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DEPOSITING A STACK OF FLEXIBLE ARTICLES

Field of the invention

This invention relates generally to the handling of flexible articles in stacks, and is of particular utility in the packaging of flexible articles for subsequent
5 individual withdrawal. Such articles include, for example, elastomeric gloves.

Background art

A known arrangement for packaging stacks of elastomeric gloves is to place the stack within a box, through a temporarily open end of the box, between a pair of vertically spaced plates that grip the stack between them. One plate may
10 be a U-shaped tray. The plates compress the stack between them, and the stack may be inserted in the open box, or vice versa.

Once insertion is completed, the top and bottom plates are withdrawn in turn, parallel to the top or bottom of the stack respectively, while a lateral stationary plate acts as a stop to maintain the stack in the box. The top and
15 bottom plates may be separated slightly vertically before withdrawal.

For gloves made in high friction materials, which offer user benefits, this approach can lead to rolling of the surfaces exposed to the plates or trays. This results in an unsightly appearance when the pack is opened, typically by tearing away of a finger extraction window, and also makes removal of a single glove
20 difficult.

Figure 1 schematically illustrates an example of conventional glove packaging apparatus, depicting the effect on the top gloves 5a of the stack 6' of withdrawal of the top plate 14'. The bottom plate is indicated at 16'. The top gloves, restrained by side plate 42', are partially rolled back on themselves by
25 plate 14'. The result, on opening the box 20' for use by pressing out tab 24' with score lines 23', is an unsightly appearance and difficulty in removing the top few

gloves through the opening left by tab 24'.

It is an object of the invention to at least in part alleviate this problem.

Summary of the invention

The invention provides an apparatus for depositing a stack of flexible
5 articles, which includes stack deposit means for contacting the stack and placing it
with respect to a reference point, which means includes at least one surface
means for contacting the top or bottom of the stack, and means to withdraw the at
least one surface means in a direction substantially parallel to the top or bottom of
the stack, respectively. The at least one surface means is arranged so that any
10 surface thereof in contact with the top or bottom of the stack, respectively, moves
at a relative speed along the top or bottom of the stack sufficiently less than the
speed of withdrawal of the surface means to substantially prevent rolling of the
articles of the stack during withdrawal.

The aforementioned relative speed along the top or bottom of the stack is
15 preferably zero.

The at least one surface means may include belt means defining the
surface in contact with the top or bottom of the stack. In one embodiment, the belt
means is a continuous belt driven by frictional contact with the stack, so that the
aforesaid surface moves oppositely to the direction of withdrawal of the surface
20 means. Alternatively, separate means may be provided to so drive the continuous
belt.

In another embodiment, the belt means is a belt extending between two
mounting positions, arranged to roll away from the top or bottom of the stack as
the at least one surface means is withdrawn. Roller means may be included to
25 facilitate the rolling away of the belt.

Advantageously, the arrangement is such that, during operation, there is no
slip between the stack and the belt, whereby said relative speed along the top or

bottom of the stack is substantially zero.

Typically, the stack deposit means includes further surface means for contacting the bottom or top of the stack, respectively. The characterising features of the invention may alternatively or additionally be incorporated in this further
5 surface means.

Preferably, the stack deposit means is arranged for placing the stack into a box from which the articles of the stack may be withdrawn individually by subsequent users.

The stack deposit means preferably, and indeed usually, includes lateral
10 stop means for restraining the stack during withdrawal of the surface means. This lateral stop means can also be used to reposition the stack between the surfaces.

In an advantageous application of the invention, the flexible articles are highly flexible thin articles such as gloves, especially elastomeric gloves.

Brief description of the drawings

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

Figure 1 is a cross-sectional schematic view of conventional glove packaging apparatus, depicting withdrawal of the top plate through an open end of a box in which the glove stack has been earlier placed;

20 Figure 2 is a cross-sectional schematic view of glove packaging apparatus according to an embodiment of the invention, shown immediately after insertion of a stack of elastomeric gloves through an open end of a box;

Figure 3 is a top plan view of the box;

Figure 4 is a view similar to Figure 1 showing the apparatus during
25 withdrawal of the top plate; and

Figures 5 and 6 are partial views similar to Figures 2 and 4 of glove packaging apparatus according to an alternative embodiment of the invention.

Preferred embodiments

The glove packaging apparatus 10 illustrated in Figures 2 to 4 is conventional to the extent that it includes stack deposit means 12 in the form of a pair of top and bottom plates 14, 16 adapted to squeeze a stack 6 of thin elastomeric gloves 5 between them. The plates 14, 16 are driven forwardly in synchronism by suitable fluid powered actuators or linear motors (eg. 15 in Figure 4), to insert the stack through the open end 21 of a pre-positioned box 20 and thereby place the stack in the box. The box is of a type having, in its top panel 22, a central tab 24 defined by score lines 23 (Figure 3). This tab is able to be readily pressed out by a subsequent user to provide an opening through which gloves may be individually extracted with the fingers.

In the drawings, the thickness of the gloves 5 is exaggerated for purposes of illustration. The stack may typically contain 100 or so gloves of 0.15 mm thick material in a stack of total depth 75 mm.

To substantially prevent rolling of the top few gloves in the stack during withdrawal of top plate 14, the glove contact surface of plate 14 is not the plate itself but the lower run 31 of a continuous belt 30 mounted about rollers 32, 33 at the front and rear of plate 14 so that the belt 30 extends about and embraces the plate. Rollers 32, 33 are idlers and the belt 30 is driven, on withdrawal of plate 14, by frictional contact with the top glove of the stack. A suitable material for belt 30 is a flexible synthetic conveyor belting.

Once insertion of a stack is completed, an automatic control sequence program in a controller (not shown) reverses the actuator 15 for top plate 14 into withdrawal mode. The plate 14 is now withdrawn through box opening 21, in a direction (Figure 4, arrow 40) parallel to the top of stack 6. A stationary side plate 42 acts as a stop to restrain the stack 6 during withdrawal of plate 14, and to thereby maintain the stack in position in box 20. This lateral stop can also be used

to reposition the stack between the surfaces. The frictional contact between drive belt run 31 and the top glove of the stack is effective to drive belt 30, ie glove contact surface 31, to move in the direction opposite to direction 40. In this way, surface 31 moves at a speed, relative to the stack, along the top of the stack, 5 sufficiently less than the speed of withdrawal of plate 14 and belt 30 to substantially prevent rolling of the top gloves of the stack. Ideally, this relative speed is zero, ie there is no slip between the top glove and the belt surface, but an exact such counterbalance of the retraction of top plate 14 may not strictly be necessary to substantially prevent glove rolling.

10 Optionally, prior to withdrawal of plate 14, it may be lifted slightly away from plate 16, but to an extent severely constricted by the presence of the box. In another alternative, a motor 34 may be provided to positively drive belt 30. The packaging process is completed by driven withdrawal of bottom plate 16, and then by folding over box flaps 25 to close the end of the box. Since some rolling of the 15 bottom gloves is not as great a problem as rolling of the top gloves, bottom plate 16 does not have a driveable contact belt, but it is of course an option to include a belt similar to belt 30.

In a further possible variation, plates 14, 16 may be withdrawn simultaneously.

20 Figures 5 and 6 depict an alternative embodiment in which like parts are indicated by like reference numerals preceded by a 1. Here, the bottom plate 116 is the actively withdrawn plate, and there is provided a belt 130 which extends about and embraces plate 116. However, in this case, belt 130 is not continuous but is fixed at one end to side plate 142 and at the other to remote tensioning 25 means 150 below and fixed to the plate or to a stationary part of the machine. An idler roller 132 (or other guide element) guides the belt at the inner edge of plate 116. As plate 116 is withdrawn (Figure 6), belt 130 remains relatively stationary in a direction along the bottom of the glove stack 6 but rolls away from the stack bottom about roller 132 as the remote end of the belt travels with the plate.

The surfaces of plate 14 or 116 may be coated with low friction material such as PTFE to prevent any gripping of the belt that might prevent the desired motion of the belt. One or both of plates 14, 16, 114, 116 may be U-shaped in cross-section, in which case plates 16, 116 may be viewed as trays.

- 5 It will of course be understood that plate 14 or 116 need not be a plate as such but may be any suitable structure, eg an open frame structure, to support belt 30 or 130 with adequate rigidity. This structure should be adequate to back the belt during the glove insertion phase, when the stack is pressed to hold and stabilise the component gloves.

10

Claims

1. Apparatus for depositing a stack of flexible articles, including:

stack deposit means for contacting said stack and placing it with respect to a reference point, which means includes at least one surface means for contacting
5 the top or bottom of the stack; and

means to withdraw said at least one surface means in a direction substantially parallel to the top or bottom of the stack, respectively;

characterised in that said at least one surface means is arranged so that any surface thereof in contact with the top or bottom of the stack, respectively,
10 moves at a relative speed along the top or bottom of the stack sufficiently less than the speed of said withdrawal of the surface means to substantially prevent rolling of the articles of said stack during said withdrawal.

2. Apparatus according to claim 1, wherein said relative speed along the top or bottom of the stack is substantially zero.

15 3. Apparatus according to claim 1 or 2, wherein said at least one surface means includes belt means defining said surface in contact with the top or bottom of the stack.

4. Apparatus according to claim 3 wherein said belt means is a continuous belt driven by frictional contact with the stack, so that said surface
20 moves oppositely to said direction of withdrawal of the surface means.

5. Apparatus according to claim 3, wherein the belt means is a continuous belt and means is provided to drive the continuous belt means so that said surface moves oppositely to said direction of withdrawal of the surface means.

25 6. Apparatus according to claim 3, wherein said belt means is a belt

extending between two mounting positions, arranged to roll away from said top or bottom of the stack as the at least one surface means is withdrawn.

7. Apparatus according to claim 6, further including roller means to facilitate said rolling away of the belt.

5 8. Apparatus according to any one of claims 4 to 7, wherein said at least one surface means further includes plate or frame structure means, about which said belt extends.

9. Apparatus according to any one of claims 4 to 8, wherein the arrangement is such that, during operation, there is no slip between the stack and
10 the belt, whereby said relative speed along the top or bottom of the stack is substantially zero.

10. Apparatus according to any preceding claim, wherein said stack deposit means includes further surface means for contacting the bottom or top of the stack, respectively.

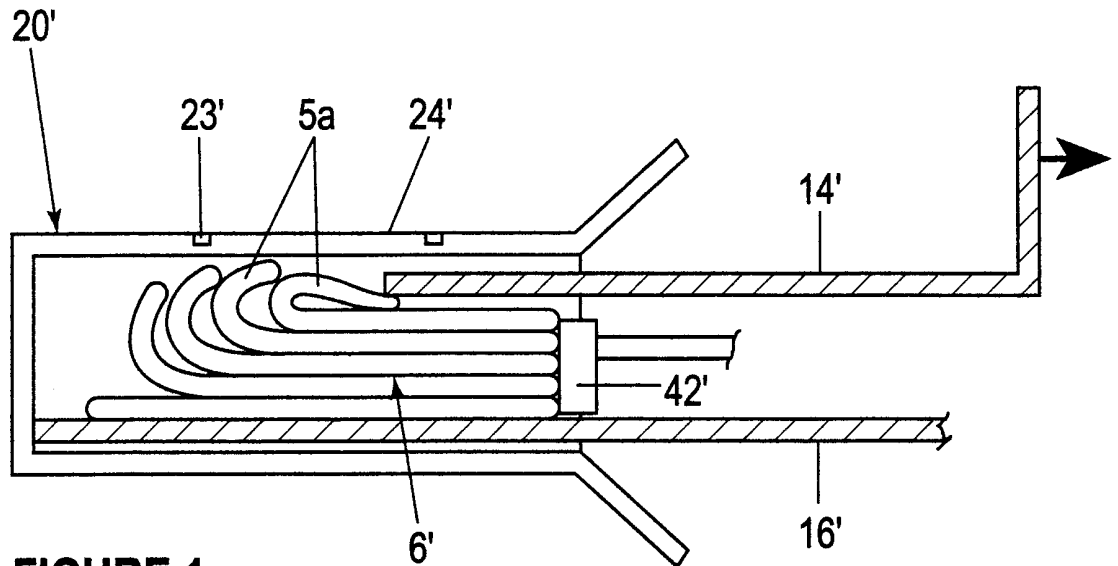
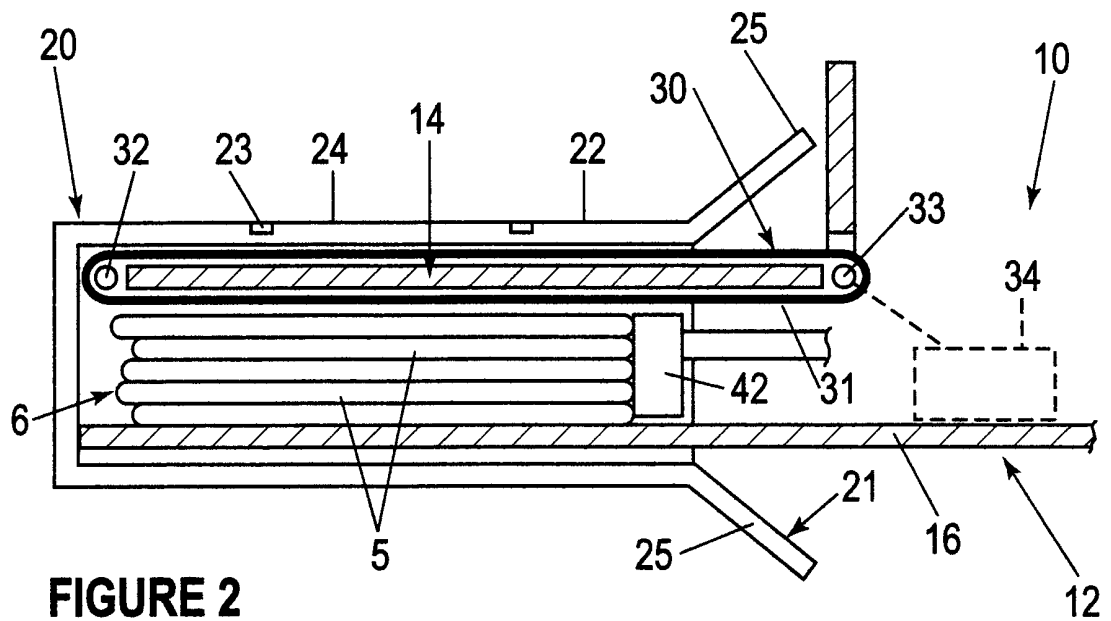
15 11. Apparatus according to any preceding claim, wherein said stack deposit means is arranged for placing said stack into a box from which the articles of the stack may be withdrawn individually by subsequent users.

12. Apparatus according to any preceding claim, wherein said stack deposit means includes lateral stop means for restraining said stack during said
20 withdrawal of the surface means.

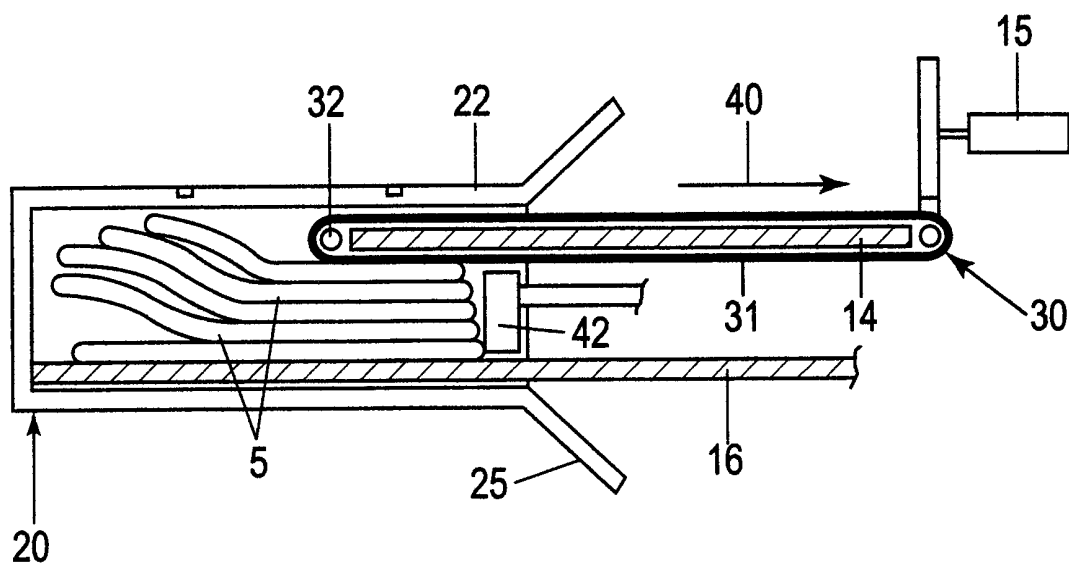
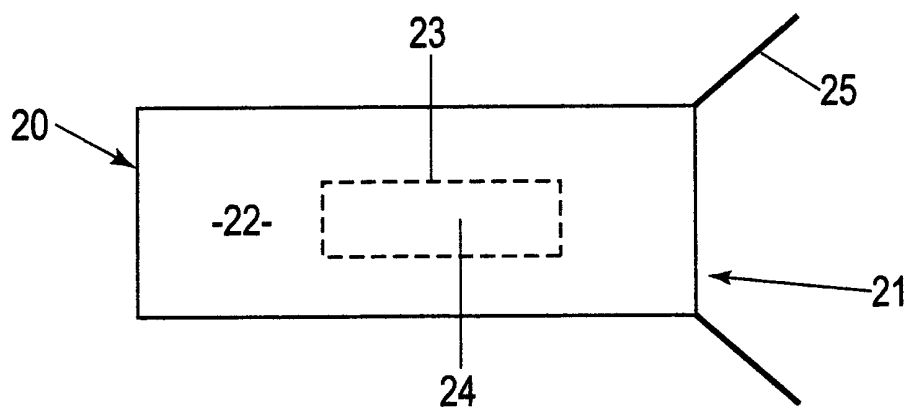
13. Apparatus according to claim 12, wherein said lateral stop means is adapted to reposition the stack relative to the surface means.

14. Apparatus according to any preceding claim, wherein said flexible articles comprise gloves.

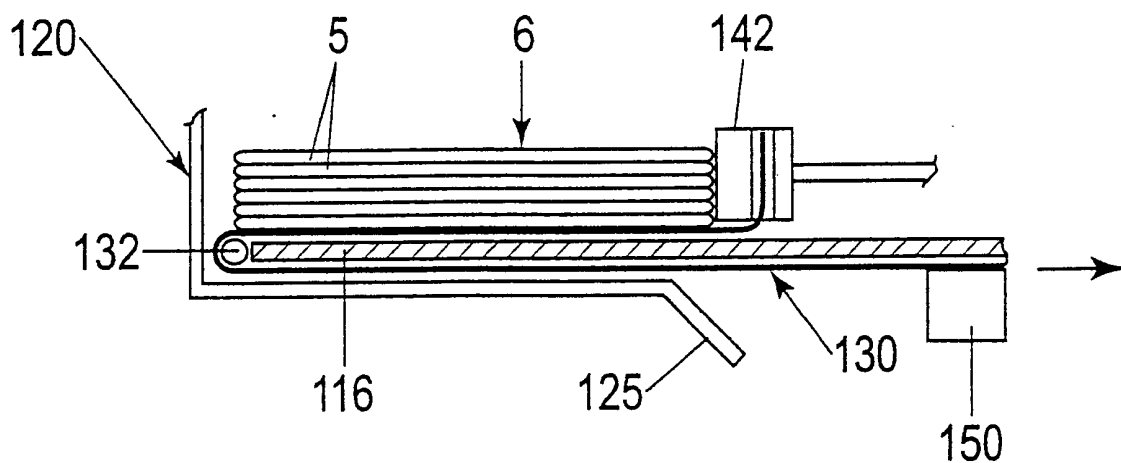
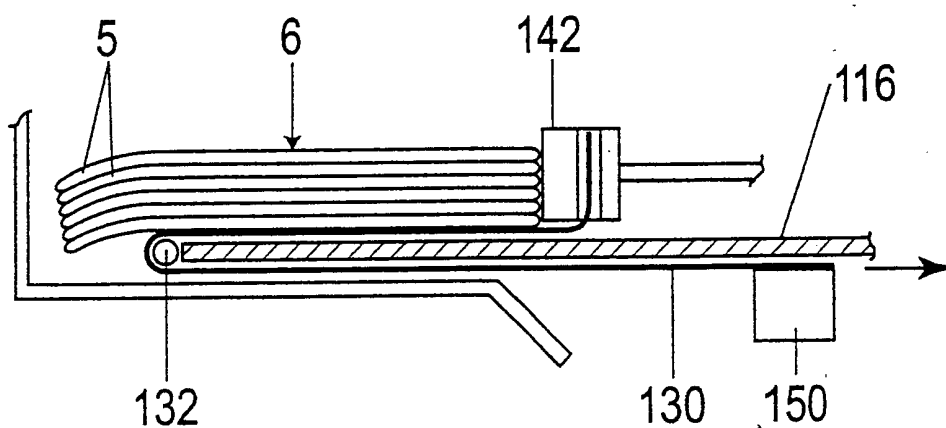
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**FIGURE 1****FIGURE 2**

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FIGURE 3**FIGURE 4**

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**FIGURE 5****FIGURE 6**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU00/01293

A. CLASSIFICATION OF SUBJECT MATTERInt. Cl. ⁷: B65B 5/06, 35/44, 63/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC (7) : B65B 5/06, 35/44, 63/02, 35/40, 39/12, 35/36, B65G 61/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

AU : IPC AS ABOVE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 5022216 A (MUCKENFUHS) 11 June 1991	1-14 1,15
Y	US 5375967 A (RATHERT) 27 December 1994	1
Y	SE 8204920 B (SIKOB) 2 April 1984	1
Y	US 5459979 A (TOMMASI) 24 October 1995	1
Y	EP 400598 A1 (OPTIMA-MASCH BUHLER) 5 December 1990	1



Further documents are listed in the continuation of Box C



See patent family annex

*** Special categories of cited documents:**

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"P" document published prior to the international filing date but later than the priority date claimed

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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

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU00/01293

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			
US	5022216	AU	52488/90	BR	9001574	CA	2012845
		CN	1046136	EP	391460	HK	974/96
		JP	3000669	NZ	233182	PH	26888
		PT	93651	TR	24246	US	4934535
US	5375967	DE	4142162	EP	548519	JP	5238549
SE	8204920	NONE					
US	5459979	EP	599787	IT	1259707		
EP	400598	DE	3917810	JP	3085232		
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