

Description

This specification relates chiefly to apparatus for holding electrical or electronic components, particularly during the application of solder. The invention is particularly concerned with the holding of dual-in-line packages (DIPs) whilst they are being soldered.

DIPs are of generally rectangular cross section in plan view and have a row of contact pins or leads along each side. The number of leads on each side is typically seven but may range from 2 to 32 to even more. DIPs contain integrated circuits and some or all of the leads are connected to respective parts of the circuits. The DIPs are designed to be inserted into circuit boards or suitable holders and may or not be soldered in place. In any event, it is desirable that the leads may be given a coating of solder and in mass production this is done by means of wave soldering apparatus.

In general, a number of DIPs are loaded in a carrier, and then subjected to processing steps of e.g. cleaning, rinsing, etching, rinsing, drying, fluxing, pre-heating, wave soldering, fan drying, hot water rinsing, drying, cooling and unloading. The carriers pass along a track during these steps and in mass production the average cycle time between loading and unloading DIPs in the carrier for wave soldering is about 20 to 22 seconds with known arrangements.

The carriers must be able to withstand the temperature changes involved, particularly with repeated cycling and must permit easy access for solder to the leads of the DIPs. The carriers must be such that the DIPs will be located securely, but for commercial reasons it is desirable that as many DIPs as possible be held in a small space.

A known carrier disclosed in JP—A—59-76662 comprises a generally rectangular frame with a number of parallel tracks, typically fourteen, for holding the DIPs. Each track consists of six parallel tungsten steel rods arranged to restrict lateral movement of the packs in any direction. During the processing steps, a gate at one end of the carrier holds the DIPs in their tracks, restricting axial movement of the rows. This gate is opened for the loading and unloading steps, the other end of the carrier being blocked permanently.

Not only is such an arrangement complex in terms of manufacture, but it is thoroughly reliable. There is an appreciable rate of loss of DIPs possibly caused by thermally induced deformation of the tracks. The need for a gate to permit axial access to the tracks makes location of the rod ends difficult. Furthermore, the loading and unloading processes can be lengthy. In the known arrangement, unloading takes about 32 seconds and this is considerably longer than the cycle time for the processing of the DIPs. This leads to delays or to unnecessarily high numbers of carriers being required.

IBM Technical Disclosure Bulletin, Vol. 19 No. 12 May 1977 pages 4544—4545 "Module Transport System" discloses a system for moving

individual components through a soldering operation by urging them along tracks. There are no portable carriers used to carry the components during soldering.

From US—A—4 194 865 it is known to provide apparatus for loading components into a frame.

Viewed from one broad aspect there is disclosed in this specification a portable carrier for a plurality of electrical or electronic components such as dual-in-line packages or the like, comprising a frame in which is provided a plurality of parallel tracks for receiving the components, characterised in that the tracks are formed by a plurality of parallel, laterally spaced, axially extending upper support members each of which defines a pair of parallel, axially extending upper rails having downwardly extending portions, and by a plurality of parallel, laterally spaced, axially extending lower support members aligned with the upper support members, each of the lower support members defining a pair of parallel, axially extending lower rails having upwardly facing portions, whereby each track is defined by four rails and is situated between two adjacent upper support members and their aligned lower support members.

Thus, between any two adjacent pairs of aligned upper and lower support members there will be a track defined by four rails, one from each member. There will be two laterally spaced upper rails having downwardly facing portions and two laterally spaced lower rails having upwardly facing portions. These rails will be so arranged as to support a row of components such as DIPs and restrain vertical and horizontal movement. However, whilst effective location of the DIPs is provided, the support members themselves can be securely located whilst permitting ready axial access to the tracks.

There are a number of ways in which the four rails could support e.g. a DIP. Preferably, the DIP rests on upwardly facing ends of the two lower rails. However, the rails could be stepped so as to have laterally extending but upwardly facing portions and the DIP could rest on these portions. Similarly, upwards movement could be restricted by downwardly facing ends of the two upper rails. Preferably, however, the upper rails are stepped so as to have laterally extending but downwardly facing portions which will restrict upwards movement of the DIP. An advantage of stepped rails, is that the laterally facing portions can be used to restrict lateral movement of the DIP by engagement of its side. However, some DIPs may have inclined portions on their sides in which case engagement with the ends of the rails may restrict both vertical and lateral movement. In this case, stepped rails may not be necessary although they can be used to provide the correct spacing between the ends of adjacent rails.

In general, the configuration and vertical and lateral spacings of the rails will be chosen to adapt to the size and shape of the DIP or other component to be located, so as to provide suitable restriction against movement in any lateral

or vertical direction. Preferably, a certain amount of tolerance is permitted to facilitate insertion of the DIPs into the tracks although care should be taken to ensure that thermal effects do not increase clearances to a level at which DIPs could be displaced from the tracks and drop out e.g. during a soldering operation.

In a particularly preferred embodiment, each support member is of "U" shaped cross section and in accordance with the preferred arrangement referred to above the ends of the legs of the upper members are stepped inwardly.

In general, each support member will be secured to the frame by means disposed between the rails of the support member. Thus the space between two adjacent support members, where the track is defined for receiving e.g. DIPs, will be free of locating means. This provides easy axial access for the insertion or removal of DIPs. It is possible to use both ends by inserting the DIPs from one end and removing them from the other. Not only is there a greater reliability and flexibility in the construction as a whole, but this improved ease of handling can reduce the unloading time to a level corresponding to or less than the cycle time for soldering, e.g. about 12 second.

There is also disclosed herein apparatus and a process for loading and unloading a carrier with access from both ends. The carrier itself has a gate at either end to hold the DIPs in place. The carrier is placed in the apparatus in an inclined position and means are operated to open the upper gate so that DIPs slide into the carrier. The gate is then closed and the full carrier subjected to the wave soldering process. The carrier is then placed back in the apparatus and means are operated to open the lower gate so that the DIPs slide out of the carrier. Since the DIPs can move in or out at either end, it does not matter whether or not the carrier is turned through 180° between the loading and unloading operations. This dual entry concept is particularly advantageous.

The means locating the support member could include spacers positioned at the two axial ends of aligned upper and lower members although it would be possible to have continuous or semi-continuous spacer webs. It would be possible to have two aligned upper and lower support members and a spacer formed integrally. Preferably, however, they are separate and this facilitates arranging for thermal movements. In one advantageous arrangement, spacers which are integral with the frame are provided at the two axial ends and the support members are located by means of slots engaged with lugs on the spacers in such a way as to allow for axial thermal movement. The slots may have a first portion to facilitate assembly with the spacer, and a second narrower portion which locks the support member to the spacer by axial movement during assembly. The axial extent of the second portion should be such as to accommodate thermally induced axial movement without the first slot portion coming into operation and causing instability of the construction. The method of locating the support

members may be of use in other contexts and need not be restricted to the particular carrier described above.

In use, the leads of a DIP supported in a track will lie inside the rail of one of the support members on either side. The arrangement should be such as to provide easy access for solder to this region and this can be achieved by providing apertures in the appropriate support members. In preferred arrangements, therefore, the lower support members will be apertured whilst the upper support members need not be.

As many tracks as are desirable may be provided in the frame. If standard elements are used throughout, there will be spare half tracks at either side of the array but manufacture will be simplified.

The components can be made from any suitable material capable of withstanding the temperatures and stresses involved. Titanium may be used, and the rails may be coated e.g. with P.T.F.E. to facilitate sliding of DIPs during loading and unloading.

An embodiment exemplifying some of the above, and other, broad aspects will now be described by way of example and with reference to the accompanying drawings in which:—

Fig. 1a and 1b are upper and lower perspective views of an upper support member for use in a carrier;

Figs. 2a and 2b are upper and lower perspective views of a lower support member for use in a carrier;

Fig. 3 is a diagrammatic end view of the carrier without the support members;

Fig. 4 is an enlarged perspective view of the part of Fig. 3 marked IV;

Fig. 5 is an end view of the carrier with the support members and other components in place;

Fig. 6 is an enlarged partial end view showing a DIP in position;

Fig. 7 is a plan view of the carrier;

Fig. 8 is a diagrammatic plan view of apparatus for handling the carrier; and

Fig. 9 is a diagrammatic side view of the apparatus.

As shown in Figs. 1a and 1b an upper support member 1 is in the form of an elongate channel of e.g. titanium coated with P.T.F.E. the cross section of the channel is generally of "U" shape but the legs, which define downwardly directed laterally spaced parallel rails 2, are stepped at 3 so that the extremities 4 are inset. At each end of the track are provided apertures 5, to be described in more detail below.

In Fig. 2a and 2b there is shown a lower support member 6. This is again in the form of an elongate channel of e.g. titanium coated with P.T.F.E. The cross section is of "U" shape, with the legs defining upwardly directed laterally spaced parallel rails 7 with extremities 8. The width of the member 6 is substantially the same as that of the upper member 1, but the spacing between the extremities 8 is greater than that between

extremities 4 of rails 2 since the rails 7 are not stepped. The member 6 is provided with apertures 9 along its length to permit easy access for solder, whilst at its axial ends there are apertures 10 corresponding to apertures 5 of the upper member.

Figure 3 shows a portion of a frame 11 with side members 12, carrying handles 13 and cross members 14 at either end (only one being shown) carrying fifteen downwardly directed integral mounting posts 15. As shown more clearly in Fig. 4 each post is designed to provide two pairs of surfaces i.e. 16, 16' and 17, 17'. The surfaces of each pair are separated by lugs 18 and 19 respectively of reduced cross section, whilst the two pairs are separated by a spacer portion 20. This spacer portion is waisted so as to be of reduced cross section, which inter alia reduces the thermal capacity of the arrangement.

During assembly, the upper and lower support members are attached to the mounting posts 15 at either end of the frame 11. The apertures 5 and 10 have portions which are large enough to pass over the free ends and spacer portions of the posts but once positioned between the required pair of surfaces, i.e. 16, 16' or 17, 17', relative axial movement will cause a smaller portion of the aperture 5 or 10 in the form of a slot 5', 10' to engage lug 18 or 19 as appropriate. The support member is then locked in place but is still capable of limited axial movement relative to the supports to allow for thermal contraction and expansion, the smaller portions of apertures 5 and 10 having a greater axial extent than lugs 18 or 19.

Fig. 5 shows fifteen upper and lower support members 1, 6 side by side on their respective mounting posts. The upper and lower support members are aligned and all of the members are axially parallel as shown in Fig. 7. As shown clearly in Fig. 6 between any two adjacent mounting posts 15 there is defined a track T comprising two rails 7 and two rails 2, the extremities 8 of rails 7 being closer together than those 4 of rails 2. The track can thus receive a row of DIPs, diagrammatically indicated at 200, the DIPs resting on extremities 8 of rails 7 and being restrained against upwards movement by stepped portions 3 of rails 2. There is a small amount of clearance between DIPs 200 and stepped portions 3. Horizontal lateral movement is restricted by means of extremities 4 of rails 2 engaging slightly inclined side portions 21 of the DIPs. Leads of the DIPs, indicated at 22, lie inside of rails 7 but the apertures 9 in support members 6 will ensure free access for solder.

To restrain a row of DIPs against axial movement, gates 23 are provided at either end of the frame as shown in Figs. 5 and 7. Side portions 24 are mounted in vertical guides 25 and the gates are movable upwardly against the action of springs 26 to permit removal or insertion of DIPs at either end. When in the rest position shown in Fig. 5, fingers 27 on the gate restrain the DIPs from movement. Adjusting screws not shown, may be provided for the gates.

The metal used in the apparatus described

above is titanium, and in general it should be a corrosion resistant material, capable of withstanding the conditions of use as regards temperature etc, and of a type which does not accept solder.

The arrangement described provides escape passages for poisonous fumes emitted in the soldering process. Furthermore, there is reduced wastage of water during the cleaning process, since run-off escapes down the pins of the DIPs, cleaning the leads and ensuring optimum use of water.

The apparatus can be manufactured in various specifications and sizes depending on the number, size and shape of the components to be carried. Any number of tracks may be provided, of any suitable length, and conveniently the tracks may be long enough to accommodate fourteen DIPs in a row.

To cope with DIPs of different width, the same support members 1 and 6 could be employed, but the mounting posts 15 would have different lateral spacings. With posts which are integral with the frame member 14, this member would be changed although other frame components could be retained. It might be possible to have movable posts 15 which could be re-positioned on the frame member 14. The gate 23 might need to be changed, depending on the positioning of the DIPs.

Referring now to Figures 8 and 9, there is disclosed schematically apparatus for loading and unloading a carrier such as that disclosed above, respectively before and after a wave soldering operation. The apparatus includes a base 28 carrying an inclined ramp 29. At the upper end of the ramp 29 is a loading platform 30 which can be pivoted between the position A shown in Figure 9 and the dotted line position B, at which it is aligned with ramp 29, by means of a pneumatic actuator 31. In use, magazines of DIPs are placed on the loading platform 30 whilst it is in position A, following which the platform is raised to position B. Two gates 32 and 33 on the ramp 29 are then opened, whilst a gate 34 remains closed. DIPs from the platform 30 then slide down the ramp to occupy sections 35 and 36. The platform 30 is then lowered to position A to be reloaded with cartridges of DIPs.

A carrier, as described with reference to Figures 1 to 7, is then positioned on the ramp 29 below gate 34 in a locating region 37 where it is automatically latched into place by four latches. The two carrier gates 23 are closed at this stage. The upper gate 23 is then opened, gate 33 is closed, and 1.5 seconds later gate 34 is opened to allow DIPs in section 36 to slide down and fill the tracks in the carrier. When the carrier is full, and section 36 empty, gate 34 is closed, carrier gate 23 is closed, and gate 33 is opened to permit any DIPs in section 35 to slide down into section 36. The latches are then released and the carrier ejected and taken to wave soldering apparatus to be subjected to steps in a wave soldering operation.

If further carriers are to be filled, the process is repeated. A sensor switch 38 prevents platform 30

being raised to position B if there are any DIPs left in section 35, however.

The same apparatus is used to discharge soldered DIPs from a carrier. Thus, empty magazines are placed on unloading platform 39. A full carrier is placed on the ramp 29 and again latched in position. Its lower discharge gate 23 is opened and the DIPs slide down into sections 40 and 41, a gate 42 between them being opened.

The lower carrier gate 23 is then closed. If any DIPs are trapped, further operation is prevented until the blockage is cleared manually. The now empty carrier is then filled as described above, ejected, and replaced by a carrier full of soldered DIPs which are discharged as described above. When section 40 and 41 are filled with soldered DIPs, gate 42 is closed and a gate 43—previously closed—is opened so that the soldered DIPs pass down into the magazines on unloading platform 39. Once all the DIPs in section 41 have been discharged, gate 43 is closed, gate 42 opened, and the filled magazines on platform 39 removed.

The ramp 29 is provided with guides such as those indicated at 44 and 45, to ensure that the DIPs are correctly aligned in rows for the various steps of the unloading/loading process.

The process is repeated as many times as desired. It will be appreciated that the continuous processing which is possible, is brought about by the ability to open each end of the carrier as desired so that once in position it can be emptied and then filled. This in turn is a result of the novel manner of construction which provides easy axial access.

It will be appreciated that the novel loading/unloading apparatus and process could be employed with any other form of carrier which might be designed to have easy axial access at both ends.

Modifications may be possible both to the broad aspects and to the specific arrangements discussed above, whilst maintaining at least some of the advantageous results obtained by the carrier, apparatus or process described. For example, whilst the carrier is specifically intended for use in the wave soldering of DIPs it may have uses in other soldering operations or other fields, and for other components.

As regards broad aspects disclosed herein, attention is directed particularly to the process for wave soldering a plurality of electrical or electronic components, preferably dual-in-line packages, in which the components are located in tracks in the carrier whilst being subjected to process steps in the wave soldering operation. Attention is also directed particularly to the broad concept of apparatus for loading or unloading the carrier with two gates, including an inclined ramp having a region adapted to receive and releasably latch in place the carrier, means for selectively opening or closing the gates of the carrier when in place, a plurality of gates on the ramp to control the passage of components down the ramp, an unloading platform at the lower end of the ramp, below the region for receiving the carrier, and a

loading platform at the upper end of the ramp above the region for receiving the carrier, the loading platform preferably being selectively movable between a first position at which components can be loaded onto the platform and a second position at which components on the platform can slide down the ramp to positions at which they can be loaded into the carrier.

Claims

1. A portable carrier for a plurality of electrical or electronic components (200), comprising a frame (11) in which is provided a plurality of parallel tracks (T) for receiving the components, characterised in that the tracks (T) are formed by a plurality of parallel, laterally spaced, axially extending upper support members (1) each of which defines a pair of parallel, axially extending upper rails (2) having downwardly facing portions (3), and by a plurality of parallel, laterally spaced, axially extending lower support members (6) aligned with the upper support members (1), each of the lower support members defining a pair of parallel, axially extending lower rails (7) having upwardly facing portions (8), whereby each track (T) is defined by four rails (2, 7) and is situated between two adjacent upper support members (1) and their aligned lower support members (6).

2. A carrier as claimed in claim 1 characterised in that the upper support members (1) or the lower support members (6) are stepped so as to have laterally facing portions to restrict lateral movement of components (200) in the tracks (T).

3. A carrier as claimed in claim 1 or 2 characterised in that each lower support member (6) is an elongate channel member of generally U-shaped cross-section.

4. A carrier as claimed in claim 3 characterised in that the lower support members (6) are provided with apertures along their length.

5. A carrier as claimed in any preceding claim characterised in that each upper support member (1) is an elongate channel member of generally U-shaped cross section.

6. A carrier as claimed in any preceding claim characterised in that the upper and lower support members (1, 6) are mounted slidably with respect to the frame (11) to allow for thermal movement.

7. A carrier as claimed in any preceding claim, characterised in that the upper and lower support members (1, 6) are mounted on posts (15) which project downwardly from the frame (11) at either end thereof.

8. A carrier as claimed in claim 7 characterised in that the rails (2, 7) on the support members (1, 6) extend on either side of the mounting posts (15).

9. A carrier as claimed in any preceding claim characterised in that access to the tracks (T) is provided at either end thereof and is controlled by movable carrier gates (23).

10. A carrier as claimed in claim 9 characterised in that the carrier gates (23) have fingers (27) which project into the tracks (T) in the closed condition.

11. Apparatus for loading and unloading electri-

being raised to position B if there are any DIPs left in section 35, however.

The same apparatus is used to discharge soldered DIPs from a carrier. Thus, empty magazines are placed on unloading platform 39. A full carrier is placed on the ramp 29 and again latched in position. Its lower discharge gate 23 is opened and the DIPs slide down into sections 40 and 41, a gate 42 between them being opened.

The lower carrier gate 23 is then closed. If any DIPs are trapped, further operation is prevented until the blockage is cleared manually. The now empty carrier is then filled as described above, ejected, and replaced by a carrier full of soldered DIPs which are discharged as described above. When section 40 and 41 are filled with soldered DIPs, gate 42 is closed and a gate 43—previously closed—is opened so that the soldered DIPs pass down into the magazines on unloading platform 39. Once all the DIPs in section 41 have been discharged, gate 43 is closed, gate 42 opened, and the filled magazines on platform 39 removed.

The ramp 29 is provided with guides such as those indicated at 44 and 45, to ensure that the DIPs are correctly aligned in rows for the various steps of the unloading/loading process.

The process is repeated as many times as desired. It will be appreciated that the continuous processing which is possible, is brought about by the ability to open each end of the carrier as desired so that once in position it can be emptied and then filled. This in turn is a result of the novel manner of construction which provides easy axial access.

It will be appreciated that the novel loading/unloading apparatus and process could be employed with any other form of carrier which might be designed to have easy axial access at both ends.

Modifications may be possible both to the broad aspects and to the specific arrangements discussed above, whilst maintaining at least some of the advantageous results obtained by the carrier, apparatus or process described. For example, whilst the carrier is specifically intended for use in the wave soldering of DIPs it may have uses in other soldering operations or other fields, and for other components.

As regards broad aspects disclosed herein, attention is directed particularly to the process for wave soldering a plurality of electrical or electronic components, preferably dual-in-line packages, in which the components are located in tracks in the carrier whilst being subjected to process steps in the wave soldering operation. Attention is also directed particularly to the broad concept of apparatus for loading or unloading the carrier with two gates, including an inclined ramp having a region adapted to receive and releasably latch in place the carrier, means for selectively opening or closing the gates of the carrier when in place, a plurality of gates on the ramp to control the passage of components down the ramp, an unloading platform at the lower end of the ramp, below the region for receiving the carrier, and a

loading platform at the upper end of the ramp above the region for receiving the carrier, the loading platform preferably being selectively movable between a first position at which components can be loaded onto the platform and a second position at which components on the platform can slide down the ramp to positions at which they can be loaded into the carrier.

Claims

1. A portable carrier for a plurality of electrical or electronic components (200), comprising a frame (11) in which is provided a plurality of parallel tracks (T) for receiving the components, characterised in that the tracks (T) are formed by a plurality of parallel, laterally spaced, axially extending upper support members (1) each of which defines a pair of parallel, axially extending upper rails (2) having downwardly facing portions (3), and by a plurality of parallel, laterally spaced, axially extending lower support members (6) aligned with the upper support members (1), each of the lower support members defining a pair of parallel, axially extending lower rails (7) having upwardly facing portions (8), whereby each track (T) is defined by four rails (2, 7) and is situated between two adjacent upper support members (1) and their aligned lower support members (6).

2. A carrier as claimed in claim 1 characterised in that the upper support members (1) or the lower support members (6) are stepped so as to have laterally facing portions to restrict lateral movement of components (200) in the tracks (T).

3. A carrier as claimed in claim 1 or 2 characterised in that each lower support member (6) is an elongate channel member of generally U-shaped cross-section.

4. A carrier as claimed in claim 3 characterised in that the lower support members (6) are provided with apertures along their length.

5. A carrier as claimed in any preceding claim characterised in that each upper support member (1) is an elongate channel member of generally U-shaped cross section.

6. A carrier as claimed in any preceding claim characterised in that the upper and lower support members (1, 6) are mounted slidably with respect to the frame (11) to allow for thermal movement.

7. A carrier as claimed in any preceding claim, characterised in that the upper and lower support members (1, 6) are mounted on posts (15) which project downwardly from the frame (11) at either end thereof.

8. A carrier as claimed in claim 7 characterised in that the rails (2, 7) on the support members (1, 6) extend on either side of the mounting posts (15).

9. A carrier as claimed in any preceding claim characterised in that access to the tracks (T) is provided at either end thereof and is controlled by movable carrier gates (23).

10. A carrier as claimed in claim 9 characterised in that the carrier gates (23) have fingers (27) which project into the tracks (T) in the closed condition.

11. Apparatus for loading and unloading electri-



cal or electronic components (200) into a portable carrier according to claim 9 or 10, the apparatus comprising an inclined ramp (24) having a region (37) adapted to receive and releasably latch in place the carrier, means for selectively opening and closing the carrier gates (23) when the carrier is latched in place, a loading platform (30) at the upper end of the ramp above the region for receiving the carrier, the loading platform having means for receiving a plurality of components, at least one movable ramp gate (32, 33, 34) on the ramp (29) to control movement of the components down the ramp into the carrier receiving region (37), an unloading platform (39) at the lower end of the ramp (29) below the region for receiving the carrier (37), and at least one movable ramp gate (42, 43) on the ramp to control movement of components down the ramp from the carrier receiving region (37) to the unloading platform (39).

12. Apparatus as claimed in claim 11, characterised in that there is provided a plurality of spaced ramp gates (32, 33, 34) between the loading platform (30) and the carrier receiving region (37).

13. Apparatus as claimed in claim 12 characterised in that upper (32), intermediate (33) and lower (34) spaced ramp gates are provided between the loading platform (30) and the carrier receiving region (37) and are controlled such that the upper ramp gate (32) is initially closed to prevent components (200) sliding from the loading platform (30), the upper ramp gate (32) is subsequently opened whilst the lower ramp gate (34) is in the closed condition and the intermediate ramp gate (33) is in the open condition to permit components to occupy the space (35, 36) between the upper and lower ramp gates, the intermediate ramp gate (33) is subsequently closed, and the lower ramp gate (34) is subsequently opened to permit components occupying the space (36) between the intermediate (33) and lower (34) ramp gates to pass into a carrier, the lower ramp gate (34) is closed, and the intermediate ramp gate (33) is opened to permit components to pass from the region (35) above the intermediate ramp gate (33) into the space (36) between the intermediate (33) and lower (34) ramp gates.

14. Apparatus as claimed in claim 11, 12 or 13 characterised in that there is provided a plurality of spaced gates (42, 43) between the carrier receiving region (37) and the unloading platform (39).

15. Apparatus as claimed in claim 14 characterised in that upper (42) and lower (43) spaced ramp gates are provided between the carrier receiving region (37) and the unloading platform (39) are controlled such that when the carrier gate (23) of a carrier is opened to permit components (200) to pass down the ramp (29) in an unloading operation, the lower ramp gate (43) is closed and the upper ramp gate (42) is opened to permit components to occupy the space (40, 41) between the carrier and the lower ramp gate (43),

the upper ramp gate (42) is subsequently closed, the lower ramp gate (43) is subsequently opened to permit components occupying the space (41) between the upper (42) and lower (43) ramp gates to pass down the ramp (29) to the unloading platform (39), the lower ramp gate (43) is closed and the upper ramp gate (42) is opened to permit components to pass from the region (40) above the upper ramp gate (42) into the space (41) between the upper (42) and lower (43) ramp gates.

16. Apparatus as claimed in any of claims 11 to 15, characterised in that the loading platform (30) is pivotal between a first position at which the platform is inclined downwardly with respect to the ramp (29) to facilitate the loading of components (200), and a second position at which the platform (30) is aligned with the ramp (29) to enable components (200) to slide down the ramp from the platform (30).

Patentansprüche

1. Transportabler Träger für eine Vielzahl elektrischer oder elektronischer Elemente (200), bestehend aus einem Rahmen (11), in dem eine Vielzahl paralleler Bahnen (T) zur Aufnahme der Elemente vorgesehen sind, dadurch gekennzeichnet, daß die Bahnen (T) durch eine Vielzahl paralleler, seitlich mit Abstand angeordneter, längslaufender oberer Trägereile (1) gebildet werden, von denen jeder ein Paar paralleler, längslaufender oberer Schienen (2) mit nach unten gerichteten Stirnflächen (3) aufweist, und weiters durch eine Vielzahl paralleler, seitlich mit Abstand angeordneter, längslaufender unterer Trägereile (6) gebildet werden, die mit den oberen Trägereilen (1) fluchtend ausgerichtet sind, wobei jeder der unteren Trägereile ein Paar paralleler, längslaufender unterer Schienen (7) mit nach oben gerichteten Stirnflächen (8) aufweist, wodurch jede Bahn (T) durch vier Schienen (2, 7) abgegrenzt ist und zwischen zwei benachbarten oberen Trägereilen (1) und mit diesen fluchtenden unteren Trägereilen (6) angeordnet ist.

2. Träger nach Anspruch 1, dadurch gekennzeichnet, daß die oberen Trägereile (1) oder die unteren Trägereile (6) abgestuft sind, wodurch sie seitliche Stirnflächen zur Einschränkung einer seitlichen Verschiebung der Elemente (200) in den Bahnen (T) aufweisen.

3. Träger nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß jeder untere Trägereil (6) ein länglicher Kanal mit gewöhnlich U förmigen Querschnitt ist.

4. Träger nach Anspruch 3, dadurch gekennzeichnet, daß die unteren Trägereile (6) der Länge nach Öffnungen aufweisen.

5. Träger nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß jeder obere Trägereil (1) ein länglicher Kanal mit gewöhnlich U-förmigen Querschnitt ist.

6. Träger nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die



oberen und die unteren Trägereile (1, 6) in bezug auf den Rahmen (11) verschiebbar befestigt sind, um eine thermische Verschiebung zu ermöglichen.

7. Träger nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die oberen und die unteren Trägereile (1, 6) an Stützen (15) befestigt sind, die an jedem Träger-teilende von Rahmen (11) nach unten absteigen.

8. Träger nach Anspruch 7, dadurch gekennzeichnet, daß sich die Schienen (2, 7) an den Trägereilen (1, 6) beiderseits der Befestigungs-stützen (15) erstrecken.

9. Träger nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß ein Zugang zu den Bahnen (T) an jedem ihrer Enden vorgesehen ist und durch verschiebbare Trägere-tore (23) gesteuert wird.

10. Träger nach Anspruch 9, dadurch gekennzeichnet, daß die Trägerstore (23) Finger (27) aufweisen, die in geschlossenem Zustand in die Bahnen (T) hineinragen.

11. Vorrichtung zum Beladen und Entladen eines transportablen Trägers mit elektrischen oder elektronischen Elementen (200) nach Anspruch 9 oder 10, wobei sich die Vorrichtung zusammensetzt aus einer schrägen Rampe (24), die einen für die Aufnahme und die lösbare Arretierung des Trägers vorgesehenen Bereich (37) aufweist, Mittel zum selektiven Öffnen und Schließen der Trägereile (23) bei Arretierung des Trägers, einer Ladebühne (30) am oberen Ende der Rampe über dem Aufnahmebereich des Trägers, wobei die Ladebühne Mittel zur Aufnahme einer Vielzahl von Elementen aufweist, mindestens einem verschiebbaren Rampentor (32, 33, 34) auf der Rampe (29) zur Steuerung der Führung der Elemente rampenabwärts in den Trägereile-nahmebereich (37), einer Entladebühne (39) am unteren Ende der Rampe (29) unter dem Aufnahmebereich des Trägers (37), und mindestens einem verschiebbaren Rampentor (42, 43) auf der Rampe zur Steuerung der Führung der Elemente aus dem Trägereile-nahmebereich (37) zur Entladebühne (39).

12. Vorrichtung nach Anspruch 11, dadurch gekennzeichnet, daß eine Vielzahl in Abstand angeordneter Rampentore (32, 33, 34) zwischen der Ladebühne (30) und dem Trägereile-nahmebereich (37) vorgesehen sind.

13. Vorrichtung nach Anspruch 12, dadurch gekennzeichnet, daß ein oberes (32), mittleres (33) und unteres (34) in Abstand angeordnetes Rampentor zwischen der Ladebühne (30) und dem Trägereile-nahmebereich (37) vorgesehen sind und so gesteuert werden, daß zuerst das obere Rampentor (32) geschlossen wird, um ein Entgleiten der Elemente (200) von der Ladebühne (30) zu verhindern, das obere Rampentor (32) in der Folge geöffnet wird, während sich das untere Rampentor (34) in geschlossenem Zustand und das mittlere Rampentor (33) in geöffnetem Zustand befinden, um eine Aufnahme der Elemente im Raumbereich (35, 36) zwischen dem oberen und dem unteren Rampentor zu ermöglichen,

das mittlere Rampentor (33) in der Folge geschlossen und das untere Rampentor (34) in der Folge geöffnet wird, um eine Aufnahme der Elemente im Raumbereich (36) zwischen dem mittleren (33) und dem unteren (34) Rampentor und ein Einführen in einem Träger zu ermöglichen, das untere Rampentor (34) geschlossen wird, und das mittlere Rampentor (33) geöffnet wird, um ein Einführen der Elemente vom Bereich (35) über dem mittleren Rampentor (33) in den Raumbereich (36) zwischen dem mittleren (33) und dem unteren (34) Rampentor zu ermöglichen.

14. Vorrichtung nach Anspruch 11, 12 oder 13, dadurch gekennzeichnet, daß eine Vielzahl mit Abstand angeordneter Tore (42, 43) zwischen dem Trägereile-nahmebereich (37) und der Entladebühne (39) vorgesehen sind.

15. Vorrichtung nach Anspruch 14, dadurch gekennzeichnet, daß das obere (42) und das untere (43) mit Abstand angeordnete Rampentor zwischen dem Trägereile-nahmebereich (37) und der Entladebühne (39) angeordnet sind und so gesteuert werden, daß, wenn das Trägereile (23) eines Trägers bei einer Entladung zum Passieren der Elemente (200) die Rampe (29) hinunter geöffnet ist, das untere Rampentor (43) geschlossen wird und das obere Rampentor (42) geöffnet wird, um eine Aufnahme der Elemente in den Raumbereich (40, 41) zwischen dem Träger und dem unteren Rampentor (43) zu ermöglichen, das obere Rampentor (42) in der Folge geschlossen wird, das untere Rampentor (43) in der Folge geöffnet wird, um eine Aufnahme der Elemente im Raumbereich (41) zwischen dem oberen (42) und dem unteren (43) Rampentor und ein Passieren der Rampe (29) hinunter zur Entladebühne (39) zu ermöglichen, das untere Rampentor (43) geschlossen wird, und das obere Rampentor (42) geöffnet wird, um eine Führung der Elemente vom Bereich (40) über dem oberen Rampentor (42) in den Raumbereich (41) zwischen dem oberen (42) und dem unteren (43) Rampentor zu ermöglichen.

16. Vorrichtung nach einem der Ansprüche 11 bis 15, dadurch gekennzeichnet, daß die Ladebühne (30) schwenkbar angeordnet ist zwischen einer ersten Stellung, in der die Bühne in bezug auf die Rampe (29) schräg nach unten steht, um das Beladen mit Elementen (200) zu erleichtern, und einer zweiten Stellung, in der die Bühne (30) fluchten mit der Rampe (29) ausgerichtet ist um ein Gleiten der Elemente (200) von der Bühne (30) auf die Rampe zu ermöglichen.

Revendications

1. Support portatif pour plusieurs composants électriques ou électroniques (200), comportant un cadre (11) dans lequel sont prévues plusieurs pistes parallèles (T) destinées à recevoir les composants, caractérisé en ce que les pistes (T) sont formées par plusieurs pistes supports supérieures (1) parallèles espacées latéralement et disposées axialement dont chacune définit une paire de rails supérieurs (2) parallèles disposés



axialement, comportant des parties faisant face vers le bas (3) et par plusieurs pièces supports inférieures (6) parallèles, espacées latéralement, disposées axialement, alignées avec les pièces supports supérieures (1), chacune des pièces supports inférieures définissant plusieurs rails inférieurs (7) parallèles, disposés axialement comprenant des parties tournées vers le haut (8), de manière que chaque piste (T) soit définie par quatre rails (2, 7) et soit située entre deux pièces supports supérieurs voisines (1) et leurs pièces supports inférieures alignées (6).

2. Support selon la revendication 1, caractérisé en ce que les pièces supports supérieures (1) ou les pièces supports inférieures (6) sont en forme de gradin de manière à comporter des parties faisant face latéralement de manière à limiter tout mouvement latéral des composants (200) dans les pistes (T).

3. Support selon la revendication 1 ou 2, caractérisé en ce que chaque pièce support inférieure (6) est une pièce en canal allongée de section transversale en forme générale de U.

4. Support selon la revendication 3, caractérisé en ce que les pièces supports inférieures (6) comportent des ouvertures suivant leurs longueurs.

5. Support selon l'une quelconque des revendications précédentes, caractérisé en ce que chaque pièce support supérieure (1) est une pièce en forme de canal allongé mfe section transversale en forme générale de U.

6. Support selon l'une quelconque des revendications précédentes, caractérisé en ce que les pièces supports supérieures et inférieures (1, 6) sont montées de manière à pouvoir coulisser par rapport au cadre (11) pour permettre un mouvement thermique.

7. Support selon l'une quelconque des revendications précédentes, caractérisé en ce que les pièces supports supérieures et inférieures (1, 6) sont montées sur des colonnettes (15) qui font saillie vers le bas du cadre (11) à chacune de ses extrémités.

8. Support selon la revendication 7, caractérisé en ce que les rails (2, 7) sur les pièces supports (1, 6) s'étendent de chaque côté des colonnettes de montage (15).

9. Support selon l'une quelconque des revendications précédentes, caractérisé en ce que l'accès aux pistes (T) est permis à chaque extrémité et est commandé par des portes de support mobiles (23).

10. Support selon la revendication 9, caractérisé en ce que les portes de support (23) comportent des doigts (27) qui font saillie dans les pistes (T) en condition fermée.

11. Appareil de chargement et de déchargement de composants électriques ou électroniques (200) dans un support portatif selon la revendication 9 ou 10, l'appareil comportant une rampe inclinée (24) avec une région (37) agencée pour recevoir et pour verrouiller de façon amovible en position le support, des moyens d'ouverture et de fermeture sélectives des portes du support (23)

quand le support est verrouillé en position, une plate-forme de chargement (30) à l'extrémité supérieure de la rampe au-dessus de la région de réception du support, la plate-forme de chargement comprenant des moyens pour recevoir plusieurs composants, au moins une porte de rampe mobile (32, 33, 34) sur la rampe (29) pour commander le mouvement des composants en descente sur la rampe dans la région de réception du support (37), une plate-forme de déchargement (39) à l'extrémité inférieure de la rampe (29) au-dessous de la région de réception du support (37) et au moins une porte de rampe mobile (42, 43) sur la rampe pour commander le mouvement des composants en descente sur la rampe depuis la région de réception de support (37) vers la plate-forme de déchargement (39).

12. Appareil selon la revendication 11, caractérisé en ce que sont prévues plusieurs portes de rampe espacées (32, 33, 34) entre la plate-forme de chargement (30) et la région de réception de support (37).

13. Appareil selon la revendication 12, caractérisé en ce que des portes de rampe espacées, supérieure (32), intermédiaire (33) et inférieure (34) sont prévues entre la plate-forme de chargement (30) et la région de réception de support (37) et sont commandées de manière que la porte de rampe supérieure (32) soit initialement fermée pour éviter que des composants (200) ne glissent depuis la plate-forme de chargement (30), la porte de rampe supérieure (32) étant ouverte ensuite pendant que la porte de rampe inférieure (34) se trouve en position fermée et que la porte de rampe intermédiaire (33) sont en position ouverte pour permettre que des composants occupent l'espace (35, 36) entre les portes de rampe supérieure et inférieure, la porte de rampe intermédiaire (33) étant ensuite fermée et la porte de rampe inférieure (34) étant ensuite ouverte pour permettre que des composants occupant l'espace (36) entre les portes de rampe intermédiaire (33) et inférieure (34) laissant passer vers un support, la porte de rampe inférieure (34) étant fermée, et la porte de rampe intermédiaire (33) étant ouverte pour permettre que des composants passent de la région (35) au-dessus de la porte de rampe intermédiaire (33) dans l'espace (36) entre la porte de rampe intermédiaire (33) et la porte de rampe inférieure (34).

14. Appareil selon la revendication 11, 12 ou 13, caractérisé en ce qu'il comporte plusieurs portes espacées (42, 43) entre la région de réception de support (37) et la plate-forme de déchargement (39).

15. Appareil selon la revendication 14, caractérisé en ce que des portes de rampe espacées supérieure (42) et inférieure (43) sont prévues entre la région de réception de support (37) et la plate-forme de déchargement (39) et sont commandées de manière que lorsque la porte de support (23) d'un support est ouverte pour permettre que des composants (200) descendent la rampe (29) dans une opération de déchargement, la porte de rampe inférieure (43) sont fermée et la



portion de rampe supérieure (42) sont ouverte pour permettre que des composants occupent l'espace (40, 41) entre le support et la porte de rampe inférieure (43), la porte de rampe supérieure (42) étant ensuite fermée, la porte de rampe inférieure (43) étant ensuite ouverte pour permettre que des composants occupant l'espace (41) entre les portes de rampe supérieure (42) et inférieure (43) descendent la rampe (49) jusqu'à la plate-forme de déchargement (39), la porte de rampe inférieure (43) étant fermée et la porte de rampe supérieure (42) étant ouverte pour permettre que des composants passent de la région (40)

au-dessus de la porte de rampe supérieure (42) dans l'espace (41) entre les portes de rampe supérieure (42) et inférieure (43).

5 16. Appareil selon l'une quelconque des revendications 1 à 15, caractérisé en ce que la plate-forme de chargement (30) peut pivoter entre une première position dans laquelle la plate-forme est inclinée vers le bas par rapport à la rampe (29) pour faciliter le chargement de composants (200) et une seconde position dans laquelle la plate-
10 forme (30) est alignée avec la rampe (29) pour permettre que des composants (200) glissent vers le bas sur la rampe à partir de la plate-forme (30).

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