



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/GB86/00455 (22) International Filing Date: 31 July 1986 (31.07.86) (31) Priority Application Number: 8519317 (32) Priority Date: 31 July 1985 (31.07.85) (33) Priority Country: GB</p> <p>(71) Applicants (for all designated States except US): PLAS-VAC LIMITED [GB/GB]; 7 Farm Industrial Estate, Severn Road, Welshpool, Powys SY21 7DF (GB). AGRICULTURAL PACKAGING & CONTAINERS (SALES) LIMITED [GB/GB]; Rowena Nurseries, Loughborough Road, Rothley, Leicester LE7 7NL (GB).</p>	<p>(72) Inventor; and (75) Inventor/Applicant (for US only) : BUCKLER, David, John [GB/GB]; The Old Forge, Rowton, Halfway House, Nr. Shrewsbury, Shropshire (GB). (74) Agent: ELKINGTON AND FIFE; High Holborn House, 52/54 High Holborn, London WC1V 6SH (GB). (81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB, GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.</p> <p>Published With international search report.</p>	
<p>(54) Title: METHOD OF FORMING NESTABLE PRODUCTS</p>		
<p>(57) Abstract</p> <p>Method of forming nestable products of plastics material. The method includes the step of applying a release agent to each product, before or after moulding, by spraying a water based silicone fluid on one surface of the product. This avoids denesting problems later.</p>		

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- 1 -

METHOD OF FORMING NESTABLE PRODUCTS

The present invention relates to a method of forming nestable products of plastics material. Such products may be containers used, for example, for the packing of foodstuffs in the food industry or as seedtrays in the horticultural industry. However, the invention is
5 relevant to nestable plastics products for any purpose.

After such products have been manufactured, for example by vacuum or thermo forming from a plastics sheet, they are nested or stacked together and transported to
10 where they are actually used. Before use, however, the products must be separated from each other. In practice, this often proves to be difficult and time-consuming, especially in the case of large containers having several pockets, like seed trays, and some of the containers tend
15 to be damaged in the process. This problem has confounded the plastics forming industry almost since its inception.

It has been proposed to form lugs on each product so that when nested the individual products are held apart from each other. While this prevents them sticking
20 together, the storage volume of the stacked containers is substantially increased and this leads to higher transportation costs. It does not therefore provide an economical solution to the problem.

It has also been conventional practice for decades
25 to apply a release agent to the moulding tool in various moulding industries in order to aid the release of the

- 2 -

moulding from the mould.

According to the present invention there is provided a method of forming nestable products of plastics material, including the step of applying a release agent to the plastics material, the release agent comprising a water-based silicone.

The invention also provides an apparatus for forming nestable products of plastics material, comprising means to apply the release agent to the material.

Preferably, the release agent is sprayed onto each product after it is vacuum moulded from a plastic sheet. The heat stored in the product at this stage helps to dry the release agent.

Alternatively, the release agent may be sprayed onto the plastics sheet immediately after extrusion or as the sheet is unrolled from a roll before moulding. The release agent could also be applied by passing the sheet, or the containers, through a bath rather than by spraying, or by a sponge roller fed by gravity from a wick as the sheet is unrolled or extruded. Further, if the products are containers for food, the release agent must be of a food grade.

The invention provides a surprisingly simple solution to the problem of products sticking together. It has been found that substantial labour time can be saved and that breakages of products due to forcing them apart are greatly reduced. All this is achieved

- 3 -

without increasing the volume of the stacked containers.

Preferred embodiments of the invention are described below, by example only, with reference to the accompanying example and drawings:

5 Figure 1 of the drawing shows a schematic view of a manufacturing line for the production of nestable containers of plastics material, and

Figure 2 shows a separate unit for applying the release agent.

10 As shown in Fig. 1, a roll 1 of sheet plastics material 2 is fed through a heater 3. Thereafter, the material 2 passes to the forming station 4 in which it is moulded to form the products 9. The material is then cut in a cutting station 5 to form lines of weakness.

15 Next, the material is separated into sheets of individual products in a guillotine or punching station 6.

The individual sections of the material 2 are shaped in the forming station 4 in a conventional manner, e.g. by forming a vacuum within the mould 5 and sucking
20 in the hot plastics material. After the material has cooled sufficiently, it is released from the mould by an injection of compressed air.

The sheet may be formed of polystyrene, polyvinyl-
chloride, polypropylene, polyethylene or A.B.S. for
25 example.

In Fig. 1 are shown three examples of where in the manufacturing line the release agent may be applied.

- 4 -

In position A the spray nozzle 7 is arranged between the forming station 4 and the cutting station 5.

In position B the spray nozzle 7 is arranged between the cutting station 5 and the guillotine 6.

5 In position C the spray nozzle 7 is downstream of the guillotine 6.

As illustrated, the nozzle 7 may be above or below the material 2, or both. Of course, if a wide roll of material is being moulded a row of nozzles can be used.

10 It has been found that the position at which the release agent is applied is not critical, provided of course that it is applied before the sheets of containers are stacked together. The containers should also be given time to dry out, i.e. time for the water to evaporate
15 to leave the coating of silicone.

The timing of the spray nozzle 7 is linked into the moulding/cutting so that the spray is activated a fixed time after the sheet is released from the mould. The plastics material is generally still hot enough to
20 evaporate the water.

As shown in Fig. 2 it is also possible to use a separate apparatus for applying the release agent. This apparatus comprises a conveyor belt 10 on which the individual products 11 are conveyed past spray unit 12
25 providing a fine mist and through heat chamber 13. At the top of the apparatus there are air extracts 14 adjacent

- 5 -

the spray unit 12 and at the bottom a drain 15.

The spray timing can be controlled by a photo-cell 16, or, if the apparatus is linked to the forming machine, it can be linked to the moulding cycle. As the sprayed products pass through the heat chamber the water is evaporated so that they emerge dry and ready for immediate nesting.

In developing the invention, a large number of proprietary release agents have been tested by spraying onto a number of plastics nestable containers.

It has been found that almost all available release agents will provide some advantages, assuming that they or their solvent are not incompatible with the material of the plastics product or with what it has to contain. However, from the point of view of providing a simple and economical solution to the denesting problem, which is the aim of the invention, it has been found that only water based silicones which can be easily diluted with water are suitable since they are easy to apply and are relatively cheap.

EXAMPLES

(a) Products supplied by Basildon Chemical Co. Ltd., Kimber Road, Abbingdon, Oxon OX14 1RZ.

1. Ref. BC 330. This is a non-ionic O/W emulsion of polydimethyl-siloxane fluid. It contains 35% of silicone release fluid and can be easily diluted with water at a ratio of 1 to 50/100 parts. The diluted

- 6 -

product provides for a very economical application by brushing or spraying.

2. Ref. BC 81/10. This is similar to the above product but has food grade approved ingredients. It can again be substantially diluted for an economical application.

5 (b) Products supplied by ICI Ltd., Organics Department, P.O. Box 41, Blackley, Manchester M93 5A.

1. Ref. M 400. This is a silicone release emulsion which is non-food grade but is water based and dilutable in 50/100 parts of water.

10 2. M 404. This product is similar to the above.

(c) Products supplied by Rhone Poulenc, of France.

1. Product No. 70001. This is a 35% emulsion of polydimethylsiloxane having a viscosity of 300 cs. it is easily diluted.

15 Examples of products which were tested but were found unsuitable are:

(a) Products sold by Basildon Chemicals.

1. Ref. BC 350. This contains polydimethylsiloxanes of various viscosities. It can be diluted using
20 solvents such as white spirit or kerosine.

2. Ref. BC 360. This contains compounds of polydimethylsiloxane fluid and silicon filter. As with BC 350, it can be diluted with solvents.

(b) Products supplied by Rocol Ltd., Rocol House,
25 Swillington, Leeds LS26 8BS.

- 7 -

1. Rocol MRS. This is a non-silicone dry film spray based on a solid fluorocarbon telomer. It is solvent based but non-dilutable and so is very expensive. It is, however, food approved.
- 5 2. Rocol RS7. This is a non-silicone wet film spray which is not food approved, is solvent based and is non-dilutable.
3. Rocol PR. This is a silicone release spray which is food approved but is not dilutable. It is expensive
10 and also the spraying time proved to be critical and thus difficult to control.

(c) Products supplied by Ambersil Ltd., Whitney Road, Daneshill, Basingstoke, Hants.

1. Ref. Formula 1, 6 and 8. These products are
15 silicone based but are only available in aerosol cans and so have proved expensive.
2. Ref. Formula 7 and 5. These are non-silicone based, but are solvent-based and sold only as aerosol sprays.

20 (d) Other Products

1. "Mr. Sheen" sold by Reckitt Household Products. This is a household aerosol polish. Since it is sold in aerosol cans only it is very expensive to use.
 2. "Johnson's Pledge". Comments as above.
- 25 As mentioned above, the applicants found that only silicone-water emulsions could be economically applied

- 8 -

as release agents to avoid denesting problems. Such emulsions should be diluted before use, a 35% silicone emulsion typically being diluted in from 10 to 100 parts of water, preferably 20 to 40 parts.

5 The silicones come in varying viscosities, generally from 300 to 60,000 cs. The lower viscosity silicones around 300 to 1,000 cs, were found to be more suitable for preventing the nestable products from sticking together.

10 The silicones tested by the applicants were dimethyl-polysiloxanes, though other siloxanes such as diphenyl-polysiloxane would work in the same way. However, such other silicones would be more expensive.

15 Products treated with silicone in the manner described above look and feel exactly like untreated products. However, the products can be denested very much more easily. For example, in one test the scrap rate of denested cosmetic inserts was reduced from 20% to 0.005% after treating with the method of the invention.

20 Further, it has been surprisingly found that the application of the silicone to the plastics products renders them antistatic. It is believed the reason for this is that when two plastics products are nested, the silicone on one product is transferred to a small extent
25 to the surface of the other product and so when the products are denested one is separating silicone from

- 9 -

silicone and the charges remain balanced on each surface.
Of course, if both sides of the nestable product, rather
than only the inside our outside, then one is already
separating silicone from silicone with any transfer
5 between the surfaces.

- 10 -

CLAIMS:

1. A method of forming nestable products of plastics material, including the step of applying a release agent to the plastics material the release agent comprising a water-based silicone.
2. A method according to claim 1, wherein the silicone is applied to each product after it has been moulded from the plastics material.
3. A method according to claim 1, wherein the silicone is applied by spraying.
4. A method according to claim 2, wherein the silicone is applied by spraying.
5. A method according to claim 4, wherein the silicone release agent is an emulsion of silicone and water, the emulsion being diluted with water before spraying.
6. A method according to claim 5, wherein the dilution ratio is from 1 in 20 to 1 in 40.
7. A method according to claim 5, including the step of heating the products to evaporate the water.

- 11 -

8. A method according to claim 4, wherein the spray cycle is operatively linked to the moulding cycle.

9. A method according to claim 1, wherein the silicone is dimethylpolysiloxane.

10. A method according to claim 9, wherein the viscosity of the silicone is between 300 to 1,000 cs.

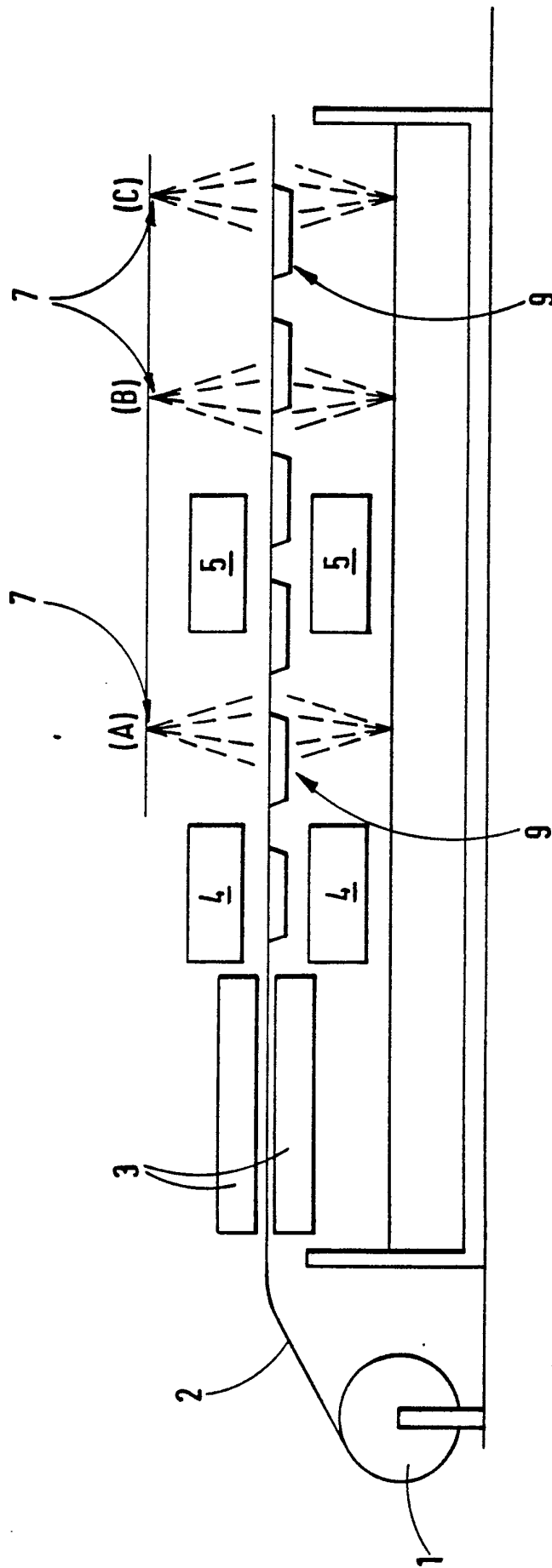


Fig.1

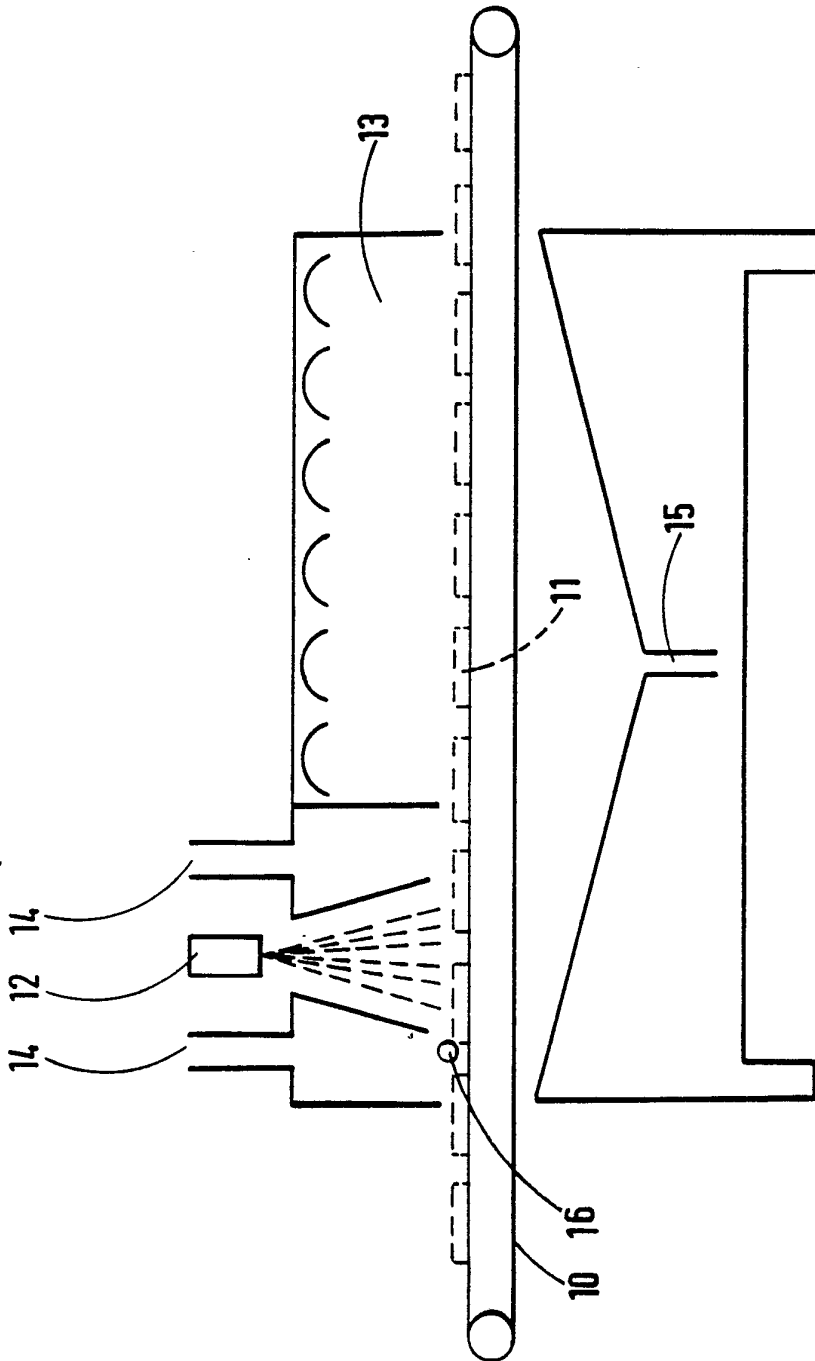



Fig. 2

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 86/00455

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁴ : B 29 C 71/00; C 08 J 7/04; B 65 D 25/34; B 05 D 5/08		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC ⁴	B 29 C; C 08 J; B 65 D; B 05 D	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category [*]	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	GB, A, 814899 (BRADFORD DYERS) 17 June 1959 see claims; page 1, lines 31-53; page 3, lines 68-101; page 3, lines 108-115 ---	1-8
A	US, A, 3409460 (R.L. MITCHEL) 5 November 1968 see the abstract; claims; figures ---	1-8
A	US, A, 2870043 (L.E. WOLINSKI) 20 January 1959 see column 2, line 39 - column 4, line 8; column 6, lines 23-26; claims ---	1-8
A	FR, A, 2364951 (WACKER-CHEMIE) 14 April 1978 see claims 1,4; page 10, lines 10-15 ---	1-8
A	DE, A, 3120982 (SONY CORP.) 3 June 1982 see the abstract; claims; page 9, paragraph 2 -----	1-8
<p>[*] Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
28th October 1986	27 NOV 1986	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	M. VAN MOL 	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 86/00455 (SA 14093)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 03/11/86

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 814899		None	
US-A- 3409460		None	
US-A- 2870043		None	
FR-A- 2364951	14/04/78	DE-A, B, C 2641699 JP-A- 53042243 US-A- 4184880 GB-A- 1564252 CA-A- 1087336	23/03/78 17/04/78 22/01/80 02/04/80 07/10/80
DE-A- 3120982	03/06/82	None	

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