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(54) Grates for piling in an interlocked manner.

(57) An open top crate (A) for palletizing in a bonded brick-stacking has a rectangular bottom (E), two long side walls (B) and two short side walls (C), an upper rim (F) extending around the open top and a lower rim (I) extending around the bottom of the crate, the rims being configured to become received one within the other when the crates are in an overlapping stacked position. A series of notches (H) is formed in one of the said rims, with a series of lateral projections (J) formed in the other rim.

The distances between the said notches (H) and the distances between the said projections (J), respectively, being such that the crates are adapted to be piled either in an aligned, overlapping relationship, whereby all projections of an overlying crate become received by respective notches of an underlying crate, or in an non-overlapping, brick-stacking relationship, whereby at least one of the projections of two adjacent sides of every overlying crate becomes received by respective notches of two underlying crates, thus interlocking the crates to each other in crossing, perpendicular directions.

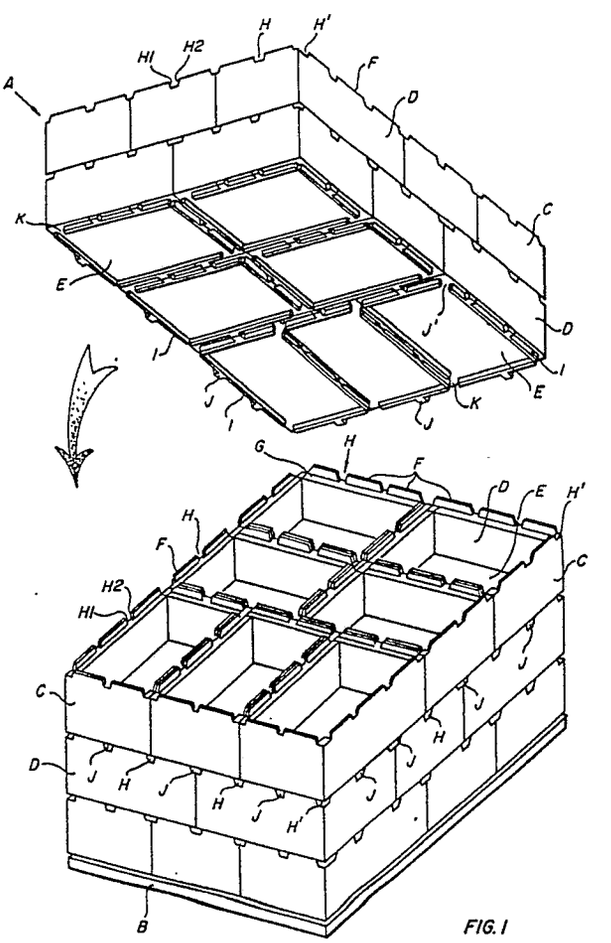

FIG. I

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CRATES FOR PILING IN AN INTERLOCKED MANNER

The present invention concerns crates for the transport of goods such as agricultural products, bottles, and the like, and more particularly such crates provided with mutual interlocking means to safeguard against lateral sliding of one layer of crates relative to an underlying or overlying layer when the crates are piled in superimposed position.

Piling of crates may be either in a fully overlapping relative position whereby the bottom of one overlying crate rests on, and is received by, the upper rim of an underlying crate, or in a partly overlapping fashion known in the art as "bonded brick-stacking".

Hence, there have been proposed various arrangements and means to this end. Thus, in U.K. Patent Specification No. 1.409,046, the contents of which being hereby incorporated by reference, there have been disclosed open-topped containers with a top rib and downward depending rim around the bottom of the containers formed with an array of recesses below the bottom platform, the recesses being so located that when two similar containers are stacked vertically one on top of the other, and with the upper container partially overlapping the top of the lower container in brick-stacking relationship, the top rib of the lower container can cross with the bottom rim of the upper container where such bottom rim is discontinuous and be received within recesses in the side walls of the upper container to provide bonded brick-stacking between the two containers.

Various examples of stacking in an exact overlapping, aligned relationship, and in a brick-stacking, partly overlapping arrangement have been described and need not be further elaborated.

In U.S. Patent Specification No. 3,568,879, a typical "4+3" arrangement of layers of crates in staggered crossing directions have been exemplified, where interlocking of the crate layers is effected by rows of spaced and aligned rectangular frame-like extensions, of substantially rectangular cross section, projecting outward from the bottom wall, which projections cooperate with the upper rim of an underlying crate to effectively avoid lateral sliding of one layer with respect to the other.

While these solutions effectively overcome the problem at hand, closer examination of the forces to which the crates are subjected during transportation thereof in piles will reveal that, in both cases, the amount of resistance to relative displacement of the piled crates is wholly determined by the purely bending moment of force applied to the upward extending rim surrounding the open top of the crates.

More specifically, when integrally molded crates are considered, it is known that the downward depending bottom rim is substantially stronger than the upper rim, forming actually an extension of the crate bottom. The upper rim is inherently weaker and fully depends on the profile measurements and the strength of the material of which it is made. Now, since a uniform wall width is always kept when plastic injection molding is employed, the upper rim width, determined by strength considerations, dictates the measurements of the remaining crate portions. This entails a considerably waste of material.

In the case of foldable or collapsible crates, such as those disclosed in U.S. Patent Specification 4,491,231 and many others as therein mentioned, both the lower and the upper rims are of substantially the same reduced strength, i.e. of inherently insufficient mechanical resistance to bending when substantial lateral forces are applied. Such forces are likely to appear during transportation of the stacked crates, in whatever configuration or relationship, when the transporting vehicle jerks or stops abruptly. Accordingly, again a crate of a substantial weight must be produced, and, in fact, commercially available crates weigh as much as 1.4 Kg.

It is thus the major object of the invention to provide relatively light-weight, stackable crates with interlocking means that assure safe transport even under extreme conditions.

It is a further object of the invention that such interlocking means will act not only in a direction perpendicular to the direction of the lateral forces, but also in a direction parallel to such force or forces.

It is a still further object of the invention to form both the lower rim and the upper rim of the crates with interlocking or matching profiles, in the form of mating recesses and projections, so that resistance to sidewise forces will be achieved in two, crossing directions.

As the result of cooperation between the suitably profiled sections of overlying and underlying crates, should the crates be stacked in the fully aligned relative position, all projections of an overlying crate will be nested within recesses or notches in the upper rim of an underlying crate (or vice-versa); if arranged in a staggered, non-overlapping or bonded brick-stacking fashion, at least one such projection of one crate will cooperate with a corresponding recess of at least another crate, to effectively avoid slipping movements of the crates by adding a resistance force directed parallel to the externally applied forces.

As aforesaid, the invention is particularly useful

in relation to collapsible crates in terms of saving special and costly strengthening of the lower and/or of the upper rims; in this context, and according to another aspect of the invention, it is proposed to provide the bottom rim, at its inside, with tapering or funnel-shaped cavities into which complementary profiled extensions or projections formed in the bottom wall of the crate -- which is to be assembled to erect the crate -- so that the combined effect of the extension and cavity is to tighten the sidewalls against the bottom wall under the weight to which the bottom wall is subjected. The greater the weight, the more closely will the bottom wall become tighened against its frame, on the one hand, and on the other hand the assembly of the crates by the insertion of the bottom wall thereinto is greatly facilitated compared with other, conventional arrangements.

It is therefore provided, according to one aspect of the invention, an open-top crate for palletizing, particularly in a bonded brick-stacking relationship, comprising a rectangular bottom, two long side walls and two short side walls, an upper rim extending around the open top and a lower rim extending around the bottom of the crate, the rims being configured to become received one within the other when the crates are in an overlapping stacked position, characterized by a series of notches formed in one of the said rims; a series of lateral projections formed in the other of the rims; and the distances between the said notches and the distances between the said projections, respectively, being such that the crates are adapted to be piled either in an overlapping relationship whereby all projections of an overlaying crate become received by respective notches of an underlying crate, or in a non-overlapping, brick-stacking relationship, whereby at least one of at least two adjacent sides of each one of the projections of every overlying crate becomes received by respective notches of at least two of the underlying crates, thus interlocking the crates to each other in crossing, prependicular directions.

According to another aspect of the invention the crate is foldable with hinged side walls and a separate bottom, at least two opposite side walls are provided with tapered sockets, and the bottom wall is provided with downward projecting tongnes adapted to fit into the said sockets and inpair an inward directed force when the bottom is loaded.

These and other details of construction and advantages of the invention will become more fully apprehended in the light of the ensuing description of a preferred embodiment thereof, given by way of example only, with reference to the accompanying drawings, wherein --

Fig. 1 shows schematically the arrangement of crates provided with interlocking means according to the invention and the manner of stacking the crates on a pallet in the brick-stacking pattern;

Fig. 1a shows a pair of a crates in a vertically aligned stacked position;

Fig. 2 is a three-dimensional view of a collapsible crate provided with the interlocking means illustrated in Fig. 1;

Fig. 3 is a front view of one, short side wall of the crate of Fig. 2;

Fig. 4 is a top view of the side wall of Fig. 3;

Fig. 5 is a section taken along line 5-5 of Fig. 3;

Fig. 6 is a section taken along line 6-6 of Fig. 3;

Fig. 7 is a front view of one, longer side wall of the crate of Fig. 2;

Fig. 8 is a top view of the side wall of Fig. 7;

Fig. 9 is a section taken along line 9-9 of Fig. 7;

Fig. 10 is a section taken along line 10-10 of Fig. 7;

Fig. 11 is a section taken along line 11-11 of Fig. 7;

Fig. 12 is a section taken along line 12-12 of Fig. 7;

Fig. 13 is a section taken along line 13-13 and Fig. 12;

Fig. 14 is a section taken along line 14-14 of Fig. 7;

Fig. 15 is a top view of a bottom wall of the crate of Fig. 2;

Fig. 16. is a side view of the bottom wall of Fig. 15;

Fig. 17 is a section along line 17-17 of Fig. 15;

Fig. 18 is a section taken along line 18-18 of Fig. 15;

Fig. 19 is a partial cross-sectional view showing the interconnection of superimposed stacked crates, as well as the nesting of a bottom wall within a crate;

Fig. 20 shows a portion of Fig. 19 on an enlarged scale; and

Fig. 21 shows the crate of Fig. 2 in its collapsed, folded-together position.

Fig. 1 illustrates the arrangement of crates generally indicated A piled-up for transportation of a pallet B. As already mentioned, the arrangement of crates A in a pattern of "four plus three" in such a non-overlapping arrangement -- is known in the art as "the bonded brick-stacking" relationship. While the crates A are shown as being of solid, plastic injection structure, this arrangement applies as well to the collapsible design of crates as will be described in more detail below.

The crates are rectangular having short side

walls C, long side walls B and a bottom wall or platform E.

As more clearly seen in Fig. 2, each crate has an upward directed rim F associated with its respective side wall and surrounding the open top of the crate. The rim consists of a projecting rib whose outer surface coincides with the outer surface of the respective side wall. Thus, a shoulder G is formed inside and all along the rim F.

The upper rim F is discontinued by a plurality of notches, cutouts or recesses II, preferably with convergent sides H1 and H2.

Similar notches H′, i.e. of an inverted trapezoid shape, are formed at the four corners of the upper rim F.

The spacing of the notches H is determined according to certain considerations which will be explained further below. In the illustrated example, two equidistant notches are formed in the rim of the long side walls D and one, centrally-located notch H is formed in the rim associated with the short side wall C.

Referring now to the bottom side of the crates A, an elongated, downward projecting rim I is provided, however somewhat distanced from the plane defined by the respective outer surface of the crate of side wall. The rim I is provided with sidewise directed projections J, of an outer profile corresponding to the profile of the notches H, and in vertical alignment therewith.

The rims I are discontinued at the corners of the bottom forming spaces K, as shown.

According to the overlapping piling arrangement of Fig. 1a, it will readily be seen that every projection J becomes neatly nested within respective notches or recesses H of an underlying crate, while the lower rim I is seated within the shoulder G. Consequently, assuming that an oppositely directed couple of forces, as designated by the respective arrows L1 and L2 in Fig. 1a are applied, tending to thrust one crate against the other, the resistance to slipping of the crates is obtained by the following factors: First of all, the short side rims F are subjected to a bending moment through the lower rim I, seated within the shoulder G. This is the situation according to all conventional designs, and dicated the heavier design as above explained.

However, a second factor is introduced according to the design proposed by the present invention, namely, the resistance of the two projections J seated within the respective notches H along the long side D of the crate, i.e. in a direction parallel to the applied forces. In order to overcome such resistance, the projections -- or the intermediate ribs F -- must in fact become torn off depending on the relative strengths of these components, before relative displacement of the crates can take place.

It can be readily proven that such resistance to tear of the projections is higher than the bending resistance acting normally to the applied forces, namely along the short sides of the crates. It is for this reason that the design of the crates, in term of wall-thickness and strength of material, can be made much more economical, and considerably reduce the overall weight of the crates.

Referring back to the "bonded brick-stacking" arrangement of Fig. 1, it will be readily noted that that for each and every crate, at least one projection J is accommodated within a respective notch H, in both crossing directions. Hence, the interlocking means will act not only in the direction perpendicular to the applied thrust or lateral forces (along the short sides of the crate) but also parallel to the forces, namely along the long sides of the crates.

It can be readily seen that the roles and the configurations of the upper and lower rims F and I, are interchangeable, namely, that projections such as J be provided around the open top of the crate, and notches such as H be formed along the bottom rim.

As already mentioned the invention is particularly useful in connection with collapsible or foldable crates. Foldable crates are generally known -- e.g. U.S. Patent No. 4,491,231. It is however important to note that the design of the projection J associated with the lower rim I is advantageously formed in the manner to be described in more detail below, such design being facilitated by separate production of each of the long side wall and of the short side walls by plastic injection molding. Hence, with particular reference to Figs. 2 and 3-6, it is shown that the short side wall C of the crate mainly comprises a pattern of honeycomb profile denoted 10. This pattern was selected not only for its strength, but also because it is less prone to the accumulation of dirt at its corners, which are mostly of obtuse angles.

Further shown are the rim portions F, formed by rib 12, defining the inner shoulder G at the top of the wall C. At its bottom, as most clearly seen in Fig. 5, the projection J consists of a cavity 14 defined within outward projecting ribs 16a and 16b, directed at an angle with respect to each other, to form the tapering or oblique configuration of the projection J, and a bottom rib 18.

At the opposite side of the rib I (which is, as shown, of a profiled rather than a plain, solid structure) there are provided three inwardly directed shoulders or steps 20 designed to support the bottom wall E of the crate when the crate is assembled.

An array of hinge support ears 22 is provided at both sides of the wall for cooperation with hinge rods 24 (Fig. 2).

Opening 26 is left the honeycomb pattern 10 to

serve as a handle for the assembled crate.

Referring now to Figs. 7 though 14, the long side wall D and its design details, which are substantially the same as for the short side wall C, are shown.

Hence, there are provided the upright ribs forming the discontinued upper rim F and the hollow bottom projections J, as well as the bottom wall supports 20′, the hinges 22′ (with a connector brackrt 28), and the honeycomb pattern 10′.

In addition, and according to a further aspect of the invention, there is provided a pair of socket-like projections 30 comprising a T-shaped profile 32 (Fig.13) which defines a pair of pocket-like spaces 34 at both its sides. Wall 36 at the front side of the socket 30 extends at an acute angle with respect to the vertical.

The function of the tapered sockets 30 will be clearly understood in relation to the structure of the bottom wall E shown in detail in Figs. 15-18.

At a location corresponding to each one of the sockets 30, associated with a downward directed rib 40 thereof, there is formed a pair of cutouts or clots 42 slightly extended by opposite located detents or lugs 44 (Fig. 16). Wall portion 46 of the bottom wall E, at that location, is bent over in an L-shape profile (see Fig. 17) marked 48 and 49, leaving a hollow space 50 at the corner between the sections 44 and 46.

At the other, short side of the bottom wall E there is provided a pair of thickened portion 52 projecting from the outer surface of the surounding rib 40.

As shown in Fig. 19 and more clearly in Fig. 20, the function of the sockets 30 formed at the long side wall, and the respective profiled sections 44 formed at the bottom wall, is to provide self-locking, self-tightening engaging means between the bottom wall and the long side walls. As shown, the extensions 44 with the associated portions of the rib 40 are inserted into the pockets 30, and rest against the tapering wall section 36.

This arrangement is advantageous in the following two respects: First, there is enough freedom for the positioning of the protrusions 44 into the sockets 30, even in the case -- as frequently happens -- that the side wall is somewhat distorted and thus does not follow an exact straight plane; secondly, the more force or weight applied to the bottom as a whole -- the greater will be the force that attracts the respective side wall bottom portions against the edge of the bottom wall, due to the inclined direction of the socket wall 36. Therefore, the risk of accidental release of the bottom wall from the side walls is greately reduced.

Fig. 21 shows the crate in its folded-down position; it is self-explanatory and need not be further described.

It will be now readily appreciated that the crate design as so far described features important advantages over the conventional containers of similar type and use. The special design of the interlocking means assures safer stacking of the crates in both the overlapping and the non-overlapping configuration, without increasing manufacturing cost. On the contrary, it has been prove that the saving of material in the production of crates according to the invention may reach up to 50%, without affecting whatsoever the mechanical strength and load capacity of the crate, all other factors being equal (such as the quality of the plastic material being used).

Those skilled in the art will readily appreciate that various changes, modifications, and variations may be applied to the preferred embodiment of the invention as described above without departing from its the scope as defined in and by the appended claims.

Claims

1. An open top crate for palletizing, particularly in a bonded brick-stacking relationship, comprising a rectangular bottom, two long side walls and two short side walls, an upper rim extending around the open top and a lower rim extending around the bottom of the crate, the rims being configured to become received one within the other when the crates are in an overlapping stacked position, characterized by -

(a) a series of notches formed in one of the said rims;

(b) a series of lateral projections formed in the other rim; and

(c) the distances between the said notches and the distances between the said projections, respectively, being such that the crates are adapted to be piled either in an aligned, overlapping relationship, whereby all projections of an overlying crate become received by respective notches of an underlying crate, or in a non-overlapping, brick-stacking relationship, whereby at least one of the projections of two adjacent sides of every overlying crate becomes received by respective notches of two underlying crates, thus interlocking the crates of each other in crossing, perpendicular directions.

2. The crate as claimed in Claim 1 wherein the upper rim is formed with the said notches and extends around the outer surfaces of the crate, the bottom rim is provided with said projections and extends inward in relation to said surfaces, the projections being directed outwards, so that the bottom rim becomes received within the top rim.

3. The crate as claimed in claims 1 or 2 wherein the short side walls top and bottom rims are each provided with one, centrally located of the said notches and projections, and the long side walls -- with two, symetric notches and projections, respectively.

4. The crate as claimed in any of claims 1-3 wherein the notches and the projections are of an inverted trapezoid shape.

5. The crate as claimed in any of the preceding claims wherein the side walls of the crate are connected to each other by hinges.

6. The crate as claimed in any of the preceding claims wherein the side walls and the bottom wall are made by plastic injection molding.

7. The crate as claimed in any of the preceding claims wherein at least two opposite side walls are provided with inward inclined sockets, and the bottom wall is provided with downward projecting lugs adapted to fit into the said sockets and impair an inward directed force when the bottom is loaded.

8. The crate as claimed in any of the preceding claims wherein the side walls comprise honeycomb pattern.

9. A collapsible crate having four side walls hingedly connceted to each other and a bottom, characterized in that at least two opposite side walls are provided with inward inclined sockets, and the bottom wall is provided with downward projecting lugs adapted to fit into the said sockets and impair an inward directed force when the bottom is loaded.

U. LEVY

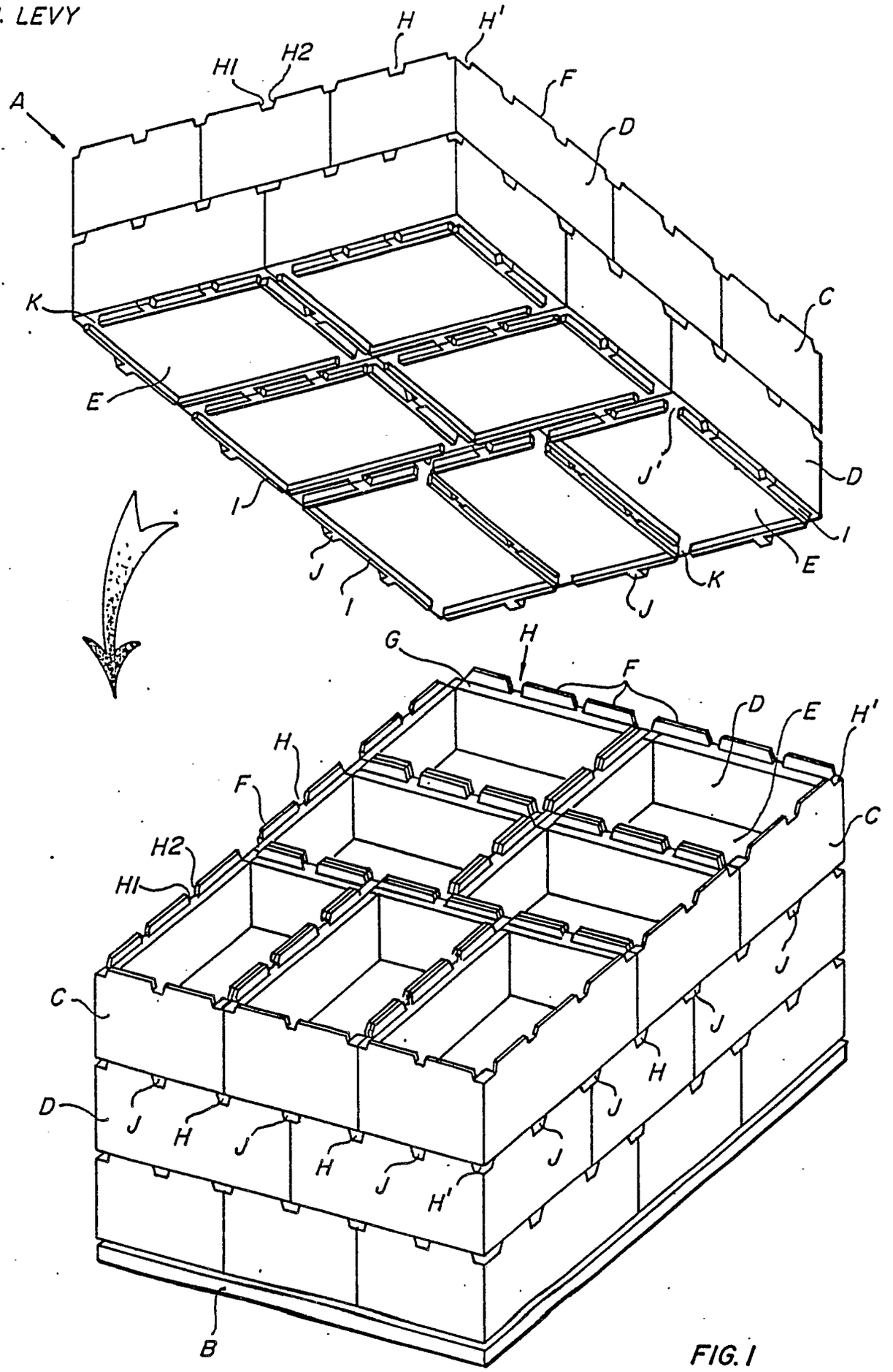

FIG. 1

U. LEVY

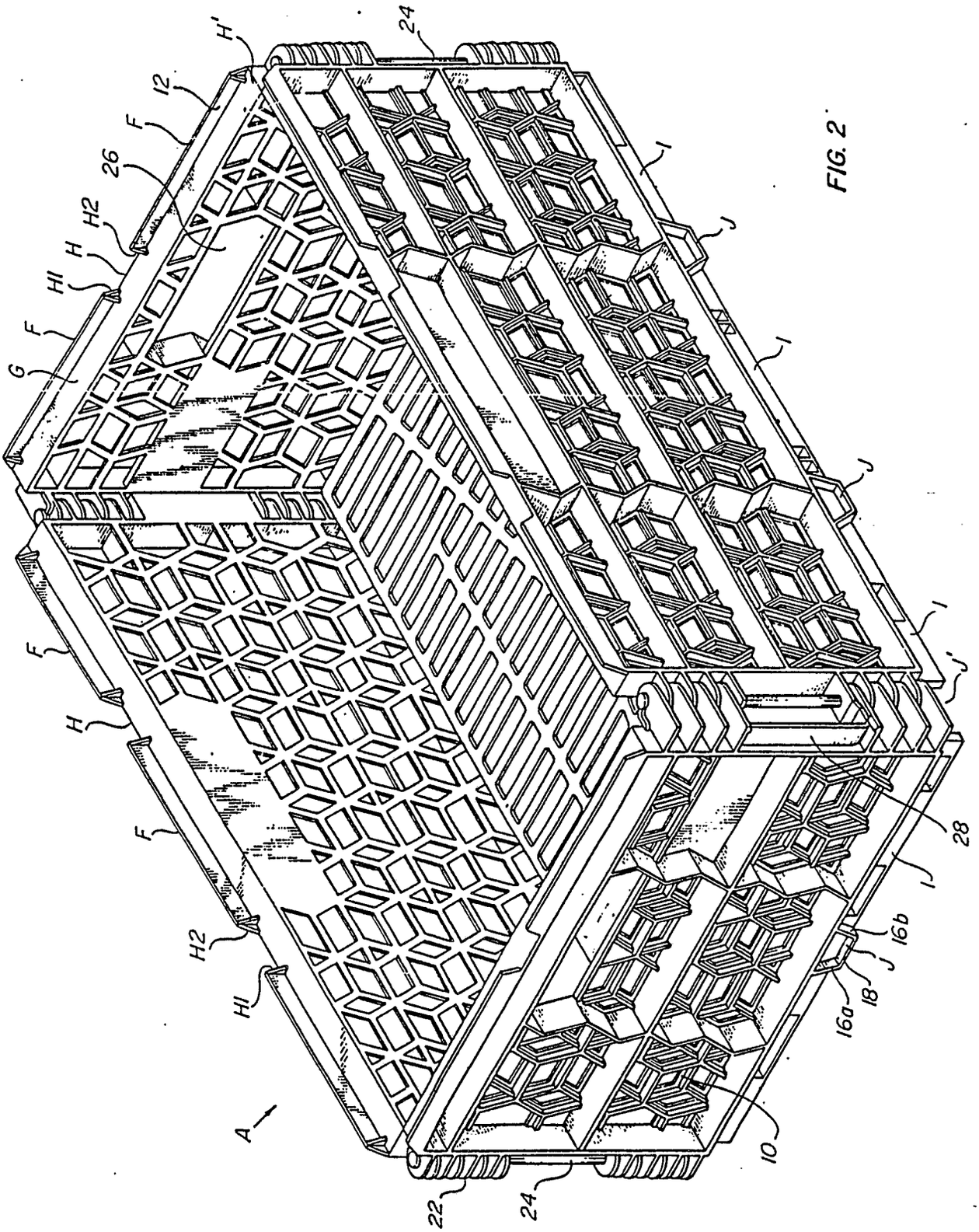

FIG. 2

U. LEVY

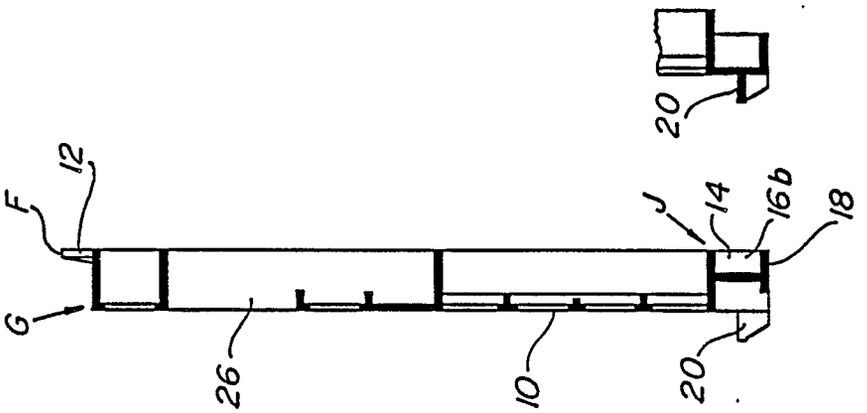

FIG. 6

FIG. 5

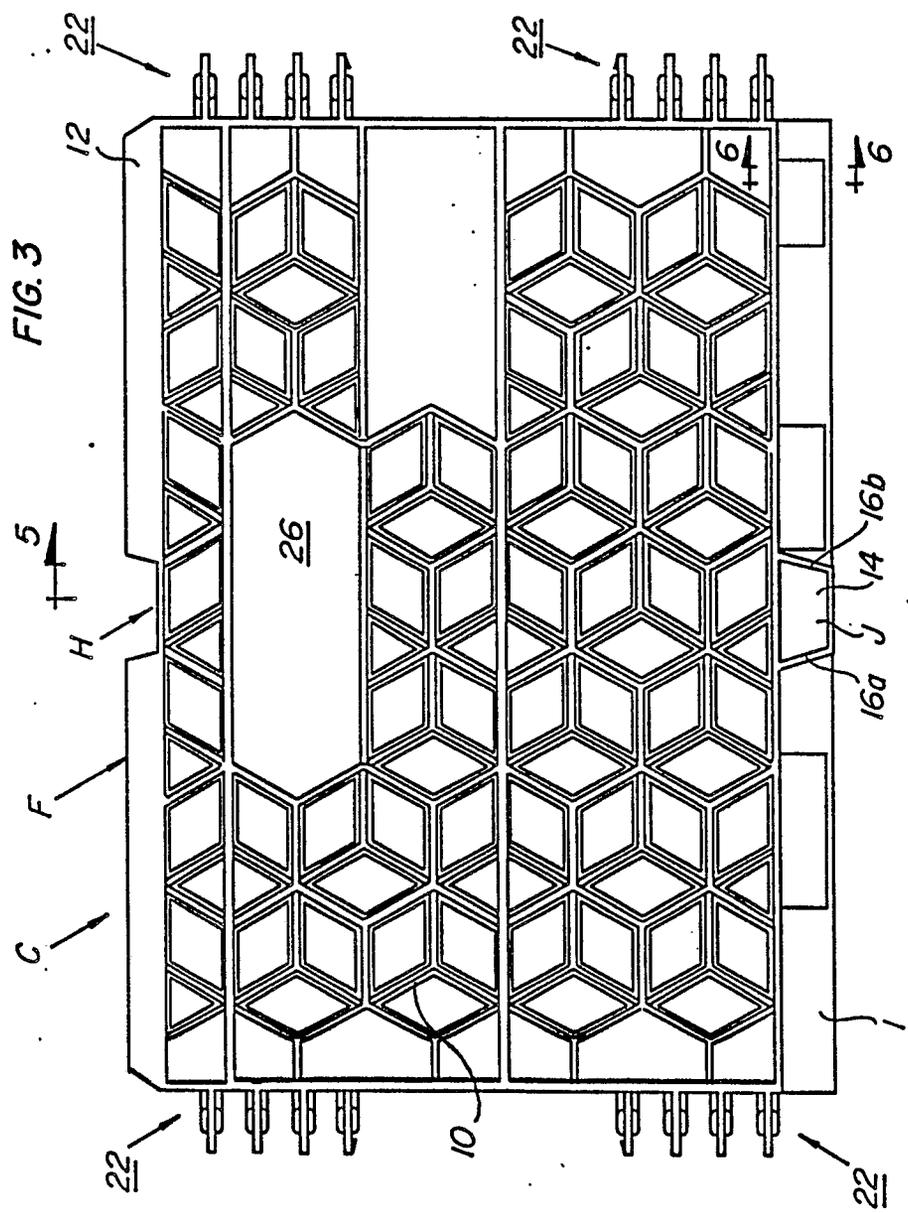

FIG. 3

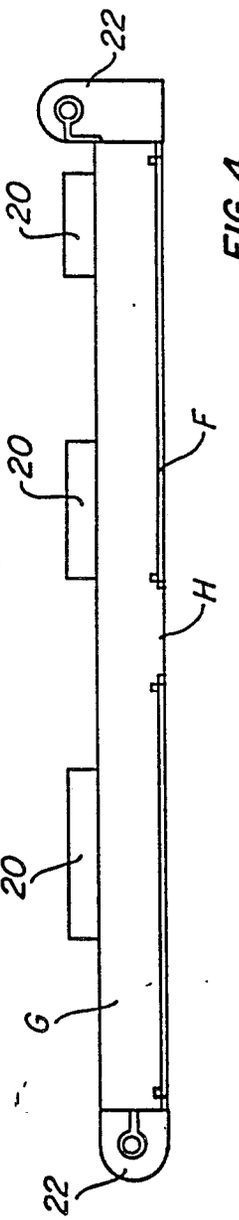

FIG. 4

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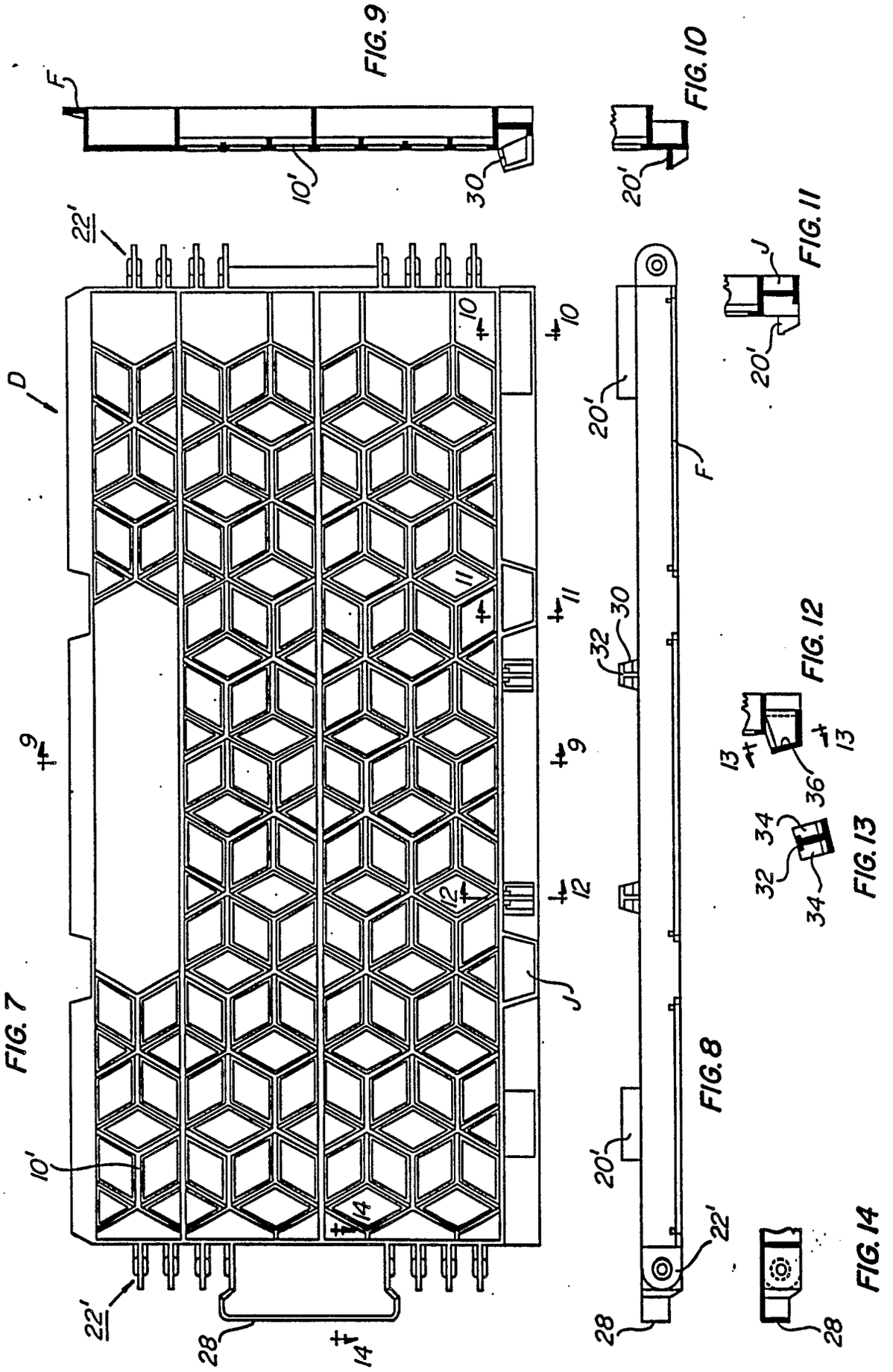
FIG. 7
FIG. 8
FIG. 9
FIG. 10
FIG. 11
FIG. 12
FIG. 13
FIG. 14
D
F
J
9
10
11
12
13
14
10'
20'
22'
28
30
32
34
36

U. LEVY

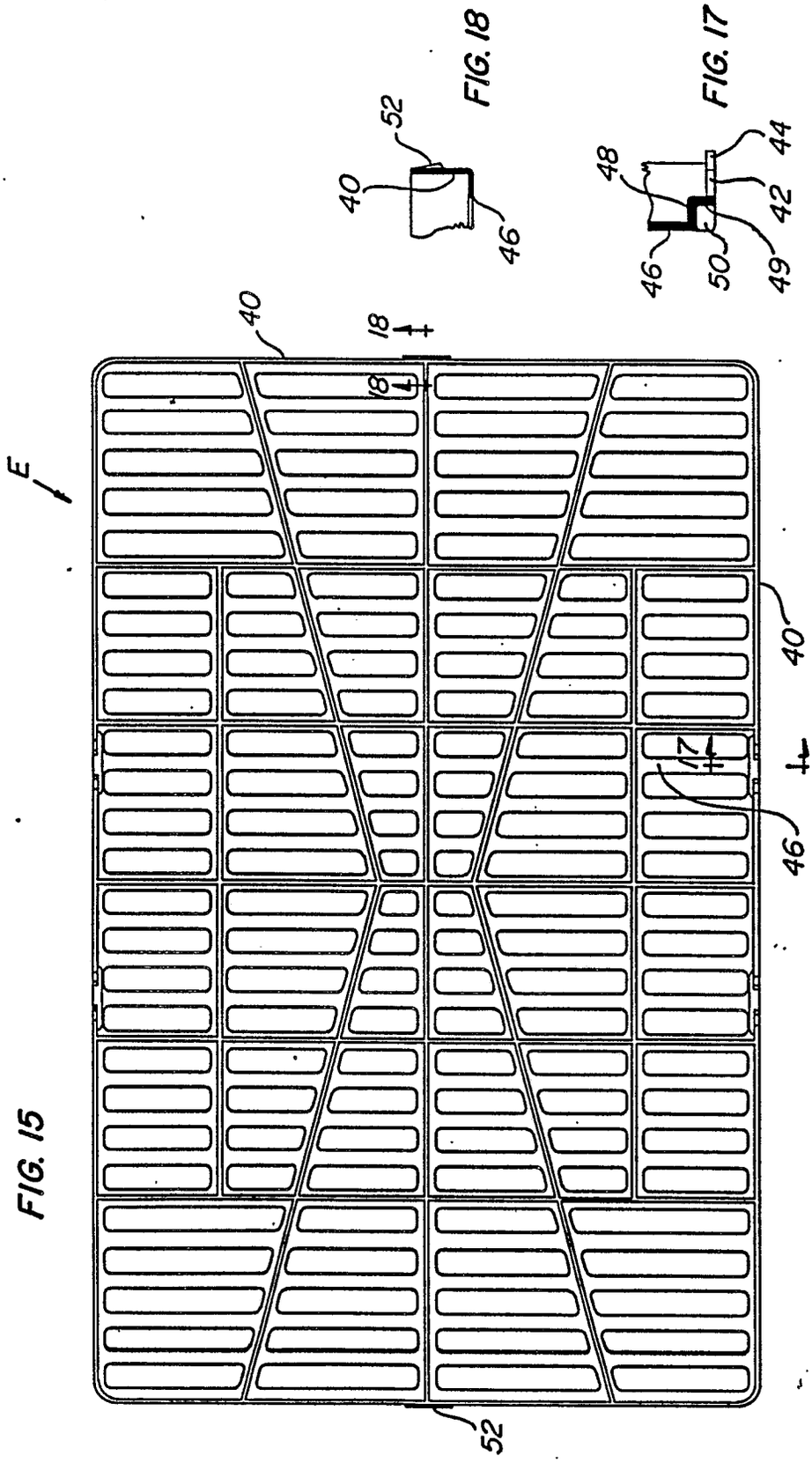

FIG. 18

FIG. 17

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FIG. 19

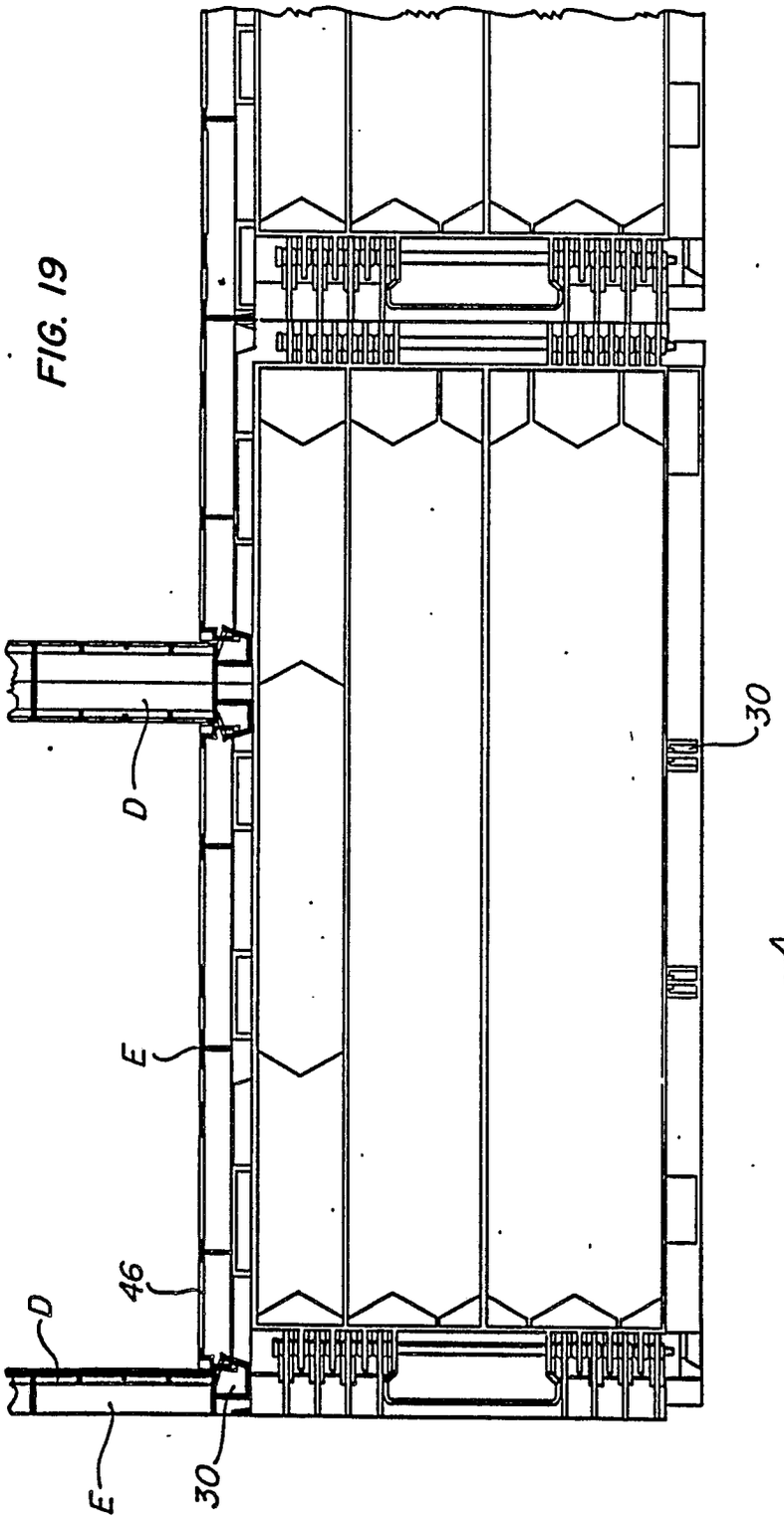
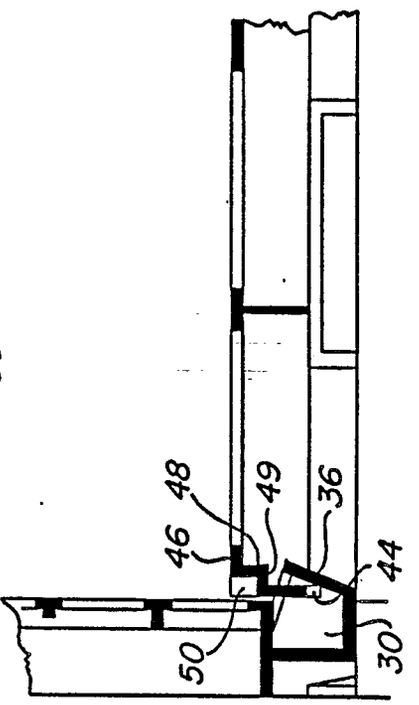


FIG. 20



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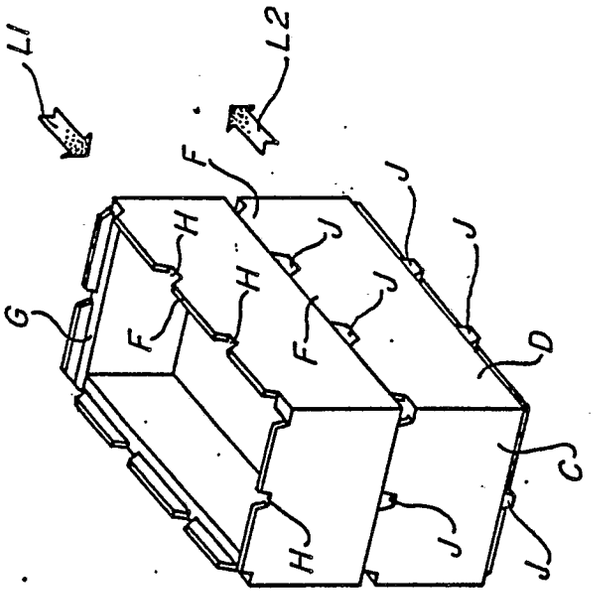

FIG. 1a

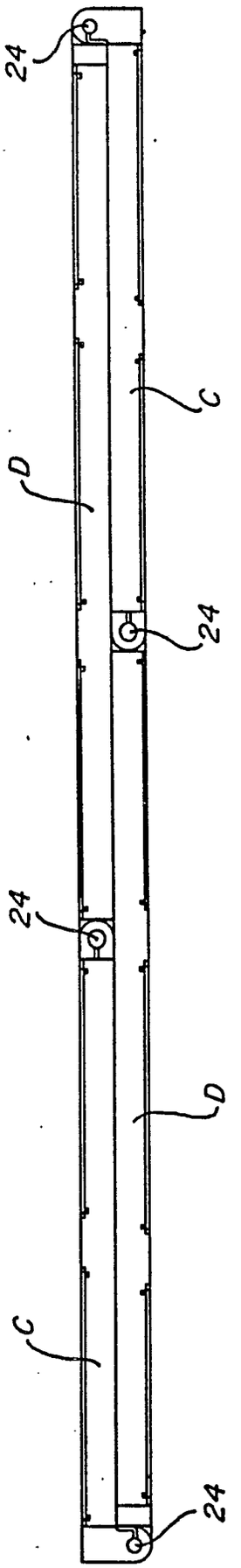

FIG. 2I