A collapsible shipping container of the type used for loading on ships, trailer trucks, airplanes and railroad flat cars. The container includes a floor having four corner members, side walls supported by the floor, a roof connected to the side walls and end walls each having two corner posts pivotally connected to the corner members and adapted to be supported only by the corner members when the container is in an erected condition. The upper end of each of the corner posts has at least one gripping member receiving formation which conforms to international standards as to size, configuration and location so that the erected container can be picked up and moved by a standard container handling device. The lower end of each of the corner posts also has at least one gripping member receiving formation which conforms to international standards as to size and configuration and is located so that when the container is in a collapsed condition with the end walls positioned over the roof, the formations at the lower ends of the corner posts will conform to international standards as to location so that the collapsed container can be picked up and moved by the standard container handling device in the collapsed condition as well as in the erected condition.
COLLAPSIBLE SHIPPING CONTAINER

The present invention relates to collapsible shipping containers of the type used for loading on ships, trailer trucks, airplanes and railroad flat cars. More particularly, the present invention relates to a collapsible container which is constructed so that it can be handled by a standard container handling device either in the erected condition or in the collapsed condition. Also, the container is constructed so that the corner posts of each end wall of the container are pivotally connected to the corners of the floor of the container in such a way that no vertical load is placed upon the pivot connections when the container is in the erected condition. With this construction, a plurality of loaded containers can be stacked vertically one upon the other, with the weight of these containers being supported only by the corner posts and floor corners of the bottom container.

Accordingly, the present invention provides a collapsible container including a floor having four corner members, first and second side walls each of which is supported by the floor between two of the corner members, first and second end walls each of which is pivotally connected to one pair of corner members and arranged to be supported only by the one pair of corner members when the container is in an erected condition, and a roof connected to the side walls. Each corner of each of the end walls has at least one upper gripping member receiving formation and at least one lower gripping member receiving formation which are situated so that when the container is in the erected condition, the upper formations conform to international standards as to size, configuration and location for receiving gripping or hook members of a standard container handling device, and when the container is in a collapsed condition, the lower formations conform to international standards as to size, configuration and location for receiving the gripping members of the standard container handling device. With this construction, the container can be handled by the standard container handling device either in the erected condition or in the collapsed condition.

A general object of the present invention is the provision of a collapsible shipping container which can be used for loading on ships or airplanes and which can form the material receiving body portion of a trailer truck or a railroad car.

Another object of the present invention is the provision of a collapsible container of the type which can be stacked, one upon the other, either in an erected condition or in a collapsed condition.

Another object of the present invention is the provision of a collapsible shipping container which can be handled by a standard container handling device either in the collapsed condition or in the erected condition.

Another object of the present invention is the provision of a collapsible shipping container which has pivotally mounted end walls which are supported only by the floor structure of the container when the container is in an erected condition so that no load is placed upon the pivot connections when the container is in an erected condition.

Another object of the present invention is the provision of a collapsible shipping container which can be collapsed to a height which is not more than one fifth the height of the erected container so that five collapsed containers can be stacked in the same space taken up by one erected container.

Still another object of the present invention is the provision of a collapsible shipping container of the type used for loading on ships, trailer trucks, airplanes and railroad flat cars and in which the side walls of the container fold inwardly and rest on the floor with the roof resting on the side walls and the end walls being pivotally mounted to fold inwardly on top of the roof, when the container is collapsed to its fully collapsed condition.

These and other objects of the present invention, and the manner of their attainment, will become more apparent from the following description of a preferred embodiment of the invention taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective view of the collapsible container of the present invention in the erected condition;
FIG. 2 is a perspective view of the container in a partially erected condition;
FIG. 3 is a perspective view of the container in the fully collapsed condition;
FIG. 4 is an enlarged side elevational view of the lower left hand corner of the container shown in FIG. 1 and showing a corner post seated on a corner support member;
FIG. 5 is a view similar to FIG. 4 showing the corner post rotated out of engagement with the corner support member;
FIG. 6 is a sectional view taken along lines 6—6 of FIG. 3 and showing the nesting relationship of a collapsed side wall and end wall of the container;
FIG. 7 is a fragmentary sectional view taken along lines 7—7 of FIG. 1 and showing the position of the side wall hinges when the side wall shown in FIG. 6 is in an erected condition; and,
FIG. 8 is a fragmentary perspective view of the inside lower left hand corner of the container shown in FIG. 1.

Referring now to the drawings in greater detail, FIG. 1 shows a container 10 in the erected condition. The container 10 includes a floor 12, end walls 14 and 16, side walls, one of which is shown at 18, and a roof 20. It is to be understood that the side wall not shown is a mirror image of the side wall 18. In the illustrated embodiment, the end wall 14 includes two door panels 22 and 24 each of which is hingedly connected, as indicated at 25 and 26, to one of two corner posts 28 and 30. Each of the corner posts 28 and 30 has an upper corner fitting 32 and 34 respectively. An upper tubular member 36 is secured between the upper corner fittings 32 and 34. A lower corner fitting 38 is secured to the lower end of the corner post 28 and a similar lower corner fitting 39 is secured to the lower end of the corner post 30. These lower corner fittings 38 and 39 are secured to a lower tubular frame member 40. Each of the lower corner fittings 38 and 39 is pivotally connected to the floor 12 in a manner which will be more fully described in connection with the description of FIGS. 4 and 5.

As best shown in FIG. 3, the end wall 16 is constructed in a similar manner to the end wall 14 with corner posts 41 and 42, upper corner fittings 43 and 44, lower corner fittings 45 and 46, and upper and lower tubular frame members 47 and 48. However, instead of door panels, the end wall 16 has a single end panel 49 secured between the corner posts 42 and 44.
3. To facilitate handling of the container 10 in the erected condition each of the upper corner fittings 32, 34, 43, and 44 (FIG. 2) have gripping member receiving formations, such as the hook received members (not shown) in the upper corner fittings 3 and 43, for receiving a hook member (not shown) of a standard container handling device (not shown). The formations 52 and 54 are in the form of elongated openings in the corner fittings 32 and 43. These formations 52 and 54, and similar formations in the corner fittings 34 and 44 conform to international standards as to size, configuration and location when the container 10 is in the erected condition so that the erected container 10 can be easily picked up and moved by a standard container handling device.

Although not shown, it is to be understood that each end of the roof 20 may have one or more keeper members secured thereto and each one of the upper frame members 36 and 47 may have one or more movable latch members which are adapted to cooperatively engage and latch with respective ones of the keeper members. Also, a sealing gasket may be provided along the inside surface of each of the frame members 36 and 47 for sealing the junction between the roof 20 and the end walls 14 and 16 when the roof 20 is latched in place.

As best shown in FIG. 2, the side wall 18 includes an upper section 53 which is connected by an upper hinge 54 to the roof 20 and a lower section 55 which is connected by a lower hinge 56 to the floor 12. The sections 53 and 55 are connected together by a middle hinge 58. When it is desired to collapse the container 10, the roof 20 is first unflatched from the upper tubular frame members 36 and 47 and side latches 59 are retracted and then the side walls such as side wall 18 are folded or buckled inwardly as shown in FIG. 2 to fold the upper section 53 onto the lower section 55 and in so doing, lower the roof 20 to its lower collapsed condition shown in FIG. 3. When the side walls are fully collapsed, the lower section 55 will rest upon the floor 12 and the upper section 53 will rest upon the lower section 55. The roof 20 in turn, will rest upon the upper section 53 of the side wall 18 and a similar upper section of the opposite side wall (not shown). After the side walls have been collapsed, the end walls 14 and 16 are folded over the roof 20 as shown in FIG. 3.

An important aspect of the present invention is the provision of gripping member receiving formations in the lower corner fittings 38, 39, 45 and 46, such as the formation 60 in the lower corner fitting 38 and the formation 62 in the lower corner fitting 45. These formations 60 and 62, and similar formations (not shown) in the lower corner fittings 39 and 46, are elongated openings similar to openings 50 and 52 in the upper corner fittings 32 and 43 and conform to international standards as to size and configuration. Also, these openings are so situated on the lower corner fittings 38, 39, 45 and 46 that when the end walls 14 and 16 are collapsed, the openings, e.g., openings 60 and 62, are in proper location with respect to the corners of the collapsed container 10 to conform to international standards respecting location. In other words, the openings 60 and 62 shown in FIG. 3, are in a position with respect to each other which is similar to the position of openings 50 and 52 in FIG. 1 so that the hook members (not shown) of a standard container handling device (not shown) can be received in the openings 60 and 62 for picking up and moving the collapsed container 10. The openings 60 and 62 also are adapted to receive conventional T-shaped twist lock connectors for securing the container 10 to another container 10 either in the collapsed condition or in the erected condition. The lower corner fittings 38, 39, 45 and 46 also have a second group of gripping member receiving formations 63 which are adapted to receive suitable T-shaped twist lock connecting lugs on a lowered rectangular frame of a standard container handling device (not shown). The upper corner fittings 32, 34, 43 and 44 have similar formations 64 on the top surfaces thereof for receiving the connecting lugs when the container 10 is in the erected condition. The formations 63 and 64 are also adapted to receive twist lock connectors for securing a plurality of containers 10 erected or collapsed, for securing the containers in a stacked condition. For this purpose, it will be understood that although not shown, the underside of the corners of the floor 12 have gripping member receiving formations similar to the formations 63 and 64.

Also, the floor 12 is provided with lift pockets 67 which are adapted to receive fork members (not shown) of a suitable fork lift mechanism for lifting the container 10, or bars (not shown) of a suitable spreader-bar sling for lifting the container by a crane (not shown).

As shown in FIG. 3, the floor 12 has a corner member at each corner thereof, three of which are indicated at 70, 72 and 74 in FIG. 3. Each of the corner members has an opening therein, such as the opening 75 in the corner member 72 and the opening 80 in the corner member 74 which are similar to the openings 50 and 52 and which conform to international standards as to size, configuration and location so that a container handling device (not shown) can engage the container at the lower corners thereof for moving the same.

The corner member 72 is identical to the corner member (not shown) and the corner members 70 and 74 are mirror images of the corner member 72. Therefore, only the corner member 72 and the lower corner fitting 38 associated therewith will be described in detail with reference to FIGS. 4 and 5.

As best shown in FIGS. 4 and 5, the lower corner fitting 38 is pivotally connected to the corner member 72. For this purpose, the lower corner fitting 38 has a trunion portion 82 including a pin 84 and the corner member 72 has a gudgeon portion 86 including an opening 88 for receiving the pin 84. The opening 88 is elongated in the vertical direction having a rounded bottom surface 90 and a rounded top surface 92. The pin 84 received in the opening 88 is circular and is adapted to be supported by and slidably rotated on the bottom surface 90 when the end wall 14 is pivoted between an erected position and a collapsed position of the container 10.

In addition to the trunion portion 86, the corner member 72 also has a step portion 93 with an upper load bearing seating surface 94. The lower corner fitting 38 has a block portion 95 with a lower load bearing surface 96 which is adapted to mate with and rest on the load bearing surface 94 of the step portion 93 when the end wall 14 is pivoted to an upright position. The corner fitting 38 and the corner member 72 are constructed so that the height L1 of the lower side of the cylindrical surface of the pin 84 above the seating surface 96 is greater than the height L2 of the rounded bottom surface 90 above the seating surface 94. With this
construction, the pin 84 will move upwardly in the elongated opening 88 when the block portion 95 is rotated to engage seating engagement on the step portion 93, and no shear forces will be placed on the pin 84 in a vertical direction when the container 10 is in an erected condition as best shown in FIG. 4. Stated otherwise, the pin 84 will not engage either the lower surface 90 or the upper surface 92 of the opening 88. In this way, all the load placed on the corner post 28 will be supported only by the load bearing surface 94 of the step portion 93. This is an important aspect of the present invention since it permits a number of containers 10 to be stacked one upon the other without damaging the pivot connections between the end walls 14 and 16 and the floor 12 of each container, i.e., without placing vertical shear forces upon the pins 84 of each container 10.

As best shown in FIG. 5, the pin 84 will rest on the bottom surface 90 of the opening 88 when the lower corner fitting 40 is rotated toward and away from the vertical position of the end wall 14. Also, when the end wall 14 is in a collapsed position over the roof 20, some shear forces will be placed upon the pin 84 which is resting on the rounded bottom surface 90 of the opening 88. Preferably, the pin 84 has sufficient strength to sustain shear forces of at least 10,000 lbs. thereon from the weight of at least four similar collapsed containers 10 stacked on top of the collapsed container 10 and from the weight of a loaded container when the container 10 is gripped at the upper corner fittings and then lifted.

As shown in FIGS. 4 and 5, the lower corner fitting 38 has a hanger portion 97 which is adapted to be engaged and held by a locking member 98 when the end wall 14 is in an erected position. The locking member 98 has a handle portion 100 which is received in a recess 102 in the corner member 72. When the handle member 100 is in the recess 102, the locking member 98 is in an extended locking position and when the handle portion 100 extends outwardly from the recess 102, the locking member 98 is in a retracted position which will not engage the latch portion 97. As clearly shown in FIGS. 1 and 2, the latch 59 and the handle portion 100 are clearly visible from the outside of the container so that the container 10 can be latched and unlatched from the outside and so that one can easily determine whether or not the container 10 is properly secured in the erected condition. By having the roof latch members (not shown), the latch 59 and the handle portion 100 connected to the locking member 98 positioned on and operable from the outside of the container, one does not have to go inside the container 10 before it is secured in the erected condition, which could be hazardous. Also, as shown in FIG. 3, the handle member 100 projects outwardly from the container 10 when the end walls 14 and 16 are unlatched, thereby providing a visual safety indication of the unlatched condition of the end walls 14 and 16.

As shown in FIG. 5, the lower corner fitting 38 may have a pin formation 104 to which a spring (not shown) can be connected for spring biasing the end wall 14 to an erected position so that movement of the end wall 14 to the collapsed position will be damped by the spring tension. The spring tension will also facilitate erection of the end wall 14 in a similar way that a biasing spring is used on a conventional garage door to reduce the force necessary to open and close the door.

As best shown in FIG. 5, the corner support member 72 also has a beam connecting formation 106 which is adapted to engage a side floor beam 109 which extends the length of the container 10 and is connected to the corner member 74 (FIGS. 1 to 3). A similar floor beam (not shown) is connected between the corner members 70 and the corner member not shown. The floor 12 also includes end beams, such as the end beam 110 which is connected between corner members 70 and 72 as best shown in FIG. 3.

As shown in FIG. 6, the beam 109 includes a side channel section 112 and a bottom channel section 114. A floor hinge member 116 of the lower hinge 56 is secured to the upper corner 117 of the channel section 112. Floor boards 118 of the floor 12 extend from a lower flange 119 of the floor hinge member 116 across the floor 12 and are supported by a plurality of cross beams 120 which extend between the side beams of the floor 12.

In the collapsed condition shown in FIG. 6, the lower section 55 of the side wall 18 is supported above the floor boards 118 by the hinge 56 and the hinge 58 (not shown) which rests on the floor boards 118. The upper section 53 and the roof 20 are supported by the hinges 54 and 58 above the lower section 55. In this respect, the upper hinge 54 includes a roof hinge member 122 having a flange portion 124 which rests upon the floor hinge member 116 and the upper corner 117 of the channel section 112 when the container is in a collapsed condition.

As shown in FIG. 6, the upper hinge 54 includes the roof hinge member 112 which is secured to the roof 20 and a wall hinge member 128 which is secured to the upper section 53 of the side wall 18. The members 122 and 128 have gear segment portions 130 and 132 respectively which are held in meshing engagement by a hinge connector 134.

Similarly, the lower hinge 56 includes the floor hinge member 116 and a wall hinge member 136. The members 116 and 136 each have a gear segment portion 138 and 140 respectively which are held in meshing engagement by a hinge connector 142.

In FIG. 7, the hinges 54, 56 and 58 are shown in an upright position which they will assume when the container 10 is in an erected condition. As shown in FIG. 7, the hinge 58 includes an upper hinge member 144 which is connected to the upper side wall section 53, a lower hinge member 146 which is connected to the lower side wall section 55 and a connector member 148. The construction of the hinge 58 is similar to the construction of the hinges 54 and 56 in that the members 144 and 146 have gear segment portions 150 and 152 respectively which are held in meshing engagement by the connector member 148. Preferably, the connector member 148 is formed with a T-shaped handle portion 153 extending therefrom. This handle portion 153 can be easily gripped for pulling the side wall sections 53 and 55 outwardly to a proper vertical position thereof where both sections 53 and 55 lie in the same vertical plane. The handle portion 153 preferably extends the length of the connector member 148 to strengthen the connector member 148.

The members 144 and 146 are provided with seating surfaces 154 and 156 respectively. When the container 10 is in a collapsed condition, the seating surface 156 on the member 146 is adapted to rest upon the floor boards 118 and, the seating surface 154 on the hinge
member 144 is adapted to support the roof 20 thereon. Preferably, the component parts of the hinges 54, 56 and 58 are extruded from a lightweight material, such as aluminum. Since these parts will extend substantially the length of the container 10, the loading forces on these parts will be distributed throughout their length. For this reason, this type of hinge construction is preferred for the hinges 54, 56 and 58.

The construction of the hinges 54, 56 and 58 is of the type shown in U.S. Pat. Nos. 3,092,870 and 3,402,422 which issued on June 11, 1963 and Sept. 24, 1968, respectively, to Austin R. Baer. Although this particular construction of the hinges 54, 56 and 58 is preferred, it is to be understood that other types of hinges can be utilized.

The corner post 28 of the end wall 14 is shown in FIG. 6 spaced slightly above the roof 20 and the roof hinge member 122. This is because the pivot connection of the lower corner fitting 38 and the corner member 72 is slightly above the collapsed position of the roof 20 and the roof hinge member 122. As a result, the end wall 14 in the folded over collapsed condition inclines slightly downwardly from the pivot connections thereof toward a point of resting engagement with the floor side beams, such as the floor side beam 109 shown in FIG. 6.

To ensure proper nesting or resting engagement of the end wall 14 above the roof 20, a guide flange 160 is secured to an inner corner 162 of the corner post 28. This guide flange 160 is adapted to rest on a corner portion 164 of the roof hinge member 122 at a point near the upper corner fitting 56. The roof hinge member 122 in turn is supported by the portion of the floor hinge member 116 which rests upon the upper corner 117 of the side channel section 112. It is to be understood that the other corner post 30 of the end wall 14 is supported in like manner by the other floor side beam (not shown) when the container 10 is in the collapsed condition. In this way, the end wall 14 will be supported in the collapsed condition by the pivot connections and the floor side beams and is not supported directly by the roof 20.

The guide flange 160 includes a channel portion 166 which as an L-shaped configuration for mating with the L-shaped corner surface of the corner portion 164 of the roof hinge member 122. In this way, the roof hinge member 122 and the flange 160 cooperate to align the end wall 14 relative to the roof 20 when the end wall 14 is folded over to the collapsed position. Also, the upper hinge member 122 has a depending skirt portion 168 which serves to align the roof hinge member 122 relative to the upper corner 117 of the side channel section 112. Thus, the hinge member 122 not only forms part of the upper hinge 54, but also serves as a supporting member, a seating member and an alignment member by reason of the flange portion 124, the corner portion 164 and the skirt portion 168. It is to be understood, of course, that the other corner posts 30, 41 and 42 are seated and aligned in a similar manner.

By supporting the corner posts 28 and 30 of the end wall 14 on the side beams of the floor 12 and the pins 84 of the corner members, very little, if any, load is placed on the roof 20 and the side wall sections 53 and 55 when the container 10 is in a collapsed condition. As a result, the thickness of the roof 20 and the side wall sections 53 and 55 can be kept to a minimum. By keeping the thickness of the roof 20 and the side wall sections 53 and 55 at a minimum and by reason of the simple and compact nesting of the walls and roof of the container 10 on the floor 12 (as indicated in FIG. 6), the collapsed container shown in FIG. 3 can have a height no greater than one fifth of the height of the erected container 10 shown in FIG. 1. In this way, five of the collapsed containers 10 shown in FIG. 3 can be stacked in the same space taken up by the one erected container 10 shown in FIG. 1. By way of example, one working model of a container constructed in accordance with the teachings of the present invention was 20 feet long, 8 feet wide and 8 feet high in the erected condition and 19.2 inches high in the collapsed condition.

As shown in FIG. 7, the wall hinge member 128 has a recessed seating portion 170 which is adapted to receive and support the skirt portion 168 of the roof hinge member 122 when the container is in an erected condition to minimize the load placed on the gear segment portions 130 and 132. In like manner, the wall hinge member 154 has a downward extending projection 172 which is received and supported in a recessed portion 174 of the wall hinge member 156 to minimize the load placed on the gear segment portions 150 and 152. Also, lateral forces placed on the hinge 56 will be placed on the projection 172 and the recessed portion 174 instead of on the gear segment portions 150 and 152. Also, in like manner, the wall hinge member 136 has a portion 176 which will bear against the floor hinge member 116 so that lateral forces placed on the hinge 56 will be borne by the members 136 and 116 instead of by the gear segment portions 138 and 140.

To prevent moisture or foreign material from entering into the area of meshing engagement of the gear segment portions of the hinges 54, 56 and 58, the hinge members 122, 146, 136 and 116 are provided with slots for receiving gasket strips 178, 180, 181 and 182 respectively. These gaskets 178, 180, 181 and 182 not only prevent moisture and foreign material from reaching the gear segment portions of the hinge 54, 56 and 58 but also seal the side walls to prevent moisture from entering into the container 10.

The wall hinge member 136, and the connector member 142 of the hinge 56 also have projecting formations 184 and 186 respectively which mate with each other as shown in FIG. 7 to prevent foreign material from reaching the pivot connection of the connector member 42 with the hinge member 136.

To seal the junction of the side walls (such as side wall 18) with the end walls 14 and 16, the side wall sections 53 and 55 are provided with a gasket strip 188 (FIG. 2) at each end thereof which will bear against a portion of the guide flange 160 secured to each of the corner posts 28, 30, 41 and 42 when the container 10 is in the erected condition.

As best shown in FIG. 8, the corner construction of the container 10 is such that the lower inside corner of the container in the erected condition has essentially smooth side and bottom surfaces with only a small portion of the corner block portion 95 of the lower corner fitting 38 extending slightly into the lower inside corner of the container 10.

I claim:

1. A collapsible shipping container of the type used for loading on ships, airplanes, trailer trucks and railroad flat cars, said container comprising a floor having
four corner members, first and second side walls each of which is adapted to be connected to said floor between two of said corner members, first and second end walls each of which is pivotally connected to one pair of said corner members and is arranged to be supported by said one pair of corner members when said container is in an erected condition, and a roof which is supported by said end walls when said container is in said erected condition, each of said end walls including two corner posts and an end panel therebetween, each of said corner members including a gudgeon portion having a pin receiving opening and each of said corner posts including a trunnion portion at the lower end thereof having a pivot pin which is received in said opening, each of said corner members having a load bearing seating surface and each of said lower ends of each of said corner posts having a mating load bearing seating surface which is adapted to rest upon and be supported only by said seating surface of the cooperating adjacent one of said corner members when said container is in said erected condition, so that any load placed on said corner posts will be supported only by said corner posts and said corner members and not by said pivot pins.

2. The container as defined in claim 1 wherein each of said openings in said gudgeon portions has a rounded load bearing bottom surface for supporting one of said pins received therein when each of said side walls is being pivoted toward or from a generally vertical position, and each of said openings is elongated in a generally vertical direction to permit the pin received therein to shift generally vertically in said elongated opening when said seating surface on said lower end of one of said corner posts is pivoted into engagement with said mating load bearing seating surface on said cooperating adjacent corner member whereby each of said corner posts is supported only by said seating surface on the adjacent one of said corner members when said container is in said erected condition.

3. The container as defined in claim 1 wherein each of said side walls has an upper section, a lower section and a hinge means hingedly connecting said sections, said roof being connected to said upper sections and said hinge means permitting said side wall sections to fold inwardly along a fold line defined by said hinge means in such a way that said lower section of each of said side walls will rest upon said floor, said upper section of each of said side walls will rest upon said lower section thereof, said roof will rest upon said upper sections of said side walls and said end walls will rest upon said roof, when said container is in a fully collapsed condition.

4. The container as defined in claim 3 wherein each of said hinge means includes at least one gasket receiving formation and a gasket material received therein for sealing each of said hinge means from moisture and foreign material when said container is in said erected condition.

5. The container as defined in claim 1 wherein first gasket means are provided along the upper end of each of said end walls for sealingly engaging said roof to seal the junctions between said roof and said end walls and said side walls have gasket means at each end thereof for sealingly engaging said corner posts of said end walls to seal the junction between said end walls and said side walls when said container is in said erected condition.

* * * * *