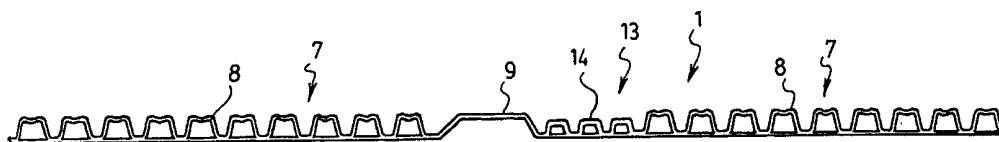


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(21) International Application Number: PCT/CA99/00937 (22) International Filing Date: 7 October 1999 (07.10.99) (30) Priority Data: 09/197,435 23 November 1998 (23.11.98) US (71)(72) Applicants and Inventors: LUPKE, Manfred, A., A. [CA/CA]; 92 Elgin Street, Thornhill, Ontario L3T 1W6 (CA). LUPKE, Stefan, A. [CA/CA]; 32 Vintage Lane, Thornhill, Ontario L3T 1X6 (CA). (74) Agents: JOHNSON, T., Scott et al.; Dennison Associates, Suite 301, 133 Richmond Street West, Toronto, Ontario M5H 2L7 (CA).	(81) Designated States: CA, CN, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>With amended claims.</i>	

(54) Title: PIPE COUPLING HAVING SAME OUTER DIAMETER AS PIPE**(57) Abstract**

A plastic pipe has a multiple layer wall (1) construction including major (7) and minor (13) wall portions. The major wall portions (7) are formed with first corrugations (8) and are separated from one another by the minor wall portions (13) which are formed with second corrugations (14) and a bowed wall part (9) which is of the same diameter as the first corrugations (8). The second corrugations (14) are smaller in diameter than both the first corrugations (8) and the bowed wall part (9). The wall construction is cut at the bowed wall part (9) to produce two pipe sections which couple with one another. One of those pipe sections has an open ended bell converted from the bowed wall pipe and the other pipe section has a male spigot formed by the second corrugations (14) of the wall construction.

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PIPE COUPLING HAVING SAME OUTER DIAMETER AS PIPE

FIELD OF THE INVENTION

The present invention relates to the making of
5 couplers in plastic pipes.

BACKGROUND OF THE INVENTION

Plastic pipes are built with belled ends for
10 coupling with other pipes. Conventionally, these belled
ends are of a larger diameter than the remainder of the
pipe. This presents a problem with respect to shipping and
storage of the pipes because spacers are needed between the
pipes. Without these spacers, the enlarged coupling bell
15 of each pipe is exposed to the weight of all of the pipes
around it. This can easily cause damage to the bells by
weakening, deforming and even cracking of the bells making
them ineffective in providing a sealed coupling between the
pipes.

20

SUMMARY OF THE PRESENT INVENTION

The present invention relates to a plastic pipe
from which pipe sections having male and female coupling
25 ends are made. According to the present invention, the
female coupling end, i.e. the coupling bell is consistent
in diameter with the main body of the pipe. As such, when
the pipe is loaded with other similar pipes without using
spacers between the pipes most of the load is taken up by
30 the pipe body rather than the coupling bell of the pipe.

In particular, a plastic pipe made in accordance
with the present invention has a multiple layer wall
construction comprising major wall portions which are
35 formed with first corrugations. These major wall portions
are separated from one another by minor wall portions

formed with second corrugations and also formed with a bowed wall part. The second corrugations are smaller in diameter than both the first corrugations and the bowed wall part. The bowed wall part is consistent in diameter
5 with the first corrugations.

A plastic pipe made with the above wall construction is used for forming coupleable pipe sections. This is achieved by removing a transition piece of the
10 bowed wall part to the second corrugations. This produces a first pipe section having a coupling bell converted from the bowed wall part and a second pipe section having a male spigot formed by the second corrugations of the pipe. The male spigot fits into the bell for coupling the two pipe
15 sections with one another.

BRIEF DESCRIPTION OF THE DRAWINGS

The above as well as other advantages and features
20 of the present invention will be described in greater detail according to the preferred embodiments of the present invention in which;

Figure 1 is a sectional view through a pipe wall construction according to a preferred embodiment of the
25 present invention;

Figure 1A shows an enlargement of part of the pipe wall construction of Figure 1;

Figures 2 through 4 show various stages of preparing the pipe wall construction of Figure 1 to produce
30 coupled pipe sections;

Figure 5 is a sectional view through a pipe wall construction according to a further preferred embodiment of the present invention;

Figures 6 through 9 show the different method steps
35 of preparing the pipe wall construction of Figure 5 to produce coupled pipe section.

DETAILED DESCRIPTION ACCORDING TO THE PREFERRED EMBODIMENTS
OF THE PRESENT INVENTION IN WHICH:

5 Figure 1 shows a pipe wall construction generally indicated at 1. This pipe wall construction is formed from a common source of plastic separated into different streams through an extrusion process as is known in the art. However, unlike conventional practice these two streams of
10 plastic are brought together to form the unique configuration of the pipe wall construction of Figure 1.

 More specifically, and as better seen in Figure 1A the wall construction comprises an inner pipe wall 3 formed
15 from the first stream of plastic and an outer pipe wall 5 formed from the second stream of plastic. The inner pipe wall is flat except where the pipe wall is formed with a bowed wall part 9. The outer pipe wall is formed with a series of corrugations except at the bowed wall part 9
20 where the inner and outer pipe walls conform with one another.

 As noted above, the outer pipe wall is formed into corrugations. However, these corrugations vary in diameter
25 lengthwise of the pipe. Specifically, along major portions 7 of the length of the pipe, the outer wall is formed into corrugations 8 and along minor portions 13 of the length of the pipe, the outer wall is formed into corrugations 14. These minor portions 13 of the pipe wall also include the
30 bowed wall part 9.

 Figure 1 best shows how the major portions 7 provided with corrugations 8 dominate the length of the pipe relative to the intervening minor pipe wall portions
35 13 comprising bowed wall part 9 and corrugations 14.

In Figure 1A it will be seen that although corrugations 8 have a larger diameter than the corrugations 14, the corrugations 14 have a greater wall thickness. This is because both corrugations are made with the same amount of plastic material.

Bowed wall part 9 has a transition area 11 where it meets with the small diameter corrugations 14. The removal of this transition area produces two separate pipe sections having end wall constructions as shown in Figures 2 and 3. The wall construction of Figure 2 terminates in a bell 9a which has been converted from the bowed wall part 9 through the removal of the transition area 11 of the bowed wall part. This transition region removal also produces a male spigot end wall construction as shown in Figure 3 where the spigot is formed by the small diameter corrugations 14. Figure 4 of the drawings shows that a seal 15 is placed into one of the valleys of the corrugations 14. The bell 9a of the pipe wall section of Figure 2 is then slid over the spigot forming corrugations 14 of the pipe wall end of Figure 3. This produces a sealed coupling of the two pipe ends relative to one another. The increased wall thickness of the spigot forming corrugations makes them strong to maintain the seal in the coupling.

25

Figure 4 clearly shows that the bell 9a is of a height or diameter consistent with that of the corrugations 8. This produces two benefits. Firstly, the bell on the pipe does not protrude outwardly relative to the major portions of the pipe wall and as such is not subject to localized pressure which would be experienced by larger bells on conventional pipes during shipping and storage. As such, the bell 9a maintains its circular configuration around the pipe and is very effective in providing a sealed pipe coupling.

35

Secondly, the coupled regions of joined pipe sections are of a consistent diameter with the rest of the pipe. This is important for a number of reasons such as for example the feeding of the pipe into relatively tight
5 spaces. In such a situation the size of the opening is not dictated by an enlarged coupling as is the case in prior art constructions.

Another benefit of making a pipe wall construction
10 with first corrugations, second smaller diameter corrugations and a bowed wall part consistent in diameter with the first corrugations, is that such a wall construction can be used to make a triple wall pipe as shown in Figure 5 of the drawings.

15 The triple wall pipe is in its first stages of formation made in exactly the same manner as the double wall pipe of Figure 1, i.e. two streams of plastic are extruded with one another to form a pipe wall having major
20 pipe wall portions formed with corrugations 8a and separated by minor pipe wall portions comprising corrugations 14a and a bowed wall part 9a. Corrugations 14a are again smaller in diameter than but of increased wall thickness relative to corrugations 8a.

25 After the two streams of plastic have been formed into a double wall pipe as described immediately above, it is fitted within a plastic sheath or layer 15. This sheath is only very slightly greater in diameter than the
30 corrugations 8a and the bowed wall part 9a. The sheath as shown is however substantially greater in diameter than the corrugations 14a.

The outer sheath is preferably applied by a cross
35 head and the entire pipe comprising all three layers is put through a vacuum sizing tank. This sets the outside shim of the sheath where it attaches to the corrugations 8a and the bowed wall part 9a. The sheath and the corrugations

14a do not attach to one another as shown in Figure 5.

The triple wall pipe has a transition area defined by the lines 17 and 19 in Figure 5. By removing this transition area, two separate pipe sections shown in Figures 6 and 7 are produced. The pipe section of Figure 6 terminates with a belled end 10a which comprises the portion of the bowed wall part 9a remaining after the transition region has been removed and the sheath 15 covering that remaining bowed wall part.

The end wall region of the pipe section shown in Figure 7 comprises corrugations 14a and a sheath portion 15a spaced outwardly of the corrugations. Figure 8 of the drawings shows that in preparing a male spigot coupler, sheath portion 15a is removed from the pipe end to uncover corrugations 14a.

Figure 9 of the drawings shows the coupling of the bell 10a with the spigot forming corrugations 14a. Prior to making this coupling, a flexible O-ring seal 21 is inserted into one of the valleys of the corrugations 14a to provide an effective seal for the coupling.

The description above relates to a female bell on one end of the pipe section and a male spigot on one end of the another pipe section. As will be appreciated, an individual pipe section according to the present invention has these male and female coupling parts at its opposite ends.

Although various preferred embodiments of the present invention have been described in detail, it will be appreciated by those skilled in the art that variations may be made without departing from the spirit of the invention or the scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A plastic pipe having a multiple layer wall
5 construction comprising major wall portions which are
formed with first corrugations and which are separated from
one another by minor wall portions formed with second
corrugations and also formed with a bowed wall part, said
10 second corrugations being smaller in diameter than both
said first corrugations and said bowed wall part and said
bowed wall part being of a diameter consistent with that of
said first corrugations.
2. A plastic pipe as claimed in Claim 1 including
15 first, second and third layers in said multiple layer wall
construction, said third layer being provided outwardly
over and adhered to said first corrugations and said bowed
wall part and being spaced outwardly of said second
corrugations.
- 20 3. A plastic pipe having a multiple layer wall
construction with a coupling end for coupling with another
pipe, said wall construction including a plurality of
corrugations, said coupling end comprising an open ended
25 bell having a diameter consistent with that of said
corrugations.
4. A plastic pipe having a multiple layer wall
construction including a coupling end for coupling with
30 another pipe, said wall construction being formed with
first and second corrugations, said first corrugations
being provided over most of the pipe, said second
corrugations being provided at the coupling end of the pipe
and being smaller in diameter than said first corrugations.
35
5. A plastic pipe having a multiple layer wall

construction with first and second coupling ends for coupling to other pipes, said wall construction being formed with first corrugations, second corrugations and an open ended bell, said first corrugations being provided
5 along most of said pipe, said second corrugations being provided at said first coupling end and being smaller in diameter than said first corrugations, said bell being provided at said second coupling end and being of a diameter consistent with that of said first corrugations.

10

6. A plastic pipe as claimed in Claim 5, including first, second and third layers in said wall construction, said third layer being adhered to said first corrugations and said bell while being spaced from said second
15 corrugations.

7. A method of making a plastic pipe comprising extruding first and second streams of plastic into a mold to provide said pipe with a multiple layer wall
20 construction, forming first corrugations along major portions of said wall construction and forming second corrugations and a bowed wall region along minor portions of said wall construction between said major portions thereof, said first corrugations and said bowed wall part
25 being consistent in diameter, said second corrugations having a diameter less than that of said first corrugations and said bowed wall part.

8. A method as claimed in Claim 7, wherein said bowed
30 wall region has one end forming a transition wall part to said second corrugations, said method including removing said transition wall part to form first and second pipe sections from said pipe in which said bowed wall region is converted to an open ended bell on said first pipe section
35 and said second corrugations from a male spigot on said second pipe section, said bell and said spigot being inter-

fittable with one another for coupling said first pipe section with said second pipe section.

9. A method as claimed in Claim 7, including covering
5 said wall construction with an external layer of plastic and then forcing said first corrugations and said bowed wall region of said wall construction and said layer of plastic to adhere to one another.

10 10. A method as claimed in Claim 9, including dividing said pipe into first and second pipe sections through said external layer and removing part of said bowed wall region of said wall construction to provide said first pipe section with a belled end covered by said external layer.

15

11. A method as claimed in Claim 10, including removing part of said external layer around and uncovering said second corrugations to form a spigot end on said second pipe section.

20

AMENDED CLAIMS

[received by the International Bureau on 23 March 2000 (23.03.00);
original claims 3-11 replaced by new claims 3-8 (3 pages)]

1. A plastic pipe having a multiple layer wall
5 construction comprising major wall portions which are
formed with first corrugations and which are separated from
one another by minor wall portions formed with second
corrugations and also formed with a bowed wall part, said
10 said first corrugations being smaller in diameter than both
said bowed wall part and said bowed wall part being of a diameter consistent with that of
said first corrugations.

2. A plastic pipe as claimed in Claim 1 including
15 first, second and third layers in said multiple layer wall
construction, said third layer being provided outwardly
over and adhered to said first corrugations and said bowed
wall part and being spaced outwardly of said second
corrugations.

20 3. A plastic pipe having a multiple layer wall
construction comprising first, second and third layers and
being provided with first and second coupling ends for
coupling to other pipes, said wall construction being
25 formed with first corrugations, second corrugations and an
open ended bell, said first corrugations being provided
along most of said pipe, said second corrugations being
provided at said first coupling end and being smaller in
diameter than said first corrugations, said bell being
30 provided at said second coupling end and being of a
diameter consistent with that of said first corrugations,
said third layer being adhered to said first corrugations
and said bell while being spaced from said second
corrugations.

35 4. A method of making a plastic pipe comprising

extruding first and second streams of plastic into a mold to provide said pipe with a multiple layer wall construction, forming first corrugations along major portions of said wall construction and forming second
5 corrugations and a bowed wall region along minor portions of said wall construction between said major portions thereof, said first corrugations and said bowed wall part being consistent in diameter, said second corrugations having a diameter less than that of said first corrugations
10 and said bowed wall part.

5. A method as claimed in Claim 4, wherein said bowed wall region has one end forming a transition wall part to said second corrugations, said method including removing
15 said transition wall part to form first and second pipe sections from said pipe in which said bowed wall region is converted to an open ended bell on said first pipe section and said second corrugations from a male spigot on said second pipe section, said bell and said spigot being inter-
20 fittable with one another for coupling said first pipe section with said second pipe section.

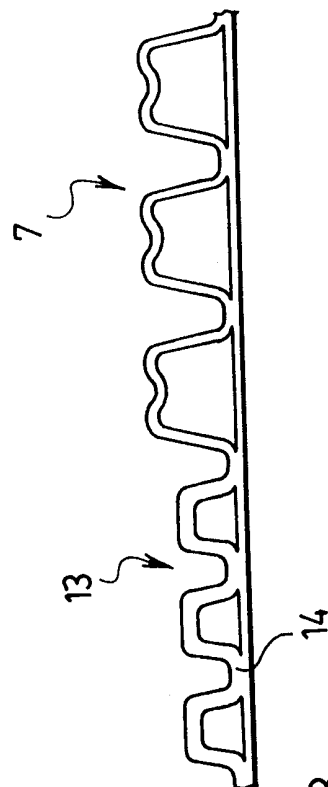
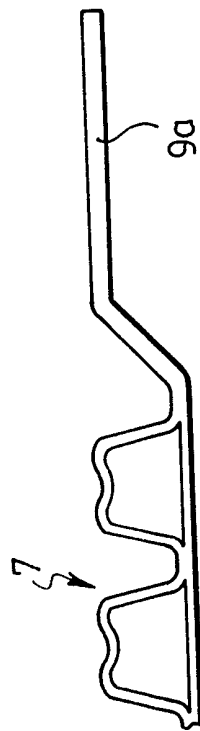
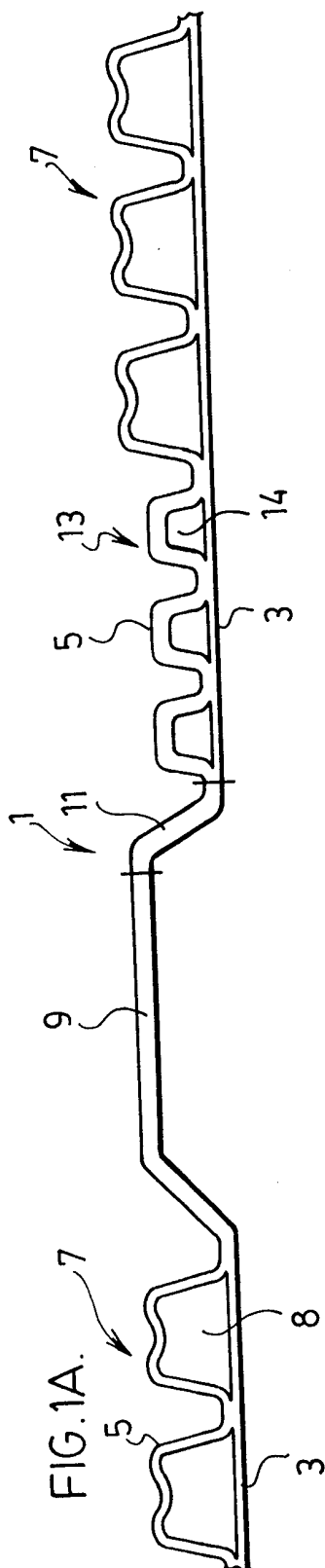
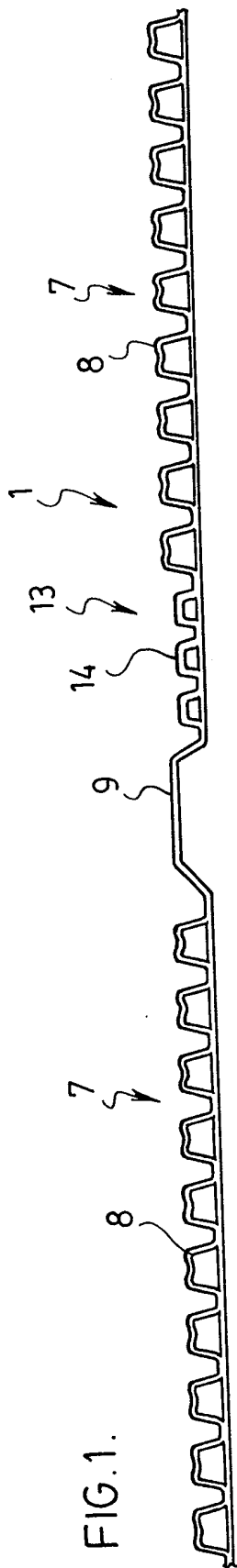
6. A method as claimed in Claim 5, including covering said wall construction with an external layer of plastic
25 and then forcing said first corrugations and said bowed wall region of said wall construction and said layer of plastic to adhere to one another.

7. A method as claimed in Claim 5, including dividing
30 said pipe into first and second pipe sections through said external layer and removing part of said bowed wall region of said wall construction to provide said first pipe section with a belled end covered by said external layer.

35 8. A method as claimed in Claim 7, including removing part of said external layer around and uncovering said

second corrugations to form a spigot end on said second pipe section.

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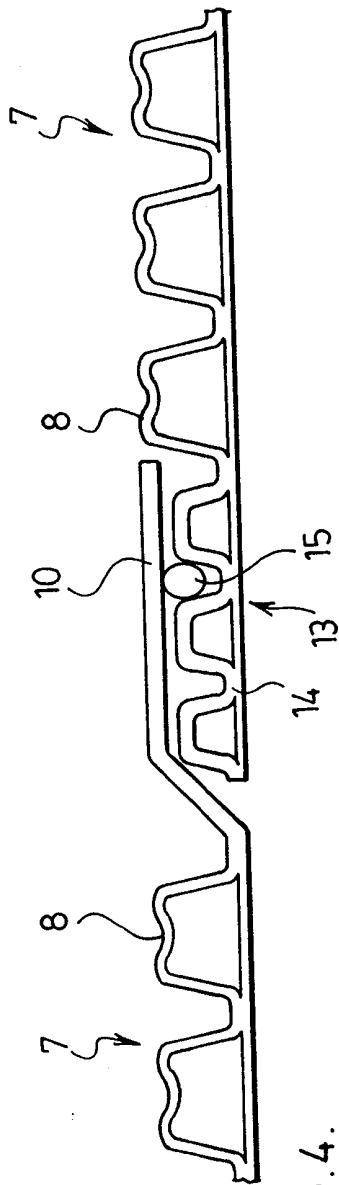


FIG. 4.

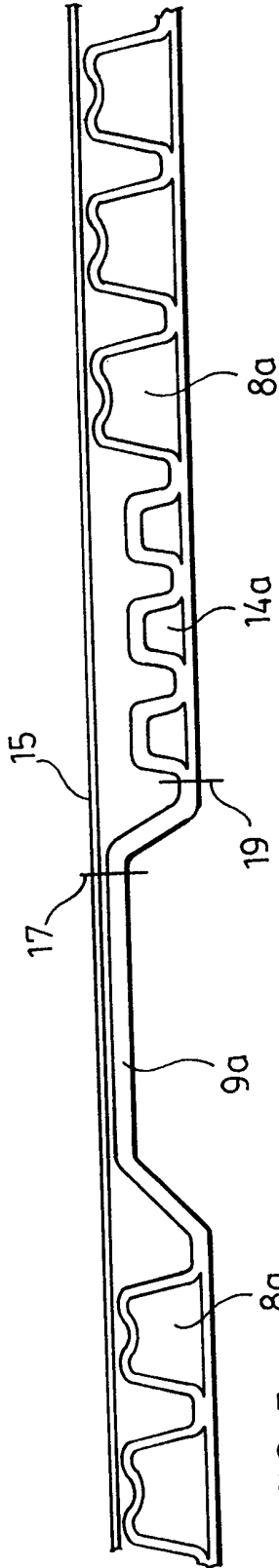


FIG. 5.

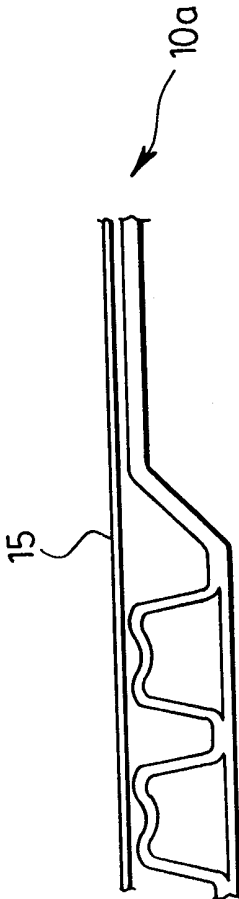
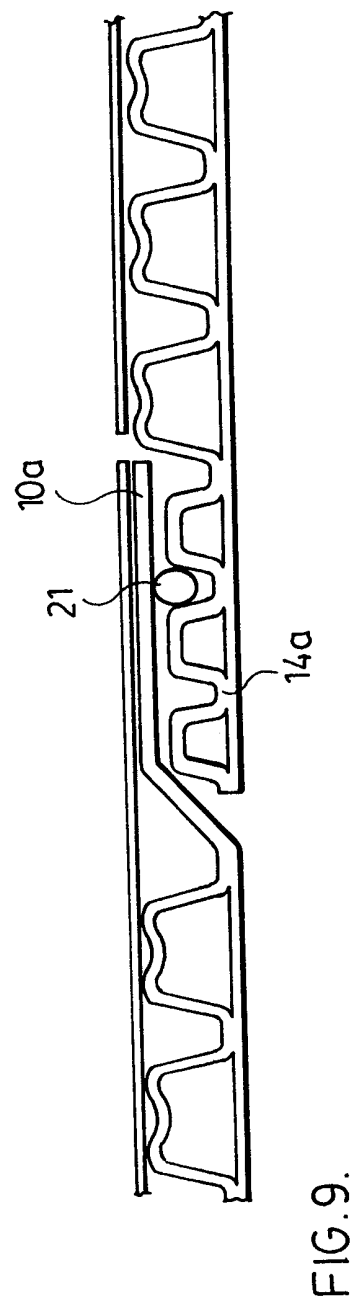
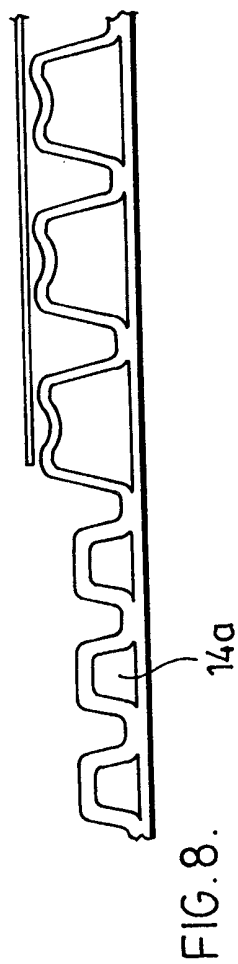
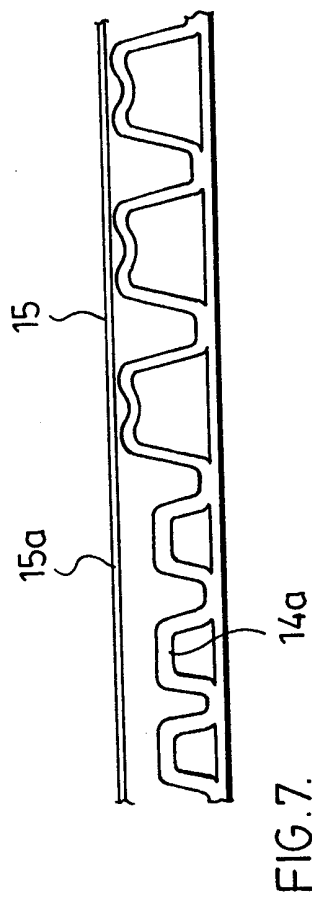


FIG. 6.



INTERNATIONAL SEARCH REPORT

International Application No.

PCT/CA 99/00937

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F16L47/06 F16L25/00

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 7 F16L

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.
Y	US 5 429 398 A (LUPKE STEFAN A) 4 July 1995 (1995-07-04) abstract figures 4,5,11,12 column 3, line 1 - line 30 column 5, line 9 - line 39 claim 1	1
A	---	2-5,7
Y	EP 0 385 465 A (OLTMANN'S KUNSTSTOFFWERK GMBH) 5 September 1990 (1990-09-05) abstract column 3, line 15 - column 4, line 25 column 5, line 12 - line 50 claims 14-16 figures 1,2	1
A	---	9-11
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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Date of the actual completion of the international search

12 January 2000

Date of mailing of the international search report

21/01/2000

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 99/00937

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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International Application No

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