

June 24, 1930.

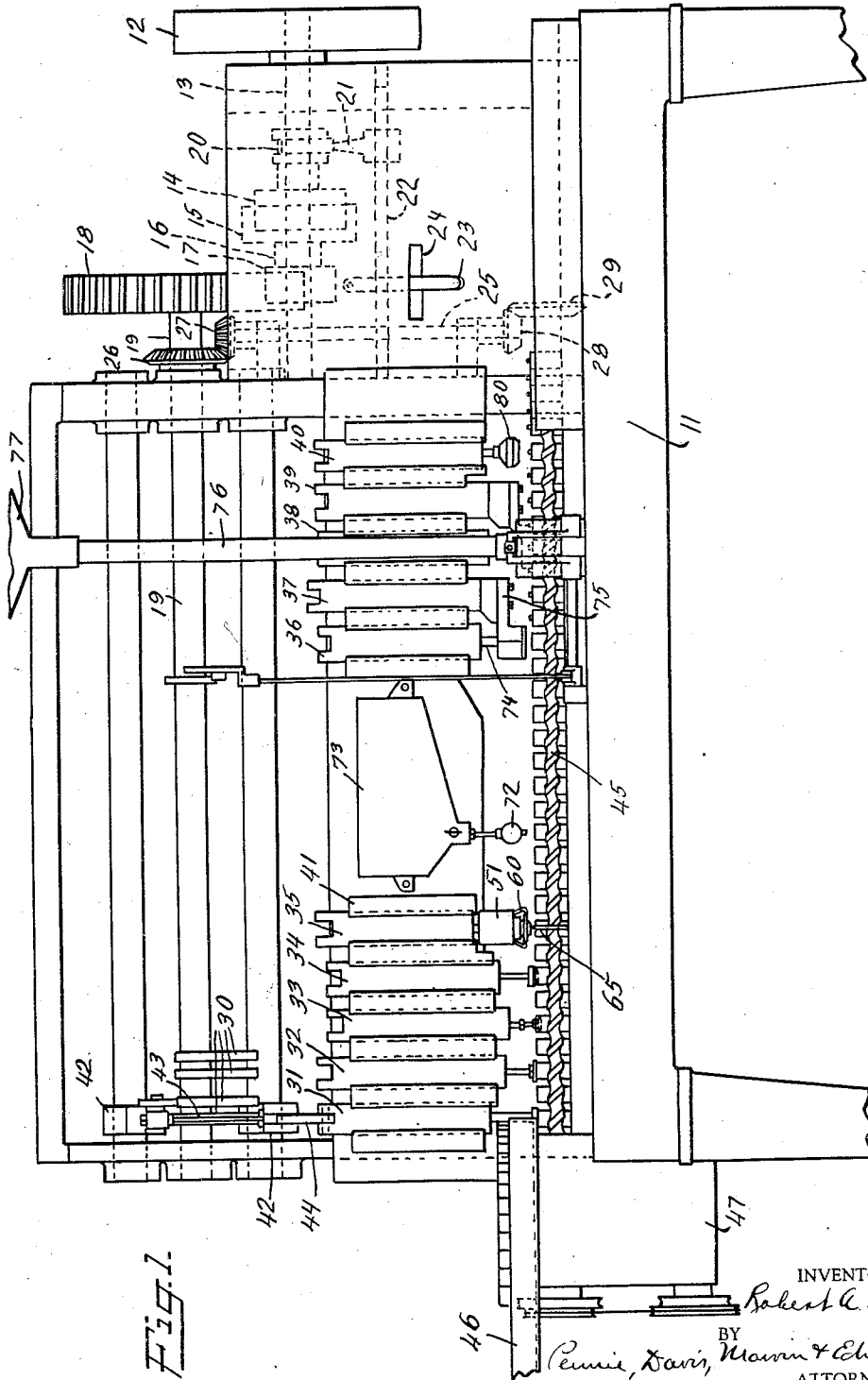
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APPARATUS FOR MAKING DRY CELLS

Filed March 21, 1928

3 Sheets-Sheet 1



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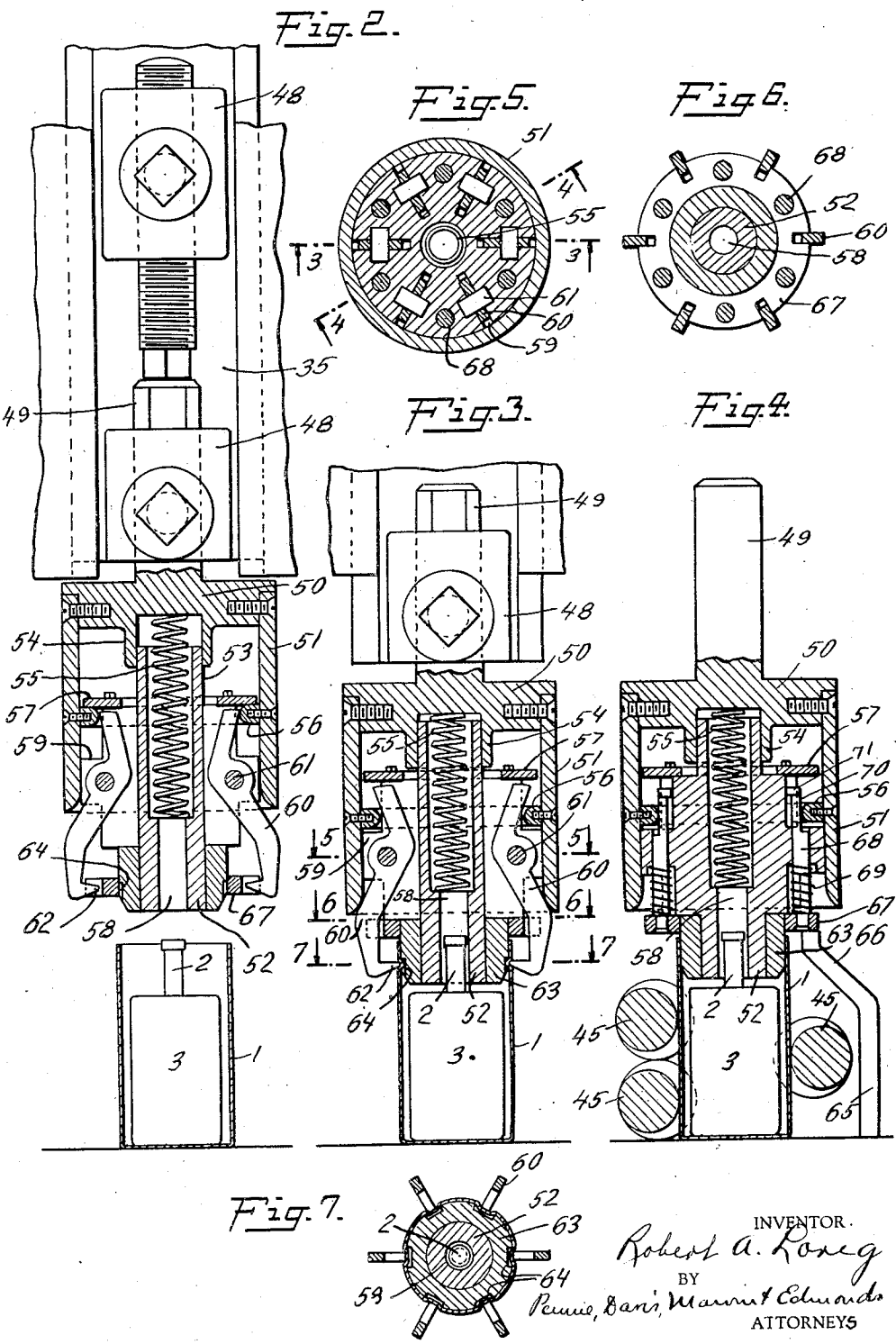
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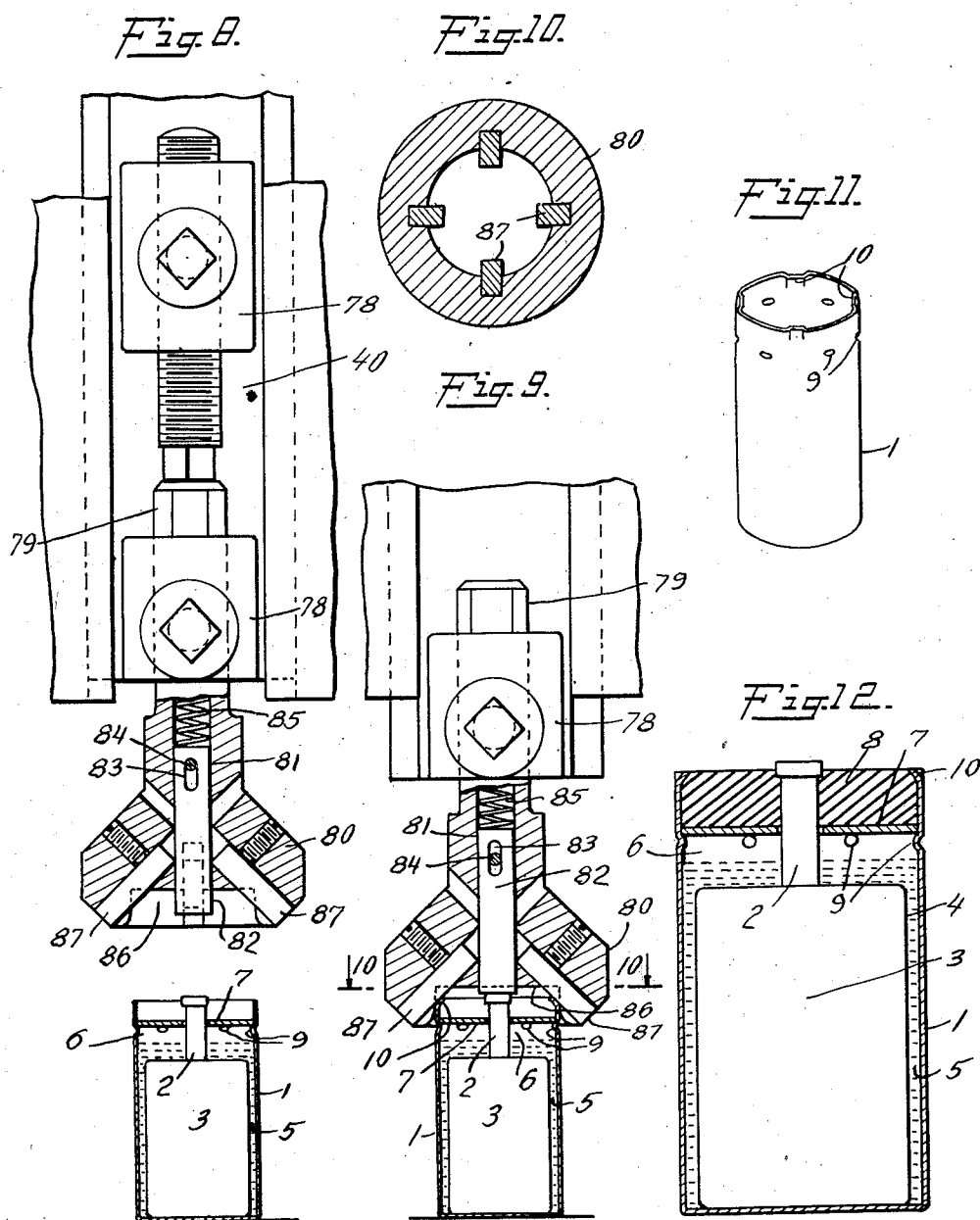
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3 Sheets-Sheet 3



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APPARATUS FOR MAKING DRY CELLS

Application filed March 21, 1928. Serial No. 263,232.

This invention relates to improvements in apparatus for assembling dry cells.

In the manufacture of dry cells it has been proposed to insert a washer of substantially the same diameter as the inner diameter of the zinc cup over the cathode core slightly spaced from the top of the core to form an expansion space for gases formed during the discharge of the cell. A fusible seal is placed over this washer and the upper edge of the cup then crimped.

In some instances the frictional resistance between the washer and the wall of the can is depended on to hold the washer in its proper place. This requires the use of washers and cans of exact dimensions, with the cans perfectly round. In actual practice, difficulties are encountered due to the washers slipping down too far in the cans or tilting too much to one side thereby making an uneven seal. Where the washers are inserted by hand this condition is aggravated by careless workmanship. Furthermore, when the upper edge of the can is crimped, it apparently causes a slight bulge or distortion of the can at about the washer level and the washers then drop to the top of the core.

In a prior application of Howard D. Hodge, (deceased), Serial No. 123,237, Apparatus for assembling galvanic cells (now Patent No. 1,669,054 granted May 8, 1928), there is described and claimed a machine by means of which the various components of a dry cell are inserted in a can as it is automatically fed past a number of stations. When the Hodge machine is employed in the assemblage of cells, defects due to careless workmanship in the placing of the washers are avoided and such defective insertion is entirely due to defective washers and cans.

It has been proposed to overcome these difficulties by crimping or spinning a continuous shoulder at a slight distance below the top of the can on which the washer is adapted to rest. Such spinning or crimping of a continuous shoulder cannot be readily accomplished in a battery assembling machine, and, therefore, adds an extra step to the manufacturing operation and adds to the cost of the cell.

In a copending application of George Stone, Serial No. 263,274, filed March 21, 1928, there is disclosed a dry cell can having indentations at circumferentially spaced intervals a slight distance below the top of the can, and having the top of the can crimped, preferably by spot crimping at intervals in staggered vertical arrangement with the indentations.

My invention consists in the provision of suitable apparatus for producing the Stone dry cell can in a machine of the Hodge type whereby the improved battery can and cell can be assembled without resorting to extra steps in the process of manufacture.

One form of the invention is illustrated in the accompanying drawings, in which,

Fig. 1 is a diagrammatic front elevation;

Fig. 2 is a front elevation, on an enlarged scale of the indenting mechanism;

Fig. 3 is a vertical, sectional view on line 3—3 of Fig. 5;

Fig. 4 is a similar view on line 4—4 of Fig. 5;

Fig. 5 is a horizontal, sectional view on line 5—5 of Fig. 3;

Fig. 6 is a similar view on line 6—6 of Fig. 3;

Fig. 7 is a similar view on line 7—7 of Fig. 3;

Fig. 8 is an enlarged front elevation of the crimping mechanism in raised position, parts being shown in section;

Fig. 9 is a similar view with a crimping head in lowered position;

Fig. 10 is a horizontal, sectional view on line 10—10 of Fig. 9;

Fig. 11 is a perspective view of the cup, and,

Fig. 12 is a vertical, sectional view of the completed cell.

A dry cell of the type desired is shown in cross section in Fig. 12. It consists of a can 1 containing a depolarizing cathode core consisting of a central carbon rod 2 about which is firmly tamped a depolarizing mix 3 of carbon or graphite and a depolarizer such as manganese dioxide, conducting salts and water. The cathode core may be naked or may be surrounded by a bibulous envelope 4

of cheesecloth, tissue paper or hardened dip such as is described in United States Patent, No. 1,316,597 and may be insulated at the bottom by folding under the bibulous envelope. A suitable gelatinous or pasty electrolyte 5 separates the core from the can. This electrolyte may be that described in United States Patent, No. 1,292,764 and may be compounded as described in United States Patent, No. 1,370,056. An expansion space 6 is provided above the top of the core and a water-proofed washer 7 is arranged over this expansion space to support a wax or pitch seal 8. As shown, the washer rests upon a series of circumferentially spaced indentations 9 arranged in substantially the same horizontal plane and adapted to limit the downward movement of the washer to retain it suitably spaced from the top of the core. The upper edge of the can is provided with spaced crimped portions 10 which may be arranged staggered with respect to the indentations 9 and these crimped portions prevent the seal from being blown from the cell by an accumulation of gases in the expansion space.

The apparatus employed in constructing the cell is mounted on an elevated bed 11 and may be driven by a pulley 12 or by a direct motor drive. This pulley is mounted on a drive shaft 13 which is journaled in suitable bearings and carries one element 14 of a control clutch. The driven element 15 of the clutch is carried by a sleeve 16 loosely mounted on the drive shaft. The sleeve also carries a gear 17 meshing with a gear 18 on a cam shaft 19. The cam shaft 19 extends substantially the full length of the machine. The driving element 14 of the clutch may be splined to the drive shaft to permit relative movement and may be provided with a groove 20 adapted to receive the ends of a yoke 21 carried by a movable rod 22 and controlled by a pivoted clutch lever 23. This lever projects through a slot 24 in the gear casing. A shaft (not shown) arranged on the bed of the machine and extending longitudinally thereof is driven from the shaft 19 by means of a vertical shaft 25. As shown, the shafts 19 and 25 are provided with bevel gears 26 and 27 meshing with each other and the opposite end of shaft 25 is likewise provided with a bevel gear 28 meshing with a bevel gear 29 on the driven shaft. This latter shaft drives the various mechanisms of the apparatus.

On shaft 19 are mounted cams 30, two of which are shown and these cams actuate reciprocating devices or sliders 31 to 40 which are mounted in vertical slides 41 on the frame of the machine. These sliders are termed "stations" hereinafter. The sliders are actuated by toggles 42 which are arranged in pairs above and below the cams 30 and pivotally mounted on the frame of the machine.

The upper and lower toggles of each pair are connected to each other by links 43 and are connected to the sliders 31 to 40 by links 44. The cams are so designed as to give the proper speed and throw for each of the reciprocating devices, the downward stroke being made while the cans are held stationary by the can feeding mechanism with which the cam shaft 19 is synchronized.

The cans are carried forward singly for the various operations by means of lead screws 45, or other similar apparatus. The lead screw mechanism consists of three screws mounted as shown in Fig. 4 of the drawings, two screws being in the rear plane and one in the front for operating convenience and inspection. The screws are so cut that when mounted, as shown in Fig. 4, the corresponding arcs form a portion of a circle and a can of predetermined size may be firmly held between the screws and will not tip. With each revolution of the screws the can is advanced the pitch of the screw and is successively brought beneath each of the stations. The lead screws are operated from the shaft carrying the bevel gear 29 by suitable mechanism (not shown) to give them an intermittent motion, preferably a Geneva movement. A can feeding disc 46 is arranged at the inlet end of the machine and is rotated by means of suitable gearing (not shown) arranged in a gear casing 47 to feed the cans to the lead screws. The first station 31 lowers the can into the lead screws so that it will be fed forwardly. At station 32 the reciprocating device inspects for "no can". Station 33 inspects for the presence of a can in an inverted position and station 34 straightens or rounds the top of the can if it has been accidentally deformed.

The indenting mechanism is arranged at station 35 and is shown in detail in Figs. 2 to 7 of the drawings. A pair of lugs 48 are carried by the slider 35 and these lugs receive an adjustable rod 49 having an enlarged lower end or head 50. A cylindrical cross head or sleeve 51 is mounted on this head. A mandrel 52 is arranged within the head and is capable of movement with respect thereto. As shown the upper end of the mandrel is of reduced cross area as indicated at 53 and is adapted to be received in a guide 54 carried by the head 50. The mandrel is recessed to receive a coil spring 55, the upper end of which bears against the head 50 to normally retain the mandrel in lowered position with respect to the head. The sleeve 51 is provided with a ring 56 arranged intermediate the top and bottom and the upper end of the body portion of the mandrel is provided with a plate 57 of larger area than the mandrel and adapted to engage this ring when the indenting apparatus is in raised position to limit the downward movement of the mandrel with respect to the head.

The lower end of the mandrel is provided with a central bore 58 adapted to receive the carbon rod 2 when the mandrel is in lowered position (see Figs. 3 and 4). The body portion of the mandrel is provided with a plurality of radial slots 59 and indenting tools 60 are pivotally mounted in these slots by means of pins 61. When the indenting apparatus is in raised position, the upper ends of the indenting tools 60 engage the ring 56 as shown in Fig. 2 of the drawings to force the upper ends of the tools inwardly and the lower ends outwardly. As shown pointed as at 62 to form the indentations 9 in the sides of the can when the tools are forced inwardly. The lower end of the mandrel is reduced in cross section and carries a sleeve 63 adapted to enter the top of the can. This sleeve is provided with a plurality of recesses 64 in alignment with the pointed ends 62 of the indenting tools.

Suitable stripping mechanism is provided for removing the mandrel from the can after the indenting operation has been completed. A stop pin 65 is arranged beside the front lead screw, the upper portion of the pin being offset as at 66 to extend over the lead screw. A ring 67 is mounted on the reduced lower end 63 of the mandrel and is supported by a plurality of pins 68 mounted in openings in the mandrel arranged between the radial slots 59 as shown in Figs. 5 and 6 of the drawings. These pins are surrounded by coil springs 69 bearing against the ring 67 and the enlarged central portion of the mandrel respectively. The upper ends of these pins are recessed as at 70 to permit downward movement of the ring 56. These pins are provided with heads 71 which control the downward movement of the ring 67.

In the operation of the indenting mechanism the downward movement of the slider 35 caused by its cam 30 is transmitted to the head 50 and the parts of the indenting mechanism move downwardly together during the first portion of this movement. The ring 67 is in its lower position and is retained in such position by the springs 69. As the indenting apparatus moves downwardly, the stop pin 65 is engaged by the ring 67 causing the ring to move upwardly on the lower reduced end of the mandrel and placing the springs 69 under compression. When the ring 67 reaches its upper position, shown in Figs. 3 and 4 of the drawings, further downward movement of the mandrel is arrested and as the head 50 and sleeve 51 continue to move downwardly, the spring 55 is placed under compression. During this continued downward movement of the head 50 and sleeve 51, the upper end 53 of the mandrel moves into the guide 54 as shown in Figs. 3 and 4 of the drawings. The lower end of the sleeve engages the indenting tools below

their pivots as shown in Fig. 3 of the drawings, forcing them inwardly to form the indentations 9. When the cam passes its high point, the reverse movement begins, the head 50 and sleeve 51 starting their upward movement first while the mandrel is retained in lowered position by the compressed spring 55. As the head moves upwardly with respect to the mandrel the ring 56 engages the indenting tools above their pivots forcing the upper ends inwardly and withdrawing the pointed lower ends of the indenting tools from the indentations. When the indenting tools have been withdrawn, the ring 56 engages the plate 57 and the mandrel then begins to move upwardly with the head. The springs 69 are still under compression and retain the ring 67 in position until the mandrel is moved sufficiently with respect to the ring to relieve the compression of the spring 69 when the ring will have returned to the position shown in Fig. 2 of the drawings and the mandrel has been withdrawn from the can.

The cans are then advanced to a position beneath an electrolyte pump 72 which is connected to a supply tank 73 and which is adapted to insert a measured quantity of electrolyte into each can. The can containing the requisite amount of liquid paste solution advances to station 36 where the cathode core is inserted into the can, the paste solution welling up about the sides of the core to form the electrolyte between the core and the can as shown in Fig. 12. Slider 36 actuates an adjustable plunger 74. The bottom of this plunger is cut away so that the pressure exerted by it will come on the body of the core instead of on the carbon embedded in it and will allow the core to slide into position from one side. A core pressure foot 75 is actuated by slider 37 which works in conjunction with slider 36. The detailed construction of the core inserting mechanism is shown in the copending Hodge application referred to above and as this feature forms no part of the present invention, a detailed description thereof is omitted for brevity.

The top washer 7 is inserted into the can at the station 38. The washer is provided with a central opening for the reception of the carbon rod and is preferably of a slightly greater diameter than the inside diameter of the can. This variation in diameter allows the washer to be forced down until it seats on the indentations 9 to form a gas space 6 above the core and it also provides a base for the sealing wax or pitch 8. The slider 38 controls the feed of washers from a tube 76 connected to a source of supply 77 and the washer is inserted in the can by suitable mechanism carried by slider 39 which co-operates with slider 38.

The can then passes to station 40 where the top is crimped as shown in Figs. 11 and

12 of the drawings. The details of the crimping mechanism are shown in Figs. 8 to 10 of the drawings. As shown slider 40 is provided with a pair of lugs 78 adapted to adjustably receive a rod 79 and the crimping tool or head 80 is mounted on the lower end of this rod. The crimping tool is provided with a central bore 81 adapted to receive a guide or centering member 82 which is movable with respect to the head. This centering member is provided with an elongated slot 83 adapted to receive a transverse pin 84 to limit the movement of the centering member. A spring 85 is arranged in the bore above the centering member. As shown the head of the crimping tool is substantially cone shaped and is provided with a conical recess 86 in its lower face to receive the cell. When the tool is lowered the centering member 82 contacts with the carbon pencil and the pin 84 then moves downwardly in the slot 83, placing the spring 85 under compression and thus rigidly holding the cell during the crimping operation. The lower recessed face of the crimping head is adapted to receive a plurality of radially arranged crimping tools 87 which project beyond the surface of the head and, as the head moves downwardly engage the can at spaced intervals to form the spot crimps 10 in the upper edge of the can.

The machine forms spaced indentations, in lieu of a continuous shoulder, and the operation may thus be accomplished on a battery assembling machine of this type and the crimps in the upper edge of the can may likewise be formed as a step in the assemblage of the cell without necessitating a separate later operation as is necessary when the can is crimped continuously around its upper edge.

I claim:—

1. Apparatus for assembling dry cells consisting essentially of means for advancing a zinc can to successive stations and causing it to pause at each of said stations, means for indenting the exterior of said can at spaced circumferential points near its top while pausing at one of said stations and means for crimping the upper edge of said can while pausing at another of said stations.

2. Apparatus for assembling dry cells consisting of means for advancing a dry cell can to successive stations and causing it to pause at said stations, a reciprocating mandrel arranged at one of said stations, a reciprocating sleeve surrounding said mandrel and movable with respect thereto, and a plurality of indenting tools pivotally mounted on said mandrel and adapted to be actuated by the movement of said sleeve to indent the exterior of said can at spaced circumferential points near its top.

3. Apparatus for indenting dry cell cans

comprising a reciprocating head, a mandrel mounted in said head and movable with respect thereto, a ring carried by said head to limit the downward movement of said mandrel, and indenting tools pivotally mounted on said mandrel adapted to be actuated by relative movement of said head and said mandrel and stripping mechanism to withdraw said mandrel from the dry cell can after the can has been indented.

4. Apparatus for indenting dry cell cans comprising a movable head, a sleeve carried by said head, a mandrel mounted in said head and movable with respect thereto, a ring mounted on said mandrel, a stationary stop adapted to be engaged by said ring during the downward movement of said head and mandrel, said ring being adapted to arrest further downward movement of said mandrel while said head and sleeve continue their downward movement, a plurality of pivotally mounted indenting tools carried by said mandrel and adapted to be actuated by the continued downward movement of said sleeve, and springs arranged between said ring and said mandrel whereby said mandrel will be withdrawn from the dry cell can.

5. Apparatus for indenting dry cell cans comprising a reciprocating head, a sleeve mounted on said head, a mandrel mounted in said sleeve and movable with respect to said sleeve and said head, means for limiting the downward movement of said mandrel with respect to said sleeve and said head, and indenting tools pivotally mounted on said mandrel and adapted to be moved inwardly by engagement of said sleeve and said tools upon downward movement of said sleeve with respect to said mandrel.

In testimony whereof I affix my signature.
ROBERT A. LORIG.

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