June 1, 1954 C. E. McKINSEY ET AL 2,679,962

ARTICLE FEEDING AND COLLECTING MECHANISM

Filed May 8, 1948 3 Sheets-Sheet 1

Fig. 1.

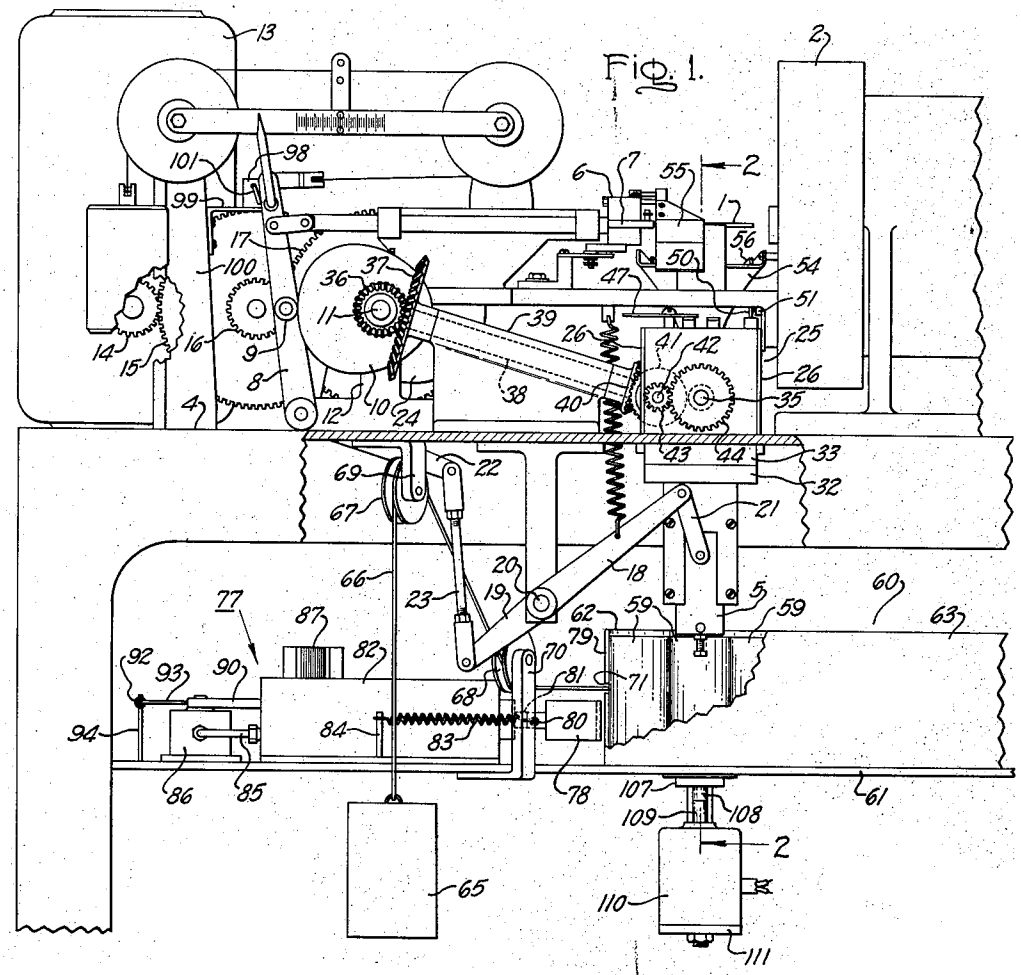


Fig. 5.

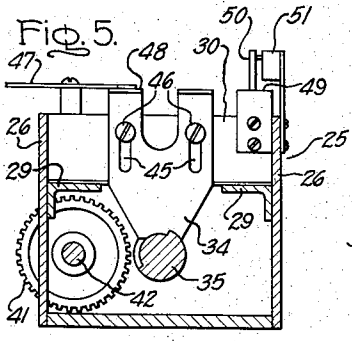
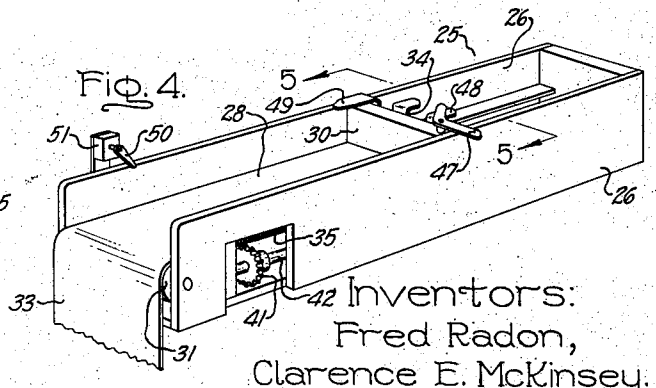


Fig. 4.



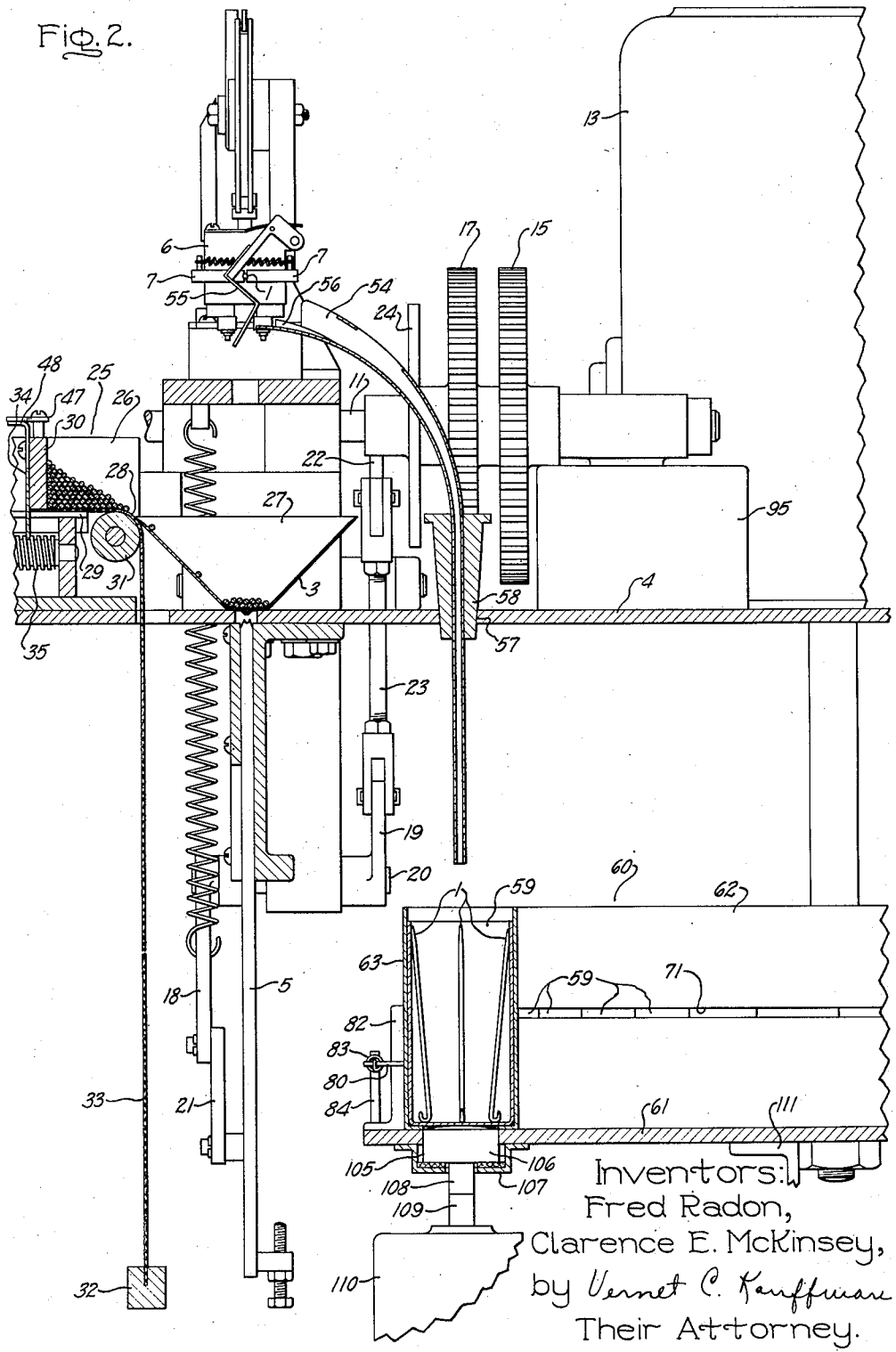
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Fig. 2.



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ARTICLE FEEDING AND COLLECTING MECHANISM

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Fig. 3.

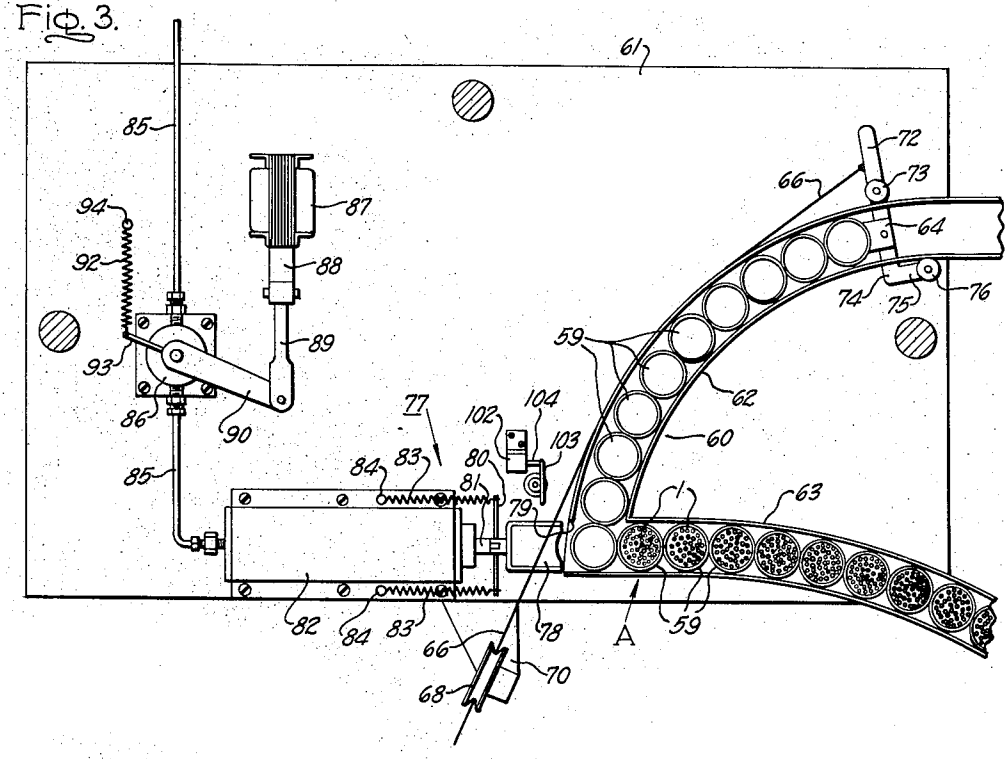
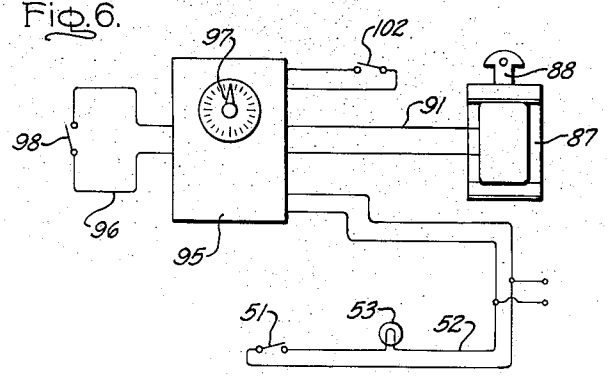


Fig. 6.



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ARTICLE FEEDING AND COLLECTING MECHANISM

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Application May 8, 1948, Serial No. 25,963

5 Claims. (Cl. 226—2)

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Our invention relates in general to wire-swaging apparatus, and more particularly to apparatus for automatically feeding lengths of wire endwise into the swaging head of a wire-swaging machine and collecting the swaged wires into bundles, each consisting of a predetermined number of such wires.

Certain types of lead-in wires for large sized electric incandescent lamps comprise an inner lead portion of relatively heavy, rigid wire, one end of which is formed with a hook for clamping the lamp filament therein and the other end of which is tapered down to conform in size to the diameter of the seal wire portion of the lead-in wire which is butt-welded thereto. In forming such inner lead portions, it is customary to first form the filament clamp hook at one end of the wire and to then taper or swage the opposite end of the wire down to the required diameter by insertion into the swaging head of a conventional type wire-swaging machine. After being swaged, the wire lengths are gathered and tied into bundles, and the individual bundles then passed through an annealing oven. While it is desirable to bundle together as many wires as possible in order to obtain the highest possible rate of production, nevertheless, it has been found that in order to obtain uniform annealing of the wires throughout the bundle, the number of wires in each bundle should not exceed a certain approximate maximum figure which, for the particular case under consideration, has been found to be around 300 wires or so.

In co-pending United States application Serial No. 626,557, filed November 3, 1945, now Patent No. 2,571,594, dated October 16, 1951, and assigned to the assignee of the present invention, there is disclosed and claimed apparatus for automatically feeding such hooked-end wire leads endwise into the swaging head of a wire-swaging machine. With the apparatus therein described and illustrated, however, the wires are discharged into a common storage receptacle from which an operator must gather together a number of the wires as near as possible to the maximum number permissible for satisfactory annealing thereof, and then tie the collected wires into bundles with a thin wire, in readiness for the annealing thereof. Because of the requirement for thus segregating the swaged wires into bundles of approximately the same number of wires, and further, because of the necessity for frequent reloading of the feed hopper thereof, the feeding apparatus disclosed in the said co-pending application therefore requires the practically constant attention of an operator.

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It is an object, therefore, of our invention to provide an automatic feeding and collector device for a wire-swaging machine which will operate to feed lengths of wire into the swaging machine and collect the swaged wires into bundles, each consisting of a given number of the swaged wires.

Another object of our invention is to provide an automatic feeding and collector device of the above-described character which will operate continuously for prolonged periods of time and require the attention of an operator only at relatively infrequent intervals.

Further objects and advantages of our invention will be apparent from the following description of a species thereof and from the accompanying drawings in which:

Fig. 1 is a front elevation, partly broken away and in section, of apparatus comprising our invention; Fig. 2 is a tranverse vertical section on the line 2—2 of Fig. 1; Fig. 3 is a plan view of the underlying shelf of the apparatus comprising our invention as viewed on the line 3—3 of Fig. 1 and showing the wire-collecting mechanism comprising our invention; Fig. 4 is a perspective view of the wire storage tray and associated feeding means of the apparatus comprising our invention; Fig. 5 is a sectional view on the line 5—5 of Fig. 4; and Fig. 6 is a wiring diagram illustrating the electrical circuit connections for various elements of the apparatus comprising the invention.

Referring to the drawings, the wires 1 (Fig. 2) to be swaged are fed into the swaging head 2 of a conventional type wire-swaging machine, such as that manufactured by the Torrington Company of Torrington, Connecticut, by automatic feeding apparatus essentially of the type disclosed and claimed in the said co-pending application Serial No. 626,557 and comprising, in general, a wire storage hopper 3 mounted on the upper side of the table 4 of the swaging machine adjacent the swaging head 2, a slide or elevator 5 vertically reciprocable through the hopper 3 to pick up the wires 1 therein, one at a time, and carry them up to a position in alignment with the wire-insertion aperture of the swaging head 2, and a sliding carriage 6 provided with wire-gripping jaws 7—7 and horizontally reciprocable to insert the gripped wire into and withdraw it from the swaging head 2. The carriage 6 of the wire feeding means is reciprocated by actuating means comprising a lever 8 which is pivoted at one end on the table 4 and connected adjacent its other end to the carriage 6 and is provided, intermediate its ends, with a roller 9 which rides on the periphery of a plate

cam 10 mounted on a cam shaft 11 which is supported in an upstanding bracket 12 mounted on the table 4. The said cam shaft 11 is rotated at the desired operating speed by means of an electric motor-driven speed reducer 13 which is mounted on the table 4 and which drives the cam shaft 11 through a train of gears comprising spur gears 14, 15, 16 and 17. The slide or elevator 5 of the wire-feeding means is vertically reciprocated by a rocker arm or lever comprising arms 18 and 19 mounted on shaft 20 and respectively connected at their free or swinging ends to the slide 5 through connecting link 21, and to one arm of a bell crank lever 22 through connecting rod 23. The bell crank lever 22 is pivoted on the table 4 and its other arm carries a follower roller (not shown) which rides on the periphery of a plate cam 24 mounted on the cam shaft 11. For a more detailed description of the construction and operation of the above feeding mechanism, reference may be had to the said co-pending application Serial No. 626,557.

To enable prolonged automatic operation of the above-described apparatus without the necessity of frequent attention by an operator, supplementary wire-supplying means are provided in accordance with the invention comprising a horizontally extending elongated tray 25 mounted on the upper side of the table 4 adjacent one end of and in longitudinal alignment with the hopper 3. The said tray 25 is adapted to receive therein an appreciable number of the wire leads 1 to be swaged and is provided with means for guiding and progressively feeding the wires 1 in properly oriented position into the hopper 3 at a rate approximating the rate at which the wires 1 are fed to the swaging head 2 by the slide 5 and carriage 6. For this purpose, the side walls or plates 26 of the tray 25 are approximately aligned with the sides 27 of the hopper 3 so as to guide the wires 1 in proper position into the hopper upon their discharge thereinto from the tray. The wires 1 are supported in the tray 25 on, and discharged therefrom by, a movable belt 28 of canvas or other suitable flexible material, which belt forms the tray bottom and is supported for linear advance and retractive movement longitudinally of the tray on flanges 29 (Fig. 5) extending from the inner sides of the tray side walls 26. One end of the belt 28 is secured to an upstanding follower plate 30 which rides through the tray between the side walls 26 thereof as the belt is linearly advanced and retracted. The belt 28 is drawn over a roller 31 rotatably mounted on the tray at the discharge end thereof, and it is held taut by a freely-suspended weight 32 fastened to the free hanging end 33 of the belt. The belt 28 is linearly advanced to feed the wires 1 thereon into the hopper 3, by the pull of the weight 32 acting on the belt, the rate of advance movement of the belt being controlled (so as to feed the wires 1 into the hopper 3 at a rate approximately corresponding to the rate at which they are fed to the swaging head 2 by the elevator slide 5 and carriage 6) by a clutch in the form of a shoe 34 fastened to the follower plate 30 and riding in the screw thread of a feed screw 35 mounted on the tray 25 beneath the belt 28.

The feed screw 35 is gear-driven from the cam shaft 11 which is provided for such purpose with a bevel gear 36 which meshes with a corresponding bevel gear 37 fastened on one end of a cross shaft 38 journaled in an upstanding bearing bracket 39 fastened on the upper side of the table 4. The other end of the cross shaft 38 carries a bevel gear 40 which meshes with a bevel gear 41 fastened on a shaft 42 which is rotatably mounted on the tray 25 beneath the belt 28 and extends parallel to the feed screw 35. The shaft 42 and feed screw 35 are provided with intermeshing gears 43 and 44, respectively, at the forward end of the tray for transmitting the rotational movement of the said shaft to the feed screw.

The clutch or shoe 34 is disengageable from the feed screw 35 to permit retraction of the belt 28 for periodic reloading of the tray 25 with a fresh supply of the wires 1 to be swaged. For this purpose, the shoe 34 is vertically slidable on the follower plate 30 into and out of engagement with the feed screw 35, the shoe 34 being provided with vertical elongated slots 45—45 within which ride the fastening screws 46—46 which fasten the shoe to the plate. The shoe 34 may be locked in its lower position in engagement with the feed screw 35 by means of a locking lever 47 which is pivoted on the follower plate 30 and is adapted to be swung into a position in which it overlies and engages a tab or tongue 48 formed on the shoe 34 at the upper end thereof.

As the supply of wires 1 in the tray 25 nears exhaustion by reason of the advance travel of the feed belt 28 and associated follower plate 30 toward their limiting advance position, a striker or finger 49 carried by the follower plate 30 engages the actuating finger 50 of a switch 51 mounted on the tray, thus closing an electric circuit 52 (Fig. 6) through an electric signaling device such as an electric incandescent lamp 53 preferably giving a red signal light, or an electric alarm bell, or both. The signal thus given by the signal device 53 indicates to an operator the empty condition of the tray and the need for refilling thereof with a fresh supply of wires 1.

After the wires 1 have been discharged from the tray 25 into the hopper 3 and individually carried therefrom by the elevator slide 5 to the carriage 6 and thence moved into and out of the swaging head 2 by the said carriage, they are released by the jaws 7 and collected into groups or lots of a desired number (300 in the particular case under consideration) by collector mechanism according to the invention. The said collector mechanism comprises a chute 54 into which the swaged wires 1 are deflected by a deflector plate 55 as they drop from the jaws 7, the said deflector plate being pivotally mounted on the carriage 6 for swinging movement out of the path of upward movement of the elevator slide 5. At its entrance mouth the chute 54 is provided with an upstanding striker flange or baffle plate 56 against which the forward or swaged end of the wires 1 strike as they drop into the chute to thereby swing or turn the wires around into a position with their hooked ends down. The chute 54 extends down through an opening 57 in the table 4 and is supported in a support bushing 58 fastened within the said table opening.

The swaged wires 1 are guided by the chute 54 into the open end of a relatively heavy metal container or can 59, of brass or other suitable metal, which is positioned directly underneath the discharge end of the chute. The can 59 is supported, with its open end up, in a guide channel 60 mounted on a shelf 61 supported on the machine frame in a position underneath the table 4. As shown in Fig. 3, the said channel 60 is composed of an empty can supply section 62

and a loaded can storage section 63 which extends transversely from the section 62, the two channel sections 62 and 63 together providing a continuous passageway for receiving therein a plurality of the containers or cans 59 which are progressively advanced therethrough to successively position the empty cans at station A (Fig. 3) of the channel section 63 where they are filled with the swaged wires 1 dropping from the chute 54.

The line of empty containers or cans 59 in the channel section 62 is continuously urged forwardly and advanced therethrough by feed means comprising a follower slide 64 which is slidable longitudinally within the channel section 62 and is continuously held against the rearmost one of the line of empty cans 59 by the pull of a freely suspended weight 65 connected to the slide 64 by a wire cable 66 running over guide pulleys 67 and 68 mounted, respectively, on brackets 69 and 70 fastened on the table 4 and shelf 61. As shown in Fig. 3, the slide 64 is in the form of a cross-bar which extends across the channel section 62 and is slidable within longitudinal slots 71 (Fig. 2) provided in the sides of the said channel section. The slide bar 64 projects outwardly beyond the sides of the channel section 62 and the cable 66 is connected to one of the projecting ends 72 of the slide bar, the said projecting end 72 also carrying a roller 73 which engages and rides on the outer surface of the channel side. The other projecting end 74 of the slide bar 64 is provided with a rearwardly extending leg portion 75 carrying a similar roller 76 which likewise engages and rides on the outer surface of the corresponding channel side. The engagement of the two rollers 73, 76 with the opposite sides of the channel section 62, together with the pull of the cable 66 acting on the projecting end 72 of the slide bar 64, acts to hold the latter in position crosswise of the channel section 62 and in engagement with the line of empty cans 59 therein.

When the cam 59 positioned at the loading station A has become filled with the desired number of swaged wires 1, it is immediately moved away from the loading position A and an empty can advanced into the said loading position by automatically operating intermittent container transporting means 77 comprising a pneumatically actuated reciprocating push or shoe member or ram 78 which is adapted to enter an opening 79 in the side of the channel section 62 directly opposite the entrance to the channel section 63 and push the foremost one of the line of empty cans in the channel section 62 into the wire-loading position A, the advanced empty can at the same time pushing the loaded can out of the said wire-loading position A and advancing the entire line of loaded cans in the storage section 63 of the guide channel 60. The push member 78 is mounted to reciprocate in a direction in alignment with the loaded can storage section 63 of the guide channel, and it is connected by a pin 80 to the piston rod 81 of an air cylinder 82 mounted on the upper side of the shelf 61. The push member 78 is normally held in a retracted position as shown in Fig. 3 by a pair of tension coil springs 83—83, each connected at one end to the pin 80 and at its other end to anchor pins 84 on the air cylinder. The chamber of the air cylinder 82 is connected to a source of compressed air by a conduit or air line 85, and a control valve 86 is connected in the air line 85 to open and close the latter. The valve 86 is

mounted on the shelf 61 and is actuated by a solenoid 87 likewise mounted on the shelf 61, the armature 88 of the solenoid being connected by a link 89 to the operating arm 90 of the valve 86. Energization of the solenoid 87 by closure of its electrical operating circuit 91 (Fig. 6) opens the valve 86. The valve 86 is closed, upon de-energization of the solenoid 87, by the pull of a tension coil spring 92 connected at one end to a pin 93 extending from the valve operating arm 90 and anchored at its other end to a pin 94 upstanding from the shelf 61.

The closure of the solenoid operating circuit 91 is controlled by a commercial-type automatic re-setting electric current pulse counter 95 (Fig. 6), such as manufactured by the Eagle Signal Corporation of Moline, Illinois, and which is adapted to count the number of pulses in a signal circuit 96 and then close a control circuit (in this case the solenoid circuit 91) when the number of current pulses in the signal circuit 96 reaches the predetermined number for which the counter has been previously set by means of its setting control 97, after which the counter automatically resets itself to zero in readiness for a new current pulse counting cycle. The counter 95 may be mounted on the upper side of the table 4, and its signal circuit 96 is closed by a switch 98 carried on an arm 99 (Fig. 1) extending from an upstanding bracket 100 on the table 4, the operating arm 101 of the switch 98 being engaged and actuated by the carriage actuating lever 8 to thereby close the said switch and, therefore, the signal circuit 96 each time the lever 8 retracts to withdraw one of the swaged wires 1 from the swaging head 2 and discharge it into the chute 54. Since in the normal operation of the apparatus a swaged wire 1 will be discharged into the chute 54 during each cycle of reciprocating movement of the carriage 6, the closing of the counter signal circuit 96 by switch 98 each time the carriage 6 completes one of its cycles of reciprocating movement will therefore cause the counter 95 to register each swaged wire 1 as it is discharged into the chute 54.

As soon as the can 59 at the loading position A is filled with the number of swaged wires 1 set on the counter setting control 97, as determined by the signal circuit current pulses registered by the counter 95, the counter automatically resets itself to zero and at the same time closes the control circuit 91 of, and thus energizes, the solenoid 87, which then opens the valve 86 in the air line 85. The resulting flow of compressed air into the cylinder 82 actuates the piston thereof which, in turn, moves the pusher member 78 forwardly through the channel opening 79 and into the channel section 62 where it engages the foremost empty can 59 and pushes it into wire-loading position A directly underneath the discharge end of the chute 54 and simultaneously advances the line of loaded cans 59 in the storage section 63 of the guide channel 60.

During the last portion of its forward movement into the channel section 62, the pusher member 78 opens a switch 102 which interrupts the electrical operating circuit 91 of the solenoid 87. The resulting de-energization of the solenoid 87 allows spring 92 to close the air control valve 86 which then shuts off the supply of compressed air to the air cylinder 82, allowing springs 83 to retract the piston of the air cylinder and therefore the pusher member 78. The switch 102 is mounted on the upper side of the shelf 61

adjacent the pusher member 78, and it is operated by a lever 103 which is pivotally mounted on the shelf and is engaged and pivoted by the pin 80 connecting the pusher member 78 to the piston rod 81. Pivotal movement of the lever 103 by the pin 80, during the forward movement of the pusher member 78, depresses the actuating plunger 104 of the switch 102 to thereby open the latter and thus interrupt the operating circuit 91 of the solenoid 87. Upon retraction of the pusher member 78 from the channel section 62 by the springs 83, the line of empty cans 59 in the channel section 62 is then immediately moved forwardly by the weight-actuated slide 64 to push the forwardmost empty can in position opposite the pusher member 78.

As the swaged wires 1 drop hook end down into the containers or cans 59 at position A, their hooked ends tend to interlock in such manner as to cause a pyramiding of the wires in the can. To obviate such a condition, the cans 59 may be subjected to a rapid vibratory motion while positioned at the wire-loading station A in order to shake the wires 1 all the way down into the can. For this purpose, a vertically movable bumper pin 105 is provided in the bottom of the guide channel section 63 on which the cans 59 rest while positioned at the loading station A, as shown in Fig. 2. The pin 105 is supported by its head portion 106 on a collar 107 fastened to the underside of the shelf 61, and the pin head portion 106 projects up through suitable openings in the shelf and channel bottom. The pin 105 is provided with a depending shank portion 108 which projects down through an opening in the collar 107, and it is rapidly vibrated up and down by an electromagnetic vibrator 110 the armature 109 of which butts against the lower end of the depending shank portion 108 of the bumper pin. The vibrator 110 is mounted on a suitable bracket 111 fastened to the underside of the shelf 61.

In the operation of the apparatus according to the invention, the loaded cans 59 are removed from the storage section 63 of the guide channel 60 by an operator at the time the wire storage tray 25 is reloaded with a fresh supply of wires 1 to be swaged. Each loaded can 59 is emptied of its contents, and the bundle of swaged wires 1 from each can is tied together by means of a thin wire, in readiness for annealing. The emptied cans 59 are then re-inserted into the empty can supply section 62 of the guide channel 60 by pulling back the slide 64 and dropping the cans into the channel section 62 ahead of the said slide.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. Apparatus for loading containers with a predetermined quantity of individual wire lengths and conveying along a fixed path a succession of the loaded containers, said apparatus comprising means including a chute for sequentially discharging a predetermined number of the wires into a container positioned beneath the discharge end of the chute, a guide channel extending underneath the discharge end of said chute and adapted to support a plurality of the containers in line and in open end up position, container-transporting means comprising a member movable relative to said channel and engageable with the containers therein to advance them successively into loading position directly beneath the lower discharge end of said chute to receive the wires as they are discharged therefrom, and electric control means operatively associated with said transporting means for periodically actuating the latter, said control means comprising an electrical operating circuit for actuating the said transporting means, an electrical signal circuit including a switch operable to make and break the said signal circuit once for each wire discharged by said wire-discharging means, and an automatically resetting electric current pulse counter connected to the said operating and signal circuits to register the number of current pulses in the signal circuit and close the operating circuit upon registry of a predetermined number of current pulses in the signal circuit.

2. Apparatus for loading containers with a predetermined quantity of individual wire lengths and conveying along a fixed path a succession of the loaded containers, said apparatus comprising means including a chute for sequentially discharging a predetermined number of the wires into a container positioned beneath the discharge end of the chute, a guide channel extending underneath the discharge end of said chute and adapted to support a plurality of the containers in line and in open end up position, said guide channel comprising an empty container supply section and a loaded container storage section extending transversely from the forward end of said supply section, electrically controlled container-transporting means comprising a member movable transversely of said supply channel section and engageable with the container at the forward end of said supply channel section to advance it into loading position in the said storage channel section directly beneath the discharge end of said chute to receive the wires as they are discharged therefrom, container feed means associated with said supply section and operable upon retraction of the movable member to feed the empty containers successively into position at the forward end of said supply channel section in readiness for subsequent advance movement thereof by said transporting means into the said loading position, and electric control means operatively associated with said transporting means for periodically actuating the latter, said control means comprising an electrical operating circuit operable upon closure to actuate said transporting means and a counter device adapted to register the number of wire lengths discharged by the wire-discharging means and connected to the said operating circuit to close the latter upon registry of a predetermined number of wire lengths discharged by the wire-discharging means.

3. Apparatus for loading containers with a predetermined quantity of individual wire lengths and conveying along a fixed path a succession of the loaded containers, said apparatus comprising means including a chute for sequentially discharging a predetermined number of the wires into a container positioned beneath the discharge end of the chute, a guide channel extending underneath the discharge end of said chute and adapted to support a plurality of the containers in line and in open end up position, said guide channel comprising an empty container supply section and a loaded container storage section extending transversely from the forward end of said supply section, container-transporting means comprising a pusher member reciprocable into and out of said supply channel section and in line with said storage channel section to engage the container at the forward end of said supply channel section and advance it into the storage channel section into a loading position

therein directly beneath the discharge end of said chute to receive the wires as they are discharged therefrom, empty container feed means associated with said supply channel section to feed the empty containers therein successively into position at the forward end thereof upon retraction of said pusher member, and electric control means comprising a solenoid operatively associated with said transporting means to actuate the latter upon energization of the solenoid, an operating circuit for said solenoid, and an automatically resetting counter adapted to register the number of wire lengths discharged by the wire-discharging means and connected in the operating circuit of said solenoid to energize the latter upon registry by the counter of a predetermined number of wire lengths discharged by the wire-discharging means.

4. Apparatus of the character set forth in claim 3 wherein the said empty container feed means comprises a slide movable longitudinally within said supply channel section and engageable with the last one of the line of empty containers therein, and a freely suspended weight connected to said slide to continuously urge it forward in said supply channel section against the line of empty containers therein.

5. Apparatus for loading containers with a predetermined quantity of individual wire lengths and conveying along a fixed path a succession of the loaded containers, said apparatus comprising means including a chute for sequentially discharging a predetermined number of the wires into a container positioned beneath the discharge end of the chute, a guide channel extending underneath the discharge end of said chute and adapted to support a plurality of the containers in line and in open end up position, container-transporting means comprising a member movable within said channel and engageable with the containers therein to advance them successively into loading position directly beneath the lower discharge end of said chute to receive the wires as they are discharged therefrom, an air cylinder having a piston connected to said member to actuate it, a conduit connecting said air cylinder to a source of compressed air, a control valve connected in said conduit and having an operating member, a solenoid having an armature connected to the valve operating member to open the valve upon energization of the solenoid, an electrical operating circuit for said solenoid, an electrical signal circuit including a switch operable to make and break the said signal circuit once for each wire discharged by the wire-discharging means, and an automatically resetting electric current pulse counter connected to the said operating and signal circuits to register the number of current pulses in the signal circuit and close the operating circuit upon registry of a predetermined number of current pulses in the signal circuit.

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