(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 394 497 A1**

(12) **EUROPEAN PATENT APPLICATION published in accordance with Art. 158(3) EPC**

(21) Application number: **89911868.1**

(51) Int. Cl.5: **B65D 81/10**

(22) Date of filing: **27.10.89**

(86) International application number:
**PCT/JP89/01110**

(87) International publication number:
**WO 90/04554 (03.05.90 90/10)**

(30) Priority: **27.10.88 JP 139200/88 U**
**14.10.89 JP 11202/88 U**

(43) Date of publication of application:
**31.10.90 Bulletin 90/44**

(84) Designated Contracting States:
**AT BE CH DE FR GB IT LI LU NL SE**

(71) Applicant: **SHINWA PACKAGE KABUSHIKI KAISHA**
**4-4 Bakurohmachi 4-chome, Chuo-ku**
**Osaka City, Osaka Prefecture 541(JP)**

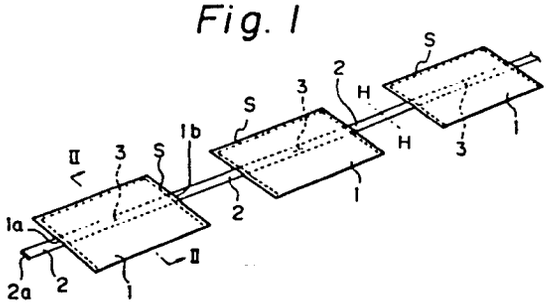
(72) Inventor: **MITSUDA, Teruo, Chiba Branch Off.**
**SHINWA PACK K.K.**
**18-6, Imai 2-chome**
**Chiba City, Chiba Prefecture 260(JP)**

(74) Representative: **Verdier, Louis**
**Cabinet Pierre HERRBURGER 115 Boulevard Haussmann**
**F-75008 Paris(FR)**

# (54) INFLATABLE SELF-SEAL TYPE BUFFER SHEET.

(57) This invention relates to an inflatable self-seal type buffer sheet comprising a series of individual air bags made of a heat-sealable material, inflatable when air is blown into it but having normally a flat shape, and at least one air blow tube penetrating through these air bags, connected to them by heat-sealing and equipped with a self-seal type valve consisting of a slit or slot at a position inside the individual air bag. When air is charged from the end portion of the air blow tube, the individual air bag inflates independently within its allowable limit. The inflated individual air bags press the air blow tube by internal pressures so that the slits or slots are pushed to the opposed surfaces of the tube and forms the self-seal type check valves. The buffer sheet of the present invention is inserted into gaps having irregular sizes under a flat state, and when inflated, the individual air bags inflate independently to the sizes of the gaps into which it is inserted, and can reliably function as an easy-to-operate support material or buffer material. So long as each self-seal type valve functions, the each air bag is not affected by the damage or cut-off of any other air bags.

Fig. 1




EP 0 394 497 A1

# INFLATABLE SELF-SEAL TYPE BUFFER SHEET

## Technical Field

This invention relates to an inflatable self-seal type buffer sheet, and more particulartly to a buffer sheet comprising a series of individual air bags made of a heat-sealable material such as palstic or rubber films, inflatable when air is blown thereinto but having normally a flat shape, and equipped with a self-seal type valve inside each of air bags. The buffer sheet of the present inventtion can be used as a retainer material, a buffer material or packaging material.

## Background of the Invention

A buffer material named "air cap" is known in the art which comprises two layers of films adhered together, and a plurality of small protrusions or cells formed on either of the films and filled with air. This is a buffer sheet having air encapsulated preliminarily in each closed cell and a constant volume or thickness initially invariably determined. So, the "air cap" buffer sheet has many disadvantages that it cannot be used widely in different applications such as filling larger or smaller spaces than its original volume, or inserting into irregular gaps, and that it occupies relatively large volume even during transportation or storage.

In view of these disadvantages, applicant of the present

application has developed a novel self-seal type buffer material which has a flat shape before use and, when inflated by air, has several portions thereof bulging variably and independently in which air blown from outside is confined by a self-seal type valve formed in respetive bulged portions. This type of buffer material may be called "post-inflating" type and is desclosed in my co-pending application, Japanese Utility Model application No. SHO 60-184510 (Laid Open Publication No. SHO 62-93066). This new type of buffer material has several advantages in that it has normally a thin thickness prior to use and can have several portions inflated variably and independently from each other under the influence of surrounding pressures or forces acting thereon.

Unfortunately, however, the self-seal type buffer sheet in my co-pending application has relatively complicated structure requiring various components and a large amount of materials, and is relatively expensive to manufacture, all these factors being to be improved. Further, the buffer sheet in my prior application is originally contemplated to be used for covering relatively large areas rather than to be used as narrow strips or as "one point" buffer to be inserted into a small gap and basically is not suited to a wide variety of use. Moreover, the buffer material in my co-pending application is relatively uneasy to manufacture due to its complicated structure and multiple components as well as delicate manual labor involed therein, and is not adaptable to mass-production processes.

## Disclosure of the Invention

Accordingly, it is an object of the present invention to provide an inflatable self-seal type buffer sheet which can be used in a wide variety of applications and can be economically manufactured using minimum materials and components through relatively simple procedures.

Another object of the present invention is to provide a novel self-sealable buffer sheet of the "post-inflating" type comprising a series of multiple air bags connected in tandem, each of which has a simplest self-seal type check valve formed "in situ" in each of infalted bags and can even be disconnected, if desired, from the remaining bags as a single air bag to be used as "one point" buffer.

Yet another object of the present invention is to provide an inflatable and self-sealable buffer sheet comprising a series of air bags which can be mass-produced with ease and has a wide variety of uses.

These and other objects of the present invention can be accomplished by providing a novel buffer sheet comprising individual air bags which are made of tough and flexible films or sheets such as plastic or rubber and connected in series, and which are in flat shapes prior to use, but can be expanded by blowing air into the respective bags. Each of air bags has at least one air blow tube of similar film material inserted therethrough and fixed thereto for air passage therethrough as well

as self-seal type check valve therein. The air blow tube has two flat surfaces at least inside the respective bags and either of these flat surfaces is formed with at least a slit or slot for each bag, which is sealingly engaged with the other flat surface to form self-sealing check valve when two flat surfaces are pressed against each other.

In another embodiment of the present invention, an inflatable and self-sealable buffer sheet can be mass-produced by a relatively simple, economical and practical process comprising:

(a) providing an upper and a lower heat-sealable films having respectively continuous length and certain width,

(b) trueing up respective side edges of the upper and lower films,

(c) performing longitudinally heat-sealing operations on the trued edges to form a continuous flat tubular member,

(d) separately providing another upper and lower film strips having narrower width than the tubular member, either of these strips having slits or slots formed thereon at predetermined distances, and also either one of the strips having non-fusable or non-heat-sealable coatings applied to its inside surface,

(e) superimposing these two strips one on the other and heat-sealing longitudinally the side edges thereof to form an air blow tube,

(f) inserting thus formed air blow tube into and through the above-mentioned flat tubular member, and

(g) performing transversely heat-sealing operations on the tubular member at positions not overlapping with the slits or slots formed on the blow tube, thereby to yield a novel inflatable self-seal type buffer sheet comprising individually defined and consecutively connected air bags and an air blow tube inserted therethrough having self-sealing check valves for each of the air bags.

The inflatable self-seal buffer sheet of the present invention comprises essentially two components, i.e., individual air bags functioning as buffer or retainer and an air blow tube combined therewith functioning as air passage for all of the air bags and also as check valves by themselves so that there are no inutile portions of materials present in the buffer sheet of the present invention. The self-sealing check valve according to the present invention is formed by the air blow tube itself, i.e. by slits or slots formed on one flat surface of the tube and by the other flat surface engaging with the slits or slots, so that it uses minimum of material and is simple in structure, easy to manufacture and most inexpensive. So long as the self-seal type check valves of the present invention function upon inflating of individual air bags, the blow tube can be cut off at any locations between adjacent inflated bags without fear of leakage of air from any bags. By virtue of this nature, the buffer sheet comprising a series of air bags of the invention can even be dic connected, if desired, at any locations between the bags so that

even a single bag can be used for "one point" buffer to fill a small or short gap. Usually, the buffer sheet of the present invention is employed as a "linear" buffer or retainer comprising multiple air bags connected in tandem or linearly which are inserted in the gaps between multiple objects, while it may also be used as "wrapping" or "spiral" buffer such that the buffer sheet is wrapped twice, trebly or more around any object. That is, the buffer sheet of the present invention can be used not only for covering linear spaces, but also for enveloping relatively large and wide surfaces or areas. Thus, the buffer sheet of the present invention has a wide variety of unlimited use, such ar "one point" buffer, "linear" buffer, and "face" buffer. In particular, where it is needed to fill a thin gap or irregular gaps, then the buffer sheet of the present invention can advantageously be inserted there in a flat state with no air blown, whereupon the individual air bags can readily be inflated by air blown from the tube end projecting outside the gap. The individual air bags can inflate up to their individually allowed limit to effectively and reliably fill the associated gaps.

## Brief Description of the Drawings

Figure 1 is a perspective view showing a portion of a first embodiment of an inflatable self-seal type buffer sheet having multiple air bags according to the present invention.

Figure 2 is an enlarged sectional view taken along the line

II - II in Figure 1 showing an air bag and a self-seal type valve or flat valve contained therein.

Figue 3A is an enlarged sectional view schematically showing a behavior of the flat valve during blowing of air into an air bag.

Figure 3B is an enlarged sectional view of an air bag and a flat valve in it upon completion of air blowing.

Figure 4 illustrates a portion of the buffer sheet of the present invention comprising multiple air bags fully inflated.

Figure 5 is a partial perspective view showing a second embodiment of the buffer sheet comprising multiple air bags in a flat state of the invention with a portion of a bag cut away to show an inside structure.

Figure 6 is a partial perspective view showing a preferred and practical third embodiment of the inflatable self-seal type buffer sheet in a flat state of the present invention.

Figure 7 is an enlarged partial sectional view taken longitudinally of an air blow tube shown in Figure 6 and representing an example of the self-seal type valve formed on the tube.

Figure 8 is an exploded parital perspective view of various components forming the buffer sheet shown in Figure 6.

Figure 9 is an enlarged and partially broken away sectional view taken substantially along the line IX-IX in Figure 6 showing the bonding between the air bag and the blow tube.

Figure 10 is a partial enlarged perspective view with potions cut away of a modified form of the air blow tube and the self-seal type valve.

Figure 11 shows schematically an operation of individual air bags during blowing of air.

Figure 12 illustrates an air bag upon inflated and its self seal valve acting to shut off air flow.

Figure 13 schematically shows inflated buffer sheets of the invention being used as retainer or buffer between a container and articles placed therein.

## Best Mode for Carrying out the Present Invention

Referrubg to Figure 1, a first embodiment of an inflatable self-seal type buffer sheet according to the present invention comprises a series of individual air bags 1 and an air blow tube 2 inserted through and bonded to the bags 1. Each of individual air bags 1 is formed by folding a square piece of film, preferably plastic film, and sealing three sides of the folded film as by heat-sealing or adhesives as illustrated by broken lines S. Prior to the formation of sealed portions S, a flattened air blow tube 2 of similar film is inserted through opposed ends of each air bag 1. Then, sealing is made at opposite ends 1a and 1b of each bag to thereby bond together the outer surface of the tube 2 and the inner surface of the air bag 1. Thus, a plurality of air bags 1 are connected in series by a single air blow tube 2.

Inner surfaces of the tube 2 at the sealed portions S are left unsealed and opened as an air passage, as described hereinafter more specifically in connection with a second and a third

embodiments. At least one of longitudinal ends 2a is left open for an air intake end.

The air blow tube 2 has a flat upper side 2u and a flat lower side 2ℓ as seen from Figure 2 which are contiguous to each other prior to blowing of air and present normally a flat shape. The air blow tube 2 is provided with a self-sealing check valve 3 in each of the individual bags 1. In Figure 1, the self-seal valves 3 are shown by broken lines.

The self-sealing valve 3 preferably comprises a slit formed longitudinally in the upper flat surface 2u as seen in Figure 2, and thus has a flat shape in normal state. The slit 4, when air is blown into the tube 2, opens to admit air into the air bag 1 as more fully described later. When air bag 1 is filled with air and blowing is ceased, the tube 2 is pressed by surrounding air pressure and the slit 4 is forced to engage closely with the opposite flat surface 2ℓ to thereby form self-sealing check valve to shut off air flow out of the inflated air bag 1.

Air bags 1 and air blow tube 2 of the present invention may be made of tough and flexible film materials such as plastic or rubber films. There are no particular limitations imposed as to the configuration and the size of the individual air bags and air blow tube. For example, the individual air bags 1 of the flat square shape shown in Figure 1 may have the sides of from a few centimeters to about 50－60 centimeters long, and the air blow tube may have a width of from a few millimeters to about

100 millimeters and a continuous lengths. Air bags having the sides of even 1 meter or more can be obtained if a thick and tough film is employed. In such case, two or more air blow tubes 2, each having slit valves formed thereon are desirably provided in parallel and inserted through each air bag. In addition, the individual air bags may be made having roundish sides instead of linear or square sides.

Such inflatable self-sealable buffer sheet of the present invention may be utilized, e.g., for protecting articles such as grass bottles by winding the sheet around the articles, or inserting it into gaps between a container and articles positioned therein. In any case, the buffer sheet of the invention can be set in a desired place before blowing air through the blow tube 2 and inflating the individual bag. To this end, air is injected into the open end 2a of the tube 2 as by an air compressor (not shown). The tube 2, normally in a flat state as shown in Figure 2, is inflated as seen in Figure 3A to admit air therethrough and at the same time the slit 4 of the tube 2 opens to let air in the individual air bags 1 as indicated by arrows to inflate them. The individual air bags 1 can be inflated freely if no restrictions exist around them. When the air bags are inflated to the desired extent, blowing of air is ceased upon which the blow tube 2, as shown in Figure 3B, is compressed by internal air pressure inside air bags 1 and the slits are pushed naturally onto the opposite flat surfaces to form self-sealing valves

for shutting off air flow out of the individual air bags 1 and holding the air bags in their inflated states. Figure 4 illustrates a series of inflatd air bags 1 which are connected with each other by a flat air blow tube 2 presenting a unique appearance for the buffer material.

Figure 5 represents a second embodiment of the buffer sheet of the present invention comprising a series of air bags. The buffer sheet of the second embodiment is manufactured by providing a continuous tubular member made of, e.g., plastic film, inserting into and through the tubular member an air blow tube 2 having a series of slots 14 forming self-seal type check valves 3, and forming transverse heat-sealed portions E as shown by hatching for clarity purpose in Figure 5 at positions not overlapping with the slots 14 to tereby form individual air bags 11. Prior to forming heat-sealed portions E, non heat-sealable tapes or powders should be disposed within the blow tube 2 at least at positions corresponding to heat-sealed portions to be formed in order to leave air passage opened therewithin and adhere the outside surface of the tube 2 to the inner surface of the tubular member. More practical and preferred method for leaving the air passage open will be described in connection with Figure 9. In the embodiment of Figure 5, slots 14 forming the self-sealing check valves are seen as having wider width than the slits 4 shown in the previous example and yet they will perform the same function as the slits 4 in that they are pressed against opposed

flat surface of the tube by internal air pressure in the inflated air bags 11 to form the self-closing check valves.

A more practical and preferred embodiment of the inflatable self-seal type buffer sheet comprising a series of air bags of the present invention is shown in Figure 6. The buffer sheet of this embodiment comprises a series of consecutive air bags 21 which are normally flat in shape and inflatable individually, and a common air blow tube 22 inserted in a normally flat shape through the consecutive air bags and having at least one self-sealable check valve 23 at a position inside each air bag 21. The blow tube 22 has an end 22e extending outwardly from a terminal air bag 21 and forming an air intake. The other end (not shown) of the tube 22 may be conveniently closed for easy and efficient blowing of air into the respective air bags, though it may be left open.

The air blow tube 22 with its self-sealable valve 23 is partially illustrated in Figure 7 in an enlarged longitudinal sectional view. The tube 22 has two flat surfaces 22u and 22ℓ of which one surface is provided with transverse slits 24 respectively forming self-sealable check valves 23 as shown in Figure 6 in cooperation with the opposing flat surface 22ℓ. The slits 24 can take various forms such as + or × marks in place of the linear slits shown in previous examples.(see Figure 10)

A non-fusable coating 25 is applied to the inside surface of the blow tube 22 as expediently shown by numerous dots on a

lower strip 22ℓ in Figure 8. The coating 25 may be applied to the inside of either of upper or lower film strips 22u or 22ℓ. The non-fusable or non-heat-sealable coating 25 is preferably made of heat-resistant releasing agents based on silicone compositions, although other heat-resistant inks or paints may also be used. In any event, it is desirable to utilize readily applicable liquid materials to form non-fusable coating 25. Further, tinted or colored liquid materials may be used to form a visible coating 25.

Now referring to Figure 8, a practical method for readily mass-producing the inflatable and self-sealable buffer sheet of the present invention will be described in connection with the practical embodiment shown in Figure 6. To form consecutive and individual air bags 21, an upper film 21u and a lower film 21ℓ respectively of heat-sealable materials having continuous length and certain width are provided. Two films 21u and 21ℓ are trued up at their side edges and heat-sealed thereat as indicated by longitudinal sealed portions 27 in Figure 8 to form a flat and inflatable tubular member.

The air blow tube 22 is constituted by two heat-sealable strips 22u and 22ℓ having respectively slightly longer length and narrower width than the tubular member. Preferred material both for films 21 and strips 22 is a laminated film based upon nylon and polyethylene, although other film or sheet materials having heat-sealability and permeability as well as appropriate

physical strength can be used. In particular, relatively thick and tough materials are desirably employed for films 21u and 21ℓ forming the individual air bags. Slits 24 for forming the check valve 23 of self-seal type are preliminarily formed at predetermined intervals on one of strips, e.g., upper strip 22u in the illustrated embodiment. On the other strips, lower strip 22ℓ, is applied the non-fusable coating 25 as previously described. These two strips 22u and 22ℓ are combined toghether and heat-sealed at their respective side edges as indicated by phantom lines 29 to form a normally flat air blow tube 22.

The flat tube 22 is inserted between upper and lower films 21u and 21ℓ of the flat tubular member with the end 22e extending therefrom. Then, heat-sealing operations is performed on the tubular member transversely at positions not overlapping with slits 24 on the tube 22 to form pairs of transvers seals 28 on each position thereby to yield the inflatable and self-sealable buffer sheet of the present invention comprising a series of individual air bags 21 consecutively connected through link portions 30 as depicted in Figure 6.

Each of individual air bags 21 is defined by longitudinal sealed lines 27 and transverse sealed lines 28 to form an independent inflatable body. As illustrated in Figure 9, upper and lower films 21u and 21ℓ at the transverse sealed line 28 are bonded securely at their inner surface to the outer suraces of the blow tube 22 by heat-sealing operation, whereas the inner

surfaces of the tube 22 remain unadhered due to the existence of the non-fusable coating 25 applied thereto and an air passage is secured through the individual air bags 21. In Figure 9, portions represented by hatching indicate adhesion of upper and lower films 21u 21ℓ with the blow tube 22, the sections of the films 21u and 21ℓ being shown with no hatching. Non-fusable coating 25 on the inside surface of the blow tube 22 is expediently represented by numerous dots.

The inflatable and self-sealable buffer sheet illustrated in Figures 6 through 9 is essentially adaptable to the mass-production in that it is readily and efficiently manufactured by relatively simple procedures comprising:

applying non-fusable coating 25 to the inside surface of one of the strips and forming slits 24 at predetermined distances on either of the strips,

forming longitudinal heat-seals 29 onsuperimposed side edges of strips 22u and 22ℓ to produce the flat tube 22,

inserting the tube 22 between the upper and lower continuous films 21u and 21ℓ followed by forming longitudinal and transverse heat-seals 27 and 28 to yield the individual consecutive air bags 21.

Referring now to Figure 10, a varied form of the buffer sheet in Figure 6 is shown as a partial enlarged perspective view. This varied form is substantially the same as the embodiment shown in Figure 6 except that it has partial coatings 26 of

non-heat sealable nature at the locations corresponding to transverse seal lines 28 and check valves 23 of the self-seal type composed of × marks instead of linear slits. Non-heat-sealable partial coatings 26 may be applied to the inside surface of either strips as a single small area covering a pair of seal lines 28 or discrete areas respectively underlying each seal line 28. When the flat tube 22 is inserted into the tubular films 21u and 21ℓ, partial coatings 26 should be exactly aligned with the locations on which respective seal lines 28 are to be formed. In this respect, it is advantageous to use colored heat-resistant materials to form partial coatings 26. Between paired partial coatings 26 are formed spaces 30a which are to be aligned with respective link portions 30 between individual air bags 21. Consecutive individual air bags 21 may be devided, if desired or necessary, into a single air bag or two or more consecutive air bags by cutting the same along the intermediate line between adjacent bags as indicated by a broken line 31 in Figure 10, just the same as cutting of the blow tube 2 along the line H-H in Figure 1. In such cases, the cut end of the blow tube need not be sealed for ensuring maintenance of inflated state of devided air bag or bags, while cut ends may of course be sealed for safety purpose.

Referring to Figures 11 and 12, operations of the buffer sheet of the present invention will be described as to inflating of individual air bags (Figure 11) and maintaining the inflated

state by virtue of the self-seal type check valve according to the present invention (Figure 12).

In Figure 11, air is injected by an appropriate means such as an air compressor P into the tube end 22e protruding from a terminal air bag $21_1$, which is yet in a flat shape as shown in Figure 6, whereby the blow tube 22 distends as illustrated in Figure 11 to supply an air flow A into consecutive air bags $21_1$, $21_2$, $21_3$ ··· to inflate them increasingly in this order. Slit valves 24 of the respective air bags 21 are opened by air blow A of which certain protions a enter the respective air bags to expand them to the extent required for each bag. Then, stopping the injection of air through means P causes the blow tube 22 to be pressed and flattened, as shown in Figure 12, by the reaction r from the internal air pressure and the slit valve 24 to be closed to shut off air passage through the tube 22, thus preventing air blown into the inflated air bags from escaping or leaking therefrom even if air intake end 22e be left open. Preferably, however, some cutoff means S may be employed on the intake end 22e for the safety purpose.

The inflatable self-seal type buffer sheet according to the present invention can be used in a wide rariety of appications. An example of such use is illustrated in Figure 13 in which a container C accommodates a number of articles B having different sizes so that spaces of irregular sizes are left between the container and the respective articles. If conventional buffer

or retainer materials having a constant thickness are to be used to fill such uneven spaces, it is necessary to employ several buffr materials having several thicknesses corresponding to the respective spaces or to repeatedly use the buffer materials of a constant thickness to completely fill such spaces. This is very cumbersome and time-consuming procedures. In contrast, according to the present invention, a single continuous buffer sheet comprising a series of individual air bags initially in a flat state can be inserted into uneven spaces, e.g., at the left side of the container in Figure 13, before or after the articles are placed in the container C, and then air is blown into the protruding intake end 22e to inflate the individual air bags $21_1$, $21_2$, $21_3$ and $21_4$ independently to the extent that the respective air bags are allowed within the respective spaces of uneven sizes. Thus, uneven spaces inside the container can be effectively filled up in a single and simple procedure. Of course, spaces of substantially uniform size such as shown at the right side of the container C can equally be filled up by inserting a flat buffer sheet therein and then inflating the same to a uniform volume as shown by individual air bags 21. Operations for filling the spaces with the buffer or retainer materials of the present invention are far more easier and speedier than those utilizing the conventional materials having constant thickness or volume, and yet the far more reliable results can be obtained by the present invention.

Another usage is that the buffer sheet of the present invention can be advantageously utilized for protecting bittle articles such as glass bottles to be packed in the container. In this case, many brittle articles can be individually wrapped with the buffer sheets in flat states of the present invention, and then the articles are placed in the container with spaces left thereamong. Thereafter, the buffer sheets wrapped around the respective articles can be inflated by air through the respective protruding ends to the respectively allowed limits, thus eliminating cumbersome procedures such as inserting of individual buffer materials into individual spaces after the articles are placed in the container, which may lead to dangerous situations that operators may hurt their hands when bottles are accidentally broken, as well as undesirable conditions that inaccessible spaces are insufficiently filled up. Thus, the present invention provides speedy, safe and reliable packing of the brittle articles with low operational costs.

A remarkable feature of the inflatable and self-sealable buffer sheet of the present invention resides in that the individual air bags are independent from each other as to their abilities to expand and maintain expanded states. For example, if any one of air bags is broken, the remaining all of air bags can maintain their fully inflated state without being affected by the broken air bag so long as their self-seal type check valves function. Likewise, any air bags received in larger

spaces after or downstream of smaller space can be fully inflated to their own limits irrespective of insuffidiently inflated upstream air bag. Further, any of inflated air bags in series can be taken out by cutting at any desired linking portions without affecting all other bags independently inflated. Cutting may be done before inflating air bags, so the buffer sheet of the present invention can be used in a desired length irrespective of the initial length or even in a single air bag as "one point" use. Thus, the buffer sheet of the present invention can be widely used in variable fashions such as one point buffer, linear buffer, spirally wound buffer or buffers arranged in parallel covering some surface areas.

The buffer sheet of the present invention provides maximum effects by minimum components and materials in that its blow tube with slits or slots can form by itself self-seal check valves upon blowing of air. Simple structure of the buffer sheet of the presetn invention with minimum components enables mass-production with low cost and wide usage.

# CLAIMS

1. An inflatable self-seal type buffer sheet comprising:

a series of individual air bags made of heat-sealable material, which are inflatable independently, but normally in flat shapes, and

at least one air blow tube also made of heat-sealable material and penetrating said air bags longitudinally and bonded thereto, said air blow tube or tubes being equipped with slits or slots forming self-seal type check valves at positions inside the respective air bags.

2. The inflatable self-seal type buffer sheet as claimed in Claim 1 wherein said individual air bags are spaced apart from each other and said air blow tube penetrates said spaced apart air bags and is bonded to the opposite ends of each air bag by heat-sealing, the inside surfaces of said air blow tube at heat-sealed positions being left unadhered as open air passage.

3. The inflatable self-seal type buffer sheet as claimed in Claim 1 wherein said series of individual air bags are formed from a heat-sealable tubular member of continuous length through which said air blow tube is inserted and on which transverse heat-sealings are made at positions not overlapping with said slits or slots on the air blow tube to yield longitudinally consecutive individual air bags.

4. The inflatable self-seal type buffer sheet as claimed in Claim 1 wherein a plurality of air blow tubes penetrate in parallel said individual air bags.

5. The inflatable self-seal type buffer sheet as claimed in Claim 1 wherein said series of air bags are formed by providing upper and lower heat-sealable films of continuous length and of relatively wide width, heat-sealing said two films along their both side edges to form a continuous tubular member, and, in addition, providing upper and lower heat-sealable film stips of narrower width and slightly longer than the tubular member, forming slits or slots to be self-sealable valves at predetermined distances on either of said film strips, applying non-heat-sealable coatings on the inner surface of either of said film strips, then heat-sealing said two film strips along their both side edges to form said air blow tube which is inserted into and through said tubular member with at least its one end protruding from the end of said tubular member, and performing transversely heat-sealing operations on said tubublar member at its ends and at positions not overlapping with said slits or slots on the air blow tube to thereby yield longitudinally consecutive individual air bags.

6. The inflatable self-seal type buffer sheet as claimed in Claim 5 wherein said non-heat-sealable coatings are formed by heat-resistant silicone releasing compositions, colored or uncolored.

7. The inflatable self-seal type buffer sheet as claimed in Claim 6 wherein said non-heat-sealable coatings are applied partially to the areas on the film strip over which said transverse heat-sealings are to be made.

8. The inflatable self-seal type buffer sheet as claimed in Claim 5 wherein said transverse heat-sealings are comprised of paired seal lines spaced apart by narrow widths.

Fig. 1

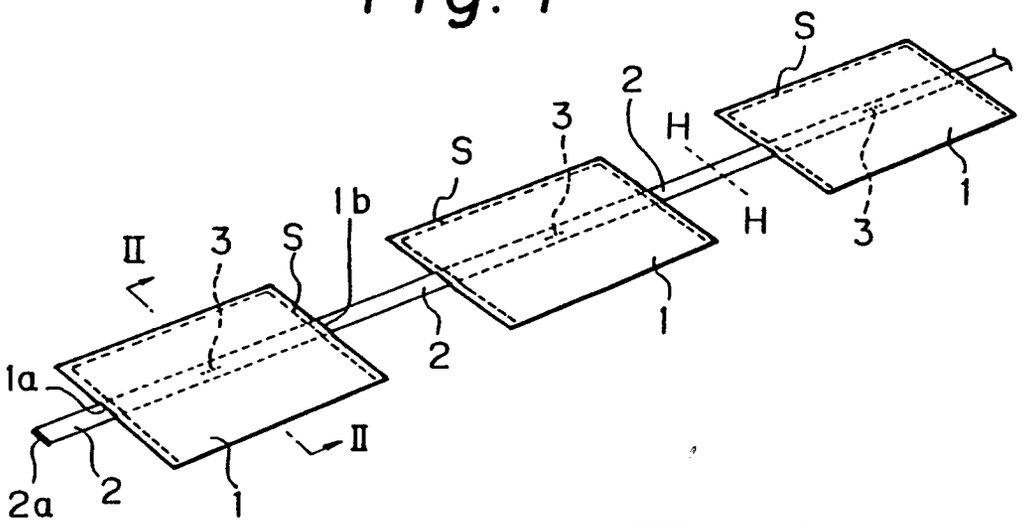



Fig. 2

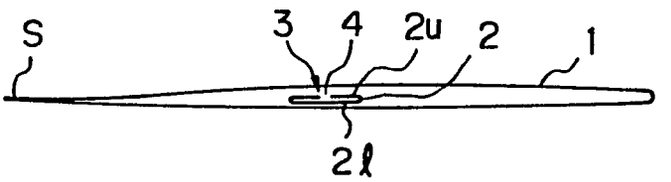



Fig. 3A

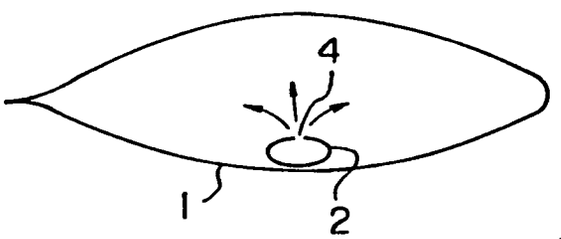



Fig. 3B

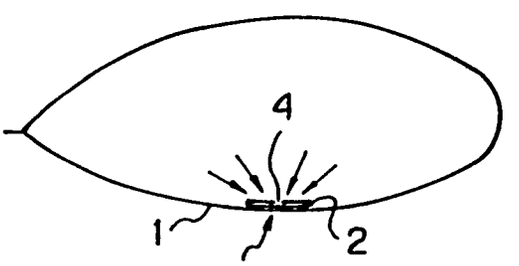


Fig. 4

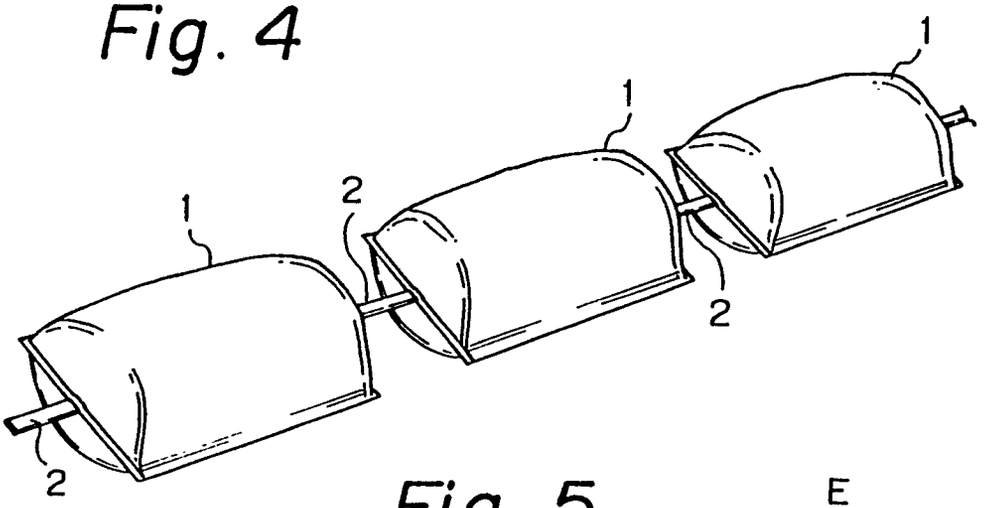



Fig. 5

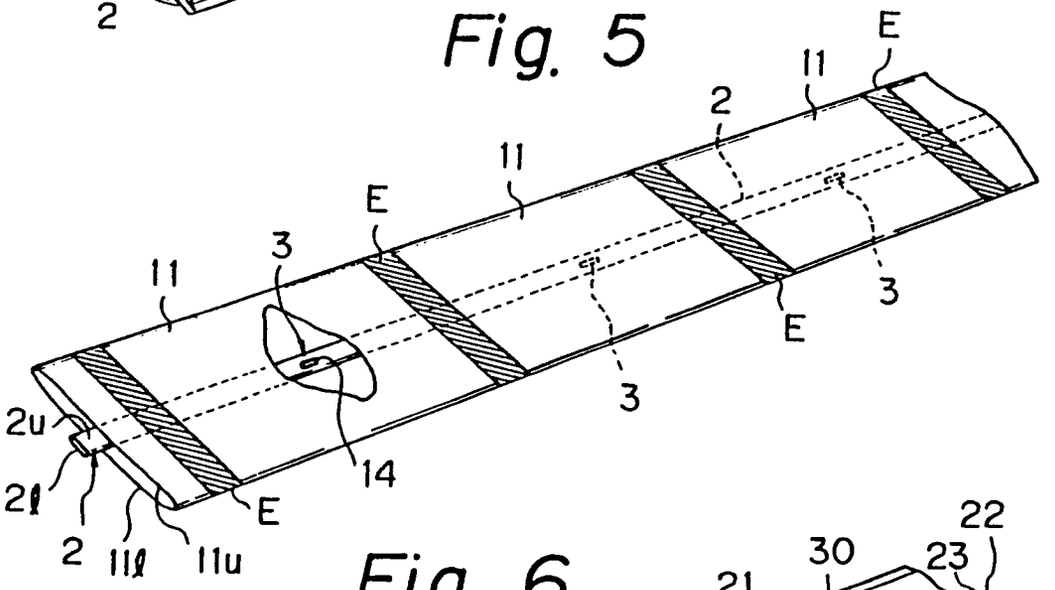



Fig. 6

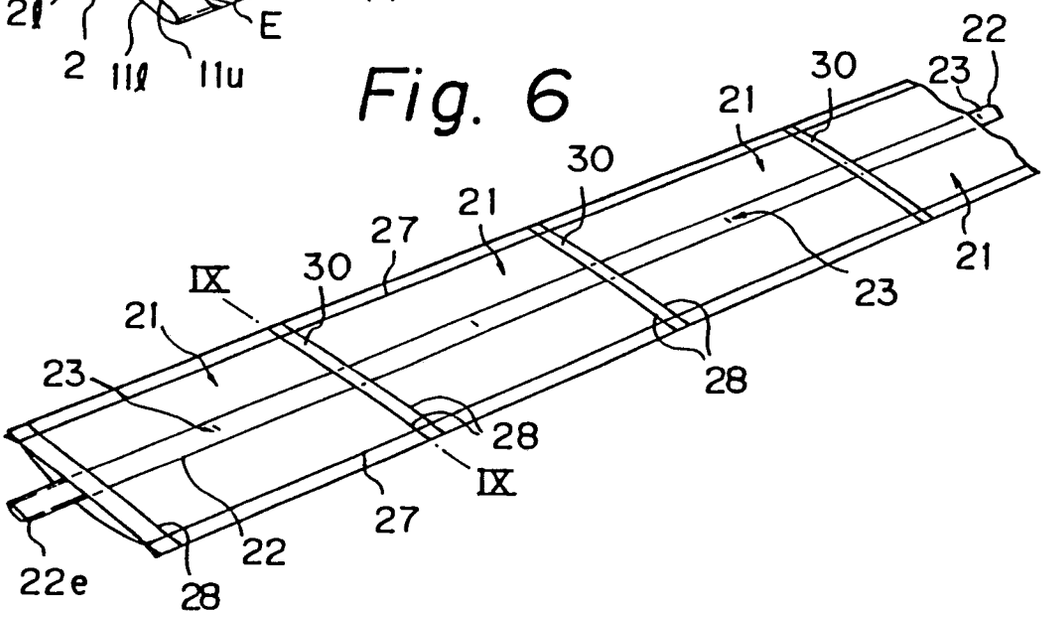


Fig. 7

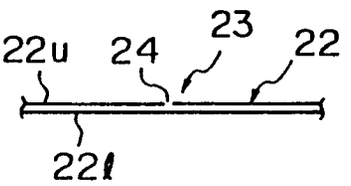



Fig. 8

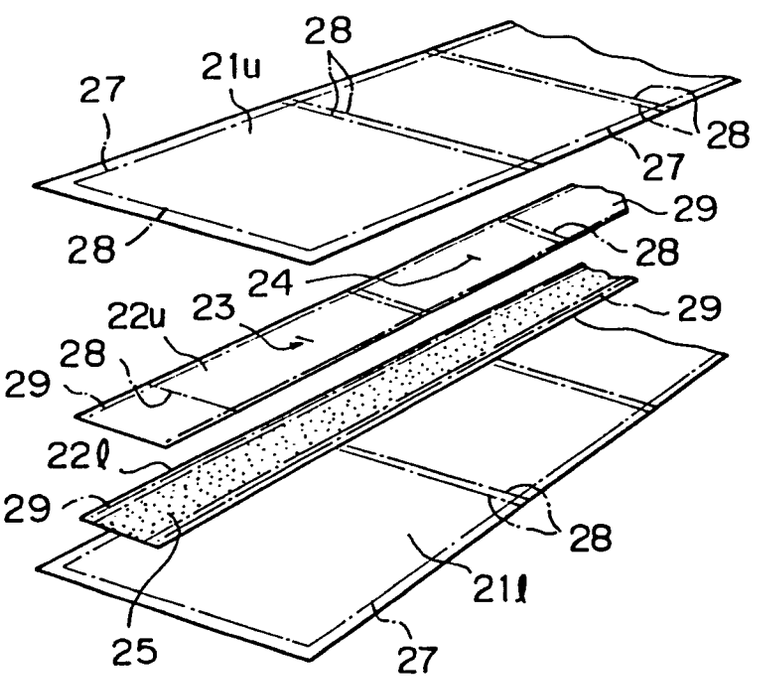



Fig. 9

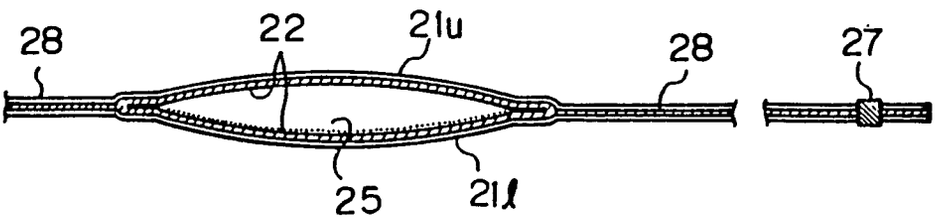


Fig. 10

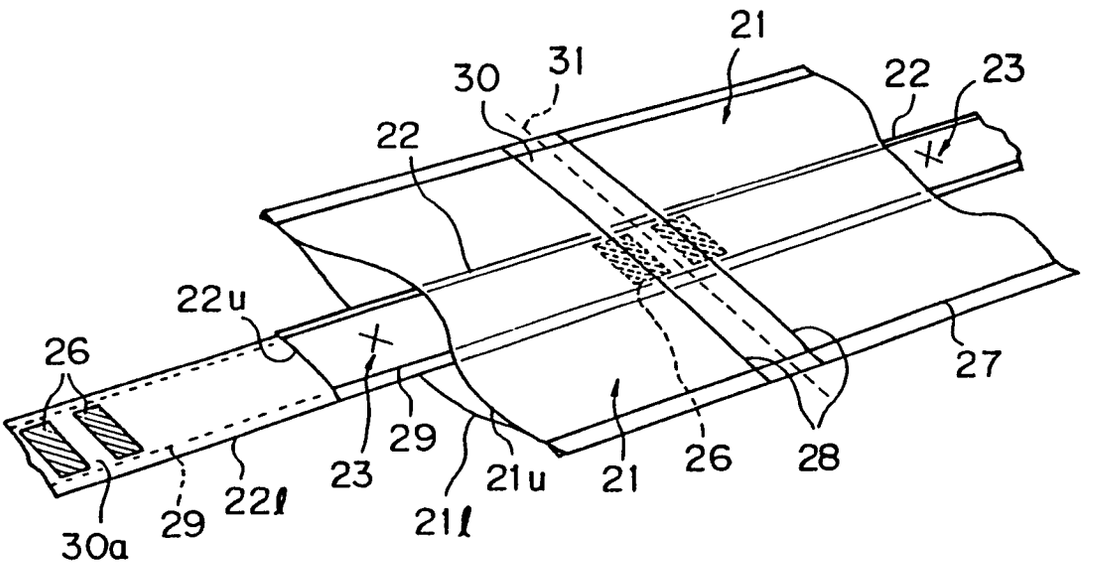

21
30
31
22
23
22
22u
26
27
29
23
21u
21
26
28
22ℓ
29
30a
21ℓ

Fig. 11

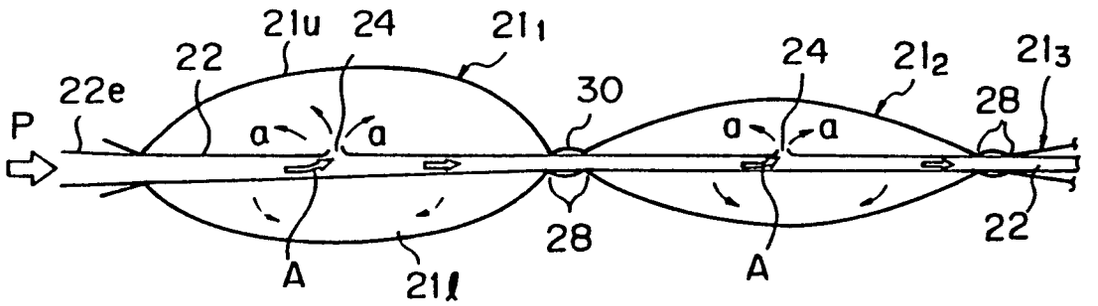

21u
24
21₁
22
24
21₂
21₃
22e
30
28
P
a
a
a
a
28
22
A
21ℓ
A

Fig. 12

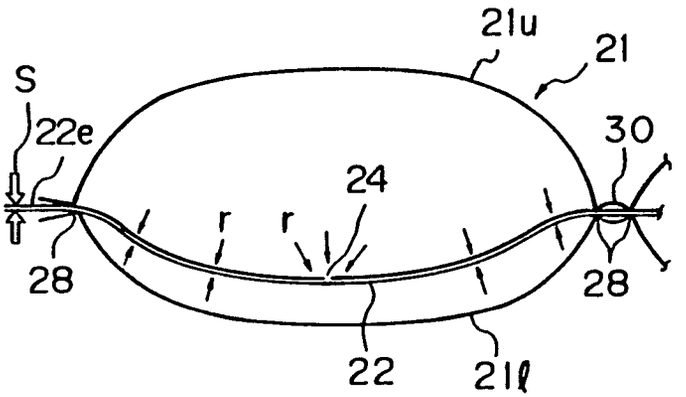
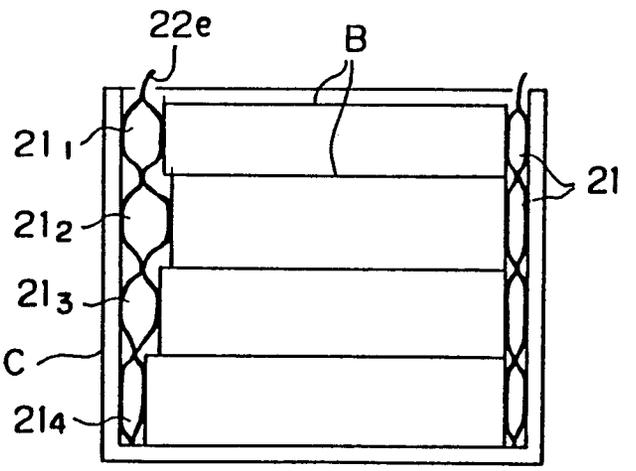



Fig. 13



# INTERNATIONAL SEARCH REPORT

International Application No PCT/JP89/01110

**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

Int. Cl[5] B65D81/10

**II. FIELDS SEARCHED**

Minimum Documentation Searched [7]

| Classification System | Classification Symbols |
|---|---|
| IPC | B65D81/02, 81/10, 81/14 |

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

| | |
|---|---|
| Jitsuyo Shinan Koho | 1926 - 1989 |
| Kokai Jitsuyo Shinan Koho | 1971 - 1989 |

**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] |
|---|---|---|
| P | JP, A, 1-153829 (Nissin Service Kabushiki Kaisha), 16 June 1989 (16. 06. 89), (Family: none) | 1 - 8 |
| A | JP, U, 62-93066 (Shinwa Package Kabushiki Kaisha), 13 June 1987 (13. 06. 87), (Family: none) | 1 - 8 |
| A | JP, Y1, 47-11039 (Matsushita Electric Ind. Co., Ltd.), 24 April 1972 (24. 04. 72), (Family: none) | 1 - 8 |
| A | JP, Y1, 40-8230 (Shibata Noritoshi), 15 March 1965 (15. 03. 65), (Family: none) | 1 - 8 |

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

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

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"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

"&" document member of the same patent family

**IV. CERTIFICATION**

| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report |
|---|---|
| January 10, 1990 (10. 01. 90) | January 22, 1990 (22. 01. 90) |
| **International Searching Authority** | **Signature of Authorized Officer** |
| Japanese Patent Office | |