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**(54) A method for wrapping under tension units of compressible flexible articles**

(57) A process for producing a tension wrapped unit (10) comprising an array (11) of at least 1 substantially parallelepipedal flexible pack (12) wherein a pusher clamp (13) is disposed adjacent side panels (18, 19) and back panel (17) of said array (11), said pusher clamp (13) pushes said array (11) towards a plastic outer packaging material (20) comprising two sheets of film sealed at the centre wherein width dimension of said plastic outer packaging material (20) extends beyond transverse limits of said array (11), said plastic outer packaging material (20) is disposed adjacent front panel (16), top panel (14) and bottom panel (15) of said array (11), said array (11) is subsequently maintained in a fixed position by the action of a pusher plate (23) and by resting on a base plate (22), said pusher clamp (13) retreats and guide rollers (24) ensure said plastic outer packaging material (20) is disposed adjacent said back panel (17),

characterised in that

said array (11) is compressed in a direction of compression C by means of said pusher clamp (13) and compressed in a direction perpendicular to said direction of compression C by said pusher plate (23), said plastic outer packaging material (20) extending beyond transverse limits of said array (11) is disposed adjacent said remaining side panels (18, 19) of said array (11).

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## Description

### Field of the invention

The invention relates to an improvement in the process of wrapping a plastic outer packaging material under tension around an array of packs of compressible flexible articles to form a tension wrapped unit.

### Background of the invention

It is widely known in the art to package an array of packs comprising compressed flexible articles encased in flexible bags in corrugated paper outer cases for ease of handling, storage and transport. The space, however, inside these corrugated paper outer cases cannot be fully utilised because of the tolerances imposed by the variations in the pack dimensions resulting from the production processes and the usual automatic mechanical packaging systems. The problem of utilisation of space is becoming more and more important with the increasingly widespread use of pallets of standard dimensions arising from the demands of large manufacturing, distribution and sales organisations. Furthermore, due to the deviations in the pack dimensions arising from the packing of compressible flexible articles into flexible bags, the cardboard cases need to be over-dimensioned. As a consequence of this over-dimensioning, arrays of packs on the bottom of pallets are incapable of supporting the imposed loads when pallets of products are stacked or grouped three pallets high. Therefore, the cardboard cases must be designed to support the extra loads.

An array of packs of compressed flexible articles can also be wrapped in plastic foil. The plastic foil can comprise relatively inexpensive materials such as polymeric films or thermoplastic films. Such materials reduce the severity of the disposal problem from an environmental standpoint both with respect to the amount of wrapping material required and the disposability/degradability of the particular wrapping material. In addition, plastic foil is lighter and more flexible than corrugated paper, which is heavy, requires space and has less flexibility for storage since it is rigid and in use continues to occupy the same amount of space even when nearly empty.

Prior art developments include EP 0 294 339 A2 which discloses a machine for packaging a plurality of articles, either loose, collected on a tray or inside a container, within a stretchable or a semi-stretchable type of film web. The machine includes a stretching device, a wrapping device and a complete sealing unit. In particular, the invention teaches a segment of stretched and tensioned film web that is wrapped peripherally around the articles by pushing the film web underneath the articles and by displacing the support plane of the articles and eventually replacing it with two roller tables associated with the wrapping device. The invention takes advantage of the elastic memory of the film web to tightly enclose the packaged articles rather than using

the compressibility of the articles with the aid of a pusher clamp and pusher plate to form a tight tension wrapped unit.

US 3,910,011 claims an apparatus for and a method of packaging stacked articles in a shipping container. The apparatus comprises a means for peripherally confining a bundle of articles in an open-ended sleeve of heat shrinkable film while leaving the surface portions of the bundle of articles accessibly exposed. The cooling of the heat shrinkable film produces a relatively rigid package. Similarly, US 3,672,116 discloses an apparatus and a method for wrapping a film about four sides of an object or stack of objects; the film having sufficient elasticity to stretch without bursting. Both patents focus on the stretch properties of the films in order to guarantee unit stability and furthermore, wrapping is only around a circumference of the bundle/object(s).

Therefore, the prior art does not teach a wrapping process which comprises tensioning in two directions using a plastic outer packaging material; which is independent of fixed dimensioned cases; which relies on the compressibility of the array of flexible packs of compressible flexible articles in combination with a pusher clamp and pusher plate to produce a stable unit; which is independent of the stretch properties of the plastic outer packaging material; and which utilises a curved pusher plate that is in close proximity to the pusher clamp.

### Objectives and summary of the invention

The object of the present invention is to wrap an array of packs of compressed flexible articles under tension in two directions using a plastic outer packaging material to form a tension wrapped unit. A further object of the invention is to prevent the distortion and deformation of the corners of the array of packs of compressible flexible articles when being wrapped under tension with the plastic outer packaging material.

The invention utilises process steps that encompass modifications in order to produce a tension wrapped unit comprising a plastic outer packaging material, which is most suitable as a replacement for conventional corrugated paper outer cases. The process originally was employed to wrap arrays of individual flexible articles to form primary wrapped packs with the aid of a pusher clamp and a pusher plate. The array of articles were tension wrapped in one direction only and the pusher clamp simply pushed the array of articles to a fixed point where the wrapping process was initiated. The resultant primary wrapped packs could be easily distorted and deformed and in addition, the compressibility of the flexible articles was not utilised to form a more stable pack. The present invention is directed towards the wrapping under tension of arrays of primary wrapped packs of compressible flexible articles to form completely enclosed units.

During the wrapping process, the inherent com-

pressibility of the arrays of packs of compressible flexible articles with the aid of the pusher clamp and pusher plate can be taken advantage of to tightly wrap the plastic outer packaging material around the entire array in two directions. This imparts increased stability and strength to the unit. Furthermore, key design optimisations - the use of a pusher plate that is curved and is in close proximity to the pusher clamp - have been incorporated into the process. These features have subsequently led to several benefits namely, units that are more stable and that are capable of sustaining higher load carrying capacities; better unit shapes; improved unit appearances and improved and optimised pallet fit during handling, storage and transport operations results.

In accordance with the objects of the invention, a unit comprising an array of at least one substantially parallelepipedal pack comprising compressed flexible articles is provided. The unit has a top and a bottom panel, a front panel and a back panel and two side panels and comprises a plastic outer packaging material. The pusher clamp pushes the array towards the plastic outer packaging material consisting of two sheets sealed at the centre. The plastic outer packaging material has a width dimension that extends beyond the transverse limits of the array and it is disposed adjacent to the front, top and bottom panels of the array. The array is maintained in a fixed position by the action of a pusher plate and by resting on a base plate. The pusher clamp then retreats and guide rollers ensure that the plastic outer packaging material is disposed adjacent to the back panel. It can then be gathered, sealed and cut. The array is compressed in a direction of compression C by means of the pusher clamp and is pushed in a direction perpendicular to the direction of compression C' by the pusher plate. The plastic outer packaging material extending beyond the transverse limits of the array is disposed adjacent to the remaining side panels of the array and then gathered, folded, sealed and cut. The unit may comprise a least one unobstructed opening feature in the plastic outer packaging material.

The pusher plate is curved at the edges and comprises a radius ranging from 5 to 30 millimetres and an angle A ranging from 30 to 90 degrees. The distance H from the top of the pusher clamp to the bottom of the pusher plate ranges from 0 to 50 millimetres.

According to the present invention, the objects are achieved by a pusher plate having the characteristics specified in the claims.

### Brief description of the drawings

The invention will be described hereinafter with reference to the following drawings:

Figure 1 is a perspective view of an array of flexible packs being compressed by a pusher clamp in the direction of compression C;

Figure 2 shows a front elevation of the partially wrapped array of packs supported on a base plate and being held in tension by a curved pusher plate;

Figure 3 shows a front elevation of an array of packs after the pusher clamp has retreated and at the point when the plastic outer packaging material is being gathered together;

Figure 4 shows the front elevation of the curved pusher plate.

### Detailed description of the invention

Figure 1 shows an array 11 comprising at least 1 substantially parallelepipedal pack 12. In particular, figure 1 details two substantially parallelepipedal packs 12. Each pack 12 is enclosed in a flexible bag and comprises compressed flexible articles. The array 11 is compressed by means of a pusher clamp 13 in the direction of compression C. The compressed flexible articles may comprise disposable absorbent diapers, sanitary articles, incontinent pads or briefs, bandages and the like. The flexible articles are compressed to between 20 and 70 percent of their uncompressed volume. Each flexible pack 12 comprises between eight to fifty disposable absorbent diapers and a flexible plastic bag with a thickness ranging from 30 to 120 micrometres. A method for the compression packing of disposable absorbent diapers into flexible bags has been described in detail in the following patents US 4,934,535, US 4,966,286, US 5,022,216, US 5,050,742 and US 5,150,561.

According to figure 1, the array 11 of packs 12 of compressed flexible articles comprises a top panel 14, a bottom panel 15, a front panel 16, a back panel 17 and two side panels 18, 19. The pusher clamp 13 is disposed adjacent to the side panels 18, 19 and to the back panel 17 of the array 11. The pusher clamp 13 pushes the array 11 towards the plastic outer packaging material 20. The plastic outer packaging material 20 comprises two sheets of film, fed from two infeed rollers 21, which are sealed at the centre. The width dimension of the plastic outer packaging material 20 extends beyond the transverse limits of the array 11 to be wrapped. The preferred material for the plastic outer packaging material 20 is a polyethylene film, which can either be of a low, medium or high density. More specifically, the film has a thickness ranging from 30-100 micrometres; 50 micrometres being preferred. The film can either be transparent or white and thus, various combinations for the array 11 of packs 12 are possible. In addition, the film may comprise graphical indicia, which can also be coloured. The plastic outer packaging material 20 is disposed adjacent to the front panel 16, the top panel 14 and the bottom panel 15 of the array 11 and maintained in tension by the pusher clamp 13. The pusher clamp 13 compresses the array 11 in the direction of compression C and ideally, the circumference of

the array 11 is reduced by a figure in the range from 2-20 percent; 5 percent being preferred.

Figure 2 shows the plastic outer packaging material 20 wrapped tightly against the front panel 16, the top panel 14 and the bottom panel 15 of the array 11. The array 11 is subsequently maintained in a fixed position by resting on a base plate 22 and by the action of a curved pusher plate 23. The curved pusher plate 23 is disposed adjacent to the top panel of the array 11 and compresses the array 11 from above in the direction of compression C'. The circumference of the array 11 around the side panels 18, 19 is reduced by approximately 2-8 percent; preferably by 5 percent. The array 11, which is partially wrapped, is still being subjected to a side compression from the pusher clamp 13.

In figure 3, the pusher clamp 13 retreats and the guide rollers 24 ensure that the plastic outer packaging material 20 is pulled under tension and disposed adjacent to the back panel 15 of the array 11. The plastic outer packaging material 20 is subsequently gathered, sealed and cut. The seal may comprise a straight seal. In order to gather the plastic outer packaging material 20 to form the tight seal, some of the compression of the array 11 may be lost, but this is minimal and is about 2-4 percent. Upon cutting, the outer plastic packaging material 20 is released from the array 11 and is available for wrapping around the next array 11 of packs 12. The plastic outer packaging material 20 extending beyond the transverse limits of the array 11 is pulled around and disposed adjacent to the remaining side panels 18, 19 of the array 11. The plastic outer packaging material 20 is then gathered, folded, sealed and cut. The side seal may either be folded or comprise a straight seal. As before, the cutting step is not essential. The end product is a tension wrapped unit 10.

Figure 4 shows the front elevation of the pusher plate 23. The pusher plate is typically characterised by a flat surface and its dimensions are usually smaller than the array of packs to be wrapped. The new design is based on a curved surface and is designed to fit the dimensions of the array 11. This modification results in a much higher level of compressed matter being retained within the array 11 since the uppermost corners of the array 11 are contained. Furthermore, the pusher plate is placed in close proximity to the pusher clamp 13 in order to provide for a much tighter tensioned wrapped unit 10. By placing the pusher clamp 13 close to the pusher plate 23, a reduced level of excess compressed matter can escape when gathering and sealing the panels 17, 18, 19. Usually, the excess compressed material held in compression by the flat surfaced pusher plate could be easily squeezed out through the free space located at the corners of the primary wrapped packs.

The radius R of the pusher plate can range from 5 to 30 millimetres though 20 millimetres is the preferred radius. The angle A ranges from 30 to 90 degrees with 60 degrees being the preferred angle. The distance H from the top of the pusher clamp 13 to the bottom of the

pusher plate 23 can vary from 0 to 50 millimetres with 5 millimetres being the preferred distance.

In relation to all the figures, the plastic outer packaging material 20 may comprise an unobstructed opening feature 25, which is readily located and which can be easily and reliably opened in order to gain easy access to the packs 12 within the array 11 of the unit 10. The unobstructed opening feature 25 is included in order to provide a more controlled release of the compressive forces acting on the compressed flexible packs 12. The plastic outer packaging material 20 comprises at least one unobstructed opening feature 25, which may comprise a predetermined tear portion in the form of a line of weakness. Lines of weakness can be formed by many means well known in the art and typically comprise, for example, perforations. The lines of weakness may be produced on-line or they may be already present in the plastic outer packaging material 20 as provided by the suppliers. Thus, the unobstructed opening feature 25 comprises a line of weakness, which may traverse the circumference of the entire unit 10 in either the horizontal or vertical plane or which either may traverse the top panel 14 or the bottom panel 15 of the unit 10 or which either may traverse the top panel 14 and part of the side panels 18, 19 or the bottom panel 15 and part of the side panels 18, 19. In addition, graphical indicia may be provided on the plastic outer packaging material 20 to highlight the location of the unobstructed opening feature 25.

For the purposes of transport and storage, a number of units 10, each unit 10 preferably comprising two to twelve packs 12, can be stacked or grouped in a plurality of configurations on a pallet such that a load is applied to an upper panel or to a side panel of the pallet configuration with the direction of the load being perpendicular to the direction of compression, which is around the circumference of the pallet configuration. The units 10 are less compressible in directions perpendicular to the direction of compression.

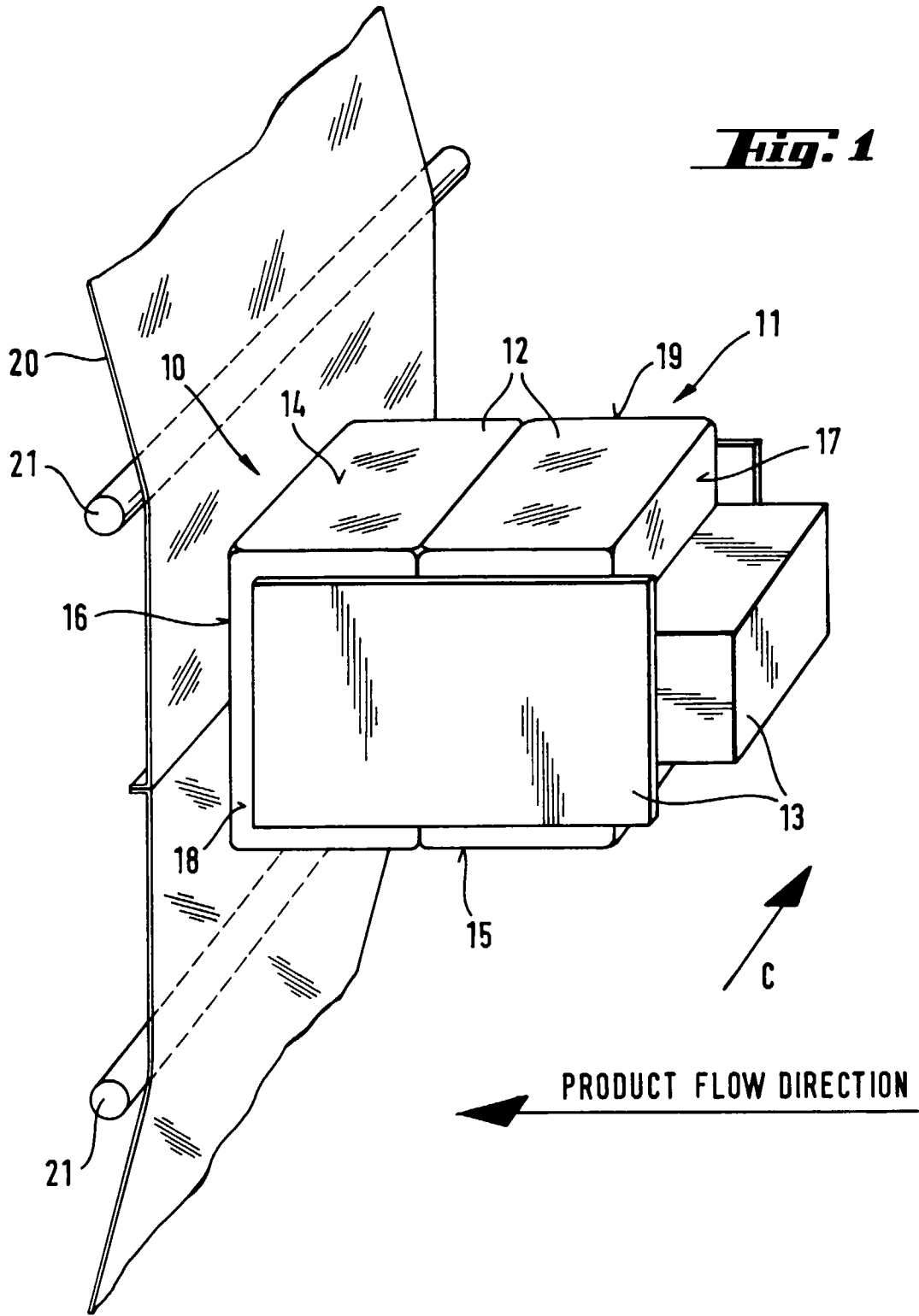
#### Glossary

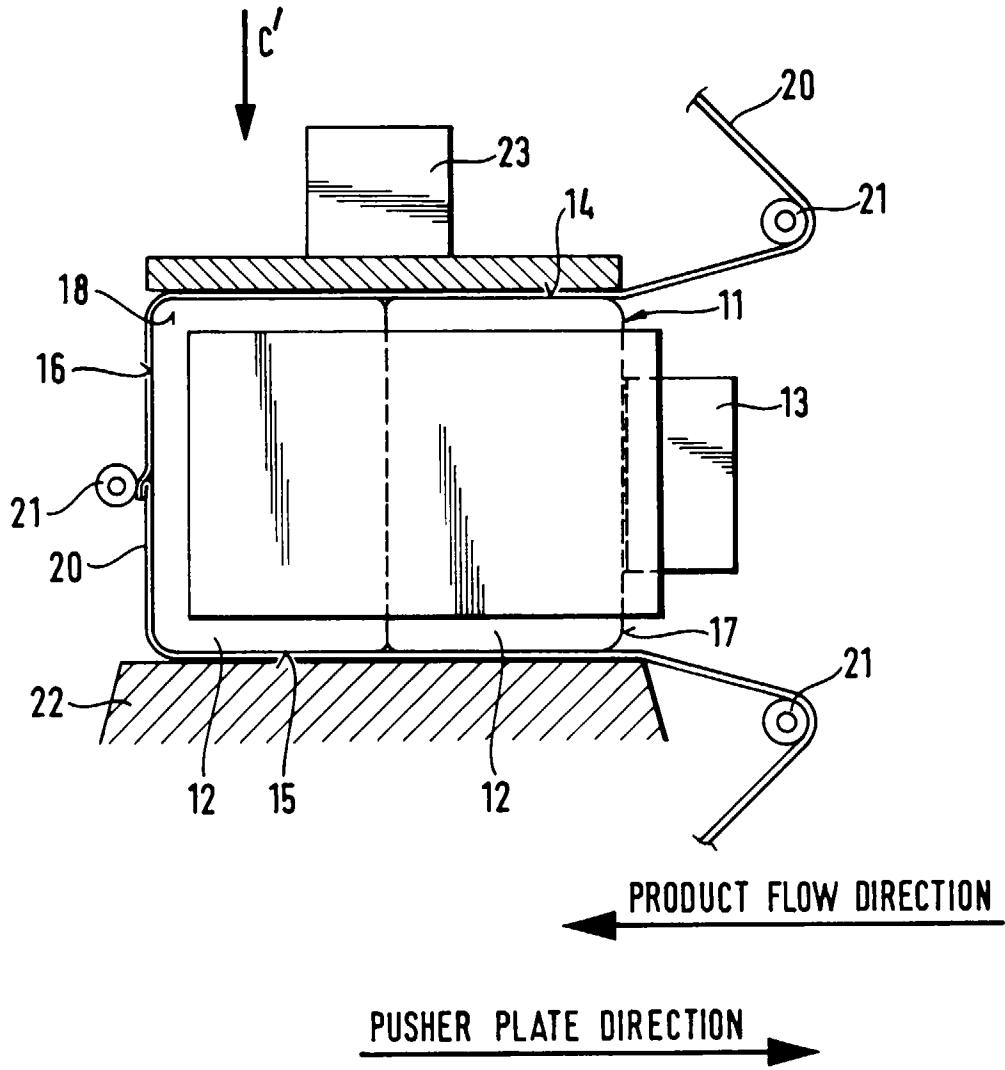
10	unit
11	array
12	pack
13	pusher clamp
14	top panel
15	bottom panel
16	front panel
17	back panel
18, 19	side panels
20	plastic outer packaging material
21	infeed rollers
22	base plate
23	pusher plate
24	guide rollers
25	unobstructed opening feature

**Claims**

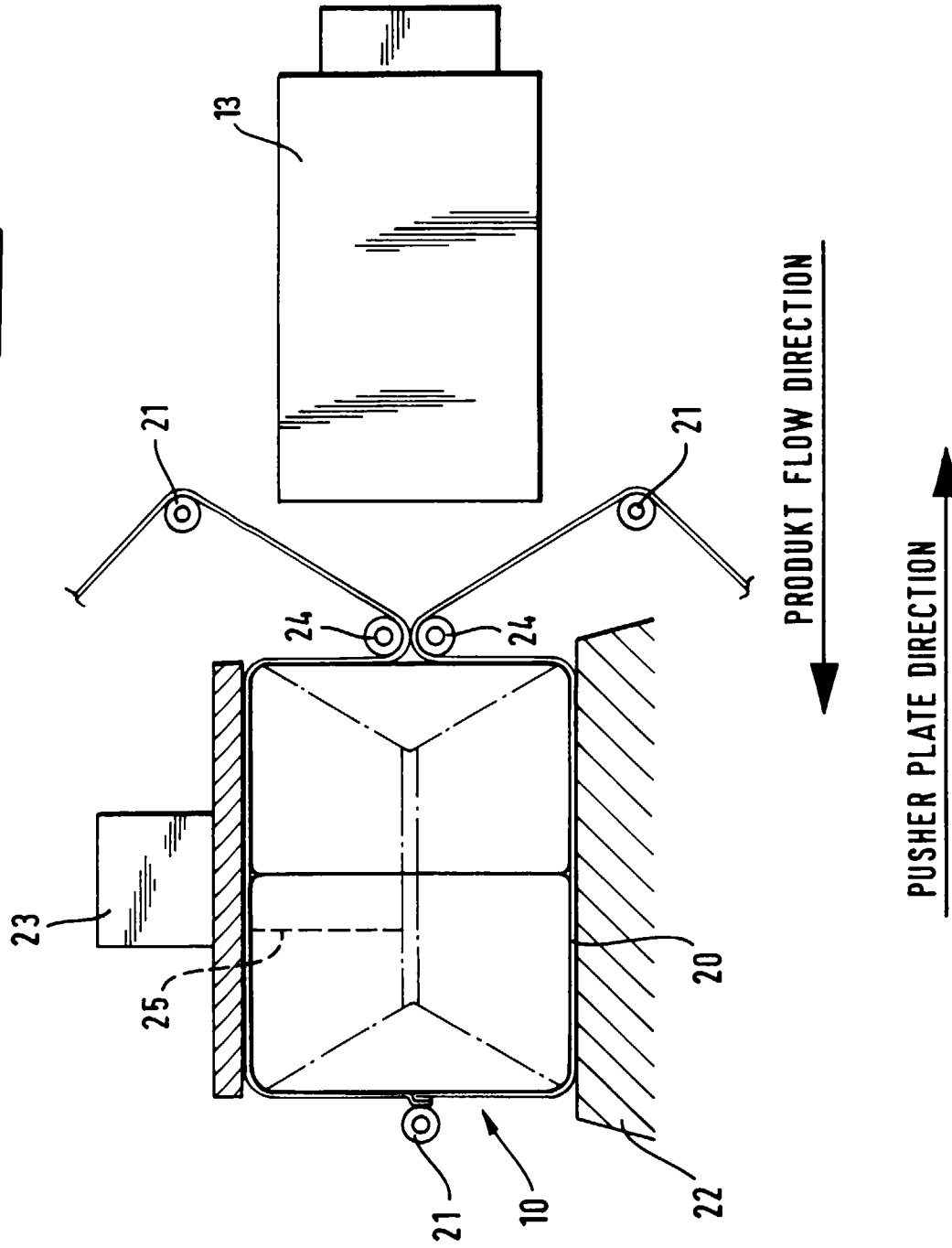
1. A process for producing a tension wrapped unit (10) comprising an array (11) of at least 1 substantially parallelepipedal pack (12) wherein a pusher clamp (13) is disposed adjacent side panels (18, 19) and back panel (17) of said array (11), said pusher clamp (13) pushes said array (11) towards a plastic outer packaging material (20) comprising two sheets of film sealed at the centre wherein width dimension of said plastic outer packaging material (20) extends beyond transverse limits of said array (11), said plastic outer packaging material (20) is disposed adjacent front panel (16), top panel (14) and bottom panel (15) of said array (11), said array (11) is subsequently maintained in a fixed position by the action of a pusher plate (23) and by resting on a base plate (22), said pusher clamp (13) retreats and guide rollers (24) ensure said plastic outer packaging material (20) is disposed adjacent said back panel (17), characterised in that said array (11) is compressed in a direction of compression C by means of said pusher clamp (13) and compressed in a direction perpendicular to said direction of compression C' by said pusher plate (23), said plastic outer packaging material (20) extending beyond transverse limits of said array (11) is disposed adjacent said remaining side panels (18, 19) of said array (11).
2. A process according to claim 1 wherein said plastic outer packaging material (20) disposed adjacent said back panel (17) is gathered, sealed and cut.
3. A process according to any of the previous claims wherein said plastic outer packaging material (20) disposed adjacent said remaining side panels (18, 19) of said array (11) and is gathered, folded, sealed and cut.
4. A process according to any of the previous claims wherein said pusher plate (23) said is curved at the edges to contain said array (11).
5. A process according to any of the previous claims wherein said pusher plate (23) comprises a radius ranging from 5 to 30 millimetres and an angle A ranging from 30 to 90 degrees.
6. A process according to any of the previous claims wherein the distance H from top of said pusher clamp (13) to bottom of said pusher plate (23) ranges from 0 to 50 millimetres.
7. A process according to any of the previous claims wherein said plastic outer packaging material (20) comprises at least one unobstructed opening feature (25).
8. A process according to any of the previous claims wherein said pack (12) may comprise disposable absorbent diapers, sanitary articles, incontinent pads or briefs, bandages and the like.

**Fig. 1**

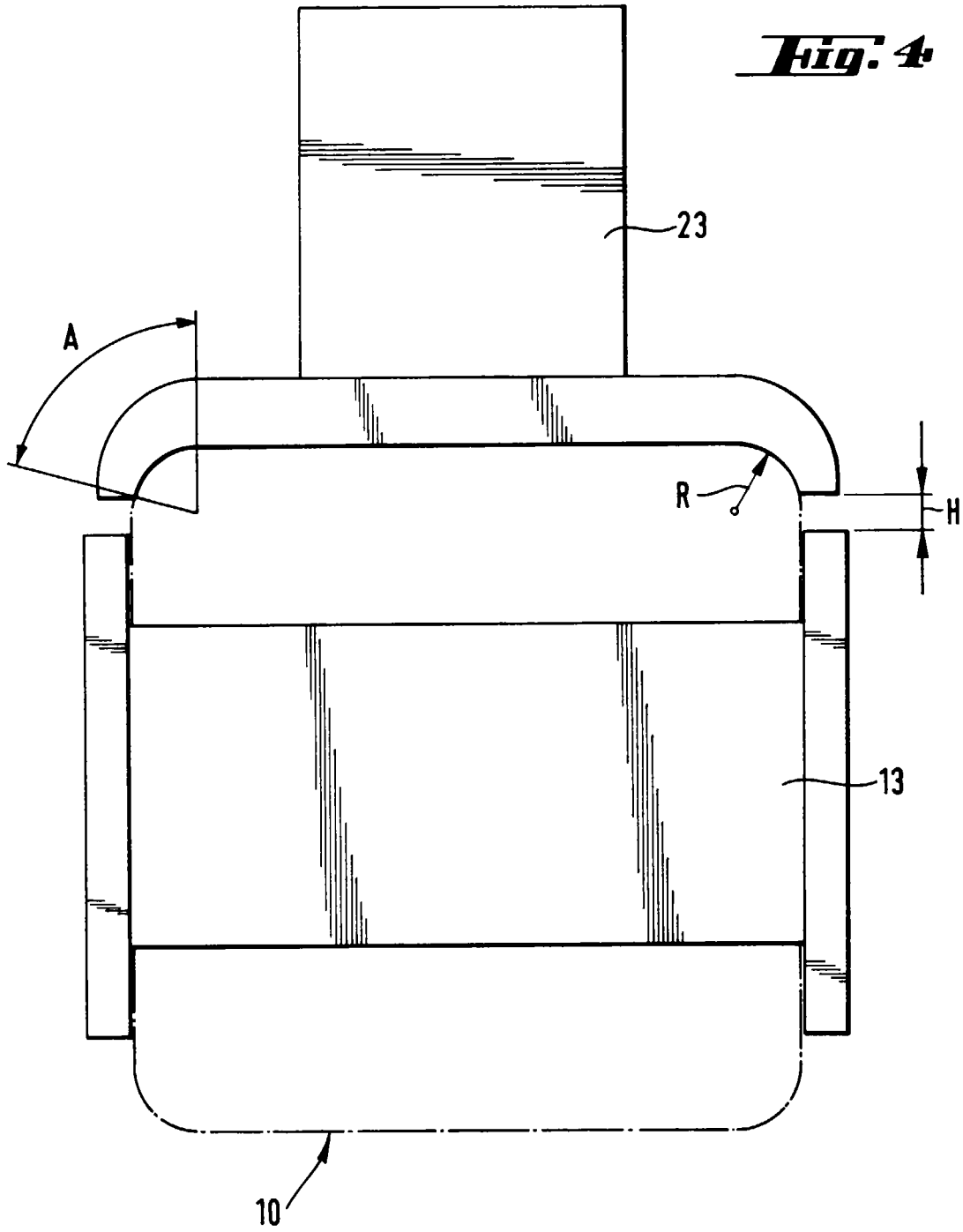




**Fig. 3**









European Patent  
Office

EUROPEAN SEARCH REPORT

Application Number  
EP 96 10 4830

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE-A-24 34 805 (FILLMANN) * page 4, line 6 - page 6, paragraph 2; figures 1-3 * ---	1	B65B9/02 B65B63/02
A	GB-A-1 594 939 (EUROPACK) * the whole document * ---	1	
A	DE-B-10 20 923 (WOLVEN) * column 8, line 53 - column 9, line 7; figures 7,8 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		14 August 1996	Claeys, H
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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