Dec. 23, 1952 H. E. HARING ET AL 2,622,272

METHOD AND APPARATUS FOR BEADING SILVER CHLORIDE SHEETS

Filed May 14, 1947 2 SHEETS—SHEET 1

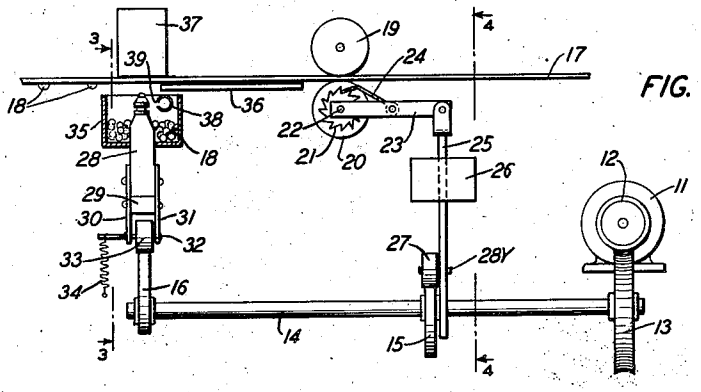


FIG. 1

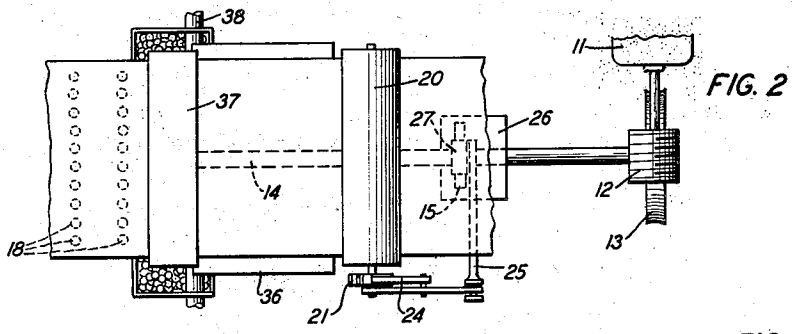


FIG. 2

FIG. 3

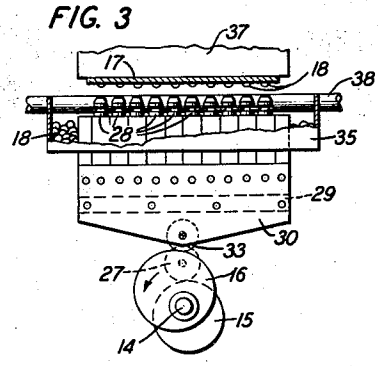


FIG. 4

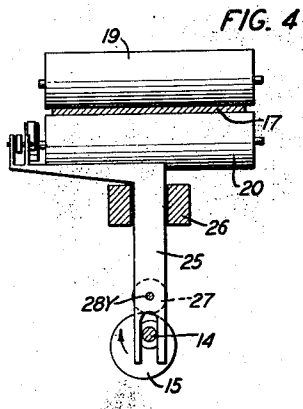
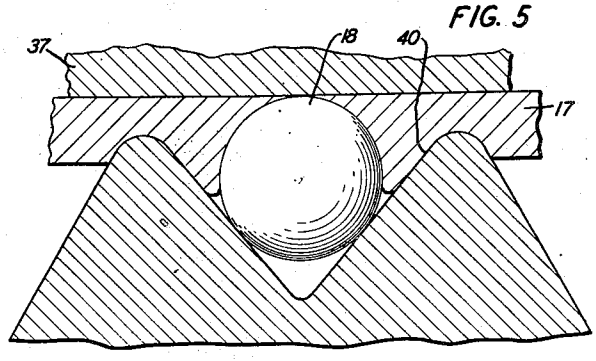


FIG. 5



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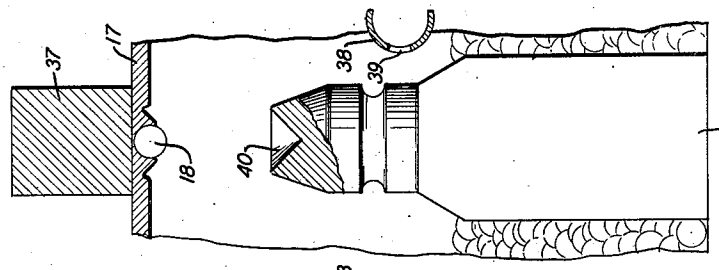

FIG. 10

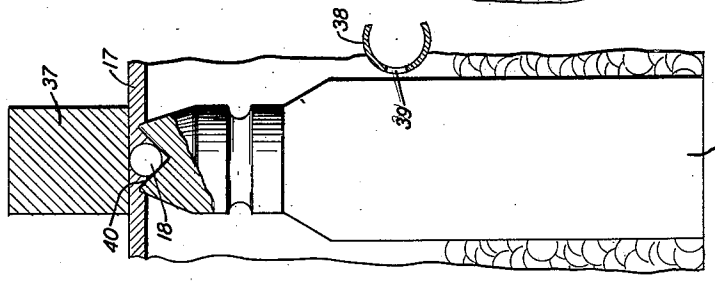

FIG. 9

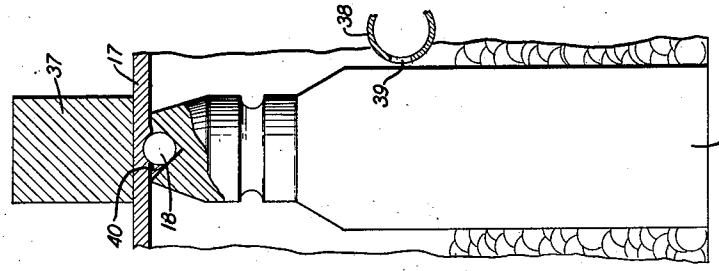

FIG. 8

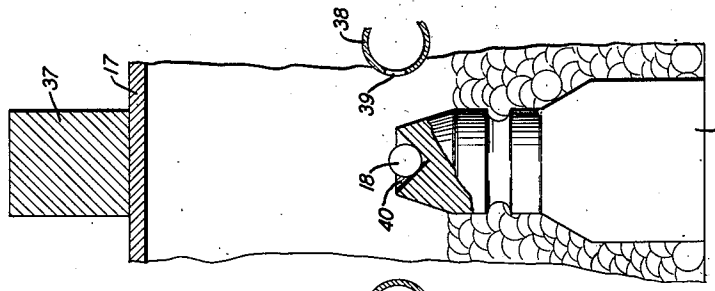

FIG. 7

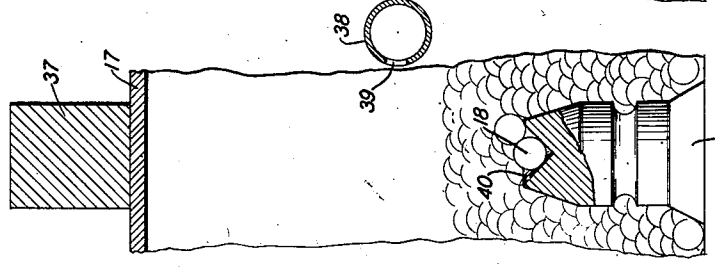

FIG. 6

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METHOD AND APPARATUS FOR BEADING SILVER CHLORIDE SHEETS

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Application May 14, 1947, Serial No. 747,978

9 Claims. (Cl. 18—1)

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This invention relates to methods and machines for embedding glass beads or the like in plates of silver chloride used in so-called sea water batteries generally known as duplex types, the glass beads serving as a dielectric or separation between the anode and cathode of the plate assembly.

The beading machine of this invention is an improvement over the machine for beading silver chloride plates disclosed in Edgar W. Gent and Walter W. Werring pending application filed April 23, 1946, Serial No. 664,386. While such a machine has been found entirely satisfactory as far as operativeness is concerned, its mechanism has been found unduly complex in that means must be provided for imparting movements to a plate serving to position the beads in registering position relative to plunger members. Other means is provided for moving the silver chloride plate in position for receiving successive rows of glass beads. Other means is provided for clamping a silver chloride plate prior to the operation of the plunger members and still other means is provided for operating the plunger members in cooperation with the clamping means for embedding the beads into the silver chloride plate.

One object of the present invention is the provision of a machine of the type above referred to using a minimum number of operating parts and which is rapid and accurate in operation.

In the drawing:

Fig. 1 is a side elevation view of the machine showing a portion of the silver chloride plate in position for receiving glass beads and a mechanism for moving the silver chloride plate relative to plunger members serving to press the glass beads into the silver chloride plate for securing them therein;

Fig. 2 is a top view of Fig. 1;

Fig. 3 is a vertical cross-sectional view taken on line 3—3 of Fig. 1;

Fig. 4 is a vertical cross-sectional view taken on line 4—4 of Fig. 1;

Fig. 5 is an enlarged view in section showing an operating part of the machine, a portion of one of the plunger members, a portion of the silver chloride plate, and a glass bead, secured in position in the silver chloride plate;

Fig. 6 is an enlarged cross-sectional view of the reservoir for the glass beads with a plunger in normal position;

Fig. 7 is a view similar to that of Fig. 6 showing the plunger during its upward movement at a

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point wherein one of the beads is carried by the plunger member;

Fig. 8 is a view showing the glass bead being forced into the silver chloride plate prior to the engagement of the plunger member with the plate;

Fig. 9 is a view showing the bead being pressed into the silver chloride plate, and with the plunger member in engagement with the plate; and

Fig. 10 is a view showing the plunger during its return movement to normal position following the completion of the beading operation.

The machine for embedding glass beads into silver chloride plates according to the present invention consists of a motor 11 on the armature shaft of which is keyed a worm 12. This worm is disposed in meshing relation with a worm gear 13 keyed on a shaft 14 shown in Figs. 1, 2, 3 and 4. On shaft 14 is keyed a pair of cams 15 and 16, the function of which will be hereinafter described in detail.

A silver chloride sheet or plate 17 to be fitted with glass beads as 18 is placed between two rollers 19 and 20 of resilient material such as rubber which may be pressed against the opposite sides of the silver chloride plate by an adjustment not shown. One of the rollers 20 is intermittently actuated by a ratchet mechanism consisting of a ratchet wheel 21 keyed on the supporting shaft 22 of roller 20, a reciprocating arm 23, a pawl 24 mounted on the arm 23 and engaging the ratchet wheel 21.

The arm 23 which has one end of its arm pivoted on shaft 22 is connected at its free end to one end of an angle-shaped connecting rod 25, the opposite end of which terminates in the form of a fork straddling the shaft 14 to serve in cooperation with a support 26 to guide the connecting rod 25 in its longitudinal reciprocating movement as imparted by the cam 15 keyed on shaft 14, through a roller 27 mounted on a spindle 28y laterally extending from rod 25.

A plurality of plunger members 28 are disposed in a row in vertical position on a cross bar 29 and clamped in assembled spaced relation to each other between a pair of plates 30 and 31, these plates being provided with a pivot 32 serving for rotatably mounting a roller 33 disposed in engagement with the periphery of cam 16 serving in cooperation with a retractile spring 34 for imparting reciprocating movement to the plunger assembly thus formed in timed relation with the operation of roller members 19 and 20 as effected by the ratchet mechanism.

The plungers 28 are disposed with their upper ends extending below the level of the beads in a container 35 so as to permit each plunger to pick up a bead in its upward movement as will be hereinafter described in detail. The silver chloride plate 17 is supported by a plate 36 extending in overlapping relation with a cross bar 37 serving as a support for the plate upon the pressing of the glass beads therein by the upward movement of the plunger unit. A tubing 38 extends into the bead container 35 in longitudinal relation therewith. This tubing is provided with a series of openings in the form of slots as 39, one for each plunger member 28 serving for directing air streams against the effective portion of each plunger so as to blow extra glass beads from the apex of the plungers following their upward movement in the bead container, the tubing 38 being connected to both ends to a source of compressed air generated by a compressor (not shown) and which forms no part of the present invention.

Each of the plunger members as best seen in Fig. 5 is formed according to our discovery with a truncated cone portion in turn formed with a conical cavity 40 of substantially 82 degrees forming a circular ridge rounded at its apex adapted to be pressed into the silver chloride plate or strip an amount substantially two-fifths that of the radius of the glass bead, following the pressing of the glass bead into the material to a point wherein the surface of the bead is substantially flush with the upper disposed surface of the silver chloride plate. This operation causes the material of the silver chloride plate to cold flow against the glass bead to a point substantially one-fifth of the radius of the glass bead beyond its equatorial line for securely embedding it in the material.

In a typical operation of the beading machine of this invention the operation of motor 11 is effective to rotate the shaft 14 and cams 15 and 16 keyed thereon through the worm 12 and worm gear 13. Rotation of cam 16 is effective to move the plunger unit 28 from the position shown in Fig. 6 to the position shown in Fig. 7. The plungers 28 in their upward movements into the bead container cause the glass beads to enter into the conical depression 40 as shown in Figs. 5, 6, 7, 8 and 9. During the continued operation of the plunger members from the position shown in Fig. 6 to a position where the beads pass the air streams as shown in Fig. 7, any extra glass beads picked up by the plungers are blown therefrom. Following the continued upward operation of the plunger unit from the position indicated in Fig. 7 to the position indicated in Fig. 8, the glass beads are pressed collectively into the silver chloride plate prior to the engagement of the ridge at the top of the cone depression with the plate to a point as indicated in Fig. 9 when the glass beads are firmly secured to the silver chloride plate, because of the material being forced to cold flow beyond the equator line of the glass beads as above described when the plunger members are returned to normal condition. This return is effected simultaneously upon the operation of the ratchet mechanism by the cam 15 for rotating the rollers 19 and 20 and thereby positioning the silver chloride plate for receiving another row of glass beads in the manner above described.

What is claimed is:

1. In a machine for embedding beads into a plate of material, said machine comprising a support for the plate, a container for the beads, a plurality of plunger members arranged for operation as a unit and extending into said container, each of said plunger members having a truncated cone portion and a conical cavity at the center of said cone portion for receiving a bead upon the movement of said plunger unit in said container, said cavity forming a circular ridge cooperating with said bead to cold flow the plate material around said bead for securing the latter to the plate, a roller, and a mechanism for actuating said roller for positioning the plate on said support relative to and following each operation of said plunger unit.

2. In a machine for embedding glass beads or the like into a silver chloride plate, said machine comprising a container for the beads, a plurality of plunger members mounted for reciprocating movement into said container, the ends of said plungers extending into said container being of the shape of truncated cones, a cavity in each of said truncated cones for receiving a glass bead upon movement of said plunger members through said container, said cavity and said truncated cone forming a circular ridge for cold flowing the plate material around the beads to anchor them into the silver chloride plate, a support for the plate guiding the latter in position relative to said plunger members, a cam for actuating said plunger members, a pair of rollers, an operating mechanism for actuating one of said rollers for moving the plate relative to said plunger members and abutting means for supporting the plate upon the operation of the plunger members for embedding the glass bead into the silver chloride plate.

3. In a machine for embedding glass beads or the like into a silver chloride plate, said machine comprising a container for the glass bead, a plunger extending into said container and arranged for reciprocating movement therein, said plunger having a truncated cone-shaped portion and a conical concave portion at the center of said truncated portion for receiving one of the glass beads upon a movement of the plunger member in said container, said concave portion cooperating with said truncated cone portion to form a circular ridge for forcing the material of the plate around the glass bead beyond the equator line thereof for securing the bead to said plate, a cam, a ratchet mechanism actuated by said cam and a pair of cooperating rollers actuated by said ratchet mechanism for imparting movement to the silver chloride plate in position for receiving successive beads in spaced relation to each other.

4. A machine for embedding beads or the like into a material which cold flows under pressure comprising a container for the beads, a plunger member extending through said container, said plunger member having a circular ridge at one end thereof and a cavity within said circular ridge to receive a bead during passage of said plunger through said container, means for actuating said plunger to proceed through said container and to press said bead into said material, and gas pressure means to remove excess beads from said one end of said plunger during its passage through said container.

5. A machine for embedding beads or the like into a plate of a material which cold flows under pressure comprising a container for the beads, a support for the plate, a plunger member having one end in the form of a truncated cone, a conical cavity in said truncated cone to receive one bead during passage of said plunger through

said container, said truncated cone and said cavity therein cooperating to form a circular ridge, means for actuating said plunger to proceed through said container, to press said bead into said plate and to recede from said plate, and means for moving said plate a discrete distance following each recession of said plunger.

6. A machine for embedding beads or the like into a plate of material which cold flows under pressure comprising a container for the beads, a plurality of plunger members arranged for operation as a unit and extending into said container, each of said plungers having a circular ridge at one end thereof and a cavity within said circular ridge to receive a bead during passage of said plunger unit through said container, means positioning the plate, means for actuating said plunger unit to proceed through said container, to press said beads into said plate, and to recede from said plate, and means for moving said plate a discrete distance following each recession of said plunger unit.

7. The method of embedding beads into a material which cold flows under pressure comprising bringing a bead up against the material, pressing said bead into said material, forming a circular indentation in said material concentric with said bead, and applying pressure to said material to cold flow some of the material between said indentation and said bead around said bead to firmly hold it in said material.

8. The method of embedding glass beads or the like into a material which cold flows under pressure comprising pressing a bead into the material a small distance, then simultaneously further

pressing said bead into said material while forming a circular indentation in said material concentric with said bead, and cold flowing some of the material between said bead and said indentation around said bead to a point beyond its equator line to secure said bead in said material.

9. The method of embedding glass beads or the like into a silver chloride plate comprising pressing a bead into the silver chloride plate, forming a circular indentation in the plate concentric with said bead, and applying pressure to said plate to cold flow some of the silver chloride between said indentation and said bead around said bead to a point beyond its equator line to secure said bead in said plate.

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