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M. C. MEYER ET AL
BEAD COATING MACHINE

2,601,307

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3 Sheets-Sheet 1

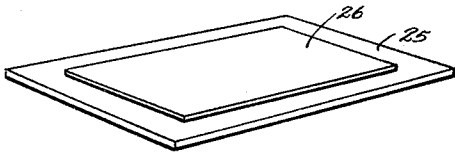


FIG. 1

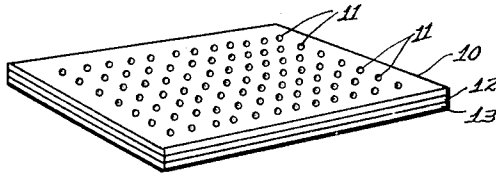


FIG. 2

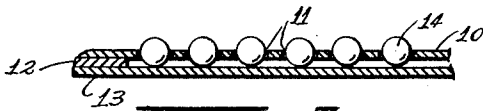


FIG. 3

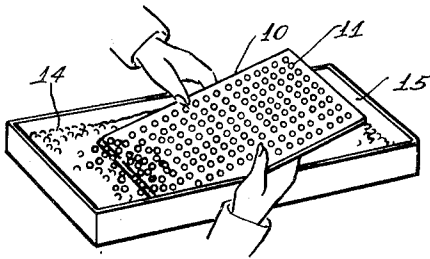


FIG. 4

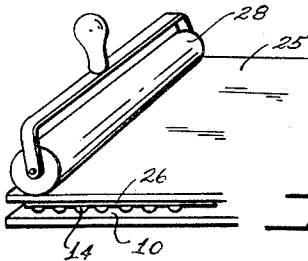


FIG. 6

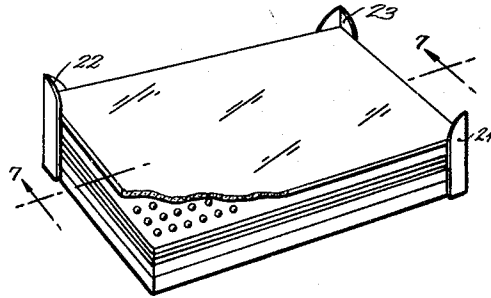


FIG. 5

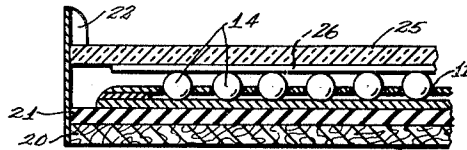


FIG. 7

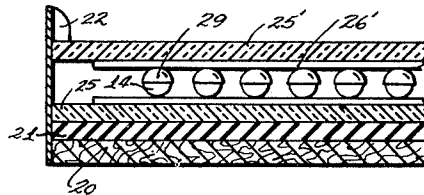


FIG. 8

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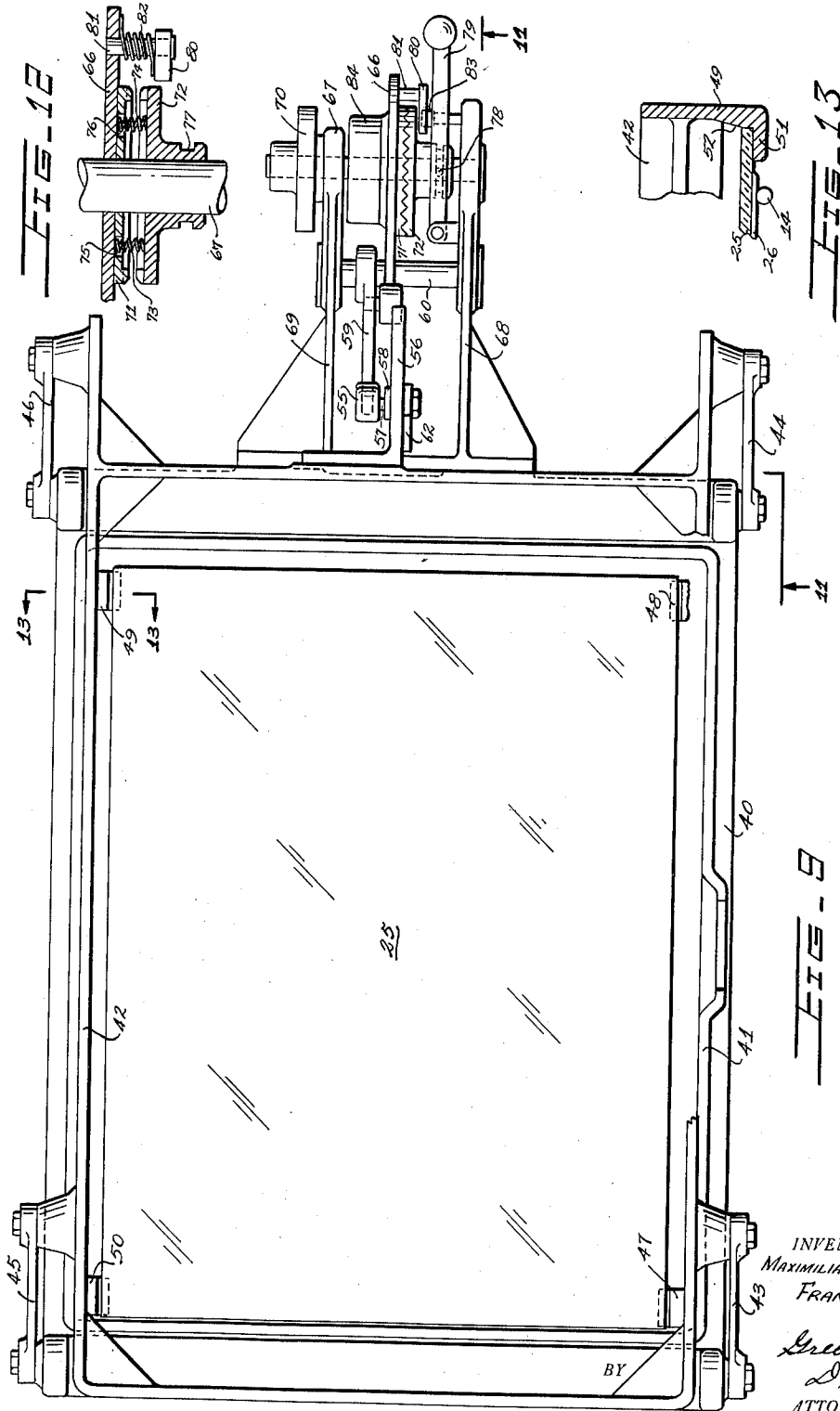
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2,601,307

BEAD COATING MACHINE

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2 Claims. (Cl. 118—425)

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This invention relates to a new process and apparatus for applying coatings to beads.

In processes for the coating of beads with lacquers or other liquid coating materials two serious difficulties become apparent. In the first place it is difficult to support the bead during the coating process or during the necessary drying process without deforming or removing a portion of the coating which is applied. In the second place there is grave danger that the capillary action of the coating liquid will cause the formation of crusts of increased and irregular thickness at areas where the supporting surface and the bead surface meet. In the coating of beads by fish scale essence, the very delicate nature of the microscopic crystals of the essence does not permit the coating by any process which involves friction or pressure. As a result it has heretofore been the practice of manually placing each bead on a toothpick and suspending the toothpicks in such a way that they can be separately coated by dipping or spraying. In any event the process of coating beads as heretofore practiced involves a considerable amount of manual labor.

An object of this invention is to provide a process and apparatus for coating beads with liquid coating materials containing delicate microscopic crystals which considerably reduces the manual labor required.

Another object of the invention is to provide a process and apparatus for suspending beads or small balls so that they can be coated without contacting the undried coated area with any supporting apparatus.

Another object of the invention is to provide a process and apparatus for holding beads or balls so that a portion of the beads not contacting the holding means can be coated.

Another object of the invention is to provide a process and apparatus for holding a number of beads in separated condition so that the beads can be partially dipped in a coating bath in such a way that the coating surrounds and coats only about half of the suspended portion of the bead.

Another object of the invention is to provide a process and apparatus for adhesively holding a plurality of beads at a narrow contacting area for coating a portion of each bead in combination with a process and apparatus for transferring the partially coated beads simultaneously to a second means for adhesively holding them so that another portion of the bead can be coated.

These and other objects ancillary thereto are obtained by first holding a plurality of uncoated beads on an adhesive surface while applying one

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or more coatings to one half of the bead surface. Thereafter drying the half coated beads and then holding the bead on the dried coated surface and separately coating the other half of the beads.

According to the preferred process, an automatic means is provided for counting and separating a number of beads and the beads are transferred from this counting and separating means to an adhesive coated support. One or more coatings are applied to the half of each of the beads which is spaced from the adhesive surface and each of the coatings are dried. The plurality of beads is then transferred to a second adhesive support so that the second adhesive support adhesively secures the beads at the dried surface coating. While so supported the remaining half of each of the beads is coated. Preferably the coatings are applied by dipping the support into a coating solution so that each of the beads is submerged half way into the solution. The same number of coating and drying operations are applied to both halves of the beads.

The novel features characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawing in which:

Figure 1 is a perspective view of an adhesively coated supporting plate.

Figure 2 is a perspective view of a counting means.

Figure 3 is a cross sectional view of the counting means of Figure 2.

Figure 4 is a perspective view illustrating how the counting plate of Figures 2 and 3 is employed.

Figure 5 is a perspective view of a transfer apparatus.

Figure 6 is a view illustrating how the transfer of the beads is effected.

Figure 7 is a cross sectional view of the transfer means when the beads are being transferred from the counting plate to the adhesive supporting plate.

Figure 8 is a cross sectional view of the transfer means when the beads are being transferred from one adhesive plate to another adhesive plate.

Figure 9 is a top plan view partly broken away, of a dipping apparatus.

Figure 10 is a cross sectional view of the dipping apparatus of Figure 9 with the supporting plate containing the beads in the apparatus.

Figure 11 is a cross sectional view of the operating mechanism for dipping the beads taken on line 11—11 of Figure 9.

Figure 12 is a detail view showing the clutch mechanism of Figure 9 in its non engaging position.

Figure 13 is a detail view taken on line 13—13 of Fig. 9 showing how the plate containing the beads is supported in the dipping apparatus.

In order to coat beads according to the present invention one preferably employs some kind of a bead separating device such as shown in Figures 2 and 3. This counting board of Figures 2 and 3 comprises a top plate or sieve 10 having a plurality of equally spaced orifices 11 therein. Underneath the frame 10 is a solid bottom plate 13 and the bottom plate 13 is separated from the sieve or top plate 10 by the frame 12. A plurality of separate sieves or top plate 10 is provided for each size bead to be coated and preferably the orifices 11 in the top plate 10 are slightly larger than the size of the largest circumference of the bead. Preferably also the bottom plate 13 is separated from the top plate or sieve 10 by an amount about equal to half of the diameter of the bead. In order to obtain a plurality of accurately separated beads the counting board is dipped into the tray 15 holding plurality of beads 14. A plurality of beads fall into the orifices 11 and all excess beads are allowed to roll off of the board by tipping the same.

Beads are then transferred to the adhesive support or carrier by the device illustrated in Figure 5. The device shown comprises a base 20, a rubber cushion 21 and a plurality of guides 22, 23 and 24 into which the counting board and adhesive supporting or carrier device 25, 26 is adapted to fit. The plate 25 which may be made of glass having an adhesive coating 26 within the borders thereof is then placed over the counting means 10 with the adhesive 26 next to the beads. Pressure is applied to the top surface of plate 25 as by a roller 28 to force the beads against the adhesive 26. As the adhesive any of the known pressure sensitive adhesives can be employed such as the vinyl acetate polymer, or the polymers of the alkyl acrylates such as methyl acrylate, or ethyl acrylate, or the polyvinyl acetals, for example, polyvinyl butyral.

It is often desirable to interpose a relatively thick plastic gel layer between the glass and the adhesive. The gel layer can be made adhesive enough to hold an adhesively coated tape such as the adhesively coated transparent cellophane tapes several types of which are available commercially. The plastic gel layer is preferably at least $\frac{1}{16}$ inch in thickness and may be formed from any sticky gelatinous material. A mixture of gel-treacle, glycerine, phenol and a little sugar forms a very satisfactory gel which remains tacky and rubbery for several months. Tacky rubbers or synthetic rubbers may also be employed. By adding this inner layer between the glass plate and the layer of adhesive for the beads, it is possible to press the beads into the adhesive and gel layer so that if one or more beads are slightly smaller in diameter than the rest of the beads, they will still come into contact with the adhesive layer of the glass plate.

After the beads 14 have been adhesively secured to the plate 25, by means of adhesive 26 the plate 25 is removed and lower portion of the beads which are suspended from the plate

25 and adhesive 26 are coated as by dipping in the apparatus to be described below. The half coated beads carried by the plate 25 is then twirled around so that the beads are on the top side and placed in the transfer means as shown in Figure 8. A second glass plate 25' having an adhesive layer 26' which is a stronger adhesive for the coated surface 29 of the bead 14 than the adhesive 26 is for the uncoated bead 14. Where glass beads are being coated the same adhesives can be employed on both sheets 25 and 25' as the coated area 29 of the bead 14 has a stronger adherence to ordinary adhesives than the glass surface of the bead. In other cases the same adhesive bases can be employed with different plasticizer or solvent content.

After transferring the beads 14 to the second plate 25' the other halves of the beads are coated by the same process used to coat the first halves.

The machine for dipping the beads is disclosed in Figures 9-13. The machine comprises a base 40 adapted to support a bath 41 and a movable frame 42 connected to the base 40 by two pair of links 43, 44, 45 and 46. The frame 42 contains four under-slung, inwardly projecting brackets 47, 48, 49, 50 one adjacent each corner thereof to support the plate 25 below the level of the frame. Preferably the lower side of the brackets slope inwardly as shown at 52 so that the plate 25 is supported below the general level of the frame 42, permitting the beads 14 on the plate 25 to dip into the solution contained in the bath 41 without immersing the whole frame 42.

A plate 25 which is placed on the bracket supports 47, 48, 49 and 50 of the frame 42 is automatically and uniformly dipped by the mechanism shown in the right hand side of Figure 9 and in Figures 10-12. The four links 43-46 keep the frame parallel with the level of the bath 41 at all times and the frame is held away from the bath by the cam follower 55 which is rotatably supported on the angle bracket 56 (attached to the right hand end of frame 42 as seen in Figure 9) by the shaft 57 and bearing means 58. The cam follower 55 is associated with the cam 59 which is pivotally supported on the shaft 60. The upper surface 61 of the cam 59 determines the vertical position of the follower 55 and therefore the frame 42 at all times. The shaft 57 and bearing means 58 is connected to the angle bracket 56 by means of a second bracket 62 which is adjustably mounted in the slot 63 of the bracket 56. The amount of dip permitted by a given angular movement of the cam 59 can be decreased by moving the bracket 62 which is adjustably mounted in the slot 63 of the bracket 56. The amount of dip permitted by a given angular movement of the cam 59 can be decreased by moving the bracket 62 upwardly along the slot 63 as will be clear from a comparison of the two positions of the cam 59 shown in full and dotted lines, respectively, in Figure 11.

The lower portion of cam 59 rotatably supports a second cam follower roller 65 which bears against the cam surface of the rotating cam 66. Rotation of the cam 66 imparts the oscillatory motion to the cam 59 which in turn moves the frame 42 up and down so as to cause the beads 14 on the plate 25 to dip into the bath 41. The shaft 60 pivotally supporting the cam 59 and the shaft 67 which rotatably supports the cam 66 (and other structure associated with cam 66 described below) are preferably both held in suitable bearings on the same frame structure 68, 69 which frame structure is secured to the base 40

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of the device. Driving means such as the pulley 70 is provided for continuously rotating the shaft 67 and clutch means are provided for driving the cam 66 which is free to rotate on shaft 67, exactly one revolution at a time. The cam 66 has a gear 71 attached thereto and this gear 71 is adapted to mesh with gear 72 but ordinarily the gear 72 is pushed away from gear 71 by springs 73, 74 held in the orifices 75, 76 of the gear 71. Gear 72 is slidable on shaft 67 but is keyed to the said shaft so that it rotates therewith. This gear 72 contains an annular depression 77 which is adapted to retain the pintle 78 of the clutch lever 79. When the gear 72 is pressed against the gear 71 by the clutch lever 79 it is held against gear 72 by the mechanism best shown in Figure 11. The cam 66 is then moved in the direction of the arrow in Figure 11. The cam contains a clamping member 80 pivotally mounted at 81 which snaps down due to the action of the spring 82 into the position shown in dotted lines in Figure 11 when the cam 66 begins to rotate with the shaft 67. As the cam 66 completes one revolution the inside end of the clamping means 80 comes into contact with the roller 83 held on the stationary bracket 68 and is forced away from the clamping position permitting the gear 72 to move away from the gear 71. The cam 66 also has the flat surface roller 84 attached thereto so that breaking means can be applied to prevent further movement of the cam 66 by inertia.

The surface of the cam 66 which bears against the cam follower 65 is so designed as to quickly lower the frame 42 to a position which immerses the lower portion of the beads 14 in the bath, to then permit the said lower portion of the beads to remain in the bath for a predetermined time and finally to quickly remove the beads from the bath.

Operation of the process

Briefly the process and apparatus operates as follows: The bead counter 10 is dipped into the bead tray 15 and tilted so that a bead rolls into each orifice 11 and all excess beads roll off. The counter 10 is then inserted into the frame of the transfer device of Figure 5 and the adhesively coated sheet 25 of Figure 1 is placed over the counter plate 10 with the adhesive coating 26 down. Pressure is applied to the top surface of plate 25 to cause the beads to adhere to the plate. The plate containing the beads is then placed in the dipping apparatus of Figure 9 with the beads suspended as shown in Figure 10. The clutch lever 79 is pushed to force the gear 72 against the gear 71, automatically causing the beads 14 to dip into the solution in bath 41 to the proper depth and permitting the beads to dwell in the solution of the bath 41 a uniform length of time. The plate 25 is then removed from the dipping device and the coating is dried. The plate 25 can be redipped any number of times to obtain the required thickness of coating or may be placed on other dipping apparatus having slightly different coating material (for example a colored coating).

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When a sufficient number of coatings have been applied and dried the plate 25 is again placed in a bead transfer device and the beads are transferred to a second adhesive plate 25' containing an adhesive 26' which has a stronger adhesiveness for the coated beads than the adhesive 26 has for the uncoated beads. The dipping process is then repeated so as to coat the uncoated half of the beads 14.

The process is especially applicable to the coating of beads with lacquers containing fish scale essence since the submicroscopic guanine crystals are easily chipped and the luster of the crystals is destroyed by any frictional contact or pressure. The invention thus provides a method of coating beads in such a way as to avoid frictional contact between the individual crystals of the coating composition and also to avoid any pressure on the crystal particles.

I claim:

1. An apparatus for dip-coating a predetermined portion of a series of articles suspended from a planar surface comprising a base portion having sides forming an enclosure adapted to contain a coating bath, a frame of substantially the same size as the enclosure formed by the sides of said base, two pair of parallel links connecting two opposite sides of said frame to two corresponding opposite sides of said base so that the frame is movable with respect to but is retained parallel to said bath from a position above said base to a position adjacent the surface of the liquid in said coating bath, and a plurality of projecting portions on the lower side of said frame adapted to retain an article-holding plate, in combination with at least one article-holding plate, said article-holding plate having one flat surface thereof coated with an adhesive material adapted to retain the articles to be coated thereon.

2. The device of claim 1 comprising in addition, cam follower means on said frame, cooperating cam means movably mounted to said base for movement in a vertical plane, the entire support for said frame with respect to said base consisting of said parallel links and the contact between the cam follower and the cooperating cam means whereby the position of said frame with respect to said base is determined by said cam elements.

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