A removable frame is adapted to be fitted inside an outer container, the frame includes at least one shelving frame that enables an extendable structure to be mounted within the shelving frame. The frame further includes a plurality of movement limiting arrangements configurable to contact an inner surface of the outer container, such contact limiting movement of the frame relative to the outer container.
FRAME ADAPTED TO BE FITTED INSIDE AN OUTER CONTAINER

[0001] This application is a continuation of U.S. application Ser. No. 11/558,667, filed Nov. 9, 2006, which claims the benefit of U.S. Provisional Patent Application Ser. No. 60/809,719, filed May 31, 2006.

FIELD OF THE INVENTION

[0002] The present invention relates to a frame adapted to be fitted inside an outer container.

BACKGROUND OF THE INVENTION

[0003] Various types of heavy-duty storage containers are available. Such containers need to be versatile and capable of securely storing items, sometimes during transportation. A typical container widely used in this way (especially by the US military) is commonly known as a “Quadcon” container or box. This is a heavy-duty container that is capable of withstanding use in rough situations and can often be dropped from considerable heights or moved violently during transportation over uneven terrain. Such boxes are heavy and difficult to handle and need to be safely secured to avoid accidental damage or injury. The contents of Quadcon boxes are checked regularly, e.g. once every month, and moving the boxes for access and then reloading them into the container/rack is a tedious and time consuming process, and has the associated risks mentioned above.

SUMMARY OF THE INVENTION

[0004] Quadcon boxes commonly store several inner containers/boxes that may themselves be heavy and difficult to handle. Obviously, these inner containers also need to be secured inside the Quadcon boxes to avoid damage and safety risks. Difficulties therefore arise if the dimensions of the inner containers do not match those of the Quadcon boxes. Further, although the Quadcon boxes are intended to have standard dimensions, variations, particularly on their inner surfaces, are not uncommon.

[0005] As Quadcon boxes have a standard configuration (governed by an ISO standard), modifying them is undesirable and not generally allowed. In particular, it is undesirable to drill holes through surfaces of the boxes, or to weld restraining hooks or the like onto them. Therefore, it can be difficult to secure smaller containers of various sizes inside Quadcon boxes.

[0006] Embodiments of the present invention are intended to address at least some of the problems addressed above.

[0007] According to a first aspect of the present invention there is provided a removable frame adapted to be fitted inside an outer container and to support at least one inner container, the frame including a plurality of arrangements configurable to contact an inner surface of the outer container, such contact limiting movement of the frame relative to the outer container.

[0008] Thus, the frame can be fitted to the outer container without requiring (permanent/invasive) modification of the outer container, e.g. no part of the frame (or associated components) need penetrate a surface of the outer container, nor is there any need for welding or some other type of fixing that is intended to be permanent/long-term. Frictional contact can limit the relative movement. The movement-limiting arrangements may also reassemble securely the frame inside the outer container. The movement-limiting arrangements may be readily removable from the outer container. For example, the movement-limiting arrangements may be removed by being rotated (directly) by hand. A said movement-limiting arrangement may include a pad configured to contact an inner surface of the outer container, the position of the pad relative to the frame being adjustable. The pad may have increased frictional characteristics compared with other components of the frame/outer container, e.g. it may be formed at least partially of rubber. The pad may be at least partially formed of compressible material. The pad may have an adhesive applied to it. Force exerted by the movement-limiting arrangement may maintain the contact. The position of the pad may be adjusted by means of the pad being mounted on a threaded member.

[0009] The frame may be assembled from a plurality of sub assemblies. At least some of the sub assemblies include at least some of the movement-limiting arrangements. The movement-limiting arrangements may be configured to contact an upper and/or lower inner surface of the outer container and at least one side surface of the outer container.

[0010] The frame may include a first sub assembly configured to extend between lower and upper surfaces (floor and ceiling) of the outer container. The first sub assembly may include at least one movement-limiting arrangement configured to contact a lower or upper surface of the outer container. The frame may include an upper sub assembly configured to fit on top of the first sub assembly. The upper sub assembly may further include at least one said movement-limiting arrangement configured to contact the lower portion of at least one inner side surface of the outer container.

[0011] The frame may further include a lower sub assembly configured to fit onto a lower end the first sub assembly. The lower sub assembly may further include at least one said movement-limiting arrangement configured to contact a lower portion of at least one inner side surface of the outer container.

[0012] The upper and/or lower sub assembly may be at least partially fitted to the first sub assembly by means of at least one readily releasable device, such as a slot bolt, that does not require routine use of a tool to lock/release.

[0013] The first sub assembly may include a plurality of uprights connected together by a plurality of cross-beams. There may be a pair of such connected uprights, and each said upright can be configured to be located adjacent a respective sidewall of the outer container. The upper and/or lower sub assembly may be configured to connect a said pair of connected uprights together across a width of the outer container.

[0014] The lower sub assembly may include at least one formation for receiving a corresponding at least one formation of another said sub assembly. The formation of the lower sub assembly may include a recess or aperture and the formation of the other said sub assembly can include a projection. Sidewalls of the recess or aperture may be sloped.

[0015] The frame may include an arrangement configured to releasably secure the at least one inner container in the frame, e.g., a lockable (front) gate. The frame may further include a shelving frame upon which a said inner container can be supported. The shelving frame may include at least one formation (e.g., a slot or aperture) configured to cooperate with at least one corresponding formation on the inner con-
tainer, thereby assisting with securing the inner container within the frame. The frame can further include a dividing member.

[0016] According to another aspect of the present invention there is provided a storage system including at least one frame substantially as described herein and at least one inner container. The storage system may further include a said outer container.

[0017] According to a further aspect of the present invention there is provided a method of fitting a frame to an outer container, the frame being adapted to support at least one inner container and the method including:
[0018] placing the frame inside the outer container, and
[0019] adjusting a plurality of arrangements to contact an inner surface of the outer container, such contact limiting movement of the frame relative to the outer container.

[0020] According to another aspect of this invention there is provided a device for assisting with holding an inner container within an outer container, the device including:
[0021] a first engaging member for engaging a formation or portion adjacent a first point of an upper surface of an inner container;
[0022] a second engaging member for engaging a formation or portion adjacent another point of the upper surface of the inner container;
[0023] an arrangement for releasing the first and second engaging members.

[0024] The first and second engaging members may be located adjacent generally opposite ends of an elongate member. The elongate member may be connected to a frame attached to the outer container (or directly to the outer container). The elongate member may be pivotally connected to the frame/outer container, with pivoting movement of the elongate member resulting in disengagement of the first engaging member. The device may include a device for biasing the elongate member so that it causes the first and/or second engaging members to engage the upper surface. A pivot point of the elongate member may be defined within a slot that allows longitudinal movement of the first and second members so that the second engaging member can be slid out of contact with the upper surface of the inner container.

[0025] Whilst the invention has been described above, it extends to any inventive combination of the features set out above or in the following description. Although illustrative embodiments of the invention are described in detail herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to those precise embodiments. As such, many modifications and variations will be apparent to practitioners skilled in this art. Furthermore, it is contemplated that a particular feature described either individually or as part of an embodiment can be combined with other individually described features, or parts of other embodiments, even if the other features and embodiments make no mention of the particular feature. Thus, the invention extends to such specific combinations not already described.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0026] The invention may be performed in various ways, and, by way of example only, embodiments thereof will now be described, reference being made to the accompanying drawings, in which:

[0027] FIG. 1 is a perspective view of an example of the frame;
[0028] FIG. 2 is a plan view of a lower sub-assembly of the frame;
[0029] FIG. 3 is a front view of the lower sub-assembly;
[0030] FIG. 4 is a perspective view showing the frame of FIG. 1 fitted with an inner storage container;
[0031] FIG. 5 is a different perspective view of the frame and container of FIG. 4;
[0032] FIG. 6 is a perspective view of an inner storage container that is fitted with a plurality of further inner containers;
[0033] FIG. 7 is a front view of the inner containers of FIG. 6 stored in an outer container using the frame;
[0034] FIG. 8 is a front view of another arrangement of inner containers stored in the outer container using the frame;
[0035] FIG. 9 is a schematic front view of another type of outer container including an example of a fastening device that holds an inner container in position;
[0036] FIG. 10 is a schematic side view of the containers of FIG. 9;
[0037] FIG. 11 details an alternative embodiment of the connecting device, and
[0038] FIGS. 12A to 12D illustrate diagrammatically an unlocking operation of the fastening device.

DETAILED DESCRIPTION OF THE INVENTION

[0039] FIG. 1 shows a perspective view of an example of a pair of frames, with the viewpoint being located above and to the right of the central axes of the frames. For brevity, only one of the frames (100) will be described in detail, but both frames are substantially identical. Certain features are only visible on one of the frames in the Figure, although it will be understood that they are present on both frames. In use, each of the frames can be fitted inside an outer container (not shown in FIG. 1), in a back-to-back arrangement, with one of the frames 100 being located at what will be referred to, for ease of reference, as the front end of the outer container and the other frame 100 being located at the rear end of the container. However, it will be understood that in some cases only one frame may be fitted inside an outer container, or frames could be arranged in an alternative manner, e.g. side-by-side.

[0040] The frame 100 comprises three main sub-assemblies, namely a first sub-assembly 102 that is connected to an upper sub-assembly 104 and a lower sub-assembly 106. The first sub-assembly 102 comprises a set of four uprights 110A-110D arranged to form a 4x4 square grid, but it will be understood that the spacing of the uprights could be modified, e.g. to form a rectangular subassembly. The pair of uprights 110A, 110D at the left-hand side of the Figure will, in use, be fitted adjacent a left-hand inner sidewall of the outer container. The pair of uprights 110B, 110C at the right-hand side of the Figure will, in use, be fitted adjacent a right-hand inner sidewall of the outer container. The height of the uprights is normally chosen to be slightly less than the height of the space inside the outer container.

[0041] The left-hand uprights 110A, 110D are connected together by means of a pair of horizontal beams 112A, 112B, with a cross-beam 114 running diagonally between the two horizontal beams. The right-hand uprights 110B, 110C are connected together by a similar set of horizontal and cross-
beams. As can be seen, each of the uprights 100A-110D is of square U-shape cross-section, the side of each upright that faces an adjacent side of the other upright in its pair (e.g. 110A and 110D) being open. The ends of the horizontal beams 112 fit into these open sides and so can be connected to the inner surfaces of the uprights. The side surfaces of the uprights have a plurality of evenly-spaced apertures 111.

[0042] Square shaped end panels 1115 are fitted/formed at both ends of each upright 110. Each lower end panel may have friction-increasing properties, e.g. it may be formed or rubber or another material that is partially rubberised, or the panels may have (removable) adhesive applied to them. Each upper end panel has fitted on its upper surface an adjustable device 116. Each device 116, in use, is adjusted to contact an inner surface of the outer container when the first sub assembly 102 is fitted therein, thereby limiting or preventing relative movement of the sub assembly (and other components connected to it) and the outer container. In the example, the device 116 is an adjustable jack having a threaded member with a frustoconical pad 116A fitted at one end. The pad may have improved frictional properties, e.g. be formed of rubber or similar material (and therefore may also be compressible) and/or have a friction-increasing coating or adhesive applied to it. In the example the pads are all formed of rubber. When rotated (by hand or using a tool), the device extends/retracts, allowing the pad 116A to come into (or break) contact with an adjacent surface. It will be understood that in other embodiments, other types of adjustable devices could be used, e.g. a slidable/telescopic mechanism that can be configured to be set at a selected length, or a removable wedge or the like. In more complex embodiments, a knob arrangement or the like may be provided for adjusting more than one adjustable device at a time.

[0043] The upper sub assembly 104 includes a rectangular frame comprising a pair of opposed end members 120A, 120C and a pair of opposed side elongate members 120D, 120B. In the example the side elongate members 120 have a length sufficient to span from one end of the frame 100 to the remote end of the other frame 100; however, it will be understood that the dimensions of the upper sub assembly could be modified so that it fits on only one of the frames (i.e. be dimensioned to correspond with the square shape formed by the four corner uprights of the first sub assembly 102). The elongate members 120 are of L-shaped cross-section. Cross beams/bars 122 extend diagonally between the side members for reinforcement. There is also a central beam 122 that extends straight between the pair of side members 120B, 120D, at a point that corresponds with the location of the uprights 110C, 110D. The central beam 124 is of square U-shape cross-section and may include a set of spaced-apart apertures 125.

[0044] At each corner of the upper sub assembly 104 there is a depending corner piece. (Two of these corner pieces, labelled 126A and 126B, can be partially seen in FIG. 1 on the rear end frame 100, located above its rear end uprights 110A, 110B). The corner pieces are generally L-shaped brackets, with one portion of each L-shape being in contact with and fixed to an upper portion of the adjacent upright and the other portion of the L-shape extending across towards the other side of the frame, e.g. the extending portion of corner piece 126A located on the left-hand side of the frame extends towards the corresponding right-hand side corner piece 126B. Square shaped end panels can be fitted/formed at the upper and lower ends of the corner pieces.

[0045] The fixed portion of each L-shape can be connected to the upper portion of its corresponding upright by means of bolts or the like (e.g. “Ny-lo” type shake-proof bolts) that fit through the apertures 111 in the upright and similar apertures in the corner piece (see the rear right-hand corner of the frame in FIG. 5). Brackets for connecting the central beam 122 of the upper sub assembly to the uprights 110C, 110D in a similar manner can also be provided (one such bracket 127 is partially visible at left-hand upright 110D in FIG. 1).

[0046] Projecting outwardly from the base of each corner piece 126A, 126B is a horizontal plate (such plates labelled 129A and 1293B can be seen on the corner pieces at the front of frame 100). Each horizontal plate 129 can include at least one aperture with which at least one corresponding bolt located on a front gate of the first sub assembly can engage. A left-hand front gate 119 (for front end frame 100) having upper 119A and lower 119B bolts is partially shown in FIG. 1. It is connected to the front of the front upright 110D by means of hinges 119C.

[0047] The vertical portion of the L-shaped cross sectioned side members 120B, 120D include apertures through which adjusting devices 126 can be fitted. In the example, an aperture is located adjacent each portion of the side member that is adjacent an upright 110, but it will be understood that the number and positions of the apertures/adjusting devices can be varied. The devices 126 can be adjustable jacks identical to the jacks 116 fitted on the uprights, or may be other types of adjustable devices. The adjusting devices 126 of the upper sub assembly 104 extend outwardly sideways from the side members 120B, 120D.

[0048] The lower sub assembly 106 of the frame 100 comprises a square shape formed by a pair of elongate end members 132A, 132B and a pair of elongate side members 130A, 130B. The square shape is dimensioned so that it generally fits within the perimeter of the notional square shape formed by the four corner uprights of the first sub assembly. FIGS. 2 and 3 show the lower sub assembly 106 in more detail.

[0049] Each side member 130 is flat elongate bar (or track) having a generally square-shaped recess 134 located near both its ends. The recesses 134 have sloping side walls and are dimensioned to correspond with dimensions of foot portions of a pallet, as will be described below. The recesses may be at least partially lined with rubber or similar material, which helps keep the foot portion in place and also reduces vibration during transportation of the loaded frame. A stop 136 projects upwardly from the side member 130 adjacent one of its recesses. The stop is located opposite to the end of the member that will, in use, be used to load a pallet/inner container. For instance, for rear end frame 100, the stops 136 will be located near the ends of the side members 130 located under the central beam 124 of the upper sub assembly 104 to allow pallets to be slid over the opposite end of the side members into the frame in the direction of arrow L.

[0050] As can best be seen in FIG. 3, extending along the outer side of the each side member 130A, 130B is a respective elongate profiled side wall 133A, 133B. Each side wall comprises a sheet of material that is formed to form a first slanted portion that has one end connected to the upper surface of the side member 130 (adjacent is outer side edge). This first slanted portion leads upwards and outwards at an angle of around 45° to the tip of a second portion of the side wall that is L-shaped in cross-section. The upper, vertical portion of each side wall 133 includes apertures through which adjusting devices 138 can be fitted. In the example, an aperture is
located adjacent each portion of the side wall that is fitted adjacent an upright 110, but, again, it will be understood that the number and positions of the apertures/adjusting devices can be varied. The devices 138 can be adjustable jacks identical to the jacks 116 fitted on the uprights, or may be different types of adjustable devices. The adjusting devices of the lower sub assembly 106 extend outwardly from the side walls 133.

[0055] The ends of the pair of side members 30A, 30B are connected together by means of respective end members 132A, 132B, which are strong elongate bars that can each include a set of spaced apart apertures 135. At the end of the each side member 130 over which, in use, a pallet is slid/loaded (i.e. the end opposite to that which the stops 136 are located) there is a foot component 139. Each foot 139 is generally square/rectangular in shape and is formed of an upper surface having four depending sidewalls. The sidewall that is located at the front of the sub assembly 106 is angled and can act as a ramp for an article being slid over the foot 139 into the frame.

[0056] There can be at least one aperture 140 in the upper surface of the base panel that is, in use, positioned to receive at least one corresponding shot bolt 119B located on one of the front gates 119 (similar to way in which the apertures in the horizontal plates 129 of the upper sub assembly 104 are used with upper shot bolt 119A). It will be understood that other arrangements (e.g. shot bolts that directly fit into bores in the inner containers or straps) can be used to secure the contents of the frame instead of or in addition to the pair of front gates. In an alternative embodiment, instead of a pair of the feet 139 there can be at least one solid/continuous plate along the lower front end of the lower sub assembly 106, which can function as a ramp if needed. Such a ramp can have a set of spaced apart apertures that function in a similar manner to the aperture 140.

[0057] In use, the first sub assembly 102 is positioned within an outer container, with the pairs of lateral uprights, e.g. 110A and 110B, being positioned abutting/adjacent to inner sidewalls of the outer container. Next, the upper sub assembly 104 is positioned on the first sub assembly 102, with the corner pieces 126A, 126B of the upper assembly being fixed to the upper portions of the uprights 110 by means of bolts or the like. Next, the lower sub assembly 106 is fitted inside the outer container.

[0058] The jacks 116 can then be adjusted to establish firm contact between the upper inner surface of the outer container and the main sub assembly 102, with the uprights 110 becoming “wedged” between the floor and ceiling of the outer container. The jacks 126 can also be adjusted so that the upper sub assembly 104 becomes wedged between the sidewalls of the outer container. Similarly, the jacks 138 can be adjusted so that the lower sub assembly 106 becomes wedged inside the sidewalls of the outer container. Thus, the frame 100 is releasably secured in position within the outer container so that relative movement (in the horizontal (sideways and front/rear directions) and vertical planes) of the frame and outer container is limited/prevented. Adhesive, if used, will also help limit such movement. The use of adjustable devices such as the jacks 116, 126, 138 (including the compressible pads) means that no permanent modification of the outer container is required (e.g. no components need to be welded or fixed in some other substantially permanent manner to the outer container) and no part of the frame needs to penetrate a surface of the outer container. Damage to the outer container should not occur during normal use. Adjustable devices, such as the jacks, can readily deal with variations in the shape/dimensions of inner surfaces of individual outer containers and can be easily and speedily removed when required.

[0059] After the frame 100 has been fitted inside the outer container, it is ready to support at least one further container. It will be appreciated that the steps of the assembly/use sequence described above can be varied.

[0060] FIGS. 4 and 5 illustrate how the assembled frames 100, 400 can be used to store at least one inner container. FIG. 4 is a perspective view similar to that of FIG. 1, whilst the viewpoint of the perspective view of FIG. 5 is located below and to the left of the central axes of the frames. Thus, in FIG. 5, the (front end) frame labelled 110 in FIGS. 1 and 4 is more prominent and the (rear end) frame 100 is not shown storing a container in the example.

[0061] A pallet 400 is shown located on top of the lower sub assembly 106. The dimensions of the lower sub assembly will be chosen to generally correspond with those of the pallet. The pallet has a set of four feet (not visible) near its corners which fit into the four recesses 136 in the side members 130 or to the lower sub assembly 106. The pallet includes a pair of channels 402 running between its front and rear ends that can accommodate forks of a fork lift truck. At least the front end of the pallet can be fitted with a pair of L-shaped brackets 404. The upper surface of each bracket 404 can include at least one aperture to engage with a bolt of an inner container (e.g. shot bolt 601), thereby releasably fixing the inner container to the pallet.

[0062] FIG. 6 is a perspective view of an example of one type of inner container 600 that can be used in conjunction with the frame 100. The container 600 is a box-shaped framework capable of storing a plurality of further inner containers. The framework comprises four corner uprights 602 that are connected together by a pair of lower elongate members 604A (and/or a square base panel). Diagonal cross beams 605 may also be used to strengthen the structure. Upper elongate members 604B (and/or a square panel) connect the upper ends of the uprights. The uprights 602, and in some cases other components of the inner container 600, may be formed of tubular lengths of material (e.g. of square-shaped cross-section) that may include a plurality of evenly-spaced apertures.

[0063] The front pair of uprights include hinges to which a pair of lockable front gates 606 are connected. A set of four upper formations 607 are connected to/from the upper surfaces of the inner container 600, each formation being located at/adjacent a corner of the inner container. Each formation includes a square-shaped base panel upstanding from which are two sloping sidewalls. The upstanding sidewalls slope at an angle of around 40° and are located at the corners of the base panel near a notional central axis of the inner container (i.e. they can be thought of as “pointing” towards the middle of the container). The formations 607 can assist with securely stacking another (similar) container on top of the container 600 when it is not located in the frame 100, e.g. when stored in a warehouse.

[0064] The inner container 600 is shown holding a stack of further inner containers 700, 702. These may be placed directly on top of each other, or shelves/frames may be used, such as the shelving frame 610 shown in FIG. 4. Two types of further inner containers are shown in the stack of the example, a first (wider) heavy-duty drawer 700 and second (narrower) heavy-duty drawer 702. The width of the wider drawer can be
around 330 mm (13") and the width of the narrower drawer can be around 685 mm (27"), but it will be understood that these widths are exemplary only and the storage system can be made to fit any combination of containers, e.g. ones having widths anywhere between, for instance, 200 mm and 1150 mm. The heights of containers such as the drawers can be anywhere from around 101 mm (4") upwards and the dimensions of the components of the inner container 600 and frame 100 can be formed to accommodate any desired height of containers, which may or may not be of uniform dimensions. The drawers can have lids and the lids may include formations that cooperate with corresponding formations on lower surfaces of other drawers/containers so as to facilitate safe stacking of the units.

[0061] Returning to FIGS. 4 and 5, it can be seen that the shelving frame 610 is located above the upper surfaces of the drawers 700, 702. The shelving frame can be fitted to the uprights 602 of the inner container 600, e.g. by means of bolts through the evenly-spaced apertures 611. The shelving frame is formed of a set of four elongate members, including a pair of parallel spaced-apart side members 612A, 612B that are connected together by means of a rear elongate member 614 and front elongate member 616. The length/width of the shelving frame generally correspond to the length/width of the drawer/container over which it is positioned. Thus, the shelving frame 610 has a similar length/width to the drawer 700 underneath it. There is also a similar second shelving frame 610A, whose length/width corresponds to the length/width of the narrower drawer 702 located beneath it.

[0062] The side 612 and rear 614 elongate members of the shelving frame are of L-shape cross-section, with the vertical portions of the L-shapes acting as walls that limit movement of a drawer/container that will be placed on top of the (horizontal portions of the L-shapes of the) shelving frame. The front elongate member 616 is flat to allow a drawer/container to be slid/load over it into the shelving frame. To assist with stabilising the drawer/container within the shelving frame, the front ends of the side members 612 include slots 618 (see FIG. 5 in particular). Each slot 618 is a V-shape rotated clockwise by 90° so that its wider portion is at the end of the side member with the slot then tapering inwards. Projections (not visible) on the outer sides of the drawer are intended to fit into the corresponding slots of the side members 612. Each slot can also include formation such as an indentation (not visible) that is intended to cooperate with the corresponding projection so that considerable force (in the forward direction) needs to be applied to release the projections, and thereby the drawer, from the shelving frame. The rear elongate member 614 of the shelving frame can include at least one formation, e.g. aperture 619, that is intended to cooperate with a corresponding at least one formation, e.g. a projection, on a rear surface of the drawer, thereby further assisting with limiting relative movement of the drawer and shelving frame. It will be appreciated that variations so the shelving frames are possible, e.g. they could include a track/roller arrangement to allow the container 700, 702 to be at least partially the extended (and retracted) relative to the frame like a drawer.

[0063] It can be seen that the base of the inner frame-type container 600 is placed on top of (and aligned with) the upper surface of the pallet. This is normally done before the pallet 400 and container 600 are transported into the frame 100, with the lockable gates 606 being closed for safety and to retain the containers. Once the inner containers are fitted inside the frame 100, the front gates 119 of the frame can be shot-bolted shut to secure the inner containers in position. In the example where the pair of frames 100 and 100' are used, access can be gained to each frame at opposite ends of the outer container. FIG. 7 shows the frame 100 and inner containers fitted inside a Quadcon box 800, although it will be understood that the frame 100 can be used to support inner containers in other types of outer containers, e.g. containers commonly called “Irecons”; full or half-width boxes; boxes having solid walls or boxes having at least some walls in the form of a mesh or frame.

[0064] It will be appreciated that the combination of inner containers shown in use in the Figures is exemplary only and that various other types of inner containers could be stored in conjunction with the frame 100 and outer container. For example, the inner frame-type container 600 need not be used in cases where inner containers such as drawers 700 have dimensions that correspond with those of the frame 100. Further, the pallet 400 need not be used, with an inner container being placed directly on the lower sub assembly 106. Also, the further inner containers do not need to be directly stacked on top of each other within the inner frame-type container 600. For example, drawer-like mechanisms that allow the further inner containers to be (partially or substantially completely) extended individually for access could be installed within the frame 100 or frame-type container 600. The frame-type container 600 can be a storage rack that includes an array of formations intended to engage with corresponding formations on the further inner containers, e.g. projections/apertures arrangements.

[0065] FIG. 8 illustrates an example of two frames 100 and 100' being fitted side-by-side in a Quadcon box 800. The left hand-frame 100 is narrower than the right-hand frame 100'. A support column (or "pylon") 850, which can comprise at least one elongate member or a plate, is also fitted inside the Quadcon box, abutting the right-hand side of frame 100 and the left-hand side of frame 100'. The support column 850 can be fitted within the Quadcon box using bolts or the like to connect the column to parts of the frame 100, e.g. into apertures 135 in the lower sub assembly 106 and apertures 125 in the upper sub assembly 104. Having a plurality of such apertures 135, 125 means that the location of the column 850 within the frame 100/Quadcon box can be set to suit the dimensions of the containers to be stored within. The column 850 effectively divides the interior of the outer container so that sets of inner containers having different widths can be stored. In some embodiments, the column 850 can be fitted with at least one front gate, similar to gate 606 or 119.

[0066] It will be understood that the dimensions, number and arrangement of the components shown in the Figures is exemplary only and variations are possible. For instance, more than four upright struts could be used in the first sub assembly 102; the frame 100 can comprise few or more than three sub assemblies (which need not be central, lower and upper sub assemblies and not all of which need necessarily include adjusting devices), or can be formed as an integral piece; adjusting devices could be provided on both upper and lower surfaces of the frame; instead of vertical struts, diagonal cross-bars could be used in the first sub assembly; solid panels could be used to connect the lower and upper frame members in addition to or instead of some of the uprights; the side members/struts need not be of square U-shape or L-shaped cross-section; devices other than shot bolts (e.g. a pivoting hook or catch arrangement) could be used.
In the example, a rigid metal such as steel is used for the components of the frame 100 and other containers, but it will be understood that other strong materials (or a combination of materials) could be used instead. The dimensions of the framework will usually be chosen to correspond with the dimensions of one or more containers that it is intended to support. For instance, the framework could be dimensioned to accommodate a container anywhere between 380 mm (15") wide, 422 mm (16-3/4") long and 101 mm (4") high, but it will be understood that these ranges are exemplary only. The components of the framework can be connected together using any suitable means, e.g. welding or nuts/bolts, or the framework can be formed at least partially in another manner, e.g. using a moulding process.

FIG. 9 shows an outer container 100.2 that is configured to accommodate a plurality of inner containers, one of which is labelled 200.2. The outer container could be a frame similar to frame 100 described above which will, in turn, be fitted inside a further outer container such as Quadrion box. The inner container may be similar to container 600 described above or a frame similar to frame 100 described above could be used in the case where the outer container 100.2 is a Quadrion box or the like. In the example, the outer container 100.2 generally comprises a framework including a base 102.2 which can be a solid plate or a pallet type base. An upward extending strut 104.2 extends vertically from each of the four corners of the base. There is also an upper frame/plate 105.2 that assists with holding the four vertical struts 104.2 in position. It will be appreciated that there are several possible variations of the outer container e.g., it can include crossbeams to further reinforce the vertical struts, or it could include solid wall or upper plate rather than an open framework. The base 101.2 of the outer container may be fitted with a tracked base 100.1 substantially as described above when the outer container is to accommodate one or more smaller storage devices that have an arrangement of foot portions. At least one end of the outer container 100.2 may be fitted with one (or a pair) of hinged gates 106.2 or similar arrangements for assisting with preventing outward movement of a container that is stored within it.

Within the outer container there is fitted an inner frame 107.2 that includes a fastening device, generally indicated at 111.2, for holding a smaller container in position within the outer container. The inner frame may be removable from the outer container so that it can free up space when not in use. Alternatively, the components described herein as forming part of the inner frame may be built into the outer container.

The inner frame 107.2 includes a base portion that may comprise the tracked base 100.1. Upstanding from each of the four corners of the base is a vertical strut. The pair of vertical struts at the front end of the inner frame is labelled 109A.2, 109B.2, whilst the pair of vertical struts at the rear end (not visible in FIG. 9) are labelled 109A'.2, 109B'.2. Again, it will be understood that several variations of the inner frame are possible, e.g. one or more of its base, side or upper surfaces may be a solid plate rather than an open framework type design.

A substantially horizontal bar 112.2 extends between points adjacent the upper ends of the front pair of vertical struts 109A.2, 109B.2. Fitted adjacent the two ends of the horizontal bar 112.2 are handle devices 114.2 that operate the fastening device 111.2. The fastening device in the example includes an engaging member 110.2 that is connected below the horizontal bar 112.2 by means of one or more vertical connecting bars 113.2. The front engaging member 110.2 is intended to engage with a portion of the smaller inner container 200.2.

In the example, the inner container includes a base frame/plate 202.2, upstanding from which are four vertical corner posts 204.2. Extending between points adjacent the upper ends of the pair of the posts at the front end of the inner container is a horizontal rod 206.2. A plurality (e.g. stock) of storage boxes/drawers 207.2 can be fitted within the framework of the inner container. It will be understood that the inner container shown in the drawings is only one example of the type of storage device that can be held within the outer container 100.2. In the example, the connecting device 111.2 of the inner frame/outer container engages with the horizontal bar 206.2 of the inner container, as well as a similar bar that extends between the rear pair of vertical posts 204.2. These components can be seen in FIG. 10.

As shown in FIG. 10, the outer container 100.2 in the example is arranged to accommodate a first inner container 200.2, located adjacent its front end, and a second inner container 207.2, located near the rear end of the outer container. However, it will be understood that the outer container can be configured to accommodate different numbers/arrangements of inner containers. The outer container may include gate arrangements at its front and rear ends to allow either of the inner containers to be accessed without requiring the other to be moved.

Extending between the front horizontal bar 112.2 and the rear horizontal bar 112'.2 of the inner frame is a pair of spaced apart parallel moveable beams 116.2. Only one of these (which would be adjacent the right hand side of FIG. 9) is visible in FIG. 10 and for brevity only operation of one moveable beam will be described, but it will be understood that one or more further corresponding moveable beams can be provided and operate in a similar manner. The rear end of the moveable beam 116.2 is pivotally and slideably connected to the rear vertical post of the inner frame 107.2 by means of a connecting mechanism 118.2, which will be described below in more detail.

FIG. 11 details part of an alternative example of the connecting device 111.2. In the example of this Figure, instead of a single engaging member 110.2, there are a pair of shorter engaging members 110C.2, 110C'.2, each located adjacent opposite ends of the horizontal bar 112.2.

Turning to FIGS. 12A to 12B, there is shown a sequence of operations involving components of the connecting device 111.2 that allow the inner container 200.2 to be released (it should be noted that the "rear" end of the is at the left hand side of these figures, whereas in FIG. 10 the "rear" end is at the right hand side). The mechanism 118.2 that connects the rear end of the moveable beam 116.2 to the rear vertical post of the inner frame 107.2 comprises a rectangular plate 122.2 having a longitudinal slot 124.2. A member 120.2 (e.g. pin, bolt or like) located near the rear end of the moveable beam 116.2 is slideably fitted within the horizontal slot 124.2. The rear engaging member 110.2 comprises an elongate member having a generally 'C-shaped' curved cross-section that is suitable for engaging with the rear cylindrical horizontal bar 206.2. However, it will be understood that the design of the rear (and front) engaging member can be varied to engage with any suitable portion/formation of the inner container that is to be fastened.
[0077] The handle portion 114.2 is connected adjacent the front end of the moveable beam 116.2 by means of a pivot pin 130.2 that passes through an aperture near the front end of the moveable beam 116.2 and an aperture about 75% along the length of the handle portion. The end of the handle portion 114.2 remote from the end held by a user is pivotally connected to one end of a second handle portion 134.2. A biasing device, e.g. spring 132.2, can be provided to help keep the handle portion in its “locked” position so that human force is required to move it. Additionally or alternatively, an end of the handle member 114.2 may contact a portion of the outer frame so that the hand is held in position. The other end of the second handle portion 134.2 is pivotally connected to one end of a third plate 136.2, the other end of which is connected to the front engaging member 110.2. Again, the engaging member 110.2 is generally C-shaped in cross-section so that it can engage with the cylindrical front horizontal bar 206.2.

[0078] When the handle arrangement is in the position shown in FIG. 12A both the rear 110' 0.2 and front 110.2 engaging members press down onto the rear horizontal bar 206.2 and front horizontal bar 206.2, respectively, thereby limiting movement of the inner container 200.2.

[0079] When it is desired to release the inner container 200.2 a first step taken by a user is to pivot the end of the handle mechanism 114.2 upwards to the position shown in FIG. 12B. This releases the front end of the moveable beam 116.2 so that it is free to pivot around rear pivot point 120.2, as shown in FIG. 12C. Thus, the front engaging member 110.2 can break contact with the front horizontal bar 206.2.

[0080] The user can then push back the handle 114.2 so that the moveable beam 116.2 slides within the slot 124.2 towards the rear end of the inner frame. This breaks contact between the rear engaging member 110.2 and the rear horizontal bar 206.2, thus allowing the inner container 200.2 to be moved longitudinally out of the outer container 100.2. Thus, the fastening device described assists with securing the inner container, but does so by means of contact with the upper surface of the inner container and does not require modification of the container itself.

1. A removable frame adapted to be fitted inside an outer container, the frame including at least one shelving frame that enables an extendable structure to be mounted within the shelving frame, the frame further including a plurality of movement limiting arrangements configured to contact an inner surface of the outer container, such contact limiting movement of the frame relative to the outer container.

2. A removable frame according to claim 1, wherein the frame is fitted to the outer container without requiring permanent modification of the outer container.

3. A removable frame according to claim 1, wherein the extendable structure is a drawer that may extend outside of the frame.

4. A removable frame according to claim 1, wherein the extendable structure includes a plurality of drawers and the shelving frame is located above the upper surfaces of the plurality of drawers.

5. A removable frame according to claim 1, wherein the movement-limiting arrangements are configured to contact an upper and lower inner surface of the outer container and at least one inner side surface of the outer container.

6. A removable frame according to claim 1, wherein the movement-limiting arrangements are configured to contact an upper and/or lower inner surface of the outer container and at least one inner side surface of the outer container.

7. A removable frame according to claim 1, wherein the movement-limiting arrangements are configured to contact two inner side surfaces of the outer container.

8. A removable frame according to claim 1, wherein the frame is assembled from a plurality of sub-assemblies, with at least some of the sub-assemblies including the movement-limiting arrangements.

9. A removable frame according to claim 8, including a first said sub assembly configured to extend partially between lower and upper floor and ceiling surfaces of the outer container, the first sub assembly including at least one said movement-limiting arrangement configured to contact a lower or upper surface of the outer container.

10. A removable frame according to claim 9, wherein the frame includes an upper sub assembly configured to fit on top of the first sub assembly, the upper sub assembly including at least one said movement-limiting arrangement configured to contact an upper portion of at least one inner side surface of the outer container.

11. A removable frame according to claim 9, wherein the frame includes a lower sub assembly configured to fit onto a lower end the first sub assembly, the lower sub assembly including at least one said movement-limiting arrangement configured to contact a lower portion of at least one inner side surface of the outer container.

12. A removable frame according to claim 8, wherein the sub assemblies may be at least partially connected together by means of at least one readily releasable device that does not require routine use of a tool to lock/release it.

13. A removable frame according to claim 8, wherein a first said subassembly includes a plurality of uprights connected together by a plurality of cross-beams, each said upright being configured to be located adjacent a sidewall of the outer container, the removable frame further including upper and/or lower said sub assembly configured to connect a pair of said uprights together across a width of the outer container.

14. A removable frame according to claim 1, wherein the shelving frame is attached to uprights of an inner container positioned within the frame.

15. A storage system including at least one removable frame according to claim 1, and:
   at least one inner container, and/or at least one said outer container.

16. A removable frame adapted to be fitted inside an outer container, the frame comprising:
   an first inner container attached to the frame;
   at least one shelving frame positioned within the inner container, the at least one shelving frame engaging a second inner container; and
   a plurality of movement limiting arrangements configurable to contact an inner surface of the outer container, such contact limiting movement of the frame relative to the outer container.

17. A removable frame according to claim 16, wherein the second inner container comprises at least one extendable drawer.

18. A removable frame according to claim 16, wherein the shelving frame is attached to uprights of the first inner container.

19. A removable frame according to claim 16, wherein the movement-limiting arrangements are configured to contact
an upper and/or lower inner surface of the outer container and
at least one inner side surface of the outer container.

20. A removable frame adapted to be fitted inside an outer
container, the frame comprising:

an first inner container attached to the frame;

at least one shelving frame formed by a plurality of elon-
gated members positioned within the inner container,
the at least one shelving frame engaging a second inner
container, said second inner container at least partially
extendable with respect to the shelving frame; and

a plurality of movement limiting arrangements config-
urable to contact two inner surfaces of the outer con-
tainer and an upper and/or lower inner surface of the
outer container, such contact limiting movement of the
frame relative to the outer container.

21. A removable frame according to claim 20, wherein the
second inner container comprises a drawer.

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