SEWING MACHINE FOR PRODUCING BELT LOOPS AND THE LIKE

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FIG. 1

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The invention relates to an apparatus for making folded and stitched pieces of material of predetermined length, or more precisely for producing belt loops for trousers or the like.

Generally such loops are made by cutting, at regular and pre-established intervals, a strip formed by off-cuts of material of varying length, suitably folded along their lateral edges, stitched one after the other. The strip can be formed by off-cuts alone or with the addition of an internal reinforcement tape. In both instances the strip manifests defects, such as the overlapping of the edges of the off-cuts, or the presence of gaps between one edge and the other in which there is only the chain of stitches or only the reinforcement tape. These defects result from the fact that the insertion of the off-cuts into the sewing machine cannot be carried out with precision since the off-cuts are of different lengths. In any event, the joints between successive off-cuts are visible and so the pieces of strip containing such joints are considered to be scrap.

Apparatus for producing pieces of material of the type mentioned are already known; however, it has not been possible through use of such apparatus to distinguish and sort the pieces of strip not having defects from the scrap or reject pieces, that is, those pieces which include the abutting or overlapping ends of successive off-cuts. Therefore, with known apparatuses, sorting had to be subsequently effected manually with an obviously noticeable loss of time. Furthermore, it not being possible to distinguish the good pieces with known apparatus, neither was it possible to maintain a count thereof, and so the counting operation also had to be carried out subsequently and manually.

As an apparatus of the type mentioned can easily produce more than 40,000 workpieces in a normal day's work, it is obvious that the necessary sorting and counting operations are arduous, costly, and provide uncertain results. A further disadvantage of known apparatus resides in the fact that the pieces are systematically cut off pre-established distances apart; the cuts occurring even where the sections of strip are of notable thickness, with a consequent unnecessary wearing of the knife.

An object of the present invention is that of speeding up the work, eliminating the manual sorting of the good pieces from the defective ones and, at the same time, recording the number of the good pieces, and finally reducing to a minimum the wearing of the cutting knife.

The technical problem to be solved in order to achieve the foregoing was that of how, after producing pieces of material of the type mentioned, to automatically sort the pieces and separately channel them into two distinct containers respectively for good pieces and scrap pieces, with prior registration occurring of only the good pieces produced and, finally, of how to exclude the cutting operation along defective sections of the strip. A further problem was how to make possible the discovery of very small thickness variations in order to avoid the danger of confusing defective pieces with good pieces.

To solve this technical problem the apparatus according to this invention developed within a follower, placed along the advancing path of the strip between the feeding members and the blade and connected by means to the cutter device and to a deviator, is made to move by the variations in thickness of the strip, to shift the deviator into one of two positions, in order to sort the pieces of strip cut by the blade.

The characteristics and advantages of the apparatus which constitutes this invention will become evident from the detailed description, which follows, of a preferred embodiment which description is referred to the accompanying drawings, wherein:

FIGURE 1 is a frontal view of the apparatus according to this invention;
FIGURE 2 is a plan view along the line II-II of FIGURE 1;
FIGURE 3 is a partial view in elevation taken along the line III-III of FIGURE 2;
FIGURES 4 and 5 are side views taken along lines IV-IV and V-V, respectively, of FIGURE 1;
FIGURE 6 is an enlarged section of a workpiece completed by the apparatus;
FIGURE 7 is a schematic drawing of portions of the apparatus; and
FIGURE 8 is a diagram showing the electrical circuitry of the apparatus.

With reference to FIGURE 1, the apparatus for making belt loops comprises a sewing machine composed of a head 1 supported by an overhanging bracket arm 2 connected by means of a standard 3 to a bed plate 4 on which the work slides. A needle bar 5, which carries at its lower end a needle clamp 6, provided, for example, with two needles 7, is slidingly supported within the head 1 and therein receives its working movement in the traditional manner from drive mechanisms which are known and, therefore, not shown. Within head 1 there is also supported the customary presser bar 8 which carries, at its lower end, a principal presser foot 9. Within the bed plate 4, in the proximity of the trajectory percolated by needles 7, are mounted the customary members which contribute to the forming of the stitches and also a principal feeder 10 which, together with presser foot 9, provides for the advancement of the workpiece after it has been stitched.

In front of the sewing area, the bed plate 4 supports a partially set-in trimming device comprising a pair of knives 11, spaced apart parallel to each other, between which is situated a supplementary front feeder 12 provided to ensure regular advancement of the workpiece toward a customary folder 13 which folds the trimmed lateral sides of the workpiece inwardly. A supplementary presser foot 14 (FIGURES 2 and 3) ensures the pressure necessary on feeder 12 for a good feeding action. Presser foot 14 is composed of a sole 15 extending from a support 16 which is fixed by a pair of screws 17 to a shaft 18 which is locked within a bushing 19. Bushing 19 is supported by and between two bearing bosses 20 of a support 21 pivoted on spindle 22 of a support plate 23 of the bed plate 4. Rigid with bushing 19 and extending generally radially therefrom is a holed tongue 24 through whose hole passes a stud 25 solid with support means 21.
A coil spring 26 is twisted around stud 25 and with its one end presses against tongue 24 and with its other bears against a threaded knob 27 screwed onto the upper part of said stud 25. Rotation of knob 27 varies the force exerted by spring 26 against tongue 24 and, therefore, the pressure exerted by the sole 15 on the feeder 12. A lever 28 is keyed onto shaft 18 for raising sole 15 from said feeder 12. A spring paw 29 is used for locking support means 21 to plate 23 in a conventional manner.

Between the presser foot 9 and the rear edge of the blade holder 59 is a support 61, hereafter described in detail. A coil spring 24 is twisted around stud 25 and with its one end presses against tongue 24 and with its other end is attached to a plate 38 fixed to head 1. Said spring is provided to elastically urge roller 34 downwardly against the workpiece, which slides on the bed plate, so that roller 34 may closely follow the workpiece profile and detect variations in thickness. Arm 33, much longer than arm 32, carries, near its free end 35, a pin 36 to which is attached a spring 37 whose other end is attached to a plate 38 fixed to head 1. Said spring is provided to elastically urge roller 34 downwardly against the workpiece, which slides on the bed plate, so that roller 34 may closely follow the workpiece profile and detect variations in thickness. Arm 33, much longer than arm 32, carries, near its free end 35, a pin 36 to which is attached a spring 37 whose other end is attached to a plate 38 fixed to head 1. Said spring is provided to elastically urge roller 34 downwardly against the workpiece, which slides on the bed plate, so that roller 34 may closely follow the workpiece profile and detect variations in thickness.

Contact 39 normally rests spaced between two stationary contacts 41 and 42, the latter being part of another electrical conductor 43 of the same circuit, contact 39 being movable to contact either of the stationary contacts 41 and 42.

Pursuant to every variation in thickness detected by roller 34, the follower 31 oscillates about its own fulcrum at 32, causing a movement of contact 39 towards one of the other of the contacts 41 and 42, thus closing the circuit formed by electrical conductor 40 and by electrical conductor 43 when the thickness variation is of a certain minimum amplitude. Contacts 41 and 42 are supported by a block of insulating material 44 fixed above an arm 45 hinged on a support 46, the bed plate 4 and having the other arm elastically pulled by a return spring 47 against said support 46. An adjustment knob 48 is provided on support 46 to finely adjust the positions of contacts 41 and 42 with respect to contact 39 of the follower 31.

Since the workpiece which slides under roller 34 could curl up due to the combined actions of the feeder 10, which pushes it towards the rear of the machine, and of the roller 34, which presses it against the bed plate 4, the sewing machine has been supplied with a supplementary rear feeding device 49 (FIGURES 1 and 2) which pulls the work in synchronization with said feeder 10, as bit by bit this last moves it from the sewing area.

The feeding device 49 comprises two rollers 50 and 51, the first of which is mounted idle about a spindle 52 which is supported by a fork 53 which is pivoted on the base of a bar 54. Bar 54 is mounted in a bushing supported in a projecting portion of head 1. Roller 50 is resiliently urged towards the lower roller 51 by conventional not shown spring means. The lower roller 51 is rotatably mounted within the bed plate 4 and is driven in a conventional manner by the same means which drives the presser foot 9. Said roller 51 transmits its feeding movement to the upper roller 50 through contact there with since it partially protrudes upwardly from the bed plate.

Immediately following the feeding device 49, there is a cutting device 56 (FIGURES 1 and 5) composed of a counter blade 57 fixed to the bed plate 4, of a blade 58 supported by a movable blade holder 59 which is hinged on spindle 60 of a support 61. Blade holder 59 is provided with an arm 62 which has a slot into which is engaged the protruding stem 63 of the axially reciprocatable core of a double-acting solenoid 64 which is also mounted on support 61. A spring 65 having its ends attached respec-
Solenoid 89 (FIGURE 1) has an axially movable core 90 whose stem is pivoted to a movable wall or guide baffle 91 which is longitudinally spaced from the line of symmetry of pole 51. The upper end walls 93 joined together by two transverse walls 94 and 95. Movement of guide baffle 91 is determined by the movement of the movable core 90 which moves against the action of a return spring 96. When the solenoid 89 is excited, as is the case shown in FIGURE 1 by the continuous line representation of baffle 91, the upper end of the baffle 91 bears against wall 94 to form, in cooperation with walls 93 and 95, an entrance slot into a container for scrap pieces. When solenoid 89 is not excited, guide baffle 91 is pulled by the spring 96 against wall 95, as shown by the dotted line in FIGURE 1, to form, in cooperation with walls 93 and 94, an entrance slot into a container for good pieces.

In the electrical circuit control of the apparatus (FIGURE 8) the closing of contact CPA, actuated for example by means of a pedal not shown in the diagram, completes circuit 85 and, therefore, current flows in the winding ATER of the solenoid switch TER which, in turn, by closing its contacts starts the motor M.

As previously described, strip 73 is cut into many pieces whose length is equal to the circumferential length of roller 50 defined between two successive lobes 71 of the cam 70, which lobes effect the closing of leaf spring 69 against contacts 68 for the excitation of solenoid 64 which in turn actuates the blade 58.

Supposing that a first cut has been made at point A (FIGURE 7), the successive cut will be affected at point B which is longitudinally spaced from A, as already noted, by a length equal to half the circumference of roller 50. In fact, point B will be under the blade 58 when said roller 50 has completed a half revolution and a successive lobe 71 has reached roller 72 of leaf spring 69. Said point B passes, during its advancement, under roller 34 of the follower 31 before reaching said blade 58 and if the thickness of the section of strip 73 corresponding to point B is free of defects, i.e., it is good, said follower does not undergo any movement and, therefore, nothing intervenes to stop said strip from being cut at point B when it gets under blade 58 and the lobe 71 has pushed leaf spring 69 against contacts 68. Moreover, if the thickness of leaf spring 73 comprised between A and B does not present any defects relative to thickness, this will be held to be good and will be sent into the container for good pieces.

Since the follower 34 does not move at the passing of point B (FIGURE 7), the contact 39 remains equidistant from the contacts 41 and 42. The leaf spring 69, under pressure from the lobe 71, closes against contacts 68 through which can pass the discharge current of condenser C1, previously charged when the leaf spring 69 was closed against contacts 57 and through a contact ET2 which is normally closed and which excites the coil of a relay ATS1 for the closing of contacts ATS1 through which is excited the pushing winding of solenoid 64 which actuates blade 58 to cut said strip 73. Contemporaneously with the closing of contacts ATS1 the relay ATS moves its other contact ATS2 from the contacts 97 against contacts 98 through which passes the charge current for condenser C2.

At the termination of discharge from condenser C1, the relay ATS becomes de-excited causing the opening of contact ATS1 and the de-excitation of the pushing winding of said solenoid 64 and the movement of contact ATS2 back against the contacts 97 through which can pass the discharge current from condenser C2 for the excitation of the coil of a relay ATT. Relay ATT opens a contact ATT2, whose function will be described later, and closes a contact ATT1 through which is closed the current for exciting the winding of solenoid 64 for the raising of blade 58. At the termination of discharge of current from condenser C2, the relay ATT becomes de-excited, reopening the contact ATT1 and reclosing the other contact ATT2. Contemporaneously with the above described operations the passage of current through the contacts 68 and the leaf spring 69 also causes a passage of current through a contact ES1 bearing against contacts 99 which excites the coil of a second Nemax, and the rotor of the latter contact, the baffle 91 remains stopped in its rest position shown by the dotted line in FIGURE 1 forming, with walls 93 and 94, an entrance slot into the container for pieces through which slides the piece of strip 73 just cut.

In another instance the piece of strip 73 extending between A and B may be of good thickness, while at point B, where the next cut will take place, it may be of defective thickness, constituted for example by a gap 77 where material is missing between one off-cut and the next or by an overlap 76 of the ends of said off-cuts. In either case it is desired to prevent the blade 58 from cutting said strip, thereby sparing the blade from being unnecessarily worn. In this regard, any oscillation of the follower 31 consequent to the passage of the defective point under the roller 34 causes the closing of the contact 39, against one or the other of the contacts 41 and 42, thus causing the predisposition of the electrical control circuit into the position required for scraping the defective piece, into the position of not counting the scrapped piece, and into the position of not cutting the strip with said blade 58.

In the position of scraping the defective piece, the baffle 91 moves to the position shown by the continuous line in FIGURE 1, that is, against the wall 94 to form, with walls 93 and 95, the entrance slot into the container for scrap pieces. While a strip of constant thickness runs under the roller 34, the follower 31 remains with its contact 39 equidistant from contacts 41 and 42, but immediately upon the defective point arriving under roller 34 the follower 31 moves toward contact 41 or 42, which provokes the passage of current which excites the coil of the two relays RT and TAS, the latter being provided only to maintain the excitation on relay RT. In this regard, it could happen that the extent of the defect present in strip 73 is very short so that the duration of contact 39 bearing on contact 41 is too short for the current that passes through said contacts to completely excite said relay RT, for which reason it is necessary to provide an auxiliary relay TAS which is excitable even by currents of extremely small duration. Therefore, the small current that passes through contacts 39 and 41 is more than sufficient to excite relay TAS which moves its contact TAS1 from contacts 100 against contacts 101 through which passes the discharge current of condenser 102 of a timer 103 which excites the coil of relay RT.

The excitation of the relay RT causes the closure of a contact RT1 of the electric circuit 85 provided to keep the excitation in the winding ATER, even in the event that contact CPA is opened, until the defective part of the strip has passed the cutter device 56 and at least one subsequent cut on the part of blade 58 has been effected. All this is provided because it is desired that the sewing machine not be stopped with its electric control circuit excited and predisposed to perform a particular operation, thereby avoiding that the conditions determined by the movement of the follower 31 become altered at the recommencement of operation.

Contemporaneously with the closure of contact RT1, a contact RT2 also is closed by the holding of the excitation of the coil of a delaying relay ET whose function is that of effecting delayed actuation of its own contacts ET1 and ET2. The excitation of said relay effects the closing of the contact ET1 for the excitation of a relay RC which then becomes self-excited through the closing of the contact RC1. Besides the other contact, the relay RC closes the contact RC2 for the excitation of the relay ES which causes the excision of piezo counter NM, through the movement of a contact ES1 from contacts 99 to contacts 104, and the excitation of the solenoid 89 through the closing of contact ES2. At the excitation of solenoid 89, its core is drawn back thus...
moving baffle 91 towards the wall 94 so as to close the entrance shute to the container for good pieces and open the way into the container for scrap pieces.

To the closing of contact ET1 corresponds the opening of contact ET2 which prevents condenser C1 from exciting the coil of relay ATS by discharge of its current when the leaf spring 69 bears against contacts 68 under pressure from lobe 71, and this condition persists until the defective part of strip 73 has passed cutter device 56.

As the follower 31 is placed at a certain distance from the cutter device 56 and, therefore, with its roller 34, inspects sections of strip which do not correspond to those which are at the same instant under blade 58, it is necessary that the conditions due to defective thickness discovered by roller 34 are maintained in the electrical control circuit until said defective section under consideration has passed said cutter device. This is made possible by the fact that the working speed of the machine is uniform so that the time taken by a defective point to traverse the distance which separates the roller 34 from said cutter device is constant and corresponds to the discharge time of condenser 102 of the timer 103 which, for the duration of said time, keeps relay RT excited.

In fact, when a defective point A arrives under the blade 58 of the cutter device 56, lobe 71 has been moved against contacts 68. Since contact ET2 is opened by the excited relay ET no discharge current from condenser C1 can pass to excite relay ATS, so that blade 58 remains in the stopped position and the strip 73 continues its advancement under the action of said feeder organs. Until relay ATS is excited by current passing through contacts 68 and leaf spring 69, relay ATT also remains de-excited and relay RC remains excited, whereby the machine continues to function as above described.

Let it now be supposed that the cut at point A had not been made because of a defective thickness at that point and that the length of strip between points A and B is either good or defective but that at point B itself the strip 73 possesses a thickness suitable to cut. Since defective point A placed the circuitry in a condition of not cutting, the circuitry remains in that condition even after the defective portion passes roller 34 and up until non-defective point B passes under roller 34, whereupon the follower immediately assumes its normal position, being influenced by the non-defective strip thickness, thereby moving contact 39 away from contact 41.

The opening of contacts 39, 41 interrupts the passage of currents of relays RT and TAS which, however, remain excited by virtue of the discharge of condenser 102 of the timer 103, thereby permitting, as aforementioned, point B to reach the cutter device 56 before the cut occurs. At the cessation of excitation of relay RT contact RT1 opens and so frees electric circuit 85 from automatic operation so that the motor M can be stopped at any time through deliberate actuation of contact CPA. Contact RT2 also opens and thereby interrupts the excitation of relay ET which results in the opening of contact ET1 and the closing of contact ET2. From this instant the cutter device 56 can effect its cutting movements while the baffle 91 remains under the action of solenoid 89 closed to the entrance shute for the good pieces. The piece counter NM also remains de-excited.

In fact, while the opening of contact ET1 does not cause any changes, relay RC being self-excited by means of its cut or closed contact RC1, the closing of contact ET2 makes it possible for the discharge current of condenser C1 to excite relay ATS when the leaf spring 69 bears against the contacts 68 under pressure from a lobe 71. In the meantime relay RC continues to be excited as also is released through the closed contact RC2 so that the winding of solenoid 89 also remains excited. At the moving of leaf spring 69 to against contacts 68, the discharge current of condenser C1 excites the coil of relay ATS which causes the closing of contact ATS1 and the cutting of the piece of strip at point B, and the movement of contact ATS2 against contacts 98 to charge condenser C2. Upon the completion of discharge of condenser C1, relay ATS becomes de-excited returning the contact ATS1 to the open position and the contact ATS2 back against contacts 97 which permit the discharge current of condenser C2 to excite relay ATT which opens contact ATT2 and the closing of contact ATT1.

The closing of the latter contact permits the solenoid 64 to return blade 58 into its rest position where it will be kept by the action of spring 65; the opening of contact ATT2 causes the de-excitation of relay RC which opens contact RC1 and contact RC2 which causes the de-excitation of relay ES.

In the meantime the defective piece of strip just cut slides into the container for scrap pieces through the shute formed by said baffle 91 and by said walls 93 and 95. De-excitation of relay ES results in the return of contact ES1 to against contacts 99 which re-establishes the circuit of the piece counter NM which does not register a count at this point since the cut has already taken place. De-excitation of ES also opens contact ES2 which de-excites solenoid 89 which results in the return of baffle 91 to its rest position under the action of spring 96.

Upon the exhaustion of the discharge current of condenser C2 relay ATT also becomes de-excited causing the opening of contact ATT1 and the closing of contact AT22 which corresponds to the rest position of the entire electrical control circuit.

In circuit 85 there is provided a switch PE for the emergency stopping of the machine which switch, if opened, interrupts the flow of current into the winding of the relay ET thereby de-exiting solenoid TER whose related contacts open, thus interrupting the passage of current through line 81 to the motor M. On the other hand, if the motor 84 and on one of the two conductors of the line 86 there is also provided a switch E for isolating that part of the electrical control circuit related to actuation of cutter device 56, piece counter NM, and baffle 91. The opening of switch E allows the sewing machine to produce a continuous strip.

It is to be understood that while a preferred embodiment of realization has been described in detail, the invention is also intended to cover all equivalents, substitutions, and modifications, which are obvious from the herein presented disclosure or within the purview of one skilled in the art.

What is claimed is:
1. A sewing machine including means for folding over and sewing two opposite edges of a material to form a double layer elongate strip thereof, and comprising: a cutter means arranged subsequent to the sewing means along the path of travel of said material for cutting the sewn strip into respective lengthwise segments along transverse longitudinally spaced apart lines along the strip length, a receiving means having a plurality of separate sections arranged subsequent to the cutter means along said path of travel for receiving said segments, a movable guide means associated with said receiving means and movable or equally or different positions relative thereto for guiding the successively cut segments into either of said separate sections, a follower means arranged ahead of said cutter means and being responsive to cut variations in the thickness of the segments in order to actuate said guide means to guide the successive segments onto either of said sections in accordance with the thickness characteristics of said segments along their length.
2. The sewing machine of claim 1, said follower means being associated with said cutter means whereby said cutter means is actuated in an uncut opening by said follower means in accordance with the thickness characteristics of the strip.
3. The sewing machine of claim 2, said cutter means including a movable blade, a strip feed means arranged
between the sewing means and the cutter means for feeding the sewn strip to the cutter means, an actuating means driven by said feed means to actuate said movable blade periodically at fixed intervals corresponding to a fixed length of strip being fed to said cutter means, said follower means being arranged to interrupt the actuation of said blade by said actuating means pursuant to said follower means sensing a thickness variation along said strip.

4. The sewing machine of claim 3, said feed means comprising a pair of cooperating feed rollers, said actuating means comprising a cam integrally rotatable with a one of said feed rollers, an electrical power means for driving said blade, said cam cooperating with a first electrical switch means to periodically actuate said power means through related electrical circuitry to drive said blade, said follower means cooperating with a second electrical switch means to open the circuit to said blade power means pursuant to movement of said follower means from a pre-established neutral position.

5. The sewing machine of claim 4, including an electrically operated counter means for counting the strip segments which are guided by said guide means into a first of said sections, said second electrical switch means being arranged to open the circuit to said counter means pursuant to the aforementioned movement of said follower means.

6. The sewing machine of claim 4, including a second electrical power means for moving said guide means to a one of said positions, said second electrical switch means being arranged to actuate said second power means pursuant to said aforementioned movement of said follower means.

7. The sewing machine of claim 6, including a resilient means for urging said guide means to another of said positions.

8. The sewing machine of claim 5, said cam serving also to periodically energize said counter means in correspondence to the aforementioned periodic actuation of said blade power drive means.

9. The sewing machine of claim 3, said follower means being responsive to thickness of the strip at a point spaced at a distance ahead of said cutter blade along the path of travel of the strip, and including a delaying device associated with said follower means and with said actuating means for delaying the aforementioned interruption of the actuation of the blade for a period of time at least equal to the period it takes for the strip to traverse said distance.

10. The sewing machine of claim 9, including an electrical power device for driving said blade, said actuating means comprising a first electrical switch means to periodically actuate said blade power device through related electrical circuitry to drive said blade, said follower means cooperating with a second electrical switch means to open the circuit to said blade power device pursuant to movement of said follower means from a pre-established neutral position, said delaying device being adapted to effect the opening of the blade power device circuit after the follower means ceases its aforementioned cooperation with said second switch means.

11. The sewing machine of claim 10, including a second electrical power device for actuating said movable guide means to a position for guiding a strip segment into one of said sections, said follower means being arranged to actuate the guide means power device pursuant to said follower means moving from said neutral position thereof, said delaying device being associated with the electrical circuitry of said second electrical power device whereby said delaying device serves to delay the actuation of said guide means by said follower means for a period of time subsequent to the occurrence of said follower means moving from said neutral position and back thereto.

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