

Nov. 9, 1971

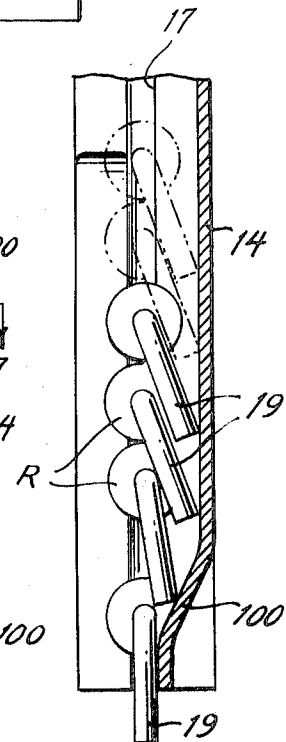
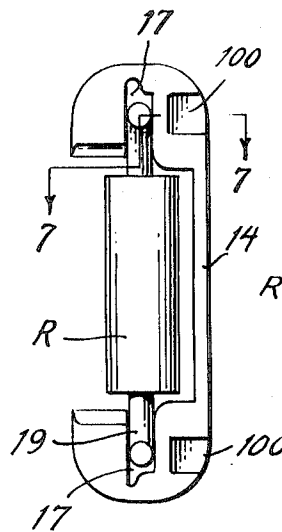
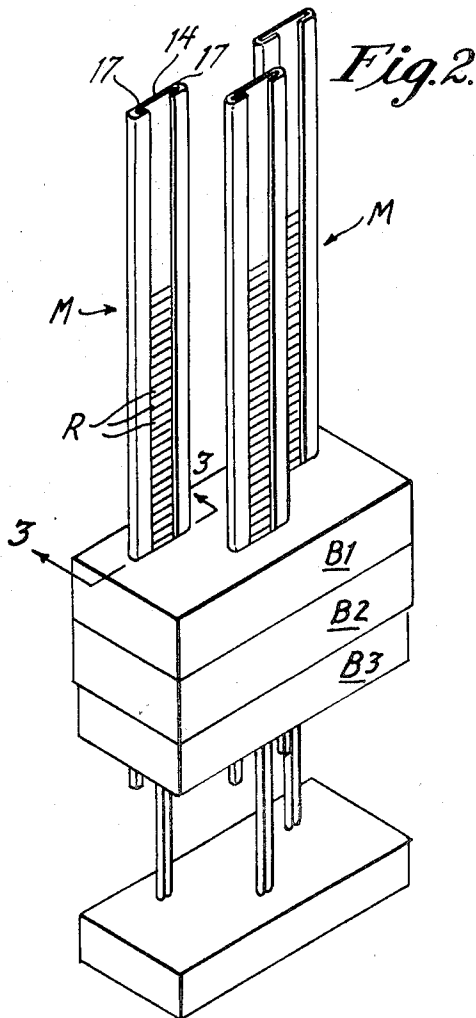
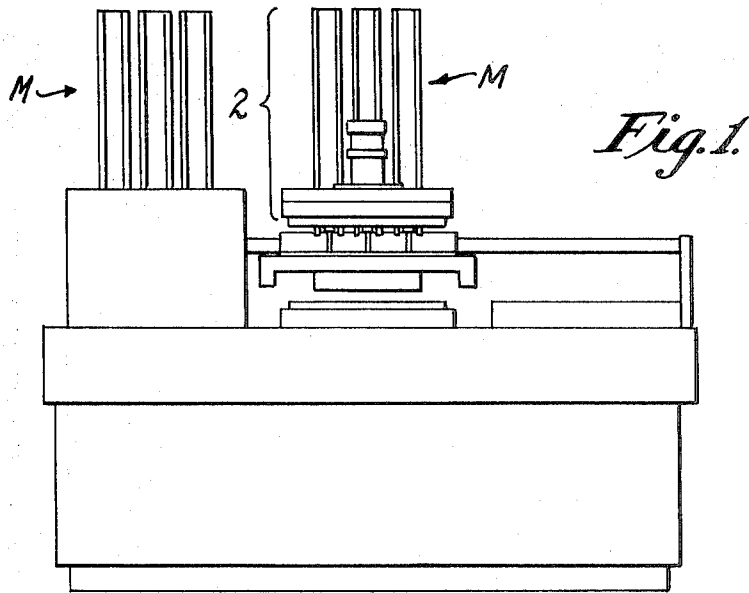
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3,618,192

UNIFORM COMPONENT RECEIVING AND DISPENSING MECHANISM

Filed Nov. 26, 1969

5 Sheets-Sheet 1



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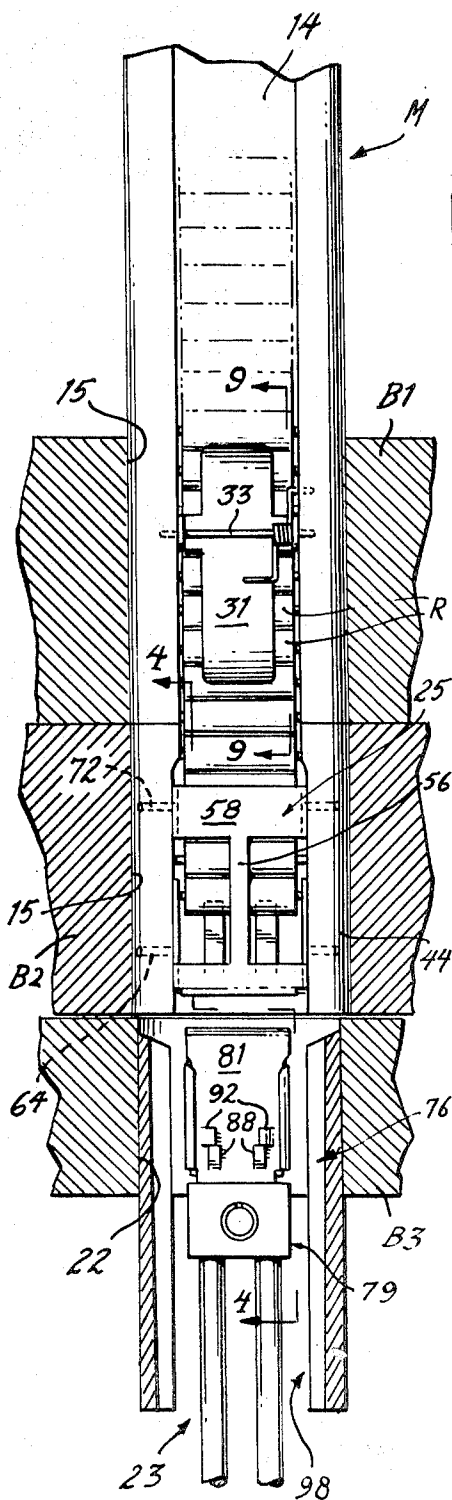


Fig. 3.

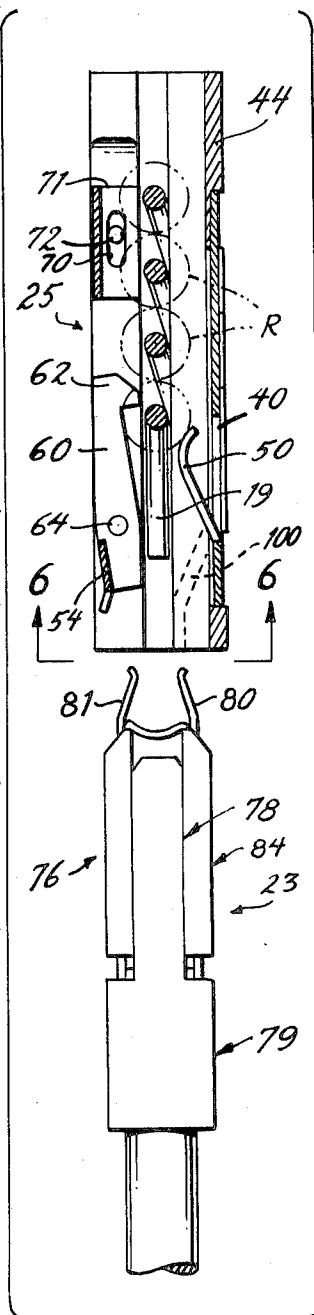


Fig. 4.

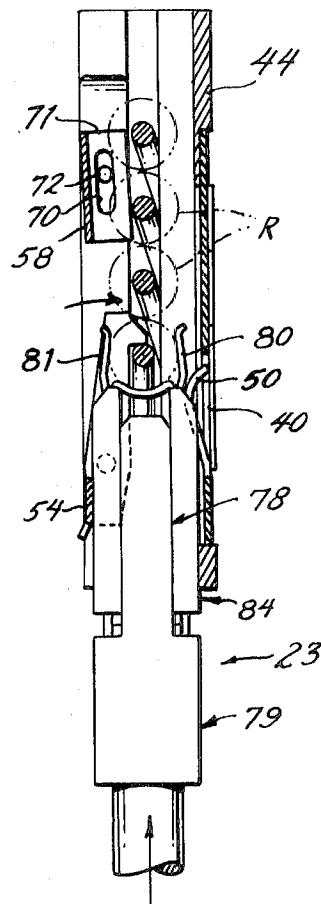


Fig.5.

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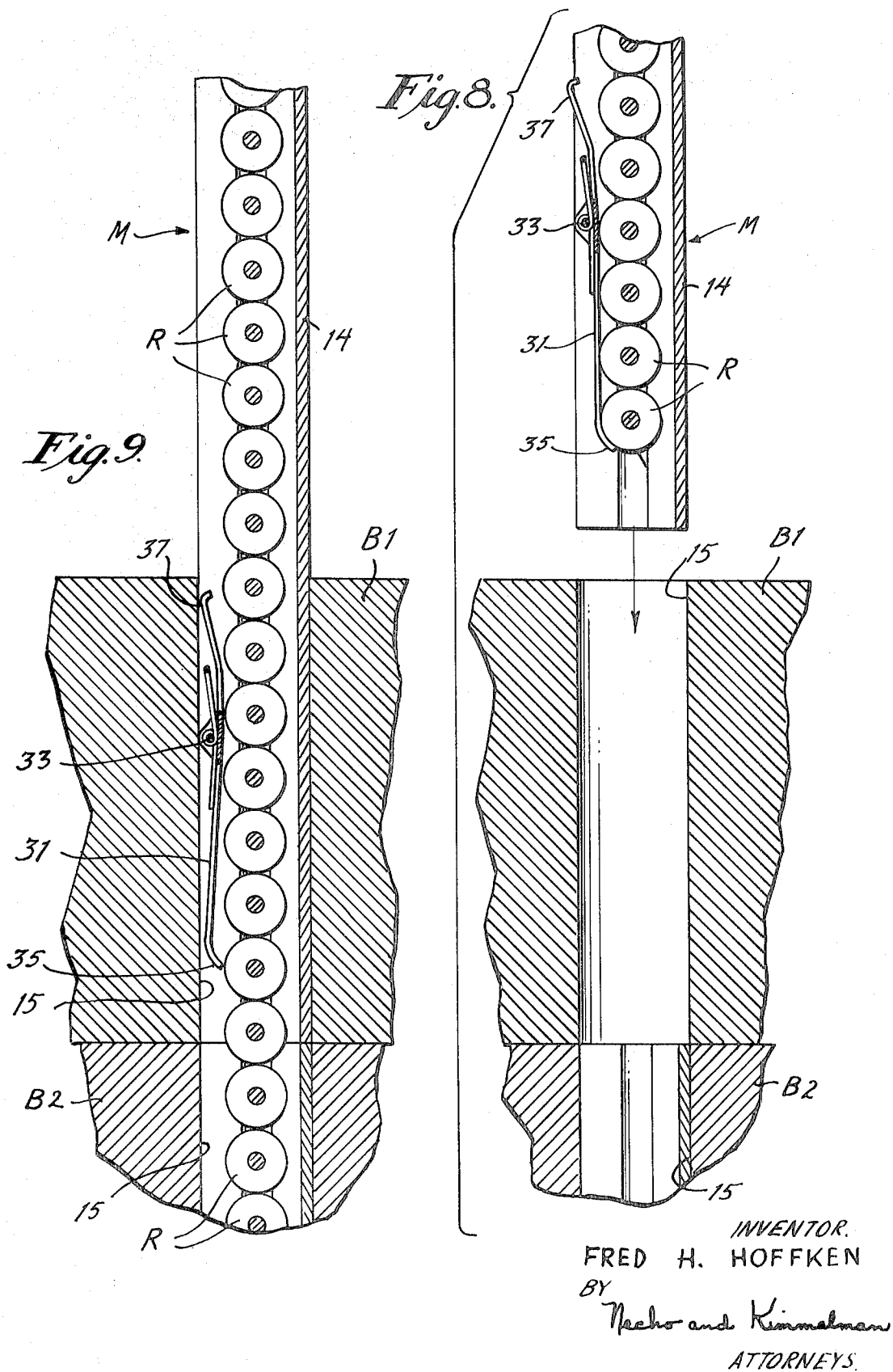
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UNIFORM COMPONENT RECEIVING AND DISPENSING MECHANISM

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UNIFORM COMPONENT RECEIVING AND DISPENSING MECHANISM

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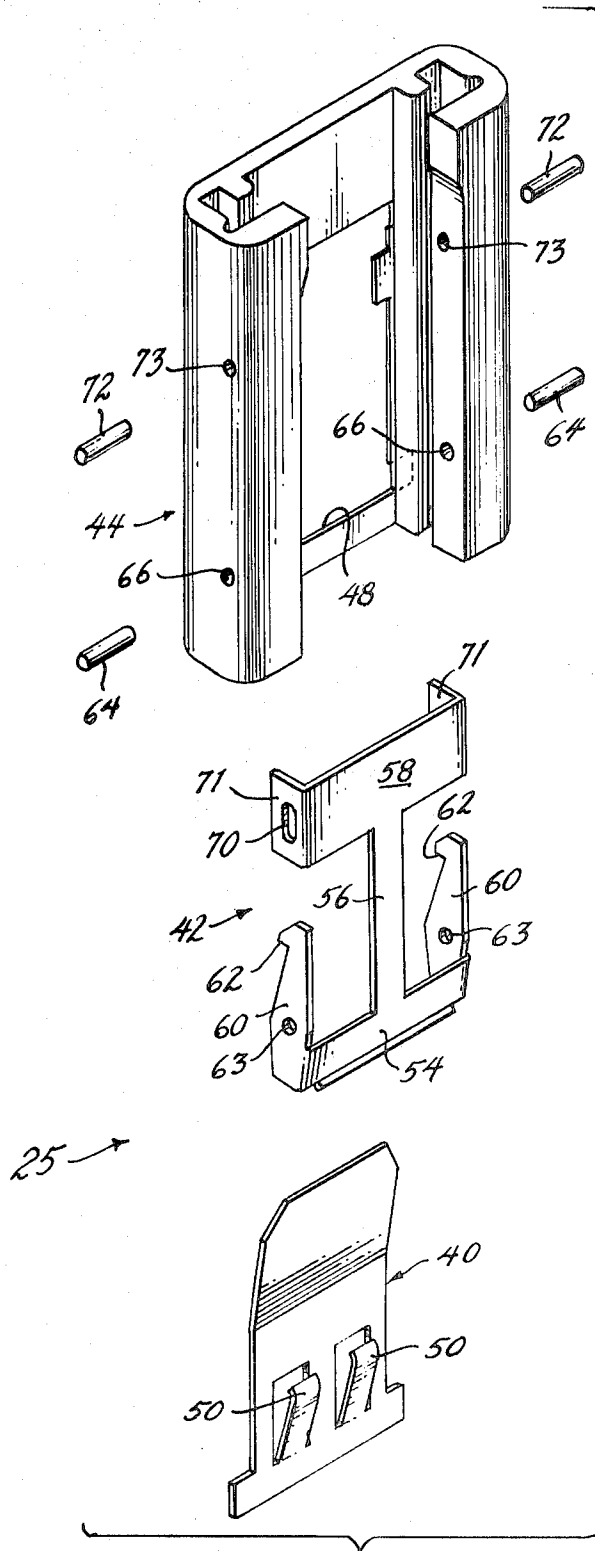


Fig. 10.

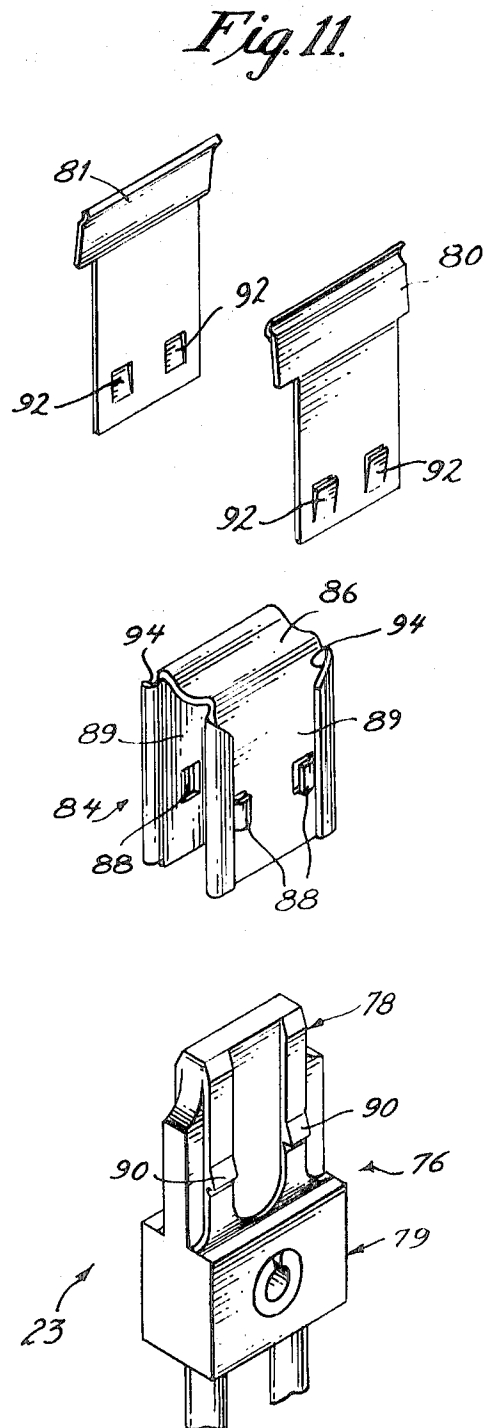


Fig. 11.

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5 Sheets-Sheet 5

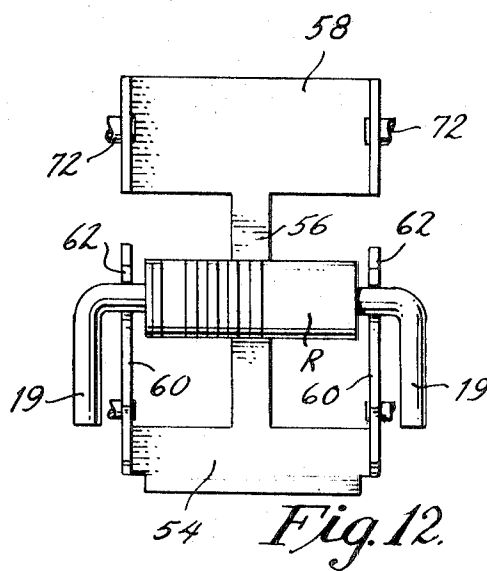
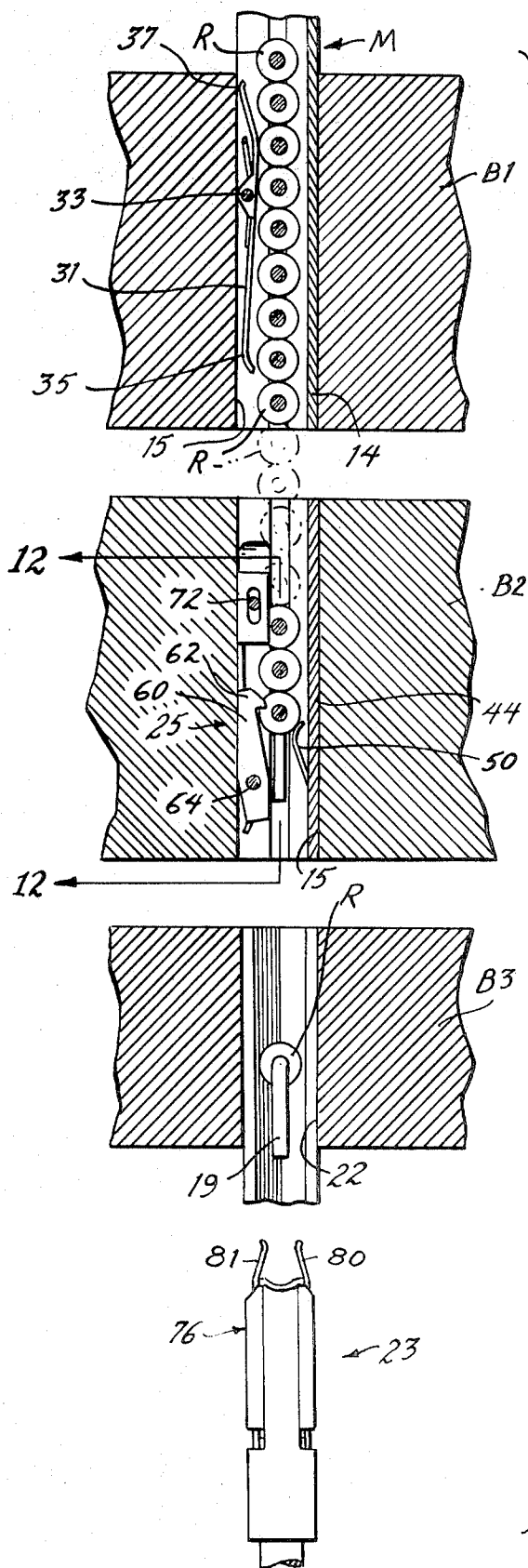


Fig. 13.

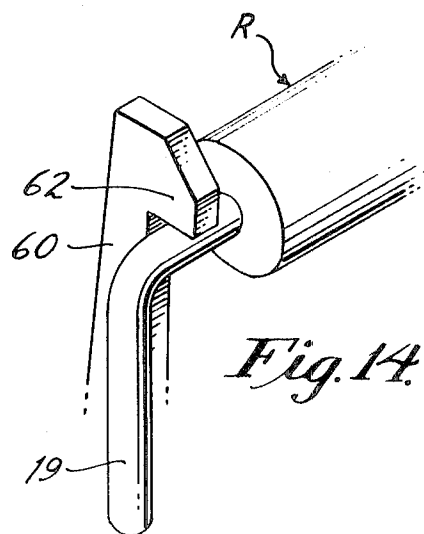


Fig. 14.

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3,618,192

UNIFORM COMPONENT RECEIVING AND DISPENSING MECHANISM

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Filed Nov. 26, 1969, Ser. No. 880,244

Int. Cl. H01r 43/00; B23g 7/10

U.S. Cl. 29—203 B

14 Claims

ABSTRACT OF THE DISCLOSURE

A magazine for receiving a supply of uniform, electronic components, such as resistors, or the like; means associated with said magazine for facilitating the loading of components thereinto; means for facilitating the dispensing of the components from the magazines; and an extractor, cooperating with said last mentioned means for withdrawing the components from the magazine, one at a time, and transferring them to a mechanism which inserts the components into a printed circuit board, for incorporating the components in selected circuits printed on said board.

BACKGROUND

An electric component, such as a resistor, and the like, includes a body and wires projecting from the ends thereof. Such components are commonly used in electronic printed circuits and are applied by passing said end wires through holes in a printed circuit board and clinching the wires against the opposite side of the board. One example of a machine for carrying out the invention is disclosed in my Pat. No. 3,508,315, to which reference may be had.

THE INVENTION

The present disclosure is limited to improvements in the structure of the magazine, itself, and to improvements in the extractor which withdraws the components from the magazine, one at a time, and delivers them to a component-inserting mechanism, such as that shown in the patent application aforesaid.

In the drawings:

FIG. 1 is a fragmentary front elevational view and shows some of the parts which are shown in FIG. 1 of the application aforesaid.

FIG. 2 is an enlarged perspective view of the parts encompassed by bracket 2 on FIG. 1.

FIG. 3 is an enlarged sectional view looking in the direction of line 3—3 on FIG. 2.

FIG. 4 is an enlarged, composite view, partly in section and partly in elevation, looking in the direction of line 4—4 in FIG. 3, and showing the extractor in a position to enter the lower end of a loaded magazine.

FIG. 5 is similar to FIG. 4 except that it shows the extractor after it has been inserted into the magazine and has gripped a component, but before it has been withdrawn from the magazine.

FIG. 6 is an enlarged view looking in the direction of line 6—6 on FIG. 4 and showing details of construction.

FIG. 7 is an enlarged sectional view looking in the direction of line 7—7 on FIG. 6 and showing details of construction.

FIG. 8 is an enlarged, exploded view, partly in elevation and partly in section, looking in the direction of line 8—8 on FIG. 3 and showing one position of a stop mechanism in which downward movement of resistors is prevented.

FIG. 9 is similar to FIG. 8 but shows another position of the stop mechanism in which the resistors can move, freely, through the magazine.

FIG. 10 is an enlarged, exploded, perspective view, showing details of an "escapement" mechanism which co-

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operates with an "extractor" for withdrawing resistors, one at a time, from the magazine.

FIG. 11 is similar to FIG. 10 and shows details of construction of the "extractor" referred to.

FIG. 12 is a side elevational view showing the relation of a resistor to the escapement referred to.

FIG. 13 is an exploded composite view showing the essential parts of the invention separated for easier understanding.

FIG. 14 is a fragmentary view showing the operation, in part, of the escapement mechanism.

In FIG. 1, herein, there is partially shown a machine which, like the machine which is disclosed in the application aforesaid, has, at least, two sets of magazines M, and has two loading stations like stations A and F in FIG. 2 of the application, and a component-dispensing station (B in the application), whereby, as one set of magazines is being emptied at dispensing station B, the other set of magazines will be loaded at station A or at station F. Also, like the machine disclosed in said application, the present machine has a printed circuit-board supply station C, and station D where a resistor, R, such as that shown in FIG. 12 herein, is inserted into a printed circuit-board, (such as that shown in FIGS. 11, 12 and 13 of the said application).

Since the present invention only relates to means for facilitating the loading of resistors into, and the extraction of resistors from, a magazine, only the structure and operation of these mechanisms is shown and described.

Also, while, in the drawings, there are shown two sets of magazines M which are all the same, it is thought that the structure and operation of only one magazine need be shown and described.

For the purpose of this disclosure, it need only be noted that the magazine is of channel shape in cross section, FIG. 6, and that it is formed of back wall 14, the margins of which are bent to form grooves 17 for receiving the end wires 19 of resistors R, stacked therein, as best shown in FIGS. 8 and 9. It will be noted that, if unrestrained, the resistors are freely slidable by gravity alone.

From FIGS. 2 and 3, it will be seen that there is a fixed upper channel-receiving and supporting block B1 which has a through-hole 15 for receiving the lower end of a loaded magazine M, which holds a number of resistors R; an intermediate block B2 which has a continuation of hole 15 and contains an escapement mechanism 25, and a lower block B3 which has a through hole 22 for the passage of a resistor extractor 23 therethrough and has means for retaining a resistor withdrawn from the magazine by the extractor. See FIG. 13.

MAGAZINE LOADING

Loading components into a magazine presents a problem because, filling it, in situ, is an expensive manual operation. Taking an empty magazine to a source of supply for loading is an improvement but, since the resistors slide freely in the magazine, it is necessary to plug up the lower end of a magazine to prevent the resistors from falling out while the lower end of the magazine is being inserted into hole 15 in upper block B1.

Accordingly, one feature of my invention resides in providing the lower end of the magazine with an internal, automatic stop mechanism which prevents the resistors from passing out through the bottom of a magazine until after the lower end of the magazine has been inserted into hole 15 of block B1, as shown in FIGS. 8 and 13.

The stop mechanism can assume the form which is shown in FIGS. 8 and 9, and which includes an arm 31 which is rotatable about the axis of the pivot pin 33. Arm 31 is spring-loaded so as normally to assume the position of FIG. 8, in which its lower end 35 engages the underside of a resistor R near the lower, open end of the magazine.

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It will be noted that the upper end 37 of arm 31 normally projects beyond the circumference of hole 15 in block B1 so that, when the lower end of the magazine is fully inserted into hole 15, arm 31 is rotated from the position of FIG. 8 to the position of FIG. 9 in which the bottom end 35 of arm 31 does not obstruct the path of the resistors in the magazine.

By this arrangement, magazines can be loaded at a supply station and can be carried to, and inserted in block B1, without losing any components and without disturbing their alignment.

The escapement mechanism is shown in its operative position in FIGS. 3, 4, 5 and 13, and the structural details are shown in FIG. 10 from which it will be seen that this mechanism includes a spring plate 40 and a spring housing 42 which are assembled to form a passage for insertion of the extractor of FIG. 4 for engagement with a resistor to be removed as shown in FIG. 5. The assembled escapement mechanism is fixedly carried in a piece 44 of the magazine extrusion, the length of which is equal to, or less than, the thickness of block B2, so that the upper and lower edges of the escapement do not project above or below block B2. FIG. 13. Plate 40 is adapted to fit in an opening 48 in the back wall of magazine portion 44 and is provided with tongues 50 which project from the plane of the back wall toward the front wall of the magazine, or to the left as viewed in FIG. 4. In this position, the upper ends of tongues 50 engage the underside of the lowermost resistor to prevent its downward movement except when it is withdrawn in the manner herein-after set forth. Housing 42 includes lower horizontal bar 54 which is connected by vertical bar 56 to upper horizontal bar 58, and carries side arms 60 which terminate in hooks 62. It will be seen from FIG. 10, that hooks 62 face toward the back wall of magazine section 44 and that side arms 60 are provided with holes 63 for receiving pivot pins 64 which also engage holes 66 in magazine section 44 pivotally to mount housing 42 in the magazine section. Housing 42 is also provided with elongated openings 70 formed in the wings 71 of upper bar 58 for receiving pins 72 which also engage holes 73 in magazine section 44. By this arrangement, housing 42 can pivot about the axis of pins 64 and has some play at slots 70 so that the spring housing can flex freely and can freely resume its normal configuration as shown in FIG. 10.

From FIGS. 3, 4, 5 and 13, it will be seen that plate 40 and housing 42 co-act to form a vertical passage, which aligns with opening 15 in block B1, for the insertion therethrough of the extractor 76 which is shown in the lower part of FIG. 4, and the details of which are shown in FIG. 11. Generally speaking, extractor 76 includes a core 78 and a fitting 79 which is engageable with any desired means to reciprocate the extractor vertically within the escapement. The mechanism for reciprocating this extractor can be of the type disclosed in the application aforesaid and, since it forms no part of the present invention, the reciprocating mechanism is not shown nor described. It will be noted from FIG. 4 and from FIG. 5 that when the extractor is moved up into the escapement, its right-hand jaw 80 moves spring tongues 50 out of the way to permit jaws 80 and 81 to engage a resistor to be pulled down through the escapement. It will also be noted from FIG. 4 that as the extractor is pulled down, out of the escapement, springs 50 immediately proceed to resume the obstructing position of FIG. 4 to arrest the downward movement of the resistors.

In the preferred embodiment which is shown in FIG. 11, the extractor is formed of a permanent core 78 and a nose piece 84 which is adapted to fit over the core, and the previously mentioned jaws which are adapted to be mounted on the nose piece 84. The nose piece is provided with a cradle 86 for receiving the body of a resistor, the sides of which are engaged by the jaws of the extractor as shown in FIG. 5.

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An apparatus of this kind must work continuously, at high speed and with great precision. Therefore, any deformation, or wear and tear of the extractor or of the escapement mechanism will need immediate replacement, and to save "down" time and to reduce the cost of labor and material which is entailed in repairing or totally discarding the extractor, I have devised the structure shown in FIG. 11, from which it will be seen that the nose piece is formed of any available, slightly springy, material, and that it has tabs 88 which are struck out of its pendant walls 89, and that the core is provided with tabs 90 which, when the nose piece is in use position, engage the openings which are produced by striking out tabs 88. Jaws 80 and 81 are similarly formed and are provided with tabs 92, the upper edges of which engage the under edges of tabs 88 when the jaws are inserted in grooves 94 far enough to permit tabs 92 to clear tabs 88. By this arrangement, as soon as an extractor exhibits wear, or other defect, the nose piece and the jaws carried thereby are pried loose of the core 78 and a new nose piece provided with new jaws is snapped into position by merely pushing the nose piece down over the core until tabs 90 engage the openings formed by striking tabs 88.

The engagement of jaws 80 and 81 with a resistor R, involves the application of upward pressure sufficient to separate the jaws enough to accept the resistor therebetween, as shown in FIG. 5. This upward pressure tends to push the resistors up so that the lowermost resistor will be out of reach of, or will fail to enter between, the jaws. In other words, for a resistor to enter between the jaws, it is necessary that the resistor be held against upward movement in response to the upward pressure exerted by the extractor. To this end, housing 42 is so constructed that pressure exerted against the inner face of bar 54 causes side arms 60 to rotate in counterclockwise direction, as viewed in FIG. 10, so as to cause hooks 62 to engage the horizontal portions of end wires 19 of the resistor. The space between the inner surface of bar 54 and the juxtaposed portion of plate 40 is such that insertion of the extractor therebetween will rotate side arms 60 to the extent needed to engage hooks 62 with the end wires of a resistor as shown in FIG. 14. Upon withdrawal of the extractor, housing 42 and side arms 60 resume their normal shape as shown in FIGS. 5 and 10.

As disclosed in the application aforesaid, lowermost block B3 serves to take a resistor which has been withdrawn by the extractor and to transfer it to the resistor insertion station which is station D in the said application. The mechanism for horizontally reciprocating block B3 and the mechanism for driving the end wires of a resistor in the appropriate holes in a printed circuit board form no part of the present invention and they are not shown nor described, but they may be like those shown in said application. For the purpose of this disclosure, it is merely necessary to point out that block B3 herein, like its counterpart in my said application, is provided with a downwardly converging passage 98 for trapping a resistor being moved downwardly through the block. For this purpose, the upper end of passage 98 is big enough to permit free downward movement of a resistor clamped between the jaws of the extractor while the lower portion of the passage is narrow enough to engage the resistor with force sufficient to disengage it from the jaws of the extractor so that, upon complete withdrawal of the extractor from block B3, the resistor will remain in approximately the position shown in FIG. 13. As in the application aforesaid, block B3 is now moved to a position above a circuit board, at station D where a driving mechanism, such as that shown in the said application, expels the resistor from block B3 and causes its end wires to enter the appropriate holes in the circuit board to secure the resistor in place.

When the resistors are loaded into, and while they are moving down through the magazines, their wires point

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downwardly, but because they can slide freely, they can be uniformly, or hap-hazardly, oriented as shown in FIG. 7, or in some other direction. When the end wires are to be driven through the desired holes in a horizontally disposed printed circuit board, they must be disposed vertically. To move the resistors into the vertical alignment necessary for proper insertion into the circuit board, I deflect the back wall of the lower end of the magazine M which is inserted in block B1 and/or the back wall of the magazine portion which is mounted in block B2, to form a ramp 100. This ramp moves the resistors from the slanted position shown at the top to the vertical position shown at the bottom of FIG. 7. Therefore, when a resistor is disengaged from the extractor and is held by the downwardly covering passage 98 in transfer block B3, the end wires will be disposed vertically, as shown in FIG. 13, so that, when block B3 is moved to a position over a printed circuit board, the end wires of the resistors will align with the axes of the selected holes and can be driven there-through in the manner set forth in the application aforesaid.

It will be appreciated that the escapement mechanism is mounted in a magazine section 44 which is carried by fixed block B2. In this way, it is unnecessary to provide each magazine with an escapement as might otherwise be necessary. According to this invention, one escapement mechanism will service a magazine inserted through block B1 until its lower edge comes to rest on the upper edge of escapement-containing section 44 which is in FIG. 2.

The operation is as follows:

The magazines are filled with components at a conveniently located supply station not shown, and are carried, in a more or less vertical position to a machine such as the one herein referred to. It will be noted that, while a magazine is in transport and while it is being inserted into its dispensing position in block B1, arm 31 effectively closes the lower end of the magazine. It will also be noted that mere insertion of the lower end of the magazine into opening 15 in block B1 opens the lower end of the magazine and permits resistor R to flow into the top of opening 15 in block B2, which also carries the escapement mechanism. It will be seen that the provision of arm 31 and block B1, simplifies and shortens the magazine loading operation.

Since, upon disengagement of arm 31, the units can flow right out of the magazine, and since the units can only be used, one at a time, it was necessary to provide for dispensing the units one at a time. I provide springs 50 which, in effect, support the column of resistor thereabove and which are pushed out of the way by the extractor and which follow the extractor as it is retracted again, to prevent any unit from passing down through block B2.

As the extractor is pushed up into the escapement, it deforms bar 54 which, in turn, rotates arms 60 so as to bring hooks 62 to rest on wires 19 of the resistor. The movements are so timed that the hooks engage end wires 19 just as jaws 80 and 81 begin to press upwardly against the underside of the lowermost unit. The resistance of arms 60, forces jaws 80 and 81 open to receive a unit therebetween which ultimately comes to rest on cradle 86. As soon as the extractor is withdrawn, the housing returns to its normal position in which the arms 60 and hooks 62 are withdrawn to permit a succeeding resistor to move down until it is arrested by springs 50.

The structure of the extractor provides operating parts which are precision made but which are inexpensive enough to be discarded at the first sign of developing deficiency.

What I claim is:

1. In combination:

a magazine adapted to contain a plurality of freely slidable units,

means defining an opening for receiving one end of the magazine, and

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stop means associated with said end of the magazine and operative, on withdrawal of said end of the magazine from said opening, to prevent movement of said units longitudinally of the magazine, said stop means being also operative, on insertion of said end into said opening to permit said movement of said units.

2. The combination of claim 1 wherein said stop means includes:

an arm pivoted to a wall of the magazine for rotation to a first position in which one end of said arm is inside the magazine and intrudes into the path of movement of the units longitudinally of the magazine, and its other end is outside the magazine, and means yieldably urging said arm into said first position, said arm being moved, by insertion of said other end into said opening, to a second position in which said one end of said arm is moved out of the path of movement of said units.

3. The combination of claim 1:

an escapement mechanism adjacent said opening and including,

a housing for receiving a unit discharged from said end of said magazine,

a first stop means associated with said housing and normally engaging one side of said unit to prevent movement of said unit through said housing,

a second stop means engageable with said unit to prevent its movement away from said housing,

an extractor insertable through said housing for engaging and withdrawing said unit through said housing, means operable upon insertion of said extractor to disengage said first stop means from said unit, and

means also operable upon insertion of the extractor for engaging said second stop means with the other side of said unit to prevent movement of said unit out of reach of the extractor.

4. In combination:

an upper, horizontal, fixed block having a first vertical opening therein,

a lower horizontally movable block having a second vertical opening therein,

an intermediate, fixed, horizontal block having a third, vertical opening therein aligning with said first and second openings,

a magazine containing units and insertable into said first opening,

obstructing means normally preventing movement of said units longitudinally of said magazine,

means operable, on insertion of the end of said magazine into said first opening, to de-activate said obstructing means and permit movement of units from said first opening to said third opening,

a first stop means in said third opening normally engaging the underside of a unit arriving from said first opening to prevent said unit from passing through said third opening,

a second stop means engageable with the upper side of such unit to prevent said unit from moving in the direction of said first opening,

an extractor insertable through said second and third openings into engagement with a unit engaged by said first stop means, and

means operable on inserting said extractor into said third opening for disengaging said first stop means (from said unit) and for engaging said second stop means with said unit.

5. In combination:

(a) a magazine including a structure defining an opened channel adapted to receive components freely slidable therethrough,

(b) supply means for delivering a component to one end of said channel,

(c) stop means normally occupying a first position in which it obstructs said channel at a point inwardly of

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said one end to prevent said component from moving toward the other end of said channel,

(d) said stop means being also movable to a second position in which it does not obstruct said channel, and

(e) means insertable through the other end of said channel and operable to move said stop means to its second position to permit passage of the component through said channel.

6. The combination of claim 5 wherein:

(e) includes jaw means engageable with said component for withdrawing it through the other end of said channel.

7. The combination of claim 6, and

a second stop means located between the first mentioned stop means and said one end of said channel and normally occupying a position out of the path of movement of a component toward said one end of the channel,

said second stop means being movable to a second position in which it prevents movement of a component in the direction of said one opening.

8. The combination of claim 7 wherein said second stop means is resilient and wherein it is moved to its second position by insertion of (e) into said channel.

9. In combination:

(a) a magazine defining a channel for receiving components, freely slidable therethrough,

(b) means supplying at least one component to one end of said magazine,

(c) an escapement mechanism in said magazine for controlling the movement of components through said magazine,

(d) said escapement mechanism comprising a flexible, form-resuming housing defining a restricted passage for said components,

(e) spring stop means carried by said housing and normally protruding into said passage to prevent the movement of said components toward the other end of said magazine, and

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(f) an extractor insertable into said housing through the other end of the magazine and operative to deflect said stop means out of the path of movement of said components toward said other end of said magazine.

10. The combination of claim 9 wherein (f) includes spring jaws for yieldably engaging a component after deactivation of said stop means and pulling out of the magazine through said passage.

11. The combination of claim 9 wherein said housing is distorted by insertion of said extractor into said passage, and

at least one spring arm carried by said housing and normally disposed out of the path of movement of said components toward said one end of the magazine,

said arm being movable, upon distortion of said housing to a position in which it obstructs the movement of components in the direction of said one end of said magazine.

12. The combination of claim 9 wherein said extractor comprises:

(a) a core member,

(b) a component engaging jaw member, and

(c) means removably and interchangeably securing said members together.

13. The combination of claim 12 wherein (c) consists of yielding detents carried by one of said members and corresponding openings formed in the other of said members and engageable with said openings.

14. The combination of claim 13 wherein one of said members is a throw-away item.

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THOMAS H. EAGER, Primary Examiner

U.S. Cl. X.R.

29-211