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MACHINE FOR COATING IGNITER LIDS

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BY

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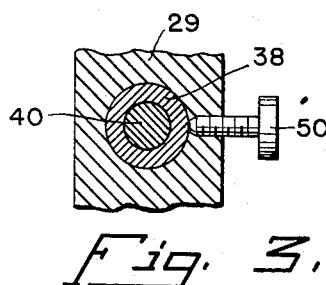
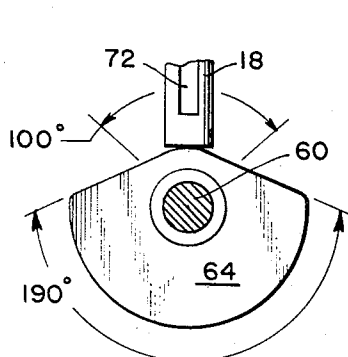
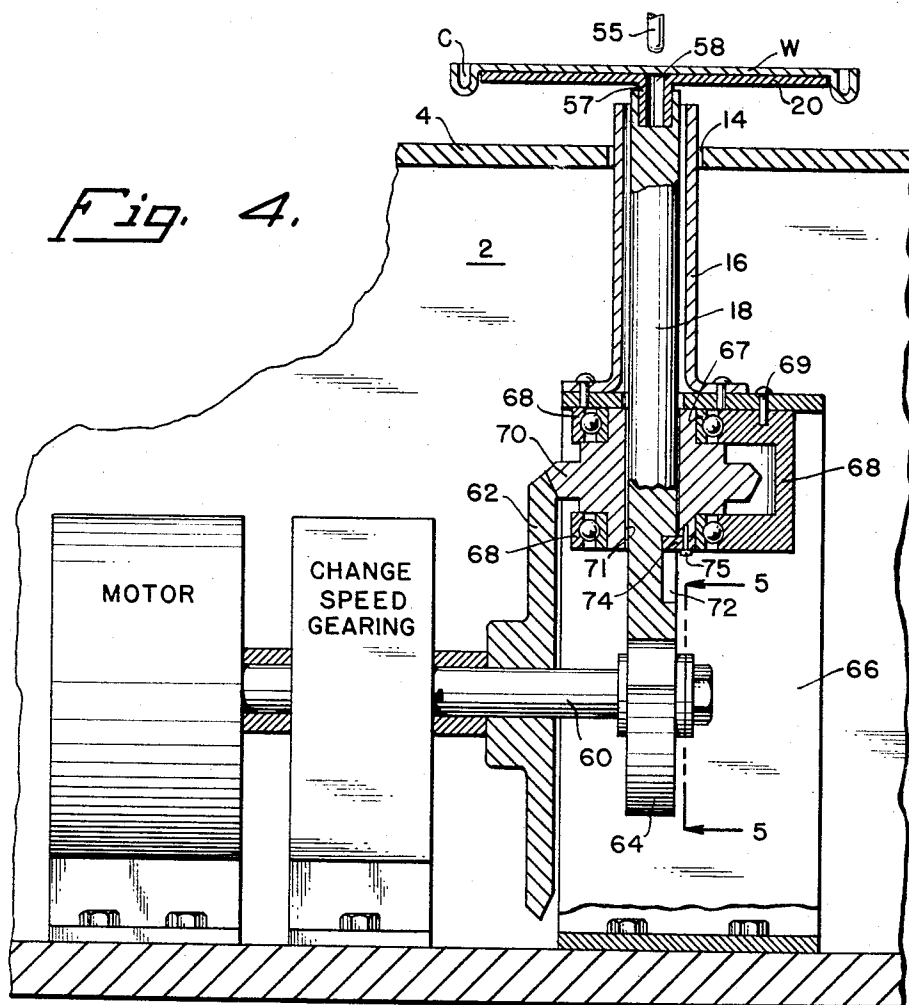
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MACHINE FOR COATING IGNITER LIDS

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MACHINE FOR COATING IGNITER LIDS

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to devices for applying a coating to container lids, and more particularly to apparatus for applying an annular coating of liquid, such as glue, on a face of such lids. Even more specifically, the novel apparatus relates to an improved device for applying a coating in an annular channel disposed in a face of a lid of the type used to seal explosive igniter containers.

It is a common expedient in the container art to coat either an annular portion adjacent the periphery of a container lid, or the entire lid. Apparatus for performing this function has generally been of two types, each subject to disadvantages, and both types generally involves a rotary table to support the work, the table sometimes being mounted so that it may be periodically raised to a position in which it is coated by glue dispensed under pressure from a valve mechanism. One type of coating device utilizes work operated valve arrangements operated by raising the rotating work into contact with a valve operator. In such devices the valve operator is in the form of a pin, extending through the valve outlet and such valves are subject to plugging by virtue of the thickness and viscosity of the materials used and are also disadvantageous in that the valve operator either mars the work or streaks the coating. Alternately, complex linkages and cam arrangements have been utilized to operate the valves in a timed relationship with the operation of the work support, with the obvious disadvantages of expensiveness and difficulty of design, and with the further disadvantage that, in many such devices, the glue dispensing cycle is not dependent upon the presence of the work so that glue may be dispensed when no work is in position to receive it, causing fouling of the apparatus.

The present invention overcomes the disadvantages of the prior art devices discussed hereinabove. By a novel arrangement of valve operating means, the present invention makes it possible to have a coating machine having a work operated valve in which the valve actuation is not effected by a pin extending through the valve, which does not depend on any complex timing linkage, which is adjustable for different size work, and which is so arranged that the dispensing valve will not operate unless a piece of work is in position on the work support.

It is, therefore, an object of this invention to provide apparatus for applying a coating on the face of a workpiece, such apparatus having work operated valve means not subject to plugging and which cannot mar the coating or the work.

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It is a further object of the invention to provide improved means for applying a coating in an annular pattern on the face of a workpiece, said means including work operated valve means in which the operator does not extend through the valve outlet, thus obviating damage to the coating as it is formed.

It is a still further object of this invention to provide novel coating means for applying a coating in an annular channel disposed in a face of a workpiece, said means including a dispensing valve having an internally operated valve which is operated by a portion of the work remote from the part to be coated whereby the coating is not disturbed by a valve operator.

Still another object of this invention is to provide a coating machine of the class described which is easily adjustable for the coating of workpieces of different sizes and having channels of different depths.

Still another object of this invention is to provide a coating apparatus in which the coating applying means is rendered inoperative by the absence of a workpiece from the work supporting means thereof.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a fragmentary perspective view of the coating apparatus which is the subject of the present invention, illustrating the relationship of the work support, the adjustably positioned coating material dispensing valve, and the work operated valve operating means;

Fig. 2 is a fragmentary sectional view taken along the line 2—2 of Fig. 1 and illustrating the means for adjusting the height of the nozzle member above the work support;

Fig. 3 is a fragmentary sectional view taken along the line 3—3 of Fig. 1 showing the set screw means for adjusting the radial and angular position of the nozzle member relative to the work support;

Fig. 4 is a somewhat schematic showing of a type of mechanical movement adapted to impart continuous rotary and intermittent raising and lowering motions to the work support of the present invention, showing also in section the details of the work support shown in Fig. 1; and

Fig. 5 is a fragmentary side elevation taken in the direction of the arrows 5—5 of Fig. 4 and illustrating the outline of a cam adapted to perform the intermittent elevation and lowering of the work support in the mechanical movement of Fig. 4.

Referring now to the drawings in which like reference numerals have been applied to like parts throughout, the present invention comprises a casing 2 which serves to house the motivating mechanism of the apparatus (see Fig. 4) and which has a top wall 4. Top wall 4 is provided with means to support a coating supply container 6, the specific mounting means not being critical. Supply container 6 is provided with an inlet passage 8 adapted to be connected to a source of pressure gas and with an outlet or spout 10 adapted to be connected to flexible hose means 12 to conduct coating liquid under pressure to a point of use to be later described. The specific internal details of supply container 6 are not shown since for the purposes of this invention it is only necessary that flexible hose 12 serve as a source of coating material under pressure and many old and well-known devices are adapted to provide such a source.

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The top wall 4 of the casing has an opening 14 therein through which a hollow guide conduit 16 (suitably fixedly supported within casing 2) extends and through which a shaft 18 which serves to raise and lower the work supporting means 20 is operative, as best seen in Fig. 4.

Means, in the form of a standard 22 (see Fig. 1) is provided for the adjustable support of a valved coating nozzle 28 and of mechanism for operating the valve. Standard 22 comprises a base portion 24, a vertical section 25 and an elevated arm portion 26 extended in a direction opposite that of the base. Arm portion 26 is provided at the end nearest the base end with an upwardly and outwardly curved portion 29 having a column 30 at the end thereof, said column having a passage therethrough for supporting a flexible casing means 32 for a purpose to be later described. At the outer extremity of the arm 26 is an elongated vertical piece 34 having a guide hole passing vertically therethrough. Standard 22 is provided also with a pivot bearing 36 extending upwardly between arms 29 and 36. The standard 22 is attached to casing top 4 in any suitable manner, as by threaded studs, for example, in a position such that the guide hole in the vertical arm 34 overlies the center of the hole 14 and hence the center of shaft 18.

A cylindrical member 38 is slidably and rotatably retained in bearing means provided by a suitable bore in vertical arm 25 of the standard. Member 38 is hollow and a headed pin 40 of a length to pass completely through member 38 and to extend beyond said member slightly, the extending end being screw threaded as shown at 42. Nozzle member 28 is controlled by an inwardly opening spring pressed valve, and the details thereof are not of the essence of this invention, such valves being old and well known in the art. It is necessary for the practice of this invention only that the nozzle have a side inlet as at 44 for admitting the coating material and that the operator for the valve thereof be operated from a point remote from the outlet, as shown in Fig. 1. The outer body of nozzle 28 is suitably attached to a thin supporting and adjusting stake 46, as by an integral block 45. A cap screw 48, of a size to accommodate threads 42 of pin 40 is provided with opposed openings adjacent its closed end, said openings being of a size to slidably and rotatably receive the stake 46. As best shown in Fig. 2, the stake 46 may be inserted in the openings in cap screw 48. The pin 40 may then be screwed into the cap screw 48 to lock the stake 46 and attached valved nozzle 28 into position. It should be noted that the arrangement just described serves as a means for varying the vertical position of the nozzle as well as its angle about the center of the stake as an axis since stake 46 may be secured in any chosen longitudinal and angular position by the pin 38. Further adjustment means for the valve position is provided by set screw 50 extending through a screw threaded hole in a transverse wall of the arm 25 into contact with the exterior surface of cylindrical member 38 as best shown in Fig. 3 whereby upon loosening of said screw 50 the member 38 may be rotated and longitudinally adjusted to any desired position. Thus, the position and angular disposition of nozzle 28 is adjustable in any direction.

The valve means of nozzle 28 is controlled by novel work operated linkage means comprising a flexible casing 32 attached at one end to the column 30 as previously described and to the valve casing at its other end. A flexible control cable 52 extends through casing 32 and extends beyond its ends. At the valve end said cable 52 is attached to the valve operator and at its other, free end it is attached to a securing post 53 attached to the end of a lever 54. Lever 54 is mounted for pivoted motion in the pivot bearing 36, the pivot point being between the ends of the lever, as shown and one end of said lever having a securing means 53, previously described. A work contacting valve operating member 55 is positioned for sliding movement in the guide hole in the vertical arm 34 and said member 55 is provided with

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a slot which accommodates the free end of lever 54, as shown at 56 in Fig. 1.

From the foregoing, it should therefore be apparent that with the supply receptacle 6, containing liquid material under pressure, if a workpiece W is elevated to contact the member 55 to raise said member, the pivotal movement of lever 54 will cause the cable 52 to be pulled downwardly to open the valve in nozzle 28 to allow the liquid material to be dispensed or sprayed upon the work. Also, the foregoing description fully describes means whereby the position of the nozzle may be varied for handling different size work. In conjunction with the handling of different sizes of work, the work supporting member or table 20 is removable from the shaft 18 and may be replaced by other table members of other appropriate outer diameters for cooperation with appropriate size workpieces. Work table elements 20 are provided with hollow extensions 57 which fit a corresponding cavity in the end of shaft 18 as shown in Fig. 4.

A function of primary importance as a related improvement over the prior art is presented in the aforementioned hollow construction of the extension 57 of table 20. This hollow construction results in a pocket 58 into which valve actuator 55 will be received if the table 20 should be raised with no workpiece W thereon thus precluding opening of the valve 28 in the absence of a workpiece.

In combination with the work supporting and valve actuating means previously described the present invention includes means whereby a work piece which is being continually rotated is elevated from a relatively low loading position to a raised position in which it contacts valve operating shaft 55 to allow liquid under pressure to be sprayed on the workpiece, said workpiece being rotated a full turn or more while in the elevated position and then lowered for removal and replacement. With such a combination selection of a work table 20 of appropriate size and adjustment of the position of nozzle 28 to the proper angle, height and distance from the shaft center will result in a semi-automatic deposit of a thickness of an annular coating of glue or other coating material on a flat workpiece, or if the workpiece is of the type having a channel C as in the drawings, the glue or other coating material may be deposited in said channel as shown.

The details of the mechanical means for rotating, elevating and lowering the work table 20 are not of the essence of this invention. Many such devices are known in the filling and packaging arts and in various other mechanical usages. For the purposes of this invention any such device may be used. However, for purposes of illustration and clarification a schematic showing of one such mechanism is included as best shown in Fig. 4. In the illustrative example of Fig. 4, a motor and change speed gearing appropriately bolted to the base of casing 2, as shown, drive the shaft 60 at a desired low rate of speed. Attached to the shaft 60 for rotation therewith are the bevel gear 62 and the cam 64, the latter being positioned at the free end of the shaft 60.

A support means 66 in the form of a metallic strap member is bolted to the casing floor and extends upwardly as shown to support the guide 16 and bevel gear 70. Gear 70 is supported from the upper surface of strap 66 by roller bearing means 67, 68, as shown, inner ball bearing races 67 being attached to axial extensions of the gear above and below the gear and matching outer races being formed as part of a cylindrical member 68 of U-shaped cross-section (to clear the teeth of the gear). Bearing member 68 has a portion cut-away to permit mating of the gears 62 and 70, and is attached to strap 66 by screws 69, as shown. Gear 70 is positioned to be turned by gear 62 and is of a size to make a chosen plurality of turns for each turn of gear 62 (two turns in the illustrated example) and the distance of cam 64 from gear 62 along drive shaft 60 is such as to place the cam 64 beneath the center of the gear 70.

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Bevel gear 70 has a central bore of a size to permit free longitudinal movement of shaft 18 therethrough, the shaft when thus positioned resting upon cam 64 to be elevated and lowered thereby. In order to cause rotation of shaft 18, and intermittent elevation and lowering thereof the shaft is provided with a slot 72 extending longitudinally in the periphery thereof, and the bevel gear 70 is provided with a pin 74 extending inwardly into the bore 71 of the gear to be engaged in the slot 72. With this arrangement, pin 74, by engaging the side walls of slot 72 is effective to cause shaft 18 to rotate continuously with gear 70 as it is driven by the motor means through gear 62. Simultaneously, shaft 18 is permitted to move vertically by virtue of the fact that slot 72 permits such movement relative to pin 74, in response to rotation of the cam 64. Pin 74 may be attached to bevel gear 70 in any appropriate manner, as for example, by screw means 75, as illustrated.

The sizes of gears 62 and 70 are so chosen that gear 70 (and the work W supported on work support 20) make two revolutions to each revolution of shaft 60 with its attached gear 62 and cam 64. The contour of cam 64 as shown in Fig. 5 provides slightly more than 180° dwell in the elevated position and, in view of the gear ratio, this represents slightly more than a complete revolution of the workpiece. Thus, for each revolution of the shaft 60 the work is continuously rotated twice and (for the exemplary cam contour of Fig. 5) this cycle provides 200° of dwell in the lowered position (for removal and replacement of workpieces) about 140° of rotation while being raised and while being lowered, and slightly more than a full turn or about 380° in the raised position during which valve operator 55 is raised by the workpiece W to cause valved nozzle 28 to open to discharge glue in an annular pattern in the channel C of the workpiece.

Apparatus as described may be operated continuously, by regulation to low speed operation and by continuous removal and replacement of workpieces; it being noteworthy that if the operator neglects to position a workpiece no glue will be dispensed, since valve operator 55 will be received in the pocket 58 and not lifted to cause dispensing. Alternatively, the apparatus may be provided with known conventional means to control motor operation to operate through one or more cycles at each operation of a starting switch.

From the foregoing it should be clear that the present invention presents new and improved coating apparatus wherein work operated valve means of improved non-plugging characteristics are provided and in which the valve means do not contact and mar the coating as it is applied to the work. Moreover, this invention provides simple and effective means of adjustability for varying sizes of work and means for preventing unwarranted discharge of coating material.

While only a single illustrative example of a device according to this invention has been specifically described herein, it is obvious that many variations and modifications thereof are possible within the scope of the teachings of this disclosure. It is therefore to be understood that the scope of the invention is not intended to be limited by the specific illustrative example described but rather by the scope and language of the appended claims.

What is claimed is:

1. Apparatus for applying liquid coating material on a face of a workpiece, the combination of a work support mounted for vertical movement and having a horizontal top surface, means for raising and lowering said work support, a normally closed valved liquid applying nozzle, means supporting said nozzle above said work support in a position to discharge a stream of liquid on a workpiece positioned on said work support, said means supporting said nozzle being adjustable to vary the horizontal distance of said nozzle from the center of said work support and to vary the angularity of said nozzle relative to said work support and its height above said work sup-

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port, a source of liquid under pressure connected to said valved nozzle, valve operating means positioned remotely from the valved nozzle in the vertical path of movement of said workpiece on said work support, means operatively connecting said valve operating means to said valved nozzle so that elevation of said workpiece will operate to contact and move said valve operating means to cause said valved nozzle to open to deposit liquid on said workpiece, said work support being provided with a vertical cavity in the said horizontal top surface thereof and said valve operating means being aligned vertically with said cavity so that upon elevation of said work support without a workpiece thereon said valve operating means will enter said cavity and thus not be moved to cause operation of said valved nozzle and unwarranted escape of liquid coating material, said means connecting said valved nozzle and said valve operating means including a link comprising a flexible wire sheathed in a flexible housing so that variations in the relative positions of said valved nozzle and said valve operating means may be absorbed in the degree of flexure of said link, said valve operating means consisting of a shaft mounted for vertical movement in response to contact by a workpiece on said work support, the operative connection to said valved nozzle comprising a lever pivotally mounted between its ends, one end of said lever being attached to said shaft for movement thereby, the other end of said lever being attached to one end of said flexible wire, the opposite end of said flexible wire being connected to said valved nozzle member to control the operation thereof.

2. In apparatus for applying an annular coating of liquid material on a face of a workpiece, the combination of a work support mounted for rotation about a vertical axis and movable in the direction of said axis, said work support consisting of a horizontal top surface centrally mounted on the top end of a vertical shaft, means for continuously rotating said work support while intermittently causing it to be vertically raised and lowered along its axis, said work support vertical shaft being operatively connected to said means for continuously rotating and intermittently raising and lowering the work support for rotation and longitudinal movement thereby, a normally closed valved liquid applying nozzle, means supporting said nozzle above said work support in a position to discharge a stream of liquid on a workpiece positioned on said work support, a source of liquid under pressure connected to said valved nozzle, said means supporting said nozzle being adjustable to vary the horizontal distance of said nozzle from the center of said work support so that the diameter of the annular coating applied on the workpiece may be selectively varied, valve operating means positioned remotely from the valved nozzle in the vertical path of movement of said workpiece on said work support, means operatively connecting said valve operating means to said valved nozzle so that elevation of said workpiece into contact with said valve operating means operates to cause said valved nozzle to open to deposit liquid coating material in an annular path on said workpiece as the latter is rotated by said work support in the elevated position, said means connecting said valved nozzle and said valve operating means including a link comprising a flexible wire sheathed in a flexible housing so that variations in the relative positions of said valved nozzle and said valve operating means may be absorbed in the degree of flexure of said link, said horizontal top surface of said work support having a vertical cavity in the center thereof and said valve operating means being aligned vertically with said cavity so that upon elevation of said work support without a workpiece thereon said valve operating means will enter said cavity and thus not be moved to cause operation of said valved nozzle and unwarranted escape of coating material.

3. Apparatus according to claim 2 wherein said work support comprises an interchangeable table member being removably connected to said vertical shaft, whereby said

table member may be replaced by other table members to cooperate with said adjustable nozzle supporting means in providing adjustability of the apparatus for the handling of workpieces of different sizes.

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