

METHOD OF PRODUCING A MAIN FRAME FOR A
SHIPPING CONTAINER

The present invention relates to a method of producing a main frame for a shipping container.

Shipping containers are used for transporting many different types of cargoes. Cargoes requiring temperature control and/or ventilation will need a refrigeration unit comprising a fan motor, condenser coils, liquid receiver, compressor, contactor panel and a micro computer controller coupled to the shipping container. Hitherto, each shipping container has housed the refrigeration unit in the container's main frame. The main frame is secured by huckbolts to the open end of the refrigeration unit and sealed with silicone.

A conventional main frame is shown in figs. 1 and 2. The profile of the main frame has first been punched from sheet metal, then profiled where necessary and then welded together to create the necessary profile required for housing the refrigeration unit. Assembling such a main frame in this manner is extremely time consuming.

An aim of the present invention is, therefore, to provide a method of producing a one-piece main frame.

According to the present invention there is provided a method of producing a main frame for a shipping container, the main frame comprising a sheet of metal

provided with an integral recessed portion; the method comprising deep drawing in a direction substantially perpendicular to the plane of the sheet to form the recessed portion whilst applying an additional compressive force to the sheet towards the desired position of the recessed portion and in a direction in the plane of the sheet .

By way of example only, a preferred embodiment of the present invention will now be described with reference to the accompanying drawings, of which:

fig. 1 is a schematic diagram of the components of a main frame according to the prior art;

fig. 2 is a schematic planar view and cross-section of an assembled main frame according to the prior art;

fig. 3 is a schematic planar view and cross-section of a main frame produced according to the preferred embodiment at a first step of production;

fig. 4 is a schematic planar view and cross-section of a main frame produced according to the preferred embodiment at a second step of production;

fig. 5 is a planar view and cross-section of a main frame produced according to the preferred embodiment; and

fig. 6 is a schematic flow diagram of an hydraulic device used in the preferred embodiment.

The structural components of a main frame produced according to the preferred embodiment are shown in figure 5 and comprise a side (2) of the main frame which

is secured by huckbolts to the open end of a refrigerated container (not shown) and sealed with silicone to form an enclosed space. The side (2) includes a recessed portion (4), a number of profiles (6) and holes (8).

The first stage of production is as shown in figure 3. A recess (4) is initially deep drawn in a direction perpendicular to the plane of the side. If the material used has a low ductility then in order to avoid cracks, an hydraulic device (10) applies a force in the plane of the side (2) whilst the recess is being deep drawn. Deep drawing is a process known in the art whereby shapes may be formed with large depth - diameter ratios usually from sheet or strip metal by considerable plastic distortion. The force applied by the hydraulic device (10) enables the material of the side to flow evenly thereby maintaining a specific thickness of the main frame.

In figure 4 the second stage is illustrated in which the profiles (12) are deep drawn in a direction perpendicular to the plane of the side (2) but opposite to that of the deep drawn recess (4). The profiles (6) are also deep drawn at this stage.

In stage three of the production shown in figure 5, the holes (8) are blanked and any excess material (14) is sheared off.

Side (2) is then fixed to the other sides usually by

securing with huckbolts and then sealed with silicone. Preferably the material from which side (2) is formed comprises aluminium but other metals may be used. The present invention thus provides a main frame more quickly and efficiently than produced hitherto and even though the recess (4) is off centre, still enables the side (2) to maintain constant thickness through the use of the hydraulic device (10).

Preferably, the deep drawing stages are executed by a 2000 ton hydraulic deep drawing machine which is already known in the art and has at least two pairs of dies. Preferably, the hydraulic device (10) applies a force in the order of 50 tons. The hydraulic device as shown in figure 6, comprises two hydraulic cylinders (16) coupled to a plate (18) for applying a force uniformly over the side (2). The hydraulic cylinders (16) are activated by a motor (20) via a 2-way hydraulic valve (22).

The foregoing description has been given by way of example only and a person skilled in the art would appreciate that modifications may be made to the present invention without departing from the scope thereof.



CLAIMS

1. A method of producing a main frame for a shipping container, the main frame comprising a sheet of metal provided with an integral recessed portion; the method comprising deep drawing in a direction substantially perpendicular to the plane of the sheet to form the recessed portion whilst applying an additional compressive force to the sheet towards the desired position of the recessed portion and in a direction in the plane of the sheet .

2. A method of producing a main frame for a shipping container as claimed in any preceding claim; further comprising deep drawing in the direction perpendicular to the plane of the sheet but in an opposite direction to the deep drawing of the recessed portion, in order to form at least one profile.

3. A method of producing a main frame for a shipping container as claimed in any preceding claim; further comprising blanking the sheet to provide at least one hole.

4. A method of producing a main frame for a shipping container as claimed in any preceding claim; further comprising shearing the edges of the sheet.



5. A method of producing a main frame for a shipping container substantially as described herein with reference to any one of figures 3 to 6.
