base elements are provided with connector 9 for interconnection with other base elements. These connectors may be simple projections to be used only for a mechanical connection or they may be electrical connectors, for example for supplying energy to an internal motor, fluid connectors or the like depending on any functional elements included in the base elements as will be explained later. Here the connectors 9 are visible only at one end of the base elements, but it is to be understood that the opposite end surfaces may also be provided with connectors. These may be identical to the ones shown, but it is preferred that the connectors at opposite ends of a base element are made to cooperate, e.g. as plug and socket.

A second embodiment, where the top base elements 1 are provided with grooved tracks 18 in stead of the longitudinal projections 17, is shown in Fig. 2. Moreover, the base elements are here made with a curved underside 1', giving is the shape of a simple bridge, in order to provide the best possible balance between strength and weight of the base element.

Another difference from Fig. 1 is that adjustment members 19 are spanning the length of the container along its sides, interconnecting the ends of the base elements 1 so that a frame is formed on the top of the container. This not only provides strength and stiffness to a stack of containers, the adjustment members also having a curved underside 19', but also allows other containers etc. to move across in the length direction of the container. For this purpose adjustment members are also provided with wheels 16 and in this case all wheels, both on base elements and adjustment members should preferably be made retractable or turnable to avoid friction when movement is perpendicular to their direction as shown in Fig. 2.

Fig. 3 shows a third embodiment of the top base element 1, but still with wheels 16 and connectors 9 for connection to other base elements. This base element is further provided with fasteners 20 for connection both to the container on which it is mounted and to a container, which may potentially be arranged on top of it. Moreover, connectors 20' are provided for interconnection with bottom base elements or carriers

as will be described later. Finally, the base element in Fig. 3 is provided with brakes for blocking or stopping the wheels in order to keep a container arranged on top of the base element still or stop a container moving across the base element. It is also possible to provide for collection and storing of the kinetic energy of a container or the like, when it is stopped or slowed down by means of the brakes, and the base element may then include a battery or other appropriate hardware (not visible). The energy collected may be used for driving an internal motor or for supplying other functional elements as will be described later.

The embodiments of the top base element 1 shown in Figs. 1-3 are very well suited for transporting containers mounted with bottom base elements, which provide a relatively smooth underside. If transporting containers without bottom base elements, however, a design more like that in Fig. 4 will be expedient. As is well known to the skilled person, most cargo containers are built for transferring all loads via the corner fittings 14, while the walls and edges there between have limited load bearing capability. Therefore the corner fittings project slightly over the sides, bottom and roof of the container so that the corner fittings are the only points of contact when the container is resting on a level surface or on top of another container. When passing over a series of wheels 16 as on the base elements in Figs. 1-3, where the distance between the points of contact with the wheels are relatively large, the corner fittings may, however, loose contact and the load on the container will then be on a point on the bottom, which then comes into contact with wheels. To avoid this, the centre distance D between the wheels, rollers or balls should therefore be smaller than the width of the corner fittings of the containers to be handled, depending of course of the direction of movement. For ISO containers the distance should thus be smaller than 162 mm when movement is across the container and smaller than 178 mm when movement is in the length direction. In this respect it is noted that Figs. 3 and 4 are not made to measure, but are only intended as illustrative sketches.

An alternative would of course be to use belts or chains, which provide a wholly or substantially continuous support, but wheels or roll-

ers generally tend to demand less maintenance. Particularly since a base elements can often be used even if there is a failure on one or a few wheels.

A fifth type of top base element 1, which is also provided with adjustment members as in Fig. 2, is shown in Fig. 5. These base elements 1 too have a curved underside 1', but have neither a longitudinal projection nor a groove and may therefore be considered a simplified version. The wheels are here replaced with balls 16', thereby avoiding the potential directional problems associated with wheels or rollers having a fixed axis as described above.

The uppermost container shown in Fig. 5 further comprises a set of bottom base elements 31 corresponding to the top base elements 1 with regards to structure and mode of attachment but without balls or wheels. Like the top base elements, the bottom base elements too are supplemented with adjustment members 32 so that a frame is formed underneath the container, but it is to be understood that adjustment members need only be present either at the top or at the bottom to enable containers to move over each other in the length direction as described above.

Moving now to Figs. 6a-6c, three possible combinations of top base elements 1 and bottom base elements 31 are shown, the top base element of Fig. 6a corresponding to that in Fig. 1 and the top base element in Fig. 6b corresponding to that in 2. The top base element in Fig. 6c corresponds to that in Fig. 5 except for having wheels 16 in stead of balls 16'. As may be seen, the bottom base elements 31 are all provided with a groove serving as a track for the wheels, thus contribution to keeping the uppermost container in place, but it may suffice to provide a raised edge on one side of the wheels. Moreover, the functionality of the top and bottom base elements may be exchanged so that the wheels or balls are provided in the bottom base elements in stead of in the top base elements and vice versa for other functional elements, including those to be described later.

A more complex embodiment of the top base elements 1 is shown in Fig. 7, where the one to the left is shown in the mounted state,

while the one to the right is shown prior to mounting by means of a remote operating carrier 13. In the version shown here both the carrier and the base element itself is constructed so slim that the carrier can pass between two containers mounted on top of each other, even while carrying a base element. For this purpose the base element has to be either expandable, possibly telescopic, or have a width smaller than its height so that it can be transported in a lying position as shown in Fig. 7 and then turned around its length axis as indicated by the arrow M for mounting.

Further to the construction of the base element in Fig. 7, it may be seen that this base element has no wheels or the like, but is provided with a projecting edge 2 for keeping wheels of a bottom base element of another container on track. The base elements further include tracks 18 as in Figs. 2 and 6b, fasteners 20 for connection to the container corner fittings 14, here twist-locks, and connectors from base element to base element, here in the form of an induction unit 8 for data and electricity transfer and a separate connector 9 for cooled air exchange.

Additional functional elements found on the base elements in Fig. 7 are a power supply socket 5, cooling fluid sockets 6, particularly for Porthole or Conair containers, manual handle bars 7 for disconnecting the base element from the container, locking or lashing holes 15, and grooves 10 and 12 on the side surface facing the container in the mounted state for keeping additional elements in position, here in form of a twistlock negative, and for enabling a remote carrier to drive along the elements, respectively. Finally, CCTV equipment 4, possibly supplemented by satellite surveillance equipment, RFID chips, camera and/or a remote operating control unit, is provided for enabling efficient electronic monitoring and handling of the containers. Moreover, with integrated functional elements like CCTV and/or satellites for example in the base element, containers can be constantly controlled and monitored via network or web-based solutions worldwide. A solution which is today often not possible as different container solutions exists in the market or remote operating units are not offering this functionality yet. Such systems could in principle have been fitted into the actual containers, but this is

neither economical nor operationally feasible. However by integrating such solutions into the base elements such services can be offered without changing the standards of known container, ISO or other.

As indicated in Fig. 7 the base element may be provided with grooved tracks both on the exterior side, i.e. the side surface facing away from the container in the mounted state, and on the opposite interior side. An example of the use of these grooves is shown in Fig. 8, where adjustment elements 33 and 34 provided with projecting buds 35 on their sides, which buds are inserted in the grooves. The adjustment elements 33, 34 shown here also have grooves in their sides intended to serve as tracks for other equipment, and since they overlap two base elements they contribute to stabilising the group or array formed by the containers.

Another example of the use of grooved tracks facing away from the container in shown in Fig. 9, where such grooves 18 in both a top base element 1 and a bottom base element 31 is used for attachment of a lashing device 21. This lashing provides extra stiffness to the container and thus increased stability when other containers are subsequently arranged on top. The element shown at the bottom of the container may, however, also represent a top base element of an underneath container (not shown), in which case the lashing device 21 keeps the two containers together as a unit. Likewise the element shown at the top of the container might be a bottom base element of an above container (not shown).

The embodiment shown in Fig. 10 is slightly different from Fig. 9 in that the lashing device 22 is here attached to the corner fittings 14 of the container. Here it is the top corner fittings, but it could also have been the bottom corner fittings. Moreover, the lashing device 22 shown here is much slimmer than the lashing device 21 in Fig. 9, which is intended to illustrate that several different types of device, particularly having different strength, may be employed depending on demand. If made from materials, which allow very slim, foldable designs, the lashing devices may be housed in grooves or depression in top and/or bottom base elements, when not in use.

The function of the lashing devices 21 ,22 in Figs. 9 and 10 is illustrated in Fig. 11. As may be seen, it has the overall shape of an X, where the angles between the legs may be varied as indicated by the arrows a and where end members 23 may be telescoped in and out of the legs to adjust their length as indicated by the arrows b. In this way the size of the lashing device may, within certain limits, be adjusted to different container standards, but more importantly, it may be stored and moved into its intended position of use in a folded state and then expanded for attachment. For this purpose the end members 23 are provided with connectors 24 and wheels 25 for engaging base elements and/or corner fittings, the connectors 24 preferably being moveable between an advanced engagement position and a retracted position as indicated by the arrows c. It is preferred that the movement of the different parts of the lashing device is automated and preferably even remote controlled, so that lashing may be done with little or no operator involvement.

Lashing of containers may, however, also be achieved by a simple overlapping brick arrangement and interlocking of top and/or bottom base elements, so that one container is arranged with its middle above the gap between two neighbouring containers. The connectors 20' shown on the base element in Fig. 3 may be used for this purpose.

An alternative to the adjustment elements 33 shown in Fig. 8 is attachment elements as those shown in Figs. 12a-12c, which are used for stabilization, strengthening, lashing or supply means which may be active, even self-driven units, or pure passive attachments. These attachment elements 36, 37, 38 differs from the adjustment elements in being connected directly to the side of the corner fittings 14 of container and thus in principle being independent of the top base elements 1, which are attached to the upper sides of the corner fittings. However, also a combined solution of such attachment with a base element could well be imagined. The attachment element 36 in Fig. 12a constitutes a groove 18 corresponding to that in Figs. 2 and 6b and the attachment element 37 in Fig. 12b constitutes a projection 17 corresponding to that in Figs. 1 and 6a, while the attachment element 38 in Fig. 12c consti-

tutes a ledge 39. Distance keeper 40 made out of rubber or the like ensure a minimum space between containers and serve as protection and stopping members in container flow storage solutions. However, such distance keepers can also be build as connectors or power supplies.

Fig. 13 is a perspective view of a three-dimensional array of containers with top base elements 1, bottom base elements 31 and attachment elements 38 as that shown in Fig. 12c. As may be seen the attachment elements 38 span from one corner fitting to another, having substantially the same length as the container and is provided with small reinforcements 41 at intervals along their length. In the example shown in Fig. 13 the common or modified base element is directly mounted to the supporting surface, i.e. the ground, a floor or a deck. Accordingly, negative locking holes, such as known from standard integrated container fittings, are provided in the supporting surface. Such a system is very flexible and adjustable to various container sizes and volumes.

Fig. 14 shows an example of the use of ledge type attachment members, where pick-up carriers 29 run on the attachment elements along alleys or paths formed between the containers, taking cargo 3 in and out of open-sided containers. The carrier having approximately the same height and width as the base elements 1, 31 used on the containers in the array means that the carriers may also be used for transporting or storing entire containers, but the attachment elements and their connection to the containers of the array should then of course be dimensioned accordingly. Carriers may also run on the ground or other supporting surface or rest on the top of the stack of containers, and any of these carriers may including means for lifting and lowering entire containers or other loads.

The basic idea behind the use of base elements for housing functional elements and transferring loads may also be employed in a warehouse solution as shown in Fig. 15. Here containers are stored on a rack 50 made from shelf elements 51 resembling the base elements in Figs. 2, 6b, 7 and 8, pillars 52 and bracing 53, which may advantageously be lashing device as shown in Figs. 9-11. The shelf elements are provided with wheels 56, allowing containers to rest thereon and be eas-

ily moved into and out of the rack, even if not being provided with wheeled bottom base elements. The shelf elements 51 further comprises grooves 58, which, in this embodiments, may serve as tracks for equipment running in between the containers, for holding proper shelves in spaces not occupied by containers, etc.

Figs. 16a-16c show different embodiments of the detail marked E in Fig. 15. The embodiment in Fig. 16a corresponds to the one shown in Fig. 15, where the shelf elements 51 are provided with wheels 56 and where the container 55 is mounted with a bottom base element 31, interconnected to the corner fittings 14 and serving to distribute loads from the points of contact with the wheels.

Fig. 16b really shows two different embodiments, namely one on the right, where the bottom base element 31 is provided with wheels 46 for running in the groove of the shelf element 51, and another on the left, where the shelf element 51 is provided with one or more wheeled runners for carrying containers.

Finally, Fig. 16c shows what may be said to be a hybrid solution, where wheels are 56 are provided on an insert member 59 inserted in the groove of the shelf element. This provides increased flexibility of the warehouse system, as such insert members can easily be removed and possibly replaced by others having different functionality.

Where Figs. 15 shows a complete container stack flow system with each container moveable, Fig. 13 and 14 on the other hand show stacked systems, where no single container is moveable and where a moving element (not shown) would be mounted under the lowermost container or the containers simply stacked on the ground.

It is to be understood that the invention is not limited to the embodiments described above and shown on the drawing, only by the claims, and that the features described in each of these embodiments may thus be combined in other ways than those described without departing form the scope of the invention. For example features described above with reference to a top base element may also be employed in a bottom base element.

PATENT CLAIMS

1. A container handling and flow system comprising:

a plurality of base elements selected from one of the same lengths or different lengths , said base elements having a first side configured to be removably mounted on a top side of a container using container corner fittings, and having a second side configured to support other containers on top of the containers;

fasteners configured to lock base elements on to corner fittings of a container;

a plurality of containers having corner fittings;

wherein base elements are elongate and have a length corresponding to the width of a container,

wherein the fasteners are arranged one at each end of the base element at a distance corresponding the distance between the comer fittings,

wherein said base elements have sufficient strength and stiffness for allowing transfer of a load consisting of at least one of one or more container(s) and a functional element resting on top of or moving across a pair of base elements,

wherein a series of base elements removably mounted on an array of containers forms at least one path on which a load can travel to transport the load to a different location along the top of the array.

2. A container handling and flow system according to claim 1, wherein the base elements are configured to and are of the length sufficient to span the width of two or more containers arranged side-by-side.

3. A container handling and flow system according to claim 1, where at least some of the base elements also comprise rollers, wheels or conveyors, which may be either passive or driven by roller motors, conveyor drives, push/pull

systems or the like capable of moving at least one container, brakes, vibration dampeners and/or means for regaining/collecting kinetic energy.

4. A container handling and flow system according to claim 1, further comprising one or more functional element(s) chosen from the group consisting of: carriers, cranes, lashing, supply and/or stabilization elements, roof and/or sidewall systems for water, wind and sunlight protection, safety and security solutions, lights, lamps, CCTV and contra! cameras, remote control units, wireless or Bluetooth systen1s, network solutions, RFID and/or Memory and control chips, Gensets, Engines, Power Packs, fly wheels, batteries, capacitors, chargers, cooling systems, grooved tracks, weight balancing and trimming means for container, stacks and vessels, sensors for sensing distances, sensors for container and stacking stability, sensors for sensing damage, sensors for sensing motion, sensors for sensing weather, sensors for sensing supply of air/gas or electricity, wherein said functional element(s) are either separate units or are integrated into the base elements.

5. A container handling and flow system according to claim 1, where at least some base elements are configured to be interconnected or wherein at least some base elements include at least one of lashing elements, tracks, and connectors for attaching the lashing elements, wherein the lashing elements or connectors are manually or automatically operable.

6. A container handling and flow system according to claim 1, further including attachment or adjustment members configured to be mounted directly on or integrated into containers.

7. A container handling and flow system according to claim 1, where the base elements are shaped as bridges with a curved side in the length direction.

8. A container handling and flow system according to claim 1, further comprising at least one of storage facilities, supply systems for storing and delivering base elements, and an electronic control system.

9. A container handling and flow system according to claim 1, further including at least one of mounting carriers and supply carriers for running on top of or along other base elements which have already been mounted, in order to mount or dismount base elements on other containers and/or to deliver supplies.

10. A container handling and flow system according to claim 1, where the height of at least one type of base element is greater than its width, when seen in the mounted position.

11. A container handling and flow system according to claim 1, where the base elements are made with one or more materials chosen from the group consisting of metal, plastic and composites.

12. A method for handling a container and flow system comprising the step of implementing and the system of claim 1 system in at least one of container terminal, a warehouse or on board a vessel.

13. A method of handling containers comprising the steps of: a) providing an array of containers, b) arranging at least two base elements each having a length corresponding to the width of a first container in the array, c) locking the base elements to corner fittings of the first container using fasteners on the base elements, said corner fittings being located at opposite corners at the same end of the first container, d) arranging the first container so that at least one or more other container(s) can be positioned to be resting on top of, moving across, or transferred via the pair of base elements to at least another container in the array, e) arranging additional base elements on another container adjacent to the first container in the array so that other container(s) can be positioned to be

resting on top of, moving across, or transferred across the first container to at least one another container thus forming a path, and optionally f) repeating step e) with a series of base elements on a series of containers in the array thus elongating the path .

14. A method according to claim 13, further including the step of mounting base elements both at the top and at the bottom of containers before arranging them in a stack, said top and bottom base elements possibly being of different construction.

15. A method according to claim 13, where base elements are mounted by a robotic or machine system, preferably at first point of contact in a warehouse or a container terminal.

16. A method according to claim 13, where the first container and a plurality of other containers is equipped with a series of removably mounted base elements, and wherein the containers are arranged side by side so that the base elements form a path across on top of the containers to transport other containers across the path.

17. A method according to claim 13, where containers equipped with base elements are arranged in terminals or on vessels so that they form access paths for container carriers.

18. A method according to claim 13, where two or more containers are interconnected using base elements to form a movable unit.

19. A method according to claim 13, where base elements are left on the container when it is transferred to a vessel, truck or train.

20. A method according to claim 13, wherein the containers are stacked onto carriers or base elements and moved on paths through the terminal, warehouse or vessel, substantially without being lifted.

21. A method according to claim 20, where the paths are inclined and the containers are arranged on negative height equalization carriers.

22. A method according to claim 13, where containers to be relocated to other rows/stacks are moved onto carriers.

23. A method according to claim 13, where the handling and operating of containers within terminals, warehouses or vessels is controlled by software and an operational systems controlled centrally or autonomously to move and position containers optimally.

24. A fixed container handling and flow system comprising:

a plurality of containers having corner fittings;

fasteners configured to lock container base elements on to the corner fittings of a container, wherein the fasteners are arranged one at each end of the container base element at a distance corresponding the distance between the corner fittings of a container;

a plurality of base elements selected from one of the same lengths or different lengths with a length sufficient to span the width of at least one container, said base elements having a first side configured to be removably mounted on a container using container corner fittings, and having a second side configured to engage with a shelf element affixed horizontally between adjacent beams;

a plurality of beams affixed to a floor and extending vertically from a floor mounted position, spaced apart by and configured to be stabilized by shelf elements extending horizontally between each beam and forming a plurality of paths therebetween,

wherein shelf elements are elongate, extend a length corresponding to a distance between the beams and have connectors between each shelf element to further extend and form a path between the beams,

wherein a series of shelf elements horizontally mounted between an array of beams forms at least one path which moveably engages containers via the container base elements and through which at least one container can travel to a different location along the array of beams.

base elements are provided with connector 9 for interconnection with other base elements. These connectors may be simple projections to be used only for a mechanical connection or they may be electrical connectors, for example for supplying energy to an internal motor, fluid connectors or the like depending on any functional elements included in the base elements as will be explained later. Here the connectors 9 are visible only at one end of the base elements, but it is to be understood that the opposite end surfaces may also be provided with connectors. These may be identical to the ones shown, but it is preferred that the connectors at opposite ends of a base element are made to cooperate, e.g. as plug and socket.

A second embodiment, where the top base elements 1 are provided with grooved tracks 18 instead of the longitudinal projections 17, is shown in FIG. 2. The longitudinal projections 17 may serve as rails for supplementary equipment as will be explained later. Moreover, the base elements 1 are here made with a curved underside 1', giving is the shape of a simple bridge, in order to provide the best possible balance between strength and weight of the base element 1.

Another difference from Fig. 1 is that adjustment members 19 are spanning the length of the container along its sides, interconnecting the ends of the base elements 1 so that a frame is formed on the top of the container. This not only provides strength and stiffness to a stack of containers, the adjustment members also having a curved underside 19', but also allows other containers etc. to move across in the length direction of the container. For this purpose adjustment members are also provided with wheels 16 and in this case all wheels, both on base elements and adjustment members should preferably be made retractable or turnable to avoid friction when movement is perpendicular to their direction as shown in Fig. 2.

FIG. 3 shows a third embodiment of the top base element 1, but still with wheels 16 and connectors 9 for connection to other base elements. The wheels 16 may be passive, or active. An active wheel 16 receives power from an internal motor 26. This base element 1 is further provided with fasteners 20 for connection both to the container on which it is mounted and to a container, which may potentially be arranged on top of it. Moreover, connectors 20' are provided for interconnection with bottom base elements or carriers as will be described later. Finally, the base element in FIG. 3 is provided with brakes 30 for blocking or stopping the wheels 16 in order to keep a container arranged on top of the base element still or stop a container moving across the base element 1. It is also possible to provide for collection and storing of the kinetic energy of a container or the like, when it is stopped or slowed down by means of the brakes 30, and the base element 1 may then include a battery or other appropriate hardware (not visible). The energy collected may be used for driving the internal

motor 26 or for supplying other functional elements or supplementary equipment as will be described later. In some embodiments, base elements 1 contain vibration dampeners 30a, which will optimize the dynamic load distribution on elements 1. Such vibration dampeners 30a can be found near, but not limited to, the wheels 16, points of connection to the container, and along the entire length of the base element 1.

The embodiments of the top base element 1 shown in Figs. 1-3 are very well suited for transporting containers mounted with bottom base elements, which provide a relatively smooth underside. If transporting containers without bottom base elements, however, a design more like that in Fig. 4 will be expedient. As is well known to the skilled person, most cargo containers are built for transferring all loads via the corner fittings 14, while the walls and edges there between have limited load bearing capability. Therefore the corner fittings project slightly over the sides, bottom and roof of the container so that the corner fittings are the only points of contact when the container is resting on a level surface or on top of another container. When passing over a series of wheels 16 as on the base elements in Figs. 1-3, where the distance between the points of contact with the wheels are relatively large, the corner fittings may, however, loose contact and the load on the container will then be on a point on the bottom, which then comes into contact with wheels. To avoid this, the centre distance D between the wheels, rollers or balls should therefore be smaller than the width of the corner fittings of the containers to be handled, depending of course of the direction of movement. For ISO containers the distance should thus be smaller than 162 mm when movement is across the container and smaller than 178 mm when movement is in the length direction. In this respect it is noted that Figs. 3 and 4 are not made to measure, but are only intended as illustrative sketches.

An alternative would of course be to use belts or chains, which provide a wholly or substantially continuous support, but wheels or rollers generally tend to demand less maintenance. Particularly since a base elements can often be used even if there is a failure on one or a few wheels.

A fifth type of top base element 1, which is also provided with adjustment members as in Fig. 2, is shown in Fig. 5. These base elements 1 too have a curved underside 1', but have neither a longitudinal projection nor a groove and may therefore be considered a simplified version. The wheels are here replaced with balls 16', thereby avoiding the potential directional problems associated with wheels or rollers having a fixed axis as described above.

The uppermost container shown in Fig. 5 further comprises a set of bottom base elements 31 corresponding to the top base elements 1 with regards to structure and mode of attachment but without balls or wheels. Like the top base elements, the bottom base elements too are supplemented with adjustment members 32 so that a frame is formed

underneath the container, but it is to be understood that adjustment members need only be present either at the top or at the bottom to enable containers to move over each other in the length direction as described above.

Moving now to Figs. 6a-6c, three possible combinations of top base elements 1 and bottom base elements 31 are shown, the top base element of Fig. 6a corresponding to that in Fig. 1 and the top base element in Fig. 6b corresponding to that in 2. The top base element in Fig. 6c corresponds to that in Fig. 5 except for having wheels 16 instead of balls 16'. As may be seen, the bottom base elements 31 are all provided with a groove serving as a track for the wheels, thus contribution to keeping the uppermost container in place, but it may suffice to provide a raised edge on one side of the wheels. Moreover, the functionality of the top and bottom base elements may be exchanged so that the wheels or balls are provided in the bottom base elements instead of in the top base elements and vice versa for other functional elements, including those to be described later.

A more complex embodiment of the top base elements 1 is shown in FIG. 7, where the one to the left is shown in the mounted state, while the one to the right is shown prior to mounting by means of a remote operating carrier 13 (i.e., a supplementary equipment 13). The supplementary equipment 13 is able to traverse the base element 1 using wheels received in a track 12 extending the length of the base element 1. Alternatively, the carrier 13 traverses the base element using wheels received (i.e., guided) by a projecting edge 2, grooves 10, 18, or longitudinal projection 17 (shown in FIG. 1). In the version shown here both the remote operating carrier 13 and the base element 1 itself is constructed so slim that the carrier can pass between two containers mounted on top of each other, even while carrying a base element 1. For this purpose the base element 1 has to be either expandable, possibly telescopic, or have a width smaller than its height so that it can be transported in a lying position as shown in FIG. 7 and then turned around its length axis as indicated by the arrow M for mounting.

Further to the construction of the base element in FIG. 7, it may be seen that this base element has no wheels or the like, but is provided with a projecting edge 2 for keeping wheels of a bottom base element of another container on track. Alternatively, the projecting edge 2 guides supplementary equipment 13 (e.g., the remote operating carrier 13). The base elements further include tracks 18 as in FIGS. 2 and 6 b, fasteners 20 for connection to the container corner fittings 14, here twist-locks, and connectors from base element to base element, here in the form of an induction unit 8 for data and electricity transfer and a separate connector 9 for cooled air exchange. The induction unit 8 may receive and/or transfer instructions from software (e.g., control management systems) as will be explained later.

Additional functional elements found on the base elements in FIG. 7 are a power supply socket 5, cooling fluid sockets 6, particularly for Porthole or Conair containers, manual handle bars 7 for disconnecting the base element from the container, locking or lashing holes 15, and grooves 10 and 12 on the side surface facing the container in the mounted state for keeping additional elements (e.g., supplementary equipment 13) in position, here in form of a twistlock negative, and for enabling a remote carrier to drive along the elements, respectively. Finally, CCTV equipment 4, possibly supplemented by satellite surveillance equipment, RFID chips, camera and/or a remote operating control unit, is provided for enabling efficient electronic monitoring and handling of the containers. Moreover, with integrated functional elements like CCTV and/or satellites for example in the base element, containers can be constantly controlled and monitored via network or web-based solutions worldwide. A solution which is today often not possible as different container solutions exists in the market or remote operating units are not offering this functionality yet. Such systems could in principle have been fitted into the actual containers, but this is neither economical nor operationally feasible. However by integrating such solutions into the base elements such services can be offered without changing the standards of known container, ISO or other.

As indicated in Fig. 7 the base element may be provided with grooved tracks both on the exterior side, i.e. the side surface facing away from the container in the mounted state, and on the opposite interior side. An example of the use of these grooves is shown in Fig. 8, where adjustment elements 33 and 34 provided with projecting buds 35 on their sides, which buds are inserted in the grooves. The adjustment elements 33, 34 shown here also have grooves in their sides intended to serve as tracks for other equipment, and since they overlap two base elements they contribute to stabilising the group or array formed by the containers.

Another example of the use of grooved tracks facing away from the container in shown in Fig. 9, where such grooves 18 in both a top base element 1 and a bottom base element 31 is used for attachment of a lashing device 21. This lashing provides extra stiffness to the container and thus increased stability when other containers are subsequently arranged on top. The element shown at the bottom of the container may, however, also represent a top base element of an underneath container (not shown), in which case the lashing device 21 keeps the two containers together as a unit. Likewise the element shown at the top of the container might be a bottom base element of an above container (not shown).

The embodiment shown in Fig. 10 is slightly different from Fig. 9 in that the lashing device 22 is here attached to the corner fittings 14 of the container. Here it is the top corner

fittings, but it could also have been the bottom corner fittings. Moreover, the lashing device 22 shown here is much slimmer than the lashing device 21 in Fig. 9, which is intended to illustrate that several different types of device, particularly having different strength, may be employed depending on demand. If made from materials, which allow very slim, foldable designs, the lashing devices may be housed in grooves or depression in top and/or bottom base elements, when not in use.

The function of the lashing devices 21, 22 in Figs. 9 and 10 is illustrated in Fig. 11. As may be seen, it has the overall shape of an X, where the angles between the legs may be varied as indicated by the arrows a and where end members 23 may be telescoped in and out of the legs to adjust their length as indicated by the arrows b. In this way the size of the lashing device may, within certain limits, be adjusted to different container standards, but more importantly, it may be stored and moved into its intended position of use in a folded state and then expanded for attachment. For this purpose the end members 23 are provided with connectors 24 and wheels 25 for engaging base elements and/or corner fittings, the connectors 24 preferably being moveable between an advanced engagement position and a retracted position as indicated by the arrows c. It is preferred that the movement of the different parts of the lashing device is automated and preferably even remote controlled, so that lashing may be done with little or no operator involvement.

Lashing of containers may, however, also be achieved by a simple overlapping brick arrangement and interlocking of top and/or bottom base elements, so that one container is arranged with its middle above the gap between two neighbouring containers. The connectors 20' shown on the base element in Fig. 3 may be used for this purpose.

An alternative to the adjustment elements 33 shown in Fig. 8 is attachment elements as those shown in Figs. 12a-12c, which are used for stabilization, strengthening, lashing or supply means which may be active, even self-driven units, or pure passive attachments. These attachment elements 36, 37, 38 differs from the adjustment elements in being connected directly to the side of the corner fittings 14 of container and thus in principle being independent of the top base elements 1, which are attached to the upper sides of the corner fittings. However, also a combined solution of such attachment with a base element could well be imagined. The attachment element 36 in Fig. 12a constitutes a groove 18 corresponding to that in Figs. 2 and 6b and the attachment element 37 in Fig. 12b constitutes a projection 17 corresponding to that in Figs. 1 and 6a, while the attachment element 38 in Fig. 12c constitutes a ledge 39. Distance keeper 40 made out of rubber or the like ensure a minimum space between containers and serve as protection and stopping members in container flow storage solutions. However, such distance keepers can also be build as connectors or power supplies.

Fig. 13 is a perspective view of a three-dimensional array of containers with top base elements 1, bottom base elements 31 and attachment elements 38 as that shown in Fig. 12c. As may be seen the attachment elements 38 span from one corner fitting to another, having substantially the same length as the container and is provided with small reinforcements 41 at intervals along their length. In the example shown in Fig. 13 the common or modified base element is directly mounted to the supporting surface, i.e. the ground, a floor or a deck. Accordingly, negative locking holes, such as known from standard integrated container fittings, are provided in the supporting surface. Such a system is very flexible and adjustable to various container sizes and volumes.

Fig. 14 shows an example of the use of ledge type attachment members, where pick-up carriers 29 run on the attachment elements along alleys or paths formed between the containers, taking cargo 3 in and out of open-sided containers. The carrier having approximately the same height and width as the base elements 1, 31 used on the containers in the array means that the carriers may also be used for transporting or storing entire containers, but the attachment elements and their connection to the containers of the array should then of course be dimensioned accordingly. Carriers may also run on the ground or other supporting surface or rest on the top of the stack of containers, and any of these carriers may including means for lifting and lowering entire containers or other loads.

The basic idea behind the use of base elements for housing functional elements and transferring loads may also be employed in a warehouse solution as shown in Fig. 15. Here containers are stored on a rack 50 made from shelf elements 51 resembling the base elements in Figs. 2, 6b, 7 and 8, pillars 52 and bracing 53, which may advantageously be lashing device as shown in Figs. 9-11. The shelf elements are provided with wheels 56, allowing containers to rest thereon and be easily moved into and out of the rack, even if not being provided with wheeled bottom base elements. The shelf elements 51 further comprises grooves 58, which, in this embodiments, may serve as tracks for equipment running in between the containers, for holding proper shelves in spaces not occupied by containers, etc.

FIGS. 16a-16c show different embodiments of the detail marked E in FIG. 15. The embodiment in FIG. 16 a corresponds to the one shown in FIG. 15, where the shelf elements 51 are provided with wheels 56 and where the container 55 is mounted with a bottom base element 31, interconnected to the corner fittings 14 and serving to distribute loads from the points of contact with the wheels. The shelf element 51 contains a groove 58 extending the length of the shelf element 51 that may guide supplementary equipment 13 along the entire shelf element 51. In some embodiments, the groove 58 receives a wheel of supplementary equipment 13. In other embodiments, the shelf element 58 contains a longitudinal projection and/or projected edge for guiding the supplementary equipment 13.

FIG. 16b really shows two different embodiments, namely one on the right, where the bottom base element 31 is provided with wheels 46 for running in the groove 58 of the shelf element 51, and another on the left, where the shelf element 51 is provided with one or more wheeled runners for carrying containers. Alternatively, the wheels 46 may be part of supplementary equipment 13 that is able to traverse the entire length of the shelf element 51 using the groove 58.

Finally, FIG. 16c shows what may be said to be a hybrid solution, where wheels are 56 are provided on an insert member 59 inserted in the groove 58 of the shelf element 51. This provides increased flexibility of the warehouse system, as such insert members 59 can easily be removed and possibly replaced by others having different functionality.

FIG. 17 illustrates an embodiment of the present invention that includes elements for raising and lowering containers 55 along an incline path. An incline path (composed of several inclination elements 62) may reduce the energy needs of a container handling and flow system. The incline path may form a straight line from one end of a terminal or warehouse to the other with or without integrated sideways or may be built in lines and curves allowing the container to be rolled/moved back to the quay. Lifting of containers 55 thus only has to take place once or a few times and may be concentrated to one or a few places in the terminal or warehouse (a robotic or machine system for lifting is described in FIG. 18 and 19). The inclination elements 62 are mounted to containers 55 at the fittings 14. A base elements 1" may be attached to the inclination elements 62 to provide strength, support, and guidance for elements previously described in relation to base element 1. A container 55 may be transported along the incline path by a negative height equalization carrier 63 (i.e., supplementary equipment 62). The carrier 63 includes wheels 46 that are guided along the base elements 1" and/or the inclination elements 62 by a groove and/or projection (not shown; describe with respect to FIG. 1-2). a negative height equalization carrier 62, the container 55 is parallel to the ground while traversing the inclination elements 2 of the incline path, which is preferable for cargo security and operation safety. Alternatively, it is possible to employ an active hydraulic device for the equalization of height level of stacks as integrated or separate unit to the base elements or bottom carriers. The carrier 63 and/or the hydraulic devices may even be built in a shape bringing two or more container stacks to the same height level to ease the work of carriers and shuttles driving along the attachments for pick-up and exchange cargo. An inclination solution shown in FIG. 17 would be of major benefit not only for transhipment hubs in terms of energy, emissions, operational planning complexity and time requirement.

FIG. 18 illustrates a container handling and flow system 100. A software 60, for example, but not limited to, a controlling management system, ensures that the containers 55 are at the required place in a terminal or warehouse at the desired time and with the right

container 55 loaded by keeping track of all moves and enabling a smooth and energy efficient operation. The software 60 is able to communicate with a robot 61 (i.e., a robotic or machine system) over a network 80 that is able to move containers 55. The network 80 is, for example, but not limited to, a wireless internet, a cellular network, or other communication networks. In some embodiments, the software 60 is able to communicate with base elements 1, 31 over the induction unit 8 (described in detail with respect to FIG. 7). Supplementary equipment 13, 63 may be able to receive instructions from the software 60 by connecting to the induction unit 8 of the base elements 1, 31.

FIG. 19 illustrates a container handling and flow system 100 that includes a robot 61 (i.e., a robotic or machine system). The robot 61 is able to mount base elements 1, 31 to containers 55. In some embodiments, the robotic or machine system 61 is able to move containers 55. Elements of the container 55 are described with respect to FIG. 1. The robot 61 mounting base elements 1, 31 to containers 55 may help keep labor costs for the system 100 at a minimum. It is preferred that base elements 1, 31 are mounted by the robot 61 at first point of contact in a warehouse or a container terminal (e.g., when first received at the warehouse or terminal).

Where Figs. 15 shows a complete container stack flow system with each container moveable, Fig. 13 and 14 on the other hand show stacked systems, where no single container is moveable and where a moving element (not shown) would be mounted under the lowermost container or the containers simply stacked on the ground.

It is to be understood that the invention is not limited to the embodiments described above and shown on the drawing, only by the claims, and that the features described in each of these embodiments may thus be combined in other ways than those described without departing form the scope of the invention. For example features described above with reference to a top base element may also be employed in a bottom base element.

PATENT CLAIMS

1. A container handling and flow system comprising a plurality of base elements for mounting on containers and fasteners for locking the base elements on to corner fittings of a container, wherein base elements are elongate and have a length corresponding to the width of the containers to be handled, wherein said base elements comprise at least one of grooved tracks extending the length of the base element and longitudinal projections for receiving a wheel of a supplementary equipment, said system possibly including base elements of element length is selected from equal lengths or different lengths corresponding to different container standards, that wherein the fasteners are arranged one at each end of the base element at a distance corresponding to the distance between the corner fittings, and wherein that said base elements are rigid and configured to allow have sufficient strength and stiffness for allowing transfer of the load of one or more container(s) resting on top of or moving across a pair of base elements.

2. A container handling and flow system according to claim 1, further including base elements capable of spanning the width of two or more containers arranged side-by-side.

3. A container handling and flow system according to claim 1 wherein at least some of the base elements are equipped with further comprise at least one of rollers, wheels, [[or]] conveyors, which may be either passive or driven by roller motors, conveyor drives, push/pull systems or the like capable of moving at least one container, brakes, and vibration dampeners and/or means for regaining/collecting kinetic energy driven by at least one method consisting of passivity, roller motors, conveyor drives, and push/pull systems.

4. A container handling and flow system according to claim 1, further comprising one or more functional element(s) chosen from the group consisting of: carriers, cranes, lashing, supply and/or stabilization elements, roof and/or sidewall systems for water, wind and sunlight protection, safety and security solutions, lights, lamps, CCTV and control cameras, remote control units, wireless or Bluetooth systems, network solutions, RFID and/or Memory and control chips, Gensets, Engines, Power Packs, fly wheels, batteries, capacitors, chargers, cooling systems, grooved tracks, weight balancing and trimming means for container, stacks and vessels, sensors for sensing distances, container and stacking stability, damages, motions, weather, etc. as well as supply of air, gas, air/gas or electricity, said functional element(s) being either separate unites)units or integrated in the base elements or carriers.

5. A container handling and flow system according to claim 1, where at least some base elements can beare interconnected by the group consisting of lashing elements, or include lashing elements or tracks, and connectors for attachment of lashing elements, the lashing elements or connectors preferably being automatically operable.

6. A container handling and flow system according to claim 1, further including comprising attachment or adjustment members for being mounted directly on *or* which are integrated in containers.

7. A container handling and flow system according to claim 1, wherein the base elements are shaped as bridges with a curved side in the length direction.

8. A container handling and flow system according to claim 1, further including comprising at least one of storage facilities for storing base elements and/or , supply systems for storing and delivering base elements, and respectively, and/or an electric control system, preferably with remote communication.

9. A container handling and flow system according to claim 1, further including mounting and/or supply carriers for running onto or along other base elements, which has already been mounted, to mount or dismount base elements on other containers and/or deliver supplies.

10. A container handling and flow system according to claim 1, where the height of at least one type of base element is bigger than its width, when seen in the mounted position.

11. A container handling and flow system according to claim 1, where the base elements are made with one or more materials chosen from the group consisting of: metal, such as steel, plastic, and composites, including and fiber fibres reinforced materials.

12. A method for handling a container and flow system comprising the steps of: step of determining a location selected from the group consisting of a container terminal, a warehouse and on board a vessel; providing a plurality of base elements and fasteners at the location, wherein base elements are elongate and have a length corresponding to the width of the containers to be handled, wherein base elements comprise at least one of grooved tracks extending the length of the base element and longitudinal projections for receiving a wheel of a supplementary equipment, wherein base element length is selected from equal lengths or different lengths corresponding to different container standards,

wherein the fasteners are arranged one at each end of the base element at a distance corresponding to the distance between the corner fittings, and wherein said base elements are rigid and configured to allow transfer of the load of one or more container(s) moving across a pair of base elements; providing a plurality of containers at the location; arranging at least two base elements on a first container using the fasteners on the base elements said corner fittings being located at opposite corners at the same end of the first container; and arranging the first container in a stack with at least one other container so that the load of one or more container(s) resting on top of a pair of base elements may be transferred via the base elementsimplementing the method and system in at least one of a container terminal, a warehouse or on board a vessel.

13. A method of handling containers comprising the steps of:
a) providing a plurality of base elements comprising at least one of grooved tracks extending the length of the base elements and longitudinal projections configured to stably retain base element members from the group consisting of longitudinal elements, projection buds, and end members,
b) arranging at least two base elements on a first container,
c) attaching the base members by affixing at least one of a grooved track and longitudinal projection on one base member to a reciprocal longitudinal element, projection bud or end member on the other base member,
d) locking the base elements to corner fittings of the first container using fasteners on the base elements, said corner fittings being located at opposite corners at the same end of the first container,
e) arranging the first container in a stacks stack with at least one other container so that the load of one or more container(s) resting on top of or moving across a pair of base elements may be transferred via the base elements.

14. A method according to claim 13, further including the step of mounting base elements both at the top and at the bottom of containers before arranging them in a stack, said top and bottom base elements possibly being of different construction.

15. A method according to claim 13, where base elements are mounted by a robotic or machine system, preferably at first point of contact in a warehouse or a container terminal.

16. A method according to claim 13, where containers equipped with base elements are arranged to form a path for other containers.

17. A method according to claim 13, where containers equipped with base elements are arranged in terminals or on vessels so that they form access paths for container carriers.

18. A method according to claim 13, two or more containers are interconnected using base elements to form a movable unit.

19. A method according to claim 13, where base elements are left on the container when it is transferred to a vessel, truck or train.

20. A method according to claim 13, where the containers are stacked onto carriers or base elements and moved on paths through the terminal, warehouse or vessel, substantially without being lifted.

21. A method according to claim 20, where the paths are inclined and the containers are preferably arranged on negative height equalization carriers.

22. A method according claim 13, where containers to be relocated to other rows/stacks are moved onto carriers.

23. A method according to claim 13, where the handling and operating of containers within terminals, warehouses or vessels are controlled by software and an operational systems system controlled centrally or autonomously to move and position containers optimally.

24. The system as in claim 5, wherein the base elements interconnection by the group is manually operated.

25. The system as in claim 5, wherein the base elements interconnection by the group is automatically operated.

26. The method as in claim 14, wherein the base elements are of different construction.

27. The method as in claim 15, further comprising a first point of contact and wherein the robotic system mounts base elements at the first point of contact.

28. The system as in claim 8, wherein the at least one of the storage facility, supply system, and electric control system is/are remote controlled.