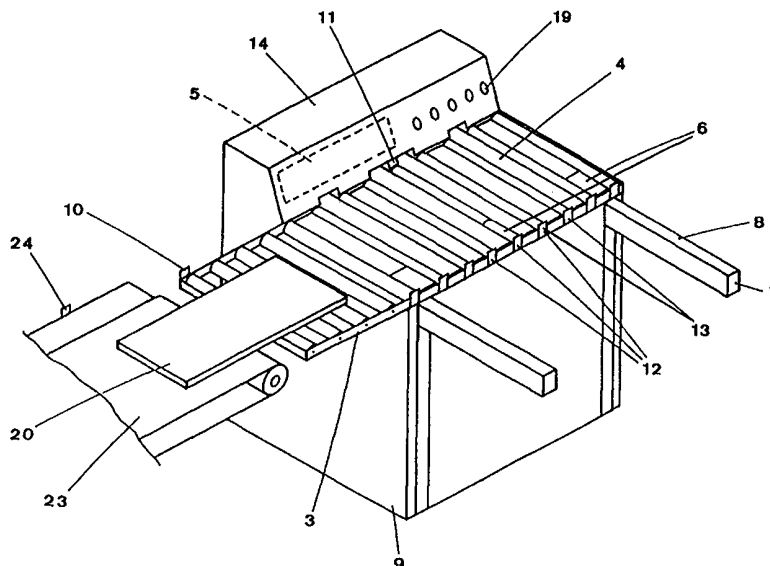




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<p>(21) International Application Number: PCT/NZ99/00101</p> <p>(22) International Filing Date: 29 June 1999 (29.06.99)</p> <p>(30) Priority Data: 330809 29 June 1998 (29.06.98) NZ</p> <p>(71) Applicant (for all designated States except US): H &amp; P TECHNOLOGIES LIMITED [NZ/NZ]; P.O. Box 9029, Annesbrook, Nelson (NZ).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): VAN OEVEREN, Henk [NL/NZ]; 42D Quarantine Road, Stoke, Nelson (NZ).</p> <p>(74) Agents: SCHUCH, Ernst, Robert et al.; Level 3, 330 Lambton Quay, P.O. Box 10 932, Wellington (NZ).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	

(54) Title: STACKING DEVICE FOR STACKING ARTICLES



(57) Abstract

A method of and apparatus (1) for handling articles including a conveyor (2) to receive an article (20) from the upstream end of the conveyor (2), a lifting means (4) to lift the said article off the conveyor (2), at least a first sensor (10) located at the upstream end of the conveyor (2) to sense the presence of the leading edge of the article (20) as it moves adjacent the sensor (10) and a second sensor (11) located adjacent the lifting means (4) to sense the presence of the leading edge of the article (20), a controller (5) associated with the sensors (10, 11) to control the operation of the lifting means (4) such that the controller (5) determines when the article (20) is substantially centrally disposed over the lifting means (4) and triggers the lifting means (4) to lift the article (20) off the conveyor (2).

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## STACKING DEVICE FOR STACKING ARTICLES

### TECHNICAL FIELD

5 This invention relates to an apparatus and method for handling articles. More particularly, but not exclusively, this invention relates to an apparatus for and method of receiving articles being conveyed from a conveyor belt, and subsequently stacking them in a desirable way.

### 10 BACKGROUND ART

Conventional stacking systems generally involve a transversely aligned conveyor belt to the main conveyor belts direction of travel. A disadvantage with transversely oriented systems is that articles having easy to scratch surfaces can be scratched due to the  
15 articles being moved from the direction of travel of the conveyor to an adjacent stack or by the articles being dropped into the stack.

A further method of stacking articles is by use of suction cups to lift the articles being conveyed and placing them onto a stack. The use of suction cups may prevent  
20 scratching of boards being conveyed but the machinery required to operate this handling system can be expensive as it requires a large plant.

Commonly, conventional machines do not handle different sized articles or to stack the articles in a convenient way. The result of the use of these conventional machines is  
25 that the different sized articles can be stacked in an unstable manner.

It is an object of the present invention to provide an apparatus for stacking articles that overcomes at least some of the abovementioned problems, or which at least provides the public with a useful choice.

30

It is an object of the present invention to provide a method of stacking articles that overcomes at least some of the abovementioned problems, or which at least provides the public with a useful choice.

- 5 It is an object of the present invention to provide a system for stacking articles that overcomes at least some of the abovementioned problems, or which at least provides the public with a useful choice.

### SUMMARY OF THE INVENTION

10

According to a broad aspect of the invention there is provided an apparatus for handling an article being conveyed, the apparatus including a conveying means to receive a said article from the upstream end of the conveying means and conveying the said article, a lifting means to lift the said article off the conveying means, at least  
15 a first sensor located at the upstream end of the conveyor means to sense the presence of the leading edge of the said article as it moves adjacent the first sensor, a second sensor located adjacent the lifting means to sense the presence of the leading edge of the said article, a control means associated with the first sensor and the  
20 control means determines when the said article is substantially centrally disposed over the lifting means and triggers the lifting means to lift the said article off the conveying means.

Preferably the conveying means is a plurality of spaced apart substantially parallel  
25 rollers. Desirably the lifting means are at least two spaced apart lifting forks, each said lifting fork being located between the rollers.

Preferably the second sensor is located in a substantially central position between the lifting forks. Advantageously two pairs of spaced apart lifting forks are located  
30 between adjoining spaced apart said rollers, each said pair of forks being spaced apart for easier handling of the said article.

Preferably the apparatus further including a stacking means located to the side of the conveying means adjacent the lifting means to enable the lifting means to relocate the said article thereupon from the conveying means. Desirably the stacking means are  
5 stacking arms projecting from the apparatus and being sufficiently spaced apart to cradle the said article.

Preferably the stacking arms is provided with stack sensing means positioned slightly below the conveyor means above the stacking arms, in use, to sense the presence of  
10 the next said article being stacked and provide a signal to the control means, the control means, after receiving said signal, will cause the stacking arms to be lowered such that the top of a stack of said articles is maintained at a height of just below the conveying means.

- 15 According to a further aspect of the invention there is provided a method of handling articles being conveyed comprising the steps of:
- a. sensing the leading edge of a said article being received by a conveying means at the upstream end and providing a first signal to a control means;
  - 20 b. conveying the said article at substantially the same speed along the conveying means until a second sensor sensing the leading edge of the said article and providing a second signal to a control means; and
  - c. lifting the said article off the conveying means when the control means determines that the said article is substantially centrally disposed  
25 between lifting means.

Preferably the method further comprises the step of stacking the articles on a stacking means, the stacking means then being lowered to continue to align the top surface of the last placed said article with the top of the rollers.  
30

Preferably the method further comprises the step of determining the speed of the article being conveyed to the upstream end of the conveying means, the steps including a third sensor positioned substantially about one article length upstream of the conveying means on an adjacent second conveying means to detect the presence of the article and  
5 provide a signal to the control means; and subsequently when the article is conveyed further downstream the first sensor will detect the presence of the article and provide a further signal to the control means, the control means then compares the two signals to determine the speed of the second conveying means and, if the control means determines that a difference in conveying speed exists, the control means will adjust the  
10 speed of the conveying means such that the speed of the conveying means substantially matches that of the second conveying means.

#### BRIEF DESCRIPTION OF THE DRAWINGS

15 A preferred embodiment of the invention will now be illustrated, by way of example only, with reference to the accompanying drawings in which:

**Figure 1:** illustrates a perspective view of an apparatus 1 in accordance with a preferred embodiment of the invention;  
20

**Figure 2:** illustrates a perspective view of the preferred apparatus for operating the rollers in accordance with an aspect of the invention;

25 **Figure 3:** illustrates a side view of a preferred apparatus for operating the stacking arms in accordance with an aspect of the invention;

**Figure 4:** illustrates a side view of a preferred apparatus for operating the lifting forks in accordance with an aspect of the invention;  
30

**Figure 5:** illustrates a cross-sectional view through figure 4; and

**Figure 6:** illustrates a block diagram of the control means.

#### DETAILED DESCRIPTION OF THE DRAWINGS

- 5 Referring to figure 1, the apparatus of the invention, generally referred to as 1, according to a preferred embodiment of the invention, as illustrated.

The apparatus 1 for handling conveyed articles is in the form of the compact, robust and durable machine that is advantageously positioned adjacent the downstream end of an  
10 adjoining conveyor 23.

The articles 20 being handled by the apparatus 1 include wood and fibre board panels that can have surfaces that can be easily scratched and therefore careful handling of such articles 20 is desirable. It will be appreciated that further advantages of the  
15 invention include an efficient article stacking feature that can result in having a stable stack of articles 20 for easy movement.

It will be appreciated that the articles 20 being conveyed onto the apparatus 1 will likely have been operated on in some form such as edge banding, and that the apparatus 1  
20 serves as a convenient and effective method of handling and stacking articles being conveyed. An article 20 is shown in figure 1 as just being conveyed to the apparatus 1.

The apparatus 1 includes a conveying means in the form of a plurality of elongate rollers 2 configured and arranged in a spaced apart and substantially parallel orientation and  
25 being rotatable in the same direction. The rollers 2 are rotatable within a frame 3. A preferable drive arrangement of the rollers 2 is described in figure 2.

The lifting means in this embodiment is in the form of two pairs of spaced apart lifting forks 4. The lifting forks 4 of each pair are desirably spaced apart on either side of one  
30 of the rollers 2 as shown. Each pair of lifting forks 4 is spaced apart for easier handling of the article 20.

Desirably the lifting forks 4 are made of a durable and resilient material such as, for example, a solid plastics material. In this preferred embodiment, the forks are an ultra high molecular weight polyethylene.

5

The lifting forks 4 are configured and arranged to operate by a control means 5 when the article 20 being conveyed is positioned above the lifting forks 4. The lifting forks 4 operate to lift the article 20 and place the article 20 either on pads 6 located at the distal end of the lifting forks 4 between some of the rollers 2 or on stack supporting means 7  
10 in the form of stacking arms.

The control means 5 is in the form of a programmable logic controller configured and arranged to receive all the sensed data provided by all the sensors of the apparatus 1 and to control the timing and operation of the various motors, rams and lifters that are  
15 required to handle the articles 20 being introduced at the upstream end of the rollers 2.

The pads 6 in a static state are such that the top surface is just below the top of the rollers 2. When used in an operation they are inflated so that the top surface rises above the top of the rollers 2 to allow an article 20 to be stacked thereupon without interfering  
20 with the operation of the rollers 2.

The stacking arms 7 are configured and arranged to commence operating such that the top surface 8 of the stacking arms 7 is substantially co-planar with or slightly lower than the top of the rollers 2.

25

The control means 5 is adapted to control the stacking arms 7 to lower at about a thickness of the article 20 with each article being stacked on the stacking arms 7. This results in the top of the stacked articles 20 being substantially co-planar with or slightly lower than the top of the rollers 2 after every article 20 is stacked. A more detailed  
30 description is with reference to figure 3.



The stacking arms 7 are desirably located at either end of the housing 9 and spaced apart such that the central point of the lifting forks 4 is also the central point of the stacking arms 7.

- 5 Advantageously, the method of transferring the articles 20 being conveyed from the rollers 2 to the pads 6 or arms 7 by way of the control means 5 being fed sensed data from sensors 10, 11 and controlling the operation of the lifting forks 4. A more detailed description of the operation of the forks 4 is with reference to figures 4 and 5.
- 10 According to an aspect of the invention there is a method of determining when the article 20 has moved substantially over the central point between the lifting forks 4. The desirable method includes the sensors 10, 11 being adjacent two different locations along the rollers 2 to provide a signal to the control means 5 when the article 20 passes that location of the rollers 2.

15

The control means 5 then determines when the article being conveyed is centrally placed over the lifting forks 4. It will be appreciated that any sensors capable of detecting the presence of an object in its path may be used with the invention. In this embodiment the sensors 10, 11 are photoelectric sensors.

20

- The sensor 10 is positioned at the upstream end of the rollers 2 and sensors when the article being conveyed moves onto the upstream end of the rollers 2. When the sensor 10 detects the presence of the leading edge of an article 20 it provides a signal to the control means 5 and a first register commences counting at a rate of preferably 100 Hz
- 25 for as long as the article 20 is being detected. As the article 20 moves downstream at a constant velocity it will eventually be detected by sensor 11 as the leading edge moves into the view of the sensor 11. When that happens the sensor 11 provides a signal to the control means 5 and a second register commences counting at a rate of preferably 200 Hz for as long as the article 20 is being detected.

30

The control means 5 continually compares the value of the first and second registers. When the control means 5 determines that the value in the second counter exceeds the value in the first counter, the control means 5 will determine that the article being conveyed is approximately centrally placed over the lifting forks 4 whereupon the lifting forks will be operated to lift the article 20 either onto the stacking pads 6 or the stacking area on the stacking arms 7.

Stop guides 12 are fastened to the outside of the frame 3 to stop the articles being stacked on the stacking arms 7 from sliding back against the rollers 2. The guides 12 also aid to position articles being placed on the pads 6 before they are transferred to the stack on the stacking arms 7.

Sensors 13 are located in some of the guides 12 for sensing the top of the stack of articles on the stacking arms 7. The purpose of the sensors 13 is to ensure that the top of the stack of articles 20 does not rise level with or above the sensor 13 height as it will interfere with the operation of the forks 4. The sensors 13, when detecting the presence of an article 20, will provide a signal to the control means that will in turn cause the stacking arms 7 to lower until the sensors 13 see over the stack of articles 20. At that point the stacking arms 7 will stop being lowered.

20

Referring now also to figure 2, a preferred apparatus for operating the rollers 2 in accordance with an aspect of the invention, is illustrated.

The arrangement of components for driving and controlling the operation of the rollers 2 is generally contained within the housing 9 under the control panel 14.

A layshaft 15 is oriented substantially perpendicular to the longitudinal axis of the rollers 2. A round belt 16 is associated with the layshaft 15 and each of the rollers 2 such that when the layshaft 15 is rotated the rollers 2 rotate also. A groove 17 in each of the rollers 2 locates and retains the belt 16.

30

The layshaft 15 is rotatable by a belt drive arrangement including a pulley 18 attached to the layshaft 15, a belt 19 and pulleys 21, the belt arrangement being driven by an hydraulic motor 22.

- 5 The speed at which the layshaft 15 and rollers 2 rotate can be adjusted by moving the belt 19 onto a larger or smaller pulley 21 on the motor 22 and or layshaft 15.

Alternatively the speed of the rollers 2 can be adjusted by regulating the flow of oil through the motor 22. However, this will require an automatic speed adjustment as the  
10 mechanism of reducing oil flow tends to be inconsistent over time. As a further alternative a variable speed motor can be used.

The rotational speed of the rollers 2 is desirably adjustable to match or be close to the speed of the article being conveyed by an adjacent conveyor 23 at the upstream end or  
15 infeed of the apparatus 1. Matching the relative speeds of the adjoining conveyor and the rollers is desirable for the reason that the accuracy of the stacking method and placing the conveyed articles into the stacking area can be dependant on the sensors 10, 11 and respective first and second registers sensing and the control means 5 determining the central position of the article when over the lifting forks 4.

20

An advantage with having a variable speed conveying means is that the rotational speed of the rollers 2 can be adjusted to match the speed of the conveyor of many of the machines to which the apparatus 1 is being used at the downstream end. This avoids the need to customise the motor in the apparatus 1 for a particular adjoining item of  
25 machinery. Further, the apparatus 1 can be used in conjunction with a variable speed conveyor at the upstream end.

A method of determining the speed of the conveyor 23 at the upstream end of the rollers 2 can be implemented according to an aspect of the invention. A third sensor 24  
30 is desirable positioned at least one article or board length upstream from the infeed of the apparatus 1 or the sensor 10. This sensor 24 detects the presence of the article 20

and provides a signal to the control means 5 and the sensor 10 further downstream will subsequently detect the leading edge of the article 20 and provide a further signal to the control means 5. The control means 5 will compare the two signals and, if a difference exists, the control means 5 will adjust the speed of the rollers 2 such that the speed of  
5 the rollers 2 substantially matches that of the conveyor 23.

It is envisaged that there can be circumstances whereby articles being conveyed onto the rollers 2 can be received at different speeds and that the apparatus 1 can function to determine the speed of each article being received and to adjust the speed of the rollers  
10 2 to substantially match that speed.

Referring now to figure 3, a preferred apparatus for operating the stacking arms 7 in accordance with an aspect of the invention, is illustrated.

15 The stacking arms 7 are desirably operated by a scissor-type lifting system. One end of the arm 26 is pivotally connected to a top member 29 by pivot 28. The stacking arm 7 is releasably attachable to the top member 29. A wheel 30 is rotatably attached to one end of arm 25 to allow the top member 29 to slide over the wheel 30 as the stacking arms 7 are being raised and lowered.

20

The arm 25 is pivotally fixed at the other end to joint 31 at the bottom of the apparatus housing 9. The other end of the arm 26 is rotatably attached to a wheel 32 to allow movement backwards and forwards along the bottom of the housing 9. A ram 33 is pivotally connected at the lower end to joint 31 and at the higher end to a link 34. The  
25 link 34 is welded at an appropriate angle adjacent the intermediate point of the arm 26.

In operation, the control means 5 will receive a signal from the sensor 13 (as seen in figure 1) that an article has been stacked on the pile on the stacking arms 7 and will operate the lifter 33 to cause the stacking arms 7 to be lowered until the sensor 13 no  
30 longer detects the presence of the top article on the stack. When that occurs the lifter 33 will halt until the sensor 13 further detects the presence of the next article to be

stacked, in which case the lifter 33 will operate again to lower the stacking arms 7 further.

Alternatively the stacking arms 7 can be detached from the top member 29 in operations whereby the articles 20 are required to be returned to the upstream end of the adjoining conveyor 23 such as, for example, as in an edge bander. In this situation, the conveyor (not shown) is positioned in the place of the area of the stacking arms, and being advantageously on rollers, to receive the articles 20 from the forks 4 and convey the articles 20 to the upstream end of the edge bander for a repeat of the operation. It is seen that the apparatus 1 can allow one operator at the edge bander to perform on the articles 20 without further assistance. The height of the conveyor is slightly below the top of the rollers 2. The supplementary conveyor is considered an accessory to the apparatus 1 and therefore is an inessential feature.

Referring now to figures 4 and 5, a preferred apparatus for operating the lifting forks 4 in accordance with an aspect of the invention, is illustrated.

The lifting forks 4 are designed to function while the rollers 2 freely rotate. A suitable clearance from a lifting bed 35 in the form of scalloped grooves 36 is provided. The lifting bed 35 is raised by a lifter 37 in the form of a pneumatic cylinder centrally placed under the lifting bed 35. Guides 38 are positioned at suitable points under the lifting bed 35 to guide the operation of the lifting forks 4 and associated carriage arrangement.

The forks 4 are preferably bolted to vertical members 39. Vertical members 39 are desirably welded to a base member 40. The base member 40 is attached to rollers 41. The rollers 41 run along grooves 42 in the blocks 43 to move the carriage and lifting forks 4 forwards and rearwards. The mechanism by which the carriage is moved is desirably by way of a drive chain arrangement including a link means 44 to a chain 45 and pulleys 46. The pulleys 46 are associated with a motor 47 that is designed to rotate in opposite directions to drive the chain arrangement as required. The lifter 37 and the motor 47 are associated with the control means 5 by suitable connecting means such

that the control means 5 operates the lifter 37 and motor 47 at appropriate moments during operation of the apparatus 1.

A pusher 48 (as seen in figure 4) is located at the rear of the forks 4 to prevent an article 20 being lifted by the forks 4 from sliding rearwards. The top surface of the pusher 48 is below the top of the rollers 2 when the forks 4 are in a static state.

In one example of the operation according to an aspect of the invention is described with reference to all the figures. The apparatus 1 is set up at the downstream end of the conveyor 23 of a machine, such as an edge bander, for preparing or operating on wooden boards as articles. The articles 20 are subsequently conveyed toward the apparatus 1.

The speed of an article 20 being conveyed by conveyor 23 toward the apparatus 1 is determined by the sensors 24, 10 in turn detecting the presence of the article 20 and sending signals to the control means 5. The control means 5 will determine the speed of the article 20 being infeed at the upstream end of the rollers 2 and make any adjustment to the rotational speed of the rollers 2 as required. Additionally once the article 20 triggers sensor 10 a counting register commences counting at a predetermined rate. When the article 20 is conveyed along and triggers sensor 11 a second register commences counting at a rate double that of the first register. When the control means determines that the value of the second register exceeds the value of the first register the control means 5 will conclude that the article 20 is substantially centrally placed and operate the lifter 37 to lift the article 20. The control means 5 then operates the motor 47 to drive the carriage and forks forward such that the article 20 is transferred to above the stacking arms 7 and placed thereon. The motor 47 is then reversed and the carriage and forks retract back to the start position and the lifter 37 lowers and the forks 4 are lowered below the top of the rollers 2 to await the next article 20.

The sensor 13 will sense the presence of the article 20 on the stack and signal to the control means 5. The control means 5 upon receiving the signal from the sensor 13 that

an article has been stacked on the stacking arms 7 and will operate the lifter 33 to cause the stacking arms 7 to be lowered until the sensor 13 no longer detects the presence of the top article on the stack. When that occurs the lifter 33 will halt until the sensor 13 further detects the presence of the next article to be stacked, in which case the lifter 33  
5 will operate again to lower the stacking arms 7 further.

In another example the apparatus 1 can be used to stack articles 20 side by side on the stacking arms 7. In this respect the sensors 10 serves a second function of providing a second signal to the control means 5 to cause the rollers 2 to be stopped and restarted  
10 as required. In operation, when sensor 10 detects a first article and provides a signal to the control means 5, the roller 2 continue rotating until the sensor 10 no longer detects the presence of the first article in its viewing range as the trailing edge of the article 20 just passes the sensor 10. When that occurs the control means 5 will cause the rollers 2 to stop. The rollers 2 remain stationary until the leading edge of the second article is  
15 detected by the sensor 10. At this moment the control means 5 determines that the first article and the second article are side by side and the rollers 2 are restarted to convey both articles along toward the lifting forks 4 as if they are a single article.

It will be appreciated that once the stacking arms 7 reach the lowered level due to a full  
20 stack of articles 20, the apparatus 1 can cease operating until the stack of articles 20 is removed by a forklift or other such stack moving device (not shown). Once the stack of articles 20 is removed the stacking arms 7 are reset to the highest level being slightly lower than the top of the rollers 2 in anticipation of the next group of articles 20 being conveyed to be stacked.

25

Referring now more particularly to figure 6, the control means 5 is shown as the central component in a control system in accordance with an aspect of the invention.

The sensors 10, 11, 13, 24 located at various points on and about the apparatus 1 to  
30 detect the presence of the article 20 at different areas of the operation and to provide a signal to the control means 5. The control means 5 processes and determines the

particular signals and triggers the particular component to perform a desirable task. For example, cause the motor 22 to increase or decrease the speed of the rollers 2, to lift or lower the ram 33, to raise or lower the cylinder 37 and operate the motor 47.

- 5 The components of the invention are made of suitable known durable and resilient materials depending on the use of the components. Metals such as mild steel are a commonly used material, alloys, plastics materials and combinations thereof.

Wherein the foregoing reference has been made to integers or components having  
10 known equivalents, then such equivalents are herein incorporated as if individually set forth. Accordingly, it will be appreciated that changes may be made to the above described embodiments of the invention without departing from the principles taught herein.

- 15 Additional advantages of the present invention will become apparent for those skilled in the art after considering the principles in particular form as discussed and illustrated. Thus, it will be understood that the invention is not limited to the particular embodiments described or illustrated, but is intended to cover all alterations or modifications which are within the scope of the appended claims.



**CLAIMS:**

1. An apparatus for handling an article being conveyed, the apparatus including a conveying means to receive a said article from the upstream end of the conveying means and conveying the said article, a lifting means to lift the said article off the conveying means, at least a first sensor located at the upstream end of the conveyor means to sense the presence of the leading edge of the said article as it moves adjacent the first sensor, a second sensor located adjacent the lifting means to sense the presence of the leading edge of the said article, a control means associated with the first sensor and the second sensor to control the operation of the lifting means such that, in use, the control means determines when the said article is substantially centrally disposed over the lifting means and triggers the lifting means to lift the said article off the conveying means.
2. An apparatus according to claim 1 wherein the conveying means is a plurality of spaced apart substantially parallel rollers.
3. An apparatus according to claim 2 wherein the lifting means are at least two spaced apart lifting forks, each said lifting fork being located between the rollers.
4. An apparatus according to claim 3 wherein the second sensor is located in a substantially central position between the lifting forks.
5. An apparatus according to claim 3 or claim 4 wherein two pairs of spaced apart lifting forks are located between adjoining spaced apart said rollers, each said pair of forks being spaced apart for easier handling of the said article.
6. An apparatus according to any one of the preceding claims further including a stacking means located to the side of the conveying means adjacent the lifting

means to enable the lifting means to relocate the said article thereupon from the conveying means.

- 5 7. An apparatus according to claim 6 wherein the stacking means are stacking arms projecting from the apparatus and being sufficiently spaced apart to cradle the said article.
- 10 8. An apparatus according to claim 7 wherein the stacking arms is provided with stack sensing means positioned slightly below the conveyor means above the stacking arms, in use, to sense the presence of the next said article being stacked and provide a signal to the control means, the control means, after receiving said signal, will cause the stacking arms to be lowered such that the top of a stack of said articles is maintained at a height of just below the conveying means.
- 15 9. A method of handling articles being conveyed comprising the steps of:
- 20 a. sensing the leading edge of a said article being received by a conveying means at the upstream end and providing a first signal to a control means;
  - b. conveying the said article at substantially the same speed along the conveying means until a second sensor sensing the leading edge of the said article and providing a second signal to a control means; and
  - 25 c. lifting the said article off the conveying means when the control means determines that the said article is substantially centrally disposed between lifting means.
- 30 10. A method according to claim 9 further comprising the step of stacking the articles on a stacking means, the stacking means then being lowered to continue to align the top surface of the last placed said article with the top of the rollers.

11. A method according to claim 9 further comprising the step of determining the speed of the article being conveyed to the upstream end of the conveying means, the steps including a third sensor positioned substantially about one article length upstream of the conveying means on an adjacent second conveying means to  
5 detect the presence of the article and provide a signal to the control means; and subsequently when the article is conveyed further downstream the first sensor will detect the presence of the article and provide a further signal to the control means, the control means then compares the two signals to determine the speed of the second conveying means and, if the control means determines that a  
10 difference in conveying speed exists, the control means will adjust the speed of the conveying means such that the speed of the conveying means substantially matches that of the second conveying means.
12. A method according to claim 9 substantially as herein described.  
15
13. An apparatus substantially as herein described with reference to any one of the accompanying drawings.
- 20

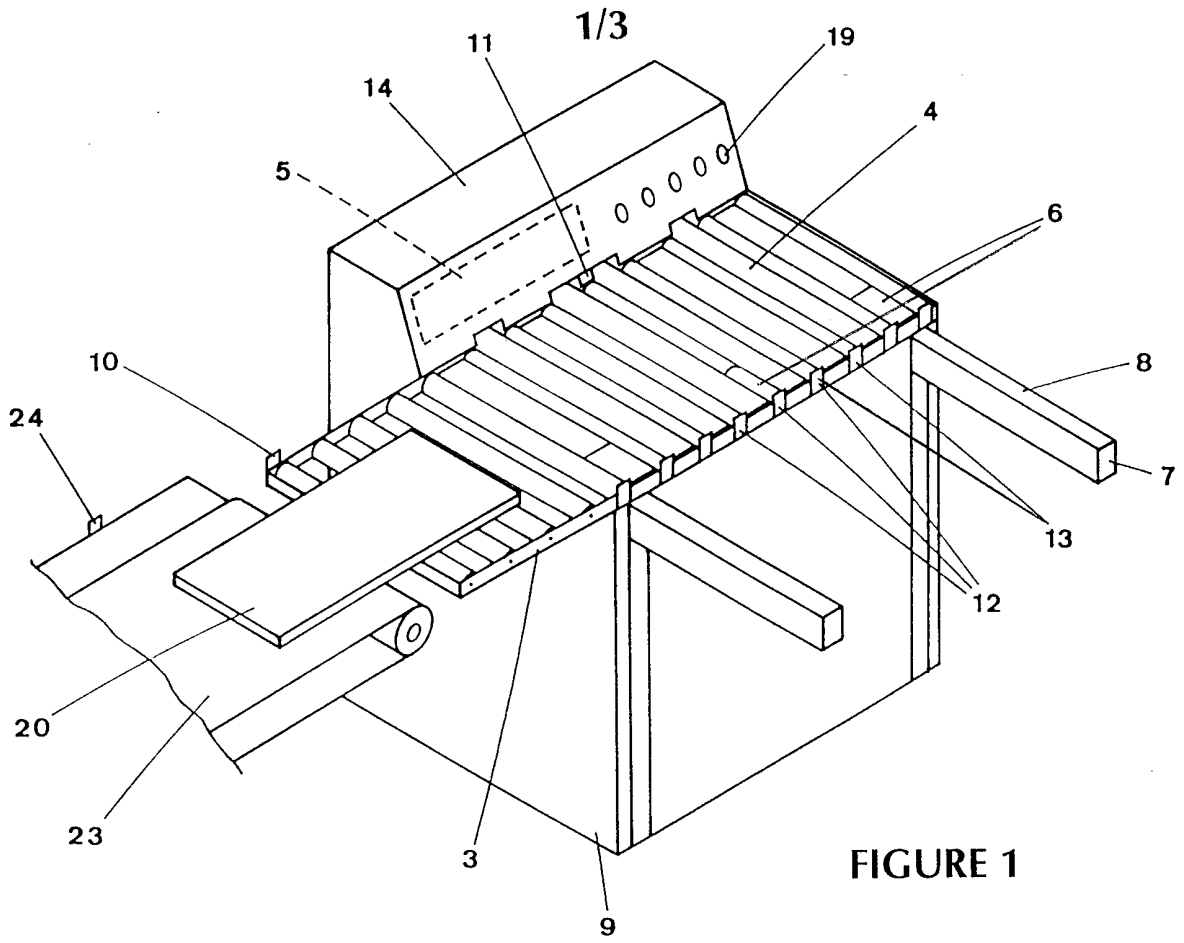


FIGURE 1

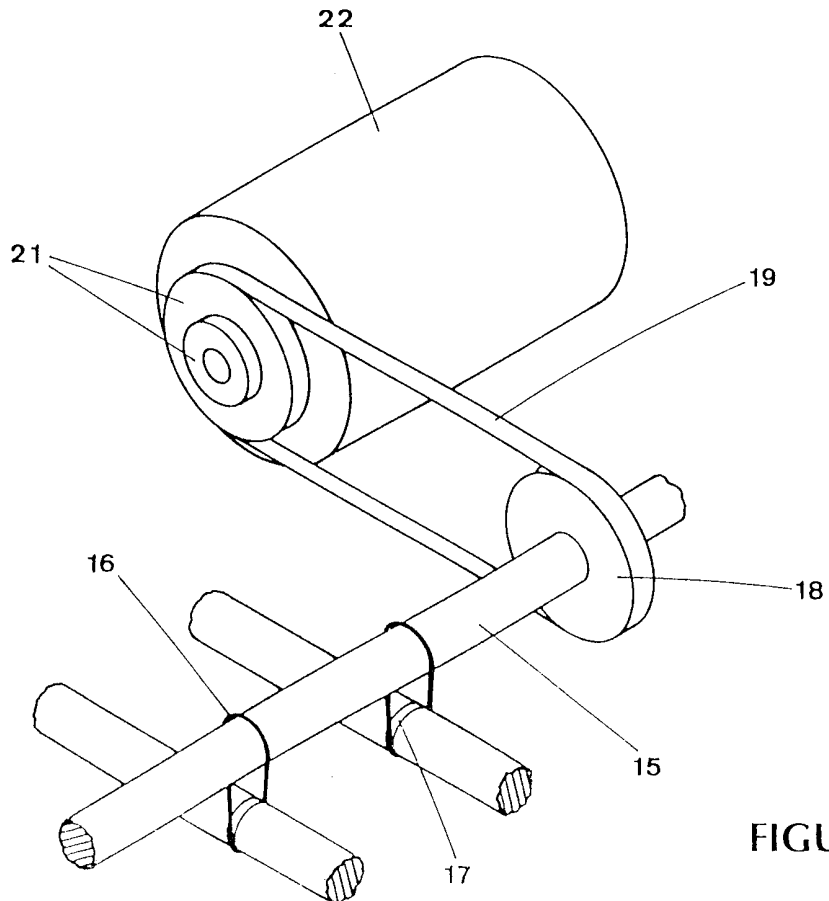


FIGURE 2

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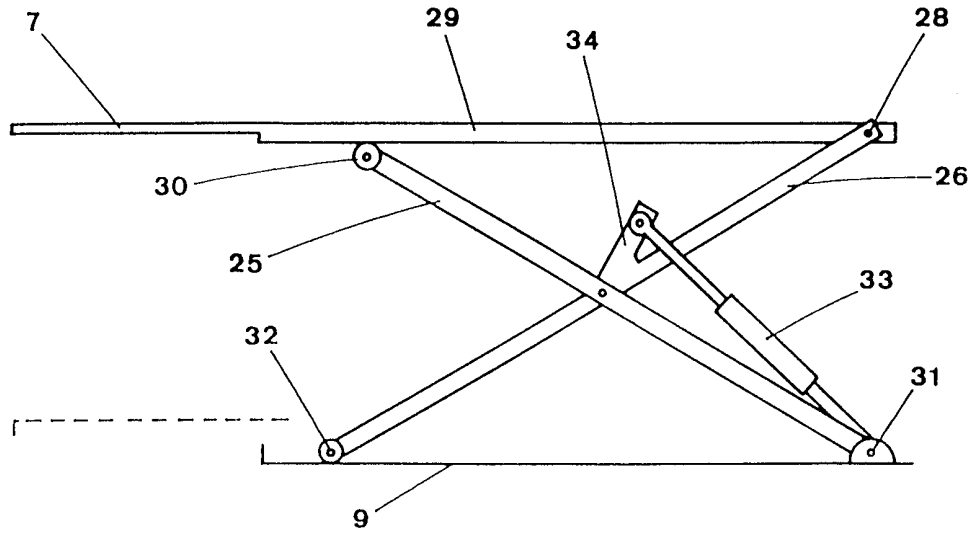


FIGURE 3

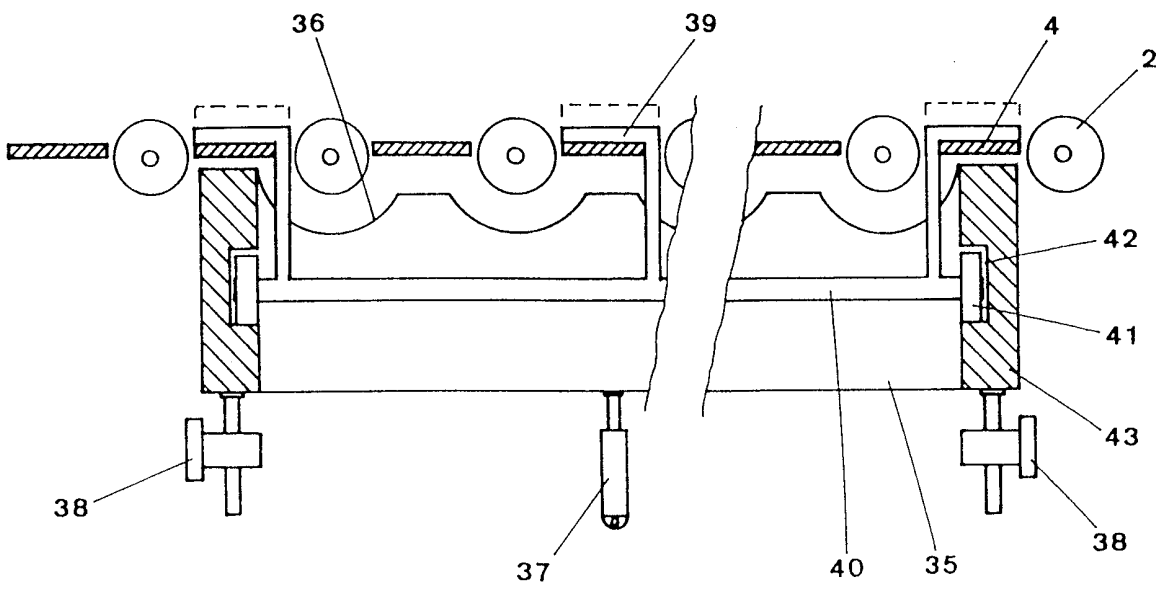


FIGURE 4

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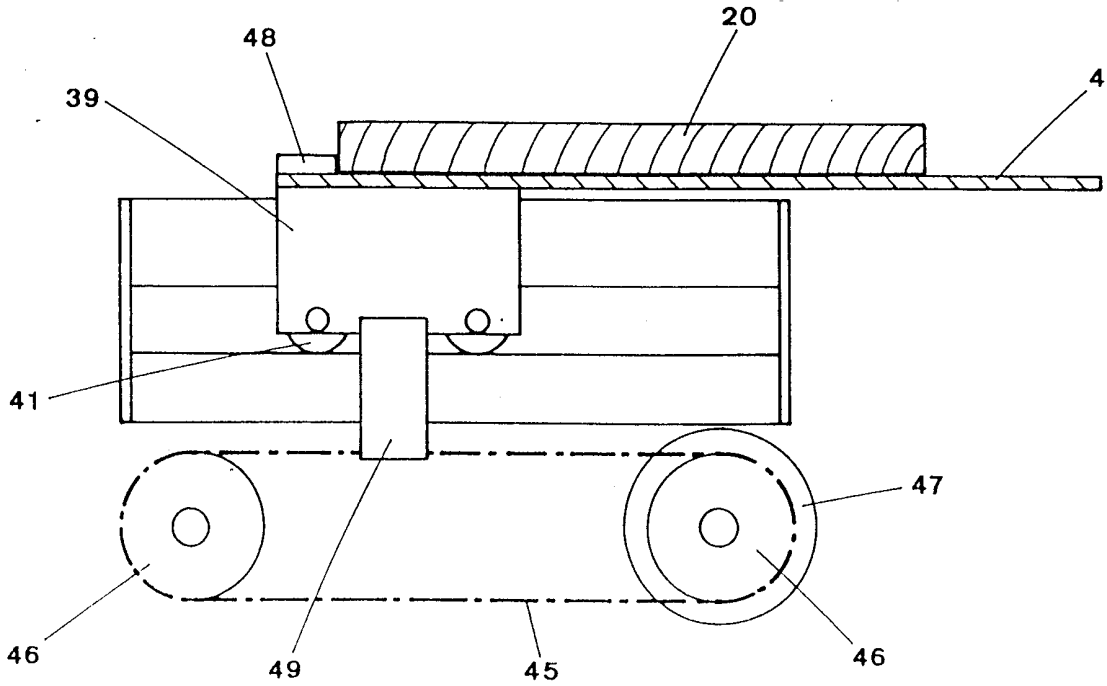


FIGURE 5

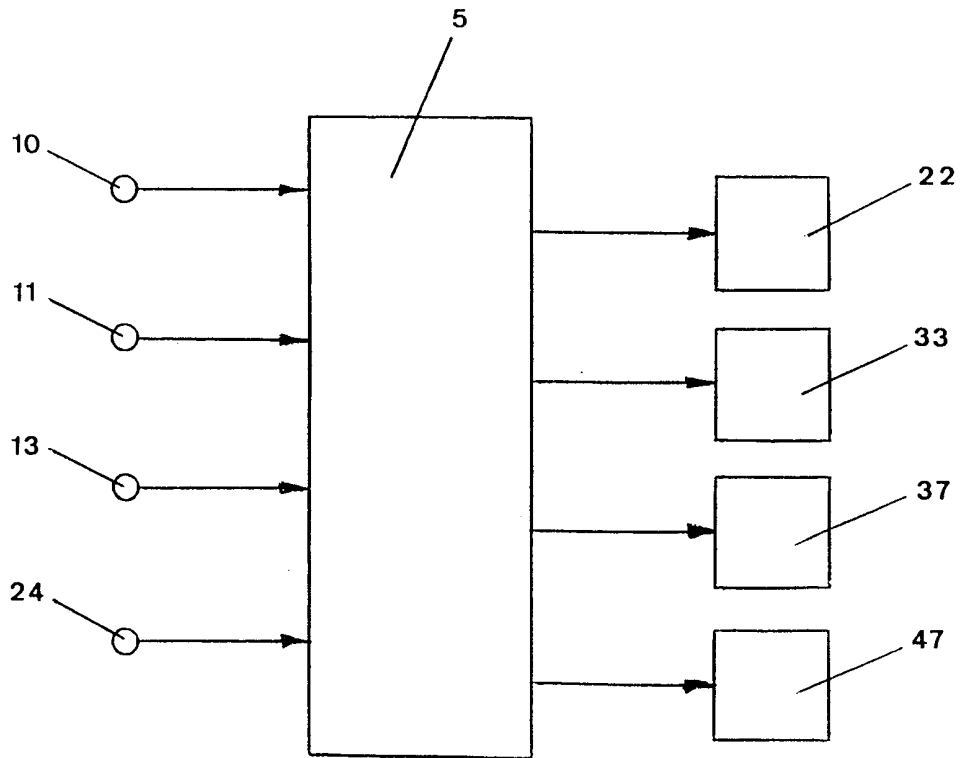


FIGURE 6

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ 99/00101

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int Cl <sup>6</sup> : B65G 43/08, 47/22, 57/10, G05D 3/20, G01B 21/06		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) B65G 43/00, 43/08, 47/, 57/, 65/, 69/00, G01B 5/04, 7/04, 11/04, 13/04, 21/06, G05D 3/-		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPAT: IPC AS ABOVE AND KEYWORDS. WPAT: KEYWORDS		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 3538209 C (SCHIEPE STAPELAUTOMATEN GmbH) 7 May 1987 Whole document	1-10
X	Derwent Abstract Accession No. 84-293509/47, Class Q35, SU 1082713 A (VENDING MACH CONS R) 30 March 1984 Whole document	1,9,10
A	Derwent Abstract Accession No. 44771Y/25, Class F09 R11, SU 536272 A (KALIN CELL-PAPER IN) 28 December 1976	1,9
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 23 November 1999		Date of mailing of the international search report -7 DEC 1999
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929		Authorized officer  <b>SIMON OCHSENBEIN</b> Telephone No.: (02) 6283 2781

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
**PCT/NZ 99/00101**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
DE	3538209	DK	5067/86	JP	62175323

END OF ANNEX