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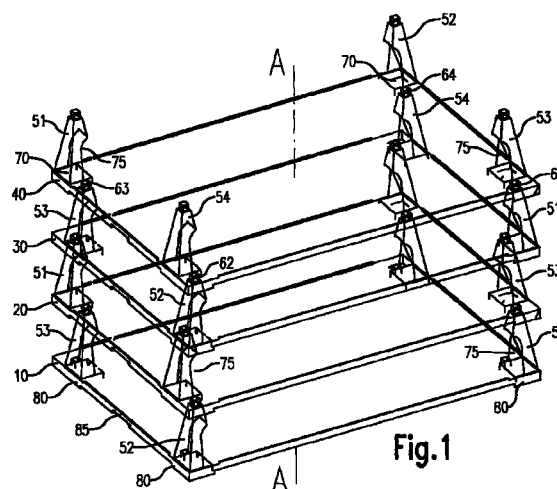
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(54) **Stackable and nestable container**

(57) Transport means for individual products comprising a series of at least substantially identical shelves (10,20,30,40) placed one above another so as to receive the products thereon. The shelves are provided with stacking members (51-54) which each comprise a hollow body open on at least one side (70) and extend at least practically perpendicularly from the shelf. The stacking members (51-54) are able to receive therein at least practically the greater part of a similar stacking member (51-54) of a further shelf. The shelves further comprise support zones (61-64) which are intended to allow the stacking members of a following shelf to support at that position. A stacking member (51-54) and a support zone (61-64) associated therewith always lie rotated at least practically 180° relative to each other round an imaginary central normal line of the shelf. With an identical orientation of the shelves (10,20,30,40) the shelves will hereby fall into each other to form an extremely compact stack. When on the other hand the shelves are alternately rotated 180° relative to each other, a stack will be obtained wherein the shelves maintain a certain mutual pitch which is substantially determined by the length of the stacking members.



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## Description

**[0001]** The invention relates to a transport means for individual products comprising a series of at least substantially identical shelves placed one above another so as to receive the products thereon, which shelves are mutually coupled and herein maintain a mutual pitch.

**[0002]** A transport means of the type stated in the preamble is applied on large scale in storehouses, warehouses and at auctions and the like where individual and sometimes vulnerable products have to be transported from one place to another, either in-house or to a location elsewhere. The most usual transport means for this purpose at the moment is the so-called Danish trolley. This trolley comprises a mobile, rectangular chassis from which extends a tubular frame in the form of four posts at the corner points. The posts are provided with a regular pattern of openings into which can snap corresponding protrusions on the corner points of the shelves. The shelves each comprise a metal framework having therein a wooden or wood-like panel and can thus be fixed between the posts at the desired height. Once the trolley has been assembled in this way, the products can be placed thereon and the whole can be moved. The trolley is for instance loaded together with a number of others into a truck for delivery to another location. Once empty, the shelves are fixed at a minimal pitch, whereby the shelves of a number of trolleys are collected in one trolley and loading space is saved in a return freight.

**[0003]** A drawback of the known Danish trolley is however the great weight thereof, whereby the use thereof in practice has ergonomic disadvantages and is sometimes also time-consuming. The assembly and disassembly of a Danish trolley is also time-consuming. Moreover, the existing trolley still takes up a considerable volume even when empty. While the above described placing together of the shelves of different trolleys does result in a volume reduction, the empty volume is still about a third of the original, which results in substantial return freight costs. Furthermore, the empty trolleys thereby take up considerable storehouse space, thus resulting in substantial storage costs.

**[0004]** The present invention has for its object to provide a transport means of the type stated in the preamble which obviates one or more of these drawbacks.

**[0005]** In order to achieve the intended objective a transport means of the type stated in the preamble has the feature according to the invention that the shelves are provided with stacking members which each comprise a hollow body open on at least one side and extend at least practically perpendicularly from the shelf, which body opens at least on a side directed to the shelf and is able to receive therein at least practically the greater part of a similar body of a further shelf, that the shelves comprise support zones which are intended to allow the stacking members of a following shelf to support at that position, and that on each of the

shelves each stacking member and a support zone associated therewith lie rotated at least practically 180° relative to each other round an imaginary central normal line of the shelf. Otherwise than the Danish trolley, the transport means according to the invention assumes separate elements which can be stacked on top of one another. The stacking members of a first shelf herein support on the support zones of a second shelf, and so on. The mutual pitch of the shelves is thus determined by the length of the stacking members.

**[0006]** Owing to the stated positioning of the stacking members and the support zones relative to each other, a stacking is thus brought about if the shelves are alternately rotated 180° relative to each other. If on the other hand the shelves are laid one on top of another with the same mutual orientation, the stacking members of successive shelves will fall into each other and an extremely compact package is obtained which takes up no more than for instance an eighth part of the original volume. A significant reduction of the empty volume is thus achieved. An additional space advantage is obtained herein compared to the Danish trolley in that the height of the empty stacking is not limited to the height of the available posts, whereby in a truck or in the storehouse it is possible to continue stacking empty elements and thus achieve an additional space saving. In addition, both stacking and unstacking of the shelves can be realized relatively easily.

**[0007]** Although the invention can in principle be applied with flat shelves and support zones, a preferred embodiment of the transport means according to the invention has the feature that the support zones each comprise a recess for receiving therein an outer end of a stacking member, which recess extends over at least a part of a thickness of the shelf. The recess brings about a practically automatic alignment between the stacking members and the support zones, whereby it is particularly simple to stack the separate elements straight above each other. The recess can herein be a sunk portion of the shelf, but can also form a continuous opening.

**[0008]** A further embodiment of the transport means has the feature according to the invention that the stacking members support on the support zones of a shelf placed thereabove. This has the advantage that the bottom shelf in the stack will thus support with a substantially flat side on a ground and can thereby generally bear a heavier load. The mechanical strength of the shelves must thus be adapted to the maximum load of the bottom shelf but one and can thus be lighter.

**[0009]** A further embodiment of the transport means has the feature according to the invention that the stacking members narrow both internally and externally over at least a part of their length. Such narrowing stacking members can be embodied internally and externally such that the members of separate shelves will fall into each other in virtually fining manner so that an extremely compact stacking of empty shelves can be

achieved. A preferred embodiment of the transport means according to the invention has the feature herein that the stacking member of the shelf is received fittingly in the cavity of the stacking member of the first shelf, and that releasing means are provided in said cavity to maintain a certain clearance between both bodies. Such releasing means comprise for instance one or more protrusions or a shoulder in the cavity of the body, on which the outer end of a stacking member can support, therein maintaining a certain clearance between both stacking members. The clearance thus defined by the releasing means avoids the forming of vacuums between the stacked-together stacking members, which would otherwise impede the taking apart of empty shelves.

**[0010]** For a further simplification of the release and nesting of the stacking members, they are provided in a preferred embodiment with at least one opening for respectively supplying and discharging air to and respectively from the stacking members.

**[0011]** A further embodiment of the transport means has the feature according to the invention that the cavities in the bodies forming the stacking members also open on a side directed toward each other. Such cavities in the bodies which are also open on a side surface of the body not only enhance their mutual release when the empty shelves have been taken apart but also enlarge the useful loading surface area of the shelf, which thus also extends partially into the cavities.

**[0012]** In a further preferred embodiment the transport means has the feature according to the invention that the series of shelves is arranged on a chassis. The chassis can herein be provided with wheels or be otherwise mobile, but it is also possible for the chassis to comprise a pallet base whereby the transport means can be picked up and displaced with usual lifting and displacing means. Use is preferably made as such of a so-called Euro-pallet base with standardized dimensions of 120x80 centimetres. Not only is such a pallet base compatible with most standard lifting means, but the internal dimension of a common truck is also adapted to this size such that both in the length and particularly also in the width a whole plurality is placeable therein without appreciable loss of space. This in contrast to the Danish trolley which in practice, with dimensions of about 134x56 centimetres, generally does not fit as a plurality in the width of a truck without leaving considerable space.

**[0013]** For reliable but releasable placing of the shelves on a chassis, a further embodiment of the transport means has the feature according to the invention that at least the lowermost shelf is provided over at least a part of its periphery with an edge which depends therefrom. The depending edge herein engages round an edge of the chassis whereby a shear-free placing is possible.

**[0014]** In order to achieve a significant weight reduction relative to the currently used Danish trolley, a fur-

ther embodiment of the transport means has the feature according to the invention that the shelves comprise an injection moulded plastic and have an open structure. Not only does such an embodiment result in a significantly lower weight of the individual shelves, the cost price per shelf can also be reduced considerably owing to the omission of assembly operations. The open structure herein not only results in material-saving and weight loss but also enhances an efficient flow of the injection moulding material during the manufacturing process.

**[0015]** A further embodiment of the transport means has the feature according to the invention that the shelves are provided with a removable cover sheet. The removable cover sheets can be adapted to the type of product which has to be transported. A closed cover sheet can thus be chosen for transport of for instance plants so as to avoid soil falling onto the plants of underlying shelves or, conversely, a perforated cover sheet to allow a product to breathe optimally. In addition, a smooth cover sheet can for instance be chosen for relatively heavy products, which can thereby be shifted easily to their position, and, conversely, a cover sheet with an anti-slip surface if it is necessary to prevent the products shifting during transport. In order to facilitate handling of the shelves, a further specific embodiment of the transport means is characterized according to the invention in that the shelves are provided with handgrips on at least two opposite sides. The shelves can herein be grasped easily on the handgrips.

**[0016]** The invention will now be further elucidated hereinbelow with reference to an embodiment and an associated drawing. In the drawing:

- figure 1 shows a perspective view of an embodiment of the transport means according to the invention;
- figure 2 is a top view of a shelf of the transport means of figure 1;
- figure 3 shows a cross-section of the transport means of figure 1 in a fillable, assembled situation; and
- figure 4 shows a corresponding cross-section of the transport means in an empty, stacked-together situation.

**[0017]** The figures are otherwise purely schematic and not always drawn to scale. Some dimensions in particular may be shown in highly exaggerated manner for the sake of clarity. Corresponding parts are designated as far as possible in the figures with the same reference numeral.

**[0018]** Shown in perspective in figure 1 is an embodiment of the transport means according to the invention which in this case comprises four at least practically identical shelves 10,20,30,40. Shelves 10,20,30,40 are substantially rectangular in shape and measure about 120x80 centimetres, in accordance with the size of so-

called Euro-pallets which can be used as chassis. The shelves are manufactured integrally from a suitable plastic such as HD polypropylene or polyethylene by means of injection moulding, whereby the manufacturing costs can be limited. As can be seen more clearly in the top view of figure 2, the shelves have an open structure. Such a structure not only decreases the net weight of a shelf, it also simplifies the manufacturing process which can thereby be carried out more cheaply. The thus open shelf can be covered with a separate cover sheet which is provided with a suitable surface structure adapted to the specific application of the transport means. Such a cover sheet is for instance formed by a foil with a thickness from several tenths of millimetres to several millimetres and made of an appropriate material and is integrally supported by the basic structure of the shelf. For the sake of clarity these cover sheets are not further shown in the figures.

**[0019]** The shelves each comprise four stacking members 51,52,53,54 which are placed close to the corner points. These stacking members each comprise a hollow body which is open on at least the side 70 directed toward the associated shelf. The cavities and stacking members both narrow and are therein dimensioned such that similar stacking members of separate shelves can be placed into one another. In empty state the shelves 10,20,30,40 can thus be stacked on top of each other extremely compactly and to any desired height, as shown in figure 4. In this situation the diverse shelves 10,20,30,40 have the same orientation. Releasing means in the form of an internal shoulder 72 ensure that the stacking members of the individual shelves maintain a mutual clearance 73, which prevents the forming of vacuums and possible mutually clamping of stacking members in other manner.

**[0020]** Each stacking member 51-54 has on a shelf a support zone 61-64 associated therewith, at the position of which it can support on another shelf. According to the invention the stacking members 51-54 and support zones 61-64 associated therewith lie rotated relative to each other about 180° round an imaginary central normal line A-A. This implies that the first stacking members 51 and support zone 61 associated therewith lie rotated 180° relative to each other, as do the other stacking members 52,53,54 and support zones 62,63 respectively 64 associated therewith. As a result the shelves will fall into each other with the same mutual orientation as shown in figure 4. If on the other hand successive shelves lie rotated 180° relative to each other, as shown in figures 1 and 3, the stacking members of a shelf will then support on the support zones associated therewith of a following shelf so that a stacking is obtained between the shelves at a pitch which is substantially determined by the length of the stacking members. Because the support zones each comprise a recess 60 over a part of their thickness for receiving therein of an outer end of a stacking member, see in particular figures 3 and 4, an exact positioning of the

shelves one on top of another is achieved virtually automatically, which results in a straight, orderly and robust stacking. In this situation products can be loaded onto the shelves for transport with the transport means. The bottom shelf 10 is herein preferably placed on a suitable chassis, such as in this case for instance a Euro-pallet, whereby the stack can be picked up integrally making use of standard lifting and displacing means. In order to prevent the possibility of the stack herein sliding off the chassis, the shelves are each provided on the corners with an edge 80 which depends therefrom and engages round the chassis (not drawn).

**[0021]** So as to further enhance mutual release of the shelves, but particularly to obtain more effective loading surface area on the shelves, the cavities 71 in the stacking members are also open on a side 75 directed toward each other, see figure 1. The loading surface area hereby extends into the relevant cavities of the stacking members, whereby as the case arises more products can be accommodated on the shelves.

**[0022]** Once empty, the shelves of the stack are taken apart and placed together with the same mutual orientation in the manner indicated in figure 4. In this situation the shelves take up less than an eighth part of the original volume, which results in a radical reduction of transport and storage costs. Furthermore, the empty shelves can in principle be stacked to any required height, which results in a further reduction of the floor area occupied thereby. In order to facilitate handling of the shelves, these are each provided on either sides with handgrips 85 with which they can be easily picked up.

**[0023]** Although the invention is elucidated above on the basis of only a single embodiment, it will be apparent that the invention is by no means limited to the given embodiment. On the contrary, many other variations and embodiments are possible within the scope of the invention. The given dimensions are thus given solely by way of example, and the shelves can also be dimensioned and designed differently. The materials used can also be substituted by other materials. Completely closed shelves can also be used as a starting point instead of an open structure, despite the advantages associated with this latter.

**[0024]** In the embodiment a pallet base is used as chassis. The stack can however also be arranged on a movable chassis or even be applied without chassis. The position of the stacking members can also be varied, wherein however a support zone associated with the shelf and on which the stacking member can support on a further shelf will always be found through a rotation of 180° round the central normal line of the shelf.

**[0025]** An example of such a different positioning of the stacking members is placing of the stacking members on a short side of a shelf on the outer corner points and placing of the stacking members on the opposite short side of the shelf at a distance from the corner

points.

**[0026]** The length of the stacking members can also be varied as desired to adapt this optimally to the nature of the products for transporting, wherein shelves with mutually differing stacking member lengths can also be used interchangeably.

**[0027]** The invention generally provides a transport means constructed from separate elements which can be stacked on each other at a certain pitch and which can be stacked together in extremely compact manner, wherein the mutual orientation determines the manner of stacking. As such the invention provides many advantages compared to the currently substantially usual Danish trolley.

#### Claims

1. Transport means for individual products comprising a series of at least substantially identical shelves placed one above another so as to receive the products thereon, which shelves are mutually coupled and herein maintain a mutual pitch, **characterized in that** the shelves are provided with stacking members which each comprise a hollow body open on at least one side and extend at least practically perpendicularly from the shelf, which body opens at least on a side directed to the shelf and is able to receive therein at least practically the greater part of a similar body of a further shelf, that the shelves comprise support zones which are intended to allow the stacking members of a following shelf to support at that position, and that on each of the shelves each stacking member and a support zone associated therewith lie rotated at least practically 180° relative to each other round an imaginary central normal line of the shelf.
2. Transport means as claimed in claim 1, **characterized in that** the support zones each comprise a recess for receiving therein an outer end of a stacking member, which recess extends over at least a part of a thickness of the shelf.
3. Transport means as claimed in claim 1 or 2, **characterized in that** the stacking members support on the support zones of a shelf placed thereabove.
4. Transport means as claimed in claim 1, 2 or 3, **characterized in that** the stacking members narrow both internally and externally over at least a part of their length.
5. Transport means as claimed in claim 4, **characterized in that** the stacking member of the shelf is received fittingly in the cavity of the stacking member of the first shelf, and that releasing means are provided in said cavity to maintain a certain clearance between both bodies.

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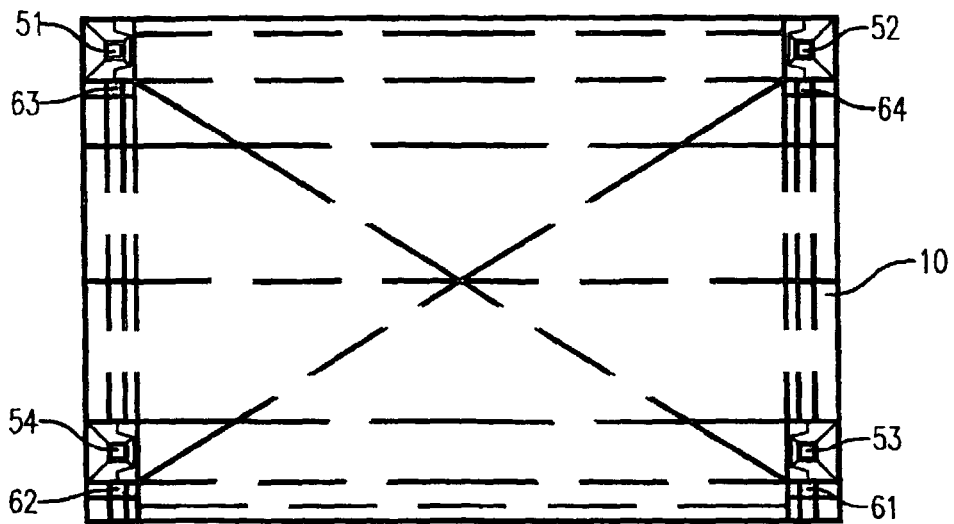
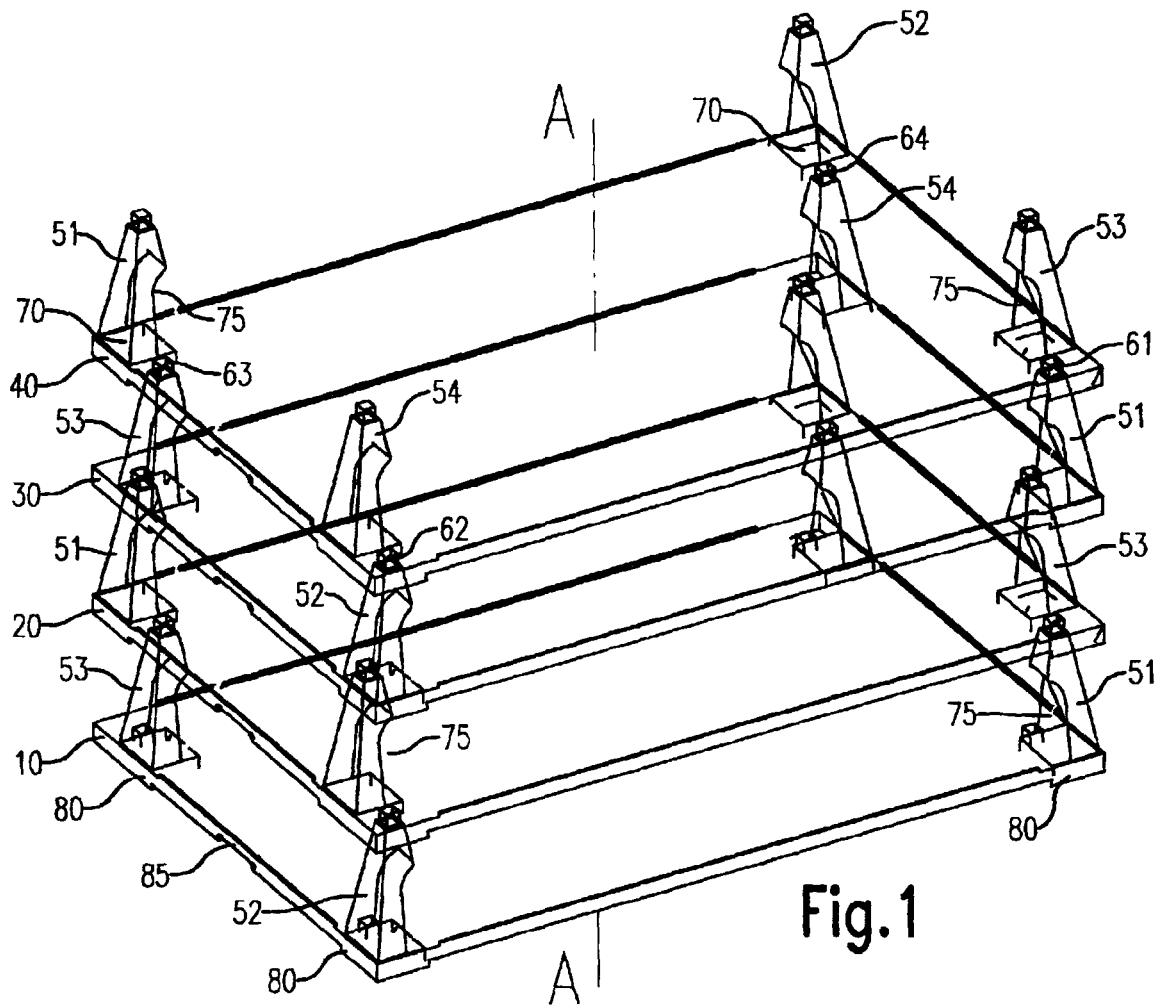
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6. Transport means as claimed in any of the foregoing claims, wherein the stacking members are provided with at least one continuous opening for passage of air.
7. Transport means as claimed in one or more of the foregoing claims, **characterized in that** the cavities in the bodies forming the stacking members also open on a side directed toward each other.
8. Transport means as claimed in one or more of the foregoing claims, **characterized in that** the series of shelves is arranged on a chassis.
9. Transport means as claimed in claim 7, **characterized in that** the chassis comprises a pallet base.
10. Transport means as claimed in claim 7, **characterized in that** the chassis is mobile.
11. Transport means as claimed in one or more of the claims 7-9, **characterized in that** at least the lowermost shelf is provided over at least a part of its periphery with an edge which depends therefrom.
12. Transport means as claimed in one or more of the foregoing claims, **characterized in that** the shelves comprise an injection moulded plastic and have an open structure.
13. Transport means as claimed in one or more of the foregoing claims, **characterized in that** the shelves are provided with a removable cover sheet.
14. Transport means as claimed in one or more of the foregoing claims, **characterized in that** the shelves are provided with handgrips on at least two opposite sides.



Fig,2

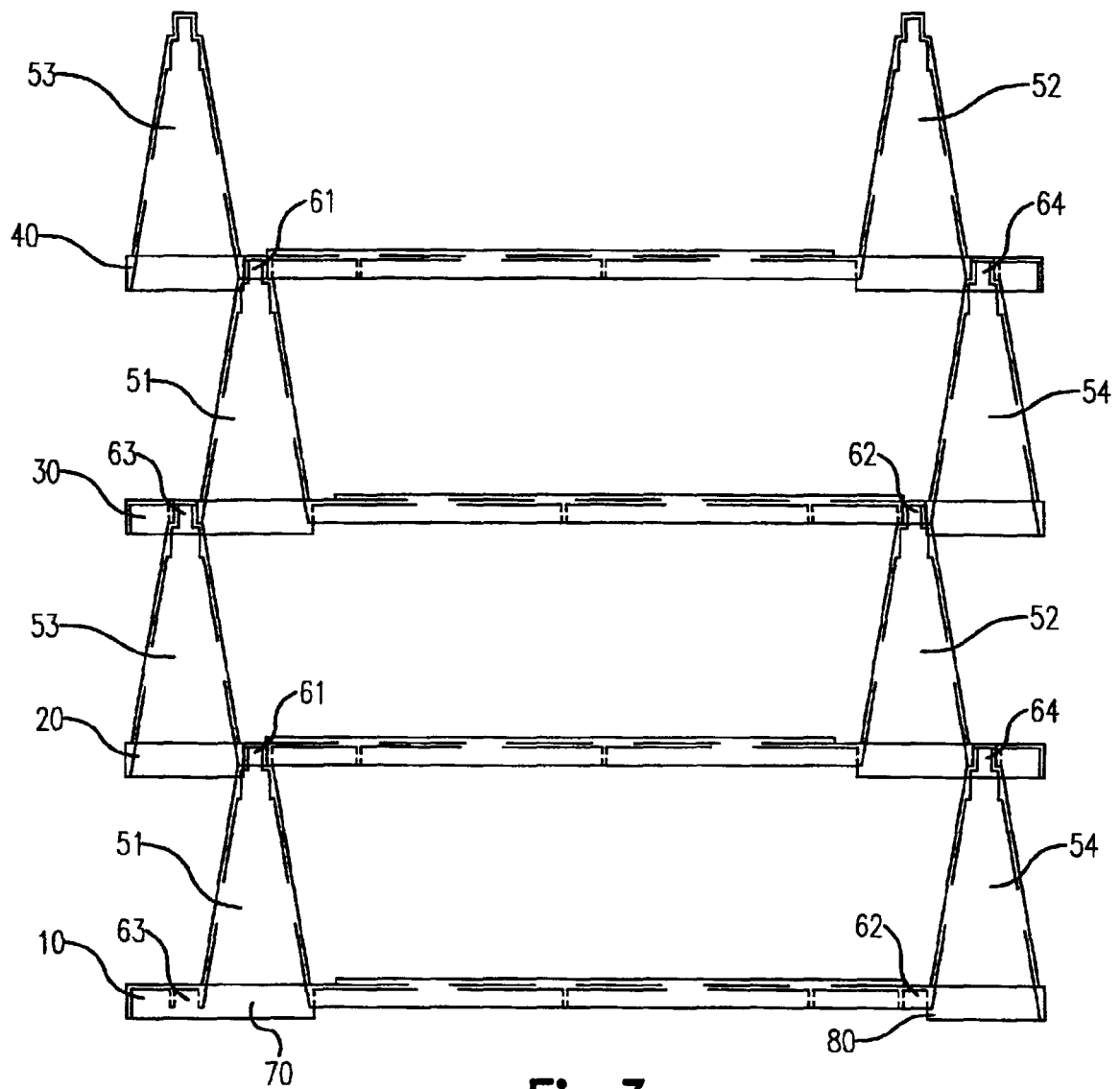


Fig.3

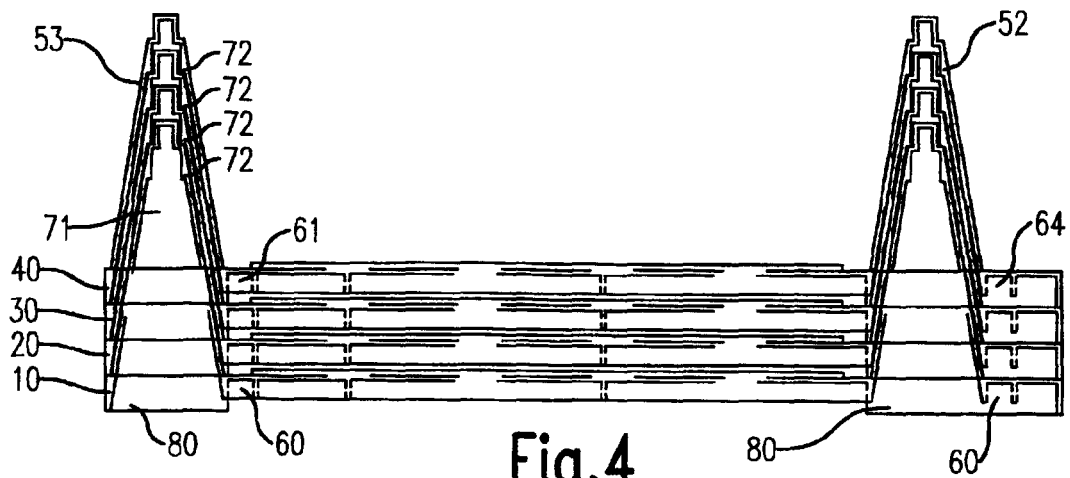


Fig.4



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# EUROPEAN SEARCH REPORT

Application Number  
EP 99 20 2721

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                      |                                  |                                              |
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| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                      |                                  |                                              |

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 20 2721

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