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54 **An automatic, continuous method for producing a panty-hose and a panty-hose closer used therefor.**

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Description

The present invention relates to an automatic continuous method for producing a panty-hose on a panty-hose closer which includes a panty closer assembly provided with a plurality of clamp holder units circulating along an endless first path of travel, a toe closer assembly provided with a plurality of suction holder units circulating along an endless second path of travel, and a transferer assembly arranged at a junction between the panty closer and toe closer assemblies.

Furthermore, the invention relates to an automatic continuous panty-hose closer comprising a panty-hose closer assembly which includes a plurality of clamp holder units arranged for circulation along an endless first path of travel and is adapted for closing the panty section of a material panty-hose to form an incomplete panty-hose during the circulation of the clamp holder units, a toe closer assembly which includes a plurality of suction holder units arranged for circulation along an endless second path of travel and is adapted for closing the toe ends of the incomplete panty-hose to form a complete panty-hose during the circulation of the suction holder units, and a transferer assembly arranged at a junction between the panty closer and the toe closer assemblies.

In the conventional production of a panty-hose, toe ends of the leg sections of a material panty-hose are closed on a toe closer while the panty section of the material panty-hose is closed on a panty closer, separately. Though either operation can be carried out first, closing of the toe ends usually precedes closing of the panty section due to the constructions of toe closers available on market.

One example of such a panty closer is described in US—A—3 777 681, and one example of such a toe closer is described in US—A—4 133 280. Panty-hose closers are also known from US—A—3 520 262, GB—A—2 081 316, GB—A—2 103 257, and FR—A—2 415 684.

The panty and toe closers are usually built as separate machines and usually a panty-hose production mill is equipped with a number of panty and toe closers. One closer requires one operator and additional operators are required for transportation of incomplete panty-hoses between panty and toe closers. Here, the words "an incomplete panty-hose" refers to a material panty-hose with a closed panty section when closing of the panty section comes first, and to a material panty-hose with closed toe ends when closing of the toe ends precedes. In either case, transportation of incomplete panty-hoses between panty and toe closers is highly labour and time consumptive, thereby seriously lowering efficiency in production of panty-hoses.

It is the object of the present invention to provide a production system of panty-hoses which assures remarkable saving in labour and running costs at mills producing panty-hoses.

In accordance with one aspect of the present invention, the method is carried out by mechanically holding one incomplete panty-hose on one clamp holder unit in a laterally spread state in which the sew line on its closed panty section should be substantially in line with the first path of travel of the clamp holder units and its open leg sections should be separately left free, seizing, while keeping the laterally spread state, the leg sections into a pair of successive suction holder units by application of pneumatic suction at the junction, releasing the incomplete panty-hose from the mechanical hold by the clamp holder unit while keeping the laterally spread state, catching the panty section of the incomplete panty-hose by the transferer assembly, and inserting the closed panty section of the incomplete panty-hose inside out over the suction holder units by reciprocation of the transferer assembly for fully automatic transfer of the incomplete panty-hose from the panty closer to the toe closer assembly.

In accordance with the other aspect of the present invention, the panty-hose closer is characterized in that the junction is taken facing a station on the first path of travel for the clamp holder units whereat the incomplete panty-hose is mechanically held in a laterally spread state in which the sew line on its closed panty section is substantially in line with the first path of travel, that leg sections of the spread incomplete panty-hose held by the clamp unit in a free state are pneumatically seized separately by a pair of successive suction holder units arriving at the junction, that the transferer assembly catches the spread panty section of the incomplete panty-hose, that the clamp holder unit thereafter releases the spread incomplete panty-hose from its mechanical hold, and that the transferer assembly inserts the panty section of the incomplete panty-hose inside out over the suction holder units by its reciprocation for automatic transfer of the incomplete panty-hose from the panty closer to toe closer assembly.

The invention will hereinafter be explained in more detail in reference to the accompanying drawings, in which;

Fig. 1 is a plan view of one embodiment of the panty-hose closer in accordance with the present invention.

Fig. 2 is a side view of the one embodiment of the clamp holder unit used for the panty closer assembly of the panty-hose closer in accordance with the present invention.

Figs. 3A to 3D are perspective views of material, incomplete and complete panty-hoses processed on the panty-hose closer in accordance with the present invention,

Fig. 4 is a plan view for explaining the arrangements relating to the oval path of travel for suction holder units on the toe closer assembly,

Fig. 5 is a plan view for showing operations applied to incomplete panty-hoses at different work stations on the oval path of travel for suction holder units on the toe closer assembly,

Figs. 6 is a side view of one embodiment of the transferer assembly used for transfer of incomplete panty-hoses from the panty closer to toe closer assembly,

Fig. 7 is a view seen in the direction of VII—VII in Fig. 6,

Figs. 8 and 9 are plan views for showing the manner of incomplete panty-hose transfer on the panty-hose closer shown in Fig. 1,

Figs. 10, 11A and 11B are perspective views for showing operation of the transfer assembly on the panty-hose closer shown in Fig. 1,

Figs. 12 and 13 are plan and side views of the other embodiment of the panty-hose closer in accordance with the present invention, and

Figs. 14A and 14B are transverse cross sectional views of suction guides used for the panty-hose closer shown in Figs. 12 and 13.

One embodiment of the panty-hose closer in accordance with the present invention is shown in Fig. 1, in which the panty-hose closer includes a panty closer assembly P for closing the panty sections of an incomplete panty-hose, a toe closer assembly T arranged next to the panty closer section P and for closing toes in the leg sections of the incomplete panty-hose and a transferer assembly 50 arranged facing the junction between the panty and toe closer assemblies P and T for periodical transfer of each incomplete panty-hose from the panty closer to toe closer assembly T.

The panty closer assembly P includes an endless, substantially horizontal guide rail 11 which defines, in the case of the illustrated embodiment, a circular path of travel. A flat, circular carrier 12 is slidably coupled to the guide rail 11 and holds, via support arms 14, a substantially horizontal, circular guide pipe 13 which is larger in diameter than the above-described guide rail 11. A plurality of clamp holder units 20 are arranged on the carrier 12 at substantially equal intervals for movement along the above-described path of travel as the carrier 12 rotates. In the case of the illustrated embodiment, the panty closer assembly P includes six sets of clamp holder units 20 of same construction.

One embodiment of the above-described clamp holder unit 20 is illustrated in Fig. 2, in which the clamp holder unit 20 is provided with a pair of support arms 23 and 24 swingably mounted, at their proximal ends, to a common vertical shaft 25. One support arm 23 carries, at its distal end, a pair of upper and lower clampers 21a and 21b whereas the other support arm 24 carries at its distal end a pair of upper and lower clampers 22a and 22b.

When the support arms 23 and 24 assume positions on the shaft 25 with the smallest center angle, the clampers 21a and 21b are located substantially in parallel to the clampers 22a and 22b directed radially normal to the above-described path of travel for the clamp holder units 20. When the support arms 23 and 24 assume positions on the shaft 25 with the largest center angle, the clampers 21a and 21b are located substantially in alignment with the clampers 22a and 22b and directed along the above-described

path of travel for the clamp holder units 20. Further, in each pair, the upper and lower clampers 21a and 21b (or 22a and 22b) are movable to and from each other so that they can apply, in pressure contact with each other, a clamp on the panty section of an incomplete panty-hose mounted to the associated clamp holder unit 20.

Each clamp holder unit 20 travels, together with the carrier 12 and the guide pipe 13, in a direction shown with an arrow "a" in Fig. 1 in order to be sequentially registered at one of six work stations A to F taken along the above-described path of travel at equal intervals. Since the panty closer unit P in the illustrated embodiment includes six sets of clamp holder units 20, each of the six work stations A to F are occupied by one of the six sets of clamp holder units 20.

As shown in Fig. 3A, a material panty-hose 4 includes a pair of leg sections 1 and 2 with toe ends 1a and 2a still open and connected to each other at a section above the crotch which is later formed into a panty section 3 shown in Fig. 3C.

At the first work station A, a material panty-hose 4 such as shown in Fig. 3A is mounted to each clamp holder unit 20 of the panty closer assembly P in such a manner that one leg section 1 should be inserted over the upper clampers 21a and 22a whereas the other leg section 2 should be inserted over the lower clampers 21b and 22b. In this state, the leg sections 1 and 2 of the material panty-hose hang outside from the guide pipe 13.

A cutter unit 16 is arranged centrally of the path of travel for the clamp holder units 20 and turns about its inner end in synchronism with the movement of the carrier 12. As the clamp holder unit 20 travels from the second work station B to the third work station C, the cutter unit 16 turns in the same direction and forms a cut in the crotch of the material panty-hose 4 as shown in Fig. 3B. After formation of this cut, the arms 23 and 24 swing away from each other about the support shaft 25 so that the clampers 21a, 21b, 22a and 22b are aligned in the direction of the circular path of travel for the clamp holder units 20 and the cut edges should be exposed towards the center of the circular path of travel.

A sewing machine 17 is arranged whilst facing from the inner side the circular path of travel for the clamp holder units 20. As the clamp holder unit 20 travels from the fourth work station D to the fifth work station E, the upper and lower cut edges in the material panty-hose 4 are shown together by the sewing machine 17 in order to form an incomplete panty-hose 5 shown in Fig. 3C which includes a panty section 3 and a pair of leg sections 1 and 2 with toe ends 1a and 1b still open.

As the clamp holder unit 20 with the incomplete panty-hose 5 travels from the fifth work station E to the sixth work station F, the support arms 23 and 24 swing towards each other about the shaft 25 so that the clampers 21a, 21b, 22a and 22b are again directed radially normal to the circular path of travel for the clamp holder units 20.

The toe closer assembly T is arranged facing the fifth work station E of the panty closer assembly P.

More specifically, the toe closer assembly T is arranged so that, when a clamp holder unit 20 with an incomplete panty-hose 5 of the panty closer assembly P arrives at the fifth work station E, at least two of suction holder units 30 of the toe closer assembly T should be located facing the clamp holder unit 20 of the panty closer assembly P. Before the moment whereat the two suction holder units 30 face the clamp holder unit 20, the two leg sections 1 and 2 of the incomplete panty-hose 5 held by the clamp holder unit 20 and hanging down from the guide pipe 13 are separately caught by these suction holder units 30.

As this seizure of the leg sections 1 and 2, suction at the suction holder units 30 should preferably be generated when the leg sections 1 and 2 come closest to the suction ends of the suction holder units 30. At this seizure by the suction holder units 30, one leg section 1 held by the upper claspers 21a and 22a of the clamp holder unit 20 is caught by the preceding suction holder unit 30 and the other leg section 2 held by the lower claspers 21b and 22b of the clamp holder unit 20 is caught by the following suction holder unit 30.

After the above-described preemptive seizure of the leg sections 1 and 2 of the incomplete panty-hose 5 the successive suction holder units 30 face the clamp holder unit 20 at the fifth work station E whereat the clamp holder unit 20 releases the incomplete panty-hose 5 and, concurrently with this release, the panty section 3 is inserted inside out over the leg sections 1 and 2 already caught by the suction holder units 30 by operation of the transferer assembly 50. As the suction holder units 30 travel further move along a prescribed, endless path of travel on the toe closer assembly T, the toe ends 1a and 1b of the incomplete panty-hose 5 are shown in order to obtain a complete panty-hose 6 shown in Fig. 3D.

The toe closer assembly 50 is shown in detail in Figs. 1, 4 and 5. A pair of spaced, oval frames 32 are mounted to the front side, i.e. the side facing the panty closer assembly P, of a magazine 31. The frames 32 both extend vertically and substantially in parallel to each other in order to define an oval path of travel for the suction holder units 30. In the case of the illustrated embodiment, 16 sets of suction holder units 30 are arranged along the oval path of travel at substantially equal intervals. As best seen in Figs. 4 and 5, eight work stations I to VIII are taken on the oval path of travel for operations to be applied to an incomplete panty-hose 5 carried by each pair of suction holder units 30.

Each suction holder units 30 includes a suction tube 34 having a front suction head 33 and directed substantially normal to the oval path of travel for the suction holder units 30, and intermediate and rear sliders 35 and 36 slidably coupled to the suction tube 34. It further includes a pair of finger plates 37 and 38 which are slidably complied to guide grooves formed in both lateral sides of the suction head 33 and extend along the

suction tube 34. These finger plates 37 and 38 are pivoted at their bodies to the intermediate slider 35. The rear slider 36 carries a circular disc 39 used for opening and closing the front ends of the finger plates 37 and 38. That is the front ends are opened upon rotation of the circular disc 39 in one direction and are closed upon rotation of the 39 in the other direction. The finger plates 37 and 38, the intermediate slider 35 and the rear slider 36 form a unit which is movable to and from the suction head 33 along the suction tube 34.

As described already, the suction holder units 30 are arranged along the oval path of travel defined between the pair of frames 32 and driven for intermittent movement in a direction shown with an arrow "b" in Fig. 4. Eight work stations I to VIII are taken along the oval path of travel for prescribed operations to be applied to an incomplete panty-hose 5 carried by each suction holder unit 30.

When an incomplete panty-hose 5 carried by a clamp holder unit 20 arrives at the first work station I shown in Figs. 4 and 5, its two leg sections 1 and 2 hanging down from the guide pipe 13 are separately and pneumatically caught by a pair of successive suction holder units 30. More specifically, the upper side leg section 1 held by the upper claspers 21a and 22a of the clamp holder unit 20 is caught by the suction tube 34 of the preceding suction holder unit 30 whereas, the lower side leg section 2 held by the lower claspers 21b and 22b is caught by the suction tube 34 of the following suction holder unit 30. This pneumatic seizure of the two legs 1 and 2 may be carried out either concurrently or separately depending on the condition.

A first suction unit 40 is arranged facing the rear ends of the suction holder units 30 passing by whilst extending from the first to second work station II as shown in Fig. 5 so that the suction tubes 34 of the suction holder units 30 travelling through this area are brought into pneumatic communication with the suction unit 40.

With the suction on the leg sections 1 and 2 being kept, the suction holder units 30 come to the second work station II and face the clamp holder unit 20 still holding the panty section 3 of the incomplete panty-hose 5. At this moment, the clamp holder unit 20 cancels its hold on the incomplete panty-hose 5 and, as already described, the panty section 3 is inserted inside out over the two suction holder units 30 by operation of the transferer assembly 50. Thus, at this second work station, II, the incomplete panty-hose 5 is fully transferred from the panty closer assembly P to the toe closer assembly T by assistance of the transferer assembly 50.

The suction acting on the incomplete panty-hose 5 is cancelled as the suction holder units 30 travel from the second to third work station III.

At the third work station III, a pair of turn-over rollers 41 and 42 are arranged for contact with the panty section 3 of the incomplete panty-hose 5 brought to this station. As the turn-over rollers 41 and 42 rotate, the panty section 3 is moved

rearwards so that the panty section 3 and the leg sections 1 and 2 should fully be inserted inside out over the two suction holder units 30. The toe ends 1a and 1b of the incomplete panty-hose 5 in this state are located near the front suction ends 33 of the suction holder units 30.

Heel and toe position adjustments are conditionally carried at the fourth and fifth work stations IV and V. For correct seaming of a toe end of an incomplete panty-hose 5, the heel end has to be located on the associated suction holder unit 30 so that it should come into exact alignment with the seam line of the associated toe end.

A pair of heel adjusters 43 are arranged at the fourth work station IV and a pair of toe adjusters 44 are arranged at the fifth work station V. Any conventional adjusters are usable for this purpose. One example of such an adjuster includes a photoelectric sensor, a comparator circuit, a pulse motor electrically connected to the comparator circuit, and an adjuster roller which is driven for rotation by the pulse motor and arranged for contact with an incomplete panty-hose 5 on the suction holder unit 30. The photoelectric sensor detects the actual position of, for example, the toe end with respect to the front suction head 33 of the associated suction holder unit 30 and generates a corresponding actual position signal. On receipt of this signal, the comparator circuit compares this actual position signal with a reference position signal which represents the correct position of the toe with respect to the above-described front suction head 33, and generates an operation signal corresponding to the difference between the actual and reference position signals. On receipt of this operation signal, the pulse motor drive the adjuster roller over a period enough to bring the toe end to the correct position represented by the above-described reference position signal. It should be understood by one skilled in the art that the position adjustments at the fourth and fifth work stations IV and V are both carried out only when the difference is obtained in the comparator circuit.

After the conditional position adjustments, the incomplete panty-hose 5 carried by the suction holder units 30 is brought to the sixth work station VI. A plate cam 45 is secured horizontally to the rear side frame 32 at a level able to come into contact with the circular disc 39 of each suction holder unit 30 passing by. As the circular disc 39 comes in contact with the plate cam 45, the finger plates 37 and 38 of the suction holder unit 30 swing horizontally outwards from each other in order to laterally spread the toe ends 1a and 1b of the leg section 1 on the suction holder unit 30. Further, the finger plates 37 and 38 with the spreaded toe ends 1a and 2a moves forwards for toe seaming preparation.

A sewing machine 46 is arranged at the seventh work station VIII facing the front suction head 33 of the suction holder unit 30 passing by. As the incomplete panty-hose 5 on the suction holder units 30 passes through the seventh work station

VII, the spread toe ends 1a and 1b are closed by seaming by the sewing machine 46 in order to obtain a complete panty-hose 6 shown in Fig. 3D, in which the complete panty-hose 6 includes a closed panty section 3 and a pair of toe closed leg sections 1 and 2.

As the suction holder units 30 travel from the seventh to eighth work station VII, the finger plates 37 and 38 swing towards each other and recede in order to cancel the spreaded state of the toe ends 1a and 2a.

A second suction unit 47 is arranged facing the rear ends of the suction holder units 30 passing by in the area of the eighth work station VIII so that the suction tubes 34 of the suction holder units 30 travelling through this area are brought into pneumatic communication with the suction unit 47. By operation of this suction unit 47, the leg sections 1 and 2 of the complete panty-hose 6 on the suction holder units 30 are sucked into the respective suction tubes 34. A pair of turn-over rollers 48 are arranged at this work station VIII in order to again turn over the complete panty-hose 6 concurrently with the suction by the suction tubes 34. After the complete panty-hose 6 is fully turned over on the suction holder unit 30, the suction by the second suction unit 47 is cancelled.

A funnel shaped suction pipe 49 is arranged at the eighth work station VIII facing the front sucking head 33 of each suction holder unit 30 passing by. Thus, the complete panty-hose 6 on the suction holder units 30 now released from suction by the suction unit 47 is dismounted from the suction holder units 30 by suction of the suction pipe 49 for pneumatic transportation to the next process.

As briefly described already, each incomplete panty-hose 5 is passed from the panty closer assembly P over to the toe closer assembly T by operation of the transferer assembly 50. One embodiment of the transfer assembly 50 is shown in Figs. 6 to 8. The transferer assembly 50 is attached to the magazine 31 to the toe closer assembly T whilst extending across the oval path of travel for the suction holder units 30.

More specifically, the transferer assembly 50 includes an elongated bracket 51 is secured to the side of the magazine and extends towards the panty closer assembly P. A pair of upper and lower guides 52 and 53 are horizontally mounted to the bracket 51 and both extend in parallel to each other in the longitudinal direction of the bracket 51. These guides 52 and 53 carry a slide head 54 which reciprocates along them. A pair of sprocket wheels 55 and 56 are rotatably mounted to the bracket 51 being horizontally spaced from each other in order to carry an endless chain 58. The sprocket wheels 55 and 56 are driven for rotation by a drive motor 57 operationally coupled to the sprocket wheel 55 via a suitable reduction gear. A guide roller 59 is secured to one link of the endless chain 58 and engages with a vertical groove 54a formed on the mating side of the slide head 54 on the guides 52 and 53. As the endless chain 58 is driven for one way rotation by

the drive motor 57, the guide roller 59 travels along the course of the endless chain 58 in order to cause corresponding reciprocation of the slide head 54 on the guides 52 and 53.

A vertical plate 60 is secured atop the slide head 54 and carries, on one side thereof, an air cylinder 70 which is horizontally directed in the longitudinal direction of the bracket 51. A pair of pins 61 and 62 are secured near the front end of the plate 60 whilst being vertically from each other, and bifurcate swing levers 63 and 64 are pivoted at their apexes to the pins 61 and 62, respectively. The upper swing lever 63 includes a rear branch 63a extending upwards and rearwards and a front branch 63b extending horizontally forwards. The lower swing lever 64 includes a rear branch 64a extending downwards and rearwards and a front branch 64b extending horizontally forwards in a manner same as that of the front branch 63b of the upper swing lever 63. The front branches 63b and 64b are both directed towards the fifth station E on the panty closer assembly P. Rear ends of the rear branches 73a and 64a are pivotably coupled to the front end of the piston rod 70a of the air cylinder 70 by means of intermediate links 65 and 66.

When the air cylinder 70 operates to advance its piston rod 70a, the swing levers 63 and 64 swing about the pins 61 and 62 on the vertical plate 60 so that their front ends moves towards and away from each other. In case of the embodiment shown in Fig. 6, the front ends of the branches 63b and 64b of the swing levers 63 and 64 are provided with a pair of cooperative hooks 67 and 68 which are driven for turning towards each other by a suitable drive mechanism (not shown). The hooks 67 and 68 are arranged in a vertical plane including a center line Z (Fig. 8) which connects the center of a clamp holder unit 20 at the fifth work station E on the panty closer assembly P and with the mid-point between two suction holder units 30 at the second work station II on the toe closer assembly T.

The hooks 67 and 68 are usually located at a stand-by position SP. As the slide head 54 moves forwards on the guides 52 and 53, the hooks 67 and 68 are brought to an advanced position AP. As the slide head 54 moves rearwards on the guides 52 and 53, the hooks 67 and 68 are brought to a receded position RP on the suction holder units 30 of the toe closer assembly T as shown with phantom lines. In other words, by operation of the air cylinder 70, the hooks 67 and 68 are driven for reciprocation over a distance between the advanced and receded positions AP and RP.

The incomplete panty-hose 5 bridges the clamp holder unit 20 and the suction holder units 30 at the junction between the panty closer and toe closer assemblies Pond T. When the clamp holder unit 20 and the suction holder units 30 both arrive at the above-described junction, the pair of hooks 67 and 68 of the transferer assembly 50 turn towards each other in order to grip the open edge of the panty section 3 of the incomplete panty-hose 5 held by the clamp holder unit 20.

Next the clamp holder unit 20 released the incomplete panty-hose 5 from its mechanical hold and, by operation of the air cylinder 70, the front branches 63b and 64b of the levers 63 and 64 swing upwards and downwards, respectively, in order to open the panty section 3 of the incomplete panty-hose 5. While keeping this open state of the panty section 3, the hooks 67 and 68 catching the open edge of the panty section 3 are moved rearwards, by operation of the air cylinder 70, to the receded position RP so that the panty section 3 is dismounted from the clamp holder unit 20 and inserted inside out over the suction holder units 30 catching the leg sections 1 and 2. After the transfer is complete, the hooks 67 and 68 are turned from each other in order to release the open edge of the panty section 3, are moved forwards to the stand-by position SP with closing of the front branches 63b and 64b of the levers 62 and 64 in order to complete one cycle transfer of the incomplete panty-hose 5.

If the transfer of an incomplete panty hose 5 would take place at the sixth work station F on the panty closer assembly P, the hooks 67 and 68 of the transferer assembly 50 would have to be advanced to an advanced position AP located deep in the area between the clampers of the clamp holder unit 20, because at this station, the panty section 3 of the incomplete panty-hose 5 would have to be held by clampers of a clamp holder unit 20 in a closed state. This mode of transfer would force the transferer assembly 50 to reciprocate over a very long distance between the advance position AP and the receded position RP.

The clamp holder units 20 on the panty closer assembly P may be driven for an intermittent movement from station to station along the circular path of travel. For more efficient production of panty-hoses, however, it is preferably that the clamp holder units 20 should be driven for a continuous movement along the path of travel. In this case, each clamp holder unit 20 does not stop but just passes by the point of transfer between the panty closer and toe closer assemblies, and only a short time can be reserved for transfer of incomplete panty-hoses 5. In other words, the transferer assembly 50 is required to complete its operation very swiftly. In order to enable such a swift operation, it is preferable to make the reciprocating distance of the transferer assembly 50 as short as possible.

In the case of the embodiment shown in Fig. 1, transfer of incomplete panty-hoses 5 is carried out at the fifth work station E on the panty closer assembly P in order to suffice the above-described requirement for a shorter reciprocating distance. At this work station, the clampers of the clamp holder unit 20 are yet kept in an open state as shown in Fig. 8 and, in this state, the open edges of the panty section 3 of the incomplete panty-hose 5 is located, as shown in Fig. 9, closer to the positions of the associated suction holder units 30 than it would be possible at the sixth work station F. In this case, the transferer assembly 50 is required to reciprocate only over a

short distance between the advanced position AP and the receded position RP as shown in Fig. 8.

The panty closer assembly P includes an arcuate, additional guide pipe 27 properly secured to the pedestal of the apparatus. This additional guide pipe 27 extends horizontally from the second to fifth work station on the diametrically outer side of the guide pipe 13, and at a level somewhat higher than the guide pipe 13. In the area between the second and third work stations, the additional guide pipe 27 is curved diametrically inwards and downwards towards a clamp holder unit 20 located at the second work station B.

At the first work station A, a material panty-hose 4 is manually mounted to a clamp holder unit 20 with its leg sections 1 and 2 hanging down from the guide pipe 13. As the clamp holder unit 20 passes by the second work station B, the starting end of the additional guide pipe 27 intrudes into the gap between the two leg sections 1 and 2 so that, after passing the second work station B, the upper side leg section 1 hangs down from the additional guide pipe 27 and the lower side leg section 2 hangs down from the guide pipe 13. Due to the difference in diametral position and level, the leg sections 1 and 2 are automatically separated without any manual operation.

Operation of the transferer unit 50 on the panty-hose closer shown in Fig. 1 is shown more in detail in Figs. 10, 11A and 11B. In this case of Figs. 11A and 11B, as a substitute for the hooks 67 and 68 used for the previous embodiment, a pair of clampers 71 and 72 are used for catching the open edges of the panty section. First, the clampers 71 and 72 in an open state are brought to the position of the open edges of the panty section 3 of the incomplete panty-hose 5 as shown in Figs. 10 and 11A. Next, the clampers 71 and 72 close to catch the opposite open edges of the panty section 3 as shown in Fig. 11B.

In the case of the foregoing embodiments, leg sections 1 and 2 of an incomplete panty-hose 5 hanging down from the guide pipe 13 or guide pipes 13 and 27 are pneumatically caught, at the point of transfer, directly by the suction tubes 34 of the successive suction holder units 30. An embodiment of the panty-hose closer shown in Figs. 12 to 14 assures more reliable seizure of the leg sections 1 and 2 by the suction holder units 30.

More specifically, the transferer assembly 50 of this embodiment includes a pair of suction guides 73 and 74 arranged between the panty closer and toe closer assemblies at the point of transfer. These suction guides 73 and 74 are properly secured to the pedestal of the device. The upper suction guide 73 has one end located close to the upper side leg section 1 of the incomplete panty-hose 5 at the point of transfer and the other end located close to the mouth of the suction tube 34 of the preceding suction holder unit 30 as best seen in Fig. 13. Whereas, the lower suction guide 74 has one end located close to the lower side leg section 2 of the same incomplete panty-hose 5

and the other end located close to the mouth of the suction tube 34 of the following suction holder unit 30. The suction guides 73 and 74 have tubular sections 73a and 73b provided with longitudinal side slits, and movable lids 73b and 74b provisionally closing the side slits as shown in Fig. 14.

As an incomplete panty-hose 5 carried by a clamp holder unit 20 arrives at the point of transfer, suction is applied to the associated suction holder units 30 by operation of the first suction unit 40 (see Fig. 5) and the side slits of the suction guides 73 and 74 are provisionally closed at this moment by the lids 73b and 74b. As a consequence, the leg sections 1 and 2 are sucked into the suction tubes 34 of the suction holder units 30 via the suction guides 73 and 74 as shown in Fig. 13. Soon after this suction, the lids 73b and 74b open the side slits of the suction guides 73 and 74 so that the incomplete panty-hose 5 directly bridges the clamp holder unit 20 and the suction holder units 30. In this state, the incomplete panty-hose 5 is passed from the clamp holder unit 20 over to the suction holder units 30 by the above-described operation of the transferer assembly 50.

As is clear from the foregoing description, in the production system of the present invention, a panty closer assembly is directly connected in operation to a toe closer assembly by assistance of a transferer assembly arranged at the junction so that transfer of incomplete panty-hoses can be carried out quite automatically for a continuous production of panty-hoses. More specifically, the heart of the present invention resides in the process in which two leg sections of an incomplete panty-hose held by a clamp holder unit on a panty closer assembly are pneumatically and separately seized by two successive suction holder units on a toe closer assembly, and the panty section of the incomplete panty-hose is thereafter turned over and transferred to the suction holder units by operation of a transferer assembly which reciprocates between the panty closer and toe closer assemblies.

By employment of the production system of the present invention, the amount of labour can be reduced to about half of that needed in the conventional system in which panty and toe closers are quite separated from each other. In addition, the direct connection between the two processes avoids the need for manual transportation of incomplete panty-hoses between panty and toe closers. These concur to assure efficient production and low production cost of panty-hoses.

Claims

1. An automatic continuous method for producing a panty-hose on a panty-hose closer which includes a panty closer assembly (P) provided with a plurality of clamp holder units (20) circulating along an endless first path of travel, a toe closer assembly (T) provided with a plurality of

suction holder units (30) circulating along an endless second path of travel, and a transferer assembly (50) arranged at a junction between the panty closer and toe closer assemblies characterized by mechanically holding one incomplete panty-hose (5) on one clamp holder unit (20) in a laterally spread state in which the sew line on its closed panty section (3) should be substantially in line with the first path of travel of the clamp holder units (20) and its open leg sections (1, 2) should be separately left free, seizing, while keeping the laterally spread state, the leg sections into a pair of successive suction holder units (30) by application of pneumatic suction at the junction, catching the panty section (3) of the incomplete panty-hose by the transferer assembly (50), releasing the incomplete panty-hose (5) from the mechanical hold by the clamp holder unit (20) while keeping the laterally spread state, and inserting the closed panty section (3) of the incomplete panty-hose (5) inside out over the suction holder units (30) by reciprocation of the transferer assembly (50) for fully automatic transfer of the incomplete panty-hose (5) from the panty closer to toe closer assembly.

2. An automatic, continuous method according to claim 1 characterized in

that the clamp holder units (20) are driven for movement along an endless path of travel including prescribed number of work stations (A—F), and

that pneumatic seizing of the leg sections (1, 2) by the suction holder units (30) and inserting of the panty section (3) by the transferer assembly (50) are carried out at a same work station (E) but with a proper time difference.

3. An automatic, continuous method according to claim 2 characterized in

that, at the work station (E), the clamp holder unit (20) is kept in an open state and the panty section (3) is spread in the direction of the path of travel for the clamp holder units (20).

4. An automatic continuous panty-hose closer comprising a panty-hose closer assembly (P) which includes a plurality of clamp holder units (20) arranged for circulation along an endless first path of travel and is adapted for closing the panty section (3) of a material panty-hose (4) to form an incomplete panty-hose (5) during the circulation of the clamp holder units, a toe closer assembly (T) which includes a plurality of suction holder units (30) arranged for circulation along an endless second path of travel and is adapted for closing the toe ends (1a, 2a) of the incomplete panty-hose (5) to form a complete panty-hose (6) during the circulation of the suction holder units, and a transferer assembly (50) arranged at a junction between the panty closer and the toe closer assemblies (P, T) characterized in

that the junction is taken facing a station (E) on the first path of travel for the clamp holder units (20) whereat the incomplete panty-hose (5) is mechanically held in a laterally spread state in which the sew line on its closed panty section (3) is substantially in line with the first path of travel,

that leg sections (1, 2) of the spread incomplete panty-hose (5) held by the clamp unit (20) in a free state are pneumatically seized separately by a pair of successive suction holder units (30) arriving at the junction,

that the transferer assembly (50) catches the spread panty section (3) of the incomplete panty-hose,

that the clamp holder unit (20) thereafter releases the spread incomplete panty-hose (5) from its mechanical hold, and

that the transferer assembly (50) inserts the panty section (3) of the incomplete panty-hose (5) inside out over the suction holder units (30) by its reciprocation for automatic transfer of the incomplete panty-hose from the panty closer to toe closer assembly.

5. An automatic, continuous panty-hose closer according to claim 4 characterized in that the transfer assembly (50) includes

a pair of closeable catchers (67, 68; 71, 72) adapted for catching the open edges of the panty section (3) of the incomplete panty-hose (5),

a first driving mechanism for reciprocating the catchers in a direction normal to the path of travel for the clamp holder units (20),

a second driving mechanism for swinging the catchers in a vertical plane including their course of reciprocation, and

a third driving mechanism for causing the catchers to close to catch the open edges of the panty section (3).

6. An automatic, continuous panty-hose closer according to claim 5 characterized in

that the first driving mechanism includes at least one horizontal guide (52, 53) extending in the reciprocating direction of the catchers and a slide head (54) mounted to the guide and driven for reciprocation therealong, and

that the second driving mechanism includes a pair of swing levers (63, 64) swingably coupled to the slide head, one end of each swing lever carrying one of the catchers and the other end of each swing lever being coupled to a drive source (70) for causing swing motion of the swing levers.

7. An automatic, continuous panty-hose closer according to claim 4 characterized in

that the panty closer assembly (P) includes a horizontal, circular guide pipe (13) extending on the outer side of the path of travel for the clamp holder units (20), and

that the transferer assembly (50) includes an arcuate, additional guide pipe (27) which is arranged on the outer side of and at a higher level than the guide pipe (13) and extends towards the point of transfer of the incomplete panty-hose (5).

8. An automatic, continuous panty-hose closer according to claim 4 characterized in

that the transferer assembly (50) includes a pair of suction guides (73, 74) arranged at the point of transfer of the incomplete panty-hose (5),

that one end of each suction guide is located close to one of the leg sections of an incomplete panty-hose held by a clamp holder unit (20) located at the point of transfer whereas the other

end close to the mouth of one of the suction holder units (30) located at the point of transfer, and

that each suction guide is provided with a longitudinal side slit and a lid provisionally closing the slit.

Patentansprüche

1. Automatisches, kontinuierliches Verfahren zur Herstellung einer Strumpfhose auf einer Strumpfhosenschließmaschine, welche eine Rumpfschließvorrichtung (P) mit einer Vielzahl von Klemmhaltereinheiten (20), welche auf einer endlosen ersten Bahn umlaufen, eine Zehenschließvorrichtung (T) mit einer Vielzahl von Saughaltereinheiten (30), welche auf einer endlosen zweiten Bahn umlaufen, und eine Übertragungsvorrichtung (50), welche am Übergang zwischen der Rumpfschließvorrichtung und der Zehenschließvorrichtung angeordnet ist, enthält, gekennzeichnet durch mechanisches Halten einer unvollständigen Strumpfhose (5) auf einer Klemmhaltereinheit (20) in einem seitlich gestreckten Zustand, in welchem die Nahtlinie an ihrem geschlossenen Rumpfabschnitt (3) im wesentlichen mit der ersten Bahn der Klemmhaltereinheiten (20) übereinstimmen und ihre offenen Beinabschnitte (1, 2) einzeln frei gelassen werden sollten, wobei, während der seitlich gestreckte Zustand beibehalten wird, die Beinabschnitte von einem Paar von aufeinanderfolgenden Saughaltereinheiten (30) durch Anwendung von pneumatischem Sog am Übergang ergriffen werden,

Erfassen des Rumpfabschnitts (3) der unvollständigen Strumpfhose von der Übertragungsvorrichtung (50), Loslassen der unvollständigen Strumpfhose (5) vom mechanischen Halt der Klemmhaltereinheit (20), während der seitlich gestreckte Zustand beibehalten wird, und Überziehen des geschlossenen Rumpfabschnitts (3) der unvollständigen Strumpfhose (5) mit dem Inneren nach außen auf die Saughaltereinheiten (30) durch Hin- und Herbewegung der Übertragungsvorrichtung (50) zur vollständigen automatischen Übertragung der unvollständigen Strumpfhose (5) von der Rumpfschließvorrichtung zur Zehenschließvorrichtung.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet,

daß die Klemmhaltereinheiten (20) auf einer endlosen Bahn bewegt werden, welche eine vorgeschriebene Anzahl von Arbeitsstationen (A—F) enthält, und

daß das pneumatische Ergeifen der Beinabschnitte (1, 2) durch die Saughaltereinheiten (30) und Überziehen des Rumpfabschnitts (3) durch die Übertragungsvorrichtung (50) an der gleichen Arbeitsstation (E) ausgeführt werden, aber mit entsprechendem Zeitabstand.

3. Verfahren nach Anspruch 2, dadurch gekennzeichnet,

daß an der Arbeitsstation (E) die Klemmhaltereinheit (20) in offenem Zustand gehalten wird und

daß der Rumpfabschnitt (3) in Richtung der Bahn der Klemmhaltereinheiten (20) gestreckt wird.

4. Automatische, kontinuierliche Strumpfhosenschließmaschine, welche eine Rumpfschließvorrichtung (P) mit einer Vielzahl von Klemmhaltereinheiten (20) welche zum Umlaufen auf einer endlosen ersten Bahn angeordnet sind, wobei die Rumpfschließvorrichtung dazu eingerichtet ist, den Rumpfabschnitt (3) einer unbearbeiteten Strumpfhose (4) zu schließen, um während des Umlaufens der Klemmhaltereinheiten eine unvollständige Strumpfhose (5) zu bilden, eine Zehenschließvorrichtung (T) mit einer Vielzahl von Saughaltereinheiten (30), welche zum Umlaufen auf einer endlosen zweiten Bahn angeordnet sind, wobei die Zehenschließvorrichtung dazu eingerichtet ist, die Zehenenden (1a, 2a) der unvollständigen Strumpfhose (5) zu schließen, um während des Umlaufens der Klemmhaltereinheiten eine vollständige Strumpfhose (6) zu bilden, und eine Übertragungsvorrichtung (50) enthält, welche am Übergang zwischen der Rumpfschließvorrichtung (P) und der Zehenschließvorrichtung (T) angeordnet ist, dadurch gekennzeichnet,

daß der Übergang an einer Station (E) auf der ersten Bahn der Klemmhaltereinheiten (20) liegt, wo die unvollständige Strumpfhose (5) mechanisch in einem seitlich gestreckten Zustand gehalten wird, in welchem die Nahtlinie an ihrem geschlossenen Rumpfteil (3) im wesentlichen mit der ersten Bahn in Übereinstimmung ist,

daß die Beinabschnitte (1, 2) der gestreckten unvollständigen Strumpfhose (5), welche von der Klemmhaltereinheit (20) in einem freien Zustand gehalten werden, einzeln von einem Paar aufeinanderfolgender Saughaltereinheiten (30), welche am Übergang ankommen, pneumatisch festgehalten werden,

daß die Übertragungseinheit (50) den gestreckten Rumpfabschnitt (3) der unvollständigen Strumpfhose erfaßt,

daß die Klemmhaltereinheit (20) anschließend die gedehnte unvollständige Strumpfhose (5) vom mechanischen Halt befreit, und

daß die Übertragungsvorrichtung (50) den Rumpfteil (3) der unvollständigen Strumpfhose (5) mit dem Inneren nach außen durch Hin- und Herbewegung über die Saughaltereinheiten (30) zieht, um die unvollständige Strumpfhose von der Rumpfschließvorrichtung automatisch auf die Zehenschließvorrichtung zu übertragen.

5. Strumpfhosenschließmaschine nach Anspruch 4, dadurch gekennzeichnet,

daß die Übertragungsvorrichtung (50) folgendes enthält:

ein Paar von Schließaren Greifvorrichtungen (67, 68; 71, 72), welche eingerichtet sind, die offenen Ränder des Rumpfabschnitts (3) der unvollständigen Strumpfhose (5) zu ergreifen,

einen ersten Antrieb zur Hin- und Herbewegung der Greifvorrichtungen in Richtung senkrecht zur Bahn der Klemmhaltereinheiten (20),

einen zweiten Antrieb zum Schwenken der Greifvorrichtungen in einer vertikalen Ebene,

welche ihre Hin- und Herbewegung einschließt, und

einen dritten Antrieb, um die Greifvorrichtungen zu schließen und damit die offenen Ränder des Rumpfabschnittes (3) zu erfassen.

6. Strumpfhosenschließmaschine nach Anspruch 5, dadurch gekennzeichnet,

daß der erste Antrieb mindestens eine horizontale Führung (52, 53), welche sich in der Richtung der Hin- und Herbewegung der Greifvorrichtungen erstreckt, und einen Schlitten (54) aufweist, welcher auf der Führung befestigt ist und sich darauf hin- und herbewegt, und daß der zweite Antrieb ein Paar von Schwenkhebeln (63, 64) aufweist, welche schwenkbar am Schlitten befestigt sind, wobei ein Ende jedes Schwenkhebels eine der Greifvorrichtungen trägt und das andere Ende jedes Schwenkhebels mit einem Antrieb (70) verbunden ist, um die Schwenkbewegung der Schwenkhebel auszuführen.

7. Strumpfhosenschließmaschine nach Anspruch 4, dadurch gekennzeichnet,

daß die Rumpfschließvorrichtung (P) ein horizontales kreisförmiges Führungsrohr (13) enthält, welches sich an der äußeren Seite der Bahn der Klemmhaltereinheiten (20) befindet, und

daß die Übertragungsvorrichtung (50) ein gebogenes zusätzliches Führungsrohr (27) aufweist, welches an der äußeren Seite des Führungsrohrs (13), jedoch auf einer höheren Ebene, angeordnet ist, und sich in Richtung zur Übertragungsstelle der unvollständigen Strumpfhose (5) erstreckt.

8. Strumpfhosenschließmaschine nach Anspruch 4, dadurch gekennzeichnet,

daß die Übertragungsvorrichtung (50) ein Paar von Saugführungen (73, 74) aufweist, welche an der Übertragungsstelle der unvollständigen Strumpfhose (5) angeordnet sind,

daß ein Ende jeder Saugführung nahe an einem Beinabschnitt einer unvollständigen Strumpfhose angeordnet ist, welche von einer Klemmhaltereinheit (20) an der Übertragungsstelle gehalten wird, wogegen das andere Ende nahe an der Mündung einer Saughaltereinheit (30) an der Übertragungsstelle angeordnet ist, und

daß jede Saugführung mit einem Längsschlitz an der Seite und einer Klappe zum provisorischen Verschließen des Schlitzes versehen ist.

Revendications

1. Procédé continu automatique pour fabriquer un collant sur un fermeur de collant qui comprend un ensemble fermeur de slip (P) muni de plusieurs ensembles de support à pince (20) circulant le long d'une première trajectoire sans fin, un ensemble fermeur de bout (T) muni de plusieurs ensembles de support à aspiration (30) circulant le long d'une deuxième trajectoire sans fin, et un ensemble de transfert (50) disposé à une jonction entre les ensembles fermeur de slip et fermeur de bout, caractérisé en ce que l'on maintient mécaniquement un collant incomplet (5) sur un ensemble de support à pince (20) dans un état étalé

latéralement dans lequel la ligne de couture sur sa partie de slip fermée (3) doit être pratiquement alignée sur la première trajectoire des ensembles de support à pince (20) et ses parties de jambe ouvertes (1, 2) doivent être laissées libres séparément, en ce que l'on saisit, tout en maintenant l'état étalé latéralement, les parties de jambe dans une paire d'ensembles successifs de support à aspiration (30) par application d'une aspiration pneumatique à la jonction, en ce que l'on saisit la partie de slip (3) du collant incomplet au moyen de l'ensemble de transfert (50) en maintenant l'étalé latéralement, et en ce que l'on insère la partie de slip fermée (3) du collant incomplet (5), à l'état retourné, par dessus les ensembles de support à aspiration, par va-et-vient de l'ensemble de transfert (50) pour un transfert entièrement automatique du collant incomplet (5), de fermeur de slip à l'ensemble fermeur de bout.

2. Procédé continu automatique selon la revendication 1, caractérisé en ce que les ensembles de support à pince (20) sont entraînés pour un mouvement le long d'une trajectoire sans fin comprenant un nombre prescrit de postes de travail (A à F), et en ce que la prise pneumatique des parties de jambe (1, 2) par les ensembles de support à aspiration (30) et l'insertion de la partie de slip (3) par l'ensemble de transfert (50) s'effectuent en un même poste de travail (E) mais une différence de temps appropriée.

3. Procédé continu automatique selon la revendication 2, caractérisé en ce qu'au poste de travail (E), l'ensemble de support à pince (20) est maintenu dans un état ouvert et la partie de slip (3) est étalée dans la direction de la trajectoire des ensembles de support à pince (20).

4. Fermeur de collants continu automatique comprenant un ensemble fermeur de slip (P) qui comprend plusieurs ensembles de support à pince (20) disposés pour la circulation le long d'une première trajectoire sans fin et conçus pour fermer la partie de slip (3) d'un collant en matière (4) pour former un collant incomplet (5) pendant la circulation des ensembles de support à pince, un ensemble fermeur de bout (T) qui comprend plusieurs ensembles de support à aspiration (30) disposés pour la circulation le long d'une deuxième trajectoire sans fin et est conçu pour fermer les extrémités de bout (1a, 2a) du collant incomplet (5) pour former un collant complet (6) pendant la circulation des ensembles de support à aspiration, et un ensemble de transfert (50) disposé à une jonction entre les ensembles fermeur de slip et fermeur de bout (P, T), caractérisé en ce que la jonction est prise en face d'un poste (E) sur la première trajectoire des ensembles de support de pince (20) où le collant incomplet (5) est retenu mécaniquement dans un état étalé latéralement dans lequel la ligne de couture sur sa partie de slip fermée (3) est pratiquement alignée sur la première trajectoire, que des parties de jambe (1, 2) du collant incomplet étalé (5) maintenues par l'ensemble à pince (20) dans un état libre sont séparément saisies pneumatiquement par une paire des ensembles de support à

aspiration successifs (30) arrivant à la jonction, en ce que l'ensemble de transfert (50) saisit la partie de slip étalée (3) du collant incomplet, en ce que l'ensemble de support à pince (30) libère ensuite le collant incomplet étalé (5) de sa retenue mécanique, et en ce que l'ensemble de transfert (50) insère la partie de slip (3) du collant incomplet (5), à l'état retourné, par dessus les ensembles de support à aspiration (30), par son va-et-vient pour le transfert automatique du collant incomplet du fermeur de slip à l'ensemble fermeur de bouts.

5. Fermeur de collants continu automatique selon la revendication 4, caractérisé en ce que l'ensemble de transfert (50) comprend une paire d'accrocheurs pouvant être fermés (67, 68; 71, 72) conçue pour accrocher les bords ouverts de la partie de slip (3) du collant incomplet (5), un premier mécanisme d'entraînement pour faire aller et venir les accrocheurs dans une direction normale à la trajectoire des ensembles de support à pince (20), un deuxième mécanisme d'entraînement pour faire osciller les accrocheurs dans un plan vertical comprenant leur parcours de va-et-vient et un troisième mécanisme d'entraînement pour faire en sorte que les accrocheurs se ferment pour accrocher les bords ouverts de la partie de slip (3).

6. Fermeur de collant automatique selon la revendication 5, caractérisé en ce que le premier mécanisme d'entraînement comprend au moins un guide horizontal (52, 53), s'étend dans la direction de va-et-vient des accrocheurs et une tête de chariot (54) montée sur le guide et entraînée pour un va-et-vient le long de celui-ci, et en ce

que le deuxième mécanisme d'entraînement comprenant une paire de leviers oscillants (63, 64) accouplés avec possibilité d'oscillation à la tête de chariot, une extrémité de chaque levier oscillant portant l'un de accrocheurs et l'autre extrémité de chaque levier oscillant étant accouplée à une source d'entraînement (70) pour causer un mouvement d'oscillation des leviers oscillants.

7. Fermeur de collants continu automatique selon la revendication 4, caractérisé en ce que l'ensemble fermeur de slip (P) comprend un tuyau de guidage circulaire horizontal (13) s'étendant sur le côté extérieur de la trajectoire des ensembles de support à pince (20), et en ce que l'ensemble de transfert (50) comprend un tuyau de guidage supplémentaire arqué (27) qui est disposé sur le côté extérieur de tuyau de guidage (13) et s'étend en direction du point de transfert du collant incomplet (5).

8. Fermeur de collants continu automatique selon la revendication 4, caractérisé en ce que l'ensemble de transfert (50) comprend une paire de guides à aspiration (73, 74) disposée au point de transfert du collant incomplet (5), en ce qu'une extrémité de chaque guide à aspiration est située près de l'une des parties de jambe d'un collant incomplet retenu par un ensemble de support à pince (20) situé au point de transfert, tandis que l'autre extrémité est située près de l'embouchure de l'un des ensembles de support à aspiration (30) situé au point de transfert, et en ce que chaque guide à aspiration est muni d'une fente latérale longitudinale et d'un couvercle fermant provisoirement la fente.

5

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11

FIG. 1

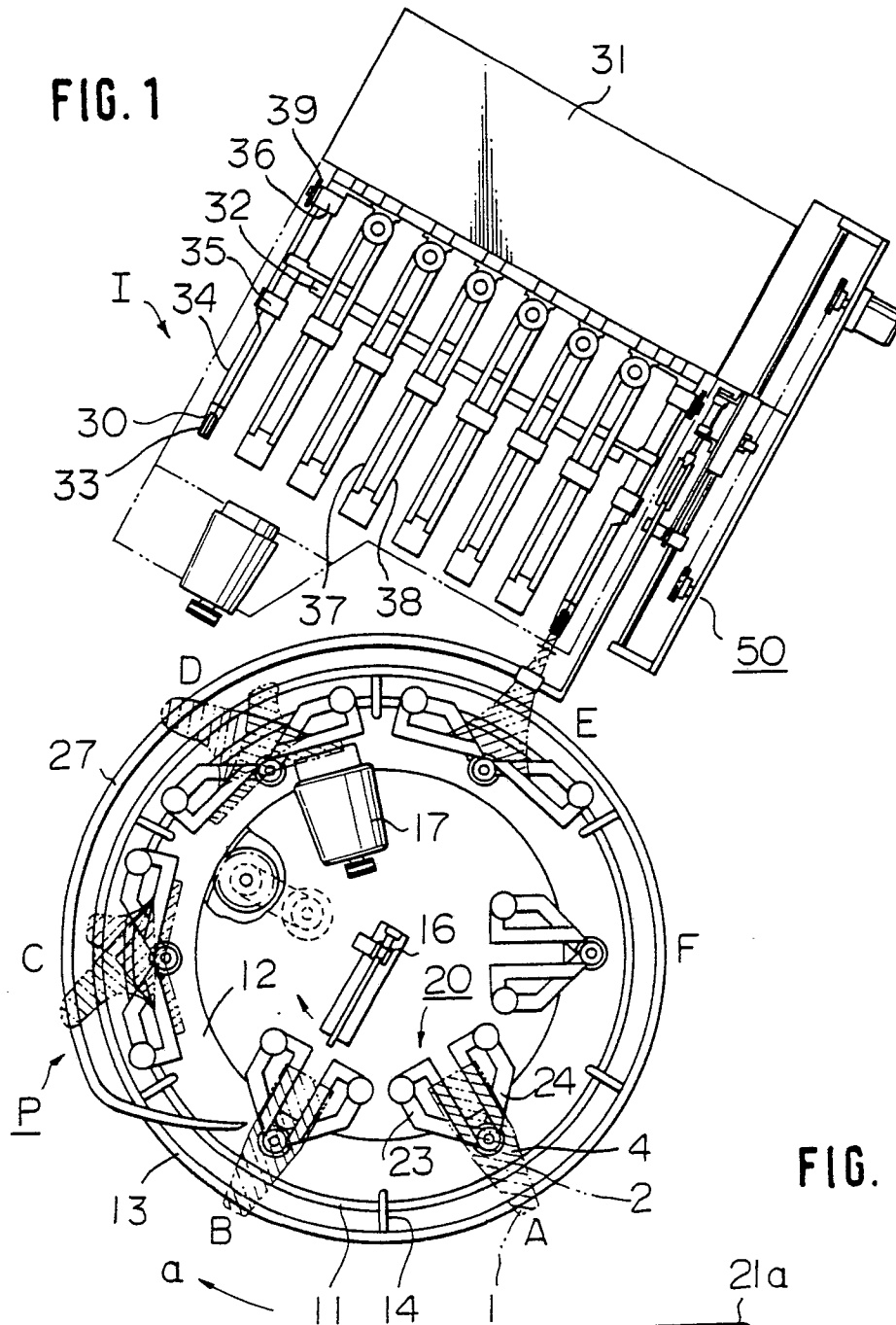
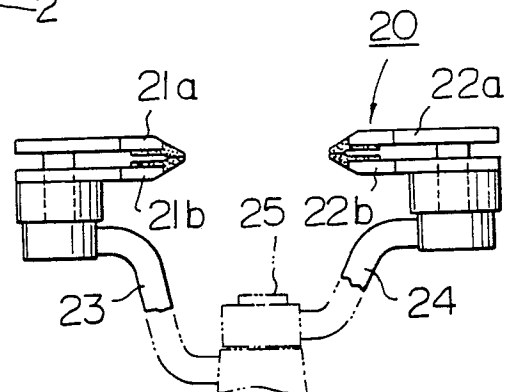


FIG. 2



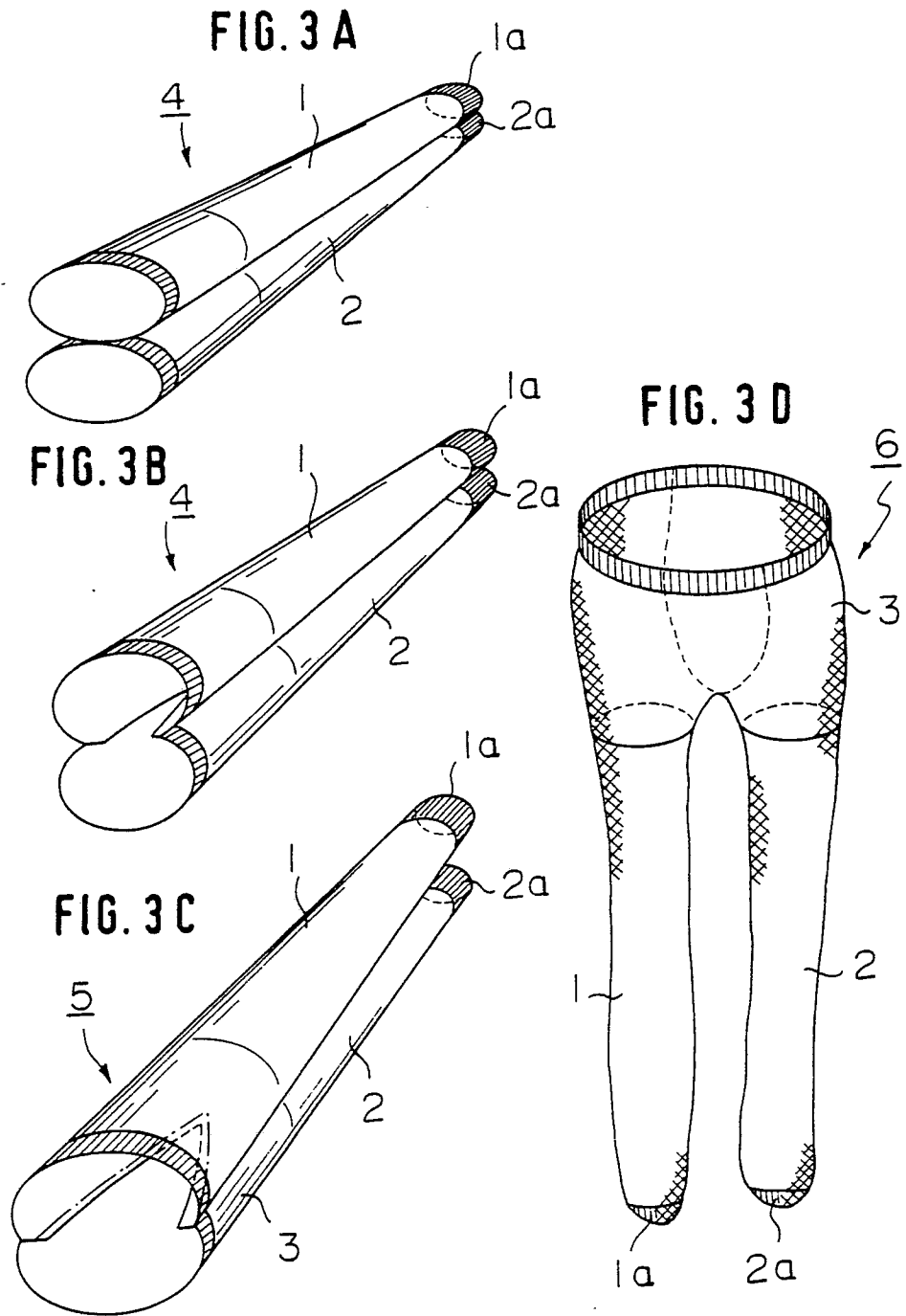


FIG. 4

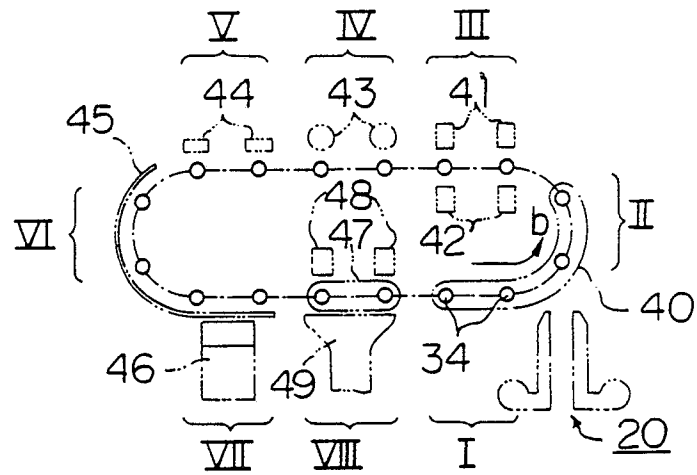
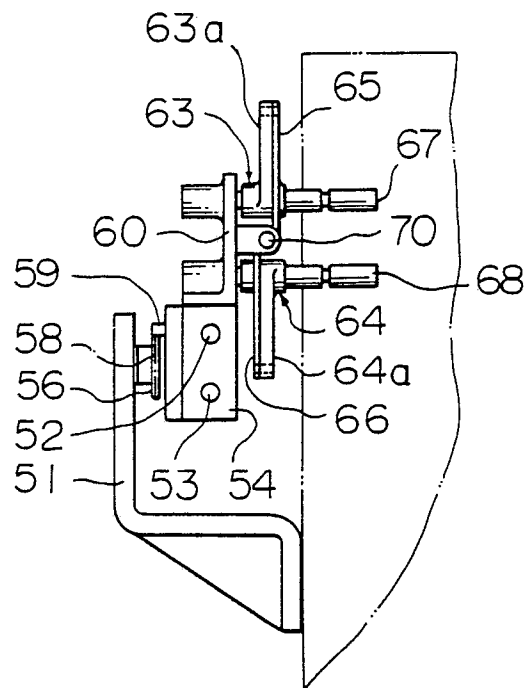
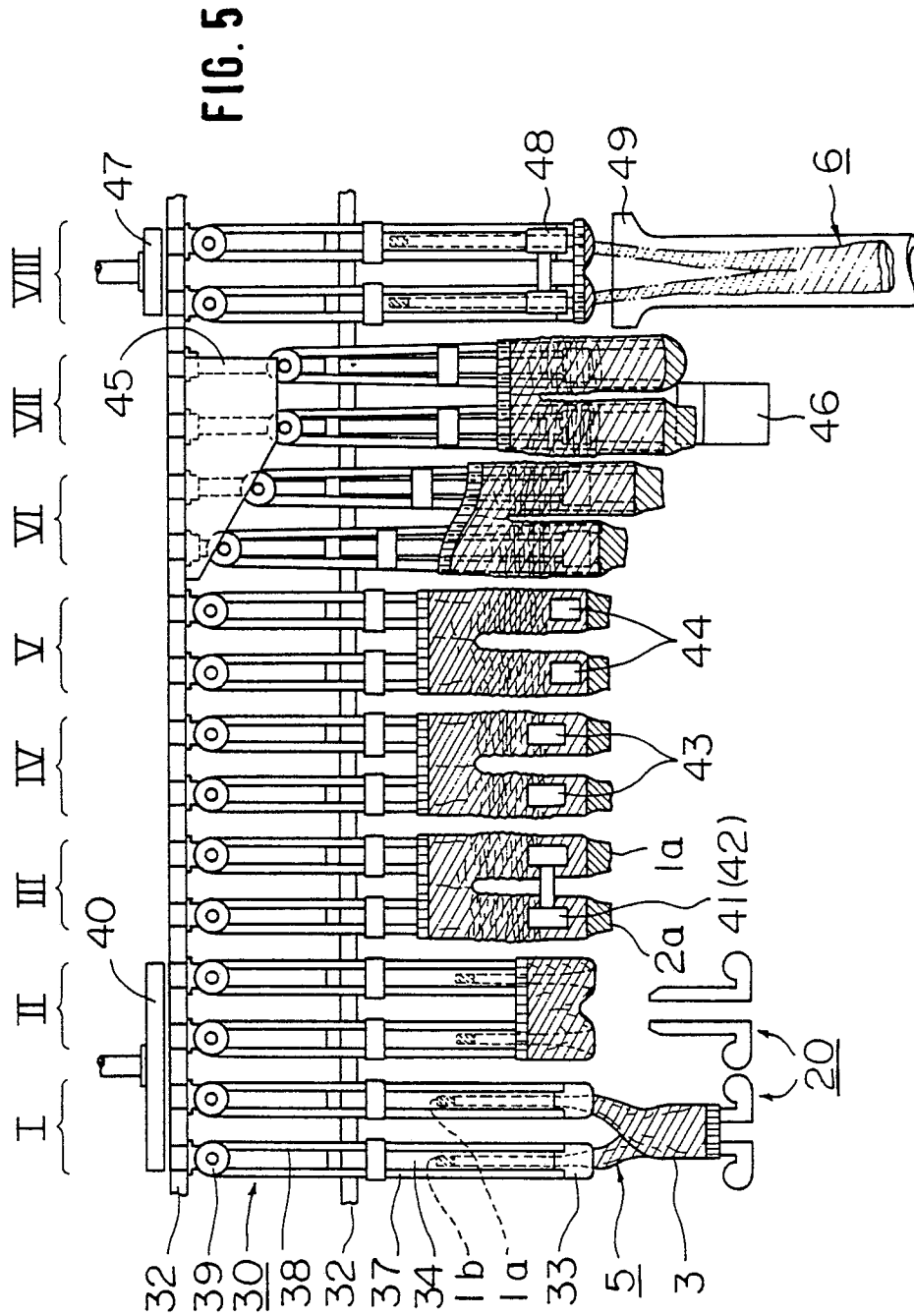


FIG. 7





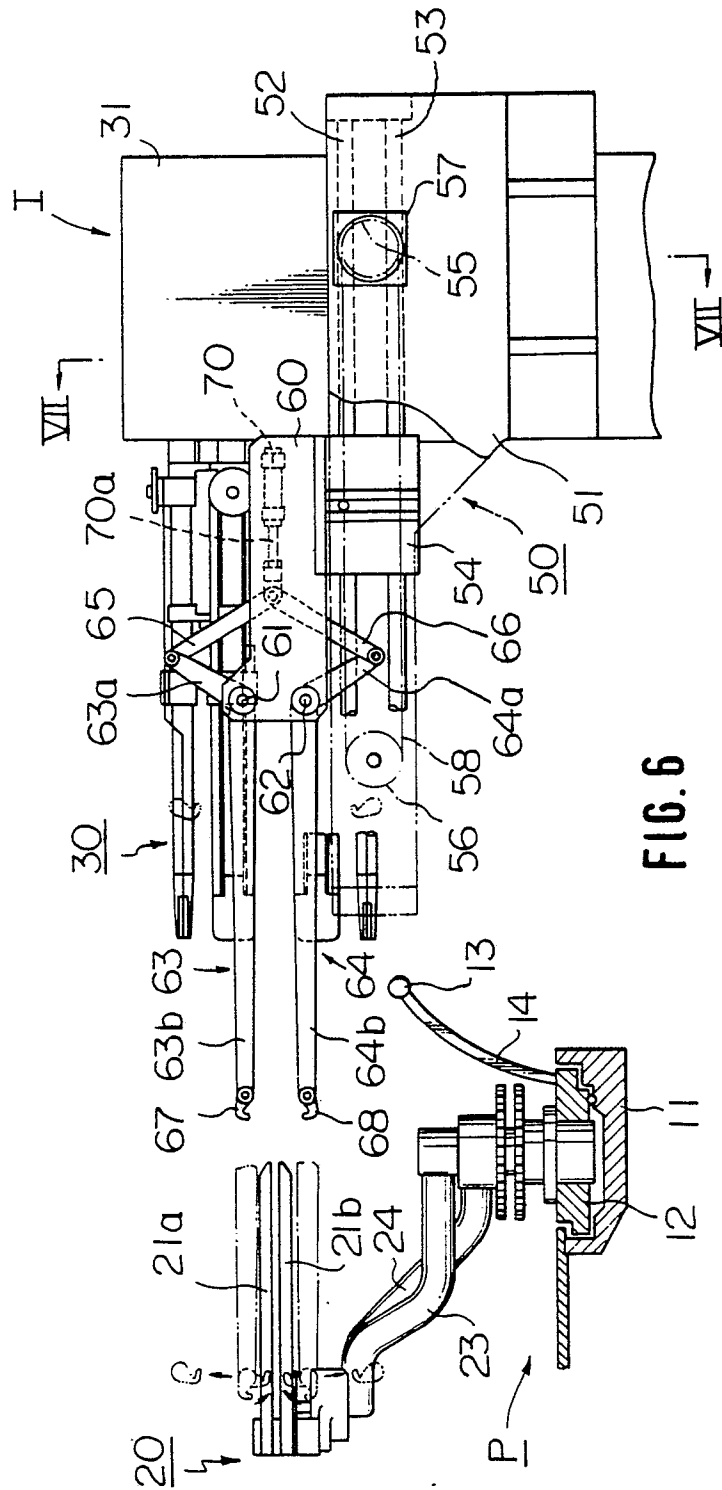
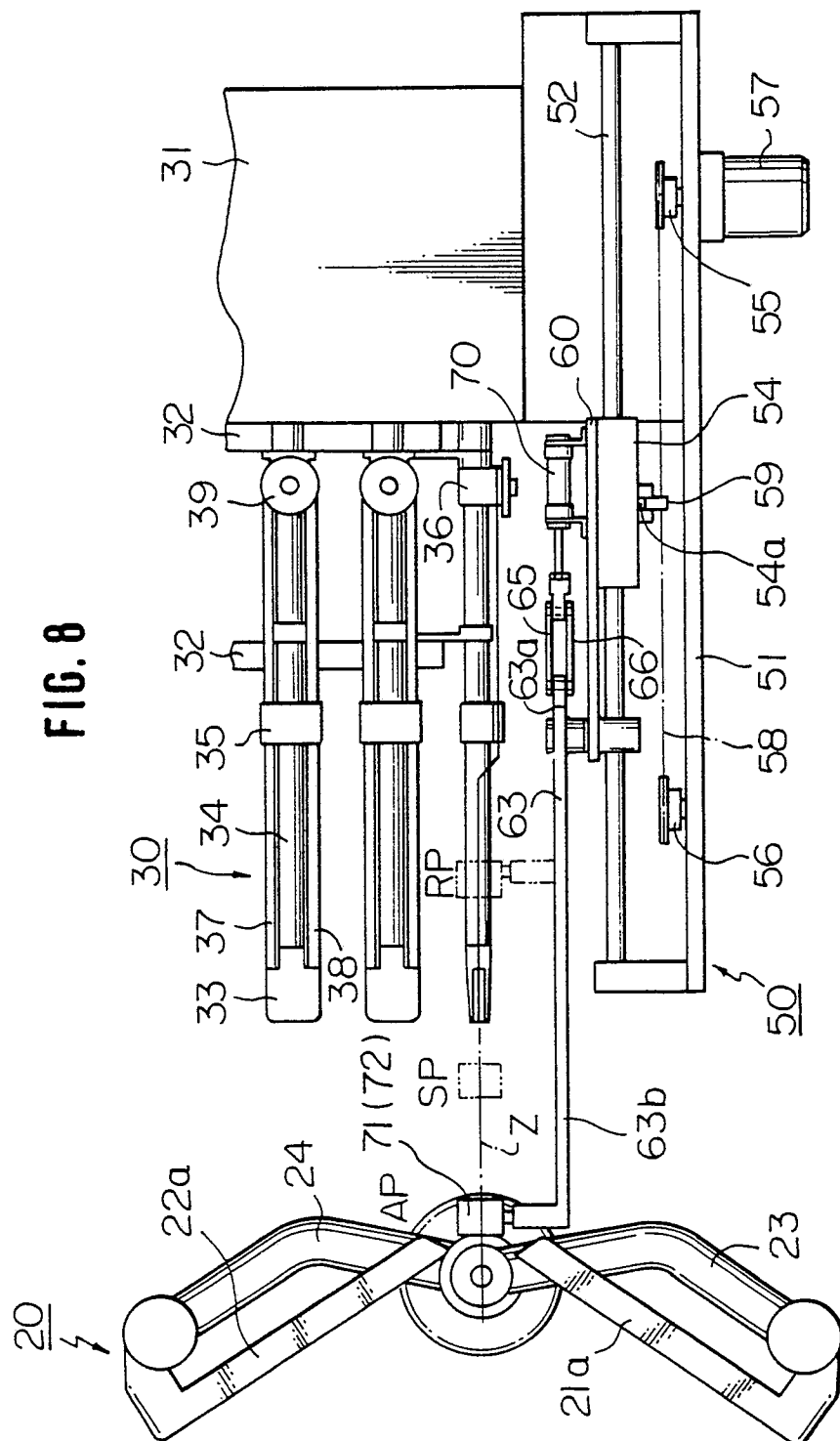
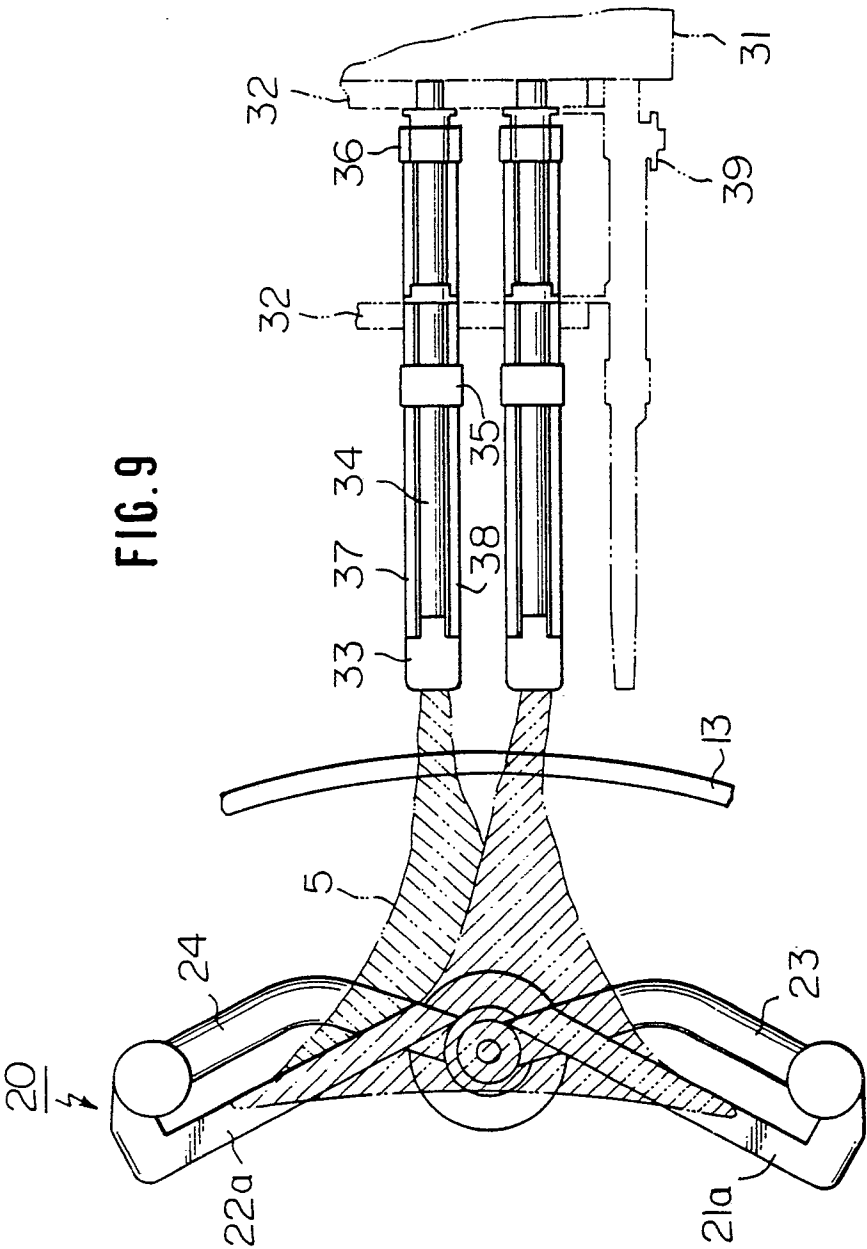


FIG. 6





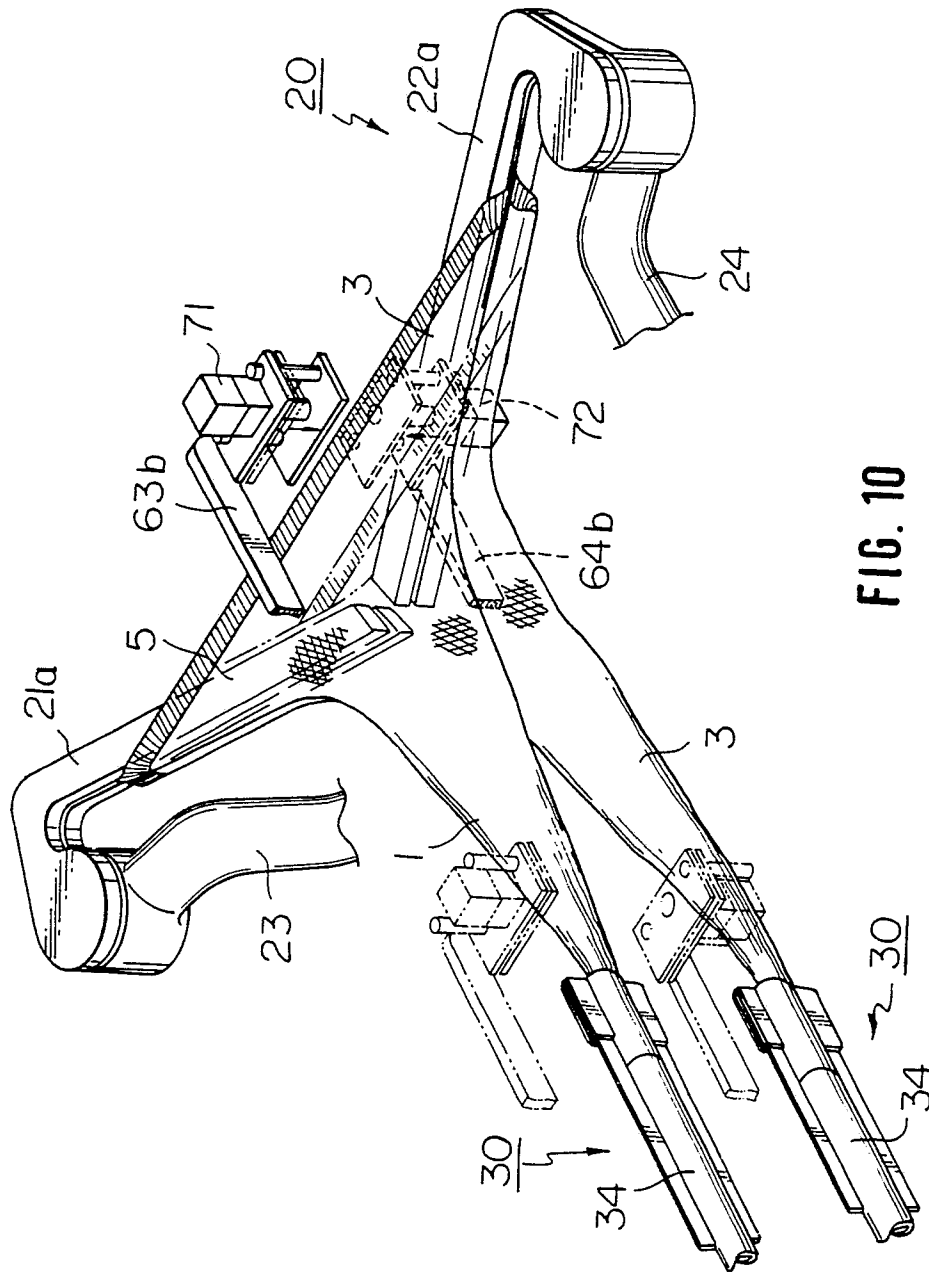


FIG. 10

FIG. 11A

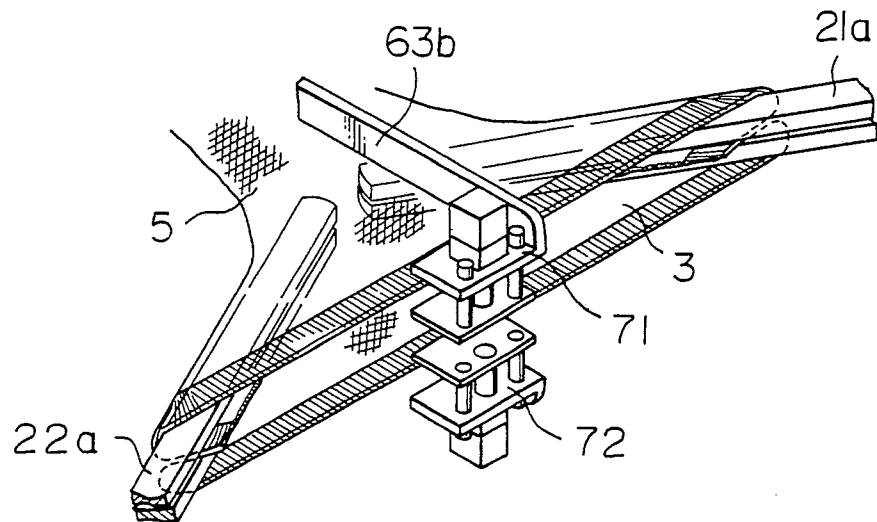


FIG. 11B

