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(71) Applicant *(for all designated States except US)*: RACKLINE LIMITED [GB/GB]; River Dane Road, Daneside Business Park, Congleton, Cheshire CW12 1UN (GB).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)* : HORAN, Brian, Anthony [GB/GB]; Rackline Limited, River Dane Road, Daneside Business Park, Congleton, Cheshire CW12 1UN (GB).

(74) Agent: ALLMAN, Peter, John; Marks & Clerk, Suite 301, Sunlight House, Quay Street, Manchester M3 3JY (GB).

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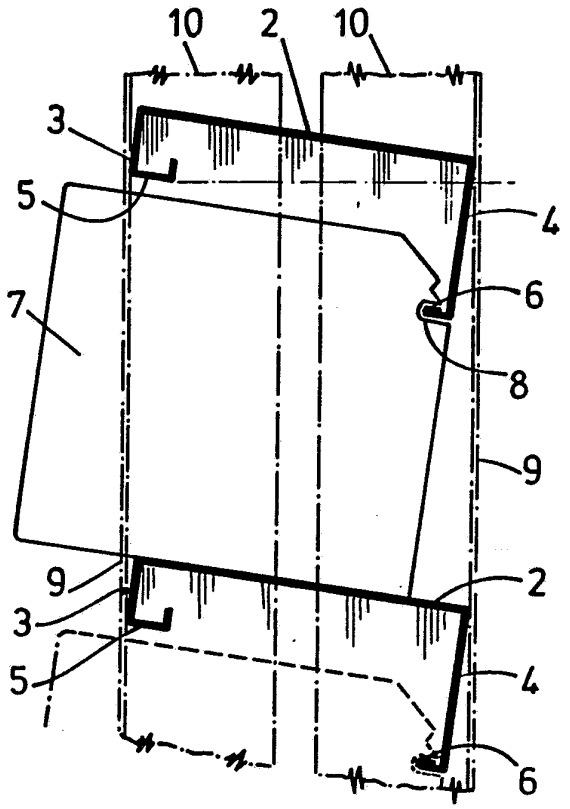
(54) Title: A STORAGE SHELF

(57) Abstract

A storage shelf for supporting thin, flat articles such as data cartridges (7) through an edge of which a slot (8) extends. The storage shelf provides a support surface (2) upon which an edge of an article may be placed with the article extending vertically upwards from that edge in an orientation such that the slot (8) opens towards the back of the shelf. An elongate member (6) extends above and parallel to the support surface (2) such that it is received in the slot (8) of an article placed on the support surface. Thus, the article is supported against falling sideways. The shelf may be supported by two end support structures (1) each of which is provided with a pair of spaced apart mounting formations engaging a respective end of the shelf. The mounting formation (12) are arranged at the same vertical height and the shelf is constructed from a sheet material defining the support surface and a depending flange (13) at each end. Each of the flanges defines a slot (14) adjacent the back edge of the shelf and opens to the underside of the shelf to receive the rearmost one of the mounting formations so that the shelf slopes rearwardly.



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A STORAGE SHELF

The present invention relates to a storage shelf for supporting a plurality of thin, flat articles having a slotted edge. Particularly, but not exclusively, the system is designed for the storage of standard 3480 data cartridges which are widely used for the storage of computer data.

There exist many different storage systems designed for the storage of a vast range of articles. Generally, all storage systems are designed with a common aim, that is to optimise available storage space at minimum cost whilst allowing ready access to the articles stored.

One known storage rack system designed for the storage of 3480 data cartridges is based on a standard horizontal shelf system which serves as a support structure for an array of storage units. Each storage unit is designed to hold up to 20 cartridges with each cartridge standing on one of its edges. Each of the individual cartridges is supported between a pair of support webs which are moulded integrally with the storage unit. The webs prevent individual cartridges falling over. In addition, one of each pair of support webs is formed with a resilient spring clip which engages a cartridge inserted between the webs. This gives extra support to the cartridge and helps to prevent it being accidentally displaced, for example when a neighbour is removed.

Such systems function satisfactorily in that the individual cartridges are well supported and readily accessible. However, the system does suffer from two important disadvantages. Firstly, the individual storage units have a relatively intricate structure and are generally manufactured as unitary plastic mouldings. The necessary detail of the units results in them being relatively expensive to produce. Secondly, a significant portion of the available shelving/storage space is wasted due to the construction of the storage units. The support webs and resilient clips which support the cartridges space the cartridges apart. A single space between two neighbouring cartridges may appear insignificantly small, but the cumulative effect along a row of stored cartridges can be substantial.

Further potential storage space is lost to the space occupied by the external walls of each individual storage unit. Again, when several such units are positioned adjacent each other on a shelf, the cumulative lost space can be significant.

It is an object of the present invention to provide a storage system that obviates or mitigates the above disadvantages.

According to the present invention there is provided a storage shelf for supporting a plurality of thin, flat articles through an edge of which a slot extends, the storage shelf comprising a support surface upon which an edge of an article may be placed with the article extending vertically upwards from that edge in an orientation such that the slot opens towards the back of the shelf, and an elongate member extending above and parallel to the support surface such that it is received in the slot of an article placed in the said orientation.

The term "thin, flat articles" is intended to encompass any article that may be supported upon an edge, but which when so supported is either unstable or easily destabilised. For instance, this includes articles such as data cartridges, which may be supported on an edge but which are easily knocked over if disturbed. The term is also intended to cover plate-like articles, eg disc sleeves, which will not rest stably on an edge, whether disturbed or not, unless further support is provided.

Preferably the support surface is provided by a single member, although alternatively it may be provided by a plurality of parallel members.

Preferably the said elongate member is a thin web, but may be for example a small diameter rod. Preferably the elongate member is supported directly by a member defining the support surface. The elongate member may be supported by the support surface above the level of the support surface to engage an article placed in said orientation on that support surface. Alternatively the elongate member may be supported by the support surface below the level of the support surface to engage an article placed on a second support surface below it.

In a preferred embodiment of the invention in which the elongate member is integral with the support surface, one longitudinal

edge of the support surface which is to be the back edge is provided with a depending flange, the edge of which is folded towards the front edge of the shelf forming a lip which serves as the said elongate member. In this embodiment the elongate member engages an article placed on an adjacent lower level support surface. The lip which forms the elongate member may be provided with a resilient plastics covering for a more secure engagement with the said articles. The plastics covering may be in the form of a sleeve that is a tight fit around the lip.

It is desirable that the shelf is arranged such that the support surface slopes backwards to help prevent stored items being accidentally dislodged from the shelf. In particular, in the present system such a slope tends to help maintain stored items in engagement with the elongate member.

Accordingly, it is a further object of the present invention to provide a system for mounting shelves such that the shelf support surfaces slope backwards.

According to the present invention there is provided a shelf system comprising two end support structures for supporting a shelf therebetween, each of said end support structures being provided with a pair of spaced apart mounting formations adapted to engage a respective end of said shelf, and each mounting formation being arranged at the same vertical height, wherein the shelf is constructed from a sheet material defining a support surface and a depending flange at each end, each of said flanges defining a slot adjacent the back edge of the shelf and opening to the underside of the shelf to receive the rearmost one of said mounting formations.

The arrangement is such that when the shelf is mounted between the said end support structures by means of the said mounting formations, the back edge of the shelf will drop to a lower level than the front edge as the respective back mounting formations are received within the said slots in the end flanges of the shelf. Thus a backward slope is introduced into the support surface of the shelf.

One advantage offered by this system is that it obviates the need to introduce a height differential between the mounting formations of each pair and to ensure that the same differential is introduced into each pair, in order to obtain the desired slope. Thus,

the mounting procedure for mounting a sloping shelf is much simplified by the present invention.

Preferably the said mounting formations are hooked members. The mounting formations may be removably attachable to the end support structures. All of the mounting formations may be identical.

In one embodiment of the invention, the shelf end flanges may each define two slots opening to the underside of the shelf, one slot being adjacent one edge of the shelf and the other being adjacent the other edge of the shelf, the separation of the slots being greater than the separation of the mounting formations of each pair, and the two slots being equally spaced from the respective shelf edge.

In this embodiment either edge of the shelf could form the back edge of the shelf. Only one of each pair of end slots will engage a mounting formation at any time, thus ensuring that the slot near the edge that is to be the back edge engages a mounting formation to produce the desired slope.

This embodiment further simplifies the shelf mounting procedure as it avoids the need to mount the shelf in one particular orientation.

A specific embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a front view of a storage system embodying storage shelves according to the present invention;

Fig. 2 is a sectioned perspective view of part of the storage system of Fig. 1;

Fig. 3 is an end elevation of part of the storage system of Fig. 1 showing a 3480 data cartridge in position;

Fig. 4 is a perspective view of components of the system of Fig. 1 adapted to support the shelves in accordance with the present invention;

Fig. 5 is a perspective view illustrating one end of a shelf of Fig. 1; and

Fig. 6 is an end elevation of part of the system of Fig. 1 illustrating the manner in which the shelves are mounted.

Referring to the drawings, the illustrated embodiment of the invention is a system adapted for the storage of 3480 data cartridges. However, it will be appreciated that the invention could be embodied

in a system adapted for storage of a variety of articles which have a suitable configuration.

Referring to Figure 1, the storage system comprises an arrangement of equally spaced parallel shelf members supported between vertical support structures 1. The shelf members are disposed parallel to a horizontal line between the support structures 1.

Referring to Figures 1 and 2, the shelf members are constructed from sheet metal and comprise a flat support surface 2 with a perpendicular depending flange, 3 and 4, at each edge. The flange 3 depends from the front edge of the shelf member and is bent reawardly to define an abutment surface 5. The flange 4, at the back edge of the shelf member, depends further than the flange 3. The edge of the flange 4 is bent towards the front of the shelf member defining a lip 6. The edge of the lip 6 is folded back upon itself to increase its thickness.

From Figure 2 it can be seen that the shelf members are mounted between the support structures 1 such that the support surface 2 of each shelf member is inclined at an angle to the horizontal so that it slopes from the front to the back, the support surfaces 2 of adjacent shelf members being parallel to each other. The shelf members may be mounted in any suitable manner to obtain the desired slope. For instance, each end of a shelf member may be supported by a pair of hooks provided on the support structures 1, one hook of each pair supporting the front and back edges of the shelf member respectively. The hooks supporting the front edge of the shelf member could then be arranged on the support structure 1 such that they are higher than the hooks supporting the back edge of the shelf member.

Figure 3 is an end elevation of the part of the shelf system shown in Figure 2 but showing a 3480 data cartridge 7 in the position in which it is stored. The data cartridge 7 has a generally square profile with four perpendicular, flat, relatively narrow edges. One of the cartridge edges defines a transverse slot 8. The cartridge is positioned between two adjacent shelf members, such that one edge of the cartridge, its bottom edge, is supported upon the support surface 2 of the lower of the pair of shelf members. The slot 8 receives the lip 6 of the higher of the pair of shelf members. Engagement of the support lip 6 within the cartridge slot 8 gives further support to the

cartridge 7 preventing it from being unbalanced and falling over if disturbed, so long as the lip 6 remains in engagement with the slot 8. The slope of the support surface 2 upon which the cartridge 7 rests helps to maintain the cartridge 7 in engagement with the lip 6 as the cartridge tends to slide to the back edge of the shelf. The abutment surface 5 of the upper shelf member restricts vertical movement of the cartridge between the shelf members which may result in disengagement of the cartridge from the lip 6. In this manner individual cartridges 7 are supported against the likelihood of accidentally falling over or becoming dislodged from the shelf as a result of any disturbance, for instance due to the removal of a neighbouring cartridge. The manner in which the cartridges are supported allows adjacent cartridges to be stored directly next to each other, ie in direct contact with each other. Thus the support means does not take up any of the available shelf space which could be used to store cartridges. The full length of the shelf may be used to store cartridges, there being no wasted space between the individual cartridges. For example, the described storage shelf system can store approximately 25% more cartridges in a given space than the prior art system described above.

The manner in which the cartridges 7 are supported allows them to be slid along the shelf in either direction, either individually or in groups, to create room for a new cartridge to be inserted or a cartridge to be removed. This has advantages over the prior art system described above in that a new cartridge can be introduced on to a shelf in between previously neighbouring cartridges whilst preserving the order in which all the cartridges on the shelf are stored, without first having to individually reposition each cartridge as would be necessary with the prior art system described above.

The lip 6 of each shelf member may, in addition to, or as an alternative to, being folded back upon itself, be provided with a plastics covering to increase its thickness and improve its engagement with the slot 8 in the cartridges 7. The covering could for instance be in the form of a length of plastics sleeve that is simply slid onto the lip 6 and is a tight fit thereon.

In the embodiment of the invention described above, each actual "shelf" can be considered as comprising a support surface 2 and a

support lip 6, which are provided by two different shelf members. With this arrangement a pair of shelf members are required to support a single cartridge. As one possible alternative arrangement, the back flange 4 of each shelf member could extend upwards instead of downwards from the shelf member. The support lip 6 defined by the upwardly extending flange 4 could then engage a cartridge resting on the support surface 2 of that shelf member. Thus, only a single shelf member would be required to support a single row of cartridges.

Alternatively, a separate support member may be provided to engage the cartridge slots, not being integral with the shelf members. For example, a small diameter rod could be supported between the two support structures 1, extending parallel to and above suitable support surfaces to engage cartridges resting thereon.

In the arrangement described above the shelves are orientated such that the support surface 2 of each shelf slopes backwards. Although this arrangement is not essential, as discussed above it does offer advantages over mounting the shelves such that the support surfaces are horizontal. The advantages to be gained by mounting shelves with a slope are not limited to shelves according to the present invention. The backward sloping of the shelves of any shelving system would reduce the likelihood of any item stored on the shelf accidentally falling from the shelf should the shelf or the article be disturbed. Accordingly, a second aspect of the present invention relates to the mounting of shelves so as to introduce a slope in the support surface of the shelf.

Referring to the drawings, the end support structures 1 comprise a front and back vertical support member 9 (shown in detail in Fig. 4) each of which has a "T"-shaped cross section defining a portion 10 which defines generally oval holes 11. Each pair of support members 9 is fixed to main support members which support them vertically with the desired spatial separation and such that the portion 10 lies laterally to the shelf ends. The spatial separation of the front and back members 9 is determined by the width of the shelves.

Hook members 11, of standard design, are provided which are removably insertable into the slots 11 in the vertical members 9 such that they can be installed at any required position. In use, the arrangement is such that each shelf member is supported between the

two end support structures 2 by means of the engagement of a pair of hook members 12 with each end of the shelf, each one of each pair of hook members being supported in the described manner by the front and back vertical support members 9 respectively. The hook members 12 are arranged on the support structures such that they are all at the same vertical height.

Each end of a shelf member, as shown in Fig. 5, is provided with a depending perpendicular end flange 13 which defines a slot 14 adjacent the back edge of the shelf and opening to the underside of the shelf. The slot 14 is dimensioned to receive the hook member 10 supported by the rear vertical support member 9. As shown in Figure 6, the arrangement is such that when the shelf is mounted between the support structures 2 each pair of hook members 12 engages an end of the shelf such that the front hook member of each pair locates under the front edge of the flange 12 and the rear hook member of each pair is received within the slot 13 defined by the flange 12. As a result of this the back edge of the shelf drops to a lower level than the front edge of the shelf, introducing the desired slope into the support surface 2.

One of the advantages offered by this arrangement is that the hook members 12 of each pair may be positioned on a horizontal line, the desired slope being automatically produced when the shelves are mounted. Thus there is no need to introduce a carefully measured height differential between the front and back hook members 12, and to ensure that height differential is the same for each pair of hook members supporting each end of the shelf, and that corresponding pairs of hook members supporting adjacent shelves have the same height difference.

It will be appreciated that the described arrangement may be applied to a variety of shelf formats and is not limited to the shelves shown in the Figures and described above.

The shelving system described is a system designed for the storage of 3480 data cartridges. As mentioned above, however, it will be appreciated that the underlying concept of the system may be applied to systems designed for storage of other articles which are to be stored on an edge thereof and which define a slot in a substantially vertical edge thereof. The dimensions and relative

angular orientations of each component of the shelf, i.e. the support surface 2, the flanges 3 and 4 the abutment surface 5 and the lip 6, can be adapted to correspond to the dimensions and configuration of the article to be stored. Furthermore, a system according to the present invention could be used to store articles which do not normally define the required slot but which can easily be provided with a slot in order to gain the benefits of a storage shelf system according to the present invention. For example , disc sleeves or similar articles could readily be provided with the necessary slot so that they would be made compatible with a suitably dimensioned shelf system according to the present invention.

CLAIMS

1. A storage shelf for supporting a plurality of thin, flat articles through an edge of which a slot extends, the storage shelf comprising a support surface upon which an edge of an article may be placed with the article extending vertically upwards from that edge in an orientation such that the slot opens towards the back of the shelf, and an elongate member extending above and parallel to the support surface such that it is received in the slot of an article placed in the said orientation.

2. A storage shelf as claimed in claim 1, wherein the support surface is provided by a single member.

3. A storage shelf as claimed in claim 1, wherein the support surface is provided by a plurality of parallel members.

4. A storage shelf as claimed in any one of claims 1 to 3, wherein the said elongate member comprises a thin web.

5. A storage shelf as claimed in any one of claims 1 to 3, wherein the said elongate member comprises a small diameter rod.

6. A storage shelf as claimed in any preceding claim, wherein the said elongate member is supported directly by a member defining the said support surface.

7. A storage shelf as claimed in claim 6, wherein the said elongate member is supported by the said support surface above the level of the said support surface to engage an article placed in said orientation on that support surface.

8. A storage shelf as claimed in claim 6, wherein the said elongate member is supported by the said support surface below the level of the said support surface to engage an article placed on a second support surface below it.

9. A storage shelf as claimed in claim 8, wherein one longitudinal edge of the said support surface which is to be the back edge is provided with a depending flange, the edge of which is folded towards the front edge of the shelf defining a lip which forms the said elongate member.

10. A storage shelf as claimed in claim 9, wherein the said lip is provided with a resilient plastics covering for a more secure engagement with the said articles.

11. A storage shelf as claimed in claim 10, wherein the plastics covering comprises a sleeve that is a tight fit around the lip.

12. A storage shelf as claimed in any preceding claim, wherein the support surface is inclined at an angle to the horizontal such that it slopes from its front longitudinal edge to its back longitudinal edge.

13. A shelf system comprising two end support structures for supporting a shelf therebetween, each of said end support structures being provided with a pair of spaced apart mounting formations adapted to engage a respective end of said shelf, and each mounting formation being arranged at the same vertical height, wherein the shelf is constructed from a sheet material defining a support surface and a depending flange at each end, each of said flanges defining a slot adjacent the back edge of the shelf and opening to the underside of the shelf to receive the rearmost one of said mounting formations.

14. A shelf system as claimed in claim 13, wherein the said mounting formations comprise hooked members.

15. A shelf system as claimed in either of claims 13 and 14, wherein the said mounting formations are removably attachable to the said end support structures.

16. A shelf system as claimed in any one of claims 13 to 15, wherein all of the said mounting formations are identical.

17. A shelf system as claimed in any one of claims 13 to 16 wherein each of said depending flanges defines two slots opening to the underside of the shelf, one slot being adjacent one edge of the shelf and the other being adjacent the other edge of the shelf, the separation of the slots being greater than the separation of the mounting formations of each pair, and the two slots being equally spaced from the respective shelf edge.

18. A storage shelf substantially as hereinbefore described with reference to the accompanying drawings.

19. A shelf system substantially as hereinbefore described with reference to the accompanying drawings.

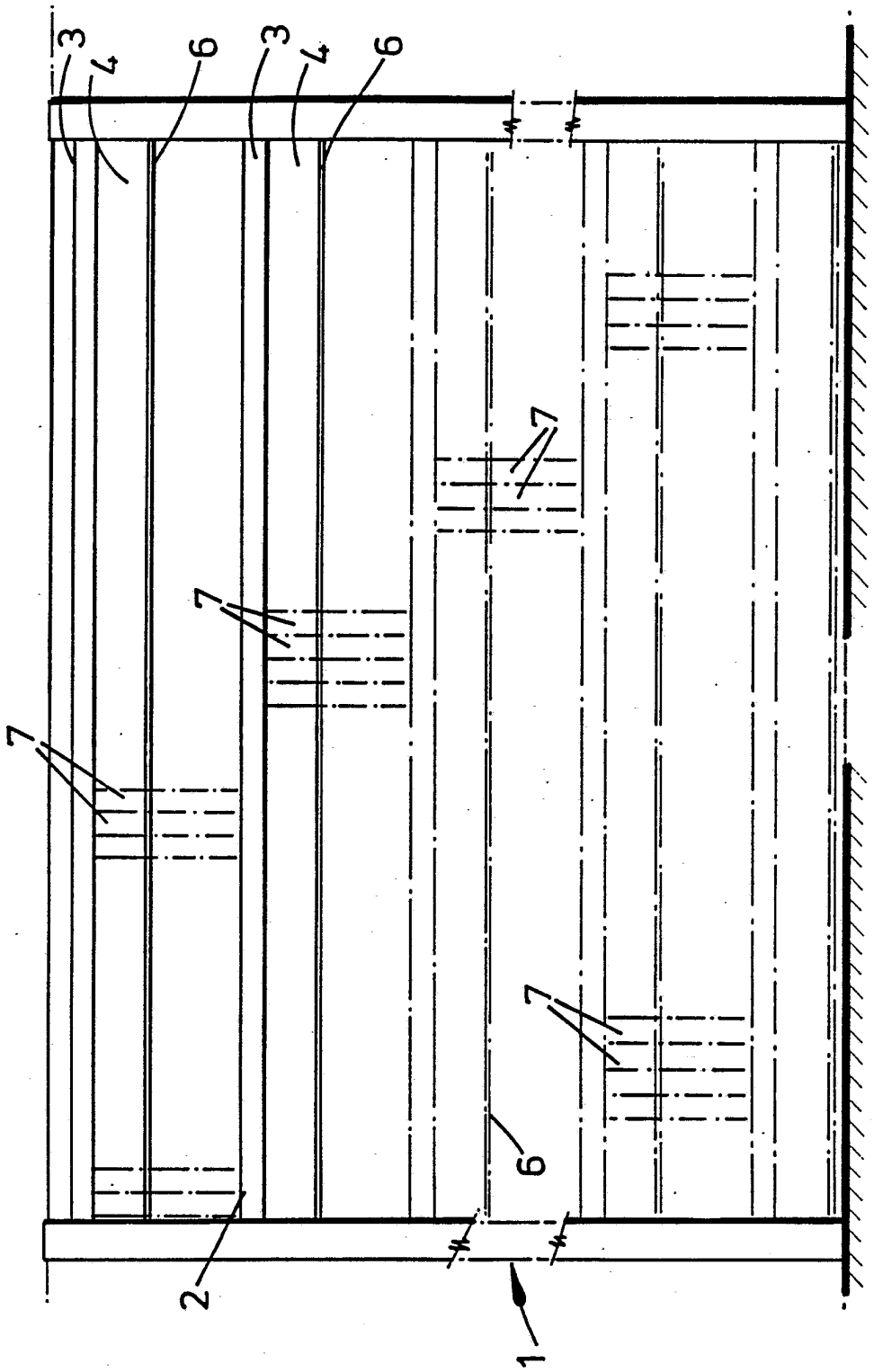

FIG.1

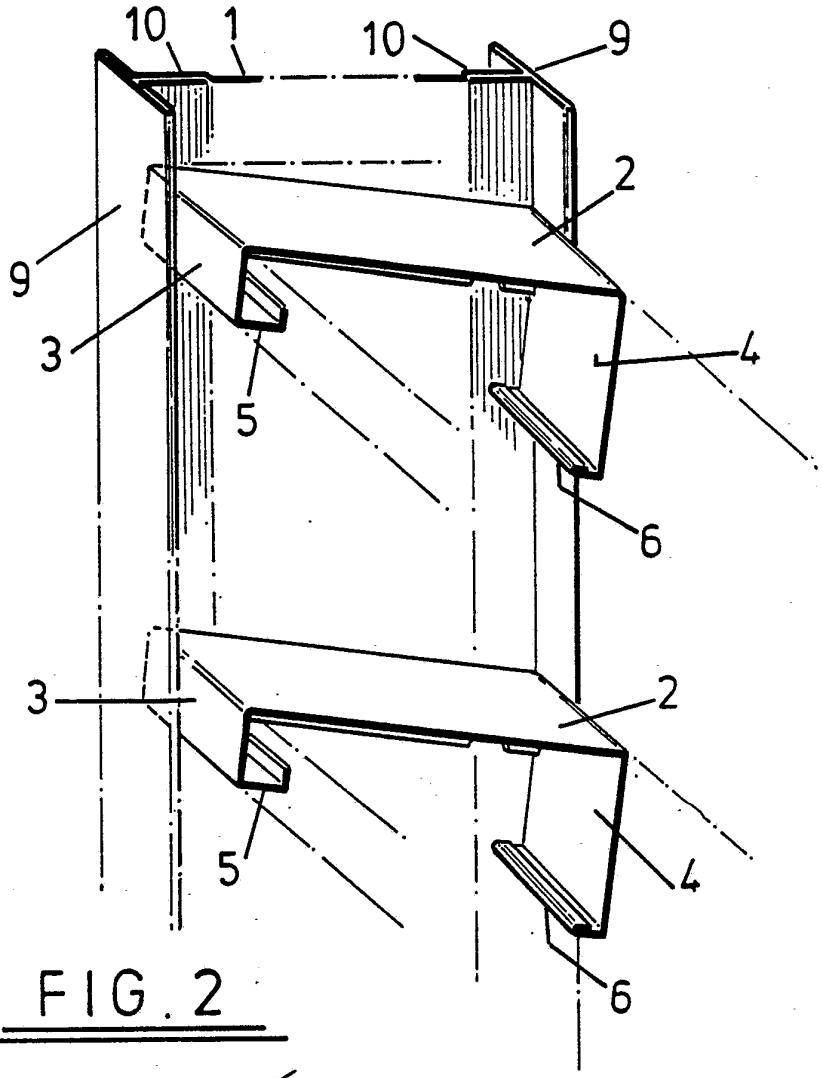

FIG. 2

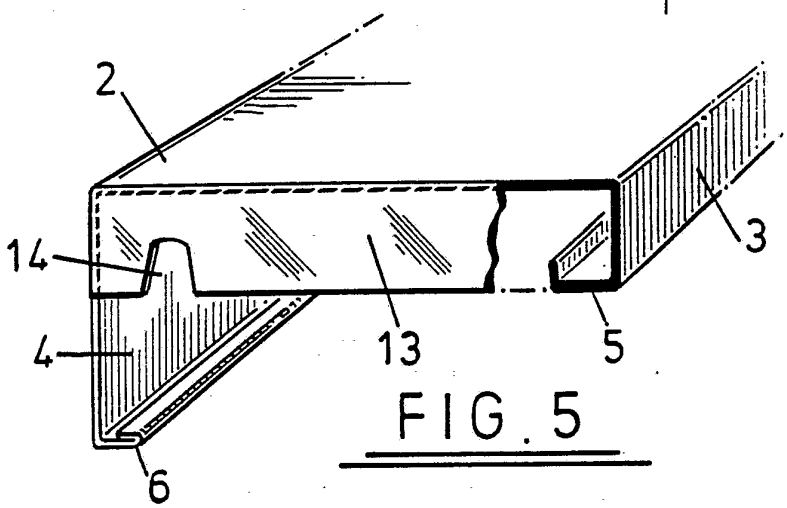

FIG. 5

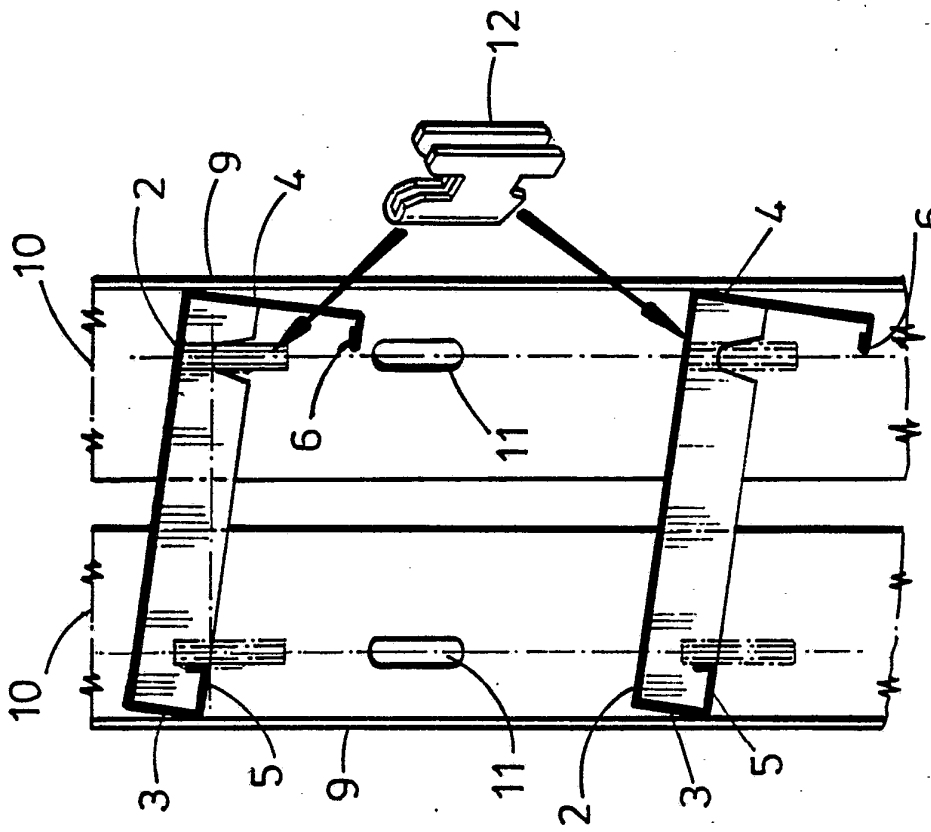

FIG. 6

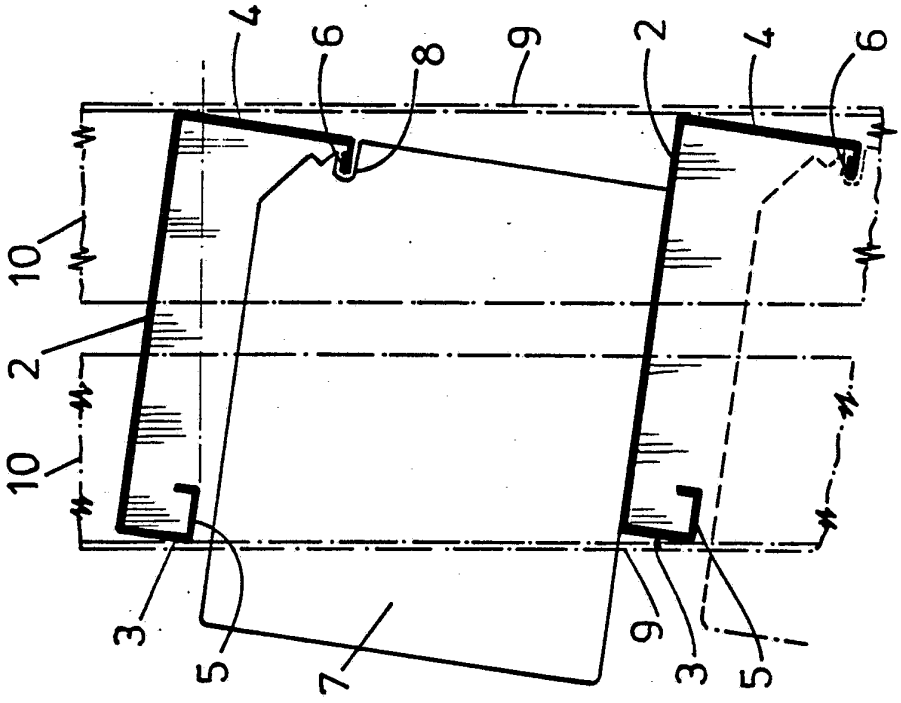

FIG. 3

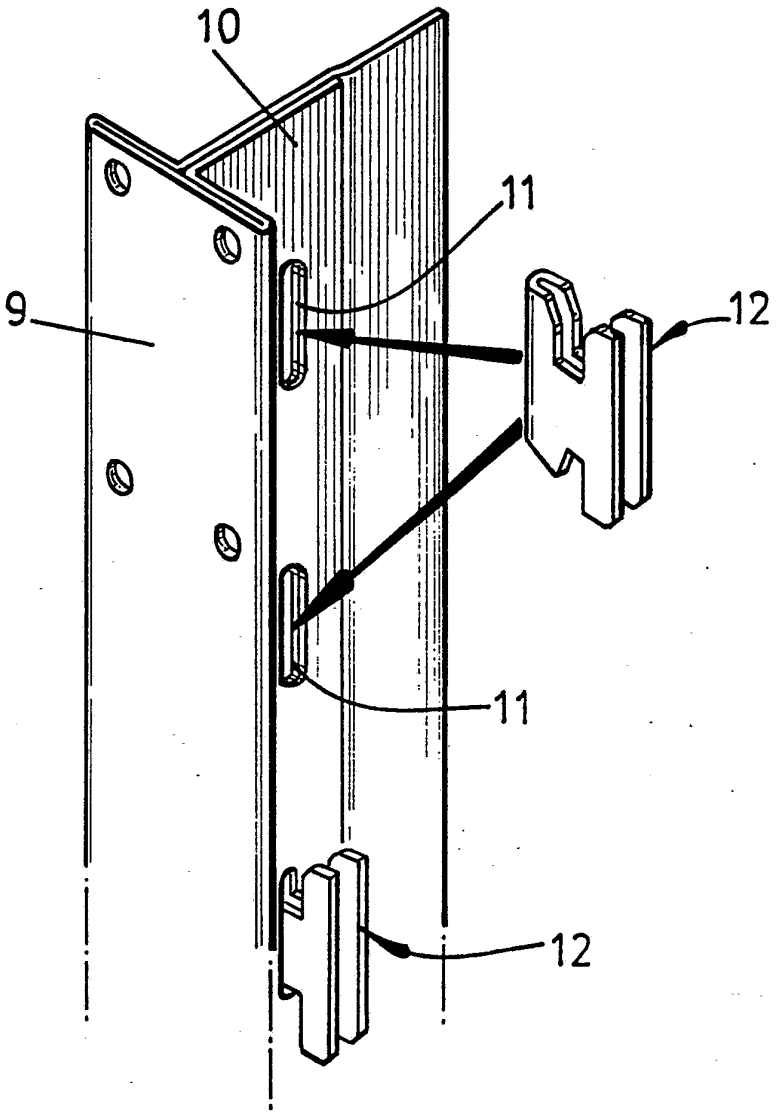

FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 92/01732

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[5]: A 47 B 81/06,A 47 F 7/03,G 11 B 23/02

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[5]	A 47 B 57/00,63/00,65/00,81/00,96/00;A 47 F 7/00; B 65 D 85/00;G 11 B 23/00,33/00

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	FR, A, 2 381 492 (PREVOST) 22 September 1978 (22.09.78), see totality; especially fig. 1,3,4.	13-16
Y	--	17
Y	CH, A5, 610 505 (ANDRES) 30 April 1979 (30.04.79), see fig. 4.	17
	--	
A	US, A, 4\720 153 (HATCHER) 19 January 1988 (19.01.88), see column 3, line 49 - column 4, line 27; column 6, lines 10-27; fig. 2,4,5,6.	1,2, 12,13
	--	
A	DE, A1, 2 611 076 (EICHMÜLLER GMBH) 29 September 1977 (29.09.77),	1,2,5

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
18 November 1992	01 DEC 1992
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	VELINSKY-HUBER e.h.

International Application No PCT/GB 92/01732

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages	Relevant to Claim No.
	see page 12, lines 1-5; fig. 1. --	
A	US, A, 4 793 665 (KING) 27 December 1988 (27.12.88), see column 2, lines 45-61; column 3, lines 16-22; fig. 1,2. --	1,2, 13-15
A	US, A, 4 715 669 (BAILLIE et al.) 29 December 1987 (29.12.87), see column 1, lines 60-66; column 2, lines 1-16; column 3, line 53 - column 4, line 7; fig. 2,4,5. ----	1,2,9

ANHANG

zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

ANNEX

to the International Search Report to the International Patent Application No.

ANNEXE

au rapport de recherche international relatif à la demande de brevet international n°

PCT/GB 92/01732 SAE 65415

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The Office is in no way liable for these particulars which are given merely for the purpose of information.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche international visée ci-dessus. Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsibilité de l'Office.

Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
FR A 2381492		FR A1 2381492 FR B3 2381492	22-09-78 19-10-79
CH A 610505	30-04-79	keine - none - rien	
US A 4720153	19-01-88	CA A1 1302350	02-06-92
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US A 4715669	29-12-87	keine - none - rien	