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(71) Applicant: **Nicolon B.V.**
Sluiskade N.Z. 14
NL-7602 HR Almelo(NL)

(72) Inventor: **Vermeulen, Jan**
Ripperdalaan 11
NL-7491 BZ Delden(NL)

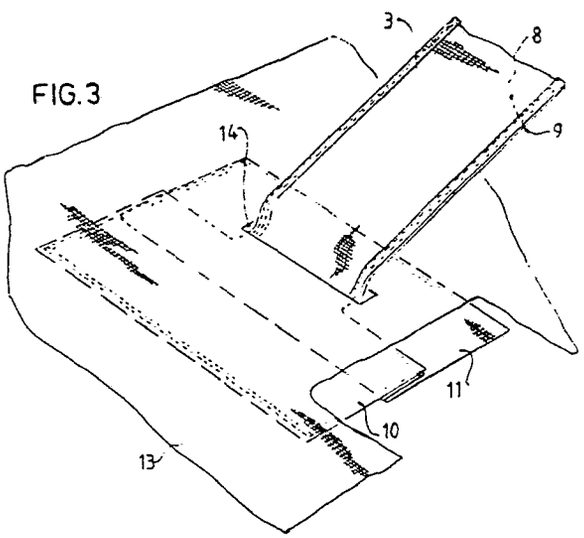
(74) Representative: **Schumann, Bernard Herman Johan et al**
OCTROOIBUREAU ARNOLD & SIEDSMA
Sweelinckplein 1
NL-2517 GK The Hague(NL)

(54) Tube body for forming e.g. the core of a dike and a method for manufacturing same.

(57) The invention relates to a tube body (1, 13) intended as a permanent encasement for loose or lightly coherent material for forming e.g. the core of a dike, a quay, a bank reinforcement,a jetty or a breakwater, said body being made of a fabric permeable to water and impermeable to the material and comprising at least one connection tube (3, 43) serving as a supply inlet for a mixture of the material and water pumped into the tube and as an outlet for water, said connection tube being fastened to the tube body.

The tube body (1, 13) according to the invention is characterized in that the connection tube (3) extends through an aperture (14) in the tubelar body and is fastened to the inner surface of the tube body by means of a flange portion (10, 11). By this is achieved that the large forces that can occur though the pumping is under pressure of the mixture are as evenly distributed as possible, whereby the chance of leakage or a tearing away of an inlet tube from the tube body is minimized.

FIG.3



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Tube body for forming e.g. the core of a dike and a method for manufacturing same

The invention relates to a tube body intended as a permanent encasement for loose or lightly coherent material for forming e.g. the core of a dike, a quay, a bank reinforcement,a jetty or a breakwater, said body being made of a fabric permeable to water and impermeable to the material and comprising at least one connection tube serving as a supply inlet for a mixture of the material and water pumped into the tube and as an outlet for water, said connection tube being fastened to the tube body.

In general the mixture of the loose or lightly coherent material, such as sand or other ground material, and water can easily be obtained by use of known pumping means, by means of which the mixture can be drawn by suction from e.g. the beds of water ways. By pumping the material into the tube body the mixture is supplied at a predetermined pressure, whereby the loose material is free to sink and the water can be discharged to the fabric.

It is noted that the place of any outlet must be so chosen that as little of the loose material as possible is washed away together with the water to be discharged. It will be clear that this depends on, among other things, the flow velocity of the mixture of the material and water in the tube body. It will also be clear that a compromise must be sought between the most rapid possible and the most effective possible filling of the tube body.

The tube body may be regarded as a permanent encasement or containment of the filling material.

The tube body according to the invention is characterized in that the connection tube extends through an aperture in the tubelar body and is fastened to the inner surface of the tube body by means of a flange portion. By this is achieved that the large forces that can occur though the pumping is under pressure of the mixture are as evenly distributed as possible, whereby the chance of leakage or a tearing away of an inlet tube from the tube body is minimized.

A very reliable and strong embodiment it that in which a reinforcing textile is situated between the inner surface of the tube body and the flange portion.

A variant, in which the reinforcing textile is a strip which is connected at its two edges around the tube body, has moreover the advantage that the permeability to water of the wall in the region of the input is reduced, whereby the erosion, the local washing away of the ground material, is prevented. Moreover, the inlet region of the basic fabric is reinforced.

In an embodiment that has proved to be very practical, the tube body has the characteristic that the connection tube comprises a number of flat strips joined together in the longitudinal direction of the tube.

In this case that variant is preferred wherein each strip in integrated with a widened portion, said widened portions being connected together to form the relevant flange portion. The continuous seams ensure a good homogeneous transmission of forces and prevent leakage.

In another embodiment the tube body has the characteristic that the form of the strips and the form of the widened portions determine the mutual orientation of the tube body and the connection tube. This orientation can be of importance, for instance, for creating a charging stream in the tube body which is directed more or less in the longitudinal directon of that tube body, or at least in the longitudinal directon of that tube body, or at least does not lie in a substantially radial directon. By this means, too, a relatively favourable distribution of forces is obtained.

With this same background, a variant can be used which has the characteristic that a flange portion displays a portion extending under the opening in the tube body, such that during the pumping in of mixture into the tube body through the connection tube, the stream of mixture acquires a direction different from the radial direction of the tube body.

A tube body according to the invention can be simply manufactured by a method in which the longitudinal edges of a strip of water-permeable fabric are joined together, the ends of the tube body thus formed are closed, the tube body is provided with an aperture and a connection tube is fastened to the zone around that aperture, said connection tube extending through said aperture and being fastened to the inner surface of the tube body by means of a flange portion.

A tube body according to the inventaion can be simply fabricated by connecting together the longitudinal edges of a strip of water-permeable fabric, closing the ends of the tube body thus formed, providing the tube body with an aperture and fastening a connection tube to the zone around that aperture. In this case the bredth of the strip of fabric determines the circumference of the tube body.

To prepare tubelar bodies of other diameters using a given breadth of fabric strip, a method can be used according which a strip of water-permeable fabric is helically wound up so that adjacent edges acquire overlapping zones, after which the

overlapping zones are joined together, the ends of the thus formed tube body are closed, the tube body is provided with an aperture and a connection tube is fastened to the zone around that opening. This last method has the further advantage that the seams extend helically, so that they are relatively strong as a consequence of a flat seam construction and of a lesser loading through any change in angular position with respect to the longitudinal direction of the tube body, and the risk of tearing under the high filling-pump pressure is less than in the previously described embodiment.

The invention will now be elucidated by reference to the drawing. In the drawing:

Figure 1 shows a body according to the invention lying ready and partly filled;

Figure 2 shows a connection tube with flange portion;

Figure 3 shows a detail of a tube body, to which the connection tube according to figure 2 is fastened;

Figure 4 shows a detail of a tube body in a variant of the embodiment according to figure 3;

Figure 5 shows the variant according to figure 4 in a condition wherein the connection tube is in its operational position; and

Figure 6 shows the variant according to figures 4 and in a condition in which the connection tube is stored away in a rolled-up state before or after use;

Figure 7 shows an alternative to the embodiment according to figure 5;

Figure 8 shows a condition corresponding to figure 6 of the alternative embodiment according to figure 7;

Figure 9 shows a detail of an embodiment whereof the components are depicted, for the sake of clarity, at some distance from one another, for the purpose of elucidating the manner of fabrication;

Figure 10 shows a detail of a finished tube body corresponding to figure 9;

Figure 11 shows an alternative to the embodiment according to figure 10, in which the input tube is disposed at an angle to the longitudinal direction of the tube body; and

Figure 12 shos a strongly schematic representation of an apparatus for the fabrication of a tube body by the helical winding of a strip of fabric.

Figure 1 shows a tube body 1, that is laid on a bed 2. Tube body 1 consists of fabric permeable to water but impermeable to sand.

Tube body 1 is provided with a multiplicity of connection tubes 43, 44, 45, 46. The filling of tube body 1 can now take place, such that tube body 1 is filled a section at a time. To that end tube body is tied off in the manner of a sausage after the second connection tube 44, which can now initially serve as a supply tube for mixture. After the desired filling of the section determined by these first two connection tubes 43, 44 has been achieved, the second section is formed by tying off tube body 1 after the third connection tube 45, which can now serve as discharge tube, while the said second connection tube 44 can now serve as the supply tube for mixture. This procedure can be continued until the whole tube body is filled with sand.

The pumping direction of mixture for the filling of the first section is indicated by arrow 5, while the discharge of water is shown by arrow 6. For the filling of the second section, mixture is pumped into tube 44 in accordance with arrow 47 while water is discharged through connection tube 45 in accordance with an arrow 48, and so on.

When the desired extent of filling has been reached in a section, the supply tube can be worked off in a manner to be further described below. After filling of the entire tube body 1, the last discharge tube can also be worked off in a manner to be further described below. After filling of the entire tube body 1, the last discharge tube can also be worked off.

Figure 2 shows the supply tube 3, which consists of two flat parts 8, 9 and connected thereto widened parts 10, 11, which together can form a flange portion 12 (see figure 1).

Figure 3 shows that in a tube body 13 a slit-shaped opening 14 is made, through which connection tube 3 is thrust. The widened portions 10 and 11 are united to form a rectangular flange portion in the manner indicated. The portion 10 extends flat along the inner surface of tube body 13, while the flange portion 11 possesses a turned-back form, such that during the pumping in of mixture through connection tube 3 the stream concerned will not flow radially with respect to tube body 13 but in a more or less axial direction, and no leakage can occur and a good strength of the connection is achieved.

Figure 4 shows the same construction as according to figure 3, but is differs in that a protection flap 15, fastened to tube body 13, extends over the transitional zone between the connection tube 3 and that tube body, said protection flap being sewn to the tube body 13 on three edges 16, 17, 18 such that flap 15 can serve for the covering up of the connection tube 3 in its folded state before or after use.

Figure 5 shows the operational state of the tube body, in which mixture is pumped in according to arrow 5.

Figure 6 shows the connection tube according to figure 4 in its rolled up state. In this figure this connection tube is thus indicated by reference number 3'. Ths flap 15 covers up the connection

tube 3.

Figure 7 shows a view corresponding to figure 5 of an embodiment in which a flap 20 shows a hole 21 for the penetration of connection tube 3. Also this flap 20 is free of tube body 13 at one edge 21.

Figure 8 shows the manner in which the connection tube, which is in this case indicated by 3", can be stored away under protection flap 20 in a rolled up state.

Figure 9 shows a connection tube 22 with flange portion 23. The connection tube 22 and the flange portion 23 consist of four flat, flexible parts that are joined to one another along four seams 25 and are thus united as an entity.

The connection tube 22 is thrust into the tube body 27 via a hole 26. In that connection zone 28 (see figure 10), the tube body 27 is reinforced by, applied to the inner surface, a strengthening strip 29, which is to that end also provided with a hole 30.

Figure 10 shows a partly cut-away perspective view of the total construction of the tube body 27 with connection tube 22. The reinforcing strip 29 is connected at its two edges by sewing circumferentially to the tube body 27.

Figure 11 shows a variant of figure 10, in which a tube body 31 is provided with a connection tube 32, which in this case forms an angle with the longitudinal axis (not drawn) of the tube body 31. It will be clear from figure 11 that this is achieved by a considered choice of the shapes of the component flat parts 33, 34, 35, 36 which together form the connection tube 32, also to be understood as referring to the flange-part forming broadened portions thereof.

In the preceding descriptions a tube body has always been intended that is made by joining the longitudinal edges of a strip of fabric.

Figure 12 shows a variant, wherein a strip of fabric is wound up helically, such that the adjacent edges acquire overlapping zones, which can joined together at the position of a sewing station 38.

The fabric strip is provided beforehand at previously chosen places with connection tubes 3' under the protection flaps 15, these connection tubes and protection flaps being so oriented that in the finally formed tube body they extend in the same plane as the longitudinal axis of the formed tube body 39.

After the formation of this tube body 39, it is led through rollers 40 and wound up onto a spool 41. The rollers and the spool 41 are mounted on a rotating drivable frame 42 and are thus together with that frame rotatably arranged, the rotational axis and the rotational velocity of said frame being so chosen that they agree with the winding speed for the formation by helical winding of tube 39.

Claims

1. A tube body (1) intended as a permanent encasement for loose or lightly coherent material for forming e.g. the core of a dike, a quay, a bank reinforcement, a jetty or a breakwater, said body being made of a fabric permeable to water and impermeable to the material and comprising at least one connection tube (43-46) serving as a supply inlet for a mixture of the material and water pumped into the tube (43-46) and as an outlet for water, said connection tube (43-46) being fastened to the tube body (1),
characterized in that
the connection tube (43-46) extends through an aperture in the tubular body and is fastened to the inner surface of the tube body (1) by means of a flange portion (10-12).

2. The tube body as claimed in claim 1, characterized in that a reinforcing textile (29) is situated between the inner surface of the tube body (1) and the flange portion (23).

3. The tube body as claimed in claim 2, characterized in that the reinforcing textile is a strip (29) which is connected at its two edges around the tube body (1).

4. The tube body as claimed in anyone of claims 1-3, characterized in that the connection tube (22) comprises a number of flat strips joined together in the longitudinal direction of the tube.

5. The tube body as claimed in claim 4, characterized in that each strip forms an entity with a widened portion, said widened portions being connected together to form the relevant flange portion (23).

6. The tube body as claimed in claim 5, characterized in that the form of the strips and the form of the widened portions (23) determine the mutual orientation of the tube body (1) and the connections tube (22).

7. The tube body as claimed in claim 1, characterized in that a flange portion (23) displays a portion extending under the opening in the tube body, such that during the pumping in of mixture into the tube body through the connections tube, the stream of mixture acquires a direction different from the radial direction of the tube body (1).

8. The tube body as claimed in anyone of claims 1-7 inclusive, characterized in that a protection flap (15) is fastened to the tobe body (1) extends over the transition zone between the connection tube (3) and the tube body (1), said protection flap (15) being free of the tube body (1) at minimally an edge part (16-18) and being capable of serving to cover up the connection tube (3) in its folded state before or after use.

9. A method for manufacturing a tube body (1) as claimed in anyone of claims 1-8, characterized

in that the longitudinal edges of a strip of water-permeable fabric are joined together, the ends of the tube body thus formed are closed, the tube body (1) is provided with an aperture and a connection tube (43-46) is fastened to the zone around that aperture, said connection tube (43-46) extending through said aperture and being fastened to the inner surface of the tube body (1) by means of a flange portion (10-12).

10. The method according to claim 9, characterized in that a strip (37) of water-permeable fabric is helically wound up so that adjacent edges acquire overlapping zones, after which the overlapping zones are joined together, the ends of the thus formed tube body (1) are closed, the tube body (1) is provided with an aperture and a connecton tube (43-46) is fastened to the zone around that aperture.

11. The use of the tube body according to claim 1 as a permanent encasement for loose or lightly coherent material for forming e.g. the core of a dike, a quay, a bank reinforcement, a jetty or a breakwater, said body being made of a fabric permeable to water and impermeable to the material and comprising at least one connection tube (43-46) serving as a supply inlet for a mixture of the material and water pumped into the tube (43-46) and as a outlet for water, said connection tube (43-46) being fastened to the tube body, said connection tube (43-46) extending through an aperture in the tubular body and fastened to the inner surface of the body (1) by means of a flange portion (10-12).

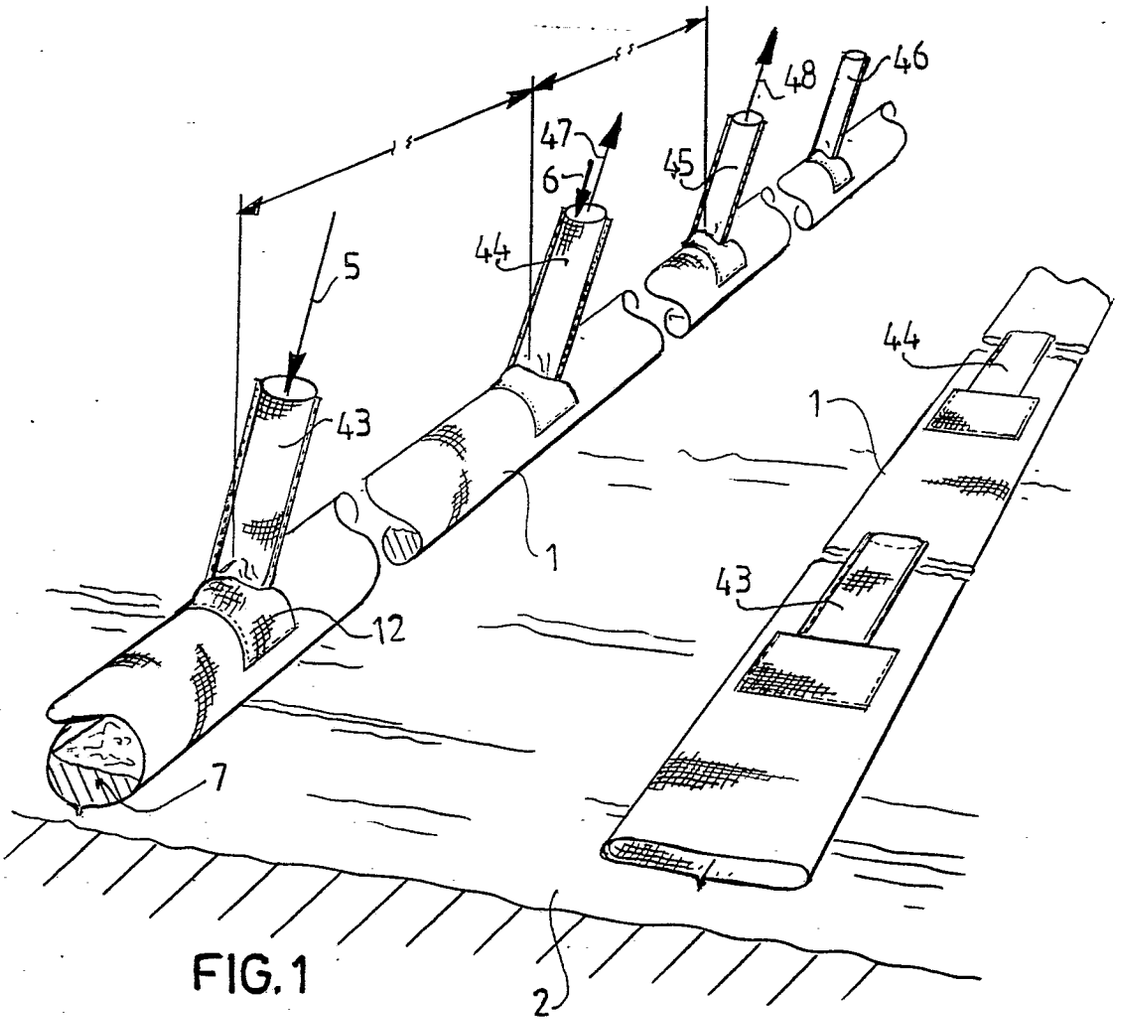


FIG.1

FIG.2

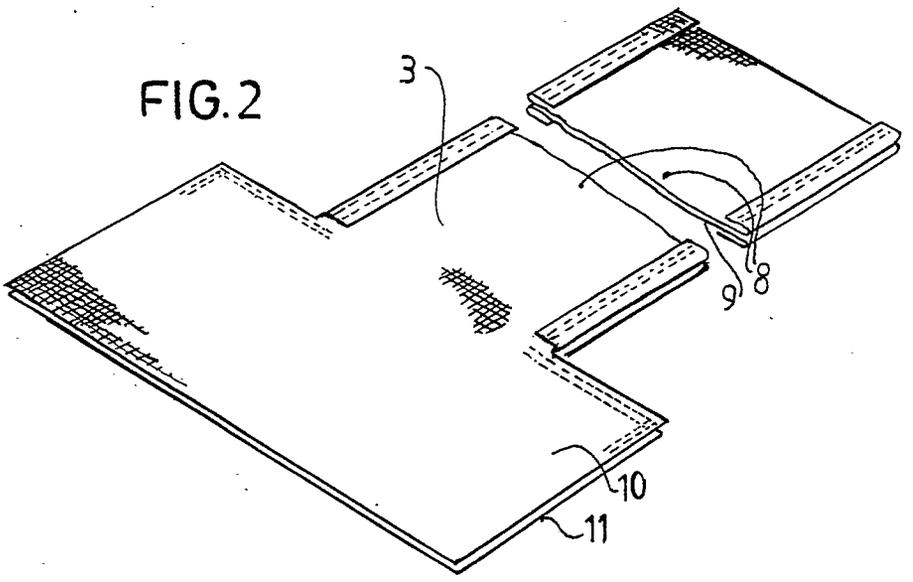


FIG.3

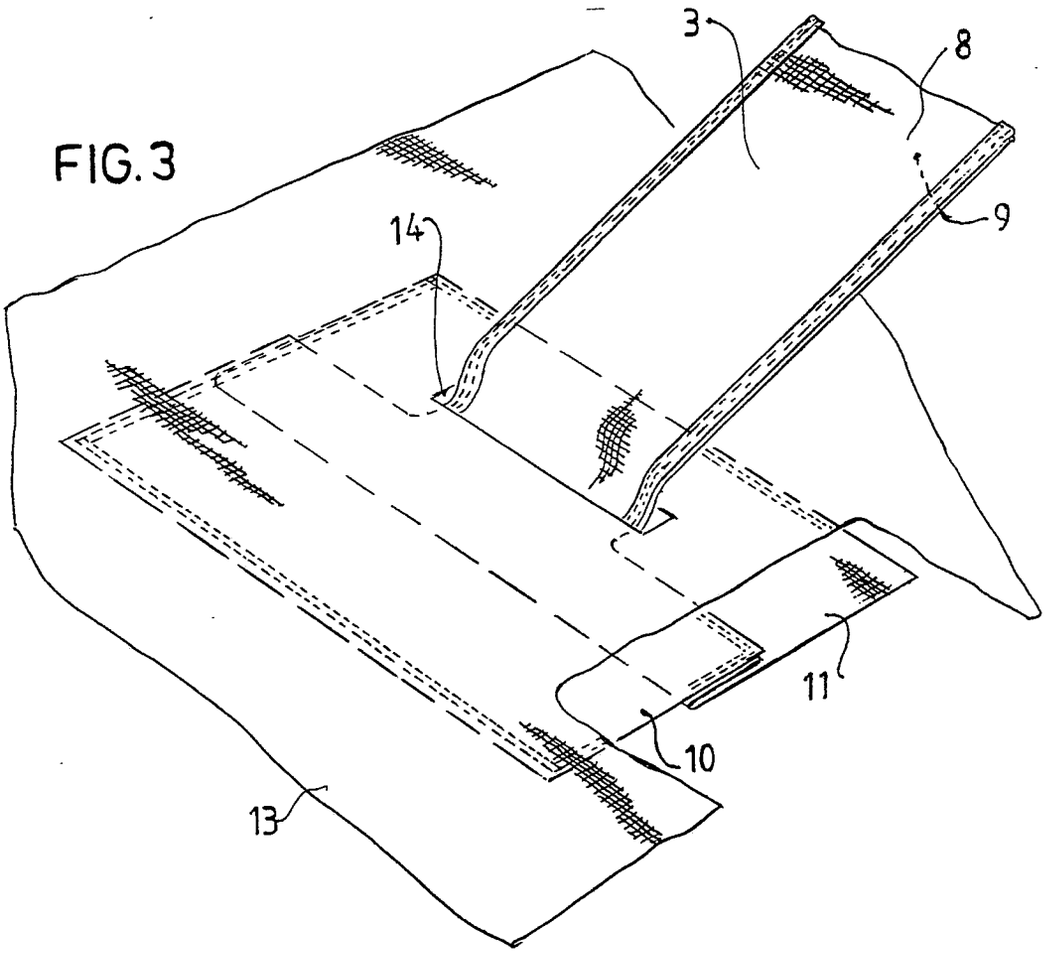
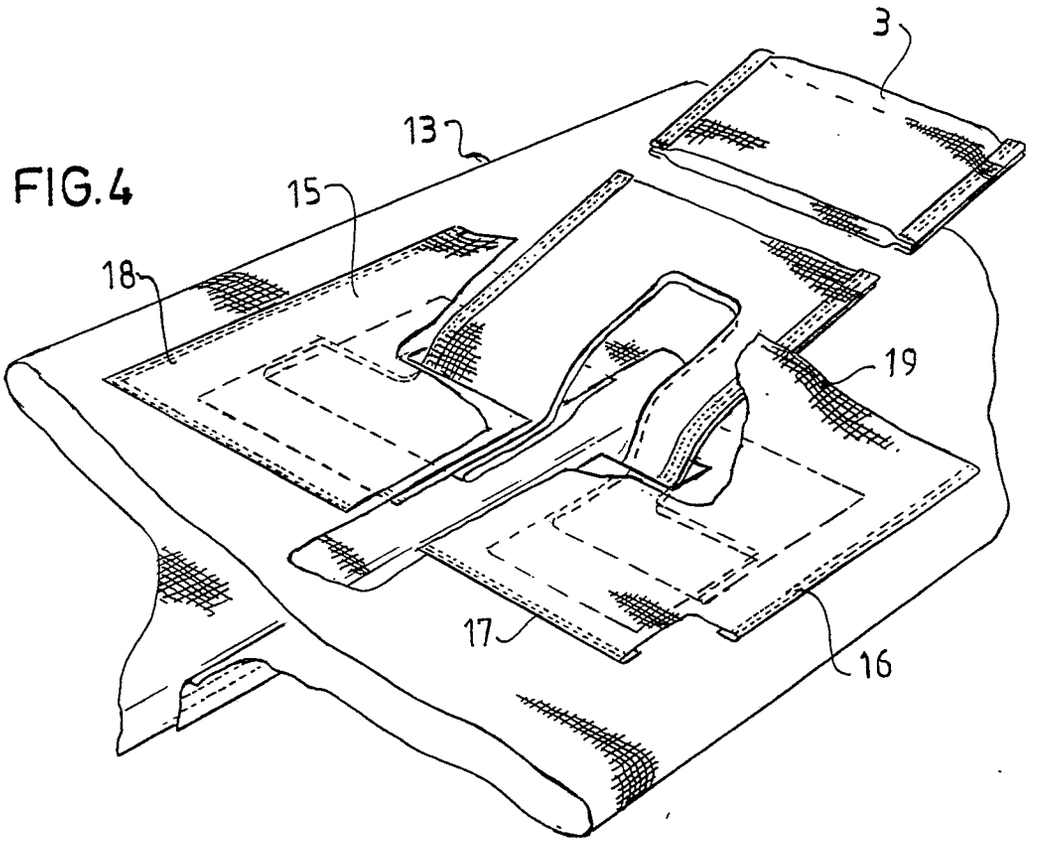


FIG.4



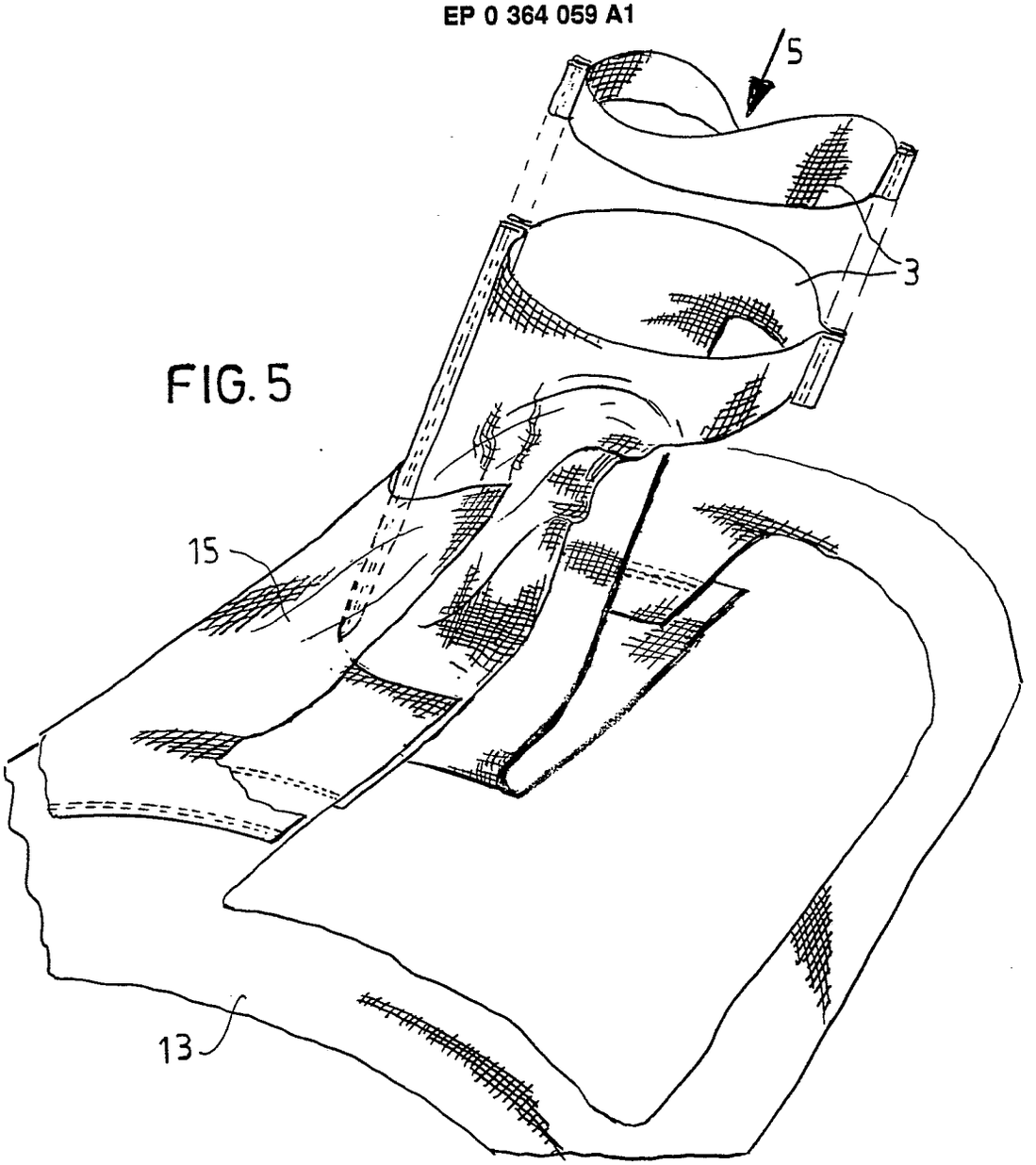


FIG. 5

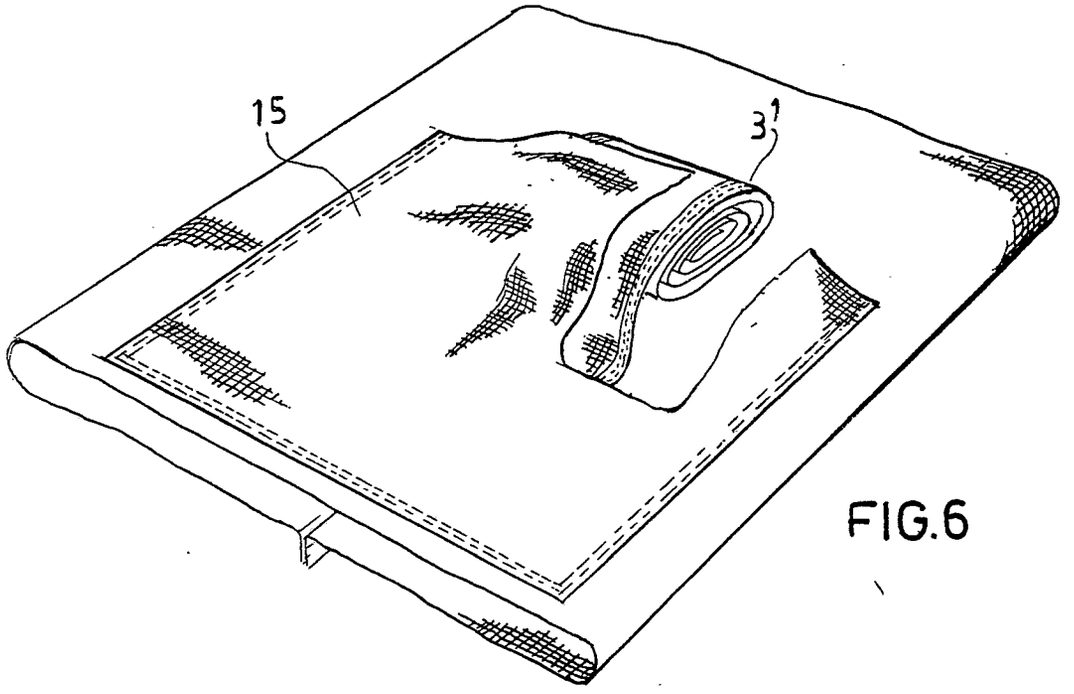


FIG.6

FIG.7

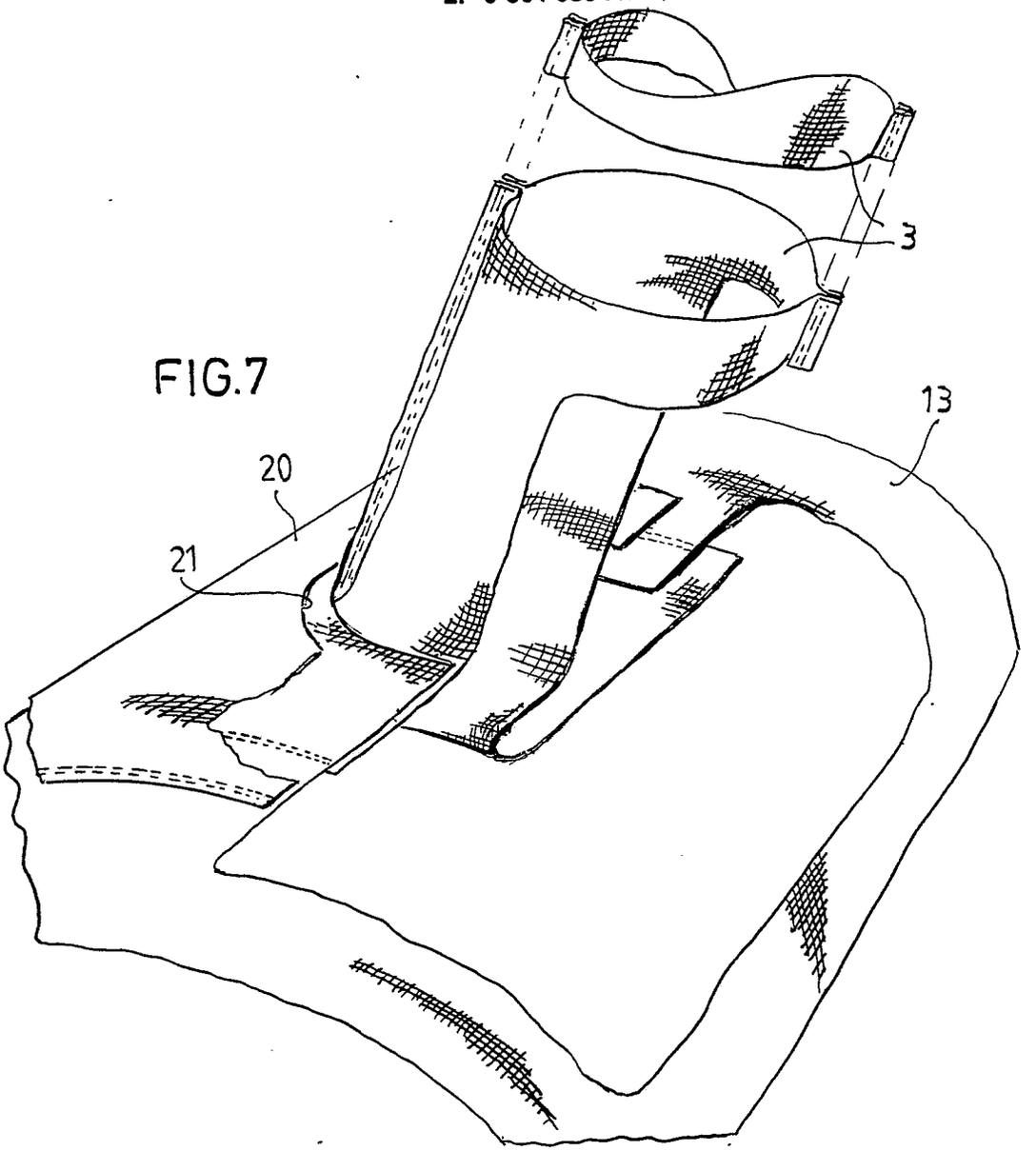
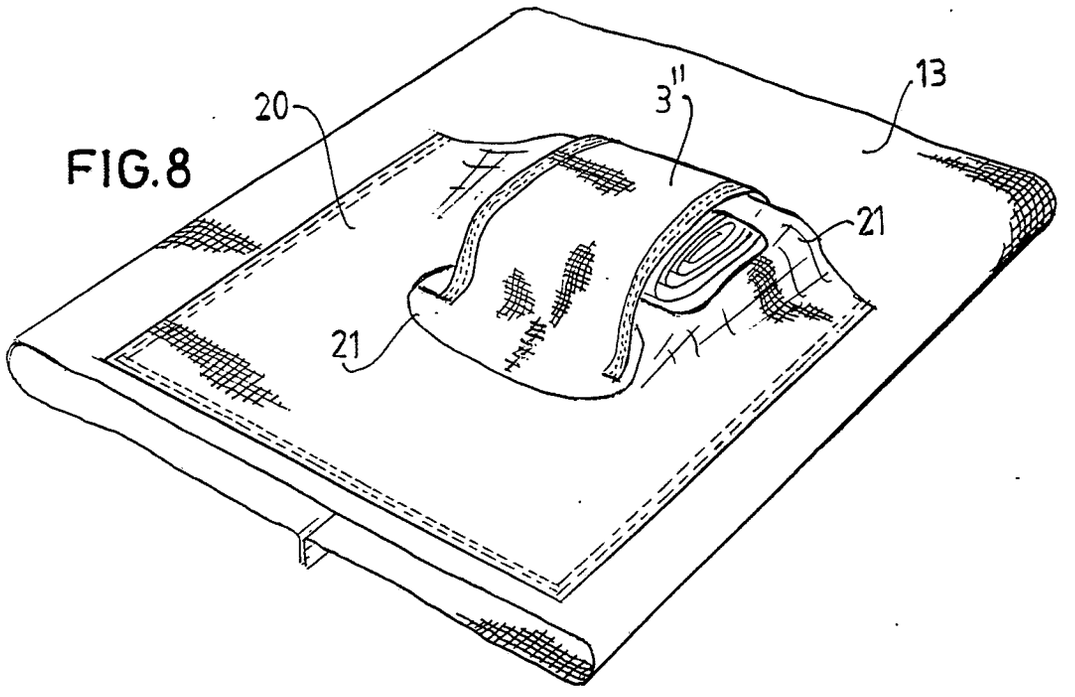


FIG.8



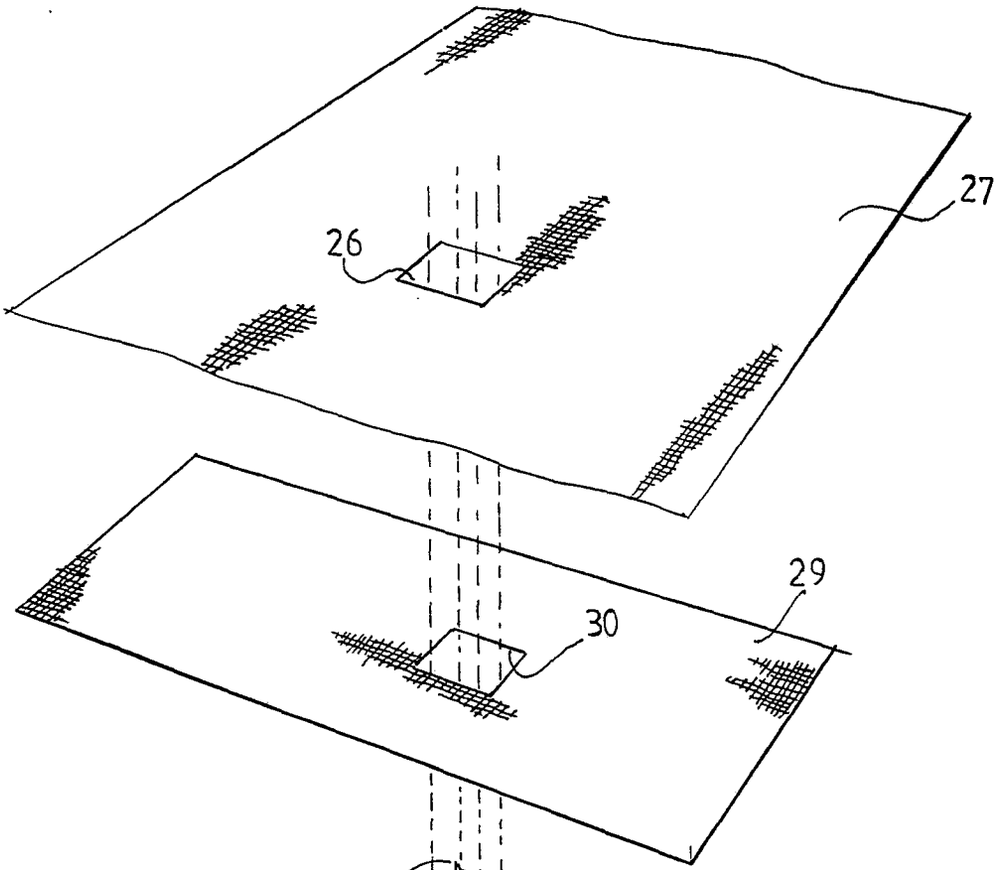


FIG.9

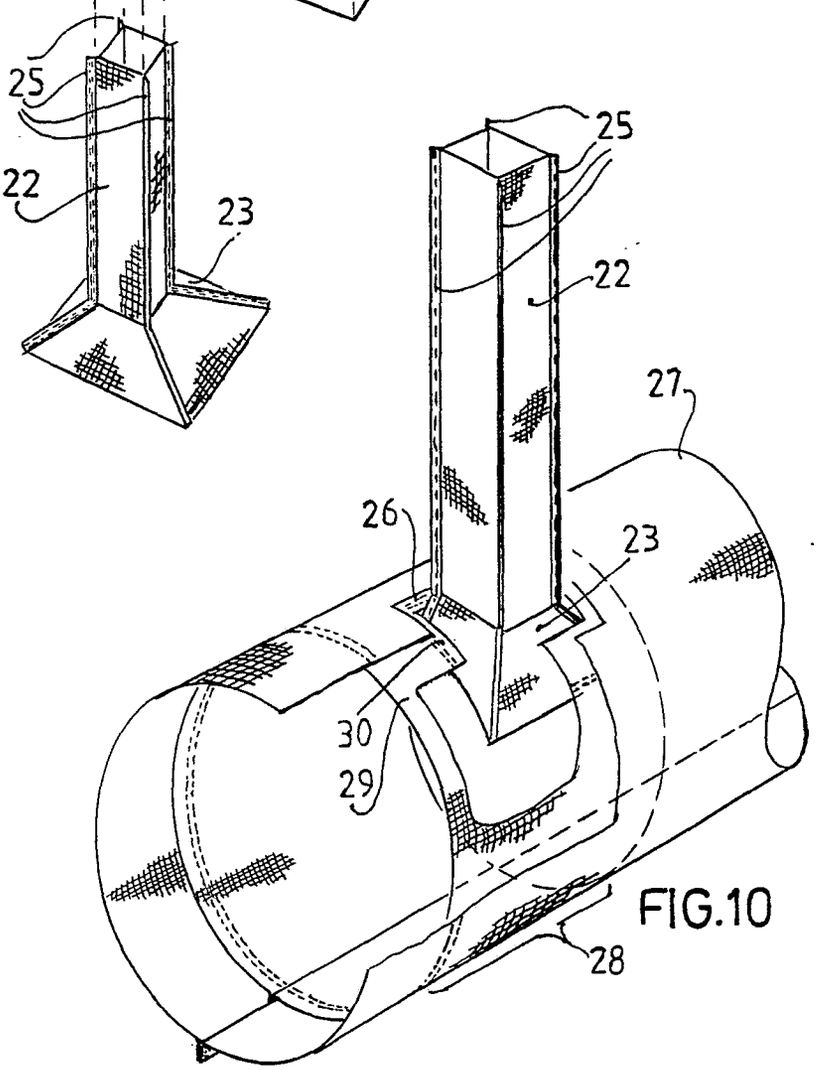


FIG.10

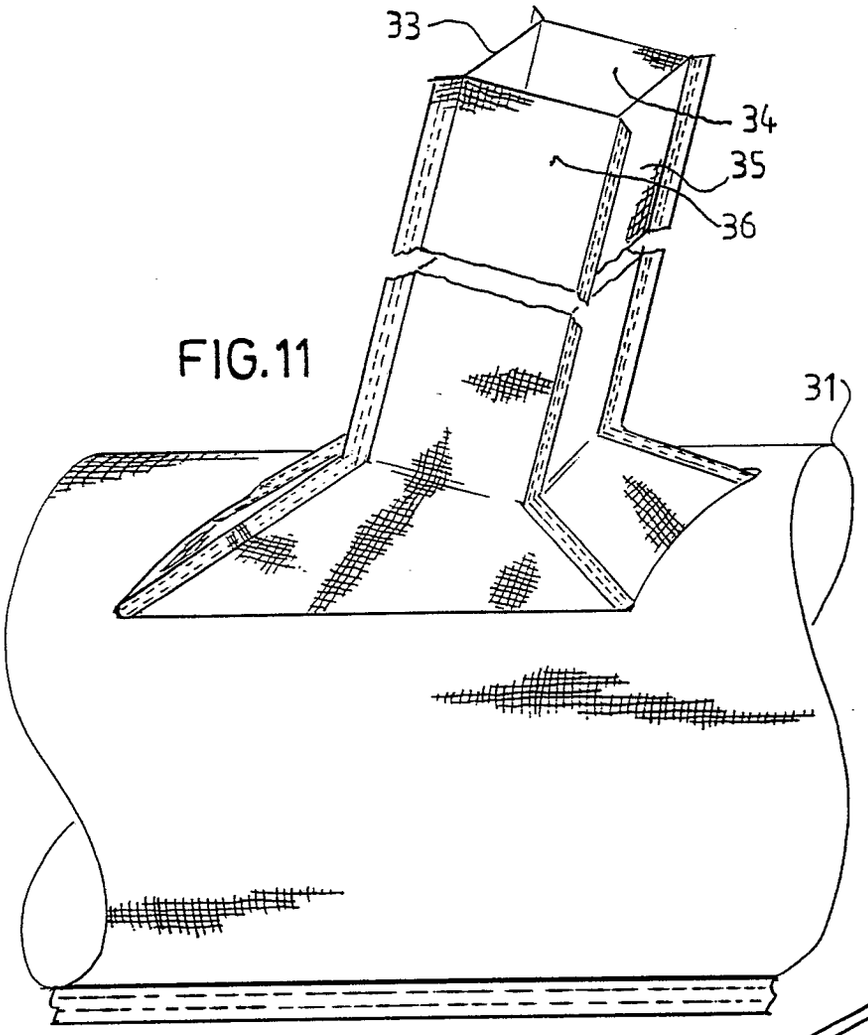


FIG.11

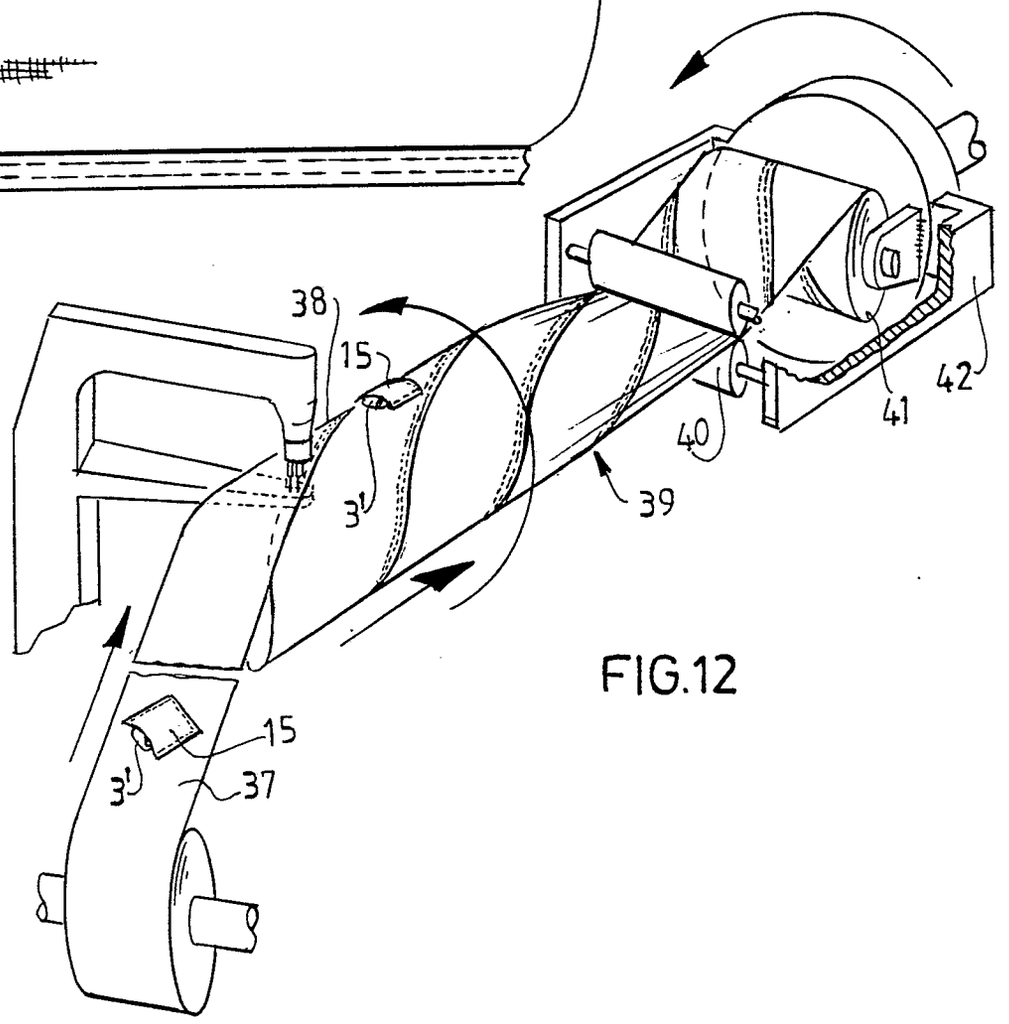


FIG.12

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EUROPEAN SEARCH REPORT

Application Number

EP 89 20 3042

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.4)
A	NL-A-7 006 810 (FYENS) * The whole document * ---	1	E 02 B 3/12 E 02 B 3/04
A	DE-A-2 725 552 (COLCRETE) * The whole document * ---	1	
A	US-A-2 685 385 (KUSS) * Column 4, lines 5-15; figures 1,8,10 * ---	1	
A	NL-A-7 708 364 (FAIBAIRN LAWSON PACKAGING LTD) * Page 1, lines 4-21 * -----	9	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

E 02 B
B 63 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18-12-1989	HANNAART J.P.

CATEGORY OF CITED DOCUMENTS

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