Jan. 1, 1963 D. R. KERNS 3,071,174

TRANSFER DEVICE

Filed Jan. 4, 1960 2 Sheets-Sheet 1

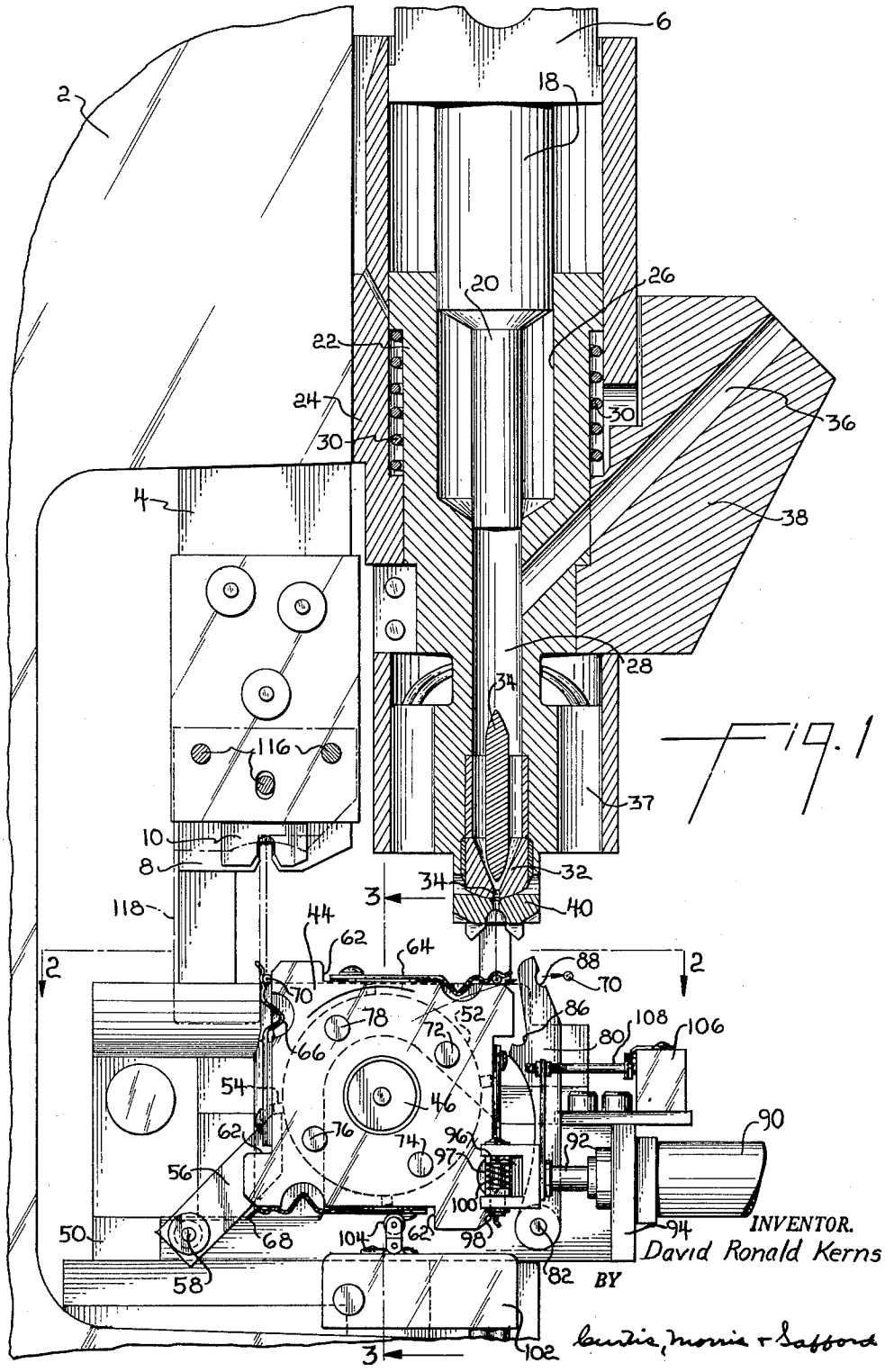


Fig. 1

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Fig. 5

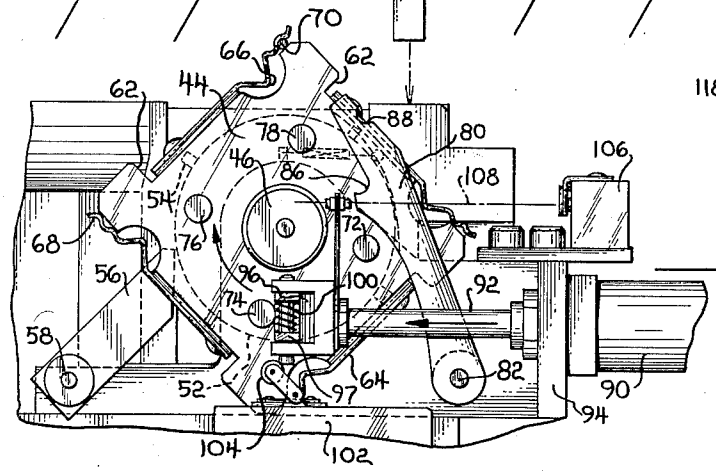


Fig. 6

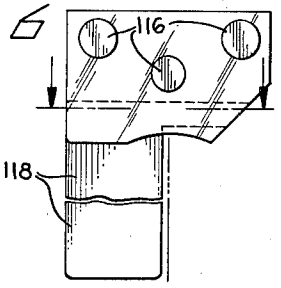


Fig. 7

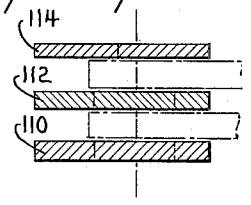
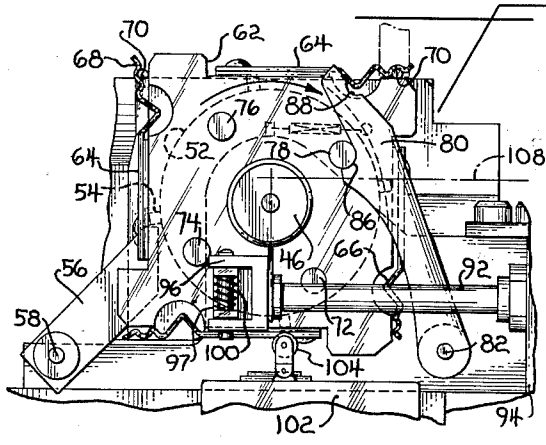


Fig. 4



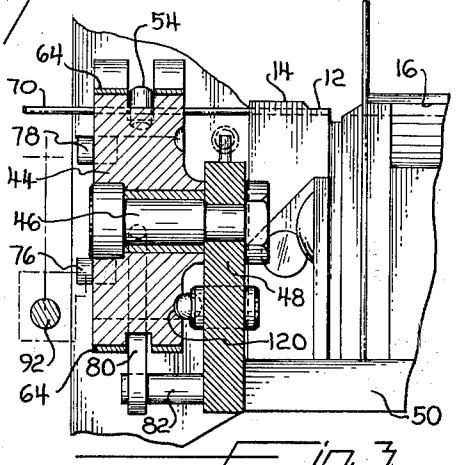


Fig. 3

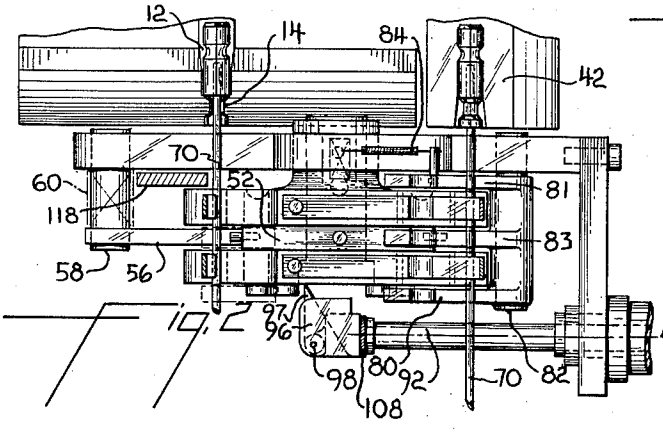


Fig. 2

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United States Patent Office 3,071,174
Patented Jan. 1, 1963

3,071,174

TRANSFER DEVICE

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Filed Jan. 4, 1960, Ser. No. 386
6 Claims. (Cl. 153—1)

This invention relates to transferring devices particularly, but not necessarily exclusively, intended for usage with an electrical terminal applying machine.

An object of the invention is to provide an improved transferring device for cylindrical articles such as rods or wires. A further object is to provide a rod or wire transferring device having means for ejecting the rod or wire at one station. A further object is to provide a holding and transferring device for wires in conjunction with a machine for crimping terminals onto the ends of wires and/or performing another operation on the end of the wire.

These and other objects of the invention are achieved in a preferred embodiment comprising a square plate which is centrally mounted for rotation in its own plane. Wire holding leaf springs are secured to each of the four sides of the plate and extend towards the corners to hold wires against the sides of the plate with their axes extending normally of the plane of the plate. Indexing of the plate is achieved by means of a reciprocable rod which, during each stroke, engages one of four pins which are provided on one of the faces of the plate. An ejector lever is pivotally mounted near the plate and normally extends parallel thereto and between one of the corners and the center of the plate. This lever is engaged by the reciprocable rod mentioned above during its return stroke, after indexing, and is pivotally swung away from the plate past the adjacent corner thereof. During this motion of the lever, the wire held at the corner is pushed out of engagement with its spring and ejected. In the disclosed embodiment, the transferring device is shown in conjunction with a press having a crimping ram, for securing terminals onto wire ends, and a molding ram or plunger for molding an insulating material around parts of the terminal. The transfer device is located such that one of its corners is aligned with the crimping station so that the crimping ram will push a wire manually held at this station towards the plate and between one of the leaf springs and a side of the plate.

In the drawings:

FIGURE 1 is a frontal view of a preferred embodiment of the invention;

FIGURES 2 and 3 are views taken along the line and looking in the direction of the arrows 2—2 and 3—3 of FIGURE 1;

FIGURE 4 is a frontal view showing the transfer mechanism of the preferred embodiment and at an intermediate stage of the operating cycle;

FIGURE 5 is a view similar to FIGURE 4 but showing a different intermediate stage;

FIGURE 6 is a fragmetary view showing a wire tamper for tamping a wire into engagement with the transfer device of the invention; and

FIGURE 7 is a view taken along the lines 7—7 of FIGURE 1.

Referring first to FIGURE 1, there is shown at 2 portions of a C-shaped frame member of a crimping press having a pair of reciprocable rams 4, 6 mounted therein. Ram 4 has crimping dies 8, 10 secured to its lower end for cooperation with a crimping anvil 12 (FIGURE 2) which are mounted on a bolster plate 50 of the press. Terminals T are fed along a feed path generally indicated at 16 towards the anvil 12 so that upon descent of the ram 4, the leading terminal of the strip is crimped onto the end of a wire.

The ram 6 has a cylindrical projection 18 on its lower end from which there extends a reduced diameter portion 20 which functions as an injection molding plunger. Plunger 20 and cylindrical extension 18 are reciprocable within the bores 26, 28 of a cylinder 22 which, in turn, is reciprocably carried in a housing 24 secured to press frame 2. A coil spring 30 surrounds cylinder 22 and reacts between housing 24 and a shoulder on the cylinder normally to bias this cylinder upwardly as viewed in FIGURE 1. A nozzle 32 is mounted on the lower end of cylinder 22 in alignment with the bore portion 28 thereof, and a conventional spreader for the molding material 34 is mounted within the lower portion of the bore. An upper mold-half 40 is carried by cylinder 22 adjacent the nozzle 32 and is movable into engagement with the lower mold-half 42 secured to a mounting block on bed plate 50. Molding material, in filamentary form, is fed into bore 28 through an oblique passageway 36 which extends through the wall of cylinder 22 and through a mounting block 38 which is secured to cylinder 22. Feeding means (not specifically shown) are provided on this mounting block for feeding the filamentary molding material through the passageway 36 and into the bore 28 during each cycle of the press.

Crimping and molding devices of the type generally described above are disclosed more fully in the application of Paul T. Hahn, Serial No. 772,007, filed November 5, 1958, for Crimping and Injection Molding, now Patent Number 3,009,197, issued November 21, 1961. For purposes of the instant disclosure, it is sufficient to say that the rams 4, 6 are each concatenated by means of toggle links with a lever pivotally mounted intermediate its ends on the press frame which lever has one end pivoted to the end of a piston rod of a pneumatic piston cyinder. The arrangement is such that when this lever is rotated in one direction about its intermediate pivotal axis, the toggle linkage between the lever and the ram 4 causes this ram to go through its bottom dead center position so that it descends and then ascends. During this same period, the ram 6 descends and approaches its bottom dead center position although it does not go through this bottom dead center position. During the descent of the ram 6, the plunger 20 compresses the molding material in bore 28 and cylinder 22 is thereby moved downwardly, as viewed in FIGURE 1, against the force of spring 30 until the upper half 40 of the mold is seated against the lower half 42 of the mold. Thereafter, and upon continuing descent of plunger 20, the molding material, which has been heated by heating unit 37, is forced through the orifice of nozzle 32 and into the mold cavity. When the lever is rotated in the opposite direction (when the pneumatic piston cylinder of the press is reversed), the ram 6 ascends as viewed in FIGURE 1, and the ram 4 again descends and ascends as the toggle linkage is straightened out and broken. During the second descent of the ram 4, the leading terminal of the strip, which is positioned on the anvil means 12, 14, is crimped onto the end of a wire. When both of the rams 4, 6 return to the positions shown in FIGURE 1, it is necessary to remove the wire at the molding station and to transfer the wire at the crimping station from that station to the molding station. There will now be described the structure by means of which this transfer is accomplished.

The transfer device comprises a generally square carrier plate 44 which is rotatably mounted on a pin 46 extending from a mounting plate 48 which, in turn, is secured to bolster plate 50. A groove 52 extends entirely around the periphery of plate 44 on the sides thereof and has a cylindrical surface from which pins 54 project at 90° intervals. These pins are engageable with a pawl 56 which is rotatably mounted on a shaft 58 and which is biased in the clockwise direction, as viewed in FIGURE

1, by means of a torsion spring 60. Thus, pawl 56 can be swung in a counterclockwise direction, as viewed in FIGURE 1, but is normally urged in a clockwise direction against the cylindrical surface of the groove 52. This arrangement prohibits counterclockwise movement of the carrier plate 44 since the pawl engages one of the pins 54.

The sides of plate 44 are cut away as shown at 62 and leaf springs 64 are mounted in these cut out portions and on each side of the central groove 52, as best shown in FIGURE 2. These leaf springs each extend toward the corners of the plate and have a bowed portion 66 near their ends which is received within a recess in the carrier plate face. The ends 68 of the springs are sinuous to facilitate their engagement with the circular conductors 70 which they grip by holding the conductors against the edges of the carrier. The face of carrier 44 is provided with four pins 72, 74, 76 and 78 at 90° intervals which are equally spaced from the center of rotation and are in alignment with the center and the corners of the plate.

Arms 80, 81, 83 having a common hub 82 are pivotally mounted on a pin in plate 48. A spring 84 acting between the arm 83 and plate 48 normally biases these levers in a counterclockwise direction as viewed in FIGURE 1 towards the plate. Arm 80 is contoured on one side to define a pocket 85 for the pins and has an additional pocket or notch 88 on the opposite side to receive wire or conductor which is disposed at the crimping station. Arm 80 thus serves the dual function of locking the carrier against clockwise rotation during a portion of the cycle and ejecting the conductor from the molding station when it is rotated in a clockwise direction against the force of the spring 84. Since the arms 81, 83 and 80 are arranged to move in unison, when the finished conductor is ejected, as described below, it is engaged at three separate points adjacent its end.

Indexing of the carrier plate and pivotal movement of the ejecting arms is achieved by means of a pneumatic cylinder 90 mounted in a plate 94 which extends from plate 48. This cylinder has a piston rod 92 extending therefrom, upon the end of which there is provided a yoke 96. A pawl 97 is pivotally mounted on a pin 98 in this yoke and is biased in a counterclockwise direction, as viewed in FIGURE 2, by means of a spring 100 surrounding the pin. The pawl 97 has an enlarged base so that it cannot be rotated in a clockwise direction beyond the position of FIGURE 2, although it can be moved in a counterclockwise direction against the force of the spring 100.

As is explained below, the conductor must be pushed downwardly as viewed in FIGURE 1 so that it will be gripped by the leaf springs on the side of the square which is aligned with the crimping die and anvil. In order to push the wire evenly, there are provided plates 110, 112, 114 secured to the crimping die by means of fasteners 116 and having sides which extend normally of the axis of the wire. Spacers (not shown) are provided between these plates so that the plate 110 will be in a plane in front of the base of carrier plate 44 and plate 112 will be in the plane of the groove in the carrier plate while plate 114 is located behind carrier plate 44 as indicated in FIGURE 7. Advantageously, a guide extension 118 is provided on plate 114 to assist in aligning the wire with the terminal on the anvil.

In use, the parts will be in the position of FIGURE 1 at the beginning of the cycle and the levers 80, 81, 83 will be held out of engagement with the carrier plate by the yoke 96 on the piston rod. The operator first energizes a control circuit, not specifically shown, which supplies air to the righthand end of cylinder 90 to drive the piston rod 92 leftwardly. As this piston rod moves leftwardly, the pawl 97 on the end of the rod engages the pin 74 and causes the carrier 44 to be rotated for substantially 90°. During this leftward stroke of the piston rod, the fingers 80, 81 and 83 are released, and under the influence of the spring 84, swing towards the carrier until the center finger rests against the surface 52 of the central groove. The pocket 86 will then be as shown in FIGURE 4, and the pin 78 will come to rest against this pocket to act as a positive stop for the carrier plate. During this leftward movement of the piston rod, the conductor which was previously at the crimping station of the press and held by the spring 64 at this station, will be transferred to the molding station. Also, during this stroke, a switch 102 having a contact arm 104 will be closed to initiate the movement of the two rams 4, 6. It will be understood that plate 44 will have been indexed before there is substantial movement of the rams. As previously explained, the ram 4 will then go through its bottom dead center position while the ram 6 moves towards its bottom dead center position. The control system for these two rams should be such that a relatively brief delay is permitted as this ram 6 is moved downwardly to assure completiion of the molding operaton. During this interval, the operator positions a wire over the terminal which has been fed to the crimping anvils so that, on the return stroke of the ram 6, during which the ram 4 again goes through its bottom dead center position, the leading terminal will be crimped onto the end of the wire and the wire will be pushed by plates 110, 112, 114 between the spring and plate. After the two rams have reached their top dead center position, air is supplied to the lefthand end of cylinder 90 and the piston rod 92 moves rightwardly, as viewed in FIGURE 1, to swing the levers or arms 80, 81, 83 in a clockwise direction thereby to eject the finished lead from the molding station. The piston rod is permitted to move rightwardly from the position of FIGURE 4 past the pin 72 by virtue of the fact that the pawl 97 can swing in the counterclockwise direction as viewed in FIGURE 2 thus permitting it to ride over the pin 72.

If desired, an additional micro-switch 106 can be provided adjacent the end of the cylinder 90 and a contacting device 108 provided on the piston rod. The switch 106 would, if used, function to initiate a new cycle of the apparatus every time it was closed. If such a switch is used in conjunction with the switch 102 then the operator need not be concerned with the control of the press but need only position the wires at the crimping stations during each cycle and during the interval of dwell of the ram 4 and while the piston rod 92 is in its extended position.

In the embodiment shown there is provided a spring biased plunger 120 (FIGURE 3) having a ball bearing on its end which enters recesses in the back face of plate 44. This detent serves as a drag to prevent unduly rapid movement of the plate while it is rotated and additionally prevents accidental rotation of the plate when the parts are in the position of FIGURE 1.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

I claim:

1. Apparatus for crimping connectors onto the ends of wires at a first station and transferring said wires to a second station for subsequent operations comprising, a crimping die and a crimping anvil, said die being movable relatively towards and away from said anvil, said die and anvil constituting said first station, said second station being disposed beside said first station, a plate mounted for rotation in its own plane on an axis extending between said first station and said second station, said plate having a plurality of leaf springs equally spaced around, and parallel to, the sides thereof, means for indexing said plate, stop means for defining the positions of rest of said plate, said stop means being adapted to stop said plate in

positions such that one of said leaf springs extends parallel to the path of motion of said crimping die whereby, upon actuation of said crimping die, a wire extending transversely past said plate with its end disposed over said anvil is pressed between said plate and the leaf spring and is thereby held against said plate for transfer to said second staton during subsequent indexing of said plate.

2. Apparatus for crimping connectors onto the ends of wires at a first station and transferring said wires to a second station for a subsequent operation comprising, a crimping die and a crimping anvil, said die being movable towards and away from said anvil, said die and anvil constituting said first station, said second station being disposed besides said first station, a square plate mounted for rotation in its own plane on an axis extending between said first station and said second station, means for indexing said plate through 90 degrees and stopping said plate with one side thereof extending normally of the path of movement of said crimping die whereby, a side adjacent said one side extends parallel to said path of movement, each side of said plate having a leaf spring secured thereto and extending parallel therealong, and means movable with said die for pressing a wire extending past said adjacent side between the leaf spring and the surface of said adjacent side, whereby said wire is gripped during crimping of a connector thereon and transferred to said second station during subsequent indexing of said plate.

3. Apparatus as set forth in claim 2 including ejecting means for removing a wire from engagement with said plate at said second station, said ejecting means being actuated by said means for indexing said plate.

4. Apparatus as set forth in claim 2 wherein said means for indexing said plate comprises a reciprocable rod engageable with said plate during movement in one direction, said apparatus including a pivotally mounted ejector lever extending parallel to said plate and between the center of said plate and the corner thereof which is disposed at said second station, said rod being engageable with said lever during movement in the direction opposite to said first direction thereby to swing said lever past said second station and remove a wire held at said second station.

5. Transfer means for wire or the like comprising a plate centrally mounted for rotation in its own plane, a plurality of springs secured to the sides of said plate at evenly spaced intervals, said springs extending along, and substantially parallel to, the sides of said plate and being adapted to hold a wire with its axis extending normally of the plane of said plate, a rod reciprocable along a path extending parallel to the plane of said plate, means on said rod for engaging said plate during movement in one direction to index said plate, an ejector lever pivotally mounted adjacent said plate and normally extending towards said plate and between the center thereof and one of said springs, and means on said rod for engaging said lever during movement of said rod in the direction opposite to said first direction thereby to swing said lever relatively away from said plate and eject a wire from one of said springs.

6. Transfer means for wire or the like comprising, a square plate centrally mounted for rotation in its own plane, each side of said plate having a spring mounted thereon and extending towards a corner of the plate to hold a wire adjacent the corner with the wire axis extending normally of the plane of the plate, four pins extending from one face of said plate at locations equidistant from, and evenly spaced around, the center of said plate, a rod reciprocable along a path extending parallel to said plate, pawl means on said rod engageable with one of said pins to index said plate during movement of said rod in one direction towards and over the plane of said plate, an ejector lever pivotally mounted adjacent said plate and normally extending between one corner of said plate and the center of said plate, the axis of said lever extending obliquely of the axis of said rod, said rod being engageable with said lever during movement of said rod in the opposite direction to swing said lever past said one corner and remove a wire held at said one corner.

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