

**(12) PATENT**  
**(19) AUSTRALIAN PATENT OFFICE**

**(11)** Application No. **AU 199951645 B2**  
**(10)** Patent No. **762166**

(54) Title  
Method and device for interlocking stackwise plastic bags,  
especially bags for automatic machines, by welding

(51)<sup>6</sup> International Patent Classification(s)  
B31B 019/98

(21) Application No: 199951645 (22) Application Date: 1999 . 07 . 28

(87) WIPO No: WO00/12299

(30) Priority Data

(31) Number	(32) Date	(33) Country
19839155	1998 . 08 . 28	DE

(43) Publication Date : 2000 . 03 . 21  
(43) Publication Journal Date : 2000 . 05 . 11  
(44) Accepted Journal Date : 2003 . 06 . 19

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(56) Related Art  
US 4670083  
US 3917505  
EP 384281



51645/99

PCT

WELTORGANISATION FÜR GEISTIGES EIGENTUM  
Internationales BüroINTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE  
INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

(51) Internationale Patentklassifikation <sup>7</sup> : <b>B31B 19/98</b>	<b>A1</b>	(11) Internationale Veröffentlichungsnummer: <b>WO 00/12299</b>  (43) Internationales Veröffentlichungsdatum: 9. März 2000 (09.03.00)
(21) Internationales Aktenzeichen: PCT/EP99/05398 (22) Internationales Anmeldedatum: 28. Juli 1999 (28.07.99)  (30) Prioritätsdaten: 198 39 155.2 28. August 1998 (28.08.98) DE <del>66/126,310 26. März 1999 (26.03.99) US</del>  (71) Anmelder (für alle Bestimmungsstaaten ausser US): LEMO MASCHINENBAU GMBH [DE/DE]; Rheidter Strasse 52, D-53859 Niederkassel (DE).  (72) Erfinder; und (75) Erfinder/Anmelder (nur für US): SCHULZE, Peter [DE/DE]; Chopinstrasse 1, D-40670 Meerbusch (DE).  (74) Anwalt: PFEIFFER, Helmut; Rheinmetall Aktiengesellschaft, Zentrale Patentabteilung, Rheinmetall Allee 1, D-40476 Düsseldorf (DE).		(81) Bestimmungsstaaten: AU, CA, JP, US, europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  Veröffentlicht Mit internationalem Recherchenbericht.
(54) Title: METHOD AND DEVICE FOR INTERLOCKING STACKWISE PLASTIC BAGS, ESPECIALLY BAGS FOR AUTOMATIC MACHINES, BY WELDING  (54) Bezeichnung: VERFAHREN UND VORRICHTUNG ZUM STAPELWEISE VERBLOCKEN VON KUNSTSTOFFBEUTELN, INSBESONDERE AUTOMATENBEUTELN DURCH VERSCHWEISSEN		
(57) Abstract  The invention relates to a method and a device for interlocking stackwise plastic bags, especially bags for automatic machines, by welding, wherein welding is effected by an interlocking device (21) integrated into the grip hand (17) of a robot (16) with the purpose of simplifying welding.  (57) Zusammenfassung  Die Erfindung bezieht sich auf ein Verfahren und eine Vorrichtung zum stapelweisen Verblocken von Kunststoffbeuteln, insbesondere Automatenbeuteln durch Verschweißen, wobei das Verschweißen aus Vereinfachungsgründen durch eine in einer Greifhand (17) eines Roboters (16) integrierte Verblockungseinrichtung (21) erfolgt.		

## METHOD AND DEVICE FOR THE STACKWISE BLOCKING OF PLASTIC BAGS, ESPECIALLY BAGS FOR AUTOMATIC MACHINES, BY WELDING

### Technical Field

The invention initially relates to a method for the stackwise blocking of plastic bags, in particular bags for automatic machines, by welding.

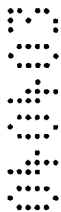
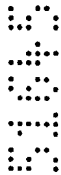
A known method applied regarding plastic bags of the type discussed, in particular of automatic machine bags, is to provide bags during their manufacture with suspension openings or stack openings and to deposit these bags immediately following their manufacture onto stack pins of a pin stack chain in packs in order to thus form a stack of bags. After a sufficient number of bags has been stacked on each stack pair, the respective pin stack pair is moved along to allow new bag stacks to be formed on the successive stack pin pair of the continuously driven pin stack chain. In order to ensure that the individual plastic bags are held together, a blocking/interlocking process is executed directly on the pin stack chain. Blocking requires an elaborate blocking/interlocking station. Such a station is not only expensive but takes up a lot of space so that the pin stack chain is relatively long. Bag stacks of the type discussed here are for instance disclosed in the German registered design 74 29 628. For the blocking of the bag stacks, so-called heat bulbs or glow plugs are used which, after having been heated to a high temperature, are forced through the bag stack. At the point where the plugs are forced through, a punch hole can be made in advance, if required. The blocking of the plastic bag in the bag stack is performed immediately following the actual stacking process, that is within the region of the pin stack transfer device. At the end of the pin stack transfer device the blocked bag stack is withdrawn by an operator, is again checked within the scope of a quality control and finally transferred and transported off.

As far as bag stacks are concerned which are not blocked by welding but are bound and contained by application of a wire support with additional securing plates or rubber stoppers, a method which requires elaborate measures to be undertaken in order to form a bag stack, a method has become known involving the replacement of manual handling by application of a robot, as is for instance described and illustrated in EP 0 384 281 A1.

### Description of the Invention

In accordance with the invention, there is provided a method for transporting stacked plastic bags from a discharge point associated with a stack forming station to a delivery station using a robotic arm, including grasping a stack of plastic bags with a gripper of a  
5 robot arm and interlocking the bags with an interlocking device which is carried by the arm and interacts with the gripper.

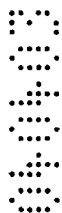
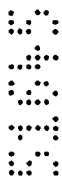
In another aspect, there is provided a robot device for transporting stacked plastic bags, including a gripper having an integrated interlocking device and clamping device comprising upper and lower clamping means, wherein the interlocking device has a heat  
10 source, for heat welding the bags together, arranged such that the device is adapted to grip a stack of bags and interlock the bags during transportation to a delivery station.



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### Brief Description of the Invention

Preferred embodiment examples of the invention are shown in the drawing and are explained in greater detail below. Shown are in:



- Figure 1 a side view of a plastic bag making machine with a pin stack transfer device and downstream therefrom a robot with a gripper hand comprising an integrated blocking device.
- 5 Figure 2 a top view of the machine shown in Figure 1,
- Figure 3 a perspective view of a single plastic bag,
- Figure 4 a respective view of a blocked bag stack consisting of a plurality of plastic bags,
- Figure 5 a front view of a gripper hand of the robot with integrated blocking
- 10 device,
- Figure 6 the respective side view,
- Figure 7 a top view of the multifunction hand

15 Implementation of the invention

Figure 1 shows a schematic view of a bag making machine 1 which is designed and equipped to produce plastic bags 2 (Figure 3), in particular so-called automatic machine bags. Each plastic bag 2 has within the region of a filling opening 7 tab 8 projecting on

20 one side, into which two suspension holes 9 are punched, to which tear-off perforation slots 12 are assigned at a small distance in the direction of the outer edge 11 of the tab 8.

The above described plastic bags are made of a thermoplastic foil web, which is wound off a take-off reel on a take-off stand not shown in the drawing and can be made into a

25 tubular film web. Within the bag making machine 1, the tubular film web is led via drive rollers and tensioning rollers not shown. By means of a hole punching device and a transverse weld severing station the plastic bags 2 can be manufactured in the manner described in greater detail below. The transverse weld severing station is followed by a transfer device 3, which is finally followed by a pin stack transfer device 4 with a step-

30 wise continuous pin stack chain 5.

At the pin stack chain 5 there are stack pins 10 arranged in pairs mounted in upright position, on which behind the transfer device 3 a bag stack each can be formed in the known manner and shown as reference 6 in Figs 1 and 4. On the pin stack transfer chain

- the plastic bags are merely held by stack pins 10. For the further handling, in particular the transfer of the bag stacks 6, the back stacks 6 must be blocked, for instance in the manner shown in Fig. 4. In corner regions 14, separated by perforation lines 13 in the marginal region 8, blocking points 15 are inserted in a manner described in more detail below via which blocking points 15 all the plastic bags 2 in the stack are blocked. Bag stacks thus blocked can be received and withdrawn with the aid of gripper hand 17 of a robot 16 and corresponding to a preset control can be delivered into a cassette station 18 of an unloading station 20.
- Robot 16 or rather the gripper hand has multiple functions. For instance by means of the robot not only can the bag stack 6 be withdrawn from the pin stack transfer device 4 and delivered into the unloading station, but at the same time the gripper hand 17 is equipped with an integrated blocking device 21, which is detailed in Figures 5 to 7. The gripper hand 17 is carried by a cylinder piston unit 22 which is pivoted at 23 at an arm of robot 16. The cylinder piston unit 22 is supported on an elbow 24 at which an essentially trapezoidal support plate 25 is fastened. The support plate 39 which preferably consists of fluted aluminium sheeting has at its front face two work guides 26 arranged at a distance from one another, in which there is a cross bar 28 axially slideably supported via a guide element 27. The cross bar 28 in cross section has a multiple T-groove profile. In the individual profile grooves there is on the one hand the guide element 27, on the other hand a piston 29 of the cylinder piston unit 22, furthermore at the front face one or two L-shaped clamping strips 31 and on the underside angular receiving pins 32, the distance between which corresponds to the distance of the suspension holes 9 in the plastic bags 2.
- In interaction with the upper clamping strip 31 there is a lower clamping strip 33 mounted at the lower end of the support plate 25. Both clamping strips can be fitted with an elastic layer 34, 35. In the embodiment example the upper clamping strip 31 is formed by two strip segments arranged at a distance from one another.
- The above mentioned blocking device 21 has a heat source in the form of two glow plugs 36 arranged at a distance from each other; Fig. 5 shows only the glow plug disposed on the left side. The right hand side glow plug with its drive is identical to the left hand plug and has therefore not been illustrated. Glow plugs or heat bulbs of the
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type shown are known per se. In each case a cylinder piston unit 37 in the form of an air cylinder is provided for the axial adjustment of the glow plug 36. The cylinder piston unit is adjustably fastened via a holder 38 at the cross profile 28. The upper clamping strip 31 has a through opening 39 each for the penetration of the glow plug 38. The  
5 distance of the two glow plugs is situated outside the receiving pins 32.

The device in accordance with the invention has the following functions :

After formation of a bag stack 6 in the pin stack transfer device 4 each bag stack 6  
10 arrives in the position shown in Fig. 1. In this position the bag stack, which has not yet been blocked, is clamped and held between the clamping strips 31 and 33 of the gripper hand 17 of the robot, wherein the receiving pins 32 engage the suspension holes 9 of the plastic bags. Immediately following the gripping and clamping of the bag stack the blocking of the bag stack is executed by way of welding with the aid of the blocking  
15 device 21 integrated in the gripper hand 17 of the robot 16. For the purpose of blocking, the glow plugs 36 serving as heat source are by means of the air cylinder 37 introduced into the bag pack - to be more precise in the corner regions 14 -during the clamping of the bag stack in order to form the blocking points 15 in accordance with the bag pack as per Fig. 4. This interlocking is either still performed in the pin stack device,  
20 advantageously, however, the transfer of the bag stack to a delivery or unloading station is performed immediately following gripping and clamping of the bag stack. Preferably the blocking is performed simultaneous with this transfer motion. After a short holding time of the glow plug in the bag stack, the glow plug is returned to a rest position to allow the blocking points to cool off. During the return travel the upper clamping strip  
25 31 serves as ejector. After blocking the bag pack can be transferred immediately to the unloading station 20 by means of the gripper hand of the robot 16, as is shown in Fig. 2.

An alternative option is to transfer the blocked bag stack 6 into an intermediate position to allow the blocking points to cool off. This can for instance be achieved in that the  
30 bag stack is taken to a control unit 41 (Fig. 2). From this control unit the bag stacks can be deposited in a carton manually or again by the robot. Finally, for cooling, the bags can be suspended on a plate carousel. Such a plate carousel is indicated in Fig. 2 and comprises return drums 42 with support plates 43 and wire supports 44 fastened thereto.

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It is apparent that by the arrangement of the robot at the end of the pin stack transfer device and its multiple functions relating to the transfer of the bag stacks as well as for their blocking, universal application of the invention is possible for a great variety of bag types. For this reason it is possible in accordance with the invention to block other  
5 bag types, such as for instance shirt carrier bags.

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The claims defining the invention are as follows:

1. Method for transporting stacked plastic bags from a discharge point associated with a stack forming station to a delivery station using a robotic arm, including grasping a stack of plastic bags with a gripper of a robot arm and interlocking the bags with an interlocking device which is carried by the arm and interacts with the gripper.
2. A method according to claim 1, wherein the interlocking of the bags is performed during the transfer of the stack by the robot to the delivery station.
3. A method according to claim 2, wherein the interlocked bag stacks are suspended by way of stack holes inserted into the bag stacks, for intermediate storage.
4. A robot device for transporting stacked plastic bags, including a gripper having an integrated interlocking device and clamping device comprising upper and lower clamping means, wherein the interlocking device has a heat source, for heat welding the bags together, arranged such that the device is adapted to grip a stack of bags and interlock the bags during transportation to a delivery station.
5. A device according to claim 4, wherein the interlocking device is fastened in a torsion-resistant manner at a support plate of the gripper.
6. Method for transporting stacked plastic bags, substantially as hereinbefore described with reference to the drawings.
7. A device for transporting stacked plastic bags, substantially as hereinbefore described with reference to the drawings.

DATED this 4th day of April, 2003

**LEMO MASCHINENBAU GMBH**

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Fig.1

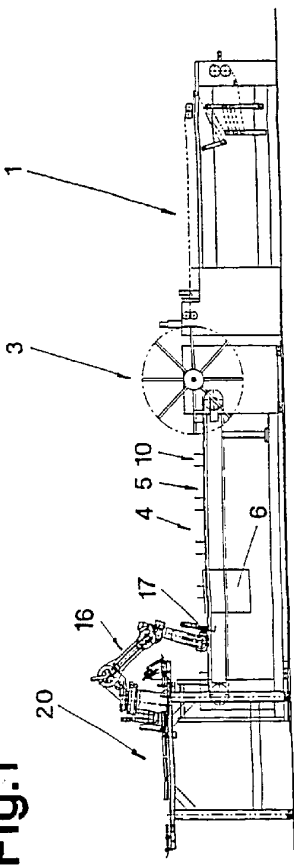
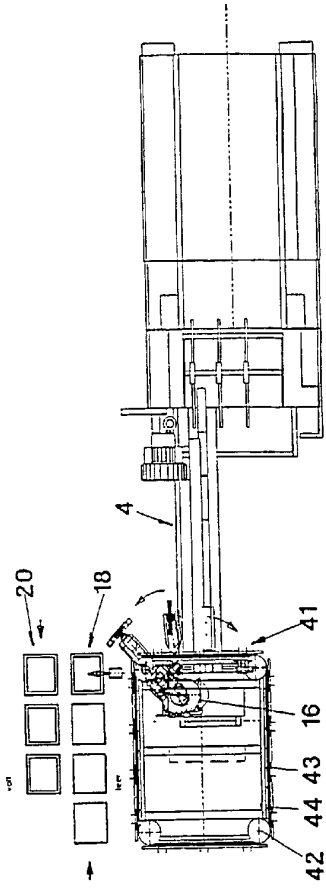


Fig.2



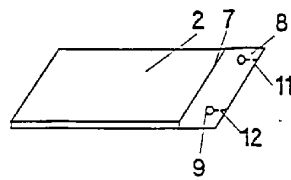


Fig.3

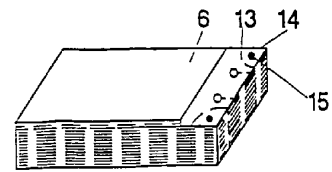


Fig.4

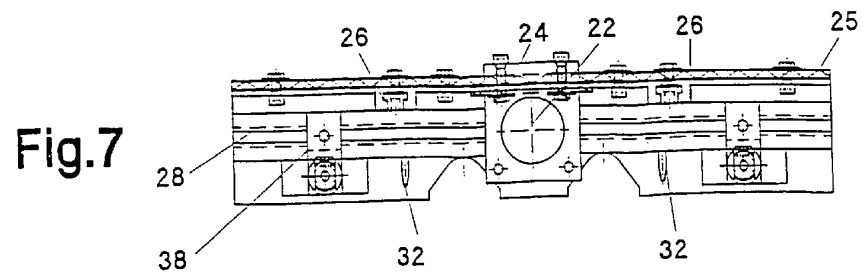
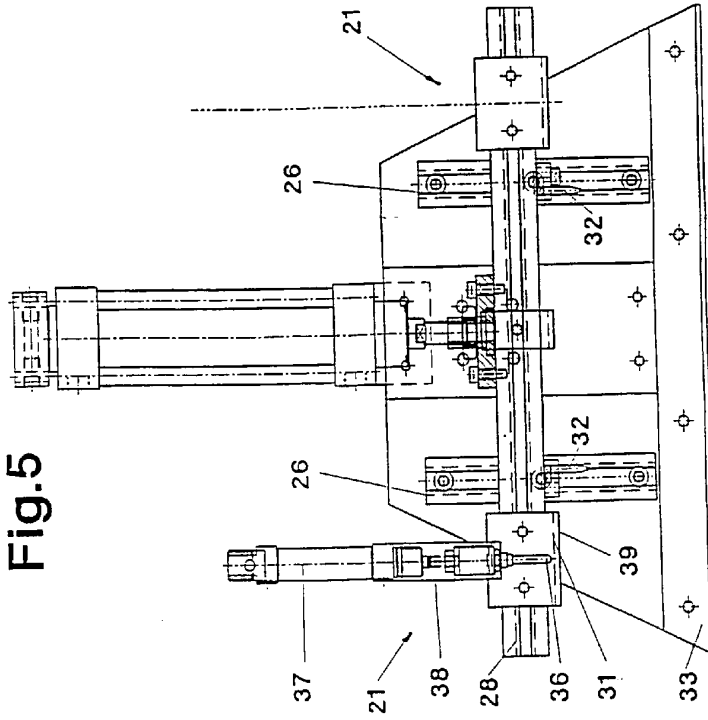


Fig.7

**Fig. 5**



**Fig. 6**

