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[54] MECHANISM FOR RIGIDIFYING A COLLAPSIBLE OBJECT

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[52] **U.S. Cl.**.....**156/540,** 156/156, 156/366, 156/238

[51] **Int. Cl.**.....**B32b 31/20,** B32b 31/12

[58] **Field of Search**.....156/156, 230, 234, 238, 285, 156/287, 366, 381, 540–542; 101/9, 10; 137/624.11

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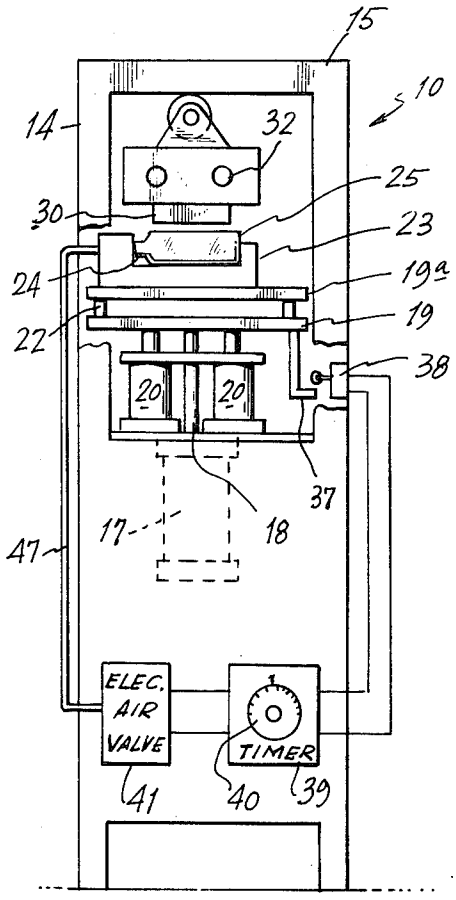
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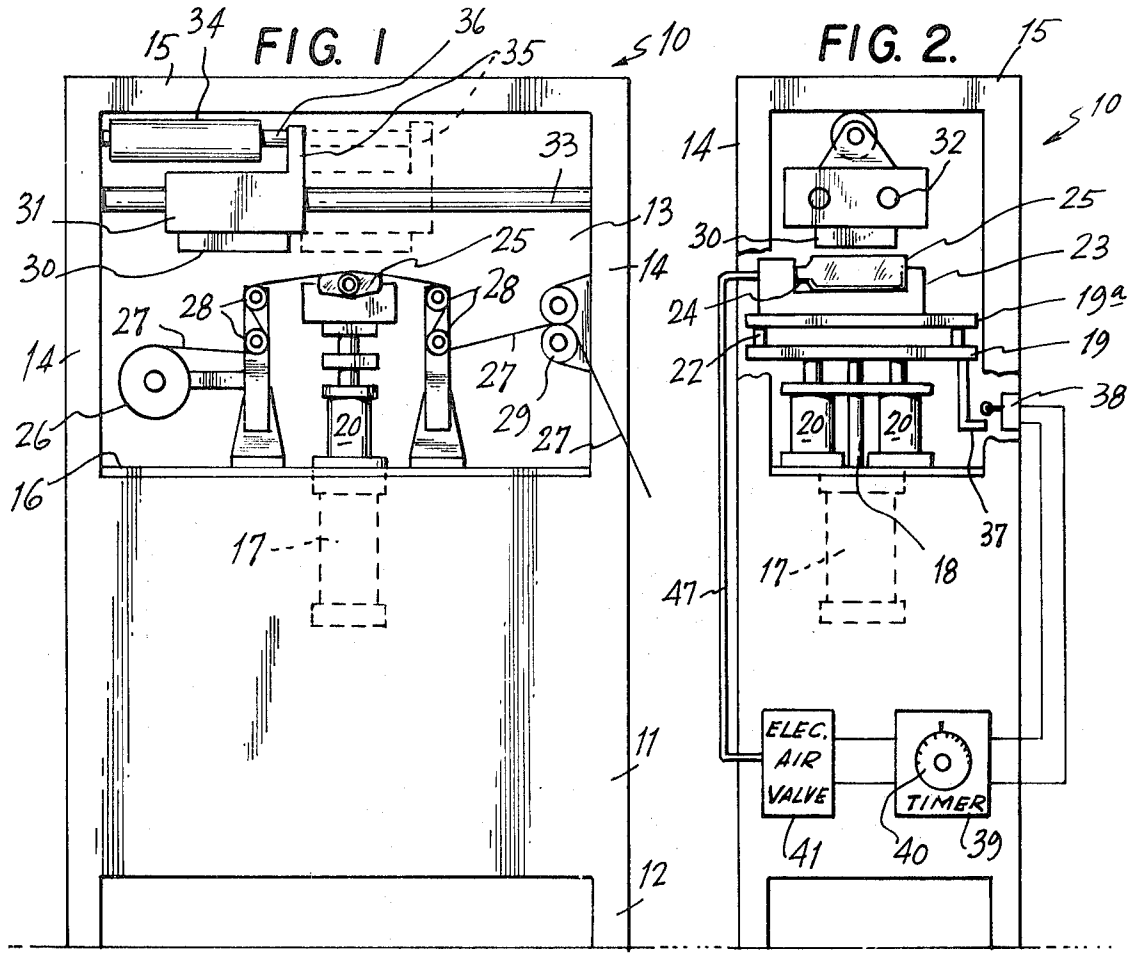
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[57] **ABSTRACT**

A mechanism for rigidifying a collapsible object to be decorated to prevent the object from collapsing as a result of pressure being applied thereto in a hot stamping operation. Air is blown into the object for a period of time and released at the proper time to permit the object to be placed under pressure when a foil is pressed onto its surface.

8 Claims, 3 Drawing Figures





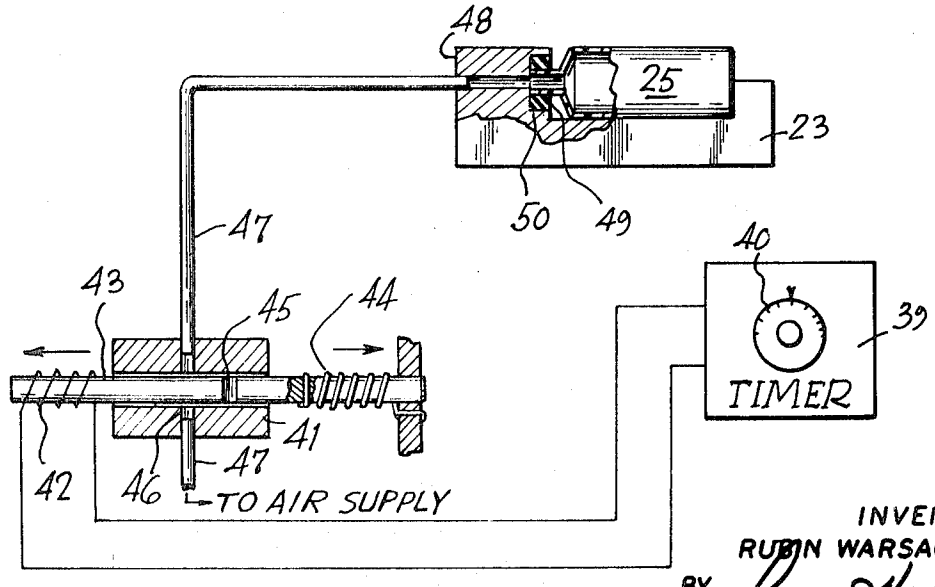


FIG. 3.

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MECHANISM FOR RIGIDIFYING A COLLAPSIBLE OBJECT

This invention relates to the surface decoration of hollow objects such as plastic bottles.

A machine for the surface decoration of hollow objects has been successfully developed and is depicted in my U.S. Pat. No. 3,309,256 entitled "APPARATUS FOR SURFACE DECORATING OF ARTICLES" issued on Mar. 14, 1967. This patent discloses a machine for hot stamping, via heat and pressure, a foil onto the surface of an object to be decorated. To accomplish this, an object is urged, under pressure, against the foil and a heated die. Generally, the object is rotated when it is circular in cross-section and a heated die presses the foil on the object, thereby transferring the decorative foil onto the surface of the object.

When a bottle is used which is non-circular in cross-section, the decorative foil cannot be placed on the surface of the bottle by rotating it. This occurs because it is essential that a uniform pressure be maintained between the die and the bottle and if the bottle is not circular, the higher and lower areas will be subjected to different pressures because the die is fixed.

To decorate a plastic bottle it must be made rigid or the pressure between the bottle and the die will collapse the bottle and this produces an unsatisfactory transfer of foil to the object.

To overcome the aforementioned disadvantage, the plastic bottle is inflated which serves to rigidify the bottle and prevents it from collapsing. There are a number of problems associated with rigidifying a plastic bottle. For example, it is essential that the air supply to the bottle be cut off before the bottle ruptures or is distended beyond its elastic limit and does not return to its original shape. It is also necessary that the air supply not be cut off too soon because the bottle can begin to collapse and the decorative foil will be distorted. Balanced against the latter, if the bottle is filled with air after it moves away from the die, the bottle can rupture because the die no longer acts as a counter balancing force. If the bottle is in contact with the die for too long a period of time then distortion will appear. Thus, it can be seen that timing is of the essence.

By utilizing a timer to control the injection of air into the bottle all of the aforementioned problems can be taken into consideration and eliminated. Thus, the timer signals an air valve which permits air under pressure to be supplied to a bottle. After the bottle is inflated, the timer maintains the air in the bottle at a fixed pressure and then the timer allows the air to be released from the bottle just a fraction of a second before it leaves the die.

It is therefore an object of the invention to provide a mechanism for rigidifying an article to be decorated and maintaining and releasing the rigidifying force at the proper time.

It is another object of the invention to provide a timer in conjunction with a rigidifying means to control the latter.

It is yet another object of the invention to provide a timer in conjunction with an air supply apparatus to control the supply and the shut off of the air.

It is still another object of the invention to provide a sealed system for pressurizing a bottle which is simple to fabricate, inexpensive and reliable in operation.

For a better understanding of the invention, reference may be had to the accompanying drawings in which:

FIG. 1 is a front view of a stamping machine incorporating the invention;

FIG. 2 is a side view thereof showing the details of the air supply actuating mechanism; and

FIG. 3 is a detail view of the components used to control the supply and shut off of the air to a bottle.

For the purpose of illustrating the present invention, a specific type of hot stamping machine is disclosed. It should be understood, however, that the aspects of the present invention are applicable to various types of stamping machine well known to those skilled in the art, and it is not intended to limit the present invention to the specific type of machine illustrated.

Referring now to the drawings, there is illustrated a hot stamping machine generally designated at **10**. The housing **11** for the machine is preferably formed of a heavy guage metal, however, any known material can be used. The machine can be raised off the floor by means of legs **12** or the machine can rest flat on the floor. In either case the machine is firmly anchored to preclude lateral movement of the latter.

The work area **13** is an open area extending from front to rear of the machine and is defined by the side rails **14**, a top rail **15** and a rigid horizontal bed **16**. Securely fastened to the bed **16** is an air cylinder **17** which is supplied by an outside source (not shown) with air under pressure. The air cylinder **17** has a diaphragm therein (not shown) and air can be fed into the cylinder either above or below the diaphragm. Thus, as the diaphragm moves in an upward or downward direction, the shaft **18** moves correspondingly therewith.

The end of the shaft **18** is fixed to a platform **19** which is constrained to move in a vertical direction only corresponding to movement of the shaft **18**. A pair of elevator guides **20** having longitudinal bores therein for the reception of a shaft **21** are provided to supply rigidity and stability to the platforms **19**, **19***a*. The shafts **21** are free to move in their respective bores and are designed to have a close sliding fit. By utilizing these elevator guides, the platform **19** is firmly constrained to vertical movement without any lateral rocking of the platform. The platform **19** can include an upper part **19***a* rigidly held to the lower part **19** by posts **22** or it can be a unitary platform.

Mounted on top of and securely fastened thereto is a housing **23** which can have gears therein. An arm **24** which can be in the form of a mandrel is rotatably secured to the housing **23** whereby the arm is free to rotate or it can be positively driven through a gear arrangement within the housing **23**. The object **25** to be decorated is placed on the mandrel **24** such that it can be either rotated or held stationary thereon.

A reel **26** is rotatably mounted on the housing **10** and a tape **27** is wound on the reel. The tape is preferably Mylar having a foil thereon which is to be transferred in the form of a decorative design to the object **25**. The tape **27** is passed over a plurality of tape guides **28**. Four guides are shown, however, the number used is a matter of choice. The guides **28** are preferably rollers having a low coefficient of friction and having flanged ends to prevent the tape from moving laterally from the roller. The tape **27** is threaded around the left set of guides **28** as illustrated in FIG. **1** and thence between the object **25** and a die **30** where it is subsequently passed over the right set of guides. The tape **27** is then fed between a pair of pull rollers **29**. These rollers have a surface thereon having a relatively high coefficient of friction or any type of known surface which will grip the tape, for example, a knurled surface can be applied to the rollers. The rollers **29** are rotatably mounted on the housing **10** and can be driven by a motor (not shown) or they can be actuated by hand to advance the tape **28** after the foil carried by the tape has been transferred to the object **25**. Thus, by rotating one or both of the rollers **29**, a positive grip is exerted on the tape **27** and it is pulled to the right as shown in FIG. **1** so that a fresh portion of tape having foil thereon is placed between the object **25** and the die **30** for each new object placed on the mandrel **24**.

The die **30** can have a design etched thereon or it can be plain according to the desires of the user and depending upon how he wishes to decorate the object **25**. The die **30** is fixed to a carriage **31** having openings **32** bored therein for the reception of a pair of guide rails **33**. The carriage **31** is freely slidable on the guide rails **33** under the influence of an air cylinder **34** or any other motor means. An arm **35** is fixed at one end thereof to the carriage **31** and at its opposite end to a rod **36**. A piston in the air cylinder **34** is fixed to the rod **36** and under the influence of air pressure the rod **36** is moved to the right as shown in FIG. **5**; thus, the die is moved therewith to contact the tape **27** and the object **25**. The die **30** is preferably heated by electrical means (not shown) and by applying heat and pressure to the tape and the object, the foil on the tape can be transferred to the object.

Fixed to the elevator platform **19** is a finger **37** which can be any convenient configuration and is herein shown as an L-shaped member. When the platform **19** is raised, the finger **37** trips a switch **38** which can be a micro-switch. The micro-switch completes an electrical circuit to a conventional timer **39** having a dial **40** thereon which enables one to set desired time limits. The timer **39** is electrically connected to a solenoid air valve **41**. The air valve includes a coil **42** which when energized attracts an armature **43**. Fixed to one end of the armature **43** is a coil spring **44** which serves to return the armature to its rest position after it has been actuated and the field current is removed from the coil **42**. The armature **43** is effectively a sliding valve having a passageway **45** bored therethrough. Another passageway **46** is bored through the block of the air valve **41** and air lines **47** are fixed to opposed ends of the passageway **46**. When the armature coil **42** is energized by passing current therethrough, the armature is moved to the left as shown in FIG. **3** and the passageway **45** in the armature **43** aligns with the passageway **46** in the block **41**. This permits air to flow through the air supply lines to a passageway **48** bored through the bottle support block **23**. The block **23** can be formed to any convenient shape which will firmly cradle the bottle **25** therein. The block **23** has a seal **49** which can be rubber or neoprene pressed into a counterbore **50** at one end thereof. The inner diameter of the seal **49** is dimensioned to receive the neck of the bottle **25** firmly so as to prevent air from leaking out of the bottle **25**. The air flows into the bottle through the passageway **48** and through the opening in the seal **49**.

In actual operation, the operator presses an "on-off" switch (not shown) which actuates a pump to supply air to the air cylinder **17** thereby raising the platform **19**. The finger **37** trips the micro-switch **38** thereby actuating the timer **39**. The timer sends a signal to the solenoid **41** which opens an air valve permitting air under pressure to enter the bottle **25**. The timer has a dial **40** which enables one to preset the amount of time that air can enter the bottle. The bottle is inflated and it contacts the heated die **30** whereby the decorative material on the tape **27** is transferred to the bottle **25**. The timer **40**, at the end of a pre-set time signals the solenoid **41** to release the air by actuating the armature **43**. This signal occurs at approximately one-half a second before the timer **40** signals the air supply to the cylinder **17** to lower the platform **19** and thence the object **25** affixed thereto.

While there has been shown and described a particular embodiment of the present invention, it will be apparent to those skilled in the art that various changes and modifications may be made without departing from the invention in its broader aspects, and it is therefore, contemplated in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In a machine for decorating and inflating a bottle comprising,

a. a first base for supporting said machine,

b. a frame on said base defining an open work area,

c. a die mounted in said work area,

d. a platform mounted in said base for movement between proximate and distal positions with respect to said die,

e. means for selectively moving said platform between said proximate and distal positions,

f. said platform having a second base thereon having an air receiving opening therein and means to receive a bottle thereon whereby the neck of the bottle is contiguous with said opening,

g. a tape having decorative material removably secured thereto extending between said die and the bottle on said platform whereby the tape is impressed against the bottle and the die when the platform is in the proximate position with respect to the die,

h. an air line interconnecting an air supply to the air receiving opening in said second base,

i. selectively operable valve means in said air line for opening and closing said air line to selectively permit air to flow from said supply to said second base to inflate a bottle thereon,

j. an adjustable timer for selectively operating said valve means upon actuation of the timer to open said valve means for a selected predetermined period of time, which period of time after actuation of the timer, is independent of the position of said platform, thereby to pressurize said bottle for said predetermined period of time, and

k. means, responsive to movement of the platform, for actuating the timer.

2. The machine for decorating and inflating a bottle as defined in claim **1** wherein said predetermined period of time extends from the actuation of said timer to immediately prior to the movement of said platform from said proximate position to said distal position, whereby air pressure within said bottle is relieved prior to the release of the balancing pressure applied to the bottle by the die in said proximate position.

3. The machine for decorating and inflating a bottle as defined in claim **1** in which the means responsive to movement of the platform comprises a finger on the platform and a switch in the path of movement of said finger.

4. The machine for decorating and inflating a bottle as defined in claim **1** in which the valve means comprises a block having a first passageway bored therethrough and an armature having a second aperture bored therethrough reciprocally mounted in said block and electrical means adapted to reciprocate said armature such that in one position of the armature the first and second passageways are in alignment and in another position said passageways are not aligned.

5. The machine for decorating and inflating a bottle as defined in claim **4** in which said air line is attached to said first passageway at opposite ends thereof.

6. The machine for decorating and inflating a bottle as defined in claim **1** further comprising sealing means on said second base to seal the neck of the bottle thereon and to prevent the escape of air therefrom.

7. The method of rigidifying a bottle for decoration in a machine having a die and a platform mounted for movement between proximate and distal positions with respect to the die and having a base thereon having an air receiving opening and means to receive a bottle thereon whereby the neck of the bottle is contiguous to said opening, and a tape having decorative material removably secured thereto and extending between the die and the bottle on the platform, whereby the tape is impressed against the bottle and the die when the platform is in the proximate position with respect to the die, said method comprising the steps of

a. presetting a time interval into a timer

b. moving said platform to said proximate position with respect to said die,

c. actuating said timer as said platform approaches said proximate position,

d. opening an air valve upon actuation of said timer,

e. supplying air through said valve to said base opening and the bottle to inflate the bottle whereby the bottle is held rigidly against the die in the proximate position of said platform, and

f. releasing the air from said bottle after expiration of the preselected time interval in the timer independently of the position of the platform.

8. The method as defined in claim **7** wherein said step of presetting a time interval into the timer comprises the step of setting a time interval having a duration which will end prior to the movement of the platform from said proximate position to said distal position whereby the air in the bottle is released therefrom prior to movement of the bottle away from said die.

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