



(51) International Patent Classification:

F16L 9/12 (2006.01) F16L 9/133 (2006.01)
F16L 9/14 (2006.01) F16L 9/18 (2006.01)
F16L 9/22 (2006.01)

(21) International Application Number:

PCT/AU2012/000453

(22) International Filing Date:

30 April 2012 (30.04.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2011901669 5 May 2011 (05.05.2011) AU

(71) Applicant (for all designated States except US): PIPELION PTY LTD [AU/AU]; c/o Suite 4, Level 3, 20 George St, Hornsby, New South Wales 2077 (AU).

(72) Inventor; and

(75) Inventor/Applicant (for US only): MCNAB, John [AU/AU]; c/o Suite 4, Level 3, 20 George St, Hornsby, New South Wales 2077 (AU).

(74) Agent: ADAMS PLUCK; Suite 4, Level 3, 20 George Street, Hornsby, New South Wales 2077 (AU).

(81) Designated States (unless otherwise indicated, for every kind of national protection available):

AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available):

ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: A FIRE RETARDANT AND ANTI STATIC PIPE

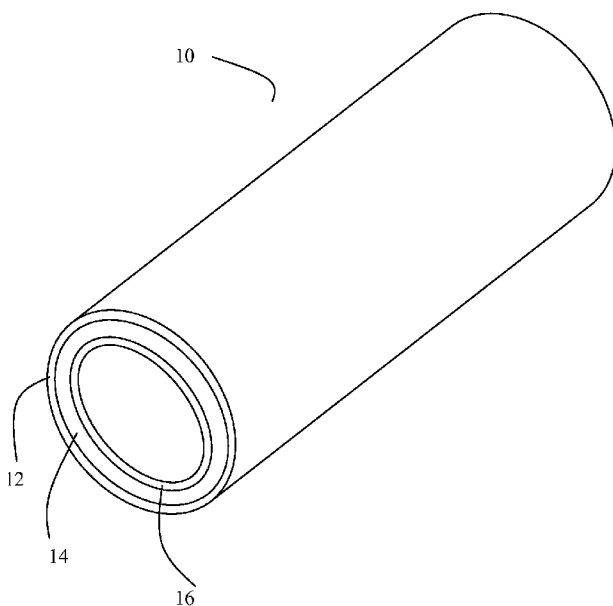


Fig 1

(57) Abstract: A pipe is described having a wall defining a bore, the wall is formed from at least two layers comprising: a structural core layer; an outer layer which is statically dissipative; and wherein the outer layer is also fire retardant.



A FIRE RETARDANT AND ANTI STATIC PIPE

Technical Field

The present invention relates to pipe systems and particularly relates to pipes
5 with fire retardant and anti-static properties.

Background to the Invention

Pipes are well known for use in conveying fluids under pressure such as water,
other liquids, or compressed air.

10 In certain environments, such as in underground mines, for example, there is a
particular need for pipes to have either or both of fire retardant or anti-static properties
for safety reasons. One suitable material for this purpose is steel. However, steel pipe
installations are expensive to manufacture and install. Furthermore, steel is prone to
corrosion and thus has a limited life span, requiring replacement of the entire pipe
15 installation.

Summary of the Invention

In a first aspect the present invention provides a pipe having a wall defining a
bore, the wall is formed from at least two layers comprising: a structural core layer; an
20 outer layer which is statically dissipative; and wherein the outer layer is fire retardant.

The outer layer may include a statically dissipative polymer.

The statically dissipative polymer may be in the form of a matrix distributed in
a host polymer.

The host polymer may include polypropylene.

25 The structural core layer may be formed from a polymer such as
polypropylene.

The outer layer may include a non-halogenated fire retardant material.

The pipe may further include an inner layer which is also statically dissipative.

In a second aspect the present invention provides a method of producing a pipe
30 including the steps of: co-extruding at least two pipe layers comprising: a structural core
layer; and an outer layer which is statically dissipative and fire retardant.

The outer layer may be formed by distributing a statically dissipative polymer
as a matrix into a host polymer.

The host polymer may include polypropylene.

The outer layer may be made fire retardant by the addition of a non-halogenated fire retardant material.

The method may further include the step of co-extruding an inner layer which
5 is statically dissipative.

The inner layer may be formed by distributing a statically dissipative polymer as a matrix into a host polymer.

The inner layer may be made fire retardant by the addition of a non-halogenated fire retardant material.

10

Brief Description of the Drawings

An embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a section of pipe according to an embodiment
15 of the invention; and

Figure 2 is an end view of the pipe of figure 1.

Detailed Description of the Preferred Embodiment

Referring to figure 1, a length of pipe 10 is shown in perspective view. The
20 pipe has been formed by a co-extrusion process and has a multi-layered wall structure which defines a central bore.

Outer layer 12 consists of a statically dissipative outer layer which is formed by distributing a statically dissipative polymer in a polypropylene-based host polymer which has also been mixed with a non-halogenated fire retardant material.

25 Inner layer 16 is formed from the same material as layer 12. In some embodiments, the fire retardant material is omitted from layer 16.

Intermediate structural core layer 14 is formed from Impact Modified Copolymer Polypropylene. Layer 14 has high strength and provides the overall multilayer pipe structure with strength making it suitable for use in pressure or vacuum
30 applications.

Statically dissipative polymers are commercially available and are used, for instance, in the production of electrostatically discharging packaging for use in the electronics industry.

In other embodiment the inner and outer layers may be made statically dissipative by the addition of one or more of carbon black, carbon nanotubes or metal fibres.

Where a layer is said to be statically dissipative it is generally considered by those skilled in the art to have a level of resistivity between 10^5 and 10^{11} ohm-metres. This provides a suitable level of electrical conductivity to dissipate charge in a reasonably short time without the risk of a spark hazard and avoids the need to provide earthing for a pipe installation formed using pipe according to embodiments of the invention.

Non-halogenated fire retardant materials are commercially available and can include one or more of ammonium polyphosphate (APP), melamine polyphosphate (MPP), magnesium hydroxide, aluminium trihydrate and red phosphorous.

Where a layer is said to be fire retardant it is generally understood by those skilled in the art that it would meet one of the classifications under the UL 94 standard, which is a plastics flammability standard released by Underwriters Laboratories of the USA.

Pipe 10 is formed in a continuous co-extrusion process in which all three layers are combined in one operation. The constituents of each of the layers are heated and mixed appropriately and introduced into an extrusion machine fitted with a co-extrusion die. Lengths of pipe emanating from the machine are cut to desired lengths and allowed to cool.

In the embodiments described above, the fire retardant material used was a non-halogenated fire retardant material. In other embodiments, a halogen based fire retardant material may be used such as a bromide or chloride.

In the embodiment described above the inner and outer layers included a polypropylene host polymer. Similarly, other host polymers could be used such as other polyolefins including polyethylene or polybutylene.

30

It can be seen that embodiments of the invention provide at least one of the following advantages:

- Pipe is suitable for use in areas where fire rating and anti-static rating is required.
- Being non-metallic, pipe does not suffer from corrosion.
- Being polymeric, pipe is lightweight and simple to transport and cut to length
- 5 • Non-halogenated fire retardant provides improved safety over bromide based fire retardant in the event of fire
- Pipe is suitable for pressure and vacuum applications
- No earthing required

10 Any reference to prior art contained herein is not to be taken as an admission that the information is common general knowledge, unless otherwise indicated.

 Finally, it is to be appreciated that various alterations or additions may be made to the parts previously described without departing from the spirit or ambit of the present invention.

CLAIMS:

1. A pipe having a wall defining a bore, the wall is formed from at least two layers comprising:
a structural core layer;
an outer layer which is statically dissipative; and
wherein the outer layer is fire retardant.
2. A pipe according to claim 1 wherein the outer layer includes a statically dissipative polymer.
3. A pipe according to claim 2 wherein the statically dissipative polymer is in the form of a matrix distributed in a host polymer.
4. A pipe according to claim 3 wherein the host polymer includes polypropylene.
5. A pipe according to any preceding claim wherein the structural core layer is formed from a polymer.
6. A pipe according to claim 5 wherein the polymer includes polypropylene.
7. A pipe according to any preceding claim wherein the outer layer includes a non-halogenated fire retardant material.
8. A pipe according to any preceding claim further including an inner layer which is also statically dissipative.
9. A pipe according to claim 8 wherein the inner layer includes a statically dissipative polymer.
10. A pipe according to claim 9 wherein the statically dissipative polymer is in the form of a matrix distributed in a host polymer.
11. A pipe according to claim 10 wherein the host polymer includes polypropylene.
12. A method of producing a pipe including the steps of:
co-extruding at least two pipe layers comprising:
a structural core layer; and
an outer layer which is statically dissipative and fire retardant.
13. A method according to claim 12 wherein the outer layer is formed by distributing a statically dissipative polymer as a matrix into a host polymer.
14. A method according to claim 13 wherein the host polymer includes polypropylene.
15. A method according to any one of claims 12 to 14 wherein the outer layer is made fire retardant by the addition of a non-halogenated fire retardant material.
16. A method according to any one of claims 12 to 15 wherein the structural core layer is formed from polypropylene.

17. A method according to any one of claims 12 to 16 further including the step of co-extruding an inner layer which is statically dissipative.
18. A method according to 17 wherein the inner layer is formed by distributing a statically dissipative polymer as a matrix into a host polymer.
19. A method according to claim 18 wherein the host polymer includes polypropylene.
20. A method according to any one of claims 17 to 19 wherein the inner layer is also fire retardant.
21. A method according to claim 20 wherein the inner layer is made fire retardant by the addition of a non-halogenated fire retardant material.

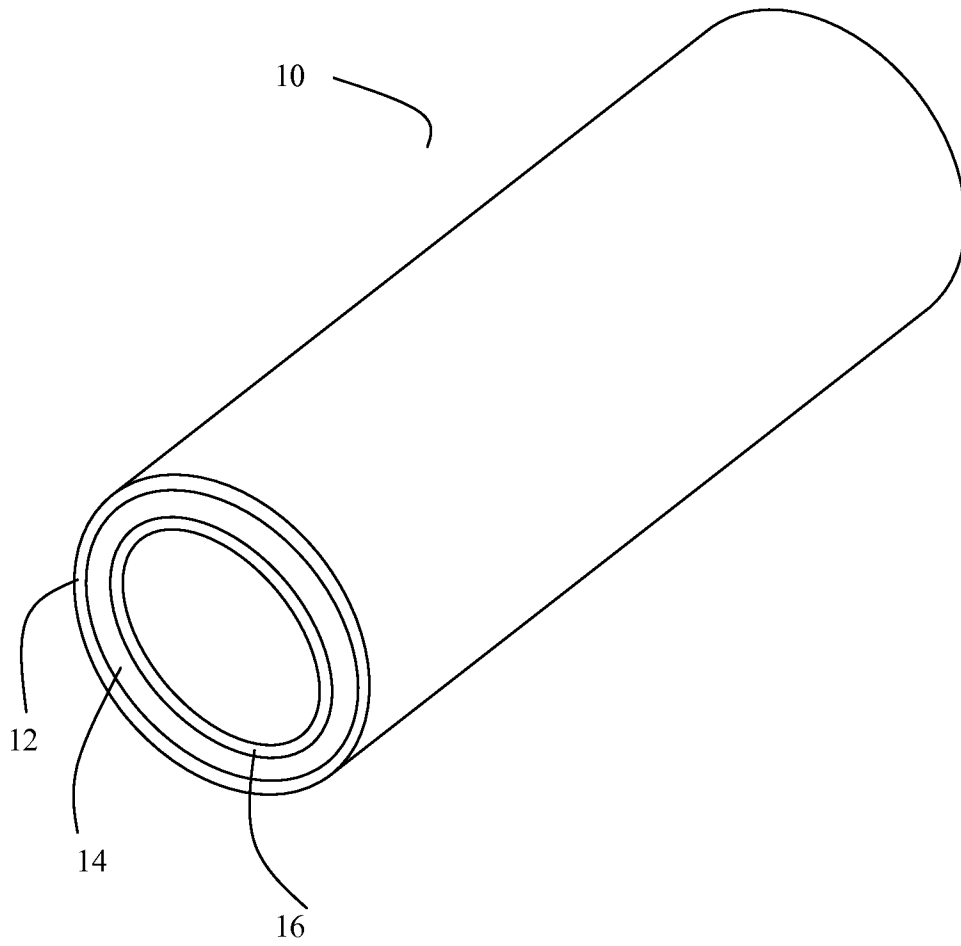


Fig 1

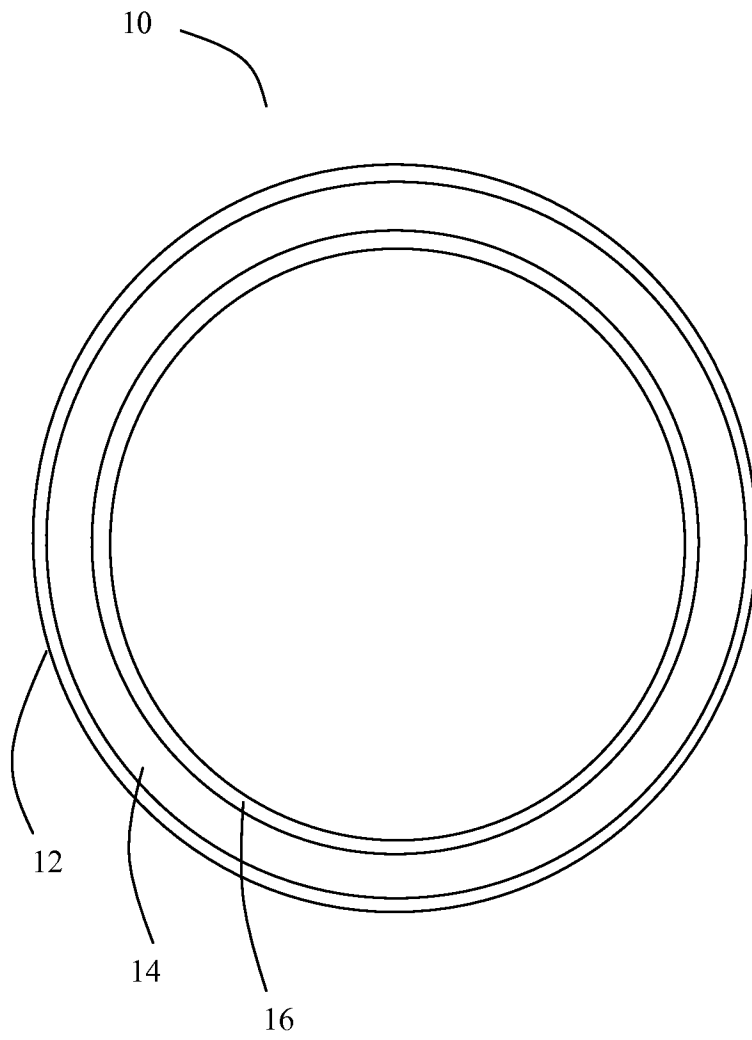


Fig 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2012/000453

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

F16L 9/12 (2006.01)*F16L 9/14* (2006.01)*F16L 9/22* (2006.01)*F16L 9/133* (2006.01)*F16L 9/18* (2006.01)

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)

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 practicable, search terms used)

EPODOC & WPI: IC/EC F16L & KW (Layer, Core, Anti-static, Static, Fire, Thermal, Heat, Retardant, Resistant, Insulate, Polymer, Non-Halogen, Phosphorous, Carbon, and similar words or terms)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/0100328 A1 (GOOSSENS) 11 May 2006 Abstract, Para 0003, 0007, 00015, 0017 & 0027	1-21
X	CN 2926724Y Y (LI SHOUSHAN) 25 July 2007. English Abstract retrieved from EPODOC database Abstract	1-2, 5 & 8-9
X	CN 2771609Y Y (WANG XIN) 12 April 2006. English Abstract retrieved from EPODOC database Abstract	1-2, 5 & 8-9

 Further documents are listed in the continuation of Box C See patent family annex

* Special categories of cited documents:

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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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

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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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

"&" document member of the same patent family

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

Date of the actual completion of the international search

29 May 2012

Date of mailing of the international search report

6 June 2012

Name and mailing address of the ISA/AU

AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
E-mail address: pct@ipaustralia.gov.au
Facsimile No. +61 2 6283 7999

Authorized officer

PASCAR CHITSAKA

AUSTRALIAN PATENT OFFICE
(ISO 9001 Quality Certified Service)

Telephone No : +61 2 6283 2130

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2012/000453

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	2006100328	EP	1831329	US	7754808	WO	2006047691
CN	2926724	NONE					
CN	2771609	NONE					

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX