April 28, 1953 LA RUE V. REGELMAN 2,636,251

BASE THREADER

Filed Feb. 28, 1946 3 Sheets-Sheet 1

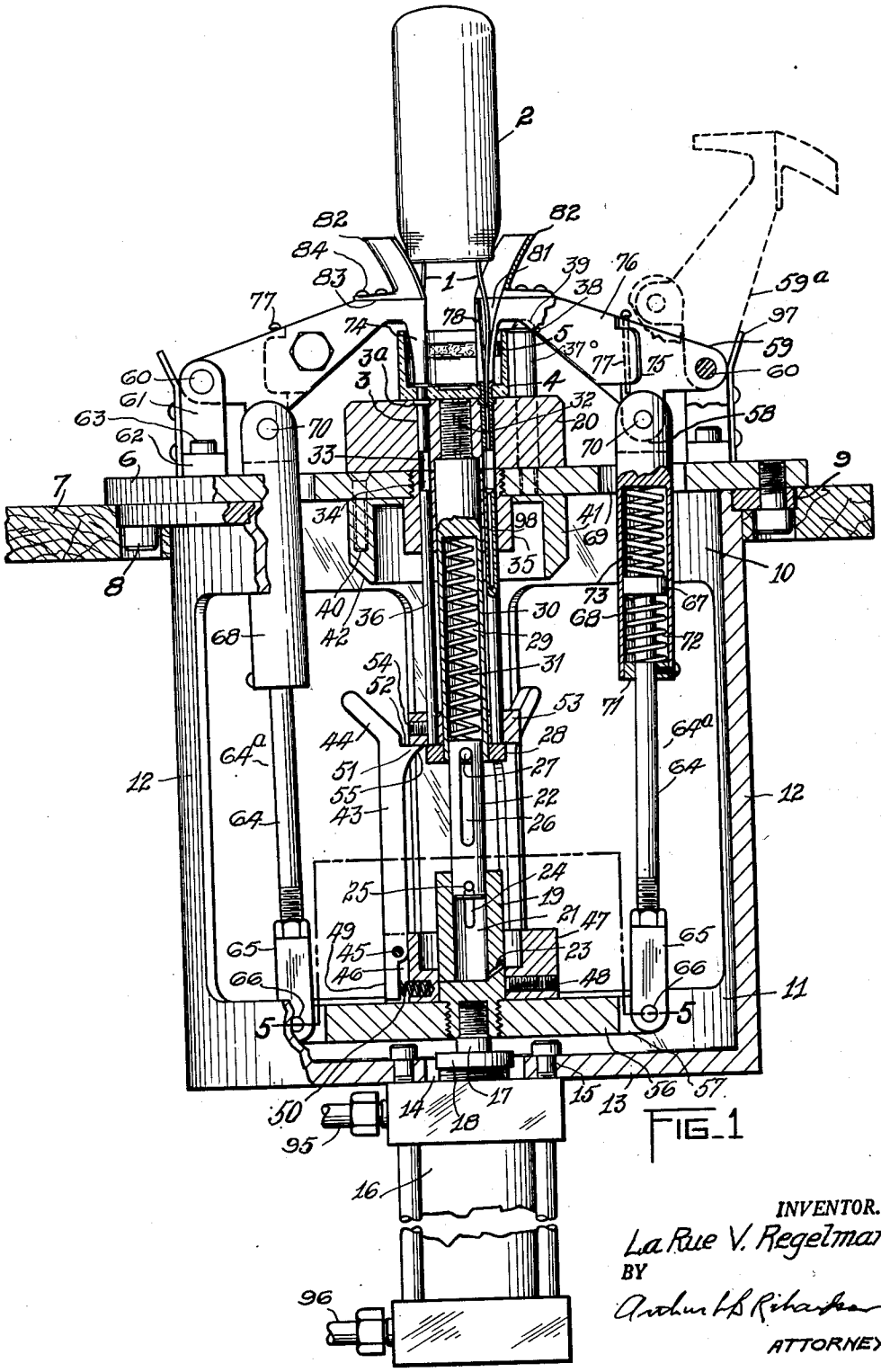

FIG_1

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BASE THREADER

Filed Feb. 28, 1946 3 Sheets-Sheet 2

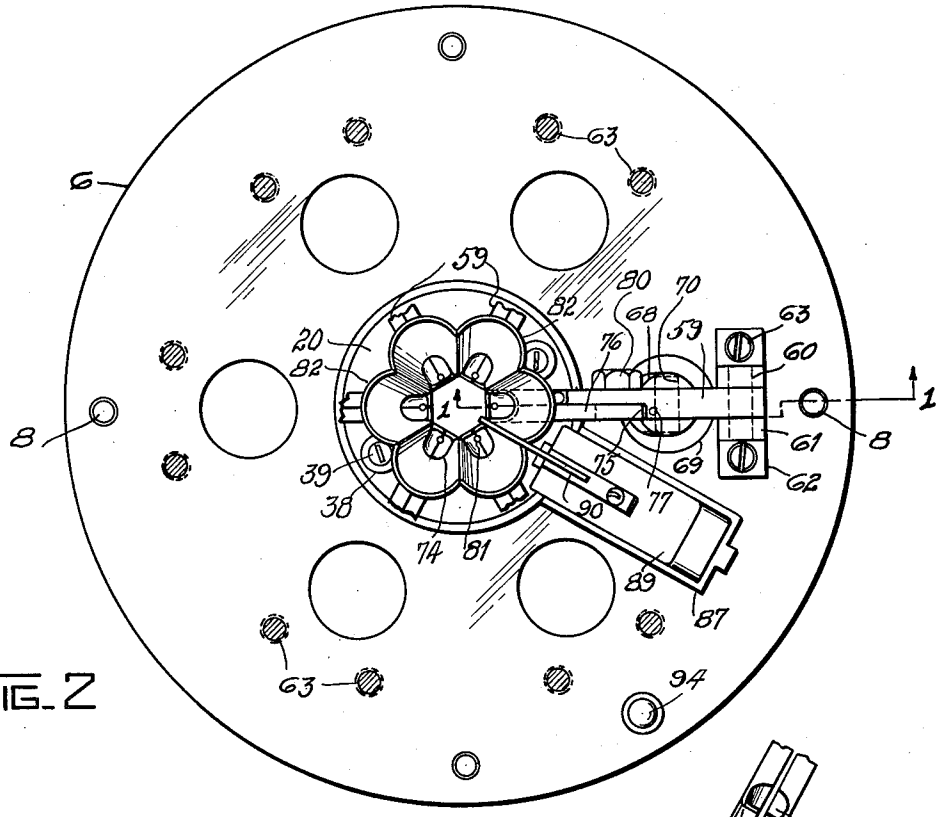

FIG_2

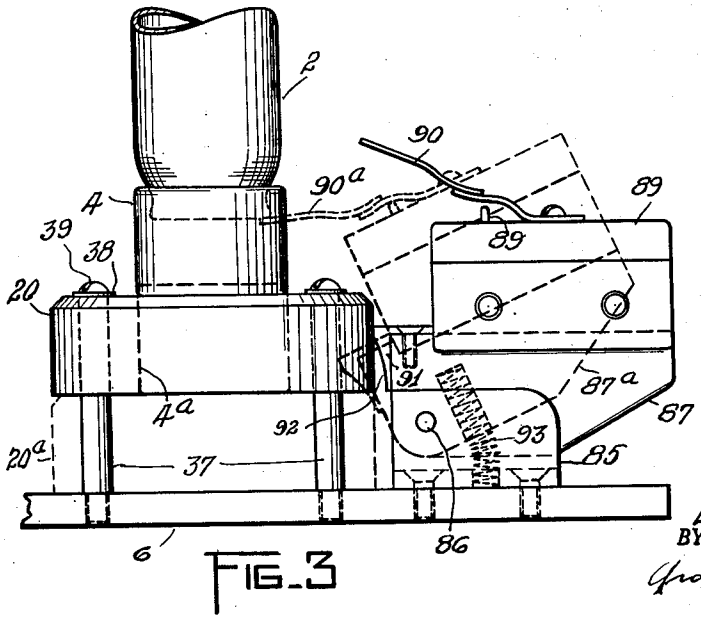

FIG_3

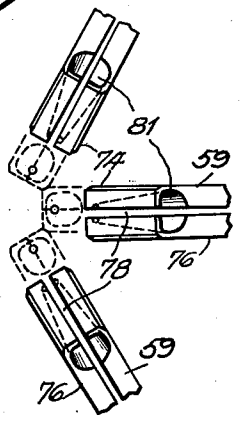

FIG_4

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April 28, 1953 LA RUE V. REGELMAN 2,636,251

BASE THREADER

Filed Feb. 28, 1946 3 Sheets-Sheet 3

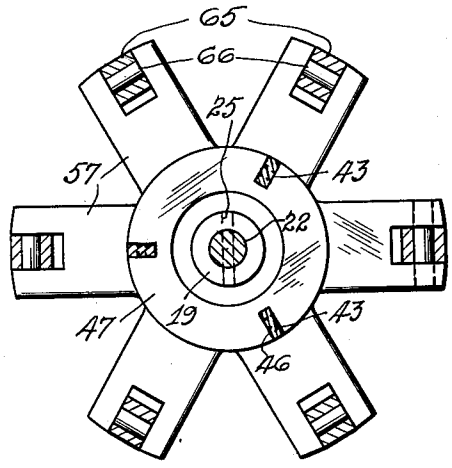

FIG. 5

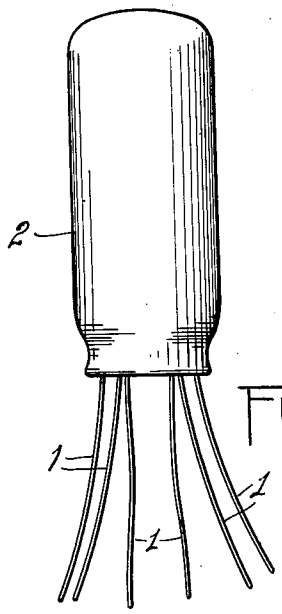

FIG. 6

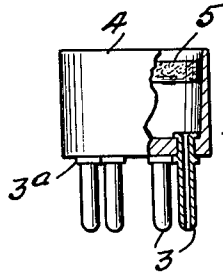

FIG. 7

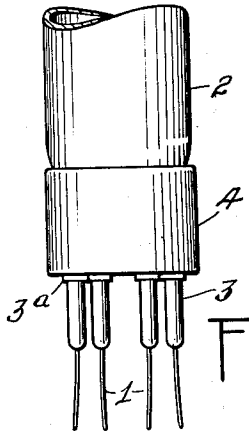

FIG. 8

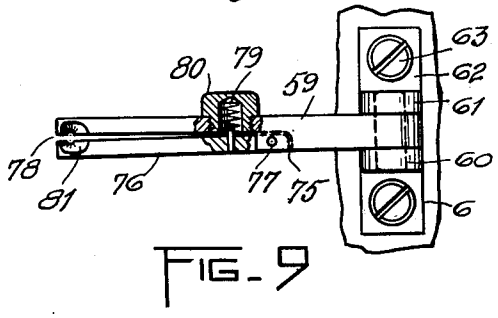

FIG. 9

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UNITED STATES PATENT OFFICE

2,636,251

BASE THREADER

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Application February 28, 1946, Serial No. 650,988

8 Claims. (Cl. 29—25.19)

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The present invention relates to the method of basing envelopes, and to a fixture used to facilitate threading the lead-in wires of a member such as a radio tube or the like into the tubular terminal pins in a base member.

An object of my invention is to provide an improved method for facilitating the threading of a wire into an aperture.

An object of the invention is the provision of an assembly fixture which makes threading of the wires practically automatic in that all that is required of the operator is to hold the glass envelope in one hand, exert a slight end pressure thereon and press a button. Thus the work is done more expeditiously, production is greatly increased, and the eyestrain and general fatigue resultant from manual operation are eliminated.

A further object of the invention is to make provision for the cushioning of movable parts so as to absorb all shocks and thus prevent possible injury to the internal structure of the tubes or the like constituting elements of the work being assembled.

Another object of the invention is the provision, in a fixture of the character described, of a plurality of uniquely constructed wire threading split needles operating in a manner to readily receive and guide the wires into the apertures of respective terminal pins, and then being movable to an inoperative position which permits a relative axial movement of the envelope and base in the uniting of these two members.

And, still another object of the invention is to provide a base threading fixture which is positive and efficient in operation, of simple and practical construction, easy to manipulate and not liable to derangement.

To these and other ends which will become apparent as the specification proceeds, the invention consists of certain parts and combinations of parts as will be fully set forth in the following description and particularly defined in the appended claims.

The accompanying drawings illustrating the invention and forming a part of the specification are as follows:

Figure 1 shows the apparatus partly in side elevation and partly in vertical section along line 1—1 of Fig. 2. In this view lead-in wires from the header of a glass envelope are shown as being guided into the apertures of the terminal pins and one of the needle carrying arms is indicated in dotted lines in its inoperative position.

Fig. 2 is a top plan view of the apparatus seen in Fig. 1 but with all of the needle carrying arms

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except one being broken off adjacent their inner or needle ends.

Fig. 3 is a view in side elevation of the micro switch and the adapter with which it cooperates, the switch being shown in full lines in one position and in dotted lines in another position.

Fig. 4 is a fragmentary illustration in top plan view of three adjacent needles, these parts being shown in dotted lines in their operative position and in full lines as moved part way to open or inoperative position.

Fig. 5 is a detail sectional view on line 5—5 of Fig. 1.

Figs. 6 and 7 are detail views in elevation of the parts to be assembled, a portion of Fig. 7 being in section through one of the terminal pins.

Fig. 8 is a view in elevation of the work after assembly, the lower portion only of the envelope being shown, and,

Fig. 9 is a top plan view of one of the needle carrying swinging arms, parts being in section to show details of construction.

In the drawings similar reference numerals refer to similar parts throughout the several views.

The work to be accomplished by the fixture apparatus is, referring first to Figs. 1, 6, 7, and 8, the threading of the comparatively long, thin and flexible lead-in wires 1, which project from the header of a glass envelope 2, substantially as illustrated in Fig. 6, into and through the tubular terminal pins 3, projecting downward from the bottom wall of the usual socket or base member 4. The envelope shown is that of a radio receiving tube having six lead-in wires, and the terminal pins 3 which are anchored in the bottom wall of the socket 4, extend parallel to the axis of such member and are regularly spaced in a circle concentric therewith. When assembled the socket or base 4 telescopically receives the header end of the envelope, a thin ring 5 of a plastic substance on the side wall of the socket adjacent its upper end providing a seal and protective bumper between the two members. The projecting ends of the wires 1, with reference to Fig. 8, are severed and the wires soldered to the lower ends of the tubular pins which are sealed in a machine designed for that purpose.

In the fixture apparatus embodying the invention, numeral 6 represents a base plate which, in this instance, is circular and supported upon the top 7 of a suitable work table. Secured to the underside of plate 6 by screws 8 is an external flange 9 at the top and integral with a cylindrical housing which projects through an opening

in the table top. The cylindrical housing comprises top and bottom annular portions 10 and 11, respectively, connected by spaced side bars 12, and a bottom wall 13 having a central opening 14.

Secured to the underside of the wall 13 by screws 15 is a reciprocatory two-way air motor having a cylinder 16 and a piston rod 17. The piston rod is slidable in a gland 18 extending through the opening 14, the end of the rod being threaded into the reduced and externally threaded lower end of a block 19 comprising the lower one of three relatively axially movable sections of an operating connection between the piston rod and a base block or adapter 20 upon which the work piece 4 is supported. The block 19 has an upwardly opening axial bore 21 for slidably receiving the lower end of a rod 22 comprising the intermediate section of the said connection. Communicating with the bore 21 there may be provided an air vent 23.

Relative axial movement of the parts 19 and 22 is limited by the length of opposing slots 24 in the block which slidably receive the projecting ends of a key pin 25 having a drive fit in the rod. In this rod 22, and extending in the direction of its length, is an elongated slot 26 for slidably receiving a pin 27 whereby the rod is splined to a collar 28 integral with the lower end of a tubular portion formed by a downwardly opening bore 29, in a rod 30 which is the upper section of the piston-to-adapter connection. The tubular portion of the section member 30 thus provides a sleeve in telescopic arrangement with the member 22. Interposed between the latter and the end of the bore 29 is a coiled compression spring 31. The upper end of the rod member 30 is threaded into the adapter 20 and pinned at 32 to prevent relative turning of these parts.

The adapter 20, illustrated in Fig. 1 as resting upon the base plate 6, is, in this instance, shown as a disc having a plurality of apertures 33 extending axially therethrough and of a size to slidably receive the terminal pins 3. The upper ends of the openings are preferably countersunk to receive shoulders 3a on the pins. These apertures 33 register with like openings 34 extending through a guide member 35 screwed to the underside of plate 6. This member 35 also has an axial bore in which the tubular rod 30 is guided in its reciprocating movement, while the apertures 33 and 34 in the adapter and guide member, respectively, slidably receive knockout pins 36 upstanding from a collar 53 which is slidably mounted on the rod 30 above the collar 28. The adapter 20, in its movement from the position illustrated in Fig. 1 to that in which it is seen in full lines in Fig. 3, is guided on two diametrically opposite posts 37 upstanding from plate 6 and provided at their upper ends with stop washers 38 held in place by screws 39.

Surrounding the guide 35 and secured to the underside of plate 6 by screws 40 is an inverted cup-shaped member 41 the annular sidewall of which is chamfered to provide a cam surface 42. This surface is for the purpose of deflecting a plurality of spring retractable fingers 43, of which there are three in the illustrated embodiment of the invention, by the engagement therewith of outwardly diverging extensions 44 of the fingers when the latter move upward.

The fingers 43 normally extend parallel with the piston-to-adapter connection and adjacent their lower ends have pivoted connection at 45 in slots 46 cut in the periphery of a lifting member 47. Lifting member 47 surrounds and is secured to the lower connector section 19 by one or more set screws 48. Depending tail portions 49 on the fingers are engaged by coiled compression springs 50 seated in radially extending bores in the member 47. Extending inwardly from each finger 43, and in the plane thereof from a point adjacent the inner end of the angular extension 44, is a detent 51 which provides a shoulder 52 adapted to engage under and support the collar 53, the latter having apertures for receiving the knockout pins 36 and set screws 54 whereby the pins are secured thereto. The inner edges of the fingers are tangential to cam surfaces 55 terminating at their junction with the free ends of the shoulders 52.

The reduced end of the connector section 19 is threaded into a horizontally disposed plate 56 formed with a plurality of regularly spaced radially slotted spider arms 57 of a number equal to that of the lead-in wires 1 and the openings 33 and 34. These spider arms have flexible link connection with depending ears 58 on a like number of radially extending arms 59 arranged above the plate 6 and having their outer ends pivoted on studs 60 mounted in spaced uprights 61 on brackets 62 which by screws 63 are secured to the plate 6.

The link connection between each spider arm and its respective swinging arm 59, while indicated generally at 64a, comprises a rod 64 adjustably threaded into one end of a connecting bar 65 which, at its other end, is pivoted at 66 to a spider arm 57. The rod 64 is formed with a head 67 guided for relative axial movement in the elongated tubular portion of an upper connector 68 which engages through an opening 69 therefor in the plate 6 and has its upper end bifurcated to straddle and have pivotal connection at 70 with the ear 58. The tubular portion of the member 68 is closed by a removable cap 71 having an opening for slidably receiving the rod 64 and interposed between the head 67 and the end closure 71, and the head and the end of the bore, are opposing coiled compression springs 72 and 73, respectively. Stops 97 on the brackets 62 limit outward movement of the arms 59 when reaching the position indicated for one of them at 59a in Fig. 1.

The swinging arms 59 are movable in vertical planes coincident with the axes of the apertures 33 in the adapter 20 and are formed at their inner ends with depending nose pieces 74 which, when the arms are swung to operative position, as illustrated in full lines in Figs. 1 and 2 and in dotted lines in Fig. 4, engage within the annular side wall of the socket member 4 and come to rest with their tip ends in yielding contact with the upper ends of respective terminal pins 3.

The nose pieces 74 are split longitudinally through their center and this division is extended part way of the length of the arms to provide two half sections one of which is an integral part of the arm, while the other terminates at a dividing line 75 at right angles to the split in the nose pieces to provide a leaf 76. This leaf member for each arm 59 has hinge connection at 77 and is permitted a limited outward or sidewise movement sufficient to provide an opening 78 in the nose piece which will allow passage therethrough of a lead-in wire 1. A coiled compression spring 79 housed within a screw plug 80 threaded into the arm proper acts against the leaf 76 to normally urge it to an open position. When, however, the arms swing

into operative position toward a common center, as illustrated in Fig. 4, the nose sections of the arms moving simultaneously will engage each other, just prior to the completion of such movement, with sufficient wedging action to close the openings 78.

Each nose piece 74 is formed with a channel 81 throughout its length, the wall of which, when the two sections are closed, converges toward its lower end so that the smallest diameter is exactly that of the opening through the terminal pin 3 with which it registers. The upper end of the channel wall merges with the inner face of a concavo-convex segmental part 82 which by a tail piece 83 and screws 84 is secured to the half section which forms an integral part of the arm 59.

Attached to the plate 6 in a radial line midway between two of the arms 59 is a bracket 85 including spaced sidewalls in which is pivotally mounted at 86 the forward end of a rocker arm 87 upon which a micro switch 88 is supported, this switch including an electrical contact 89 and a spring contact finger 90. In the plane of the arm 87 at its forward or inner end is a detent 91 formed on its underside with a cam surface 92. The detent rides on the peripheral surface of the adapter 20 so that when the latter is in its raised position, as illustrated in Fig. 3, the rocker arm will be moved to its full line position. When, however, the adapter is dropped to the dotted line position 20a against the plate 6, the cam surface 92 riding on the top peripheral edge of the adapter permits the rocker arm to swing to the dotted line position 87a under action of a coiled compression spring 93, thus moving the projecting free end of contact finger 90 to substantially the dotted line position 90a.

Operation of the fixture apparatus is as follows:

When starting an assembly the spider arm plate 56 is in its upper position whereby the needle arms 59 by means of their link connection with the spider arms 57 are in the dotted line position indicated for one of them at 59a in Fig. 1, and with the adapter plate 20 in the raised position illustrated in Fig. 3. With the arms 59 thus swung clear of the adapter 20, the operator places a base 4 upon the adapter with its terminal pins 3 inserted in the apertures 33 and presses a button 94 conveniently located in the plate 6. This closes a circuit through an electrically controlled air valve, not shown, whereby air is admitted through a connection 95 at the top of cylinder 16 to cause a downward stroke of the piston rod 17 and a consequent lowering of the parts actuated thereby to their respective positions as illustrated in Fig. 1, the adapter resting upon the plate 6 and as indicated in dotted line at 20a in Fig. 3. At this time the segmental members 82 on the arms 59 have closed in to form, as illustrated in Fig. 2, the scallops of the inclined and slightly convexed undulated side wall of a dish with, as hereinabove stated, the inner edges of the bottoms of the scallops merging with the upper edges of the needle openings 81, and with the splits 76 in the wall of these openings 81 closed due to the wedging together of adjacent nose pieces 74.

The operator then holds an envelope 2 in substantially axial alignment with the socket member 4 with the end of each lead-in wire 1 engaging one of the segmental scallops 82 which, with downward movement of the envelope 2, directs the wire into and through its respective needle opening 81 and part way into a terminal pin 3. At this time, the header end of the envelope engages the spring contact finger which is in its dotted line position 90a, Fig. 3, and moves it to closed position against contact 89, it being understood that, by reference again to Fig. 3, the adapter 20 and socket 4 are at this time in their dotted line position 20a and 4a, respectively.

A circuit is thus established through the electrical connections whereby air is admitted through pipe 96 to the bottom of cylinder 16 and the piston rod moves upward to again raise plate 56 and with it the lower section 19 of the piston-to-adapter connection, the block member 47 secured to the section 19 and the fingers 43, the latter carrying with them the collar 53 and pins 36 which, in this initial movement, are guided in the apertures 34 and 33 to an approximate contact with the ends of terminal pins 3. The links 64a also move upward with plate 56 and effect an outward swing of the needle arms 59 about their pivotal connections 60.

This initial, or delayed movement, which is the length of slots 24 in member 18, enables the nose pieces or needles 74 to clear the side wall of the work piece 4. And, as the arms 59 start their upward and outward swing in radial planes and the segmental pieces 82 spread apart due to enlargement of the circle within which they are contained, the leaves 76, urged by springs 79, move sidewise to form the openings 78 in the nose pieces which permit the latter to clear the lead-in wires 1.

Thereafter section rod 22, now moving upward with the lower section member 19, effects through the comparatively heavy compression spring 31 a resilient upward movement of the upper, tubular section 30 and the adapter 20 which, with a slight downward pressure on the envelope 2 by hand of the operator effects a telescoping engagement of the socket or base member 4 with the header end of the envelope 2 and passage of the lead-in wires 1 through the tubular terminal pins 3, as illustrated in Fig. 8.

Upward movement of the adapter 20 is limited by the stop washers 33. Continued movement of rod section 22 compresses spring 31, the slot 26 permitting a relative axial movement of the rod 22 and the telescoping tubular section 30. The knockout pins 35 however continue upward movement to lift the terminal pins 3 out of the apertures 33. With the work thus ejected, and prior to completion of the upstroke of the lifting devices, the angular extensions 44 of fingers 43 engage the fixed cam surface 42 causing a deflection of the fingers and their release from under the collar 53.

Thus the assembly is completed and the work ejected from the fixture. When the operation is repeated with another base 4 placed on the adapter 20, and the reciprocating parts start their downward movements, in the manner hereinabove stated, the cam edges 55 of fingers 43 when reaching collar 53 will ride over the collar, the fingers then snapping back into place, under action of the springs 50, to support the collar. From the foregoing it will be observed that insertion of the envelope 2 into its base member 4 is against the resiliency of spring 31, that engagement of the arms 59 against stops 97 on the brackets 62 is cushioned by springs 73 in the flexible link connections 64a and, also, that contact of the nose pieces or needles 74 with the upper ends of the terminal pins 3 is a yielding

one due to action of the link springs 72. It will also be observed that the knockout pins 36 are tubular, at least throughout a portion of their length as indicated at 98, Fig. 1, to receive that portion of the wires 1 projecting beyond the lower ends of the terminal pins 3.

Although I have shown and described particular embodiments of my invention, I do not desire to be limited to the embodiments described, and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim is:

1. In a fixture apparatus, whereby wires leading from the header of an envelope are threaded through parallel tubular terminal pins projecting from a base member and spaced in a circle concentric with the axis of said base, the combination of a support for the base guided for reciprocating movement and having openings therethrough for receiving said pins, a guide for each of said wires, said guides being mounted for movement radially of said support into and out of operative position in planes coincident with the axes of said pins, a common actuating means for said guides and for reciprocation of said support, knockout pins guided for axial movement and movable by said actuating means to eject said terminal pins from said openings in said base support, individual operating connections between said actuating means and said guides, and an operating connection between said actuating means and said support comprising a plurality of relatively movable sections whereby movement of said support is limited with respect to the complete movement of said actuating means and timed relatively to the radial movement of said guides.

2. In a base threading fixture, the combination with an adapter upon which a base is removably supported and having a plurality of openings for receiving tubular terminal pins projecting from the bottom of the base, of means for guiding wires individually into the pins, means for moving said guiding means into and out of an operative position to receive the wires, a two-way fluid operated motor including a piston, a piston-to-adapter connection for reciprocating said adapter and comprising three relatively movable sections, comprising a lower section secured to said piston, an upper section secured to said adapter and an intermediate section, said lower and upper sections having opposing bores for slidably receiving said intermediate section, a coiled compression spring housed within the bore of said upper section and acting against said intermediate section, pin-and-slot connections between said intermediate section and said upper and lower sections whereby respective relative movement of said sections is limited to the length of said slots, and means for guiding said adapter in its reciprocating movement.

3. In a base threading fixture, the combination with an adapter upon which a base is removably supported and having a plurality of openings for receiving tubular terminal pins projecting from the bottom of the base, of means for guiding wires individually into said terminal pins, means for moving said guiding means into and out of an operative position to receive the wires, a two-way fluid operated motor including a piston, a piston-to-adapter connection for reciprocating said adapter and comprising three relatively movable sections, viz., an upper section secured to said adapter, a lower section secured to said piston and an intermediate section in telescopic arrangement with said upper and lower sections, means limiting respective relative axial movement of said sections and a compression spring housed within said upper section and engaged by said intermediate section, a lifting block fixed to said lower section, a plate for supporting said adapter when in one position, means on said plate for guiding said adapter in its reciprocating movement, stops on said guiding means, said stops and said plate limiting the up and down movement of said adapter to a distance less than the stroke of said piston, a collar slidable on said upper connector section, a guide on the under side of said plate having openings axially aligned with said adapter openings and an axial bore for slidably receiving said upper connector section, knockout pins carried by said collar and engaging in said guide openings, spring retractable fingers pivoted in said lifting block to swing in planes radially thereof, shoulders on said fingers for supporting said collar, said knockout pins functioning to eject said terminal pins from said adapter, means acting on the upstroke of said piston and after ejection of said terminal pins to disengage said fingers from said collar, and cam surfaces on said fingers for engaging said collar on the down stroke of said piston to again deflect said fingers.

4. In a base threading fixture, whereby wires leading from a header are threaded into tubular terminal pins projecting axially from a base on relative axial movement of the base and header, an adapter for supporting the base, means for effecting a reciprocating movement of said adapter, a plurality of arms arranged radially of said adapter and pivoted adjacent their outer ends to swing about axes at right angles to the direction of said adapter movement, nose pieces depending from the inner ends of said arms and having open ended channels in the direction of their length for receiving and guiding the wires into the tubular pins when said nose pieces are swung to an operative position above the base, stops limiting movement of said arms in each direction of their oscillating movement, a lifting plate and motor means for raising and lowering said plate, a flexible connection between said lifting plate and said adapter for raising and lowering the adapter and providing a delayed movement of the adapter with respect to that of said lifting member, and individual link connections between said lifting member and said arms, each of said link connections comprising a clevis pivoted to said lifting member, a rod axially adjustable to one end in said clevis, a head on said rod, an upper section pivoted at one end to a respective one of said arms inwardly of the pivotal mounting of said arm and having an axial bore from its other end partway of its length and in which said head is slidable, a closure for said bore and having an opening for said rod, and two coiled compression springs in said bore, one being between said head and the inner end of said bore, the other encircling said rod and engaging between said head and said end closure.

5. The combination, in a threading fixture whereby wires leading from a member are each threaded through one of a number of tubular pins of a hollow base member, of means upon which the base is supported, a plurality of pivotally mounted arms, nose pieces comprising threading needles depending from the ends of said arms and formed in the direction of their length with open ended tapered channels, the

wall of each being split longitudinally, means for effecting movement of said arms to first bring said needles simultaneously to an operative position within said base to facilitate the threading of the wires into the tubular pins and then to an inoperative position permitting further relative axial movement of pins and wires to bring the parts together, and means for moving the walls of the channels apart to permit passage of said wires between them on outward movement of said arms.

6. In a base threading fixture, a combination as recited in claim 5 and including an outwardly inclined and transversely concaved segmental member secured to the needle end of each of said arms, said segmental members, when said arms are swung to operative position forming a flaring, undulated, annular side wall the bottom inner edges of the undulations merging with the adjacent end edges of said channels to provide unbroken guiding surfaces for said wires.

7. The combination, in a base threading fixture whereby wires leading from the header of an envelope of a radio tube or the like are each threaded through one of a like number of parallel tubular terminal pins projecting from a base member and spaced in a circle concentric with the axis of said base, of an adapter upon which said base is centered, said adapter being guided for axial reciprocation and having openings for slidably receiving said tubular pins, stops limiting said adapter movement, a plurality of arms extending radially of said adapter and each being pivoted adjacent its outer end to swing about an axis at right angles to that of said adapter, nose pieces comprising threading needles depending from the inner ends of said arms and formed in the direction of their length with open ended tapered channels the wall of each being split longitudinally, a lifting member, motor means for reciprocating said lifting member in the direction of but through a greater distance than that traversed by said adapter, link connections between said lifting member and said arms for oscillating said arms to first bring said needles simultaneously to an operative position, in which said wires from an envelope moved axially toward said supported base are directed into the mouths of said channels and guided through the smaller ends into said tubular pins, and then to an inoperative position permitting further relative axial movement of said base and envelope to bring said parts together, the split walls of said channels being relatively resilient, whereby said walls spring apart to permit passage of said wires through the split openings on outward movement of said arms, and the split openings of said needless being closed by the wedging action between the walls of adjacent needles when said arms are swung to operative position.

8. A device for guiding lead-in wires from the header of a radio tube or the like through a number of tubular contact pins of a hollow base including a support for said base, a number of pivotally arranged arms, nose pieces for said arms including hollow wire guide members which depend from the ends of said arms and funnel-shaped segmented outer wire guides on the sides of the nose pieces, the walls of said members being split in lengthwise direction, means to effect movement of said arms whereby the guide members are simultaneously brought together and placed in an operating position within said base and individual contact with said tubular contact pins, and means for moving said arms into a rest position, the walls of said guide members being arranged to separate from each other so that the wires during the outward movement of the arms can pass between the walls of said guide members.

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