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Remarks:

- The references to the drawing no. 6. are deemed to be deleted (Rule 56(4) EPC).
- A request for correction of the description has been filed pursuant to Rule 139 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).

(54) **Apparatus for automatic feeding and pendulum working of wood elements**

(57) The invention relates apparatus (1) for automatic feeding and pendulum working of wood elements (E) comprising:
 - a storage zone (M) for wood elements (E);
 - a machine (3) for pendulum working of wood elements (E) comprising a working zone (L) of said wood elements (E);
 said apparatus (1) being characterized in that it further

comprises
 - a transportation device (2) to transport said wood elements (E) from said storage zone (M) to the proximity of said working zone (L) of said machine (3); and
 - a feeding device (8) to take and displace said wood elements (E) from said transportation device (2) to said machine (3) on the corresponding working zone (L) of said wood element (E).

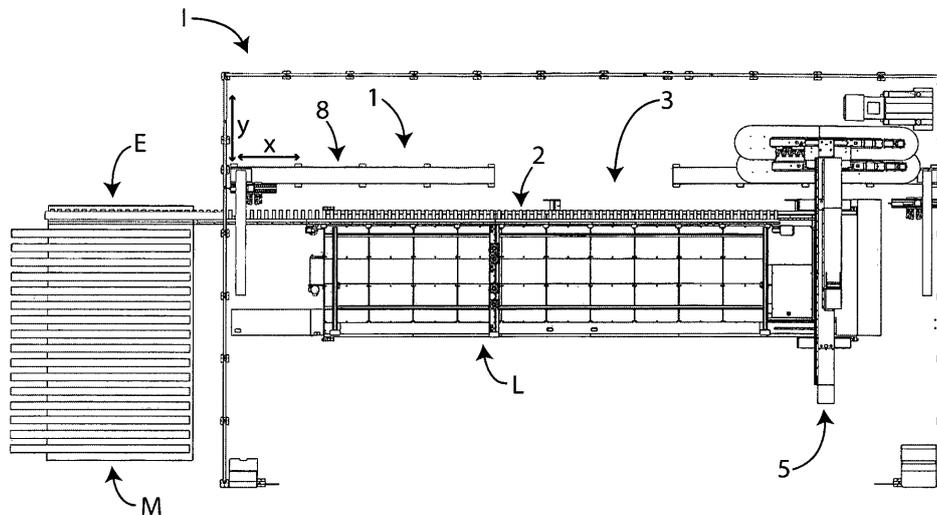


Fig. 1

Description

[0001] The present invention relates to an apparatus for automatic feeding and pendulum working of wood elements.

[0002] More specifically, the invention concerns an apparatus of the above kind, particularly studied and realized to load wood elements, such as massive woods and/or plankings from a storage magazine to a loading station of a pendulum working machine.

[0003] By "pendulum working machine" it is meant a machine having two zones, each one designed to work alternately either as piece loading station or as piece working station, alternating said operative modes on the basis of control logics.

[0004] Further, at least a working unit is provided in this kind of machine, translating between said two loading and working zones, so that, while working unit occupies first zone, e.g. working zone, the second zone acts as loading station and is free to be loaded by wood elements to be subjected to working.

[0005] Once said working is finished, working unit moves on said second loading zone, beginning working as a working station and, previous working station acts as loading station.

[0006] Thus, loading Tim of the machine is "concealed", thus increasing its efficiency.

[0007] In the following, specification will be addressed to loading of wood elements on a milling machine, but it is well evident that the same must not be considered limited to this specific use.

[0008] As it is well known, at present loading of massive woods and/or plankings from a storage zone to a loading zone of a machine can occur manually or by suitable devices, external to the machine.

[0009] During manual loading, operator must take the work piece from storage zone, loading the same in the loading zone of the machine, engaging by blocking clamps.

[0010] Said operation is particularly difficult when the machine loading zone and relevant clamps are far from operator.

[0011] Said distance obliges the operator to lean within the machine loading station to be able to load the piece within said station, blocking the same by said clamps.

[0012] It is therefore well evident that said loading operation is tiring, requires many time for loading the pieces and involves a large number of operators dedicated to this kind of activity, on the basis of the number of pieces to be loaded.

[0013] While loading by suitable devices external to the machine, robot or motorized gripping hands are employed, occupying the area surrounding the working machine.

[0014] Said motorized devices take the work piece from the storage zone and load the same on the machine in correspondence of the loading station. During said taking and loading operations, motorized devices external

to the machine move about the machine, thus occupying area surrounding the same and creating stuff.

[0015] It is clear that said loading operation requires providing a free area around the machine dedicated to displacement of motorized devices involving occupation of space within the wood piece working plant.

[0016] In view of the above, it is therefore object of the present invention that of realizing an apparatus wherein it is possible automatically feeding a pendulum machine without the manual intervention of the operator, automatically moving work pieces, particularly wood elements, from a storage zone to a loading station of the machine.

[0017] Another object of the present invention is that of carrying out loading operation remaining within the space strictly connected to the working machine dimensions, without occupying further surrounding space.

[0018] These and other results are obtained, according to the invention, by an apparatus providing inner devices that are able to automatically load on the machine wood elements from a storage zone without occupying space around the working machine.

[0019] It is therefore specific object of the present invention an apparatus for automatic feeding and pendulum working of wood elements that can comprise a storage zone for wood elements; a machine for pendulum working of wood elements that can comprise a working zone of said wood elements; said apparatus being characterized in that it further comprises a transportation device to transport said wood elements from said storage zone to the proximity of said working zone of said machine; and a feeding device to take and displace said wood elements from said transportation device to said machine on the corresponding working zone of said wood element.

[0020] Preferably, according to the invention, said transportation device and feeding device can be provided inside the side dimensions of said machine for the working of wood elements, said side dimensions being an occupation zone on the ground in which working, electrical and hydraulic feeding devices of said apparatus lie and said side dimensions being outside said storage zone.

[0021] Furthermore, according to the invention, said transportation device can also be inside the storage zone.

[0022] Advantageously, according to the invention, either said transportation device and said feeding device are also inside said storage zone.

[0023] Still according to the invention, said transportation device is a roller adjacent to a working plane of said machine comprising a plurality of cross members provided with corresponding clamps suitable to receive and block said wood elements.

[0024] Preferably, according to the invention, said roller is in contact with said machine all along said working plane.

[0025] Furthermore, according to the invention, said apparatus can comprise at least two feeding devices suit-

able to be respectively placed upstream and downstream said apparatus.

[0026] Advantageously, according to the invention, said feeding device can be a robotic system comprising a first rod, a second rod and a third rod, each one provided with sliding systems, in particular tracks, along which a drawing unit slides.

[0027] Still according to the invention, said drawing unit can further comprise at least a first gripper and a second gripper sliding along a longitudinal rod to conform to the size of the wood element to be taken from said roller, and furthermore, said first gripper and second gripper are so realized to take said wood element from said roller entering between couples of adjacent rolls comprised in said roller.

[0028] Preferably, according to the invention, said drawing unit can comprise coupling means by which said drawing unit can be sliding coupled along at least one of said first rod, second rod and third rod.

[0029] Furthermore, according to the invention, said second rod and third rod are integral and orthogonal each other and are sliding mounted on said first rod.

[0030] Advantageously, according to the invention, said feeding device consists of a plurality of pliers sliding placed inside said working plane of said machine.

[0031] Still according to the invention, each of said plurality of pliers can comprise at least a base supporting at least a gripping hand suitable to take said wood element from said transportation device, and furthermore, said base is able to slide parallel with respect to said cross members of said working plane towards and away from said transportation device and upward and downward said working plane from a rest position, wherein said gripping hand is at the level of said working plane, and a working position, where said gripping hand is above said clamps.

[0032] Preferably, according to the invention, said feeding device consists of a plurality of conveyor belts comprising an active surface suitable to receive a wood element, said conveyor belts being placed on pulleys and inside said working plane, parallel with respect said cross members.

[0033] Furthermore, according to the invention, each conveyor belt can slide upward and downward said working plane and can be in a rest position, wherein said active surface is at the level of said working plane, and a working position, wherein said active surface is on at a level above said clamps.

[0034] The present invention will be now described, for illustrative, but not limitative, purposes, according to its preferred embodiments, with particular reference to the figures of the enclosed drawings, wherein:

figure 1 shows a schematic plan view of a first embodiment of apparatus according to the invention;
figure 2 shows a lateral view of apparatus of figure 1;
figure 3 shows a perspective view of a particular of apparatus of figure 1;

figure 4 shows a front view of a second embodiment of apparatus according to the invention;
figure 5 shows a front view of a third embodiment of apparatus according to the invention;
figure 6 shows a plan view of a different arrangement of apparatus according to the invention.

[0035] Same reference numbers will be used in the various figures to indicate the same parts.

[0036] Making first reference to figures 1 and 2, it is initially indicated dimension (I) of apparatus 1 as the zone occupied, or that can be occupied, by apparatus 1 and its movable parts.

[0037] Apparatus 1 for feeding a machine for working wood elements E having a main dimension, and that are employed to realizes doors and windows, such as massive woods and/or plankings, comprises a conveying device 2, particularly a roll conveyor belt, on which wood elements E are loaded.

[0038] Said wood elements E can be stored beforehand within a storage zone M, such as an automatic magazine supplying roll conveyor 2 or can be provided within other storage elements, or can be manually loaded by an operator directly on roll conveyor 2.

[0039] Said storage zone M is not part of dimension (I) of apparatus 1, but it is possible providing apparatuses 1 where wood elements E storage zone M is part of dimension (I).

[0040] Particularly, reference is made to wood elements E stored within an automatic magazine M within which a part of roll conveyor 2 taking by contact element E to be subjected to working ready for loading on machine.

[0041] Apparatus 1 further comprises a working machine 3 for element E (which is not a specific part of the invention), particularly a milling machine, comprising a working unit 5 and a working plane 6, inside a working zone L, and comprised of cross elements on which elements E are placed and the fixed by clamps 7.

[0042] Roll conveyor 2 is substantially adjacent to the working plane 6 of the working machine 3.

[0043] Roll conveyor 2 can slide along the whole working plane 6, or can partially extend to the side.

[0044] Roll conveyor 2 can also contact said working plane 6.

[0045] Milling machine 3 carries out a pendulum-type working, i.e. working unit 5 can slide all along the working zone L, moving from one end to the other of the working plane 6, and thus it is convenient that said roll conveyor 2 extends all along the working plane 6.

[0046] Apparatus 1 further comprises a feeding device 8, taking wood elements E from roll conveyor 2 and moving the same toward working station of machine 3, where said wood elements E are fixed to the cross elements of the working plane 6 by clamps 7.

[0047] Said feeding device 8 is provided either upward and downward the working plane 6.

[0048] Thus, when wood elements E are loaded on a

loading zone upward the working plane 6, first feeding device 8, upward the working plane 6, is active to load wood elements E ready to be subjected to working by working unit 5.

[0049] Meanwhile, second feeding device 8' provided downward the working plane 8 is inactive since wood elements E must not be loaded on working plane, occupied by working unit 5.

[0050] Said feeding devices 8 and roll conveyor 2 are provided within dimension (l) of the apparatus 1.

[0051] According to a different arrangement of apparatus 1, said feeding device 8 can be also provided within the storage zone M, as shown in figure 6.

[0052] According to a first embodiment of the present invention shown in figures 1 and 2, and making specific reference to figure 3, feeding device 8 is represented by a robotic system, comprising support and sliding rods for pliers suitable for taking wood elements E.

[0053] Particularly, feeding device 8 comprises a first rod 8a, a second rod 8b and a third rod 8c, all provided with sliding systems, particularly tracks, along which a drawing unit 9 slides.

[0054] Said drawing unit 9 comprises coupling means 10, by which said drawing unit 9 can be sliding coupled along said first rod 8a, second rod 8b and third rod 8c.

[0055] Said drawing unit further comprises at least a first pliers 9a and a second pliers 9b, sliding along a longitudinal rod 11, to conform to dimensions of element E to be taken.

[0056] Said first pliers 9a and second pliers 9b are so designed to take element E from roll conveyor 2, inserting between adjacent rolls comprising said roll conveyor 2.

[0057] Particularly, said second bar 8b and third bar 8c are integral each other, and provided along directions perpendicular each other, and sliding along said first rod 8a.

[0058] Drawing unit 9 is sliding coupled with said second rod 8b and third rod 8c. operation of apparatus 1 according to the invention is as follows.

[0059] When wood element E is within storage zone M, part of roll conveyor 2 enters within storage zone M, takes by contact element E, making it passing through the working station of the milling machine 3, particularly along the working plane 6.

[0060] When element E enters within machine 3 working station, feeding device 8 is actuated so that taking unit 9 slides along said second rod 8b and along said first rod 8a by said third bar 8c, so as to place along said roll conveyor 2, exactly in correspondence of element E to be taken. Further, said first pliers 9a and second pliers 9b of drawing unit 9 slides along rod 11 to conform to dimension of element E and enter between rolls of roll conveyor 2, to take element E.

[0061] After taking of element E, feeding device 8 positions element E along working plane 6, resting the same on cross elements, and placing the same between gauge clamps 7.

[0062] Once loading of element E on working plane 6

is finished, feeding device goes back to its resting position close to the loading station of machine 3.

[0063] Then, working unit 5 slides along working plane 6 to work on element E fixed on cross elements by gauge clamps 7.

[0064] It is possible providing feeding element 8 also within machine 3 working station, so as to take element 3 from working plane 6 after working and putting it again within a storage zone for wood elements E.

[0065] A second embodiment of the invention provides that feeding device 8 is represented by a plurality of pliers, sliding along tracks parallel with respect to cross elements of working plane 6.

[0066] Each pliers 8 has a base 12 supporting a gripping hand 13, suitable to take the element E from roll conveyor 1.

[0067] Base 12 can slide parallel to cross elements of working plane 6, toward and from roll conveyor 2.

[0068] Base 2 can further move upward with respect to the working plane 6, passing from a rest position where gripping hand 13 is at the level of the working plane 6, and a working position where gripping hand 13 is above gauge clamps 7.

[0069] Number of pliers 8 used to take and move the element E from roll conveyor 2 to working plane 6 is proportional to dimensions of said element E.

[0070] Thus, a set number of pliers 8 are activated to take and load elements E.

[0071] Base 12 moves gripping hand for each pliers 8 from working position along track toward roll conveyor 2 on which working element E is provided. Gripping hands 13 of each pliers 8 enter between adjacent rolls of roll conveyor 2 to take element E.

[0072] After taking, pliers 8 slide along rods, going away from roll conveyor 2 to position element E in correspondence of corresponding cross elements and gauge clamps 7.

[0073] After having positioned element E, pliers 8 goes back to the rest position so as to permit to the working unit 5 to slide along working plane 6 and working elements E placed and fixed in working plane 6.

[0074] A third embodiment of the invention shown in figure 5 provided that feeding device 8 is represented by a plurality of conveyor belts 8 mounted on pulleys 14 and provided within working plane 6, parallel with respect to cross elements.

[0075] Each belt can slid upward and downward with respect to working plane 6.

[0076] Belt 8 can be in a rest position wherein active position 15 suitable to take element E from roll conveyor 2 is at the same level of the working plane 6 and a working position where active surface 14 is at a level above gauge clamps 7.

[0077] Number of belts 8 used for taking and moving element E from roll conveyor 2 to working plane 6 is proportional to dimensions of said element E.

[0078] Thus, a set number of pliers 8 are activated to take and load elements E.

[0079] Active surfaces 15 of belts 8 take element E from roll conveyor 2. Pulleys 14 make belt 8 at a level above gauge clamps 7, moving belt toward relevant cross elements and gauge clamps 7.

[0080] It is possible providing, for all the above embodiments and arrangements described in the above, presence of two or more feeding devices 8 respectively upward and downward said apparatus 1. The three embodiments according to the present invention permit an automatic loading of wood elements E taking them from a storage zone M and reducing dimensions due to presence of a feeding device 8 of wood elements E.

[0081] The present invention has been described for illustrative, but not limitative purposes, according to its preferred embodiments, but it is to be understood that variations and/or modifications can be introduced by those skilled in the art, without departing from the relevant scope as defined in the enclosed claims.

Claims

1. Apparatus (1) for automatic feeding and pendulum working of wood elements (E) comprising:
 - a storage zone (M) for wood elements (E);
 - a machine (3) for pendulum working of wood elements (E) comprising a working zone (L) of said wood elements (E);
 - said apparatus (1) being **characterized in that** it further comprises
 - a transportation device (2) to transport said wood elements (E) from said storage zone (M) to the proximity of said working zone (L) of said machine (3); and
 - a feeding device (8) to take and displace said wood elements (E) from said transportation device (2) to said machine (3) on the corresponding working zone (L) of said wood element (E).
2. Apparatus (1) according to the previous claim, **characterized in that** said transportation device (2) and feeding device (8) are inside the side dimensions (I) of said machine (3) for the working of wood elements (E), said side dimensions (I) being an occupation zone on the ground in which working, electrical and hydraulic feeding devices of said apparatus (1) lie and said side dimensions (I) being outside said storage zone (M).
3. Apparatus (1) according to anyone of the previous claims, **characterized in that** said transportation device (2) is also inside the storage zone (M).
4. Apparatus (1) according to any of the previous claims 1 and/or 2, **characterized in that** either said transportation device (2) and said feeding device (8) are also inside said storage zone (M).
5. Apparatus (1) according to anyone of the previous claims, **characterized in that** said transportation device (2) is a roller adjacent to a working plane (6) of said machine (3) comprising a plurality of cross members provided with corresponding clamps (7) suitable to receive and block said wood elements (E).
6. Apparatus (1) according to anyone of the previous claims 1 - 4, **characterized in that** said roller (2) is in contact with said machine (3) all along said working plane (6).
7. Apparatus (1) according to anyone of the previous claims, **characterized by** comprising at least two feeding devices (8) suitable to be respectively placed upstream and downstream said apparatus (1).
8. Apparatus (1) according to anyone of the previous claims, **characterized in that** said feeding device (8) is a robotic system comprising a first rod (8a), a second rod (8b) and a third rod (8c), each one provided with sliding systems, in particular tracks, along which a drawing unit (9) slides.
9. Apparatus (1) according to claim 8, **characterized in that** said drawing unit (9) further comprises at least a first gripper (9a) and a second gripper (9b) sliding along a longitudinal rod (11) to conform to the size of the wood element (E) to be taken from said roller (2), and furthermore, said first gripper (9a) and second gripper (9b) are so realized to take said wood element (E) from said roller (2) entering between couples of adjacent rolls comprised in said roller (2).
10. Apparatus (1) according to anyone of the claims 8 and/or 9, **characterized in that** said drawing unit (9) comprises coupling means (10) by which said drawing unit (9) can be sliding coupled along at least one of said first rod (8a), second rod (8b) and third rod (8c).
11. Apparatus (1) according to any of the claims 8 - 10, **characterized in that** said second rod (8b) and third rod (8c) are integral and orthogonal each other and are sliding mounted on said first rod (8a).
12. Apparatus (1) according to any of the claims 1 - 7, **characterized in that** said feeding device (8) consists of a plurality of pliers sliding placed inside said working plane (6) of said machine (3).
13. Apparatus (1) according to claim 12, **characterized in that** each of said plurality of pliers comprises at least a base (12) supporting at least a gripping hand (13) suitable to take said wood element (E) from said transportation device (2), and furthermore, said base (12) is able to slide parallel with respect to said cross members of said working plane (6) towards and

away from said transportation device (2) and upward and downward said working plane (6) from a rest position, wherein said gripping hand (13) is at the level of said working plane (6), and a working position, where said gripping hand (13) is above said clamps (7). 5

14. Apparatus (1) according to any of claims 1-7, **characterized in that** said feeding device (8) consists of a plurality of conveyor belts comprising an active surface (15) suitable to receive a wood element (E), said conveyor belts being placed on pulleys (14) and inside said working plane (6), parallel with respect said cross members. 10 15

15. Apparatus (1) according to claim 14, **characterized in that** each conveyor belt (8) can slide upward and downward said working plane (6) and can be in a rest position, wherein said active surface (15) is at the level of said working plane (6), and a working position, wherein said active surface (14) is on at a level above said clamps (14). 20 25 30 35 40 45 50 55

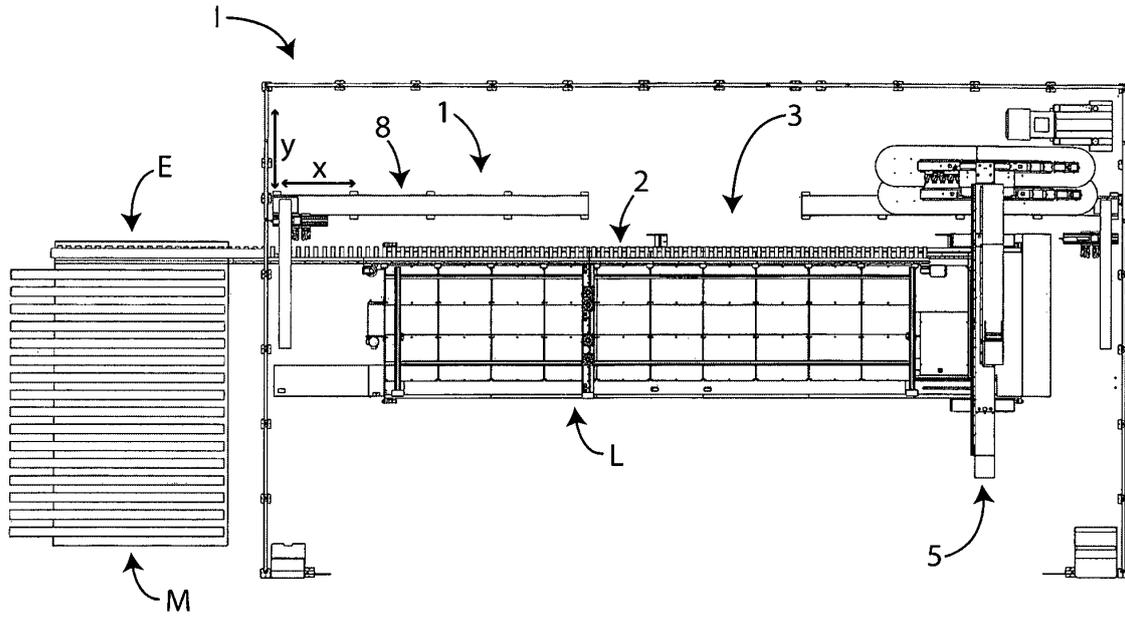


Fig. 1

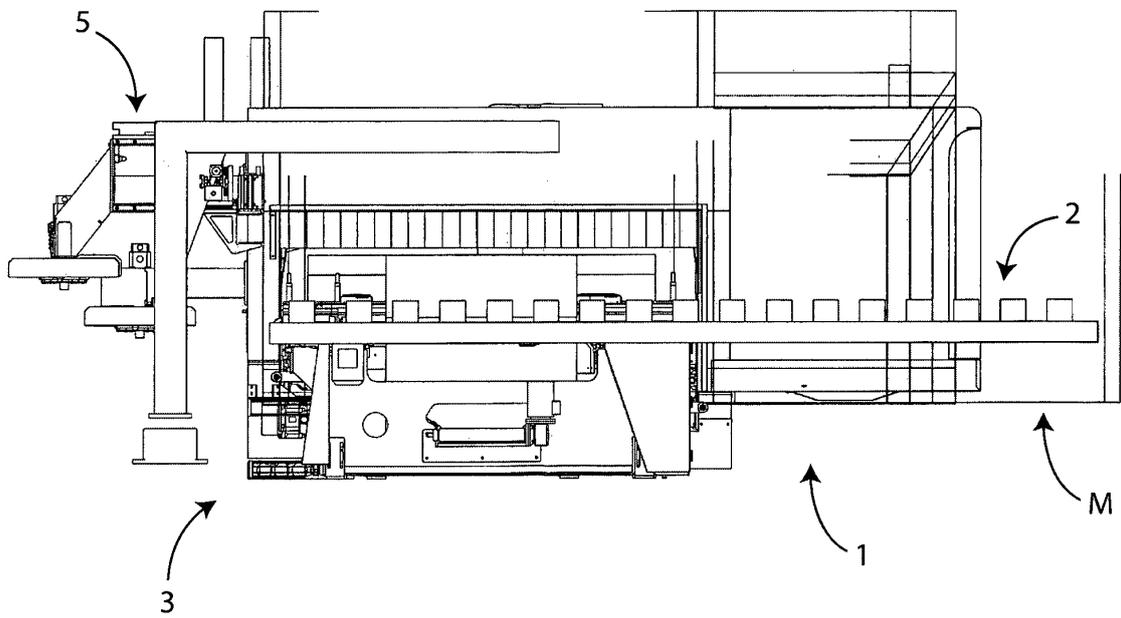


Fig. 2

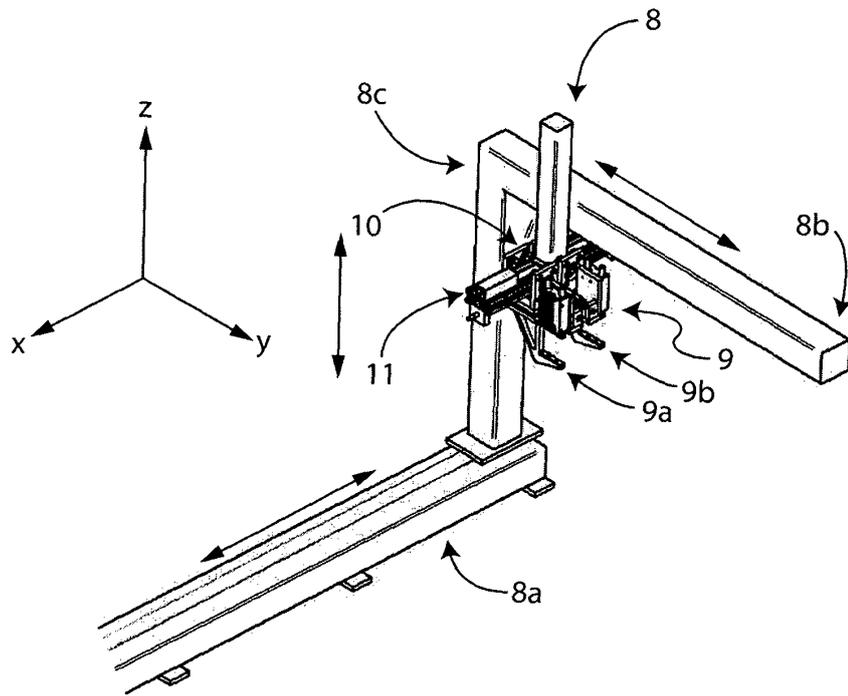


Fig. 3

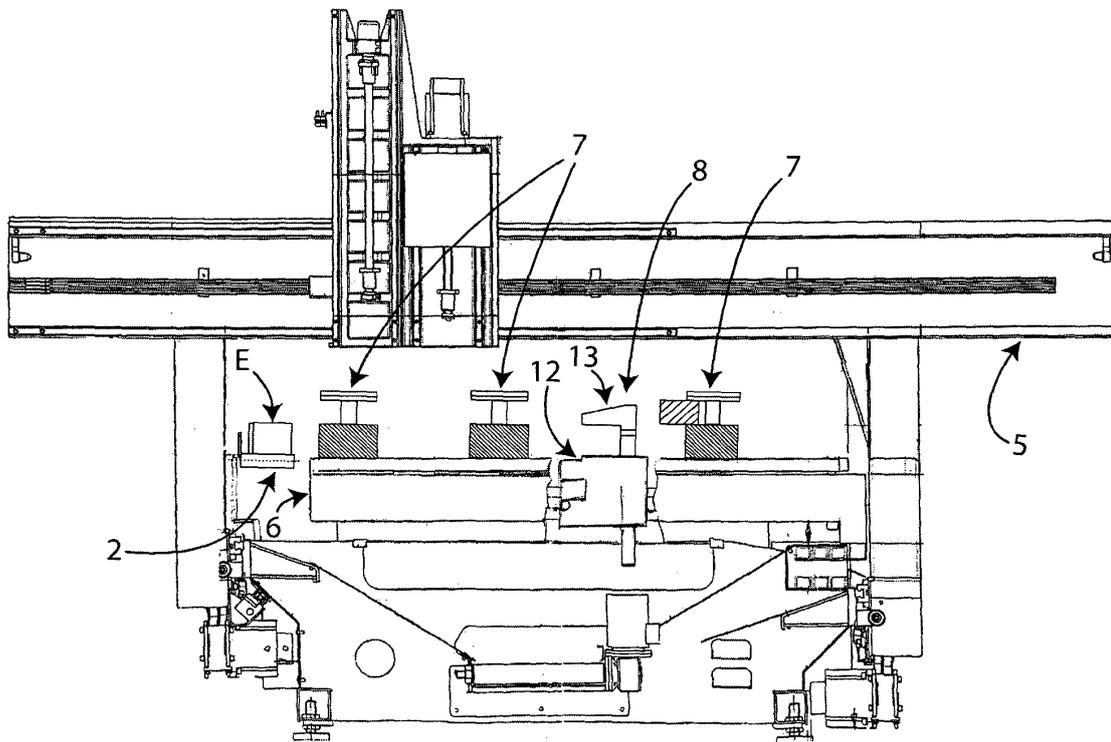


Fig. 4

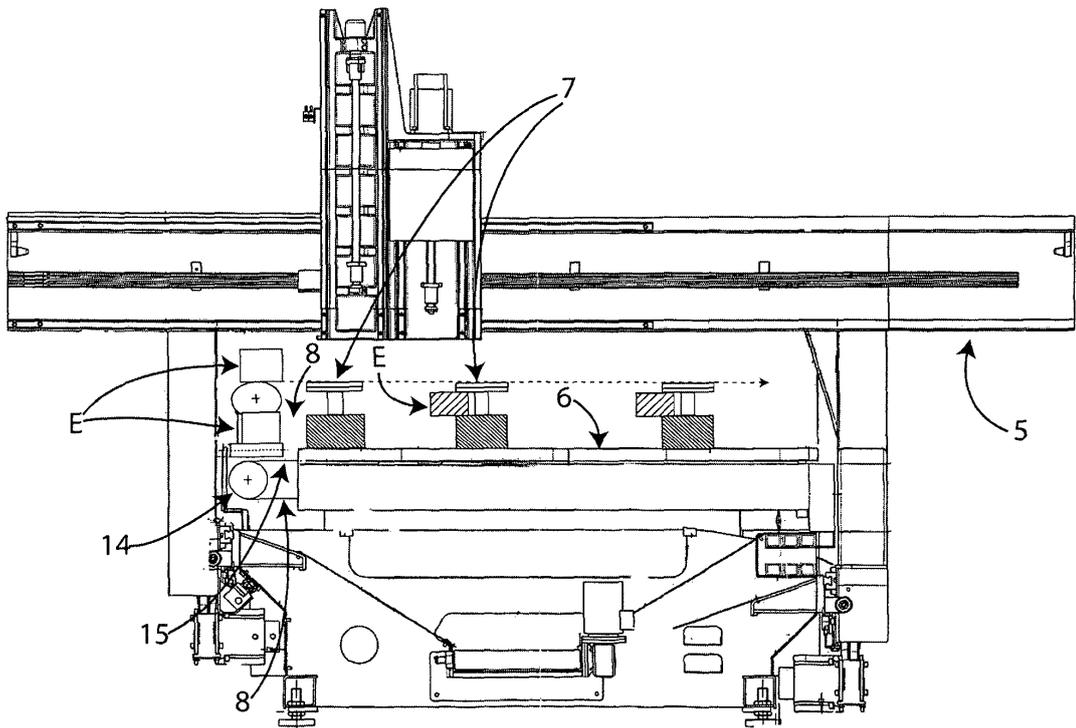


Fig. 5



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Application Number
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Place of search		Date of completion of the search	Examiner
The Hague		27 January 2015	Hamel, Pascal
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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