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(54) **A method for packing articles of clothing, in particular women's hose, and a machine performing the same method.**

(57) The invention regards a method and machine (1) for packing articles of clothing (2), wherein the single articles are arranged laid-out in succession, on two first conveyor belts (107, 108), are then fed alternately to respective laying stations (110') of cardboard stiffening sheets (110) around which the articles are wound in a predetermined way, and are fed in alternate succession into respective container elements (11), mobile in step, and deposited in a free space (54) defined by a belt (52) of wrapping ma-

terial folded longitudinally at its half-point and longitudinally mobile in step; the belt (52) is welded transversally and cut immediately upstream of a position which can be occupied, during the course of a pause phase, by each container element (11), and each wrapper (53) obtained following the operation, containing an article of clothing (2) and exhibiting one side still open, is extracted from the relative container element (11) and sent towards a cutting-welding device (34) which completes its closure.

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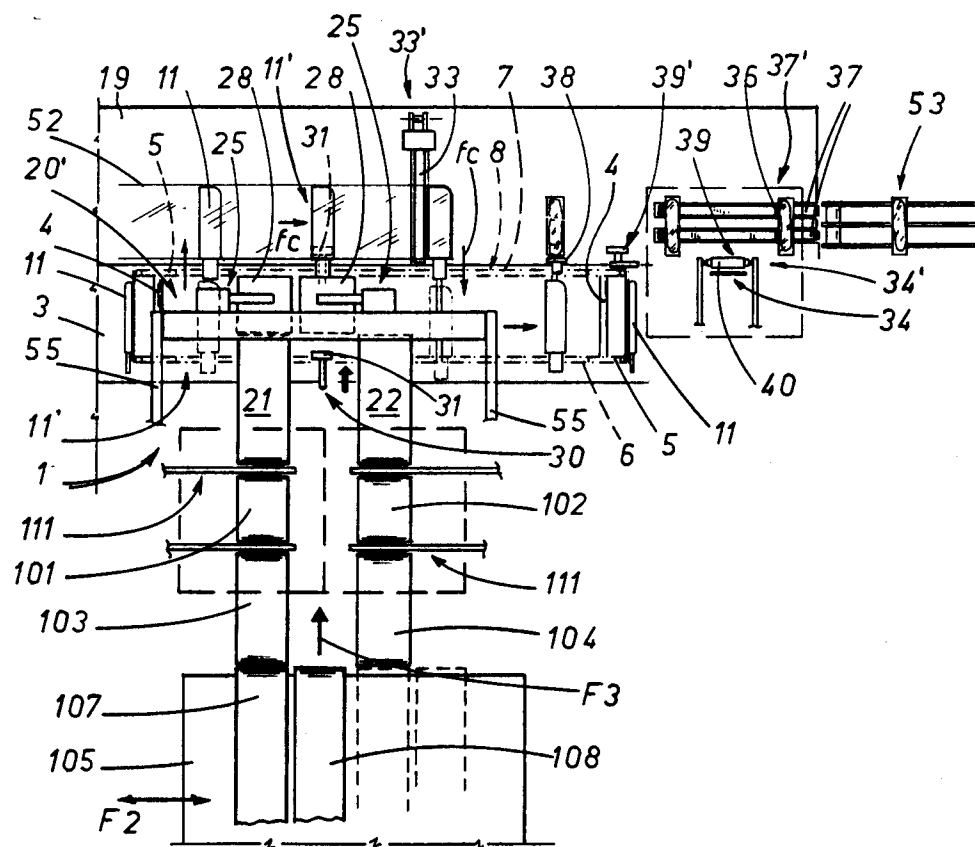


FIG 1

The invention relates to a method for packing articles of clothing, in particular women's hose.

The prior art comprises clothes packing machines for particularly flexible articles such as women's hose, which function according to two principal methods.

The first of these methods envisages the feeding of a continuous heat-weldable material already formed into an envelope to a packing station where the clothing, folded by appropriate devices, is inserted into the respective envelopes.

Subsequently the envelopes are separated and heat-welded transversally, thus becoming single envelopes containing the respective articles.

The second method comprises the feeding of the single envelopes arranged one on top of another inside a vertical-axis hopper into a packing station.

Worthy of note is the fact that both methods envisage the use of ready-prepared envelopes into which the articles are inserted.

Obviously, because of the delicate nature of the product to be packed, large tolerances are necessary between product and envelope, leading to a certain amount of waste of material as well as some product movement inside the envelope itself.

These tolerances are necessary because when the edges of the envelope are raised for the insertion of the product, obviously the breadth of the envelope's opening is proportionally reduced.

Further, products such as hose are packed in such a way that one of their sides, or at least a part it, is in view to show the colour, type etc. of the product and, naturally, the side in view must be aesthetically acceptable since the consumer will wish to see the exact nature of the product she may decide to buy.

Hose packaged with the machines employing the methods described above is often not correctly stretched since excessive tolerance between the hose itself and the respective wrapping envelope allows the hose to move about, losing the tension necessary to a desirable aesthetic effect.

On the other hand, a reduction in the tolerance leads to the risk of blocking, with consequent halting of the packaging machines at the moment of hose insertion, not to mention the damage caused to the hose itself.

The above machines also exhibit considerable limits of operative speed; limits which derive from the fact that the articles of hosiery to be folded are brought in succession to the said folding devices by a conveyor belt, which cannot have a high advancement speed primarily for two reasons: the first is that the hose resting on the belt could become incorrectly positioned due to excessive belt speed; the second is connected with the fact that the product is long and the personnel whose

job it is to place the hose on the said conveyor must wait for one article to pass out of their working range before they can place another article on the belt. Thus, in the second case, due to the length of the hose and the necessary slowness of the belt, a high work-rate is not possible.

The aim of the present invention is thus to obviate the above-mentioned drawbacks, and in particular to enable the packing of delicate products such as women's hose without having to allow excessive tolerance and without risks of work stoppage or damage to the products themselves.

A further aim of the present invention is to provide a method for packaging articles of clothing such as women's hose, and a machine to realise that method able to deliver a high production rate.

The invention, as it is characterised in the claims that follow, solves the problem of providing a method for packing articles of clothing such as women's hose, comprising at least the following phases: feeding the said articles in alternate succession, previously folded and removed from first conveyor devices, to a first transfer station by means of two second conveyor devices; then transferring them alternately and in succession from the two conveyors by transfer means to a second transfer station, whence they are transferred by means of translators into respective container elements moving in step in front of the second transfer station and occupying a free space defined by a belt of wrapping material folded longitudinally at its half-line and mobile in step in the same advancement direction as that of the container elements. Then a transversal weld is effected and the said belt of wrapping material is cut by first cutting-welding means, at a first cutting and welding station arranged immediately upstream of a position which, during a pause phase, can be occupied by each said containing element, consequently obtaining, about each said article of clothing, a wrapping of substantially rectangular shape closed on three sides. The said articles are then extracted in succession, with their relative wrappings, from the respective container elements, and the wrappings are arranged in succession on a further conveying device which takes them to a second cutting and welding station in order that a further welding and cutting operation can be effected at an open side of each of the wrappings, using second cutting and welding means having a line of action parallel to the advancement direction of the wrappings themselves on board the said further conveying device. The said wrappings are then distanced from the said second cutting and welding station.

The invention further relates to a machine for realising the above-mentioned method.

According to the invention, a machine for packing articles of clothing, in particular women's hose,

is realised, characterised in that it comprises at least two second conveying devices to feed in alternate succession the said articles to a first transfer station, first transfer means to collect alternately and in succession the said articles from the second transport devices and lead them to a second transfer station, and first translating means for transfer in succession of the said articles from the second transfer station into respective container elements being part of the second transfer means, which pass in step in front of the second transfer station; at least a part of the said container elements being mobile in a space defined by a belt of wrapping material folded longitudinally at its half-line and mobile in step according to a direction which coincides with the advancement direction of the container elements themselves. The invention is further characterised by the fact that it comprises first cutting and welding means to effect a transversal welding and cutting on said wrapping material strip at a first cutting and welding station arranged immediately upstream of a position which can be occupied, during the course of a pause phase, by each said containing element, with a consequent obtaining of a wrapping about each article of clothing of a substantially rectangular shape closed on three sides, extracting means to extract in succession the said articles of clothing and the relative wrapping from the respective container elements, a further conveying device to receive the said wrappings in succession and to bring them, also in succession to a second cutting and welding station, and second cutting and welding means to effect a further welding and cutting operation at the open side of each wrapper.

The technical characteristics and advantages of the present invention will better emerge from the detailed description that follows, of an embodiment of the invention, herein illustrated purely in the form of a non-limiting example in the accompanying figures, in which:

- figure 1 shows a schematic plan view of the machine performing the method of the present invention;
- figure 2 shows a schematic plan view of a portion of the machine of figure 1 performing the method of the invention;
- figures 2a and 2b shows a schematic plan view and respectively a perspective view of some details of figure 2;
- figure 3 shows a frontal elevation of a portion of the machine of figure 1;
- figure 3a shows the view of figure 3 in a successive phase of operation of the machine;
- figure 4 shows a frontal elevation of a further portion of the machine of the preceding figures and in particular illustrated section IV-IV

of figure 3;

- figure 5 shows a plan view of a portion of the machine of the preceding figures;
- figure 6a shows a schematic plan view of a portion of the machine of figure 1;
- figures 6b, 6c and 6d show three schematic frontal elevations of A from figure 6a;
- figure 7 shows a plan view of a further portion of the machine of the preceding figures;
- figure 8 shows a further schematic frontal elevation of a part of the machine of the present invention;
- figures 9 and 10 show a schematic lateral view of a containing organ containing a pre-folded article of clothing, which move in the free space defined by the strip of wrapping material folded longitudinally drawing with it the strip itself and respectively the same schematic lateral view in a different position, reached by the containing organ and successively the transversal cutting and welding of the same belt and
- figure 11 shows, in a perspective view, a wrapping for articles of clothing realised by means of the machine of the present invention;
- figure 12 shows in a perspective view, a construction form of the containing element or organ of the present invention.

With reference to the drawings, 1 denotes in its entirety a machine for packing articles 2 of clothing, for example women's hose, preferably folded in a known way about a rectangular sheet of cardboard 110 (see in particular figures 4, 5, 7, 8, 9 and 10).

The machine 1 comprises a frame constituted substantially by a base 3 superiorly equipped with a horizontally-developing plane 19. The base 3 rotatably supports at a same level, two horizontal and parallel shafts 4, one of which is made to rotate intermittently by motorisation means of known type and not illustrated. Each shaft 4 rigidly and coaxially supports a cogwheel 5 at each of its ends. Ring chains, respectively 6 and 7, are wound about each pair of cogwheels 5 supported by the respective shafts 4. In order to make a distinction between the two chains 6 and 7, it can be said that 6 indicates the chain which in the drawings of figures 2 and 5 is arranged lower and thus further away from the plane 19 of the chain 7, which is in the same figures arranged superiorly and closer to the plane 19.

For each of the chains 6 and 7, an upper branch 8 and a lower branch 8' can be identified, both developing horizontally. The two chains are reciprocally connected to, or rather support, by means of brackets 9', a plurality of reciprocally equidistant bars 9 (see figures 2 and 3) which

develop horizontally and parallel to the axes of the shafts 4. Each bar 9 supports, slidably according to a direction which is parallel and along the development direction of the bar 9 itself and externally to the rings defined by the chains 6 and 7, a slide 10 which bears, connected rigidly by a bracket 63, a containing organ or accompanying element 11 for the article of clothing 2. The bars 9 are also connected at the opposite ends to respective runners 9a which slide along respective guides 9b arranged in a ring and developing parallel and laterally to each chain 6 and 7. The runners 9a permit the bars 9 to advance stably and remain still in their transversal position to the advancement line, drawn by the chains 6 and 7, also when they are borne by the lower branch 8' of the chains 6 and 7. Each container element 11, as illustrated in figures 4, 9, 10 and 11, exhibits in substance the shape of an envelope open on one side, and is essentially constituted by a steel or plastic sheet 12 exhibiting, according to a plan view, a substantially rectangular shape, and is shaped in such a way as to exhibit, if sectioned in any of its areas with a vertical plane normal to the axes of the shaft 4, a "C"-shape with its concavity turned according to the advancement direction F1 of the upper branches 8 of the chains 6 and 7. The face 11a of the "C"-shaped containing element 11 turned towards the horizontal plane 19 has greater transversal dimensions but, for reasons which will be explained hereinbelow, its transversal dimension t is smaller than the transversal dimension T of the above-mentioned cardboard 110, which the articles 2 of clothing are wrapped around. In the description that follows, the container element 11, the chains 6 and 7 supporting and moving them, as well as all of the accessory organs such as for example the slide 10 and the bracket 63 shall be defined in their entirety as transfer means of the articles 2 of clothing, and will be denoted in the illustrations by 11'.

According to figures 2, 2a, 3 and 4, the base 3 rotatably supports two shafts 13 with horizontal axis, normal to the axis of the shafts 4, arranged within the course made by the bars 9 during their advancement movement when drawn by the chains 6 and 7, and in proximity to each pair of cogwheels 5 supported by a relative shaft 4. Each of the shafts 13 is arranged close to a relative chain 6 and 7. In particular, the shaft 13 arranged closer to the chain 7 is continuous, while the shaft closer to the chain 6 is constituted by two pieces, indicated also by 13. Each shaft 13 bears a coaxially keyed cogwheel 14 at each of its two ends. As can be seen in figures 2, 2a and 2b, a positive drive belt 15 is wound about each reciprocally facing cogwheel 14 pair according to a parallel direction to the shafts 4 axes, equipped with intermittent ad-

vancement movement, together with the relative cogwheels 14, conferred by motor means 13' of known type and thus not described in detail, on the shaft 13 arranged in proximity to the chain 7. More precisely, the upper branch of the positive drive belt 15 arranged on the left in figure 2 and also visible in figure 2b, is made to advance in step in such a way that each of its points moves progressively towards the chain 7, according to arrow fa, while the upper branch of the other positive drive belt 15 is made to advance in step in the opposite direction, according to arrow fb. Obviously all of the movements, as will emerge better hereinbelow, are in phase.

According in particular to figures 3 and 3a, each slide 10 inferiorly supports a vertical idle roller 16, by means of a bracket 10', while each positive drive belt 15 supports a plurality of movement organs constituted by blocks 17 reciprocally equidistant and each equipped with a throat or housing 18 developing in a horizontal and parallel direction to the shafts 13 axis, as can also be seen in figure 2b. The housing 18 exhibits dimensions such as to be able to receive, slidably and internally, and as will be better described hereinbelow, a roller 16, and thus constitutes a drawing means.

Each container element 11, thanks to the action of the positive drive belts 15 on the rollers 16, by means of the blocks 17 and in a way which will better emerge hereinbelow, is able to translate cyclically between a first position in which it is entirely disposed above the substantially rectangular surface described, on two sides in plan view by the chains 6 and 7, as illustrated in figures 2 and 3a with a continuous line in the latter, and a position in which it is superposed and adjacent to a horizontal plane 19 making up part of the base 3 and developing laterally to the chain 7 in a parallel direction to the advancement direction of the chains 6 and 7, as can be seen in figures 3, 3a and 2. The movement of the positive drive belts 15, or container elements, is also visible in figure 1, by following the arrows fc.

In the following each complex comprising two cogwheels 14, their relative positive drive belts 15 and blocks 17 will also be defined "movement means" of the container organs 11, and will be denoted in its entirety by 15' in the figures.

By comparing figures 1, 2, 2b, 3 and 4, it is evident that each container organ 11, together with its slide 10 and its idle roller 16, is driven on two distinct journeys during its movement operated by the chains 6 and 7 and through the bars 9. The first of the journeys is defined by a couple of guides 80 which are arranged in proximity to the chain 6 and which are superiorly interrupted in a tract which is parallel to the upper branch 8 of the chains 6 and 7 and corresponds to the position of the movement

means 15'. The roller 16, running along the guides 80, obliges the slide 10 to move substantially above the chains 6. Once the slide 10 arrives at the blocks 17 the idle roller 16 inserts into the housing 18 and is pushed towards the plane 19 in the direction of arrow fa by the movement means 15'. The slide 10 thus moves towards the plane 19 as can be seen by comparing figures 3 and 3a, and brings the container element 11 above the plane 19 as can be seen in figure 2. During this movement the idle roller 16 runs on two other guides 70, obliging the container element 11 and slide 10 group to run along the other journey. Once the container element 11 arrives with the slide 10 and the idle roller 16 in the vicinity of the other movement means 15', it enters the housing 18 of the corresponding blocks 17 and is displaced towards the chain 6 in the direction of arrow fb.

At this point, the guides 80 having reached the roller 16, the group newly proceeds along the first journey defined by the guides 80 themselves.

As can be seen in figures 3, 4 and 5, the base 3 supports, in proximity to the chain 7 and according to a parallel arrangement to the chain 7 itself, a substantial rectangular vertical wall 20. This wall 20 is supported at a higher level than that of the upper branches of the chains 6 and 7 by uprights 55 and also at a higher level than a first transfer station 20' of the prefolded article 2, which will be dealt with in more detail in the following. The first transfer station 20' is situated close to the lower edge of the wall 20, below which, between it and the above-mentioned container element 11', two side-by-side conveyor belts 21 and 22 terminate (see also figure 5), reciprocally distanced by a tract of length which is about the same as the step of the container element 11. The conveyor belts 21 and 22 develop horizontally, and their transport direction is parallel to the shaft 4 axes, since their transport direction is such as to produce advancement towards the wall 20 and more precisely towards the station 20', of articles 2 supported on the upper branches of the conveyor belts 21 and 22.

As can be seen from figures 7 and 8, the entrance portions of the conveyor belts 21 and 22 communicate with respective exit portions of two conveyor belts 101 and 102, respective aligned to the first conveyor belts 21 and 22 according to a horizontal direction F3, which entrance portions communicate with respective exit portions of two further conveyor belts 103 and 104, once more respectively aligned to the previous belts according to the horizontal direction F3, (see also figure 1).

A support structure 105 is arranged in front of the entrance portions of the conveyor belts 103 and 104, which structure 105 can slide in both senses, in a direction F2 which is normal to the transport direction of the conveyor belts 103 and

104 and coincides with direction F3, on the action of activating means 106 of known type denoted by a broken line in figure 7, and along a guide 120 which is part of the frame or base 3, through a couple of idler rollers 121. The support structure 105 superiorly supports two conveyor belts 107 and 108 having the same transversal dimensions as the conveyor belts 103 and 104, which in turn are transversally sized and arranged reciprocally side-by-side in such a way that, for whatever position assumed by the support structure 105 due to the action of the activating means 106, one only of the two conveyor belts 107, 108 will be horizontally aligned with a corresponding conveyor belt 103, 104, while the other conveyor belt will be facing the interspace comprised between the same conveyor belts 103 and 104.

All of the said conveyor belts 101, 102, 103, 104, 107 and 108 are motorised in known ways by motor means (not illustrated) according to chronological sequence orders which will become clear hereinbelow.

Turning to figure 8, a feeding device 109 (of known type) is located above each conveyor belt 101 and 102, which feeding device 109 feeds in sheets 110 of cardboard above the articles 2 of clothing which are longitudinally arranged and which are brought progressively on to the conveyor belts 101 and 102 themselves, as will become clearer hereinbelow. Further, at each of the conveyor belts 101 and 102 a folding device 111 is located, of known type and represented schematically in the figures and is for example of the type described in Italian Patent Application 355A/90 of the same applicant, which winds each article 2 of clothing which is brought on the respective conveyor belts 101, 102 about the cardboard 110 sheet. Each station where the placing occurs, by feeding means 109 of the said cardboard 110 stiffening sheets, will be denoted by reference number 110'.

The said wall 20 is provided, at a face turned towards the plane 19, with two cams each constituted by a shaped channel 23. The two channels 23 are arranged more or less vertically aligned with the exit ends of respective conveyor belts 21 and 22, exhibit a substantially straight downwards-inclined movement and also inclined towards a zone of the wall 20 arranged between the conveyor belts 21 and 22. The direction of the two channel 23 can clearly be seen in figure 4. Each of the channels 23 is engaged by an idle roller 24 solid with its spindle 24a (see in particular figures 3 and 4) to a gripping and conveying element 25. Each gripping and conveying element 25 (hereinafter known as first transfer means 25) is mobile in two senses indicated by the arrow F along the wall 20 and follow the journey defined by the relative shaped channel 23 in

ways which will be described in more detail hereinbelow.

Each first transfer means 25 is freely slidable, by means of its own idle rollers 57, along relative vertical guides 58 which are part of a slider frame 56 supported by and mobile along the vertical wall 20, by means of two idle roller pairs 59 slidable on longitudinal guides 60 realised along the upper and lower horizontal edges of the vertical wall 20. Thus when the slider frame 56 moves along the vertical wall 20 in the direction of arrow F, which movement is caused by an activator of known type and not illustrated, the first transfer means 25 also moves, in a way defined by the development of the channels 23. As can be seen in figure 5, each first transfer means 25 overlies a portion of the space existing, in plan view, between the two chains 6 and 7 (indicated in dotted lines) and essentially comprises two horizontal planes 27 and 28 able to be reciprocally approached and distanced by means of relative movement means 61 and with the help of special guides 62 which are part of the said first transfer means 25, as is clear from figures 3 and 4.

The planes 27 and 28 are thus mobile, as described above, between a raised position (indicated on the left of figure 4) in which the plane 27 of each first transfer means 25 is arranged in front of and aligned with the exit end of the relative conveyor belt 21 or 22 and slightly below the exit end itself, and a lowered position (indicated on the right of figure 4) defined also as the second transfer station 25', at which the said plane 27 is horizontally aligned with the internal lower surface of the container elements 11 borne by the upper branch of the chains 6 and 7 and which run just above the horizontal plane 19, as can also be seen in figure 3. In figure 4 also the approaching movement of the planes 27 and 28 is shown, which happens in phase with the movement of all of the first transfer means 25 to permit, apart from a good grip on the prefolded articles 2, also the compacting of articles 2 during the transfer phase from the conveyor belts 21 or 22 to the release position, in which the plane 27 is horizontally aligned with the internal lower surface of the container element 11.

Figures 3, 3a and 5 particularly show that in the zone below the vertical wall 20 situated between the lower portions of the channels 23 and in proximity to the said second transfer station 25', and at a level which is substantially the same as that of the container element 11, a translating means is mobile in two directions parallel to the shaft 4 axis and activated by a linear activator 30 of known type. The translating means is constituted by a pushing element 31 able to translate between a first, rest position, arranged on the opposite side of the wall 20 with respect to the chains 6 and 7

towards the conveyor belts 21 and 22 (see figure 3) and a second operative position at which it is substantially adjacent to the upper branch of the chain 7 and partially inserted into the initial tract of the container element 11, as shown by a broken line in figure 3a.

Figures 2 and 5 evidence a portion of the plane 19 comprised between the said movement means 15' and crossed by an opening 32 having a development which is parallel to that of the shaft 4 axes.

Cutting-welding means 33 of known type move vertically through the said opening 32 on the activating of activating means of known type and not illustrated, which cutting-welding means are able, as will be described in more detail hereinbelow, to perform a transversal cutting and welding operation of two strips of plastic film 52 running on the plane 19. The upper cutting-welding means 33 are in figure 2 and the lower cutting-welding means 33' are in figures 5 and 7, schematically represented in all cases. The zone of activity comprising the cutting-welding means 33 will be defined hereinafter as the first cutting-welding station, and will be denoted by 33'. In figure 4 it is indicated by a broken line.

As can be seen in figures 2 and 5, a portion of plane 19 extending, with reference to advancement direction F1 of the upper branches 8 of the chains 6 and 7, between the movement means 15' arranged downstream and a zone arranged even further downstream, where a cutting-welding device 34 is located (see figure 5), is provided with two elongated openings 35, parallel to each other and also parallel to the development direction of the chains 6 and 7. As will be clarified hereinbelow, the initial portions of the openings 35 are arranged along a terminal portion of the journey followed by the container element 11 which are, as previously mentioned, outside the space comprised, in plan view, between the chains 6 and 7 above the plane 19. Pushing elements 36 extend upwards through the openings 35, which elements 36 are supported at a step which is constant and equal to that of the container element 11 by two conveyor belts 37 respectively arranged below the openings 35 themselves and are provided with advancement motion in step and equal to that of the chains 6 and 7 by motor means of known type and not illustrated. The conveyor belts 37 constitute, in their entirety, a conveying device of compartmental type, which hereinafter will be denoted with number 37'.

Figure 2 shows a zone overlying the movement means 15', which is arranged downstream with reference to advancement direction F1 of the upper branches 8 of the chains 6 and 7, where a pushing device or extracting means 38 is arranged and is horizontally moved in the two directions along a line of action parallel to the shaft 4 axes, and which

is able to penetrate, as will be clarified hereinafter, into a container element 11 which is stationary in front of the movement means 15' and above the compartmental conveyor 37'.

As can be seen in figures 5 and 6, the cutting-welding device 34, operating at a station which hereinafter will be defined "second cutting-welding station" 34', is arranged on the plane 19 in a zone comprised between the conveyor belts 37 and the chain 7. A presser-translator device 39 is situated between the said cutting-welding device 34 and the plane 19, as can be seen in figures 6a, 6b, 6c and 6d. The presser-translator 39 comprises two lines of rollers 40 superposed one on another, in each of which the rollers 40 are keyed coaxially on a shaft 41 parallel to the shafts 13.

The shafts 41 are connected to motor means of known type 42 able to confer rotation in opposite directions, and are supported rotatably at adjacent ends of respective arms 43 being a part of respective two-arm levers 44. The two-arm levers 44 exhibit a portion close to the ends of the said arms 43 which portion is pivoted on a pivot 45 with horizontal and parallel axis to the axes of the shafts 13, and are connected in a known way to activating means 46 of known type able to confer contemporaneous rotations in opposite directions of the two-arm levers 44 about the pivot 45 axis. A cyclic shaft 47 which is part of the machine 1 and rotates continuously is able to activate in a known way and at predetermined moments the said motor means 42, as well as produce, through the said activating means 46, the reciprocal approaching of the roller 40 lines, and the second arm 48 of one of the two-arm levers 44 has its free end arranged in proximity to a sensor means constituted essentially by a switch-commutator 49 of known type and stopping, when activated, motor means 42 and causing the reciprocal distancing of the said roller 40 lines. In effect, the second welding station constitutes also a multiplier of vertical movements of the rollers 40.

By comparing figures 6a, 6b, 6c and 6d it can be understood that at the moment when the extra portion 52c of plastic film 52 begins to be collected and drawn towards the inside of the cutting-welding device 34 by the rollers 40 in the direction of arrow F3 (figures 6a and 6b), the rollers, on perceiving the different and greater width caused by the double-breadth of plastic film 52 now increased by the articles 2 present between the sheets of plastic film 52, are distanced but press on the plastic film 52, compressing the articles 2 (figure 6c); a distancing movement of the arms of the lever 48 corresponds to the previous said movement, which distancing movement is intensified, causing the ends 48 of the lever arms 43 to excite the sensor means 49. The lever arms 43 are very long and a small distancing of the rollers 40 corresponds to a

great distancing of the ends 48. In the above-described way a fast and precise control of the rollers 40 and the cutting-welding device 34 is obtained, in such a way as to allow the cutting and welding of the head at the established point with very high precision. Once the welding has been effected, along an edge denoted in the figures by 53', the presser-translator 39 is in the position illustrated in figure 6d.

The cutting-welding device 34 comprises essentially two heated welding bars 50 which are horizontal and parallel to the pivot 45 axis, which bars 50 can be reciprocally neared or distanced by activating means 51, at determined instants which will be better specified hereinbelow, on the command of the said cyclic shaft 47, to weld and at the same time cut two sheets of the said plastic film which are superposed (see figure 6c).

The functioning of the machine will now be described, considering initially the support structure 105 arranged in its left position, looking at the machine 1 from its entrance side which is represented in figure 7 with a continuous line.

An operator arranges, in succession and alternately, the articles 2 of clothing laid out in prefixed positions on the conveyor belts 107 and 108, and the conveyor belt 107 is activated first to bring the articles 2 on it to the conveyor belt 103, which then carries it towards the conveyor belt 101, in an arrangement whereby the article 2 exhibits a median portion arranged on the conveyor belt 101 and its end portions respectively arranged on the conveyor belts 21 and 103. When the conveyor belt 101 pauses, the feeding device 109 arranges a sheet of cardboard 110 on the median portion of the articles 2 of clothing in question, and the folding device 111 folds the opposite ends of the article 2 in a desired manner on the cardboard 110. The support structure 105 has, in the meantime, been moved towards the right (figures 1 and 7), so as to assume the arrangement shown by the broken line in figure 1, and so as to arrange the conveyor belt 108 bearing an article 2 laid out in an aligned position with regard to the conveyor belt 104. The conveyor belt 108, in the same way as the conveyor belt 107, brings an article of clothing 2 to the conveyor belt 104, with a successive passage of the article 2 on to the conveyor belt 102 where the overlying feeding device 109 and folding device 111 perform their operations in the same way as was previously described with reference to the articles 2 arranged on the conveyor belt 101.

The conveyor belts 21 and 22 bring, alternately and in succession, the respective folded articles 2 to the station 20', at which the first transfer means 25, in turn and following the action of the relative activating means, of known type and thus not illus-

trated, receive an article 2 and carry it in front of the pushing element 31.

As can be seen in figures 4 and 5, a heat-weldable plastic film 52 is longitudinally folded at its half-point, and runs in contact with the upper surface of the plane 19, defining a space 54 between its folded leaves, which are kept adequately apart.

While the chains 6 and 7 advance in step, the container element 11, together with the slides 10, reaches the movement means 15' arranged upstream with reference to the advancement direction of the upper branches of the chains 6 and 7, making the first journey along which the rollers 16 run along the guides 80. Once the roller 16 has been introduced into the housing 18 of the block 17, the container elements 11 are gradually translated from an original position in which they are above the space comprised between the chains 6 and 7, up to a position in which they enter the said space 54 defined by the plastic film 52, during the course of an advancement step of the positive drive belt 15 in the direction of arrow fa and thanks to the engagement, as mentioned above, between the idle rollers 16 associated to the container element 11 and a housing 18 of a block 17 (see figures 3 and 3a). Due to the repetitive insertion of the container element 11 into the space 54 and the in-step translation of the container element 11 together with the chains 6 and 7, the plastic film 52 is mobile in step in a direction F1 coinciding with the advancement direction of the container elements 11 since it is progressively drawn, as will become clearer hereinbelow, in step by a container element 11 downstream of which the two superposed halves of the plastic sheet 52a and 52b have been reciprocally and transversally welded by the cutting-welding means 33.

Whenever a container element 11 housed in the space 54 is brought in front of the pushing element 31, a folded article 2 is introduced into the container element 11 (see figure 3a).

Following the movement of the chains 6 and 7, and the container elements 11 carried by them, each container element 11 is brought immediately downstream of the cutting-welding means 33 which transversally weld and cut the plastic film 52 immediately upstream of the container element 11 arranged at the cutting and welding station 33', thus originating a wrapper 53 of substantially rectangular shape, which has one open side turned towards the chains 6 and 7 and encloses a container element 11 and an article 2 of clothing (with relative cardboard sheet 110). It is extremely important at this point in the description to specify why the transversal dimension T of the sheet of cardboard 110 about which the article 2 of clothing is wound is greater than the lower face 11a of the said con-

tainer element 11. As can clearly be seen from figures 9 and 10, in the moment when the container element 11 begins to move in the direction of arrow F1, the element which first reaches the welding between the sheet halves 52a and 52b of the plastic film 52 precedently carried out is indeed the cardboard sheet 110 which, forced to draw the plastic film 52 and being made in a relatively giving material, elastically bends up until it assumes the configuration represented in figure 9. This fact, once the further transversal cutting and welding of the sheet 52 has been carried out and the container element 11 removed from the said space 54, enables the vertical breadth occupied by the container element 11 to be recuperated. In fact, following the extraction of the container element 11, the cardboard 110, due to its elasticity, stretches and tensions the plastic film 52 which already constitutes a wrapper 53 without having been cut and welded on one side. The wrapper 53 obtained is thus well tensioned, as can be seen in figure 11.

When each container element 11 reaches the movement means 15' arranged downstream with reference to the direction of the upper branches 8 of the chains 6 and 7, the movement means 15' produces the extraction of the container element 11 from the wrapper 53 surrounding it, as well as the return of the said container element 11 in the direction of arrow fb, on to the space described by the chains 6 and 7; the article 2 of clothing contained in the wrapper 53 surrounding the container element 11 in question more-or-less maintains its position, though moving slightly towards the vertical wall 20, thanks to the control exerted on it by the pushing device 38, which inserts momentarily into the container element 11 with the aim of opposing undesired movements of the article 2 and its relative wrapper 53 following the removal of the container element 11. All of the movements of the container element 11, the slide 10 and the roller 16, arranged internally to the housing 18 of the block 17, is the same, but in an opposite direction to that described in the case of transfer of the container element 11 on to the plane 19.

The wrapper 53, freed from the container element 11, is thus removed by two pushing elements 36, belonging to the conveying device 37', and is taken in front of the presser-translator 39, which is kept in a correct position by an overlying fixed guide element 39' of known type, equipped with an idler roller 39'' under which it effects sliding (figures 5 and 6) with its end portion still open and arranged between the two reciprocally distanced roller 40 lines, as can be seen in figures 6a and 6d. The roller lines 40 are thus reciprocally brought side-by-side (see figure 6b) thank to the intervention of the activating means 46 and are set in rotation by the motor means 42, with a consequent

running of the wrapper 53 towards the cutting-welding device 34 in the direction of arrow F3. This running of the wrapper 53 finishes at the moment when the article 2 contained in the wrapper 53 (and/or the said cardboard 110) has begun to insert between the roller lines 40 and the latter have begun to distance slightly from each other and the arms 48 of the levers 44, of considerably greater length than the arms 43 have been neared by a determined and much greater length than that separating the roller lines 40, producing the activation of the switch element 49 (figure 6c). Following this, the rotation of the rollers 40 is stopped and the cutting-welding device 34 is activated to seal the last remaining open side of the wrapper 53 (figure 6d) and to separate a portion of by-now waste material which is distanced (not illustrated in the figures).

The two roller 40 lines are thus reciprocally distanced and the fully-sealed wrapper 53 is distanced from the welding station 34' by means of the conveyor device 37'.

In accordance with what was previously stated, and according to what is illustrated in figure 11, the complete wrapper 53 is of a substantially rectangular shape and is perfectly sealed. It has three consecutive sides 53' which have been heat-welded and a fourth side 53'' where the plastic film 52 constituting the wrapper 53 is folded. A sheet of cardboard 110, with an article 2 of clothing wound around it is inside each wrapper 53, with no free play. The fact that the rollers 40, as illustrated in figure 6c during their recall from the wrapper 53 compress the article 2 serves to recuperate the space necessary for welding the film half 52 to 52' once the rollers 40 are distanced and the article 52 recovers its real mass. All of the preceding permits of obtaining a wrapper 53 which is completely stretched, as in figure 11.

Thus it is evident how the described method, and the machine 1 realised according to it, permit of fully attaining the prefixed aims, since the machine 1 described is perfectly able to perform the packaging of articles 2 of clothing such as women's hose without the need to envisage excessive tolerance inside the wrappers 53 and without risks of machine 1 stops or damage to the articles of clothing 2 themselves.

Worthy of note is the fact that to improve the centring of the container elements 11 with respect to the pushing element 31 according to the various dimensions of the articles and/or the cardboard 110, the container element 11 is provided with (see figure 12) a further portion of the face 11a denoted in the figure by 64, which offers the possibility of being regulated transversally with respect to the face 11a itself through a slot 65 and special blocking means 66 acting between the slot 65 and the

structure of the container element 11. In this way the transversal size t of the container element 11 can be varied. Accordingly the advancement phase of the container elements 11 can also be varied, or the connecting bracket 63 of the container elements 11 and the slide 10 can also be equipped with a slot 67 on which special blocking means 68 act, which can equip the said container element 11 itself.

Further, the machine 1 is able to function at much higher operative velocities than those of the machines of known type conceived for the same purpose.

Claims

1. A method for packing articles of clothing such as women's hose, characterised in that it comprises at least the following phases: feeding the said articles (2) in alternate succession, previously folded and removed from first conveyor belts (107, 108), to a first transfer station (20') by means of two second conveyor belts (21, 22); then transferring them alternately and in succession from the two second conveyor belts (21, 22) by first transfer means (25) to a second transfer station (25'), whence they are transferred by means of first translating means (31) into respective container elements (11) moving in step in front of the second transfer station (25') and occupying a free space (54) defined by a strip of wrapping material (52) folded longitudinally at its half-line and mobile in step in the same advancement direction as that of the container elements (11), a transversal weld being effected on the said strip of wrapping material (52) which is then cut by first cutting-welding means (33), at a first cutting and welding station (33') arranged immediately upstream of a position which, during a pause phase, can be occupied by each said container element (11), consequently obtaining, about each said article of clothing (2), a wrapping (53) of rectangular shape closed on three of its sides; the said articles (2) then being extracted in succession, with their relative wrappings (53), from the respective container elements (11), the wrappings (53) being arranged in succession on a further conveying device (37') which takes them to a second cutting and welding station (34') in order that a further welding and cutting operation can be effected at an open side of each of the wrappings (53), using second cutting and welding means (34) having a line of action parallel to an advancement direction of the wrappings (53) on board the said further conveying device (37'), the said wrappings (53) then being

distanced from the said second cutting and welding station (34').

2. A method as in claim 1, characterised in that it comprises a further phase consisting in translating the said wrappers (53) in succession with respect to the further conveyor device (37') towards the said second cutting and welding station (34'), with a transversal movement to a transport direction of the further conveying device (37'), by action of second translating means (39); in verifying by sensor means (49) a position assumed by the said wrappers (53) with respect to the second translating means (39); and in regulating activity of the said second translating means (39) and second cutting and welding device (34) according to what is read by the sensor means (49). 5
3. A method as in claim 2, characterised in that the position of the wrappers (53) and the activity of the second cutting-welding device (34) stem from a presence of a different and greater breadth, with regard to an original breadth, of a double breadth of plastic film (52) increased by a thickness of the article (2) of clothing read by the sensors (49) through the second translating means (39). 10
4. A method as in claim 1, characterised in that before an alternated feeding phase in succession of folded articles (2) of clothing to a first transfer station (20'), single said articles of clothing (2) are arranged laid out in succession and alternately on two side-by-side first conveyor belts (107, 108) and fed alternately to respective laying stations (110') of stiffening sheets of cardboard (110), by means of feeding devices (109), the said articles of clothing (2) being folded in a predetermined way by a folding device (111), the folded article of clothing (2) then being fed on to two said second conveyor belts (21, 22). 15
5. A method as in claim 4, characterised in that it comprises a further phase consisting in translating alternately and transversally, with respect to a transport direction of the second conveyor belts (21, 22), a support structure (105) of the first conveyor belts (107, 108) between two alternated alignment positions of one of the first conveyor belts (107, 108) respectively with one or another of first (103, 101) and second (104, 102) conveyor devices taking said articles of clothing (2) to the second conveyor belts (21, 22), the said first (103, 101) and second (104, 102) conveyor devices 20

and the second conveyor belts (21, 22) being respectively and reciprocally distanced by a tract of length which is substantially equal to a breadth of each said first conveyor belts (107, 108). 25

6. A machine for packing articles of clothing such as women's hose according to the method of claims from 1 to 5, characterised in that it comprises at least two second conveyor belts (21, 22) to feed in alternate succession the said articles (2) to a first transfer station (20'), first transfer means (25) to collect alternately and in succession the said articles (2) from the second conveyor belts (21, 22) and transport them to a second transfer station (25'), and first translating means (31) for transfer in succession of the said articles (2) from the second transfer station (25') into respective container elements (11) being part of second transfer means (11'), which container elements (11) pass in step in front of the second transfer station (25'); at least a part of the said container elements (11) being mobile in a space defined by a strip of wrapping material (52) folded longitudinally at its half-line and mobile in step in a direction coinciding with an advancement direction of the container elements (11); being further characterised by the fact that it comprises first cutting and welding means (33) to effect a transversal welding and cutting on said wrapping material strip (52) at a first cutting and welding station (33') arranged immediately upstream of a position which can be occupied, during the course of a pause phase, by each said containing element (11), with a consequent obtaining of a wrapper (53) about each article of clothing (2) of a rectangular shape closed on three sides, extracting means (38) to extract in succession the said articles of clothing (2) and the relative wrapping (53) from the respective container elements (11), a further conveyor belt (37') to receive the said wrappings (53) in succession and to bring them, also in succession to a second cutting and welding station (34'), and second cutting and welding means (34) to effect a further welding and cutting operation at the open side of each wrapper (53). 30
7. A machine as in claim 6, characterised in that it further comprises second translating means (39) to translate the wrappers (53) in succession with respect to said further conveyor belt (37') towards the second cutting and welding station (34'), moving transversally with respect to an advancement direction of the further conveyor belt (37'), sensors (49) being provided to 35

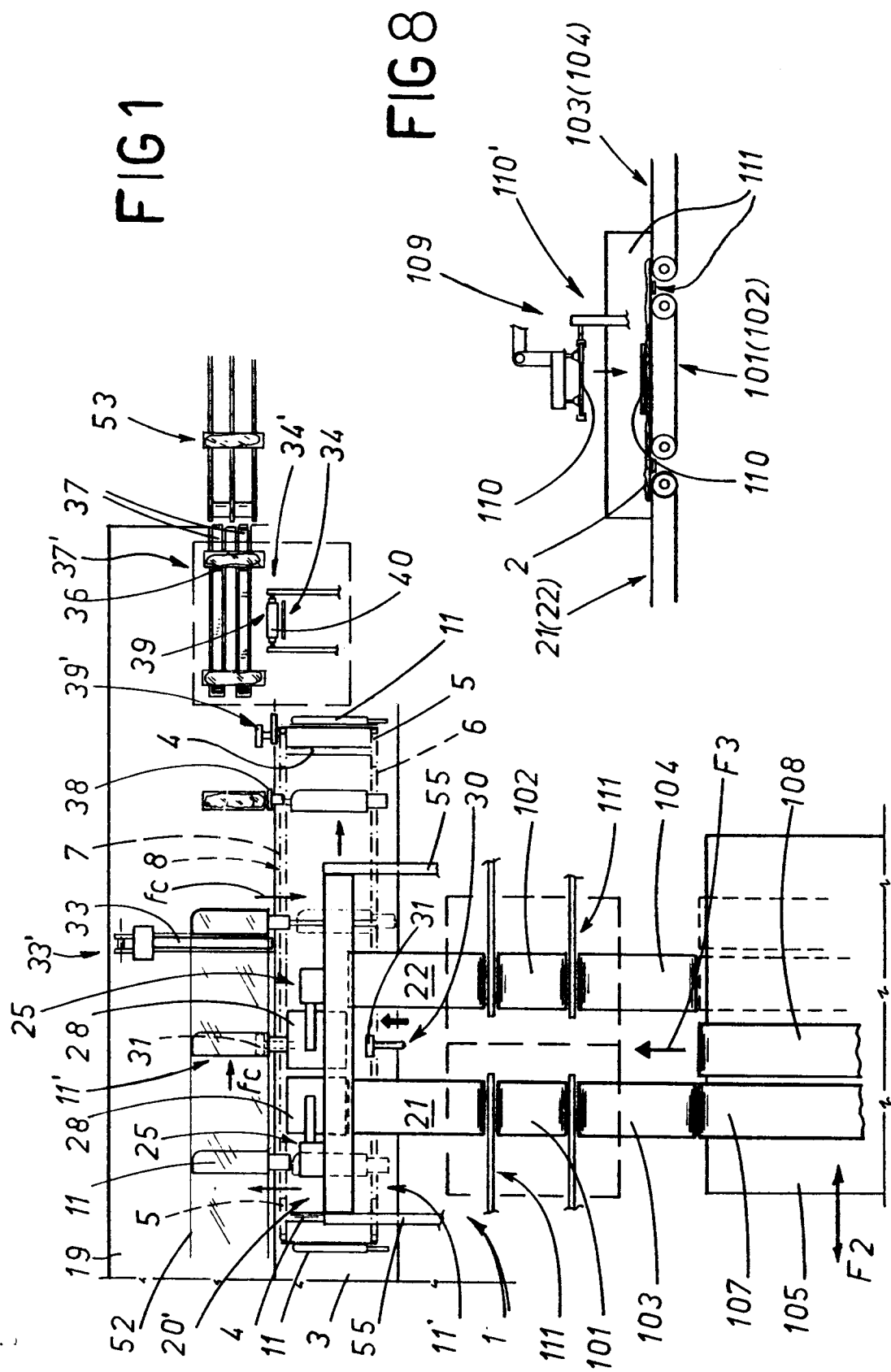
verify a position assumed by the wrappers (53) with respect to the second translating means (39) and the second cutting and welding means (34) in accordance with what is read by the sensors (49).

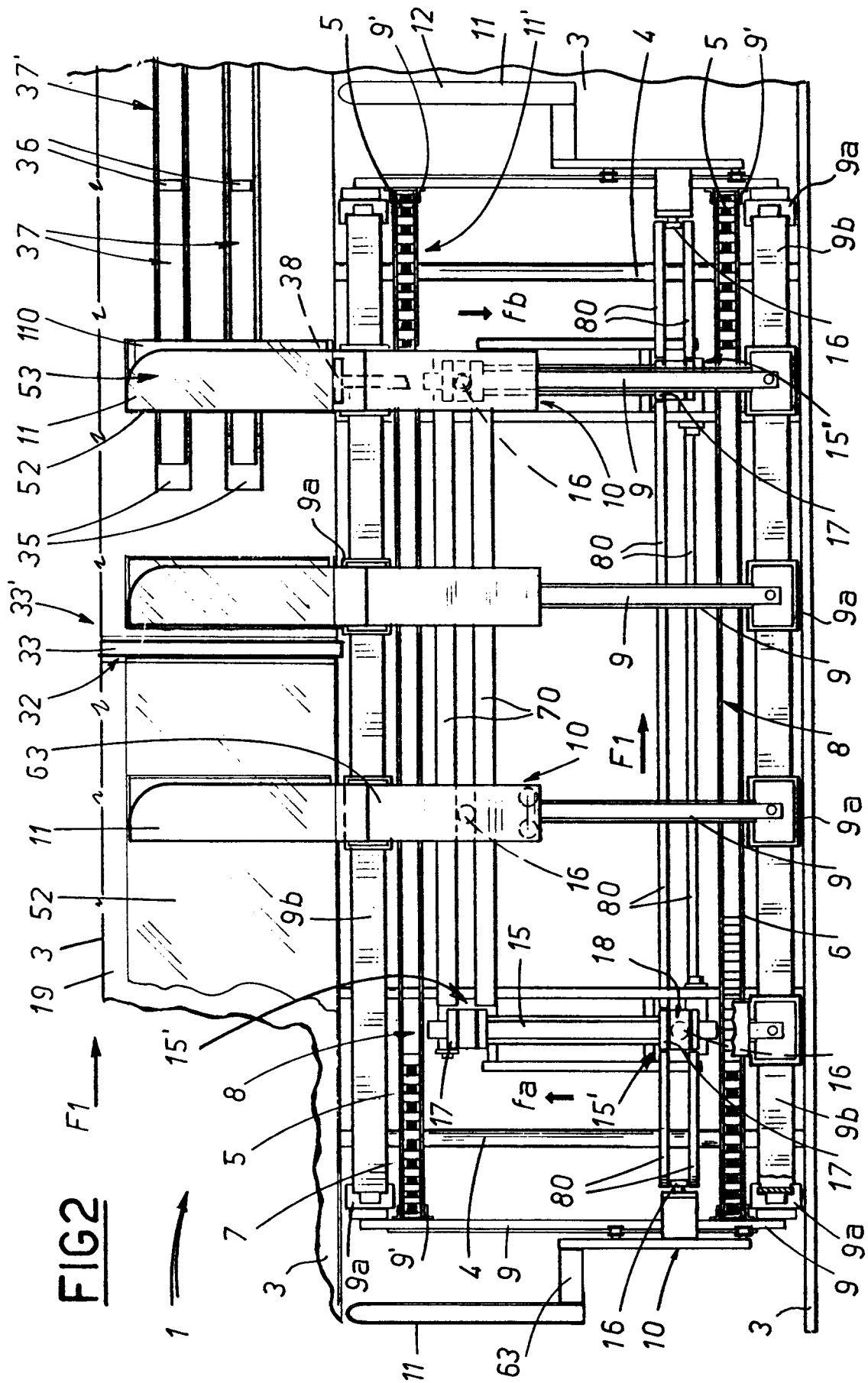
8. A machine as in claim 6, characterised in that it further comprises two alternately activatable side-by-side first conveyor belts (107, 108), which receive, in succession and alternately, single laid-out articles of clothing (2), first (103, 101) and second (104, 102) conveyor devices to receive alternately and in succession the said articles of clothing (2) from the first conveyor belts (107, 108), feeding means (109) to lay cardboard stiffening sheets (110) in contact with the articles of clothing (2) supported on said first (103, 101) and said second (104, 102) conveyor devices, folding means (111) to fold the articles of clothing (2) borne by the first (103, 101) and second (104, 102) conveyor devices; the said second conveyor belts (21, 22) receiving the articles of clothing (2) respectively from the first (103, 101) and the second (104, 102) conveyor devices.
9. A machine as in claim 8, characterised in that it comprises a support structure (105) of said first conveyor belts (107, 108), activating means (106) for alternately translating said support structure (105) transversally with respect to a transport direction of said second conveyor belts (21, 22), between two alternated alignment positions of one of the first conveyor belts (107, 108) with one or another of the said first (103, 101) and said second (104, 102) conveyor devices, said first (103, 101) and said second (104, 102) conveyor devices together with said second conveyor belts (21, 22) being reciprocally distanced by a tract of length which is substantially the same as the breadth of each of said first conveyor belts (107, 108).
10. A machine as in claim 8, characterised in that the said first transfer means (25) comprise two gripping and conveying apparatus respectively mobile in two directions, cyclically and alternately between respective adjacent zones at the exit portions of said second conveyor belts (21, 22) and said second transfer station (25').
11. A machine as in claim 10, characterised in that each of said first transfer means (25) is mobile in two directions along a course defined by a relative shaped channel (23) made in a vertical wall (20) supported by means of uprights (55) from the base (3) at a higher level than that of

the first transfer station (20'), and in proximity to exit ends of said second conveyor belts (21,22); said first transfer means (25) being also freely slidable, by means of idle rollers (57) along relative vertical guides (58) which are part of a slider frame (56) supported and mobile along said vertical wall (20), through idle rollers (59) slidable on respective longitudinal guides (60) realised along horizontal upper and lower edges of the vertical wall (20); each said first transfer means (25) being arranged and operating above said second transfer means (11') and comprising two horizontal planes (27) reciprocally mobile in nearing and distancing by respective motorisation means (61) with the help of special guides (62).

12. A machine as in claim 11, characterised in that the said planes (27) and (28) are mobile between a raised position in which the said plane (27) is arranged in front of and aligned with the exit end of a relative second conveyor belt (21 or 22), and a lowered position, at which the said plane (27) is horizontally aligned with an internal inferior surface of the container elements (11).
13. A machine as in claim 6, characterised in that the container elements (11) are constituted by envelopes, open on one side arranged downstream with reference to an advancement direction of said second transfer means (11'), movement means (15') also being provided to translate the container elements (11) in two directions with respect to said second transfer means (11') and normally to advancement direction of said second transfer means (11'), at determined instants in accordance with the said alternative and successive phases and in synchrony with a transfer of said articles of clothing (2) inside the container elements (11).
14. A machine as in claim 13, characterised in that said movement means (15') comprise movement elements (17) which are mobile in a normal direction to an advancement direction of said second transfer means (11'), drawing means (18) being associated to said movement elements (17) able to engage at determined instants and for determined spans of time, defined portions of said container elements (11).
15. A machine as in claim 14, characterised in that said movement means (15') are constituted by a pair of cogwheels (14) on which a positive drive belt (15) is wound, on which positive drive belt (15) blocks (17) are supported, which

- blocks (17) constitute the said movement elements and are equipped with a throat (18) constituting said drawing means able to engage, at determined instants and for determined time spans, an idle roller (16) connected by means of a bracket (10') to a support guide (10) of said container elements (11), said container elements (11) being moved by means of said movement means (15') from a retracted position with respect to a plane (19), wherein the container elements (11) move along a first course determined by guides (80) along which the idle rollers (16) run and an advance towards the plane (19), and along a second course determined by guides (70).
16. A machine as in claim 7, characterised in that the second translating means (39) comprise two roller conveyors (40) one superposed on another, connected to motor means (42) able to move the two roller conveyors (40) alternately in two directions, said motor means (42) being commanded by activating means (46) which distance them or near them, said translating means (39) being provided with sensors (49) to command said motor means (42) and activating means (46) each time that an increase in a breadth of the wrapper (53) is read, said increase in breadth being due to a presence of an article of clothing (2) in the wrapper (53).
17. A machine as in claim 16, characterised in that the roller conveyors (40) each comprise a line of coaxial rollers (40) supported at their free ends to a first arm (43) of a two-arm lever (44); the said two-arm levers (44) being pivoted on a pivot (45) and at least one of the second arms (48) of the two-arm levers (44) acting on the sensors (49), each time that the greater breadth of the wrapper (53) with the article of clothing (2) inside it causes the two rollers (49) to distance from each other.
18. A machine as in claim 17, characterised in that said first arm (43) of said two-arm lever (44) exhibits a smaller length than that of the second arm (48), so that a lever amplifier is created, rendering the said roller conveyors (40) more sensitive.
19. A machine as in claim 6, characterised in that the further conveyor belt (37') is constituted by a compartmental conveyor.
20. A machine as in claim 6, characterised in that the second transfer means (11') comprise two chains (6, 7) placed side-by-side and wound about respective support and/movement cog-wheels (5), said chains (6, 7) being reciprocally connected by connecting elements (9) supporting slidably in both senses in a normal direction to the development planes of the chains (6, 7) respective said container elements (11).
21. A machine as in claim 13, characterised in that the said container elements (11) are constituted by envelopes which are open on one side arranged downstream with reference to an advancement direction (F1) of said second transfer means (11'), said container elements (11) being constituted by a steel or plastic sheet (12) of rectangular shape folded in such a way as to exhibit in transversal section a "C" conformation, with its concavity turned in the advancement direction (F1) and its face (11a) turned towards the horizontal plane (19) being transversally wider (t) than its upper face (11b).
22. A machine as in claim 21 wherein the articles of prefolded clothing (2) are wound around a sheet of cardboard (110), characterised in that the container element (11) has its face (11a) turned towards the horizontal plane (11a) of smaller transversal size (t) than the transversal size (T) of the said sheet of cardboard (110).
23. A machine as in claim 22, characterised in that the said container element (11) is equipped with of further portion (64) of the face (11a) which can be transversally regulated with respect to the face (11a) itself through special blocking and regulation means (65, 66) acting between the face (11a) and the structure of the container element (11), so as to be able to vary the transversal size (t).





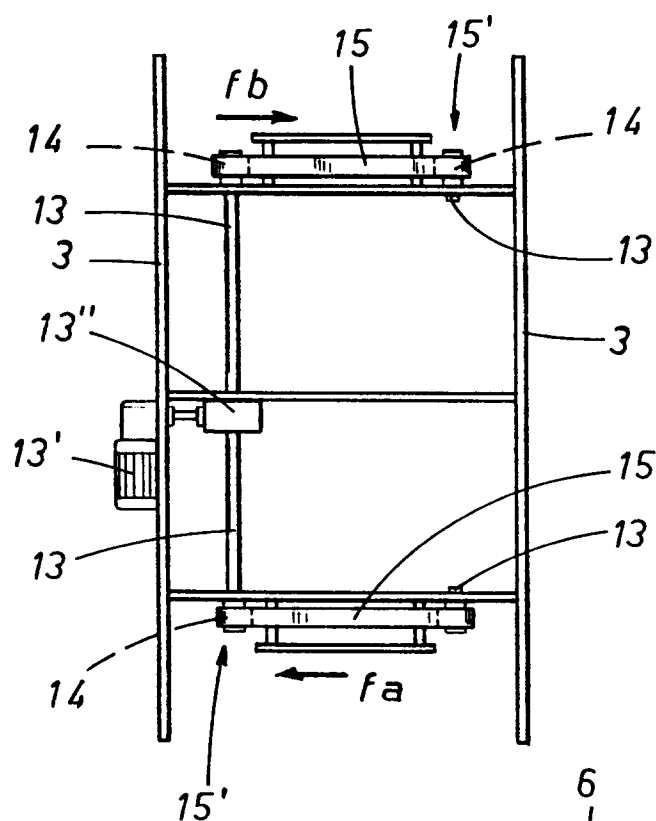


FIG 2a

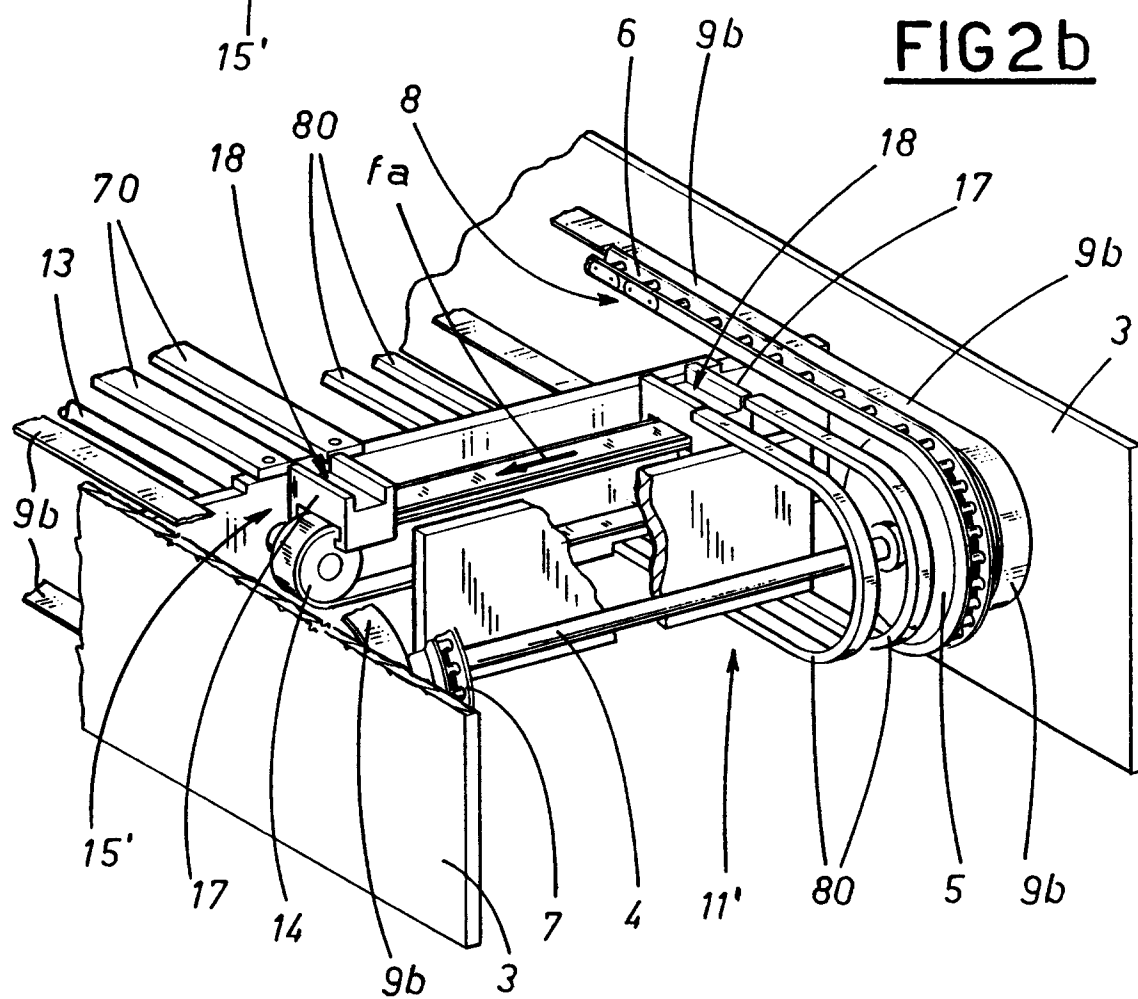


FIG 2b

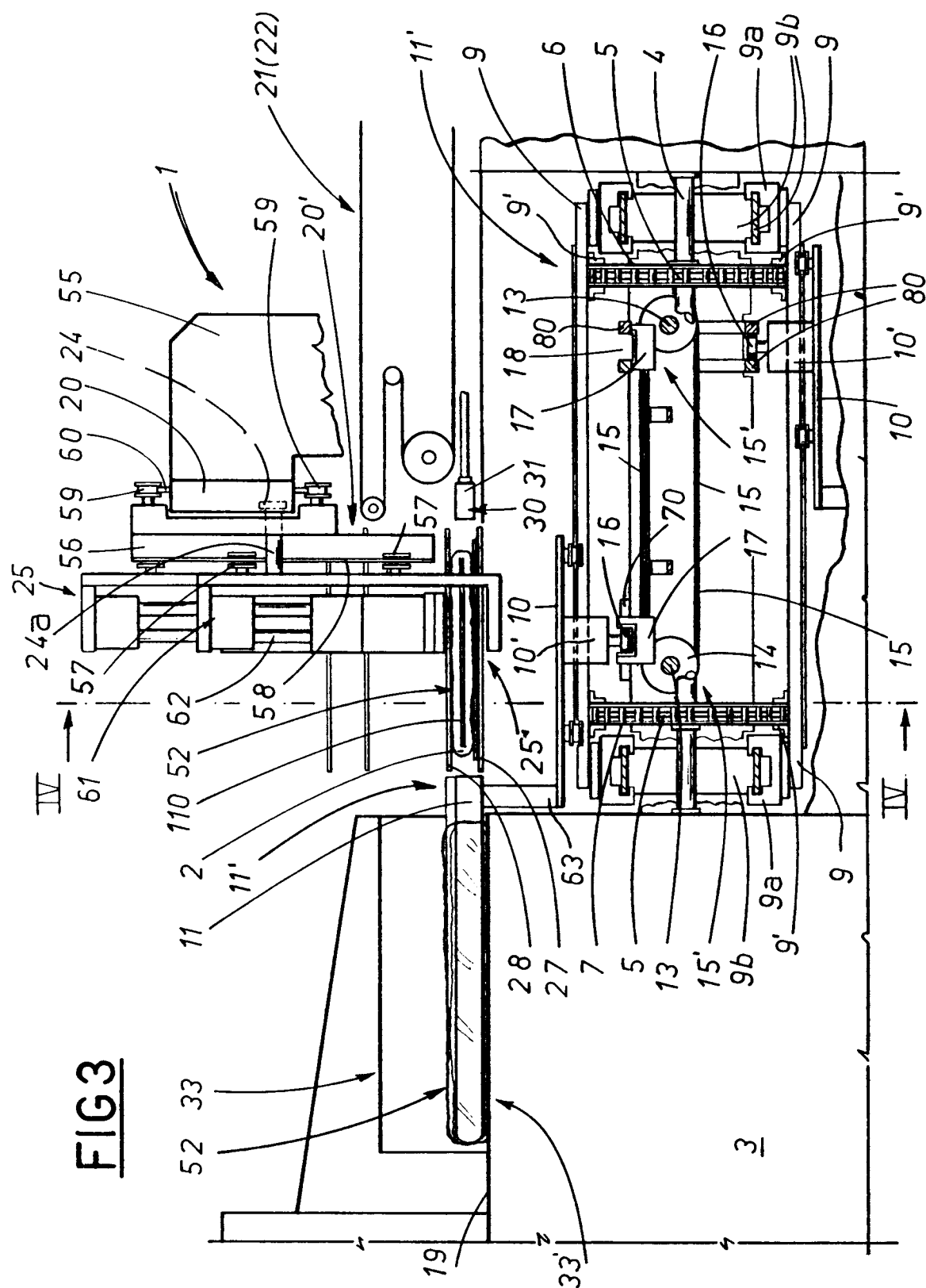
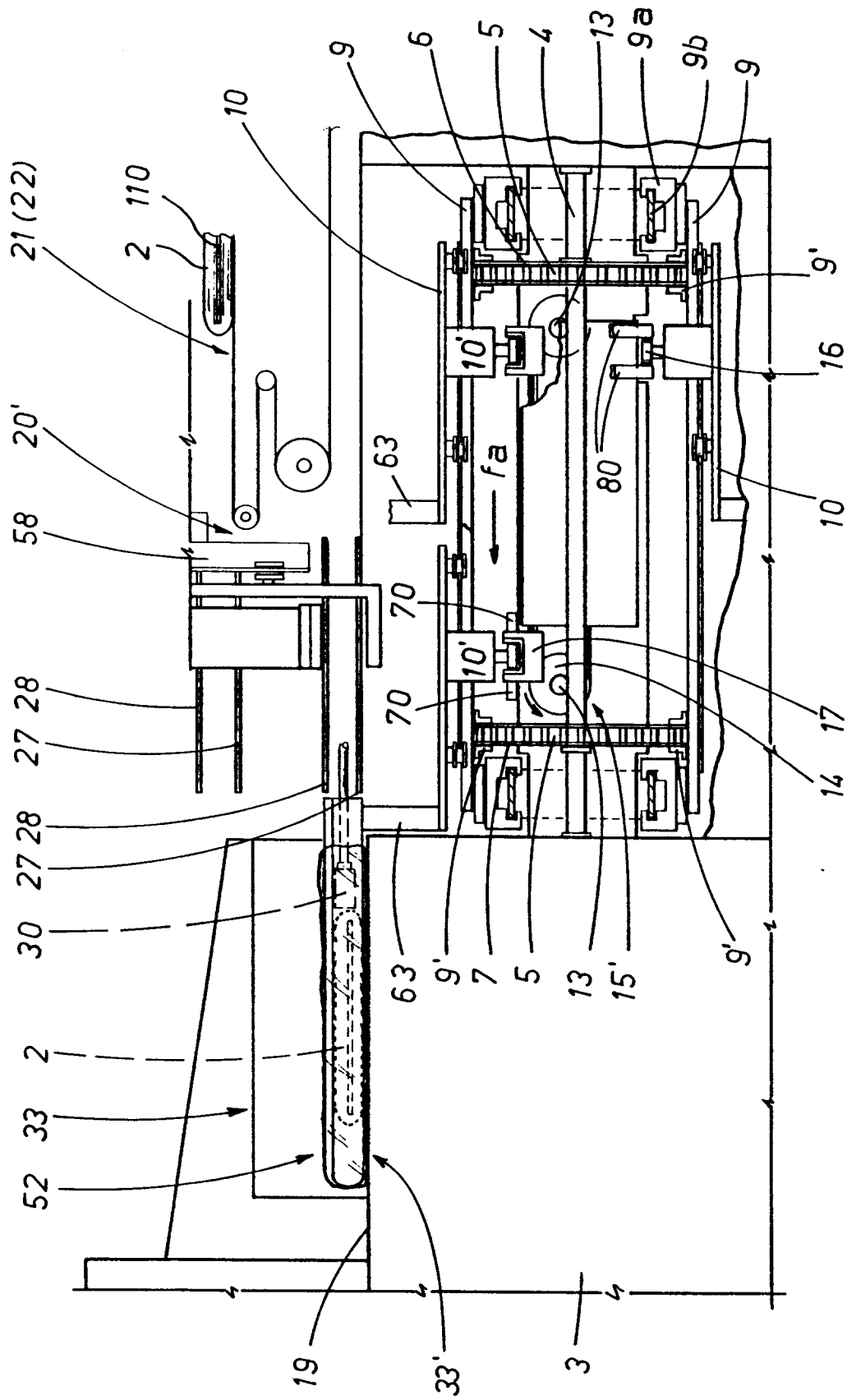
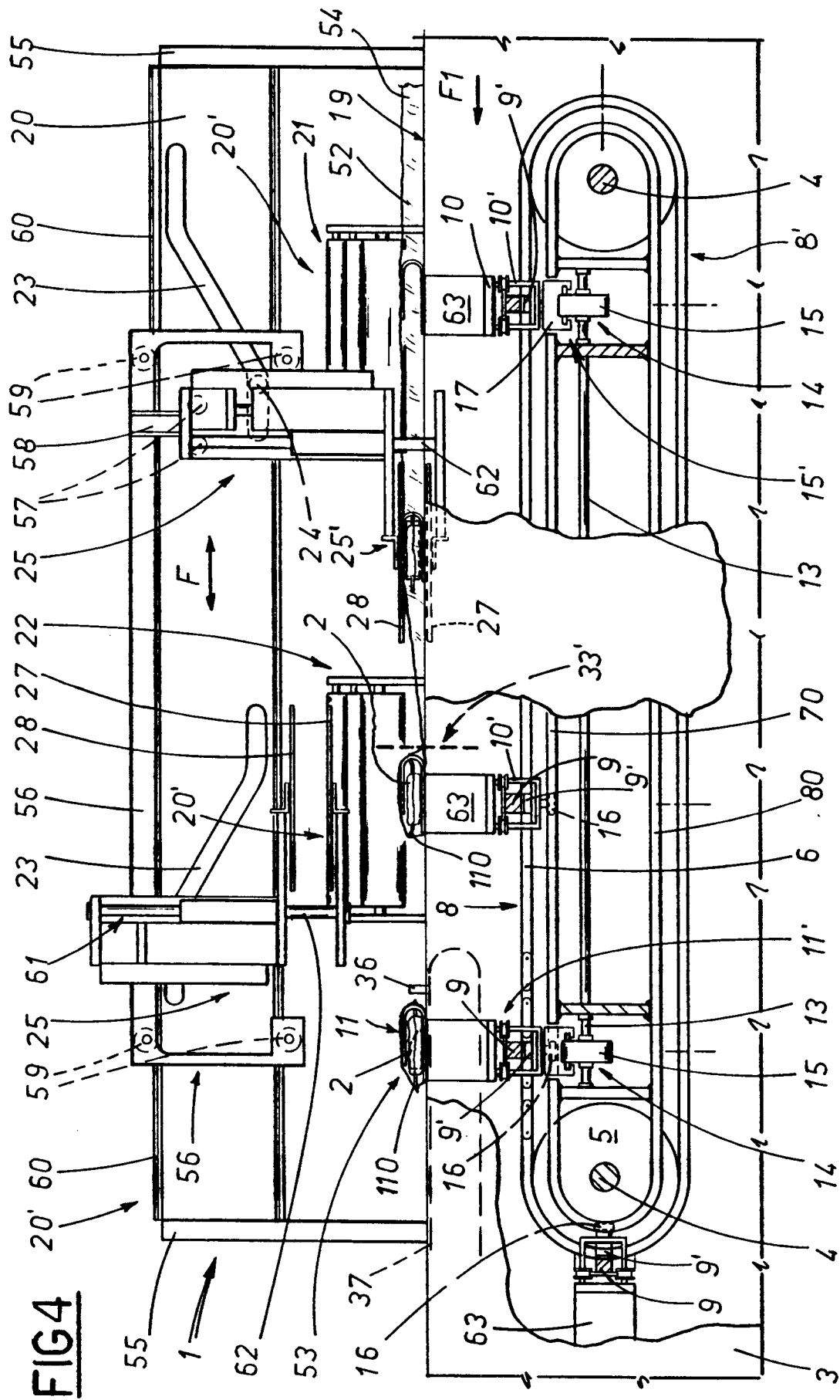
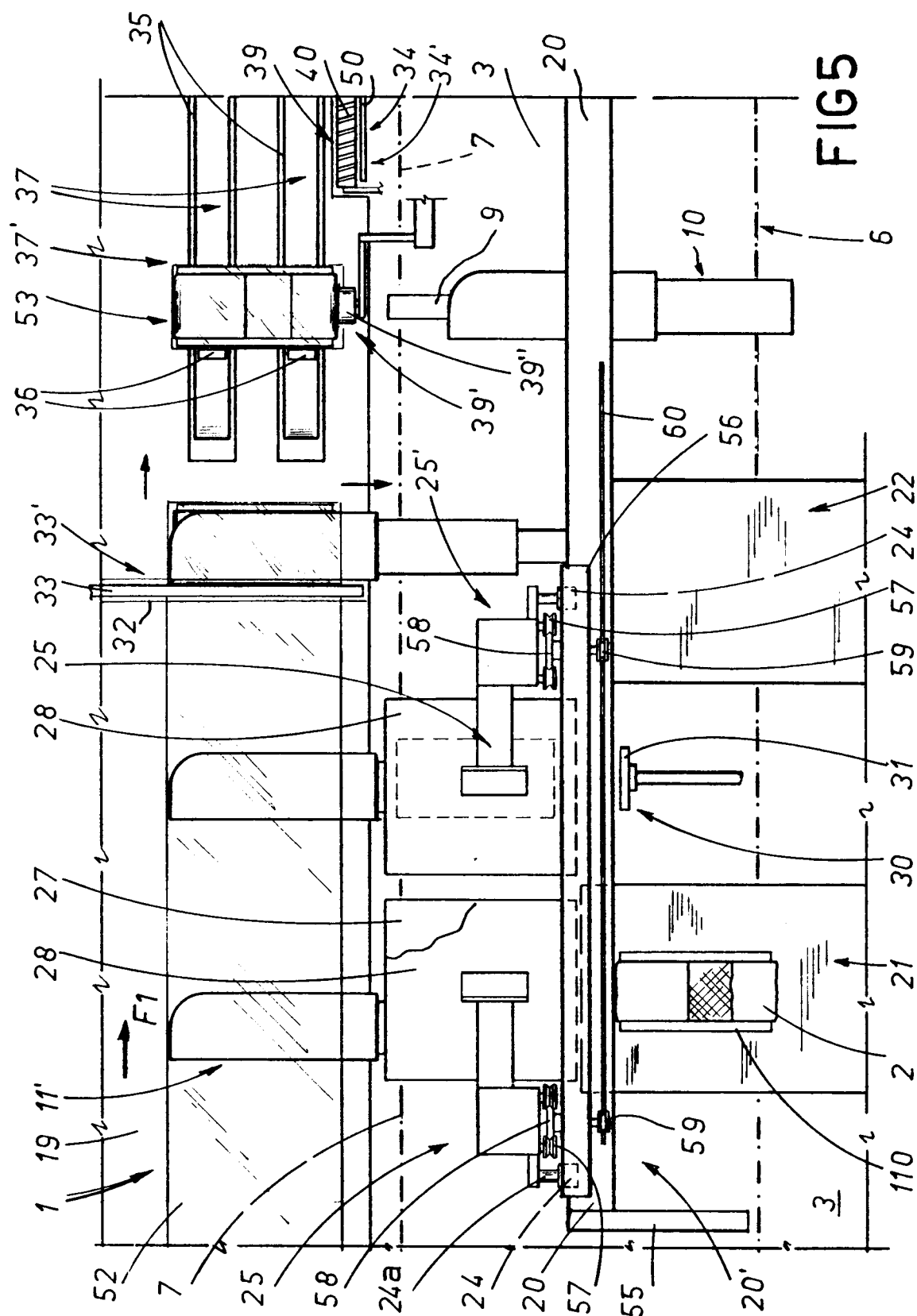
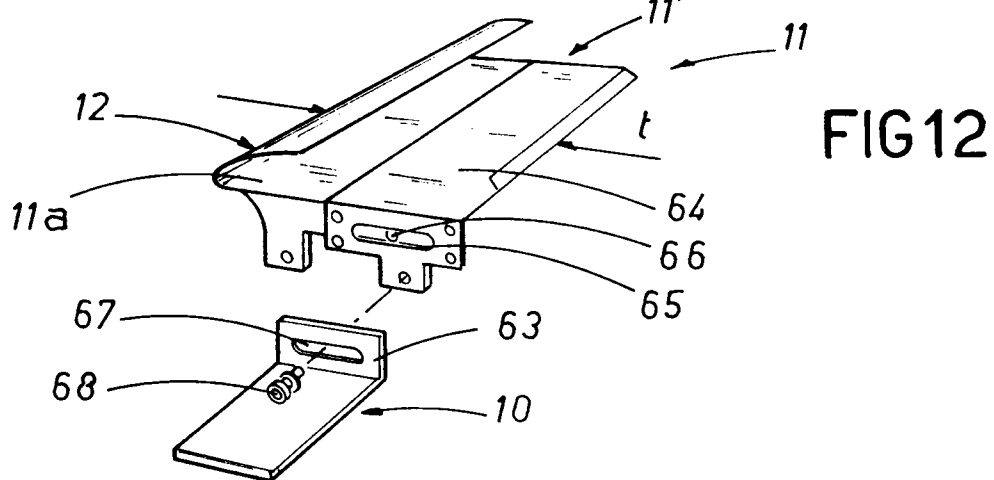
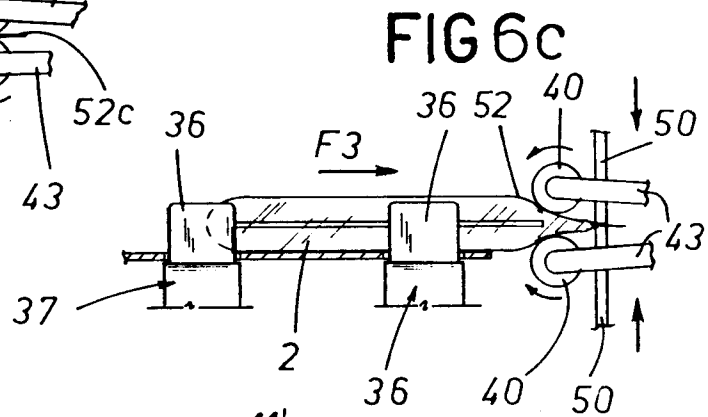
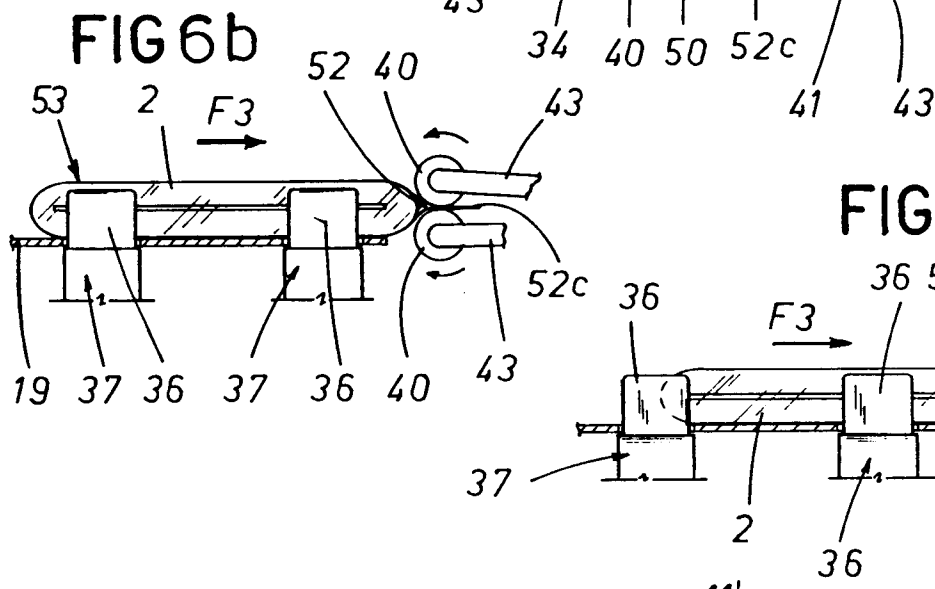
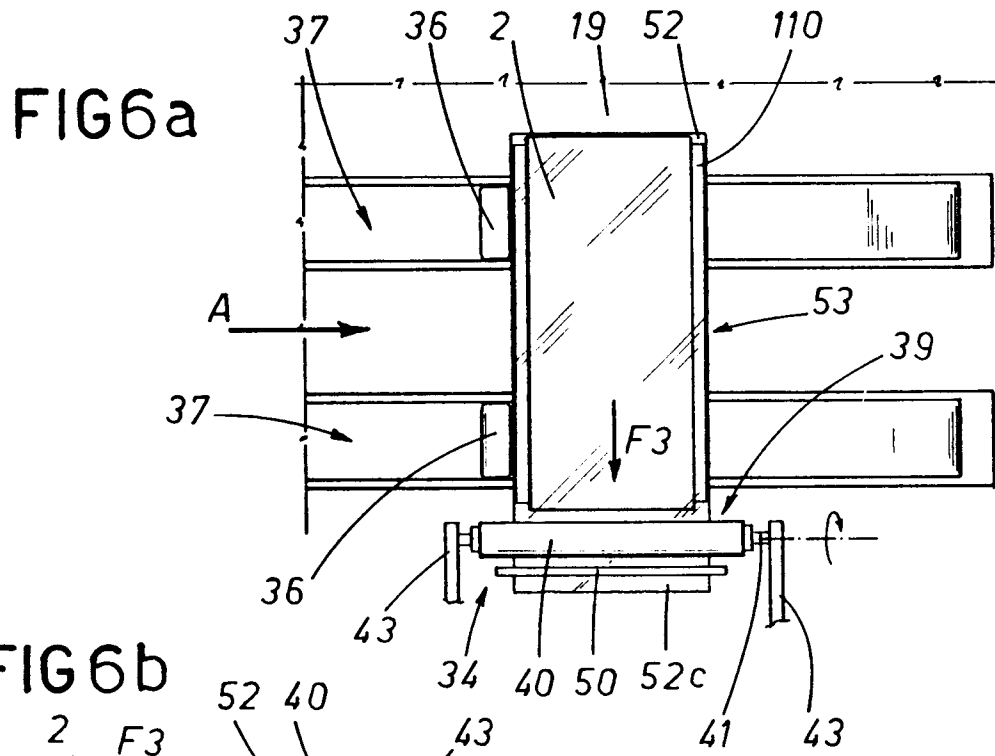


FIG 3a









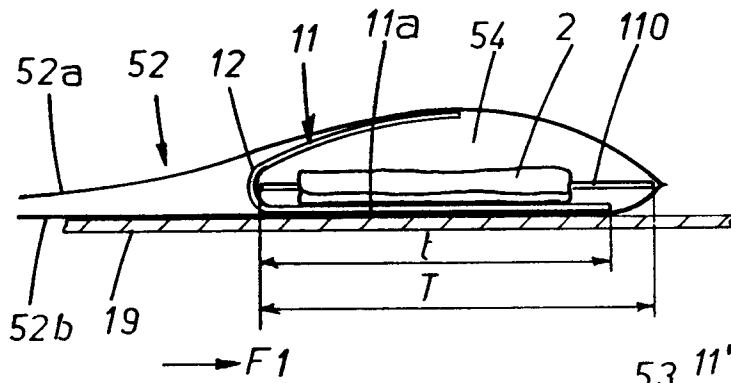


FIG 9

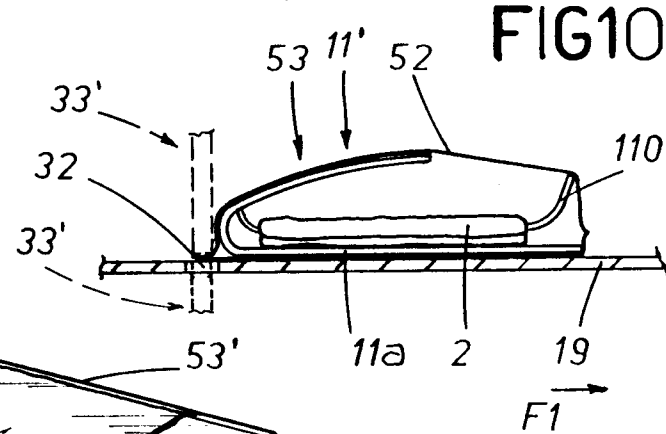


FIG 10

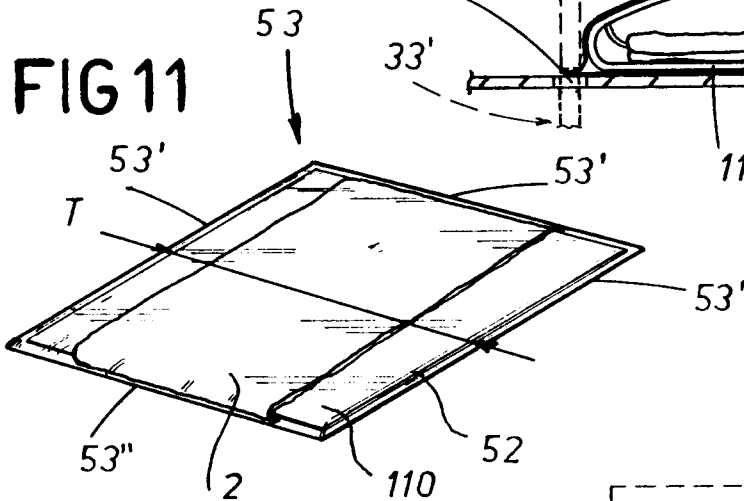


FIG 11

FIG 6d

