

[54] **DEVICE FOR TURNING-IN THE BORDER
OF PIECES MADE OF FLEXIBLE SHEETS**

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112/121.26, 136, 147, 148, 153, 176, 178,
203, 214; 270/66, 93**

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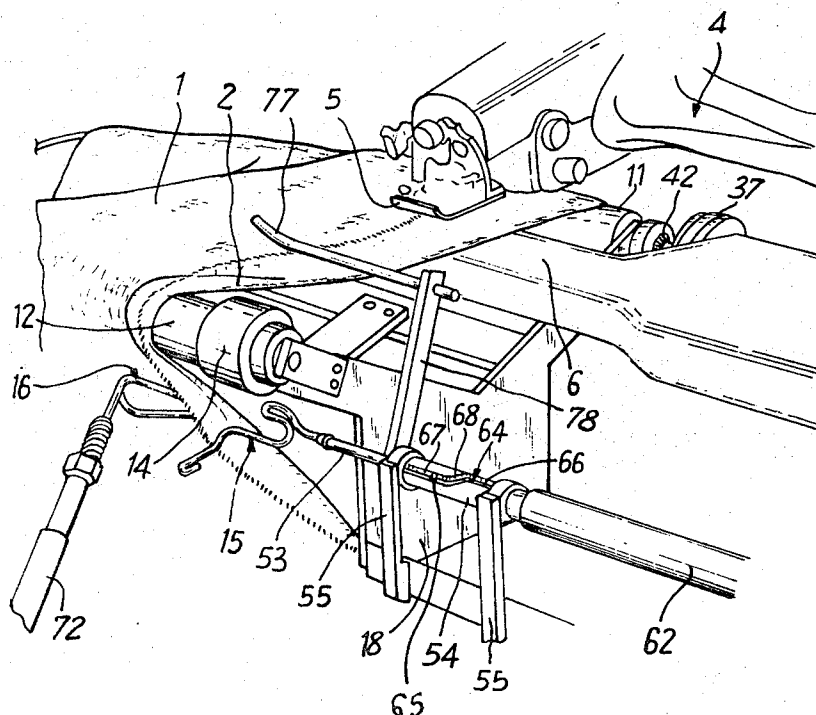
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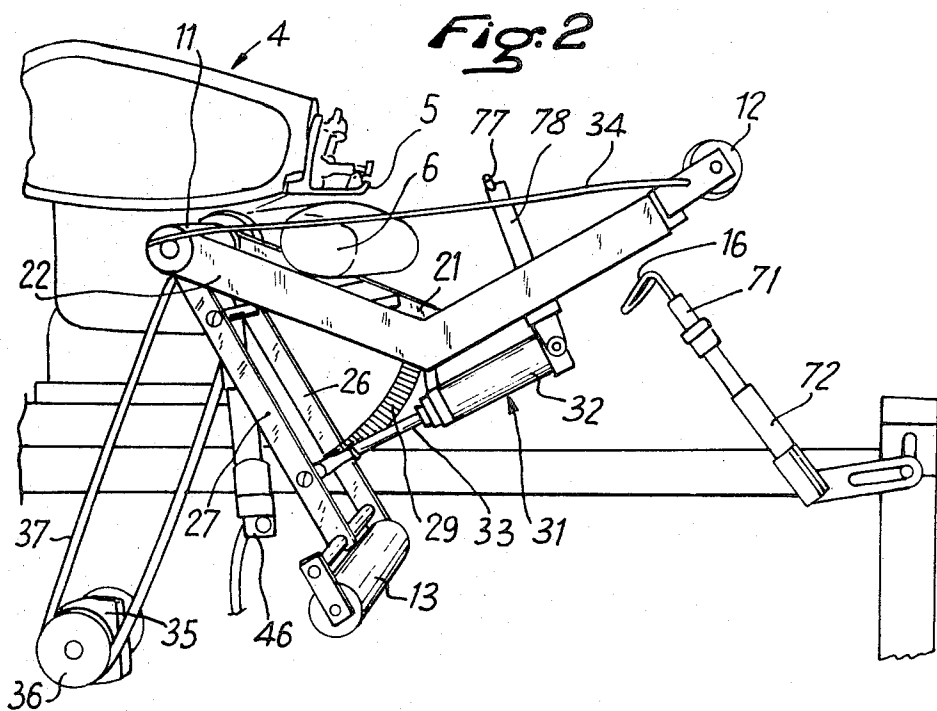
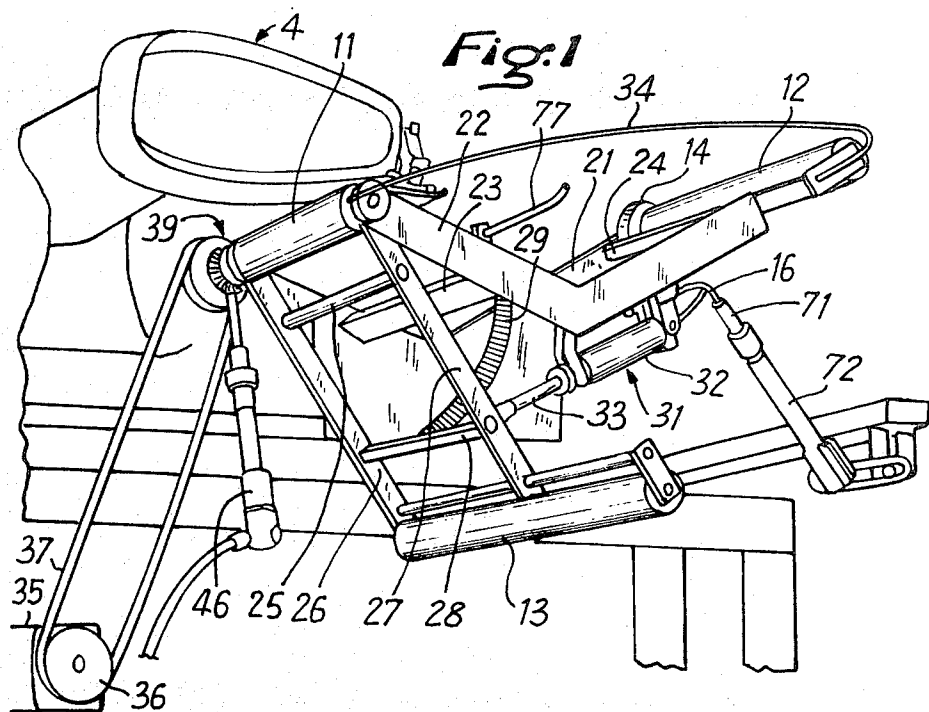
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[57] **ABSTRACT**

Device for turning-in the border of pieces made of flexible sheets comprising : means for supporting the piece in such a way that its marginal portion that is to be turned-in finds itself, at least partially, in a predetermined reference plane ; a lateral guide for positioning the border of the said marginal portion ; means for causing the border of the marginal piece portion which finds itself in the said reference plane to advance longitudinally, against the said lateral positioning guide ; a stop whose position, in relation to the lateral guide, determines the width of the turning-in that is to be formed ; a turning mobile member ensuring the formation of the turning-in in cooperation with the said stop ; control means for the turning-in member ; and means for introducing the turned-in marginal portion of the piece into the entry of the machine for fixing the turning-in.

5 Claims, 9 Drawing Figures





SHEET 2 OF 5

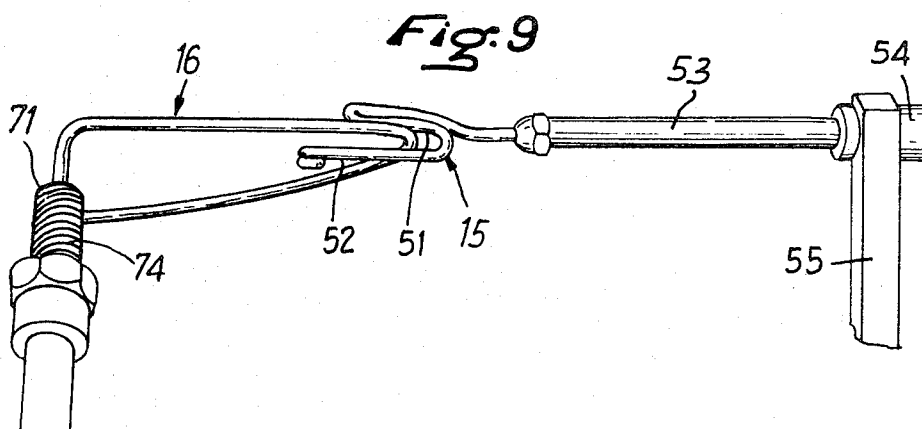
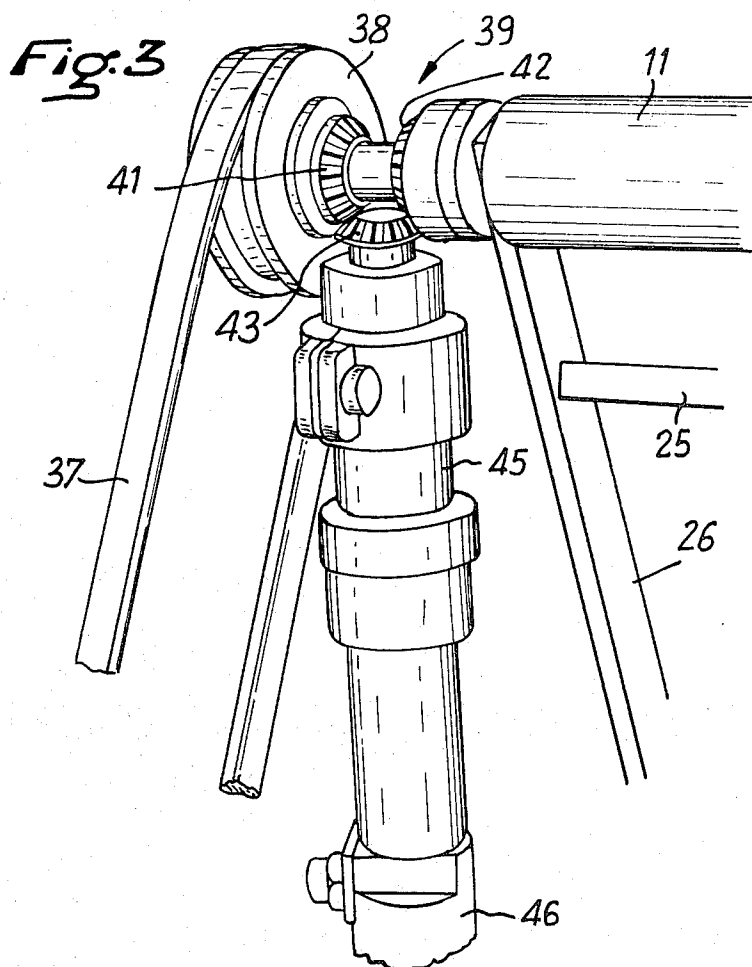
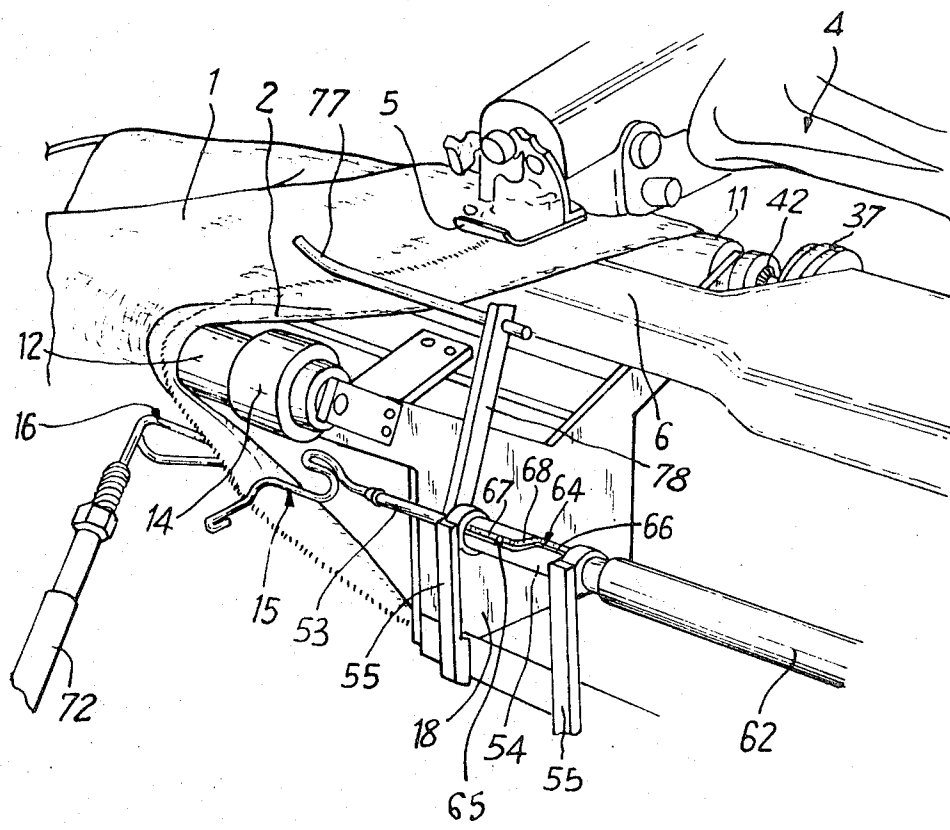


Fig. 4





DEVICE FOR TURNING-IN THE BORDER OF PIECES MADE OF FLEXIBLE SHEETS

The invention relates to the turning-in of the border of pieces made of flexible sheets, for example of woven fabric, or stitch fabric, or non-woven fabric, made of all fibres, natural, synthetic or artificial, or else made of sheets of plastics material or any other flexible material.

The turning, once formed, is then fixed by any suitable means such as sewing, gluing or welding for example.

Until now the formation of the turning-in used to be effected by hand just in front of the fixing means, such as, for example, the stitching needle of a sewing machine. Even if one used, to this end, formation guides for the turning-in, such guides were constituted by fixed mechanical members secured to the plate of the sewing machine and at the entry of which the seamstress had to introduce and guide unceasingly, manually, the border of the piece for the turning-in to form and for its configuration to be correct.

Such a manner of proceeding is obviously relatively slow and onerous, especially when it is a question of executing standardized items of work.

The aim of the invention is to provide an automatic device in which the turning-in is formed and is fixed automatically, in a regular manner without the seamstress having to intervene, except possibly for putting the piece in place in the device and removing it therefrom once turned-in, in the event of the feeding and the removal of the piece not themselves being effected in an automatic manner.

To this end, the tuning-in device in accordance with the invention is characterized in that it comprises :

means for supporting the piece in such a way that its marginal portion that is to be turned-in finds itself, at least partially, in a predetermined reference plane ;

a lateral guide for positioning the border of the said marginal portion ;

means for causing the border of the marginal piece portion which finds itself in the said reference plane to advance longitudinally, against the said lateral positioning guide ;

a stop whose position, in relation to the lateral guide, determines the width of the turning-in that is to be formed ;

a turning mobile member ensuring the formation of the turning-in in cooperation with the said stop ;

control means for the turning-in member ;

and means for introducing the turned-in marginal portion of the piece into the entry of the machine for fixing the turning-in.

With a device such as the one which has just been defined, it becomes possible to form and to fix a turning-in piece, both a strip piece and a tubular piece, in an automatic manner. In accordance with the elaboration of the device, all the operations of a cycle can be absolutely automatic, including the feeding and the removal of the pieces, or else these latter can be effected by hand, as well as possibly other very simple operations such as the starting and stopping of the means for driving the piece in the turning-in device, the displacement of its turning-in member, and the starting and stopping of the machine for fixing the turning-in, for example be sewing, at each cycle.

The invention will be better understood by reading the following description and by examining the attached drawings which show, by way of a non-restrictive example, one embodiment of a device in accordance with the invention for turning-in the border of a skirt. In these drawings :

FIGS. 1 and 2 are two perspective views of the turning-in device observed from one and the same side, but at different angles ;

FIG. 3 shows, on a larger scale, the control system for feeding the piece into the position where it can be seen in FIG. 1 ;

FIG. 4 shows, in perspective, the device observed from the other side thereof ;

FIGS. 5 to 8 show four successive phases of formation of the turning-in ;

and

FIG. 9 shows the position of the turning-in members alone, at the end of the formation of a turning-in, the piece being assumed to be removed.

The device shown practically in its entirety in FIGS. 1 and 2 is intended to turn-in the marginal portion 2 (FIG. 8) of the bottom of a skirt 1. It is intended to work in combination with a machine for fixing the turning-in constituted, in this example, by a sewing machine 4 having a curved needle and fixed presser-foot 5 against which the piece that is to be stitched is applied by a slight raising movement of the piece-carrying tubular member 6 of the said sewing machine.

The main members of the turning-in device comprise support means for the piece that is to be turned-in constituted by three rollers, namely : a feed roller 11, a supporting roller 12 and a stretching roller 13, a lateral guide 14 for positioning the border of the skirt, a turning-in member 15 (FIG. 4), a stop 16 for determining the width of the turning-in, as well as various control and driving mechanisms and members.

The whole of the three rollers 11, 12, 13 is supported by a frame 18 (FIG. 4) secured to the frame of the sewing machine 4. On the frame 18 there is fixed a double arm 21 in the form of a widely open "V" in this example and supporting a similar double arm 22, through the medium of cross-pieces 23, 24 (FIG. 1). The feed roller 11 and the supporting roller 12 are mounted for rotation on the corresponding ends of the said double arms 21, 22.

The stretching roller 13 is supported by the lower ends of two other arms 26, 27 whose upper ends can pivot on the axis of the feed roller 11. The two arms 26, 27 are connected, in the vicinity of their upper ends, by a cross-piece 25 and, in the vicinity of their lower ends, by a cross-piece 28. A helical compression spring 29, of which one end rests on the cross-piece 23 and the other end against the cross-piece 28, urges the two arms 26, 27 to pivot downwards so as to draw the stretching roller 13 away from the two upper rollers 11 and 12. One can cause the stretching roller 13 to rise again, against the action of the spring 29, with the aid of a pressurized-fluid jack 31 whose cylinder 32 is secured to the frame 18, whilst its piston rod 33 is connected to the cross-piece 28.

A bow 34, constituted by a wire, connects the outer ends of the double arm 22 in order that the skirt be supported more efficiently in the course of turning-in.

The arrangement of the two upper rollers 11 and 12 which support the piece that is to be turned-in is such that the upper plane tangent to these two rollers is at

the same time substantially tangent to the top face of the tubular member 6 which supports the piece that is to be stitched in the sewing machine 4.

With a view to ensuring the feed of the marginal portion of the skirt in the turning-in device, the upper feed roller 11 is connected to a motor 35 through the medium of a transmission and of a clutch. The transmission comprises a pulley 36 secured to the shaft of the motor 35, a belt 37 flexing over the pulley 36, and a pulley 38 (see also FIG. 3) mounted loosely on the shaft of the feed roller 11 and over which there flexes also the belt 37. The clutch designated as a whole by 39, comprises a conical toothed pinion 41 (FIG. 3) integral with the pulley 38, a conical pinion 42 integral with the shaft of the feed roller 11, and a third conical pinion 43 which can enter into engagement simultaneously with the two pinions 41 and 42 and disengage from these latter through an axial sliding movement of its shaft mounted inside a socket 45 secured to the frame of the device.

The pinion 43 and the shaft with which it is integral have a tendency, under the action of gravity, to draw away from the two pinions 41 and 42, abolishing in this way the connection between these two pinions and, accordingly, the connection between the belt transmission 37 and the feed roller 11. This disengaging action is urged also by the reaction of the teeth of the pinions one on the others.

As a contrast, the engaging effect is obtained by causing the pinion 43 to rise against the two pinions 41 and 42, by means of a pressurized-fluid jack 46 also secured to the frame of the machine and whose mobile element repels the shaft of the pinion 43.

The turning-in member 15 is constituted by a fork having two prongs 51, 52 (FIG. 5) terminated by rounded portions integral with a handle 53 (see also for example FIG. 9) which can slide and pivot inside a sleeve 54 fixed to the frame of the machine by two tabs 55 (see also FIG. 4). The prong 52 is longer than the prong 51 and these two prongs are situated in one and the same plane passing through the axis of the handle 53. In addition, the large prong 52 has an extension which comprises a first portion 57 bent back into the plane of the two prongs 51, 52 so as to form, with the long prong 52, an angle "A" which is slightly less than 90°, and a second portion 58 substantially perpendicular to this prong and terminated by a rounded part 59.

The turning-in member 15 can assume two distinct angular positions, namely: the one shown, for example, in FIG. 5, in which its prongs find themselves slightly off-set on one side (above in the example), of a reference plane determined by the plane tangent externally to the supporting roller 12 and to the stretching roller 13, and another angular position shown, for example, in FIGS. 7 and 9 in which the plane of its prongs is substantially perpendicular to the said reference plane.

The means for actuating this turning-in member are constituted by a jack 62 (FIG. 4) whose cylinder is secured to the frame of the machine and whose piston rod is integral with the handle 53 of the turning-in member, the said handle bearing a radial lug 65 movable in a cam groove 64 contrived in the sleeve 54, the said cam groove comprising two rectilinear longitudinal portions 66, 67 which extend along two generatrices staggered by about 90° and which are connected by an oblique portion 68.

The stop 16 (FIGS. 1 and 5) is constituted by a plane part of triangular general shape formed, in this example, from a wire suitably bent and secured to a rod 71 which can slide and pivot in a socket 72 fixed to the frame of the machine. The plane of this stop 16 is perpendicular to the rod 71 and the direction of this latter is substantially perpendicular to the aforesaid reference plane so that the stop 16 is parallel to the said reference plane and slightly off-set below this latter. The aim of the pivoting movement of this stop is to make this latter retractable for reasons which will be better understood later on. For conveniences of putting in place of the tubular piece to be turned-in, the rod 71 which bears the stop 16 carries out, at the same times as its pivoting movement, an axial sliding movement which draws it away from the reference plane, downwards. To this end, the rod 71 bears a lug (not visible in the drawing) which shifts in an appropriate cam groove contrived in the socket 72, the said groove having at its lower end, a small recess which retains the lug in the retracted position of the stop, for the conveniences of the manipulation, the stop being subsequently brought back manually into the active work position. The rod 71 is urged, simultaneously downwardly and angularly, by a torsion spring 74 (FIGS. 5-9).

The free end of the stop 16 serves to determine the width of the turning-in 2 and, to this end, it therefore finds itself at a distance from the border 9 (FIG. 5) of the piece 1 that is to be turned-in, corresponding to the width of the turning-in to be formed. The said border of the fabric finds itself positioned by a lateral guide 14 fixed on the corresponding end of the upper supporting roller 12, preferably in an axially adjustable manner on the said roller. One can therefore say that the end 16A of the stop finds itself at a distance "D" from the positioning line of the lateral guide 14 which corresponds to the width of the turning-in that is to be formed.

In addition, the free end 16A of the stop 16, in the work position, finds itself substantially in the axis of the handle 53 of the fork of the turning-in member 15, which can be ascertained, more especially, by examining FIG. 9.

A holding element, constituted by a finger 77 (FIG. 1 and 4), fixed on an arm 78 secured to the frame of the device, is situated substantially against the top of the upper plane tangent to the two rollers 11 and 12, so as to apply the turned-in portion 2 of the skirt 1 against the said skirt, during the advance of this latter. The free end of the finger 77 is slightly bent upwards in order not to hinder the introduction of the skirt onto the two upper rollers.

The operation of the turning-in device is as follows:

The stop 16 (FIG. 5) being in its lower retracted position, the turning-in member 15 in its position of rest, that is to say of maximum withdrawal and the stretching roller 13 (FIG. 1) raised against the action of the spring 29 under the action of its control jack 32, one threads the skirt 1 about the assembly of the three rollers 11, 12, 13 by causing its upper portion to pass below the holding finger 77 and above the stop 16; one brings its border 9 (FIG. 5) against the lateral positioning guide 14 carried by the upper supporting roller 12.

The jack 32 is released in order to free the stretching roller 13 which descends against the skirt and stretches it. The stop 16 is brought into the active position, the motor 35 is started up (if not yet running), and the clutch 39 is engaged in order to ensure the rotation of

the feed roller 11 for running the skirt on the rollers. Pressure fluid is sent into the jack 62, which causes the turning-in member 15 to pass from the position shown in FIG. 5 where it is withdrawn to the maximum, flat, just below the reference plane where the fabric that is to be turned-in is to be found to an intermediate forward position in which the extension 58 of the turning-in member finds itself substantially facing the end 16A of the stop 16, that is to say that the lug 65 (FIG. 4) finds itself at the end of the first rectilinear portion 66 of the cam groove 64 which controls the turning-in member. Immediately after, the continuance of the movement of the jack 62 brings about the pivoting by 90° of the turning-in member through the passage of the lug 65 from the end of the rectilinear portion 66 of the cam groove, through the oblique portion 68, to the start of the rectilinear portion 67. The long prong 52 of the fork rises (FIG. 6) by shifting, in this example, in the opposite direction to the feed direction of the marginal portion 2 of the fabric and starts the turning-in action of the said marginal portion which passes from the configuration shown in FIG. 6 to that shown in FIG. 71; the fold of the fabric, which is formed over the end 16A of the stop, now finds itself imprisoned between the two prongs of the fork of the turning-in member 15.

The jack still continuing to act, the lug 65 now traverses the second portion 67 of the cam groove 64, which brings about a movement of translation of the turning-in member, from the position of FIG. 7 to that of FIG. 8. The turning-in forms progressively as the fabric shifts over the rollers; depending on circumstances, it can be completely formed when the skirt has effected one complete revolution on itself, or else this formation can necessitate, for example, two or three revolutions of the skirt. In FIG. 9 there can be seen the location of the turning-in member 15 cooperating with the stop 16 at the end of the turning-in operation, the fabric being assumed to be removed.

As soon as the turning-in is completely formed all around the skirt, one proceeds to its fixing and, for that, one disengages the clutch 39 which controls the feed roller 11, whilst one starts up the members of the sewing machine 4. The fabric already being in the turned-in state, in place on the tubular support 6 of the sewing machine, the stitching commences immediately and the fabric is moved by the feed dog of the machine, whilst the rollers 11, 12 and 13 are rotated idle by the fabric. When the skirt is on the point of having effected one complete revolution over the rollers, the first stitch point repels the stop 16 towards its disengagement position. When the turning-in has been stitched over the whole of its length, after automatic cutting of the stitching thread, one puts the jack 32 under pressure once more in order to raise the stretching roller 13 and once can disengage the skirt. The cycle of formation and of fixing of the turning-in is completely concluded and the device is ready for the turning-in of a fresh article.

Of course, the invention is not restricted to the embodiment described and shown; modifications can be

made thereto, in accordance with the applications envisaged, without however, departing from the scope of the invention.

Thus, for example: one could adapt the device to the performance of turning-in bottoms of trousers, or else along pieces of materials in strips.

I claim:

1. A device for turning-in the border of a flexible sheet for subsequent fixing of the turned border by a machine, said device comprising means supporting said sheet in a longitudinal plane, a lateral positioning guide engaging said sheet, a stop having an end portion located adjacent said sheet at a distance from its edge corresponding to the width of the turned border, a turning-in member comprising a fork having a handle and two prongs, one of said prongs being longer than the other, both prongs having rounded ends, means actuating said turning-in member relatively to said sheet and said stop to turn an edge of said sheet by a width determined by the location of said stop, and means moving said sheet relatively to said guide and toward said machine, wherein said means actuating the turning-in member comprise means moving it toward said stop initially in a plane parallel to said plane of the sheet, then pivoting it by substantially 90 degrees and then moving it in a plane perpendicular to said plane of the sheet to cause said longer prong to turn an edge of said sheet over said top.

2. A device in accordance with claim 1, wherein said sheet supporting means comprise two rollers, and means driving at least one of said rollers and wherein one of said rollers is situated in front of said stop and turning-in member relatively to the movement of said sheet, the other one of said rollers being situated behind said stop and turning-in member, said sheet supporting means further comprising a third roller and means movably connecting said two rollers with said third roller for stretching the sheet.

3. A device in accordance with claim 1, wherein the last-mentioned means pivot said turning-in member when its longer prong reaches the stop and terminate its movement when the bottom of its fork reaches the stop.

4. A device in accordance with claim 1, wherein the longer prong of said turning-in member has an inner portion extending substantially parallel to the other prong and an outer portion extending substantially perpendicularly to said inner portion.

5. A device in accordance with claim 1, wherein said means actuating the turning-in member comprise a handle carrying said fork and wherein said means actuating the turning-in member comprise a jack having a moving member connected with said handle, a fixed sleeve, said handle being located in said sleeve and movable therein, said sleeve having a cam groove including two rectilinear portions and an inclined portion interconnecting said rectilinear portions, said handle having a lug slidable in said cam groove.

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