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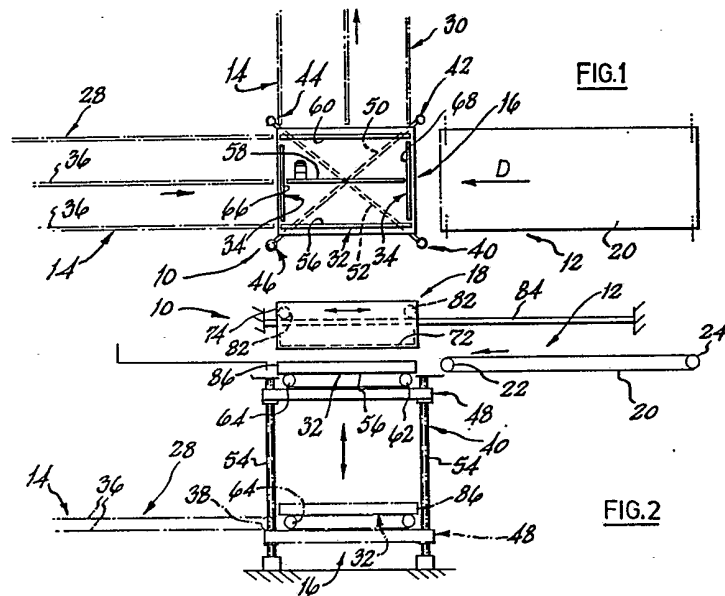
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(54) Article handling method and apparatus

(57) Can palletising or de-palletising apparatus 10 comprises a can conveyor 12, a pallet conveyor 14, a pallet lift and lower mechanism 16, and a magnetic can transfer head 18 to transfer cans between the conveyor 12 and the mechanism 16. The lift and lower mechanism comprises a vertically displaceable frame having its own conveyor 32 for receiving and/or discharging pallets from and to the pallet conveyor. As shown, if the pallet conveyor comprises mutually perpendicular sections 28, 30 as opposed to in-line sections (Figure 3), a fixed-height further conveyor 34 extending perpendicular to conveyor 32 is provided adjacent the lift frame to facilitate transfer of a loaded pallet. The magnetic transfer head 18 may be height adjustable to accommodate different sized cans and a forward group of cans to be picked up thereby may be separated by forward displacement of an end stop (26) whilst an arrestor (76) retains the cans upstream of the group.



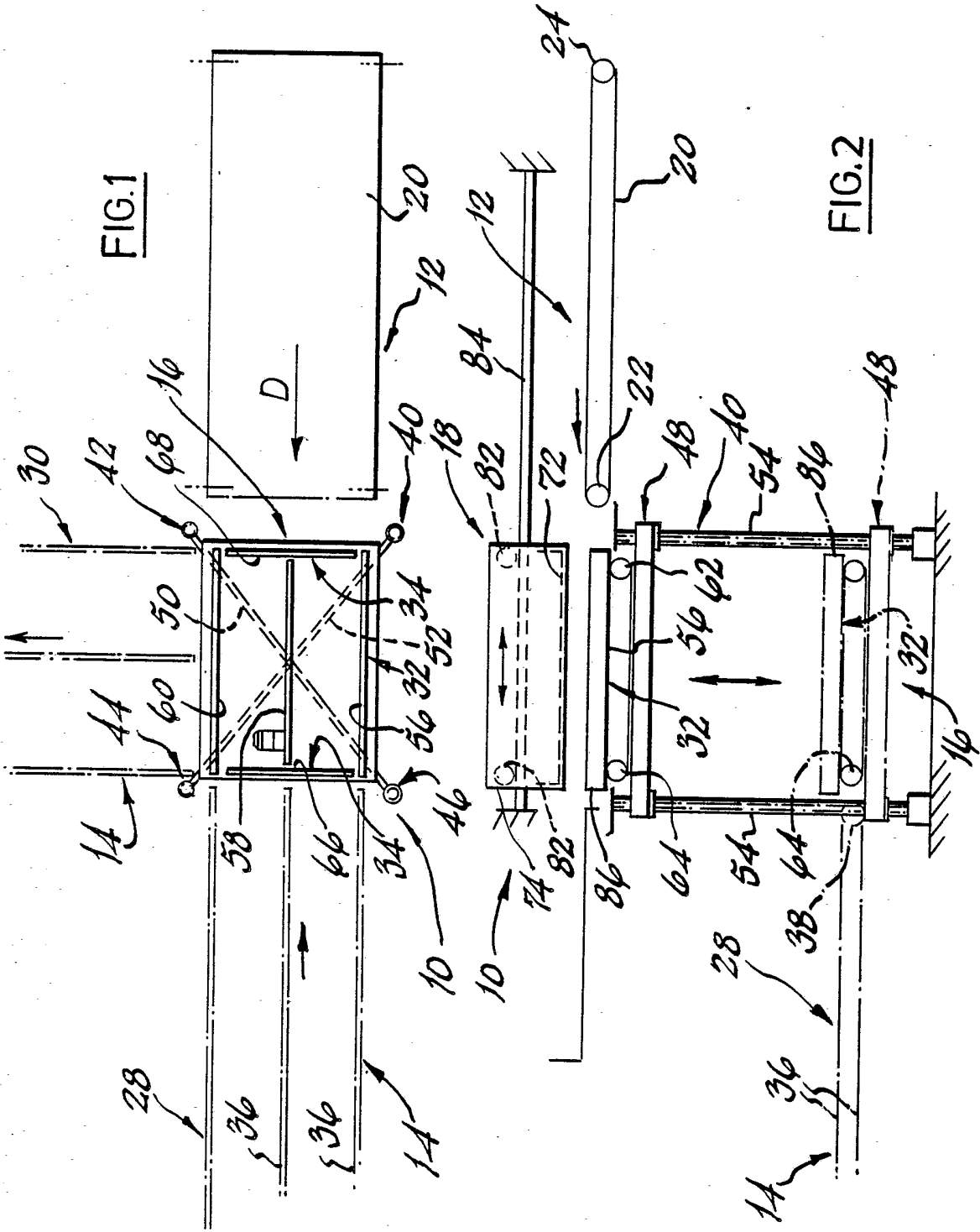
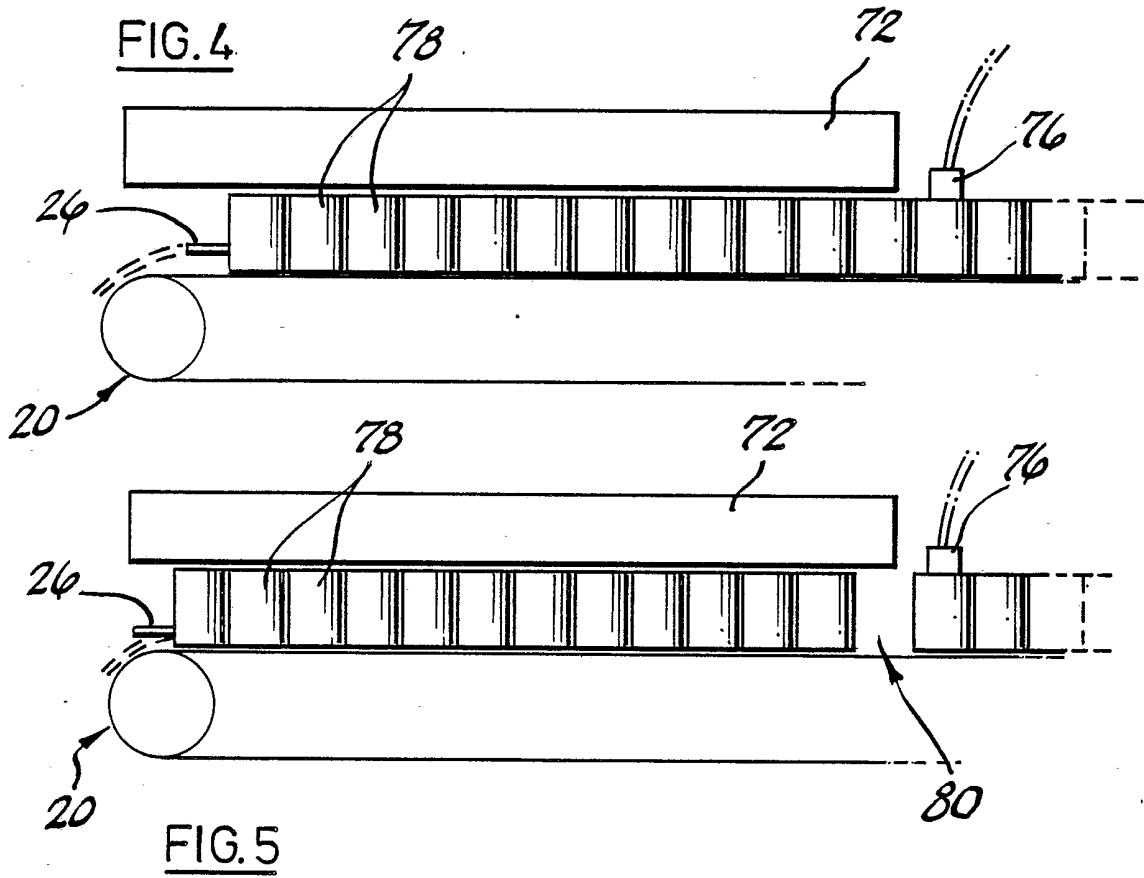
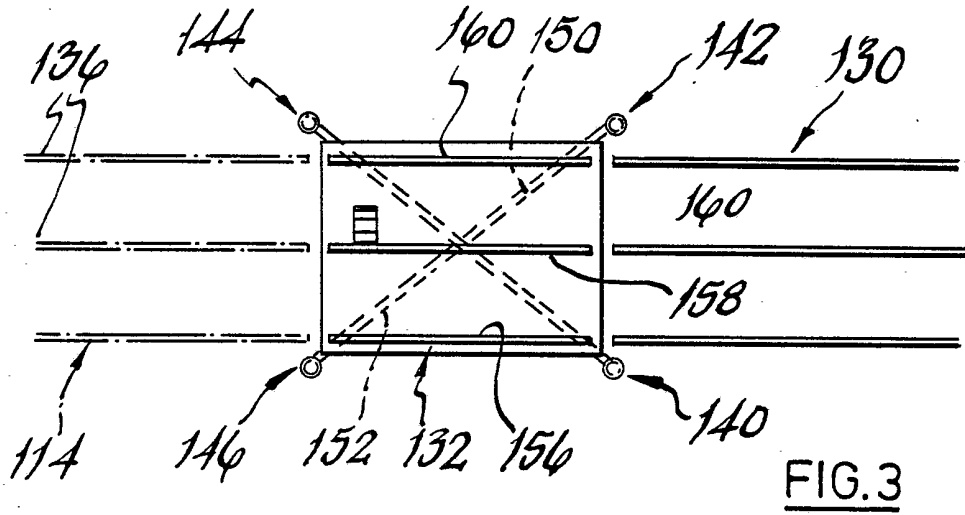


FIG. 1

FIG. 2



SPECIFICATION

Article handling method and apparatus

5 This invention relates to an article handling method and apparatus therefor. An example of the application of the method is to the palletizing of tins of foodstuffs for the purpose of bulk handling of the tins at the end of a canning process for the foodstuffs.

10 An example of previously proposed apparatus for the handling of articles is to be found in patent specification GB 1,540,839. In this prior patent there is disclosed apparatus comprising a conveyor to deliver cans to be handled, a pallet conveyor to deliver pallets on which the cans are to be stacked, a lift well in which pallets are raised and lowered, and a magnetic head to transfer cans from the can conveyor onto pallets in the lift well.

20 Among the technical shortcomings of the apparatus disclosed in the above-mentioned prior patent, and other prior proposals known to the present Applicants, are the following.

25 Firstly, there is the question of the lift and lower mechanism for the pallets. In the prior patent, the pallets are raised and lowered by means of a fork-lift device which slots into gaps in the assembly of conveyor rollers of the pallet conveyor. The rollers rotate about axes extending transverse to the conveying direction. When a pallet reaches a position on the conveyor which is above the fork-lift device, the latter can be raised so as to raise the pallet in the lift well to a position in which the magnetic head can transfer cans to it from the can delivery conveyor.

30 This arrangement is reasonably satisfactory with regard to the pallet conveying apparatus as disclosed in the prior specification, in which the lifting zone accommodating the lift well simply forms a portion of a linearly-extending pallet conveyor.

40 Where however it is desired that the lift well is located at the junction of two mutually inclined portions of the pallet conveyor, the arrangement disclosed in the prior patent is found to be subject to significant shortcomings. These arise from the fact that there is a need to provide means for selectively changing the conveying direction of the pallets according to whether a given pallet is being received in or discharged from the lift well. The roller conveyor of the prior patent and its associated fork-lift device for raising the pallet is not well adapted to accommodate such a design modification. Moreover, the present Applicants have found that even where the roller conveyor is replaced by chain conveyors which more readily permit the provision of mutually inclined conveying direction, the fork-lift device on which the pallets rest while being raised and lowered imposes space requirements in relation to the relative locations of the conveyors. As a result, the gaps between successive portions of the conveyors are unduly large which can lead to problems in the feed-in and feed-out of the pallets whereby they may falter, judder or even stop altogether.

50 Moreover, again with regard to the situation where the two portions of the pallet conveyor are inclined at ninety degrees, there is a need for one conveying direction to take over from the other. Where a fork-lift device, as proposed in the prior patent, is employed the Applicants have found that it is necessary in addition to provide some means for effecting relative height adjustment between the overlapping portions of the inclined pallet conveyors. This leads to considerable mechanical complication and attendant costs.

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70 A further factor which the present Applicants have identified relates to the question of support of the pallets during the lifting and lowering process. The pallets themselves when fully loaded may carry a load of at least one tonne and it will be appreciated therefore that the wooden structure of a conventional pallet is obviously going to be better supported and therefore last longer in use if its weight is supported at its strongest locations. The Applicants have found that where a fork-lift device is provided in addition to a mechanism for relative height adjustment of two portions of the pallet conveyor, the space implications of this arrangement are such that it is more or less impossible to support the pallet at all times under its strongest zones.

75 An object of the present invention is to provide a method and apparatus for handling articles offering improvements in relation to one or more of the shortcomings of the prior art identified above, or generally.

80 According to the invention there is provided a method of handling articles comprising providing article conveyor means and pallet conveyor means and pallet height adjustment means together with article transfer means to transfer articles between the article conveyor means and pallets on the pallet height adjustment means, characterised by the step of providing the pallet height adjustment means with conveyor means which is height-adjusted with the pallets during transfer of articles by the article transfer means, and by the step of conveying pallets between the pallet height adjustment means and the pallet conveyor means by driving said conveyor means.

85 Preferably, the pallet conveyor means comprises two conveyor portions each having an end portion adjacent the pallet height adjustment means, the two portions having mutually inclined conveying directions, the conveying direction of the conveyor means of the pallet height adjustment means being in line with one of said conveyor portions, and further conveyor means being provided having a conveying direction in line with the conveying direction of the other conveyor portion, the method comprising the further step of lowering the pallet height adjustment means until a pallet rests on or can be transferred to said further conveyor means.

90 According to another aspect of the invention there is provided article handling apparatus comprising article conveyor means, pallet conveyor means, pallet height adjustment means, and article transfer means to transfer articles between the article conveyor means and pallets on the pallet height adjustment means, characterised in that the

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pallet height adjustment means comprises conveyor means which is height-adjusted with a pallet during transfer of articles between the article conveyor means and the pallet conveyor means and can serve to convey the pallets between the pallet height adjustment means and the pallet conveyor means.

Preferably, the pallet height adjustment means comprises a frame supporting the conveyor means thereof. The frame may be carried by at least two lift mechanisms. Preferably, the frame is carried by four lift mechanisms.

The pallet conveyor means may comprise two conveyor portions each having an end portion adjacent the pallet height adjustment means. The two portions may be arranged so that their conveying directions are in line, and the conveyor means of the pallet height adjustment means conveys in the same direction as both said portions. Alternatively, said two conveyor portions may be arranged with their conveying directions mutually inclined, the conveying direction of one of said conveyor portions being in line with that of the pallet height adjustment means, and further conveyor means being provided having a conveying direction in line with that of the other pallet conveyor portion, and means being provided for effecting height adjustment of one conveyor means of the pallet height adjustment means with respect to the other conveyor means thereof. Said means for effecting height adjustment may be provided by mounting said further conveyor means at a fixed height which is unaffected by height adjustment of the pallet height adjustment mechanism and which is horizontally aligned with the other portion of the pallet conveyor means. The further conveyor means may comprise endless chain conveyor elements located at opposite ends of the frame of the pallet height adjustment means.

According to another aspect of the invention there is provided a method of handling articles comprising providing article conveyor means and pallet conveyor means and pallet height adjustment together with article transfer means to transfer articles between the article conveyor means and the pallet height adjustment means, characterised by the provision of a further pallet height adjustment means operatively associated with the article transfer means.

The invention also provides a method of handling articles comprising providing apparatus as defined in the last preceding paragraph and characterised by the step of transferring articles from said article conveyor means to both of said pallet height adjustment means using said article transfer means.

According to a further aspect of the invention there is provided article handling apparatus comprising article conveyor means, pallet conveyor means, pallet height adjustment means and article transfer means to transfer articles between the article conveyor means and the pallet height adjustment means, characterised by said pallet conveyor means comprising at least two conveyors to deliver pallets to said pallet height adjustment means

and secondary pallet support means being provided to temporarily support a pallet for transfer of articles between said pallet and the article conveyor means by the article transfer means during discharge of a loaded pallet.

According to another aspect of the invention there is provided a method of handling articles comprising providing apparatus as defined in the last preceding paragraph above characterised by the step of supporting a second pallet by said secondary pallet support means while a first pallet is discharged from the pallet height adjustment means.

According to a further aspect of the invention there is provided a method of handling articles comprising providing apparatus comprising article conveyor means and pallet conveyor means and pallet height adjustment means and article transfer means to transfer articles between article conveyor means and the pallet height adjustment means, characterised by the step of superimposing on a layer of transferred articles carried by a pallet on the pallet height adjustment means a spacer member or board, moving the article transfer means into position above the pallet height adjustment means with a supply of articles to be transferred, and then raising the pallet height adjustment means to a position to receive said articles.

According to a further aspect of the invention there is provided article handling apparatus comprising article conveyor means and article transfer means to transfer articles from the conveyor means to a receiving zone comprising a stop extending laterally with respect to the conveying direction of the article conveyor means to build up on the conveyor means a supply of articles to be handled, and an arrestor member positioned above the conveyor means to be lowered into engagement with the articles on the conveyor means so that those articles engaged by the arrestor member are retained on the article conveyor means, and those beyond it in the conveying direction can be transferred by the article transfer means, characterised by position adjustment means for the stop member whereby the latter can be position-adjusted a short distance in the conveying direction of the article conveyor means so as to permit the latter to move those articles to be transferred to a position to be spaced from the remainder thereof for transfer by the article transfer means.

The invention also provides a method of handling articles comprising providing apparatus as defined in the last preceding paragraph above characterised by the step of position-adjusting said stop member as defined therein.

The invention also provides a method and apparatus for handling articles comprising any novel feature or step or novel combination of features or steps disclosed herein.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 shows, diagrammatically, a plan view of article handling apparatus comprising a pallet conveyor having pallet delivery and pallet discharge

portions arranged mutually at right angles;

Figure 2 shows, diagrammatically, a side elevation view of the apparatus of Fig 1;

Figure 3 shows, in a plan view corresponding to 5 that of Fig 1, article handling apparatus in which the pallet delivery and pallet discharge portions of a pallet conveyor are arranged in line; and

Figures 4 and 5 shows, diagrammatically, side elevation views of successive steps in a method 10 according to the invention in which a group of articles to be transferred are separated from the remainder of a supply thereof prior to attachment to a transfer head.

As shown in Figs 1 and 2 article handling apparatus 10 comprises article conveyor means 12, pallet conveyor means 14, pallet height adjustment means 16 and article transfer means 18 to transfer articles between the article conveyor means 12 and the pallet height adjustment means 16. These principal items of the article handling apparatus 10 will now be described in more detail.

Firstly however it is to be noted that apparatus 10 is in the form of a magnetic palletizer/depalletizer suitable for the loading and unloading of 25 magnetically attractable cans. Such apparatus is suitable for use, for example, in a food canning factory for the bulk handling of the output thereof. A machine of the type currently envisaged is intended to be capable of palletizing/depalletizing at 30 a rate of four and five layers, respectively, on a full size conventional pallet per minute.

Article conveyor means 12 is in the form of an endless mesh belt conveyor 20 having chain edges trained around end sprockets 22, 24 which can be 35 driven in either direction at variable speeds according to operating conditions. When used for palletizing, conveyor 20 delivers cans in the direction of arrow D. As shown in Figs 4 and 5, a stop member in the form of a forming bar 26 is provided near 40 the inner delivery end of conveyor 20 to cause the cans to collect into a group or pattern for transfer. Forming bar is formed with scallops (not shown) to assist pattern formation and position-adjustable side guides (not shown) are provided and adjustable 45 for the various can diameters. The side guides and bar 26 are retracted when the apparatus is used for depalletizing.

Pallet conveyor means 14 comprises primary and secondary pallet conveyors 28 and 30 arranged 50 with their conveying directions mutually at right angles. Between conveyors 28 and 30, in the rectangular zone between the ends of those conveyors, are short primary and secondary pallet conveyor extension portions 32 and 34. The primary portion 32 is (as more fully described below) 55 mounted on the pallet height adjustment means 16 so as to be height adjustable, whereas the secondary pallet conveyor extension portion 34 is mounted at a fixed height so as to be non-height- 60 adjustable.

The pallet conveyors 28 to 34 comprise endless chains 36 trained round sprockets 38. Although in Fig 1 both conveyor 28 and conveyor 30 are shown to be of triple chain construction (two edge chains 65 and a central chain), where one conveyor is used

for full pallets and the other only for empty pallets, the latter conveyor does not require the central chain.

Height adjustment means 16 is provided in the 70 zone between the ends of the primary and the secondary pallet conveyors 28 and 30 to raise pallets from the level of the pallet conveyors 28, 30 to the level of mesh belt conveyor 20, as shown in Fig. 2. For this purpose, there is provided an assembly of 75 four lift mechanisms 40, 42, 44 and 46 arranged at the corners of a rectangular frame 48 having diagonal main beams 50, 52. Each lift mechanism 40 to 46 comprises an upstanding screw member 54 engaging a screw-threaded sleeve (not shown) attached to frame 48 whereby rotation of the screw 80 members in unison raises or lowers the frame. A suitable drive for this purpose is provided.

Mounted on frame 48 is the primary pallet conveyor extension portion 32 comprising three conveyor chains 56, 58, 60 trained around end sprockets 62, 64. Thus, conveyor portion 32 is 85 raised and lowered with frame 48.

On the other hand, the secondary pallet conveyor extension portion 34 is mounted at a fixed 90 height independently of frame 48 so as to be permanently horizontally aligned with the secondary pallet conveyor 30, and comprises chains 66, 68 trained round end sprockets (not shown).

As can be seen in Fig 1, the chains and sprockets 95 of the secondary pallet conveyor extension portion 34 are located and constructed to be of a size such as to fit between the ends of the two outer chain and sprocket assemblies of primary pallet conveyor extension portion 32, the middle chain and sprocket assembly of the latter being slightly shortened accordingly.

It will be appreciated from the above that the 100 outer chains 56, 60 of conveyor portion 32 can be positioned very close to and horizontally aligned with the corresponding chain conveyors of the primary pallet conveyor 28.

Article transfer means 28 is in the form of a 105 magnetic head 72 constructed to lift one complete layer of filled cans. The rectangular permanent magnet is mounted above the main frame of the apparatus on a four-wheeled carriage 74, the magnet is provided with a stainless steel release plate (not shown) and is height-adjustable for various 110 can sizes. Attached to the magnetic head is a pneumatically operated can height detector to control the pallet height adjustment means.

Apparatus 10 is provided with an operator's platform (not shown) and storage means for a supply 115 of spacer or layer pads for manual insertion and removal between layers of cans. A control system for apparatus 10 comprises a programmable microprocessor together with associated control 120 modules, starters, isolators etc. These include hydraulic systems for controlling forming bar 26 and the co-operating arrestor bar 76 shown in Figs 125 4 and 5.

In use, article conveyor means 12 is fed with 130 cans 78 to be palletized and these proceed along mesh belt conveyor 20 until they reach forming bar 26 where the motion of conveyor 20 forms

them into a pattern of rows and this continues until a sensor (not shown) detects a predetermined extent of can build-up whereupon the control system actuates arrestor bar 76 which descends and
5 clamps one layer of cans 78 against movement lengthwise of the mesh belt conveyor.

Forming bar 26 is then caused by the control mechanism to index forwards a short distance, as shown in Fig 5, such movement being immediately
10 followed by movement of the supply of cans in front of arrestor bar 76, whereby a short gap 80 is opened up between the two portions of the supply of cans.

Magnetic head 72 then descends and picks up
15 and transfers the supply of cans which has thus been separated. In this way the batch of cans to be transferred at any given time is centralised with respect to the magnetic head, thereby reducing a tendency for any cans to drop off.

20 Once the layer of cans has been raised by the magnetic head, the latter can travel on its wheels 82 and rails 84 to the position shown in Fig 2 where it lies directly above the frame 48 of the pallet height adjustment means 16, in the raised position of the latter as shown in Fig 2. Note that Fig 2
25 also shows (dotted) the lowered position of the height adjustment means, for purposes of comparison and illustration only.

As shown in Fig 2, pallet 86 rests on the chains
30 of the extension portions 32, 34 of the pallet conveyors at a height at which its upper surface is approximately horizontally aligned with the upper surface of mesh belt conveyor 20, which delivers the cans. The group of cans which are magnetically adhered to magnetic head 72 are then in contact with, or nearly so, the upper surface of the
35 pallet and are then released, whereupon the magnetic head is returned (to the right in Fig 2) to its take-up position where it picks up a further group of cans in the manner described above.

Meanwhile, frame 48 is indexed downwards by suitable actuation of screw members 54 and an operator manually places a spacer board or card or pad (not shown) on top of the layer of cans already
45 deposited on the pallet, ready to receive a second layer.

The frame 48 and the pallet are indexed downwards by a short distance in excess of the combined depth of the layer of cans and the spacer
50 pad, so that the top surface of the pad is slightly below the level of the top surface of mesh belt conveyor 20. In this manner, magnetic head 72 can traverse from its pick-up position over belt 20 to its delivery position over the pallet 86 without any interference with the pallet or its load - even if the
55 spacer pad on top of the cans has, by reason of long use, become somewhat distorted with up-turned edges. Then with the magnetic head above the pallet, the frame is raised slightly - for example by about 1.5 cm - to bring it to its can-receiving
60 position, whereupon a further layer of cans is deposited on the pad and the above sequence of operations is repeated. In this manner, the pallet 86 is loaded with a series of layers of cans up to its
65 maximum carrying capacity, if desired. When the

latter point has been reached, discharge of the loaded pallet is carried out as follows. Frame 48 is lowered by actuation of screw members 54 until the level of the chains 56, 58, 60 of primary pallet
70 conveyor extension portion 32 pass below the level of the chains 66, 68 of extension portion 34, whereby the weight of the pallet is transferred to the latter chains and the pallet has effectively been transferred from primary pallet conveyor 28 to secondary pallet conveyor 30. It will be appreciated
75 that by merely driving chains of conveyor 30 in the discharge direction, the loaded pallet will be discharged from the apparatus 10.

A further pallet 86 is then passed into height adjustment means 16 as follows. Frame 48 is raised
80 to a position in which (as shown in Fig 2) it is horizontally aligned with primary pallet conveyor 28, and an unloaded pallet waiting on the latter is moved into the height adjustment means by driving the latter conveyor together with its extension
85 portion 32. Then, frame 48 is raised and the loading sequence described above is repeated. For depalletizing operations the above-described sequence of operations is reversed.

90 Among the advantages provided by the above-described embodiment are the following. Firstly, the gaps between the chains of the primary and secondary conveyors can be made very short, since there is no need for a fork-lift device to pass
95 through the gaps. Secondly, the basic structural simplicity of the apparatus arises from the need to provide only one set of apparatus which is height adjustable (the pallet height adjustment means 16) whereas the fork-lift arrangement necessitates both
100 a liftable fork device and a height adjustable chain conveyor. In addition, the chains of the pallet conveyor extension portions are positioned so as to exactly underlie the regions of maximum strength of the pallets, which is not possible if a fork-lift device is to be used in addition to a height adjustable
105 conveyor.

Moreover, as shown in Figs 4 and 5, considerable operating efficiency arises from the provision of the position-adjustable forming bar 26. The
110 arrestor bar 76 holds the next supply of cans securely away from the transfer head, and the collection of cans to be handled are moved onwards so as to be centralised with respect to the transfer head, thereby avoiding the risk of cans on the edge
115 of the transfer head becoming detached during use and falling into the mechanism and causing serious delays.

Fig 3 illustrates a simplified embodiment, which otherwise corresponds to Figs 1 and 2. In Fig 3,
120 parts which correspond to those of the preceding embodiment are given the same reference numeral as in the latter embodiment but with the number increased by the value of one hundred. However, in the embodiment of Fig 3, the secondary pallet conveyor 130 has its conveying direction arranged
125 in line with that of the primary pallet conveyor 128. Therefore, there is no need to make provision for a secondary pallet conveyor extension portion 34 as in the preceding embodiment. Extension portion
130 132 serves the necessary purpose. Moreover, the

central chain 158 of extension portion 132 can be extended somewhat. With this modification of construction, the operation of this embodiment corresponds to that described above with corresponding modifications.

Many modifications can be made in the above-described embodiments without departing from the scope of the invention as envisaged herein. Amongst such modifications are the following:

1 The use of a non-magnetic transfer device.

For example, it might well be possible to use a suction device in the case of articles having a suitable upper surface.

2 The relative heights of the pallet conveyors and the article conveyors need not be as shown. It is only necessary for the transfer head to be able to be able to pick up articles from the article conveyor and to transfer them across to a pallet on the pallet height adjustment means. After the pallet has been suitably loaded, it could be raised or lowered for discharge purposes.

3 As regards the term 'pallet' it is to be understood that this term as used in this specification and claims is not limited strictly to the well known wooden pallet but is intended to cover any support member or structure on which articles can be stacked and transported in a stacked condition. Obviously, many other materials other than wood can be employed for this purpose.

4 As regards the pallet and article conveyor means, any suitable conveyor means can be provided, including belts, chains, rollers, etc according to need. Combinations of various types of conveyor devices can be provided, though where rollers are used, these may impose space considerations.

5 As regards the pallet height adjustment means, various types of lift and lower mechanisms could be employed as an alternative to the screw device disclosed, including chains, rams (whether hydraulic or otherwise), lazy tong devices etc.

6 More than one pallet height adjustment means 16 may be employed per article transfer means 18. In other words, when one pallet has been fully loaded and is in process of being discharged, the transfer head could then commence loading a pallet which has been placed ready for loading in a second pallet height adjustment means.

7 Likewise, more than one pallet delivery conveyor may be provided to deliver pallets to the pallet height adjustment means. This arrangement would enable a second pallet to be delivered to the apparatus while a previous pallet in loaded condition was being discharged. For this purpose, secondary pallet support means may be provided to support temporarily a pallet during the discharge of a preceding pallet so that the former can be loaded during the discharge process. When however the frame 48 returns to its raised position, the secondary position pallet support means can be retracted. Such support means could for example be in the form of mechanical supports swingable to an operating position but normally stowed in a retracted position.

8 The drives for the conveyors may be hydraulic, electric, mechanical or otherwise.

In a further embodiment, to which the above-identified design modifications may be applied as appropriate, this embodiment not being illustrated, the arrangement is generally as described above in relation to the preceding embodiments described with reference to the drawings, but with the following modification.

For the purpose of simplifying the process of resetting the apparatus when it is desired to change the height of articles being conveyed (for example where the can size and height varies) there is provided apparatus whereby the operating height of the magnetic head 72 with respect to the can conveyor 20 is made adjustable. This is achieved by mounting the magnetic head and its associated rails or tracks on a sub-frame which is height-adjusted by power means controlled by hydraulic rams. Mounted on the same frame is the arrestor bar 76 and its associated apparatus whereby it also is height adjusted in unison.

In this way, the change over between two different can heights is readily accomplished at the push of a button. The magnetic head operates at its new height in just the same way as before. So indeed does the arrestor bar 76.

In this embodiment the lift and lower mechanism of the pallet height adjustment means comprises four assemblies, one at each corner thereof, each assembly comprising a chain actuated by a hydraulic ram and functioning in the manner described above.

In a further embodiment, also not illustrated, there is provided article alignment apparatus for effecting grouping of the cans or other articles when deposited on a pallet in the lift well.

There is a tendency for the cans after deposition from the magnetic head to become untidy or irregularly distributed and, with a view to maintaining a regular and upright and strong stack of cans on the pallet it is preferred to provide means for realigning and regrouping the cans.

For this purpose, there is provided at least one extendible and retractable blade for engagement with the cans after deposition on the pallet (or on a support pad on top of a layer of cans thereon). Extension of the blade pushes the outer layer of cans into linear alignment. The blade is then retracted.

Similar alignment members, also retractable and extendible, can be provided at other sides of the pallet according to need.

The alignment apparatus is preferably arranged to be extended and retracted hydraulically. It can be mounted at a fixed height corresponding to the height within the well of the uppermost layer of cans after transfer. The exact form of the alignment member or blade may be adapted to suit the circumstances. It may have a straight edge, or may be formed with concave recesses to receive the cans.

CLAIMS

1. A method of handling articles comprising

providing article conveyor means and pallet conveyor means and pallet height adjustment means together with article transfer means to transfer articles between the article conveyor means and pallets on the pallet height adjustment means, characterised by the step of providing the pallet height adjustment means with conveyor means which is height adjusted with the pallets during transfer of articles by the article transfer means, and by the step of conveying pallets between the pallet height adjustment means and the pallet conveyor means by driving the conveyor means of the pallet height adjustment means.

2. A method according to claim 1 wherein two conveyor portions are provided each having an end portion adjacent the pallet height adjustment means, the two portions having mutually inclined conveying directions, the conveying direction of the conveyor means of the pallet height adjustment means being in line with one of said conveyor portions, and further conveyor means being provided on the pallet height adjustment means and having a conveying direction in line with the conveying direction of the other conveyor portion, the method comprising the further step of lowering the pallet height adjustment means until a pallet rests on or can be transferred to said further conveyor means.

3. Article handling apparatus comprising article conveyor means, pallet conveyor means, pallet height adjustment means, and article transfer means to transfer articles between the article conveyor means and pallets on the pallet height adjustment means, characterised in that the pallet height adjustment means comprises conveyor means which is height-adjusted with a pallet during transfer of articles between the article conveyor means and the pallet conveyor means and can serve to convey the pallets between the pallet height adjustment means and the pallet conveyor means.

4. Apparatus according to claim 3 wherein the pallet height adjustment means comprises a frame supporting the conveyor means thereof.

5. Apparatus according to claim 4 wherein said frame is carried by at least two lift mechanisms.

6. Apparatus according to claim 5 wherein the frame is carried by four lift mechanisms.

7. Apparatus according to any one of claims 3 to 6 wherein the pallet conveyor means comprises two conveyor portions each having an end portion adjacent the pallet height adjustment means.

8. Apparatus according to claim 7 wherein said two conveyor portions are arranged so that their conveying directions are in line, and the conveyor means of the pallet height-adjustment means conveys in the same direction as both said portions.

9. Apparatus according to claim 7 wherein said two conveyor portions are arranged with their conveying directions mutually inclined, the conveying direction of one of said conveyor portions being in line with that of the pallet height-adjustment means, and further conveyor means being provided having a conveying direction in line with that of the other pallet conveyor portion, and means

being provided for effecting height adjustment of one conveyor means of the pallet height adjustment means with respect to the other conveyor means thereof.

10. Apparatus according to claim 9 wherein said means for effecting height adjustment is provided by mounting said further conveyor means at a fixed height which is unaffected by height adjustment of the pallet height-adjustment mechanism and which is horizontally aligned with the other portion of the pallet conveyor means.

11. Apparatus according to claim 9 or claim 10 wherein said further conveyor means comprises endless chain conveyor elements located at opposite ends of the frame of the pallet height-adjustment means.

12. A method of handling articles comprising providing article conveyor means and pallet conveyor means and pallet height-adjustment means together with article transfer means to transfer articles between the article conveyor means and pallets on the pallet height-adjustment means, the article transfer means being mounted for reciprocating movement between the article conveyor means and the pallet height-adjustment means, characterised by the step of actuating adjustment means to adjust the height of the article transfer means with respect to the article conveyor means to accommodate a change in the height of articles to be handled.

13. A method according to claim 12 wherein arrestor means is provided to limit movement of articles in the transfer direction, the method including the step of height-adjusting the arrestor means with the article transfer means.

14. Article handling apparatus for performing a method according to claim 13 wherein said article transfer means and said arrestor means are mounted on a common sub-frame.

15. Article handling apparatus comprising article conveyor means and pallet conveyor means and pallet height-adjustment means together with article transfer means to transfer articles between the article conveyor means and the pallet height-adjustment means, characterised by the provision of a further pallet height-adjustment means operatively associated with the article transfer means.

16. A method of handling articles comprising providing apparatus according to claim 15, the method further comprising the step of transferring articles from said article conveyor means to both of said pallet height-adjustment means using said article transfer means.

17. Article handling apparatus comprising article conveyor means, pallet conveyor means, pallet height-adjustment means and article transfer means to transfer articles between the article conveyor means and the pallet height-adjustment means, characterised by said pallet conveyor means comprising at least two conveyors to deliver pallets to said pallet height-adjustment means and secondary pallet support means being provided to temporarily support a pallet for transfer of articles between said pallet and the article conveyor means by the article transfer means during

discharge of a loaded pallet.

18. A method of handling articles comprising providing apparatus as defined in claim 17, the method further comprising the step of supporting
5 a second pallet on said secondary pallet support means while a first pallet is discharged from the pallet height-adjustment means.

19. A method of handling articles comprising providing apparatus including article conveyor
10 means and pallet conveyor means and pallet height-adjustment means and article transfer means to transfer articles between said article conveyor means and the pallet height-adjustment means, characterised by the step of superimposing
15 on a layer of transferred articles carried by a pallet on the pallet height-adjustment means a spacer member or board, and by the step of moving the article transfer means into position above the pallet height-adjustment means with a supply of arti-
20 cles to be transferred, and then raising the pallet height-adjustment means to a position to receive said articles.

20. Article handling apparatus comprising article conveyor means and article transfer means to
25 transfer articles from the conveyor means to a receiving zone, the apparatus comprising a stop extending laterally with respect to the conveying direction of the article conveyor means to build up on the conveyor means a supply of articles to be
30 handled, and an arrestor member positioned above the conveyor means in order to be lowered into engagement with the articles on the conveyor means so that those articles engaged by the arres-
35 tor member are retained on the article conveyor means, and those beyond it in the conveying direction can be transferred by the article transfer means, characterised by position-adjustment means for the stop whereby the latter can be posi-
40 tion-adjusted in the conveying direction of the article conveyor means so as to permit the latter to move those articles to be transferred to a position spaced from the remainder thereof, for transfer by the article transfer means.

21. A method of handling articles comprising
45 providing apparatus according to claim 20, the method further comprising the step of position-adjusting said stop in the conveying direction of the article conveyor.

22. A method of handling articles substantially
50 as described herein.

23. Article handling apparatus substantially as described herein.

24. Article handling apparatus comprising article conveyor means, pallet conveyor means, pallet
55 height adjustment means, and article transfer means to transfer articles between the article conveyor means and pallets on the pallet height-adjustment means, characterised in that extendible and retractable article alignment means is provided
60 to engage and re-align articles after transfer to a pallet on the pallet height-adjustment means by the article transfer means from the article conveyor means.

25. Apparatus according to claim 24 wherein
65 the article alignment means comprises an align-

ment member positioned at a height in the pallet height-adjustment means such as to engage the articles when supported on a pallet at the same height as the articles on the article conveyor
70 means.

26. A method of handling articles comprising providing apparatus according to claim 24 or claim 25 and the further step of extending and retracting the article alignment member to engage and re-align articles transferred by the article transfer
75 means.

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