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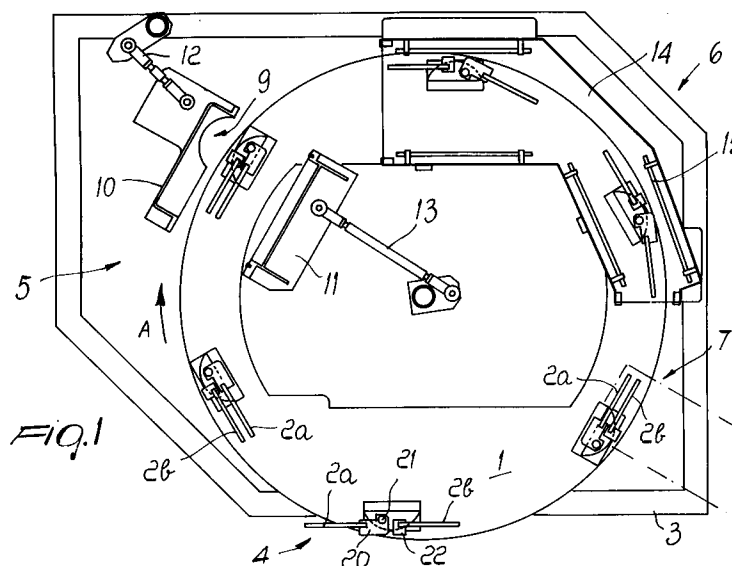
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I-20123 Milano (IT)(54) **Machine for treating socks with a well-defined heel.**

(57) The machine for treating socks with a well-defined heel includes a carousel (1) on which multiple pairs of tubular templates (2a, 2b) are distributed peripherally; respective pairs of men's socks are meant to be fitted on the templates. The carousel is suitable to be actuated stepwise at a station (4) for fitting the pairs of socks on the tubular templates, at least one station (5,6) for treating the socks, and a

station (7) for removing the pairs of socks from the templates, in which the socks are paired together. The templates (2a, 2b) are adapted to alternately be arranged in a single plane, for example at the fitting station (4) and a drying/pressing station (6), or in respective parallel planes, for example at the removal station (7) and a steam-fixing station (5).

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The present invention relates to a machine for treating socks, particularly men's socks with a well-defined heel.

It is known that in the manufacture of men's socks said socks are subjected to appropriate heat treatments before being sent to packaging. In particular, the socks are generally subjected to pressing and/or fixing treatments. Appropriate infrared-ray devices are used for example to perform pressing, whereas pressurized steam chambers are particularly used to perform fixing, which gives the fabric a permanent deformation.

Machines for drying and pressing men's socks are currently known which are constituted by a carousel provided with appropriate templates over which said socks are fitted and stretched. The socks fitted on the templates are carried by the carousel inside a fixing chamber, for example of the steam type, and then inside a drying and pressing chamber, for example of the infrared-ray type; the socks are then removed to be sent to the further packaging steps.

The socks are fitted, treated and removed individually from said carousel and therefore must be appropriately paired during packaging. This operation is hindered by the fact that the socks that are obtained are not all perfectly identical, since they assume lengths that are generally different as a consequence of the heat treatments they have undergone. Accordingly, the personnel must manually select the socks to be paired, with an obvious increase in production costs related to labor and an evident limitation of the productivity of the plant.

The fact of operating individually on the socks in the above mentioned carousel furthermore entails considerable space occupation and proportionally high construction costs in comparison with productivity.

Due to a hitherto undisputed technical prejudice, the templates used to treat men's socks are constituted by a solid profile having the contour of the socks to be produced; said profile is formed for example by an elongated metal plate that shapes the contour of the foot at its top. The sock is fitted manually over the template by the assigned personnel, who then stretch it uniformly and also check for the presence of any defects.

The sock is instead removed automatically from the template in an appropriate station arranged downstream of the provided treatment stations.

The steps for fitting the socks on the corresponding templates and for removing them -from said templates are rather difficult and require the application of a certain force to the sock. It is in fact necessary to pass beyond the discontinuity constituted by the bent portion of the template that corresponds to the foot and heel of the sock.

The sock is furthermore generally removed from the template along a direction that lies at an angle to the longitudinal axis of said sock and in practice coincides with the tilt of the foot of said template; said tilt is usually 45° with respect to the longitudinal axis of the template. This can easily lead to defects along the sock's body.

In order to facilitate these operations, templates that can become narrower while the socks are being fitted and removed have been proposed. Templates of this type are constituted for example by two metal elements which are mutually pivoted and can be alternately moved mutually closer or apart by virtue of suitable mechanisms. However, these templates are obviously complicated and expensive and furthermore do not satisfactorily solve the problem of fitting and removing the socks, since the discontinuity constituted by the foot and heel of the socks is not altered significantly.

The fact is also noted that said templates arrive at the sock fitting station at a relatively high temperature as a consequence of the heat treatments they have undergone. This entails particular precautions on the part of the assigned personnel to avoid burns while fitting socks on said templates.

A principal aim of the present invention is to obviate the described problems, by providing a machine for treating socks with a well-defined heel which allows to automatically pair the socks to be sent to the subsequent packaging steps.

Within the scope of this aim, an object of the present invention is to provide a machine for treating socks which is simple in concept, safely reliable in operation, and versatile in use.

According to the invention, there is provided a machine for treating men's socks with a well-defined heel, which is characterized in that it comprises: a carousel on which multiple pairs of tubular templates are distributed peripherally, respective pairs of men's socks being meant to be fitted on said templates, said carousel being suitable to be actuated stepwise at a station for fitting said pairs of socks on said tubular templates; at least one station for treating said socks; and a station for removing said pairs of socks from said templates in which said socks are paired together.

The features of the invention will become apparent from the following detailed description of a preferred embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a plan view of the machine according to the invention;

figure 2 is a partially sectional front view of a pair of tubular templates of the invention;

figure 3 is a side view of a pair of templates arranged at the removal station of the machine;

figures 4a, 4b, 4c, and 4d are schematic perspective views of successive operating steps of the machine according to the invention.

With particular reference to the above figures, the reference numeral 1 generally designates a circular carousel on which multiple pairs of tubular templates 2a, 2b are distributed peripherally; respective pairs of men's socks may be fitted on said templates. The carousel 1 is rotatably supported about a vertical axis on a base 3 and is suitable to be actuated stepwise at appropriate treatment stations where corresponding heat treatments, such as the fixing and/or pressing of the socks, are performed.

In particular, in the illustrated case there is a station 4 for fitting the socks on the tubular templates 2a and 2b; a station 5 for fixing said socks; a drying and pressing station 6; and a station 7 for removing said socks from the templates 2a and 2b to send them to an appropriate output unit 8.

Fixing is performed by means of pressurized steam inside a chamber 9 which is formed by two shells 10 and 11 which are suitable to be associated at respective front rims; the shells 10 and 11 are movable from a position for opening the chamber 9 and a position for closing it under the actuation of respective linkage systems 12 and 13. Pressing is instead performed inside a chamber 14 which is provided with medium-wavelength infrared-ray lamps 15; the chamber 14 is arranged downstream of the fitting station 4 along the direction A in which the carousel 1 rotates.

The templates 2a and 2b are constituted by respective tubular elements which are appropriately bent so as to form, in an upper part, the contour of the foot 2c that forms the heel 2d. In particular, the longitudinal extension of said foot 2c is inclined by an angle of no more than 25° with respect to the longitudinal axis of the template, designated by X in figure 2; in the illustrated case, said inclination is approximately 15°.

The templates 2a, 2b can be spaced apart, so as to be arranged on the same vertical plane, in order to facilitate the fitting of the socks at the station 4; the templates 2a, 2b can then be arranged mutually adjacent on parallel planes, in order to remove the socks in the station 7 and fix them in the station 5, as clarified hereinafter.

For this purpose, said tubular elements are inserted in a corresponding pair of sleeves 16 and 17 which constitute an extension of the vertical portions of said tubular elements; the sleeves 16 and 17 of each template 2a and 2b are associated in a downward region with corresponding supports 18 and 19 of said templates. The support 18 of the first template 2a is fixed to a coupling 20 that is rotatable about a pivot 21 with respect to the carousel 1 under the actuation of known means which

are not illustrated in the drawings. The support 19 of the second template 2b is instead rigidly coupled to a corresponding coupling 22 that is fixed to the carousel 1 on a vertical plane that is substantially tangent to said carousel 1.

It should be noted that the templates 2a and 2b are arranged symmetrically with respect to each other in said spaced position (figure 4a) so that they have a matching contour in the position (figures 4b, 4d) in which they are mutually adjacent. In the illustrated case, the corresponding longitudinal extension at the feet 2c of the templates 2a, 2b converge in the spaced position (see figure 2); however, it is obviously possible to provide said feet so that they instead diverge.

It is also possible to provide templates 2a, 2b that can become appropriately narrower at their base, by using the intrinsic elasticity of said tubular elements, so as to facilitate sock fitting. This can be achieved, for example, by making the corresponding sleeves 16 slide transversely in appropriate slots formed in the supports 18 and 19.

The sleeve 16 of the templates 2a and 2b is closed at its lower end by means of a plug 23; the sleeve 17 is instead connected to a duct 24 and 25 which is formed respectively in the coupling 20 and in the support 19 and leads outside at a hole 26, 27 that is directed outwardly in the above mentioned position in which the templates 2a, 2b are mutually adjacent.

The holes 26 and 27 are suitable to be engaged, at the sock removal station 7, by respective coupling elements 28 and 29 which are connected to conventional means for supplying compressed air. Said coupling elements 28 and 29 can be actuated by corresponding actuation elements 30 and 31 which act in a direction that is substantially radial to the carousel 1, so as to couple to said holes 26 and 27, as shown schematically with dashed lines 28a and 29a in figure 3.

The compressed air fed by means of the coupling elements 28 and 29 is meant to exit through multiple holes 32 formed at the top of the templates 2a and 2b at the toe of the corresponding feet 2c, so as to produce a jet that is suitable to direct the corresponding toe of the socks towards the pick-up elements provided in the removal station 7. Said pick-up elements are preferably of the type disclosed in Italian patent application BO93A000423 filed October 22, 1993 by the same Applicant, which is incorporated herein by reference.

In particular, the removal station 7 has a device 33 for gripping the top of the templates 2a and 2b which acts at the foot 2c (figure 3). Said grip device 33 has two pairs of arms 34 that can oscillate on a horizontal plane and are individually provided with a sponge pad or the like. The arms

34 are supported in an adjustable position by two vertical rods 35 which are rotatable about their axis. The rods 35 are slidingly guided, by means of appropriate bushes, through a plate 36 that is rigidly coupled to the fixed framework of the machine and are rotatably supported by a frame 37 which is in turn slidingly guided on two posts 38 which are connected to the plate 36 in an upward region.

Respective gears 39 are keyed to the rods 35, mesh together, and cause the said rods, and accordingly the arms 34 provided with the pads, to perform an angular rotation in opposite directions. This rotation is actuated by an actuator element, not shown in the drawing, which acts on one of the rods 35 by means of an appropriate lever system.

The posts 38 are connected, in a downward region, to a cross-member 40 that supports an actuator element 41 having a vertical axis. The stem of said actuator 41 is rigidly coupled to the frame 37 so as to actuate the vertical movement of the grip device 33, as shown schematically by the dashed line 34a which relates, for the sake of simplicity, only to one of the arms 34.

The output unit 8 is located above the removal station 7 and has a conveyor belt 42 that winds around two rollers 43 and 44 which are rotatably supported on one side of a vertical plate 45. A contrarotating abutment roller 46 is suitable to cooperate with the roller 43 during removal and is supported at the free end of an arm 47 which is pivoted to the plate 45 about one axis 48; the roller 46 is driven by the roller 43 by virtue of suitable transmission means.

A presser roller 49 is suitable to act on the active upper portion of the belt 42 at right angles to said belt 42; said roller 49 is movable between an active position, in which it is lowered onto the belt 42, and a position in which it is raised from said belt. The lowering of the roller 49 is actuated, when the sock arrives, by appropriate photocell sensor elements which are arranged upstream of said roller; subsequent lifting is actuated by additional sensor elements arranged downstream of said roller 49.

The operation of the described machine is as follows.

At the beginning of each working cycle, the operator, who works at the fitting station 4, fits and stretches a pair of socks 50 on the tubular templates 2a and 2b which are parked at said station 4 (figure 4a).

The carousel 1 then rotates so as to move the socks fitted on the templates 2a and 2b inside the chamber 9 of the fixing station 5 (figure 4b). For this purpose the first template 2a is rotated beforehand through 180° about the vertical axis formed by the pivot 21, so as to move into the position in which it is adjacent to the second template 2b.

The subsequent rotation of the carousel 1 moves the socks fitted on the tubular templates 2a and 2b inside the infrared-ray chamber 14, where the socks are pressed. Inside the chamber 14, the templates 2a and 2b are arranged preferably in a spaced and slightly angled position so as to facilitate optimum drying and pressing of the socks by the infrared-ray lamps 15 arranged on the opposite walls of said chamber 14 (figure 4c). However, the templates 2a and 2b may keep their preceding mutually adjacent position even inside the infrared-ray chamber 14; the adoption of tubular templates in fact allows adequate drying even in this adjacent configuration.

When they leave the chamber 14, the templates 2a and 2b are again moved into the mutually adjacent position to remove the socks in pairs at the station 7 (figure 4d). In this removal station 7 the portion 2c of the templates 2a and 2b that forms the foot is clamped between the pads of the arms 34 of the grip device 33, and said arms close simultaneously starting from a spaced inactive position.

The flow of compressed air that leaves the holes 32 of the tubular templates 2a, 2b directs the top of the paired socks between the rollers 43 and 46 of the output unit 8. At the same time the jack 41 is actuated, causing the frame 37 to slide upwards so as to lift the arms 34 that clamp the socks. This lifting keeps up with the removal of the socks from the templates 2a and 2b.

The top of the paired socks is inserted between the contrarotating rollers 43 and 46; the closing of the abutment roller 46 on the roller 43, performed by actuation means which are not shown, pulls said socks, which are removed from the templates 2a and 2b and sent along the conveyor belt 42.

The fact should be stressed that the grip arms 34 act on the portion of the socks that is arranged at the feet 2c of the templates 2a and 2b, so as to make it easier to pass beyond the discontinuity determined by the heel 2d of said feet.

Easy removal of the socks from the templates 2a and 2b is furthermore facilitated by the limited inclination of the feet 2c with respect to the longitudinal axis X of said templates. This inclination is in fact no more than 25°, i.e. significantly less than the 45° inclination used traditionally in hitherto known templates.

When the passage of the socks carried on the belt 42 is detected, the presser roller 49 is actuated so that it descends into the lowered position so as to act on said socks. The roller 49 rises automatically when the heel of the socks passes, in order to avoid forming an unwanted crease. Likewise, the abutment roller 46 is spaced when the heel passes; however, at that time the roller 49 is

already engaged. The subsequent lowering of the roller 49 after the passage of the heel of the socks is actuated by appropriate timing means.

The described machine allows, in summary, to treat men's socks in an optimum manner, simultaneously and automatically pairing the socks to be sent to the subsequent packaging steps.

This is achieved particularly by overcoming the technical prejudice according to which until now men's socks were treated individually on templates constituted by solid profiles that exactly duplicated the contour of the socks to be produced. The use of tubular templates arranged in pairs on the carousel instead allows to pair the socks before the treatment and to then treat the paired socks; the socks are thus paired when removed from the templates and maintain this paired configuration when they are sent to the packaging steps.

In other words, the problem constituted in the known art by the need to manually pair the socks is eliminated in the manner described above, by selecting beforehand pairs of socks with matching dimensions. This produces an evident reduction in labor costs and a corresponding increase in the productivity of the plant, in addition to an evident benefit in terms of automation of the production process.

The machine furthermore has a very compact shape, since the paired arrangement of the tubular templates allows an appropriate reduction in overall dimensions.

Furthermore, the significant reduction in the inclination of the foot of the templates with respect to the longitudinal axis of said templates is in turn a significant innovation with respect to the conventional art. Indeed this inclination, without compromising the final shape of the manufactured socks, makes it much easier to fit said socks on the templates manually and to automatically subsequently remove the paired socks, in particular so as to make the socks pass beyond the discontinuity produced by the heel of the foot formed by said templates.

The fact should be noted that the adopted solution allows to remove the socks along a vertical direction that is longitudinal with respect to the templates instead of along the oblique direction of the foot of said templates.

Easy fitting of the socks on the templates is furthermore facilitated by the fact that the tubular templates undergo a limited heating during the steady-state operation of the machine, i.e. in passing through the successive heat treatment stations, and therefore do not require particular precautions on the part of the personnel assigned to the operation.

The tubular templates are furthermore less expensive than the corresponding solid profiles. This

greater economy is all the more significant in relation to the large number of templates generally required during production, since it is obviously necessary to provide different templates for the different sock sizes to be produced.

Tubular templates furthermore allow a significant energy saving with respect to the corresponding solid profiles. This energy saving arises both from better utilization of the steam in the fixing chamber and from the drying step in the infrared-ray chamber; in particular, drying does not require the use of hot heating air, as generally occurs in the known art.

In the illustrated case, the machine provides the treatment for fixing and pressing the socks, which is performed respectively by means of pressurized steam and by means of medium-wavelength infrared rays in the corresponding stations. However, it is possible to perform the fixing of the socks not in an autoclave but by means of steam at atmospheric pressure. As an alternative, it is also possible for the machine to perform only the infrared-ray pressing treatment.

The choice of the treatment to be performed depends on the type of thread being treated and on the degree of finish to be given to the socks.

The fact should also be noted that the above templates remain inside the fixing chamber for a relatively long time. This time is in fact linked to the time required by the assigned personnel to load the socks on the pair of templates parked in the fitting station. This allows to work at a relatively lower pressure in said fixing chamber, to the benefit of the quality of the manufactured socks.

Finally, the removal device that is used allows to avoid the formation of unwanted creases on the socks in addition to avoiding damaging the socks themselves.

In the practical embodiment of the invention, the materials employed, as well as the shapes and dimensions, may be any according to the requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

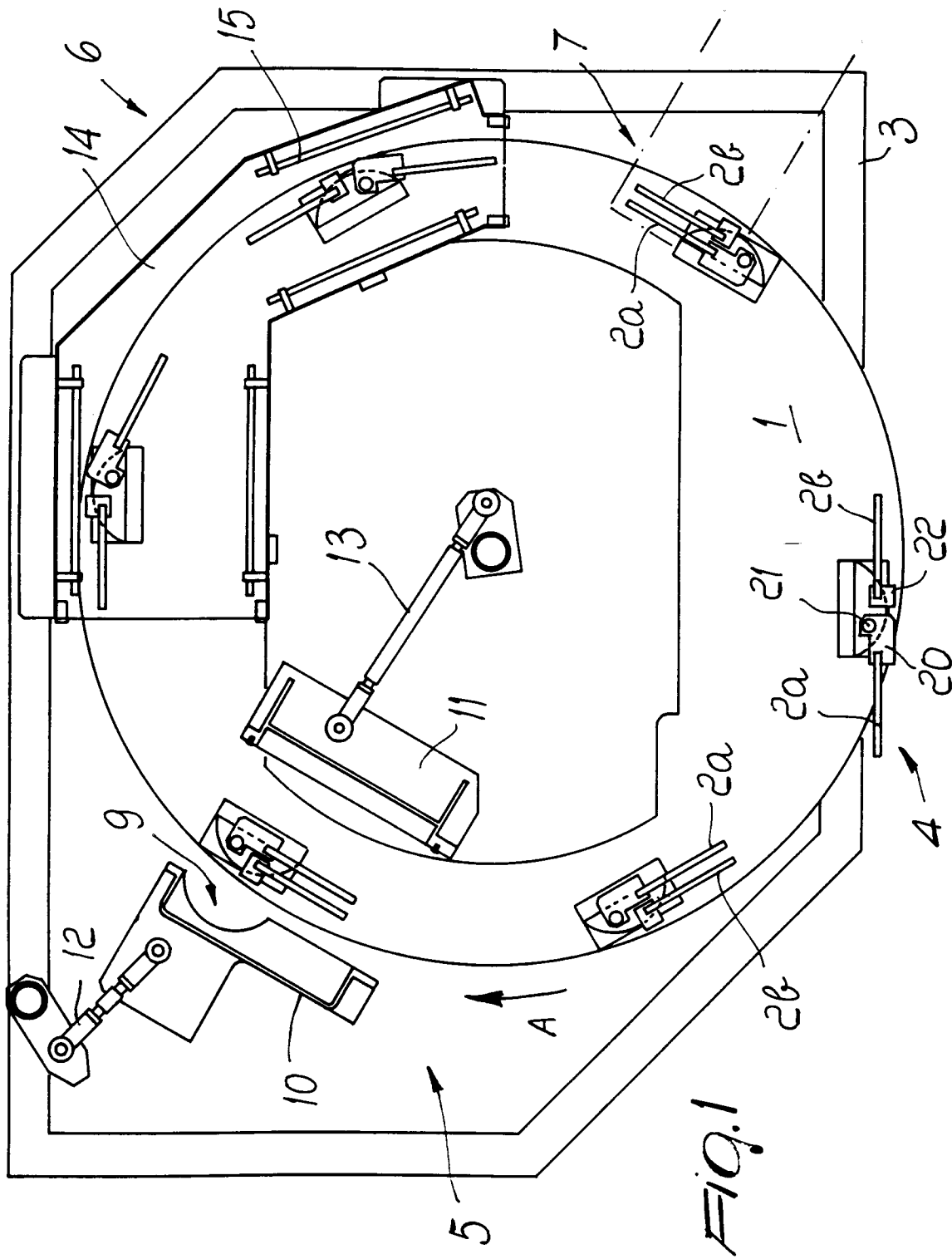
1. Machine for treating socks with a well-defined heel, characterized in that it comprises: a carousel (1) on which multiple pairs of tubular templates (2a, 2b) are distributed peripherally, respective pairs of socks being meant to be

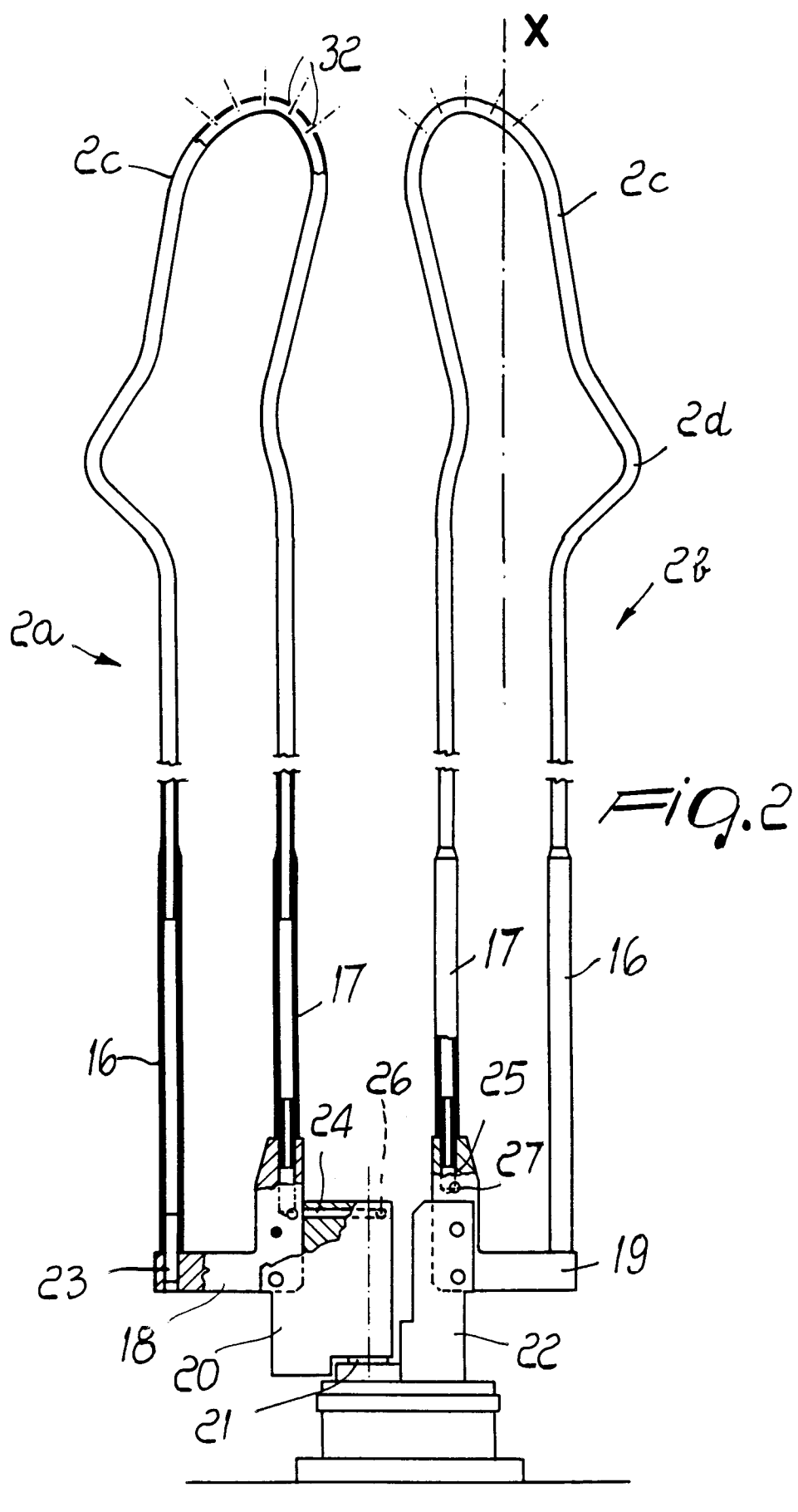
fitted on said templates, said carousel being suitable to be actuated stepwise at a station (4) for fitting said pairs of socks on said tubular templates; at least one station (5,6) for treating said socks; and a station (7) for removing said pairs of socks from said templates in which said socks are paired together.

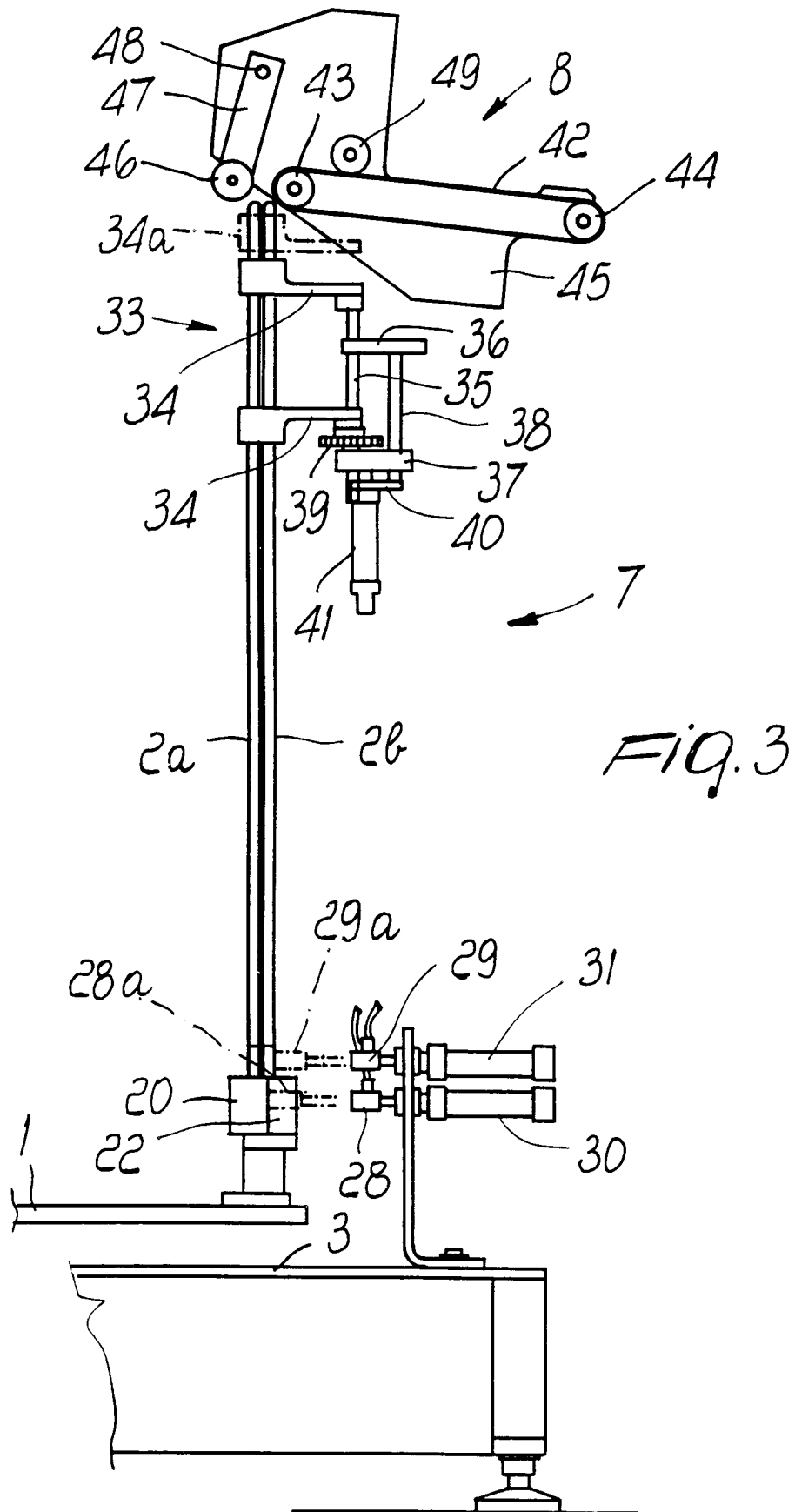
2. Machine according to claim 1, characterized in that said templates are constituted by respective tubular elements (2a, 2b) which are appropriately bent so as to form, in an upper part, the contour (2c) of the foot which shapes the heel (2d), the longitudinal extension of said foot being tilted at an angle of no more than 25° with respect to the longitudinal axis of the respective template. 10
3. Machine according to claim 1, characterized in that said tubular templates (2a, 2b) are supported so that they can move with respect to each other between a spaced position, in which they are arranged substantially on a same vertical plane, at said sock fitting station (4), and a position in which they are mutually adjacent on parallel planes, in order to remove said socks in pairs in said removal station (7). 15 20 25
4. Machine according to claim 3, characterized in that said pairs of tubular templates have a first template (2a) that is rotatably supported about a vertical axis on said carousel and a second template (2b) which is rigidly coupled in fixed position on a vertical plane that is substantially tangent to said carousel, said templates being arranged symmetrically with respect to one another, in said spaced position, so as to have a corresponding contour in the mutually adjacent position. 30 35 40
5. Machine according to claim 1, characterized in that said tubular templates are suitable to be fed with compressed air which is meant to exit through multiple holes (32) formed at the top of said templates, so as to produce a jet that is suitable to direct the corresponding end of said socks towards pick-up means (33) provided in said removal station. 45
6. Machine according to claim 1, characterized in that said removal station has means (33) for gripping the top of said tubular templates and for lifting the end of said paired socks, said means having at least one pair of arms (34) that are oscillatable on a horizontal plane, have a corresponding pad, and can be actuated so as to mutually open and close on supporting means (35) which are meant for alternating 50 55

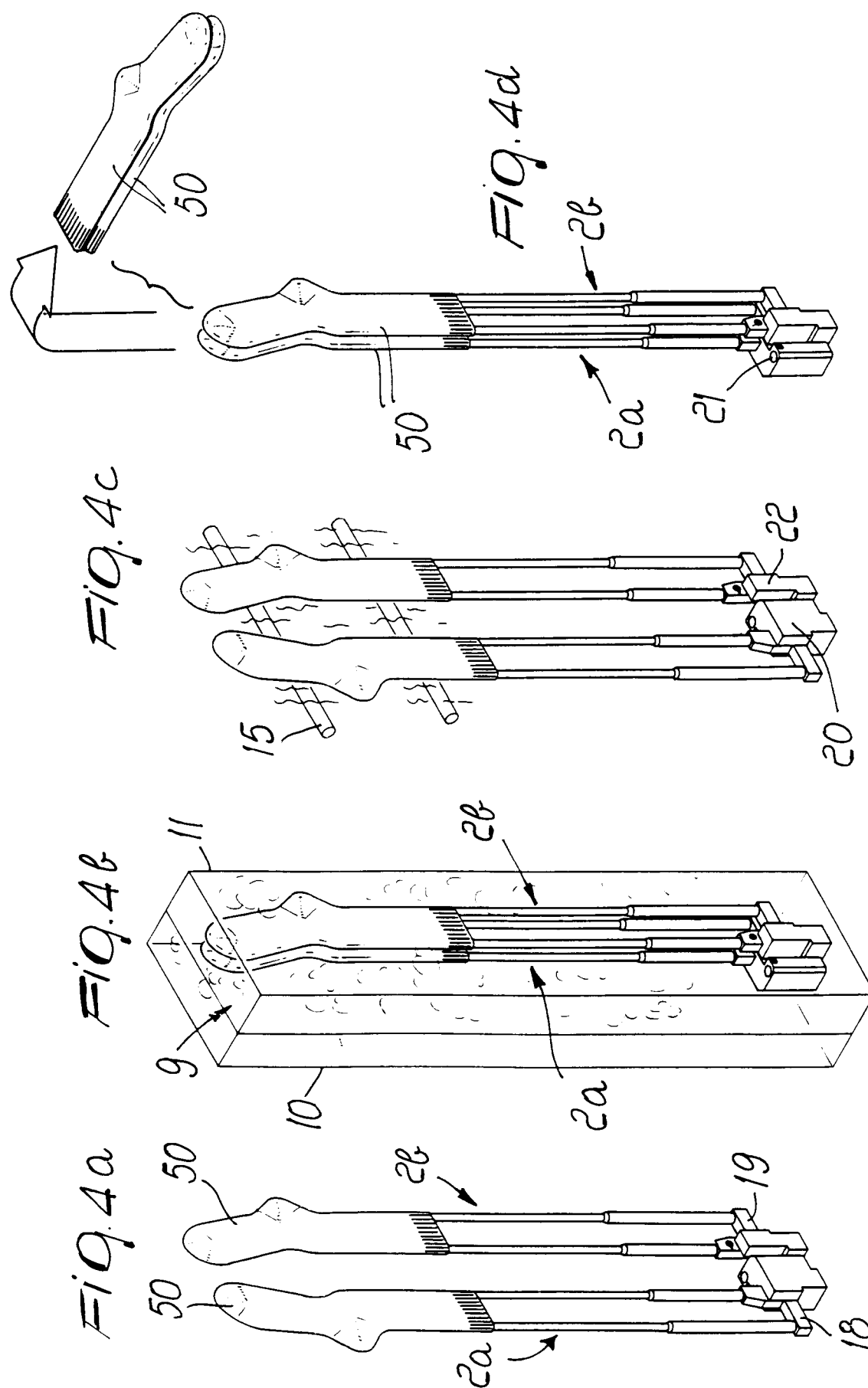
vertical sliding, said pads being meant to clamp said tubular templates at an upper part that forms the contour of the foot.

7. Machine according to claim 1, characterized in that said sock treatment stations comprise at least one fixing station (5) inside a chamber (9) which is supplied with steam and in which said pairs of tubular templates are arranged in a position in which they are mutually adjacent on parallel planes. 10
8. Machine according to claim 1, characterized in that said sock treatment stations comprise at least one pressing station (6) inside a chamber (14) provided with infrared-ray lamps (15), in which said pairs of tubular templates are arranged preferably in a spaced position in which said templates are arranged substantially on a same vertical plane. 15 20
9. Machine for treating socks with a well-defined heel, comprising one or more of the features described and/or illustrated herein. 25











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EUROPEAN SEARCH REPORT

Application Number
EP 94 11 7190

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 311 888 (CORTESE) * abstract; figures 1,2 * * column 4, line 55 - column 5, line 21 * ---	1,3-6	D06C5/00
A	FR-A-1 582 596 (BEGY) * the whole document * ---	2	
A	FR-A-2 211 951 (HELIOT) * claims 1,2 * -----	3,4,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			D06C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17 February 1995	Examiner Petit, J-P
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