

Sept. 9, 1969

E. SCHUMANN ET AL

3,465,897

STORAGE ARRANGEMENT

Filed July 25, 1966

2 Sheets-Sheet 1

FIG. 1

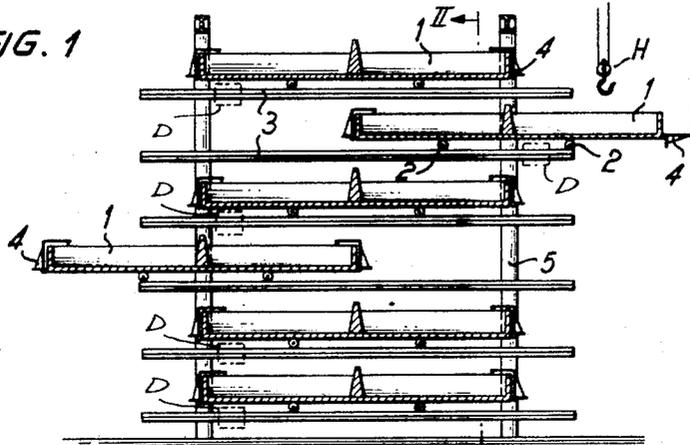


FIG. 3

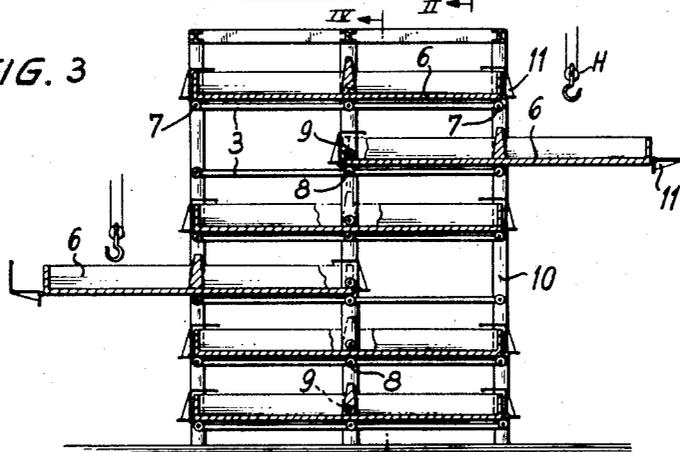
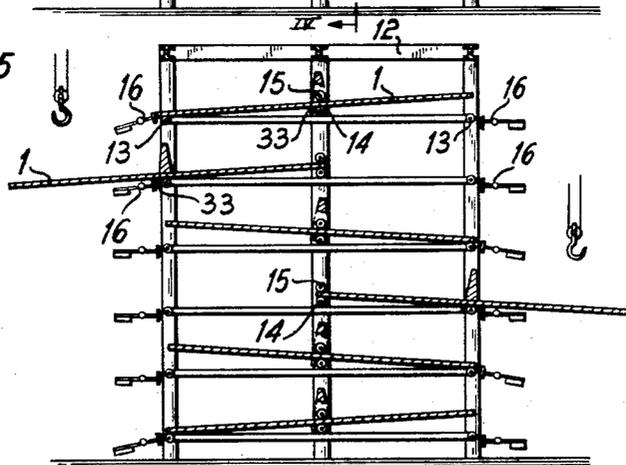


FIG. 5



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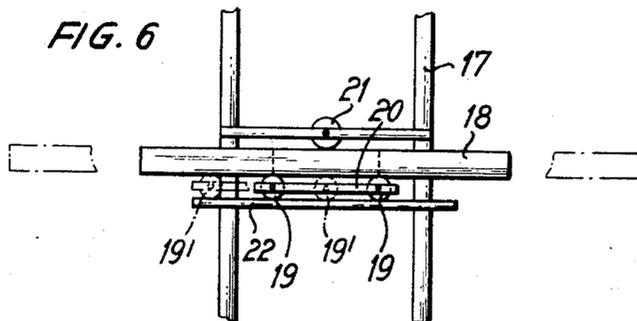
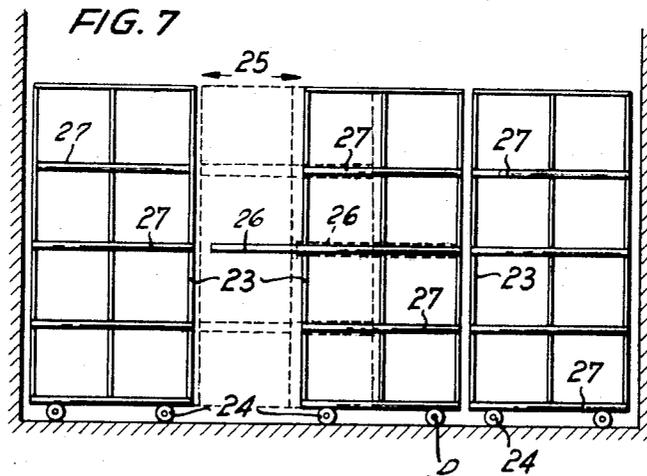
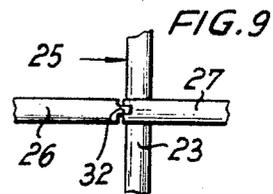
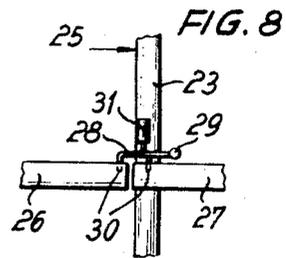
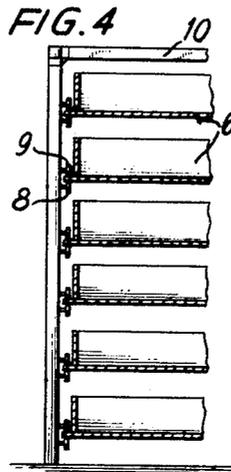
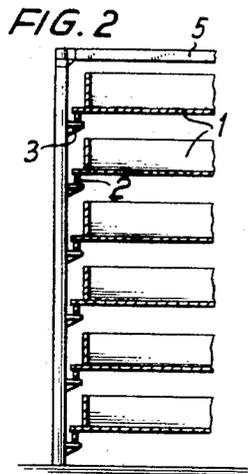
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Filed July 25, 1966

2 Sheets-Sheet 2



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3,465,897

**STORAGE ARRANGEMENT**

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 Filed July 25, 1966, Ser. No. 567,704  
 Claims priority, application Germany, July 29, 1965, S 98,519; Sept. 1, 1965, S 99,184  
 Int. Cl. A47f 5/00

U.S. Cl. 211-151

4 Claims

**ABSTRACT OF THE DISCLOSURE**

In a storage arrangement, a rack having spaced opposite sides supports a plurality of vertically superposed pallets, each of which is movable independently of the others between a central position in which it is located wholly within the confines of the rack, and two end positions in each of which it partially extends beyond one of the opposite sides of the rack. A guide arrangement guides the pallets for movement, and drive means provides the motive power for their movements.

The present invention relates to a storage arrangement. More specifically, the invention relates to a storage arrangement in which a column comprising a plurality of superimposed article-supporting members is arranged and carried within a rack or frame.

Stocking of equipment, or of components of such equipment is becoming ever more complicated because of the proliferation of items of any given type, and also because of the many modifications in which such items are usually available. Since these items, or the components therefor, must not only be on hand but must also be quickly, easily and reliably accessible, storage arrangements provided for this purpose must naturally be able to fulfill all of these requirements. This is particularly true in the storage of heavy or bulky items and it is known from the prior art to provide, for the storage of such items, storage racks which accommodate one or more stacks of vertically superimposed "drawers" in which the respective items are kept. Since items of such type cannot generally be moved by hand, but must be accessible for movement by such mechanical means as cranes or the like, it is necessary that each of the drawers be exposed outside the respective rack so as to be accessible to the mechanical means in question. In the prior-art constructions this has been accomplished by providing rails for each of the drawers; however, these rails of necessity are located not only within the confines of the rack for the drawer to move upon, but must also extend outside of the rack by a distance at least equivalent to the depth of the respective drawer, so that the drawer can be moved far enough out of the rack to be completely exposed. Obviously, this is highly disadvantageous not only because of the additional material involved in constructing such arrangements, but also and primarily because such outwardly projecting rails naturally take up a considerable amount of space which is thus no longer available for storage purposes. Furthermore, projecting rails of this type make it more difficult to gain access to the racks.

All of these points clearly indicate that presently known arrangements of the type in question are not satisfactory, wherefore it is a general object of the present invention to provide a storage arrangement which is not subject to the disadvantages outlined above.

A more specific object of the invention is to provide such a storage arrangement in which the hitherto necessary projecting rails are eliminated.

A further object of the invention is to provide such a

storage arrangement which is simple to construct and to operate.

A concomitant object of the invention is to provide a storage arrangement of the type outlined above which requires significantly less space than those arrangements which are known to us from the prior art.

Yet a further object of the invention is to provide a storage arrangement, the contents of whose article-supporting members are readily accessible exteriorly of the storage rack for manual and for power-assisted manipulation.

In accordance with one feature of our invention we provide in such a storage arrangement the combination of rack means having a pair of spaced opposed sides, and at least one column of superimposed pallet means carried by the rack means. Each of these pallet means is independently and individually movable between a central position in which it is located wholly within the confines of the rack means, and two end positions in each of which a portion corresponding to at least half of the respective pallet means extends beyond a respective side of the rack means while the remainder of the pallet means stays within the confines of the rack means and provides a counterweight to the outwardly extending portion. We further provide a guide arrangement for each of the pallet means for the purpose of determining the direction of movement of the respective pallet means with reference to the rack means.

Although the article-supporting members have heretofore been described as pallet means, and although the term "pallet means" or "pallet" will be used throughout this specification and the appended claims for reasons of simplicity, it should be understood that it is intended to encompass not only pallets but also platforms, dollies, drawers, trays and the like. By so constructing our arrangement that the respective pallet can be moved outwardly beyond one or the opposed other side of the rack, we achieve our aim of making the contents of the pallet completely accessible while it is yet necessary only to shift each pallet by a distance sufficient to let substantially half of it project beyond one or the other side of the rack. This eliminates the need for the projecting guide rails, and at the same time that portion of the pallet which remains located within the confines of the rack serves to counterbalance the projecting portion.

In accordance with a further feature of our invention we provide rails on the rack, and we provide on each of these rails three rollers which are spaced from one another intermediate the opposite sides of the rack and carry the pallet thereon. We have found it to be advantageous to provide each pallet with two rails and to associate three rollers with each of the rails in such a manner that the pallet is supported in any given portion thereof by two rollers of each set. Counter rolls may also be provided, either a single one for the entire pallet or one in association with each set of three rollers. These counter rolls will of course engage the pallet from a side opposite the one which is engaged by the rollers, and they will thus serve to maintain the pallet between themselves and the rollers against unwanted displacement, e.g. tilting.

A further feature of the invention provides that the rollers of each set be spaced equidistantly from one another in direction to their respective axes. Obviously, the axes of all rollers in a set will be parallel. The center rollers of both sets thusly will be located in a common horizontal plane which is located higher than the plane common to the remaining four rollers, so that the pallet will be inclined to the horizontal both in its center position and in either one of its end positions in which at least one half of the pallet extends beyond one or the

other side of the rack. This greatly facilitates withdrawing of the pallet from the interior of the rack to one or the other of the end positions. Naturally, suitable moving means can be provided for accomplishing such withdrawal, for instance a motor may be used in conjunction with suitable transmission means, such as gears, a rope, or a similar expedient for transmitting movement to the respective pallet.

Particularly where very large storage arrangements for very cumbersome or very heavy articles are provided, it can be advantageous to provide one or both of the pallet ends with platforms, gangplanks or a similar expedient on which an operator can either temporarily deposit material or on which he can even stand while handling the material or securing it to the lifting means provided. To prevent the gangplanks from taking up too much space they can advantageously be pivotably secured to the respective pallets so that they can be moved between a first position, in which they extend outwardly beyond the pallet and in effect constitute a continuation of the pallet surface, and a second position in which they are partly or completely displaced inwardly of the pallet ends. Of course, such gangplanks or similar arrangements can be provided at one or both ends of some or all of the pallets.

To prevent undesired movement of the pallets from their center positions to their respective end positions, stop means or limiting means can be provided for the purpose of maintaining the pallets in their center positions until such movement is desired. This is particularly necessary where the pallets are inclined with reference to the horizontal, as outlined earlier. To facilitate use of the novel storage arrangement the stop means may be constituted by a double-armed lever which is pivotable in such a manner that normally one of the arms is positioned in the path of movement of the respective pallet but cannot be pushed aside by the same, whereas a tilting of the lever by hand or by mechanical or electrical means withdraws this arm from the path and permits movement of the pallet to the respective end position thereof. Particularly in the case of the inclined pallets it is advantageous to provide a further stop on the pallets which will engage the stop means when the pallets have moved to their desired end position, so as to prevent the pallets from completely sliding out of the rack.

In accordance with another feature of the invention each pallet can be so arranged as to rest on two rollers and to be engaged from the side opposite the two rollers by at least one counter roll. The rollers will be movable with reference both to the rails and to the pallet, whereas the counter roll will be secured to the rack and thus stationary, although rotatable. In this arrangement it is advantageous if the spacing between the two rollers is fixed and if the arrangement is such that the path to be traversed by the pallet during movement of the same from its center position to one of the end positions or vice-versa.

It is a further feature of our invention to make the rack itself movable so that, when two racks are arranged directly adjacent one another, at least one of the racks can be moved away from the other whereby a corridor is created between the two racks from which the respective pallets in both racks are accessible. This arrangement, it will be understood, makes it possible to achieve a considerable saving in floor space. For instance, a room filled with such racks need have only a free floor space corresponding to the width of one desired corridor, since the racks can be separated at will and the corridor thus brought into being between any two of the racks. Movement of the racks can of course be accomplished manually or via a suitable drive means and, in accordance with a further feature of the invention, such movement can simultaneously serve to shift one or a plurality of the pallets to one or the other of their end positions.

Another feature of our invention resides in the concept

that the pallets of adjacent racks, that is in two or more adjacent racks such pallets as are located on a common or at least substantially common level, can be coupled with one another.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which—

FIG. 1 is a somewhat schematic cross section through one embodiment of the invention;

FIG. 2 is a partial section taken on the line II—II of FIG. 1;

FIG. 3 is a view similar to FIG. 1, showing a second embodiment of the invention;

FIG. 4 is a partial sectional view taken on the line IV—IV of FIG. 3;

FIG. 5 is a view similar to FIG. 1 and showing a third embodiment of the invention;

FIG. 6 is a partly sectioned detail view of a fourth embodiment of the invention;

FIG. 7 is a schematic vertical section through a fifth embodiment of the invention;

FIG. 8 is a detail view, on an enlarged scale, of a pallet-coupling means for use in conjunction with the embodiment of FIG. 7; and

FIG. 9 is a view substantially similar to FIG. 8 and showing a further feature of the invention.

Discussing now the drawing in detail, and firstly FIGS. 1 and 2 thereof, it will be seen that the rack is indicated with reference numeral 5. Provided on the rack is a plurality of vertically superimposed guide rails 3 which support a respective pallet 1 through the intermediary of rollers 2. The guide rails 3 extend slightly beyond the opposite side of the rack 5 but only to the extent necessary to properly support the pallets in their respective end positions while not interfering with the hook H which is shown symbolically to represent any suitable mechanical lifting means, such as a crane or the like, for depositing and removing articles on the respective pallets 1. The rollers 2, which may be wheels, cylindrical members and the like, are so distributed with reference to the longitudinal extension of each pallet 1 that the pallet will remain balanced even if one of its two sections is empty while the other is filled and projects from one or the other side of the rack 5. Loading platforms or gangwalks 4 are provided on both ends of the pallets 1 and it will be seen that their arrangement is such that they can either be moved to a position where they extend outwardly beyond the end of the respective pallet or can be moved tightly against the pallet so that they do not take up extra space. It goes without saying that such walks 4 can also be provided at only one end of the pallets and can, in fact, be provided only on some pallets, just as it will be obvious that the arrangement of the rails 3 and rollers 2 can be reversed so that the rails would be carried by the pallets and the rollers would be secured to the rack 5.

The embodiment in FIGS. 3 and 4 shows how a pair of rollers 7 can be respectively secured to the rack, which here is designated with reference numeral 10, at the opposite sides thereof, whereas the pallets 6 each carry their own guide rail 3 at opposite lateral sides. A support roll 8 is also provided on the rack 10 intermediate the outer rollers 7, and a counterroll 9 is secured to the rack 10 above the support roll 8 and engages the pallet 6 from above whereas the support roll 8 engages it from below. In this arrangement the support roll 8 does not carry a load when the pallet 6 is in its center position in which it is located wholly within the confines of rack 10. However, when the pallet 6 is moved to one or the other of the end positions in which a portion of it projects beyond one of the sides of the rack 10, then the counterroll 9 be-

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comes one of the load-bearing rollers and together with rollers 7 supports the weight of the pallet 6. The gang-walks are in FIGURE 3 indicated with reference numeral 11.

As shown in FIG. 1, drive means D are provided for each of the pallets and it will be understood that any suitable drive means may be utilized. It is therefore not believed necessary to describe the drive means D in detail since the provision of such a means will pose no problem to persons conversant with the art.

Coming now to the embodiment of FIG. 5 it will be seen that the pallets are here again identified with reference numeral 1 whereas the rack is identified with reference numeral 12. Rollers 13 are provided on the rack 12 at the opposite sides thereof and intermediate these rollers 13 there is provided an additional roller 14 which, as is clearly evident from FIG. 5, is located at a level somewhat above the level which is common to rollers 13. A counterroll 15 is upwardly spaced from roller 14 and engages the pallet 1 from a side opposite that one from which the roller 14 engages it. As is evident from FIG. 5 this arrangement results in an inclination of the pallet 1 with reference to a horizontal plane, whether the pallet be located in its center position or in one of its end positions.

Since the pallets thus have a tendency to slide out of the rack 12 we have provided stop or limiting means 16 on the rack 12 at each side thereof. This limiting means may comprise a lever which is pivotable and which has an arm normally located in the path of the respective pallet 1 so that the end portion of the pallet must engage this arm as it attempts to slide from the rack 12. Undesired movement of the pallets from their center position is thus avoided. On the other hand, when it is desired to move the pallet to one of its end positions, it is simply necessary to slightly lift it or to so pivot the lever of stop means 16 so that the same is withdrawn from the path so that the pallet can now slide over the lever as is clearly shown in FIG. 5. Of course, it is also necessary to limit outward movement of the respective pallets 1 so that they do not completely slide out of the rack 12. For this purpose, each of the pallets 1 is provided at or adjacent its middle with a stop 33 which engages the lever of the respective stop means 16 and thus defines the maximum extent to which the respective pallets 1 can move out of the rack 12.

Coming now to the embodiment of FIG. 6 it will be seen that the support of the pallet, which here is designated with reference numeral 18, in the rack 17 is different from what has been heretofore described. In FIG. 6 the pallet 18 rests on wheels, rollers or the like which are indicated with reference numeral 19. The rollers 19 travel on rail means 22 and are freely movable with reference both to the rail means 22 and the pallet 18 which they merely support. A counterroll 21 engages the pallet 18 from above. This counterroll 21 is stationarily secured to the rack 17 but is rotatable. The counterroll 21 of course serves to counter-balance whichever portion of the pallet 18 extends outwardly beyond the rack 17. Movement of the rollers 19 is shown by way of example in dot-dash lines 19' and it will be seen that the length of the path traversed by the rollers 19 until they reach the positions indicated by lines 19' is less than the path traversed at the same time by the pallet 18 from its center position to its respective end position. It is advantageous to provide a spacer means 20 which connects the respective rollers 19 to one another so as to prevent them from independent movement relative to each other which could result in jamming or similar difficulties.

Coming now to the embodiment shown in FIGS. 7-9, it will be seen that in FIG. 7 there are shown three racks, each of which is indicated with reference numeral 23 and each of which is provided with wheels or rollers 24 so as to be movable. The racks are shown by way of example in a room which they completely fill with the exception

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of a space 25 for a corridor. It will be obvious that this corridor can be created wherever desired, that is either at the extreme left of FIG. 7, between the first and second racks as shown in the drawing, between the second and third rack, or at the extreme right of the figure, always depending upon which of the racks are moved where. Reference numeral 26 indicates the schematically shown pallet which is to be made accessible from the corridor 25, whereas reference numeral 27 indicates the pallets which are to remain within the confines of their respective racks 23.

In this embodiment it is possible to dispense with individual drives for each of the pallets 26, 27. Rather, the individual pallets to be moved to their end positions are selected before the respective racks are moved apart by the schematically illustrated drive means D. This movement apart of the racks then serves to withdraw the selected pallets. To accomplish this, these pallets which are located in a common horizontal plane in the various racks 23 are normally connected together and, when for instance the pallet 26 is to be withdrawn from the rack shown at the middle of FIG. 7, this pallet 26 remains connected to the pallets 27 of the rack on the left-hand side when the middle rack is moved, whereas the pallets 27 of the rack on the left-hand side are disconnected from the corresponding pallets 27 of the middle rack. Obviously, when the middle rack is now moved to the right to create the corridor 25, only the pallet 26 is withdrawn by virtue of the fact that it is still connected to the corresponding pallets 27 of the left-hand rack 23. Conversely, a similar cooperation of the pallet 26 with the right-hand rack and movement of the middle rack in such a manner as to create corridor 25 between it and the right-hand rack, will result in withdrawing of the pallet 26 beyond the opposite side of the middle rack.

FIG. 8 shows how this connection is accomplished. Reference numeral 23 in FIG. 8 is intended to designate the center rack shown in FIG. 7, and reference numeral 27 indicates in this latter rack the pallet which is located in a common horizontal plane with the pallet 26 which is to be withdrawn from the left-hand rack in FIG. 7. A lever 28 is connected to the rack 23 and is pivotable about an axis 29. Lever 28 is provided with two projections 30 which respectively engage in the pallets 26 and 27 so that the same are connected to one another. Lever 28 can be turned about the axis 29 by hand or by some other suitable means, for instance by an electromagnet 31 which acts upon it, so that the projections 30 are thus withdrawn from the pallets 26 and 27. Thus, and assuming that the left-hand rack 23 in FIG. 7 is still located directly adjacent to the center rack in this figure and that all of the levers 28 are in connecting position, connecting together the pallets which in the respective racks are located in common horizontal planes, it will be seen that when the left-hand rack is to be moved to the left with the intention of withdrawing the pallet 26 to the right, the levers 28 are moved to their respective disconnect positions for all pallets of the left-hand and the center rack 23, with the exception of the connection between the pallet 26 and its corresponding pallet 27 in the center rack 23. Thus, when the left-hand rack is moved to the left the pallet 26 is simultaneously withdrawn for access.

It is desirable that the pallets not only be connected together as shown in FIG. 8, but also be able to provide support for one another. As shown in FIG. 9, this is accomplished by providing cooperating male and female portions which engage one another. In FIG. 9 the pallet 26 is shown to be provided with a projection 32 whereas the pallet 27 is provided with a corresponding recess into which the projection 32 extends, somewhat in the manner of a tongue-and-groove arrangement so that the pallets 26 and 27 lend mutual support to one another. Of course it will be understood that the connecting means of FIG. 8 is still required and is not to be replaced by the arrangement of FIG. 9 which merely supplements it.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of storage arrangement differing from the types described above.

While the invention has been illustrated and described as embodied in storage arrangements, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can be applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a storage arrangement, in combination, a first and at least one additional rack means each having a pair of spaced opposite sides and at least one of said rack means being movable with reference to the other between a first position in which facing sides of said rack means are spaced close together and a second position in which such facing sides are spaced farther apart; at least one column of superimposed pallet means mounted on each of said rack means, each of said pallet means having opposite end portions and being independently and individually movable between a central position in which it is located wholly within the confines of the respective rack means and two opposite end positions in one of which only one of said opposite end portions of said pallet means extends beyond one of said opposite sides of the respective rack means and in the other of which only the other of said opposite end portions of said pallet means extends beyond the other of said opposite sides of the respective rack means while in both opposite end positions the remainder of the pallet means stays within the confines of the respective rack means and provides a counterweight for the extending end portion; moving means operative for moving said pallet means and said rack means relative to each other between said two opposite end positions of said pallet means and coupling means for selectively coupling the

facing ends of the respective pallet means in the respective rack means so that, when the respective rack means are moved from said first to said second positions thereof, pallet means on one of said rack means and so coupled are thereby moved to their corresponding end positions.

2. A combination as defined in claim 1, wherein said coupling means comprises a lever pivotably secured to one of said rack means and comprising a pair of projections which respectively extend into one pallet means on each of said rack means when the latter are in said first position and the pallet means are in their respective center positions.

3. A combination as defined in claim 2, said coupling means further comprising electromagnet means cooperating with said lever and arranged to selectively pivot the same so that said projections are withdrawn from the respective pallet means and the same thereby uncoupled.

4. A combination as defined in claim 2; and further comprising cooperating male and female portions provided at facing ends of the respective pallet means in said rack means and adapted to engage with one another when the pallet means of the respective rack means are coupled, so that the pallet means of one rack means contribute to supporting the pallet means of the other rack means.

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U.S. Cl. X.R.

211—162; 312—286