Oct. 25, 1966 F. E. KALNING ET AL 3,281,044

MATTRESS BORDER EYELETTING MACHINE

Filed March 3, 1965 2 Sheets-Sheet 1

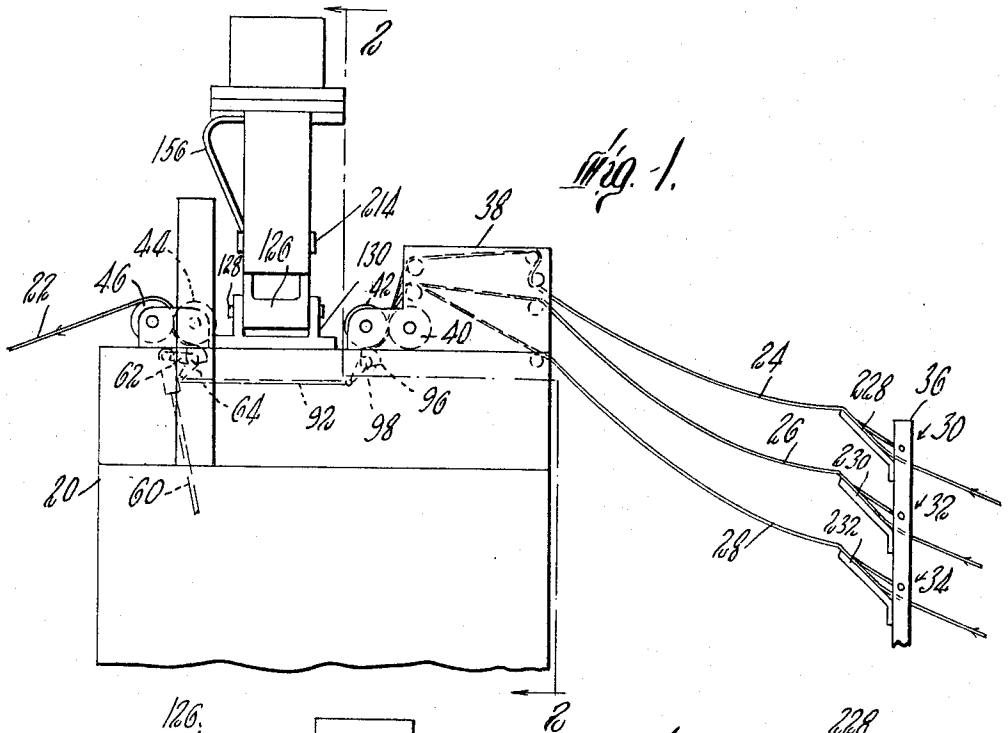


Fig. 1.

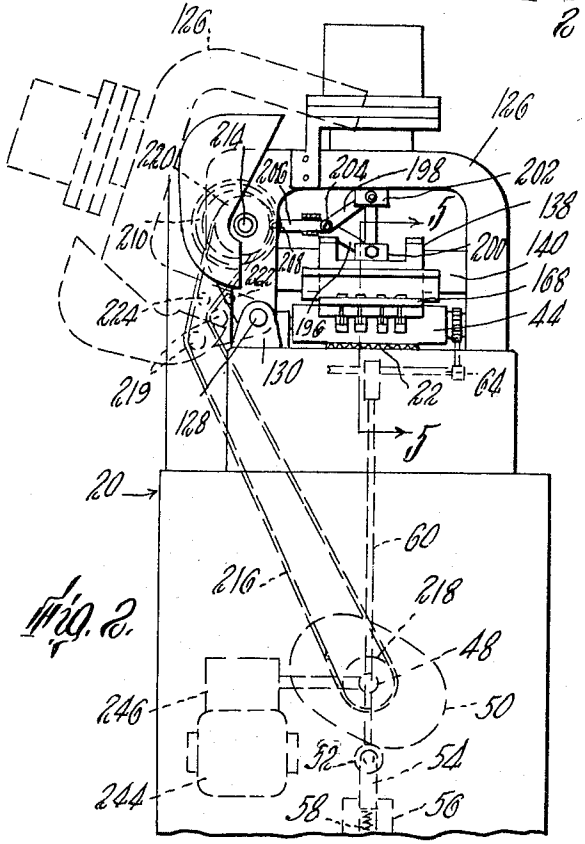


Fig. 2.

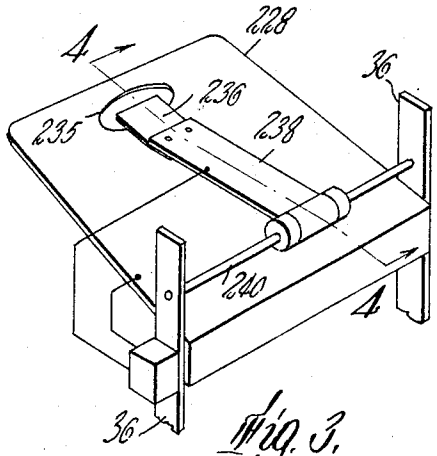


Fig. 3.

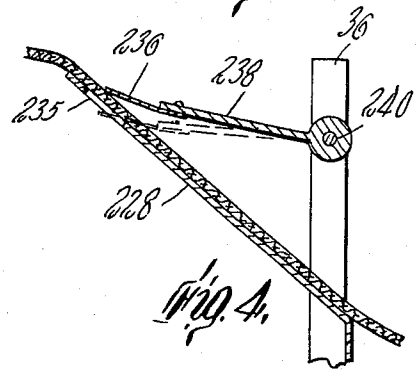


Fig. 4.

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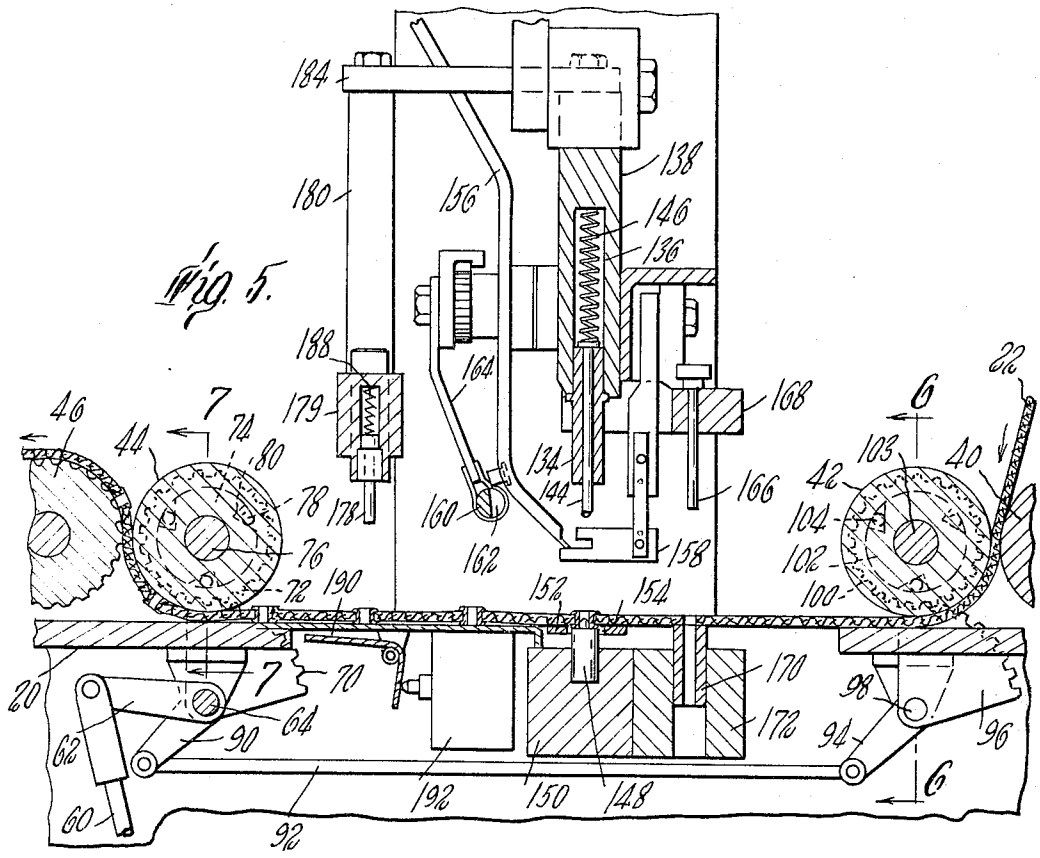


Fig. 5.

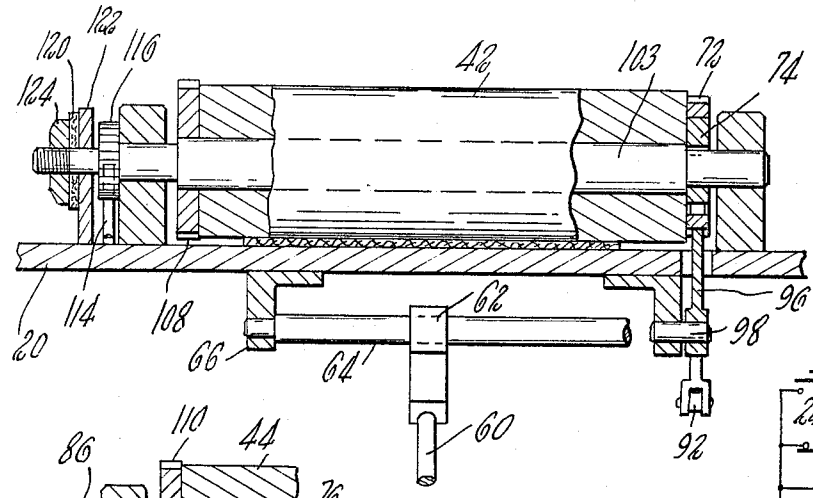


Fig. 6.

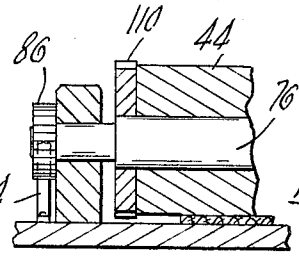


Fig. 7.

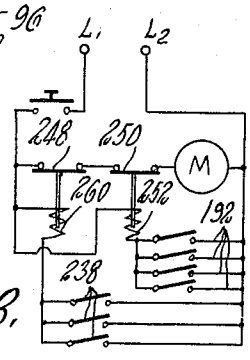


Fig. 8.

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MATTRESS BORDER EYELETTING MACHINE

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3 Claims. (Cl. 227—1)

The present invention relates to a mattress border fastening machine, and is herein disclosed as embodied in a machine for advancing in superimposed relation and for eyeletting together the assembled elements of a mattress border strip.

It is a principal object of the invention to provide a novel and effective device for detecting the presence or absence of individual eyelets in the eyeletted border strip as an indication that the eyeletting mechanism is not performing its intended function.

It is a further object of the invention to provide a mattress border eyeletting machine having a novel and improved mechanism for holding and for inserting eyelets in successive locations in the assembled border strip, and for thereafter detecting the presence or absence of the eyelet inserted in each said location.

It is a further object of the invention to provide a novel and improved mechanism for supporting in a stretched out position and for imparting incremental feed movements to the assembled border strip which will cause successive eyelet location in the strip to be presented accurately at each of a plurality of spaced apart operating stations of the machine.

It is a further object of the invention to provide a mattress border eyeletting machine having a novel and more efficient construction and arrangement of the eyeletting mechanism suitable for eyeletting together the superimposed elements of a border strip.

With these and other objects in view as may hereinafter appear the several features of the invention will be readily appreciated by one skilled in the art from the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a view in side elevation of a mattress border eyeletting machine embodying therein the several features of the invention;

FIG. 2 is a view of the machine shown in FIG. 1 looking from the right on a line 2—2, portions of the border strip assembling and feed mechanism having been removed;

FIG. 3 is a detail perspective view of one of the devices for detecting the exhaustion of a feeding border strip element;

FIG. 4 is a sectional view in side elevation taken on a line 4—4 of FIG. 3;

FIG. 5 is a sectional view in front elevation taken on a line 5—5 of FIG. 2, but on an enlarged scale, illustrating particularly the mechanism for supporting and advancing the assembled border strip, and elements of the eyeletting and eyelet detector devices;

FIG. 6 is a sectional view in elevation taken on a line 6—6 of FIG. 5 ilustrating the assembled border strip feed-in rolls and certain of the driving connections therefor;

FIG. 7 is a detail sectional view taken on a line 7—7 of FIG. 5 illustrating a portion of the step driving mechanism for the feed-out rolls; and

FIG. 8 is a diagrammatic view of the electrical circuits energized by the operation of the eyelet and strip feed detector devices to stop the machine.

Referring particularly to the drawings, the illustrated border eyeletting machine comprises a base 20 on which

are mounted a border strip feed mechanism, eyeletting mechanism including separate devices for punching holes in the strip and for inserting eyelets through the previously formed holes and eyelet detecting devices operable to ascertain the presence or absence of individual eyelets in each of the lines of eyelets inserted in the border strip. The border strip, designated at 22, is shown as consisting of a border cover strip 24, a filler strip 26 and a backing strip 28 which are drawn from a source of supply, not shown, are guided over detector plates 30, 32 and 34 mounted on a rack 36, through a feed assembly box 38, to a feed-in nip provided by two feed-in rolls 40 and 42. The assembled strip is then fed across an operating area in which the eyeletting and eyelet detecting operations take place to a nip provided by two feed-out rolls 44 and 46.

A stepped rotational feeding movement of equal extent is imparted simultaneously to feed-in rolls 40 and 42, and to the feed-out rolls 44 and 46 through connections driven from a main cam shaft 48 in the base of the machine. A cam 50 on the cam shaft is arranged to be engaged by a follower roll 52 carried on a vertically movable plunger 54 slidably mounted in the fixed sleeve element 56 and arranged to be held upwardly against the cam by means of a spring element 58. The plunger 54 and follower 52 are connected by an upwardly extending link 60 and a rocker arm 62 with a rock shaft 64 supported in suitable bearings of which a bearing 66 is shown attached to the base 20. The rock shaft 64 is in turn connected by an actuator for the feed-out rolls 44, 46 comprising a gear segment 70 attached to the shaft 64 which meshes with a gear 72 forming the driving element of a one-way overrunning clutch. The driven element of said clutch comprises a disc member 74 secured to the shaft 76 which carries the feed-out roll 44. When the driving gear 72 is advanced the driven disc member 74 is clutched thereto by the engagement of clutch rolls 78 between cam surfaces formed between the driven element 74 and the inner peripheral surface of the driving gear 72. During the return movement of the oscillating actuator 70 and gear 72 the nip roll shaft 76 is held against rocking movement in the reverse direction by engagement of a pawl 84 pivoted on a fixed portion of the machine with a ratchet wheel 86 on the shaft 76. Stepped advancing movements of equal extent are imparted simultaneously to the feed-in rolls 40 and 42 by means of connections from the rock shaft 64 which include a rocker arm 90 secured to the rock shaft 64 which is connected by means of cross-link 92 and a similar rocker arm 94 to impart oscillatory movement to an actuator comprising a gear segment 96 about a pivot 98. The actuator 96 meshes with a gear 100 forming the driving element of an overrunning clutch. The driven element of said clutch comprises a disc 102 secured to turn with the supporting shaft 103 for the feed-in roll 42. A rocking movement of gear 100 in the advance direction causes wedge rolls 104 to become wedged between surfaces of the gear 100 and disc 102 as shown in FIG. 5 to effect an incremental advance of the feed-in rolls 40, 42. It will be noted that the feed-in nip roll 40 is driven synchronously with roll 42 but in the opposite direction by means of a gear 108 formed at one end of the feed-in roll 42 which meshes with a corresponding gear, not specifically shown, formed integrally with the cooperating feed-in nip roll 40. The feed-out nip roll 46 is similarly driven as a unit with the feed-out roll 44 by the engagement of a gear 110 formed at one end of the feed-out roll 44 with a corresponding gear, not specifically shown, formed at the adjacent end of the cooperating feed-out roll 46. As best shown in FIG. 6 the supporting shaft 103 and the feed-in nip rolls 40, 42 associated therewith are locked against movement in the reverse direction by the engagement of a pawl 114

pivoted on a fixed portion on the machine with a ratchet **116** on the support shaft **103** for the nip roll **42**.

The operation of the feed-in rolls **40**, **42** is further affected by the action of a friction brake which acts against the support shaft **103**, to prevent overrun of said rolls, so that the length of each successive advancing movement of the assembled border strip **22** through the nip rolls **40**, **42** is determined by the extent of the rocking movement applied to the actuator **96**. As best shown in FIG. 6, the brake comprises a friction disc **120** supported on the shaft **103** between a fixed abutment **122** and a nut **124** threaded to the shaft **103**.

The eyeletting mechanism and the eyelet detecting mechanism for the machine are mounted within a U-shaped eyeletting head **126** supported on the base **20** overlying the stretched out area of the assembled border strip extending between the feed-in and feed-out nip rolls. As best shown in FIG. 2, the eyeletting head **126** is pivotally supported along its rear side on a pivot shaft **128** supported in lugs **130** on the machine base **20**. The arrangement is such that the eyeletting head **126** may be tilted backwardly to the dotted-line position of FIG. 2, thus facilitating the inspection of the operating mechanism and such repair as may be needed particularly of the eyelet feeding inserting mechanisms.

The eyeletting mechanism of the illustrated machine consists specifically of a battery of four eyelet hole punch and spaced eyelet inserting assemblies which operate to insert four rows of eyelets in previously punched holes along the length of the assembled border strip. In accordance with the invention there is also provided within each said punch and eyelet inserting assembly an eyelet detector device. Each of the four complete operating units thus comprises a fabric holing device, an eyelet inserting device and an eyelet detector device which are spaced apart in the direction of feed and operate simultaneously for the performance of their respective functions. The eyelet inserting devices comprise a group of four hollow top eyelet sets **134** fitted into the lower ends of bores **136** in a bar-shaped anvil support **138** which extends across the width of the traveling border strip **22** and is supported at each end for up and down movement in suitable guideways **140** housed within the U-shaped eyeletting head **126**. Each eyelet set **134** is formed with a central bore adapted to receive an eyelet positioning plunger **144**, which is normally supported in a downwardly extended position with relation to the top eyelet set **134** by means of a compression spring **146** mounted within the upper portion of the bore **136**. Each eyelet set **134** and plunger **144** is arranged to cooperate with a relatively stationary bottom eyelet set **148** carried on a cross bar **150** attached to the machine frame **20**. A narrow resiliently supported fabric support **152** having formed therein a large aperture **154** at the location of each eyelet inserting device extends across the width of the machine and is provided with a large aperture **154** in line with each bottom eyelet set **148** to receive the associated plunger **144** and upper eyelet set together with the immediately adjacent portion of the assembled border strip.

Eyelets are fed to the individual eyelet plungers **144** by means of a well-known eyelet-feeding device which as generally indicated in FIG. 5 comprises an eyelet guideway **156** and an eyelet positioning element **158**. Eyelets are fed, one at a time, to the eyelet positioning element **158** by means of an eyelet selecting device comprising a transversely extending rod **160** having formed therein transverse slots **162**, and supported for lengthwise movement on downwardly extending rocker arms of which one is shown at **164**. Rod **160** normally acts as a stop for the eyelets as indicated in FIG. 5, the eyelet being released by an axial movement of the rod **160** so that the slot **162** is aligned therewith.

The mechanism for holding the assembled border strip preparatory for the insertion of a group of four eyelets therethrough comprises a bank of four fabric punches

166 adjustably mounted in a laterally extending U-shaped support **168** which is secured to the lower edge of the bar type anvil support **138** at each end thereof. Each said fabric punch **166** is arranged to cooperate with a hollow die **170** mounted in a transverse bar **172** mounted on the machine frame **20** to extend across the machine beneath the traveling border strip. The lower end of each punch **166** is beveled in order to bring the punch into line with the sharp inner cutting edge of the die **170**.

The eyelet detector device provided in the illustrated machine is adapted to sense the presence or absence, as the case may be, of each successive eyelet inserted by the operation of the machine in each of the four rows of said eyelets.

The eyelet detector mechanism comprises a group of four spring pressed plungers **178** which are supported to move downwardly against the eyeletted border strip as a unit with the fabric hole punches, and eyelet inserting devices at locations in which the plungers will strike a previously inserted eyelet in each of the four lines of such eyelets inserted in the border strip. The respective plungers **178** are slidably mounted in bores formed in a transverse support **179** supported at each end by vertically depending tubes **180** held by two straps **184** connected with the upper edge of the bar type anvil **138** adjacent the two ends thereof. Each plunger **178** is yieldably supported in a downwardly extended position relative to the support bar **179** by means of a coiled spring **188**. The arrangement is such that, assuming an eyelet has been inserted, the plunger **178** striking the eyelet will be arrested against the pressure of spring **188**. In the event that for any reason no eyelet has been inserted at this location, the plunger **178** will pass through the hole in the fabric formed by the fabric punch **166** and into engagement with the actuating arm **190** of a microswitch **192** thereby closing a circuit to stop the machine.

The bar type anvil support **138** together with the fabric punches **166**, top eyelet sets **134**, eyelet guiding plungers **144**, and eyelet detecting plungers **178**, are reciprocated vertically for the performance of successive operating cycles through connections operated by a cam on the main cam shaft **148** of the machine. The bar type anvil support **138** is adapted to be acted upon by a pair of toggle links **196**, **198** one arm of which is connected to a block **200**, movable with the support bar **138**, and the other arm of which is connected to a fixed bracket **202** in the upper portion of the eyeletting frame **126**. The central pivot **204** of the toggle links **196**, **198** is connected with one end of a slide **206**, the other end of which is provided with a follower roll **208** which rides in a closed cam track **210** forming one face of a cam disc **212** fixedly secured on a cam shaft **214** for the eyeletting mechanism. The cam shaft **214** is carried on the U-shaped frame **126** in suitable bearings, and is driven from the main cam shaft **48** in the base **20** of the machine by means of a sprocket chain **216** which passes around a sprocket **218** on the main shaft **48**, around idler pulleys **219** mounted on the frame **20** and around a sprocket **220** on the cam shaft **214** for the eyeletting mechanism. When the eyeletting head is tilted backwardly to the raised inoperative position shown in dotted lines in FIG. 2, a corresponding rearward and downward movement imparted to the cam shaft **214** and sprocket **220** rearwardly and downwardly about the rock shaft **128** causes the two legs of the sprocket chain **216** to engage against two additional idler pulleys **222**, **224**. Sprocket chain **216** may also be tensioned by means of a sprocket chain tightener of ordinary description, not here shown.

In the illustrated machine devices are provided also for detecting the exhaustion of any one of the component elements of the border strip feeding into the machine. The cover strip **24**, filler **26** and bottom strip **28** are caused to pass respectively over plates **228**, **230**, **232** mounted on a frame **234**. Each plate, as exemplified by the top plate **228** shown in FIGS. 3 and 4, is formed

with an aperture 235 adapted to receive a contact member 236 provided on the end of a feeler arm 238 loosely supported on a cross rod 240 on the frame. The feeler arm 238 carrying contact member 236 normally rests on a portion of the strip element passing over the plate which is disposed directly over the aperture 235. In the event that the strip becomes exhausted, the contact member 236 drops into engagement with the plate 228 closing a circuit which arrests the operation of the machine. The aperture 235 as shown is of relatively large size thus providing a substantial contact clearance between the contact member 236 and the edge of the aperture in the plate 228 through which a circuit closing contact is made.

FIG. 8 of the drawings illustrates a suitable electric circuit for arresting the operation of the driving motor for the machine which is designated at 244 in FIG. 2 and is connected through a gear box 246 to drive the main cam shaft 48. The motor 244 is driven from a main line L_1, L_2 through a circuit which includes two normally closed solenoid actuated switches 248, 250. The solenoid 252 for switch 250 forms part of a secondary circuit which includes the four normally open microswitches 192, any one of which may be closed by the engagement of the respective plunger 178 with the actuating arm 190 of the microswitch. The solenoid 260 for switch 248 similarly forms part of a secondary circuit which includes the three normally open switch contacts provided between the plates 228, 230 and 232 and the respective feeler arms exemplified by the feeler arm 238 in FIGS. 3 and 4, any one of which may be closed by the exhaustion of the feeding strip element.

The machine operates as follows:

The link 60 of the border strip feed mechanism is moved downwardly and then up imparting a feed and return movement of equal extent to each of the actuator gear segments 96 and 70, thus causing the feed-in and feed-out nip rolls to be advanced positively by the same amounts. Further forward movement of the feed-in rolls 40, 42 is prevented by the action of the friction brake 120 (FIG. 6). Inertia, however, causes the feed-out rolls 44, 46 to be further advanced sufficiently to place the stretched out area of the assembled border strip between the two feed nips under some tension, thus insuring the accurate spacing of successive eyelet locations from one another in the border strip, and a correct register of said eyelet locations, in succession with each of the hole punch, eyelet inserting and eyelet detecting devices.

Following the advance of the assembled border strip, the anvil plate 138 moves downwardly causing the punches 166 cooperating with the fixed die 172 to form four holes across the border strip, causing the plungers 144 and top eyelet sets 134 to move downwardly relative to the fixed bottom eyelet set 148 to insert eyelets in each of the holes formed in the next preceding operating cycle of the machine, and causing the plungers 178 to engage with eyelets inserted in a second preceding operating cycle of the machine. If an eyelet is present in the particular location of an eyelet detector device, downward movement of the eyelet detecting plungers 178 is arrested against the pressure of its spring 179. If no eyelet has been inserted in the particular location, the plunger will pass downwardly through the empty hole in the border strip to engage with and move the arm 190 of the associated microswitch 192 thus closing a secondary circuit to stop the machine motor 244.

The invention having been described what is claimed is:

1. A mattress border eyeletting machine having, in combination, mechanism for advancing the assembled elements of a border strip superimposed on one another in stretched out relation past successive hole forming, eyelet inserting and eyelet detecting stations spaced from one another along said line of advance, eyelet hole forming, eyelet inserting and eyelet detecting devices at said respective stations including a yieldable eyelet detecting plunger adapted to be stopped by the presence of an eyelet at said eyelet detecting station, and to be moved through said hole in the absence of a said eyelet, and a device rendered operative by movement of said plunger through the hole to stop the machine, and operating means for actuating each of said eyelet hole forming, eyelet inserting and eyelet detecting devices simultaneously, said operating means acting thereafter when an eyelet is present at said eyelet detecting station to impart a stepped advance to said superimposed border strip elements the length of said spaced interval.

2. A mattress border eyeletting machine having, in combination, mechanism for supporting and for imparting successive stepped feeding movements to the assembled elements of a border strip in stretched out relation between feed-in and feed-out positions on said machine for transferring successive eyelet receiving locations of said border strip to successive border strip holing, eyelet inserting and eyelet detecting stations along said stretched out border strip, opposed movable and stationary hole punch and die elements at said border strip holing station, opposed movable and stationary top and bottom eyelet set elements at said eyelet inserting station, and a yieldably movable detecting plunger at said eyelet detecting station, an anvil support on which said movable elements are movable simultaneously toward and away from said stretched out border strip, and operating means for moving said anvil support toward and away from the border strip for simultaneous performance of said hole forming, eyelet inserting, and eyelet detecting operations at said respective stations, and thereafter for imparting a stepped advance to said border strip for moving the next following eyelet inserting location to each of said stations.

3. A mattress border fastening machine having repetitively operating means at each of a plurality of operating stations for fastening together the assembled elements of a border strip, according to claim 1, which comprises mechanism for supporting in a stretched out position and for imparting an incremental advancing movement to a length of said assembled elements through said operating stations between feed-in and feed-out positions to present successive fastening receiving locations of said border strip to each said operating station, including a pair of infeed nip rolls, and a pair of outfeed nip rolls supporting said length of said assembled elements therebetween, and a drive mechanism comprising an oscillatory actuator and an overrunning one-way clutch connected with said feed-out pair of nip rolls, an oscillatory actuator, and an overrunning, one-way clutch connected with said feed-in pair of nip rolls for imparting oscillatory movements of equal extent to said actuator, and a friction brake acting upon said feed-in pair of nip rolls to prevent overrun of said rolls in the feed direction.

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