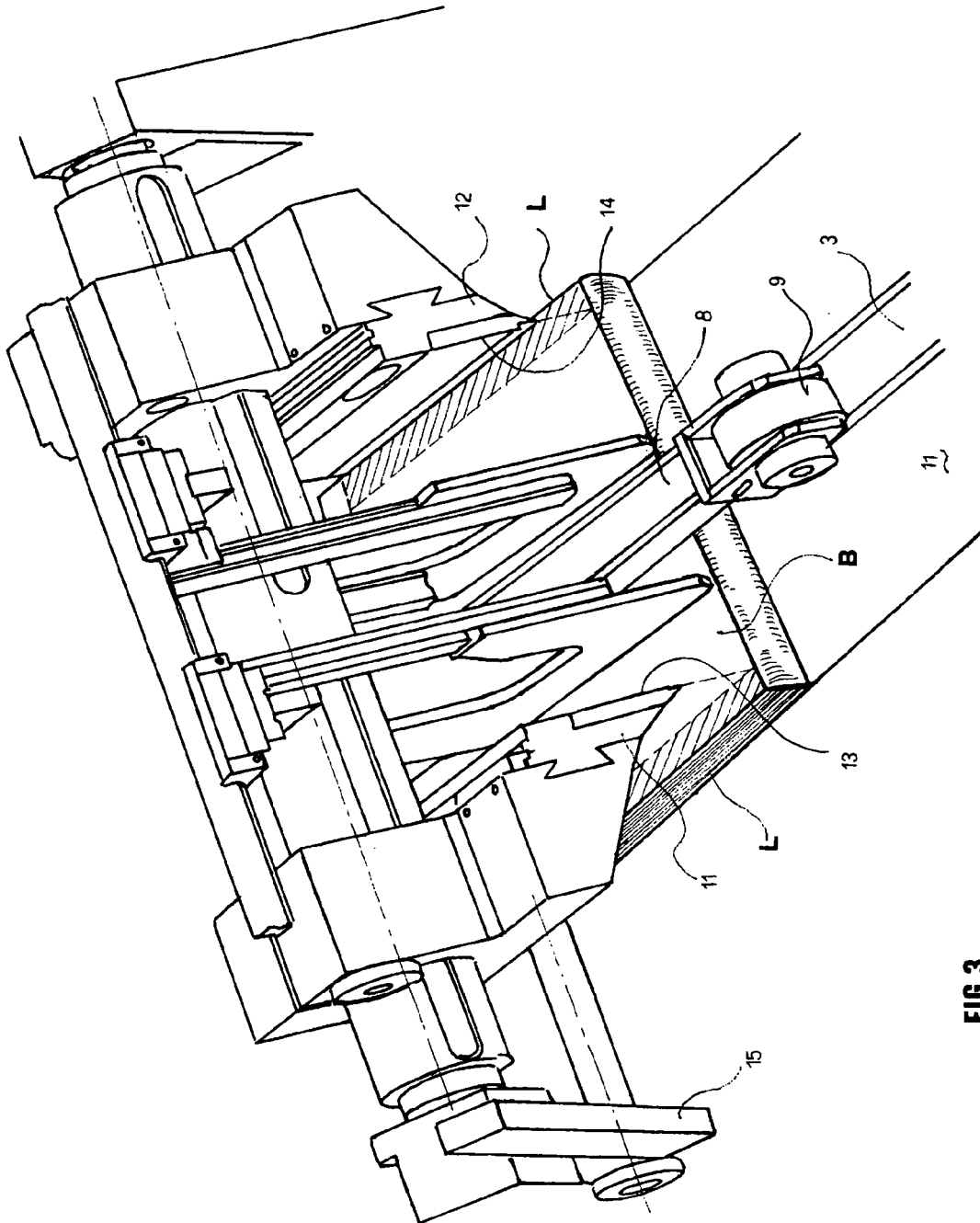


FIG. 3

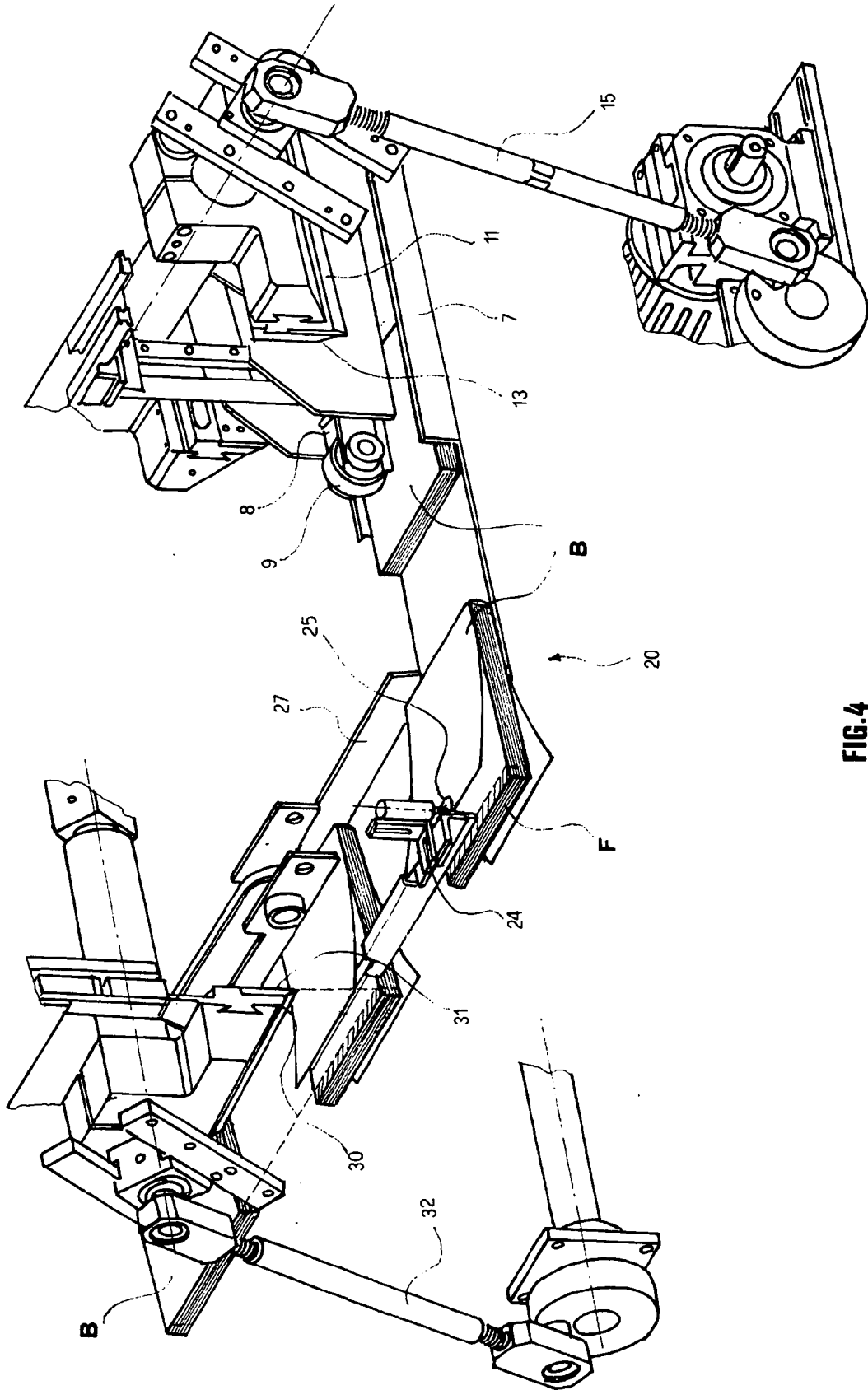


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 10 42 5010

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 June 2010	Examiner Canelas, Rui
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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. The members are as contained in the European Patent Office EDP file on
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