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(54) **MACHINE FOR PRODUCING BOBBINS OF YARN WITH SUPERIMPOSED WINDING POSITIONS WITH MULTIPLE MOTOR DRIVES**

MASCHINE FÜR DAS PRODUZIEREN VON GARNSPULEN MIT ÜBEREINDANDER LIEGEND WICKELPOSTEN MIT MEHREREN ANTRIEBEN

MACHINE PRODUISANT DES BOBINES DE FIL INCLUANT DES EMPLACEMENTS DE BOBINAGE SUPERPOSÉS AVEC PLUSIEURS MOTEURS

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(56) References cited:

FR-A1- 2 575 738 US-A- 5 192 032

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Description

Technical Field

[0001] The present invention relates to improvements to yarn processing machines. More in particular, the invention relates to machines for winding bobbins of yarn. Some embodiments of the invention relate specifically to texturing machines.

State of the art

[0002] In the textile field, in particular in the production of synthetic yarns, the single yarns are subjected to various machining processes, which require unwinding of semi-finished yarns from supply bobbins and rewinding of processed yarns on take-up bobbins. For example, in the production of textured and/or composite yarns comprising an elastomeric yarn core and a covering formed by a textured covering yarn, machines are used that are provided with a plurality of winding stations, aligned according to one or two operating fronts, which are fed with a yarn to be textured, which is textured along the feed path and then coupled if necessary, in an interlacing jet, with an elastomeric yarn, to produce a composite yarn that is wound on single bobbins. Machines of this type comprise a high number of winding stations, mutually adjacent and aligned along operating fronts. Each winding station can comprise one or more mutually superimposed take-up or winding positions.

[0003] Texturing and interlacing machines for producing composite yarns are described in EP1551745, EP1411014 and EP1689664. A machine for producing interlaced yarns with a plurality of mutually superimposed take-up or winding positions in each winding station is described in EP 1448819.

[0004] These machines occupy a very wide surface area and therefore have high costs. There is therefore the need to provide machines with a smaller footprint, in which a larger number of bobbins can be formed in mutually superimposed winding positions.

SUMMARY OF THE INVENTION

[0005] According to the invention, this and other objects and advantages, which will be apparent to those skilled in the art from reading the text below, is achieved by arranging at least four mutually superimposed winding positions in each winding station of the machine and on each operating front of the machine. Such a machine is described in US 5,192,032. However, with this arrangement the distance between the yarn winding point and the yarn dispensing point from the last feed roller of a feed station placed above the winding positions is greatly variable. This distance increases fourfold passing from the first to the last winding position. As the yarn processed in the feed station can undergo variations, for example in tension, along the free path to the point of take-up on

the winding bobbin and as these variations can be a function of the length of the free path, by arranging a large number of mutually superimposed winding positions at increasing distance from the last feed roller that controls the yarn, this can cause the problem of producing bobbins that are not homogeneous with one another, for example with regard to the tension of the wound yarn, and therefore with different densities. These variations in quality cause a lack of uniformity in the properties of the yarn, which can have a negative influence on subsequent operations, such as dyeing and/or knitting or weaving. Therefore, the invention also provides for the combination of several winding or take-up positions and for independent motor drives for groups of winding positions. In this way, it is possible to regulate each motor drive separately from the others and compensate any variations in the feed parameters of the yarn due to the different length of the feed paths.

[0006] Therefore, according to some embodiments, the invention provides for machine for producing bobbins of yarn, comprising a plurality of winding stations mutually aligned on at least one operating front, wherein:

each winding station comprises at least one feed zone for feeding a plurality of yarns toward a corresponding underlying plurality of mutually superimposed winding positions;

each winding position comprises a support for a tube on which one of said yarns is wound to form a bobbin, a motorized winding roller arranged to be in contact with the winding bobbin, and a traversing device, to distribute the yarn in helical turns around the bobbin being formed;

each winding station comprises at least four mutually superimposed winding positions, with four paths for respective yarns from the feed zone to the winding positions, and the four winding positions are divided into two pairs, each of which comprises a respective motor drive system, separate and independent with respect to the other pair.

[0007] By grouping the winding positions in pairs an optimal arrangement is obtained, which on the one hand solves the problem of the variation in length of the feed path of the yarns, due to the possibility of acting on the operating parameters, for example the winding speed, of the winding positions. On the other hand, the arrangement is such as not to greatly increase the costs, as a single motor drive controls more than one level of take-up positions.

[0008] According to some advantageous embodiments, the machine is a texturing machine. In embodiments the texturing machine comprises supports for bobbins of starting yarn, for example in the form of one or more creels. Between the supports of the bobbins of starting yarn and the respective winding stations there are advantageously arranged texturing members of yarns fed to the machine. The texturing members can comprise

one or more ovens, one or more cooling zones, one or more twisting or false twisting members, one or more feed rollers with optional differential control of the peripheral speeds of the rollers placed in series along the path of the respective yarns, so as to define tensioning zones, or relaxation zones, or combinations thereof. For example, along the feed path of the yarns an oven can be provided, followed by a cooling zone, downstream whereof a false twisting member is arranged. Downstream thereof, one, two, three or more motorized feed rollers with controlled speed can be provided. Each of the feed rollers can advantageously be associated with an idle roller, to form a yarn feed nip, each nip being formed by two adjacent rollers, one of which is preferably motorized and the other is idle.

[0009] Further features and embodiments of the invention are described hereunder with reference to embodiments of the invention and in the appended claims, which form an integral part of the present description.

[0010] In particular, the machine preferably has two opposite operating fronts, on each of which there are arranged at least four winding positions for each winding station, divided into two pairs of winding positions, each provided with a respective independent motor drive system.

[0011] Advantageously, each motor drive system can comprise a first motor for rotation of the respective two motorized winding rollers and a second motor for operation of the two respective traversing devices.

[0012] In advantageous embodiments, on each operating front drive shafts, extending through all the winding stations, are arranged. In practice, there can be provided on each front there can be as many mutually superimposed drive shafts as there are winding or take-up positions. Similarly, there can be as many shafts for operation of the traversing devices as there are mutually superimposed winding positions. In substance, the winding rollers of the winding positions positioned at a same height are operated by a single drive shaft. Similarly, the traversing devices of winding positions positioned at a same height are operated by a same drive shaft. It must be understood that, usually, each drive shaft will be formed by single portions or parts, joined together by appropriate joints, to form a single component of suitable length.

[0013] In some embodiments, two motors will be provided for each pair of winding positions: the first driving the winding roller and the second driving the traversing device. When all the winding rollers of the winding positions positioned at the same height are driven by a single shaft, and all the traversing devices of the winding positions positioned at the same height are driven by a single shaft, at the head of the machine there can be provided, for each operating front, the same number of pairs of motors as the pairs of winding positions of a single winding station. By arranging four winding positions in each winding station, there will be provided in total four motors for each operating front of the machine: two motors for the first pair of winding positions will respectively control

the drive shaft of the winding rollers and the drive shaft of the traversing devices of the first pair of winding positions; two motors for the second pair of winding positions will respectively control the drive shaft of the winding rollers and the drive shaft of the traversing devices of the second pair of winding positions

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The present invention will be better understood by following the description and accompanying drawing, which shows a non-limiting exemplary embodiment of the invention. More in particular, in the drawing:

Fig.1 shows an overall axonometric view of a machine embodying the invention;

Fig.2 shows a cross section along the line II-II of Fig. 1;

Fig.3 shows an enlargement of the central part of Fig.2;

Fig.4 shows a view along line IV-IV of Fig.3 of a portion of the machine;

Fig.5 shows an enlargement of Fig.4 at the bobbins of elastomeric yarn;

Figs.6A-6C show axonometric views of the system for supporting and replacing the bobbins of elastomeric yarn in different operating positions;

Fig.7 shows a front view of the motor drives on the head of the machine;

Fig.8 shows a front view of a lateral side member of a module of the machine;

Fig.9 shows a front view of a lateral side member of a module of the machine in a different embodiment;

Fig. 10 shows a front view of an intermediate vertical structure for facilitating assembly;

Fig.11 shows an axonometric view of the framework or load bearing structure of a single module of the machine.

Detailed description of embodiments of the invention

[0015] The following detailed description of the exemplary embodiments refers to the accompanying drawings. The same reference numbers in different drawings identify the same or similar elements. Additionally, the drawings are not necessarily drawn to scale. Also, the following detailed description does not limit the invention. Instead, the scope of the invention is defined by the appended claims.

[0016] Reference throughout the specification to "one embodiment" or "an embodiment" or "some embodiments" means that the particular feature, structure or characteristic described in connection with an embodiment is included in at least one embodiment of the subject matter disclosed. Thus, the appearance of the phrase "in one embodiment" or "in an embodiment" or "in some embodiments" in various places throughout the specification is not necessarily referring to the same embodiment(s).

Further, the particular features, structures or characteristics may be combined in any suitable manner in one or more embodiments.

[0017] Fig.1 shows a schematic and simplified axonometric view of a machine according to the invention in a possible embodiment. The machine is indicated as a whole with 1 and has a plurality of winding stations indicated as a whole and schematically with 3, aligned according to a direction of alignment A, along which the machine 1 extends. In advantageous embodiments, the machine has two operating fronts 3A, 3B, arranged on opposite sides of the longitudinal extension of the machine and located on each of which are a series of winding stations, the two series being substantially symmetric with respect to a median line. In some embodiments, at the head of the machine 1 an electrical enclosure 5 is provided, in which there can be housed electrical and electronic logic, control and power devices, not described in greater detail, and the motor drives to control the rotating shafts of the machine, as described in greater detail below.

[0018] In front of each machine front 3A, 3B respective series of creels are arranged, which are labeled 7A and 7B respectively in Fig.1. In a known manner the creels 7A, 7B comprise supports for bobbins of a starting yarn that is to be processed and wound, optionally forming a composite yarn consisting of a covering yarn and of an elastomeric yarn.

[0019] Between the creels 7A, 7B and the winding stations 3 aligned according to the operating front or fronts 3A, 3B, there are advantageously provided paths 9A, 9B for feeding the yarns unwound from the bobbins located in the creels 7A, 7B and which are fed to the operating members of the machine 1, described in greater detail below.

[0020] Fig.2 shows a section along line II-II of Fig.1 of the machine 1 in a possible embodiment. In the example illustrated, the creels 7A, 7B comprise a plurality of carriages 8A, 8B movable according to the double arrow f8 to facilitate movement thereof with respect to a vertical median line P-P of the machine 1. B1 indicates the starting yarn bobbins, mounted on the creels 7A, 7B, the yarn F1 whereof will be processed in the machine 1.

[0021] The yarns F1 coming from the bobbins B1 of the creels 7A, 7B are fed to respective feed rollers 11, 13, arranged above the creels 7A, 7B and wherefrom the yarns coming from the bobbins B1 are fed to texturing ovens 13A, 13B located along the paths 9A, 9B of the yarn (Fig.1).

[0022] In some embodiments, the ovens 13A, 13B are arranged inclined from the bottom toward the top and from the creels toward the operating fronts, indicated with 3A and 3B respectively in Fig.2. Downstream of the ovens 13A, 13B surfaces can be positioned for cooling and/or guiding the yarn before reaching a stretching and/or false twisting zone, as described below.

[0023] Fig.3 shows an enlargement of the central zone of the machine. In this figure, the main components of a

single winding station are visible in a section according to a vertical plane orthogonal to the direction of alignment A of the winding stations. Fig.4 shows a front view of one of the operating fronts 3A, 3B limited to one part of the winding stations. In advantageous embodiments, the stations of the machine 1 are divided into modules, each of which comprises a given number of winding stations, each in turn comprising a given number of winding positions on each front 3A, 3B of the machine 1. As illustrated in particular in Fig.4, the single module of the machine 1 comprises four winding stations 1A aligned along the direction A.

[0024] In Fig.3, for each operating front 3A, 3B the path of each of a plurality of yarns F1 coming from the respective creel 7A, 7B is shown. In some embodiments, each winding station 1A of the machine 1 comprises a feed zone 15 through which the yarns F1 coming from the creels 7A, 7B travel to be fed toward a plurality of underlying winding positions 17.

[0025] As mentioned above in the embodiment illustrated, in each winding station 1A four mutually superimposed winding positions 17 are provided, indicated with 17A, 17B, 17C and 17D respectively, starting from the highest to the lowest position.

[0026] In the embodiment illustrated in Fig.3 and Fig.4, as will be better explained below, from the feed zone 15 four composite yarns FC are fed toward the four underlying winding positions 17A-17D, each composite yarn FC being formed by the combination of one of the respective four starting yarns F1 coming from the creels 7A, 7B with a corresponding elastomeric yarn F2. The elastomeric yarns are fed, parallel to the yarns F1, from respective bobbins of elastomeric yarn indicated with B2 and housed in the feed zone 15 of each station 1A. See also the enlargement of Fig.5

[0027] In the embodiment illustrated, as each winding station 1A comprises four superimposed winding positions 17A-17D, in each winding station 1A four bobbins B2 are provided for feeding four elastomeric yarns F2 in parallel that are covered, in the manner described below, by means of four corresponding covering yarns F1.

[0028] In each winding station 1A false twisting units 19 are provided, arranged in the upper part of the feed zone 15. The false twisting units 19 are known and will not be described in detail herein. Advantageously, the number of false twisting units 19 for each winding station 1A is equal to the number of yarns F1 fed from the respective creel 7A, 7B toward the operating front of the machine 1.

[0029] In the feed zone 15 guide rollers 21 are also provided, one for each yarn F1, which divert the yarns F1 toward respective pairs of feed rollers 23, 25. In some embodiments the roller 23 is motorized, while the roller 25 is idle. In Fig.3 the two rollers 23, 25 are represented spaced apart from each other, but it must be understood that during effective operation of the machine 1 the distance between the rollers 23, 25 is such that the two rollers are in mutual contact and form a nip through which

the yarn F1 that is pinched between the rollers 23, 25 passes. In this way, the controlled rotation of the motorized roller 23 causes feed of the yarn or yarns F1 toward the underlying members. The rollers 23 and 25 can have an axial extension such as to engage a single yarn F1, as in the example illustrated (Fig.4). In this way, each yarn F1 is pinched and drawn by a respective pair of rollers 23, 25. The rollers 23 can advantageously be fitted on a common drive shaft 23A, while the rollers 25 can be supported independently with respect to each other on autonomous spindles.

[0030] It would also be possible to use rollers 23 and/or 25 of larger axial dimension, so that a single pair of rollers 23, 25 (or one roller 23 and a plurality of rollers 25, or a single roller 25 and a plurality of rollers 23) engage several yarns F1 fed in parallel.

[0031] As can be seen in particular in Fig.3, each yarn F1 follows an almost vertical path from the pair of feed rollers 23, 25 toward a further pair of rollers 27, 29 arranged in a position lower than the pair of the rollers 23, 25. Advantageously, one of the rollers 27, 29, for example the roller 27, is motorized, while the other, for example the roller 29 is idle. In Fig.3 the rollers 27, 29 are illustrated spaced apart, but it must be understood that during effective operation of the machine the rollers 27, 29 are adjacent to each other so that the yarn F1 is pinched between the rollers 27, 29 drawn by rotation of the roller 27. Reference 27A indicates a common drive shaft on which the motorized rollers 27 can be mounted.

[0032] Downstream of the pair of rollers 27, 29 a path extends, along which the yarn F1 advances together with an elastomeric yarn F2 fed from the corresponding bobbin B2.

[0033] As mentioned above, in each winding station 1A comprising four winding positions 17A-17D four bobbins B2 of elastomeric yarn are provided, supported by respective supports 20, which will be described in greater detail below with specific reference to Figs.6A-6C. Each support 20 can hold the respective bobbin B2 of elastomeric yarn F2 in contact with a motorized unwinding roller 22. As will be clarified below, each support 20 can be movable to move the bobbin B2 away from the motorized unwinding roller 22 and to perform operations to remove the exhausted bobbin B2 and replace it with a new bobbin B2 of elastomeric yarn F2, or to perform other operations.

[0034] The unwinding rollers 22 associated with the bobbins B2 of elastomeric yarn F2 can be mounted on a common drive shaft 22A.

[0035] In the embodiment illustrated in Fig.3 the parallel path of the yarns F1 and F2 passes through an interlacing jet 31, where the elastomeric yarn F2 is covered by the covering yarn F1, in a known manner. This latter can in practice consist, for example, of a plurality of filaments with micrometric cross section. Passing through the interlacing jet 31 the filaments forming the covering yarn F1 cover the elastomeric yarn F2 in a more or less regular manner.

[0036] Therefore a composite yarn FC formed by the

combination of the elastomeric yarn F2 covered with the covering yarn F1 is delivered from the interlacing jet 31.

[0037] Downstream of the interlacing jet 31, for each composite yarn FC a yarn guide 33 can be provided, for example made of ceramic, through which the composite yarn FC passes. Downstream of the yarn guide 33 the path of the composite yarn FC extends through a nip formed between a further pair of rollers 35 and 37. In some embodiments, the roller 35 can be motorized and the roller 37 can be idle. The rollers 35 can be mounted on a common drive shaft 35. The idle rollers 37 can be supported independently with respect to each other.

[0038] In the schematic representation of Fig.3 the rollers 35 and 37 are illustrated spaced apart from each other, with a greater distance between them with respect to the effective distance during operation of the machine. In fact, during effective operation, the rollers 35 and 37 are adjacent to each other to form a feed nip of the composite yarn FC. This latter, pinched between the rollers 35 and 37, is drawn by the rotation of the motorized roller 35 and subsequently advances along a path that can extend, for example, through further yarn guides 38 and 39. In a known manner, between the yarn guides 38 and 39 a system for oiling the yarns can be provided.

[0039] At a lower height with respect to the interlacing jet 31 and to the pair of rollers 35, 37 the four mutually superimposed winding positions 17A-17D are arranged. The path of the four composite yarns FC, which feed the four superimposed winding positions 17A-17D, extends from the respective pair of rollers 35, 37 downward so that one of the four composite yarns FC formed in each winding station 1A is fed to each winding position 17A-17D. In the diagram of Fig.3 the four composite yarns FC fed to the four winding positions 17A-17D are indicated with FC^A , FC^B , FC^C and FC^D respectively.

[0040] In some embodiments, each winding position 17A-17D can comprise a support 41 for a respective winding tube T, on which bobbins B3 of composite yarn FC are formed. In some embodiments, the winding movement according to the arrow fB3 is imparted to the respective bobbin B3 by a corresponding winding roller 43 provided in each winding position 17A-17D. In Fig.3, the supports 41 of the four winding positions 17A-17D are marked with the reference 41A-41D and similarly the motorized winding rollers are indicated with 43A-43D for the four winding positions 17A-17D.

[0041] In the condition illustrated in Fig.3, each support 41A-41D is positioned so as to support the respective bobbin B3 at a greater height with respect to the respective motorized roller 43A-43D. Moreover, during the effective winding of the composite yarn FC the position of the supports 41A-41D is such that the outer surface of the bobbin B3 being formed is maintained in contact with the respective motorized winding roller 43A-43D and pressed against it. In this way the bobbin being formed B3 is maintained in rotation due to the friction between the respective motorized winding roller 43A-43D and the outer surface, initially of the tube T and then of the bobbin

B3 being formed.

[0042] Each winding position 17A-17D can advantageously comprise a traversing device that is used to distribute the yarn FC uniformly along the axial extension of the respective bobbin B3, imparting to the yarn during winding a reciprocating movement parallel to the winding axis of the tube T. The traversing device is indicated as a whole schematically with 45A-45D for the four winding positions 17A-17D that are located on each operating front of the machine 1 at each winding station 1A.

[0043] In advantageous embodiments the motorized rotating members of each front 3A, 3B of the machine 1 described above can be operated by continuous shafts that extend from one to the other of the two opposite heads of the machine 1. Continuous shafts are intended as mechanical members that can also consist of several portions, lengths or parts connected to one another by means of appropriate joints, but which are advantageously and preferably rotated by a single motor for each shaft, positioned at the head 5.

[0044] In practice, the motorized rotating members positioned along each operating front 3A, 3B of the machine 1 are as follows: the feed rollers 23 of the covering yarns F1; the feed rollers 27 of the covering yarns F1 in parallel with the elastomeric yarns F2; the motorized feed rollers 35 of the composite yarns FC; the unwinding rollers 22 of the elastomeric yarns F2; the motorized winding rollers 43A-43D of the four take-up or winding positions 17A-17D; and finally the four drive shafts of the traversing device units 45A-45D of the four superimposed winding positions on each operating front 3A, 3B. Fig.7 shows a possible and advantageous arrangement of electric motors on the head 5 of the machine 1 for operation of the motorized rotating members indicated above.

[0045] More in particular, with reference to Fig.7, for each front 3A, 3B of the machine 1 a first electric motor 51 is provided for controlling rotation of the common shaft 23A, on which the motorized feed rollers 23 of the covering yarn F1 are fitted.

[0046] Advantageously, underneath the motor 51 a further motor 53 can be provided for rotation of the drive shaft 22A on which the unwinding rollers 22 of the bobbins of elastomeric yarn B2 are fitted.

[0047] The shaft 27A on which the feed rollers 27 are fitted can be rotated by a third motor 55.

[0048] Advantageously, in some embodiments a fourth motor 57 rotates the rollers 35 fitted on the shaft 35A.

[0049] In this way, it is possible to independently control the rotation speed of the feed rollers 23, 27 and 35, and of the unwinding roller 22.

[0050] The motorized winding rollers 43-43D of the four winding positions 17A-17D on each front 3A, 3B of the machine 1 can advantageously be operated by a pair of motors, each of which rotates two operating shafts of the winding rollers of two adjacent winding positions. In some embodiments, a motor 59 rotates shafts 61 and 63 on which the winding rollers 43A and 43B of the winding positions 17A and 17B are fitted. Advantageously, in

some embodiments an endless flexible member can be provided, for example a belt, preferably a toothed belt 65, which transmits motion from the common motor 59 to the two substantially parallel shafts 61 and 63, so that the series of motorized winding rollers 43A and 43B rotate in a substantially synchronous manner.

[0051] A further motor 67, positioned under the motor 59, can be provided to rotate the shafts 69 and 71 on which the motorized winding rollers 43C and 43D, respectively, are fitted. An endless flexible member, for example a toothed belt 73, can transmit motion from the motor 67 to the two shafts 69 and 71. In this way synchronous rotation of the motorized winding rollers 43C and 43D of the winding positions 17C and 17D is obtained.

[0052] In advantageous embodiments, a further motor 75 rotates a shaft 77 that controls the traversing devices 45A of the first winding position 17A, and a second operating shaft 79 of the traversing devices 45B of the second winding position 17B. A flexible member, for example a toothed belt 81, transmits motion from the motor 75 to the drive shafts 77, 79 of the traversing devices 45A, 45B. Therefore, these latter are controlled synchronously by the common motor 75.

[0053] Similarly, a further motor 83 can be provided to rotate a driving shaft 85 of the traversing devices 45C of the winding positions 17C and an operating shaft 87 of the traversing devices 45D of the winding positions 17D. An endless flexible member, for example a toothed belt 89, can be provided to operate the drive shafts 85 and 87 synchronously so that the traversing devices 45C and 45D are controlled synchronously.

[0054] In practice, in this advantageous embodiment, the winding positions 17A-17D are divided into two groups, respectively comprising the winding positions 17A, 17B and the winding positions 17C, 17D. Each pair of alignments of winding positions comprises independent operating motors with respect to those of the other pair of alignments of winding positions. The motors 59, 75 control the moving members (winding rollers and traversing devices) of the winding positions 17A, 17B, while the motors 67 and 83 operate the moving members (winding rollers and traversing devices) of the winding positions 17C, 17D.

[0055] The motors 59, 75 can be controlled independently with respect to the motors 67, 83, so as to be able to take account of the fact that the feed paths of the composite yarns FC from the nip defined by the rollers 35, 37 to the respective winding bobbin B3 have largely different lengths due to the height at which the respective winding bobbins B3 are arranged. By acting independently on the motors 59, 75 and on the motors 67, 83 it is possible to offset the variations in the feed conditions of the yarns FC so as to obtain bobbins B3 substantially the same as one another notwithstanding the different length of the feed paths. In practice, it is possible to modify the rotation speed of the winding rollers 43C, 43D with respect to the rotation speed of the winding

rollers 43A, 43B and also the speed of the reciprocating movement of the traversing devices 45C, 45D with respect to the corresponding speed of the traversing devices 45A, 45B. The variation in speed can offset the different feed tension that is generated along the paths of variable length of the yarns FC from the nip between the rollers 35, 37 and the winding point on the respective bobbins B3.

[0056] The use of independent motor drives for the two superimposed pairs of take-up units allows further advantages to be achieved. In particular, the machine thus configured allows two yarns to be fed and processed in parallel along two separate paths and to take them up on a single final bobbin B3. Therefore, in each section comprising four take-up units and four yarn paths, all four paths but only two take-up units will be used, to form two bobbins in parallel, on each of which two yarns are wound. When the machine operates in this way, one of the two motor drives and all the members controlled thereby can remain at a standstill.

[0057] According to advantageous embodiments, to obtain a more compact arrangement of the bobbins B2 of elastomeric yarn F2, particular measures are adopted in the configuration of the supports 20 of these bobbins B2. In fact, it is advantageous for all the bobbins B2 of elastomeric yarn F2 to be arranged at the same height, to prevent differences in the feed conditions of the various elastomeric yarns F2 to the interlacing jets 31. For this purpose, the supports 20 must be configured so that in a footprint corresponding to the axial dimension of a take-up bobbin B3 four bobbins of elastomeric yarn B2 are arranged. In this way, the bobbins of elastomeric yarn F2 can be placed substantially coaxial to one another and therefore paths that are substantially the same can be defined for each of the four elastomeric yarns F2 that are fed to the four underlying take-up positions, to the advantage of uniformity of the production conditions of the various bobbins B3 of composite yarn FC.

[0058] To facilitate handling of the bobbins of elastomeric yarn B2 in the steps to replace exhausted bobbins with new bobbins and also, for example, in the case of accidental breakage of the elastomeric yarn with the need to restore feed, in some embodiments there is provided a particular form of the supports 20 in Fig.3. Additional structural and functional details of an embodiment of the supports 20 will now be described with specific reference to Figs.6A-6C, which show a portion of the zone in which the supports 20 are arranged, in an axonometric view and in different operating positions.

[0059] In some embodiments, each support 20 comprises an arm 91 constrained to a fixed structure 93 of the machine 1. Advantageously, each arm 91 can be pivoted in 91A to the structure 93 and can be provided with movement of limited pivoting according to the double arrow f91 about the fulcrum 91A.

[0060] Figs.6A and 6B show by way of example the arms 91 in two different angular positions. In Fig.6A the arms 91 are placed in an angular position such that the

outer surface of the respective bobbin B2 of elastomeric yarn F2 is in contact with the outer cylindrical surface of the unwinding roller 22. In this condition, rotation of the unwinding roller 22 causes, through friction, rotation in the unwinding direction of the bobbin B2. It must be understood that the position in which the arm 91 is located, when the bobbin B2 is in contact with the unwinding roller 22, varies as a function of the diameter of the bobbin B2. As the diameter of this bobbin decreases as a result of consumption of the elastomeric yarn F2, the arm 91 rotates, i.e. pivots downward as a result of gravity, maintaining contact between the outer surface of the bobbin B2 and the outer surface of the unwinding roller 22.

[0061] Fig.6B shows a position of maximum lifting of the arms 91 of the supports 20 of the bobbins B2 of elastomeric yarn F2. In this position a core or flange A2 of the respective bobbin B2 of elastomeric yarn F2 is located abutting against a respective brake 95 carried by a respective bracket 97 blocked on the fixed structure 93 of the machine, preferably in an angular position that can be adjusted by means of a screw 99 and a slot 100, for example. Adjustment of the angular position of the bracket 97 allows the position of the brake 95 to be adapted to the dimension of the diameter of the flange or core A2 of the bobbin B2 of elastomeric yarn F2.

[0062] In the position of Fig.6B, pressing the flange or core A2 of the bobbin B2 against the brake 95 causes rotation of the bobbin B2 to be stopped, for example when it is spent and must be replaced, or to perform an operation, for example to restore feed of the elastomeric yarn after a breakage.

[0063] In some embodiments the upward pivoting movement of each arm 91 can be imparted by a respective actuator 103, for example a piston-cylinder actuator of pneumatic or hydraulic type. The gradual lowering movement to follow the decrease in the diameter of the bobbin can be obtained simply through gravity.

[0064] In advantageous embodiments, each arm 91 of each support 20 carries an extractable element 105 bearing a support member of a respective bobbin B2, for example a shank or the like. The extractable element 105 can advantageously be provided with a gripping handle 105M, constrained to a rod or spindle 105A, at the end whereof, opposite to the handle 105M, a shank 105C or other member is constrained, for engaging the bobbin B2 of elastomeric yarn F2.

[0065] The extractable element 105 can advantageously be guided in a guide 91G that can be provided in the arm 91. In some embodiments, each extractable element 105 can move according to a direction substantially parallel to the extension of the arm 91 according to the double arrow f105 to alternatively take a retracted position as shown in Figs.6A and 6B and an extracted position as shown in Fig.6C for one of the arms illustrated therein. In the movement according to the double arrow f105 the extractable element 105 carries the bobbin B2 with it. This latter can therefore be translated until it is carried with its axis outside the volume occupied by the

other bobbins B2 positioned coaxial to one another in the respective unwinding positions. In Fig.6C it can be seen how extraction of one of the extractable elements 105 causes offset of the axes of the bobbins B2 facing one another, so that the bobbin B2 that is in the position farthest from the fulcrum 91A of the arm 91 can be removed with a movement parallel to its support axis 20, without interfering with the adjacent bobbin.

[0066] This configuration allows pairs of bobbins B2 in unwinding position to be arranged very close to one another in axial direction, as can be seen in Fig.4. The distance in axial direction between the bobbins B2 of each pair is less than the distance that would allow removal and insertion of a bobbin only with axial movement, without interference with the opposite bobbin. These movements are obtained by moving each bobbin B2 according to the direction f105 by means of the extractable element 105 until it is taken outside the volume occupied by the coaxial bobbins that remain in their original position. After the extraction movement has been performed, the bobbin extracted according to arrow f105 can be removed with a movement parallel to its axis and replaced with a new bobbin B2.

[0067] From the above it can be understood that the overall structure of the machine 1 is configured so as to concentrate a large number of components in reduced spaces, with superimposition of multiple unwinding and winding members so as to occupy a limited floor space. This causes considerable difficulties in the production of the load bearing structure of the machine. According to advantageous embodiments, assembly of the load bearing structure is facilitated by adopting a particular configuration of the respective metalwork that forms the frame of the machine. Figs.8 to 11 show components relating to the frame of a single module of the machine 1.

[0068] In some embodiments a module of the machine 1 comprises two lateral side members which, in mounted arrangement, are arranged vertically and which can each be configured as indicated in Fig.8 or Fig.9. Two adjacent modules of the machine 1 can have a common intermediate side member. Preferably, each module will have two respective side members that are arranged in mutually adjacent positions when the modules are mounted in sequence. Therefore, the total number of vertical side panels of the machine depends on the total number of modules of which the machine 1 is formed.

[0069] In Figs.8 and 9 the lateral side member is labeled 111. In advantageous embodiments the side member 111 is made of metal sheet. In Fig.8 the lateral side member 111 is formed of two parts, respectively an upper part 111A and a lower part 111B, mutually joined along an interface I. In other embodiments, as shown for example in Fig.9, the side member 111 can be made of a single continuous metal sheet. In the embodiment shown in Fig.3 there are used continuous vertical side members 111, i.e. made in one piece, of the type shown in Fig.9

[0070] The lateral side members 111 can have openings or slots 113, 115, 117, both with the function of light-

ening and for the passage of shafts for operation of the rotating members described above.

[0071] In some embodiments the vertical side panels 111 have arms 121 on both sides. As can be understood in particular also from Fig.3, the traversing device units 45A-45D of the four winding positions 17A-17D can be mounted at the arms 121.

[0072] Along the lower edge 111B of the side member 111 there can be provided recesses 111C, inside which there are inserted the ends of longitudinal beams 125 which extend parallel to the direction of alignment A of the winding stations 1A of the machine 1 and which join the vertical lateral side members 111.

[0073] Each vertical lateral side member 111 can be provided with feet 127 for supporting it on the floor. In Fig.11 the frame of a single module of the machine 1 is represented with four supporting feet. As can be observed in Fig.3, two mutually adjacent vertical lateral side members 111 belonging to two consecutive modules of the machine 1 advantageously have staggered feet, to prevent the feet of one side member from interfering with those of the adjacent side member.

[0074] The two adjacent vertical lateral side members 111 that delimit the portion of frame illustrated in Fig.11 can be joined, as well as by the two lower horizontal beams 125, also by two crossed tie rods 129.

[0075] In some embodiments between the vertical lateral side members 111 horizontal longitudinal elements 131 can be arranged, which are constrained at their ends to the two respective vertical lateral side members 111. Advantageously, on each operating front 3A, 3B of the machine 1 there can be provided the same number of horizontal longitudinal elements 131 as the number of levels in which the winding positions 17A-17D are arranged. Therefore, in the example illustrated, the frame of a single module has eight horizontal longitudinal elements 131, four for each front. The longitudinal elements 131 are advantageously used to mount the supports 41A-41D of the winding bobbins B3 of the various winding positions 17A-17D positioned on the two operating fronts 3A, 3B of the machine 1.

[0076] In advantageous embodiments, in order to facilitate assembly of the frame of each module of the machine 1 and to support the weight of the members of the winding positions, between the two vertical lateral side members 111 can be placed an intermediate vertical structure 135 for facilitating assembly. One of these vertical intermediate structures 135 for facilitating assembly is illustrated in isolation in Fig.10. In some embodiments, the intermediate vertical structure for facilitating assembly 135 can consist of metal sheet, similarly to the side members 111. In some embodiments the intermediate vertical structure 135 for facilitating assembly can have a plurality of lateral arms 135A. In the embodiment illustrated, four lateral arms 135A are provided on each side of the intermediate vertical structure 135 for facilitating assembly. In practice, the number of lateral arms 135A on each side of the intermediate vertical structure 135

for facilitating assembly can be the same as the number of winding positions 17A-17D on each operating front of the machine 1.

[0077] The lower arms 135A are also used to constrain the intermediate vertical structure 135 for facilitating assembly to the longitudinal beams 125.

[0078] Advantageously, each arm 135A of the intermediate vertical structure 135 for facilitating assembly can be used to constrain a respective longitudinal element 131, simplifying and facilitating assembly of the components of the frame of the machine and of the mechanical members supported by this frame and stiffening the horizontal longitudinal elements 131 that support a high weight, represented by the bobbins B3 being wound and by the relevant supports.

[0079] In the embodiment described with reference to the attached drawings, the machine comprises a texturing, false twisting and stretching system (ovens 13A, 13B, false twisting units 19 and feed rollers) and is configured to produce a composite yarn FC obtained by combining an elastomeric yarn and a covering yarn. For this purpose, supports 20 for the bobbins B2 of elastomeric yarn F2 and interlacing jets are provided. In other embodiments, the machine can have a simpler configuration, with only texturing, stretching and false twisting means, but without feed of elastomeric yarns F2. In this case, the supports 20 and the unwinding rollers 22 can be omitted. The interlacing jets can be maintained to treat the textured yarn F1 with a jet of air that increases its volume. In other embodiments also the interlacing jets can be omitted from the machine. In this case, the single yarns F1 are textured passing through the ovens 9A, 9B and subjected to false twisting and stretching before being wound in bobbins B3.

[0080] In other embodiments, the bobbins of elastomeric yarn B2 and the related feed members can be arranged in the zone of the creels 7A, 7B.

[0081] It is understood that the drawing shows just one example, provided merely as a practical demonstration of the invention, which can vary in its forms and arrangements, without however departing from the scope of the concept underlying the invention. Any reference numbers in the appended claims are provided to facilitate reading of the claims with reference to the description and to the drawing, and do not limit the scope of protection represented by the claims.

Claims

1. A machine (1) for producing bobbins (B3) of yarn, comprising a plurality of winding stations (1A) mutually aligned on at least one operating front, wherein:

each winding station (1A) comprises at least one feed zone for feeding a plurality of yarns toward a corresponding underlying plurality of mutually superimposed winding positions (17);

each winding position (17) comprises a support (41) for a tube (T) on which one of said yarns is wound to form a bobbin (B3), a motorized winding roller (43A-43D) arranged to be in contact with the winding bobbin (B3), and a traversing device (45A-45D), to distribute the yarn in helical turns around the bobbin (B3) being formed; each winding station comprises at least four mutually superimposed winding positions, with four paths for respective yarns from the feed zone to the winding positions;

characterized in that: the four winding positions (17A-17D) are divided into two pairs, each of which comprises a respective motorization system, separate and independent with respect to the other pair; and each motorization system comprises a first motor (59; 67) for rotation of the respective two motorized winding rollers (43A-43D) and a second motor (75; 83) for operation of the two respective traversing devices (45A-45D).

2. The machine (1) as claimed in claim 1, **characterized in that** it comprises two opposite operating fronts (3A, 3B), on each of which there are arranged at least four winding positions (17A-17D) for each winding station (1A), divided in two pairs of winding positions (17A, 17B; 17C, 17D), each provided with a respective independent motorization system.
3. The machine (1) as claimed in claim 1 or 2, **characterized in that** it comprises yarn texturing members.
4. The machine (1) as claimed in claim 3, **characterized in that** said yarn texturing members comprise one or more of the following members: heating ovens (13A, 13B); cooling members; twisting or false twisting units (19); motorized stretching or relaxation rollers.
5. The machine (1) as claimed in any one of the preceding claims, **characterized by** at least four operating shafts (69, 71) of the winding rollers (43A-43D) on each operating front (3A, 3B) of the machine (1), said shafts (69, 71) extending along the operating front (3A, 3B) and each shaft operating the motorized winding rollers (43A-43D) of the mutually adjacent winding positions at a same height.
6. The machine (1) as claimed in any one of the preceding claims, **characterized by** at least four operating shafts (85, 87) of the traversing devices (45A-45D) on each operating front (3A, 3B) of the machine (1), said shafts (85, 87) extending along the operating front (3A, 3B) and each shaft operating the four traversing devices (45A-45) of the mutually adjacent winding positions at a same height.

7. The machine (1) as claimed in claim 5 or 6, **characterized in that** the first motor (59; 67) of each motorization is associated with a first continuous flexible member (65, 73) that transmits movement to the respective two operating shafts (69, 71) of the motorized winding rollers (43A-43D). 5
8. The machine (1) as claimed in claim 5, 6 or 7, **characterized in that** the second motor (75; 83) of each motorization is associated with a second continuous flexible member (81, 89) that transmits the movement to the respective two operating shafts (85, 87) of the traversing devices (45A-45D). 10
9. The machine as claimed in any one of the preceding claims, **characterized by** supports (7A, 7B, 8A, 8B) for bobbins (B1) of starting yarn (F1), and wherein between said supports (7A, 7B, 8A, 8B) and the respective winding stations (1A) texturing members (13A, 13B, 19) are arranged. 15
10. The machine (1) as claimed in claim 9, **characterized in that** the texturing members comprises at least one oven (13A, 13B), at least one cooling zone, at least one more twisting or false twisting member (19), at least one feed roller (23, 25). 20
11. The machine (1) as claimed in one or more of the preceding claims, **characterized by** an interlacing jet (31) for each winding position (17A-17D). 25
12. The machine as claimed in claim 11, **characterized by** a support (20) for elastic yarn bobbins (B2) arranged and configured for feeding an elastic yarn (F2) towards the interlacing jet (31). 30

Patentansprüche

1. Maschine (1) zum Herstellen von Garnspulen (B3), die eine Anzahl an Wicklungsstationen (1A) umfasst, die gegenseitig an mindestens einer Bedienungsfront ausgerichtet sind, wobei: 40

jede Wicklungsstation (1A) mindestens eine Zufuhrzone zum Zuführen einer Anzahl an Garnen in Richtung einer entsprechenden zugrunde liegenden Anzahl von gegenseitig übereinanderliegenden Wicklungspositionen (17) umfasst; jede Wicklungsposition (17) einen Träger (41) für eine Hülse (T), auf der eines der Garne zum Bilden einer Spule (B3) aufgewickelt wird, eine motorisierte Wicklungswalze (43A-43D), die so angeordnet ist, dass sie sich in Kontakt mit der Wicklungsspule (B3) befindet, und eine Traversiervorrichtung (45A-45D), zum Verteilen des Garns in wendelförmigen Windungen um die Spule (B3), die gebildet wird, umfasst; 45

jede Wicklungsstation mindestens vier gegenseitig übereinander liegende Wicklungspositionen umfasst, mit vier Pfaden für jeweilige Garne von der Zufuhrzone zu den Wicklungspositionen;

dadurch gekennzeichnet, dass: die vier Wicklungspositionen (17A-17D) in zwei Paare unterteilt sind, von denen jedes ein jeweiliges Motorisierungssystem, getrennt und unabhängig hinsichtlich des anderen Paares, umfasst; und jedes Motorisierungssystem einen ersten Motor (59; 67) zur Drehung der jeweiligen zwei motorisierten Wicklungswalzen (43A-43D) und einen zweiten Motor (75; 83) zum Betrieb der zwei jeweiligen Traversiervorrichtungen (45A-45D) umfasst.

2. Maschine (1) gemäß Anspruch 1, **dadurch gekennzeichnet, dass** sie zwei gegenüberliegende Bedienungsfronten (3A, 3B) umfasst, an denen jeweils mindestens vier Wicklungspositionen (17A-17D) für jede Wicklungsstation (1A) angeordnet sind, unterteilt in zwei Paare von Wicklungspositionen (17A, 17B; 17C, 17D), die jeweils mit einem jeweiligen unabhängigen Motorisierungssystem versehen sind.
3. Maschine (1) gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** sie Garntexturierungselemente umfasst.
4. Maschine (1) gemäß Anspruch 3, **dadurch gekennzeichnet, dass** die Garntexturierungselemente eines oder mehrere der folgenden Elemente umfassen: Heizöfen (13A, 13B); Kühlelemente; Drall- oder Falschdralleinheiten (19); motorisierte Streck- oder Entspannungswalzen.
5. Maschine (1) gemäß einem der vorhergehenden Ansprüche, **gekennzeichnet durch** mindestens vier Antriebswellen (69, 71) der Wicklungswalzen (43A-43D) an jeder Bedienungsfront (3A, 3B) der Maschine (1), wobei sich die Wellen (69, 71) entlang der Bedienungsfront (3A, 3B) erstrecken und jede Welle die motorisierten Wicklungswalzen (43A-43D) der gegenseitig angrenzenden Wicklungspositionen auf einer selben Höhe betreibt.
6. Maschine (1) gemäß einem der vorhergehenden Ansprüche, **gekennzeichnet durch** mindestens vier Antriebswellen (85, 87) der Traversiervorrichtungen (45A-45D) auf jeder Bedienungsfront (3A, 3B) der Maschine (1), wobei die Wellen (85, 87) sich entlang der Bedienungsfront (3A, 3B) erstrecken und jede Welle die vier Traversiervorrichtungen (45A-45D) der wechselseitig angrenzenden Wicklungspositionen auf einer selben Höhe betreibt.
7. Maschine (1) gemäß Anspruch 5 oder 6, **dadurch**

- gekennzeichnet, dass** der erste Motor (59; 67) jeder Motorisierung mit einem ersten kontinuierlichen flexiblen Element (65, 73) verbunden ist, das eine Bewegung auf die jeweiligen zwei Antriebswellen (69, 71) der motorisierten Wicklungswalzen (43A-43D) überträgt. 5
8. Maschine (1) gemäß Anspruch 5, 6 oder 7, **dadurch gekennzeichnet, dass** der zweite Motor (75; 83) jeder Motorisierung mit einem zweiten kontinuierlichen flexiblen Element (81, 89) verbunden ist, das die Bewegung auf die jeweiligen zwei Antriebswellen (85, 87) der Traversiervorrichtungen (45A-45D) überträgt. 10
9. Maschine gemäß einem der vorhergehenden Ansprüche, **gekennzeichnet durch** Träger (7A, 7B, 8A, 8B) für Spulen (B1) für Ausgangsgarn (F1), und wobei zwischen den Trägern (7A, 7B, 8A, 8B) und den jeweiligen Wicklungsstationen (1A) Texturierungselemente (13A, 13B, 19) angeordnet sind. 15 20
10. Maschine (1) gemäß Anspruch 9, **dadurch gekennzeichnet, dass** die Texturierungselemente mindestens einen Ofen (13A, 13B), mindestens eine Kühlzone, mindestens ein zusätzliches Drall- oder Falschdrallelement (19), mindestens eine Zufuhrwalze (23, 25) umfassen. 25
11. Maschine (1) gemäß einem oder mehreren der vorhergehenden Ansprüche, **gekennzeichnet durch** eine Verwirbelungsdüse (31) für jede Wicklungsposition (17A-17D). 30
12. Maschine gemäß Anspruch 11, **gekennzeichnet durch** einen Träger (20) für Elastikgarnspulen (B2), die zum Zuführen eines Elastikgarns (F2) in Richtung der Verwirbelungsdüse (31) angeordnet und aufgebaut ist. 35 40
- Revendications**
1. Une machine (1) pour produire des bobines (B3) de fil, comprenant une pluralité de stations d'enroulement (1A) alignées sur au moins un front de travail, dans laquelle : 45
- chaque station d'enroulement (1A) comprend au moins une zone d'avancement pour faire avancer une pluralité de fils vers une pluralité correspondante sous-jacente de positions d'enroulement superposées les unes aux autres (17) ; 50
- chaque position d'enroulement (17) comprend un support (41) pour un tube (T) sur lequel l'un desdits fils est enroulé pour former une bobine (B3), un rouleau d'enroulement motorisé (43A-43D) étant agencé pour être en contact avec la bobine d'enroulement (B3) et un dispositif traversant (45A-45D), pour distribuer le fil sous forme d'enroulement hélicoïdal autour de la bobine (B3) en cours de formation ; 55
- chaque station d'enroulement comprenant au moins quatre positions d'enroulement superposées les unes aux autres, avec quatre chemins pour des fils respectifs de la zone d'avancement aux positions d'enroulement ;
- caractérisée en ce que:** les quatre positions d'enroulement (17A-17D) sont divisées en deux paires, dont chacune comprend un système de motorisation respectif, séparé et indépendant de l'autre paire ; et chaque système de motorisation comprend un premier moteur (59 ; 67) pour l'entraînement en rotation des deux rouleaux d'enroulement motorisés respectifs (43A-43D) et un second moteur (75 ; 83) pour l'entraînement en rotation des deux dispositifs traversants respectifs (45A-45D).
2. La machine (1) selon la revendication 1, **caractérisée en ce qu'elle** comprend deux fronts de travail opposés (3A, 3B), sur chacun d'eux étant agencées au moins quatre positions d'enroulement (17A-17D) pour chaque station d'enroulement (1A), divisées en deux paires de positions d'enroulement (17A, 17B ; 17C, 17D), chacune pourvue d'un système de motorisation indépendant respectif.
3. La machine (1) selon la revendication 1 ou 2, **caractérisée en ce qu'elle** comprend des organes de texturation de fils.
4. La machine (1) selon la revendication 3, **caractérisée en ce que** lesdits organes de texturation de fil comprennent un ou plusieurs des organes suivants : des fours de chauffage (13A, 13B) ; des organes de refroidissement ; des unités de torsion ou de fausse torsion (19) ; des rouleaux d'étirement ou de relaxation motorisés.
5. La machine (1) selon l'une quelconque des revendications précédentes, **caractérisée par** au moins quatre arbres de travail (69, 71), des rouleaux d'enroulement (43A-43D) sur chaque front de travail (3A, 3B) de la machine (1), lesdits arbres (69, 71) s'étendant le long du front de travail (3A, 3B) et chaque arbre entraînant les rouleaux d'enroulement motorisés (43A-43D) des positions d'enroulement adjacentes les unes aux autres à la même hauteur.
6. La machine (1) selon l'une quelconque des revendications précédentes, **caractérisée par** au moins quatre arbres de travail (85, 87) des dispositifs traversants (45A-45D) sur chaque front de travail (3A, 3B) de la machine (1), lesdits arbres (85, 87) s'étendant

dant le long du front de travail (3A, 3B) et chaque arbre entraînant les quatre dispositifs traversants (45A-45D) des positions d'enroulement adjacentes les unes aux autres à la même hauteur.

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7. La machine (1) selon la revendication 5 ou 6, **caractérisée en ce que** le premier moteur (59 ; 67) de chaque motorisation est associé avec un premier organe flexible continu (65, 73) qui transmet le mouvement des deux arbres de travail respectifs (69, 71) des rouleaux d'enroulement motorisés (43A-43D). 10
8. La machine (1) selon la revendication 5, 6 ou 7, **caractérisée en ce que** le second moteur (75 ; 83) de chaque motorisation est associé avec un second organe flexible continu (81, 86) qui transmet le mouvement aux deux arbres de travail respectifs (85, 87) des dispositifs traversants (45A-45D). 15
9. La machine selon l'une quelconque des revendications précédentes, **caractérisée par** des supports (7A, 7B, 8A, 8B) pour des bobines (B1) de fil de démarrage (F1) et dans laquelle entre lesdits supports (7A, 7B, 8A, 8B) et les stations d'enroulement respectives (1A), des organes de texturation (13A, 13B, 19) sont agencés. 20 25
10. La machine (1) selon la revendication 9, **caractérisée en ce que** les organes de texturation comprennent au moins un four (13A, 13B), au moins une zone de refroidissement, au moins un organe supplémentaire de torsion ou fausse torsion (19), au moins un rouleau d'avancement (23, 25). 30
11. La machine (1) selon une ou plusieurs des revendications précédentes, **caractérisée par** un jet d'entrelacement (31) pour chaque position d'enroulement (17A-17D). 35
12. La machine selon la revendication 11, **caractérisée par** un support (20) pour des bobines de fil élastique (B2) agencées et configurées pour faire avancer un fil élastique (F2) vers le jet d'entrelacement (31). 40

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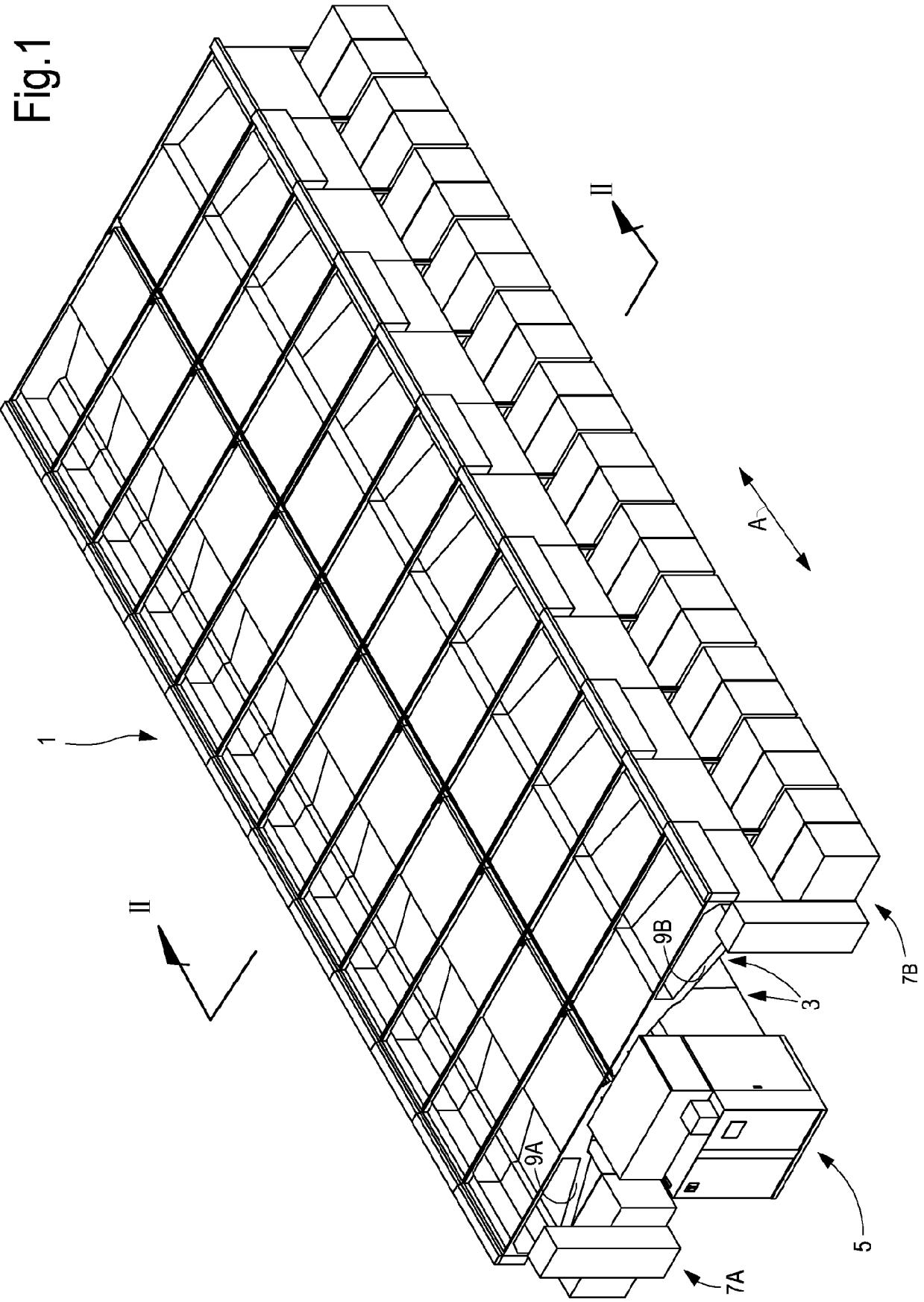


Fig.2

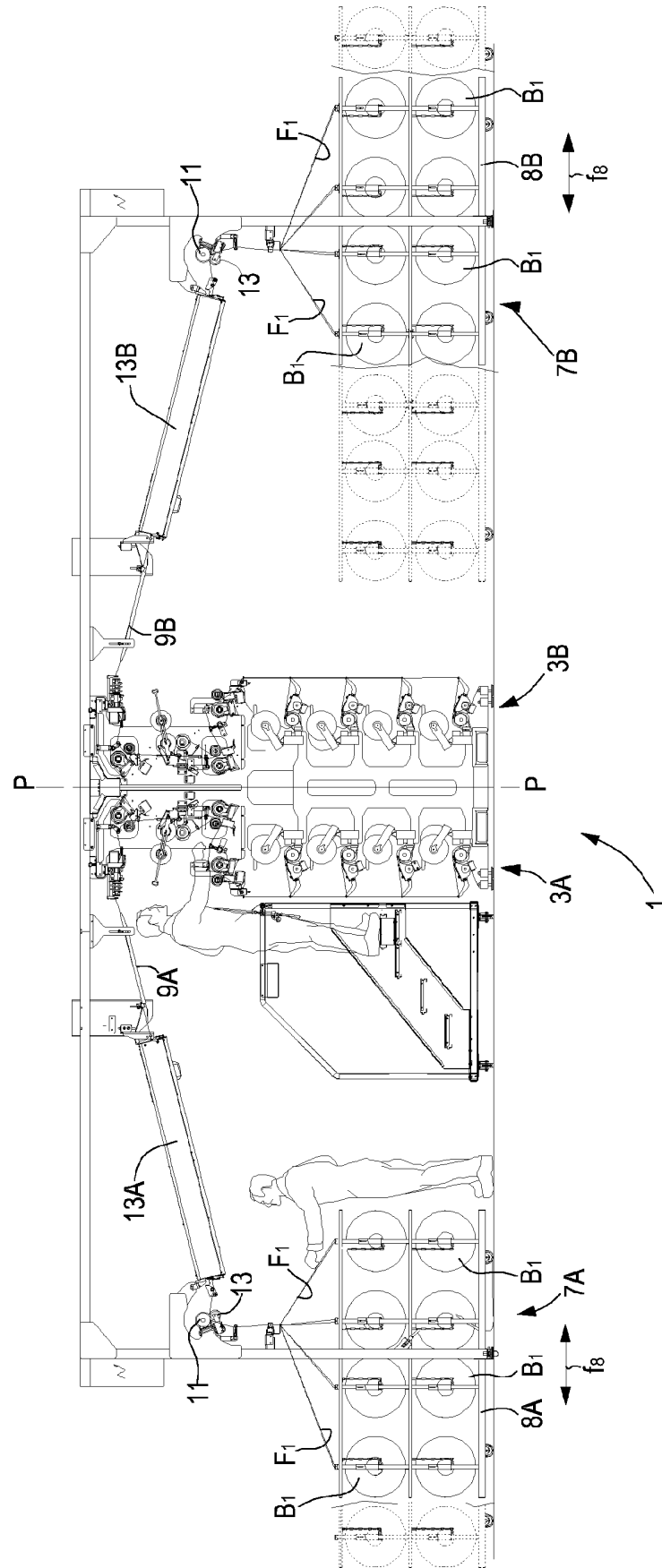


Fig.3

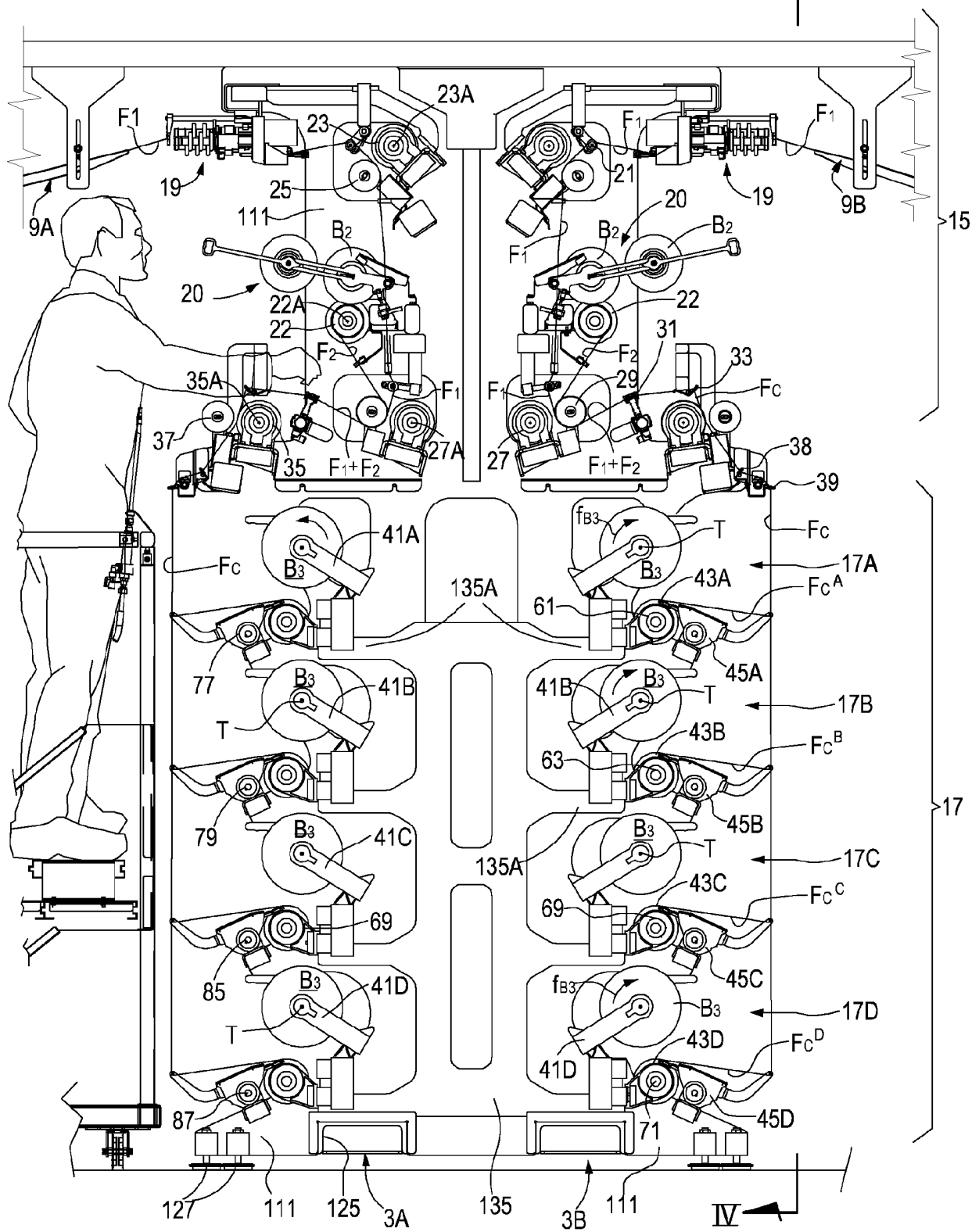
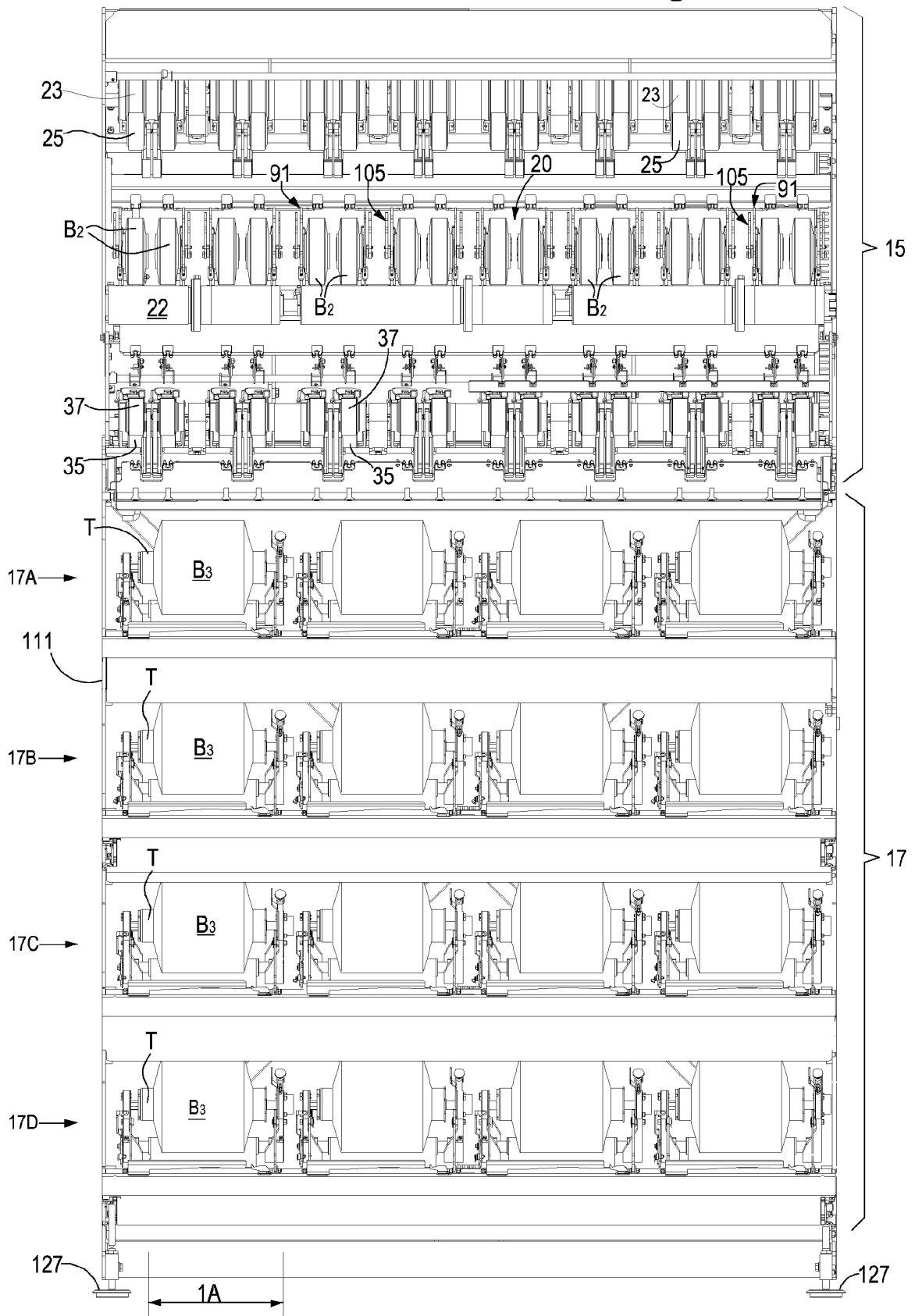


Fig.4



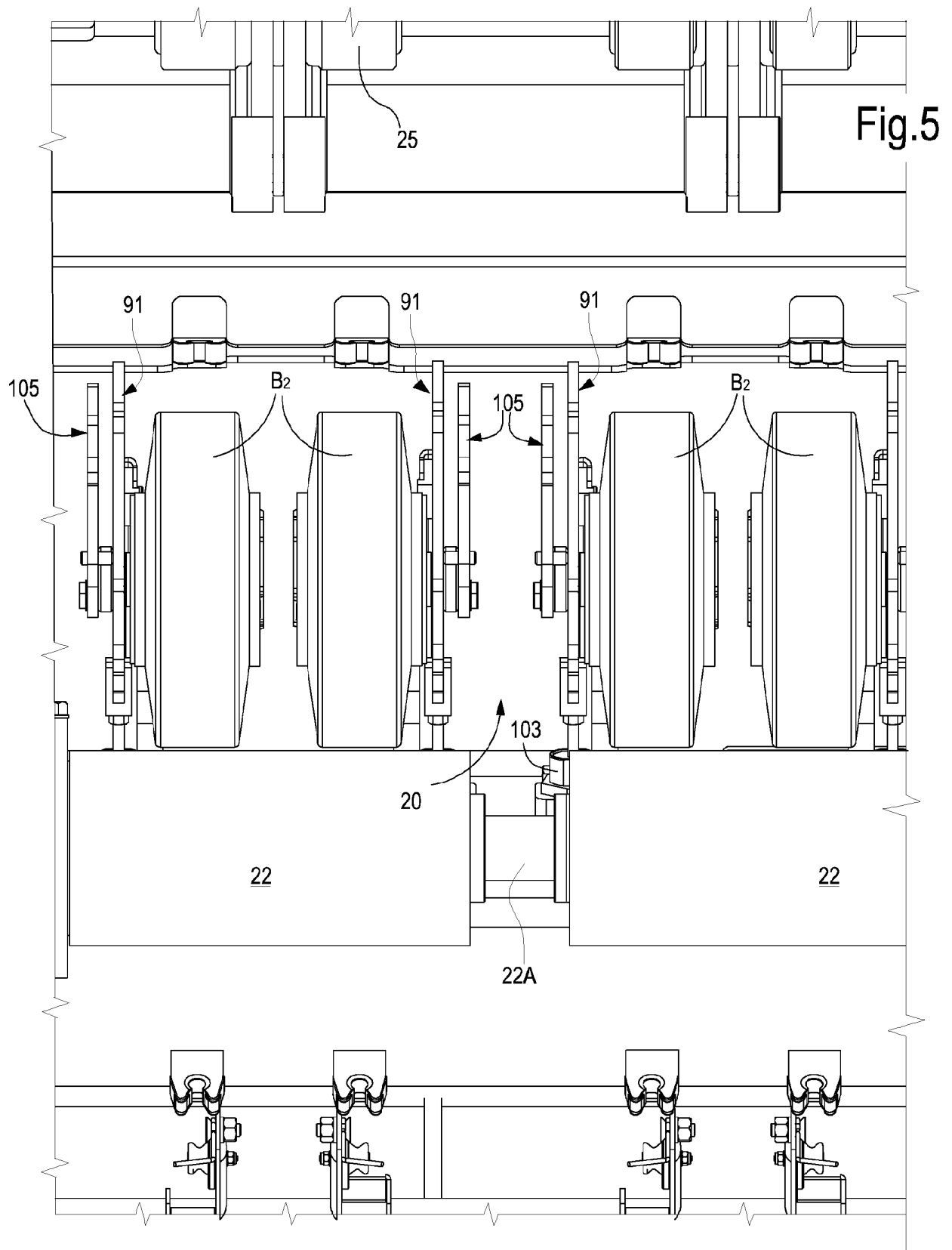


Fig. 6A

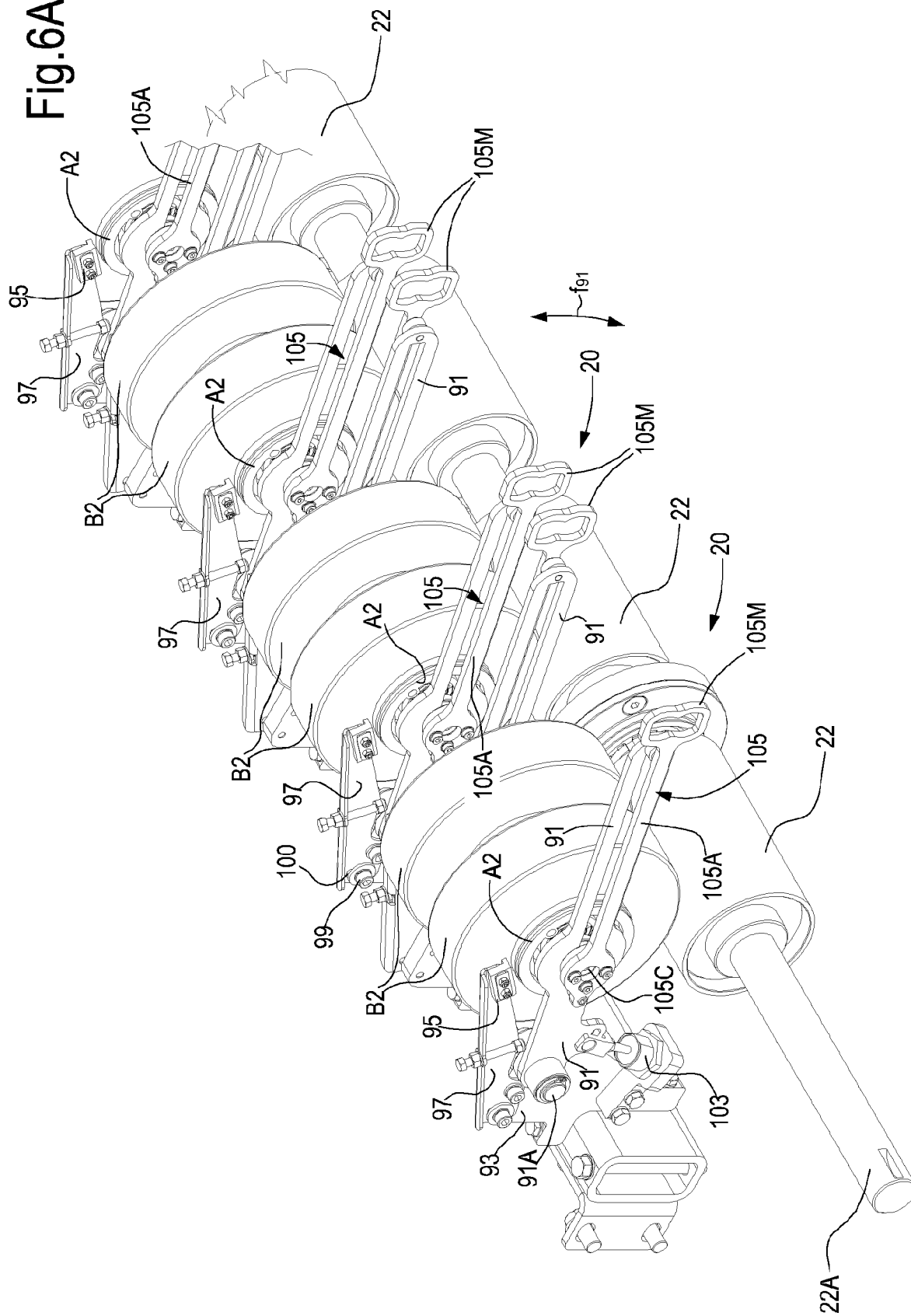
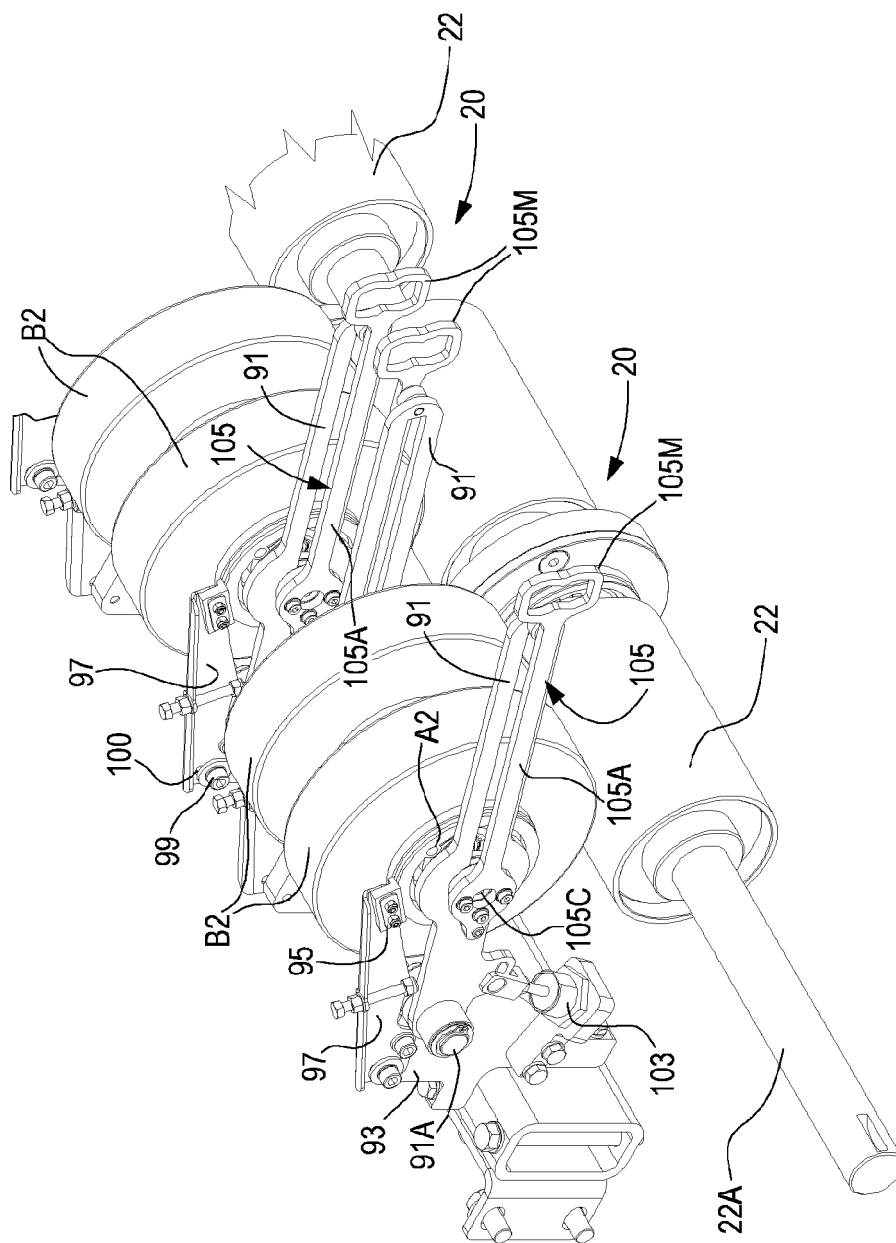


Fig. 6B



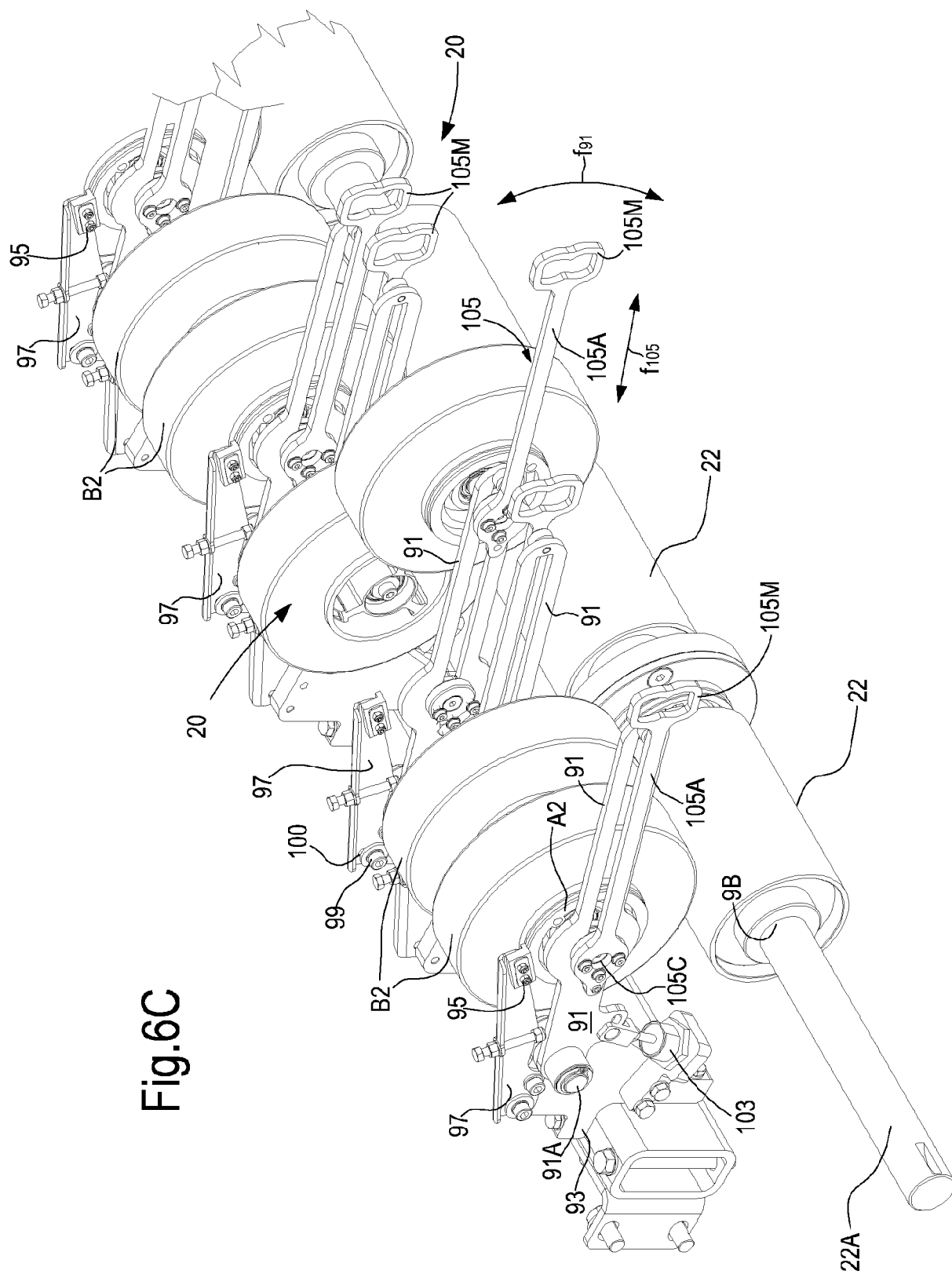


Fig. 6C

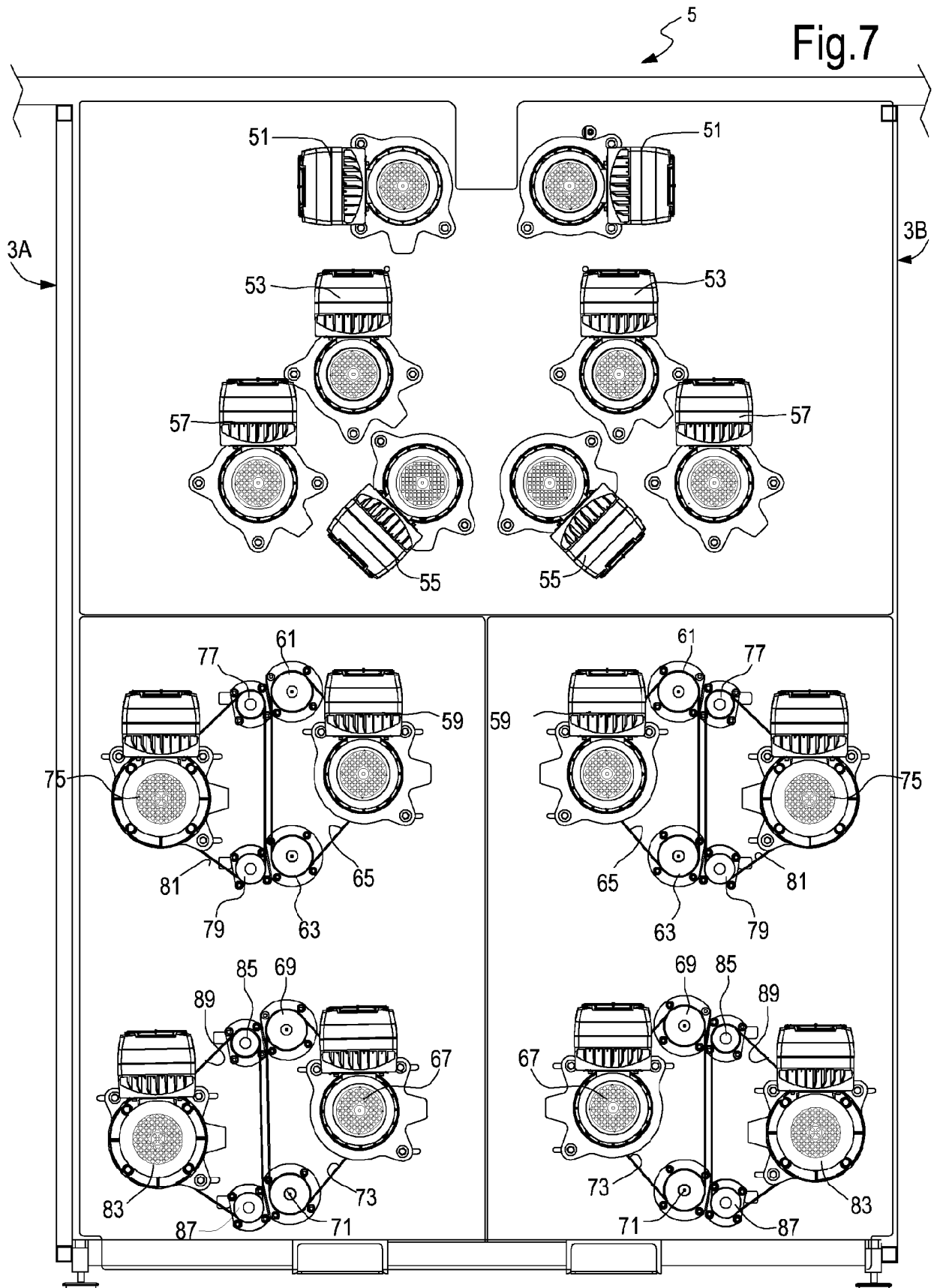


Fig.8

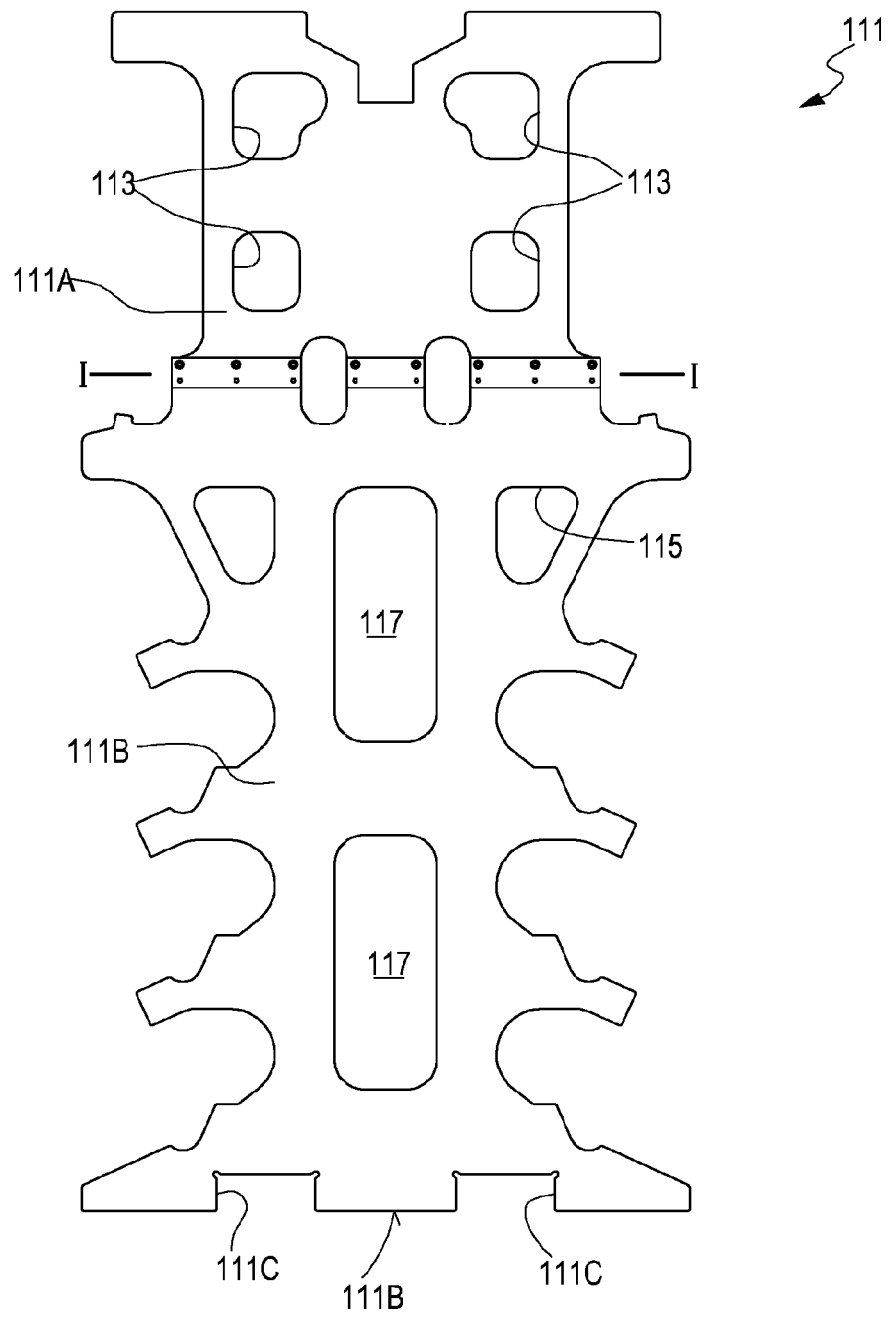


Fig.9

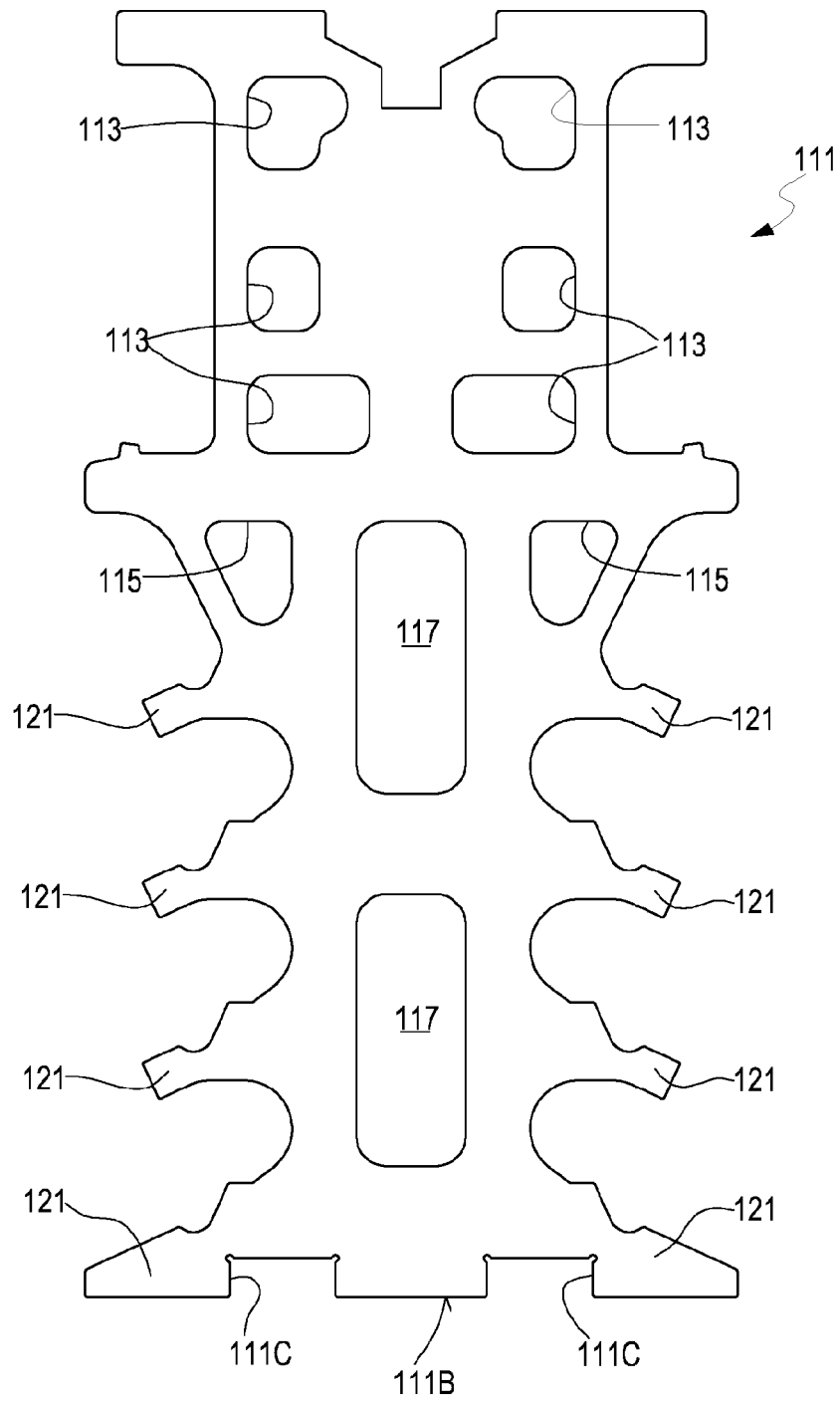


Fig.10

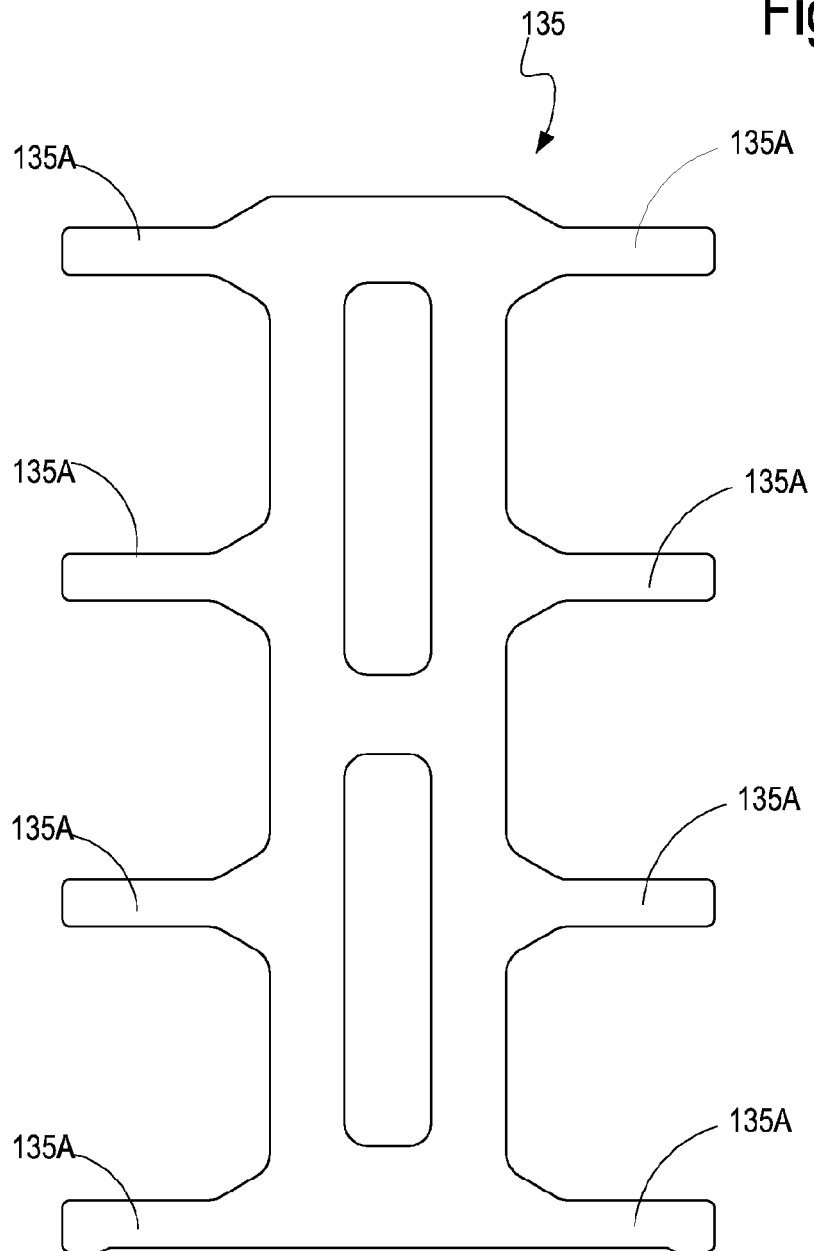
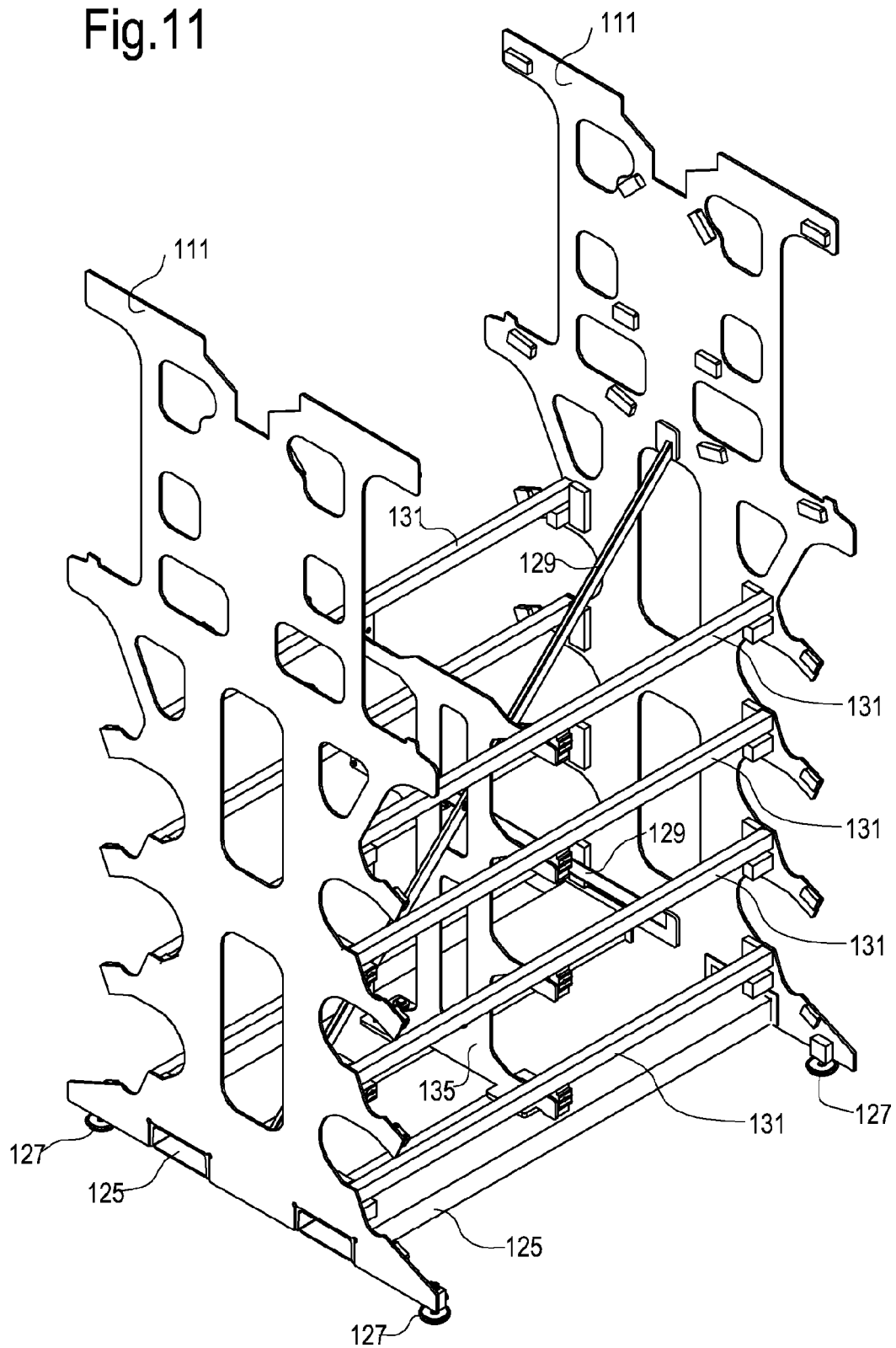


Fig.11



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1551745 A [0003]
- EP 1411014 A [0003]
- EP 1689664 A [0003]
- EP 1448819 A [0003]
- US 5192032 A [0005]