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(54) Title: THERMOFORM A TRAY INSITU WITH AN ARTICLE

(57) Abstract: The objective of this invention is to eliminate the stacking of the trays into nests and removing the trays from the nest. Another objective is to eliminate the need for an increase size of the indentations and achieve a more snug fit. These objectives are accomplished by forming the tray insitu with the articles. This insures a snug fit and at the same time allows the articles to be removed from the tray as a unit.

THERMOFROM A TRAY INSITU WITH AN ARTICLE

Field of Invention

This invention relates to placing articles on a tray prior to film wrapping the articles. After the articles are film wrapped the film is heat shrunk.

BACKGROUND OF THE INVENTION

Plastic thermoform trays are used to ship an article or a collection of articles such as bottles , vials and cartons. The tray usually holds 6 to 12 articles. In the prior art the trays are thermoformed in a conventional manner and stacked. After stacking the stacks go into a denester. The trays are removed from the denester one by one and filled with an article or articles. The filling is done by hand or by a robotic machine.

When the trays are stacked they are nested. To facilitate nesting and filling the tray with articles, the indentations in the tray are thermoformed to a size slightly larger than the articles to be used. This larger size provides easy removal of a tray from the nest. Also a chanfer is used to facilitate the loading of the articles into slightly larger size openings.

SUMMARY OF THE INVENTION

The objective of this invention is to eliminate the stacking of the trays into nests and removing the trays from the nest. Another objective is to eliminate the need for an increase size of the indentations and achieve a more snug fit. These objectives are accomplished by forming the tray insitu with the articles. This insures a snug fit and at the same time allows the articles to be removed from the tray. The term article, product bottle are used interchangeably.

Figure 1 shows transferring a sheet of film to a hot plate and than to a mold with indentations where bottles push the sheet into the indentations of the mold.

Figure 2 shows transferring the sheet to revolving heating means and then to a mold

Figure 3 shows forming the lip of the tray using spilt rings.

Figure 4 shows a tray with indentations caused by pushing the sheet into the bottom of the mold

Detailed Description of the Drawings

Figure 1 shows a roll of film 1 and a knife 2 cutting a sheet from the roll. After the film is cut a transfer plate 3 removes the cut sheet 4 and transfers the cut sheet to a hot plate. The transfer plate 3 can have holes drilled in the transfer plate 3. These holes allow a vacuum to be created that holds the cut sheet 4 to the transfer plate. After the hot plate heats the cut sheet 4 to a temperature needed to thermoform the sheet, the transfer plate moves the cut sheet 4 to a mold or die 6. Air can be blown in the holes that provided the vacuum to place the cut sheet on the mold. A frame can be used around the transfer plate to move down to create a ridge 8 around the plastic sheet resulting in a more rigid tray. An alternative to a frame, small punches 9 can be pivoted on hinges to form the ridge 8. The tray is formed when articles 10 such as bottles are pushed down on top of the plastic sheet forcing the plastic sheet conform to the indentations 7 that are in the bottom of the mold. These indentations usually have the same shape as the bottom of the articles. After the articles are pushed into the mold they are pulled up and the tray stays with the product forming a unit. Air 19 can be blown from the bottom of the mold to assist the removal of the tray with the bottles from the mold.

Figures 2-3 show a preferred embodiment for forming the ridge around the plate. The sheet 4 is placed on the mold 6 and sits on top of the mold 6. The sheet is slightly larger than mold causing the sheet to extend beyond the perimeter of the mold. The split ring 20 is mounted on hinges, having an inside dimensions a few tenths of a mm larger than the size of the mold to allow the split ring to be pushed down around the mold and in the process the film will be stretched against the outside of the mold creating a lip. While the split ring secures the film on

the mold the product can be pushed down in the mold. When the split rings open the product is removed from the mold and the tray and product are removed together without any interference from the split ring. The use of a split ring rather than a full ring has the advantage of not requiring that the product and ring to be removed at the same time.

Pushing the bottles or product into the mold and removing the bottles and removing the tray and bottles from the mold can be performed by grippers 11 mounted on a gantry that transfers the bottles from an infeed conveyor 17 to the mold 6. The grippers push the product into the mold and release the product. Afterward the gripper moves back to the in feed conveyor so the process can be repeated. A second set of grippers 20 holds the bottles and pulls the bottles with the tray out of the mold and transfers the tray and bottles to an exit conveyor 18.

A preferred embodiment is to use a rotating platform 12 having four hot plates 13 14 15 16 and one to four transfer plates to move film to a hot plate. The rotating platform speeds up the amount of trays and bottles that can be processed.

Figure 4 shows the indentations 22 caused by pushing the product or article into the mold.

CLAIMS

Claim1 An apparatus for thermoforming a tray in a mold having indentations at the bottom of the mold wherein at least one article pushes a heated sheet into the indentations to thermoform the tray comprising;

means for providing a sheet

means for heating the sheet to a temperature conducive to thermoforming

means for positioning the heated sheet on a mold having at least one predetermined indentation to accommodate the shape of at least one article

means for pushing at least one article into the mold so that the sheet is pressed into the indentation thereby thermoformed the sheet into the shape of the indentation and the bottom of the article.

means for removing the tray and article as a unit from the mold.

Claim 2 An apparatus according to claim 1 including a transfer plate for moving the sheet to a hot plate.

Claim 3. An apparatus according to claim 2 including means for moving the transfer plate to the mold.

Claim 4 An apparatus according to claim 2 including means for applying a vacuum through holes in the transfer plate to hold the sheet to the transfer plate.

Claim 5 An apparatus according to claim 2 including means for providing rigidity to the tray by forming a ridge around the tray.

Claim 6. An apparatus according to claim 3 including means for pushing at least one article into the mold to press the sheet into the indentation in the mold.

Claim 7 An apparatus according to claim 4 including means for blowing air through holes in the heat transfer plate to push the sheet into the mold.

Claim 8 An apparatus according to claim 1 including means for blowing air into the mold to assist the removal of the tray from the mold.

Claim 9. An apparatus according to claim 6 including means for removing at the article and the tray as a unit from the mold.

Claim 10. A process for thermoforming a tray in a mold wherein at least one article pushes a heated sheet into the indentations at the bottom of the mold to form the tray comprising;
providing a sheet
heating the sheet to a temperature conducive to thermoforming
positioning the heated sheet on a mold having at least one predetermined indentation at the bottom of the mold to accommodate the shape of at least one article
pushing at least one article into the mold so that the sheet is pressed into the indentation thereby thermoforming the sheet into the shape of the indentation , and
removing the tray and article as a unit from the mold.

Claim 11. A process according to claim 10 including moving the sheet to hot plate with a transfer plate.

Claim 12. A process according to claim 11 including moving the sheet from the hot plate to the mold.

Claim 13. A process according to claim 12 including means for applying a vacuum through holes in the transfer plate to hold the sheet to the transfer plate.

Claim 14. A process according to claim 10 including forming a ridge around the tray to provide rigidity to the tray.

Claim 15. A process according to claim 10 including pushing at least one article into the mold to press the sheet into the indentation within the mold.

Claim 16. A process according to claim 11 including blowing air through holes in the heat transfer plate to the place the sheet on the mold.

Claim 17 A process according to claim 15 including blowing air into the mold to assist the removal of the tray from the mold.

Claim 18. A process according to claim 17 including removing at least one article and the tray as a unit from the mold.

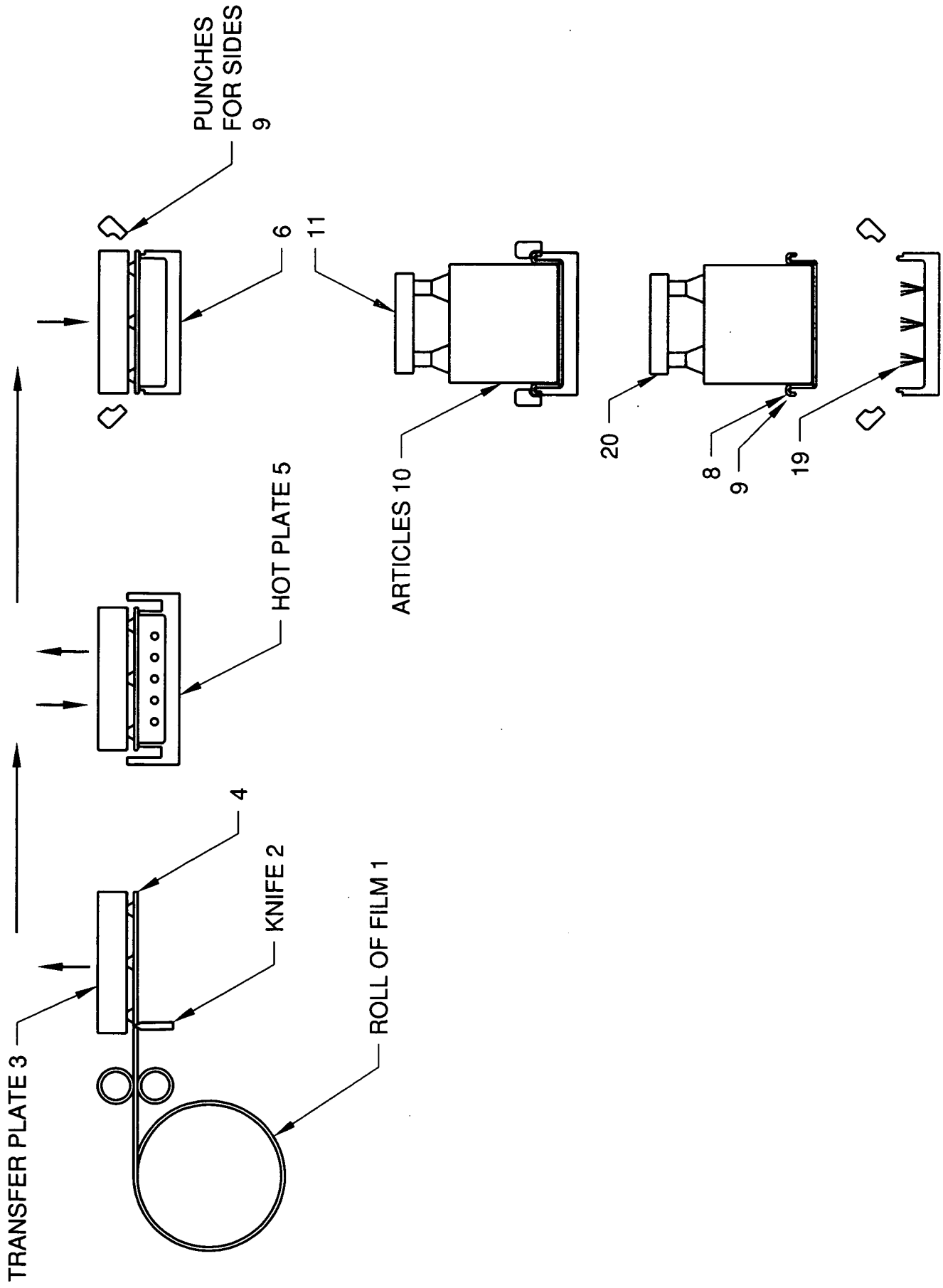
Claim 19. A product produced by the process of claim 10

Claim 20. An article comprising;

a tray having an indentation

an article having the bottom of the article pressed into the indentation of the tray so that the tray and article can be moved as a unit.

FIGURE 1


PUNCHES FOR SIDES 9
6
11
HOT PLATE 5
ARTICLES 10
20
8
9
19
4
KNIFE 2
TRANSFER PLATE 3
ROLL OF FILM 1

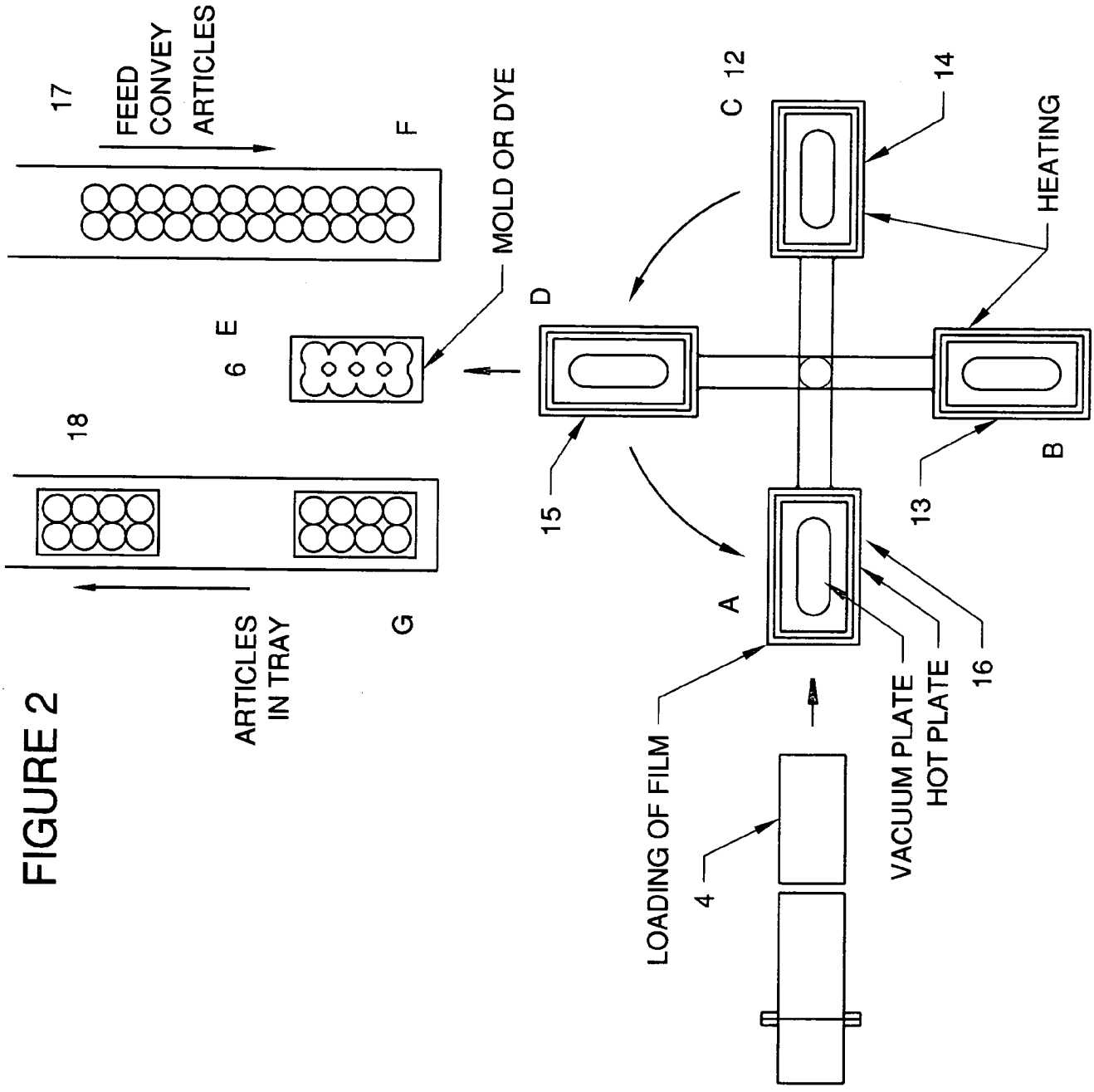

17
FEED
CONVEY
ARTICLES
F
MOLD OR DYE
6 E
18
ARTICLES
IN TRAY
G
D
C 12
14
HEATING
15
13
B
A
LOADING OF FILM
4
VACUUM PLATE
HOT PLATE
16

FIGURE 2

FIGURE 3

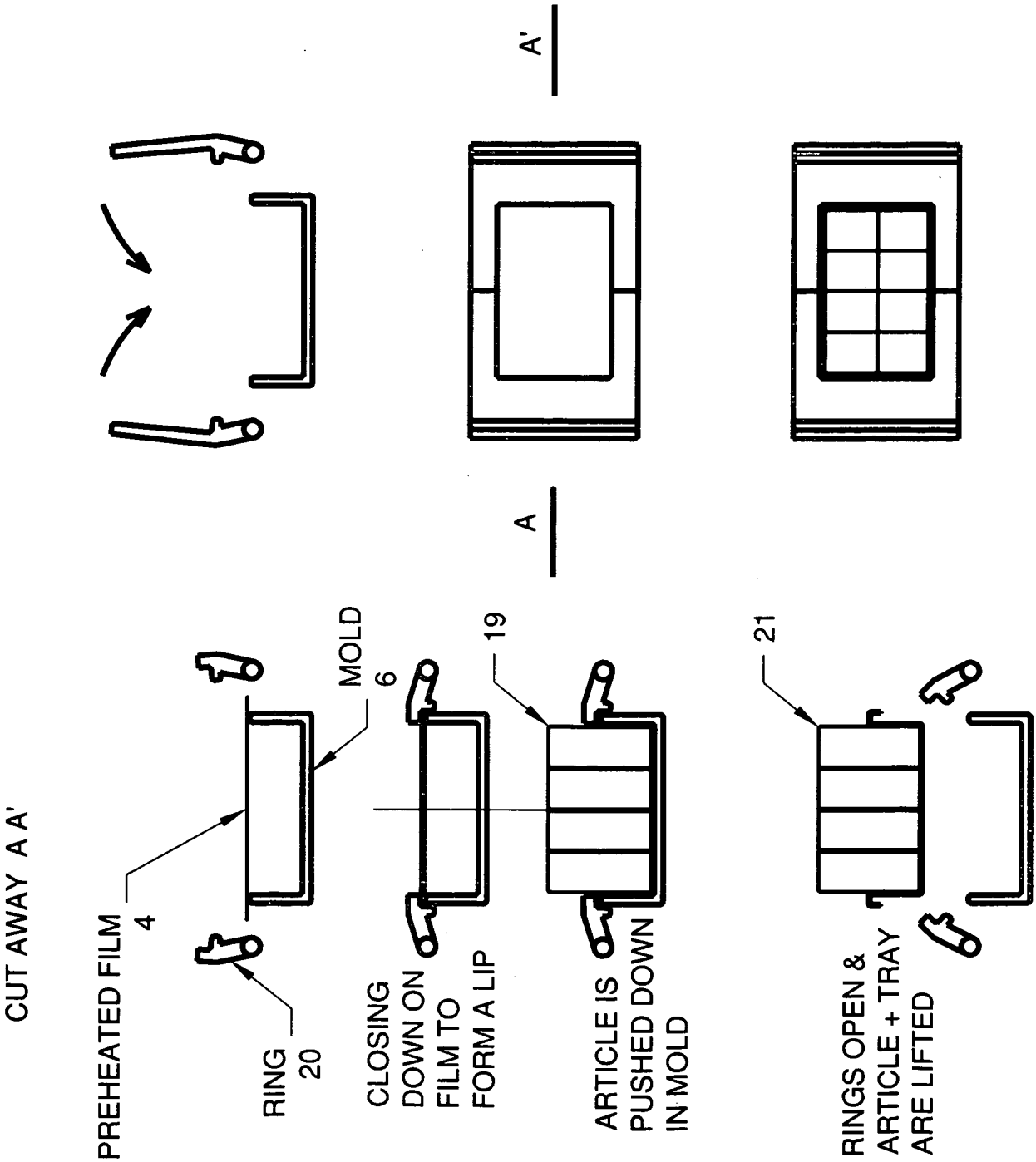
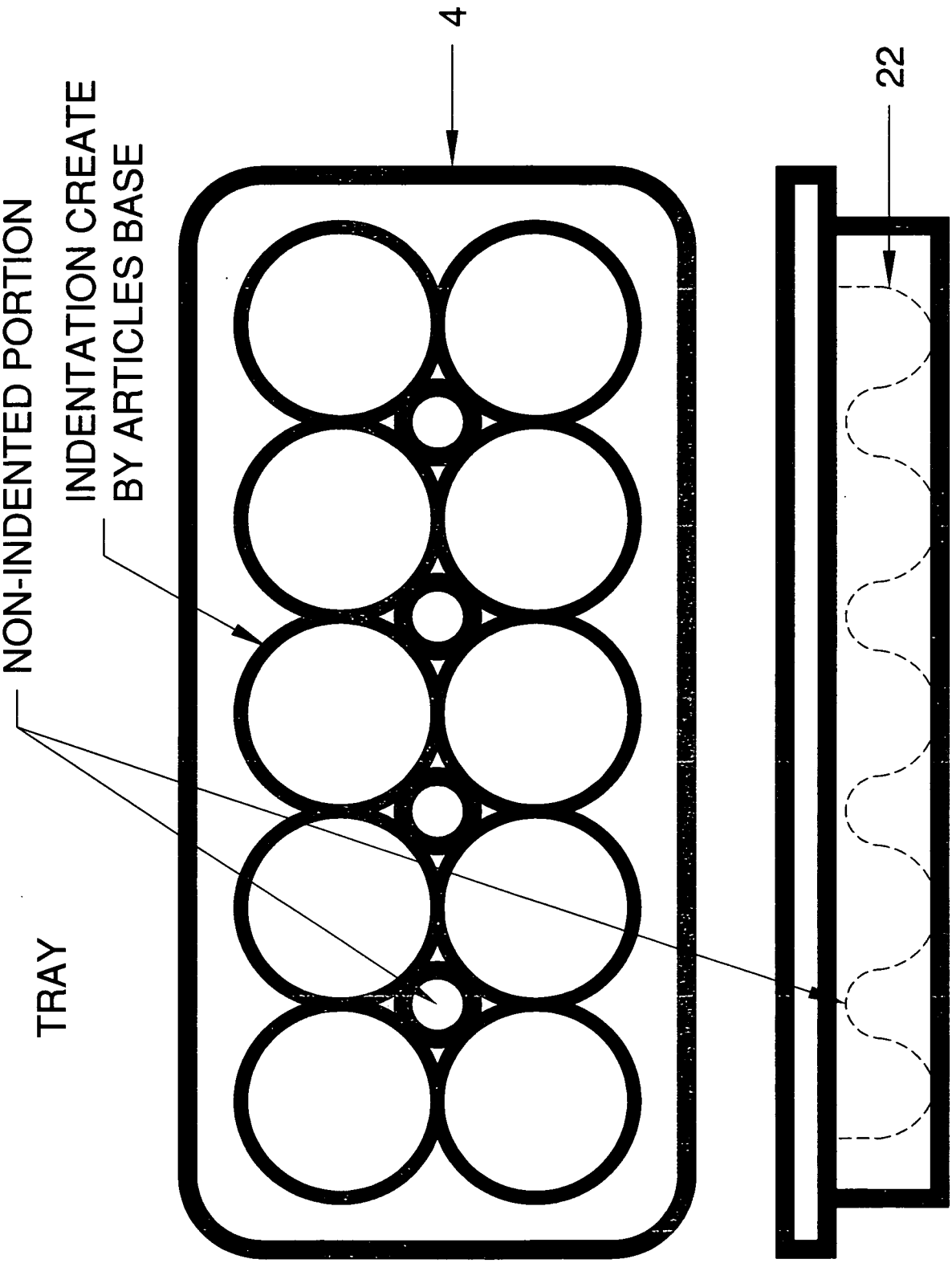

CUT AWAY A A'
PREHEATED FILM
4
RING
20
MOLD
6
CLOSING
DOWN ON
FILM TO
FORM A LIP
19
ARTICLE IS
PUSHED DOWN
IN MOLD
21
RINGS OPEN &
ARTICLE + TRAY
ARE LIFTED
A
A'

FIGURE 4


4
22
NON-INDENTED PORTION
INDENTATION CREATE
BY ARTICLES BASE
TRAY