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(54) APPARATUS AND PROCESS FOR PRODUCTION OF TIGHTS

VORRICHTUNG UND VERFAHREN ZUR HERSTELLUNG VON STRÜMPFEN

APPAREIL ET PROCÉDÉ DE PRODUCTION DE BAS

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(73) Proprietor: **Boggiani Renato S.r.l.**

46042 Castel Goffredo (MN) (IT)

(72) Inventor: **Boggiani, Francesco**

I-46042 Castel Goffredo (MN) (IT)

(74) Representative: **Galassi, Alessandro**

PGA S.r.l.

Via Mascheroni, 31

20145 Milano (IT)

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Description

[0001] The present invention relates to an apparatus and a process for production of tights. In particular, though not exclusively, the present invention relates to the step of sewing the toes of the tights.

[0002] As is known, tights are produced starting from two tubular textile manufactures, which are loaded on a machine used as a line-closer; the machine comprises a carousel structure rotating about a vertical axis and provided with a plurality of special shapes. The two tubular manufactures that make up the tights are loaded on a pair of adjacent dummies, and in subsequent stations of the line-closer are subjected to a longitudinal cut at a portion thereof which in the finished product constitutes the trunk part and, thereafter, are sewn together at the previously-cut flaps.

[0003] Also known are machines, known as toe-closers, positioned downstream of the line-closer and having the task of closing the toe of each of the above-mentioned tubular products, i.e. at the toe of each leg of the tights.

[0004] Generally, a toe-closer comprises a plurality of support tubes of the products which are mounted in a turret that moves them between a loading upturning and positioning station, a station for adapting the toe to the curvature to be obtained for the sewing, a station in which the sewing is carried out and a final unloading station of the tights with the toes sewn.

[0005] Examples of line-closer and toe-closer machines are described, for example, in the Italian patent application FI2009A000207 and in patent documents GB 1501869 A and EP 0126800 A1.

[0006] The Applicant has found that these machines, though enabling carrying out the closure of the toes of tights, are not free of drawbacks and can be improved in various aspects. In fact, the known solutions might not enable obtaining a "round" sewing, i.e. having an arc of circumference progression, and this can have an influence on the quality of the finished product, both from an aesthetic point of view and from a functional point of view, in terms of comfort when the tights are worn and/or working life of the sewing. Further, the known solutions might not be able to vary the shape and/or the length of the sewing of the toes of tights.

[0007] An aim of the present invention is to obviate one or more of the above-cited drawbacks.

[0008] A further aim of the invention is to provide an apparatus and a process for production of tights which enable realizing a sewing of the toes of tights, obtaining textile articles of high quality and substantially free of imperfections. A further aim of the invention is to provide an apparatus and a process for production of tights which enable selecting and/or easily and/or precisely regulating the shape of the sewing of the toes, for example in terms of shape and/or dimensions and/or radius of curvature.

[0009] A further aim of the invention is to provide an apparatus and a process for production of tights which enable reducing production waste.

[0010] A further aim of the invention is to provide is to provide an apparatus and a process for production of tights which enable adjusting the sewing of the toes of tights in relation to the type of tights and/or the desired characteristics for the sewing.

[0011] A further aim of the invention is to provide an apparatus and a process for production of tights which enable selecting and/or regulating the shape and/or the dimensions of the sewing of the toes of tights independently of the denier size of tubular elements forming the tights and/or the dimensions of the toes of the tights.

[0012] A further aim of the invention is to provide an apparatus and a process for production of tights which enable obtaining productions of high uniformity levels among the various tights produced and/or obtaining a high productivity in terms of tights produced per unit of time.

[0013] A further aim of the invention is to provide an apparatus and a process for the production of tights which enable realising sewn seams in a simple and/or rapid and/or automatic and/or economical way.

[0014] A further aim of the invention is to provide an apparatus and a process for the production of tights which are simple, sturdy and economical to realize, even in terms of modest modifications with respect to apparatus of known type.

[0015] These and other aims, which will better emerge during the course of the following description, are substantially attained by an apparatus for the production of tights, and a process for using the machine, according to the appended claims, in any combination thereof.

[0016] Further characteristics and advantages will more fully emerge from the detailed description of a preferred but not exclusive embodiment, according to the appended figures, in which:

- figure 1 illustrates a schematic view from above of an apparatus for production of tights according to the present invention;
- figure 2 illustrates a portion of a possible embodiment of the apparatus of the present invention, in particular of the positioning means, in a first configuration;
- figure 3 illustrates the portion of apparatus of figure 2, with the positioning means in a second configuration;
- figure 4 illustrates a portion of a possible embodiment of the apparatus of the present invention, in particular of the blocking and transport device, in a first configuration;
- figure 5 illustrates the portion of apparatus of figure 4, with the blocking and transport device in a second configuration;
- figures 6 and 7 show two perspective views, respectively front and rear, of a portion of the apparatus of the present invention, in a possible embodiment thereof, in particular of the blocking and transport

device, in a first configuration;

- figures 8 and 9 illustrate two perspective views, respectively front and rear, of the portion of apparatus of figure 6 and 7, in a second configuration. With reference to the figures, reference numeral 1 denotes in its entirety an apparatus for production of tights according to the present invention. Figure 1 illustrates a schematic layout of the apparatus 1 according to the invention. In particular, a line-closer machine and a toe-closer machine are shown, reciprocally flanked. A transfer device is present between them for transfer of the semi-finished workpieces of tights between the line-closer and the toe-closer, not illustrated and for example of known type. In the figures, the parts of the apparatus 1 that are not explicitly shown can be of a known type, and therefore are not described in detail in the present description.

[0017] The apparatus 1 for production of tights comprises a line-closer machine 2 suitable for joining a pair of tubular textile fabrics to one another, forming a semi-finished piece having a trunk part and two legs with open toes, a toe-closer machine 3 suitable for sewing, by means of a sewing machine, the toes of the legs of the semi-finished piece, and a transfer device configured for transferring the semi-finished piece from the line-closer machine to the toe-closer machine. The sewing machine of the toe-closer (not shown) can be a sewing machine of the overlock cut and sew type, for example a machine of the type produced by the company UNION SPECIAL® in one of the models of the 9M series or the like.

[0018] The line-closer machine preferably comprises a first rotating carousel and the toe-closer machine comprises a second rotating carousel, the first and second rotating carousels being synchronized with one another.

[0019] The toe-closer machine comprises a plurality of support tubes 4 of the semi-finished pieces, the tubes being coupled two-by-two such that each pair of tubes 4 supports the legs of a same semi-finished piece. The tubes of the toe-closer are preferably all identical to one another. Each tube 4 is provided with two blades 5 arranged at sides of the tube and longitudinally movable, i.e. parallel to a longitudinal axis of the tube, between a retracted position, in which the blades 5 are comprised in a longitudinal volume of the tube, and an advanced position, in which the blades are extracted longitudinally from the tube. Figure 3 shows the blades of a pair of tubes, combined with one another, in a retracted position, while figure 4 shows the same pair of tubes with the blades in an advanced position.

[0020] The apparatus 1 further comprises a blocking and transport device 6 active on the toes of the legs of a semi-finished workpiece so as to block them in a predetermined configuration and transport them to the sewing machine such that the toes are closed by performing a sewing having a predetermined progression. The blades 5 are in a retracted position when the semi-finished piece

is transferred from the line-closer machine to the toe-closer machine and during the sewing of the toes, while they are in an advanced position when the toes are subjected to the blocking and transport device 6.

[0021] The blocking and transport device comprises a plate 7 positioned inferiorly of the tubes 4 and mobile between a lowered position, in which it does not cooperate with the semi-finished piece, and a raised position (at a substantially equal height to a horizontal central plane of the tubes), in which it enters into contact inferiorly with the toes of the semi-finished piece enveloped about the blades 5, arranged in an advanced position, of a pair of tubes. The blocking and transport device 6 further comprises at least a pair of pressers 8 solidly movable between a raised position, in which they do not contact the toes of the semi-finished piece, and a lowered position, in which they each block a portion of a respective toe of the semi-finished piece, pressing the portion onto the underlying plate 7. Each presser 9 of the pair of pressers can assume at least a straight configuration, in which the presser causes the blocked portion of the respective toe to take on a linear shape and a curved configuration, in which the presser causes the blocked portion of the respective point to assume a curved shape. The curved shape substantially corresponds to the predetermined progression of the sewing.

[0022] The blocking and transport device 6 comprises movement means 9 configured such as to move the pair of pressers between a first position, in which the pressers can cooperate with the pair of tubes bearing the semi-finished piece, and a second position, in which the pressers present the toes to the sewing machine.

[0023] In the first position the pressers are preferably above the pair of tubes and in the second position they are laterally displaced with respect to the first position.

[0024] In substance, the apparatus 1 is configured to carry out a machine cycle, in which:

- the transfer device transfers a semi-finished piece from the line-closer machine 2 to a pair of tubes 4 of the toe-closer machine 3, having the respective two blades 5 in a retracted position, such that the two legs having the open toes of the semi-finished piece are each enveloped about a respective tube;
- the two blades 5 of each tube 4 of the pair of tubes are brought into an advanced position, positioning the toes of the legs of the semi-finished piece beyond the longitudinal extension of the tubes;
- the plate 7 is brought from the lowered position into the raised position, inferiorly entering into contact with the toes of the semi-finished piece enveloped on the blades of the tubes;
- the two pressers 8 of the pair of pressers, in a raised position, are preferably together brought together into the curved configuration (i.e. in a synchronised time and/or space), into the curved configuration;
- the two pressers 8 of the pair of pressers are brought into the lowered position, each blocking a curved por-

tion of a respective toe of the semi-finished piece, pressing the curved portion on the underlying plate in the raised position;

- the two blades 5 of each of the two tubes 4 are returned into the retracted position;
- the two pressers 8 of the pair of pressers are brought, preferably together, into the straight configuration, causing the blocked portions of the toes to assume a linear shape;
- the movement means 9 position the pair of pressers 8 in the second sewing position, in which the toes are closed by means of the performing of a stitching having said predetermined progression;
- on completing the stitching of the toes, the semi-finished piece is unloaded from the respective pair of tubes 4, the movement means 9 position said pair of pressers in the first position, the pair of pressers 8 is brought into the raised position and the plate 7 is brought into the lowered position.

[0025] Each of the pressers 8 preferably comprises a deformable foil 10, preferably made of metal and/or a plastic material and/or rubber, arranged vertically and normally having a substantially straight development and corresponding to the straight configuration, the foil 10 possibly being curved, under the action of an appropriate solicitation, in such a way as to be brought reversibly into the curved configuration. Each presser 8 preferably comprises a respective actuator 11 operatively active on the respective foil 10 in such a way as to selectively exert the appropriate solicitation and determine the passage of the presser 8 from the straight configuration to the curved configuration

[0026] Figures 4 and 5 illustrate a portion of the toe-closer and the blocking and transport device, with some parts removed better to evidence the pressers 6 and the respective deformable foil. In particular, in figure 4 and in figure 5 the pressers are in a curved configuration, with the foils subjected to solicitation and therefore curved. The curvature is preferably obtained by pushing a central portion of the foil and keeping the two lateral ends of the foil blocked; in this way the foil, being unable to translate, reacts by deforming in the centre and assuming an overall curved conformation; the curvature is preferably symmetrical with respect to a centre of the foil.

[0027] Each foil 10 preferably comprises a sheet portion 10a, made of metal or plastic, for example a slim steel sheet, and a sealing portion 10b, inferiorly fixed to the sheet portion, preferably over a whole length thereof, and destined to enter into contact with the respective toe of the tights enveloped on the respective tube, the sealing portion being preferably made of rubber or plastic. In practice, the portion of sheet provides the foil with the necessary elasticity and the ability to reversibly pass between the straight and curved configurations, while the

retaining portion enables effective blocking of the underlying portion of the toe of the tights, avoiding sliding thereof on the underlying plate and keeping the position fixed, up until the presser is in the lowered position, with respect to the presser.

[0028] The deformable foil 10 and the actuator are preferably structured such as to modify the curved configuration in such a way as to select the shape of the predetermined progression of the sewing. The actuator 11 is preferably a linear actuator, preferably a pneumatic piston, having a selectable pathway. The predetermined progression of the stitching is in a curved tract shape having a radius of curvature, and the dimension and/or the radius of the tract is a function of the travel of the linear actuator, which is selectable as required within an operating range.

[0029] The presser 8, when it is in the curved configuration and is brought into the lowered position, preferably blocks a portion of the respective toe of the semi-finished piece corresponding to the portion destined to be sewn in order to obtain the predetermined progression of the sewing, and when it is in the lowered position and is brought into the straight configuration, stretches out the curved portion, previously blocked by the presser in a curved configuration, such as to proffer to the sewing machine a straight portion of toe corresponding to the curved portion.

[0030] In substance, the passage of the presser from the curved configuration to the straight configuration elastically straightens the portion of toe blocked by the presser such that the sewing occurs along a straight portion, and, at the same time, once the presser has been released, produces a curved stitching of the toe having a curved progression. The predetermined progression of the stitching corresponds substantially to an arc of circumference.

[0031] The movement means 9 preferably comprise an actuator 15 and a carriage 15a activated by said actuator and bearing a pair of pressers. The carriage enables translating the pressers, between the first and the second position, in a transversal direction and/or a perpendicular direction to the longitudinal development of the tubes.

[0032] The actuator preferably comprises a step motor and a transmission belt activated by the step motor, the belt bearing - fixed thereto - the groups of the two pressers.

[0033] Each tube 4 preferably comprises a support 16 connecting the two blades 5, arranged slidably at the sides of the tube, so as to solidly constrain them to one another. The toe-closer machine 3 preferably comprises positioning means 20 operatively activatable on a pair of tubes 4 bearing the semi-finished piece such as to move the blades 5 of the tubes together between the retracted position and the advanced position. The positioning means 20 preferably comprise a translating organ 21 configured such as to engage, in a positioning station of the toe-closer machine 3, the respective two supports 16

of a pair of tubes 4 located in the positioning station and such as to determine the advancing and retracting of the supports, in such a way as to move the blades of the tubes between the advanced position and the retracted position. The positioning means preferably comprise a respective actuator 22, preferably a pneumatic cylinder or a linear motor, operatively active on the translating organ 21. In substance, when a pair of tubes bearing a semi-finished workpiece of tights reaches the positioning station (in which the semi-finished workpiece is partially extracted from the tube - by the blades - so that the toes can be subjected to the action of the pressers and borne thereby to the sewing machine), the translating organ (activated by the actuator 22 and having a C-shaped section) is aligned with the two supports 16 of the tubes and engages a pin 16a located above each support 16; in this way the activation of the actuator 22 causes the translation, selectively forwards and backwards - of the translating organ and, with it, the two supports (and thus any pair of blades connected by the respective support 16).

[0034] Figures 6, 7, 8 and 9 show an embodiment of the blocking and transport device 6, the movement means 9 and the positioning means 20. Also visible are the lever mechanisms associated to each presser and thanks to which the soliciting of the actuator 11 is transmitted to the foil, controlling the deformation thereof.

[0035] The blocking and transport device 6 preferably comprises a pad 25 positioned superiorly of the tubes 4 and mobile between a raised position, in which it does not cooperate with the semi-finished piece, and a lowered position, in which it enters into contact superiorly with the toes of the semi-finished piece enveloped on the blades (in the advanced position) of a pair of tubes. The pad 25 is configured such as to be brought into the lowered position when the plate is in the raised configuration, in such a way as to block the toes of the semi-finished piece against the plate, and to remain in the lowered configuration up to when the pressers, in the curved configuration, are brought into the lowered position thereof. The pad 25 is further configured such as to return into the raised position before the pressers, in the lowered position, pass into the straight configuration.

[0036] The toe-closer machine preferably comprises a pair of blocking organs 26 located at a positioning station of the toe-closer machine, each blocking organ being mobile between an active position, in which it presses on a portion of a respective tube of the pair of tubes in such a way as to block a portion, interposed between the toe and the body trunk part, of a respective leg of the semi-finished piece enveloped on the tube, and an inactive position, in which it is distanced from the tube and does not interfere with the respective leg, each of the blocking organs 26 being configured such as to be brought into the active position when the stitches of the semi-finished piece are blocked between the pressers and the plate and the blades of the tubes return into the retracted position and/or up to when the pressers, in the curved configuration, are in the lowered position, and/or being con-

figured such as to be brought into the deactivated position in the remaining part of the machine cycle.

[0037] The blocking organs 26 are preferably positioned in the active and inactive positions thereof in a substantially alike way, or simultaneously, to the positioning of the pad 25 respectively in the lowered and raised positions. The blocking organ and the pad overall provide two blocking points of a leg of the tights, useful for maintaining it in a fixed position while the pressers are in a lowered position and pass from the curved configuration to the straight configuration; in particular, the blocking organ exerts a slight pressure on the leg upstream of the blocked portion of the pressers, while the pad exerts a slight pressure on the leg downstream of the blocked portion of the pressers. In this way the force exerted by the pressers during the passage from the curved configuration to the straight configuration determines a "pulling" of the leg, which causes a sliding of the fabric and a possible loss of the desired progression for the curvature.

[0038] A process for producing tights, according to the present invention, comprises one or more of the following steps of:

- reciprocally joining, by means of a line-closer machine, a pair of tubular textile articles such as to form a semi-finished piece having a trunk part and two legs with open toes;
- transferring, by means of a transfer device, the semi-finished piece from the line-closer machine to a pair of tubes of a toe-closer machine, such that each leg of the semi-finished piece is enveloped on a respective tube, each tube being provided with two blades in a retracted position;
- bringing the two blades of each tube of the pair of tubes into an advanced position such as to position the toes of the legs of the semi-finished piece beyond the longitudinal extension of the tubes, keeping them enveloped on the blades;
- predisposing a blocking and transport device structured to be operatively activatable on the toes of the legs of a semi-finished piece in order to block them in a predetermined configuration and transport them to a sewing machine for the toes to be closed by means of carrying out a stitching having a predetermined progression, the blocking and transport device comprising a plate and at least a pair of pressers;
- positioning the plate in a raised position, in which it enters into contact inferiorly with the toes of the semi-finished piece enveloped on the blades of the tubes;
- positioning the two pressers of the pairs of pressers in a raised position, in which they do not contact the stitches of the semi-finished piece, and bringing them, preferably together, into a curved position,
- positioning the two pressers in a lowered position, in which they each block a portion of a respective toe of the semi-finished piece, pressing the portion on the underlying plate, such that the blocked portion

of the respective toe assumes a curved shape, the curved shape being substantially corresponding to the predetermined progression of the stitching;

- returning the blades into the retracted position;
- maintaining the pressers in the lowered position and/or the plate in the raised position, bringing the two pressers of the pair of pressers, preferably together, into a straight configuration, making the blocked portions of the toes take on a linear shape;
- predisposing movement means configured such as to move the pair of pressers between a first position, in which the pressers cooperate with the pair of tubes bearing the semi-finished piece, and a second position, in which the pressers subject the toes to a sewing machine;
- positioning, by means of the movement means, the pair of pressers, bringing the toes of the semi-finished piece into the second stitching position;
- sewing, using a sewing machine of the toe-closer machine, the toes of the legs of the semi-finished piece, such as to obtain a complete garment of tights, the sewing having the predetermined progression;
- on terminating the sewing of the stitches, unloading the semi-finished piece from the respect pair of tubes, positioning, using the movement means, the pair of pressers in the first position, bringing the pair of pressers into the raised position and bringing the plate into the lowered position.

[0039] The steps of advancing the blades and blocking the toes by the pressers are done with the second carousel stationary (i.e. with a precise "machine halt"). During the steps of translation of the pressers (with the respective toes pressed on the underlying plate) towards the sewing machine and the actual sewing, the second carousel preferably performs a rotation so as to follow the sewing (i.e. to cause the toes to slide, blocked by the pressers, to the sewing machine) and at the same time prepares a new pair of tubes of the toe-closer to receive the loading of a new semi-finished workpiece from the line-closer.

[0040] The further aspects of the sewing process of the trunk, the transfer of the semi-finished workpieces and/or the sewing of the toes, not described in detail in the present description and not deriving from special characteristics of the apparatus as described above, are to be considered of a known type.

[0041] The invention as it is conceived is susceptible to numerous modifications and variants, all falling within the scope of the inventive concept, and the components cited can be replaced by other technically-equivalent elements. The invention attains important advantages.

[0042] Primarily the invention enables obviating at least some of the drawbacks of the prior art.

[0043] The invention further enables realizing tights of high quality and substantially free of imperfections.

[0044] The invention further obtains sewing of the toes of tights having a predetermined progression and/or a

precise shape and/or specific dimensions, and/or enables easily modifying the parameter on the basis of the type of production.

[0045] The invention further enables reducing production waste and/or obtaining a high degree of precision and/or repeatability of the characteristics of the tights produced.

[0046] The invention further enables producing tights simply and/or rapidly and/or automatically. The invention is further simple and/or sturdy and/or economical to realize.

Claims

1. An apparatus (1) for production of tights, comprising a line-closer machine (2) suitable for joining a pair of tubular textile fabrics to one another, forming a semi-finished piece having a trunk part and two legs with open toes, a toe-closer machine (3) suitable for sewing, by means of a sewing machine, the toes of the legs of the semi-finished piece, and a transfer device configured for transferring the semi-finished piece from the line-closer machine to the toe-closer machine, wherein the toe-closer machine comprises a plurality of support tubes (4) of the semi-finished pieces, the tubes being coupled two-by-two such that each pair of tubes (4) supports the legs of a same semi-finished piece, wherein each tube is provided with two blades (5) arranged at sides of the tube and longitudinally movable, i.e. parallel to a longitudinal axis of the tube, between a retracted position, in which the blades (5) are comprised in a longitudinal volume of the tube, and an advanced position, in which the blades are extracted longitudinally from the tube, the apparatus comprising a blocking and transport device (6) structured for being operatively activatable on the toes of the legs of a semi-finished piece such as to block the toes in a predetermined configuration and transport them to the sewing machine such that the toes are closed by performing a sewing having a predetermined progression, in which said blades (5) are in retracted position when the semi-finished piece is transferred from the line-closer machine to the toe-closer machine and during the sewing of the toes, and are in advanced position when the toes are subjected to the blocking and transport device,

characterized in that the blocking and transport device comprises a plate (7) positioned inferiorly of the tubes (4) and mobile between a lowered position, in which it does not cooperate with the semi-finished piece, and a raised position, in which it enters into contact inferiorly with the toes of the semi-finished piece enveloped about the blades (5), arranged in an advanced position, of a pair of tubes, the blocking and transport device (6) further comprising at least a pair of pressers (8) solidly movable between a

raised position, in which they do not contact the toes of the semi-finished piece, and a lowered position, in which they each block a portion of a respective toe of the semi-finished piece, pressing the portion onto the underlying plate (7), in which each presser (8) of the pair of pressers can assume at least a straight configuration, in which the presser causes the blocked portion of the respective toe to take on a linear shape, and a curved configuration, in which the presser causes the blocked portion of the respective point to assume a curved shape, in which the curved shape substantially corresponds to said predetermined progression of the sewing, the blocking and transport device (6) comprising movement means (9) configured such as to move the pair of pressers between a first position, in which the pressers can cooperate with the pair of tubes bearing the semi-finished piece, and a second position, in which the pressers present the toes to the sewing machine.

2. The apparatus (1) of the preceding claim, configured and predisposed to perform a tights production cycle in which:

- the transfer device transfers a semi-finished piece from the line-closer machine (2) to a pair of tubes (4) of the toe-closer machine (3), having the respective two blades (5) in a retracted position, such that the two legs having the open toes of the semi-finished piece are each enveloped about a respective tube;
- the two blades (5) of each tube (4) of the pair of tubes are brought into an advanced position, positioning the toes of the legs of the semi-finished piece beyond the longitudinal extension of the tubes;
- the plate (7) is brought from the lowered position into the raised position, inferiorly entering into contact with the toes of the semi-finished piece enveloped on the blades of the tubes;
- the two pressers (8) of each pair of pressers, in a raised position, are preferably together brought together into the curved configuration;
- the two pressers (8) of the pair of pressers are brought into the lowered position, each blocking a curved portion of a respective toe of the semi-finished piece, pressing the curved portion on the underlying plate in the raised position;
- the two blades (5) of each of the two tubes (4) are returned into the retracted position;
- the two pressers (8) of the pair of pressers are brought, preferably together, into the straight configuration, causing the blocked portions of the toes to assume a linear shape;
- the movement means (9) position the pair of pressers (8) in the second sewing position, in which the toes are closed by means of the performing of a stitching having said predetermined

progression;

- on completing the stitching of the toes, the semi-finished piece is unloaded from the respective pair of tubes (4), the movement means (9) position said pair of pressers in the first position, the pair of pressers (8) is brought into the raised position and the plate (7) is brought into the lowered position.

3. The apparatus (1) of any one of the preceding claims, wherein each of the pressers (8) comprises a deformable foil (10), preferably made of metal and/or a plastic material and/or rubber, arranged vertically and normally having a substantially straight development and corresponding to the straight configuration, the foil (10) possibly being curved, under the action of an appropriate solicitation, in such a way as to reversibly be brought into said curved configuration, each presser further comprising a respective actuator (11) operatively active on the respective foil in such a way as to selectively exert the appropriate solicitation and determine the passage of the presser (8) from the straight configuration to the curved configuration.

4. The apparatus (1) of any one of the preceding claims, wherein each foil (10) comprises a sheet portion (10a), made of metal or plastic, and a sealing portion (10b), inferiorly fixed to the sheet portion, preferably over a whole length thereof, and destined to enter into contact with the respective toe of the tights enveloped on the respective tube, the sealing portion being preferably made of rubber or plastic.

5. The apparatus (1) of any one of the preceding claims, wherein the deformable foil (10) and the actuator (11) are structured such as to modify the curved configuration in such a way as to select the shape of the predetermined progression of the sewing.

6. The apparatus (1) of any one of the preceding claims, wherein the actuator (11) is a linear actuator, preferably pneumatic, having a selectable pathway, the predetermined progression of the stitching being in a curved tract shape having a radius of curvature as a function of said selectable pathway of the linear actuator.

7. The apparatus (1) of any one of the preceding claims, wherein each presser (8), when in the curved configuration and is brought into the lowered position, blocks a portion of the respective toe of the semi-finished piece corresponding to the portion destined to be sewn in order to obtain said predetermined progression of the sewing, and when it is in the lowered position and is brought into the straight configuration, stretches out the curved portion, previously blocked by the presser in a curved configuration,

such as to proffer to the sewing machine a straight portion of toe corresponding to the curved portion.

8. The apparatus (1) of any one of the preceding claims, wherein the passage of the presser from the curved configuration to the straight configuration elastically straightens the portion of toe blocked by the presser such that the stitching occurs along a straight portion, and, at the same time, once the presser has been released, produces a curved stitching of the toe having a curved progression. 5
9. The apparatus (1) of any one of the preceding claims, wherein the predetermined progression of the stitching corresponds substantially to an arc of circumference. 10
10. The apparatus (1) of any one of the preceding claims, wherein the movement means (9) comprise an actuator (15) and a carriage (15a) activated by said actuator and bearing said pressers, the carriage being configured such as to translate the pressers (8), between said first and said second position, in a transversal and/or perpendicular direction to the longitudinal development of the tubes between the first and the second position. 20
11. The apparatus (1) of any one of the preceding claims, wherein each tube (4) comprises a support (16) connecting the blades (5) of the tube, arranged slidably at the sides of the tubes, such as to solidly constrain them to one another, and wherein the toe-closer machine comprises positioning means (20) operatively activatable on a pair of tubes (4) bearing the semi-finished piece such as to move the blades (5) of the tubes together between the retracted position and the advanced position. 25
12. The apparatus (1) of any one of the preceding claims, wherein the positioning means (20) comprise a translating organ (21) configured such as to engage, in a positioning station of the toe-closer machine (3), the respective two supports (16) of a pair of tubes located in the positioning station and such as to determine the advancing and retracting of the supports, in such a way as to move the blades of the tubes between the advanced position and the retracted position, and/or wherein the positioning means (20) comprise a respective actuator (22), preferably a pneumatic cylinder or a linear motor, operatively active on the translating organ (21). 30
13. The apparatus (1) of any one of the preceding claims, wherein the blocking and transport device (6) comprises a pad (25) positioned superiorly of the tubes (4) and mobile between a raised position, in which it does not cooperate with the semi-finished piece, and a lowered position, in which it enters into contact 35

superiorly with the toes of the semi-finished piece enveloped on the blades, in the advanced position, of a pair of tubes, the pad (25) being configured such as to be brought into the lowered position when the plate is in the raised configuration, in such a way as to block the toes of the semi-finished piece against the plate, and to remain in the lowered configuration up to when the pressers, in the curved configuration, are brought into the lowered position thereof, and being configured such as to return into the raised position before the pressers, in the lowered position, pass into the straight configuration.

14. The apparatus (1) of any one of the preceding claims, wherein the toe-closer machine (3) comprises a pair of blocking organs (26) located at a positioning station of the toe-closer machine, each blocking organ being mobile between an active position, in which it presses on a portion of a respective tube of the pair of tubes in such a way as to block a portion, interposed between the toe and the body trunk part, of a respective leg of the semi-finished piece enveloped on the tube, and an inactive position, in which it is distanced from the tube and does not interfere with the respective leg, each of the blocking organs (26) being configured such as to be brought into the active position when the stitches of the semi-finished piece are blocked between the pressers and the plate and the blades of the tubes return into the retracted position and/or up to when the pressers, in the curved configuration, are in the lowered position, and/or being configured such as to be brought into the deactivated position in the remaining part of the machine cycle. 40

15. A process for producing tights, comprising steps of: 45

- reciprocally joining, by means of a line-closer machine (2), a pair of tubular textile articles such as to form a semi-finished piece having a trunk part and two legs with open toes;
- transferring, by means of a transfer device, the semi-finished piece from the line-closer machine to a pair of tubes (4) of a toe-closer machine (3), such that each leg of the semi-finished piece is enveloped on a respective tube (4), each tube being provided with two blades (5) in a retracted position;
- bringing the two blades (5) of each tube (4) of the pair of tubes into an advanced position such as to position the toes of the legs of the semi-finished piece beyond the longitudinal extension of the tubes, keeping them enveloped on the blades;

characterized in that it comprises the steps of:

- predisposing a blocking and transport device 50

(6) structured to be operatively activatable on the toes of the legs of a semi-finished piece in order to block them in a predetermined configuration and transport them to a sewing machine in a predetermined configuration and transport them to a sewing machine such that the toes are closed by means of carrying out a stitching having a predetermined progression, the blocking and transport device comprising a plate (7) and at least a pair of pressers (8);

- positioning the plate (7) in a raised position, in which it enters into contact inferiorly with the toes of the semi-finished piece enveloped on the blades of the tubes;

- positioning the two pressers (8) of the pairs of pressers in a raised position, in which they do not contact the stitches of the semi-finished piece, and bringing them, preferably together, into a curved position,

- positioning the two pressers (8) in a lowered position, in which they each block a portion of a respective toe of the semi-finished piece, pressing the portion on the underlying plate (7), such that the blocked portion of the respective toe assumes a curved shape, the curved shape being substantially corresponding to the predetermined progression of the stitching;

- returning the blades (5) of the two tubes (4) into the retracted position;

- maintaining the pressers (8) in the lowered position and/or the plate (7) in the raised position, bringing the two pressers of the pair of pressers, preferably together, into a straight configuration, making the blocked portions of the toes take on a linear shape;

- predisposing movement means (9) configured such as to move the pair of pressers between a first position, in which the pressers cooperate with the pair of tubes bearing the semi-finished piece, and a second position, in which the pressers subject the toes to a sewing machine;

- positioning, by means of the movement means (9), the pair of pressers (8), bringing the toes of the semi-finished piece into the second stitching position;

- sewing, using a sewing machine of the toe-closer machine, the toes of the legs of the semi-finished piece, such as to obtain a complete garment of tights, the sewing having the predetermined progression;

- on terminating the sewing of the stitches, unloading the semi-finished piece from the respect pair of tubes, positioning, using the movement means, the pair of pressers in the first position, bringing the pair of pressers into the raised position and bringing the plate into the lowered position.

Patentansprüche

1. Vorrichtung (1) zur Produktion von Strumpfhosen, umfassend eine Linien-Schließmaschine (2), welche zum Verbinden eines Paares röhrenförmiger textiler Stoffe miteinander geeignet ist, wobei ein halbfertiges Stück mit einem Rumpfteil und zwei Beinen mit offenen Zehen gebildet wird, eine Zehen-Schließmaschine (3), welche zum Nähen der Zehen der Beine des halbfertigen Stücks mittels einer Nähmaschine geeignet ist, und eine Transfervorrichtung, welche zum Transferieren des halbfertigen Stücks von der Linien-Schließmaschine zu der Zehen-Schließmaschine eingerichtet ist, wobei die Zehen-Schließmaschine eine Mehrzahl von Halterungsröhren (4) der halbfertigen Stücke umfasst, wobei die Röhren derart zwei-mit-zwei gekoppelt sind, dass jedes Paar von Röhren (4) die Beine eines gleichen halbfertigen Stücks haltet, wobei jede Röhre mit zwei Klingen (5) versehen ist, welche an Seiten der Röhre und längsbewegbar, d. h. parallel zu einer Längsachse der Röhre, zwischen einer zurückgezogenen Position, in welcher die Klingen (5) in einem Längsvolumen der Röhre enthalten sind, und einer vorgeschobenen Position angeordnet sind, in welcher die Klingen longitudinal aus der Röhre herausgezogen sind, wobei die Vorrichtung eine Blockier- und Transportvorrichtung (6) umfasst, welche dazu gebildet ist, an den Zehen der Beine eines halbfertigen Stücks betriebsmäßig aktivierbar zu sein, um die Zehen in einer vorbestimmten Konfiguration zu blockieren und sie zu der Nähmaschine zu transportieren, so dass die Zehen durch Durchführen eines Nähens mit einem vorbestimmten Ablauf geschlossen werden, in welchem die Klingen (5) in der zurückgezogenen Position sind, wenn das halbfertige Stück von der Linien-Schließmaschine zu der Zehen-Schließmaschine transferiert wird und während des Nähens der Zehen, und in der vorgeschobenen Position sind, wenn die Zehen der Blockier- und Transportvorrichtung ausgesetzt sind, **dadurch gekennzeichnet, dass** die Blockier- und Transportvorrichtung eine Platte (7) umfasst, welche den Röhren (4) tieferstehend positioniert ist und zwischen einer abgesenkten Position, in welcher sie nicht mit dem halbfertigen Stück wechselwirkt, und einer angehobenen Position bewegbar ist, in welcher sie von unten mit den Zehen des halbfertigen Stücks in Kontakt tritt, welches um die Klingen (5) eines Paares von Röhren gewickelt ist, welche in einer vorgeschobenen Position angeordnet sind, wobei die Blockier- und Transportvorrichtung (6) ferner mindestens ein Paar von Druckelementen (8) umfasst, welche zwischen einer angehobenen Position, in welcher sie mit den Zehen des halbfertigen Stücks nicht in Kontakt sind, und einer abgesenkten Position stabil bewegbar sind, in welcher sie einen Abschnitt eines jeweiligen Zehs des halbfertigen

Stücks blockieren, wobei sie den Abschnitt auf die darunterliegende Platte (7) drücken, wobei jedes Druckelement (8) des Paares von Druckelementen wenigstens eine gerade Konfiguration, in welcher das Druckelement den blockierten Abschnitt des jeweiligen Zehs veranlasst, eine lineare Form anzunehmen, und eine gekrümmte Konfiguration annehmen kann, in welcher das Druckelement den blockierten Abschnitt des jeweiligen Punktes veranlasst, eine gekrümmte Form anzunehmen, in welcher die gekrümmte Form im Wesentlichen dem vorbestimmten Ablauf des Nähens entspricht, wobei die Blockier- und Transportvorrichtung (6) Bewegungsmittel (9) umfasst, welche dazu eingerichtet sind, das Paar von Druckelementen zwischen einer ersten Position, in welcher die Druckelemente mit dem Paar von Röhren, welche das halbfertige Stück lagern, wechselwirken können, und einer zweiten Position zu bewegen, in welcher die Druckelemente der Nähmaschine die Zehen darbieten.

2. Vorrichtung (1) nach dem vorhergehenden Anspruch, welche eingerichtet und prädisponiert ist, einen Strumpfhosen-Produktionszyklus durchzuführen, in welchem:

- die Transfervorrichtung ein halbfertiges Stück von der Linien-Schließmaschine (2) zu einem Paar von Röhren (4) der Zehen-Schließmaschine (3) transferiert, mit den jeweiligen zwei Klängen (5) in einer zurückgezogenen Position, so dass die beiden Beine mit den offenen Zehen des halbfertigen Stücks jeweils um eine jeweilige Röhre herum angeordnet sind;
- die zwei Klängen (5) jeder Röhre (4) des Paares von Röhren in eine vorgeschobene Position gebracht werden, wobei sie die Zehen des Beines des halbfertigen Stücks über das Längserstreckungsende der Röhren hinaus positionieren;
- die Platte (7) von der abgesenkten Position in die angehobene Position gebracht wird, wobei sie von unten mit den Zehen des halbfertigen Stücks in Kontakt tritt, welches an den Klängen der Röhren angeordnet ist;
- die zwei Druckelemente (8) jedes Paares von Druckelementen, in einer angehobenen Position, vorzugsweise zusammen, miteinander in die gekrümmte Konfiguration gebracht werden;
- die zwei Druckelemente (8) des Paares von Druckelementen in die abgesenkte Position gebracht werden, wobei jedes einen gekrümmten Abschnitt eines jeweiligen Zehs des halbfertigen Stücks blockiert, wobei der gekrümmte Abschnitt auf die darunterliegende Platte in der angehobenen Position gedrückt wird;
- die zwei Klängen (5) von jeder der beiden Röhren (4) in die zurückgezogene Position zurückgebracht werden;

- die zwei Druckelemente (8) des Paares von Druckelementen, vorzugsweise zusammen, in die gerade Konfiguration gebracht werden, wodurch die blockierten Abschnitte der Zehen veranlasst werden, eine lineare Form anzunehmen;
- die Bewegungsmittel (9) das Paar von Druckelementen (8) in der zweiten Näh-Position positionieren, in welcher die Zehen mittels der Durchführung einer Naht mit einem vorbestimmten Ablauf geschlossen werden;
- auf ein Vervollständigen der Naht der Zehen hin wird das halbfertige Stück von dem jeweiligen Paar von Röhren (4) abgeladen, wobei die Bewegungsmittel (9) das Paar von Druckelementen in der ersten Position positionieren, wobei das Paar von Druckelementen (8) in die angehobene Position gebracht wird und die Platte (7) in die abgesenkte Position gebracht wird.

3. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei jedes der Druckelemente (8) eine deformierbare Folie (10) umfasst, welche vorzugsweise aus Metall und/oder einem Kunststoffmaterial und/oder Gummi hergestellt ist, welche vertikal und normal mit einer im Wesentlichen geraden Ausdehnung und entsprechend zu der geraden Konfiguration angeordnet ist, wobei die Folie (10) unter dem Einfluss eines angemessenen Drängens derart möglicherweise gekrümmt wird, dass sie reversibel in die gekrümmte Konfiguration gebracht wird, wobei jedes Druckelement ferner einen jeweiligen Aktuator (11) umfasst, welcher derart an der jeweiligen Folie betriebsmäßig aktiv ist, dass das angemessene Drängen selektiv ausgeübt wird und der Übergang des Druckelements (8) von der geraden Konfiguration in die gekrümmte Konfiguration bestimmt wird.
4. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei jede Folie (10) einen Blattabschnitt (10a), welcher aus Metall oder Kunststoff hergestellt ist, und einen Dichtungsabschnitt (10b) umfasst, welcher unterhalb des Blattabschnitts befestigt ist, vorzugsweise über eine gesamte Länge davon, und dazu bestimmt ist, mit dem jeweiligen Zeh der Strumpfhose, welche an der jeweiligen Röhre angeordnet ist, in Kontakt zu treten, wobei der Dichtungsabschnitt vorzugsweise aus Gummi oder Kunststoff hergestellt ist.
5. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei die deformierbare Folie (10) und der Aktuator (11) dazu gebildet sind, die gekrümmte Konfiguration derart zu modifizieren, dass die Form des vorbestimmten Ablaufs des Nähens ausgewählt wird.
6. Vorrichtung (1) nach einem der vorhergehenden An-

sprüche, wobei der Aktuator (11) ein linearer Aktuator, vorzugsweise pneumatisch, ist mit einem wählbaren Weg, wobei der vorbestimmte Ablauf der Naht in einer gekrümmten Teilform mit einem Krümmungsradius als eine Funktion des ausführbaren Weges des linearen Aktuators ist.

7. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei jedes Druckelement (8), wenn in der gekrümmten Konfiguration und in die abgesenkte Position gebracht, einen Abschnitt des jeweiligen Zehs des halbfertigen Stücks entsprechend dem Abschnitt blockiert, welcher dazu bestimmt ist, genäht zu werden, um den vorbestimmten Ablauf des Nähens zu erhalten, und wenn in der abgesenkten Position und in die gerade Konfiguration gebracht, den gekrümmten Abschnitt ausstreckt, welcher zuvor durch das Druckelement in einer gekrümmten Konfiguration blockiert wurde, um der Nähmaschine einen geraden Abschnitt des Zehs entsprechend dem gekrümmten Abschnitt anzubieten.
8. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei der Übergang des Druckelements von der gekrümmten Konfiguration in die gerade Konfiguration den Abschnitt des Zehs, welcher durch das Druckelement blockiert wird, derart elastisch gerade zieht, dass die Naht entlang eines geraden Abschnitts auftritt, und zur gleichen Zeit, sobald das Druckelement freigegeben worden ist, eine gekrümmte Naht des Zehs mit einem gekrümmten Ablauf produziert.
9. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei der vorbestimmte Ablauf der Naht im Wesentlichen einem Umfangsbogen entspricht.
10. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei die Bewegungsmittel (9) einen Aktuator (15) und einen Wagen (15a) umfassen, welcher durch den Aktuator aktiviert wird und die Druckelemente lagert, wobei der Wagen dazu eingerichtet ist, die Druckelemente (8) zwischen der ersten und der zweiten Position in einer transversalen und/oder zu der Längsausdehnung der Röhren rechtwinkligen Richtung zwischen der ersten und der zweiten Position zu überführen.
11. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei jede Röhre (4) eine Halterung (16) umfasst, welche die Klingen (5) der Röhre verbindet, welche an den Seiten der Röhre gleitbar angeordnet ist, um sie aufeinander fest zu begrenzen, und wobei die Zehen-Schließmaschine Positionierungsmittel (20) umfasst, welche an einem Paar von Röhren (4), welche das halbfertige Stück lagern, betriebsmäßig aktivierbar sind, um die Klingen (5) der Röhren zusammen zwischen der zurückgezogenen Position

und der vorgeschobenen Position zu bewegen.

12. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei die Positionierungsmittel (20) ein Überführungsorgan (21) umfassen, welches dazu eingerichtet ist, in einer Positionierungsstation der Zehen-Schließmaschine (3) mit den jeweiligen beiden Halterungen (16) eines Paares von Röhren, welche in der Positionierungsstation angeordnet sind, einzugreifen, und das Verschieben und Zurückziehen der Halterungen zu bestimmen, um die Klingen der Röhren zwischen der vorgeschobenen Position und der zurückgezogenen Position zu bewegen, und/oder wobei die Positionierungsmittel (20) einen jeweiligen Aktuator (22) umfassen, welcher vorzugsweise ein pneumatischer Zylinder oder ein Linear-motor ist, welcher an dem Überführungsorgan (21) betriebsmäßig aktiv ist.
13. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei die Blockier- und Transportvorrichtung (6) ein Pad (25) umfasst, welches oberhalb der Röhren (4) positioniert ist und zwischen einer angehobenen Position, in welcher es mit dem halbfertigen Stück nicht wechselwirkt, und einer abgesenkten Position bewegbar ist, in welcher es von oben mit den Zehen des halbfertigen Stücks, welches an den Klingen angeordnet ist, in Kontakt tritt, wobei das Pad (25) in der vorgeschobenen Position eines Paares von Röhren dazu eingerichtet ist, in die abgesenkte Position gebracht zu werden, wenn die Platte in der angehobenen Konfiguration ist, um die Zehen des halbfertigen Stücks gegen die Platte zu blockieren und in der abgesenkten Position zu verbleiben bis die Druckelemente, in der gekrümmten Konfiguration, in die abgesenkte Position davon gebracht werden, und dazu eingerichtet ist, in die angehobene Position zurückzukehren, bevor die Druckelemente, in der abgesenkten Position, in die gerade Konfiguration übergehen.
14. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei die Zehen-Schließmaschine (3) ein Paar von Blockier-Organen (26) umfasst, welche an einer Positionierungsstation der Zehen-Schließmaschine angeordnet sind, wobei jedes Blockier-Organ zwischen einer aktiven Position, in welcher es auf einen Abschnitt einer jeweiligen Röhre des Paares von Röhren derart drückt, dass ein Abschnitt, welcher zwischen dem Zeh und dem Körperrumpfteilel angeordnet ist, eines entsprechenden Beins des halbfertigen Stücks, welches an der Röhre angeordnet ist, blockiert wird, und einer inaktiven Position bewegbar ist, in welcher es von der Röhre beabstandet ist und mit dem entsprechenden Bein nicht wechselwirkt, wobei jedes der Blockier-Organen (26) dazu eingerichtet ist, in die aktive Position gebracht zu werden, wenn die Stiche des halbfertigen Stücks zwischen

den Druckelementen und der Platte blockiert werden und die Klingen der Röhren in die zurückgezogene Position zurückgebracht werden und/oder bis die Druckelemente, in der gekrümmten Konfiguration, in der abgesenkten Position sind, und/oder dazu eingerichtet ist, in die deaktivierte Position in dem übrigen Teil des Maschinenzyklus gebracht zu werden.

15. Verfahren zum Produzieren von Strumpfhosen, umfassend die Schritte:

- gegenseitiges Verbinden eines Paares von röhrenförmigen Textilartikeln mittels einer Linien-Schließmaschine (2), um ein halbfertiges Stück mit einem Rumpfteil und zwei Beinen mit offenen Zehen zu bilden;
- Transferieren des halbfertigen Stücks von der Linien-Schließmaschine zu einem Paar von Röhren (4) einer Zehen-Schließmaschine (3) mittels einer Transfervorrichtung, so dass jedes Bein des halbfertigen Stücks an einer jeweiligen Röhre (4) angeordnet ist, wobei jede Röhre mit zwei Klingen (5) in einer zurückgezogenen Position bereitgestellt ist;
- Bringen der beiden Klingen (5) jeder Röhre (4) des Paares von Röhren in eine vorgeschobene Position, um die Zehen der Beine des halbfertigen Stücks über die longitudinale Erstreckung der Röhren hinaus zu positionieren, wobei sie an den Klingen angeordnet bleiben; **dadurch gekennzeichnet, dass** es die Schritte umfasst:
- Voranordnen einer Blockier- und Transportvorrichtung (6), welche dazu gebildet ist, auf den Zehen der Beine eines halbfertigen Stücks betriebsmäßig aktivierbar zu sein, um sie in einer vorbestimmten Konfiguration zu blockieren und sie zu einer Nähmaschine in einer vorbestimmten Konfiguration zu transportieren und sie derart zu einer Nähmaschine zu transportieren, dass die Zehen mittels eines Ausführens einer Naht mit einem vorbestimmten Ablauf geschlossen werden, wobei die Blockier- und Transportvorrichtung eine Platte (7) und wenigstens ein Paar von Druckelementen (8) umfasst;
- Positionieren der Platte (7) in eine angehobene Position, in welcher sie von unten mit den Zehen des halbfertigen Stücks in Kontakt tritt, welches an den Klingen der Röhren angeordnet ist;
- Positionieren der beiden Druckelemente (8) des Paares von Druckelementen in eine angehobene Position, in welcher sie die Stiche des halbfertigen Stücks nicht kontaktieren, und Bringen dieser, vorzugsweise zusammen, in eine gekrümmte Position,
- Positionieren der beiden Druckelemente (8) in eine abgesenkte Position, in welcher sie jeweils einen Abschnitt eines jeweiligen Zehs des halbfertigen Stücks blockieren, wobei sie den Ab-

schnitt auf die darunterliegende Platte (7) drücken, so dass der blockierte Abschnitt des jeweiligen Zehs eine gekrümmte Form annimmt, wobei die gekrümmte Form im Wesentlichen dem vorbestimmten Ablauf der Naht entspricht;

- Zurückbringen der Klingen (5) der beiden Röhren (4) in die zurückgezogene Position;
- Halten der Druckelemente (8) in der abgesenkten Position und/oder der Platte (7) in der angehobenen Position, Bringen der beiden Druckelemente des Paares von Druckelementen, vorzugsweise zusammen, in eine gerade Konfiguration, wodurch die blockierten Abschnitte der Zehen dazu gebracht werden, eine lineare Form anzunehmen;
- Voranordnen von Bewegungsmitteln (9), welche dazu eingerichtet sind, das Paar von Druckelementen zwischen einer ersten Position, in welcher die Druckelemente mit dem Paar von Röhren, welche das halbfertige Stück lagern, wechselwirken, und einer zweiten Position zu bewegen, in welcher die Druckelemente die Zehen einer Nähmaschine aussetzen;
- Positionieren des Paares von Druckelementen (8) mittels der Bewegungsmittel (9), wodurch die Zehen des halbfertigen Stücks in die zweite Naht-Position gebracht werden;
- Nähen der Zehen der Beine des halbfertigen Stücks unter Verwendung einer Nähmaschine der Zehen-Schließmaschine, um ein vollständiges Strumpfhosen-Kleidungsstück zu erhalten, wobei das Nähen den vorbestimmten Ablauf aufweist;
- auf ein Beenden des Nähens der Stiche hin, Abladen des halbfertigen Stücks von dem entsprechenden Paar von Röhren, Positionieren des Paares von Druckelementen in der ersten Position unter Verwendung der Bewegungsmittel, Bringen des Paares von Druckelementen in die angehobene Position und Bringen der Platte in die abgesenkte

Revendications

1. Appareil (1) pour la production de collants, comprenant une machine de fermeture de ligne (2) adaptée pour unir deux produits textiles tubulaires l'un à l'autre pour former une pièce semi-finie dotée d'une partie tronc et de deux jambes aux pointes ouvertes, une machine de fermeture de pointe (3) adaptée pour coudre, au moyen d'une machine à coudre, les pointes des jambes de la pièce semi-finie, et un dispositif de transfert configuré pour transférer la pièce semi-finie de la machine de fermeture de ligne vers la machine de fermeture de pointe, **caractérisé en ce que** la machine de fermeture de pointe comprend une pluralité de tubes de soutien (4) des pièces semi-

finies, les tubes étant couplés deux à deux de sorte que chaque paire de tubes (4) soutient les jambes d'une même pièce semi-finie, **caractérisé en ce que** chaque tube est doté de deux lames (5) disposées de part et d'autre du tube et longitudinalement mobiles, c'est-à-dire de manière parallèle à l'axe longitudinal du tube, entre une position rétractée dans laquelle les lames (5) se trouvent comprises dans un volume longitudinal du tube, et une position avancée, dans laquelle les lames sont extraites longitudinalement du tube, l'appareil comprenant un dispositif de blocage et de transport (6) structuré de manière à pouvoir être fonctionnellement activé sur les pointes des jambes de la pièce semi-finie, par exemple pour bloquer les pointes dans une configuration prédéterminée et les transporter vers la machine à coudre afin que les pointes soient fermées par une couture ayant une progression prédéterminée, où lesdites lames (5) se trouvent en position rétractée lorsque la pièce semi-finie est transférée de la machine de fermeture de ligne vers la machine de fermeture de pointe et pendant la couture des pointes, et se trouvent en position avancée lorsque les pointes sont soumises à l'action du dispositif de blocage et de transport,

caractérisé en ce que le dispositif de blocage et de transport comprend une plaque (7) placée en-dessous des tubes (4) et étant mobile entre une position abaissée, dans laquelle elle ne coopère pas avec la pièce semi-finie, et une position levée, dans laquelle elle entre en contact dans sa partie inférieure avec les pointes de la pièce semi-finie enveloppée autour des lames (5), agencés en une position avancée, d'une paire de tubes, le dispositif de blocage et de transport (6) comprenant en outre au moins une paire de presses (8) mobiles de manière solidaire entre une position levée, dans laquelle elles ne sont pas en contact avec les pointes de la pièce semi-finie et une position abaissée, dans laquelle elles bloquent chacune une partie d'une pointe correspondante de la pièce semi-finie, appuyant la partie sur la plaque sous-jacente (7), où chaque presse (8) de la paire de presses peut prendre au moins une configuration droite, dans laquelle la presse fait que la partie bloquée de la pointe correspondante prenne une forme linéaire, et une configuration incurvée, dans laquelle la presse fait que la partie bloquée de la pointe correspondante prenne une forme incurvée, dans laquelle la forme incurvée correspond sensiblement à ladite progression prédéterminée de la couture, le dispositif de blocage et de transport (6) comprenant un moyen de déplacement (9) configuré de telle manière à déplacer la paire de presses entre une première position, dans laquelle les presses peuvent coopérer avec la paire de tubes portant la pièce semi-finie, et une deuxième position, dans laquelle les presses présentent les pointes à la machine à coudre.

2. Appareil (1) de la revendication précédente, configuré et prédisposé à effectuer un cycle de production de collants où :

- 5 - le dispositif de transfert transfère une pièce semi-finie depuis la machine de fermeture de ligne (2) à une paire de tubes (4) de la machine de fermeture de pointe (3) ayant les deux lames (5) correspondantes dans une position rétractée, de sorte que les deux jambes ayant les pointes ouvertes de la pièce semi-finie sont toutes les deux indépendamment enveloppées autour d'un tube correspondant ;
- 10 - les deux lames (5) de chaque tube (4) de la paire de tubes sont amenées vers une position avancée, positionnant les pointes des jambes de la pièce semi-finie au-delà de l'extension longitudinale des tubes ;
- 15 - la plaque (7) est amenée de la position abaissée vers la position levée, entrant en contact dans sa partie inférieure avec les pointes de la pièce semi-finie enveloppées autour des lames des tubes ;
- 20 - les deux presses (8) de chaque paire de presses, en position levée, sont préférablement amenées ensemble dans la configuration incurvée ;
- 25 - les deux presses (8) de la paire de presses sont amenées dans la position abaissée, chacune bloquant une partie incurvée d'une pointe correspondante de la pièce semi-finie, appuyant la partie incurvée sur la plaque sous-jacente dans la position levée ;
- 30 - les deux lames (5) de chacun des deux tubes (4) reviennent vers la position rétractée ;
- 35 - les deux presses (8) de la paire de presses sont amenées préférablement ensemble dans la configuration droite, faisant que les parties bloquées des pointes prennent une forme linéaire ;
- 40 - le moyen de déplacement (9) place la paire de presses (8) dans une deuxième position de couture, dans laquelle les pointes sont fermées grâce à l'exécution d'une couture ayant ladite progression prédéterminée ;
- 45 - à la fin de la couture des pointes, la pièce semi-finie est déchargée de la paire de tubes (4) correspondante, le moyen de déplacement (9) positionne ladite paire de presses dans la première position, la paire de presses (8) est amenée dans la position levée et la plaque (7) est amenée dans la position abaissée.

3. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** chacune des presses (8) comprend une feuille déformable (10),

préférentiellement fabriquée en un matériau métallique et/ou plastique et/ou en caoutchouc, disposée verticalement et étant normalement dotée d'un développement sensiblement droit et correspondant à la configuration droite, la feuille (10) étant possible-
ment incurvée sous l'action d'une sollicitation adé-
quate, de manière à être réversiblement amenée
dans ladite configuration incurvée, chaque presse
comprenant en outre un actionneur (11) correspon-
dant fonctionnellement actif sur la feuille correspon-
dante de telle manière à exercer sélectivement la
sollicitation adéquate et déterminer le passage de la
presse (8) de la configuration droite à la configuration
incurvée.

4. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** chaque feuille (10) comprend une partie aplatie (10a) fabriquée en métal ou en plastique, et une partie de fermeture (10b), fixée en dessous de la partie aplatie, préféra-
blement sur toute une longueur de celle-ci, et desti-
née à entrer en contact avec la pointe correspon-
dante des collants enveloppée autour du tube cor-
respondant, la partie de fermeture étant préféra-
blement fabriquée en caoutchouc ou en plastique.
5. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** la feuille défor-
mable (10) et l'actionneur (11) sont structurés de tel-
le manière à modifier la configuration incurvée pour
sélectionner la forme de la progression prédétermi-
née de la couture.
6. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** l'actionneur
(11) est un actionneur linéaire, préférentiellement pneu-
matique, ayant un trajet sélectionnable, la progres-
sion prédéterminée de la couture étant dans une for-
me au trait incurvé ayant un rayon de courbure qui
est fonction dudit trajet sélectionnable de l'action-
neur linéaire.
7. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** chaque presse
(8), quand elle est dans la configuration incurvée et
est amenée dans la position abaissée, bloque une
partie de la pointe correspondante de la pièce semi-
finie correspondant à la partie destinée à être cousue
afin d'obtenir ladite progression prédéterminée de la
couture, et quand elle est dans la position abaissée
et est amenée dans la configuration droite, étire la
partie incurvée, auparavant bloquée par la presse
dans une position incurvée, de manière à présenter
à la machine à coudre une partie droite de la pointe
correspondant à la partie incurvée.
8. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** le passage de

la presse de la configuration incurvée à la configu-
ration droite redresse de manière élastique la partie
de la pointe bloquée par la presse de sorte que la
couture se fait le long d'une partie droite, et, en même
temps, après le relâchement de la presse, produit
une couture courbe de la pointe ayant une progres-
sion incurvée.

9. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** la progression
prédéterminée de la couture correspond essentiel-
lement à un arc de circonférence.
10. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** le moyen de
déplacement (9) comprend un actionneur (15) et un
chariot (15a) activé par ledit actionneur et portant
lesdites presses, le chariot étant configuré de ma-
nière à translater les presses (8) entre ladite premiè-
re et ladite deuxième positions, dans une direction
transversale et/ou perpendiculaire au développe-
ment longitudinal des tubes entre la première et la
deuxième position.
11. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** chaque tube
(4) comprend un support (16) connectant les lames
(5) du tube, disposées de manière coulissante aux
côtés des tubes, de manière à les contraindre de
manière solidaire l'une à l'autre, et **caractérisé en
ce que** la machine de fermeture de pointe comprend
un moyen de positionnement (20) qui peut être fon-
ctionnellement activé sur une paire de tubes (4) por-
tant la pièce semi-finie de manière à déplacer les
lames (5) des tubes ensemble entre la position ré-
tractée et la position avancée.
12. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** le moyen de
positionnement (20) comprend un organe de trans-
lation (21) configuré de manière à engager, dans
une station de positionnement de la machine de fer-
meture de pointe (3), les deux supports (16) cor-
respondants d'une paire de tubes située dans la station
de positionnement et de manière à déterminer
l'avancée et la rétraction des supports, de telle ma-
nière à déplacer les lames des tubes entre la position
avancée et la position rétractée, et/ou **caractérisé
en ce que** le moyen de positionnement (20) com-
prend un actionneur (22) correspondant, préféra-
blement un cylindre pneumatique ou un moteur linéaire,
fonctionnellement actif sur l'organe de translation
(21).
13. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** le dispositif de
blocage et de transport (6) comprend un coussinet
(25) placé dans la partie supérieure des tubes (4) et

mobile entre une position levée, dans laquelle il ne coopère pas avec la pièce semi-finie, et une position abaissée, dans laquelle il entre en contact dans sa partie supérieure avec les pointes de la pièce semi-finie enveloppée autour des lames, dans la position avancée d'une paire de tubes, le coussinet (25) étant configuré de manière à être amené dans une position abaissée lorsque la plaque se trouve en configuration levée, de manière à bloquer les pointes de la pièce semi-finie contre la plaque, et à rester dans la configuration abaissée jusqu'à ce que les presses, dans la configuration incurvée, soient amenées dans leur position abaissée, et étant configuré de manière à retourner à la position levée avant que les presses, dans la configuration abaissée, passent dans la configuration droite.

14. Appareil (1) de l'une quelconque des revendications précédentes, **caractérisé en ce que** la machine de fermeture de pointe (3) comprend une paire d'organes de blocage (26) située dans une station de positionnement de la machine de fermeture de pointe, chaque organe de blocage étant mobile entre une position active, dans laquelle il appuie sur une partie d'une paire de tubes correspondante de telle manière à bloquer une partie, interposée entre la pointe et la partie tronc du corps d'une jambe correspondante de la pièce semi-finie enveloppée autour du tube, et une position inactive, dans laquelle il est éloigné du tube et n'interfère pas avec la jambe correspondante, chacun des organes de blocage (26) étant configuré de manière à être amené dans la position active où les points de la pièce semi-finie sont bloqués entre les presses et la plaque et les lames des tubes retournent dans la configuration incurvée et/ou jusqu'à ce que les presses, dans la position incurvée, se trouvent dans la position abaissée, et/ou étant configuré de manière à être amené dans la position désactivée pendant la partie restante du cycle de la machine.

15. Procédé de production de collants, comprenant les étapes consistant à :

- Joindre réciproquement, au moyen d'une machine de fermeture de ligne (2), deux articles textiles tubulaires de manière à former une pièce semi-finie ayant une partie tronc et deux jambes avec des pointes ouvertes ;
- Transférer, au moyen d'un dispositif de transfert, la pièce semi-finie depuis la machine de fermeture de ligne vers une paire de tubes (4) d'une machine de fermeture de pointe (3), de sorte que chaque jambe de la pièce semi-finie soit enveloppée autour d'un tube (4) correspondant, chaque tube étant doté de deux lames (5) en position rétractée ;
- Amener les deux lames (5) de chaque tube (4)

de la paire de tubes vers une position avancée, de manière à amener les pointes des jambes de la pièce semi-finie au-delà de l'extension longitudinale des tubes, les gardant enveloppées autour des lames ;

Caractérisé en ce qu'il comprend les étapes consistant à :

- Prédisposer un dispositif de blocage et de transport (6) structuré de manière à pouvoir être fonctionnellement activé sur les pointes des jambes d'une pièce semi-finie afin de les bloquer dans une configuration prédéterminée et à les transporter jusqu'à une machine à coudre dans une configuration prédéterminée et à les transporter jusqu'à une machine à coudre de sorte que les pointes soient fermées en faisant une couture ayant une progression prédéterminée, le dispositif de blocage et de transport comprenant une plaque (7) et au moins une paire de presses (8) ;
- Positionner la plaque (7) dans une position élevée, dans laquelle elle entre en contact dans sa partie inférieure avec les pointes de la pièce semi-finie enveloppée autour des lames des tubes ;
- Positionner les deux presses (8) de la paire de presses dans une position levée, dans laquelle elles n'entrent pas en contact avec les points de la pièce semi-finie, et les amener, préférentiellement ensemble, vers une position incurvée ;
- Positionner les deux presses (8) dans une position abaissée, dans laquelle elles bloquent chacune une partie de la pointe correspondante de la pièce semi-finie, appuyer sur la partie de la plaque sous-jacente (7), de telle manière que la partie bloquée de la pointe correspondante prenne une forme incurvée, la forme incurvée correspondant sensiblement à la progression prédéterminée de la couture ;
- Ramener les lames (5) de chacun des deux tubes (4) vers la position rétractée ;
- Maintenir les presses (8) dans la position abaissée et/ou de la plaque (7) dans la position levée, amener les deux presses de la paire de presses, préférentiellement ensemble, dans une configuration droite, faisant que les parties bloquées des pointes prennent une forme linéaire ;
- Prédisposer le moyen de déplacement (9) configuré de manière à déplacer la paire de presses entre une première position, dans laquelle les presses coopèrent avec la paire de tubes portant la pièce semi-finie, et une deuxième position, dans laquelle les presses présentent les pointes à une machine à coudre ;
- Positionner, grâce au moyen de déplacement (9), la paire de presses (8), amenant les pointes

de la pièce semi-finie dans une deuxième position de couture ;

- Coudre, au moyen d'une machine à coudre de la machine de fermeture de pointe, les pointes des jambes de la pièce semi-finie, de manière à obtenir un vêtement complet de collants, la couture ayant la progression prédéterminée;

- à la fin de la couture des points, décharger la pièce semi-finie de la paire de tubes correspondante, placer, en utilisant le moyen de déplacement, la paire de presses dans la première position, amenant la paire de presses dans la position levée et amenant la plaque dans la position abaissée.

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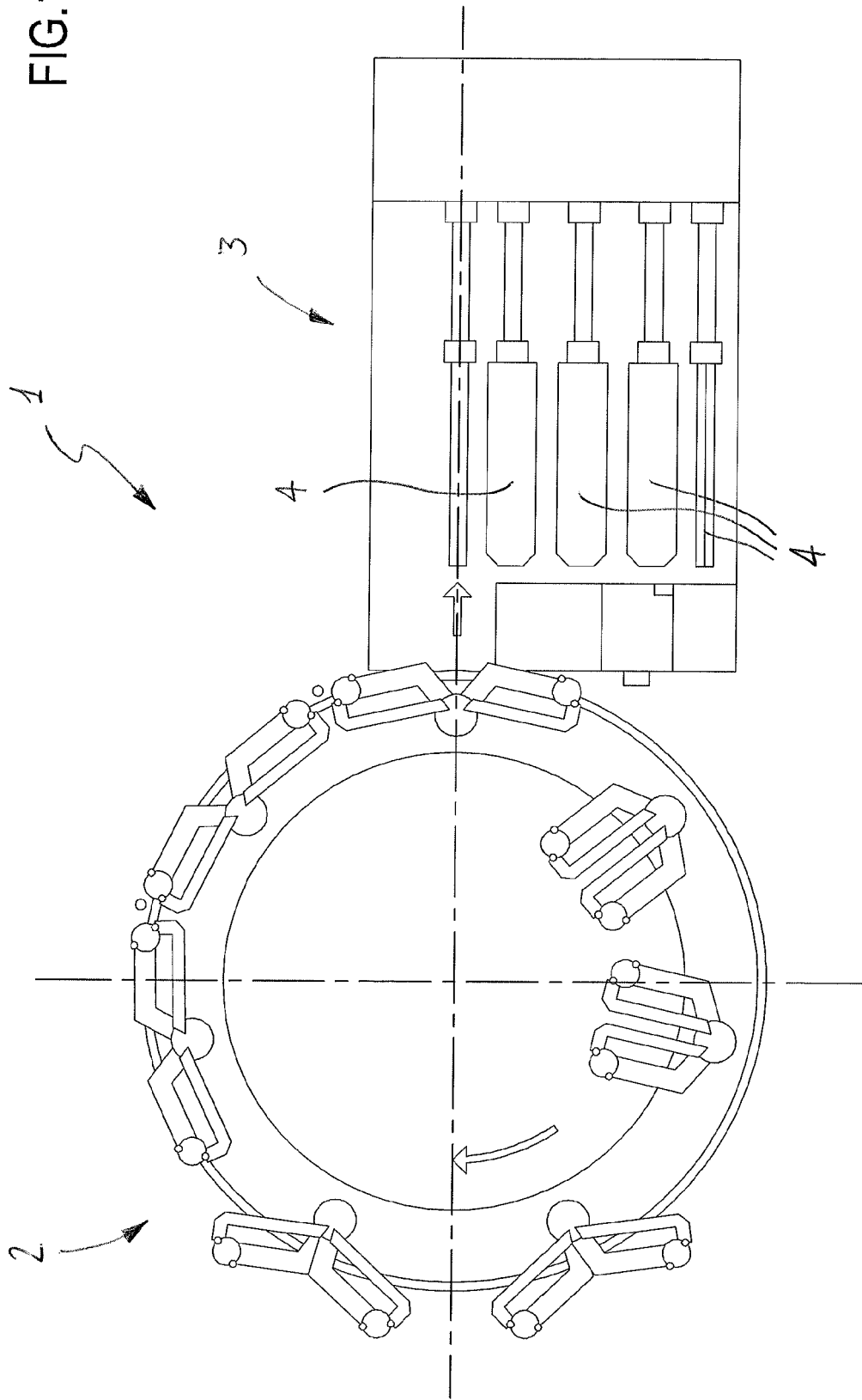
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FIG.1



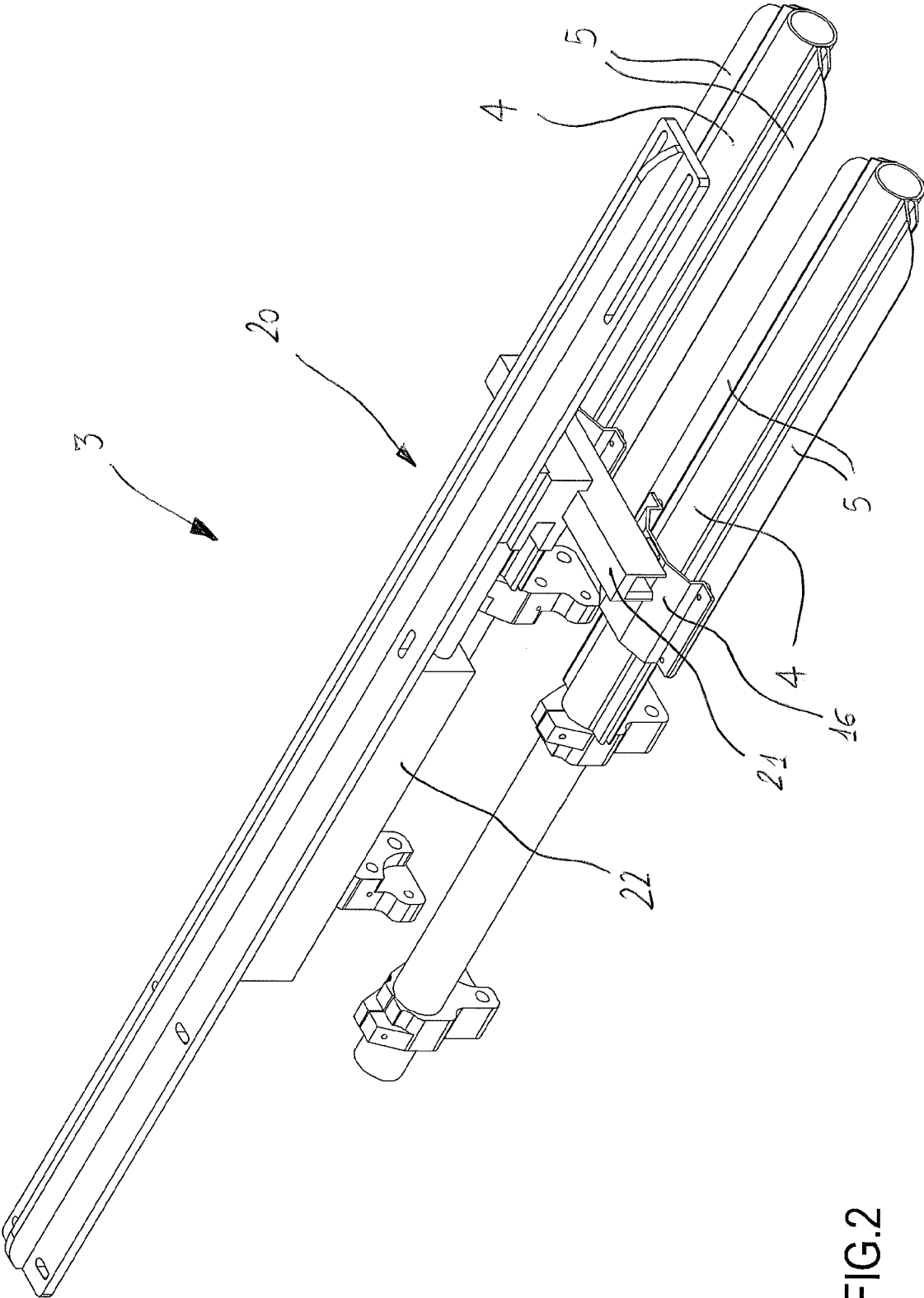


FIG.2

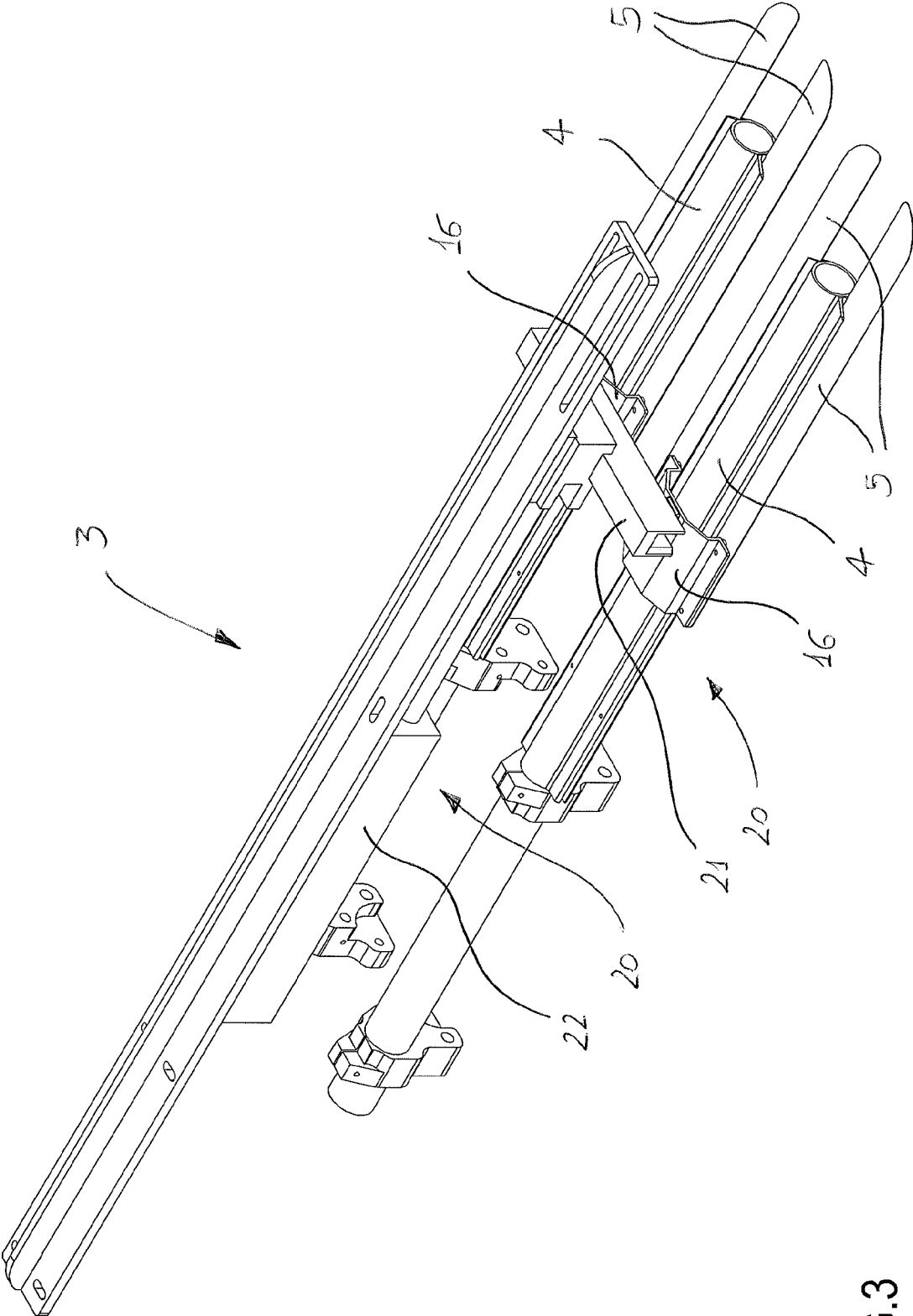


FIG.3

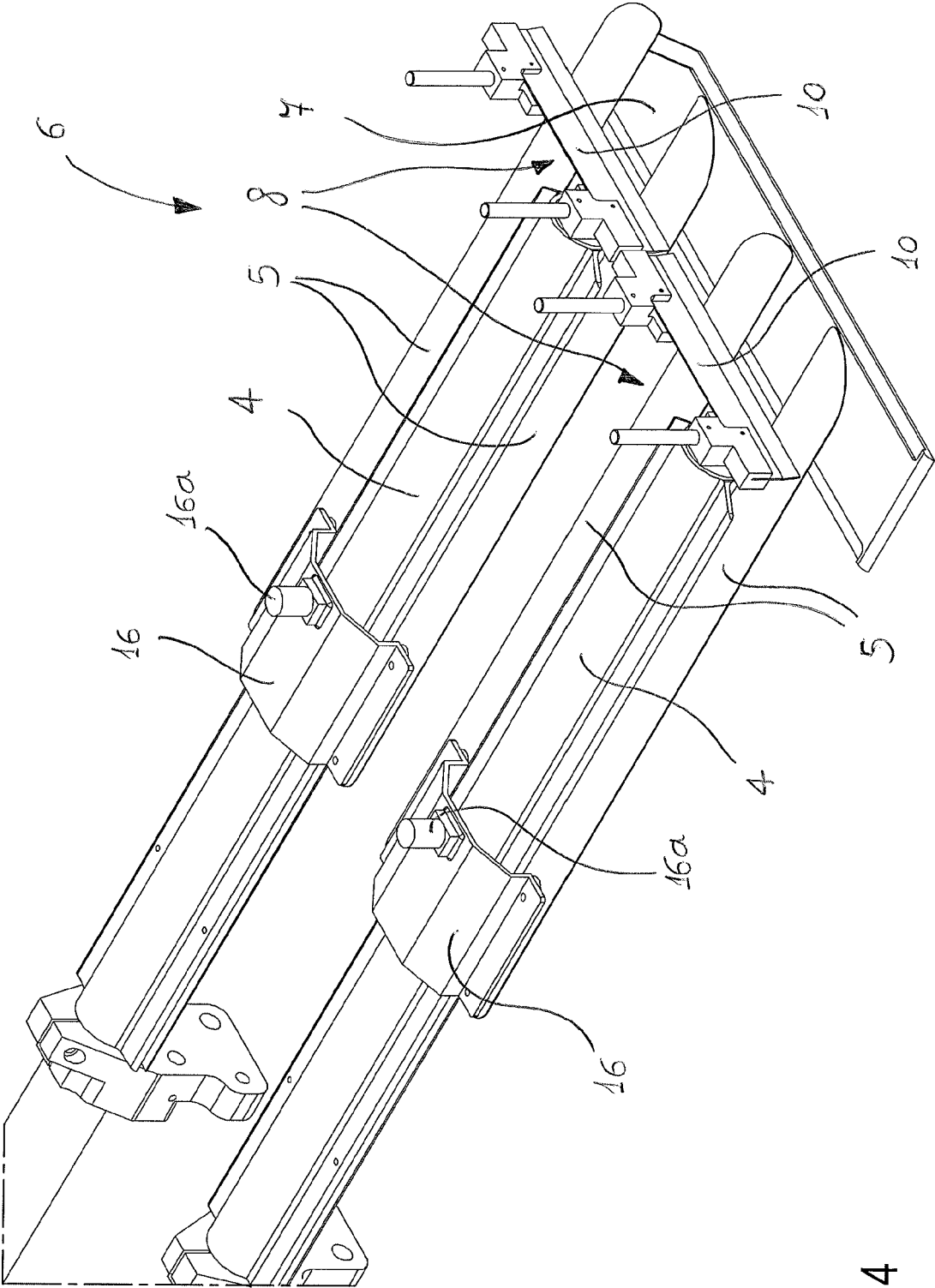


FIG.4

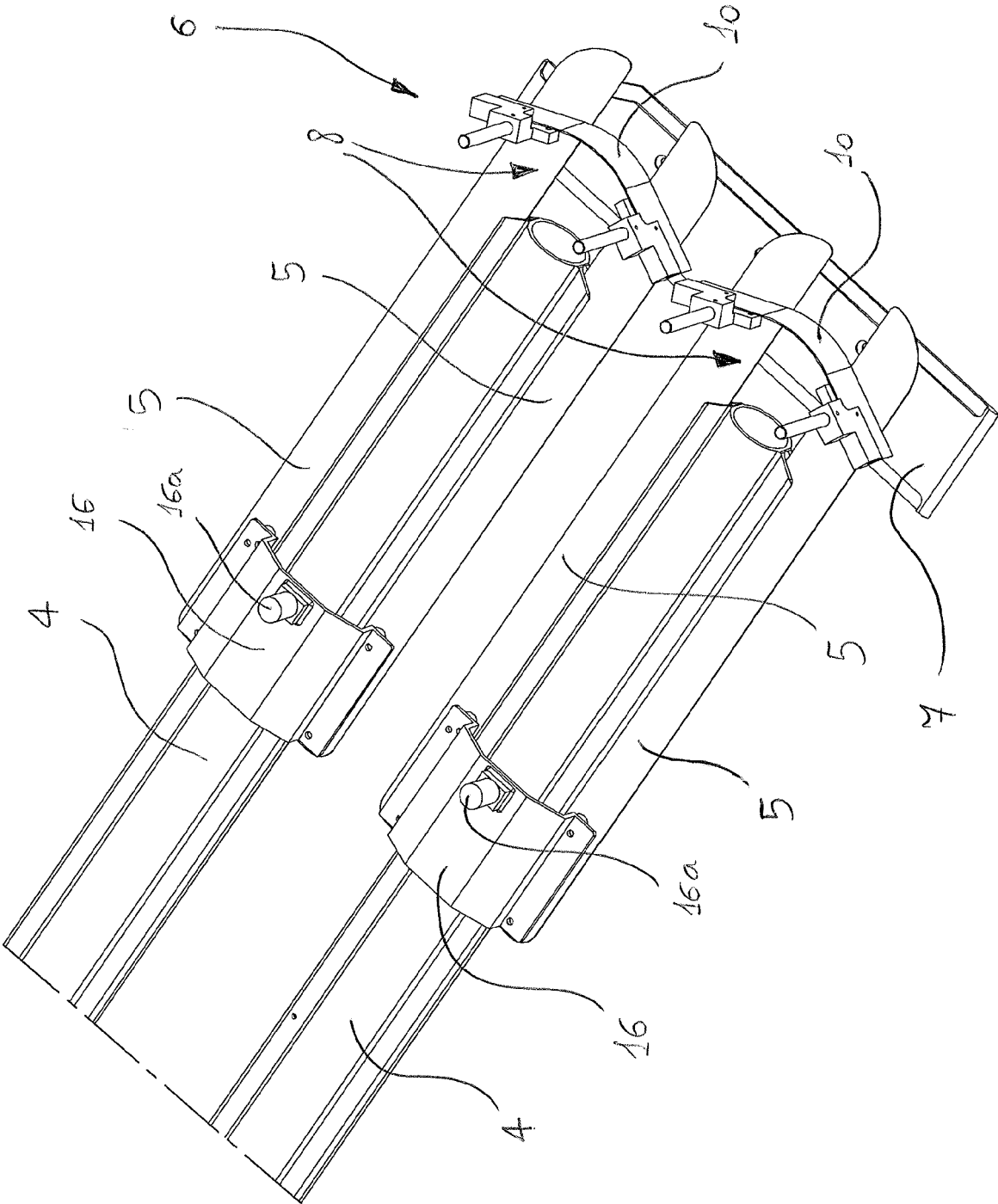


FIG.5

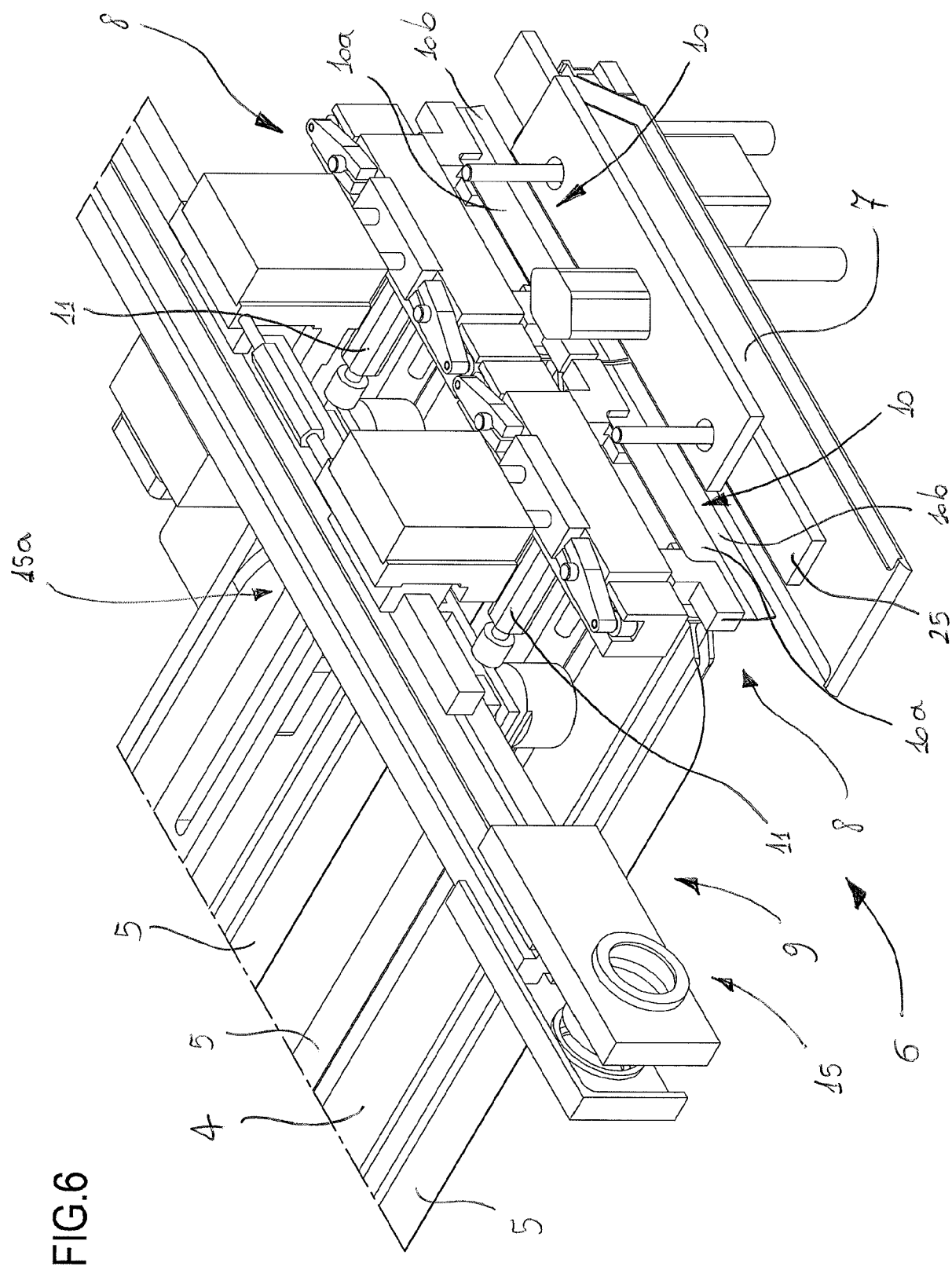


FIG. 6

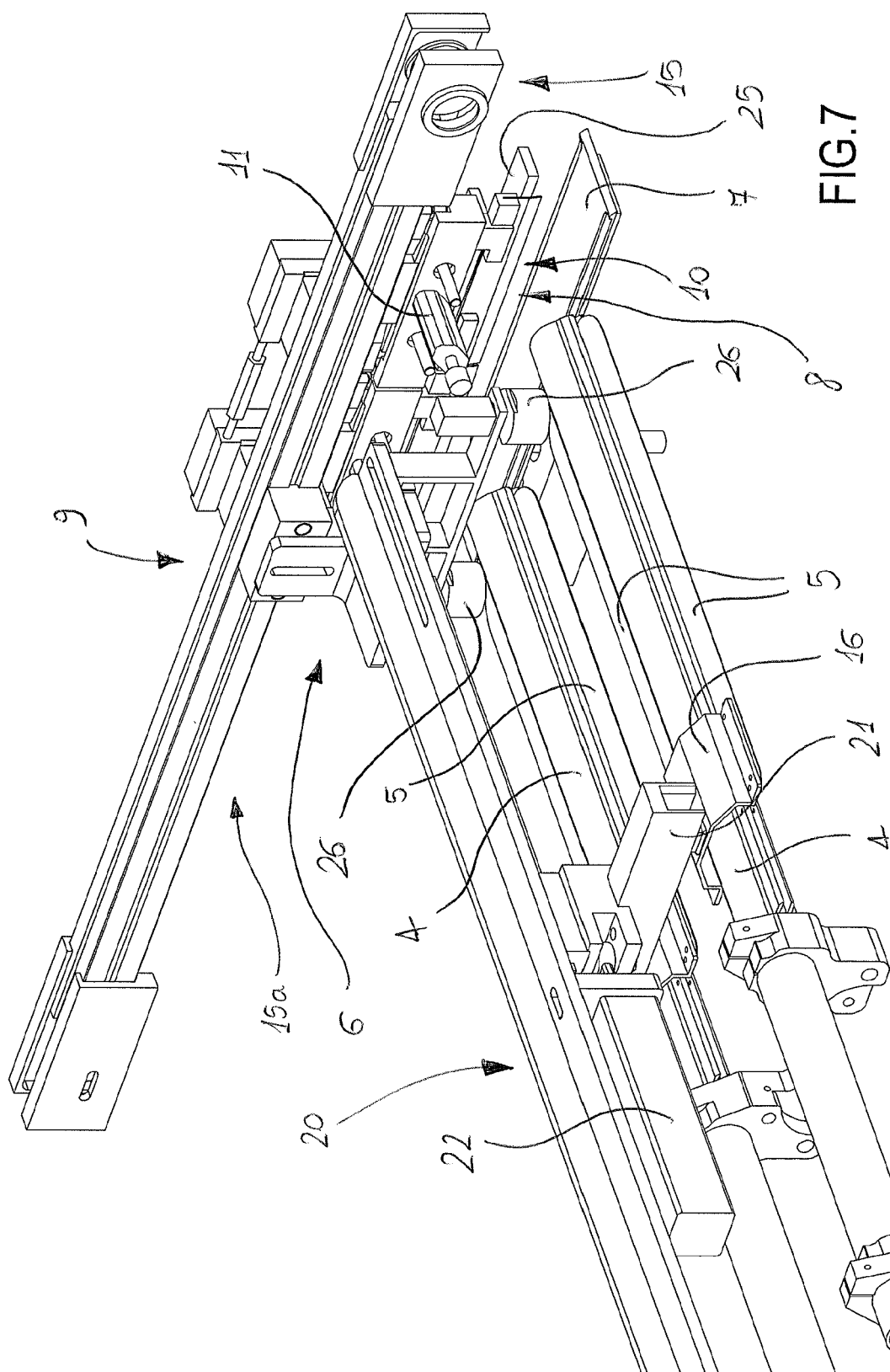
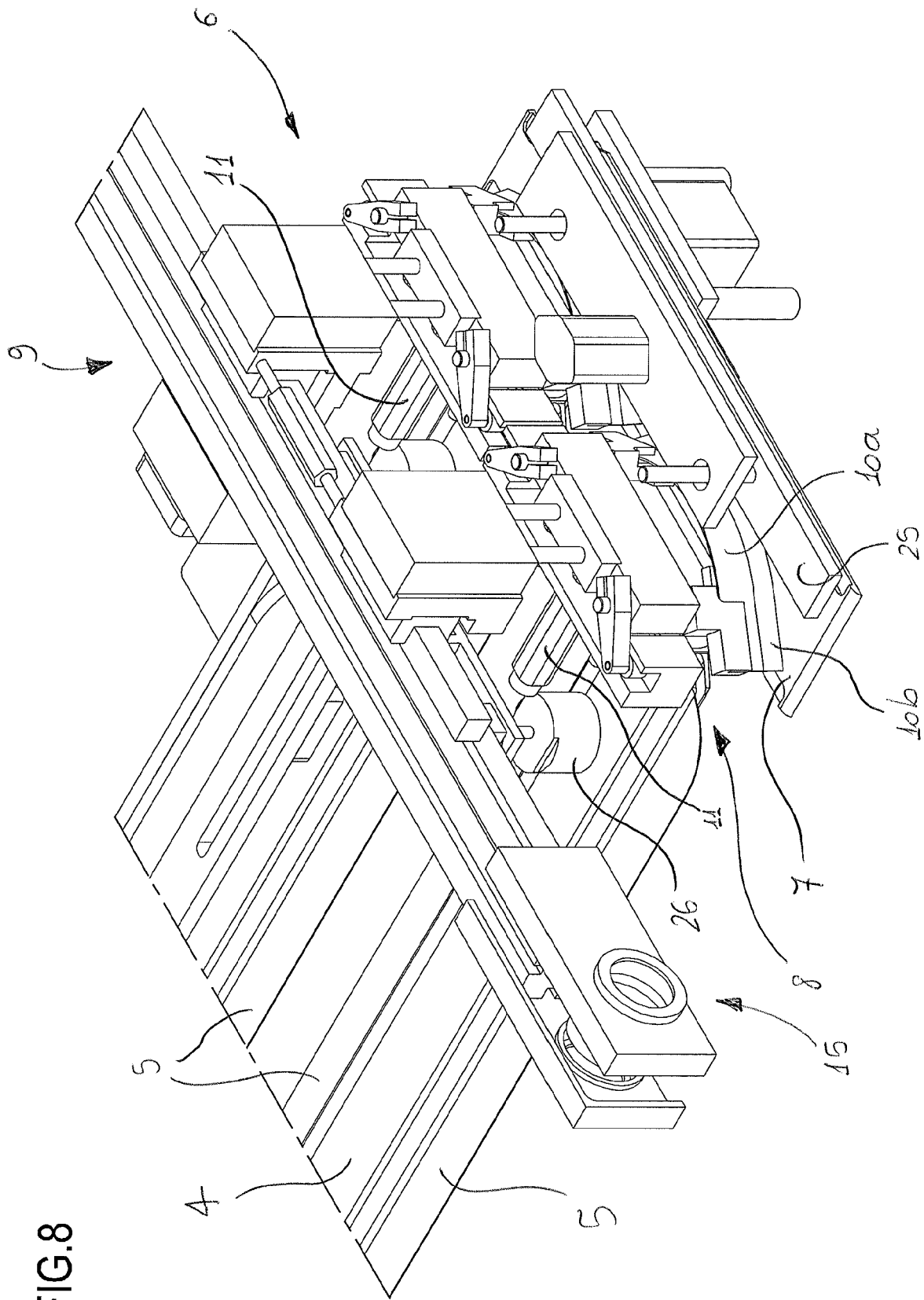


FIG. 7



F/G.8

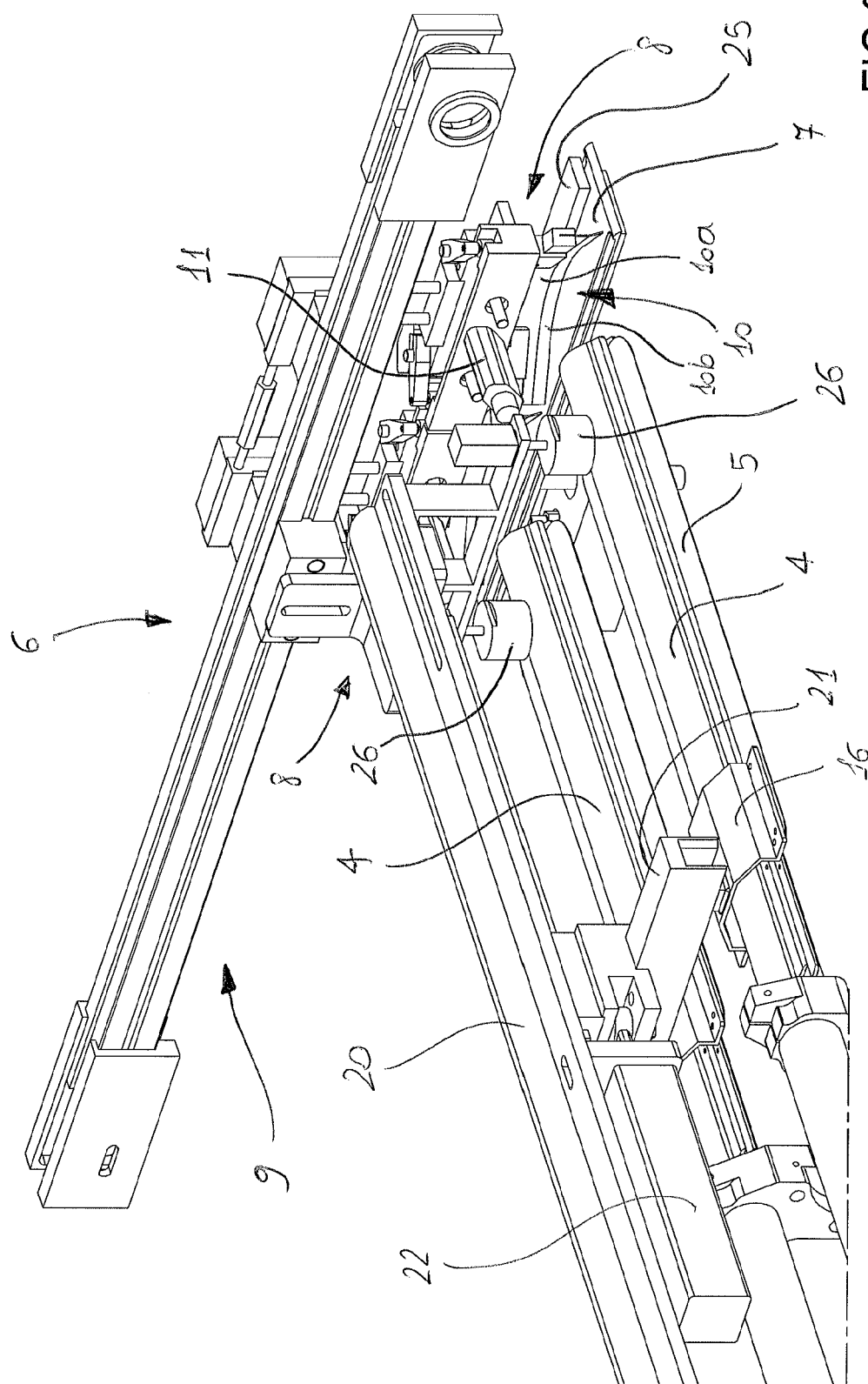


FIG. 9

REFERENCES CITED IN THE DESCRIPTION

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