March 24, 1970 E. L. SMITH 3,502,241

COMPARTMENTED TRAY REINFORCED AGAINST BENDING

Filed March 25, 1968 3 Sheets-Sheet 1

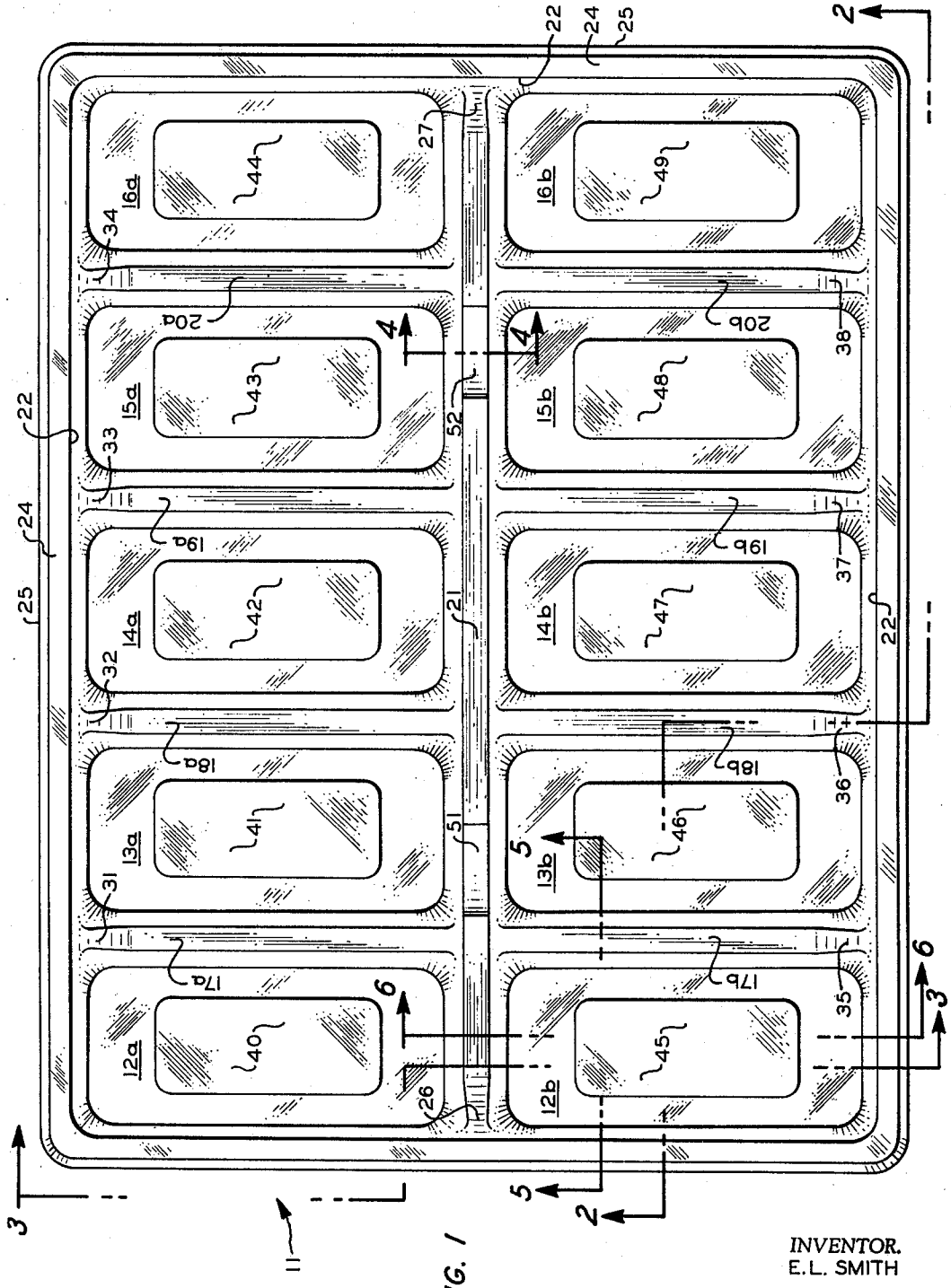

FIG. 1

INVENTOR.
E. L. SMITH

BY Young & Quigg

ATTORNEYS

March 24, 1970 E. L. SMITH 3,502,241

COMPARTMENTED TRAY REINFORCED AGAINST BENDING

Filed March 25, 1968 3 Sheets-Sheet 2

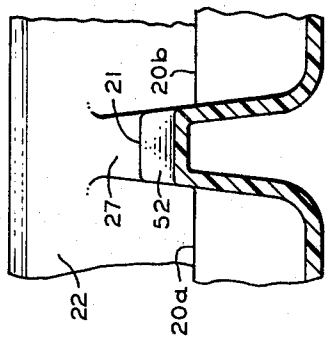

FIG. 4

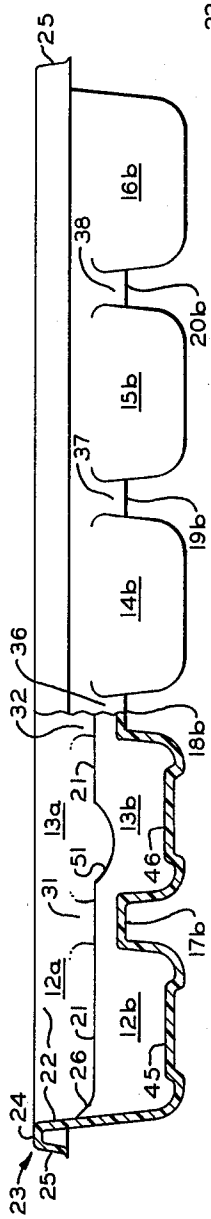

FIG. 2

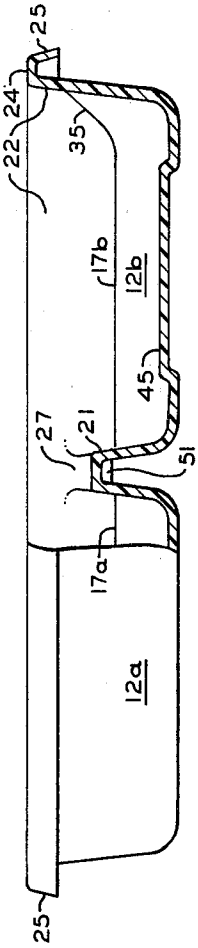

FIG. 3

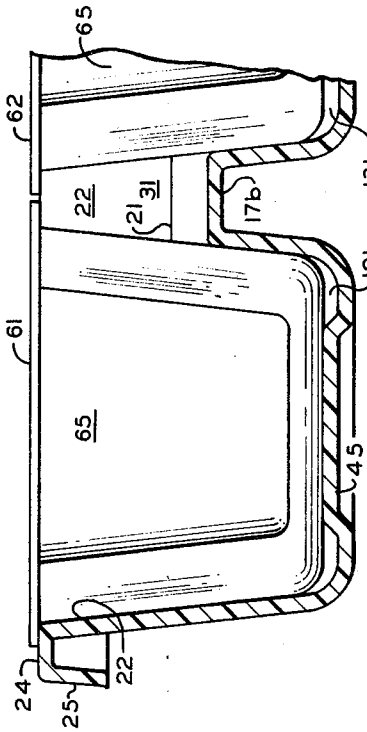

FIG. 5

INVENTOR.
E. L. SMITH

BY Young & Quigg

ATTORNEYS

March 24, 1970 E. L. SMITH 3,502,241

COMPARTMENTED TRAY REINFORCED AGAINST BENDING

Filed March 25, 1968 3 Sheets-Sheet 3

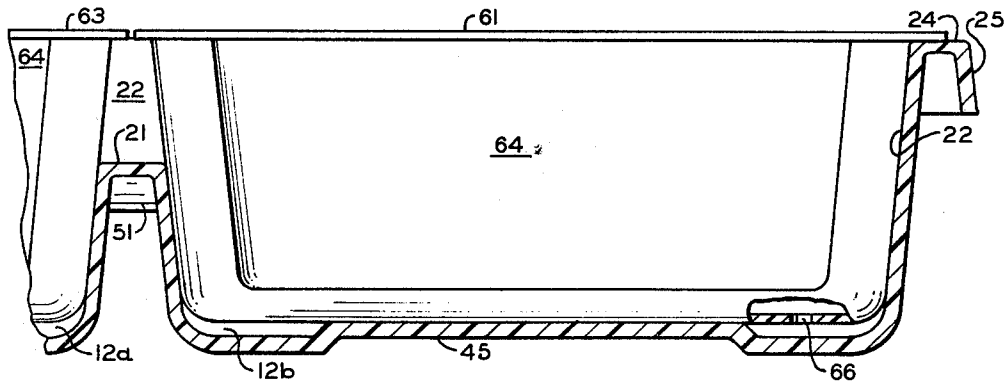

FIG. 6

INVENTOR.
E. L. SMITH

BY Young & Quigg

ATTORNEYS

United States Patent Office 3,502,241
Patented Mar. 24, 1970

3,502,241

COMPARTMENTED TRAY REINFORCED AGAINST BENDING

Ernest L. Smith, Kansas City, Mo., assignor to Phillips Petroleum Company, a corporation of Delaware

Filed Mar. 25, 1968, Ser. No. 715,776
Int. Cl. A01c 11/00; B65d 21/02, 1/34
U.S. Cl. 220—23.6 10 Claims

ABSTRACT OF THE DISCLOSURE

In a thermoformed tray containing rows of compartments, each pair of adjacent rows is joined by an inverted U-shaped reinforcing member and each pair of adjacent compartments within a row is joined by an inverted U-shaped divider member. The peripheral wall of the tray has a height greater than the height of each reinforcing member, which in turn is greater than the height of the divider members. The ends of each reinforcing member and the peripheral ends of the divider members are inclined upwardly from the remainder of the respective members to join the tray peripheral wall. A portion of the bottom wall of each compartment is raised to provide a support surface. Off-center stacking lugs are provided in each reinforcing member.

Thermoformed trays have been proposed for many uses, but in general have been restricted to bearing relatively light loads. This has been particularly true for compartmented trays wherein the compartments are in alignment due to the small resistance to bending along the line of compartment separators. It is an object of the invention to provide a thermoformed tray which can support heavy loads. It is an object of the invention to provide a compartmented thermoform tray with improved resistance to bending. Other objects, aspects, and advantages of the invention will be apparent from a study of the specification, the drawings and the appended claims to the invention.

In the drawings FIGURE 1 is a plan view of a compartmented tray in accordance with one embodiment of the invention; FIGURE 2 is a front elevational view, partly in cross section, taken along line **2—2** in FIGURE 1; FIGURE 3 is a side elevational view, partly in cross section, taken along line **3—3** in FIGURE 1; FIGURE 4 is a partial view in cross section taken along line **4—4** in FIGURE 1; FIGURE 5 is a partial view in cross section taken along line **5—5** in FIGURE 1 with rectangularly shaped seedling pots positioned in the tray compartments; and FIGURE 6 is a partial view in cross section taken along line **6—6** in FIGURE 1 with the rectangularly shaped seedling pots positioned in the tray compartments.

Referring now to the drawings in detail, tray **11** is thermoformed from a sheet of thermoplastic material, for example, a homopolymer or copolymer of at least one mono-1-olefin having up to ten carbon atoms per molecule such as polyethylene, polypropylene, ethylene-butene copolymer, or ethylene-hexene copolymer; polystyrene; poly(vinyl chloride); and the like. Tray **11** has two rows of compartments which are substantially rectangular in horizontal cross section, with compartments **12***a*, **13***a*, **14***a*, **15***a* and **16***a* being the first row and compartments **12***b*, **13***b*, **14***b*, **15***b* and **16***b* being the second row. Each adjacent pair of compartments in a row is separated by a divider member which is substantially inverted U-shaped in cross section. Thus, compartments **12***a* and **13***a* are separated by divider member **17***a*, compartments **13***a* and **14***a* by divider member **18***a*, compartments **14***a* and **15***a* by divider member **19***a*, and compartment **15***a* and **16***a* by divider member **20***a*. Similarly, divider members **17***b*, **18***b*, **19***b* and **20***b* separate adjacent pairs **12***b* and **13***b*, **13***b* and **14***b*, **14***b* and **15***b*, and **15***b* and **16***b*. Divider members **17***a*, **18***a*, **19***a* and **20***a* are colinear with divider members **17***b*, **18***b*, **19***b* and **20***b*, respectively, which separate the corresponding adjacent compartments in the other row. This colinear relationship presents a situation of only nominal resistance against bending along the line of colinear divider members. In the absence of reinforcing features, any significant weight, sometimes even just the weight of the tray, could cause folding. In accordance with the invention, reinforcing member **21**, which joins together the adjacent pair of rows of compartments, has a height greater than the height of the divider members, as illustrated in FIGURES 2 and 3. This provides a reinforcing structure transverse to each set of colinear divider members, thus aiding in strengthening the tray against bending. As illustrated in FIGURES 1 and 2, the reinforcing member **21** extends continuously from one end of tray **11** to the opposite end of tray **11**. Also, in accordance with the invention, the outer ends of divider members **17***a*, **18***a*, **19***a*, **20***a*, **17***b*, **18***b*, **19***b* and **20***b* and the compartment walls which are on the periphery of the tray as well as the ends of reinforcing member **21**, extend upwardly to form an upstanding side wall **22** having a height greater than the height of reinforcing member **21**, and thus also greater then the height of divider members **17***a*–**20***a* and **17***b*–**20***b*. This provides a reinforcing structure transverse to the outer end of each of the divider members, thereby strengthening the tray against bending along the line of colinear divider members. This also provides a reinforcing structure transverse to the ends of reinforcing member **21**, thereby giving resistance to bending along the line of reinforcing member **21**. In accordance with a presently preferred embodiment of the invention, an inverted U-shaped rim **23** is formed in combination with wall **22** by flange **24** extending outwardly from the upper end of wall **22** and flange **25** extending downwardly from the outer end of flange **24**. Rim **23** extends around the entire periphery of wall **22**.

The reinforcing structure of tray **11** is further enhanced by the ends of the reinforcing member **21** and the ends of the divider member which intersect wall **22** being inclined upwardly from the remainder of the respective member. Thus, reinforcing member **21** is provided with inclined end portions **26** and **27**, and divider members **17***a*, **18***a*, **19***a* **20***a*, **17***b*, **18***b*, **19***b* and **20***b* are provided with inclined end portions **31**, **32**, **33**, **34**, **35**, **36**, **37** and **38**, respectively. The inclined portions not only aid in resisting bending of the tray along the longitudinal axis of the reinforcing member **21** and the longitudinal axis of a pair of colinear divider members, but also increase the resistance to bending in the transverse direction.

The central portion **40**, **41**, **42**, **43**, **44**, **45**, **46**, **47**, **48** and **49**, of the bottom surface of each of compartments **12***a*, **13***a* **14***a* **15***a*, **16***a*, **12***b*, **13***b*, **14***b*, **15***b* and **16***b*, respectively, is raised above the remainder of the compartment bottom wall surface to form in each compartment a support surface surrounded by a depressed area. Where the upstanding walls of the raised portions are substantially vertical and of sufficient height so that the dimensions of the top surface of each raised portion are greater than the corresponding dimensions of the opening in the bottom of the tray formed by the raised portions, the raised portions can serve as stacking lugs. However, where the upstanding walls of the raised portions are not of sufficient height or substantially vertical, stacking lugs **51** and **52** can be formed as depressions in reinforcing member **21**, as illustrated in FIGURES 1, 2, 3 and 4. Stacking lugs **51** and **52** are formed in member **21** at different distances from the ends of the member **21**, enabling nesting when lug **51** is placed over lug **51** of a like

tray and causing stacking when one of the trays is rotated 180°.

Referring now to FIGURES 5 and 6 containers **61**, **62** and **63** have been placed in compartments **12***b*, **13***b* and **12***a*, respectively. Containers **61**, **62** and **63** have a cross section corresponding to but slightly smaller than the cross section of the compartments. The bottom of each of the containers **61**, **62** and **63** rests upon the support surface formed by raised portions **45**, **46** and **40**, respectively. Each of containers **61**, **62** and **63** is provided with indented side panels **64** and indented end panels **65**.

In one particular application containers **61**, **62** and **63** are seedling containers and tray **11** is utilized as a flat to hold and/or transport a plurality of the seedling containers. In this use, each of containers **61**, **62** and **63** can be provided with at least one opening **66** in that portion of the bottom surface of the container which overlies the depressed area around the support surface. Thus, in FIGURE 6, opening **66** is spaced from the raised portion **45**. This permits the seedlings to be watered, with the excess water draining through the opening **66** into the depressed area. Subsequent vaporization of this excess water aids in maintaining a moist environment for the seedlings.

While tray **11** has been illustrated with two rows of compartments, any desired number of rows can be employed, with a reinforcing member **21** joining each pair of adjacent rows. Similarly, while tray **11** is shown with five compartments in each row, any desired number of compartments can be utilized. While a substantially rectangular cross section is presently preferred for each compartment, trays containing other configurations, for example, substantially oval, can be fabricated in accordance with the invention. Other stacking means can be utilized instead of or in addition to lugs **51** and **52**.

I claim:

1. A compartmented tray thermoformed from a sheet of thermoplastic material and having at least two rows of compartments, adjacent compartments in each row being separated by divider members which are colinear with the divider members which separate the corresponding adjacent compartments in the other rows, a reinforcing member extending continuously from one end of the tray to the opposite end of the tray joining each pair of adjacent rows, each said divider member and each said reinforcing member being substantially inverted U-shaped in cross section, the height of each said reinforcing member being greater than the height of said divider members to provide a reinforcing structure transverse to each set of colinear divider members to strengthen the tray against bending, the divider member ends and the compartment walls which are on the periphery of the tray and the ends of each said reinforcing member extending upwardly to form an upstanding side wall having a height greater than said divider members and each said reinforcing member to provide a reinforcing structure transverse to the outer end of each divider member connected to said side wall to strengthen the tray against bending along the line of colinear divider members and to provide a reinforcing structure transverse to the outer ends of each said reinforcing member for resisting bending along the line of each said reinforcing member.

2. A compartmented tray in accordance with claim **1** wherein a portion of the bottom surface of each of said compartments is raised above the remainder of the compartment bottom surface.

3. A compartmented tray in accordance with claim **2** wherein said portion is the central portion of each compartment bottom surface to form in each compartment a support surface surrounded by a depressed area.

4. A compartmented tray in accordance with claim **1** wherein first and second stacking depressions are formed in each said reinforcing member at different distances from the ends of the respective reinforcing member.

5. A compartmented tray in accordance with claim **1** wherein each end of a divider member which intersects said upstanding side wall and each end of each said reinforcing member is inclined upwardly from the remainder of the respective divider member or reinforcing member to join said upstanding side wall, thereby forming a reinforced structure to resist bending along the line of each reinforcing member and along the line of colinear divider members and in a direction transverse to the respective divider member and the respective reinforcing member.

6. A compartmented tray in accordance with claim **5** wherein each of said compartments is substantially rectangular in horizontal cross section.

7. A compartmented tray in accordance with claim **6** wherein a portion of the bottom surface of each of said compartments in raised above the remainder of the compartment bottom surface.

8. A compartmented tray in accordance with claim **7** wherein said portion is the central portion of each compartment bottom surface to form in each compartment a support surface surrounded by a depressed area.

9. A compartmented tray in accordance with claim **8** wherein first and second stacking depressions are formed in each said reinforcing member at different distances from the ends of the respective reinforcing member, and wherein an inverted U-shaped rim extends outwardly and downwardly from the upper end of said upstanding side wall.

10. A compartmented tray in accordance with claim **9** further comprising a container having a cross section corresponding to but slightly smaller than the cross section of one of said compartments positioned on the support surface in said one of said compartments, said container having at least one opening in the bottom surface thereof spaced from the respective support surface.

References Cited

UNITED STATES PATENTS

2,743,030	4/1956	Read	220—21
3,142,133	7/1964	Brooks	47—37
3,386,608	6/1968	Diller	220—23.6
3,224,569	12/1965	Leitzel	229—2.5 X
3,362,561	1/1968	Bakos	220—21

GEORGE T. HALL, Primary Examiner

U.S. Cl. X.R.

47—37; 206—72; 220—238; 229—2.5