United States Patent

Turner

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[54] PLATE STORAGE SYSTEM

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[52] **U.S. Cl.** **211/50**

[51] **Int. Cl.** **A47f 7/00**

[58] **Field of Search** 211/50, 49, 44, 41

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[57] **ABSTRACT**

A storage device for plate materials, particularly steel plates, has upstanding tongues between which the plates are supported edgewise on a supporting base, which base is located at an angle to the horizontal.

11 Claims, 6 Drawing Figures

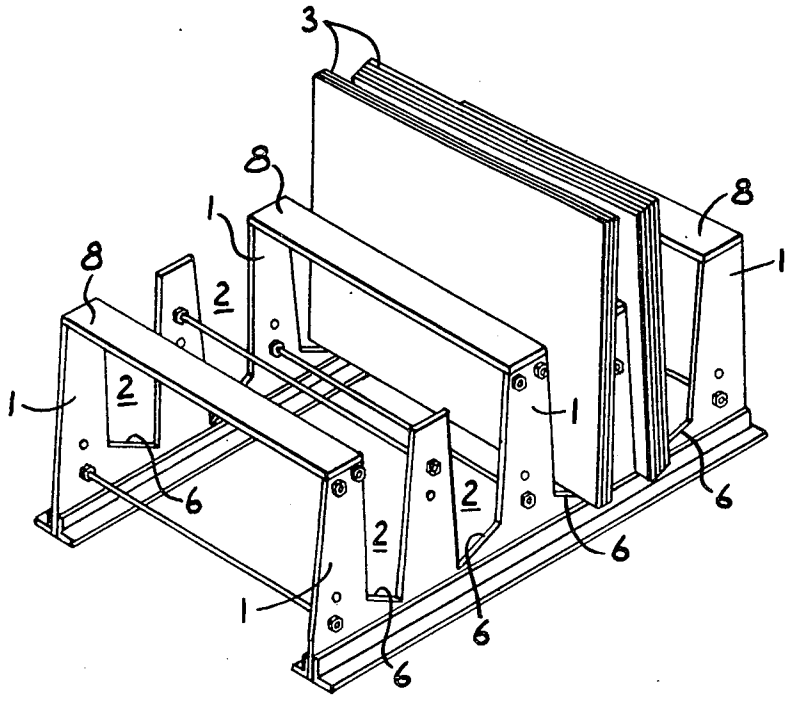
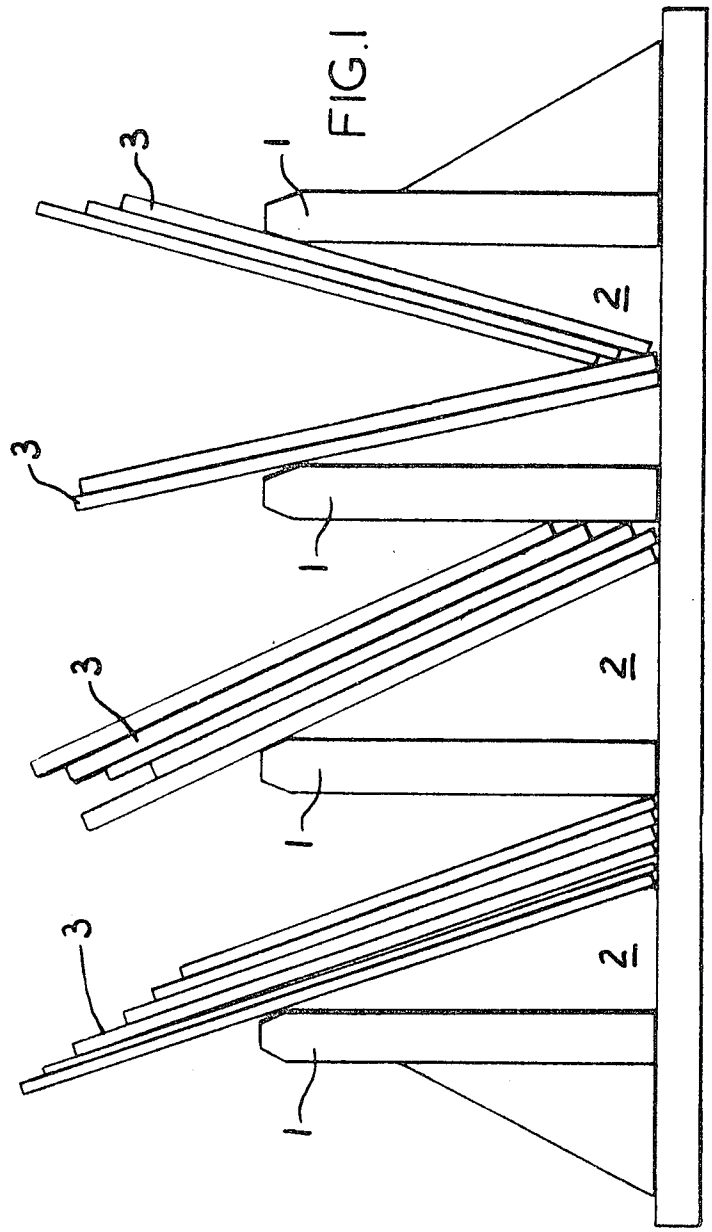


FIG. 1



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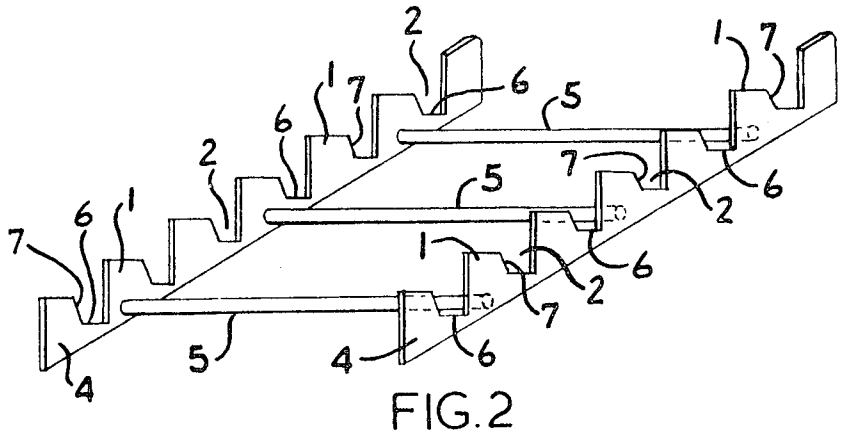


FIG.2

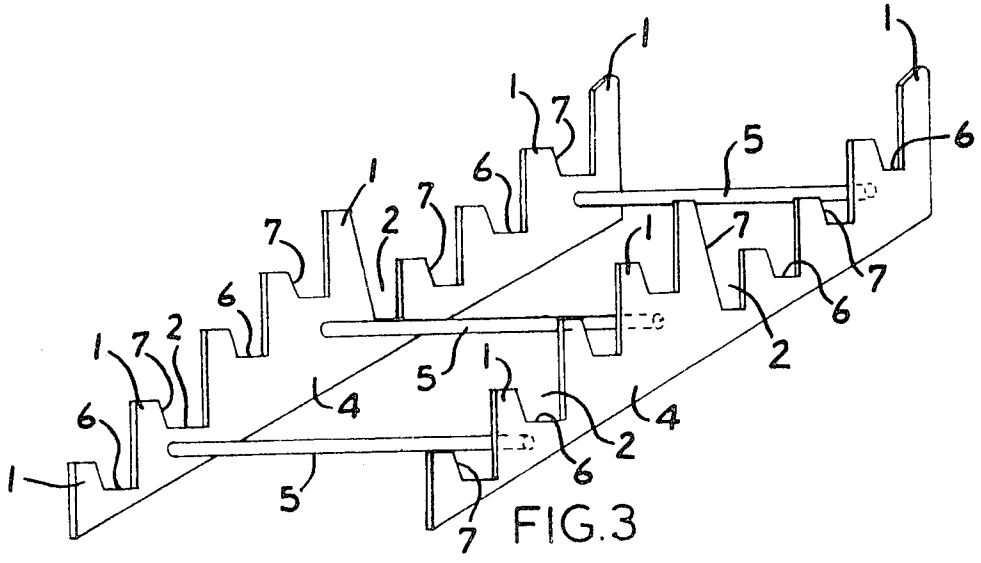


FIG.3

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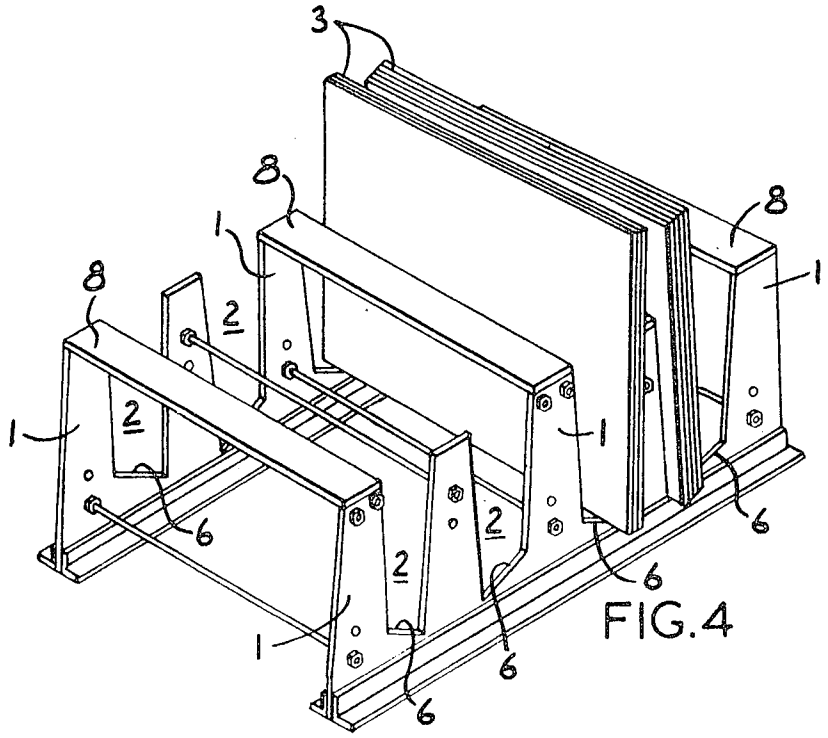


FIG.4

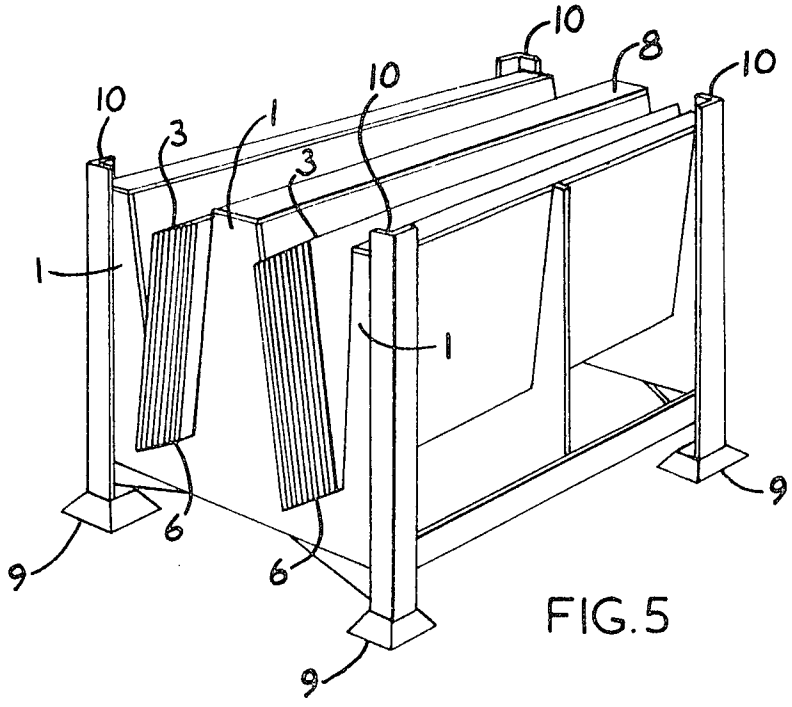


FIG.5

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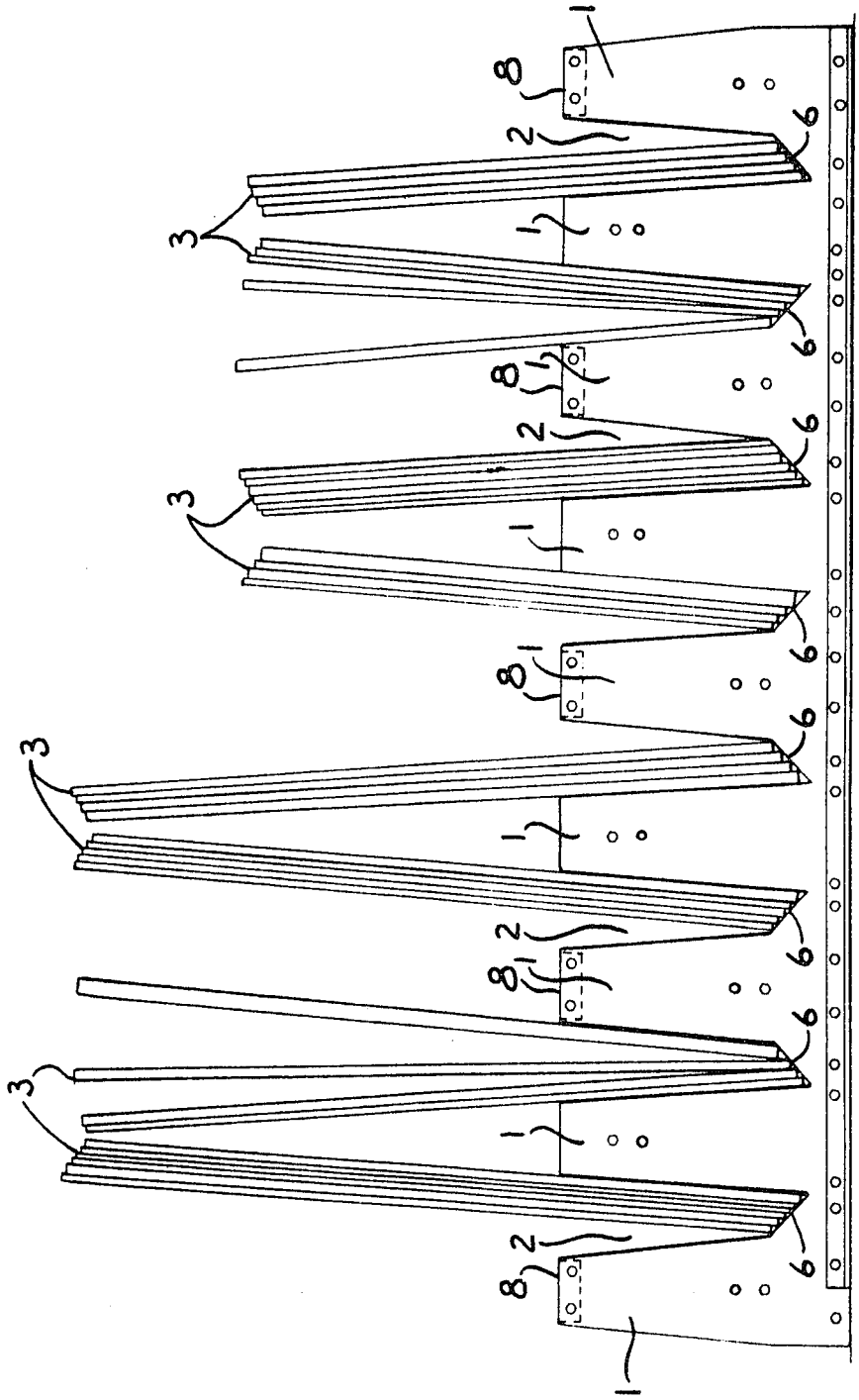


FIG.6

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PLATE STORAGE SYSTEM

This invention relates to storage systems, particularly for storing steel plates, for example, mild steel plates, boiler plates, and stainless steel plates of various thicknesses and sizes. The invention is also however suitable for storing plates made of other material, for example, nonferrous metals, glass, asbestos cement, P.V.C. and the like.

It is known to store steel plates for example, in workshops, shipbuilding yards, stockists etc., by locating them on edge on the ground between pairs of vertical supports provided on the ground, or laid flat on top of each other. The distances between such supports may be such as to accommodate a varying number of plates but a considerable number of plates may be stored face to face between two such supports; such a number of steel plates is, for convenience, hereinafter referred to as a stack.

Such known arrangements suffer from certain disadvantages. In particular the efficiency of stacking depends largely on the efficiency of the operator and if a plate is lowered between the posts incorrectly and set at too great an angle relative to the vertical support post, valuable storage space is wasted. Moreover further plates placed in the same space will conform to the angle of the preceding plate and continuous placement of plates in this manner will result in overloading of the vertical support post with the danger of the whole stack collapsing. A further serious disadvantage of this system is that plates located in the middle of such a stack cannot be easily removed, it being first necessary to remove plates stacked on top of the plate required. The disadvantages of such a system are illustrated in the accompanying FIG. 1. Thus, in FIG. 1, plates 3 are located in sections 2 between upstanding posts 1 and are supported by such posts. Various positions which can be adopted by the plates are shown in the different sections. The difficulties encountered in removing any but the uppermost plate in a section are apparent; it is clear that the stack of plates in a section cannot be manouvred by tilting as the ends of the plates would jam against the posts or against one another.

An object of the present invention is to eliminate as far as possible the difficulties and hazards associated with the handling and storage of heavy plates and to provide a compact, flexible and stable storage system adapted for the speedy and efficient movement of heavy plates.

According to the present invention a plate storage device comprises support means providing a series of upstanding tongues and intermediate storage sections in which plates may be located and supported on edge, the supporting base of the storage sections being at an angle to the horizontal. By "series of tongues" is meant at least two such tongues.

Preferably the support means comprises an elongated plate member, one longitudinal edge of which is adapted to contact the ground, and the other longitudinal edge of which is cut away to provide the upstanding tongues and intermediate storage sections.

More especially, the device of the present invention comprises at least two such support means rigidly connected together in parallel spaced relationship, for example by means of rigid bars, base plates or the like. Alternatively, such support means may be fixed in or on the ground in spaced relationship. The number of supports spaced in this manner may vary and the number will in fact depend upon the length of the plates to be stacked; for stacking relatively short plates two such spaced supports may be sufficient while for longer plates three or more spaced supports may be required to support and allow easy manipulation of the load.

The base of each intermediate storage section is located at an angle to the horizontal and such angle is hereinafter referred to as the base angle. Preferably also, the edges of the upstanding tongues against which the plates will rest when in the stacked position (stacking edges) are located at an angle to the vertical, extending away from the storage section, such angle being hereinafter referred to as the load angle. Preferably also, the edges of the upstanding tongues against which plates would not normally rest in the stacked position (non-stacking edges) are angled to the vertical in the opposite direction from the first mentioned edges.

The height of the upstanding tongues is not critical but is desirably at least 15 percent of the overall height of the plates or sheets to be stacked, preferably at least 25 percent.

The base angle size is not critical but should not be unduly large; it may for example be between 15° and 30°. The advantage of providing such a base angle is that a sheet, when lowered into the stacking position, generally by means of a crane-operated self-releasing, vertical plate lifting clamp will tend to locate itself at the bottom of the inclined base surface and thereby abut closely against the stacking edge of the tongue or against the next adjacent stacked plate as the case may be. In addition, the inclined base permits the stacked plates to be readily tilted in order to engage an intermediate plate for removal if necessary; such tilting is facilitated by the fact that there is only point contact between the supported edge of the sheet and the base of the stacking section when the sheets are tilted.

The base on which the plates are supported may be suitably toughened or provided with protective cladding if desired in order to increase the life of such base. Such protective measures are particularly desirable in systems for storing heavy plates of particularly hard material, for example, stainless steel.

The load angle of the stacking edges is again not critical and can be varied to suit various widths of plates, and quantities stacked therein.

In general the base and load angles may be varied in accordance with the thickness of plates to be stored.

The support means may provide a series of stacking sections at the same level, or alternatively, the support means may be cut away in such manner as to provide stacking sections on inclined or different levels, particularly progressively increasing in level from one section to the next adjacent section, thereby increasing even more the separation of plates stacked in one section from those stacked in the next adjacent section.

Two specific and non-limiting embodiments of the invention are described with particular reference to the accompanying FIGS. 2 and 3, in which

FIG. 2 shows a perspective view of the device according to the invention in which stacking sections are shown on a common level, and

FIG. 3 shows a perspective view of the device of the invention in which adjacent stacking sections are provided at different levels.

In FIGS. 2 and 3, upstanding tongues 1 providing intermediate storage sections 2 are formed in plate members 4 which are rigidly connected in parallel relationship by bars 5. The supporting bases 6 of storage sections 2 are angled with respect to the horizontal. Stacking edges 7 of tongues 1 are angled with respect to the vertical.

In a further embodiment of the invention the base angles of adjacent intermediate storage sections may be inclined in opposite directions. An advantage of this arrangement is that each stack of plates is caused to incline towards one adjacent stack and away from the other adjacent stack of plates. This arrangement permits easy access between the sections in which the plates incline away from one another and, for example, a walkway, such as e.g. a steel checker-plate or a timber walkway, may be installed along the tops of the tongues between such sections thereby permitting an operator to walk between the stacked plates in order to affix the crane-operated claw mechanism or other mechanism used for removing or stacking plates. Such an arrangement greatly facilitates plate stacking and unloading and improves safety.

A further modification of this last embodiment consists in the provision of a relief angle at the upper parts of the stacking edges of the tongues. This relief angle provides a certain latitude for an operator to guide plates into the storage sections, e.g., when dealing with slightly buckled plates. The size of such relief angle again is not critical, but may be varied according to the type and thickness of plates to be stored.

This embodiment also has the advantage that the loads located in adjacent sections stabilize over the intervening tongue. Preferably the base angle of the section immediately adjacent the end of the storage device is so inclined that plates stored therein incline away from the end of the device thereby reducing the load on the end of the device.

Such an embodiment is illustrated, for example, in the accompanying FIG. 4 which shows a perspective view of one such embodiment, including the walkways. In this embodiment alternate tongues 1 are provided across their tops with walkways 8. The bases 6 of sections 2 are inclined in opposite directions so that plates 3 incline away from the walkways to provide easy access along such walkways.

According to a still further embodiment the device according to the present invention may be palletized to permit the positioning of storage devices one on top of the other. In such an arrangement it is, of course, desirable that the height of the tongues should be as great or, at least, almost as great as the height of the plates to be stored therein, thereby permitting the superposing of palletized devices.

Such palletized devices may be provided, if desired, with suitable feet adapted to fit on top of a similar device, although the provision of such feet is not essential.

The base angles of alternate storage sections in the palletized arrangement may be inclined in opposite directions or in the same direction. Preferably however they are inclined in the same direction to facilitate loading and unloading by tilting the storage device to the horizontal position whereby sheets may be loaded or unloaded in the horizontal position, after which the palletized device may be tilted back to normal vertical storage position.

Where two or more pallets are located one on top of the other they may be handled, for example, by cranes, forklift trucks or the like.

A palletized device according to the invention is illustrated, for example, in FIG. 5 in which is illustrated a perspective view of a palletized storage device provided with one form of suitable feet.

In FIG. 5, the bases 6 of the storage sections are inclined in the same direction, and the height of the tongues 1 exceeds that of the stored plates 3. Walkway 8 provides access, and feet 9 permit the pallet to be located on the upper corners 10 of a similar pallet.

Palletized devices according to the invention may be used both for storing plates and, if desired, for transporting same for example on rail cars or waggons or the like. During transportation it may be desirable to hold the plates in position, for example, by means of wedges, such as timber wedges, driven into the space between the stacked plates and the non-stacking edges of the tongues.

Finally in FIG. 6 there is illustrated in a side elevation a device according to the invention in which the arrangement of supporting tongues and storage sections, as well as stored plates, is shown.

In FIG. 6, tongues 1 provide intermediate storage sections 2 whose bases 6 are inclined in opposite directions. Walkways 8 are provided across alternate tongues to provide access between the stacks 3. The point of contact between the bases 6 and the bottom ends of plates 3, permitting easy manouvring, is clearly shown.

It will be appreciated that storage devices according to the invention may be constructed of a wide variety of materials and may be adapted to store plates of a widely varying range of sizes. For example, the tongues of the storage devices may be constructed from plates made of timber, steel or any other suitable material, and may be of any convenient configuration.

What is claimed is:

1. Plate storage device comprising support means providing a series of upstanding tongues and intermediate storage sections in which plates may be located and supported on edge, the supporting base of the storage sections being at an angle to the horizontal, and walkways installed along the tops of the tongues between the storage sections.

2. Plate storage device according to claim 1 wherein the support means comprise at least one elongated plate member, one longitudinal edge of which is adapted to contact the ground, and the other longitudinal edge of which is cut away to provide the upstanding tongues and intermediate storage sections.

3. Plate storage device according to claim 2 wherein at least two support means are rigidly connected together in substantially parallel spaced relationship.

4. Plate storage device according to claim 1 wherein the stacking edge of the upstanding tongues is located at an angle to the vertical extending away from the storage section.

5. Plate storage device according to claim 1 wherein the non-stacking edges are angled to the vertical in the opposite direction from the angle of the stacking edges.

6. Plate storage device according to claim 1 wherein the height of the upstanding tongues is at least 15 percent of the overall height of the plates to be stacked.

7. Plate storage device according to claim 6 wherein the height of the upstanding tongues is at least 25 percent of the overall height of the plates to be stacked.

8. Plate storage device according to claim 1 wherein the base angle is between 15° and 30° to the horizontal.

9. Plate storage device according to claim 1 wherein the base angles of adjacent storage sections are inclined in opposite directions.

10. Plate storage device according to claim 1 wherein the upper parts of the stacking edges of the tongues are provided with a relief angle.

11. Plate storage device according to claim 1 which is palletized to permit the positioning of one device on top of another.

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