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(54) Gusseted bag

(57) A method of forming a gusseted bag, in which a flattened tube with opposed side gussets is formed and the bottom of the tube is closed such that it will create four interior recesses between the closed bottom and trapped folded regions of said side gussets. An adhesive is selectably provided at appropriate parts

(56,58,60,62) of the bag material prior to the formation of the flattened gusseted tube such that during or after the gusseting step, the surfaces defining at least parts of the four interior recesses of the bag become secured together so as effectively to close these recesses and prevent significant ingress of bag contents thereto.

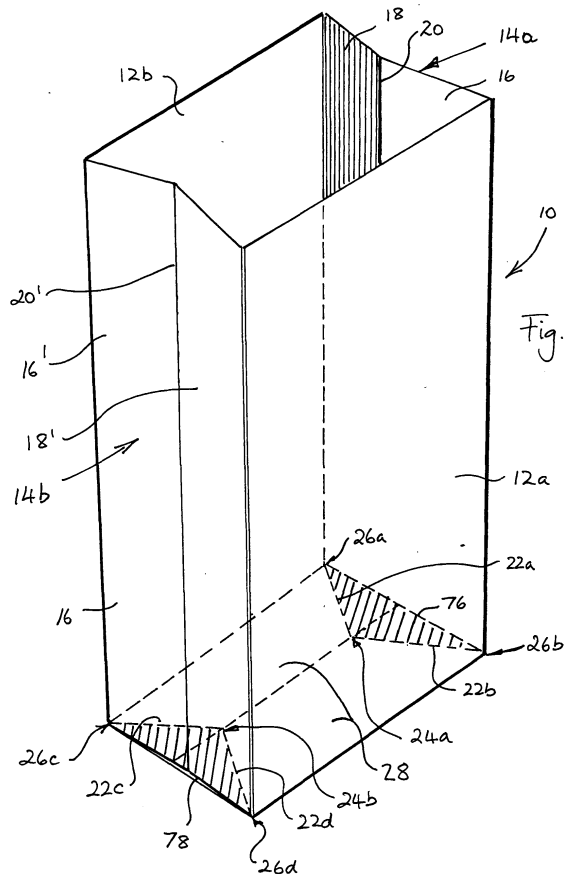


Fig. 1

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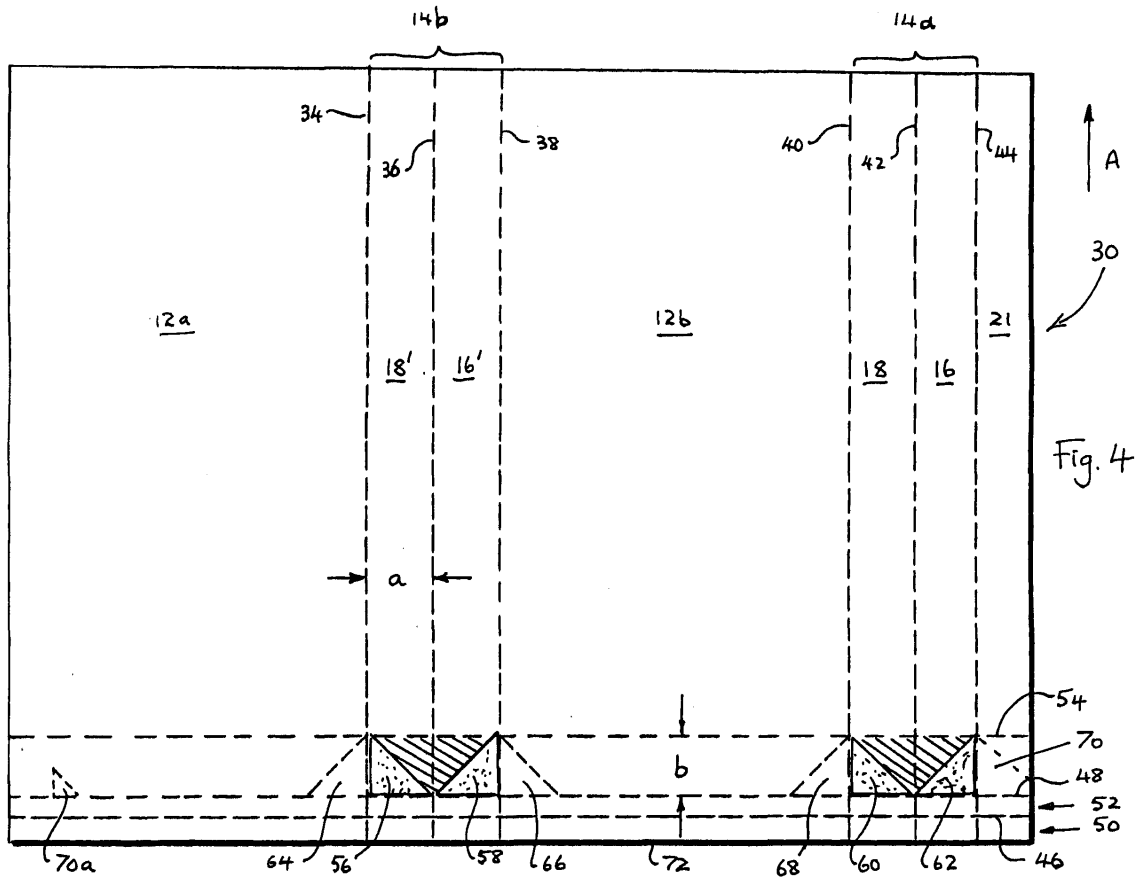


Fig. 4

## Description

**[0001]** The present invention relates to gusseted bags and is concerned in particular with open-mouthed, folded, gusseted bags/sacks of the type which assume a generally rectangular cross-sectional shape after filling.

**[0002]** All references hereinafter to bags refer equally to "sacks" and vice versa. The term "bottom" in relation to a bag means the end of the bag opposite to that having the open mouth through which the bag will be filled. The term "top" in relation to a bag means the open mouthed end which is closed only after the bag has been filled. The term "longitudinal" refers to an axis extending between the top and bottom of a bag. The term "lateral" means a direction transverse to the "longitudinal" direction.

**[0003]** Flat bags are common in the packaging trade and have identical front and rear panels separated by longitudinal folds. These bags suffer from the problem that, when filled, the corners tend to jut out and are liable to snag against extraneous objects, causing the risk of tearage and leakage of the bag. Additionally, most flat bags are not self-supporting, ie will not stand upright without support, unless a special pasted bottom closure (e.g. a block bottom) is provided, which requires expensive machinery.

**[0004]** It is conventional practice to overcome the problem of jutting corners by the inclusion, between the longitudinal junctions of the front and rear panels, of respective longitudinally extending gussets, which comprise initially V-shape edge panels which are folded inwardly so as to lie between the front and rear panels when the bag is flat but which open out so as to provide the bag with essentially flat side faces when the bag is filled. Each such gusset comprises a pair of generally rectangular subpanels connected along a common longitudinal edge and folded along that edge so as to form a flattened V when the bag is flat but which are unfolded to form said essentially flat side surfaces of the bag when the bag is filled. Thus, the gussets will open out (expand) naturally when the bag is filled to provide well defined side surfaces and to cause the bag to have an essentially rectangular transverse section.

**[0005]** Examples of this type of gusseted bag are disclosed in "Paper Sacks: A Users Guide", published in June 1995 by ETAPS (Environmental and Technical Association for the Paper Sack Industry, 5 Dublin Street, Edinburgh EH1 3PG, United Kingdom). Gusseted bags may have any type of bottom, e.g. sewn (Section 2.1.1.2 of the ETAPS publication), pinch closed (stepped ended, Section 2.1.1.5) or double folded (roll bottomed; Sections 2.1.1.7 and 6.2.7); and may be optionally closed at both ends during manufacture with a valve entry device at one corner for later filling (Section 2.1.2).

**[0006]** For the manufacture of such bags, there is formed a tube of the sack material, eg paper, into which the two gussets are arranged to be folded so as to establish a flattened tube of the sack material having a re-

spective one of said gussets extending along each of its two longitudinal edges.

**[0007]** In the simplest, cheapest bag format, the tube is closed to form the bottom of the bag by sewing or simply by folding over onto itself, once or twice, one end of the tube. The folded end can be secured either by gluing or, in principle, by any other means. This type of bottom closure is usually referred to as a double folded or "roll bottom" (Section 2.1.1.7, ETAPS publication).

**[0008]** However, there is a problem in practice with this simple type of closure. Because the folded-over, closed bottom of the bag traps the bottom ends of the two gussets inside the bag, eventual bag filling and gusset expansion creates, in the case of each gusset, two rough folds which extend respectively from the point at which the apex of the gusset fold is captured by the folded-over closed bottom to the two corners of the bag associated with that gusset. Each of these rough gusset folds formed during filling creates between itself and the base of the bag a respective interior recess. Especially when the bag is filled with fine powder, e.g. flour, or particulate or granular products, these four interior recesses become filled as well, leading to mis-shaping of the lower side and base regions, and a generally non-planar base. This means that the sack is only partially self-supporting and is liable to topple over when placed upright, causing problems during upright filling operations as well as stability and presentation problems when filled and upright at the point of sale of the bagged product.

**[0009]** This problem is commonly overcome by using a bag with a pre-formed flat, pasted bottom (e.g. block bottom). However, this requires machinery which is highly expensive.

**[0010]** Therefore, an object of the present invention is to overcome the above mentioned problem and to provide a gusseted bag which forms a regular, substantially planar base when filled, and which therefore renders the filled bag adequately self-supporting when upright without necessitating the capital expenditure required for pasted/block bottom bags and sacks.

**[0011]** In accordance with the present invention, a securing means is selectably provided at appropriate parts of the bag material prior to the formation of said flattened gusseted tube such that during or after the gusseting step, the surfaces defining at least parts of said four interior recesses of the bag become secured together so as effectively to close these recesses and prevent significant ingress of bag contents thereto.

**[0012]** Preferably, the securing means is an adhesive, such as a paper glue, which is applied to said appropriate parts of the bag.

**[0013]** Preferably, the securing means, such as the adhesive, is effective over substantially the whole of said surfaces defining said four internal recesses of the bag. However, in other embodiments the securing means can be effective only so as to close the mouths of said four recesses.

**[0014]** The securing means could also comprise dou-

ble-sided tape, ultrasonic sealing means (e.g. using paper coated for this purpose), heat sealing means (e.g. using polythene or other plastic plies or coatings), needle punching, stitching or any other practicable bonding arrangement capable of achieving the stated effect.

**[0015]** In the case of adhesive bonding, again any type of adhesive is possible, water-based or otherwise. Examples of water-based adhesive compositions include starch-based compositions or (for a faster, cleaner adhesive) polyvinyl alcohol compositions.

**[0016]** The adhesive or other bonding means can be inherent in the material used, or applied to it. The bonding can occur at any stage, e.g. when the blank is formed into a tube (e.g. in the case of applied adhesive) or in a later step after tube and/or bag forming (e.g. ultrasonic or heat sealing).

**[0017]** In a preferred embodiment, the securing means is provided at, or at part of, four triangular regions of a bag material blank prior to the formation of said flattened gusseted tube therefrom, said four triangular regions being disposed at positions which will, when the tube is gusseted and flattened, secure together the regions at the base end of the bag which lie beneath the triangular portions of the gussets which, as a result of the gussets being trapped to the bag base during the aforescribed bottom closing process, are caused to lie parallel to the base of the bag when the bag is filled.

**[0018]** The invention also provides an open mouthed bag of the type which has two side gussets and whose bottom is closed so as to trap the two gussets such that when the bag is filled it automatically forms a substantially planar, rectangular base portion which lies substantially perpendicular to its side walls, with a respective pair of triangular panels formed by each gusset lying over and substantially parallel to said substantially planar rectangular base portion and wherein at least parts of said two pairs of triangular panels are secured to said planar base portion such that the contents introduced in use to fill the bag are substantially prevented from entering between said pairs of triangular panels and the planar base portion and such that a substantially undistorted planar base can be maintained when the bag has been filled.

**[0019]** The present invention can be applied equally to the construction of single ply and multi-ply bags. In the case of multi-ply bags, it is principally with the innermost ply that the invention is concerned.

**[0020]** The invention is described further hereinafter, by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a diagrammatic perspective view of one embodiment of a bag constructed in accordance with the present invention and shown in its almost fully expanded state;

Fig. 2 is a diagrammatic enlarged perspective view of part of the bag of Fig. 1 showing the bag in a partially expanded state;

Fig. 3 is a perspective view showing part of the base region of the bag in its fully expanded state;

Fig. 4 is a plan view of a paper blank for forming the bag of Figs 1 to 3 showing fold lines which are established at various points on the formation of a bag; Fig. 5 is a plan view of a paper web showing how the blank of Fig. 4 can be formed and fed for continuous production of bags; and

Fig. 6 shows diagrammatically one possible apparatus for use in forming a bag in accordance with the present invention.

**[0021]** Referring first to Fig. 1, the illustrated bag 10 comprises identical front and rear panels 12a, 12b interconnected longitudinally by gussets 14a, 14b. Each gusset 14a, 14b comprises a pair of rectangular sub-panels 16,18; 16' 18' connected along a common longitudinal edge 20, 20' and folded along that edge so as to form a V when the bag is not fully expanded. When the bag is fully expanded, the sub-panels 16,18; 16',18' of each pair are substantially co-planar. During forming of the bag the bottom end of the bag is closed by means of a so-called roll bottom by which the bottom end of a bag material (eg paper) tube from which the bag is formed is folded over and adhered, or otherwise secured, to itself and to the bag base as described further hereinafter. This folding over step causes the bottom ends of the two gussets 14a, 14b to be trapped in the closure fold so that when the bag is eventually expanded, normally by being filled, each gusset forms two rough folds 22a, 22b; 22c, 22d. The folds 22a,22b extend respectively from point 24a, at which the apex of the gusset fold 20 is captured by the folded-over closed bottom, to the two bottom corners 26a,26b of the bag associated with that gusset. Likewise, the folds 22c,22d extend respectively from the point 24b, at which the apex of the gusset fold 20' is captured by the folded-over closed bottom, to the two bottom corners 26c,26d of the bag associated with that gusset. Each of these four rough gusset folds 22a-22d is required to be secured, in this embodiment by an adhesive, to the base part 28 of the bag so as to avoid the formation of the internal recesses therebetween which have been present in prior art bags.

**[0022]** The means by which this securing of the gusset folds is achieved in the present embodiment is best illustrated by reference to Fig. 4. Fig. 4 shows a paper blank 30 from which the bag is formed. In practice, as shown in Fig. 5, blanks 30 are formed sequentially on a length of continuous paper sheet 32 drawn off a supply roller (not shown) in a direction A or in the reverse direction. However, for the purpose of simplifying the description, reference is made primarily to the single blank of the Fig. 4.

**[0023]** Although Fig. 4 shows a number of nominal fold lines, discussed further hereinafter, these do not need to be pre-formed in the blank but are established at different stages during the formation of the bag, one

(54) actually being established only during eventual filling of the bag. However, it is useful to the understanding of how the bag is established and how the present invention is applied to this particular bag formation if the nature and function of these nominal fold lines is explained.

**[0024]** Referring now to Fig. 4 from left to right as viewed in this figure, there are shown on the blank 30 longitudinally extending nominal fold lines 34, 36, 38, 40, 42 and 44 which are to delineate the front panel 12a, the sub-panels 18', 16' of the gusset 14b, the rear panel 12b, the sub-panels 18, 16 of the gusset 14a and a further panel 21 which will be formed for closing the tube which is to be established during formation of the bag. The lower (trailing) end of the blank as viewed in Fig. 4 which is eventually to form the bottom end of the bag, is shown with further, transversely extending nominal fold lines 46, 48 which nominally delineate closure panels 50, 52 which will be used to form a roll bottom for the bag. A still further transversely extending, purely nominal fold line 54 is shown on the blank at a distance "b" from the nominal fold line 48, substantially equal to the depth "a" of the gussets 14b, 14a, ie equal to the width of the panels 18', 16', 18, 16 in Fig. 4. It is stressed that the transverse nominal fold lines 46, 48, 54 are not necessarily formed as such and are merely for the purposes of assisting the description. Lines 46, 48 show where the bottom of the bag is folded to form a roll bottom and line 54 shows where a fold is automatically generated in the bag to form the bag base 28 when the bag is eventually filled with a particulate material.

**[0025]** Although the nominal fold lines shown in Fig. 4 are not necessarily preformed it is nevertheless essential to know in advance where they will nominally lie since the technique of the present invention requires the location of certain regions of the eventual bag to be identified before any folding tubes place.

**[0026]** In order to enable the prevention of the formation of the troublesome internal recess of the prior art bags, adhesive is selectively applied to the blank so that these accessible internal recesses do not arise. In the illustrated embodiment, this is achieved by applying an adhesive to the four triangular areas 56, 58, 60, 62 shown dotted in Fig. 4.

**[0027]** Area 56 is bounded by a line extending obliquely between the junction of nominal fold lines 34, 54 and the junction of nominal fold lines 36, 48; the portion of the nominal fold line 34 between nominal fold lines 48, 54; and the portion of the nominal fold line 48 between the nominal fold lines 34, 36. Area 58 is bounded by a line extending obliquely between the junction of the nominal fold lines 38, 54 and the junction of the nominal fold lines 36, 48; the portion of the nominal fold line 48 between nominal fold lines 36, 38; and the portion of the nominal fold line 38 between the nominal fold lines 48, 54. Area 60 is bounded by a line extending obliquely between the junction of the nominal fold lines 40, 54 and the junction of the nominal fold lines 42, 48; the portion

of the nominal fold line 48 between nominal fold lines 40, 42; and the portion of the nominal fold line 40 between the nominal fold lines 48, 54. Area 62 is bounded by a line extending obliquely between the junction of the nominal fold line 44, 54 and the junction of the nominal fold lines 42, 48; the portion of the nominal fold line 44 between nominal fold lines 48, 54; and the portion of the nominal fold line 48 between the nominal fold lines 42, 44.

**[0028]** In the preferred process for forming a bag from the blank of Fig. 4, adhesive is arranged to be supplied to the triangular regions 56, 58, 60, 62 after the continuous material web has left the supply roll but before any folding has taken place. In accordance with conventional practice the web may be a laminate of several layers, not necessarily of the same material (eg paper plus plastics layers). Suffice it to say that the adhesive for the triangular regions 56, 58, 60, 62 is applied to that layer which is to be innermost within the eventual bag.

**[0029]** Fig. 6 shows one possible example of machinery by which the adhesive regions 56-62 may be applied. This is essentially conventional except for the provision of additional adhesive applicators 74 positioned above the web which is to be innermost (in this case, the upper web of two, as shown in Fig. 6).

**[0030]** In accordance with conventional bag forming techniques the web 32 containing the blank 30 is then folded over for forming a tube, adhesive is applied to the right-hand region equivalent to the panel 21 either before or during the folding over step, and the partial tube thus formed is passed between groups of creasing wheels/guides which from the side gussets 14a, 14b. During these steps the left hand edge region of the front panel 12a becomes adhered to the panel region 21 to permanently close and flatten the tube. Panel 21 can either be inside or outside panel 12a, but preferably 21 lies outside 12a.

**[0031]** It will be evident from Fig. 4 that when the tube is this formed and flattened, the triangular adhesive portions 56, 58, 60, 62 will become adhered respectively to adjacent portions of the blank marked 64, 66, 68, 70 (if panel 21 is inside panel 12a, part of the portion 70 is located on the closure panel 21 and part on the left hand side of the blank shown at 70a, depending on the width of panel 21). As an alternative process, adhesive can instead be applied to portions 64, 66, 68, 70 for adherence to portions 56, 58, 60, 62 during tube forming, thereby substantially achieving the same effect.

**[0032]** The folded tube is then normally separated from the following blank 30 on the web by guillotining along the base extremity 72 and the folded tube can then be removed and transferred to a separate apparatus for closing, e.g. by forming a roll bottom in a conventional manner. This involves cutting longitudinal slits near the bottom of two nominal fold lines enclosing a face panel (e.g. fold lines 38, 40), applying an adhesive (e.g. a hot-melt adhesive) to certain areas of the nominal panel region 50 and folding over this region twice so that it be-

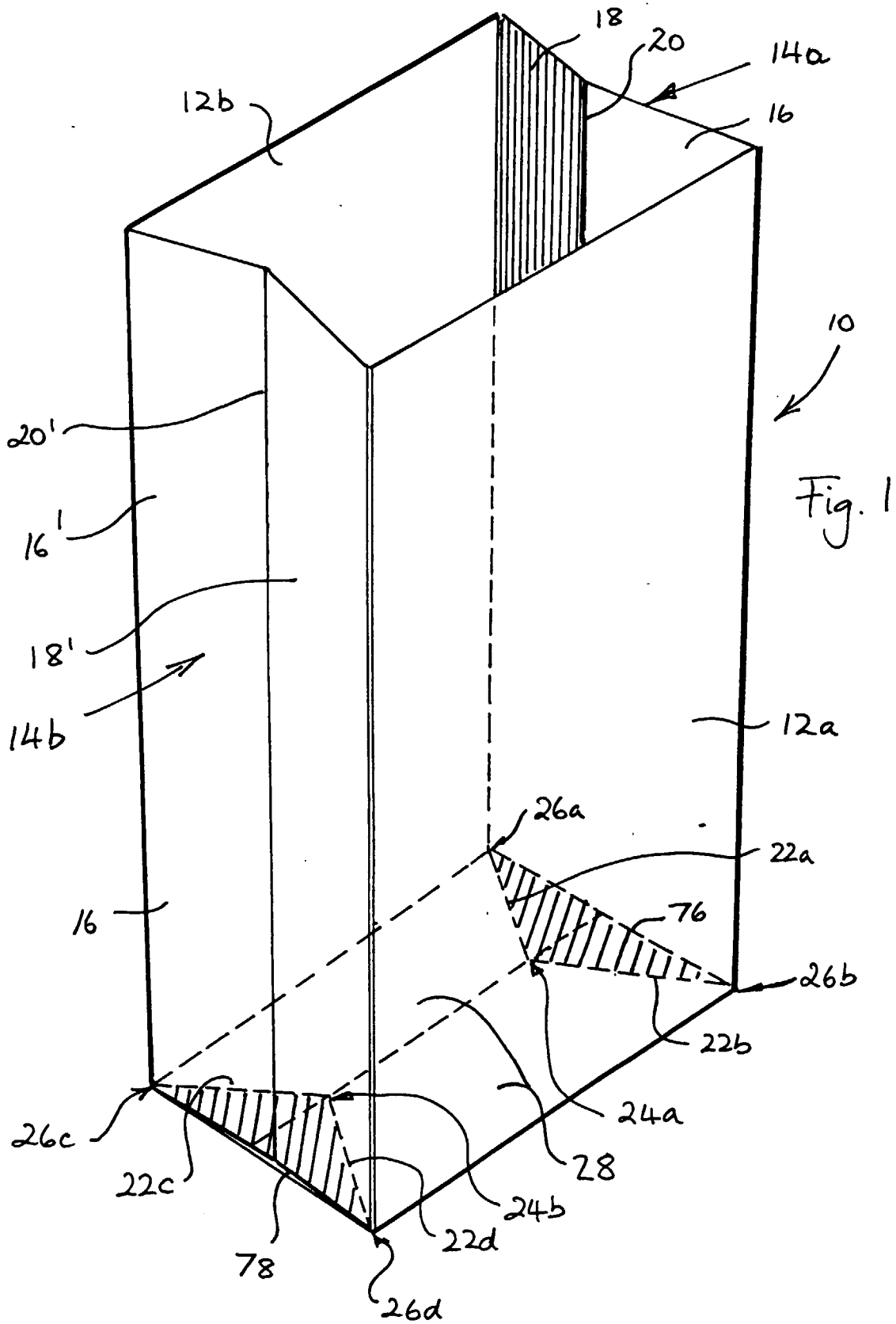
comes adhered permanently to what will become the underside of the bag base.

**[0033]** Reference is now directed to Figs 1, 2 and 3. Fig. 2 shows the bag in a partially open state and Figs. 1 and 3 show the bag in the fully open state (in Fig. 2, the roll bottom is shown only half-formed for purposes of illustration, but in practice it would normally be folded over again in the direction of arrow B to be adhered to the underside of the panel region marked 74). As a result of the fact that the regions 56,58,60,62 have been adhered permanently to the regions 64,66,68,70, the triangular regions shown cross-hatched in Figs 1 and 3 (formed from the correspondingly cross-hatched regions of the gussets 14a, 14b of Fig. 4) are adhered permanently to the regions of the base lying directly underneath. This has two practical effects which assist to enable the bag to be stable when upright: firstly that particulate material is prevented from getting underneath these shaded regions, which would cause distortion of the filled bag, and secondly that the folded edges 76,78 which form naturally when the bag is filled are maintained and supported against outward distortion.

**[0034]** It should be noted that although the above description refers to open-mouthed bags, nevertheless the description and the scope of the protection afforded to the invention should be taken as including gusseted bags which are closed at both ends, in which either one or both ends are of the type herein described.

### Claims

1. A method of forming a gusseted bag, in which a flattened tube with opposed side gussets is formed and the bottom of the tube is closed such that it will create four interior recesses between the closed bottom and trapped folded regions of said side gussets, wherein a securing means is selectably provided at appropriate parts of the bag material prior to the formation of said flattened gusseted tube such that during or after the gusseting step, the surfaces defining at least parts of said four interior recesses of the bag become secured together so as effectively to close these recesses and prevent significant ingress of bag contents thereto.
2. A method as claimed in claim 1, wherein the securing means is effective over substantially the whole of said surfaces defining said four internal recesses of the bag.
3. A method as claimed in claim 1, wherein the securing means is effective only so as to close the mouths of said four recesses.
4. A method as claimed in claim 1, 2 or 3, wherein the securing means is an adhesive which is applied to said appropriate parts of the bag.
5. A method as claimed in claim 4, wherein said adhesive is a paper glue.
6. A method as claimed in claim 1, 2 or 3, wherein the securing means comprises any of double-sided tape, ultrasonic sealing means, heat sealing means, needle punching and stitching.
7. A method as claimed in any of claims 1 to 6, wherein the securing means is provided at, or at part of, four triangular regions of a bag material blank prior to the formation of said flattened gusseted tube therefrom, said four triangular regions being disposed at positions which will, when the tube is gusseted and flattened, secure together the regions at the base end of the bag which lie beneath the triangular portions of the gussets which, as a result of the gussets being trapped to the bag base during the aforescribed bottom closing process, are caused to lie parallel to the base of the bag when the bag is filled.
8. An open mouthed bag of the type which has two side gussets and whose bottom is closed so as to trap the two gussets such that when the bag is filled it automatically forms a substantially planar, rectangular base portion which lies substantially perpendicular to its side walls, with a respective pair of triangular panels formed by each gusset lying over and substantially parallel to said substantially planar rectangular base portion and wherein at least parts of said two pairs of triangular panels are secured to said planar base portion such that the contents introduced in use to fill the bag are substantially prevented from entering between said pairs of triangular panels and the planar base portion and such that a substantially undistorted planar base can be maintained when the bag has been filled.
9. A bag as claimed in claim 8, wherein the whole or substantially the whole of said two pairs of triangular panels are secured to said planar base portion.



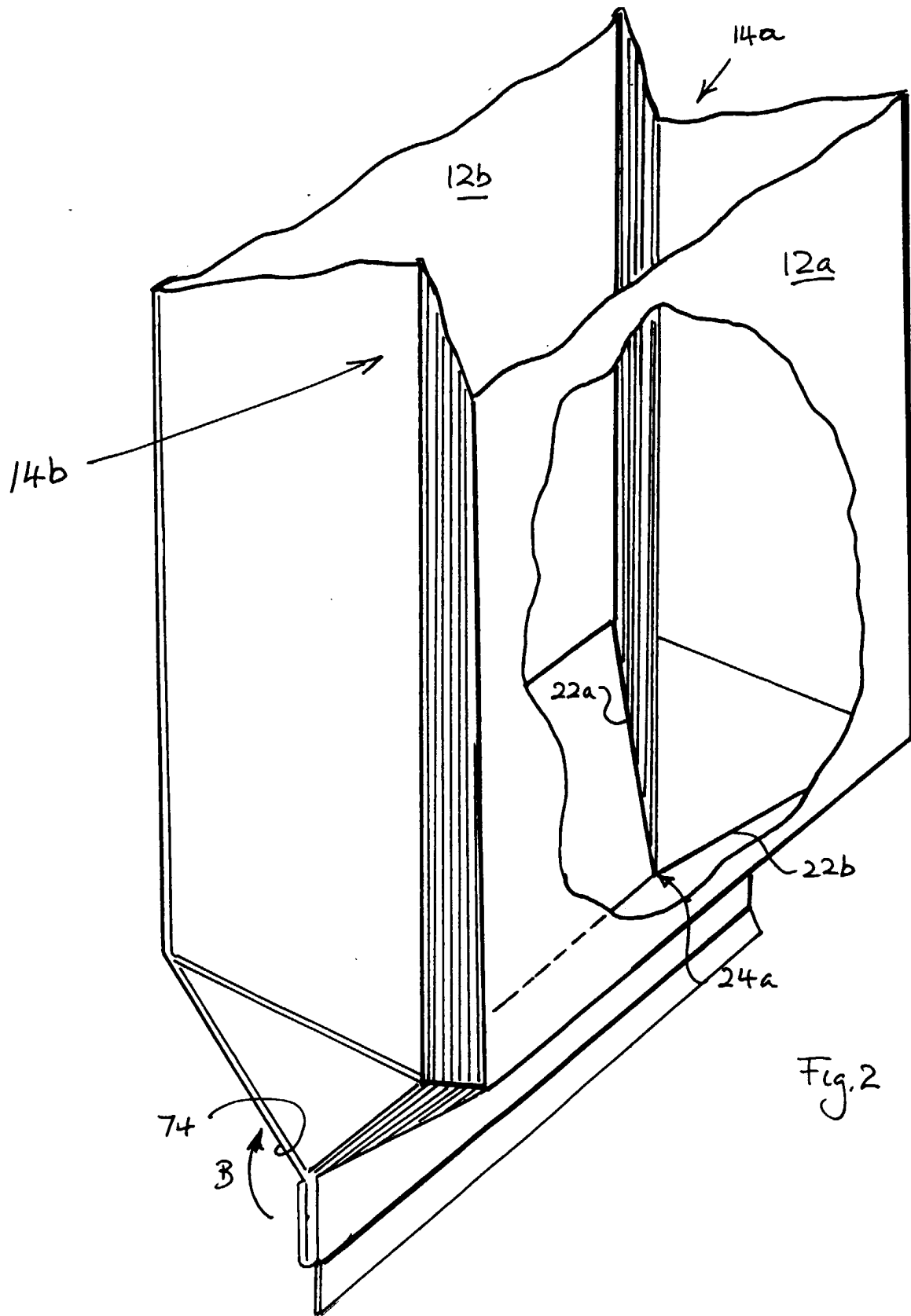
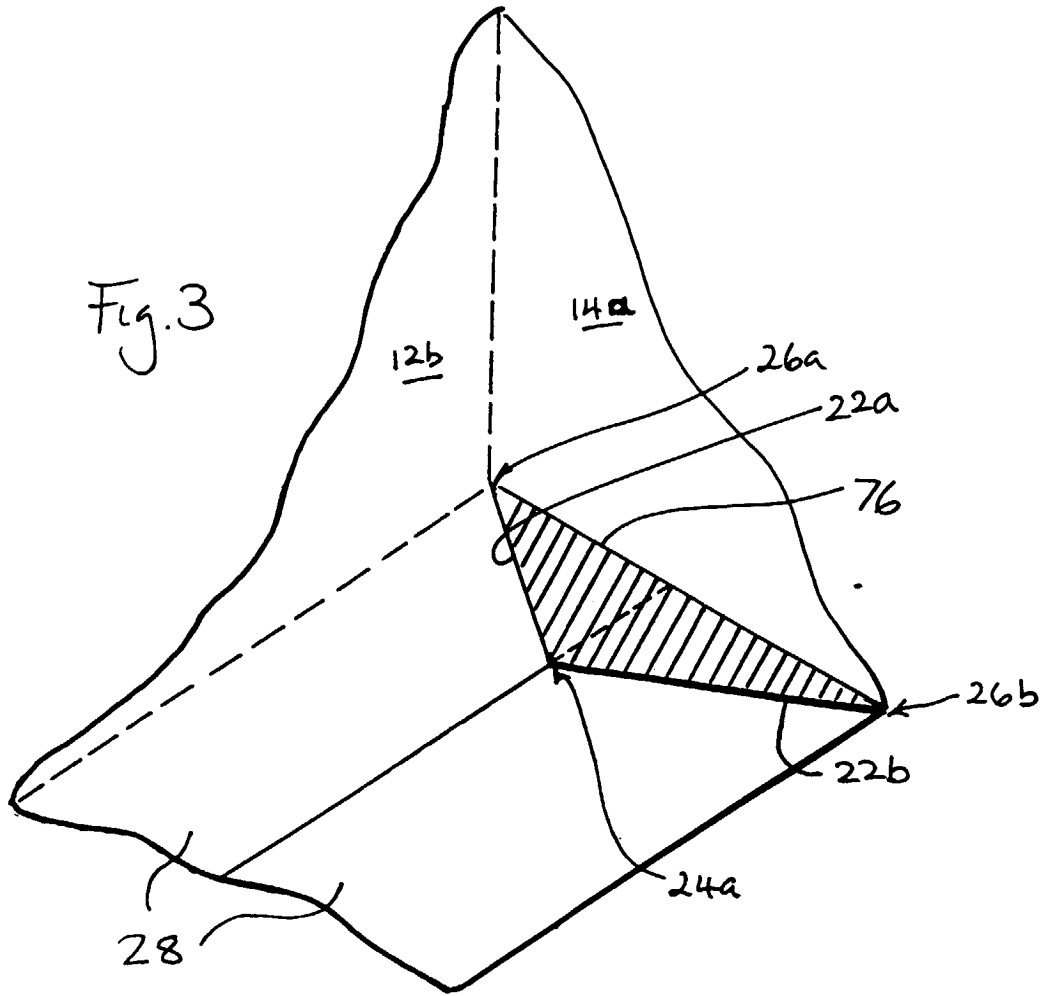
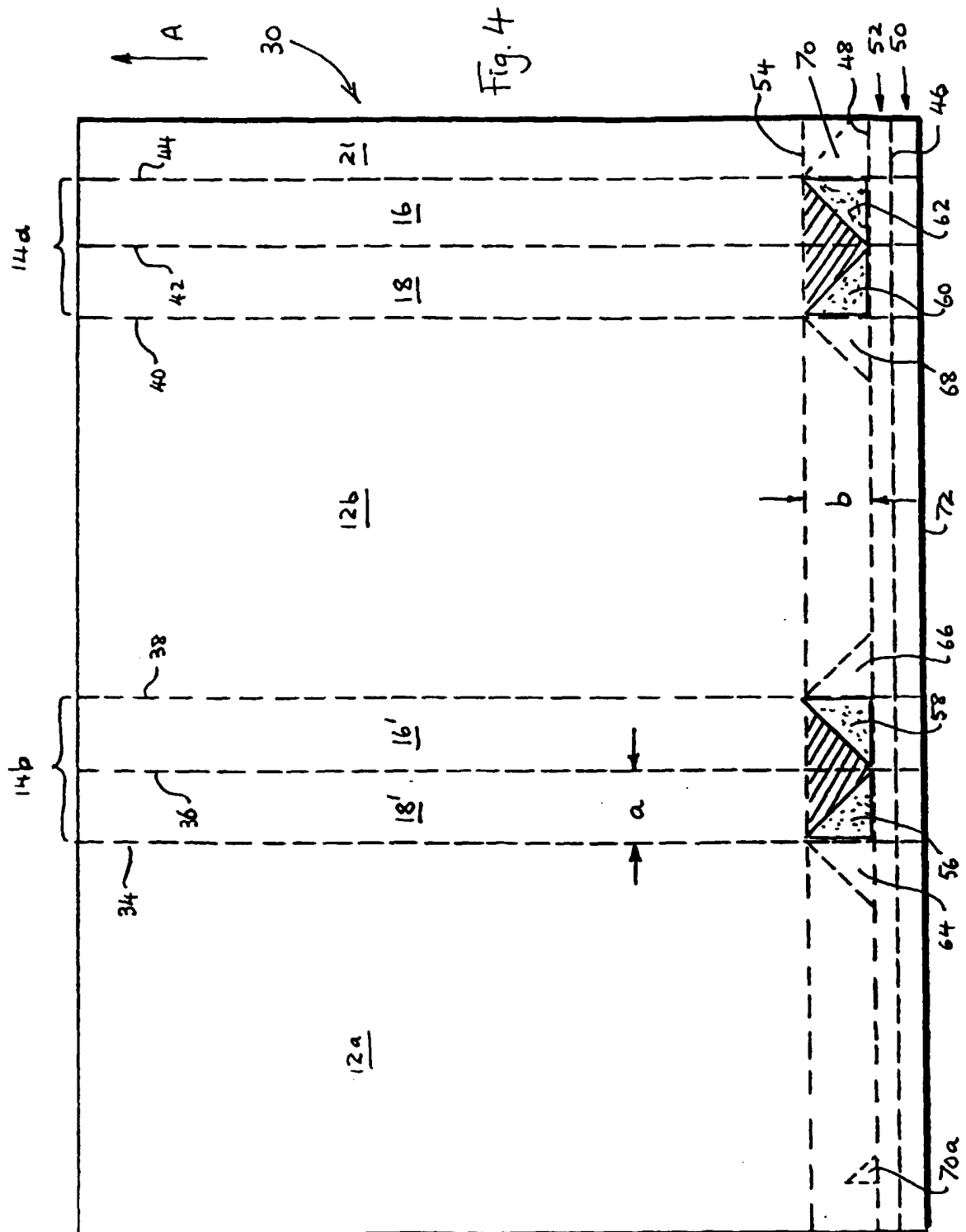


Fig. 2





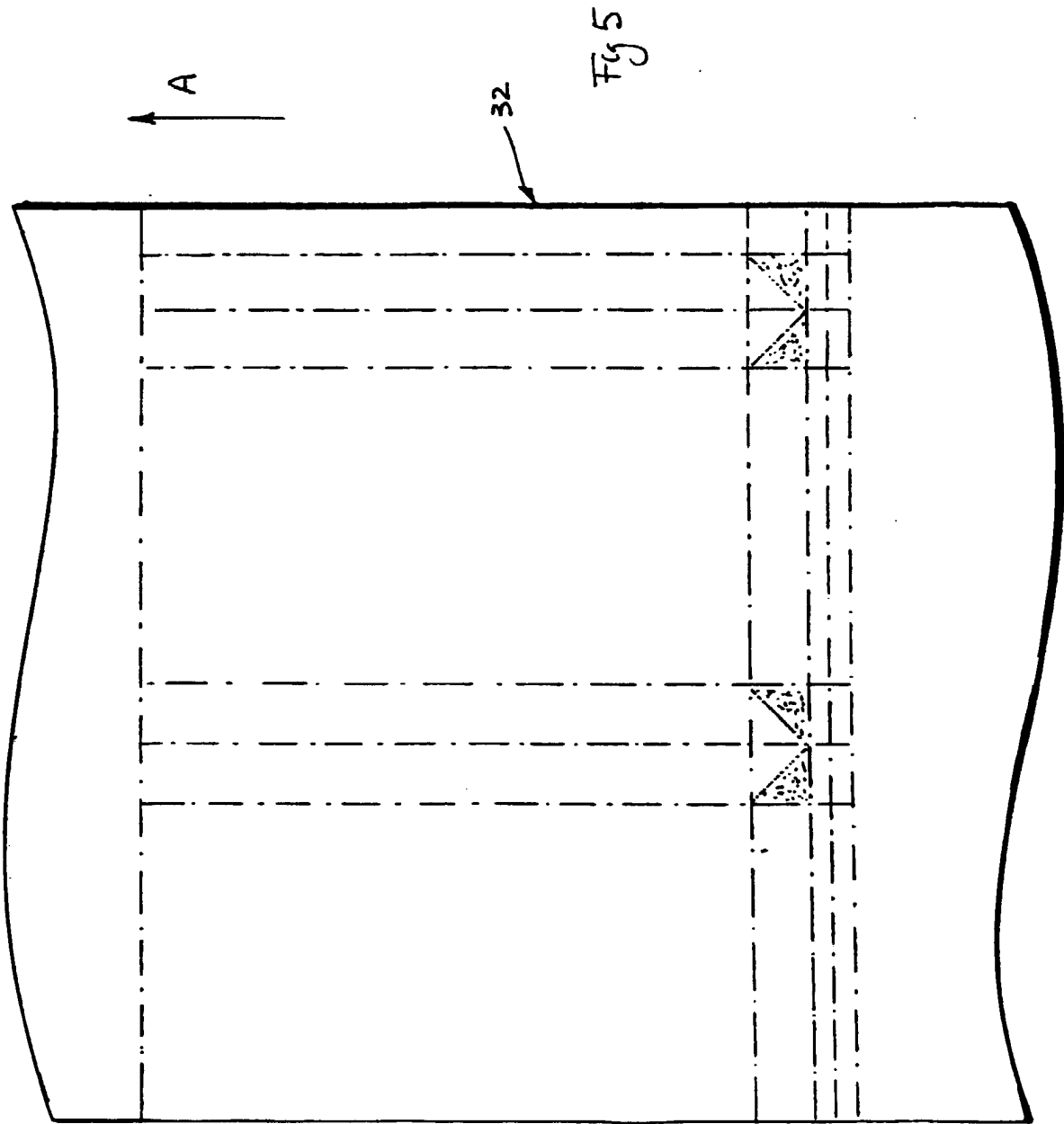
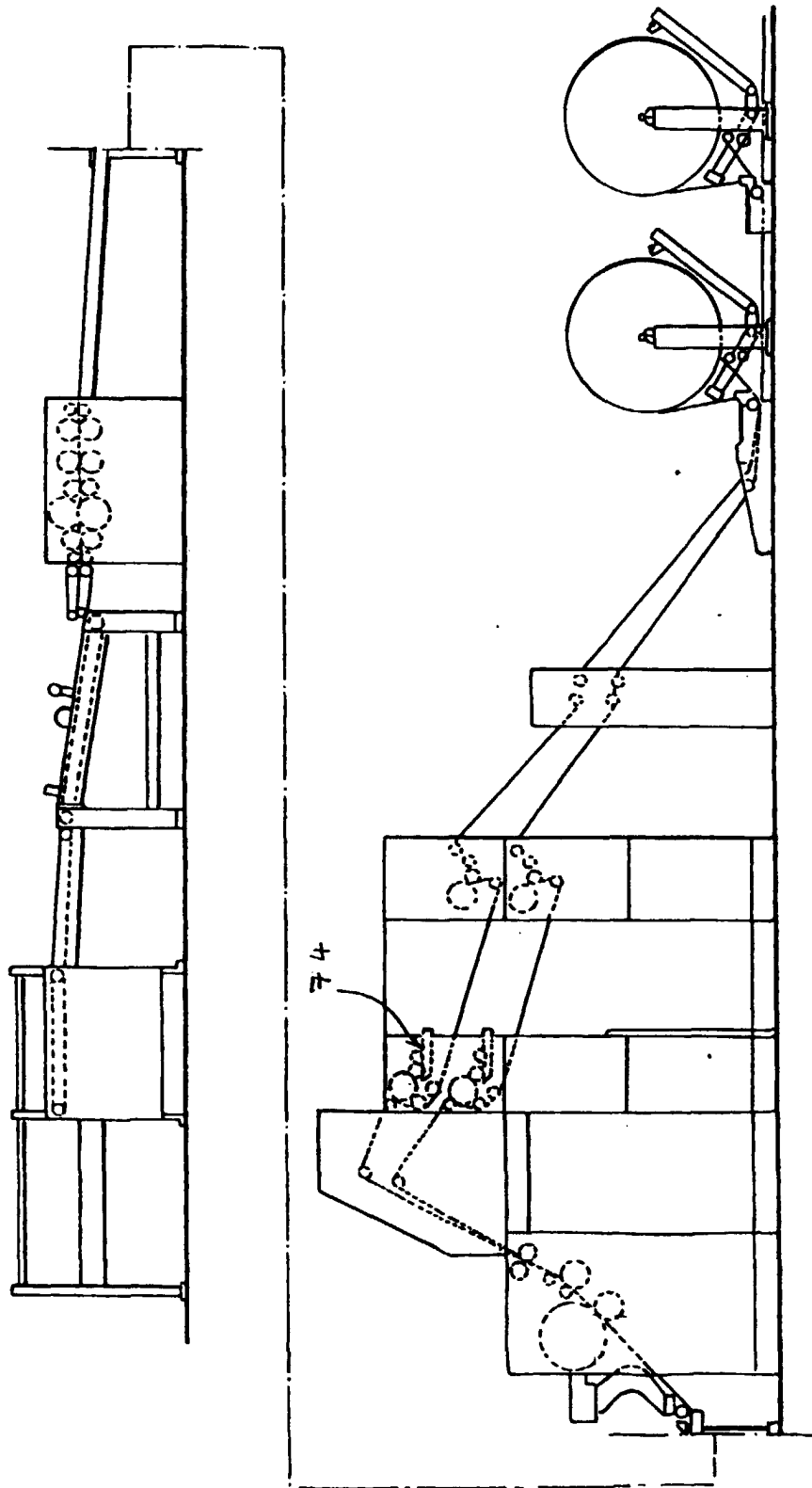


Fig 6





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EUROPEAN SEARCH REPORT

Application Number  
EP 99 30 3064

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.7)
X	US 4 526 565 A (HUMMEL JOHN E ET AL) 2 July 1985 (1985-07-02) * column 5, line 60 - column 6, line 62 * * figures 1-7 * ---	1,2,4-9	B65D30/20
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65D
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	21 September 1999	Farizon, P	
CATEGORY OF CITED DOCUMENTS		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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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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21-09-1999

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