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AUSTRALIA

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NOTICE OF ENTITLEMENT
(To be filed before acceptance)

I/We **Unilever PLC**

of **Unilever House, Blackfriars, London EC4P 4BQ, England**

being the applicant(s) and nominated person(s) in respect of Application No. ..... state the following:

(a) I/We have entitlement to the grant of the patent from the actual inventor(s) listed on the Patent Request form as follows:

We are the assignees of the employer of the actual inventors, namely UNILEVER UK CENTRAL RESOURCES LIMITED. UNILEVER UK CENTRAL RESOURCES LIMITED was entitled to have assigned to it a patent granted to any of the actual inventors in respect of the said invention.

(b) I am/We are the applicant(s) of the application(s) listed in the declaration under Article 8 of the PCT.

(c) The basic application(s) listed on the Request form is/are the first application(s) made in a Convention country in respect of the invention.

Unilever PLC

RVTate — **14 Jun 96**

(Signed, for and on behalf of the Applicant) (Date)

R V Tate
Authorised Signatory

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Application Number 21126/95

This specification does not contain a page 6.

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PACKETS AND THEIR MANUFACTURE

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(56) Prior Art Documents
WO 92/06903

(57) Claim

1. An infusion packet comprising opposite layers (2a,2b) of porous sheet material heat-sealed together to form an envelope containing infusible material (6), and a draw string or thread (8) between said layers having an intermediate portion (8a) of its length held between said layers at a first heat-sealed peripheral region of the packet, respective main portions (8b,8c) of the thread extending from opposite ends of said intermediate portion to be located between said layers at a further region or regions spaced from said first region after crossing over each other in their paths from said first region, and continuing from said further region or regions to project from the packet to provide gripping ends which can be pulled apart to apply a wringing action to the packet,

.../2

an edge seal (22) of said first peripheral region projecting inwardly relative to edge seals of adjacent peripheral regions continuing from the ends of said first region, the intermediate portion of the draw string or thread being so located in said first region edge seal that said main thread portions emerge from the ends of said first region inwardly of the edge seals of said adjacent regions to extend between said layers to said further peripheral region or regions.

ANNOUNCEMENT OF THE LATER PUBLICATION OF INTERNATIONAL SEARCH REPORTS

PCT

21126/95

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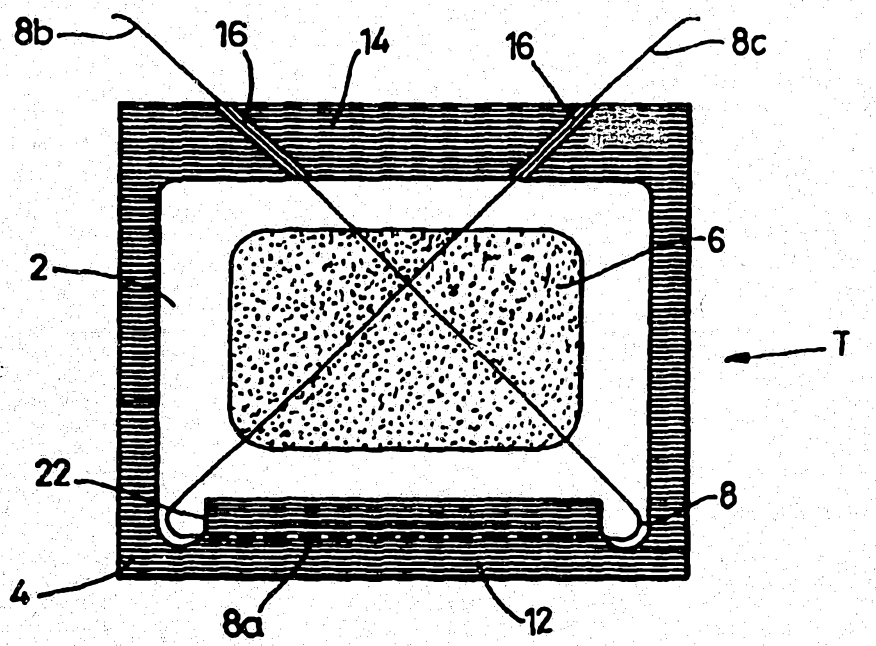
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(57) Abstract

Infusion packets (T) have envelopes of heat-sealable material with a looped thread (8) within the packets to wring moisture from the packet in use. A central part (8a) of the thread loop is held in a widened region of one edge seal (12) while the ends (8b, 8c) of the loop project through the opposite edge seal (14) in which they are movable when the loop is to be contracted. The packets are produced by forming a continuous series of thread loops on one elongate web and placing doses of infusion material on a second elongate web before bringing the webs together with the thread loops and infusion material between them. The two webs are then welded together and the individual packets are separated from the joined webs.

INFUSION PACKETS

This invention relates to packets in which a quantity of infusible material is held in a porous envelope which can be immersed in water to prepare an infusion.

When an infusion is prepared using such a packet a quantity of infused liquid is retained in the packet, usually both by the infusible material and by the material of the packet envelope, and mechanical means have been proposed for extracting at least some of that liquid by applying pressure to the packet. In particular, it has been proposed as a convenient and hygienic solution to provide the packet with draw strings which can be manipulated to contract the packet. Examples of such packets are disclosed in US 3539355, 3237550, 2881910 and 2466281.

In US 3539355, 2881910 and 2466281 a draw string or thread passes through holes in the walls of the packet, which is thus liable to leak its contents before use. Moreover, pulling on the draw strings will create high stress concentrations at the edges of the holes, with the risk of tearing and the spillage of a quantity of the infused material into the infusion as the packet is being wrung out over it. Strengthening the walls of the packet is not a solution because of cost and because

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it is likely to impair the efficiency of infusion.

In US 3237550 a string loop passes around the packet, the ends of the loop being held captive by a staple punched through an edge of the packet. Pulling the ends apart to shorten the loop contracts the packet. The staple must hold the ends sufficiently loosely to allow them to slide easily when the ends are pulled apart, but not so loosely that it allows the loop to slacken and slip off the other end of the packet, or the ends to slip out of the staple. It will be appreciated that close manufacturing tolerances must be maintained to ensure satisfactory use of such packets and the arrangement is thus ill-suited to economical large scale production. It is also a feature of this form of packet that the wringing action is concentrated along the centre line of the packet and the side edge regions may retain a considerable part of the liquid when the loop is tightened. A somewhat analogous arrangement is shown in US 3539355, in which a stiff paper strip takes the place of the string loop. This similarly does not adapt itself to economical large scale production.

It is also known from WO91/13580, WO92/06903 and CN 93103319.5 to locate a loop of thread within a packet, an intermediate portion of the loop being anchored in a heat sealed side edge margin of the packet and the ends of the loop projecting out of the opposite side edge margin. The presence of the thread in the edge seals, and in particular in the side edge anchoring the

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intermediate portion of the loop, weakens the seals however. This effect is intensified by the local stresses generated on the edge seal when tension is applied to the loop ends to wring moisture from the bag consequently rupture of the bag can too easily occur and the infusion material be spilled.

According to the present invention, there is provided an infusion packet comprising opposite layers of porous sheet material heat-sealed together to form an envelope containing infusible material, and a draw string or thread between said layers having an intermediate portion of its length held between said layers at a first heat-sealed peripheral region of the packet, respective portions of the thread extending from opposite ends of said intermediate portion to be located between said layers at a further region or regions spaced from said first region after crossing over each other in their paths from said first region, and continuing from said further region or regions to project from the packets to provide gripping ends which can be pulled apart to apply a wringing action to the packet, an edge seal of said first peripheral region projecting inwardly relative to edge seals of adjacent peripheral regions continuing from the ends of said first region, the intermediate portion of the draw string or thread

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being so located in said first region edge seal that it emerges from the ends of said first region inwardly of the edge seals of said adjacent regions to extend between said layers.

By locating an intermediate portion of the thread in an edge seal region that projects inwards of the adjacent edge seal regions, when the thread loop is pulled to wring the packets the stresses at the portions of the thread emerging from the anchoring seal region have less tendency to break the seal between the packet walls as compared with an arrangement in which the thread simply extends inwards from a uniform width seal, as in the prior art examples referred to above having an internal thread loop. The thread can be held in a margin of the edge seal that is not needed for the sealing of the bag edges, so that if the bag walls are separated in that region the bag itself is not ruptured. With said first region and said further region or regions at opposite side edges of the packet it is possible to ensure an efficient wringing action over most if not all the area of the packet.

The thread main portions may extend diagonally across each other between said first and further regions, through the area which the infusion material is located. Preferably, in the further region or regions there are passages in the secured edges between the layers in which the thread is itself releasably secured so as to be detachable from and slidable in said passages when pulled

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to apply the wringing action. The attachment of the thread may act to seal the thread although if the thread runs obliquely through said further region or regions the length of said passages can be increased independently of the width of the seal in said secured edges, so that it less likely that there will be any spillage of the packet contents.

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The invention will be further described by way of example with reference to the accompanying drawings, in which:

Fig. 1 illustrates an infusion packet according to the invention,

Fig. 2 is a schematic illustration of a part of a process for producing a series of packets of the form

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shown in Fig. 1,

Fig. 3 illustrates a means for forming the thread loops,

Fig. 4 is a detail illustration sharing a feature of the arrangement in Fig. 3,

Fig. 5 illustrates one form of thread feed mechanism for forming the loops,

Fig. 6 illustrates a tension control device for the thread feed means, and

Fig. 7 illustrates an alternative thread feed device for forming the loops.

Fig. 1 illustrates a tea bag T which comprises two identical layers 2 of conventional heat sealable paper, eg. Dexter 7146, heat sealed together around their peripheries with a crimped or flat seal 4. Within the peripheral seal 4 a dose 6 of infusible material is held between the two paper layers. A length of thread 8 is also sandwiched between the layers in a loop pattern, its crossed ends emerging from an upper edge of the tea bag.

A central portion 8a of the thread is firmly fixed by the heat seal 4 where it is between the layers in a wider, lower edge portion 12 of the seal. The two ends 8b,8c of the thread emerge from the peripheral seal at opposite ends of the wider lower edge portion 12 and extend between the layers, diagonally oppositely across the tea bag, and through the upper edge seal 14. Within the upper edge seal the two ends of the thread are held in narrow channels 16 where the paper layers are more

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lightly sealed together than the remainder of the peripheral seal. The retention of the thread by the heat seal material in these channels can easily be sheared by pulling on the exposed thread ends and the thread is then able to slide in these channels. It is possible alternatively to leave the channels 16 unsealed if they are sufficiently restricted to avoid any significant leakage of the contents of the bag.

In use, after the tea in the bag has been infused, the tea bag may be removed from the liquid, held by the free ends 8b,8c of the thread which are then pulled apart. Although this frees them to slide in the channels 16 they are still held within those channels and between the ends the thread 8 is still firmly secured by the wider lower edge seal portion 12. The bag itself is therefore contracted and puckered by the tension in the thread so that the infusible material within it is subjected to a wringing action to extract infusion liquid in the bag.

The top and bottom sealing margins 12,14 through which the thread 8 passes are made relatively wide to increase their resistance to tearing or delamination when the thread ends are pulled to apply a wringing force. Reliefs 22 at the ends of the lower edge portion 12 give a relatively wide seal area there to take the force that the thread applies across the seal. The relatively wide upper edge seal 14 also has the advantage of increasing the length of the channels 16 and so reducing any

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tendency of particles of the infusible material to escape along these restricted routes when the seal in them is broken.

Tea bags of the illustrated form can be produced in a continuous process as outlined in Fig. 2. This shows a first web 2a of the heat sealable paper carrying spaced doses 6 of infusible material, which have been deposited by a dosing wheel 31 in known manner, and a second similar web 2b joining the first web to enclose the doses between the webs. The second web 2b enters around the upper one of a pair of heat seal rollers 32,34 and the two webs sealed together as they come together in the nip between the rollers to form the peripheral seals 4 before the individual tea bags are separated. Adjacent the path of the web over the upper roller 32 is a third roller 36 with which is associated a thread positioning mechanism 38 for deploying the thread in its looped pattern on the periphery of the third roller. As the laid thread comes adjacent the upper roller 36 it is attached to the web 2b running over that roller and is so carried on its web to be sandwiched between the two webs 2a,2b as they pass through the heat seal rollers 32,34. Following severing rollers 35 separate the individual packets and also cut the thread between the packets.

The sealing pattern impressed by the rollers 32,34 preferably comprises crimped lines running in the direction of movement of the webs, in particular in the lower edge region where the central portion 8a of the

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thread is fixed, parallel to the crimped lines. In this manner the portion 8a can be fixed without risk to the integrity of the seal.

Figs. 3 and 4 show some details of carrier means on the third roller 36 for the thread deployed from the positioning mechanism, arranged to allow a continuous series of spaced thread loops to be formed on the periphery of the roller at a pitch corresponding to the width of the tea bags. For each thread loop there is an arrangement of four projecting pins 42 provided with notches 44 (Fig. 4) or hooks or both near their outer ends, so arranged as to catch a thread that is laid around them by a dispensing wand (Fig. 4 or Fig. 6). It will be noted that the thread is shown disposed entirely to one side of a centre line 48 indicating a radial plane at the middle of the axial length of the roller. A similar thread loop pattern can therefore be laid on the other half of the roller periphery, in mirror image to the illustrated thread pattern. With this arrangement the webs 2a,2b are double the width of the individual tea bags so as to form two rows of bags side by side, the bags being separated from each other after they have been fully formed. Because the thread for each row does not extend over the centre of the web width, the two thread loop patterns are formed and secured independently of each other.

Fig. 5 illustrates a first wand mechanism for positioning the thread on the carrier means of the roller

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36. The mechanism comprises a parallelogram linkage one of the arms of which is formed by a wand 52 in the form of an elongate tube 54 through which the thread is fed over an entry guide roller 56. One of the pivots of the arm 60 parallel to the wand has a fixed anchorage 62 arm 60 and a further arm 64 of the linkage have extensions 60a,64a carrying followers which are guided in closed tracks 66,68 of respective rotary cams 70,72. The cams 70,72 are rotated in synchronism and their tracks 66,68 are so shaped that the thread exit end of the wand 52 orbits on a path 74 in the form of an approximately triangular loop.

Because the third roller 36 is rotating as the wand tip describes its loop-forming orbit, the thread 8 reaches the surface of the roller and is laid around successive sets of pins 42 in a series of loops which are spaced at intervals around the roller periphery, one such loop being shown in Fig. 3. These loops are temporarily retained by the notches or hooks 44 of the pins. In the portions of the periphery of the third roller associated with each loop a set of four heatable sealing pads 76 are provided in locations which are crossed by the thread 8. As the third roller rotates each loop is brought in turn to the paper web 2b entering the apparatus around the upper roller 32 and the associated sealing pads 76 are then heated to tack the thread to the web. The tacked thread loops are immediately released from the carrier means of the third roller 36 and travel onwards with the

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web 2b. The pads 76 are so located that the tacking welds are in zones that are overlaid eventually by the edge seal portions 12 and 14 of the tea bags.

To hold the thread loops stably on the third roller 16 before transfer to the web 2b and to ensure transfer without snagging, the pins 42 are preferably displaceably mounted on the roller. For example, the pins may be radially displaceable to be lowered flush with the third roller periphery when the loops are transferred; this displacement may be obtained by holding the pins resiliently in their projecting positions or by providing a cam-operated mechanism to draw the pins in. The thread may be sprung over the ends of the pins 42 as they are retracted if it is held by hooks or notches 44 such as are shown in Fig. 4. It may be desired, however, to rotate the pins, eg. by a cam mechanism operating on an arm 78 (Fig. 4) of each pin, at the moment of transfer to facilitate the release of the looped thread from the third roller.

Whatever way the transfer is effected, it is preferable to ensure that by this stage the thread has been drawn taut into the loop pattern assumed in the finished tea bag. It is particularly desirable to locate as precisely as possible the ends 8a,8b that pass through the passages 16 in the upper edge seal 14 in order to keep the width of the passages to a minimum.

Forming the loop patterns with the thread may require significant variations of velocity of the thread

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as it emerges from the wand. It is desirable to ensure that accelerations imposed on the thread do not lead to excessive tension loads. Fig. 6 illustrates a thread feed mechanism for limiting thread tension which comprises a motorised drive device 80 drawing the thread 8 from a bobbin 82 through an entry guide eyelet 84. Downstream of the drive device the thread runs in an open loop 8' depending into the outer end of a suction tube 86. A central barrier 88 in the tube keeps the two lengths of the loop separate and a pervious screen 90 limits the penetration of the loop into the tube. Between the barrier 88 and the screen 90 the presence of the thread loop is detected by a sensing device 92, eg. a light-sensitive device, which is connected to a control circuit (not shown) for the drive device 80.

If the thread loop 8' is too short to reach the sensing device the drive 92 is operated to draw more thread from the bobbin. As thread gathers to lengthen the loop 8' it triggers the sensing device 92 and the drive is stopped or slowed. The distance of the sensing device from the barrier 90 and the rate at which the drive device 80 draws thread from the bobbin ensure that the thread loop 8' is always maintained at such a length that it will not tighten around the barrier 88. Apart from any friction in the wand, the tension load on the thread feed to the third roller 36 is thus limited to the suction force applied to it in the tube 86.

Fig. 7 illustrates an alternative mechanism for

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generating the looped path 74 of the tip of the wand 54 required to place the thread around the pins 42 on the third roller 36. The wand is held slidably in a longitudinally fixed but pivotable guide 94 so that it can move longitudinally in the guide under the action of a first driven crank 96. A second driven crank 98 pivoted to the wand remote from the guide swings the wand tip laterally and by coordination of the movements of the two cranks the required loop-form path is produced for the wand tip.



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CLAIMS

1. An infusion packet comprising opposite layers (2a,2b) of porous sheet material heat-sealed together to form an envelope containing infusible material (6), and a draw string or thread (8) between said layers having an intermediate portion (8a) of its length held between said layers at a first heat-sealed peripheral region of the packet, respective main portions (8b,8c) of the thread extending from opposite ends of said intermediate portion to be located between said layers at a further region or regions spaced from said first region after crossing over each other in their paths from said first region, and continuing from said further region or regions to project from the packet to provide gripping ends which can be pulled apart to apply a wringing action to the packet,

an edge seal (22) of said first peripheral region projecting inwardly relative to edge seals of adjacent peripheral regions continuing from the ends of said first region, the intermediate portion of the draw string or thread being so located in said first region edge seal that said main thread portions emerge from the ends of said first region inwardly of the edge seals of said adjacent regions to extend between said layers to said further peripheral region or regions.

2. A packet according to claim 1 wherein said first region and said further region or regions of the packet

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are at opposite edges of the packet.

3. A packet according to claim 2 wherein the thread main portions (8b,8c) extend diagonally away from each other through said further region or regions to the exterior.

4. A packet according to claim 2 or claim 3 wherein the main portions (8b,8c) of the thread cross each other in an area between said opposite edges in which the layers (2a,2b) are not attached to one another.

5. A packet according to any one of claims 2 to 4 wherein the two layers (2a,2b) are secured together at said opposite edges over wider margins than at the remaining edges of the packet.

6. A packet according to any one of the preceding claims wherein said main portions (8b,8c) of the thread extend through passages (16) in the secured edges (14) of the layers in which said thread is releasably sealed so as to be detached from and slidable in said passages when pulled to apply the wringing action.

7. A packet according to any one of the preceding claims, wherein said intermediate portion (8a) of the thread is heat sealed to said first peripheral region.

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8. A packet according to any one of the preceding claims wherein said first peripheral region extends along a major portion of one side edge of the packet.

9. A packet according to any one of the preceding claims wherein at least said edge seal of the first peripheral region comprises crimped lines running parallel to the intermediate portion of the thread located in said region.

10. A packet constructed and arranged for use substantially as described herein with reference to Fig. 1 of the accompanying drawings.

DATED 15/7/1998
Signed for and on behalf of UNILEVER PLC
by Unilever Australia Limited

B. F. JONES, Company Secretary.

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21126/95

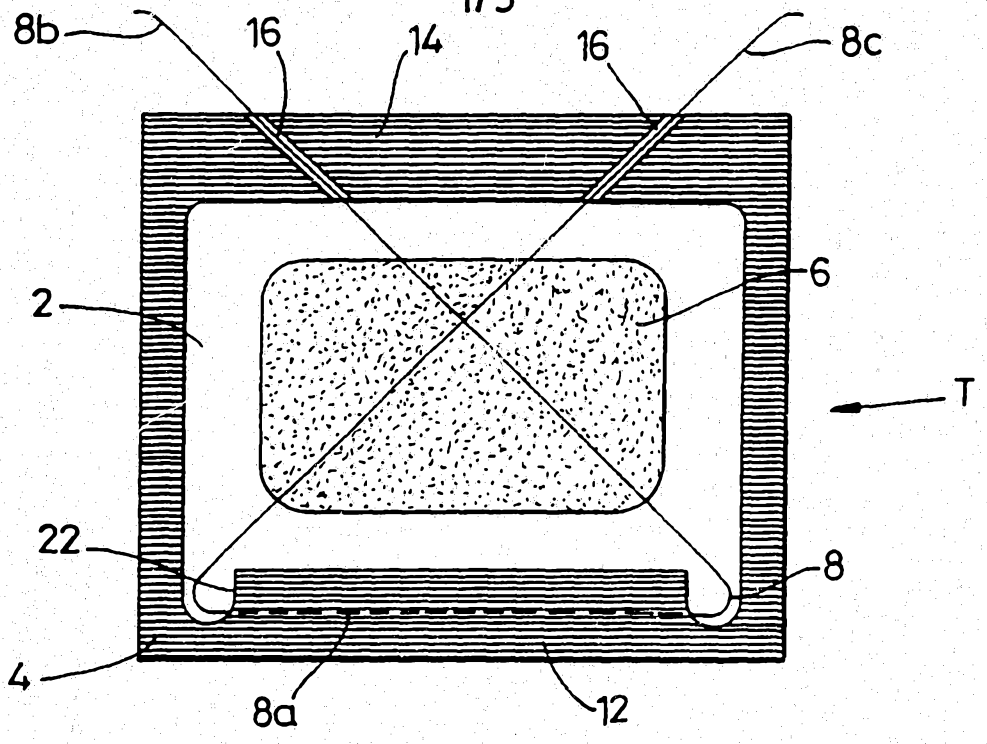


Fig. 1

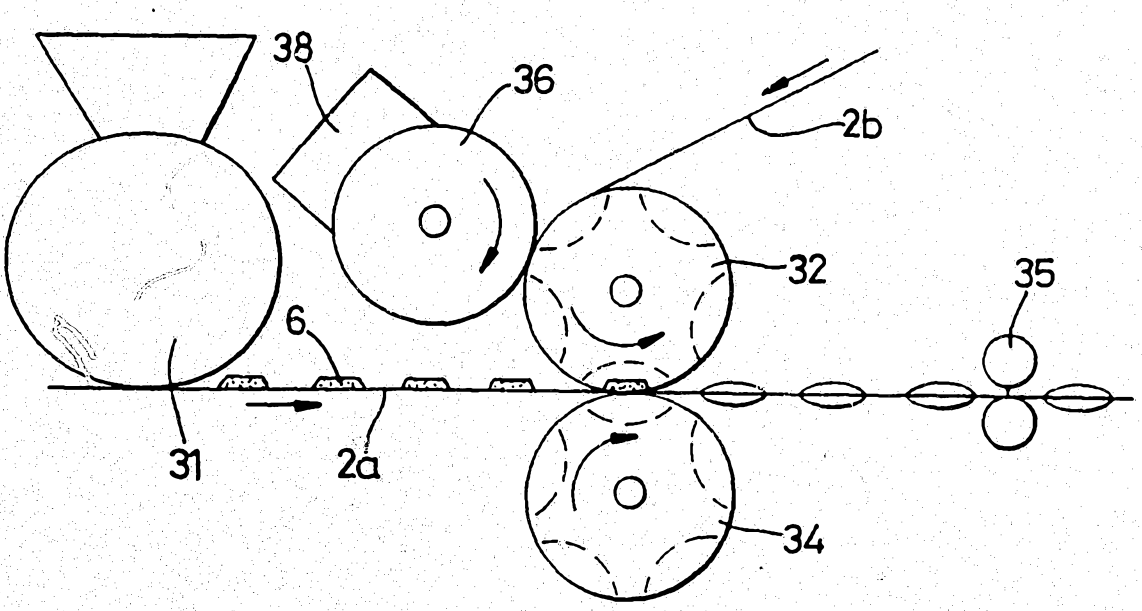


Fig. 2

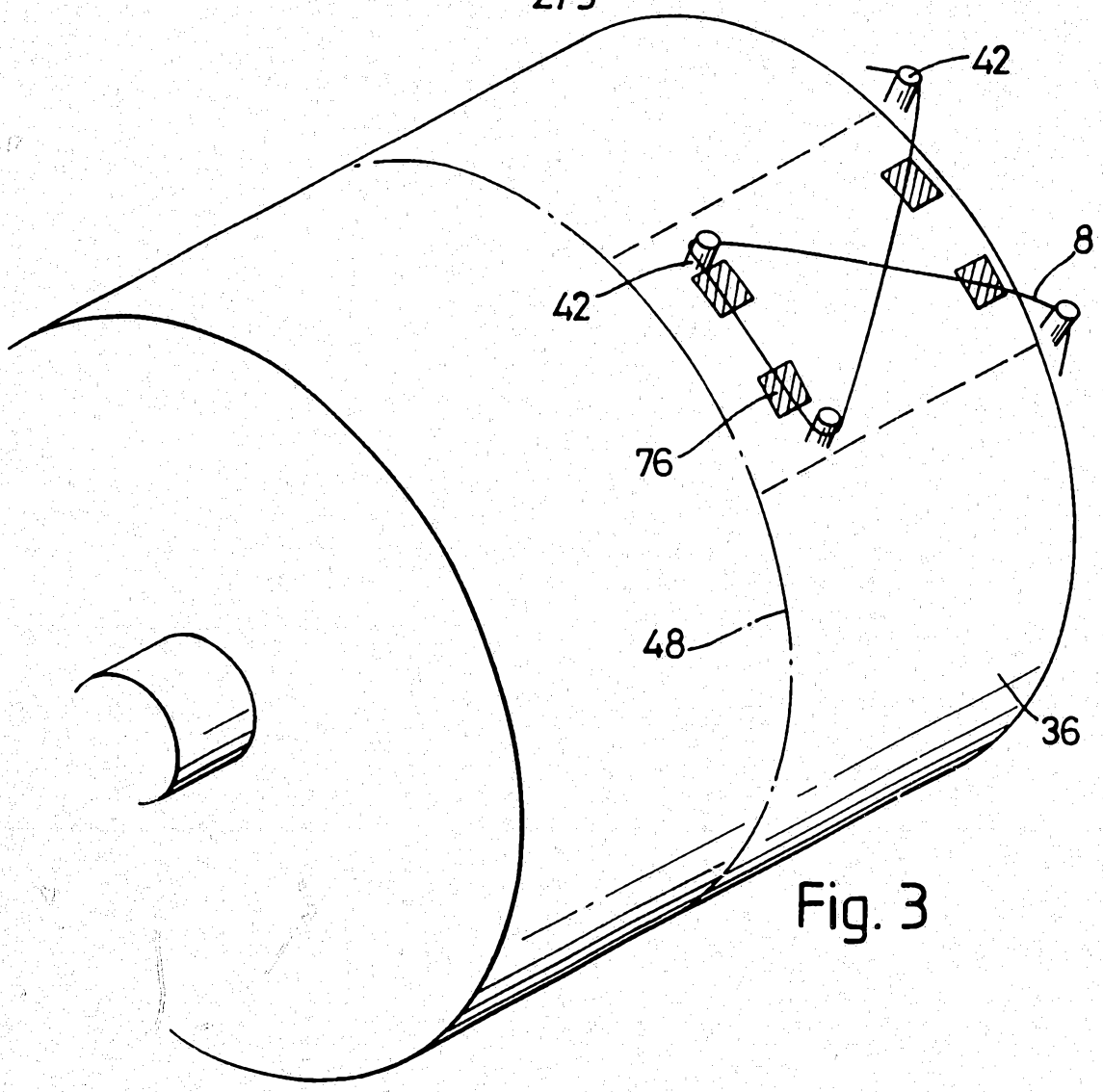


Fig. 3

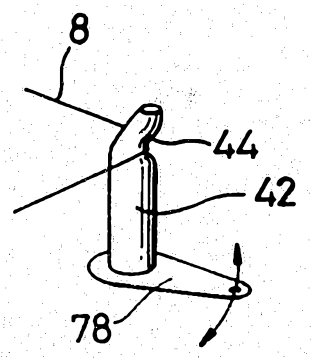


Fig. 4

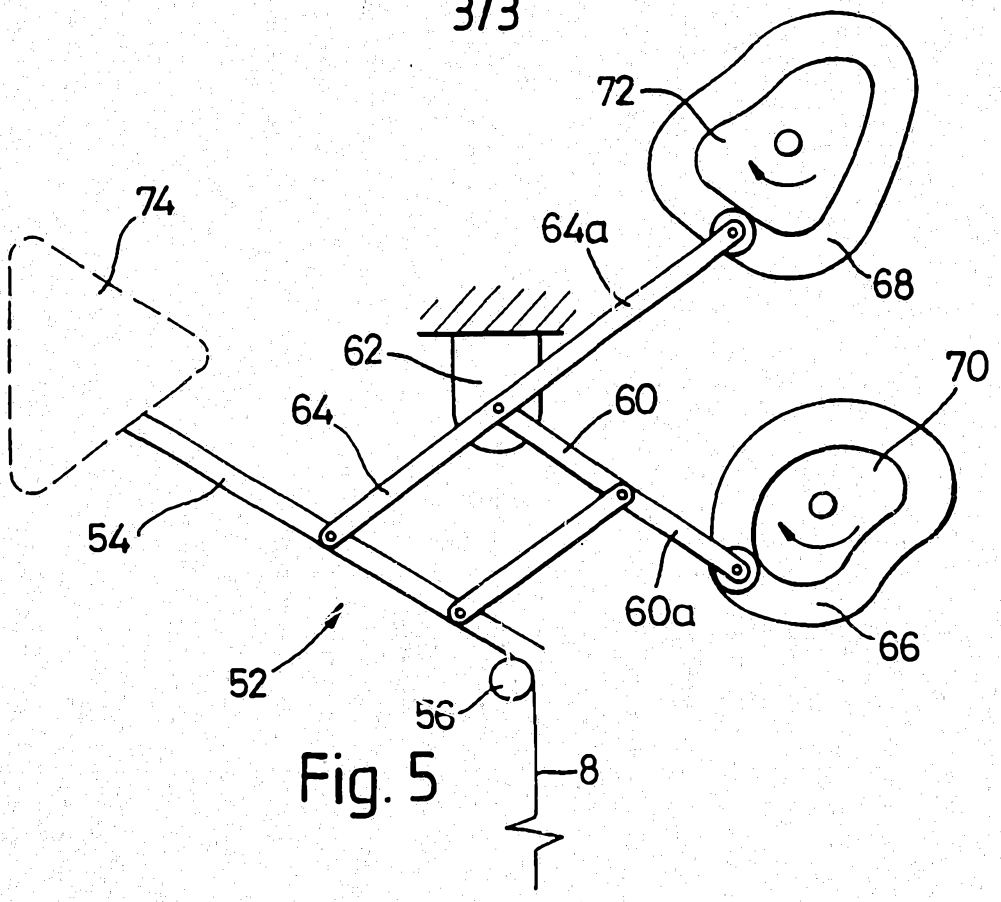


Fig. 5

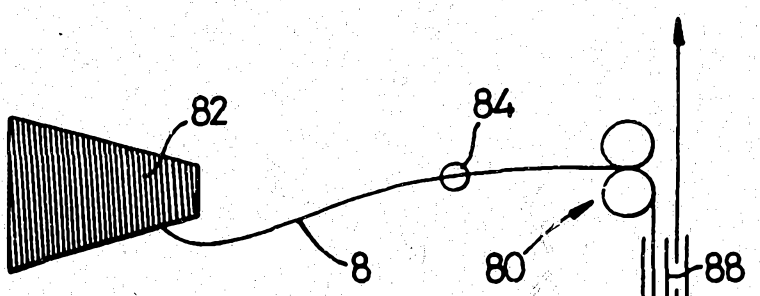


Fig. 6

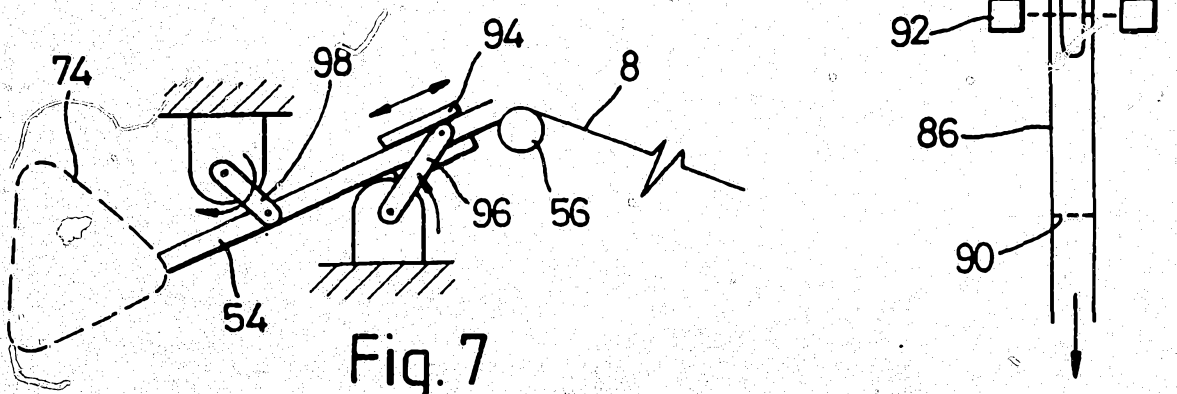


Fig. 7

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/GB 95/00775

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B65D81/00 B65B29/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B65D B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO,A,92 06903 (SHAKSPEARE) 30 April 1992 cited in the application see page 8, line 14 - page 11, line 9; figure 7A	1-8
Y	see page 12, line 20 - page 13, line 15	9
X	US,A,2 350 930 (L.L. SALFISBERG) 6 June 1944 see claims 1,2,5,6; figures 11A-F	13
Y		9
X	GB,A,910 724 (F. MORPURGO) 14 November 1962 see page 1, line 83 - page 2, line 129; figures 1,2	13
A		9

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 October 1995	02. 11. 95
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Authorized officer Grentzius, W

Form PCT/ISA/210 (second sheet) (July 1992)

A	CH,A,661 905 (H. ZIMMERMANN ET AL.) 31 August 1987 see page 3, line 56-68; figures 3,4 ---	9,13
A	US,A,2 334 256 (L.B. EATON) 16 November 1943 see page 4, column 1, line 55 - page 4, column 2, line 3; figures 1,7,8 -----	9,13,15

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INTERNATIONAL SEARCH REPORT

I. ..rnational application No.
PCT/GB95/00775

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. An infusion packet (clms 1-8).
2. A Method and apparatus for producing infusion packets (clms 9-18).

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searches without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

cited in search report	date	member(s)		
WO-A-9206903	30-04-92	AT-T-	116252	15-01-95
		AU-B-	650291	16-06-94
		AU-B-	8644991	20-05-92
		CA-A-	2093820	11-04-92
		DE-D-	69106382	09-02-95
		DE-T-	69106382	24-05-95
		EP-A-	0552214	28-07-93
		ES-T-	2065706	16-02-95
		HK-A-	100495	30-06-95
US-A-2350930	06-06-44	NONE		
GB-A-910724		NONE		
CH-A-661905	31-08-87	NONE		
US-A-2334256	16-11-43	NONE		