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(54) SYSTEM FOR SUPPORTING ROLLS

(57) It is herein described a system (1) for supporting rolls (R) having an unwinding machine (10) with a first supporting structure (Sa) for a roll (R) of material configured to allow supporting and unwinding said roll (R) along an unwinding direction (D), and movement means configured for moving the first supporting structure (Sa) and/or the roll (R) supported by it. The system (1) also comprises an apparatus (100) for supporting and transporting at least one roll (R) and for assisting in loading the same into the unwinding machine (10), said apparatus (100) comprising a second supporting structure (Sb) having at least one housing element (110) for at least one corresponding roll (R), said second supporting structure (Sb) being configured for moving the roll (R) supported by it toward an operating position (P) at the first supporting structure (Sa) of the unwinding machine (10).

The system (1) also comprises coupling means (150) between the unwinding machine (10) and the apparatus (100), wherein the apparatus (100) and the unwinding machine (10) are structurally independent of each other and are removably connectable to each other through the coupling means (150), said apparatus (100) being in this way adapted to switch from a free configuration, in which it is not connected to the unwinding machine (10), to a coupled configuration, in which the housing element (110) of the roll (R) is connected to the first supporting structure (Sa) of the unwinding machine (10) and is integral therewith, and wherein, in said coupled configuration, the movement means of the unwinding machine (10) are adapted to cause the movement of the roll (R) that is in the operating position (P).

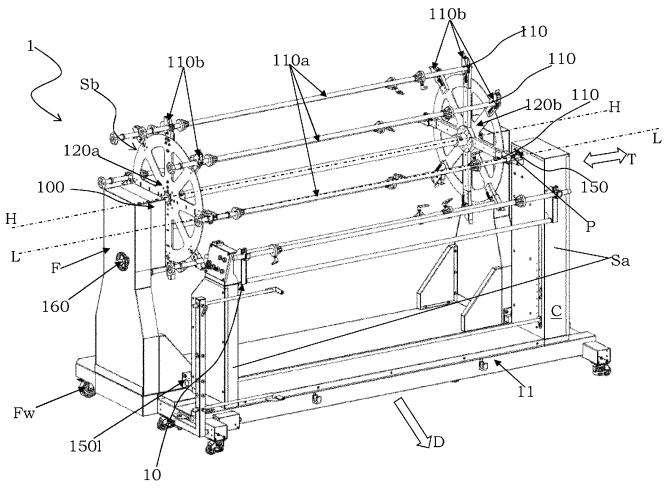

FIG. 1

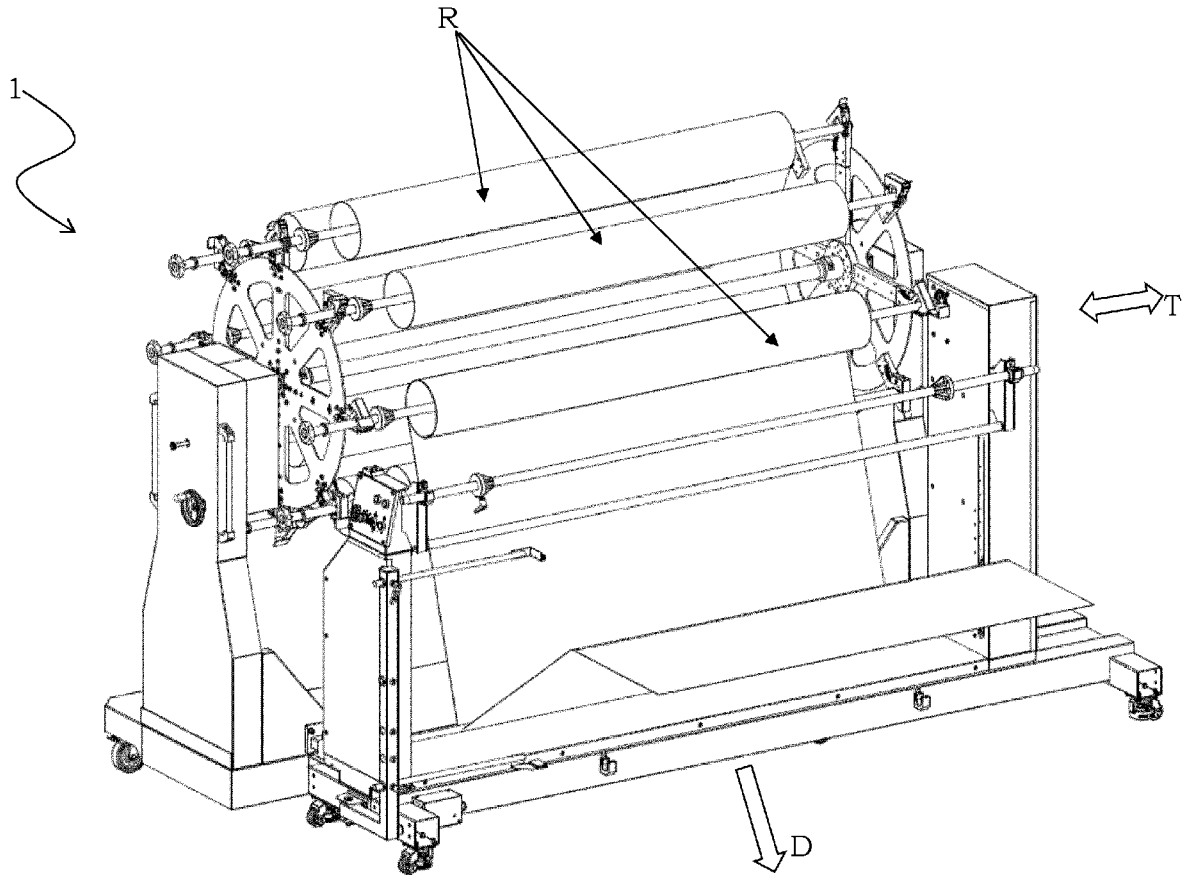

FIG. 1bis

Description

Field of application

[0001] The present invention relates to a system for supporting rolls, for instance to allow transporting and subsequently unwinding a roll of material to be cut and afterwards for feeding it into a cutting machine. The following description is made with reference to this application field with the only purpose of simplifying the exposition thereof.

Prior art

[0002] As it is known, there are cutting machines able to automatically cut portions of material according to predefined cutting paths, in which said material is moved through a conveyor belt from a loading area toward a cutting chamber and finally toward a collection area.

[0003] Very often, the material that is cut is initially wound in a roll, which then has to be unwound and arranged on the conveyor belt to proceed with the above cutting operation.

[0004] Therefore, there are operators who provide for unwinding the roll and arranging the unwound portions thereof onto the conveyor belt of a machine of the above described type, as well as they also provide for the alignment of said roll during the unwinding.

[0005] To this end, there are suitable unwinders, associated at the input with the aforementioned cutting machines, which allow feeding the material to be cut that is initially wound in a roll.

[0006] However, it is noted that many known unwinders have a complex structure and significant size, and do not allow for easy use.

[0007] In many known solutions, in which collecting rolls from a roll holder warehouse and their assembly on the unwinder are provided, the presence of at least two operators is necessary to carry out the aforementioned operations.

[0008] All this makes the assembly and replacement phase of the roll complicated and expensive, in particular when it involves multiple rolls arranged in a roll holder warehouse.

[0009] In general, therefore there is the problem of transporting the rolls to be unwound and their assembly on the unwinders themselves, something that the known unwinders and current roll holder warehouses are not able to ensure in a simple way, these operations always requiring more than one operator and complicated maneuvers.

[0010] The technical problem of the present invention is to provide a system for supporting rolls having structural and functional features, so as to allow overcoming the limitations and drawbacks still affecting the known solutions, in particular that allows easy transportation and easy assembly of a roll on an unwinder, while having a simple structure.

Summary of the invention

[0011] The solution idea underlying the present invention is to provide an accessory apparatus connectable to an unwinder (even already existing) and able to transport a plurality of rolls, which can be associated with the unwinder by simply approaching the accessory apparatus thereto and, once said approaching procedure has been carried out, by moving a structure that supports the rolls of said apparatus (for instance by rotating a rotatable carousel structure) until the roll that one wishes to unwind reaches a suitable position at the unwinder (hereinafter called "operating position"), which it is then connected to by means of a simple connection. It is thus possible to switch from a configuration in which the roll is arranged on a passive component (for instance the above carousel structure, which is able to perform a simple rotational movement for assembling the roll on the unwinder), to a configuration in which said component is made active simply thanks to the connection with the unwinder, which is able to cause a determined movement of the roll, for instance for aligning the unwound portions thereof.

[0012] Based on said solution idea, the above technical problem is solved by a system for supporting rolls, comprising:

- an unwinding machine or unwinder comprising a first supporting structure for a roll of material configured to allow supporting and unwinding said roll along an unwinding direction, and movement means configured for moving the first supporting structure and/or the roll supported by it;

- an apparatus for supporting and transporting at least one roll and assisting in loading the same into the unwinding machine, said apparatus comprising a second supporting structure comprising at least one housing element for at least one corresponding roll, said second supporting structure being configured (movable) for moving the at least one roll supported by it from a generic initial position toward an operating position at the first supporting structure of the unwinding machine; and

- coupling means between the unwinding machine and the apparatus,

  wherein the apparatus and the unwinding machine are structurally independent of each other and are removably connectable to each other through the coupling means, said apparatus thus being adapted to switch from a free configuration, in which it is not connected to the unwinding machine, and a coupled configuration, in which the at least one housing element for the roll is connected to the first supporting structure of the unwinding machine and is integral therewith, and

wherein, in said coupled configuration, the movement means of the unwinding machine are adapted to cause the movement of the roll that is in the operating position (in other words, said at least one housing element of the apparatus is configured to be moved by the movement means of the unwinding machine in said coupled configuration, allowing in this way moving the roll that is in the operating position).

[0013] More particularly, the invention comprises the following additional characteristics, taken individually or in combination if required.

[0014] Said optional features are defined in the dependent claims 2-20.

[0015] According to an aspect of the present invention, the at least one housing element of the roll of the apparatus may comprise a rod adapted to be inserted into the core of the roll, said rod extending along a longitudinal axis and being configured to move with the movement of the second supporting structure.

[0016] According to an aspect of the present invention, the second supporting structure of the apparatus may comprise holding means configured to hold the rod.

[0017] According to an aspect of the present invention, the second supporting structure of the apparatus may comprise a pair of discs whereon the holding means of the rod are arranged, the rotation of said discs causing the movement of the rod.

[0018] According to an aspect of the present invention, the holding means may be in the shape of a clamp structure configured to switch from an open configuration, in which the rod can be removed from the second supporting structure to a closed configuration about said rod, thus causing the same to be held.

[0019] According to an aspect of the present invention, the holding means may comprise bearings configured to allow the roll to rotate during the unwinding thereof when the apparatus is connected to the unwinding machine in the coupled configuration.

[0020] According to an aspect of the present invention, the rod may be adapted to perform a sliding movement along its own longitudinal axis. In particular, the rod may be configured to switch, through the above sliding movement, from a configuration in which the second supporting structure is adapted to be moved, for instance to rotate, without abutting against any component of the unwinding machine, to a configuration in which said rod abuts onto a stopping element of the unwinding machine.

[0021] According to an aspect of the present invention, the second supporting structure of the apparatus may comprise a plurality of housing elements for a corresponding plurality of rolls, which are adapted to be moved together through the movement of said second supporting structure.

[0022] In this way, when one wishes to unwind a particular roll of the plurality of rolls, the second supporting structure of the apparatus is moved (for instance is rotated) until the desired roll reaches the operating position close to the unwinder.

[0023] In particular, according to an aspect of the present invention, a plurality of rods may be connected to the second supporting structure of the apparatus through respective holding means, for housing said plurality of rolls.

[0024] According to an aspect of the present invention, the second supporting structure of the apparatus may be rotatable about a rotation axis, said second rotatable supporting structure being configured to perform a rotational movement in which the housing elements of the rolls are moved (all together) toward and away from an operating position of the first supporting structure of the unwinding machine.

[0025] According to an aspect of the present invention, the coupling means may comprise a recess formed in the first supporting structure of the unwinding machine and may comprise a portion of the housing element of the second supporting structure of the apparatus, said portion being adapted to engage with the recess, which has a shape complementary thereto.

[0026] According to an aspect of the present invention, the portion of the housing element may be an end of the rod, which is configured to be inserted into the recess formed in the first supporting structure of the unwinding machine, said end and said recess being for instance hexagonal-shaped.

[0027] According to an aspect of the present invention, the apparatus may comprise means configured to allow a manual movement of the second supporting structure, such as for instance a crank able to generate a rotational movement of said second supporting structure.

[0028] According to an aspect of the present invention, the second supporting structure of the apparatus may comprise stopping elements configured to prevent the housing element of the apparatus and the first supporting structure of the unwinding machine in the coupled configuration from decoupling (disconnecting), as well as to prevent said housing element and the second supporting structure of the apparatus in the free configuration from decoupling (coming out/disconnecting).

[0029] According to an aspect of the present invention, the stopping elements may be a pair of rings arranged on the rod and configured to mechanically abut the clamp structure so that, when said clamp structure is in the closed configuration, it blocks (for instance at a certain point) the movement of the rod along its longitudinal axis, precisely because, while the rod moves, the rings collide with the body of said clamp structure.

[0030] According to an aspect of the present invention, the clamp structure may comprise a central portion and a side portion arranged at a side of the central portion, and wherein at least one of the rings is arranged on the rod so as to be closed between said central portion and said side portion when said clamp structure is in the closed configuration and when the apparatus and the unwinding machine are in the coupled configuration.

[0031] According to an aspect of the present invention, the at least one housing element of the apparatus may be configured to be moved by the movement means of the unwinding machine in the coupled configuration, thus allowing the roll housed therein and that is in the operating position to be moved.

[0032] According to an aspect of the present invention, the movement means of the unwinding machine may be configured to allow a translation of the first supporting structure thereof in a direction that is substantially transversal to the forward direction, so that, in the coupled configuration, the housing element of the roll may move integrally with said first supporting structure along said transversal direction (and in particular the entire second supporting structure moves along said transversal direction).

[0033] Additionally or alternatively, according to an aspect of the present invention, the movement means of the unwinding machine may be configured to allow a rotation of the housing element of the roll when the apparatus is connected to the unwinding machine in the coupled configuration, thus allowing unwinding or rewinding said roll by means of said rotation (and in this case only the rod moves, and in particular the roll, in the operating position whereas the others remain passive).

[0034] According to an aspect of the present invention, the unwinding machine may comprise:

- a base whereon the first supporting structure is arranged, which is adapted to perform a translation movement with respect to said base;
- a dancer element configured to keep a tension state of an unwound portion of the roll that is engaged in the operating position when the unwinding machine and the apparatus are connected to each other in the coupled configuration;
- measuring means for measuring the position of the dancer element configured to detect the tension state of the roll based on the position; and
- measuring means for measuring the transversal position of unwound portions of the roll (for instance means for detecting the position of the edges of the unwound roll with reference to the transversal direction, in order to verify the alignment status).

[0035] The features and advantages of the system according to the invention will become apparent from the following description of an embodiment thereof, given by way of non-limiting example with reference to the accompanying drawings.

Brief description of the drawings

[0036] In those drawings:

- figure 1 shows a perspective view of a system according to the present invention;
- figure This shows a perspective view of the system of figure 1 highlighting a plurality of rolls;
- figure 2 shows a perspective view of an unwinder of the system according to an embodiment of the present invention;
- figures 3A and 3B show details of the system of the present invention in a first configuration or free configuration; and
- figures 4A and 4B show details of the system of the present invention in a second configuration or coupled configuration.

Descrizione dettagliata

[0037] With reference to those figures, a system for supporting rolls according to the present invention is globally and schematically indicated with reference number 1.

[0038] It is worth noting that the figures represent schematic views and are not drawn to scale, but instead they are drawn, so as to emphasize the important features of the invention. Moreover, in the figures, the different elements are depicted schematically, their shape varying depending on the desired application. It is also noted that in the figures the same reference numbers relate to elements that are identical in shape or function. Finally, particular features described in relation to an embodiment illustrated in a figure are also applicable to the other embodiments illustrated in the other figures.

[0039] It is also noted that, unless expressly indicated, the process steps can also be reversed if necessary.

[0040] Furthermore, positional references used in the present description, comprising indications such as lower or upper, below or above, or similar phrases, are always referred to the operating configuration represented in the figures, and they must in no case be assigned a limiting value. In any case, said references, when referred to the components of the apparatus of the present invention in the operating position, are used in practice by a person skilled in the art.

[0041] To facilitate the following description of the system 1, two orthogonal directions are identified by way of example: a direction D (which will be identified with the unwinding direction of a roll) and a direction T (which will be identified with the direction transversal to said unwinding direction).

[0042] The system 1 of the present invention allows supporting, transporting and subsequently unwinding a roll (identified herein with reference R) of material on a conveyor belt of a cutting machine for making components of various type. Essentially, the system 1 provides for the combination of an unwinder (or unwinding ma-

chine) and of an accessory apparatus, said system 1 overall assisting in feeding the material to be cut which is wound in a roll into the cutting machine (the latter not being illustrated in the figures since it is not an object of the present invention).

[0043] The material of the roll R may be any material adopted in the textile field for the mass production of components (footwear, leather goods, car interiors, clothing and the like). Obviously, the present invention is not limited to the type of material and to the above applications and many other applications are possible.

[0044] With reference to figure 1, the system 1 first of all comprises an unwinder or unwinding machine 10, which includes a first supporting structure (herein indicated with reference Sa) for a roll R to be unwound (for simplicity, the rolls R are highlighted in figure 1bis). The first supporting structure Sa, in particular, is configured to allow supporting and unwinding the roll R along the unwinding direction D.

[0045] Figure 2 shows a perspective view of the unwinder 10, in which the main components thereof are visible. It is noted that the first supporting structure Sa is not limited by a particular shape; for instance, the figures show an embodiment in which it comprises a pair of uprights or shoulders 12 which extend vertically from a base 11, thus defining a horseshoe-shaped structure, but in other embodiments even a single upright could be present (for instance the right upright), thus defining an L-shaped structure; in general, the first supporting structure Sa acts as a frame to support the main components of the unwinder 10 and various configurations are possible.

[0046] The unwinder 10 also comprises movement means configured to move the first supporting structure Sa or the roll R supported by it under the operator's command or on some occasions also automatically.

[0047] For instance, first movement means configured to allow a translation of the first supporting structure Sa along the transversal direction T are present, so as to allow an alignment of the unwound portions of the roll R. The alignment operation is indeed of crucial importance for a correct cut since, during the unwinding, creases or surface imperfections may form, which must be corrected by this alignment procedure. In this way, the control may be performed manually by the operator or automatically.

[0048] As for the manual control, the unwinder 10 comprises a control system (not illustrated in the figures since it is conventional, for instance a joystick) configured to generate control commands adapted to control the movement of the movement system based on an operator's manual input.

[0049] In an embodiment, the first supporting structure Sa may be configured to translate along a guide formed in the base 11, for instance through a motor and a worm screw.

[0050] Furthermore, there are second movement means configured to allow the roll R to rotate, so as to control the unwinding and/or rewinding thereof. By way of non-limiting example, there may be a motor that is operatively coupled to a gear system adapted to be set in rotation by said motor and configured to cause the controlled rotation of the roll R.

[0051] Even in this case, the command may be manual (for instance through the above joystick) or automatic.

[0052] It is noted in any case that the present invention is not limited by the type and operating mode of the movement means, what matters is that the unwinder 10 is able to impart a determined movement of the roll 10 when appropriate.

[0053] Suitably, the system 1 also comprises a service apparatus (herein identified with reference 100) for supporting and transporting the rolls R, as well as for assisting in loading or assembling the same on the unwinder 10.

[0054] The apparatus 100 comprises an own supporting structure whereon a plurality of rolls R is arranged (in a basic embodiment, it is possible to configure the apparatus 100 for a single roll R, even a plurality of rolls R is preferable and the examples below illustrated will refer to the latter case). This structure is herein indicated as "second supporting structure Sb", in order to differentiate it from the first supporting structure Sa of the unwinder 10. In particular, the second supporting structure Sb comprises a plurality of housing elements or supporting elements (wholly indicated with reference 110) for a corresponding plurality of rolls R; as it will be detailed herein after, the housing elements 110 in particular comprise rods and related supports whereon the rolls R are arranged.

[0055] The second supporting structure Sb of the apparatus 100 is assembled on a frame F, which is provided with wheels (indicated with reference Fw), which allow moving the same. In this way, it is possible to approach the apparatus 100 to the unwinder 10 for assembling the roll R thereonto.

[0056] Suitably, the second supporting structure Sb is movable with respect to the frame F in order to move the rolls R supported by it toward an operating position P at the first supporting structure Sa of the unwinder 10 (in particular, as it will be detailed herein after, it is a rotating structure able to make the various rolls rotate all together, in order to move a roll of interest toward the operating position where it can be unwound). In this way, once the apparatus 100 is placed close to the unwinder 10, the roll R on said apparatus 100 may be moved toward the operating position P in the unwinder 10. It is herein noted that the term "operating position P" indicates the work position in the unwinder 10 where the roll R may be unwound and moved.

[0057] Moreover, there are coupling means (generally indicated with reference 150) between the unwinder 10 and the apparatus 100, which allow connecting these two machines and fixing the roll R that one wishes to unwind to the unwinder 10.

[0058] The apparatus 100 and the unwinder 10 are thus structurally independent of each other and are re-

movably connectable to each other through the coupling means 150, so that the apparatus 100 is able to switch from a free configuration, in which it is not connected to the unwinder 10, to a coupled configuration in which one of the housing elements 110 of the rolls R is connected to the first supporting structure Sa of the unwinder 10 and is integral therewith.

[0059] As it will be detailed herein after, the connection between the apparatus 100 and the unwinder 10 provides for the above operating connection between the housing elements 110 (namely the rods) and the first supporting structure Sa, as well as a more rigid connection between the frame F of the apparatus 100 and the base 11 of the unwinder 10.

[0060] The apparatus 100 thus acts as a roll holder carriage able to support a certain number of rolls R and to transport them toward the unwinder 10 and may be constrained to said unwinder 10, so as to switch from a passive configuration to an active configuration.

[0061] Indeed, it is noted that, advantageously according to the present invention, once the auxiliary apparatus 100 has been connected to the unwinder 10, its housings 110 for the rolls R are able to move integrally with the unwinder 10 and thus are able to follow the movements thereof, for instance they can follow the translation of the first supporting structure Sa or they may be dragged in rotation (i.e. they can follow the above illustrated movements).

[0062] In the above coupled configuration, the movement means of the unwinder 10 are thus able to move the roll R that is in the operating position P (said roll remaining anyway always housed in the apparatus 100).

[0063] Still more particularly, in the coupled configuration, one of the housing elements 110 of the apparatus 100 is able to be moved by the movement means of the unwinder 10, thus allowing moving the roll R that is on said housing in the operating position P.

[0064] In this way, there is a roll R that is made active thanks to the coupling with the unwinder 10, whereas the other rolls housed in the apparatus 100 remain passive (i.e. they are not moved by the movement means of the unwinder 10).

[0065] Still more particularly, in an embodiment, the rolls R that are not coupled to the unwinder 10 (i.e. those that are not in the operating position P) remain passive as for the unwinding movement (i.e. they are not affected by the action of the second movement means of the unwinder 10), whereas they too are moved by the first movement means of the unwinder 10, which, by moving the roll R in the operating position P along the transversal direction, they also move (i.e. they make translate) the entire second supporting structure Sb.

[0066] However, other configurations may also be provided, in which the rolls R remain entirely passive, even if the configuration herein described is characterized by its simplicity.

[0067] As above mentioned, in a preferred embodiment of the present invention, the housing elements 110 of the rolls R of the apparatus 100 comprise each a respective rod (indicated with reference 110a), which is inserted into the core of the roll R for supporting the latter. The rods 110a extend along a longitudinal axis L-L and are configured to move all together with the movement of the second supporting structure Sb of the roll holder carriage, which they are connected to.

[0068] Furthermore, the second supporting structure Sb also comprises holding means 110b configured to hold the rods 110a, as it will be detailed herein after.

[0069] In a preferred embodiment of the present invention, the second supporting structure Sb is in the shape of a rotating structure rotatably assembled on the frame F, such as for instance a rotatable carousel structure whereon the rods 110a are assembled. The rotation axis of said rotating carousel is herein indicated as axis H-H.

[0070] Still more particularly, the second supporting structure Sb of the apparatus 100 comprises a pair of discs 120a and 120b whereon the holding means 110b are arranged, which are adapted to firmly hold the rods 110a; in this way, the rotation of the discs 120a and 120b causes the movement of the rods 110a, thus causing the movement of the roll R of interest toward the operating position P at the unwinder 10.

[0071] It is noted that, though the figures show a non-limiting example in which six rods are present, the present invention is not limited thereto and any number may be provided depending on the needs and/or requirements; indeed, it is possible to assemble any number of holding means 110b for corresponding rods 110a onto the discs 120a and 120b, for instance based on the size of the rolls R.

[0072] Suitably, the discs 120a and 120b are adapted to house a determined number of holding means 110b, for instance a series of notches and slots are provided for fixing these holding means 110b to the surface of said discs. It is thus possible to easily apply the holding elements 110b and, as previously seen, their number will vary based on the size of the rolls R. In the embodiment of the figures, the holding elements protrude from the discs 120a and 120b in the radial direction.

[0073] As better illustrated in figures 3A-3B and 4A-4B, the holding means 110b are in the shape of a clamp structure that is shaped so as to house the respective rods 110a. In particular, the clamp structure is configured to switch from an open configuration, in which the rod 110a is free and may be removed, to a closed configuration about said rod 110a, thus causing the same to be held. The opening and closing movement of this clamp structure may be guided for instance by a spring, even if the present invention is not limited by this particular configuration.

[0074] In an embodiment, the holding means 110b, in particular the above clamp structure, may comprise suitable bearings with the aim of allowing the rotation of the rod 110a held by them, and thus the rotation of the roll R during the unwinding thereof when the apparatus 100 is connected to the unwinder 10 in the coupled configura-

tion.

[0075] It is noted that, according to a non-limiting point of view of the present invention, the holding means 110b may be considered as part of the housing elements 110, since they form, together with the rods 110a, the actual housings of the rolls R.

[0076] In order to allow the operating coupling between the apparatus 100 and the unwinder 10, each rod 110a is adapted to perform a sliding movement along its own longitudinal axis L-L (for instance it can slide a few centimeters). Thanks to this sliding movement of the rods 110a, it is possible to switch from a configuration in which the second rotating supporting structure Sb is able to rotate without abutting any component of the unwinder 10 (for instance when all of the rods are retracted to the left, according to the reference of the figures), to a configuration in which one of them abuts onto a stopping element (indicated with reference 15) of said unwinder 10 (for instance when one of said rods is pushed to the right, still according to the local reference of the figures). The abutment of one of the rods 110a onto the stopping element 15 blocks the rotation of the second supporting structure Sb and indicates that said rod has reached the operating position P, i.e. the unwinding position of the roll R held by it.

[0077] This relevant aspect of the invention is illustrated in the passage in figures 3A-3B to figures 4A-4B, in which figures 3A-3B show the configuration in which all of the rods 110a are arranged so that the second rotating supporting structure Sb is able to freely rotate, whereas figures 4A-4B show the configuration in which one of the rods 110a has been pushed along its own longitudinal axis L-L toward one of the uprights 12 of the unwinder 10 (i.e. to the right according to the reference of the figures), so that, during the rotation of said second rotating supporting structure Sb, an end 110a' of said rod 110a abuts onto the stopping element 15.

[0078] In order to facilitate the movement of the rods 110a, each of them comprises a grip element or knob 110p, which may be gripped by the operator.

[0079] To sum up the above, in an advantageous embodiment of the present invention, the second supporting structure Sb of the apparatus 100 is rotatable about its own rotation axis H-H, which is substantially parallel to the longitudinal axis L-L of the rods 110a. In this way, the second rotating supporting structure Sb of the apparatus 100 is configured to perform a rotational movement in which the rods 110a (which support the respective rolls R) are moved toward or away from the operating position P of the first supporting structure Sa of the unwinder 10.

[0080] As for the coupling means 150 which allow the operating connection between the apparatus 100 and the unwinder 10, they are particularly simple while being very effective.

[0081] In particular, on the one hand, a recess 150r formed in the first supporting structure Sa of the unwinder 10 (in particular in the upright 12 toward which the rod is pushed, i.e. the right upright according to the reference of the figures) is provided and, on the other hand, the insertion of the end 110a' of one of the rods 110a into this recess 150r is provided, so as to obtain the connection thereof to the unwinder 10 and make it integral therewith.

[0082] More particularly, the end 110a' of the rod (that, for instance, may comprise a suitable nut) and the recess 150r have a complementary shape, which allows them to be firmly coupled, for instance they may be hexagonal-shaped, obviously without being limited to this specific shape.

[0083] In this way, once the rod 110a has abutted against the stopping element 15, it is possible to insert its end 110a' into the recess 150r, so that the mechanical engagement between these components ensures the integration of the housing elements of the rolls R with the unwinder 10. Thanks to this engagement, the roll R may thus switch from a passive configuration to an active configuration, in which it can be dragged in movement by the unwinder 10.

[0084] Furthermore, as above anticipated, the coupling means 150 may also comprise lower connection means 1501 that allow connecting the frame F of the apparatus 100 and the unwinder 10, in particular with the base 11 thereof, thus ensuring a greater mechanical stability of the system 1 as a whole.

[0085] In an embodiment of the present invention, the apparatus 100 also comprises means that allow a manual movement of the second supporting structure Sb, such as for instance a crank 160 able to generate a rotational movement. However, it is noted that the present invention is not limited to this manual configuration and motorized means for the rotation of the carousel may also possibly be provided.

[0086] In order to prevent the rods 110a from slipping out, stopping elements 140 are present, which are configured to prevent these rods 110a and the first supporting structure Sa of the unwinder 10 in the coupled configuration from decoupling (in particular detaching), thus firmly keeping the system 1 in said coupled configuration. The fixing means 140 may also be configured to prevent these rods 110a and the second rotating supporting structure Sb of the apparatus 100 in the free configuration from decoupling, in particular to prevent the rods 110a from slipping out of the rotating carousel.

[0087] More particularly, the stopping elements 140 are in the shape of rings keyed on each rod 110a, in particular a pair of rings spaced apart from each other along the longitudinal axis L-L, as illustrated in figures 3A-3B and 4A-4B.

[0088] In an embodiment of the present invention, the rings are configured to engage with the clamp structure, so that, when it is in the closed configuration, it abuts one of said rings through a portion thereof and thus prevents the movement of the rod 110a along its longitudinal direction L-L, in particular when the system 1 is in the coupled configuration (i.e. when the end 110a' of the rod 110a is inserted in the recess 150r). To this end, the clamp

structures 110b arranged on the disc 120a (i.e. on the left disc in the example of the figures) comprise, in addition to a central portion shaped so as to house the rod 110a, even a side portion 110bl arranged at a side of said central portion (for instance in the shape of a wing or side nail). This side portion 110bl of the clamp structure thus acts as block system and is shaped so as to enclose one of the rings therein and in the central portion when the clamp structure is closed on the rod, thus preventing the movement of the rod 110a since the surface of the ring abuts against said side portion 110bl.

[0089] It is noted that, though the figures show the case in which just one disc comprises clamp structures provided with the block side portion (i.e. the left disc 120a), the present invention is not limited thereto and both discs could comprise clamp structures configured as above.

[0090] In an embodiment, two rings spaced apart from each other are present, so that a first ring 140a (the right ring according to the reference of the figures - i.e. the innermost ring) prevents the rod 110a from coming out of (or slipping out of) the carousel when it is in the free configuration, and so that a second ring 140b (the left ring - i.e. the outermost ring), once engaged by the clamp, in addition to prevent the rod 110a from coming out of the carousel in the free configuration, also prevents the rod 110a and the unwinder 10 from decoupling in the coupled configuration.

[0091] Still more particularly, the first ring 140a operates alone as a lock in the free configuration since, during the sliding of the rod 100a (in particular during the sliding to the left according to the reference of the figures), it abuts against the clamp structure thus stopping said movement and preventing the rod 110a from slipping out, whereas the second ring 140b, in addition to operate as a simple lock in the free configuration, also engages with the side portion 110bl of the clamp structure in the above described mode when the system is in the coupled configuration.

[0092] In other words, in an embodiment, when the apparatus 100 is disconnected from the unwinder 10, the rod 110a is free to slide longitudinally, however without ever falling since the rings 140a and 140b limit the movement thereof, as above described. Moreover, when the rod 110a is pushed all to the right in order to inset the end thereof into the recess 150r and thus in order to constrain it to the unwinder 10, the ring 140b (which is provided with a suitable guide hole) is configured to cause the clamp and thus the side portion 110bl thereof (which is nail-shaped) to raise, clamp which then lowers by itself since it is guided by a spring. Therefore, when the rod 110a is all to the right, it remains blocked. To make it slide to the left again (and thus in order to decouple it from the unwinder 10) we proceed manually lifting the side portion 110bl and thus opening the clamp. This locking mechanism thus serves as anti-reverse mechanism when the rod, in the active mode, is inserted in the recess 150r and thus is constrained to the unwinder 10.

[0093] The holding means 110b (i.e. the above described clamp structures) thus have a dual function: in addition to housing the circular body of the rods 110a, they prevent them from falling in combination with the rings 140a and 140b (and moreover the latter also engages with the nail-shaped side portion 110bl when the rod 110a is constrained to the unwinder 10).

[0094] As clear from the present description, the coupling between the apparatus 100 and the unwinder 10 is very advantageous. Indeed, suitably, in the coupled configuration, the housing elements of the rolls R, and thus the rods 110a, are able to move integrally with the first supporting structure Sa of the unwinder 10, for instance they can move along the transversal direction T when the first movement means are actuated to align the unwound portions of the roll.

[0095] Obviously, other movement modes can also be provided, not only through the movement of the first supporting structure Sa of the unwinder 10, but also through the sole side movement of the rod 110a and/or of the roll R.

[0096] Likewise, it is also possible to cause the roll R to rotate when the apparatus 100 is connected to the unwinder 10 in the coupled configuration, thus allowing unwinding or rewinding said roll R through said rotation.

[0097] In any case, suitably, by means of a simple coupling with the unwinder 10, it is possible to make the roll R active and thus to make it move thanks to the movement means of said unwinder 10.

[0098] In an embodiment, in order to obtain the actual movement of the roll R, the presence of a retaining element 110r of said roll R is provided, said retaining element 110r being for instance configured to be arranged about the rod 110a that supports the roll R and meanwhile to abut against the internal surface of said roll R, in particular against the core of the roll R. As illustrated in the non-limiting example of the figures, the retaining element 110r is for instance provided with a body comprising a through-hole for the coupling thereof with the rod 110a (wherein the diameter of the hole substantially coincides with the diameter of the rod). Indeed, it is noted that the roll R is arranged with a certain clearance about the rod, whereas the retaining element 110r is constrained on the one hand to the rod 110a (for instance inserted by sliding about the same or constrained thereto in any other suitable way), on the other side it is in contact with the inside of the roll R (for instance it abuts the core of the roll R) and thus remains constrained thereto by mechanical interference; in this way, the retaining element 110r is integral with the roll R and a movement thereof causes a correspondent movement of the roll R.

[0099] As above mentioned, in an embodiment, the retaining element 110r has a conical-shaped portion and is also called "towing cone", wherein the tapered portion of the cone is inserted into the core of the roll R to perform the mechanical retention, although it should be noted that said retaining element 110r is not limited by a particular shape.

[0100] Finally, still referring to figure 2, some aspects of

the unwinder 10 are hereinafter illustrated for completeness.

[0101] As previously seen, the unwinder 10 comprises the base 11 whereon the first supporting structure Sa is arranged, which is able to perform a translation movement with respect to said base 11.

[0102] Furthermore, the unwinder 10 also comprises a reference element 13 configured to keep a tension state of the unwound portion of the roll R. In general, the aim of the reference element 13 is to make a cradle for the unwound portion of roll arranged between the roll itself and the conveyor belt of a cutting machine, always ensuring an exceeding portion of roll that is not under tension and that substantially forms a bend, so as to reduce the tension state of the material subject to cutting. The reference element 13 may be for instance a movable dancer element (as illustrated in the figures) or any other object whose portions of roll may engage and there may be measuring means for measuring the position of the dancer element.

[0103] In an embodiment of the present invention, the dancer element (still indicated with reference 13) is movably housed in suitable guides G formed in the supporting uprights 12.

[0104] As indicated, measuring means for measuring the position of the dancer element 13 along the guide G are present, so that it can be used to detect the tension state of the roll R based on its position; in particular, it is possible to provide for the presence of a control unit C in communication with said measuring means and with the movement means of the unwinder 10, said control unit C being configured to control the latter so as to cause the unwinding of the roll R should the position of the dancer element 13 along the guide G be different from a reference position corresponding to an optimal tension.

[0105] The measuring means may for instance comprise sensors arranged inside the uprights 12 and configured to detect the position of the dancer element 13, even if the present invention is not limited thereto and other solutions are possible (for instance, the adoption of another type of sensor, the presence of an encoder, may be provided).

[0106] Obviously the present invention is not limited by the above configuration and the dancer element may also not be present.

[0107] Then there are a photocell 13f and a related reflection reflector, configured to allow detecting the position of the edge of the material unwound by the roll R (selvage) and activating, if necessary, the right-left translation movement of the first supporting structure Sa of the unwinder 10 and thus of the roll R of the apparatus 100 as well. In this way, the unwound material remains aligned to the cutting machine automatically. The photocell 13f is thus part of the measuring means for measuring the transversal position of the roll R, in particular for measuring the edge of the unwound portions thereof, in order to allow its subsequent alignment.

[0108] The first supporting structure Sa constitutes the bearing structure of the unwinder 10 and is adapted to support its main components. In an embodiment, it is provided with wheels 14, preferably with a block system, to allow the movement thereof.

Conclusions and advantages of the invention

[0109] In conclusion, the present invention thus allows brilliantly overcoming the technical problem, by providing the above system and solving the prior art drawbacks.

[0110] Advantageously, a system is obtained in which transporting and assembling the rolls on an unwinder is enormously simplified, since it is no longer necessary to collect a single roll from the roll holder carriage and to arrange it onto said unwinder (which requires the collaboration of at least two operators), but it is first necessary to transport the roll holder carriage to the unwinder, then to move (for example rotate) the rotating supporting structure for supporting the rolls and finally to insert the rod into the hole on the unwinder once the position of interest has been reached.

[0111] The apparatus herein described thus assists in loading the rolls onto the unwinder, whose coupling allows making the rods active, which may then be moved by the movement means of said unwinder.

[0112] As previously detailed, the carousel structure is rotatably assembled on its supporting frame, thus allowing a simple selection of the roll that it is desired to be unwound, roll which does not have to be collected and assembled on the unwinder, but it is enough to simply rotate said carousel until the desired roll reaches the operating position, after which we proceed with the simple mechanical coupling described above.

[0113] Therefore, there is no roll transfer from the passive roll holder carriage to the active unwinder, since said roll is never separated from the roll holder carriage: in other words, once the rods have been connected to the rotatable discs of the carousel, they are no longer removed, but are made to translate along their axis to be coupled to the unwinder. For this reason, the presence of just one operator is enough to move the apparatus.

[0114] Even the clutch system for retaining the rods is particularly advantageous, since it allows a simple connection and disconnection by only acting with the operator's fingers.

[0115] Essentially, a system is obtained in which a single operator is able to carry out all of the assembly, transport and unwinding operations of the rolls in a simple and safe way, all with an extremely simple mechanical structure of the apparatus.

[0116] Obviously a person skilled in the art, in order to meet contingent and specific needs, may make several changes and variants, all of them falling within the scope of protection of the invention as defined by the appended claims.

Claims

1. A system (1) for supporting rolls (R), comprising:

   - an unwinding machine (10) comprising:
   - a first supporting structure (Sa) for a roll (R) of material, said first supporting structure being configured to allow supporting and unwinding said roll (R) along an unwinding direction (D), and
   - movement means configured to move the first supporting structure (Sa) and/or the roll (R) supported by it,

   the system (1) further comprising:

   - an apparatus (100) for supporting and transporting at least one roll (R) and for assisting in loading the same into the unwinding machine (10), said apparatus (100) including a second supporting structure (Sb) comprising at least one housing element (110) for at least one corresponding roll (R), said second supporting structure (Sb) being configured to move the roll (R) supported by it toward an operating position (P) at the first supporting structure (Sa) of the unwinding machine (10); and
   - coupling means (150) configured to couple the unwinding machine (10) and the apparatus (100) to each other,

   wherein the apparatus (100) and the unwinding machine (10) are structurally independent of each other and are removably connectable to each other through the coupling means (150), said apparatus (100) being adapted to switch from a free configuration, in which it is not connected to the unwinding machine (10), to a coupled configuration, in which said at least one housing element (110) of the roll (R) is connected to the first supporting structure (Sa) of the unwinding machine (10) and is integral therewith, and
   wherein, in said coupled configuration, the movement means of the unwinding machine (10) are adapted to cause the movement of the roll (R) that is in the operating position (P).

2. The system (1) according to claim 1, wherein the at least one housing element (110) of the roll (R) of the apparatus (100) comprises a rod (110a) adapted to be inserted into the core of the roll (R), said rod (110a) extending along a longitudinal axis (L-L) and being configured to move with the movement of the second supporting structure (Sb).

3. The system (1) according to claim 2, wherein the second supporting structure (Sb) of the apparatus (100) comprises holding means (110b) configured to hold the rod (110a).

4. The system (1) according to claim 3, wherein the second supporting structure (Sb) of the apparatus (100) comprises a pair of discs (120a, 120b) whereon the holding means (110b) of the rod (110a) are arranged, the rotation of said discs (120a, 120b) causing the movement of said rod (110a).

5. The system (1) according to claim 3 or 4, wherein the holding means (110b) are in the shape of a clamp structure configured to switch from an open configuration, in which the rod (110a) can be removed from the second supporting structure (Sb) to a closed configuration about said rod (110a) thus causing the same to be held.

6. The system (1) according to any one of claims 3 to 5, wherein the holding means (110b) comprise bearings configured to allow the roll (R) to rotate during the unwinding thereof when the apparatus (100) is connected to the unwinding machine (10) in the coupled configuration.

7. The system (1) according to any one of claims 2 to 6, wherein the rod (1 10a) is adapted to perform a sliding movement along its own longitudinal axis (L-L) and is configured to pass, through said sliding movement, from a configuration in which the second supporting structure (Sb) is adapted to be moved, for instance to rotate, without abutting against any component of the unwinding machine (10), to a configuration in which said rod (110a) abuts onto a stopping element (15) of said unwinding machine (10).

8. The system (1) according to any one of the preceding claims, wherein the second supporting structure (Sb) of the apparatus (100) comprises a plurality of housing elements (110) for a corresponding plurality of rolls (R), which are adapted to be moved together through the movement of said second supporting structure (Sb).

9. The system (1) according to claims 3 and 8, wherein a plurality of rods (110a) is connected to the second supporting structure (Sb) of the apparatus (100) through respective holding means (110b), for housing said plurality of rolls (R).

10. System (1) according to claim 9, wherein the second supporting structure (Sb) of the apparatus (100) is rotatable about a rotation axis (H-H), said rotatable second supporting structure (Sb) being configured to perform a rotational movement in which the housing elements (110) of the rolls (R) are moved toward and away from the operating position (P) of the first supporting structure (Sa) of the unwinding machine

(10).

11. The system (1) according to any one of the preceding claims, wherein the coupling means (150) comprise:

- a recess (150r) formed in the first supporting structure (Sa) of the unwinding machine (10); and
- a portion (110a') of the housing element (110) of the second supporting structure (Sb) of the apparatus (100), said portion (110a') being adapted to engage with said recess (150r), which has a shape complementary thereto.

12. The system (1) according to claims 2 and 11, wherein said portion (110a') of the housing element (110) is an end of the rod (1 10a), which is configured to be inserted into the recess (150r) formed in the first supporting structure (Sa) of the unwinding machine (10), said end and said recess being for instance hexagonal-shaped.

13. The system (1) according to any one of the preceding claims, wherein the apparatus (100) comprises means (160) configured to allow manually moving the second supporting structure (Sb), such as for instance a crank able to generate a rotational movement of said second supporting structure (Sb).

14. The system (1) according to any one of the preceding claims, wherein the second supporting structure (Sb) of the apparatus (100) comprises stopping means (140) configured to prevent the housing element (110) of the apparatus (100) and the first supporting structure (Sa) of the unwinding machine (10) from decoupling in the coupled configuration, as well as to prevent said housing element (110) and the second supporting structure (Sb) of the apparatus (100) from decoupling in the free configuration.

15. The system (1) according to claims 5 and 14, wherein said stopping means (140) are a pair of rings (140a, 140b) which are arranged on the rod (110a) and are configured to abut against the clamp structure so that, when said clamp structure is in the closed configuration, it blocks the movement of the rod (110a) along its longitudinal axis (L-L).

16. The system (1) according to claim 15, wherein the clamp structure comprises a central portion and a side portion (110bl) arranged at a side of the central portion, and wherein at least one of said rings (140a, 140b) is arranged on the rod so as to be closed between said central portion and said side portion (110bl) when said clamp structure is in the closed configuration and when the apparatus (100) and the unwinding machine (10) are in the coupled configuration.

17. The system (1) according to any one of the preceding claims, wherein said at least one housing element (110) of the apparatus (100) is configured to be moved by the movement means of the unwinding machine (10) in said coupled configuration, thus allowing moving the roll (R) which is housed therein and is in the operating position (P).

18. The system (1) according to claim 17, wherein the movement means of the unwinding machine (10) are configured to allow a translation of the first supporting structure (Sa) thereof in a direction (T) that is substantially transversal to the unwinding direction (D), so that, in the coupled configuration, the housing element (110) of the roll (R) moves integrally with said first supporting structure (Sa) along said transversal direction (T).

19. The system (1) according to claim 17 or 18, wherein the movement means of the unwinding machine (10) are configured to allow a rotation of the housing element (110) of the roll (R) when the apparatus (100) is connected to the unwinding machine (10) in the coupled configuration, thus allowing unwinding or rewinding said roll (R) by means of said rotation.

20. The system (1) according to any one of the preceding claims, wherein the unwinding machine (10) comprises:

- a base (11) whereon the first supporting structure (Sa) is arranged, said first supporting structure being adapted to perform a translation movement with respect to said base (11);
- a dancer element (13) configured to keep a tension state of an unwound portion of the roll (R) which is engaged in the operating position (P) when the unwinding machine (10) and the apparatus (100) are connected to each other;
- measuring means for measuring the position of the dancer element (13) configured to detect the tension state of the roll (R) based on said position; and
- measuring means for measuring the transversal position of unwound portions of the roll (R).

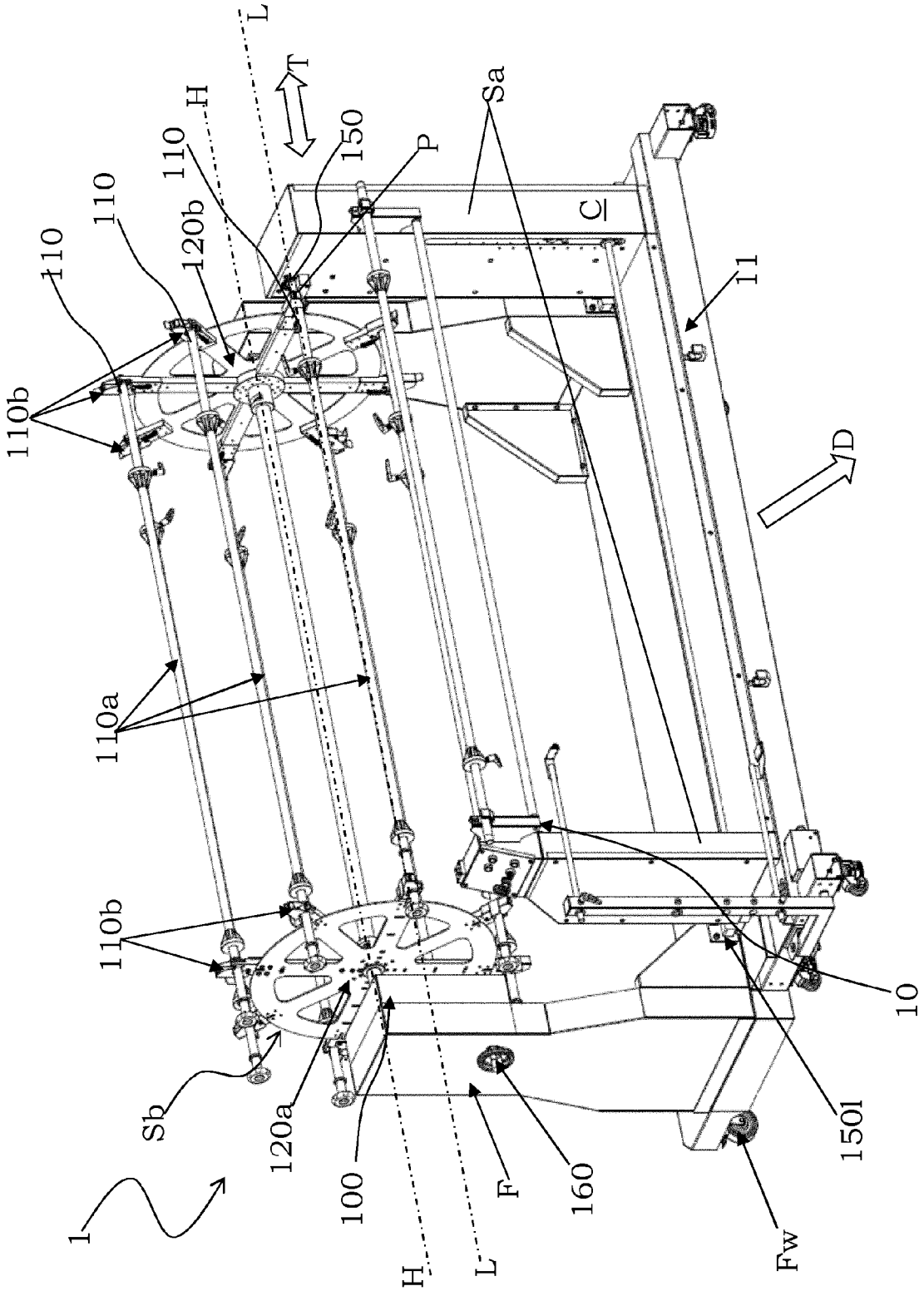
L
T
H
110
110
110
120b
150
P
Sa
C
11
D
110b
110a
110b
Sb
120a
100
H
L
F
160
Fw
150l
10
1

FIG. 1

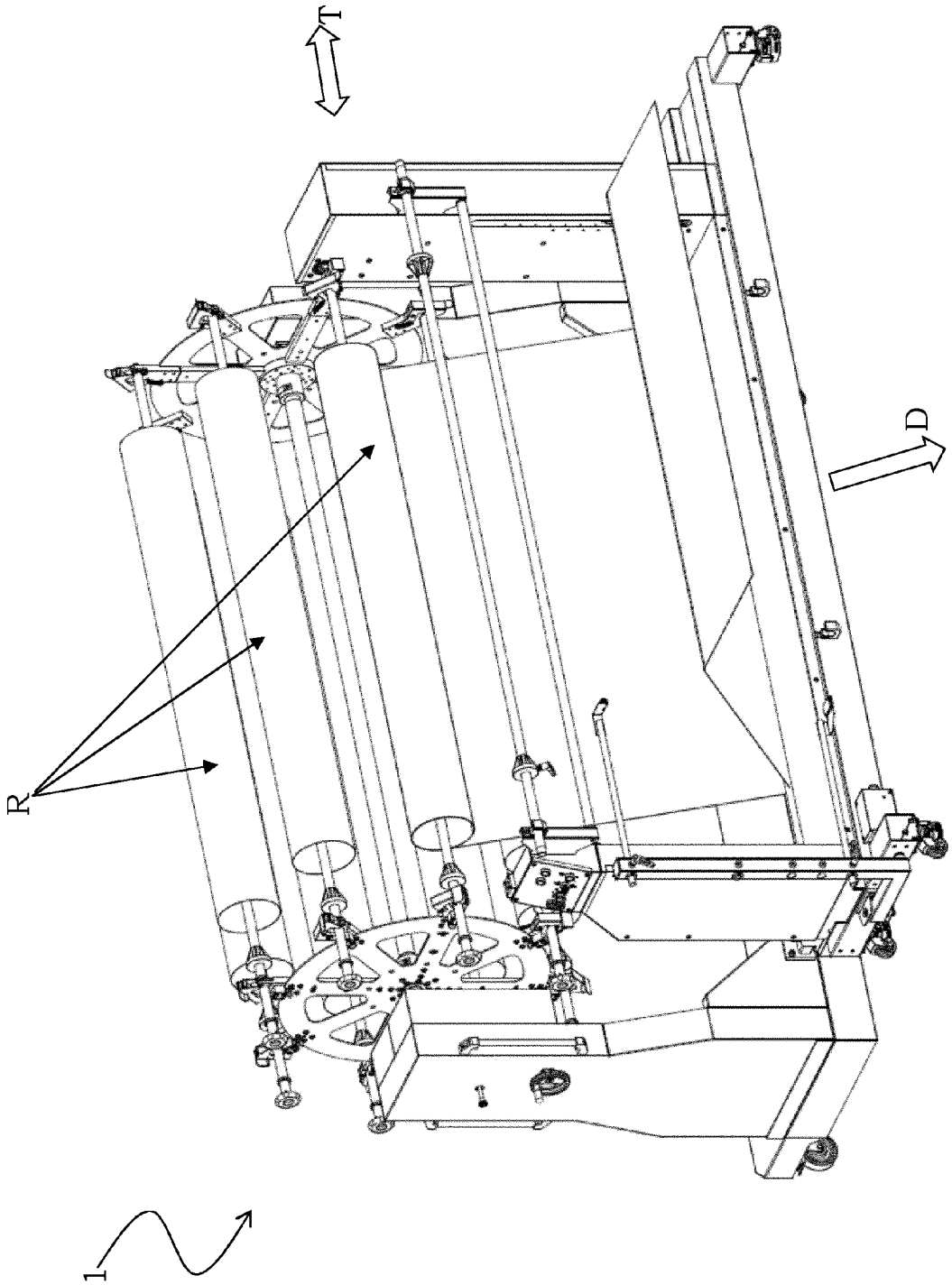

FIG. 1bis

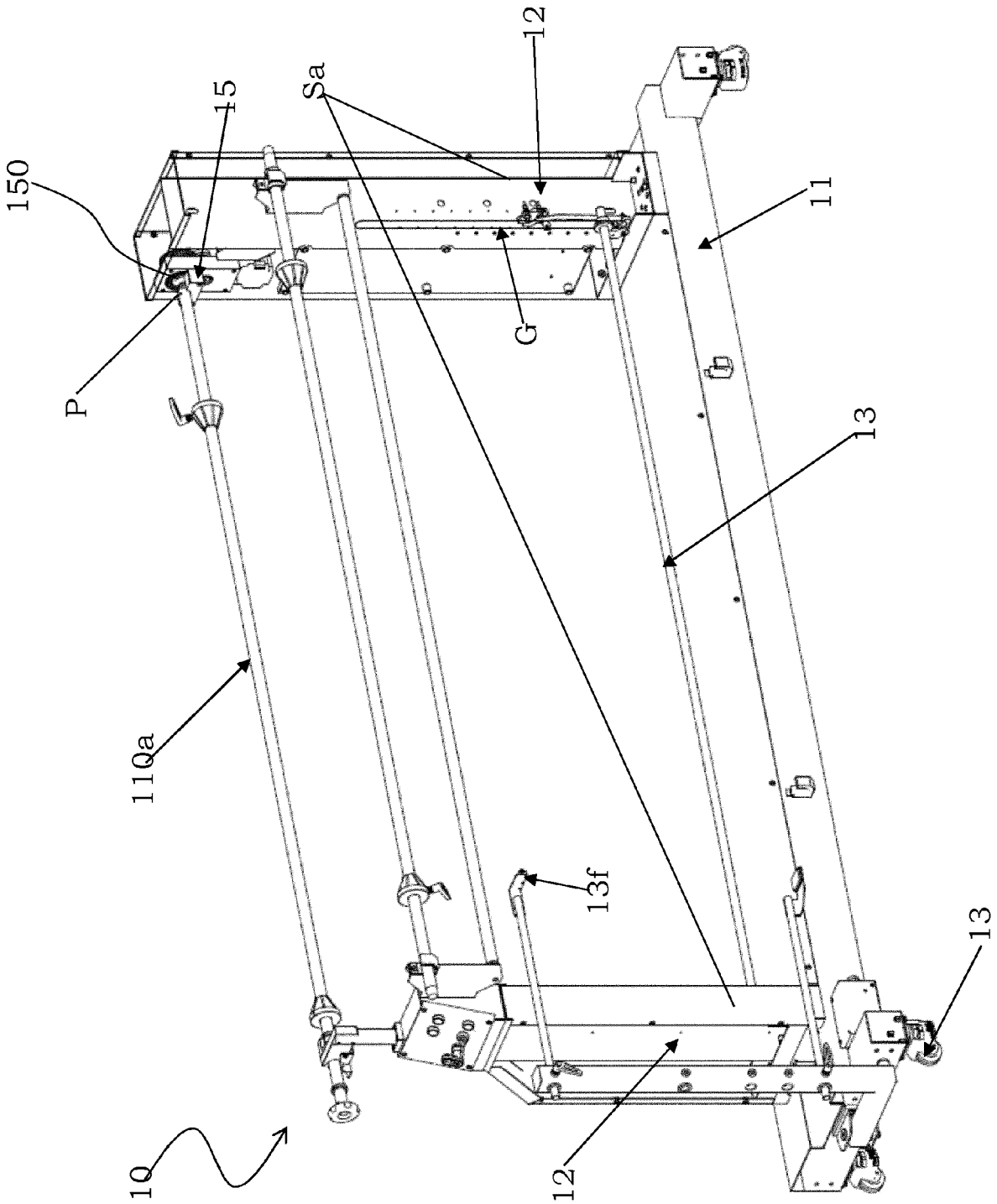

FIG. 2

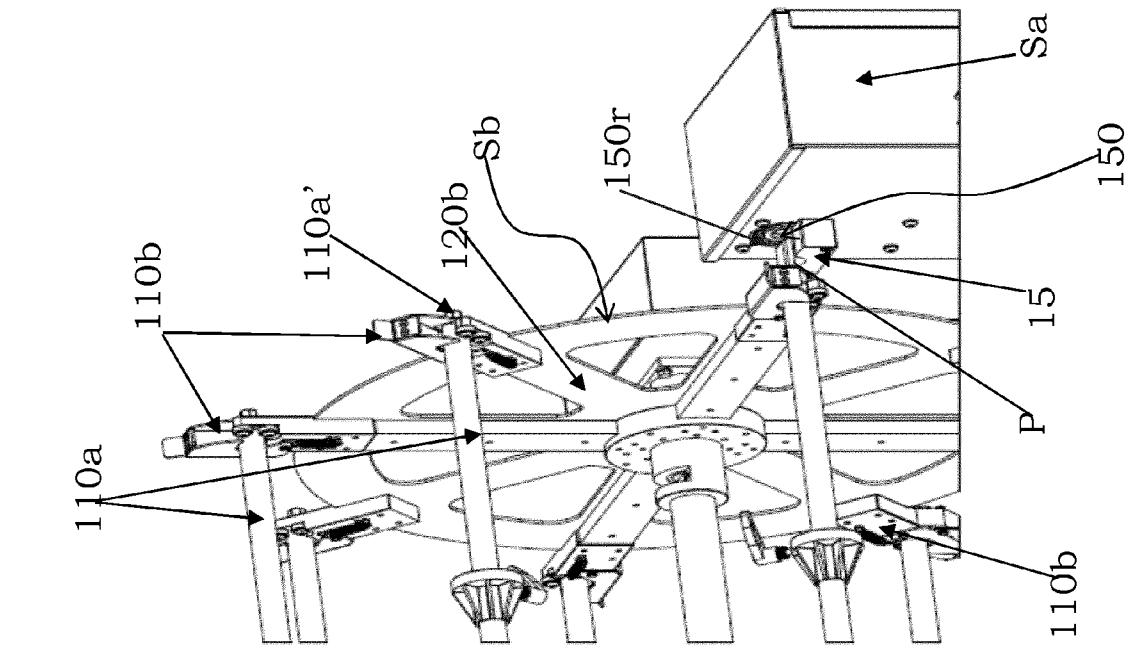
110a
110b
110a'
120b
Sb
150r
Sa
150
15
P
110b

FIG. 3B

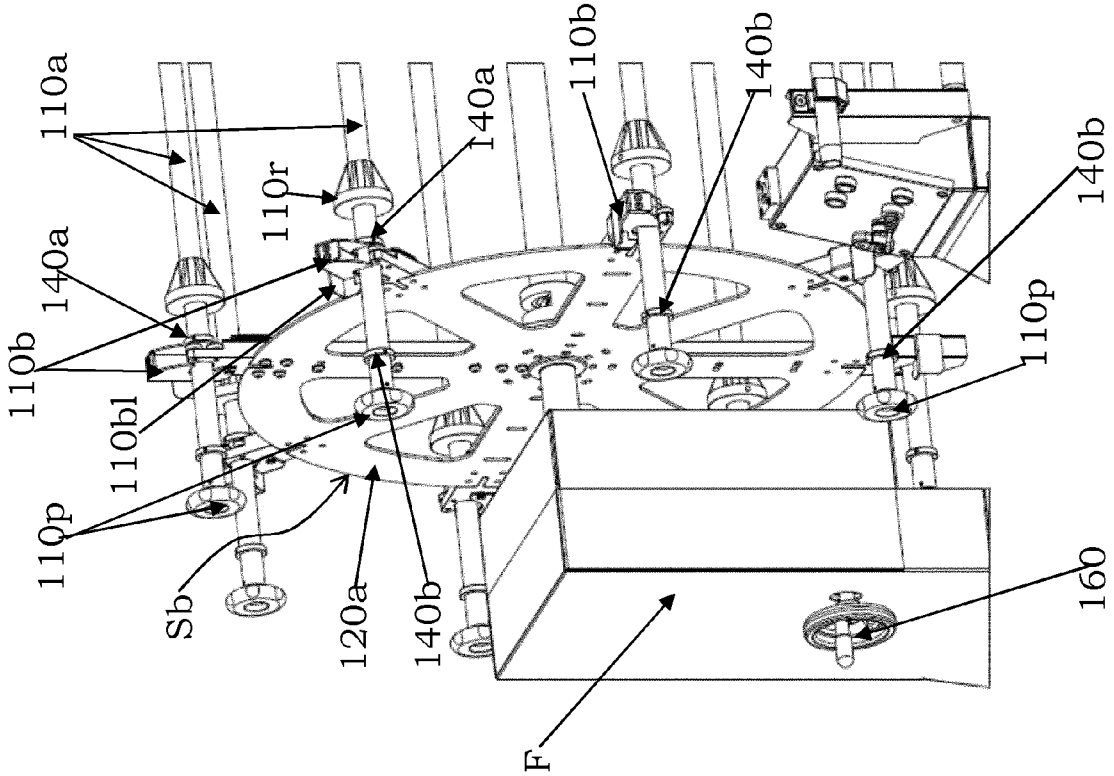
110a
140a
110r
110b
140b
110b
110b1
110p
Sb
120a
140b
F
160
140b
110p

FIG. 3A

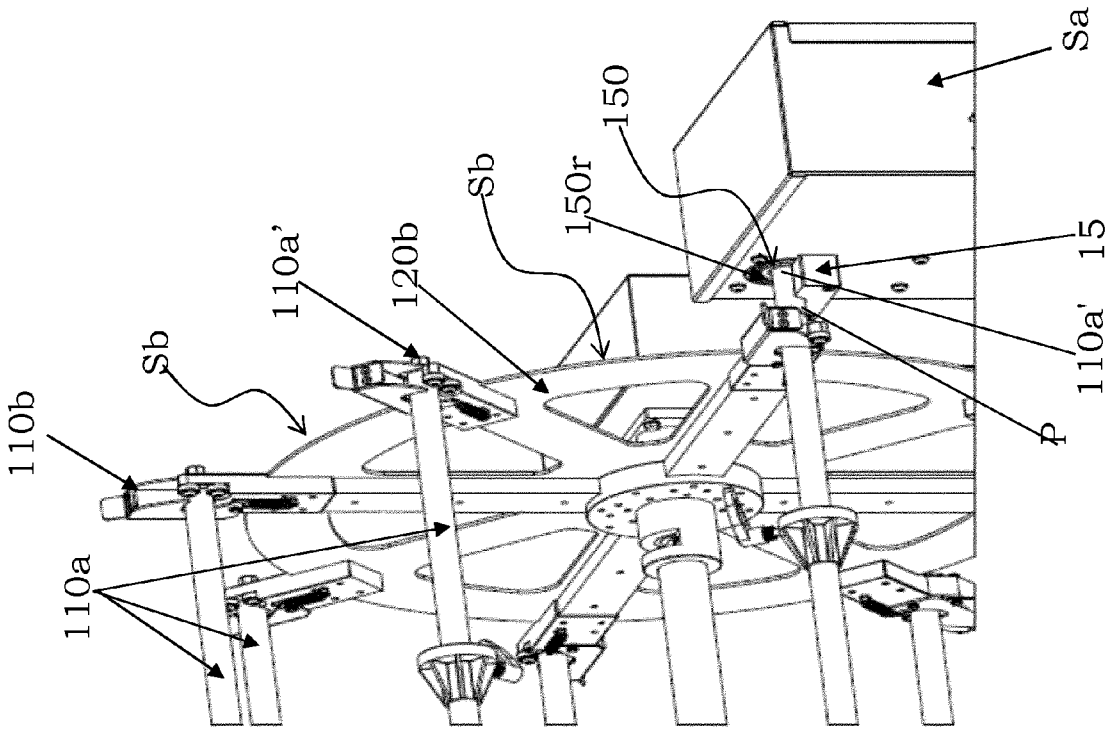
110b
Sb
110a'
120b
Sb
150r
150
Sa
110a
P
110a' 15

FIG. 4B

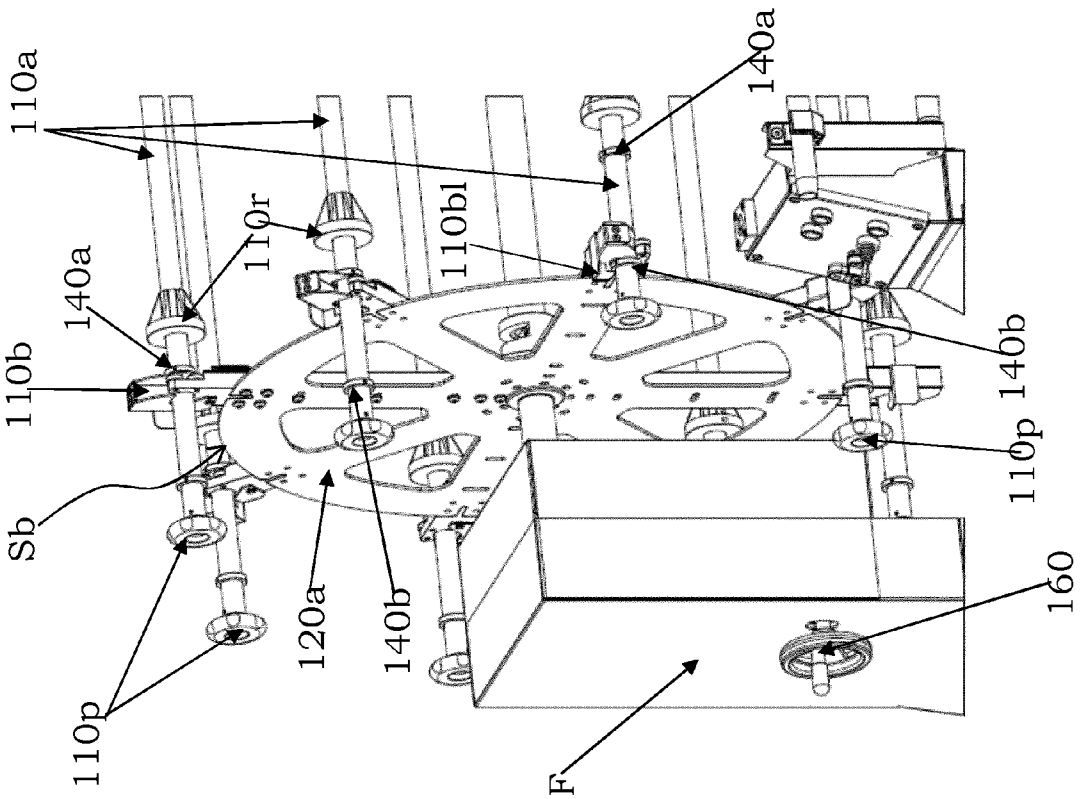
110a
140a
110r
110b1
140a
110b
Sb
140b
120a
140b
110p 140b
110p
160
F

FIG. 4A

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EUROPEAN SEARCH REPORT

Application Number
EP 24 19 2138

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2017/152120 A1 (MONTOYA ADAM [US] ET AL) 1 June 2017 (2017-06-01) * paragraphs [0022] - [0027], [0032], [0035] - [0037], [0042] - [0044], [0050] * * figures 1-9 *	1-20	INV. B65H16/02 B65H16/06
A	US 4 392 912 A (HORSLEY JOHN K [GB]) 12 July 1983 (1983-07-12) * column 1, lines 50-59 * * column 2, lines 25-66 * * figures 1-3 *	2	
A	US 5 330 126 A (GRISCHENKO GREGORY I [US]) 19 July 1994 (1994-07-19) * column 3, lines 5-30 * * column 3, line 45 - column 4, line 9 * * column 5, line 59 - column 6, line 20 * * column 6, line 67 - column 7, line 41 * * figures 1-3 *	1	

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B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 November 2024	Cescutti, Gabriel

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27-11-2024

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