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Hattingh

[11] **3,887,123**

[45] **June 3, 1975**

[54] **PACKAGING ARRANGEMENT**

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[30] **Foreign Application Priority Data**

May 23, 1972 South Africa 72/3503

[52] **U.S. Cl.** **229/2.5**; 217/26.5

[51] **Int. Cl.** **B65d 1/00**; B65d 85/34

[58] **Field of Search** ..... 229/2.5, 2, 29 M; 217/26.5

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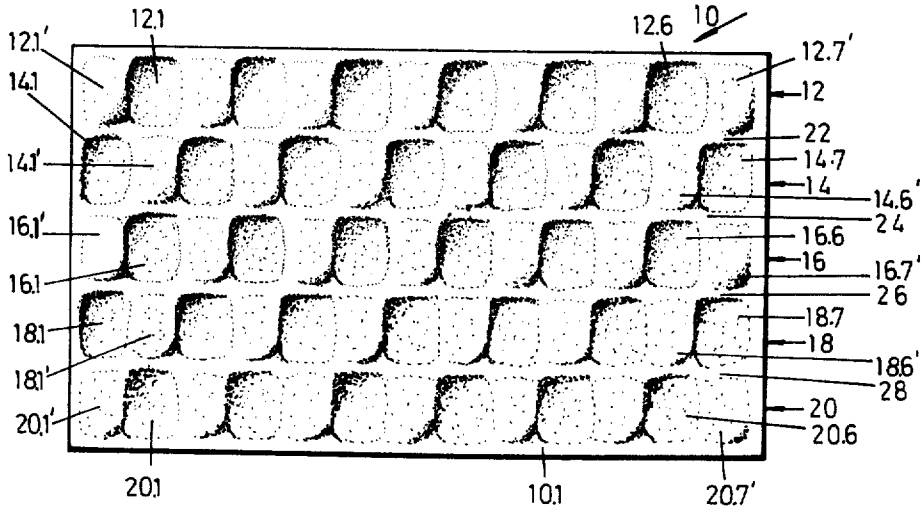
Primary Examiner—Edward J. McCarthy

Attorney, Agent, or Firm—Larson, Taylor & Hinds

[57] **ABSTRACT**

An apple packing tray for packing a plurality of apples comprising a generally rectangular sheet of shock absorbent material with a general plane, the sheet being provided with a number of adjacent longitudinal rows of alternating pockets and caps displaced in opposite directions out of the general plane for a distance less than half the diameter of an apple to be packed, and the pockets and caps being of substantially similar shape and size.

10 Claims, 12 Drawing Figures



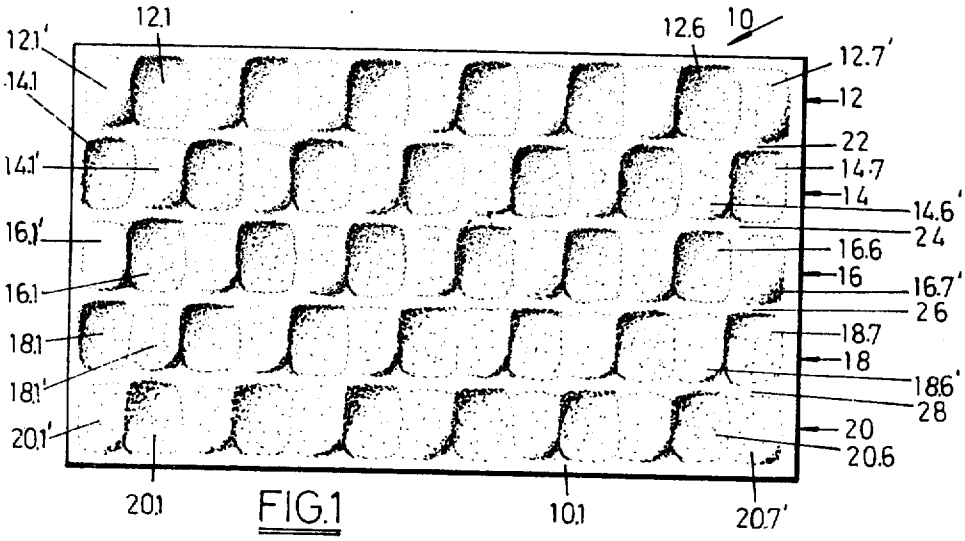

12.1
12.1'
12.6
10
12.7'
14.1
12
22
14.1'
14.7
14
14.6'
16.1'
24
16.6
16.1
16
16.7'
26
18.1
18.7
18
18.1'
18.6'
28
20.1'
20
20.6
20.1
10.1
20.7'

FIG.1

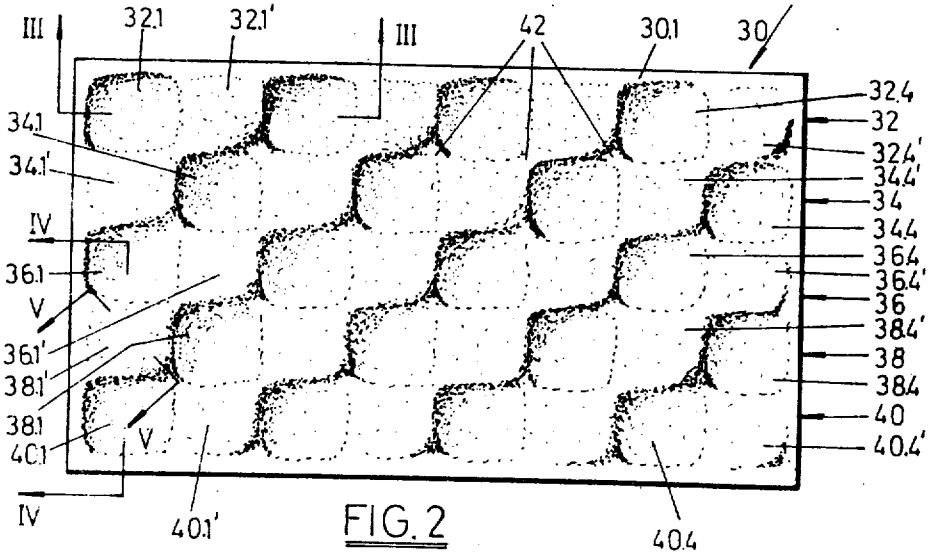

III
32.1
32.1'
III
42
30.1
30
32.4
34.1
32
32.4'
34.1'
34.4'
34
IV
34.4
36.1
36.4
V
36.4'
36
36.1'
38.4'
38.1'
38
38.1
38.4
40
V
40.1
40.4'
IV
40.1'
40.4

FIG. 2

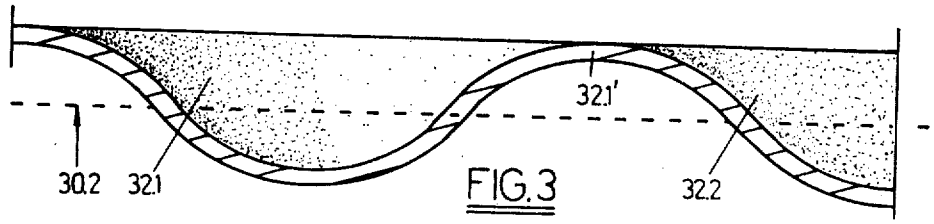


FIG. 3

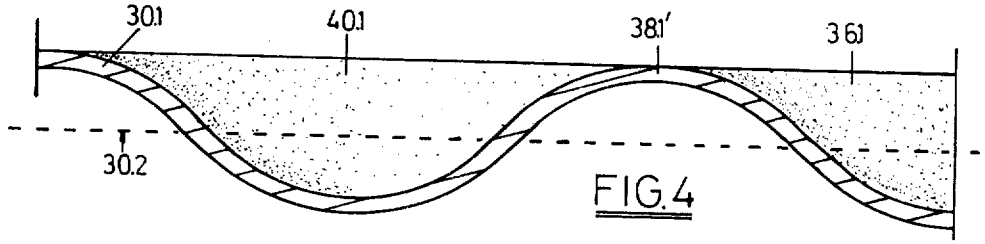


FIG. 4

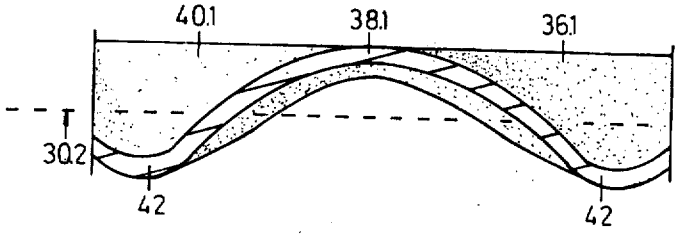


FIG. 5

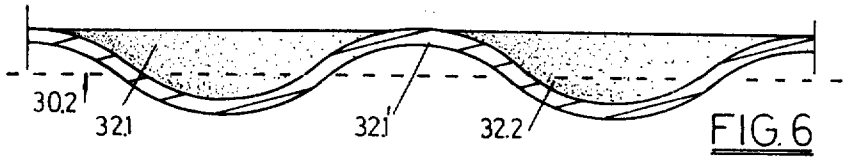


FIG. 6

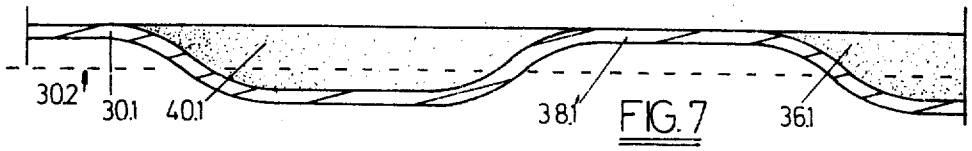
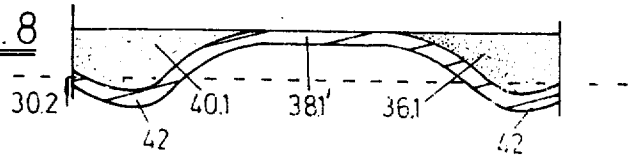


FIG. 7

FIG. 8



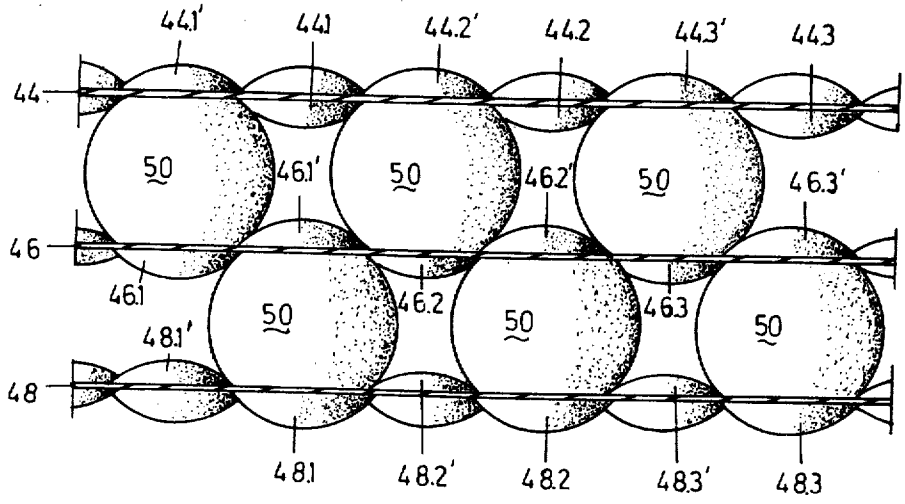


FIG. 9

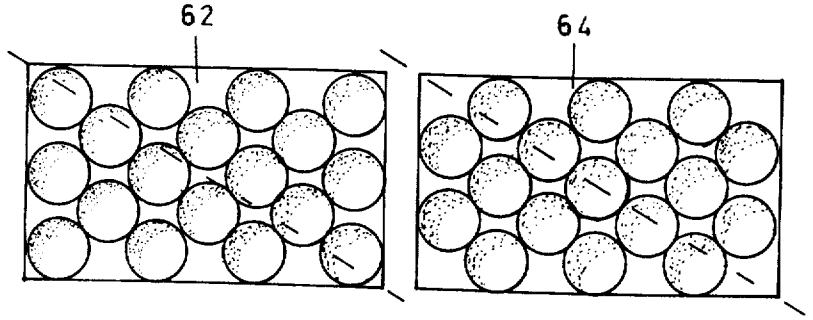


FIG. 11



FIG. 12

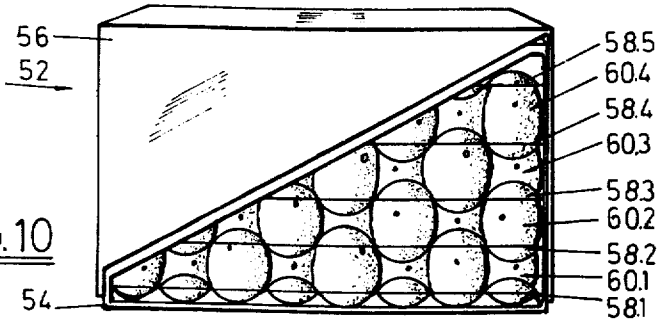


FIG. 10

PACKAGING ARRANGEMENT

The present invention relates to packing arrangements.

More particularly, the invention relates to the packing of apples.

In the specification and claims hereinafter the word "pocket" is to include any depression, cup or the like for receiving and partially enclosing an apple, and the word "cap" is to include any projection for fitting over and partially enclosing an apple.

Various types of packing trays are known in the apple industry. Apples are graded according to size and are packed into standard types of containers. The known types of packing trays, in almost all cases, require two different types of trays for each container to be packed. The reason is that in a next layer the next tray must have its pockets positioned between the pockets (or apples) of the previous lower tray. In some cases it is possible to turn the next tray through 180°, but this is not always possible.

This fact that two types generally are necessary for each container causes that a large stock of different types of trays has to be stored and be available during the apple season.

It is object of the invention to provide a packing arrangement which will eliminate or at least reduce greatly the number of types of packing trays required, without affecting the standard number of apples packed in standard containers.

According to the invention, an apple packing tray for packing a plurality of apples comprises a generally rectangular sheet of shock absorbent material with a general plane, the sheet being provided with a number of adjacent longitudinal substantially parallel rows of alternating uninterrupted pockets and caps displaced in opposite directions out of the general plane and arranged such that transverse rows of alternating pockets and caps are formed, the pockets and caps being of substantially similar shape and size, and each being shaped along a longitudinal sectional plane as a continuously circularly curved segment having a height equal to less than half its radius.

The pockets and caps may be of hollow spherical shape, or of hollow cylindrical shape.

The apple packing tray may have a border section along its edges, which may be flat. The border section may be displaced out of the general plane of the tray.

A transition section may be provided between adjacent longitudinal rows, and it may be flat.

Also according to the invention, there is provided series of types of apple packing trays for packing a plurality of apples, all trays being similar and having a common length dimension and a common width dimension for close fitting insertion in walled packing containers and all trays comprising a generally rectangular sheet of shock absorbent material with a general plane, each sheet being provided with a number of adjacent longitudinal substantially parallel rows of alternating uninterrupted pockets and caps displaced in opposite directions out of the general plane and arranged such that transverse rows of alternating pockets and caps are formed, the pockets and caps being of substantially similar shape and size, and each being shaped along a longitudinal sectional plane as a continuously circularly curved segment having a height equal to less than half its radius, the types in the series of trays being differentiated from each other by the standard size of apples to fit into the pockets.

The series may include at least those types of trays having from four to six rows of pockets, and from four to eight pockets per row.

Further according to the invention, a given standard weight comprises a walled container with a suitable closable lid, plural generally parallel levels of apples within the container, an apple packing tray supporting each layer of apples from beneath, the trays being essentially similar and being of a single type selected from a series of types of trays, the series including trays comprising a generally rectangular sheet of shock absorbent material with a general plane, each sheet being provided with a number of adjacent longitudinal substantially parallel rows of alternating uninterrupted pockets and caps displaced in opposite directions out of the general plane and arranged such that transverse rows of alternating pockets and caps are formed, the pockets and caps being of substantially similar shape and size, and each being shaped along a longitudinal section plane as a continuously circularly curved segment having a height equal to less than half its radius, the types in the series of trays being differentiated from each other by the standard size of apples to fit into the pockets.

From three to seven trays may be used, each tray having from 14 to 42 pockets for packing from 42 to 300 apples into the container.

Also according to the invention, there is provided a method of packing apples, which includes the steps of providing a series of types of apple packing trays, all trays comprising a generally rectangular sheet of shock absorbent material with a general plane, each sheet being provided with a number of adjacent longitudinal substantially parallel rows of alternating uninterrupted pockets and caps displaced in opposite directions out of the general plane and arranged such that transverse rows of alternating pockets and caps are formed, the pockets and caps being of substantially similar shape and size, and being shaped along a longitudinal sectional plane as a continuously circularly curved segment having a height equal to less than half its radius; of selecting an appropriate type of tray from the series; of placing the tray into a walled outer container; of filling a standard size of apple into each pocket of the tray; of repeating the step of placing a further tray of the same type into the container and filling it with apples until a required quantity of apples has been packed into the container; and of closing the container.

The invention will now be described by way of example with reference to the accompanying schematic drawings. It must be noted that although in the description or configurations, reference is also made to specific container sizes, the invention is not limited to such sizes or configurations. In the drawings, there is shown in

FIG. 1 a plan view of one type of apple tray in accordance with the invention;

FIG. 2 a plan view of a second type of apple tray in accordance with the invention;

FIG. 3 a part sectional side view, or larger scale, through the apple tray as seen along arrows III—III in FIG. 2;

FIG. 4 a part sectional end view, on larger scale, through the apple tray as seen along arrows IV—IV in FIG. 2;

FIG. 5 a part sectional diagonal view, on larger scale, through the apple tray as seen along arrows V—V in FIG. 2;

FIG. 6 a view equivalent to FIG. 3 but where the apple tray has pockets of smaller and substantially rectangular dimensions;

FIG. 7 a view equivalent to FIG. 4 but where the apple tray has pockets of smaller and substantially rectangular dimensions;

FIG. 8 a view equivalent to FIG. 5 but where the apple tray has pockets of smaller and substantially rectangular dimensions;

FIG. 9 a side view of two layers of apples packed between three apple trays;

FIG. 10 a side view of a container, partly cut open, illustrating the various layers of apples and trays;

FIG. 11 a plan view of two known types of apple trays; and

FIG. 12 a side view of the two known types of apple trays illustrated in FIG. 11 when superimposed for receiving a layer of apples.

Referring to FIG. 1, the apple tray **10**, having parallel sides and parallel ends, with the sides longer than the ends, includes five rows **12,14,16,18,20** of alternating depressions or pockets **12.1 . . . 12.6, 14.1 . . . 14.7,** 16.1 . . . 16.6, 18.1 . . . 18.7, 20.1 . . . 20.6 and projections or caps **12.1' . . . 12.7', 14.1' . . . 14.6', 16.1' . . . 16.7', 18.1' . . . 18.6', 20.1' . . . 20.7'** respectively.

If the tray **10** is turned upside down, the pockets will appear as caps, and the caps will appear as pockets. The rows **12,14**; **14,16**; **16,18**; **18,20** are respectively separated by a flat joining section **22,24,26,28.** Around the tray **10** a flat border **10.1** is provided.

The tray **30** of FIG. 2 is substantially equivalent to tray **10** of FIG. 1, with the exception that no joining sections are provided between the rows **32,34**; **34,36**; **36,38**; **38,40.** Here the pockets and caps of adjacent rows are joined directly, and only at the corners joining bridges **42** are present, and around the tray a flat border **30.1** is provided.

The flat border **10.1** or **30.1** may be in line, above or below the central plane (i.e., dotted line **30.2**) in FIGS. 3 to 8 between the pockets and caps. However, for facilitating production, the border will be above the general or central plane. In FIGS. 3 to 8 the cross-sectional appearance of the pockets and caps is clearly illustrated.

Referring to FIG. 9, three trays **44,46,48** are provided. Assuming a view from above, these trays **44,46,48** respectively have pockets **44.1 . . ., 46.1 . . .,** 48.1 . . ., and caps **44.1' . . ., 46.1' . . ., 48.1' . . .**. The apples are packed as shown. Each apple **50** fits snugly into a pocket of a tray below and a cap of a tray above. The apples thus are in upper and lower surface or line contact with the trays, and not in point contact, as is the case with many known types of trays.

The trays are packed into a box or crate or shipping container in known manner.

Referring to FIGS. 1 and 2, the tray may be provided in such a manner with pockets and caps that it is possible to turn the tray upside down and/or to turn it diagonally for packing, and yet always there will be the required alignment of pockets and caps with a preceding tray.

This can be explained as follows:

If

p is the number of rows of pockets per tray

n_1 is the number of pockets per uneven row

n_2 is the number of pockets per even row

the following configurations of pockets per tray can be obtained:

Configuration a:

p is an uneven number, i.e., 3,5,7, . . .

$n_1 = n_2$

This configuration allows for alignment either by turning the tray through 180° or the tray can be turned upside down.

Configuration b:

p is an uneven number, i.e., 3,5,7, . . .

$n_1 = n_2 + 1$ or

$n_1 + 1 = n_2$

This configuration allows for alignment by turning the tray upside down. In the known type of trays, if $n_1 = n_2 + 1$, alignment can only be obtained by providing a tray with $n_1 + 1 = n_2$, and vice versa.

Configuratiton c:

p is an even number, i.e., 2,4,6, . . .

$n_1 = n_2$

This configuration allows for alignment only by provision of a second tray in which the positions of the pockets and caps are such to provide alignment. Thus, if a given diagonal has caps at the ends, the same diagonal of the second tray must have pockets at the ends. This tray cannot be turned upside down for alignment.

Configuration d:

p is an even number, i.e., 2,4,6, . . .

$n_1 = n_2 + 1$ or

$n_1 + 1 = n_2$

Alignment can be obtained by rotating the tray through 180°.

Alignment thus can be obtained with a single type of tray for each configuration, with the exception of configurations of class (c) above. This difficulty can be overcome by the use of trays without the flat sections (FIG. 2), and using the same type of tray for more than one size of fruit. A specific example of this is where 80 apples are packed in a carton using a tray with 20 depressions. The standard inside dimensions of such a carton may be approximately 300 × 500 × 300 mm deep. For a known type of configuration, $p = 4$ and $n_1 = n_2 = 5$, and an alignment is obtained by using two types of trays. However, using a tray according to this invention with 20 depressions, $p = 5$, $n_1 = n_2 = 4$, alignment can be obtained. If the flat sections are omitted, the tray is suitable for packing 80 apples in four layers, or, for smaller apples, 100 apples in five layers per carton.

The tray is thus dependent on the type and size of apples to be packed and this results in a minimum number of different types of trays required: e.g., for n sizes of apples only q different types of trays are required, where

$$q \leq n$$

A standard type of apple container will now be discussed by way of example. This container has the approximate interior dimensions 300 × 500 × 300 mm. The trays have a rectangular shape with the dimensions being 500 × 300 mm.

In the table below the details are as follows for a selection of total number of apples to be packed indicating the various trays to be used:

T =	72	80	88	100	113	125	138	150	163	175	188	198	210	234
L =	4	4	4	5	5	5	5	5	5	5	5	6	6	6
Tp =	18	20	22	20	23 (22)	25	28 (27)	30	33 (32)	35	38 (37)	33	35	39
P	4	5	4	5	5	5	5	5	5	5	5	6	5	6
n_1 =	5	4	6	4	5 (4)	5	6 (5)	6	7 (6)	7	8 (7)	6	7	7
n_2 =	4	4	5	4	4 (5)	5	5 (6)	6	6 (7)	7	7 (8)	5	7	6

T = Quantity of apples in container
L = Trays per container*
Tp = Pockets per tray
P = Number of rows per tray
n_1 = Number of pockets : uneven rows
n_2 = Number of pockets : even rows
(*Obviously a final additional tray will be used to cover the top layer).
Note: The figures in brackets indicate the value for an inverted tray, e.g.:

In the case of total 113, the number of pockets is 23 on one surface. The number of pockets per uneven row is 5, the number of pockets per even row is 4. If the tray is inverted, the number of pockets per tray is 22, the number of pockets per uneven row is 4, and the number of pockets per even row is 5.

The general formula for calculating the number of apples per container is:

$$T = L_1p_1n_1 + L_1p_2n_2 + L_2p_1n_2 + L_2p_2n_1$$

Where

L_1 = number of uneven trays (i.e., tray 1,3, . .)
L_2 = number of even trays (i.e., trays 2,4, . .)
p_1 = uneven rows of a tray
p_2 = even rows of a tray
n_1 = number of pockets in each uneven row
n_2 = number of pockets in each even row.

Total 72:
$T = 2 \times 2 \times 5 + 2 \times 2 \times 4 + 2 \times 2 \times 4 + 2 \times 2 \times 5$
$= 72$

Total 80:
$T = 2 \times 3 \times 4 + 2 \times 2 \times 4 + 2 \times 3 \times 4 + 2 \times 2 \times 4$
$= 80$

Total 88:
$T = 2 \times 2 \times 6 + 2 \times 2 \times 5 + 2 \times 2 \times 5 + 2 \times 2 \times 6$
$= 88$

Total 100:
$T = 3 \times 3 \times 4 + 3 \times 2 \times 4 + 2 \times 3 \times 4 + 2 \times 2 \times 4$
$= 100$

Total 113:
$T = 3 \times 3 \times 5 + 3 \times 2 \times 4 + 2 \times 3 \times 4 + 2 \times 2 \times 5$
$= 113$

Total 125:
$T = 3 \times 3 \times 5 + 3 \times 2 \times 5 + 2 \times 3 \times 5 + 2 \times 2 \times 5$
$= 125$

Total 138:
$T = 3 \times 3 \times 6 + 3 \times 2 \times 5 + 2 \times 3 \times 5 + 2 \times 2 \times 6$
$= 138$

Total 150:
$T = 3 \times 3 \times 6 + 3 \times 2 \times 6 + 2 \times 3 \times 6 + 2 \times 2 \times 6$
$= 150$

Total 175:
$T = 3 \times 3 \times 7 + 3 \times 2 \times 7 + 2 \times 3 \times 7 + 2 \times 2 \times 7$
$= 175$

Total 188:
$T = 3 \times 3 \times 8 + 3 \times 2 \times 7 + 2 \times 3 \times 7 + 2 \times 2 \times 8$
$= 188$

Total 198:
$T = 3 \times 3 \times 6 + 3 \times 3 \times 5 + 3 \times 3 \times 5 + 3 \times 3 \times 6$
$= 198$

Total 210:
$T = 3 \times 3 \times 7 + 3 \times 2 \times 7 + 3 \times 3 \times 7 + 3 \times 2 \times 7$
$= 210$

Total 234:
$T = 3 \times 3 \times 7 + 3 \times 3 \times 6 + 3 \times 3 \times 6 + 3 \times 3 \times 7$
$= 234$

Note:

1. In the case of "Total 100" the same trays are used as for "Total 80."
2. In the case of "Total 210" the same trays are used as for "Total 175."

A further example is when a container for packing a so-called "half bushel" of apples is used. This container has the approximate interior dimensions of 300 × 400 × 220 mm. The details are as follows for a selection of total number of apples to be packed:

T	42	60	84	100
L	3	4	4	4
Pockets per tray	14	15	21	25
P = number of rows per tray	4	5	6	5
n_1 = number of pockets per uneven row	4	3	3	5
n_2 = number of pockets per even row	3	3	4	5

Referring to FIG. **10**, the packed container **52** has a lower open box **54** and an upper lid **56** fitting over the box **52**. There are five trays **58.1 . . . 58.5** and four layers of apples **60.1 . . . 60.4** packed into the pockets of the trays.

Referring to FIG. **11**, a known arrangement of two different types of trays **62,64** is shown in plan view. Tray **62** is used for layers **1,3,5 . . . *n*** and type **64** for layers **2,4,6, . . (*n*+1)**. In such arrangement the diagonal of the trays **62,64** have a pocket or a plane surface at either end. For alignment the two trays have to compensate by having a plane surface or a pocket on the same diagonal. The trays therefore cannot be turned upside down.

FIG. **12** shows the two trays **62,64** with a one row of apples at the end. Also, as shown in FIG. **12**, the fruit fits into a pocket below but above is in point contact with the next layer. This often results in damage to the apples due to bruising.

I claim:

1. An apple packing tray for packing a plurality of apples comprising a generally rectangular sheet of generally nonstretchable, shock absorbent material with a general plane, the sheet being provided with a number of adjacent longitudinal substantially parallel rows of alternating uninterrupted pockets and caps displaced in opposite directions out of the general plane and arranged such that transverse rows of alternating pockets and caps are formed, the pockets and caps being of substantially similar shape and size, and each being shaped along a longitudinal section plane as a continu-

ously circularly curved segment having a height, measured from the general plane to the top of a cap or bottom of a pocket, equal to substantially less than half its radius.

2. An apple packing tray as claimed in claim 1, in which the pockets and caps are of hollow spherical shape.

3. An apple packing tray as claimed in claim 1, in which the pockets and caps are of hollow cylindrical shape.

4. An apple packing tray as claimed in claim 1, which has a border section along its edges.

5. An apple packing tray as claimed in claim 4, in which the border section is flat.

6. An apple packing tray as claimed in claim 4, in which the border section is displaced out of the general plane of the tray.

7. An apple packing tray as claimed in claim 1, in which a transition section is provided between adjacent longitudinal rows.

8. An apple packing tray as claimed in claim 7, in which the transition section is flat.

9. A series of types of apple packing trays for packing a plurality of apples, all trays being similar and having a common length dimension and a common width dimension for close fitting insertion in walled packing containers and all trays comprising a generally rectangular sheet of shock absorbent material with a general plane, each sheet being provided with a number of adjacent longitudinal substantially parallel rows of alternating uninterrupted pockets and caps displaced in opposite directions out of the general plane and arranged such that transverse rows of alternating pockets and caps are formed, the pockets and caps being of substantially similar shape and size, and each being shaped along a longitudinal sectional plane as a continuously circularly curved segment having a height, measured from the general plane to the top of a cap or bottom of a pocket, equal to substantially less than half its radius, the types in the series of trays being differentiated from each other by the standard size of apples to fit into the pockets.

10. An apple packing of a given standard weight comprising a walled container with a suitable closable lid, plural generally parallel levels of apples within the container, an apple packing tray supporting each layer of apples from beneath, the trays being essentially similar and being of a single type selected from a series of types of trays, the series including trays comprising a generally rectangular sheet of shock absorbent material with a general plane, each sheet being provided with a number of adjacent longitudinal substantially parallel rows of alternating uninterrupted pockets and caps displaced in opposite directions out of the general plane and arranged such that transverse rows of alternating pockets and caps are formed, the pockets and caps being of substantially similar shape and size, and each being shaped along a longitudinal sectional plane as a continuously circularly curved segment having a height, measured from the general plane to the bottom of a pocket or top of a cap equal to substantially less than half its radius and substantially less than half the radius of the apple packed therein, the types in the series of trays being differentiated from each other by the standard size of apples to fit into the pockets.

* * * * *