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(54) A MANUFACTURING DEVICE FOR MANUFACTURING TOBACCO INDUSTRY RODS AND A METHOD OF MANUFACTURING TOBACCO INDUSTRY RODS

(57) A manufacturing device (1) for manufacturing tobacco industry rods (R) from a continuous rod (CR) manufactured from a crimped strand of a filling material (2), comprising: a feeding unit (5) for feeding a strand of the filling material (2), a crimping unit (6) comprising crimping drums (7, 8) for crimping the strand of the filling material (2) in a form of a flat web, a wrapper feeding unit (15) for feeding a tape of a wrapper (16), a compacting unit (10) for forming the strand of the filling material (2') into a form of a circular strand, a forming unit (12) for forming a continuous rod (CR) by wrapping the crimped strand of the filling material (2') into the tape of the wrapper (16) which is transported by a garniture belt (17) and sealed by an adhesive supplied from an adhesive apparatus (14), a cutting head (18) for cutting the continuous rod (CR) into individual rods (R), wherein the crimped strand of the filling material (2) fed from the crimping unit (6) in the form of a flat web at a first linear speed (v1) changes its cross-sectional shape from flat to circular and is compacted in the compacting unit (10) before being fed to the forming unit (12), wherein a tensioning unit (11) is positioned between the crimping unit (6) and the compacting unit (10), which comprises a first winding roller (21), wherein the first winding roller (21) is positioned such that the strand of the filling material (2) fed at the first speed (v1) winds around the first winding roller (21), characterized in that the tensioning unit (11) comprises a first drive unit (19) of the first winding roller (21) for imparting a first angular velocity (ω1) so that a second linear velocity (v2) of the lateral surface (24) of the first winding roller (21) is greater than the first linear velocity (v1) of the strand of the filling material (2) being fed, wherein a slippage is maintained between the lateral surface (24) of the winding roller (21) and the strand of the filling material (2).

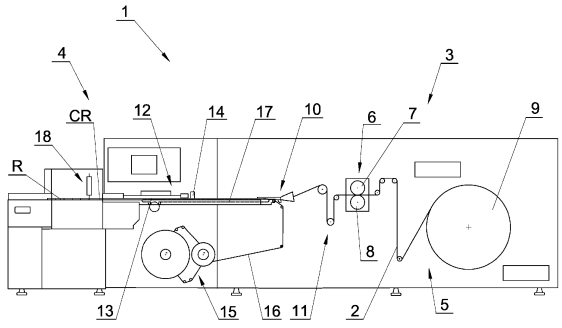

Fig. 1

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Description

TECHNICAL FIELD

[0001] The object of the present invention is a manufacturing device for manufacturing tobacco industry rods and a method of manufacturing tobacco industry rods.

BACKGROUND

[0002] In the tobacco industry, semi-finished and finished products are known, where the filling is formed from a crimped strand of material. To produce the filling, a strand of material is compacted to a cross-section close to a circular shape or inscribed in a circle. A known problem for tobacco industry products manufacturers is forming the filling material strand such as to ensure high-quality rods, with the material strand fed without creases, namely without overlapping adjacent parts of the material strand. This problem is exacerbated because crimping disrupts the structure of the material strand, resulting in many narrow strands with the structure of the input material, between which the material has a relaxed structure. Essentially, a strand is formed consisting of many narrow strands loosely coupled together, with the material fibers separated from each other. This structure has increased filtration properties, as the surface area absorbing smoke particles is increased and the resistance to airflow through the manufactured filter is increased. However, manufacturing such a structure involves an increase in the width of the strand in the free state, and the risk of longitudinal wrinkles is increased, which may reduce the finished filter rods' quality due to variation in resistance values. It is also important that the longitudinal tension of the filling material strand is as low as possible immediately before wrapping the filling material in the wrapper, so that when the finished rod is manufactured, the section of the crimped material strand placed in the rod does not visibly shorten and/or cause wrinkling of the wrapper. As mentioned above, the longitudinal creases that occur during the manufacturing process cause a change in the parameter relating to the resistance to airflow in the finished rod or in the sections of the rod that are placed in the mouthpieces of smoking articles. This parameter is described as the pressure drop of flowing air. It is important that before changing the form of the strand from a flat web to a circular strand, the strand should be acted upon to expand and smooth the material strand, reducing the risk of longitudinal creases and subsequently taking a strand of material with increased width to form a continuous rod. Excessive longitudinal tension on the material strand leads to a reduction in the manufactured product's quality, but the longitudinal tension should be high enough so that no overhang of crimped material is formed in the path of movement of the strand of material downstream the crimping device. There is a need to develop a manufacturing device equipped with a device capable of accepting material of increased width in the crimping process, to wind and tension the filling material strand coming out of the crimping device of increased width, and to reduce the tension of the material immediately before feeding it into the continuous rod forming unit.

[0003] WO2013098353A1 and WO2015097127A1 show feeding devices for a manufacturing device for manufacturing rods. The feeding devices disclosed therein comprise a crimping device and a compacting device for forming a continuous rod, wherein a strand of the filling material passes directly from the crimping device to the compacting device. Document EP3469923A1 shows a manufacturing device in which a strand of the filling material is also directly fed to the compacting device before forming a continuous rod.

[0004] It would therefore be desirable to develop a device and method for manufacturing tobacco industry rods in which at least some of the disadvantages described above are at least partially limited.

SUMMARY

[0005] The object of the invention is a manufacturing device for manufacturing tobacco industry rods from a continuous rod manufactured from a crimped strand of a filling material, comprising: a feeding unit for feeding a strand of the filling material, a crimping unit comprising crimping drums for crimping the strand of the filling material in a form of a flat web, a wrapper feeding unit for feeding a tape of a wrapper, a compacting unit for forming the strand of the filling material into a form of a circular strand, a forming unit for forming a continuous rod by wrapping the crimped strand of the filling material into the tape of the wrapper which is transported by a garniture belt and sealed by an adhesive supplied from an adhesive apparatus, a cutting head for cutting the continuous rod into individual rods, wherein the crimped strand of the filling material fed from the crimping unit in the form of a flat web at a first linear speed changes its cross-sectional shape from flat to circular and is compacted in the compacting unit before being fed to the forming unit, wherein a tensioning unit is positioned between the crimping unit and the compacting unit, which comprises a first winding roller, wherein the first winding roller is positioned such that the strand of the filling material fed at the first speed winds around the first winding roller, characterized in that the tensioning unit comprises a first drive unit of the first winding roller for imparting a first angular velocity so that a second linear velocity of the lateral surface of the first winding roller is greater than the first linear velocity of the strand of the filling material being fed, wherein a slippage is maintained between the lateral surface of the winding roller and the strand of the filling material.

[0006] The first winding roller may have a lateral surface in the shape of a cylinder.

[0007] The first winding roller may have a lateral surface in the shape of a barrel.

[0008] The lateral surface of the first winding roller may

have helically shaped elements with opposite directions of spiral inclination, which are arranged symmetrically with respect to a plane of symmetry of the first winding roller and are designed to increase a first width of the filling material strand to a second width of the filling material strand.

[0009] The second linear velocity of the lateral surface of the first winding roller can be greater than the first linear velocity of the fed material strand by a value in the range of 10 to 30%, preferably by a value in the range of 15 to 25%.

[0010] The second linear speed of the lateral surface of the first winding roller can be 20% greater than the first linear speed of the fed strand of the filling material.

[0011] The tensioning unit may further comprise a second winding roller and a tensioning roller, wherein said rollers are positioned relative to the feed path of the material strand such that the filling material strand winds around the first winding roller, the tensioning roller and the second winding roller.

[0012] The tensioning unit may comprise a second drive unit of the second winding roller for imparting a second angular velocity so that the third linear velocity of the lateral surface of the second winding roller is greater than the fourth linear velocity of the garniture belt in the forming unit.

[0013] Another object of the present invention is a method for manufacturing tobacco industry rods from a continuous rod of a crimped filling material strand, comprising the steps of: unwinding a strand of the filling material; crimping the filling material strand, in the form of a flat web, in a crimping unit comprising crimping drums for crimping the filling material strand; feeding the crimped strand of the filling material to a compacting unit; compacting the strand of the filling material in the compacting unit to form a strand with a circular cross-section; feeding and transporting the tape of a wrapper on the garniture belt in the forming unit; moving the strand of the filling material along a feeding path so that the strand of the filling material winds around the first winding roller, and tensioning the strand of the filling material between the crimping unit and the compacting unit by means of a tensioning unit; forming a continuous rod by wrapping the crimped filling material strand in the wrapper tape on the garniture belt, and sealing it with an adhesive supplied from an adhesive apparatus; characterized by driving the first winding roller at a first angular velocity so that the second linear velocity of the lateral surface of the first winding roller is greater than the first linear velocity of the fed material strand, and maintaining a slippage between the lateral surface of the winding roller and the filling material strand.

[0014] The second linear velocity of the lateral surface of the first winding roller can be greater than the first linear velocity of the fed material strand by a value in the range of 10 to 30%, preferably by a value in the range of 15 to 25%.

[0015] The second linear speed of the lateral surface of the first winding roller can be 20% greater than the first linear speed of the fed material strand.

[0016] The method may comprise moving the strand of the filling material such that the strand of the filling material winds around the first winding roller, the tension roller and the second winding roller.

[0017] The method may comprise imparting a second angular velocity to the second winding roller so that the third linear velocity of the lateral surface of the second winding roller is greater than the fourth linear velocity of the garniture belt in the forming unit.

[0018] The method may comprise increasing a first width of the filling material strand at the crimping unit to a second width of the filling material strand at the first winding roller and subsequently decreasing the second width of the filling material strand between the winding roller and the compacting unit.

[0019] The tensioning device according to the invention ensures that a strand of the filling material is effectively distributed transversely to the material feed direction and that a strand of material is tensioned in the direction along the material strand, thus eliminating the risk of longitudinal creases, which increases the efficiency of the production line. The use of a tensioning device ensures that the stresses in the filling material inside the rod are eliminated during rod manufacturing and no deformation of the rod occurs after it is manufactured. Reducing the tension of the expanded strand of the filling material facilitates the longitudinal movement of strands of the filling material relative to each other, so longitudinal stresses in the filling material in the finished product are reduced and a uniform filling material structure is achieved.

BRIEF DESCRIPTION OF DRAWINGS

[0020] The object of the invention is illustrated by means of example embodiments in the drawings, wherein:

Fig. 1 shows a manufacturing device;
Fig. 2 shows a part of the manufacturing device according to the first embodiment;
Fig. 2a shows an enlarged view of a winding roller from Fig. 2,
Fig. 2b shows a part of the manufacturing device from Fig. 2 in a top view,
Fig. 3 shows a part of the manufacturing device according to the second embodiment;
Fig. 4 shows the first embodiment of the winding roller;
Fig. 5 shows the second embodiment of the winding roller;
Fig. 6 shows the third embodiment of the winding roller;
Fig. 7 shows the fourth embodiment of the winding roller.

DETAILED DESCRIPTION

[0021] A manufacturing device 1 for the tobacco industry, as shown in Fig. 1, is used for manufacturing rods R from a continuous rod CR of a crimped strand of a filling material 2. The device 1 comprises a supplying part 3 and a forming part 4. The filling material can be a cellulose-based or other fibrous material of plant origin, or a plastic material. The supplying part 3 comprises a supplying unit 5 for feeding a strand of the filling material 2, and a crimping unit 6 with crimping drums 7, 8 for crimping the strand of the filling material 2. The strand of the filling material 2 is unwound from a roll 9. The crimped strand of the filling material 2 is fed from the crimping unit 6 in the form of a flat web at a first linear speed v1 and is compacted in a compacting unit 10 in the forming part 4. A tensioning device 11 is provided in the supplying part 3 to maintain the proper tension of the strand of the filling material 2. In the forming part 4, there is provided a forming unit 12 comprising a garniture bar 13 and an adhesive apparatus 14. Additionally, the device 1 comprises a feeding unit 15 for feeding a tape of a wrapper 16. The compacting unit 10 is configured to form a strand of the filling material 2' in the form of a circular strand and feed the filling material 2' to the forming unit 12, which forms a continuous rod CR by wrapping the crimped strand of the filling material 2' in the tape of the wrapper 16. The forming unit 12 is provided with a garniture belt 17 for transporting the wrapper 16 and the formed continuous rod CR. The adhesive apparatus 14 is adapted for feeding adhesive to close the wrapper 16 of the continuous rod CR. The continuous rod CR is cut into single rods R by a cutting head 18.

[0022] In the first embodiment of the manufacturing device 1 shown in Fig. 2, a tensioning device 11 which comprises a first winding roller 21 is positioned between a crimping unit 6 with the crimping drums 7, 8, and the compacting unit 10. The first winding roller 21 is positioned relative to a feed path P of the filling material strand 2 so that the filling material strand 2 winds around the first winding roller 21. The tensioning device 11 comprises a first drive unit 19 of the first winding roller 21 for imparting a first angular velocity $\omega 1$ such that the second linear velocity v2 of the lateral surface 24 of the first winding roller 21 is greater than the first linear velocity v1 of the filling material strand 2 being fed. Due to the difference in velocity of the lateral surface 24 and the filling material strand 2, a friction force T is generated (Fig. 2a), which is directed according to the direction of movement of the filling material strand 2 between the crimping unit 6 and the first winding roller 21. The force T constitutes a pulling force for the strand of the filling material 2 and causes the strand of the filling material 2 to be tensioned between the crimping unit 6 and the first winding roller 21, wherein a slippage occurs between the lateral surface 24 of the first winding roller 21 and the strand of the filling material 2. The slippage zone is designated as C. The second linear velocity v2 of the lateral surface 24 is greater than or equal to the fourth velocity v4 of the garniture belt 17 in the forming unit 12 and therefore is also greater than the velocity of the tape of the wrapper 16.

[0023] In the second example of the manufacturing device 1 shown in Fig. 3, a tensioning device 11' is situated between the crimping unit 6 with the crimping drums 7, 8, and the compacting unit 10, which comprises the first winding roller 21, the second winding roller 22 and a tensioning roller 23. The rollers 21, 22, 23 are located with respect to the feed path P' of the filling material strand 2 so that the filling material strand 2 winds around the first winding roller 21, the tensioning roller 23, and the second winding roller 22. The tensioning roller 23 tensions the filling material strand 2 due to the force of gravity or by using a spring element (not shown). The tensioning device 11' comprises a first drive unit 19 of the first winding roller 21 for imparting a first angular velocity $\omega 1$ such that the second linear velocity v2 of the lateral surface 24 of the first winding roller 21 is greater than the first linear velocity v1 of the fed filling material strand 2. Due to the difference in velocity, the filling material strand 2 is tensioned between the crimping unit 6 and the first winding roller 21, wherein there is a slippage between the lateral surface 24 of the first winding roller 21 and the filling material strand 2. The tensioning device 11' comprises a second drive unit 20 for imparting a second angular velocity $\omega 2$ to the second winding roller 22 so that the third linear velocity v3 of the lateral surface 27 of the second winding roller 21 is substantially equal to the first linear velocity v1. The third linear velocity v3 of the lateral surface 27 is greater than or equal to the fourth linear velocity v4 of the garniture belt 17 in the forming unit 12 and therefore is also greater than the velocity of the tape of the wrapper 16.

[0024] The first winding roller 21 may have a cylindrical lateral surface 24, as shown in Fig. 4. In a second embodiment of the first winding roller 21, shown in Fig. 5, two spiral-shaped elements 25, 26 with opposite directions of spiral inclination are arranged on the lateral surface 24'. These elements 25, 26 are symmetrically arranged with respect to the plane S, and the angle of inclination β of the helix with respect to the plane S for both helically shaped elements 25, 26 is the same. The elements 25, 26 are arranged along the axis of rotation k. The helically shaped elements 25, 26 may be convex above the lateral surface 24'. Fig. 6 shows the first winding roller 21" in the third embodiment, in which the lateral surface 24" is in the form of a barrel. In the fourth embodiment, shown in Fig. 7, two spiral-shaped elements 25', 26' are arranged on the lateral surface 24‴ of the first winding roller 21'". Similar to the second embodiment, these elements are arranged symmetrically with respect to the plane S, and the angle of inclination β of the spiral with respect to the plane S for both elements 25, 26 is the same.

[0025] As shown in the H-view of Fig. 2b, the filling material strand 2 coming out of the crimping unit 6 has a first width W1. In the free state, the width of the filling

material strand 2 is greater than the defined width W1. The spiral elements 25, 26, 25', 26' are designed to increase the first width W1 of the filling material strand 2 at the crimping unit 6 to the second width W2 of the filling material strand 2 at the first winding roller 21. The spiral elements 25, 26, 25', 26' act on the filling material strand 2 so as to provide stretching and smoothing of the filling material strand 2 in a direction transverse to the direction of movement of the filling material strand 2, preventing the formation of longitudinal creases on the material. The effect of extending and smoothing the material by stretching in the transverse direction is enhanced if there is slippage between the strand of the filling material 2 and the lateral surface 24, 24', 24", 24‴ of the first winding roller 21, 21', 21", 21'". Stretching the strand of the filling material 2 is necessary because the width of the strand of the filling material 2 increases after crimping in the free state due to the change of material structure, which poses the risk of longitudinal creases.

[0026] In the process of manufacturing tobacco industry rods R, the strand of the filling material 2 is unwound from the roll 9. The strand of the filling material 2 passes through the unit 6 of the crimping drums 7, 8, where the strand of the filling material 2 in the form of a flat web is crimped. Then, the crimped strand of the filling material 2 is fed to the compacting unit 10, where the strand of the filling material 2 is compacted into a strand 2' of a circular cross-section and is fed to the forming unit 12. In the forming unit 12, the continuous rod CR is formed by wrapping the crimped strand of the filling material 2 into the tape of the wrapper 16, transported by means of a garniture belt 17, and closed by means of an adhesive fed from the adhesive apparatus 14. The tape of the wrapper 16 is fed from the feeding unit 15. The continuous rod CR thus formed is fed toward the cutting head 18, which cuts the continuous rod CR into single rods R. In the process of feeding the strand of the filling material 2 between the crimping unit 6 of the crimping drums 7, 8 and the compacting unit 10, the strand of the filling material 2 is tensioned by a tensioning device 11, 11', in which the strand of the filling material 2 moves along the feeding path P, P'.

[0027] In the first embodiment shown in Fig. 2, the feeding path P runs so that the filling material strand 2 winds around the first winding roller 21. Further downstream of the tensioning device 11, the filling material strand 2 reduces its width, moves to the compacting unit 10, and then to the forming unit 12. The tensioning device 11 drives the first winding roller 21 with a first angular velocity $\omega 1$ so that the second linear velocity v2 of the lateral surface 24, 24', 24", 24‴ of the first winding roller 21, 21', 21", 21‴ is greater than the first linear velocity v1 of the fed strand of material 2. The first winding roller 21 and the strand of material 2 are shown in an enlarged view in Fig. 2a. Due to the action of the winding roller 21, 21', 21", 21'", a force is generated that acts on the filling material strand 2 longitudinally in the direction of movement, which increases the tension of the filling material strand 2 between the crimping unit 6 and the tensioning device 11. The tension existing downstream with respect to the winding roller 21, 21', 21", 21‴ and upstream with respect to the forming unit 12 is less than the tension upstream with respect to the winding roller 21, 21', 21", 21'". The second linear velocity v2 of the lateral surface 24, 24', 24", 24‴ of the first winding roller 21, 21', 21", 21‴ may be greater than the first linear velocity v1 of the fed material strand 2 by a value in the range from 10 to 30%, preferably from 15 to 25%, and optimally is greater by 20%. The fourth linear speed v4 of the garniture belt 17 and the continuous rod CR is equal to or less than the second linear speed v2, so that the tension of the filling material strand 2' is reduced. The tension of the filling material strand 2' on the section BC, i.e., between the crimping drums 7, 8 and the first winding roller 21, is greater than that on the preceding section AB upstream of the crimping drums 7, 8. On the section CE, i.e., between the first winding roller 21 and the inlet to the forming unit 12, the tension in the filling material strand 2' is less than that upstream of the first winding roller 21. The transformation of the filling material strand 2 from a strand in the form of a flat web to a strand of the filling material 2' with a circular cross-section is carried out at low tension. This ensures that the filling material 2 in the finished rods R is placed without stresses that could deform the rod R, since the filling material 2 is anchored, i.e., immobilized with respect to the wrapper 16 by means of an adhesive. In addition, with reduced stress on the filling material 2 before entering the forming unit 12, an even distribution of the filling material 2 in the finished rod R is achieved. The use of a first cylindrical winding roller 21' with spiral elements 25, 26, 25', 26' or a first barrel-shaped winding roller 21" or a first barrel-shaped winding roller 21‴ with spiral elements 25, 26, 25', 26' allows for an increase in the first width W1 of the filling material strand 2 at the crimping unit 6 to the second width W2 of the filling material strand 2 at the first winding roller 21. Subsequently, there is a decrease in the width W2 of the filling material strand 2 between the winding roller 21 and the compacting unit 10, as shown in Fig. 2b.

[0028] In the second embodiment shown in Fig. 3, the feed path P' is arranged such that the filling material strand 2 winds around the first winding roller 21, the tensioning roller 23, and then the second winding roller 22. The tensioning roller 23 applies tension to the filling material strand and adjusts its position in response to changes in the length of the filling material strand 2 between the first winding roller 21 and the second winding roller 22 under the influence of gravity or a force exerted by an elastic element. These changes in length may be due to temporary differences in the speed of the crimping unit 6 and the forming unit 12. Further downstream of the tensioning device 11', the filling material strand 2 narrows in width and is moved to the compacting unit 10 and then to the forming unit 12. In the tensioning device 11', the first winding roller 21 is driven with a first angular velocity $\omega 1$, so that the second linear velocity v2

of the lateral surface 24, 24', 24", 24‴ of the first winding roller 21, 21', 21", 21‴ is greater than the first linear velocity v1 of the fed material strand 2. As a result of the action of the winding roller 21, 21', 21", 21'", the tension of the filling material strand 2 between the crimping unit 6 and the tensioning device 11' is increased. The second linear velocity v2 of the lateral surface 24, 24', 24", 24‴ of the first winding roller 21, 21', 21", 21‴ may be greater than the first linear velocity v1 of the fed material strand 2 by a value in the range from 10 to 30%, preferably from 15 to 25%, and optimally is greater by 20%. The fourth linear speed v4 of the garniture belt 17 and the continuous rod CR is equal to or less than the third linear speed v3 of the filling material strand 2 downstream of the tensioning device 11', so that the tension of the filling material strand 2' is reduced. The tension of the filling material strand 2 on the section BC, i.e., between the crimping drums 7, 8 and the first winding roller 21, is greater than on the preceding section AB upstream of the crimping drums 7, 8. On the section CD, i.e., between the first winding roller 21 and the second winding roller 22, the tension of the filling material strand 2 is essentially unchanged compared to section BC, while on section DE, i.e., between the second winding roller 22 and the inlet to the forming unit 12, the tension in the filling material strand 2' is lower than upstream of the first winding roller 21. Similarly, as in the first example of embodiment, the transformation of the filling material strand 2 from a flat web to the filling material strand 2' with a circular cross-section is carried out at a low tension, which allows for an even distribution of the filling material 2 in the finished rod R. There is also an increase in the width of the filling material strand 2 from the width W1 downstream of the crimping unit 6 to the width W2, and subsequently a decrease in the width W2 downstream of the second winding roller 22.

Claims

1. A manufacturing device (1) for manufacturing tobacco industry rods (R) from a continuous rod (CR) manufactured from a crimped strand of a filling material (2), comprising:

- a feeding unit (5) for feeding a strand of the filling material (2),
- a crimping unit (6) comprising crimping drums (7, 8) for crimping the strand of the filling material (2) in a form of a flat web,
- a wrapper feeding unit (15) for feeding a tape of a wrapper (16),
- a compacting unit (10) for forming the strand of the filling material (2') into a form of a circular strand,
- a forming unit (12) for forming a continuous rod (CR) by wrapping the crimped strand of the filling material (2') into the tape of the wrapper (16) which is transported by a garniture belt (17) and sealed by an adhesive supplied from an adhesive apparatus (14),
- a cutting head (18) for cutting the continuous rod (CR) into individual rods (R),
- wherein the crimped strand of the filling material (2) fed from the crimping unit (6) in the form of a flat web at a first linear speed (v1) changes its cross-sectional shape from flat to circular and is compacted in the compacting unit (10) before being fed to the forming unit (12),
- wherein a tensioning unit (11) is positioned between the crimping unit (6) and the compacting unit (10), which comprises a first winding roller (21), wherein the first winding roller (21) is positioned such that the strand of the filling material (2) fed at the first speed (v1) winds around the first winding roller (21),

characterized in that

- the tensioning unit (11) comprises a first drive unit (19) of the first winding roller (21) for imparting a first angular velocity (ω1) so that a second linear velocity (v2) of the lateral surface (24) of the first winding roller (21) is greater than the first linear velocity (v1) of the strand of the filling material (2) being fed, wherein a slippage is maintained between the lateral surface (24) of the winding roller (21) and the strand of the filling material (2).

2. The device according to claim 1, wherein the first winding roller (21, 21') has a lateral surface (24, 24') in the shape of a cylinder.

3. The device according to claim 1, wherein the first winding roller (21", 21‴) has a lateral surface (24", 24‴) in the shape of a barrel.

4. The device according to claim 2 or 3, wherein the lateral surface (24', 24‴) of the first winding roller (21', 21‴) has helically shaped elements (25, 26; 25', 26') with opposite directions of spiral inclination, which are arranged symmetrically with respect to a plane of symmetry (S) of the first winding roller (2) and are designed to increase a first width (W1) of the filling material strand (2) to a second width (W2) of the filling material strand (2).

5. The device according to any of claims 1 to 4, wherein the second linear velocity (v2) of the lateral surface (24, 24', 24", 24‴) of the first winding roller (21, 21', 21", 21‴) is greater than the first linear velocity (v1) of the fed material strand (2) by a value in the range of 10 to 30%, preferably by a value in the range of 15 to 25%.

6. The device according to claim 5, wherein the second linear speed (v2) of the lateral surface (24, 24', 24", 24‴) of the first winding roller (21, 21', 21", 21‴) is 20% greater than the first linear speed (v1) of the fed strand of the filling material (2).

7. The device according to any of claims 1 to 6, wherein the tensioning unit (11') further comprises a second winding roller (22) and a tensioning roller (23), wherein said rollers are positioned relative to the feed path (P) of the material strand (2) such that the filling material strand (2) winds around the first winding roller (21), the tensioning roller (23) and the second winding roller (22).

8. The device according to claim 7, wherein the tensioning unit (11') comprises a second drive unit (20) of the second winding roller (22) for imparting a second angular velocity (ω2) so that the third linear velocity (v3) of the lateral surface (27) of the second winding roller (22) is greater than the fourth linear velocity (v4) of the garniture belt (17) in the forming unit (12).

9. A method for manufacturing tobacco industry rods (R) from a continuous rod (CR) of a crimped filling material strand (2), comprising the steps of:

- unwinding a strand of the filling material (2);
- crimping the filling material strand (2), in the form of a flat web, in a crimping unit (6) comprising crimping drums (7, 8) for crimping the filling material strand (2);
- feeding the crimped strand of the filling material (2) to a compacting unit (10);
- compacting the strand of the filling material (2) in the compacting unit (10) to form a strand (2') with a circular cross-section;
- feeding and transporting the tape of a wrapper (16) on the garniture belt (17) in the forming unit (12);
- moving the strand of the filling material (2) along a feeding path (P) so that the strand of the filling material (2) winds around the first winding roller (21), and tensioning the strand of the filling material (2) between the crimping unit (6) and the compacting unit (10) by means of a tensioning unit (11);
- forming a continuous rod (CR) by wrapping the crimped filling material strand (2') in the wrapper tape (16) on the garniture belt (17), and sealing it with an adhesive supplied from an adhesive apparatus (14),

characterized by:

- driving the first winding roller (21) at a first angular velocity (ω1) so that the second linear velocity (v2) of the lateral surface (24, 24', 24", 24‴) of the first winding roller (21, 21', 21" 21‴) is greater than the first linear velocity (v1) of the fed material strand (2), and maintaining a slippage between the lateral surface (24, 24', 24", 24‴) of the winding roller (21, 21', 21", 21‴) and the filling material strand (2).

10. The method according to claim 9, wherein the second linear velocity (v2) of the lateral surface (24, 24', 24", 24‴) of the first winding roller (21, 21', 21", 21‴) is greater than the first linear velocity (v1) of the fed material strand (2) by a value in the range of 10 to 30%, preferably by a value in the range of 15 to 25%.

11. The method according to claim 10, wherein the second linear speed (v2) of the lateral surface (24, 24', 24", 24‴) of the first winding roller (21, 21', 21", 21‴) is 20% greater than the first linear speed (v1) of the fed material strand (2).

12. The method according to any of claims 9 to 11, comprising moving the strand of the filling material (2) such that the strand of the filling material (2) winds around the first winding roller (21), the tension roller (23) and the second winding roller (22).

13. The method according to any of claims 9 to 12, comprising imparting a second angular velocity (ω2) to the second winding roller (22) so that the third linear velocity (v3) of the lateral surface (27) of the second winding roller (22) is greater than the fourth linear velocity (v4) of the garniture belt (17) in the forming unit (12).

14. The method according to any of claims 9 to 13, comprising increasing a first width (W1) of the filling material strand (2) at the crimping unit (6) to a second width (W2) of the filling material strand (2) at the first winding roller (21) and subsequently decreasing the second width (W2) of the filling material strand (2) between the winding roller (21) and the compacting unit (10).

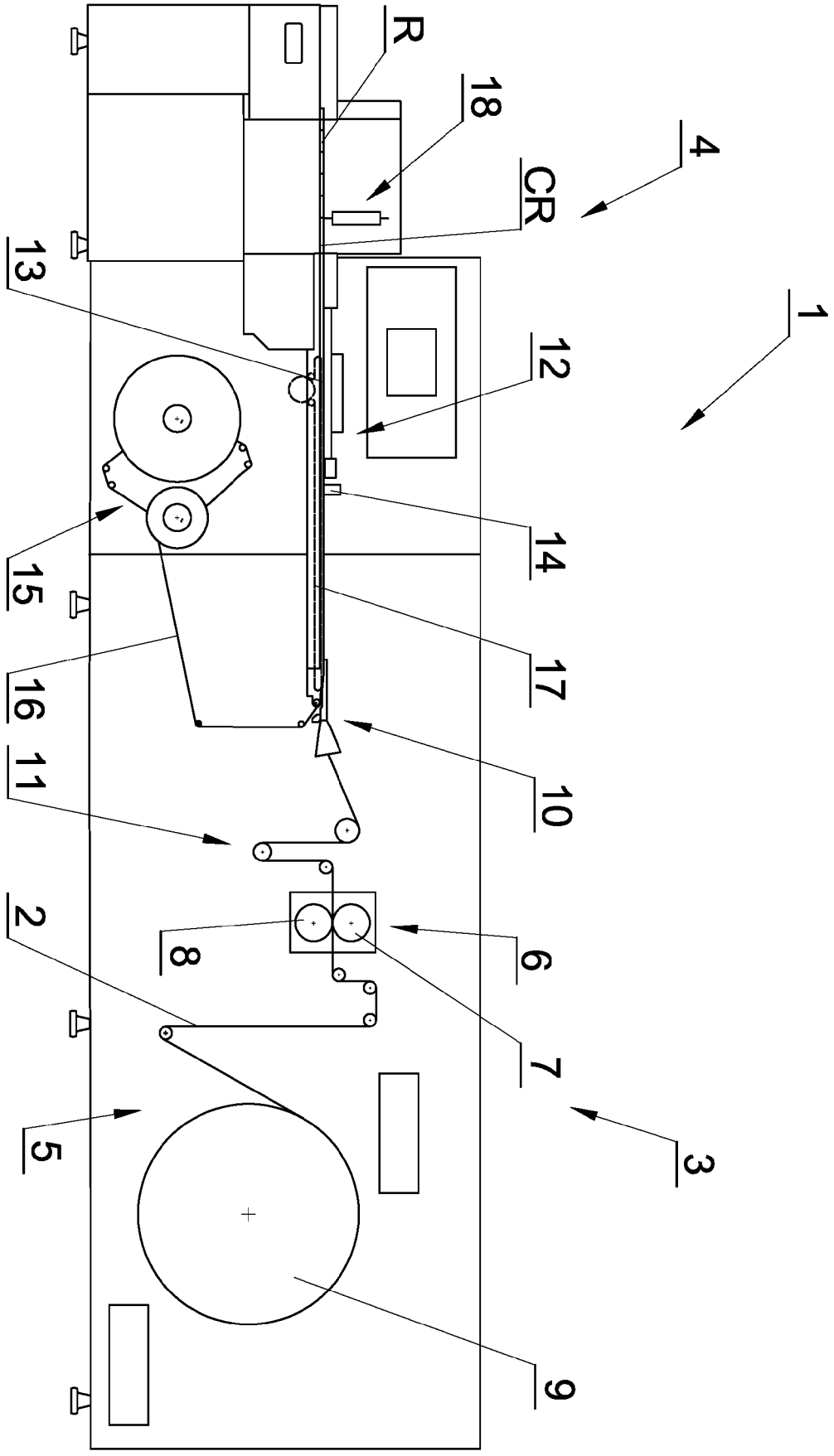

Fig. 1

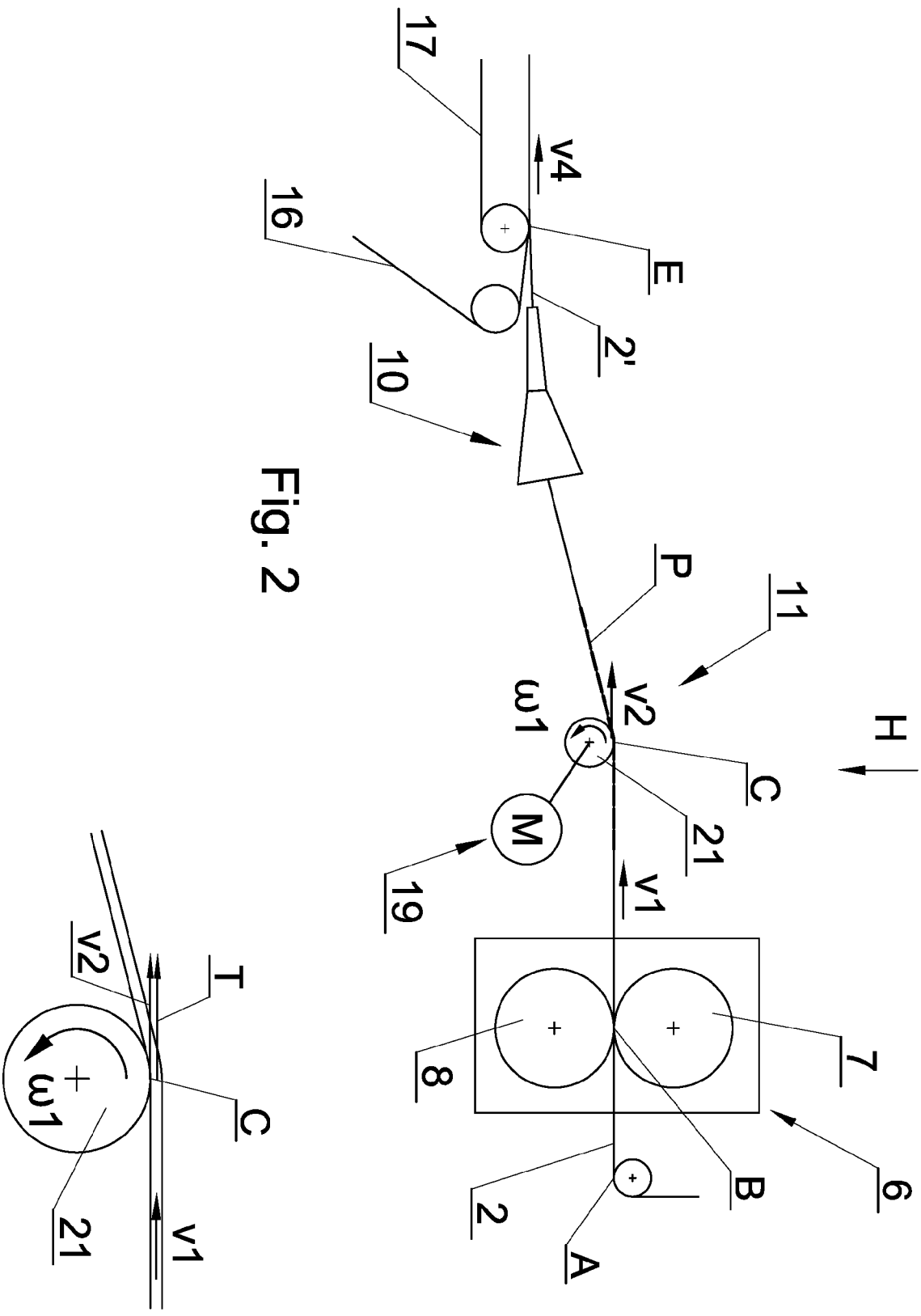

Fig. 2

Fig. 2a

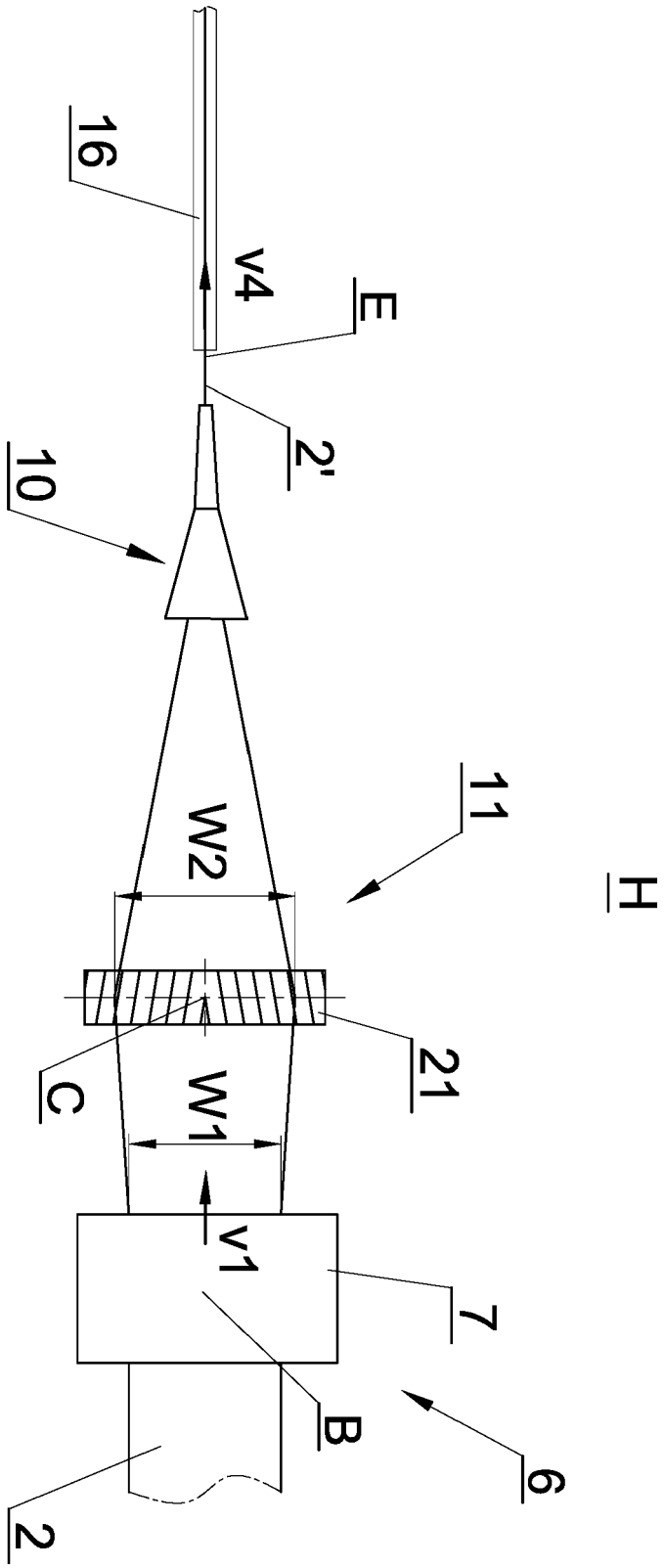

Fig. 2b

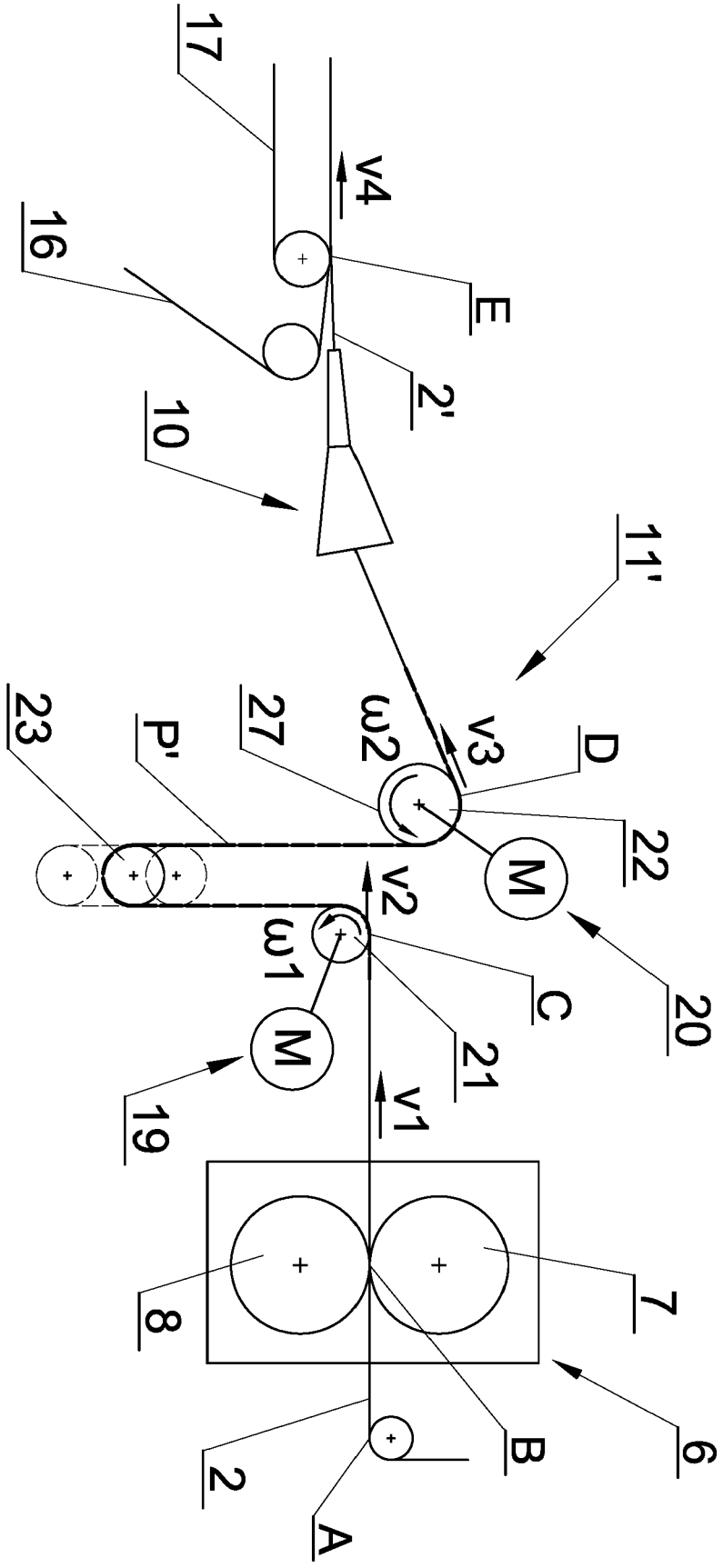

Fig. 3

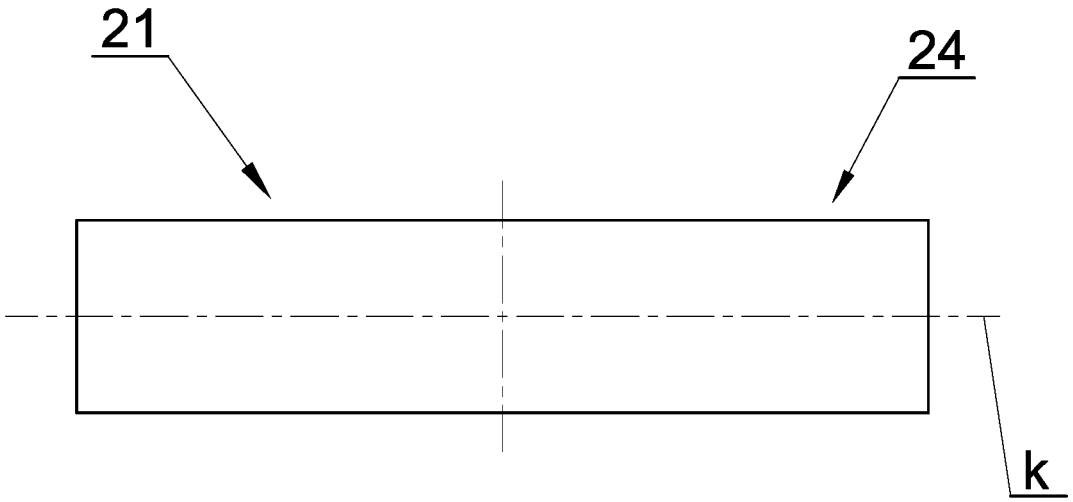

Fig. 4

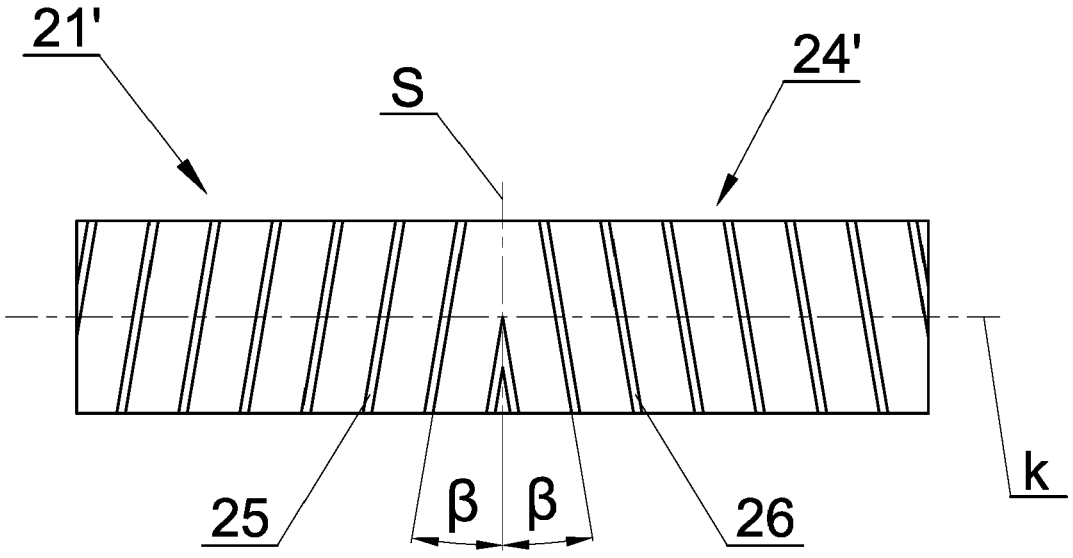

Fig. 5

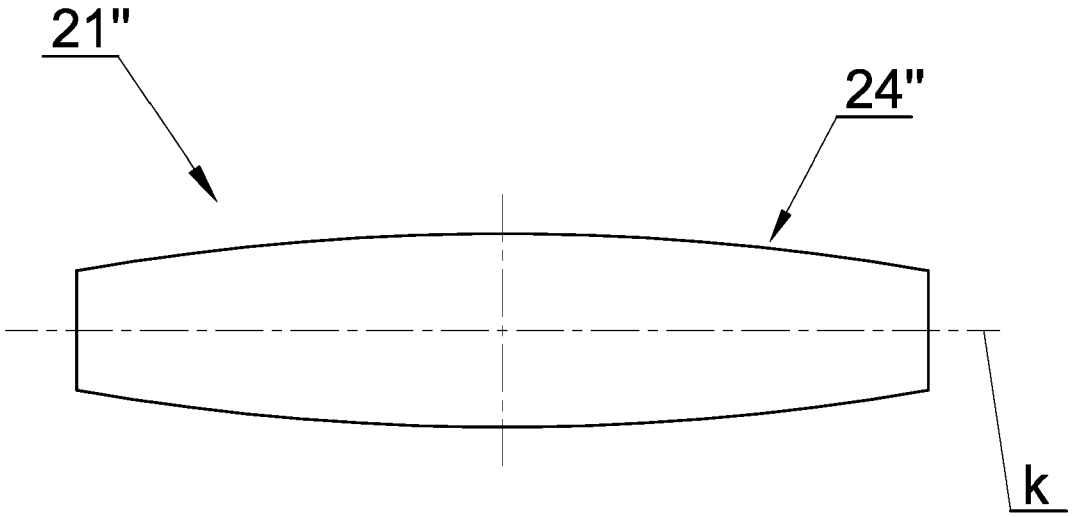

Fig. 6

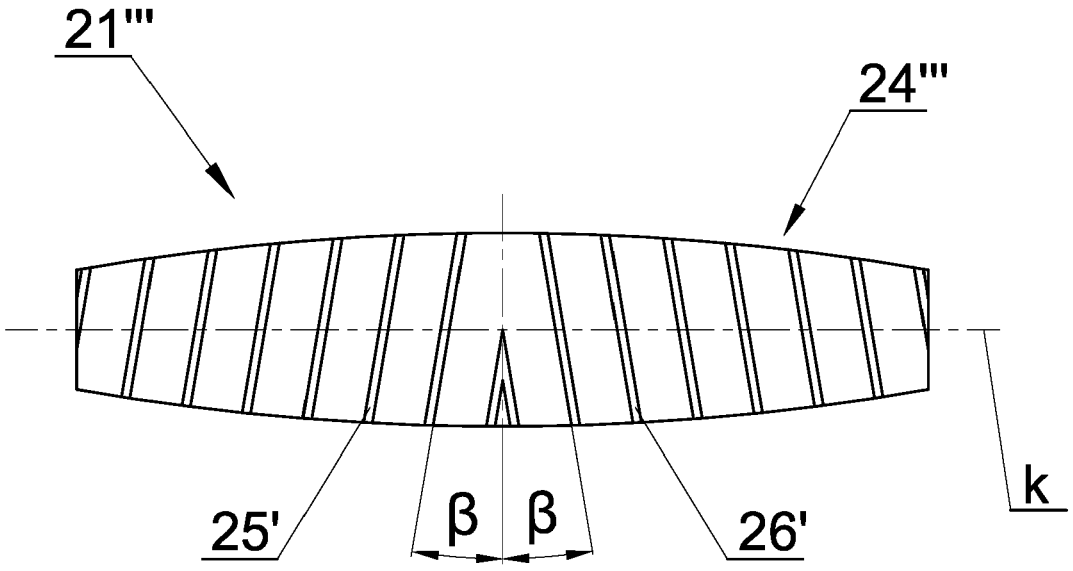

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 23 21 2829

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X A	US 2021/392946 A1 (GIANNINI ANTONELLA [IT] ET AL) 23 December 2021 (2021-12-23) * paragraphs [0053], [0054], [0071]; figure 1A * -----	1,2,5,6, 9-11,14 3,4,8, 12,13	INV. A24D3/02
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A24D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 June 2024	Schwarzer, Bernd

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