June 14, 1960 L. S. HAYWARD 2,940,637

CLEAT FEEDING APPARATUS FOR BOX-MAKING MACHINES

Filed Feb. 25, 1955 3 Sheets-Sheet 1

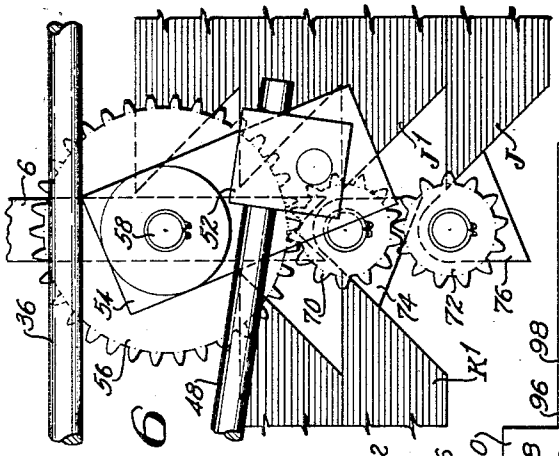

Fig. 6

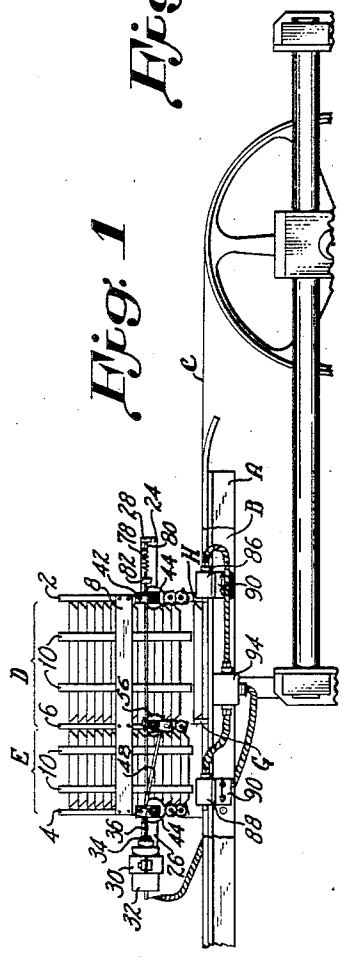

Fig. 1

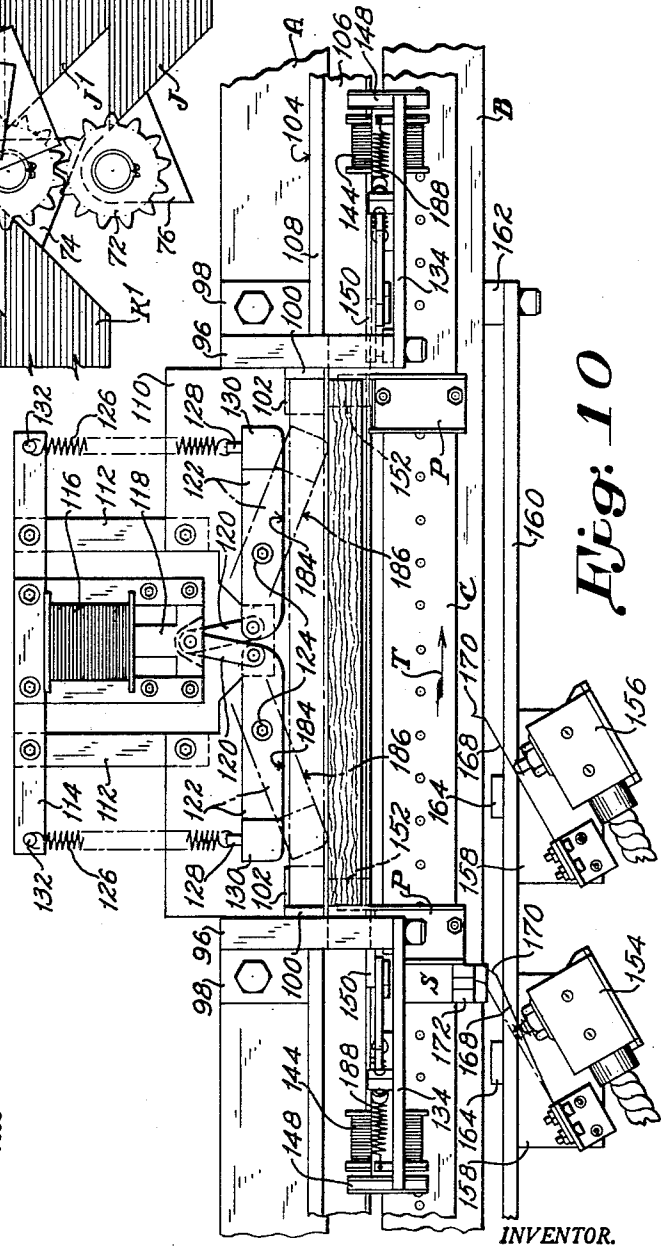

Fig. 10

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CLEAT FEEDING APPARATUS FOR BOX-MAKING MACHINES

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Fig. 3

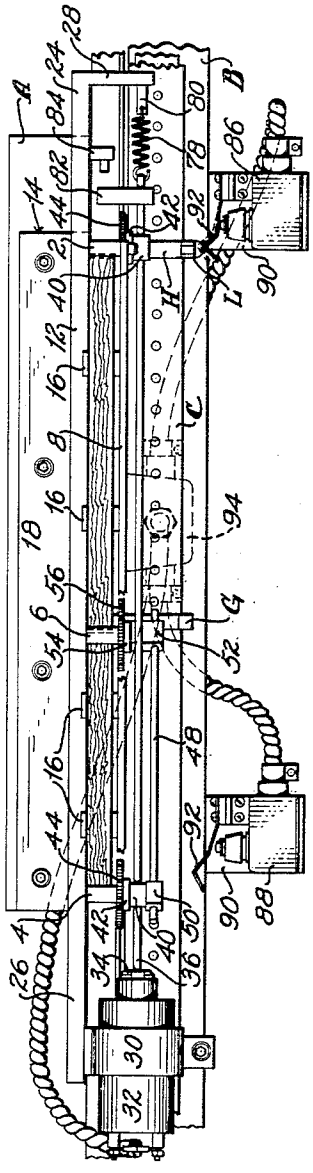


Fig. 4

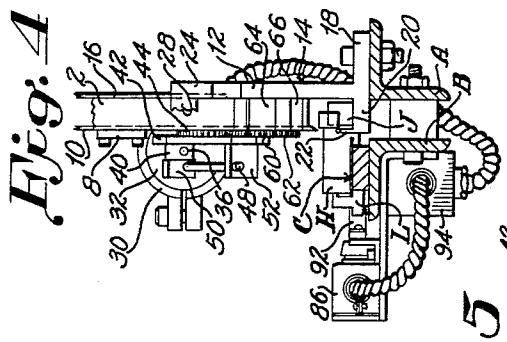


Fig. 2

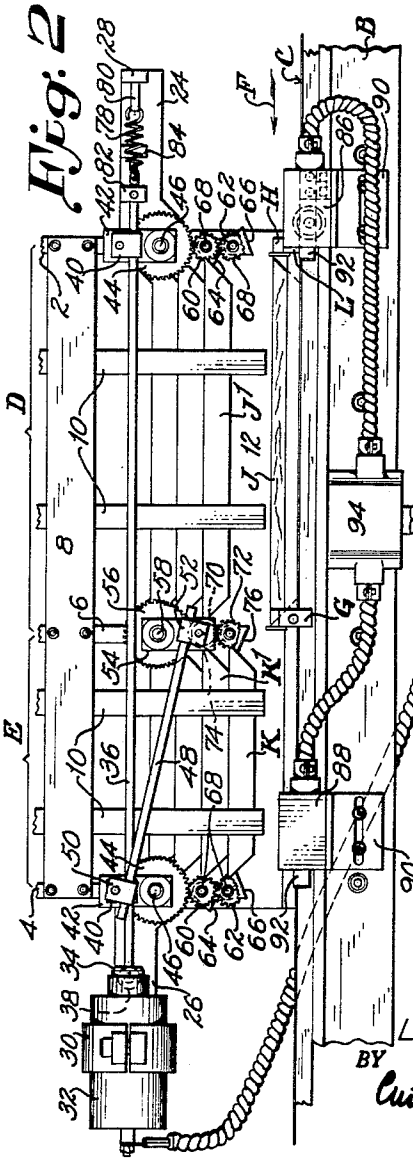
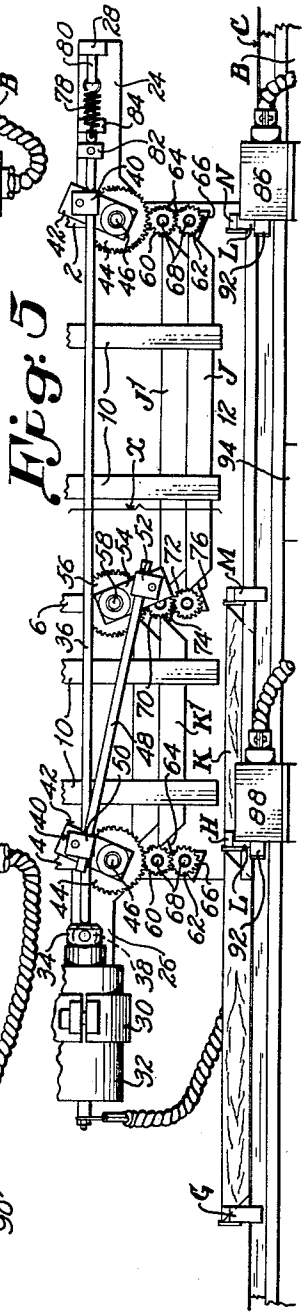


Fig. 5



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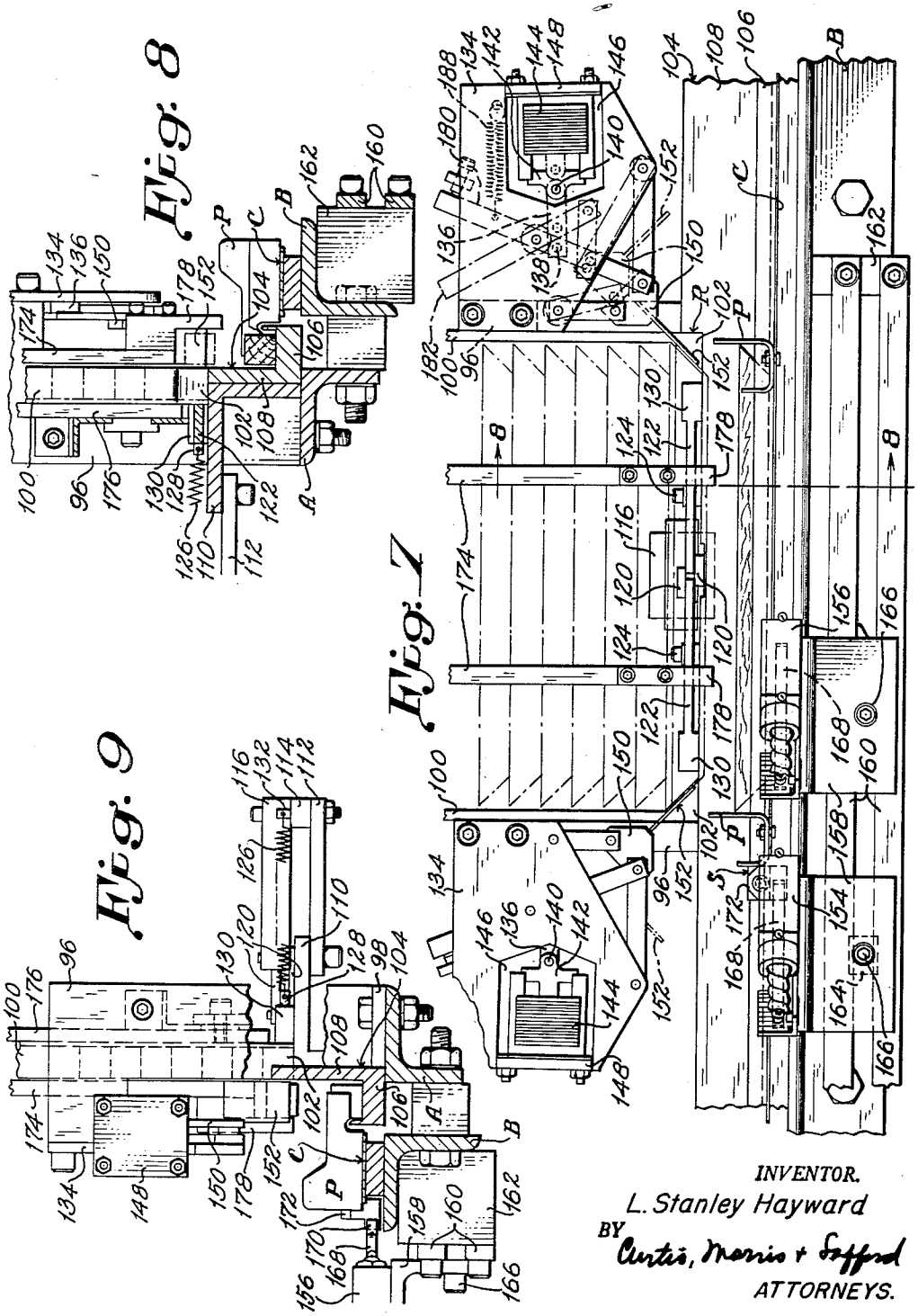

Fig. 8

Fig. 7

Fig. 9

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CLEAT FEEDING APPARATUS FOR BOX-MAKING MACHINES

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Filed Feb. 25, 1955, Ser. No. 490,529

2 Claims. (Cl. 221—116)

The invention illustrated and described herein relates to apparatus for dispensing cleats to wirebound box-making machines of the type disclosed in United States Patent No. 2,304,510, issued December 8, 1942.

In such machines, properly assembled cleats and side material or slats are conveyed beneath a transverse bank of stapling mechanisms where they are stapled to longitudinally extending binding wires to form wirebound box parts or complete wirebound box blanks. The cleats and other box part materials are conveyed through the machine by continuously moving conveyer bands having projecting push elements which engage them and maintain their properly assembled relation.

In making box blanks for wirebound boxes having oblong ends, two different lengths of cleats are required, and these must be placed on the conveyer bands in alternation. This considerably complicates the problem of mechanically feeding the cleats to the conveyer bands. U.S. Patent No. 2,658,631 discloses apparatus for feeding two different lengths of cleats from a single hopper. This apparatus, however, necessitates prearrangement of the cleats in the hopper with long and short cleats alternating.

The present invention provides a cleat feeding apparatus which, rather than depending upon the cleat pushing elements themselves to "strip" the cleats individually from the column of cleats in the hopper, includes means for dropping the cleats individually from the hopper at intervals precisely synchronized with the arrival below the hopper of the respective spaces between the cleat pushing elements. This not only avoids the difficulty with respect to frictional interlocking of the rough faces of the cleats which is involved in feeding the cleats lengthwise out of the hopper, and the attendant problems of multiple feeding, jamming, etc., but it also makes it possible to provide separate hoppers for each of two or more different lengths of cleat and thereby avoids prearrangement of the cleats, allowing them to be handled in multiple.

In the drawings:

Figure 1 is a fragmentary view of the input end of a wirebound box-making machine with some parts broken away to show an automatic cleat-feeding apparatus embodying features of the present invention mounted adjacent one of the conveyer bands of the machine.

Figure 2 is an elevational view at enlarged scale of the inner face of the automatic cleat-feeding apparatus showing the mechanism for feeding cleats of two different lengths.

Figure 3 is a top plan view of the apparatus shown in Figure 2.

Figure 4 is an end elevational view of the cleat-feeding apparatus as viewed from the end which appears at the right in Figure 2.

Figure 5 is a fragmentary view of the lower portion of the cleat-feeding apparatus showing the cleat supporting elements actuated to allow the shorter cleat to drop between the cleat spacing elements on the conveyer band.

Figure 6 is a fragmentary view at an enlarged scale of the portion of the apparatus indicated at X in Figure 5, showing the intermediately positioned mechanism which supports and feeds the adjacent ends of the cleats in the two hoppers.

Figure 7 is an elevational view of the inner face of another embodiment of the present invention showing coacting mechanism for dispensing cleats at selected intervals.

Figure 8 is a fragmentary sectional view taken on the line 8—8 of Figure 7.

Figure 9 is an end elevation of the apparatus as viewed from the end which appears at the right in Figure 7.

Figure 10 is a top plan view of the apparatus shown in Figures 7 to 9.

As may be seen with reference to Figures 1 and 4, the invention is embodied in a pair of similar cleat feeding units adapted to be mounted at opposite sides of the input end of a wirebound box-making machine on the rail assemblies which support the continuously moving conveyer bands. Since the two cleat-feeding units at opposite sides of the machine are similarly constructed, it will suffice to illustrate and describe only one of them, that being the one which is positioned at the right-hand side of the machine (looking in the direction of movement of the box parts). This unit is shown more or less diagrammatically in Figure 1 and on a larger scale in Figures 2, 3, 4, and 5.

As shown in Figure 4, the longitudinally extending rail members mentioned above include an angle member A which supports the cleat-feeding apparatus and an angle member B which supports the upper run of the conveyer band C with attached cleat spacing elements, such as H.

Referring to Figures 2 and 3, the cleat-feeding apparatus includes end walls 2 and 4 and a dividing wall 6 which is spaced between the end walls to provide two hoppers D and E of unequal length, in which supplies of cleats of two different lengths may be stored. A cross-brace 8 bearing vertical bars 10 extends across and is fastened to the end walls 2 and 4 and dividing wall 6 to provide an open framework at the inner faces of the hoppers to support and guide the downward movement of the columns of cleats stored therein.

As shown in Figure 4, the vertical portion 12 of an inverted T-shaped base member 14 supports a plurality of spaced vertical bars 16 which enclose the outer faces of the hoppers D and E. The outwardly extending horizontal base flange 18 of the T-shaped base member 14 is secured to the angle member A to support the framework of the dispensing apparatus, while the inwardly extending base flange 20 supports at its end a short, upwardly projecting wall 22 of rather thin cross section, to form a channel to receive the cleats, such as indicated at J, as they are dropped individually from the columns of cleats in the hoppers, and guide them as they are moved by the cleat spacing elements in the direction indicated by the arrow F in Figure 2.

As may also be seen in Figure 2 and 3, a pair of arms 24 and 26 extend outwardly from either side of the vertical portion 12 of base member 14. The outer end of arm 24, at the right-hand side of Figure 3, is provided with an integral projecting bracket 28, while the other arm 26 carries at its outer end a clamping strap 30 in which a solenoid 32 is adjustable clamped. A rod 36 which extends across the inner side of the cleat-feeding apparatus has at its left-hand end, as viewed in Figure 2, an eye 38 which is pivotally attached to the armature 34 of solenoid 32. This rod 32 is adjustably secured in the bores of blocks 40 which are pivotally fastened to crank arms 42 fastened to the outer faces of spur gears 44 rotatably mounted on studs 46 threaded into the adjacent edges of end walls 2 and 4.

As may be seen in Figures 2, 5, and 6, a shorter rod 48 is adjustably secured at one end in an outer block 50 pivotally mounted on the same stud as is block 40 of the mechanism mounted on end wall 4. This rod 48 extends obliquely downward and its other end is adjustably secured in a block 52 pivotally attached to a lever 54 fastened to the outer face of a spur gear 56 rotatably mounted on a stud 58 threaded into the adjacent edge of dividing wall 6. Below and in serial driven relation to the spur gears 44 are spur gears 60 and 62 of smaller diameter which are rotatably mounted on studs 68 threaded into vertical portion 12 of base member 14 and which have fastened to their inner faces triangular fingers 64 and 66 respectively. Assembled below spur gear 56 in similar fashion are spur gears 70 and 72 bearing triangular fingers 74 and 76.

The fingers 64 and 66 positioned adjacent to end walls 2 and 4 are caused to rock in one direction by longitudinal movement of rod 36 in one direction when solenoid 32 is energized, and in a reverse direction when solenoid 32 is deenergized by a tension spring 78 one end of which is fastened to the end of rod 36 and the other end of which is fastened to a stud 80 threaded into the aforementioned bracket 28.

With further reference to Figures 2, 5, and 6, and particularly Figure 6, it will be seen that the sides of the triangular fingers 64, 66, 74, and 76 are beveled at such angle that, at opposite extremes of their rocking motion, these beveled sides will flushly abut the mitered ends of the bottom cleats in the hoppers to support the cleats in a horizontal position. To achieve this desired positioning of the fingers, the longitudinal position of solenoid 32 in the clamping strap 30 may be varied to adjust the position of the fingers at one extreme movement. Their position at the opposite extreme of movement may be adjusted by varying the position of a lug 82 which is adjustably secured adjacent the free end of rod 36, and which cooperates with a stationary stop 84 fixed at the inner face of arm 24 to limit movement of the rod 36 by the spring 78.

The energization of the solenoid 32 is controlled by a pair of electric switches 86 and 88 which are mounted on brackets 90 adjustably secured to angle member B and conveniently positioned adjacent the conveyer band C. As shown in Figure 3, each of these switches is provided with a spring finger 92 which extends outwardly therefrom toward the conveyer band C and into the path of the clamping lugs L of the cleat spacing members H, N, etc. The momentary actuation of switch 86 by passage of the clamping lugs causes the closure of the contacts of a conventional latching relay housed in a box 94 attached to angle member B to energize solenoid 32, while actuation of switch 88 opens the relay contacts and deenergizes solenoid 32.

To describe the alternate feeding of two different lengths of cleats by the apparatus just described, reference is made to the arrow F in Figure 2, indicating the direction of travel of the conveyer band C with attached cleat spacing members G and H, and to Figure 5 which shows the initial position of the bottom cleat J in hopper D and bottom cleat K in hopper E. As will be seen with reference to Figures 2 and 3, as the cleat spacing members G and H, which are spaced apart a distance equivalent to the length of the cleats contained in the hopper D, arrive at a position in approximate alignment with the ends of the bottom cleat J in this hopper, the clamp lug L of cleat spacing member H depresses spring finger 92, actuating switch 86 and causing closure of the contacts of the relay in box 94 and energization of solenoid 32, retracting its armature 34. This causes rods 36 and 48 and levers 42 and 54 to be moved from the respective positions in which they are shown in Figure 5 toward the left as viewed in Figure 2.

As a result, the spur gear 44 on end wall 2 is rotated counterclockwise, imparting a similar movement to spur gear 62 and its finger 66 through the intermediate spur gear 60. Simultaneously, the spur gear 56 on dividing wall 6 is caused to rotate clockwise, imparting a similar rotation to spur gear 72 and finger 76, through the intermediate spur gear 70. Thus, both the fingers 66 and 76 are rocked out of engagement with the beveled ends of the bottom cleat J, permitting it to drop onto flange 20 of base member 14 between the cleat spacing members G and H, as shown in Figures 2 and 4.

Simultaneously, the beveled ends of the next following cleat J1 in the hopper D will be engaged and supported by fingers 64 and 74 of spur gears 60 and 70, respectively, which are rocked inwardly of hopper D. Meanwhile, as shown in Figure 2, in the hopper E the bottom cleat K is disengaged by the outwardly rocking movement of fingers 64 and 74 of spur gears 60 and 70 respectively, and allowed to drop into position on the inwardly rocked fingers 66 and 76 of spur gears 62 and 72, respectively, in readiness to be discharged into proper position on the conveyer band C in the next step of the cycle.

Figures 2 and 5, and particularly Figure 5, show the longer cleat which has thus been fed after it has been moved beneath and beyond hopper E by the cleat spacing member H. Spaced from this member H a distance equivalent to the length of the cleats contained in hopper E is another cleat spacing member M.

When these two cleat spacing members reach a position in approximate alignment with the ends of the bottom cleat K in hopper E, the clamp lug L of cleat spacing member H contacts the spring finger 92 of switch 88 to actuate electric switch 88, opening the contacts of the relay in box 94. As a result, solenoid 32 is deenergized, releasing its armature 34 and permitting tension spring 78 to move rods 36 and 48 and levers 42 and 54 toward the right as viewed in Figure 5.

This movement of the levers rotates spur gears 44 and 56 in the direction opposite to that described above. Thus, as shown in Figure 5, fingers 66 and 76 are rocked outwardly of hopper E disengaging the mitered ends of the bottom cleat K and allowing it to drop onto the flange 20 of base member 14 and between the cleat spacing members H and M, while the following cleat K1 is engaged by fingers 64 and 74, to support it and the remaining cleats in the hopper E.

Simultaneously, in hopper D the cleat J1 is released by fingers 64 and 74 (Figure 2) and allowed to drop onto fingers 66 and 76 in position to be discharged in the next feeding cycle.

This sequence of operations is repeated to feed the long and short cleats into alternate positions on the moving conveyor bands.

As will readily be understood, the short cleat may be fed first with the long cleat following, if desired. Also, the switches 86 and 88 may be positioned so that the cleat spacing members G and M may carry the clamp lugs L for actuating the switches instead of the cleat spacing members H and N.

The other embodiment of the invention, shown in Figures 7–10, constitutes a cleat dispensing apparatus of single-hopper construction, with electrically controlled mechanism for supplying individual cleats at selected intervals to the conveyer bands. This apparatus is found particularly useful in combination with another cleat dispensing unit of generally similar construction and performance, when cleats of two different lengths are required. Such a combination of independent cleat dispensing units permits greater flexibility of cleat arrangement. This apparatus may also be used individually to supply cleats when the design of the box requires cleats of only one length.

As shown in Figures 9 and 10, the apparatus is supported by upstanding members 96 at its opposite ends, said members 96 having flanged bases 98 which are secured to the upper face of angle member A. Attached to the inner face of each upstanding member 96, in posi-

tion to engage the ends of the column of cleats in the hopper and guide their descent, are flat members **100** having at their lower ends inwardly projecting feet **102**, the inner faces of which are bevelled to fit flushly against the mitered ends of the cleat at the lowermost position in the hopper.

Fastened to the left-hand faces of the two upstanding members, **96** as viewed in Figure 9, is an elongated, reverse L-shaped member **104** whose base portion **106** is channel shaped to receive and guide the cleats as they are dropped therein and pushed therealong. The vertical wall **108** of this member **104** is reduced in height for a portion of its length, as shown in Figure 7, beginning at R, to align it with the upper surface of a bracket **110** (Figures 8 and 9) which is secured to the rear face of the member **104**. As may be seen in Figure 8, these aligned surfaces serve as a lower support for the column of cleats in the hopper.

Attached to the bracket **110** and extending horizontally outward therefrom is a skeletal framework, best shown in Figure 10 and comprising bars **112** and **114**, which supports a solenoid **116**. The armature **118** of this solenoid **116** is pivotally connected by short link members **120** to a pair of horizontal arms **122** which are pivotally mounted on bolts **124** threaded into bracket **110**. These arms are normally maintained in a retracted position, shown in full lines in Figure 10, by a pair of tension springs **126** (Figure 10) one end of each of said springs being fastened to a stud **128** threaded into the headed end **130** of the arm **122** while its other end is fastened to a stud **132** threaded into the upper surface of bar **114**.

At either end of the apparatus, fastened to the inner faces of the upstanding members **96**, are plate members **134**, each of which supports at its outer face a linkage assembly including a short link member **136**, one end of which is pivotally fastened at **140** to the armature **142** of a solenoid **144** which is mounted within a cutout area **146** of the plate **134** and fastened thereto by an end plate **148**.

Supported at the lower corner of each linkage is a head member **150** bearing a fin **152** which projects downwardly therefrom at an oblique angle to fit flushly against the mitered adjacent end of the cleat.

As may be seen in Figure 7, the fin members **152** are at a level slightly below that of the bevelled feet **102** of the members **100**, so that the bottom cleat in the hopper may be pushed readily by the arms **122** laterally off the support formed by the aligned top surfaces of bracket **110** and the cut-away portion of the vertical wall **108** and onto the fin members **152**.

The solenoids **144** and **116** are respectively controlled by a pair of electric switches **154** and **156** (Figures 7 and 10) mounted adjacent the conveyor band C on brackets **158** which are adjustably spaced apart on a parallel pair of bars **160** by clamping elements **164** and **166**. The bars **160** are fastened at each end to bosses **162** which are secured to the inner face of the angle member B. Each of the brackets **158** supports a spring finger **168** the free end **170** of which projects outwardly into the path of the clamping lugs **172** of the control blocks S (Figure 10) on the conveyor band C.

The operation of this apparatus is as follows:

A column of cleats is stored in the hopper which is defined by the flat members **100** and the vertical bars **174** and **176** (Figures 8 and 9), and an additional cleat is positioned on the fins **152**. At the outset of operation, the latter cleat may be placed by hand on the fins **152**, or the switch **156** may be actuated manually to cause the arms **122** to move the bottom cleat in the hopper onto the fin members **152** in the manner described hereinafter. The extent of this outward movement of the bottom cleat is controlled by stop fingers **178** attached to the bottom ends of the hopper vertical bars **174**.

As the conveyer band C continuously moves in the direction indicated by the arrow T in Figure 10, the clamping lug **172** of conveyer band block S engages and depresses the free end **170** of the spring finger **168** adjacent the first electric switch **154** and actuates the switch to energize the solenoids **144** and cause their armatures **142** to be retracted. This moves the linkage members mounted on the plate **134** from their position shown by broken lines **180** in Figure 7 to that shown by dot-dash lines **182**, causing the members **150** and their fins **152** to swing outwardly from engagement with the mitered ends of the cleat resting thereon, permitting the cleat to drop into the channel-shaped base portion **106** of member **104**, in the space between an adjacent pair of cleat spacing members P (Figures 7 and 8).

Continued movement of the conveyer band C causes the clamp lug **172** of control block S to contact the free end **170** of the spring finger **168** adjacent the second electric switch **156** and momentarily actuate this switch. This results in energizing solenoid **116**, retracting its armature **118** and moving the arms **122** from their position shown by full lines **184** in Figure 10 to the position indicated by dot-dash lines **186**. Thus, the bottom cleat is pushed from beneath the column of cleats and onto the fin members **152** (Figures 8 and 10), which meantime will have been returned to their initial position by the tension spring **188**. The arms **122** are thereafter returned to their initial position by the tension springs **126**, allowing the column of cleats to drop downwardly to fill the space vacated by removal of the bottom cleat. The apparatus is thus readied for a repetition of the cycle just described.

The continuously moving conveyer bands C carry a number of the control blocks S properly spaced so as to actuate the electric switches **154** and **156** at the precise times required to cause cleats to be deposited into the spaces between the cleat spacing members P.

From the foregoing description, it will be understood that the invention provides a practical apparatus for reliably feeding cleats of different lengths into their proper respective positions on the rapidldy moving conveyer bands. It will therefore be appreciated that the aforementioned and other desirable objects have been achieved. However, it should be emphasized that the particular embodiments of the invention are intended as merely illustrative and not as restrictive of the invention.

I claim:

1. In a box-part making machine, apparatus for dispensing cleats with mitered ends, including a conveyor band having cleat pushing elements secured thereto and defining between them cleat spaces of alternately shorter and longer lengths, a pair of hoppers for respectively holding longer and shorter cleats with their mitered ends facing downwardly, said hoppers being arranged end-to-end above the path of said cleat pushing elements, three pairs of cleat engaging members, the members of each pair being mounted one above the other, the first pair being mounted between the proximate ends of said hoppers and the other two pairs being respectively mounted at the remote ends of said cleat hoppers, said first pair of cleat engaging members being pivotally mounted for swinging movement into respective engagement with the proximate mitered ends of the bottom cleat and the next cleat above in one or the other of said hoppers, and said other two pairs being pivotally mounted for swinging movement into and out of respective engagement with the remote mitered ends of the bottom cleat and the next cleat above in the respective hoppers, linkage members so interconnecting said cleat engaging members that when the upper one of said first pair swings in one direction the lower ones of said other two pairs swing in the same direction and the remaining ones swing in the opposite direction, whereby the bottom cleat in one hopper and the next-to-bottom cleat in the other hopper are supported while the next-to-bottom cleat in said one hopper and the bottom cleat in said other hopper are released,

and vice versa, electrically controlled means for moving said cleat engaging members as aforesaid and electrical switch means connected to control the operation of said electrically controlled means and mounted adjacent said conveyor band for actuation by lugs projecting therefrom in synchronism with the arrival beneath the appropriate hoppers of the respective longer and shorter cleat spaces defined by said cleat pushing elements.

2. In a box-part making machine, apparatus for dispensing cleats with mitered ends, including a conveyor band having cleat pushing elements secured thereto and defining between them cleat spaces of alternately shorter and longer lengths, a pair of hoppers for respectively holding longer and shorter cleats with their mitered ends facing downwardly, said hoppers being arranged end-to-end above the path of said cleat pushing elements, three pairs of cleat engaging members, the members of each pair being mounted one above the other, the first pair being mounted between the proximate ends of said hoppers and the other two pairs being respectively mounted at the remote ends of said cleat hoppers, said first pair of cleat engaging members being pivotally mounted for swinging movement into respective engagement with the proximate mitered ends of the bottom cleat and the next cleat above in one or the other of said hoppers, and said other two pairs being pivotally mounted for swinging movement into and out of respective engagement with the remote mitered ends of the bottom cleat and the next cleat above in the respective hoppers, linkage members so interconnecting said cleat engaging members that when the upper one of said first pair swings in one direction the lower ones of said other two pairs swing in the same direction and the remaining ones swing in the opposite direction, whereby the bottom cleat in one hopper and the next-to-bottom cleat in the other hopper are supported while the next-to-bottom cleat in said one hopper and the bottom cleat in said other hopper are released, a solenoid and a return spring for moving said cleat engaging members in opposite directions between their two positions as aforesaid, and a pair of electrical switches mounted at spaced positions along the path of said conveyor band for actuation by lugs projecting from alternate ones of said cleat pushing elements, said switches being connected to said solenoid so that actuation of one of said switches energizes said solenoid to move said cleat engaging members to one of their two positions, and actuation of the other of said switches de-energizes said solenoid to permit said return spring to move said cleat engaging members to the other of their two positions.

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