This invention relates to a machine for feeding laces to a lace packaging machine and is a continuation-in-part of my application, Serial No. 115,843, filed May 1, 1961.

In the manufacturing of laces, particularly shoe laces, it is desirable to supply the laces to the trade in pairs which are packaged by placing a band about the folded laces. In many instances a transparent wrapper is also placed about the banded pair of laces. A few machines have been provided for mechanically packaging a pair of laces. However, usually a lace is completed by tying, and the tipped laces are either manually fed to the machine or the tipped laces are slid along some mechanical carrier and picked up by the machine.

Difficulties are often encountered in the packaging machine if the laces which are supplied to the machine are not of the same length within the tolerances of the stretching of the laces, and when the laces are individually formed and then brought together in pairs, it is frequent that this difference in length is beyond the tolerance which will be handled by the packaging machine. When separate completed tipped laces are to be packaged, some complexity is again necessary to grasp and obtain control of the completed laces. Also when separate completely formed laces are provided, there is considerable complication involved in the feeding of these separately formed laces to the packaging machine.

One of the objects of this invention is to provide a feeding attachment to a lace packaging machine, and more particularly to the lace packaging machine illustrated in Marsh Patent No. 2,896,386, in which the feed of a lace to the packaging machine may be mechanically accomplished direct from braid supply of an indefinite length.

Another object of this invention is to provide a mechanism for tipping and feeding laces from a continuous length of lace material to the packaging machine mechanically and without hand operation.

Another object of the invention is to provide a feeding mechanism which will feed extended lengths of braid simultaneously so that a plurality, such as for example as a pair of laces, may be tipped at the same time and fed as a plurality or pair to the packaging machine.

Another object of the invention is to process a pair of laces simultaneously and in closely adjacent relation so that they will be formed together of the same length within the limits of extension of the two pieces of braid and the matched pair of laces will then be fed to the packaging machine.

Another object of the invention is to provide a feeding device for a packaging machine which will utilize some of the movement of the lace in the packaging machine for withdrawing the lace from the feeding mechanism, thus simplifying to a large extent the feeding mechanism which operates in conjunction with a packaging machine.

Another object of the invention is to control the tension of the lace as it is fed to the packaging machine that there is no serious drag placed upon the feeding of the lace to the packaging machine.

Another object of the invention is to provide a feeding mechanism for a packaging machine which may be utilized for largely varying lengths of laces by providing take-up means for the length of the lace.

Another object of the invention is to cause laces to be fed into the packaging machine and gripped therein prior to the severance of a lace or a pair of laces from the continuous length of braid from which they are formed.

Another object of the invention is the utilization of such a drive in the feeding mechanism that should some snarl-up occur, the machine will come to a stop.

With these and other objects in view the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

FIG. 1 is a top view of the machine with the cutter assembly omitted for clarity;

FIG. 2 is an end elevation;

FIG. 3 is a top plan view on a larger scale than FIG. 1 of the transfer portion of the mechanism with parts broken away and parts omitted to better show the operation of the machine;

FIG. 4 is an elevation of that portion of the mechanism shown in FIG. 3;

FIG. 5 is an edge view with parts broken away and in section of the clamp for the braid carried by the dial;

FIG. 6 is a sectional view on substantially line 6--6 of FIG. 1;

FIG. 7 is a side view of a fragmental portion of the machine;

FIG. 8 is a fragmental view partly broken away and in section to illustrate the cutter assembly;

FIG. 9 is a sectional view through the frame showing in elevation the feeding means for the braid;

FIG. 10 is an end view of the feeding means with the braid in position thereon;

FIG. 11 is a sectional view of a fragmental portion of the drive means between the machine which is the subject of this invention and the packaging machine with which it is associated; and

FIG. 12 is an elevation of a gripper for the braid associated with the transfer mechanism.

In proceeding with this invention and with reference particularly to FIG. 1, it might be first mentioned that although the machine may handle a number of different laces at one time, the illustration in the drawings is for the handling of two laces so as to form a pair of laces, as shoe laces are usually marketed, to be delivered into the packaging machine as shown in the Marsh Patent No. 2,896,386. Accordingly, as shown in FIG. 1, there are two supply sources for extended lengths of braid which sources may be from reels 20, 20'.

The braids 30, 30' are led into the machine into the area A where a drum is arranged to pull the braids from the supply source both at the same rate and to deliver the braid substantially without tension into a standard tipping mechanism 40, 40' in area B, the details of which are not shown, and then from this tipping mechanism, the braids are brought together into side by side relation in a take-up mechanism at area C, the arrangement being such that regardless of the finished length of lace within the limits of the machine the braids may be disposed for further operation. From this take-up mechanism in area C, the braids are delivered about a guide pulley 31 in their adjacent relation, still without being severed from the supply source, and are then passed into a transfer mechanism in area D for positioning the leading ends of the braids into the packaging machine shown in the Marsh Patent 2,896,386, the tipped ends of the braids being positioned at a location to be gripped by the jaws 69 of this Marsh patent also given the same number herein (FIG. 4). This transfer mechanism at area D also includes a cutter to sever the braid and tips after the leading end of the lace is located and grasped in the packaging machine as shown in the above-mentioned Patent 2,896,386.
A single motor 15 is utilized for driving the mechanism above described and also driving the packaging machine of Patent 2,896,386 so that both the mechanism above described and packaging machine will operate in unison as a single unit.

**Feeding device**

Braids in continuous lengths on separate supply spools 20 and 20' are each led into the machine at area A to be each passed about a fixed rod 21 (FIGS. 1, 9 and 10) having a plurality of grooves 22 therein and also about drum 23 which is positioned just below the rod 21 and which will be driven by pulley 24 and belt 25 at a much higher rate of speed than is desired for the travel of the braid into the machine. The drum 23 and pulley 24 are mounted for free rotation on shaft 26 which is supported in bearing 27 on bracket 28 secured to a portion of the frame. Rod 21 is supported by bracket 29 also from bracket 28. This braid 30 will be disposed about the rod 21 and drum 23 to embrace both of the rods wherein the two rods are each mounted centrally of the successive grooves 22 shown, depending upon the amount of resistance which is offered to the pulling of the braid into the machine. The arrangement is such that the braid 30 first will be disposed rather loosely about the rod 21 and drum 23, but when the braid is called for by the machine as at location 30' (FIG. 10), it will tighten up the braid about the drum and then this fast moving drum will quickly feed the braid at the location 30' until there is some slack in the braid or practically no tension at 30' when the drum will again slip on the braid. A second braid 30' (FIG. 1) is similarly fed indicated by the same numerals with a prime added. Two lines of braid are thus delivered into the tipping dies 40, 40', area B, which will apply tips to the braids which tips will be of a length sufficient to provide a tip on the trailing end of one lace and the leading end of the next lace so that when severed at substantially the mid point of the tipping material length wise of the braid, two tips will be provided. Tipping dies are standard in the trade and are not shown in detail in this machine as they are well known. These tipping dies will operate substantially in unison although they may be two separate units or they might be the same unit of a width to accept two lengths of braid.

**Take-up device**

The braids so tipped at area A are then directed to the take-up area C and extend about pairs of pulleys 45 and 45' and thence through pairs of pulleys 46 and 46' so as to bring the two lengths of braid and the two tips just provided into closer relation. The take-up mechanism will be located centrally of the two tip-applying dies so that as the braids are brought together, the tips will be in registering relation. The pair of braids are then lead about a pair of guide pulleys 47, or 47' or 47'' or 47''' or 47''', depending upon the length of the lace which is desired. While one pair of these pulleys 47 might be turned adjusting each time a different length was being operated upon, I consider it preferable to provide a plurality of pairs of pulleys set at the different distances off a straight line between pulleys 46 and 31 to take up different lengths that are standard in the industry for different uses of laces so that the take-up may be accomplished by threading the braids about the selected pair of pulleys. It will be apparent, however, that each of these pairs of pulleys may also be individually adjusted so that the right position might be had for the desired take-up. After passing about one of these pairs of pulleys 47, the tipped braid is then passed about a pair of pulleys 48 and then over a pair of pulleys 31 and then an aligning device 33 (FIG. 12) and guide 39 to be led into the transfer mechanism D.

The aligning device 33 (FIG. 1, 2 and 4) is shown on a larger scale in FIG. 12 and comprises a pair of arms 34, 35 on one of which 35 a solenoid 36 is mounted to the other arm 34. The braids 30, 30' are led between these two arms which are brought together so as to permit the braid to slide through and the tip to engage the edges of the arms so as to equalize the two laces lengthwise from their tips. The solenoid is actuated at the proper time to bring the arms toward each other and to release and allow the arms to ride off the ends of spring 38. The guide 39 with opposite inwardly extending slots 39' separates the braids and directs them into the machine (see FIG. 12).

**Transfer mechanism**

The transfer mechanism in area D is shown in plan in FIG. 1 and in elevation in FIG. 2. Also the dial is shown on a larger scale in greater detail in FIGS. 3 and 4. This transfer mechanism comprises a dial 50 which rotates 180° intermittently. The dial is generally circular but is notched on opposite sides as at 51. The radii extending portions formed by each of these notches are designated as 55 when in the position nearest pulley 31 and designated 54 when furthest from it, and on each of these portions there is a vertically mounted a clamp comprising a pair of jaws, the one on portion 53 is clamp 52 and the one on portion 54 is clamp 53 (see FIG. 5). On each portion 53 and 54 there is a ball bearing 56 (FIG. 5) which rotatably mounts a shaft 57 carrying a jaw 58 of the clamp 52, 53. This jaw 58 has a pivot 59 at a point below its pivotal mounting on a portion 53 or 54 a finger 59 which mounts on pivot 64 another jaw 60. Both of these jaws are recessed as at 61 and 62 to receive a spring 63 which swings the jaws about the pivot 64 so that the upper portion of these jaws are urged toward each other in clamping relation. Two braids 30, 30' are fed into the jaws, one of which braids at the location of portion 53 is designated as 30d and the other as 30'd. The braid 30d will be above the pivoted axis of shaft 57 and the braid 30'd will be below this axis so that the braids will be positioned on opposite sides of the pivotal axis of the mounting of the jaw 58 on portion 53 or 54 and equally distant from this pivotal axis so as to maintain a balanced relationship about this pivotal axis.

The clamp is controlled in its movement, from its position at the left of the dial 50 (FIG. 4) through its 180° movement to the right of the dial 50, by an arcuate guide 215 overhanging the disk 50 which will engage the top edge of the clamp and prevent it from freely swinging on its ball bearing pivotal mounting, thus causing it to remain more nearly vertical. Also as the clamp approaches its position to the right of dial 50, this clamp will engage the guiding surface 216 which is an L shape plate pivoted on bracket 217 and held in by spring 218 and back of which the dial rotates so as to guide the clamp and position it generally vertically for the ends 30e and 30'e to be gripped by the jaws 69 of the packaging machine. The bracket 214 also serves to engage the clamp in the position to the left of dial 50 as it moves upwardly, thus positioning the clamp to receive the braid at 30d, 30'd. These guides assist materially for high speed operation in the controlling of these clamps enabling a higher rate of operation and production.

In order to open the spring closed jaws 58 and 60, the lower portion of the jaws are squeezed to compress the spring 63. This is accomplished for each clamp intermittently by similar but slightly different mechanism. For clamp 52 the actuation is through the notch 51 in the disk by means of a solenoid 70 (FIG. 3) having a plunger 71.' Plungers 75 and 76' extend through a bracket 77' on the frame of the machine, and on the end of one of these plungers 75' there is a shoe 78' while on the end of the other plunger 76' there is a shoe 79'. These two plungers 75' and 76' are connected together by a lever arm 80' which in turn is connected to the plunger 71' by the link 81'. By this sort of a floating
arrangement, pressure may be applied to the opposite sides of the jaws 58 and 60 adjacent the location of the spring 63 to move the jaws open about the pivot 64 against the action of the compression spring 63. The action is such that when the plunger 71 is drawn into the slot 70 in the lever arm 60, it swings in a clockwise direction as seen in FIG. 3 to swing the lever 80' until one of the shoes engages the jaw of the clamp. Usually the shoe 78' will first engage the jaw of the clamp and then the lever will swing about the pivot 82' of the connection of plunger 75' and lever 80' as a pivot to draw plunger 76' with its shoe 79' into engagement with the opposite jaw of the clamp. When the clamp is engaged, then the clamp will be squeezed open again the action of the spring 63 applying substantially equal pressures upon both of the jaws and giving a balanced action. It will, of course, be apparent that should the shoe 79' first come in contact with the clamp, the lever 80' will swing about point 84' as a pivot to apply jaw 78' to the clamp. These shoes may slide along the clamp as the clamp moves.

To open clamp 55, the actuation is through a solenoid 70 (FIG. 3) having a plunger 71 which is connected by links 72 to the bell crank lever 73 fixedly pivoted as at 74. Plunger 76 is driven through a bushing 75 in the machine, and on the end of this plunger 76 there is a shoe 79. A lever arm 80' pivoted by a slotted connection to a fixed post 75 as at 82 is connected to an arm of the bell crank lever 73 by a link 81. In this location the jaw 58 is backed up by the disk 50. By this sort of arrangement, pressure may be applied to jaw 60 adjacent the location of the spring 63, and as jaw 58 is against disk 50 and cannot move, jaw 60 will move to open about the pivot 64 against the action of the compression spring 63. The action is such that when the plunger 71 is drawn into the solenoid 70, the bell crank lever swings in a counterclockwise direction as seen in FIG. 3 to swing the lever 80' until shoe 79 engages and moves the jaws of the clamp.

The braids 30', 31' are drawn about the pairs of pulleys 31 (FIG. 4) by a half revolution of dial 50 so that the leading severed tip will be in a position now designated 30e, 30o to be gripped by the jaws 69 of the packaging machine above referred to and shown in phantom in FIG. 4, and the next following double tip material will be in a position so that the tip material will be located in a proper position for severing. The severing mechanism is designated generally E as seen in FIG. 3 (see also FIG. 2 and FIG. 8) and is located opposite an aperture 90 in the dial. A guide 91 is provided on bracket 90, it which guide 91 there is slidably mounted an anvil block 92 against which the cutter operates. The anvil block 92 is mounted on rod 200 which is secured to cross head 201 from which rod 292 extends downwardly and is guided in blocks 203 and 204. A lever 265 pivoted at 206 on the frame is actuated by a pair of solenoids 207 and 208 on opposite sides of the pivot 206 and is connected to the cross head 201 by a link 209. The cutter is a chisel-shaped member 93 (FIG. 8) which slidably extends through a flange bushing 94 in the frame 77 of the machine, and a spring 96 engages the flange of this bushing and also a shoulder 97 of the cutter so as to urge the cutter away from the anvil 92. A solenoid 85 operates bell crank lever 86 which has an arm 181 with a bifurcated end 182 to enter notches 183 in the stem of the cutter so as to actuate the cutter at the proper time into engagement with the anvil and Sever the pair of braids midway between the opposite ends of the tipping material which has been applied to form the leading portion of the braid into a finished face.

As the dial 50 nears completion of one-half revolution of movement, the braid will extend approximately across the center of the dial and will continue to be gripped by the clamp 55, and it will be deflected toward the anvil block 92 by a finger 98 offset from and extending parallel to the face of block 92 (FIGS. 3 and 8). Adjacent the anvil block and fixed on the bracket 91 there is a stop. This stop is formed by an L shaped piece with one arm fixed to the bracket 91 and the other arm providing a raised portion 109 which will engage the leading edge of the tipping material to catch the same as drawn across and deflected toward the anvil block and accurately position the tipping material on the block in the desired location across the anvil in position for cutting. The braid, forward of the severing location as the dial completes 180° revolution, is disposed across pin 101 which is on the fixed bracket 91 of the frame and inclined so as to slide the braids sideways and away from the dial 50.

The take-up arm 103 is rotatably mounted on shaft 106 and carries pulley 102. This shaft 106, however, carries a worm gear 107 fixed on the shaft. Arm 103 carries by means of a bracket 108 a worm 109 to engage the worm gear 107. By means of this worm 109 and worm gear 107, the arm 103 is adjustably fixed to the shaft 106 to obtain the angular relation desired. Thus the arm 103 may extend radially of the shaft 106 at any angle of position of azimuth. The worm 109 is slidable keyed to its shaft 110 (see FIG. 4) and held in normal position against bearing 111 by a spring 112 so that there may extend through the resilience of this spring at the time of take-up of the braids so that there be a variation in stretch or some unevenness in length of braids, this could be compensated for.

Arm 105 which carries pulley 104 is connected by means of a universal joint 120 (FIG. 3) to shaft 121 which may be operated by a rack 122 and gear 123 so that, as the rack is moved longitudinally, the shaft 121 will be rotated, and the arm 105 will swing away from the position of pulley 104 in FIG. 3 and 3 so as to drop the pulley 104 downwardly and outwardly from the machine to cause a discharge of the ends of the braids which are being drawn into the packaging machine.

After the braids are severed and the packaging machine starts to draw them into the packaging machine, the trailing end of the braids drop by gravity, and in order to direct them out of the path of the next incoming braids, I provide on a spring arm 230 attached to block 231 on the machine frame a flexible deflector 220 (FIG. 4) suitably of some plastic material, the upper edge 221 of which may engage dial 50 so that, as the braids fall, they will slide over this edge 221 and by reason of the curvature or inclination of this deflector 220 will be moved away from the dial. When the braids drop, they extend over pulley 104 which is moving downwardly and outwardly from the dial 50 as in FIG. 4. The upper portion of the laces will engage the inner arcuate edge 240 of finger 241 and the lower portion of the laces will engage edge 242 of finger 243 angled outwardly therefrom because of the tendency of the lace to swing outwardly as it drops, while arm 105 will engage the outer edge 244 of cam 245, fixed to finger 240, and swing the finger and laces inwardly off of pulley 104. These fingers 240, 243 and cam 245 are mounted on rod 246 pivotally mounted on bearings 247 and 248 of bracket 249 and urged by spring 250 against a stop 251. As this action occurs, the packaging machine is drawing the severed braids into the packaging machine. As the arm 103 moves past the deflector, the deflector flexes to permit it to pass.

**Drive**

The main motor 15, FIG. 6, drives shaft 16 from which either belt 17 or 18 drives a right-angular speed reducer 125 through a shaft 126. Belt 17 drives shaft 126 at high speed, and belt 18 drives shaft 126 at low speed. Electrically controlled clutches 19, 19' select which belt does the driving. This right-angular speed reducer rotates shaft 127 (FIG. 7) on which a driven gear 129 on shaft 132 on which is a plate 134 of a Geneva motion. This plate 134 is equipped with a pin 135 (FIGS. 1, 2, 6 and 7) which engages the spider 136 of the Geneva mo-
tion arranged in thirds so that at each revolution of the clutch there will be a third of a revolution of the shaft 130 resulting from the Geneva motion. The Geneva shaft 130 (FIG. 6) has gear teeth on its end which drives idler idler 139 which in turn drives a second idler 140, and this idler in turn drives gear 141 which drives the shaft 142 on which the dial 50 is mounted, turning that dial through 180°. Idler 140 also drives gear 143 on shaft 106 to operate arm 103 each movement of the Geneva, this shaft 106 being the one which operates arm 103 for the take-up of the face at the transfer mechanism.

By reference to FIG. 6 it will be apparent that the main drive shaft 132 through chain 150 (FIGS. 6, 7) drives cam shaft 151 upon which there is mounted the cam 152 which operates the tipping mechanism 40, 40' at area B by means of the cam follower 153 on the end of the lever 154 having a T-head 155 to either end of which there is connected the links 156 and 156' to the tipping head. This head feeds in the tipping material, wraps it around the braid and severs the tipping material.

From this main shaft 132 there is also a chain drive indicated at 160 to shaft 161 of the right-angle bevel gear drive unit 162 from which there is the output shaft 163.

Keyed to this shaft 163 (FIG. 11) there is a sleeve 164 upon which there is freely rotatable a sprocket 165. On either side of this sprocket there are disks 166 and 167 having friction material presenting surfaces at their periphery which are keyed to drive with this sleeve 164 and which apply pressure on the sprocket 165 by means of spring 168 tensioned by nut 169 on the threaded outer surface of the sleeve 164. The sprocket 165 drives a chain 159 (FIG. 6) to drive the shaft of the packaging machine. Should the packaging machine bind in any way, then the sprocket 165 will stop, and the friction disks 166 and 167 and the other side will slip on the sprocket and cause the pins 158 (three in number unequally spaced to assure proper timed relation of interconnector), each of which engages in a recess in the sprocket to be pushed out of this recess so that the ball 157 will snap from one groove to the other in the pin 158 and will push rearwardly the ring 176 to actuate the arm 177 and switch 178 to cause the stopping of the machine.

The shaft 106 is provided with a cam 170 (FIG. 2) to drive the rack 122 by means of a cam follower 171 (FIG. 3) and rod 172 adjustable by nut 173 on threads 174 of the rod. This rack will turn shaft 121 which through the universal joint 120 will rotate shaft 175 to swing arm 105 downwardly so as to discharge any lace on pulley 104 and then will swing the arm back into position again in the position that it was originally located. By this operation the trailing edge of the face after it has been severed and is being drawn into the packaging machine is removed from the path of a subsequent braid which is being placed by the feeding mechanism in position for severance. The motor 15 through shaft 16 and pulley 14 drives jack shaft 180 (FIGS. 1 and 6) through belt 181, which shaft 180 through belts 25 and 25' drives the drums 23 of the feeding device.

The shaft 161' (FIG. 1) extends from the gear box 162, and at its outer end there is mounted a gear 185 which through gear 186 drives the cam shaft 187 upon which there are mounted four cams. Cam 188 actuates the follower 189 to control solenoid 70 above mentioned and also solenoid 36, while cam 190 actuates follower 191 to control solenoid 70. Cam 192 through its follower 193 actuates a switch to control the cutoff solenoid 85 to actuate the cutter 93, and cam 194 actuates follower 195 to control the solenoids 207 and 208 which actuate the anvil block 92 for the cutter.

A switch 210 (FIG. 2) is operated by a cam 211 on main shaft 132, which switch controls electric clutches 19, 19' so that the drive will shift to belt 18 and slow the operation of the Geneva motion which operates to rotate plate 50 while allowing faster speed operation the remainder of the time.

Operation

Braids 30 and 30' will be threaded into the machine about the feed mechanism in area A through the tipping dies 40 and 40' in area B, thence through the take-up mechanism in area C with each of the strands of braid 30 and 30' engaging guide pulleys mounted one above the other, thence around a pair of guide pulleys 31 and into the transfer mechanism in area D. The laces will be initially threaded into the transfer mechanism through the gripper 33 so as to position the laces in the clamp 52 on the dial portion 53, which is at the left of the dial 50 as viewed in FIGS. 2 and 4.

It will be assumed that in initial threading the severing of the tips will have been performed, and the tips of the two laces will be lengthwise aligned and will be held in the clamp 52 nearly as shown in FIG. 4 (FIG. 4 showing a position of the machine after the dial has just started to rotate). These tips in this location are designated 30d and 50' d. After this threading has been accomplished, the dial starts to rotate clockwise as seen in FIGS. 2 and 4; in FIG. 4 the dial has rotated so that the flat side of notch 51 has moved from the vertical as in FIG. 2 to a position inclined thereto. During rotation of the dial 50 above referred to, the clamp 52 on portion 53 as at the left seen in FIG. 2 and 4 remains in gripping engagement with the ends of the braid, and still rotating the arm 103 carrying pulley 102 swings at twice the angular speed of the shaft 142 causing the pulley 102 to engage the braid from above so as to draw in from the supply the amount of length desired and take up slack in the lace. The dial 50 will carry the ends of the braid 30d and 30'd held in the clamps upwardly as seen in FIG. 4, past top center and then downwardly on the right-hand side of the dial as shown in FIG. 4, which clamp now being to the right of this dial is designated as 55 and still maintains a grip on the two laces as they move to stop position with the two clamps substantially horizontal with reference to each other as shown in FIG. 2. The tips of the laces which were previously indicated at 30d and 30'd have now moved to positions 30e and 30'e as shown in FIG. 4 and are in a position to be gripped by the jaws 69 of the packaging machine which will open as shown by their dotted lines in FIG. 4. These jaws 69 are mounted radially of the center 50 of Patent No. 2,896,386 and will be cleared by the dial and clamps as moved into position. Then at the proper timed relation the shafts which carry the jaws 69 rotate in opposite directions to swing the jaws into engagement with the tipped ends of the braid so as to be ready to draw it into the packaging machine. The clamps 52 and 55 are now released on the braid. The packaging machine operates to cause jaws 69 to draw the braids into the packaging machine which action also draws the tips to the cutter block and against stop 100.

As the braid with the tipping material is properly located on the cutting block 92, the clamp 52 grips the braids and the cam 192 causes solenoid 85 to be energized and the cutter 93 to sever the braid and its tipping material halfway between the ends of the tipping material so that a completed lace is formed. As soon as severing occurs, cam 185 will cause actuation of solenoid 70 so as to release the grip of this clamp 55 on the lace, and the jaw will begin to move to the right as shown in FIG. 4 to draw the lace into the packaging machine. Also almost immediately the dial will start a second clockwise rotation, and as this dial rotates to move the empty jaws 55 downwardly through bottom center of the dial and then upwardly, these jaws will slide out of the clam, which will open. By this time the lace will have been drawn from position in the jaws. As this action is taking place, the lace will be resting upon roll 104, and the cam 170 will cause the operation of the rack above described to swing arm 105 downwardly so as to move the lace from the path of the subsequent braid being brought over the
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upper top center of the dial to position the tips in locations 30e and 30’e. As the empty jaws of the clamp 52 rise from bottom center to position adjacent the anvil block for the gripping of two fresh pieces of braid, the jaws reach a position to enter between the shoes 78’ and 79’. The cam 190 will cause solenoid 70’ to operate and close these shoes on the clamp which will at first engage near the upper portion of the clamp but will slide along the clamp as it moves upwardly so that by the time the portion 53 reaches horizontal position, this clamp will be open to grip the braid which has been drawn into the machine at a point closely adjacent to the tipping material. The braid is now in a position to be again severed, and it will be apparent that at this point the cycle has been completed and the lace is again ready for a further cycle of operation which has just been above described.

I claim:
1. A lace handling apparatus for association with a means for feeding and folding a plurality of laces into a package including means to grip the laces, a source of supply for continuous lengths of lace strands, mechanism between the source of supply and said means for folding to guide the strands into said gripping means, means to sever the strands after engaged by the gripping means whereby the feed of the folding means draws the severed laces from said mechanism.
2. A lace handling apparatus as in claim 1 wherein the guide means comprises a dial rotatable through an arc to deposit the laces in position to be gripped by said means for gripping the plurality of laces.
3. A lace handling apparatus as in claim 2 wherein the dial comprises a plurality of spring closed clamps, means to intermittently rotate said dial and means to intermittently open said clamps.
4. A lace handling apparatus as in claim 2 wherein the dial comprises a plurality of spring closed clamps, means to intermittently rotate said dial and an arm carrying a portion to engage the strand between said clamps and tension the same when the dial comes to rest.
5. A lace handling apparatus as in claim 4 wherein said arm rotates at an angular velocity faster than said dial.
6. A lace handling apparatus as in claim 4 wherein said arm rotates at an angular velocity twice that of said dial.
7. A lace handling apparatus as in claim 2 wherein the dial comprises a plurality of spring closed clamps, means to intermittently rotate said dial and means to intermittently open said clamps, each clamp comprising a pair of jaws and shoes to engage said jaws to open the clamps.
8. A lace handling apparatus as in claim 2 wherein the dial comprises a plurality of spring closed clamps, each clamp movably mounted on a pivotal axis on said dial, and means for positioning the strands on opposite sides of said pivotal axis in a balanced relation.
9. A lace handling apparatus as in claim 1 wherein means deflects the lace from its normal path of travel during the drawing of the lace into the folding means.

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