METHODS OF AND APPARATUS FOR PACKAGING COMPONENTS

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This invention relates to methods of and apparatus for packaging components and more particularly to methods of and apparatus for packaging electrical components in side-by-side relationship for transfer as a unit.

In the automated, assembly line manufacture of resistors with coaxial leads there has been a particular need for a method and apparatus for preassembling the resistors into a self-contained unit for transfer to operating stations on the assembly line or for rapid transfer of finished resistors from the assembly area to the test areas. It is therefore a principal object of this invention to provide an improved method of and apparatus for packaging electrical components having coaxial leads into a unit with the components maintained in a predetermined group pattern.

A method of packaging electrical components may include the steps of positioning a component beneath a packaging machine, elevating the component to the plane of the packaging machine, and loading the elevated component into a magazine with the leads of the component extending outside the magazine.

The magazine is filled with components, the leads of such components are exposed in a common plane and a block of penetrable material is moved into piercing engagement with the leads. The block of penetrable material and the components held thereby are then removed from the magazine.

Apparatus illustrating certain features of the invention may include a conveyor from which an elevator removes electrical components having coaxial leads. A transfer bar is employed to remove the electrical components from the elevator and place the components into a magazine with the leads in predetermined parallel arrangement. A ram moves a block of penetrable material into piercing engagement with the leads of the resistors to form a unit therewith, and the transfer bar is actuated to remove the block and the components held thereby from the magazine.

Other objects and advantages of the invention will become apparent by reference to the following detailed description and the accompanying drawings illustrating preferred embodiments of the invention, in which:

FIG. 1 is a front elevation, partly broken away, of a packaging machine;
FIG. 2 is a schematic representation of the mechanical and hydraulic control system employed in the machine shown in FIG. 1;
FIG. 3 is a plan view of a portion of the machine;
FIG. 4 is a side elevation of a portion of the machine;
FIG. 5 is a cross-sectional view taken along line 5-5 of FIG. 3 showing a packaging member in extended position;
FIG. 6 is a cross-sectional view taken along line 6-6 of FIG. 3;
FIG. 7 is a cross-sectional view of a portion of the machine taken along line 7-7 of FIG. 3;
FIG. 8 illustrates a base plate taken along line 8-8 of FIG. 4 with a portion of a package-receiving mechanism juxtaposed thereto;
FIG. 9 is a rear elevational view of a package manipulating mechanism located on the left side of the machine as shown in FIG. 1;
FIG. 10 is a side elevational view of the package manipulating mechanism taken on line 10-10 of FIG. 9;
FIG. 11 is a fragmentary perspective view of a package receiving tray;
FIG. 12 is a perspective view of a completed resistor package;
FIG. 13 is a perspective view of a transfer bar and platform mechanism;
FIG. 14 is a schematic of the machine control circuitry;
FIG. 15 is a plan view of an alternative embodiment of the packaging machine;
FIG. 16 is a detail view of a block transfer mechanism taken on line 16-16 of FIG. 12;
FIG. 17 is a detail sectional view of an air gun;
FIG. 17a is a sectional view taken on line 17a-17a of FIG. 17;
FIG. 18 is a detail sectional view taken on line 18-18 of FIG. 16; and
FIG. 19 is a detail view of a return mechanism for the transfer member shown in FIG. 16.

Referring to the drawings in which like reference characters designate like or corresponding parts throughout the several views, FIG. 1 shows a housing 21 on which is disposed an electrical control panel 22 and within which is an article conveyor 23. Located on top of the housing 21 is a resistor packaging mechanism 24 which receives workpieces from the conveyor 23 for packaging. To the right of the housing 21, and as shown in greater detail in FIGS. 9 and 10, is a packaging receiving mechanism 25 into which completed resistor packages 26 (FIG. 12) are loaded from the resistor packaging mechanism 24.

The conveyor 23, shown in FIG. 1, is intermittently driven by an electric motor 27 and carries a plurality of pallets 28 having an aperture 30, each of which cradles a resistor 29 having coaxial leads 31 (FIG. 12). A microswitch 32, within the housing 21, is opened by a pallet 28 to stop the conveyor motor 27 when the pallet reaches a position above a vacuum pump rod 33. As shown in FIG. 5, an aperture 34 extends longitudinally through the push rod 33 and is connected to a vacuum pump 35, which is driven by a motor 36, through a vacuum line 37. After a resistor 29 has been thus positioned, the vacuum push rod 33 is actuated to pass through the aperture 30 within the pallet 28 raising the resistor through an elongated aperture 38 (FIG. 5) in a base 39 and through a similar elongated aperture 41 in a plate 42. The plate 42 is adjustably held above the base 39 on runners 43 which rest upon a pair of arms 44 of a bifurcated member 45 (FIG. 8) slidably supported on the base. A plurality of vertical guide pins 46 (FIGS. 3 and 5) are rigidly attached to the base 39 and are slidably held within apertures 47 formed in the plate 42 to restrain the plate from horizontal motion with respect to the base while allowing relative vertical motion therewith.

Within the housing 21 is a push rod motor 48 (FIG. 2) which rotates a cam shaft 49 through a gear box 51. Rotatably supported on the shaft 49 are three angularly displaced cam 52, 53, and 54 which control microswitches 55, 56, and 57, respectively. A fourth cam 58, also secured to the shaft 49, is engaged by a pivoted bar 59 biased by a spring 61, which bar vertically reciprocates the vacuum push rod 33 when the cam 58 is rotated.

Also within the housing 21 is a transfer cam shaft 62 (FIG. 2) rotated through a gear box 63 by a transfer motor 64. A series of angularly displaced rotary cams 65, 66, and 67 are provided on the shaft 62 in co-operative engagement with microswitches 68, 69, and 70. A cam 72 also is mounted upon the shaft 62 and actuates a hydraulic master cylinder 73 through a push rod 74. Juxtaposed to the transfer cam shaft 62 is a packaging cam shaft 75 which is rotated by a motor 76 through a
gear box 77. Journalled on the shaft 75 are three angularly disposed rotary cams 78, 79, and 80, which co-operate respectively with microswitches 82, 83, and 84. In addition, similar cams 85, 86, and 87 are provided for the master cylinder 77 and 76 to actuate a plurality of identical push rods 88, 89, and 90, respectively. Upward movement of the push rods forces fluid from a plurality of hydraulic master cylinders 92, 93, and 94 to actuate a packaging cycle of the machine 24.

After a resistors 29 is elevated by the vacuum push rod 33, the switch 57 is closed by the cam 54 to start the transfer motor 64. As the transfer motor rotates the cam 72, the push rod 74 is raised, forcing fluid from the master cylinder 73 through a fluid line 95 into a hydraulic slave cylinder 86 located on the plate 42. As the fluid enters the cylinder 96 it forces a transfer bar 97 to the left (FIG. 1) and compresses a coiled compression spring 98. At the end of the transfer bar 97 is an enlargement 99 for releasably engaging a resistor held by the vacuum push rod 33 and transferring it to a position within a magazine 101. To aid in the transfer, a platform 102 (shown in detail in FIG. 13) is provided having a bifurcated horizontal portion 104, and a vertical portion 103 in which the bar 97 is slidably received within a slot 105. To bias the platform 102 away from the cylinder 96, a pair of compression springs 106 are provided in abutment against an upright member 107 which is secured to the base 39. Concentric with the springs 106 are a pair of support rods 108 each of which is attached at one end to the upright member 107 and on which the platform 102 is slidably supported. As the transfer bar 97 is moved to the left the platform 102 moves simultaneously therewith toward the magazine 101 due to the action of the spring 106 on the member 107, and the resistor 29 held by the push rod 33 is engaged by the bifurcated horizontal portion 104 of the platform 102. Continued movement of the transfer bar 97 causes the platform 102 to abut a floor 109 of the magazine 101 compressing the springs 106 and causing relative motion between the platform 102 and the transfer bar 97 to remove the resistor from the platform and position it within the magazine 101. When the transfer bar 97 is retracted by the cylinder 96 due to the continued rotation of the cam 72 and when the push rod 33 is lowered by the cam 88, the microswitch 56 is opened by the cam 53 to stop the push rod motor 48. Subsequently, the cam 67 on the shaft 62 engages the microswitch 70 to restart the conveyor motor 27 after which the cam 66 engages the microswitch 69 to stop the motor 64.

The temporary magazine 101 into which the resistors 29 are engaged is provided with the floor portion 109 which is attached to the base 39 and a layer of resilient material 111 (FIG. 5) under which the resistors 29 are held. Above this material is a metal plate 112 equipped with clamps indicated generally at 113 for holding the resilient material 111 on the plate 112. A pair of spring biased rods 114 slidably mounted within apertures 115 in an H-shaped plate 116 are rigidly attached to the plate 112 and serve as a suspension thereon. Supporting the H-shaped plate 116 and rigidly attached thereto are four suspension rods 117 which are secured to the plate 42.

A microswitch 118 mounted on the floor 109 of the magazine 101 is engaged by a resistor 29 when the magazine is filled to deenergize the conveyor motor 27 and energize the packaging motor 76. Upon rotation by the motor 76 the cam 87 raises the push rod 90 to force fluid from the hydraulic master cylinder 74 through a fluid line 119 into a hydraulic slave cylinder 121, thus moving a backup plate 122 outwardly and compressing a coiled spring 123 (see FIG. 1). The backup plate 122 is provided with an inset of resilient material 124 (FIG. 6) which, upon forward movement, engages and aligns the resistors 29 which are located within the magazine 101.

While the cam 87 is in a dwell position with resulting engagement of the leads 31 of the resistor 29 by the backup plate 122, the cam 86 moves the push rod 89 upwardly to force fluid from the master cylinder 93 through a fluid line 125 into a slave cylinder 126 to move an L-shaped end 127 of the magazine 101 on which are mounted the resistors 29 (FIG. 3). As the ram 127 is moved, it passes through openings 128 in the sides of an upright magazine 131 mounted on the plate 42 to carry a block 132 of penetrable material such as expanded plastic contained therein into piercing engagement with the leads 31 of the resistors 29 which are held within the magazine 101, thus forming a compact unit 26 of the resistors and the plastic block, which unit is shown in FIG. 12.

After the resistor leads 31 are embedded in the block 132, the cams 86 and 87 are moved into position to allow the rods 89 and 90 to move downwardly, thus retracting the ram 127 and the backup plate 122. As this takes place, the master cylinder 92 is actuated by the cam 85 through the push rod 88 to force fluid through a fluid line 133 into the slave cylinder 96. Because the master cylinder 92 has a greater volume than the master cylinder 73, which previously actuated the slave cylinder 96, the transfer bar 97 will move in a longer stroke than is normal in the transfer operation. Such stroke will be of such length as to remove the previously packaged resistors from the magazine 101.

Positioned at the side of the packaging machine 24 is the package receiving mechanism 25 including a frame 134 on which are mounted a double-V belt 135, an air motor 136 at one end of the belt, and a package receiving tray 137 in alignment with the air motor. A portion 138 of the frame 134 on the upper edge thereof is extended outwardly, and is located immediately below and to the side of an inclined plane 139 on which the completed resistor package 26 drops upon removal from the packaging machine 24. At the lower extremity of the double-V belt 135 is a microswitch 141 which controls the air motor 136 in any well known manner to transfer the resistor packages 26 from a plate 140 at the end of the belt 135 into the receiving tray 137 by means of a push plate 143.

The receiving tray 137, which is shown in FIG. 11, is composed of a bottom plate 144 and two parallel upright side members 145, each of which includes a longitudinal raised area 146 on the interior surface thereof. Thus, this plate 144 and plate 135 upon being forced into the tray 137, are moved into engagement with the raised areas 146 and are deformed thereby to retain the blocks for later removal.

While the completed package is being moved to the receiving tray 137, the cam 60 (FIG. 2) engages the microswitch 84 to restart the conveyor motor 27, the cam 79 opens the switch 83 to stop the packing motor 76.

The instant device can be adjusted to accommodate resistors of different lengths by a hand wheel 147 (FIG. 8) which rotates a rod 148 having a right-hand threaded portion 149, and a left-hand threaded portion 151. Co-operating with the right-hand threaded portion 149 of the rod 148 is a sleeve 152 rigidly connected to the cylinder 121 through an elongated aperture 153 in the plate 42 (FIG. 6). In a like manner the cylinder 126 is integral with a sleeve 154 threadedly attached to the left-hand threaded portion 151 of the rod 148 through an elongated aperture 155 in the plate 42. Thus, when the hand wheel 147 is turned in a clockwise direction the cylinders 121 and 126 slide toward each other to accommodate resistors which are short in length. Conversely, a counterclockwise rotation of the hand wheel 147 will move the cylinders further apart to provide space to accommodate a long resistor.

For adjusting the magazine 101 to accommodate resistors of varying diameters a hand wheel 156 rotates a shaft 157 through bevel gears 158. To one end of the shaft is threadably attached the bifurcated member 45 having arms 44 which describe an inclined plane, as
shown in FIG. 5. As the bifurcated member 45 is moved to the left by rotation of the shaft 157, the inclined runners 43 which support the plate 42 are raised by the wedging action of the arms 44 of the bifurcated member 45 with resulting vertical movement of the plate 42 on the guide pins 46.

Control circuitry

FIG. 14 shows control circuitry in which a relay system is energized from a 28-v. source (not shown) through a switch 162. Controlled by the relay system are the motors 47, 52, 48, and 55 which are energized from a 110-v. source (not shown) through switch 163, relay contacts 164 and 165, and a pair of conductors 166 and 167.

After the switch 163 is closed, the switch 162 is closed to energize a relay coil 168 which closes relay contacts 164 and 165 in the 110-v. system, energizing conductors 166 and 167. To start the packaging machine 24 with power on reset switch 169 is momentarily closed and, assuming the monitoring switches 82, 68, and 55 are in the position shown in FIG. 14, a circuit is established from the conductor 167 through switches 169, 82, 68, and 55 through the relay coil 171 to the conductor 166. Upon energization, the coil 171 closes normally open contacts 172 and 173 to start the conveyor motor 27. Simultaneously therewith, normally open contact 174 is closed by the coil 171 to establish a holding circuit for that coil. Contacts 174 and normally closed contacts 175 through the relay coil 171.

The conveyor motor 27 will continue to operate until a pallet 28 opens the switch 172 which discharges a capacitor 176 through a relay coil 177. As the coil 177 is energized, contacts 178, which are normally open, momentarily close to energize a relay coil 179 which closes a pair of normally open contacts 181 and 182 to complete a circuit to the push rod motor 48 which rotates the cam 52 to place the monitoring switch 55 in an alternate position in series with the coil 179. As the contacts 181 and 182 are closed the coil 179 also opens the normally closed contacts 175 to break the holding circuit to the coil 171 thereby opening the contacts 172 and 173 which are controlled by the coil 171 to stop the conveyor motor 27. A holding circuit for the coil 179 is simultaneously energized by that coil through normally open contacts 183 controlled by the coil 179 and the normally closed switch 56.

As the push rod motor 48 continues to rotate, the normally open switch 57 is closed momentarily by the cam 54, energizing a relay coil 184 which closes a pair of normally open contacts 185 and 186 to energize the transfer motor 64. Simultaneously, a normally open contact 187 is closed by the coil 184 to establish a holding circuit for the relay coil 184 through the normally closed switch 69. At this time the cam 65 moves the switch 68 to connect the relay coil 184 to the normally open switch 169 through the switch 82.

When the push rod motor 48 nears completion of one revolution, the cam 52 is moved to allow the monitoring switch 55 to return to the position shown in FIG. 14. and cam 53 momentarily opens the normally closed switch 56 to break the hold circuit for the coil 179 and stop the push rod motor 48 by opening the contacts 181 and 182. In addition, the normally open contacts 183 and the normally closed contacts 175 are simultaneously released by the deenergization of the coil 179.

Continued rotation of the transfer motor 64 causes the cam 67 to momentarily open the normally closed switch 70, at which time the coil 171 is again energized to start the conveyor motor 27 and to energize a hold circuit for the coil 171 in a manner previously described. As the transfer motor 64 nears the completion of one revolution the cam 66 controlled thereby momentarily opens the normally closed switch 71, at which time the coil 171 is again energized thereby opening the normally closed contacts 187 and stopping the transfer motor 64 by opening the contacts 185 and 186. At this time, the packaging machine is in condition to be recycled as a pallet strikes the switch 32.

The above sequence is continued until the normally open switch 118, mounted on the magazine 101, is closed by the engagement of a resistor 29 therewith. At this time a relay coil 188 is energized to close a pair of normally open contacts 189 and 191 which starts the packaging cycle motor 76. Also closed by the coil 188 is a normally open contact 192 which establishes a holding circuit for the coil 188 through the normally closed switch 83. Simultaneously therewith, a normally closed contact 193 is opened by the coil 188 to break the circuit to the switch 70 to prevent the starting of the conveyor motor 27. After the start of the motor 76, the cam 78 moves the monitoring switch 82 to connect the coil 188 with the normally open switch 169. The packaging cycle continues through one revolution until the normally closed switch 83 is momentarily opened by the cam 79 on the shaft 75 of the packaging motor 76. As the switch 183 is opened, the holding circuit for the coil 188 is broken, stopping the packaging motor 76, allowing the contact 193 to close, and releasing the normally open contact 192 in the holding circuit for the coil 188. At the time the switch 83 is opened, the normally open switch 84 is momentarily closed by the cam 80 to energize the coil 171 which again starts the conveyor motor 27 in a manner previously described.

If it should become necessary to interrupt the operation of the packaging machine by opening the switch 162, all relays will, of course, be deenergized. In order to overcome the necessity of recycling the machine upon every such stoppage, the monitoring switches 82, 68, and 55 have been provided. As above described, each of the above switches is sequentially moved from the position shown in FIG. 14 to an obvious alternate position in an open circuit with one of the relay coils 171, 179, or 184. Thus, if, for instance, line power is temporarily interrupted during the operation of the transfer motor 64, the switch 68 will be in the alternate position connecting the switch 169 and the coil 184 through the switch 82. The subsequent energization of the power line and temporary closing of the switch 184 will thus energize the coil 184 and start the machine from the point of interruption. It is to be understood that each of the switches 82, 68, and 55 will be returned to normal position by its respective cam at the end of each revolution of the currently energized motor.

In addition to the above circuitry, the vacuum motor 36 is also energized by the conductors 166 and 167 through a switch 194 which is operated independently of the 28-v. relay system.

Operation

In the operation of the above device, a resistor 29, cradled in the pallet 28, is carried by the conveyor 23 to a position above the vacuum push rod 33 to engage the switch 32 and actuate the push rod motor 48. Upon actuation of this motor the vacuum push rod 33 is raised vertically by the cam 58, passes through the pallet 28 to remove the resistor 29 therefrom, and places the resistor in position for subsequent transfer to the magazine 101. Upon elevation of the resistor to this position, the sleeve cylinder 96 actuates the transfer bar 97 to remove the resistor 29 from the vacuum push rod 33 and place the resistor 29 into the magazine 101. Subsequently the vacuum push rod 33 and the transfer bar 97 are returned to their normal position as shown in FIG. 14 and the conveyor motor 27 is again actuated to repeat the above sequence.

When the magazine 101 is filled with resistors 29 the switch 118 mounted thereon is closed to actuate the packaging motor 76 causing the backup plate 122 to engage and align the leads 28 of the magazine 101. Subsequently the ram 127 moves a block of expanded plastic from the magazine 131 into piercing
engagement with the leads 31 of the resistors 29 to form a package unit of the plastic block and the resistors which are now carried thereby. The ram 127 and backup plate 122 are then returned to their original positions as shown in FIG. 6, and the slave cylinder 96 is actuated by the master cylinder 92 to move the transfer bar 97 in an extended stroke whereby the completed package unit 26 is removed from the magazine 101 to a position on the inclined plate 139. Upon being placed upon the plate 139 the package slides downwardly thereon, passes over the inclined portion 138 of the frame 134, and thence to the conveyor 135. As the conveyor 135 moves the package 26 into engagement with the microswitch 141, the air motor 136 is actuated thereby to move the push plate 143 into engagement with the package and transfer it to the receiving tray 137 from which it is removed by means not shown.

A modification of the invention is disclosed in FIGS. 15 through 19, in which a resistor 29 is placed by the transfer bar 97 into a propelling device such as an air gun 195 through an elongated aperture 196 therein (FIG. 17). As the transfer bar 97 moves into an extended position, it carries a stud 197 mounted thereon which moves a bell crank 198 about a pivot 199 rigidly fixed to the plate 42. Such pivotal motion of the bell crank 198 moves a slidable sleeve 201 rearwardly of the air gun 195 and out of engagement with a microswitch 202 which controls an air supply valve 203 for supplying air to the air gun. Upon retraction of the transfer bar 97, the sleeve 201 is again slid over the aperture 196 in an obvious manner, and the switch 202 is closed by the sleeve 201 to open the solenoid valve 203 which permits air to be conducted into the air gun 195. Upon entry of the air into the gun the resistor 29 is positioned therein by the transfer bar 97 is forcefully ejected into the block of expanded plastic 132 which has been previously indexed in front of the air gun 195 by a ram 205 slidably mounted on the plate 42 in a groove 206. Motion of the block 132, due to the impact of the resistor 29, is prevented by a guide member 207 (FIG. 18) against which the block 132 slides.

Indexing of the block 132 in front of the air gun 195 is accomplished by a hydraulic slave cylinder 208 which co-operates with the master cylinder 73 (FIG. 2) through the fluid line 95 in a manner previously described. Thus, the cylinder 208, both being connected to the same master cylinder 73, are actuated simultaneously thereby. Pivot to a push rod 209 of the cylinder 208 is a pinion 211 coacting with a rack 212 which intermittently moves the ram 205 to which the rack is attached. As the ram 205 is moved to the left, as viewed in FIG. 15, it passes through an upright plastic block magazine 131 and incrementally moves a plastic block 132 therefrom into target position in front of the air gun 195.

When the plastic block 132 has been pierced by a preselected number of resistors, a microswitch 213, which is the counterpart of the original switch 118, is closed by a stud 214 on the ram 205 to start the packaging motor 76 as above. Thus the hydraulic cylinders 215 and 216, which are connected to the master cylinder 92 through the fluid passage 133, are actuated simultaneously. Upon actuation of the cylinder 216, a bifurcated member 217 travels toward the stud 214 which is integral with the ram 205. Because the relative positions of the bifurcated member 217 and the stud 214 are initially as shown in FIG. 19, there is a period of lost motion after which the rack 212 is moved to the right as viewed in FIG. 15. As the rack 212 is thus moved it would normally engage and bind upon the pinion 211. However, the hydraulic slave cylinder 215 will have moved a slotted fixture 218 away from the rack 212 during the time of lost motion between the bifurcated member 217 and the stud 214 to pivot the pinion 211 away from the rack 212 whereby free backward motion of the rack is permitted. Such motion continues until the ram member 205 is moved out of the magazine 131 and a plastic block 132 drops into position for subsequent feeding. When the ram 205 reaches this position, the feed cylinder 96 is actuated in a manner described in conjunction with the first embodiment of the invention.

The circuitry whereby the above sequence of operation is produced will be obvious from an examination of that circuitry described in relation to the first embodiment of the invention.

Although specific embodiments of the invention have been shown and described, it will be understood that they are illustrative and that various modifications may be made therein without departing from the scope and spirit of this invention.

What is claimed is:

1. The method of packaging electrical components having extending leads which comprises the steps of removing the components singly from a source of supply, positioning the singly removed components in a juxtaposed group with the leads extending towards a block of penetrable material, moving the block and electrical components toward each other in a direction parallel to the component leads, and piercing the block with the leads to simultaneously embed the leads within the block and form a unit therewith.

2. The method of packaging electrical components having extending therefrom comprising the steps of removing the components from a source of supply, positioning the components in a propelling device in juxtaposition with a block of penetrable material, and forcefully expelling the articles from the propelling device whereby the leads of the components pierce and are embedded within the block and form a unit therewith.

3. An article packaging machine which comprises means for positioning the articles in juxtaposition to a block of penetrable material, and means operated by the positioning means for moving the block and the articles toward each other whereby a portion of each of the articles pierces and is embedded within the block to form a unit therewith.

4. Apparatus for packaging articles which comprises supply means, transfer means for removing the articles from the supply means, means for removing the articles from the transfer means and means for positioning the articles in juxtaposition to a block of penetrable material, and means operated by the removing and positioning means for moving said articles and block toward each other in a direction parallel to the longitudinal axis of the articles to cause a portion of the articles to pierce and enter the block to form a unit therewith.

5. Apparatus for packaging electrical components having leads extending therefrom which comprises a base, a conveyor for carrying electrical components in a predetermined relationship to the base, means for removing the electrical components from the conveyor, a reciprocating transfer bar mounted on the base for removing the electrical components from the conveyor, means for positioning the articles in juxtaposition to a block of penetrable material, and means operated by the positioning means for moving the block to the positioned articles whereby a portion of the articles pierce and are embedded within the block to form a unit therewith.

6. An article packaging machine which comprises means for positioning a plurality of articles in juxtaposition to a block of penetrable material, and means operated by the positioning means for moving the block to the positioned articles whereby a portion of the articles pierce and are embedded within the block to form a unit therewith.

7. Apparatus for packaging elongated articles which comprises a base, article supply means, transfer means for removing the articles from the supply means and for
positioning the articles for translational movement, a holding means supported on the base, means for moving the articles from the transfer means to the holding means, means mounted on the base for aligning the articles within the holding means, a magazine supported on the base for holding a plurality of penetrable blocks, and means mounted on the base for moving a block from the magazine into piercing engagement with the elongated articles within the first holding means to form a unit therewith.

8. Apparatus for packaging electrical components having coaxial leads which comprises a base, a conveyor for carrying components to the base, an elevator for removing the components from the conveyor, a transfer bar mounted on the base for reciprocal motion with respect thereto for transferring the electrical components from the elevator, a holder mounted on the base for receiving a plurality of electrical components from the transfer bar, means for actuating the conveyor, elevator, and transfer bar in predetermined sequence, a backup plate mounted for movement on the base in juxtaposition to the holder for aligning the electrical components therein, a magazine mounted on the base for holding a plurality of penetrable blocks, a ram mounted on the base for removing the blocks from the magazine and placing the blocks in piercing engagement with the leads of the electrical components located within the holder to form a unit therewith, means for actuating the transfer bar to remove the unit from the holder, and means actuated by an electrical component within the holder for stopping the conveyor, and actuating the backup plate and the transfer bar in predetermined sequence.

9. A machine for packaging electrical components having leads extending therefrom which comprises a base, a component conveyor disposed beneath the base, a first push rod co-operating with the conveyor for removing the components therefrom, an air gun having an intermittently opened breech for receiving the electrical components therein, a transfer bar mounted for relative movement with the base for transferring the electrical components from the push rod to the breech of the air gun, means cooperating with the transfer bar to open the breech of the air gun upon forward actuation of the transfer bar, means co-operating with the air gun to stop the flow of air to the air gun when the breech thereof is open, a magazine mounted on the base for removably containing a plurality of penetrable blocks therein, a ram mounted on the base for removing the blocks from the magazine and indexing the blocks in juxtaposition with the air gun, and means for supplying air to expel the electrical components from the air gun whereby at least one lead of each component pierces and enters the block to form a unit therewith.

10. A transfer device which comprises a conveyor including a plurality of article supporting cradles, each cradle having an aperture formed therethrough, means positioned for passage through the aperture for removing an article supported within the cradle, and means for sequentially operating the conveyor and the means passing through the aperture of the cradle.

11. A transfer device which comprises a conveyor including a plurality of article supporting cradles, each cradle having an aperture formed therethrough, a hollow-tipped push rod positioned for passage through the aperture and supported within the cradle, a vacuuming source connected to the hollow-tipped push rod, and means for sequentially operating the conveyor and the push rod, the push rod engaging the article by suction.

12. The method of packaging electrical components which comprises the steps of removing a plurality of said components singly from a conveyor, positioning said components in a magazine juxtaposed with a pierceable block, aligning said components such that each component is an equal distance from the pierceable block, and moving said block into engagement with said components whereby a portion of each component is embedded within said block.

13. The method of packaging electrical components which comprises the steps of removing a plurality of said components singly from a conveyor, positioning said components in an air gun juxtaposed with a pierceable block, expelling the components forcefully into said block, and intermittently moving said block to present a different portion thereof to the air gun after each component is expelled therefrom.

14. In an apparatus for loading articles in a receiver, a pair of plates, means for urging one plate toward the other, means for forcing a succession of articles between said plates, means for advancing a receiver toward said plates, and means actuated by the forcing of a predetermined number of articles between said plates for operating said receiver advancing means.

15. In an apparatus for loading articles in a receiver, a pair of plates, means for urging one plate toward the other, means for forcing a succession of articles between said plates, means for advancing a receiver toward said plates, means actuated by the forcing of a predetermined number of articles between said plates for operating said receiver advancing means, and means operated upon the completion of forcing an article receiver advancing means for pushing said articles from between said plates.

16. A method of packaging electrical components having leads extending therefrom which comprises the steps of removing the components singly from a source of supply, pushing each component between a support and a resiliently opposed plate to arrange the components in a single plane with the leads extending beyond one edge of the support and the plate and moving a block of penetrable material into piercing engagement with the leads of the components whereby the leads are embedded within the block and form a unit therewith.

17. The method of packaging electrical components having oppositely extending wires in a penetrable block which comprises the steps of pushing the articles between a support and a resiliently opposed plate to arrange the articles in a single plane with the wires extending beyond both the front and rear edges of the support and plate, applying a force to the wires extending beyond the rear edges of the support and plate to align the articles, and moving the articles into engagement with the block whereby the wires extending beyond the front edges of the support and plate pierce the block and are embedded therein to form a unit therewith.

18. Apparatus for packaging elongated articles which comprises means for sequentially positioning the articles in spaced relationship to a block of penetrable material, means for impelling each article into the block in a direction parallel to the longitudinal axis of the articles to cause a portion thereof to pierce the block to form a unit therewith, and means rendered effective upon each operation of the impelling means for indexing the penetrable block to present successive areas in alignment with the positioning means.

19. In an apparatus for projecting articles into a holder, an air gun having a breech, movable transfer means for inserting articles through said breech into said air gun, means actuated by the motion of said transfer means for closing said breech, means for mounting and advancing the holder in position to receive articles projected from the air gun, pneumatic means actuated by the motion of said closing means for projecting said articles from said air gun into said holder, and means rendered effective upon each operation of the pneumatic means for advancing the holder to sequentially position the holder adjacent the article projecting means.

20. A machine for packaging articles which comprises article supply means, transfer means for removing said articles from the supply means, means operated by the transfer means for receiving articles from said transfer means, means operated by the receiving means for force-
fully propelling the articles into piercing engagement with a block of penetrable material, and means rendered effective upon each operation of the propelling means for indexing the penetrable block to present successive areas in alignment with the article receiving means.

21. In an apparatus for projecting articles into a holder, projecting means including a housing having an opening, means movable toward and away from said projecting means for placing the articles through said opening into said housing, means actuated by the motion of the last said means away from said projecting means for closing said opening, means for mounting and advancing the holder in position to receive articles projected from the projecting means, means actuated by said closing means for operating said projecting means to project an article therefrom into said holder, and means rendered effective upon the operation of said projecting means for advancing the holder to successive positions adjacent the article projecting means.

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Disclaimer


Hereby enters this disclaimer to claim 10 of said patent.

[Official Gazette July 24, 1962.]