

[54] AUTOMATIC EMBLEM SEWING APPARATUS

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 [58] Field of Search 112/121.15, 104, 113, 99, 102, 112/121.11, 12.12, 219, 121.29, 203, 204, 205, 212, 214, 252; 271/1

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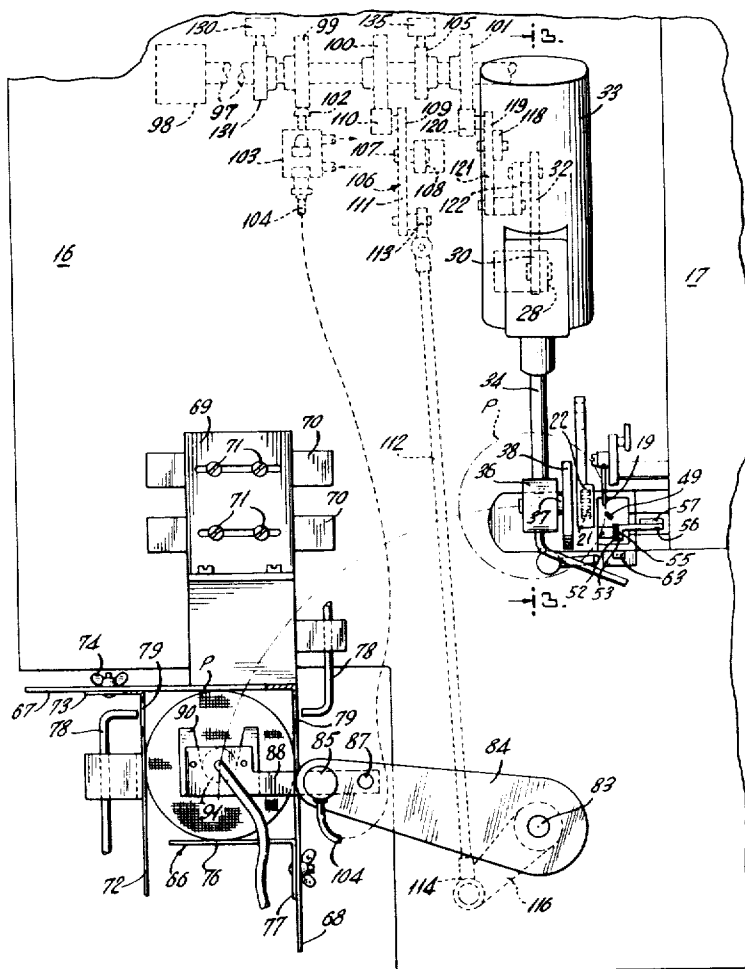
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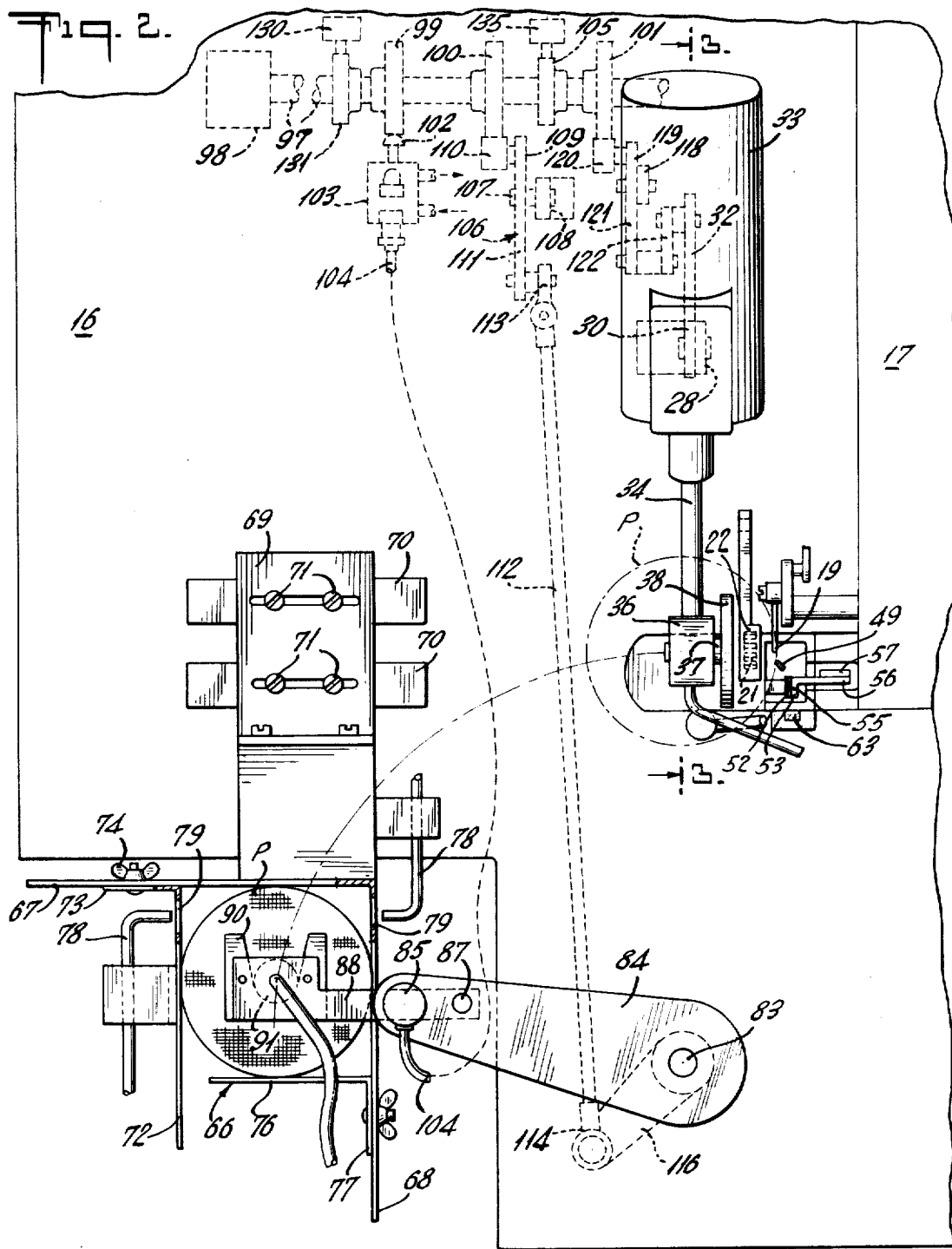
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[57] ABSTRACT

An apparatus for automatically applying finishing stitches around the borders of emblems includes a sewing machine with an automatic needle positioner, a vacuum pickup mechanism for transferring an emblem from a stack thereof to the sewing station, and an emblem guide mechanism including a servomotor-driven feed wheel laterally spaced from the sewing machine feed dog and controlled by an emblem edge sensor positioned rearwardly of the needle position. A stitch chain cutter actuated by the sewing machine trails the edge sensor and a stitch chain sensor trails the knife. A network controls the sequence of operations to raise the feed wheel and machine foot piece, transfer an emblem from the stack to the sewing station, to lower the wheel and foot piece, to start the sewing machine to advance the emblem with the last emblem attached thereto by a stitch chain and to apply stitches thereto, to continue the sewing following the sensing of the chain for a predetermined interval to form an overlap of the stitching trailing and leading ends, the connecting chain being cut and the last emblem discharged, to raise the foot piece and speed up the wheel for a predetermined period to swing the sewn emblem from the sewing station while forming a stitch chain, to stop the machine with the needle raised, to raise the feed wheel and to repeat the cycle. The machine is disabled upon thread breakage, improper label positioning and a pressure rise in the vacuum.

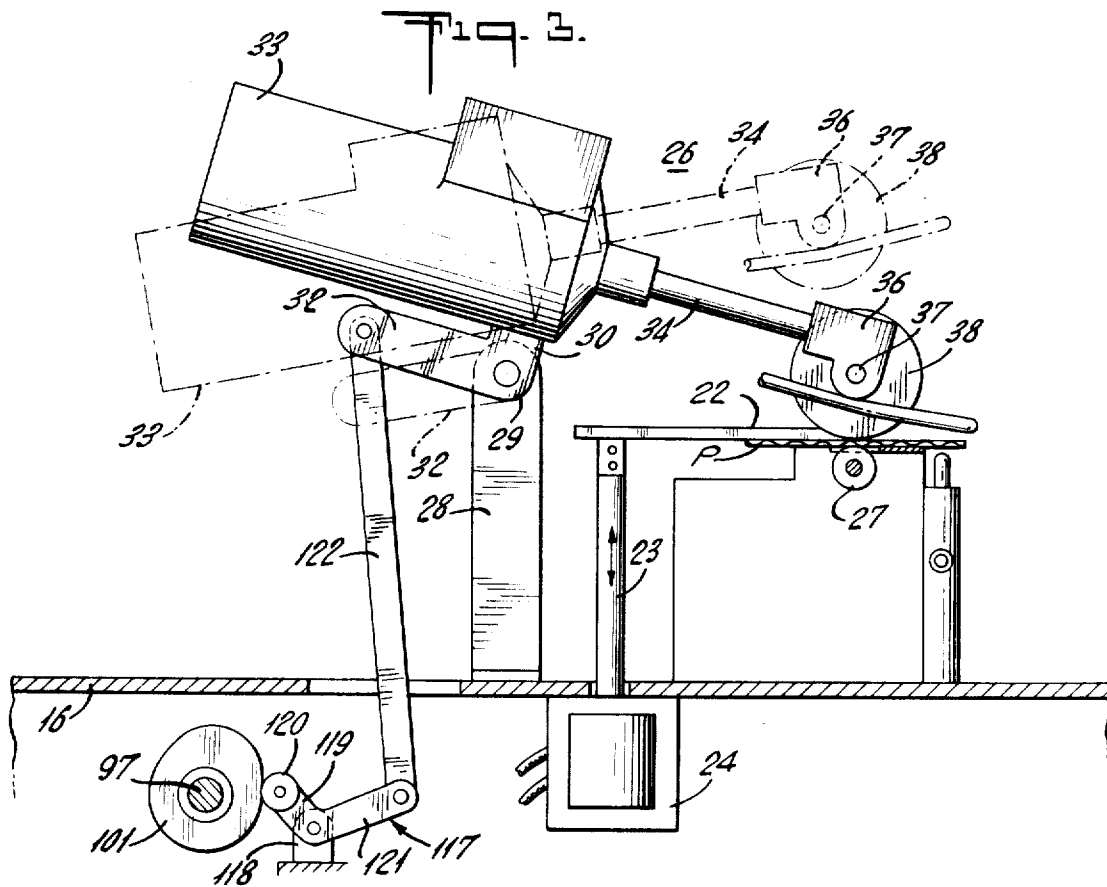
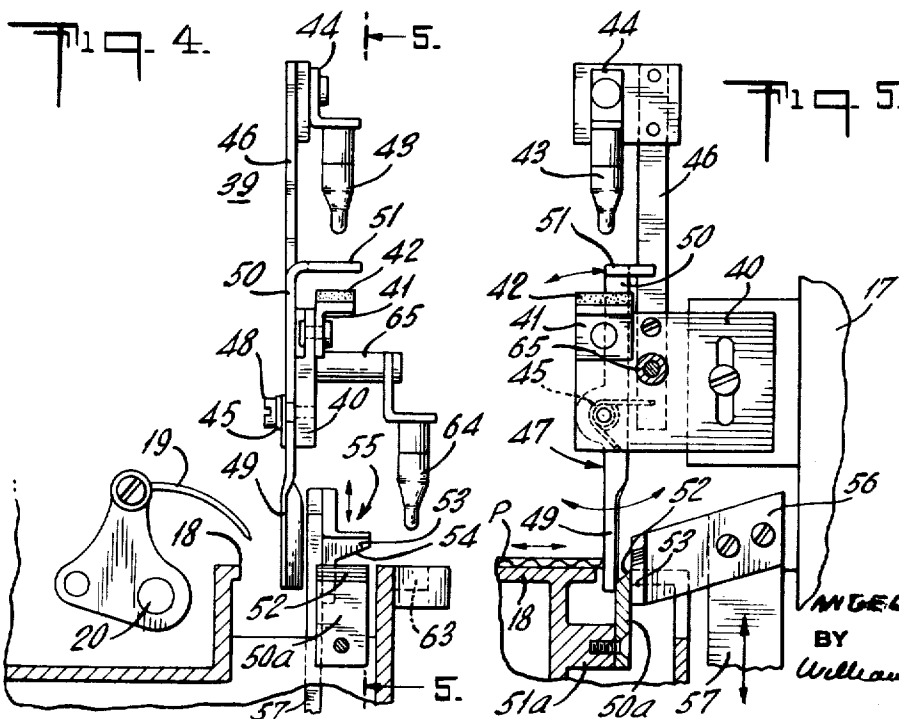
16 Claims, 12 Drawing Figures



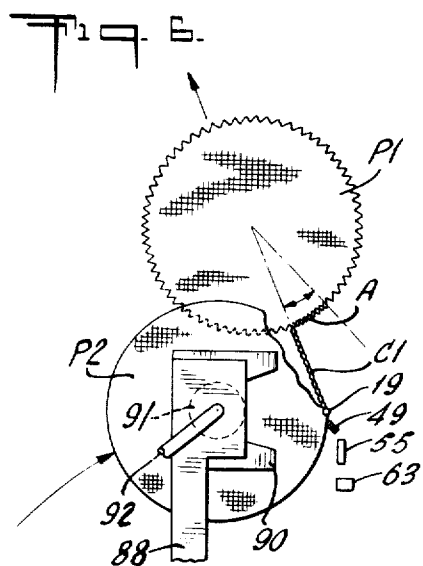
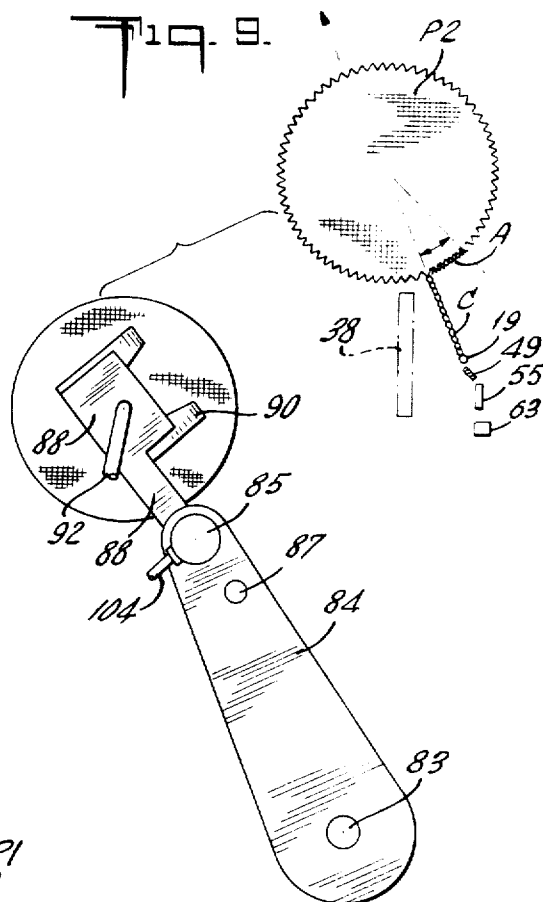
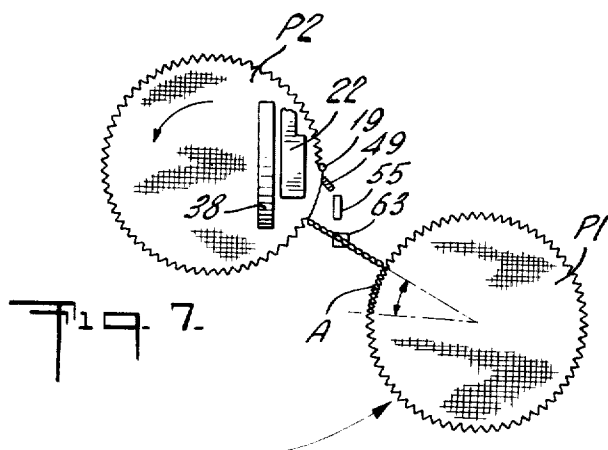
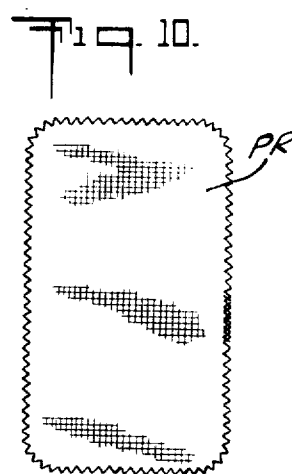
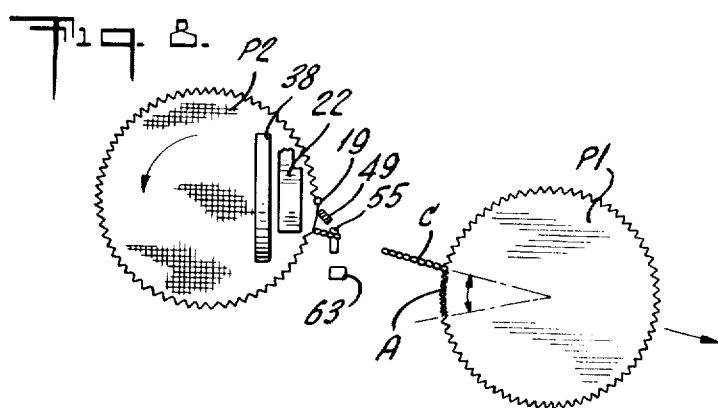


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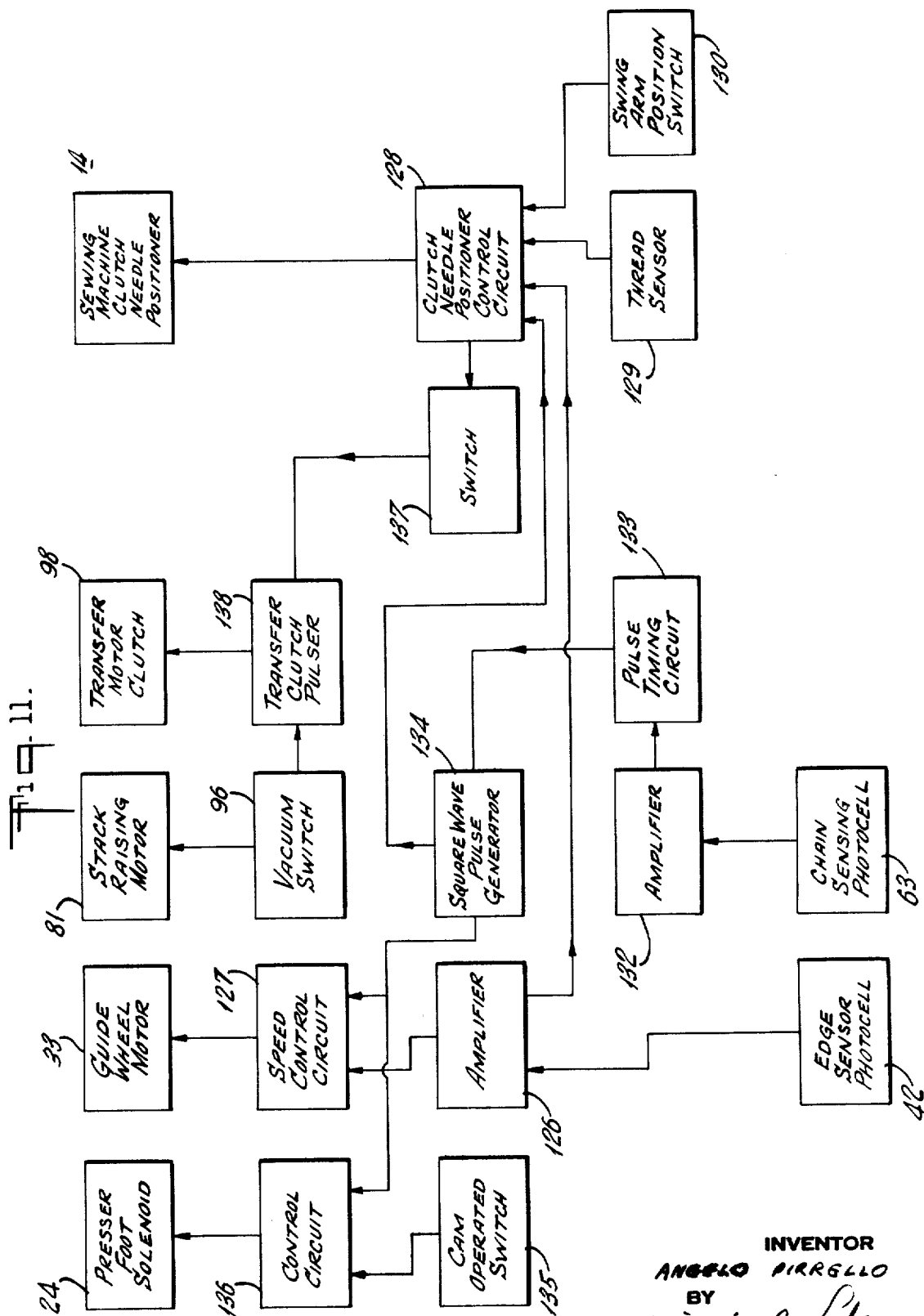
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AUTOMATIC EMBLEM SEWING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates generally to improvements in sewing apparatus and it relates particularly to an improved apparatus for automatically applying finishing stitches to the borders of successively fed work pieces such as cloth emblems and the like.

In the production of cloth emblems such as military patches and insignia in which the insignia and information may be embroidered or otherwise applied to a cloth backing, the edge of the shaped backing is initially in a rough state and is finished by applying a finishing stitch along the peripheral border of the backing piece which masks the edge thereof. This finishing operation is performed by a chain stitch or similar type of sewing machine and the pieces are individually manually fed and guided by the sewing machine operator. This finishing operation is highly time consuming and requires a high degree of skill thereby contributing greatly to the cost of the end product, and the uniformity and quality of the product leave something to be desired.

SUMMARY OF THE INVENTION

It is a principal object of the present invention to provide an improved sewing apparatus.

Another object of the present invention is to provide an improved apparatus for automatically sewing successive work pieces.

Still another object of the present invention is to provide an improved apparatus for automatically sewing the peripheral borders of work pieces successively automatically fed thereto.

A further object of the present invention is to provide an improved apparatus of the above nature characterized by its versatility, adaptability, ruggedness, and ease of operation.

The above and other objects of the present invention will become apparent from a reading of the following description, taken in conjunction with the accompanying drawings which illustrate a prepared embodiment thereof.

In a sense the present invention contemplates the provision of an automatic sewing apparatus comprising a motor-driven sewing machine including a needle movable between advanced and retracted positions through a sewing station, means for storing a plurality of work pieces, means for transferring a work piece from said storage means to said sewing station, guide means for leading said work piece at said sewing station with the border of said work piece advancing past said sewing point, means motivating said sewing machine to apply stitches to said guided work piece border following the transfer of said work piece to said sewing station, and means for discharging said work piece from said work station after said sewing machine has applied stitching to said work piece along a predetermined length of said border.

In the preferred form of the improved apparatus, the sewing machine is provided with an automatic needle positioner which positions the needle in a retracted position upon the deactivation of the sewing machine, a feed dog, and a presser foot of conventional construction. A nibbler type thread or chain stitch cutter is located on the sewing machine rearwardly and laterally offset from the sewing point and is motivated by the sewing machine drive concurrently with the operation of the sewing machine. The guide means comprises a wheel engaging the work piece at the work station at a point laterally offset from the sewing point and is rotated about a transverse axis at a variable speed by a servomotor controlled by a feeler element engaging the work piece edge at a point shortly rearwardly of the sewing point. A photocell is positioned rearwardly of the stitch chain cutter and upon the sensing of the stitch chain it activates a timer which stops the sewing machine a predetermined interval thereafter. The transfer mechanism includes a vacuum pickup head carried on a pivoted arm which swings from a vertical stack of work pieces to the sewing station and is oscillated concurrently with the raising and lowering of the guide wheel. A network con-

trols the sequence of operations to start the sewing machine when a piece is in a proper position at the sewing station, as sensed by the feeler, and the transfer arm returns and guide wheel and presser foot are lowered. The guiding of the work piece which carries the last sewn piece and the sewing continue until the connecting chain stitch is sensed and the sewing is continued for an adjustable predetermined interval, the chain being severed following its sensing. After the trailing and leading stitches overlap, the foot piece is raised and the guide wheel driven at high speed to shift the work piece from the sewing station. Thereafter, the transfer mechanism is activated to initiate the next cycle. A vacuum switch connected to the vacuum line of the work piece pick-up controls the stack raising motor and the transfer mechanism drive.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary front elevational view, partially in section, of a sewing apparatus embodying the present invention, the transfer mechanism being shown in a retracted position;

FIG. 2 is a sectional view taken along line 2—2 in FIG. 1;

FIG. 2A is a partial view similar to FIG. 2 the transfer mechanism being illustrated in advanced position;

FIG. 3 is a sectional view taken along line 3—3 in FIG. 2, the guide wheel being shown by broken line in a raised position;

FIG. 4 is an end elevational view, partially in section of the operating and sensing components of the sewing station;

FIG. 5 is a sectional view taken along line 5—5 in FIG. 4;

FIG. 6 is a plan view at the sewing station illustrating the application of a work piece at the start of a sewing cycle;

FIG. 7 is a view similar to FIG. 6 illustrating the sensing of the work piece connecting chain approaching the end of a sewing cycle;

FIG. 8 is a view similar to FIG. 6 showing the severing of the stitch chain;

FIG. 9 is a view similar to FIG. 6 showing the discharge of the work piece and the start of the next successive cycle;

FIG. 10 is a plan view of another form of work piece; and

FIG. 11 is a block diagram of the apparatus control and interlock network.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings which illustrate a preferred embodiment of the present invention, reference numeral 10 generally designates the improved apparatus as employed in the application of finishing stitches to the full borders of individual work pieces or emblems P. Apparatus 10 includes a storage section 11, an emblem transfer section 12, a sewing section 13 and a timing control section 14. Storage section 11 holds a stack S of emblems P, the uppermost of which is periodically picked up and carried by transfer section 12 to sewing section 13 where border stitching is automatically applied thereto and the finished emblem then discharged.

Apparatus 10 includes a suitably supported base plate 16 upon which is mounted an edge or border stitching sewing machine 17, for example, a chain stitch machine, which, except as hereinafter explained is of generally conventional construction. Machine 17 is driven by a main drive shaft connected to a drive motor through an electrically actuated clutch and includes a sewing station defining emblem supporting plate 18. A curved needle 19 is oscillated during the sewing operation about a shaft 20 between a retracted position and an advanced position projecting through a sewing point, and an automatic needle positioning mechanism of known construction, for example as described in U.S. Pat. No. 3,209,713 granted Oct. 5, 1965 to S. M. Cohen et al., is provided for positioning needle 19 in a retracted position upon deactivation and stopping of sewing machine 17. A thread is fed to needle 19 from a source of thread through thread tensioning and feed devices and a switch element engages the thread to sense any breaking thereof. A work piece feed dog

21 registers with an opening in plate 18 proximate the sewing point and is driven with needle 19, and a presser foot 22 is in vertical alignment with feed dog 21 and is mounted on a vertical bar 23 connected to the spring raised armature of a solenoid 24 so that the presser foot 22 is lowered upon energization of solenoid 24 and raised upon deenergization thereof.

In order to guide the border of an emblem P at sewing station 18 past the sewing point there is provided an automatic work guide mechanism 26 (see FIG. 3) of the general type described in U.S. Pat. Nos. 3,034,781 and 3,337,212, and which includes a small idler wheel 27 transversely offset from feed dog 21 and freely rotatable about a transverse axis, with its upper peripheral surface registering with an opening in plate 18 and in the plane of the top face thereof. A vertical post 28 is located atop base plate 16 forwardly of sewing station 17 and pivotally supports at the top thereof a bell crank 29 rockable about its knee and including an upwardly directed arm 30 and a forwardly directed arm 32. A longitudinally-extending variable speed servomotor 33 is mounted on and swingable with crank arm 30 and includes an elongated rearwardly projecting drive shaft inclosed in a tubular housing 34 axially projecting from motor 33. A right angle drive transmission 36 is supported at the free end of housing 34 and includes an output drive shaft 37 on which is mounted a guide wheel 38 which engages the upper periphery of idler wheel 27 when crank 29 is rocked to depress the drive end of motor 33 and guide wheel 38.

Guide wheel 38 is normally driven by servomotor 33 so that its lower periphery advances in the feed direction of dog 21 and when its peripheral speed is greater than the dog feed speed emblem P is rotated clockwise as viewed in FIG. 2; when the guide wheel speed is equal to the dog feed emblem P is advanced without turning; and when it is less than the dog feed speed emblem P is turned counterclockwise. The speed of servomotor 33 is controlled by a mechanism 39 (FIG. 4) which senses and is responsive to the edge of an emblem shortly rearwardly of the sewing point to increase the speed of motor 33 when the edge of such emblem P trailing the sewing point is to the left of the sewing sensing point as viewed in FIG. 2 and to decrease the motor speed when the emblem edge is to the right, the amount of speed increase or decrease from the straight away speed being dependent upon the amount of transverse offset of the emblem edge from the medial sensing position. Mechanism 39 includes a vertical mounting plate 40 supported for vertical adjustment on sewing machine 17 by means of a screw engaging a vertical slot in plate 40. Fixed to the upper outer corner of plate 40 is an angle bracket 41 atop which is located an upwardly facing horizontal photocell 42 in the shape of a rectangular wafer which may be of a silicon photovoltaic material or which may be other photosensitive material, for example, a photoconducting material, and of other shape. A suitably energized electric lamp 43 illuminates and is supported above photocell 42 by a bracket assembly 44 mounted atop a vertical post 46 connected at its bottom to plate 40.

An emblem edge sensing lever 47 is supported for swinging about a longitudinal axis by a pivot screw 48 engaging an intermediate opening in lever 47 and a threaded bore at the lower outer corner of plate 40 and is resiliently urged counterclockwise as viewed in FIG. 5 by a hairpin spring 45 supported by pivot screw 48. Lever 47 includes a twisted lower arm or sensing section 49 having a smoothly curved or rounded outer edge projecting into a transversely extending opening in plate 18 at a point shortly rearwardly of the sewing point. Lever 47 also includes an upper arm 50 extending above pivot 48 and terminating in a horizontal masking plate 51 positioned between lamp 43 and photocell 42 and proximate photocell 42. As sensing lever 47 is swung by spring 45 and by the edge of advancing emblem P at the sewing station mask 51 is moved thereby to vary the area of photocell 42 which is exposed to the light from lamp 43 and hence the output of photocell 42. The speeds of the servomotor 33 and wheel 38 are varied in response to the photocell output to control the direction of

feed of emblem P by any suitable network 127 such as those described in the above identified U.S. Pat. Nos. 3,034,781 and 3,337,212.

A chain stitch severing mechanism is located proximate the sewing station rearwardly of feeler arm 49 and offset to the right thereof and includes a stationary blade or cutting block 50a mounted on a bracket bar 51a integrally formed with and located below plate 18. Stationary blade 50a is directed upwardly from bar 51a to about the level of the top face plate 18 and includes a beveled longitudinally extending upper cutting edge 52 intersecting at its top the flat outer face of blade 50a. A movable blade 53 slideably engages the flat outer face of blade 50a and includes an upwardly rearwardly inclined bottom cutting edge 54 which cooperates with stationary cutting edge 52 to define a nibbler or scissor type cutter 55. Blade 53 has a laterally projecting integrally-formed arm 56 which is secured to a suitably mounted vertically reciprocable slide bar 57 having a cam follower 58 mounted at its lower end. Cam follower 58 engages a circular track 59 eccentrically formed in a disc cam 60 mounted on a shaft 61 which rotates with the operation of sewing machine 17 to reciprocate bar 57 and blade 53 thereby concurrently continuously actuating stitch chain cutter 55.

A second photosensitive element, such as a photocell 63, for example a silicon photovoltaic wafer having an upwardly directed sensitive face, is supported by a suitably mounted bracket at about the level of plate 18 rearwardly of cutter 55. A suitable energized electric lamp 64 is mounted on plate 40 and is supported rearwardly thereof by a spacer and bolt assembly 65 in vertical alignment with photocell 63 to illuminate cell 63. The cell 63 is connected to a network, as will be hereinafter explained, which controls various operating sequences of the apparatus in response to the interception of the light beam incident on photocell 63 by a traversing chain of stitches connecting an emblem P being sewn and the last sewn emblem.

Storage section 11 is of the nature of that described in U.S. Pat. No. 3,377,972 granted Apr. 16, 1968, to S. M. Cohen et al., and comprises an adjustable open-topped vertical compartment 66 including integrally formed front and side vertical walls 67 and 68 respectively, compartment 66 being mounted on the rear part of base plate 16 for transverse adjustment thereon by a bracket plate 69 projecting forwardly from wall 67 and transversely adjustably secured to a pair of longitudinally spaced mounting blocks 70 located on plate 16 by pairs of screws 71 registering with transverse slots in bracket plate 69 and engaging tapped bores in blocks 70. A compartment vertical side wall 72 opposing side wall 68 is provided with an outwardly directed front flange 73 which is secured to front wall 67 by bolts and wing nuts 74 engaging openings in flange 73 and horizontal slots in wall 67 to permit transverse adjustment of wall 72. A vertical front wall 76 provided with a rearwardly directed flange 77 is secured to side wall 68 by a similar wing nut, bolt and slot arrangement to permit longitudinal adjustment of wall 76. A pair of suitably mounted nozzles 78 are directed through opposite openings 79 in the upper front sections of side walls 68 and 72 and are connected through valves to compressed air to permit jets of air to be directed at the upper part of the emblem stack to assure the separation of the uppermost emblem P from the next underlying emblems attendant the transfer of an emblem from stack S.

A platform 80 is vertically movable in bin 66 and supports and raises the emblem stack S therein. Platform 80 is provided with means which engages and is raised by a vertical screw 81a which is driven by a slow speed motor 81 automatically energized to maintain the top face of stack S at a predetermined level in a manner which will be hereinafter described.

Transfer section 12 includes a bottom flanged tubular post 82 bolted to the top face of base plate 16 rearwardly of sewing machine 17 and has a vertical shaft 83 journaled therein and projecting through the top and bottom thereof. A horizontal radial swing arm 84 is affixed to the top section of shaft 83 and

has mounted atop its free end a vertical pneumatic cylinder 85 which houses a spring raised piston. A vertical piston rod 86 depends from cylinder 85 and a vertical slide rod 87 having an enlarged stop-defining top depends from swing arm 84 inwardly of and parallel to piston rod 86. Secured to the bottom of rods 86 and 87 and projecting outwardly of arm 84 is a vertically movable arm 88 which supports below its outer end, by means of a pair of depending support arms 89, a yoke shaped horizontal bracket plate 90.

An emblem vacuum pickup member or head 91 is supported by arm 88 and extends to the level of the underface of plate 90 between the arms thereof and is provided with bottom openings. The vacuum pickup head 91 is connected by a flexible hose 92 to the low pressure end of a vacuum pump 94 which is also connected to the actuating cylinder of a vacuum switch 96 to close switch 96 when the pressure in the vacuum line exceeds an adjustable predetermined pressure.

A transversely extending horizontal shaft 97 is suitably supported below base plate 16 forwardly of post 28 and is coupled to and rotated in response to a control signal, a single revolution by an electric drive mechanism 98 of known construction which includes a continuous running motor and clutch which is actuated for one revolution in response to an actuating signal thereto. Affixed to and rotatable with shaft 97 are five actuating cams including cams 99, 100 and 101. Cam 99 engages the actuating button 102 of a three-way valve 103 having a pair of inlet ports connected respectively to exhaust and to a source of compressed air and an outlet port connected by way of a flexible hose 104 to the upper part of cylinder 85.

Cam 100 motivates the emblem transfer swing arm 84 through a gear and link assembly which includes a bell crank 106 supported for rocking about its elbow below plate 16 rearwardly of cam 100 by a transverse pivot pin 107 suitably mounted on a bracket 108. Crank 106 includes an upwardly forwardly inclined arm 109 carrying at its free end a cam follower roller 110 which engages cam 100, and an upwardly rearwardly inclined arm 111. A connecting rod 112 has its forward end connected to the free end of crank arm 111 through a universal joint 113 and its rear end connected by a pivot coupling 114 to the free end of a crank arm 116 affixed to the bottom end of swing arm shaft 83. Spring means are provided for maintaining follower 110 in continuous engaging contact with cam 100.

Cam 101 actuates a mechanism for swinging motor 33 and guide wheel 38 between a retracted and an advanced position and comprises bell crank 117 pivotally supported at its elbow by a bracket 118 located below plate 16 for swinging about a transverse axis. Bell crank 117 includes a forwardly upwardly inclined arm 119 supporting at its free end a cam follower roller 120 which engages cam 101, and a rearwardly directed arm 121 which is connected by a link 122 to the free end of crank arm 32. Spring means are provided for maintaining follower 120 in engaging contact with cam 101.

Cams 99, 100 and 101 are so phased and shaped and related to the single revolution of the shaft 97 by drive 98 that during the rotation cycle of shaft 97 valve 103 is first actuated to connect cylinder 85 to exhaust whereby to raise the piston, arm 88, plate 90 and pickup head 91 together with a single emblem P. Cam 101 swings guide wheel 38 to its raised retracted position by way of the associated follower 120 and lever assembly, cam 100 then swings arm 84 to its advanced position with pickup head 91 supporting an emblem P at the sewing station, cam 101 swings guide wheel 38 to its lowered advanced position engaging the emblem P into pressing engagement with idler wheel 27, cam 100 fully retracts arm 84 and then cam 99 acts on valve 103 to connect cylinder 85 to air pressure whereby to lower the piston-motivated assembly and pickup head 91 to its depressed position in engagement with the top emblem P in stack S.

The sensing sequence control and timing network of the improved apparatus is illustrated in FIG. 11, the various specific circuits and components being of well known preferably solid state construction, and will be generally identified herein by their operative functions.

The emblem edge sensing photocell 42 is connected to the input of an amplifier 126 whose output is connected to the input of a network 127 controlling the speed of servomotor 33 in such manner that an increased output from photocell 42 attendant to shield 51 moving to the right as shown in FIG. 5 results in the slowing of motor 33, and a decreased photocell output increases the motor speed so that wheel 38 guides the border of an emblem P past the sewing point as earlier explained. An output of amplifier 126 is connected to an input of the sewing machine control network 128 to provide a "go" signal thereto when shield 51 substantially masks the light to photocell 42 as a consequence of the upper positioning of an emblem P. Also connected to the input of control circuit 128 is a thread sensing switch 129 which responds to the thread fed to the sewing machine so that circuit 128 is disabled upon the breaking of the thread, and a start switch 130 which is actuated by a cam 131 on shaft 97 to provide a start signal to circuit 128 during the movement of swing arm to its retracted position and after pickup head 91 has released the transferred emblem P and left the sewing station. Thus, when an emblem P is in proper position, as sensed by arm 47, and the sewing thread is continuous, the sewing machine is started by the output of circuit 128 upon the actuation of switch 130 during the return stroke of the emblem transfer mechanism.

The stitch chain sensing photocell 63 is connected to the input of an amplifier 132 whose output is connected to the input of an adjustable timing circuit 133, for example, a one shot multivibrator, whose output is in the form of a single pulse spaced an adjustable interval from the input signal thereto. The output of timing circuit 133 is connected to the trigger input of a single pulse generator, for example a one shot multivibrator, having a square wave pulse first output connected to an input of speed control circuit 127, and a sharp pulse second output at the termination of the square wave output connected to the stop input of sewing machine control circuit 128.

A circuit 136 whose output is connected to the presser foot actuating solenoid 24 has a first input connected to the first output of circuit 134 and responds thereto to deenergize solenoid 24 and cause the raising of presser foot 22 upon the start of the first pulse output from circuit 134 and the presser foot remains raised until solenoid 24 is energized by the momentary closing of a switch 135 by a cam 105 on shaft 97 during the lowering of guide wheel 38 so that presser foot 22 is in a raised position between the pulse output of circuit 133 and the subsequent lowering of guide wheel 38.

Thus, upon the sensing of a stitch chain by photocell 63, timing circuit 133 continues the sewing machine operation and emblem guiding by wheel 38 for a predetermined adjustable interval determining the length of stitching and hence the stitch overlap length and the triggering of timing circuit 134 raises foot piece 22 and provides a signal to speed control circuit 127 which overrides the signal from amplifier 126 to drive servomotor 33 at maximum speed independently of photocell 42. As a consequence, emblem P is discharged from the sewing station but is joined to the sewing point by a chain of stitches which is adjustably determined by the duration of pulse output from circuit 134 to circuit 127 at the termination of which pulse a second pulse is transmitted to circuit 128 to stop the sewing machine.

An output of the sewing machine control circuit 128, upon the stopping of sewing machine 17 following a sewing cycle, delivers a pulse through a selector switch 137 to the input of a circuit 138 which pulses the one revolution cycle of the single revolution drive mechanism 98 to effect a single revolution of transfer shaft 97. Vacuum switch 96 is connected to an input of circuit 138 to disable said circuit 138 and prevent the energization of drive 98 upon the closing of switch 96 due to a rise in pressure in the vacuum line above a predetermined level. Switch 96 is also coupled to and controls the energization of the platform raising motor 81 when switch 96 is closed as a result of excessive pressure in the vacuum line, circuit means preferably being provided to disable the energization of motor 81 during the rotation of shaft 97 particularly during the return stroke of the transfer mechanism.

Considering now the operation of the improved apparatus described above, upon the termination of a sewing cycle, a finished emblem P1, as illustrated in FIG. 6, which is discharged and offset from the sewing station is joined to the sewing thread at the sewing point by a stitch chain C. A pulse from circuit 128 through closed switch 137 at the end of the sewing cycle actuates transfer drive 98 when switch 96 is closed so that vacuum head 91 picks up an emblem P2 from stack S, the emblem separation being assured by air jets from nozzles 78, the emblem carrying head is raised as controlled by cam actuated valve 103 and swung by cam actuated arm 84 to the sewing station, the guide wheel 38 having been previously raised by cam 101 and presser foot 22 having been raised. Guide wheel 38 and presser foot 22 are then lowered to engage emblem P2 and transfer arm 84 is swung to its retracted position and pickup head 91 lowered. If an emblem P is not engaged and picked up by head 91 pressure in the vacuum line rises to actuate switch 96 and energize motor 81 to raise platform 80 and stack S until the topmost emblem P engages head 91 resulting in a drop in line pressure to open switch 96 and stop motor 81. If emblem P2 is properly positioned, as sensed by feeler 47, upon the actuation of switch 130 the sewing cycle is initiated by circuit 128 to apply stitches to the border of emblem P2 as guided by servomotor driven wheel as described above.

As emblem P2 is advanced it carries emblem P1 around therewith by the connecting stitch chain C to bring stitch chain C in registry with photocell 63, as illustrated in FIG. 7, to trigger pulsing circuit 133. The sewing and emblem advance continues to draw stitch chain C through cutter 55 which severs chain C, as seen in FIG. 8, and releases completed emblem P1 which is then discharged by a jet of air from cooperating nozzles into a suitable chute. The guiding and advancing of emblem P2 continues with the continued sewing to effect an overlap A of the border stitching until timing circuit 133 produces a pulse to trigger circuit 134, the output of which raises the presser foot 22 and effects the rapid drive of guide wheel 38 by motor 33 independently of feeler arm 49 to advance emblem P2 rapidly from the sewing station while a free stitch chain C is formed at the tail end of the border stitching. Upon termination of the speed control pulse output of circuit 134 a stop pulse is transmitted thereby to circuit 128 to stop the sewing machine and thereafter the above cycle is repeated. A single cycle may be effected by opening switch 137 between circuits 128 and 138 and manually connecting the input of circuit 138 to a starting pulse by means of a selectively actuated switch which may form part of switch 137. The length of the stitch overlap A may be adjusted by adjusting the pulse time delay of timing circuit 133 and the length of the stitch chain C may be adjusted by varying the output pulse duration of pulsing circuit 134.

It should be noted that the sewing cycle is not initiated if the emblem P is not properly positioned at the sewing station, or if a broken thread is present, or if swing arm 84 and pickup head 91 has not been retracted from the sewing station. Furthermore, the transfer cycle cannot be initiated in the absence of a picked-up emblem by head 91 as sensed by vacuum switch 96 which also controls stack raising motor 81.

Although the apparatus has been described as employed in the application of stitches to round emblems P it can be applied to the application of stitches to the border of labels of various shapes. For example to rectangular emblems PR as illustrated in FIG. 10 or to emblems or other workpieces of other configurations.

While there has been described and illustrated a preferred embodiment of the present invention it is apparent that numerous alterations, omissions and additions may be made without departing from the spirit thereof. For example, the sensitivities of the various amplifiers, such as 126 and 132, may be adjustable as well as the positions of the sensing photocells and feelers, the pressure response of switch 96 and the type of sewing machine 17.

I claim:

1. An automatic sewing apparatus comprising:
a motor-driven sewing machine including a needle movable between advanced and retracted positions through a sewing point at a sewing station;
means for storing a plurality of work pieces;
means for transferring a work piece from said storage means to said sewing station;
guide means for leading said work piece at said sewing station with the border of said work piece advancing past said sewing point;
means motivating said sewing machine to apply stitches to the border of said guided work piece following the transfer of said work piece to said sewing station;
means for sensing the position of a trailing end of said stitches on said work piece at said sewing station proximate the border of said work piece and said sewing point;
means responsive to said sensing means for stopping said sewing machine a predetermined interval following said response; and
means for discharging said work piece from said sewing station after said predetermined interval.

2. The apparatus of claim 1, wherein said interval is of a length to effect the application of stitches to the border of the said guided work piece for a distance in excess of the length of said border whereby the tailing and leading ends of said stitches on said border overlap.

3. The apparatus of claim 2, including means for adjusting the length of said interval.

4. The apparatus of claim 2, including means for driving said sewing machine a predetermined interval following the actuation of said discharge means for producing a chain of stitches attached to and trailing said sewn work piece.

5. The apparatus of claim 4, including cutting means positioned rearwardly of said sewing point for severing said stitch chain as said chain is carried by the next successive work piece toward said sewing point.

6. The apparatus of claim 5, wherein said cutting means is motivated concurrently with the motivation of said sewing machine.

7. The apparatus of claim 1, wherein said guide means comprises means for sensing the edge of a work piece at said sewing station proximate said sewing point, a guide wheel engaging said work piece at a point transversely offset from said sewing point and being rotatable about a transverse axis, and means for rotating said guide wheel at a speed responsive to said edge sensing means.

8. The apparatus of claim 7, wherein said discharge means comprises means for rotating said guide wheel at a relatively high speed independently of said edge sensing means.

9. An automatic sewing apparatus comprising:

- a motor-driven sewing machine including a needle movable between advanced and retracted positions through a sewing point at a sewing station;

- means for storing a plurality of work pieces;

- means for transferring a work piece from said storage means to said sewing station;

- guide means for leading said work piece at said sewing station with the border of said work piece advancing past said sewing point;

- means motivating said sewing machine to apply stitches to the border of said guided work piece following the transfer of said work piece to said sewing station;

- means for sensing the position of a trailing end of said stitches on said work piece at said sewing station proximate the border of said work piece and said sewing point; and

- means responsive to said sensing means for discharging said work piece from said sewing station a predetermined interval following said response.

10. The apparatus of claim 9, including means for stopping said sewing machine a second predetermined interval after said actuation of said discharge means.

11. An automatic sewing apparatus comprising:

a motor-driven sewing machine including a needle movable between advanced and retracted positions through a sewing point at a sewing station;
 guide means for advancing a work piece located in said sewing station along a predetermined path while actuating said sewing machine to apply stitching thereto;
 means for sensing the position of the trailing end of said stitching proximate said work piece periphery and said sewing point, and
 means responsive to said sensing means for stopping said sewing machine a predetermined first interval following said sensing of said stitching trailing end.
 12. The apparatus of claim 11, including means for discharging a work piece from said sewing station and means responsive to said sensing means for actuating said discharge means a predetermined second interval following said sensing of said stitching trailing end and before said stopping of said machine.
 13. The apparatus of claim 12, including means for adjusting the lengths of said first and second intervals.
 14. The apparatus of claim 10, including means for adjusting the length of said second interval.
 15. An automatic sewing apparatus comprising:
 a motor-driven sewing machine including a needle movable between advanced and retracted positions through a sewing point at a sewing station;
 means for storing a plurality of work pieces;
 means for transferring a work piece from said storage means to said sewing station;
 guide means for leading said work piece at said sewing station with the border of said work piece advancing past said sewing point;
 means motivating said sewing machine to apply stitches to the border of said guided work piece following the transfer of said work piece to said sewing station; and
 means for discharging said work piece from said sewing station after said sewing machine has applied stitching to said work piece along a predetermined length of said border,
 said transfer means including an arm swingable between said storage means and said sewing station, a vacuum pickup head mounted on said swingable arm and having a bottom opening and being connected to a source of reduced pressure, and transfer drive means responsive to the stopping of said sewing machine following the application of said stitching for advancing said transfer arm and said pickup head from said storage means to said sewing station and returning said transfer arm and pickup head from said sewing station to said storage means, and means responsive to a rise in pressure in said low pressure source above a predetermined level for disabling said transfer drive means.

bottom opening and being connected to a source of reduced pressure, transfer drive means responsive to the stopping of said sewing machine following the application of said stitching for advancing said transfer arm and said pickup head from said storage means to said sewing station and returning said transfer arm and pickup head from said sewing station to said storage means, and means responsive to a rise in pressure in said low pressure source above a predetermined level for disabling said transfer drive means.

16. An automatic sewing apparatus comprising:
 a motor-driven sewing machine including a needle movable between advanced and retracted positions through a sewing point at a sewing station;
 means for storing a plurality of work pieces;
 means for transferring a work piece from said storage means to said sewing station;
 guide means for leading said work piece at said sewing station with the border of said work piece advancing past said sewing point;
 means motivating said sewing machine to apply stitches to the border of said guided work piece following the transfer of said work piece to said sewing station; and
 means for discharging said work piece from said sewing station after said sewing machine has applied stitching to said work piece along a predetermined length of said border,
 said transfer means including an arm swingable between said storage means and said sewing station, a vacuum pickup head mounted on said swingable arm and having a bottom opening and being connected to a source of reduced pressure, and transfer drive means responsive to the stopping of said sewing machine following the application of said stitching for advancing said transfer arm and said pickup head from said storage means to said sewing station and returning said transfer arm and pickup head from said sewing station to said storage means, and said storage means including a platform supporting a stack of said work pieces and means responsive to a rise in pressure of said low pressure source above a predetermined level when said pickup head is in a retracted position for raising said platform.

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