

June 28, 1955

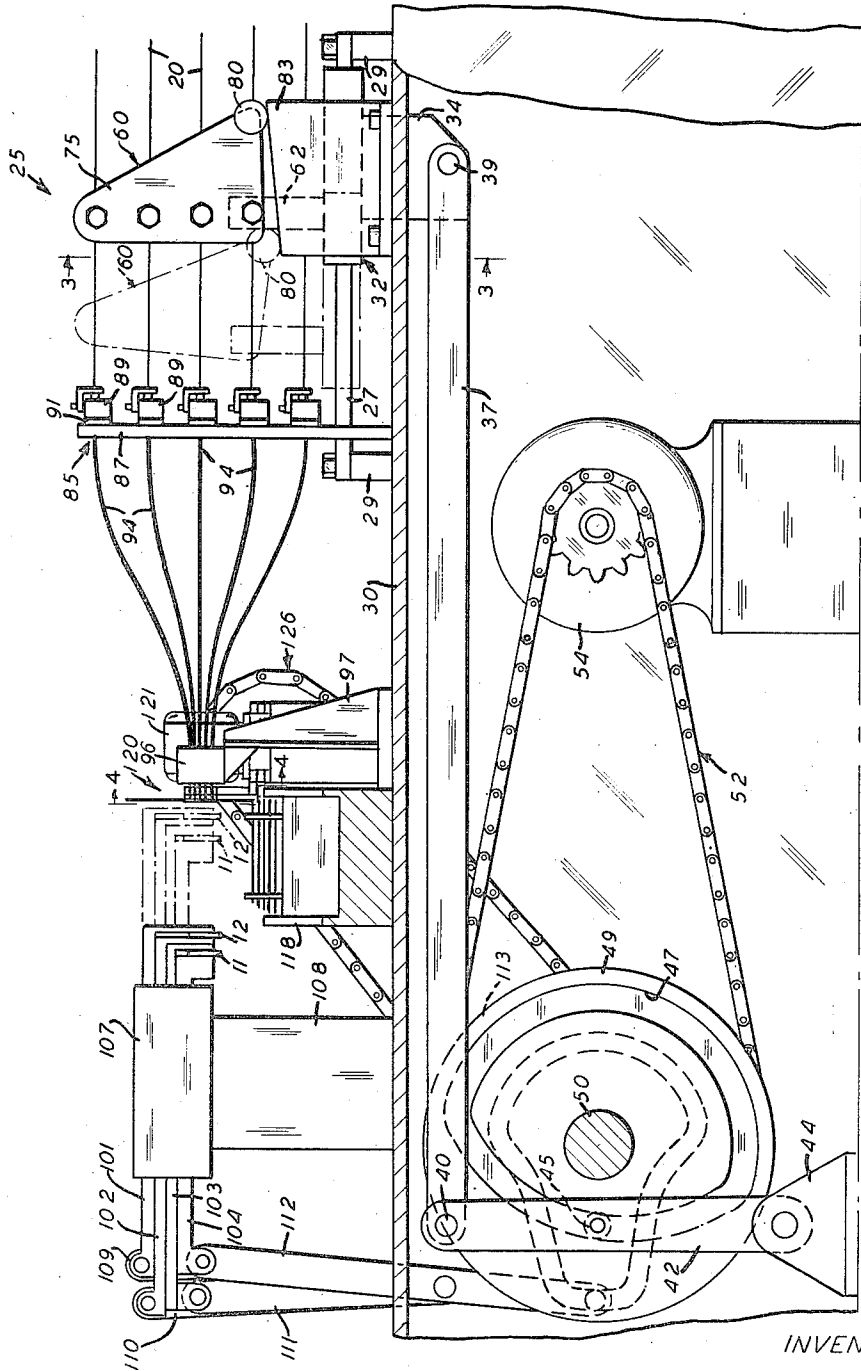
P. RUTTKAY

2,711,818

APPARATUS FOR FEEDING SIMULTANEOUSLY A PLURALITY OF WIRES

Filed Dec. 9, 1953

3 Sheets-Sheet 1



INVENTOR

P. RUTTKAY

BY *W. H. Ranz*
ATTORNEY

June 28, 1955

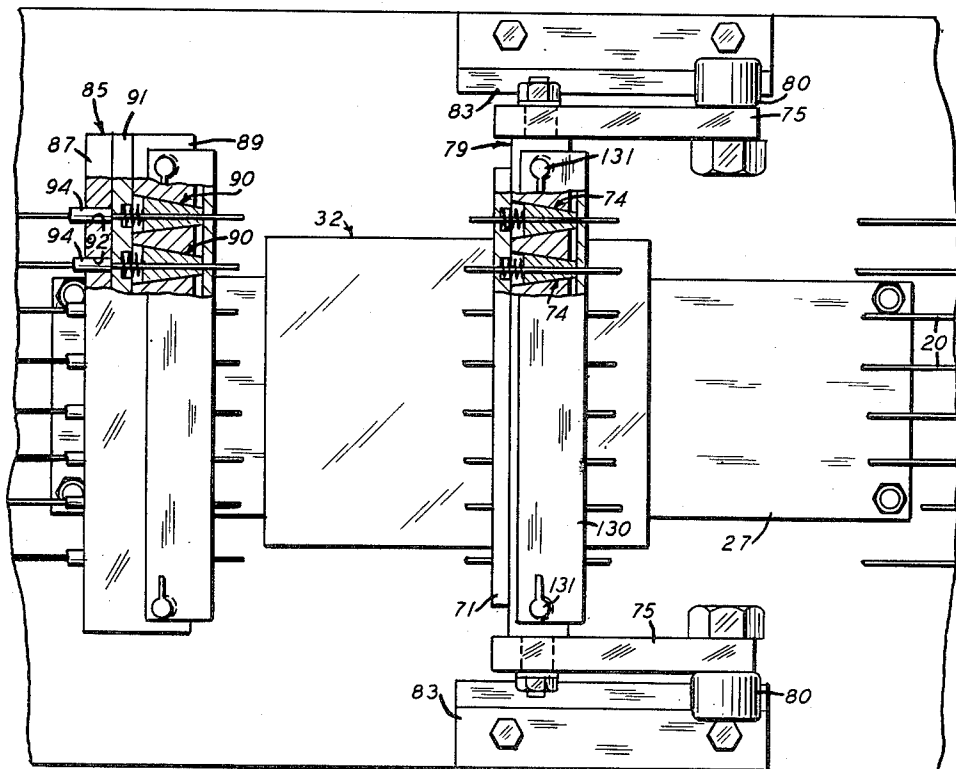
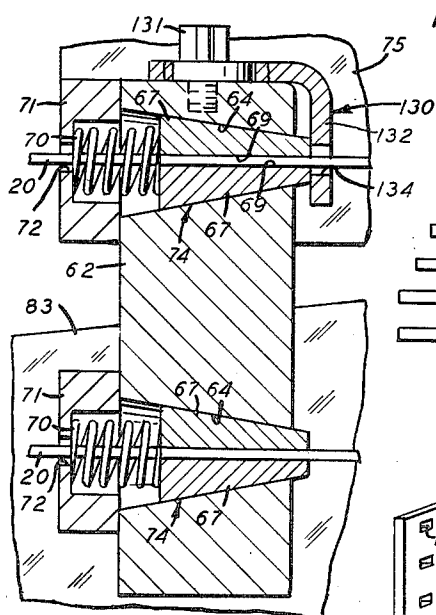
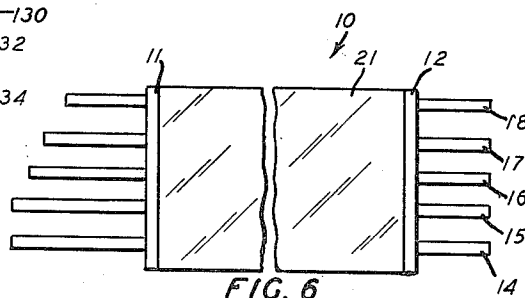
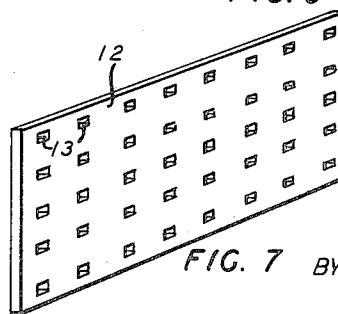
P. RUTTKAY

2,711,818

APPARATUS FOR FEEDING SIMULTANEOUSLY A PLURALITY OF WIRES

Filed Dec. 9, 1953

3 Sheets-Sheet 2



INVENTOR
P. RUTTKAY
ATTORNEY

June 28, 1955

P. RUTTKAY

2,711,818

APPARATUS FOR FEEDING SIMULTANEOUSLY A PLURALITY OF WIRES

Filed Dec. 9, 1953

3 Sheets-Sheet 3

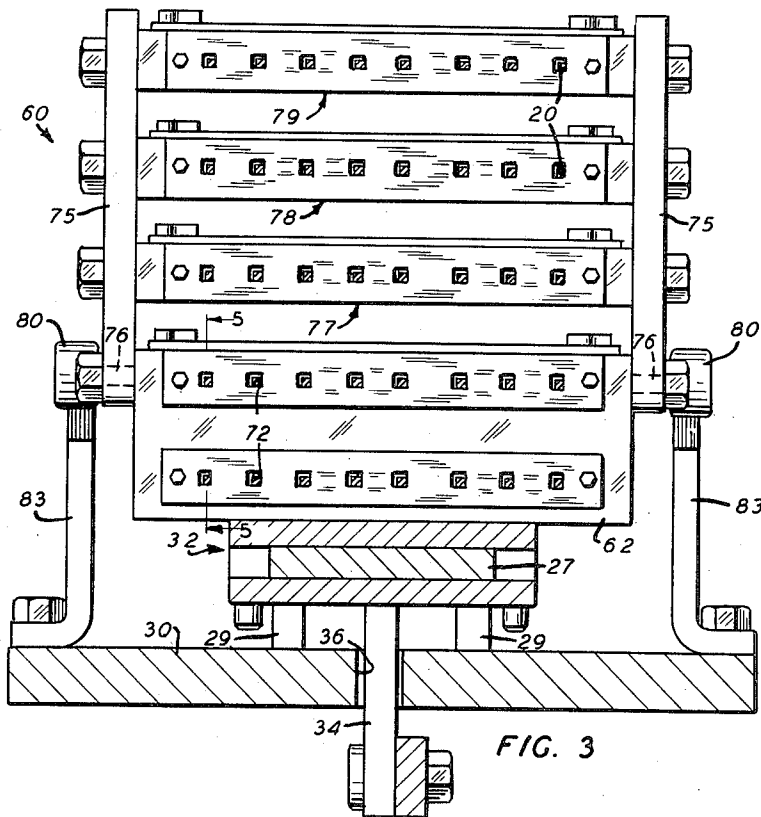


FIG. 3

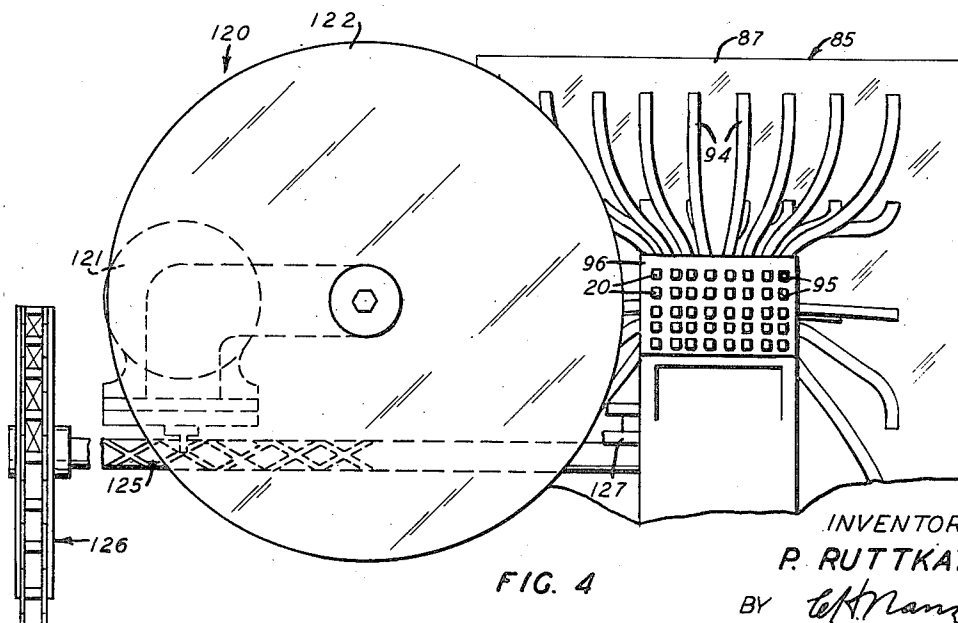


FIG. 4

INVENTOR
P. RUTTKAY
BY *W. H. R. R. R.*
ATTORNEY

1

2,711,818

APPARATUS FOR FEEDING SIMULTANEOUSLY A PLURALITY OF WIRES

Paul Ruttkay, Opequon District, Va., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application December 9, 1953, Serial No. 397,190

9 Claims. (Cl. 203-115)

This invention relates to apparatus for feeding simultaneously a plurality of wires, and more particularly to apparatus for feeding simultaneously unequal lengths of a plurality of individual wires.

In the manufacture of cast resin terminal blocks utilized in the electrical communications industry a plurality of wire terminals of different lengths are encased partially in a block of resin. Preparatory to encasing the wire terminals in a casting resin, it is necessary to insert a plurality of rows of individual wires into a pair of spaced, apertured, plastic retaining plates which serve to maintain the wires in a predetermined spaced relationship in a mold. After the wires have been inserted in the plates they are cut to predetermined lengths to form the wire terminals.

In the finished product the ends of all the wire terminals at one end of a terminal block lie in a single plane perpendicular to the longitudinal axis thereof, whereas at the other end, due to predetermined differences in the length of the wire terminals in one row as compared to the lengths of the wire terminals in adjacent rows, the ends of the terminals are staggered by rows. Manifestly, the problem of feeding a plurality of wires simultaneously and cutting them to the proper lengths from indefinite lengths of supply wire to form the wire terminals presents marked difficulties which must be overcome to meet the requirements large scale, economical production of cast resin terminal blocks.

It is an object of this invention to provide new and improved apparatus for feeding simultaneously a plurality of wires.

It is another object of this invention to provide new and improved apparatus for feeding simultaneously unequal lengths of a plurality of individual wires.

Apparatus illustrating certain features of the invention may include a pivotally mounted frame, a plurality of wire-gripping means mounted on the frame at unequal distances from the pivotal axis thereof and designed to grip individually a plurality of wires passing therethrough in a generally parallel, spaced relationship from supplies thereof, means for moving the frame in a direction parallel to the longitudinal axes of the wires, and means for pivoting the frame as it so moves whereby the wires are advanced unequal distances.

A complete understanding of the invention may be obtained from the following detailed description of apparatus forming a specific embodiment thereof, when read in conjunction with the appended drawings, in which:

Fig. 1 is a side elevation of the apparatus, with parts thereof broken away for clarity;

Fig. 2 is an enlarged plan view of a portion of the apparatus shown in Fig. 1, with parts thereof broken away for clarity;

Fig. 3 is an enlarged, fragmentary, vertical section taken along line 3-3 of Fig. 1;

Fig. 4 is an enlarged, fragmentary, vertical section taken along line 4-4 of Fig. 1;

Fig. 5 is an enlarged, fragmentary, vertical section taken along line 5-5 of Fig. 3;

2

Fig. 6 is a fragmentary, side elevation of a finished cast terminal block, and

Fig. 7 is an enlarged perspective view of a plastic retaining plate forming a part of the cast terminal block.

Referring now to Fig. 1 there is shown an apparatus for forming wire terminals and assembling them in a pair of spaced, apertured retaining plates 11 and 12 preparatory to a molding operation in which the wire terminals, properly assembled in the plates, are partially encased in a casting resin to form a finished terminal block 10, illustrated in Fig. 6.

The retaining plates 11 and 12, one of which is shown in detail in Fig. 7, are provided with five rows of eight equally spaced apertures 13-13 for receiving five rows of wire terminals 14-14, 15-15, 16-16, 17-17 and 18-18, as shown in Fig. 6. The wire terminals 14-14 to 18-18, inclusive, are cut from indefinite lengths of wires 20-20 into four different predetermined lengths, in a manner hereinafter to be described.

Referring again to the finished terminal block 10, shown in Fig. 6, it may be seen that the lengths of the wire terminals 14-14 comprising the bottom row and the lengths of the wire terminals 15-15 comprising the adjacent second row are equal and greater than the lengths of the terminals in the succeeding rows. The lengths of the wire terminals 16-16, 17-17 and 18-18, which respectively make up the succeeding rows, are progressively shorter, the terminals 18-18 comprising the topmost row being the shortest of all.

As viewed in Fig. 6, the right ends of the wire terminals 14-14 to 18-18, inclusive, lie in a common plane perpendicular to the longitudinal axis of the terminal block 10 and extend a short distance beyond the plate 12 and a resin casing 21 formed by the solidified, molded casting resin. The left ends of the terminals 14-14 to 18-18, inclusive, lie in staggered rows, with the exception that the ends of the terminals 14-14 and 15-15, which are of equal lengths, lie in a common plane perpendicular to the longitudinal axis of the terminal block 10.

A wire feeding mechanism 25 (Fig. 1) forming part of the apparatus includes a horizontal, longitudinally extending slide bar 27 mounted at either end thereof on supports 29-29, which are in turn mounted fixedly to a horizontal platform 30. The supports 29-29 space the slide bar 27 from the top surface of the platform 30. Slidably mounted on the slide bar 27 for longitudinal reciprocation therealong is a crosshead 32.

Attached fixedly to and depending from the bottom side of the crosshead 32 is a lug 34 which projects through an elongated slot 36 (Fig. 3) in the platform 30. One end of a drive arm 37 is pivotally connected by a connecting pin 39 to the lug 34 and the other end of the drive arm is pivotally connected by a connecting pin 40 to the free end of a crank arm 42, which in turn is mounted pivotally at one end to a fixed member 44. Secured to and projecting inwardly from the crank arm 42 at a point intermediate of the ends thereof is a follower pin 45 which is received within a camming slot 47 in a cam 49. The cam 49 is keyed upon a shaft 50 which is driven rotatably through a sprocket and chain drive, indicated generally at 52, by means of a constant speed electric motor 54.

Mounted on the crosshead 32 is a movable feed chuck unit, indicated generally at 60, which includes a chuck holder 62 fixedly secured to the crosshead 32 for movement therewith. The holder 62 is provided with two parallel rows of eight equally spaced, frustoconical bores, two of which designated 64-64 are shown in detail in Fig. 5. Slidably received within each of the bores 64-64 in the holder 62 are a pair of cooperating gripping jaws 67-67 which take the form of complementary halves of a truncated solid right cone. The opposed cooperat-

ing faces of the jaws 67—67 are provided with complementary grooves 69—69 designed to receive a wire 20 passed between the jaws.

Compression springs 70—70 normally urge each pair of jaws 67—67 to the right, as viewed in Fig. 5, into a position wherein the opposed faces of the jaws are urged together by the constricting wall of the tapered bore 64 and the cooperating surfaces of the grooves 69—69 frictionally engage the wire 20 positioned therebetween. In this extreme right position, which will hereinafter be referred to as the clamping position, the right-hand ends of the jaws 67—67 protrude from the bore 64 and extend a short distance beyond the right face of the holder 62, as viewed in Fig. 5. With the jaws 67—67 so positioned, they resist any rightward movement of the wire 20 in the grooves 69—69 (as viewed in Fig. 5), the gripping power of the cooperating jaws on the wire increasing as the force urging the wire to the right is increased, since the jaws are urged more tightly against the wire. However, the wire 20 is always free to move leftward between the jaws 67—67, due to the fact that, by design, the strength of each of the springs 70—70 is insufficient to hold the jaws in their clamping position against a force exerted on the wire tending to move it to the left.

Backing plates 71—71 are removably secured to the left-hand face of the chuck holder 62 (as viewed in Fig. 5), and positioned so that each backing plate covers a single row of the bores 64—64. Each of the plates 71—71 is provided with eight apertures 72—72, which correspond with the eight bores of the particular row covered by the cover plate. The apertures 72—72 are accurately aligned on the longitudinal axes of the bores and have a diameter somewhat greater than the wire to be passed therethrough. The apertures 72—72 are counterbored on the inner side of each of the backing plates to provide seats for retaining the left ends of the compression springs 70—70 (as viewed in Fig. 5), to keep the springs in concentric alignment with respect to the apertures 72—72 and bores 64—64.

For the purpose of simplifying the following description, each assembly comprising a pair of complementary wire-gripping jaws 67—67 positioned in a bore 64 and their associated compression spring 70, will hereinafter be referred to generally as a wire chuck 74 (Fig. 2).

Mounted at either side of the chuck holder 62 are a pair of spaced, generally triangular-shaped frame members 75—75. The frame members 75—75 are connected to the holder 62 by pins 76—76 on which they are free to pivot. Mounted transversely between the pivotal frame members 75—75 are chuck holders 77, 78 and 79 (Fig. 3). The chuck holders 77, 78 and 79 are connected pivotally to the frame members 75—75 at either end thereof and are aligned vertically in equally spaced, horizontal, parallel relationship. Each of the chuck holders 77, 78 and 79 is provided with a single row of eight, equally spaced, wire chucks 74—74 identical with the chucks 74—74 provided on the chuck holder 62.

The frame members 75—75 are provided with roller-type cam followers 80—80. As shown in Fig. 2, each cam follower 80 is mounted to its associated frame member 75 at the right corner of the base. The cam followers 80—80 are designed to engage, respectively, the sloping top surfaces of stationary tilt cams 83—83, which are fixedly secured to the platform 30 on opposite sides of the frame members 75—75. It may be seen that longitudinal movement of the holder 62 and pivotally attached frame members 75—75 causes pivotally movement of the frame members with respect to the holder 62 about an axis through the pins 76—76.

Positioned immediately to the left, as viewed in Fig. 1, of the position occupied by the movable feed chuck unit 60 at the extreme end of its forward travel, which position is indicated by the phantom outline of that unit in Fig. 1, is a stationary holding clutch unit 85.

The holding clutch unit 85 includes a supporting plate 87 mounted fixedly to the platform 30 in an upright position. Secured to the rear face of the plate 87 are five chuck holders 89—89, which are similar in construction to the chuck holders 77, 78 and 79. Each of the holders 89—89 is provided with a single row of eight, equally spaced, wire chucks 90—90 (Fig. 2) identical with the wire chucks 74—74 provided in the holders 62, 77, 78 and 79.

The chuck holders 89—89 are mounted in vertical alignment in an equally spaced, parallel, horizontal relationship, the longitudinal axes of their associated wire chucks 90—90 being aligned with corresponding wire chucks 74—74 in the chuck holders 62, 77, 78 and 79. For example, a wire 20 passing from its associated supply reel (not shown) through one of the chucks 74—74 in the chuck holders 79 of the movable feed chuck unit 60 passes directly through a corresponding chuck 90 in the topmost chuck holder 89 of the holding chuck unit 85.

Each of the holders 89—89 is provided with an apertured backing plate 91 similar to the backing plates 71—71, which serves to retain the compression springs associated with the chucks 90—90. The supporting plate 87 is provided with five rows of eight drilled holes 92—92 which are accurately aligned with the apertures in the backing plates 91—91 associated with the chuck holders 89—89. The holes 92—92 are designed to receive the ends of forty individual wire conduits 94—94 made of metal tubing. The opposite ends of the wire conduits 94—94 converge and are received within corresponding passages 95—95 formed in a guide block 96 mounted rigidly on a support arm 97, which in turn is fixedly secured to the platform 30. The passages 95—95 in the guide block 96 are arranged to accurately match with the spacing of the apertures 13—13 in plastic retaining plates 11 and 12. Thus, the wires 20—20 passing through the conduits 94—94 are brought into accurate registry with the apertures in the plates 11 and 12 as they are fed from the guide block 96 toward the plates.

The apertured retaining plates 11 and 12 are initially loaded between clamping members 101 and 102, and 103 and 104, respectively, by a suitable loading mechanism (not shown) or by hand. The clamping members 101, 102, 103 and 104 are slidably mounted in a bearing block 107 mounted in turn on a bracket 108 secured to the platform 30 and are slidable relative to each other and the bearing block. The clamping members 101, 102, 103 and 104 are operated by linkages 109, 110, 111 and 112, respectively, which are in turn operated by suitable cams mounted on the shaft 50 for rotation therewith, one of which designated 113 is shown in Fig. 1, operatively connected to the linkage 112.

The cam-operated linkages 109 to 112, inclusive, are operated initially to clamp the plates 11 and 12 individually between their respective clamping members 101 to 104, inclusive, and to move the clamping members with the plates clamped therebetween into positions as indicated by the phantom outlines of these members in Fig. 1, for receiving the wires 20—20 fed through the passages 95—95 in the guide block 96 of the feeding mechanism 25. In these last-mentioned positions, the plastic-retaining plates 11 and 12 are positioned relatively close together to facilitate the insertion of the wires 20—20 into and through the apertures in the plates.

After the wires 20—20 have been inserted in the apertures 13—13 of the plates 11 and 12, and have been cut by suitable cutting means, hereinafter to be described, to form terminals 14—14 to 18—18, inclusive, the clamping members 101 to 104, inclusive, are operated by the linkages 109 to 112, inclusive, respectively, to separate the plates to a predetermined spaced relationship and to release their clamping engagement with the plates whereby the plates with the terminals 14—14 to 18—18, inclusive, properly assembled therein are deposited on a suitable

chute 118 which conducts the assembly to molding apparatus (not shown).

It will be understood that the clamping members 101, 102, 103 and 104 are designed and constructed so that the plates 11 and 12 are clamped so as to leave all of the forty apertures in each of the plates unobstructed, whereby the wires 20—20 may be readily inserted through the apertures 13—13 in the plate 12 and into and through corresponding apertures 13—13 in the plate 11.

The cutting means mentioned above for cutting the wires 20—20 to form the terminals 14—14 to 18—18, inclusive, comprises a cutter 120 positioned adjacent to the exit end of the guide block 96. The cutter 120 includes an electric motor 121 which drives a rotary circular cutting blade 122 and is reciprocable between a retracted position and an operating position. In the operating position, the blade 122 moves across the exit ends of the passages 95—95 formed in the guide block 96 to cut all forty wires 20—20 in a plane perpendicular to their longitudinal axes. The reciprocating movement of the cutter blade 122 into and out of the operating position is controlled in timed relationship with a wire feeding operation of the movable feed chuck unit 60 (Fig. 2), which will hereinafter be described in connection with a description of the operation of the entire apparatus. The coordinated reciprocation of the cutter blade 122 is accomplished by means of a double-threaded reversing screw 125, which is rotatably driven through a chain drive 126 from the shaft 50. The motor 121 and operatively connected cutter blade 122 are mounted slidably on a transversely extending guide 127 and are operatively connected to the reversing screw 125 for reciprocating movement thereby in timed relationship with the wire feeding operation.

Separate means are provided for selectively deactivating any entire row of wire chucks 74—74 or 90—90 on the movable feed chuck unit 60 or the stationary holding chuck unit 85, with the exception of the bottom row of chucks 74—74 in the chuck holder 62. Each of the chuck holders 62, 77, 78, 79 and 89—89 is provided with a slidably adjustable stop member 130 (Fig. 5) which has the shape of an angle iron and is adjustably mounted on the top of a chuck holder by means of adjustable, winged fasteners 131—131. A depending portion 132 of the stop member 130 is provided with eight equally spaced apertures 134—134 somewhat larger in diameter than the wires 20—20 which are aligned so as to permit the passage of the wires 20—20 through the wire chucks without any obstruction.

The stop member 130 may be moved slidably, by turning the fasteners 131—131, between a position wherein the depending portion 132 is spaced from the rear face of its associated chuck holder by a distance slightly greater than the amount by which the ends of the jaws 67—67 normally protrude when in their clamping position, and a position wherein the portion 132 is flush against that face and forces the ends of the jaws into their associated bore. When the depending portion 132 of the stop member 130 is flush against the rear face of its associated holder, the jaws of all the chucks in the row are forced back out of engagement with the wires 20—20 and are unable to grip the wires if they should happen to move in a reverse direction through the chucks.

Operation

In order to facilitate a description of the operation of the heretofore described apparatus, it will be assumed that the apparatus is already in operation with the motor 54 energized. In addition, it will be assumed that the apparatus is at the point in its operating cycle where the clamping members 101, 102, 103 and 104 occupy the positions indicated by the phantom outlines of these members in Fig. 1.

In this position, the plate 12 is clamped tightly between the clamping members 101 and 102, and is spaced

a relatively short distance from the exit ends of the passages 95—95 in the guide block 96. The plate 11 is clamped tightly between the clamping members 103 and 104 and positioned relatively close to the plate 12 with its apertures 13—13 accurately aligned with the apertures 13—13 formed in that plate. The apertures 13—13 in the plates 11 and 12 are positioned in direct alignment with the corresponding passages 95—95 in the guide block 96. During the previous cycle of operation, the wires 20—20 were cut in a plane perpendicular to their longitudinal axes, thereby leaving equal lengths of the wires 20—20 projecting a short distance beyond the forward face of the guide block 96.

The wires 20—20 pass from forty individual supply reels (not shown) in parallel spaced relationship through corresponding chucks 74—74 of the chuck holders 62, 77, 78 and 79, and then through corresponding chucks 90—90 in the chuck holders 89—89 into the wire conduits 94—94. With the plastic retaining plates 11 and 12 in position for receiving the leading ends of the wires 20—20, the movable feed unit 60 is in its extreme right-hand position, as shown in Fig. 1 and the cam followers 80—80, extending from the outer sides of their associated pivoted frame members 75—75, are engaged on the extreme right-hand ends of the sloping top surfaces of their respective tilt cams 83—83.

In this position, the cams 80—80 hold the frame members 75—75 so that the chuck holders 77, 78 and 79 are aligned vertically with respect to the chuck holder 62, and the chucks 74—74 of every chuck holder on the movable feed chuck unit 65 are positioned in a common plane perpendicular to the longitudinal axes of the wires 20—20. At this point in the cycle of operation the continued rotation of the cam 49 causes the drive arm 37 to move forward, carrying with it the connected cross-head 32 and the movable feed chuck unit 60 attached thereto.

As the chuck holder 62 moves to the left on the forward stroke of the drive arm 37, it carries with it the chuck holders 77, 78 and 79 mounted between the frame members 75—75, which members are in turn pivotally mounted on the chuck holder 62. Concurrently with the forward movement of the chuck holders 62, 77, 78 and 79, their associated chucks 74—74 engage the wires 16—16, since the jaws 67—67 of each chuck are urged tightly against the wire 16 passing between them. With continued movement of the chuck holders 62, 77, 78 and 79, the wires 20—20 are pulled from their associated supply reels (not shown) and advanced toward the left as viewed in Fig. 1.

As the wires advance to the left they move through the chucks 90—90 in the chuck holders 89—89 of the stationary holding chuck unit 85. Since the wires 20—20 are moving in the forward direction, from left to right, as viewed in Fig. 1, through the chucks 90—90, the wires are not gripped by the chucks on the holding chuck unit 85. Therefore, they move freely through the chucks 90—90 into their respective wire conduits 94—94, through their respective passages 95—95 formed in the guide block 96, and into and through the corresponding apertures 13—13 in the plastic retaining plates 11 and 12.

As the movable feed chuck unit 60 moves forward, the cam followers 80—80 descend the sloping top surfaces of the tilt cams 83—83, causing the frame members 75—75 to rotate in a clockwise direction, as viewed in Fig. 1, about an axis through the pins 76—76 connecting the frame members 75—75 to the holder 62. When the movable feed chuck unit 60 reaches its extreme forward position, the pivoted frame members 75—75 are in the position indicated by the phantom outline of the unit in Fig. 1. In this position the chuck holders 77, 78 and 79, mounted between the frame members 75—75, lie in a plane oriented at a predetermined angle with respect to a plane perpendicular to the longitudinal axes of the wires 20—20.

It may be readily seen that the wires 20—20 advanced by the chucks 74—74 in the chuck holder 62 have been advanced a distance greater than those advanced by the chucks 74—74 of the chuck holders 77, 78 and 79. Likewise, it may be seen that the row of wires 20—20 advanced by the chucks 74—74 of the chuck holder 77 have been advanced a distance slightly greater than those advanced by the chucks 74—74 of the chuck holders 78 and 79. The topmost row of wires 20—20 advanced by the chucks 74—74 of the chuck holder 79 have been advanced a distance less than any of the other rows of wires 20—20.

When the movable feed chuck unit 60 reaches the limit of its forward movement, the cam 49 goes through a "dwell" portion of its cycle wherein there is momentarily no movement of the feed chuck unit 60 or of the wires 20—20. At this point in the cycle, the blade 122 of the cutter 120 is moved into its operating position whereby it severs the wires 20—20 immediately adjacent to the forward face of the guide block 96 in a single plane perpendicular to the longitudinal axis of the wires. As the cam 49 continues to rotate, the drive arm 37 reverses its direction of travel and moves the crosshead 32 and attached chuck holder 62 to the right, as viewed in Fig. 1.

As the movable feed chuck unit 60 moves to the right, the chucks 74—74 of the chuck holders 62, 77, 78 and 79 release their grips on the wires 20—20, allowing the wires to move freely through these chucks. However, the chucks 90—90 of the chuck holders 89—89 now grip the wires 20—20 and prevent them from being moved from left to right, as viewed in Fig. 1. Thus, the wires 20—20 remain stationary as the movable feed chuck unit 60 returns to its starting position at the extreme right end of its travel and becomes ready for subsequent operation. As the feed chuck unit 60 moved to the right to resume its starting position, the tilt cams 83—83 urged the frame members 75—75 into the initial position wherein the chucks 74—74 of the chuck holders 77, 78 and 79 lie in a common vertical plane with the chucks 74—74 of the chuck holder 62.

It may be readily seen that the slope angle of the top surfaces of the tilt cams 83—83, with respect to the horizontal platform 30, determines the predetermined angle at which the top three rows of terminals 16—16, 17—17 and 18—18, respectively, are staggered. By design the left ends of the top three rows of terminals of the finished terminal block 10 lie in a common plane disposed at a predetermined angle with respect to a plane perpendicular to their longitudinal axes. It may be seen that the chucks 74—74 of the chuck holders 77, 78 and 79 lie in a common plane disposed at this same predetermined angle with respect to a plane perpendicular to the wires 20—20 at the end of the forward travel of the feed chuck unit 60 when this unit is in its extreme left hand position, indicated by the phantom outline of the unit shown in Fig. 1.

It will be understood that various modifications of this apparatus may be made within the spirit and scope of the invention.

What is claimed is:

1. Apparatus for feeding simultaneously unequal lengths of a plurality of individual wires from supplies thereof, which comprises a pivotally mounted frame, a plurality of wire-gripping means mounted on the frame at unequal distances from the pivotal axis thereof and designed to grip individually a plurality of wires passing therethrough in a generally parallel spaced relationship from supplies thereof, means for moving the frame in a direction parallel to the longitudinal axes of said wires, and means for pivoting the frame as it so moves whereby the wires are advanced unequal distances.

2. Apparatus for feeding simultaneously unequal lengths of a plurality of individual wires from supplies thereof, which comprises a slidably mounted support,

a frame mounted pivotally on said support for angular movement about an axis oriented transversely with respect to slidable support, a plurality of wire-gripping means mounted on the frame at unequal distances from the pivotal axis thereof and designed to grip individually a plurality of wires passing therethrough in a generally parallel spaced relationship, means for moving the support in a direction parallel to the longitudinal axes of said wires, and means for concurrently pivoting the frame as it moves with the support whereby the wires are advanced unequal distances.

3. Apparatus for feeding simultaneously unequal lengths of a plurality of individual wires from supplies thereof, which comprises a pivotally mounted frame, a plurality of wire-gripping chucks mounted on the frame at unequal distances from the pivotal axis thereof and designed to grip individually a plurality of wires passing therethrough in a generally parallel spaced relationship from supplies thereof, means for moving the frame in a direction parallel to the longitudinal axes of said wires, and cam means for pivoting the frame as it so moves whereby the wires are advanced unequal distances.

4. Apparatus for feeding simultaneously unequal lengths of a plurality of individual generally parallelly disposed spaced wires from supplies thereof, which comprises a frame mounted slidably for reciprocation parallel to the wires and pivotally for angular movement about an axis oriented transversely with respect to the wire, means for periodically reciprocating the frame in a forward and a reverse direction, a plurality of wire-gripping chucks mounted on the frame at unequal distances from the pivotal axis thereof and arranged so that a wire passes through each chuck, said chucks being designed to grip and advance their associated wires when the frame is moved in a forward direction and to release said wires when the latter are moved in the reverse direction, and means for causing the frame to oscillate about its pivotal axis during the reciprocation of the frame, whereby the wires engaged by the chucks at different distances from said last-mentioned axis are advanced unequally in the forward direction.

5. Apparatus for feeding simultaneously unequal lengths of a plurality of individual generally parallelly disposed spaced wires from supplies thereof, which comprises a frame mounted slidably for reciprocation parallel to the wires and pivotally for angular movement about an axis oriented transversely with respect to the wire, means for periodically reciprocating the frame in a forward and a reverse direction, a plurality of wire-gripping chucks mounted on the frame at unequal distances from the pivotal axis thereof and arranged so that a wire passes through each chuck, said chucks being designed to grip and advance their associated wires when the frame is moved in a forward direction and to release said wires when the latter are moved in the reverse direction, means for causing the frame to oscillate about its pivotal axis during the reciprocation of the frame, whereby the wires engaged by the chucks at different distances from said last-mentioned axis are advanced unequally in the forward direction, and means for holding the wires stationary as the frame moves in the reverse direction.

6. Apparatus for feeding simultaneously unequal lengths of a plurality of individual wires from supplies thereof, which comprises a reciprocable slide, a frame pivotally mounted on the slide for angular movement about a pivotal axis oriented transversely with respect to the axis of reciprocation, a plurality of wire-gripping chucks mounted fixedly on the frame at different distances from said pivotal axis, each of the chucks on the frame being designed to grip a wire passing therethrough when the slide moves in a forward direction and to release said wire when the slide moves in a reverse direction, means for periodically reciprocating the slide, the chucks gripping and advancing their associated wires as

the slide moves in the forward direction, means for pivoting the frame about its pivotal axis as it moves forward with the slide whereby the wires engaged by chucks at different distances from said pivotal axis are advanced unequally in the forward direction, and means for holding the wires stationary as the slide and frame move in the reverse direction.

7. Apparatus for feeding simultaneously unequal lengths of a plurality of individual wires from supplies thereof, which comprises a reciprocable slide, a frame pivotally mounted on the slide for angular movement about a pivotal axis oriented transversely with respect to the axis of reciprocation, a plurality of wire-gripping chucks mounted fixedly on the frame at different distances from said pivotal axis, each of the chucks on the frame being designed to grip a wire passing therethrough when the slide moves in a forward direction and to release said wire when the slide moves in a reverse direction, means for periodically reciprocating the slide in a forward and reverse direction, the chucks gripping and advancing their associated wires as the slide moves in the forward direction, a cam mounted adjacent to the frame for co-operation therewith to pivot said frame angularly about its pivotal axis as it moves with the slide whereby the wires engaged by chucks at different distances from said pivotal axis are advanced unequally in the forward direction, and means for holding the wires stationary as the slide and frame move in the reverse direction.

8. Apparatus for feeding simultaneously predetermined unequal lengths of a plurality of individual wires disposed in spaced parallel relationship from supplies thereof and inserting said lengths of wires into apertures arranged in a predetermined pattern in a retaining member, which comprises a slide mounted for reciprocation on an axis parallel to the wires, a frame mounted pivotally on the slide for angular movement about an axis transverse to said axis of reciprocation, a plurality of wire-gripping chucks mounted on the frame at unequal distances from

the pivotal axis thereof so that a wire passes through each chuck, said chucks being designed to grip and advance their associated wires when the slide and attached frame are moved in a forward direction and to release said wires when the slide and frame are moved in the reverse direction, guide means for receiving the individual wires advanced by said chucks and urging them into predetermined spaced relationship with each other so as to cause the leading ends of the wires to register with corresponding apertures in a retaining member, means for periodically reciprocating the slide whereby the chucks grip their associated wires as the slide moves in the forward direction and advance them through the guide means and into the apertures in the retaining member, cam means for pivoting the frame about its pivotal axis as it moves in the forward direction whereby wires engaged by the chucks at different distances from said pivotal axis are advanced unequal distances, and means for holding the wires stationary as the slide and frame return in the reverse direction.

9. Apparatus for feeding simultaneously unequal lengths of a plurality of individual wires, which comprises a pivoted support, a plurality of wire-gripping means mounted on the support at unequal distances from the pivotal axis thereof and designed to grip individually a plurality of wires passing therethrough in the same general direction, means for moving the support in a direction such as to feed the wires longitudinally, and means for pivoting the support as it so moves whereby the wires are advanced unequal distances.

References Cited in the file of this patent

UNITED STATES PATENTS

192,437	Kilmer	June 26, 1877
2,288,385	Beard	June 30, 1942
2,586,536	Haller	Feb. 19, 1952
2,622,874	Haller	Dec. 23, 1952