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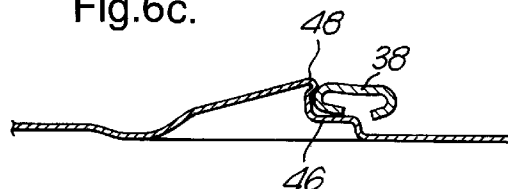
(54) **Easy-opening closure.**

(57) A closure (10) comprising a ferrous metal easy open food can end has a retention device (40) which engages the rear portion (38) of a ring-pull tab (30). The retention device (40) has a ledge (46) on which the tab sits and a hooked nipple (48) which passes around the inside of the ring-pull. The central panel (20) of the closure is recessed, particularly under the rear portion (38) of the tab, around the retention device (40). During processing of a container to which the closure is fixed, pressure building up inside the container causes the recessed parts (24, 25, 26) to flex outwardly, thus pushing the retention device (40) into further locking engagement with the tab (30). The tab is thus prevented from lifting and/or rotating during the processing procedure.

Fig.6 b.



Fig.6c.



This invention relates to a closure. In particular, but not exclusively, it relates to an end of substantially ferrous metal or a laminate of ferrous metal and polymeric material suitable for closing a container such as a can for various types of food.

Such a closure generally comprises a so-called "full-aperture easy open end" or a "partial aperture easy open end" to which a tab or ring is fixed and can be lifted in order to break a score around the periphery of the end so as completely to remove a central panel or a portion of the end for a partial aperture end, thereby obtaining access to food within the container to which the end is fixed.

Food containers are generally thermally processed in cookers such as a hydrostat, reel and spiral or static cookers. Around 40% of food processing operations use the reel and spiral procedure in which containers pass from one spiral to the next by means of a transfer valve. Typically, approximately 1000 cans per minute spiral round within a drum for about 20 minutes until they reach the end of the spiral at which point the transfer valve passes them to the next spiral. The transfer valve includes a flat plate against which the closure presses during the transfer. When the container becomes pressurised during processing there is a risk that the closure may bulge and lift the tab which then catches on the transfer plate thus compromising the integrity of the closure.

According to the present invention, there is provided a closure of substantially ferrous metal or a laminate of ferrous metal and polymeric material, the closure comprising an outer rim; a central panel connected to the rim and including a score; and a tab fixed to the central panel adjacent to the score and having a nose portion for breaking the score when a rear portion of the tab is raised; in which the central panel includes a retention device for engaging the tab and which is located in a recess under the rear portion of the tab whereby flexing of the panel is controlled and maintains engagement of the retention device with the tab.

The recessed portion of the central panel enables the panel to flex in a controlled manner during processing as the internal pressure of the container increases. The retention device moves with the recessed portion as it flexes and thereby moves into further locking engagement with the tab.

Further control of the flexing of the closure may be achieved by the provision of peripheral ridges or C-shaped formations which make the edge of the closure stiffer than the centre and less susceptible to flexing than is the centre.

Engagement of the tab with the retention device prevents the tab from lifting during pressurisation. In known full aperture easy open ends, the tab is free to lift and jam on the transfer plate and the tab can then rotate about its fixing, usually a rivet, lifting over the rim of the end and rupturing the score. The result

of this is that semi-processed food is free to escape through the broken score or that spoiling of the contents can occur and may even necessitate temporary shut-down of the cooking procedure.

Preferably, the retention device includes a ledge on which the tab rests. The tab may thus be accessed from its underside by a consumer so as to lift the tab over the retention device and open the closure in the usual manner.

Generally, the tab is a ring and the retention device may include a hook which engages the ring so as to provide additional engagement of the tab with the retention device and to maintain the tab substantially flush with the central panel.

The retention device may advantageously be positioned along the line through the rivet and the centre of the end, thus providing a radial retention of the tab and further preventing rotation of the tab about its rivet. The provision of a single retention device ensures retention of the tab against the central panel during processing but without rendering the tab difficult to lift when the consumer wishes to open the can. Preferably, only one retention device is provided since the ferrous material results in a very stiff closure, which would be extremely difficult to open, if not impossible, were two or more retention devices used.

According to a further aspect of the present invention, there is provided a method of forming a closure of substantially ferrous metal or a laminate of ferrous metal and polymeric material for food containers which are internally pressurised during processing, the method comprising: providing an end wall having an outer rim and a central panel connected to the rim and including a score; fixing a tab to the central panel adjacent to the score so that a rear portion of the tab extends towards the centre of the closure; providing a recess in the central panel under the rear portion of the tab and a raised dimple in the recessed portion which engages the rear portion of the tab to hold the tab against the central panel; whereby flexing of the central panel is controlled and maintains engagement of the dimple with the tab.

Preferably, the method further comprises forming a nipple at or adjacent to the centre of the closure; forming the raised dimple around the nipple so that the nipple projects from the raised dimple; crushing the nipple towards the centre to form a hook; fixing the tab to the central panel by a rivet adjacent to the score and along the same radius as the nipple; and engaging the hooked nipple with the rear portion of the tab.

It is essential to the present invention that the nipple and dimple be formed in separate operations, since any attempt to form the nipple and dimple simultaneously in ferrous metal would result in fracture of the nipple so that the nipple would break off either during its formation or during thermal processing of the container to which the closure is fixed.

In a still more preferred embodiment, the method comprises depressing a part of the dimple so as to provide a ledge. The tab rests on this ledge and can thus be accessed more readily by a consumer. When the closure includes a hooked nipple, the nipple is crushed towards this ledge so that the tab rests on the ledge and is retained in position more securely by the hooked nipple.

Preferred embodiments of closure will now be described, by way of example only, with reference to the drawings, in which:

Figure 1 is a plan view of a first embodiment of closure;

Figure 2a is a plan view of a second embodiment of closure with a nipple formed therein;

Figure 2b is a schematic side view of the closure of figure 2a;

Figure 2c is an enlarged side section of the nipple portion of the closure of figures 2a and 2b;

Figure 3a is a plan view of the closure of figure 2 with a nipple and dimple formed therein;

Figure 3b is a schematic side view of the closure of figure 3a;

Figure 3c is an enlarged side section of the dimple and nipple of figures 3a and 3b.

Figure 4a is a plan view of the closure with a ledge formed in the dimple;

Figure 4b is a schematic side view of the closure of figure 4a;

Figure 4c is an enlarged side section of the dimple with ledge of figures 4a and 4b;

Figure 5a is a plan view of the closure with a formed dimple and hooked nipple;

Figure 5b is a schematic side view of the closure of figure 5a;

Figure 5c is an enlarged side section of the dimple and hooked nipple of figures 5a and 5b;

Figure 6a is a schematic side view of the closure; and

Figure 6c is an enlarged schematic side section of the retention device and rear tab.

In figure 1, there is shown a closure 10 comprising a rim 12 and central panel 20 to which a tab 30 is fixed by a rivet 32. The central panel 20 includes a partial aperture around the tab area for extracting viscous products such as soup, which is defined by a continuous score 22. The panel 20 also includes two sunken panels separated by a V-shaped ridge 24. A retention device 40 is positioned near the centre of the panel 20 in the deepest of the sunken panels 24 and engages the ring-shaped rear 38 of the tab 30 as explained in more detail below.

The closure is made of ferrous material, as is common for food can ends. Ferrous material is more stiff than, for example, aluminium, so that the engagement of the retention device and tab is particularly important for optimum performance during processing.

Figures 2 to 5 show the method of formation of a second closure. A metal end 15 is first produced with stepped recesses 24, 25, 26 of increasing depth formed therein, the deepest of which is positioned under the rear of the tab 30. A rivet 32 is provided adjacent to a continuous circular score 22 (so-called "full-aperture") for fixing the tab 30 to the central panel 20. Panels 24 are surrounded by C-shaped ridges 27 which stiffen the side of the closure nearest to the rivet and limit any flexing of the closure in this area.

Figures 2a and 2b show how the retention device 40 is first produced by forming a nipple 42 into the central panel near to the centre of the panel, along the same radius as the rivet. The nipple 42 is positioned at the point at which the inside of the ring of the tab will lie, once the tab is rivetted in place, so that the nipple will engage the tab firmly and prevent movement thereof during processing.

After production of the nipple, the central panel is further shaped as shown in figures 3a to 3c where a dimple 44 is formed in the base of the end 15 around the nipple 42, thus raising the nipple still further away from the deepest recess 26 of the panel 20 (see figures 3b). In this way, when the tab is rivetted onto the panel 20, the nipple will be higher than the rear of the tab 30.

The next stage of manufacture of the retention device 40 involves the pressing-down of one side of the dimple 44, nearest to the centre of the panel 20, to form a ledge 46 as shown in figures 4a to 4c. This ledge 46 provides a rest for the tab 30 and allows access to the underside of the tab.

A consumer can apply force directly to the tab 30 away from the retention device and easily lift the tab so as to break the score 22. Pressurisation, on the other hand, causes the recesses 24, 25, 26 to flex axially outwards in a controlled manner and so move the retention device 40 further into the ring of the tab. The recesses thus enhance the engagement of the retention device and the tab and thus the performance of the closure during thermal processing.

Whilst the rivet 32 will also flex, it will do this to a lesser degree than does the central recessed portion, particularly where stiffening is provided in the rivet region using C-shaped ridges 27 for example, so that the dimple moves outwards more than the rivet to which the tab is connected, and pressurisation results in greater engagement of the retention device 40 with the tab, rather than less, as might be expected without the provision of flexible recessed portions 24, 25, 26.

Such retention is provided by crushing the nipple 42 to form a hook 48, as shown in figures 5a to 5c. The completed closure of figures 6a to 6c demonstrates how the tab rests on the ledge 46 so that the hooked nipple 48 curves around the inside of the tab ring 38 and overhangs the top of the tab, further locking the tab 30 against the ledge 46. This locking is

also enhanced by the outward flexing of the recesses 24, 25, 26 in the central panel 20 during pressurisation but it is easily releasable by the consumer after the processing procedure has been completed. This releasability is enhanced by the reduction in internal pressure as the can contents cool, thus allowing the closure to flex back towards its original position.

It will be appreciated that the invention has been described above by way of example only, and that changes may be made without departing from the scope of the invention.

Claims

1. A closure of substantially ferrous metal or a laminate of ferrous metal and a polymeric material, the closure comprising:
 - an outer rim;
 - a central panel connected to the rim and including a score; and
 - a tab fixed to the central panel adjacent to the score and having a nose portion for breaking the score when a rear portion of the tab is raised; and in which the central panel includes a retention device for engaging the tab, the retention device being located in a recess under the rear portion of the tab; whereby flexing of the panel is controlled and maintains engagement of the retention device with the tab.
2. A closure according to claim 1, in which the retention device includes a ledge on which the tab rests.
3. A closure according to claim 1 or claim 2, in which the retention device includes a hook which engages the tab.
4. A closure according to claim 1 or claim 3, in which the retention device is positioned along the radius through the point at which the tab is fixed to the central panel.
5. A method of forming a closure of substantially ferrous metal or a laminate of ferrous metal and polymeric material for food containers which are internally pressurised during processing, the method comprising:
 - providing an end wall having outer rim and a central panel connected to the rim and including a score;
 - fixing a tab to the central panel adjacent to the score so that a rear portion of the tab extends towards the centre of the closure; and
 - providing a recess in the central panel under the rear portion of the tab and a raised dimple in the recess which engages the rear portion of

the tab, whereby flexing of the central panel maintains engagement of the dimple with the tab.

6. A method according to claim 5, further comprising:
 - forming a nipple at or adjacent to the centre of the closure;
 - forming the raised dimple around the nipple so that the nipple projects from the raised dimple;
 - crushing the nipple towards the centre to form a hook;
 - fixing the tab to the central panel by a rivet adjacent to the score and along the same radius as the nipple; and
 - engaging the hooked nipple with the rear portion of the tab.
7. A method according to claim 5 or claim 6, further comprising depressing a part of the dimple so as to provide a ledge.
8. A closure substantially as hereinbefore described, with reference to the drawings.
9. A method substantially as hereinbefore described, with reference to the drawings.

Fig.1.

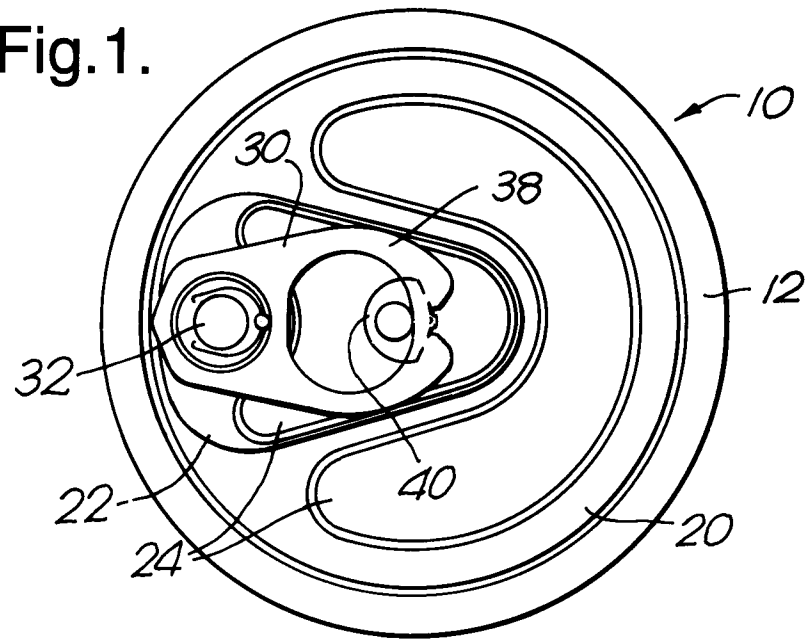


Fig.2a.

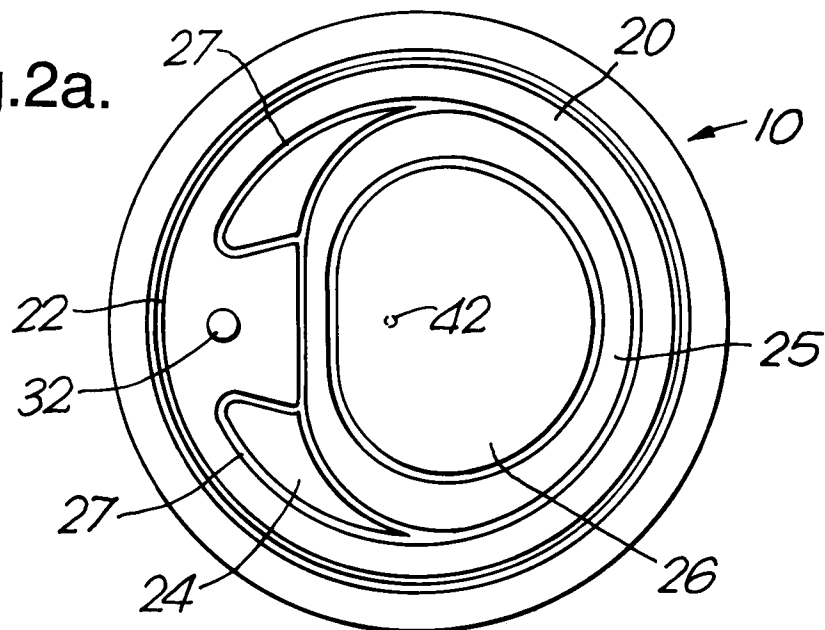


Fig.2b.

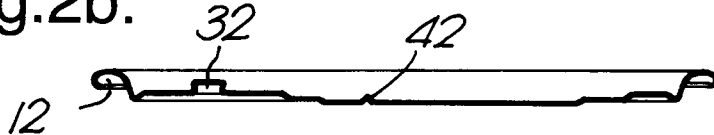


Fig.2c.



Fig.3a.

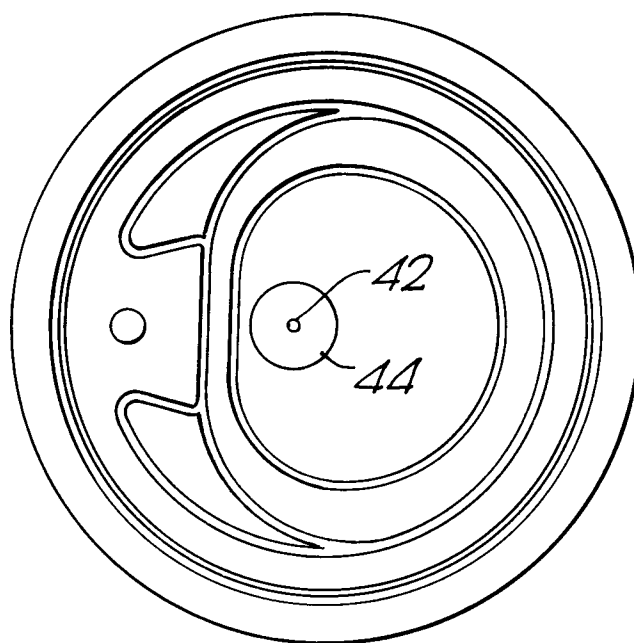


Fig.3b.



Fig.3 c.

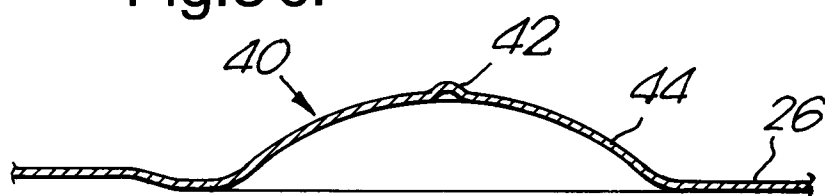


Fig.4 a.

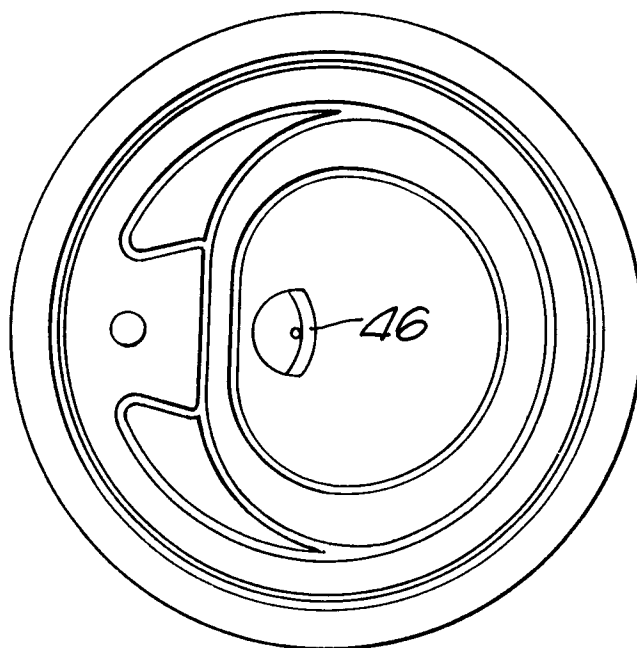


Fig.4 b.



Fig.4 c.

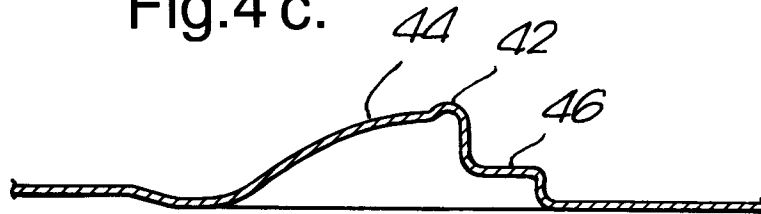


Fig.5a.

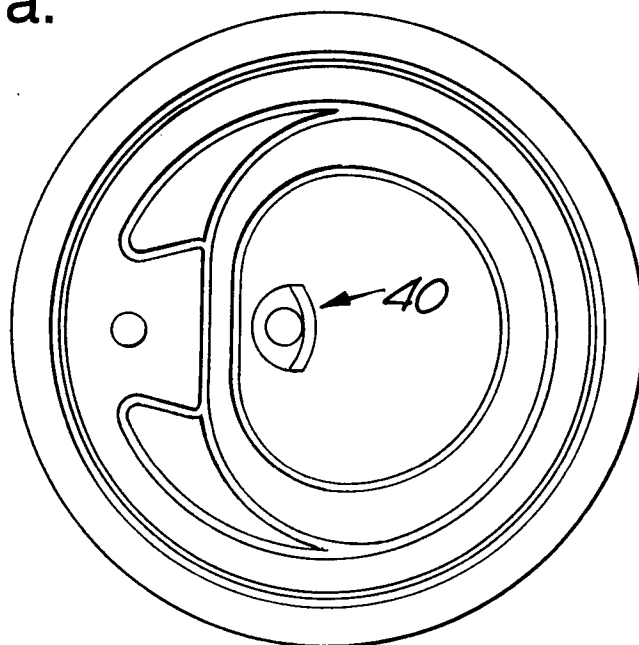


Fig.5b.

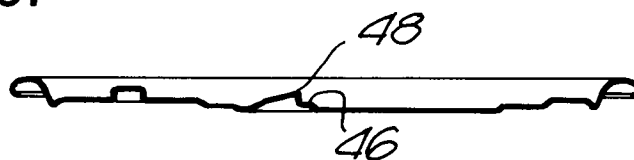


Fig.5c.

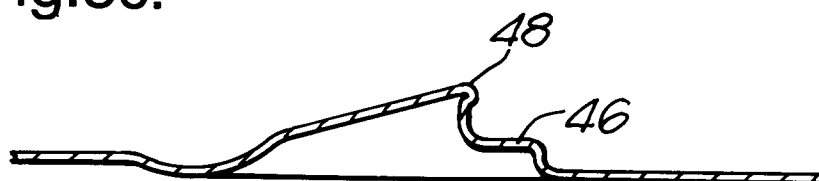


Fig.6 a.

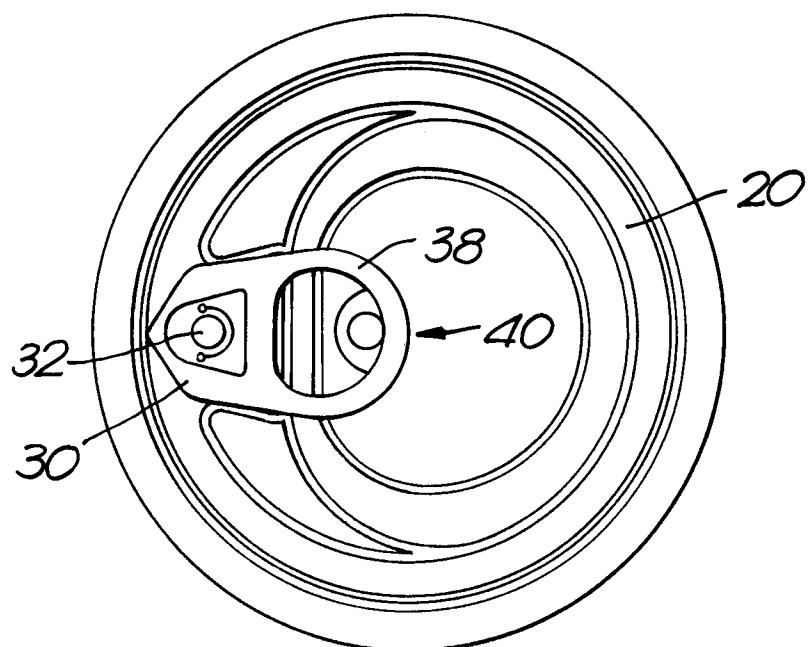
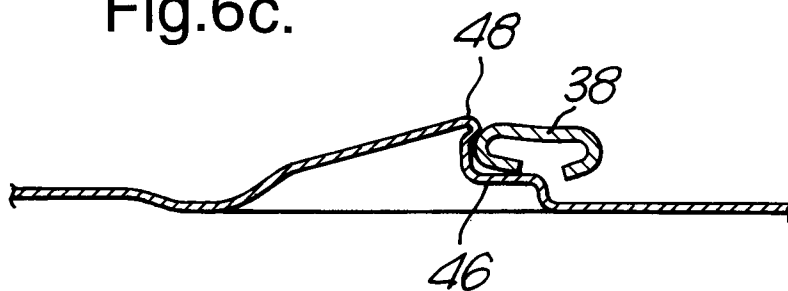


Fig.6 b.



Fig.6c.





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PARTIAL EUROPEAN SEARCH REPORT

Application Number

which under Rule 45 of the European Patent Convention EP 94 30 7478
shall be considered, for the purposes of subsequent
proceedings, as the European search report

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)
X	US-A-3 929 252 (LA CROCE) * column 2, line 50 - line 52 * * column 3, line 55 - line 61; figures 3-4 * * column 4, line 14 - line 17 *	1,3,5	B65D17/34
A	US-A-3 868 918 (SMITH, JR ET AL.) * column 3, line 45 - column 4, line 2; figure 2 * * column 5, line 19 - column 6, line 19; figures 5-14 *	1,3,5,6	
A	FR-A-2 102 290 (FRAZE) * page 17, line 21 - line 25; figure 10 *	4	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65D
INCOMPLETE SEARCH			
<p>The Search Division considers that the present European patent application does not comply with the provisions of the European Patent Convention to such an extent that it is not possible to carry out a meaningful search into the state of the art on the basis of some of the claims</p> <p>Claims searched completely : 1-7 Claims searched incompletely : Claims not searched : B, 9 Reason for the limitation of the search:</p> <p>See Rule 29(6) EPC</p>			
Place of search		Date of completion of the search	Examiner
THE HAGUE		19 January 1995	Bridault, A
CATEGORY OF CITED DOCUMENTS			
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