United States Patent

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[54] APPARATUS FOR FORMING AND STACKING CONTAINER LIDS

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[52] **U.S. Cl.** ..... **425/289,** 18/19 BC, 425/388, 425/416, 425/422

[51] **Int. Cl.** **B29c 17/00**

[58] **Field of Search** ..... 18/19 F, 19 BC, 19 R

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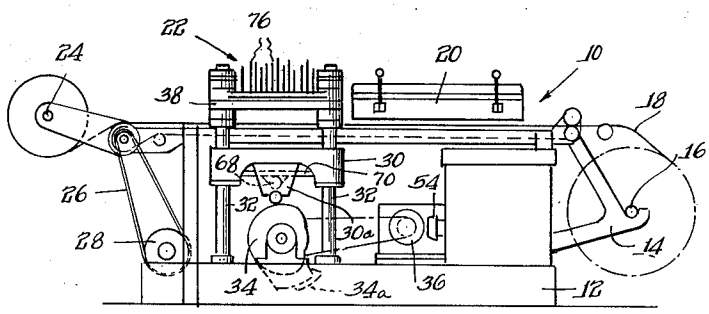
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[57] **ABSTRACT**

The present invention relates generally to improvements in apparatus for forming relatively shallow container lids and the like and more particularly to apparatus for (i.e., production of such lids from heated plastic sheet material. The present application discloses apparatus for feeding a web of heated plastic sheet material to a forming station. The forming station comprises a mold cavity positioned above the heated sheet material, and a plunger means beneath the sheet material. Relative movement between the mold cavity and plunger means causes a shallow container lid or the like to be formed and sheared from the sheet stock. Means superimposing the plunger means is provided for successively receiving completely formed lids and positioning them in stacked relation.

13 Claims, 6 Drawing Figures



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2 Sheets-Sheet 1

Fig. 1.

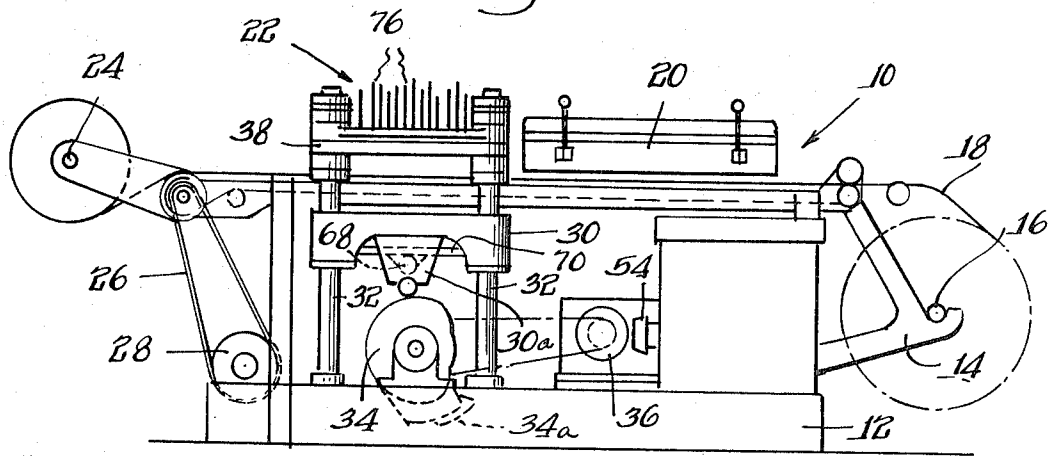


Fig. 2.

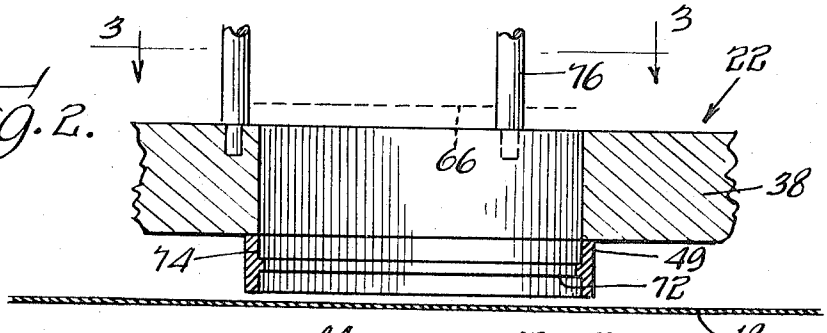
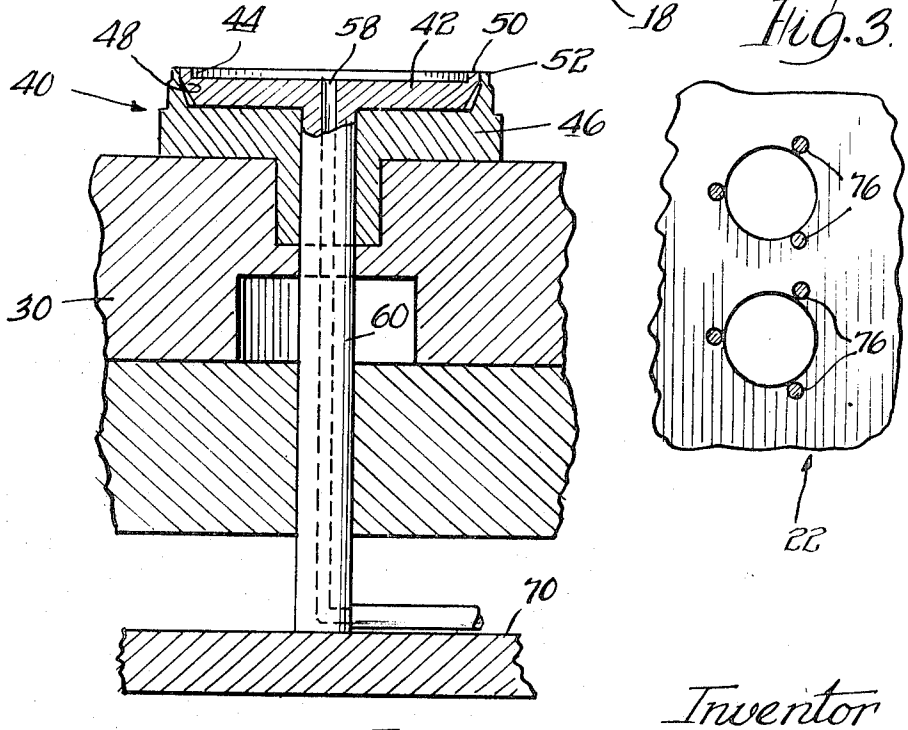


Fig. 3.



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2 Sheets-Sheet 2

Fig. 4.

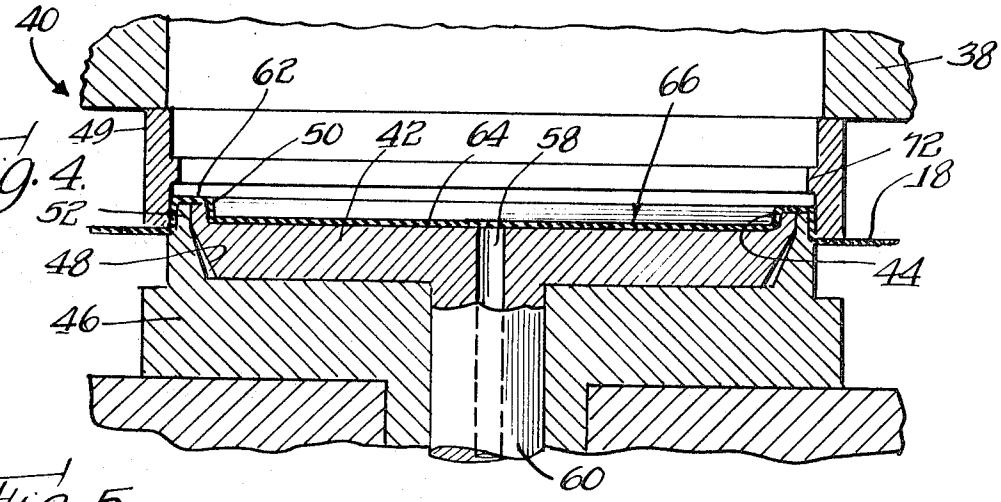


Fig. 5.

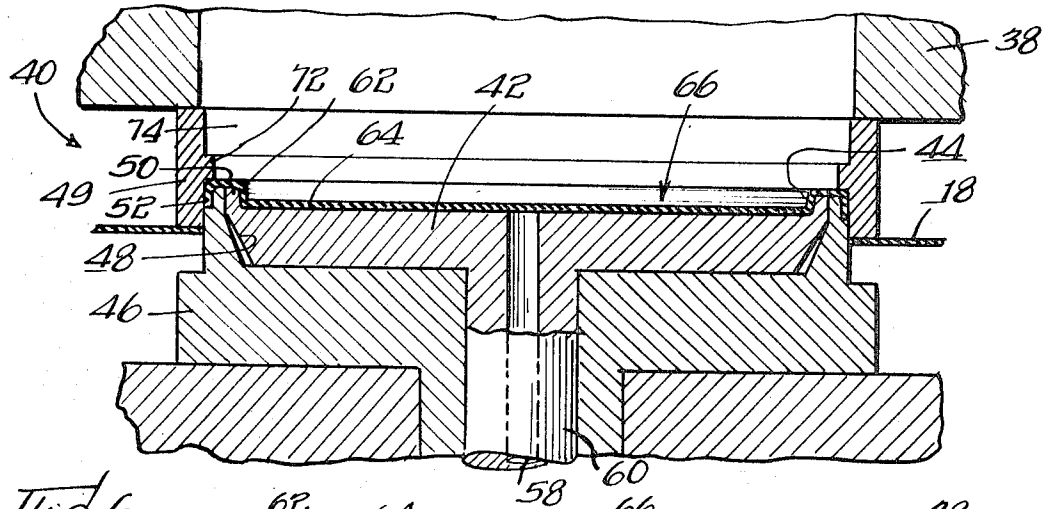
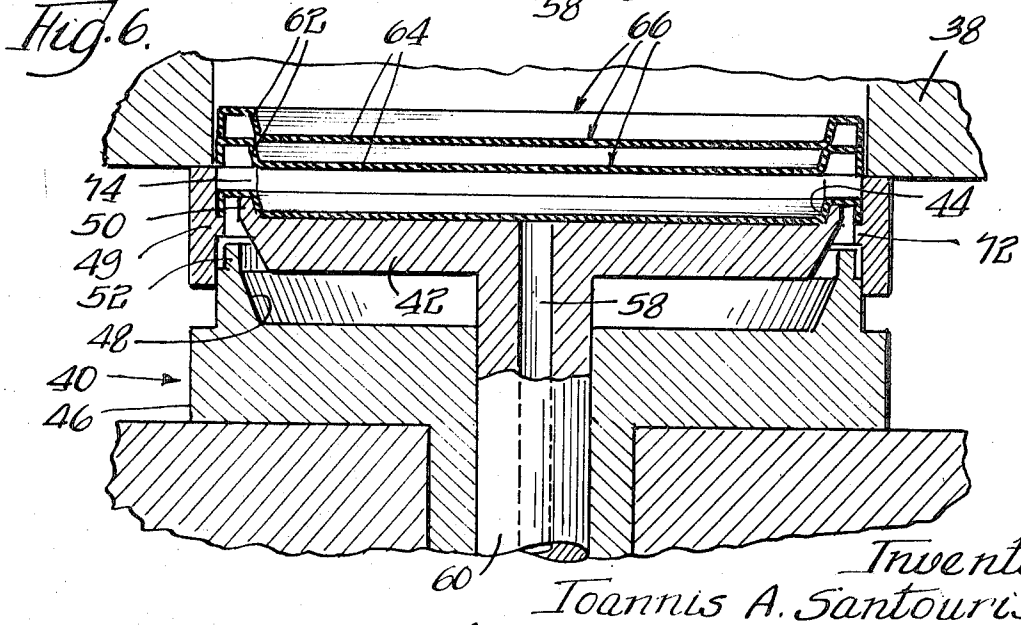


Fig. 6.



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APPARATUS FOR FORMING AND STACKING CONTAINER LIDS

SUMMARY OF THE INVENTION

It is an important object of the present invention to provide novel and practical apparatus whereby methods may be practiced to produce relatively shallow container lids and the like from a web of heated plastic sheet material and to position such container lids in stacked relation.

More specifically, the present invention contemplates a very simple and unique arrangement whereby relatively shallow container lids may be formed and thereafter successively advanced to form a vertical stack.

Still more specifically, the present invention contemplates a novel and highly efficient plunger mechanism for practicing the above-mentioned method.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects and advantages will be more apparent from the following detailed description when considered in connection with the accompanying drawing wherein:

FIG. 1 is a side elevational view of a machine equipped with the novel shallow container lid forming mechanism of the type contemplated by the present invention;

FIG. 2 is an enlarged fragmentary vertical sectional view taken centrally of one of the mold cavities and complementary plunger mechanisms, said plunger mechanism being shown in its lowermost position, before moving upwardly into association with a heated sheet of plastic material;

FIG. 3 is a fragmentary plan view of the upper portion of the lid forming structure, more clearly to illustrate the arrangement of the lid receiving and stacking rods;

FIG. 4 is a view similar to FIG. 2 showing the plunger mechanism moved upwardly into initial engagement with the heated sheet of plastic material within the mold cavity;

FIG. 5 is a view similar to FIG. 4, disclosing the manner in which continued forward or upward movement of the plunger mechanism severs a completed lid from the plastic sheet material prior to the advancement of the completed lid into the stacking station; and,

FIG. 6 is a view similar to FIGS. 4 and 5 disclosing the manner in which the central section of the novel plunger mechanism successively forces completed lids upwardly into the stacking station.

DESCRIPTION OF AN EMBODIMENT OF THE INVENTION

Referring now to the drawings more in detail wherein like numerals have been employed to designate similar parts throughout the various figures it will be seen that one embodiment of a machine or apparatus of the type contemplated by the present invention is designated generally by the numeral **10**. For a clear understanding of the present invention, a detailed description of the apparatus **10** is not deemed necessary. It will suffice therefore to point out that the apparatus **10** includes a base **12**, the right extremity of which supports a bracket **14** for accommodating a shaft or mandrel **16**. The shaft **16** carries a roll of suitable sheet thermoplastic material **18**. A web of the sheet material **18** is moved to the left (FIG. 1) through a suitable electric heating unit **20**. From the heating unit, or station **20**, the sheet **18** is fed into a lid forming and stacking mechanism or station **22**. From the station **22** the sheet material is directed to a take-up shaft **24**. The take-up shaft **24** may be intermittently rotated through the agency of a drive belt **26** driven from an electric motor **28**.

The forming and stacking mechanism **22**, includes a platen **30** mounted on vertically reciprocable guide posts **32**. Vertical reciprocation is imparted to the bed **30** by means of a rotatable cam member **34** which engages a depending section **30***a* of the platen **30**. The cam **34** is driven from a suitable electric motor **36**. The upper portion of the mechanism **22** includes a stationary platen or frame **38**. The plastic web moves intermittently from right to left as viewed in FIG. 1. During each dwell of the web the platen **30** moves upwardly through the agency of the cam **34**, thereby simultaneously moving a plurality of adjacently positioned plunger mechanisms **40**, FIG. 2, toward the underside of the plastic web **18**. The web **18** which had been previously heat treated at the station **20** is now in a softened or plastic condition.

The plunger mechanism **40** consists of an inner plunger or ejector member **42** provided with a shallow recess **44** and companion plunger member **46** secured to the upper side of the platen **30**. When the plunger member **42** occupies the position shown in FIG. 2, it is seated within a recess on the upper side of the plunger member **46**. Hence, as the platen **30** moves upwardly from the position shown in FIG. 2, the combined plunger members **42** and **46** moved upwardly as a unit.

The underside of the plastic web **18** is initially engaged by upwardly projecting annular plunger sections or ribs **50** and **52** of the plungers **42** and **46** respectively, FIG. 4. At this period in the cycle of operation the space beneath the web **18** is evacuated through the agency of a suitable pump **54**, FIG. 1, which communicates with a shallow recess **56** the upper extremity of the plunger **42** through a central passageway **58** extending longitudinally within a depending section **60** of the plunger member **42**. This evacuation causes the plastic sheet to be formed as shown in FIG. 4. The combined annular sections or ribs **50**, and **52**, cause the plastic sheet to be formed into an annular bead **62**. The bead **62** encompasses a flat central disc-like portion **64**. The bead **62** and the portion **64** combine to form a shallow recessed lid designated generally by the numeral **66**.

As the combined plunger members **44** and **46** continue their upward movement, the plunger member **46** cooperating with an annular die member **49** causes the bead **62** to be sheared from the web **18**, FIG. 5. The plunger member **46** has now reached the limit of its upward stroke and the plunger **42** continues further upward travel to the position shown in FIG. 6. This upward movement of the plunger **42** relative to the plunger member **46** results from the engagement of a cam section **34***a*, with a member **68** connected with a vertically shiftable plate **70**, FIGS. 1 and 2. This plate **70** simultaneously engages the lower extremities of each of the depending sections **60** of the plunger members **42**. During this movement the outer margin of the bead **62** is sprung past an annular abutment or shoulder **72** positioned along the inner periphery of the annular die member **49**. This annular die member **49** is secured in any suitable manner to the underside of the fixed platen **38** and presents a female mold cavity **74** for successively receiving completely formed lids **66**. These lids are ultimately shifted upwardly in stacked relation above the platen **38**. Rods **76** projecting upwardly from and supported by the platen **38** serve as guides for the lids **66** as they are moved upwardly successively in stacked relation.

As previously mentioned the platen **30** carries a plurality of adjacently positioned plunger mechanisms **40**, each of which comprise a pair of the plunger members **42** and **46**. Likewise the upper platen carries a plurality of adjacently positioned die members **49** each of which is disposed in alignment with a complementary plunger mechanism **40**. Similarly the platen **38** supports a plurality of groups of guide rods **76**, each group being complementary to one of the annular die members **49**.

From the foregoing it will be apparent that the present invention contemplates a very unique and practical method whereby relatively shallow container lids may be formed from a web of plastic material and contemporaneously arranged in stacked relation to facilitate subsequent ease of handling. When the lids have been stacked to a predetermined height within each group of three guide rods they may be removed in mass by simply lifting them out of association with the rods. Applicants novel plunger mechanism and associated annular die cavity are of relative simple and practical construction. The structurally novel plunger mechanism comprised of the plunger member **46**, and the plunger member **42** which is shiftable as a unit with, and also relative to the plunger

member 46 makes it possible to successively form, shear and contemporaneously shift completely formed lids into stacked relation.

I claim:

1. Apparatus for forming and stacking relatively shallow container lids and the like from heated plastic sheet material comprising means for supporting a sheet of such material in plastic condition, a female mold cavity means positioned immediately above a supported sheet, plunger means disposed on the underside of a supported sheet in alignment with said female mold cavity, said mold cavity and the upper portions of said plunger means cooperatively defining a relatively shallow container lid, means for shearing a completely formed lid from said plastic sheet stock, and means superimposing said mold cavity means for successively receiving completely formed lids as an incident to the upward movement of said plunger means and positioning them in stacked relation.

2. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 1, wherein the upper portion of the plunger means is provided with a shallow recess for accommodating sheet material.

3. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 1, wherein means is provided for establishing a pressure differential between the upper extremity of the plunger means and said mold cavity means.

4. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 1, wherein the plunger means is comprised of at least two plunger members, one being relatively shiftable with respect to the other.

5. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 1, wherein the inner margin of the mold cavity means is cooperatively disclosed with respect to the outer margin of said plunger means for shearing a completely formed lid from the sheet material.

6. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 1, wherein the plunger means includes an inner plunger member shiftable within and respect to a second plunger member for ejecting a completed container lid from the mold cavity means.

7. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 1, wherein said plunger means is provided with a passageway connectable with means for establishing pressure differential on opposite sides of a supported sheet whereby to form a relatively shallow recess in said sheet.

8. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 1, wherein the plunger means consists of at least two plunger members, one being longitudinally shiftable within and respect to the other, and having a passageway connectable with means for establishing a pressure differential on opposite sides of a supported sheet.

9. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 1, wherein the plunger means comprises a pair of plunger members, one being shiftable with respect to the other, and also moveable as a unit therewith, said members when combined, presenting an annular bead forming rib for engaging the underside of a supported plastic sheet.

10. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 1, wherein the mold cavity means comprises an annular member having a substantially vertical axis, and shoulder means projecting inwardly from the inner surface of said annular member.

11. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 1, wherein the mold cavity means is stationary an the plunger means is longitudinally shiftable into and out of association with said mold cavity means.

12. Apparatus for forming and stacking relatively shallow container lids and the like from heated plastic sheet material comprising means for supporting a sheet of such material in a substantially horizontal position, a female mold cavity means having a vertically disposed cylindrical opening therethrough, said female mold cavity means fixedly mounted with said cylindrical opening extending vertically upwardly immediately above said sheet supporting means, vertically reciprocable plunger means in vertical alignment with said cylindrical opening, the upper side of said plunger means and the lower portion of said female mold cavity means cooperatively disposed to define a shallow container lid when said plunger means occupies a predetermined vertically disposed position, said plunger means and the lower portion of said female mold cavity means further cooperatively disposed for shearing a formed lid from a heated section of sheet material associated therewith, and means for shifting said plunger vertically upwardly to shift a previously formed lid upwardly into lid stacking position within said cylindrical opening.

13. Apparatus for forming and stacking relatively shallow container lids and the like as set forth in claim 12 wherein an annular projection extends radially inwardly from the wall defining said cylindrical opening above the lid forming cavity adjacent the upper face of said plunger means.

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