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(54) Title: PIPE

(57) Abstract: In this invention a pipe which is suitable for use in underground pipelines and the like comprises an inner tubular member of plastics or metal around which is a layer of bitumen or plastics material surrounded in turn by a water impervious and electrically insulating plastics structural layer.

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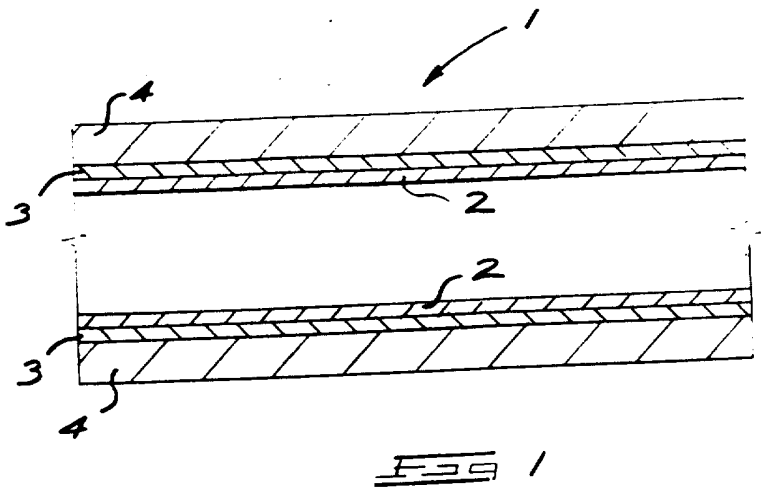

Fig 1

(56) Documents cited: GB - 1555632 GB - 2271160

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PIPE

INTRODUCTION OF THE INVENTION

This invention relates to a pipe and more particularly to a pipe which is suitable for use in a buried pipeline. The invention also relates to a method of making the pipes.

BACKGROUND TO THE INVENTION

Pipes of buried pipelines are subject to damage both during the installation process as well as afterwards. When the pipes are manufactured from steel it is known to coat the pipes with a corrosive resistant coating such as bitumen or an epoxy paint. These coatings are prone to damage which result in enhanced localised corrosion. During installation physical impact damage may occur and it is thus necessary not only to exercise care during this operation but also to carefully select the fill material used for backfilling around the pipe. Furthermore, during and after installation the pipe can also become oval due to external forces. In order to prevent corrosion of the internal surface of a steel pipe it is known to line the pipe internally with cement mortar. This lining may, however, be damaged if, due to external forces, the pipe is deformed.

After burying of such pipes and during use the additional problems associated with corrosion are present in the case of steel pipes.

As mentioned above in order to minimise physical damage and corrosion it is known to coat steel pipes with a bituminous layer. Such layers are however prone to drying out due to evaporation of volatiles which in turn leads to cracking of the bituminous layer. These cracks allow for water to reach the outside of the steel pipe which often leads to localised corrosion such as pitting corrosion. Water, being a conductor of electrical currents, further predisposes the steel to electrolytical corrosion.

An object of this invention is to provide a pipe which has improved characteristics insofar as buried pipes are concerned.

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SUMMARY OF THE INVENTION

According to the invention, a pipe comprises an inner tubular member, a continuous layer of one of bituminous and plastics material on the outside of the inner member and an outer structural layer on the outside of the continuous layer.

Further according to the invention the structural layer is water impervious and electrically non-conducting.

Still further, according to the invention, the outer layer is of a plastics material, preferably one of polyethylene, polypropylene or polyvinyl chloride.

Still further, according to the invention, the outer layer has a hollow profile and may include at least one compartment and preferably a plurality of compartments and the compartments are sealed.

Still further, according to the invention, the compartments may contain a gas such as air or a filler material such as a low grade plastics material, or a finely divided solid material.

Still further, according to the invention, the continuous layer may be reinforced and the reinforcing may be steel wire or steel mesh or fibres or a fabric such as a polyester cloth.

Still further, according to the invention, the inner tubular member may be plastics or metal and is preferably steel.

The invention also provides a method of making a pipe as defined above comprising :

coating an inner tubular member with a continuous layer of one of bituminous and plastics material; and

coating the continuous layer of material with an outer structural layer.

Further, according to this aspect of the invention, the inner tubular member is coated with the continuous layer by spirally wrapping the tubular member in an elongated bandage of flexible material carrying one of a bituminous and plastics material.

Still further, according to the invention, the continuous layer is coated with the outer layer by spirally wrapping it in overlapping manner with a bandage like member, the member being of flexible electrically insulating and water impervious material, and sealing the overlapping portions together.

Still further, according to the invention, the sealing of the overlapping portion is effected by the application of heat and pressure to weld the material together.

Still further, according to the invention, the outer layer is of a thermo-softening plastics material and is applied in a hot, soft condition.

BRIEF DESCRIPTION OF THE DRAWING

An embodiment of the invention described by way of example only follows with reference to the accompanying drawings in which :

Figure 1 is a cross sectional elevation of one embodiment of a pipe according to the invention;

Figure 2 is an elevation of a part of a pipe according to the invention;

Figure 3 is a diagrammatic view of a tubular member having a layer of bituminous material placed thereon;

Figure 4 is a section through the wall of a pipe according to the first embodiment of the invention;

Figure 5 is a section through the wall of a pipe according to a second embodiment of the invention;

Figure 6 is a section through the wall of a pipe according to a third embodiment of the invention;

Figure 7 is a section through the wall of a pipe according to a fourth embodiment of the invention;

Figure 8 is a section through the wall of a pipe according to a fifth embodiment of the invention; and
Figure 9 is a section through the wall of a pipe according to a sixth embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION WITH REFERENCE TO THE DRAWING

In the first embodiment of the invention as shown by Figures 1 to 4 of the drawings a pipe (1), suitable for laying as a buried pipe, is provided.

The pipe (1) comprises an inner tubular member or inner pipe (2) made from steel and which is surrounded by a continuous layer (3) of bitumen which serves to prevent corrosion of the inner steel pipe (2). Conveniently the bituminous layer is reinforced with a polyester fabric.

Surrounding the bitumen layer (3) is an impervious structural layer (4) of plastics material in the form of polyethylene. This structural polyethylene layer is substantially thicker than the combined wall thickness of the steel pipe (2) and the thickness of the bitumen layer (3). And serves to provide structural strength to the pipe (1) as a whole.

As may be seen from Figure 4 of the drawing, the structural polyethylene layer (4) includes a continuous chamber (5) of rectangular cross-section therein and of spiral configuration. This chamber (5) is filled with a low grade (and hence inexpensive) plastics filler such as a recycled plastics for example. In this way structural strength is provided at a relatively low cost.

The structural layer (4) is furthermore impervious to water and thus ensures that with the bitumen layer (3) the inner steel pipe (2) is not exposed to water and / or electrical currents. It is important that the structural layer is impervious to water as it is well known that where pipes are covered in a bituminous layer this layer will generally dry out and crack providing a passage for water and / or electrical currents to the steel pipe where localised corrosion may take place. The impervious nature of the structural layer also prevents the evaporation of the

volatile components of the bitumen thereby assisting in maintaining the integrity of the bitumen.

The manufacture of the pipe (1) is conveniently effected by mounting the inner tubular member or pipe (2) on a set of rollers so that it may be rotated thereon.

With the inner pipe (2) rotating it is covered with a layer of bitumen (3) by spirally winding onto it an elongated bandage (6) of polyester fabric which has been impregnated with and carries the bituminous material by passing it through a bath (7) filled with molten bitumen.

After the bitumen layering step the inner pipe (2) and its bitumen layer (3) are wrapped in a polyethylene bandage in a spirally wound overlapping manner. The overlapping portions of the bandage as indicated by numeral (8) are then welded together using a suitable heat source and the application of pressure. In this way a completely water impervious and electrically non-conducting layer is provided.

As was mentioned above the structural layer (4) includes a continuous chamber filled with recycled plastics.

A second embodiment of the invention is shown in Figure 5 of the drawings. This embodiment differs from the embodiment of Figure 4 described above in that :

(a) the polyester fabric reinforcing of the bitumen layer (3) is replaced with a glass fibre fabric reinforcing; and

(b) the filler in the voids or chambers (5) is not of a recycled plastics nature but is sand or a cementitious product.

A third embodiment of the invention is shown in Figure 6. This third embodiment differs from the first embodiment (Figure 4) in that the structural outer layer is a composite layer and comprises a first sub-layer (9) of polyethylene, a central sub-layer (10) of recycled aerated polyethylene and an outer sub-layer (11) of

polyethylene. All of the sub-layers are spirally wound onto the combined inner steel pipe (2) and bitumen layer (3) as described above and welded in position.

A fourth embodiment of the invention is shown by Figure 7. In this embodiment the inner pipe is not steel but is a inner polyethylene pipe (22). On this inner polyethylene pipe (22) is a continuous bitumen layer (23) which is reinforced by a spirally wound steel reinforcing (24) of circular cross-section.

An outer structural layer (26) is provided and this outer structural layer comprises a first sub-layer (27) of polyethylene which is spirally wound on the combined inner polyethylene pipe (22) and reinforced bitumen layer (23) and welded in place. The sub-layer (27) is covered with an outer sub-layer (28) of corrugated configuration thereby providing chambers (29) which are filled with a recycled plastics material.

A fifth embodiment of the invention is shown in Figure 8. In this embodiment a polyethylene inner pipe (30) is covered with a continuous layer (31) of reinforced polyethylene reinforcing means in the form of a spirally wound steel reinforcing (32) and an outer continuous structural layer (33) also of polyethylene.

A sixth embodiment of the invention is shown in Figure 9 and comprises a inner polyethylene pipe (35) covered by a polyethylene layer (36) reinforced with a spirally wound steel reinforcing (37) and an outer structural layer (38) of polyethylene carrying a continuous chamber (39) of rectangular cross-section and extending in a spiral configuration.

All of the above embodiments allow for a relatively thin walled inner pipe to be protected structurally and from a corrosion point of view in a cost effective manner.

Other embodiments are envisaged within the scope of the invention including other shapes, configurations and applications thereof.

CLAIMS

1. A composite pipe comprising an inner steel tubular member, a continuous corrosion prevention layer of one of bituminous and plastics material on the outside of the tubular member, and an outer structural plastics layer on the outside of the continuous layer.

2. A pipe as claimed in claim 1 in which the structural layer is water impervious and electrically non-conducting.

3. A pipe as claimed in either of claims 1 or 2 in which the plastics material is one of polyethylene and polypropylene and polyvinyl chloride.

4. A pipe as claimed in any of the preceding claims in which the outer layer has a hollow profile.

5. A pipe as claimed in claim 4 in which the outer layer includes at least one compartment.

6. A pipe as claimed in claim 5 in which the outer layer includes a plurality of compartments.

7. A pipe as claimed in either of claims 5 or 6 in which at least one compartment includes a filler.

8. A pipe as claimed in claim 7 in which the filler is one of a gas, a plastics material and a finely divided solid material.

9. A pipe as claimed in any of the preceding claims in which the continuous layer is reinforced.

10. A pipe as claimed in claim 9 in which the reinforcing is one of steel wire and steel mesh and fibres and a fabric.

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11. A pipe substantially as herein described with reference to Figures 1 to 4 or any one of Figures 5 to 9.

12. A method of making a composite pipe as claimed in claim 1

comprising:

coating an inner steel tubular member with a continuous corrosion prevention layer of one of bituminous and plastics material and covering the continuous layer of material with an outer structural plastics layer.

13. A method as claimed in claim 12 in which the inner tubular member is coated with the continuous layer by spirally wrapping the tubular member in an elongated bandage of flexible material carrying one of a bituminous and plastics material.

14. A method as claimed in either of claims 12 and 13 in which the continuous layer is coated with the outer layer by spirally wrapping it in overlapping manner with a bandage like member, the member being of flexible electrically insulating and water impervious material, and sealing the overlapping portions together.

15. A method as claimed in claim 14 in which the sealing of the overlapping portion is effected by the application of heat and pressure to weld the material together.

16. A method as claimed in claim 15 in which the outer layer is of a thermo-softening plastics material and is applied in a hot, soft condition

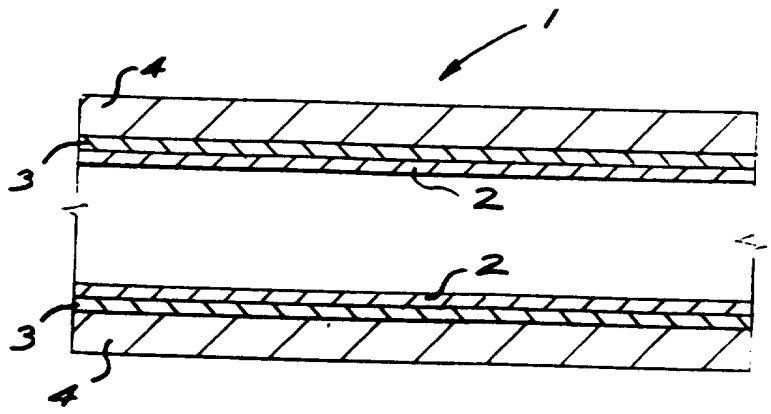

Fig 1

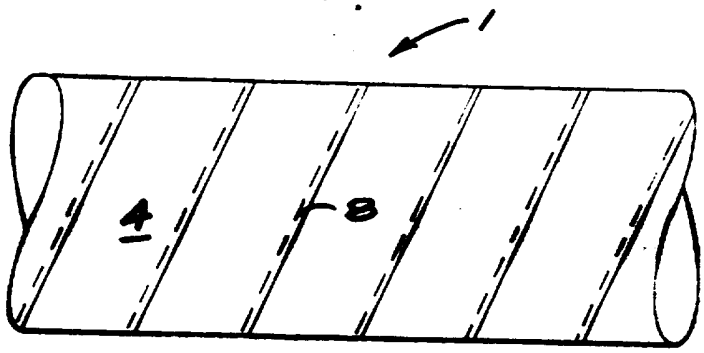

Fig 2

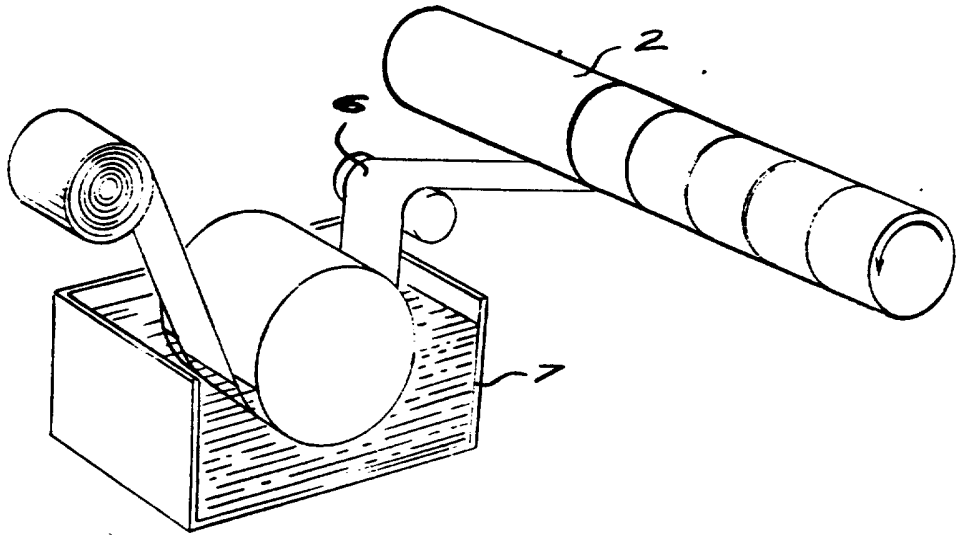

Fig 3

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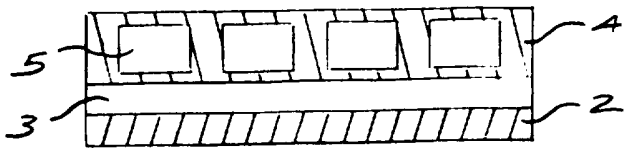

Fig 4

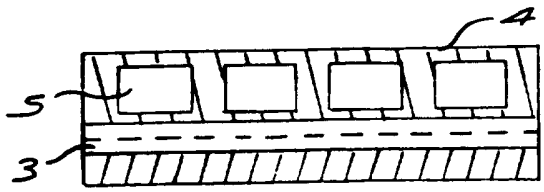

Fig 5

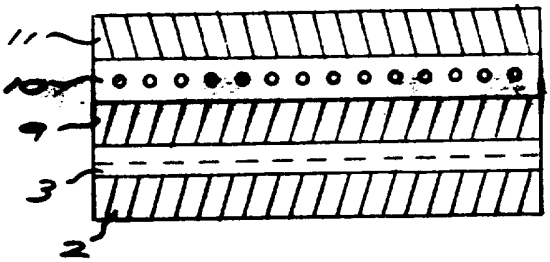

Fig 6

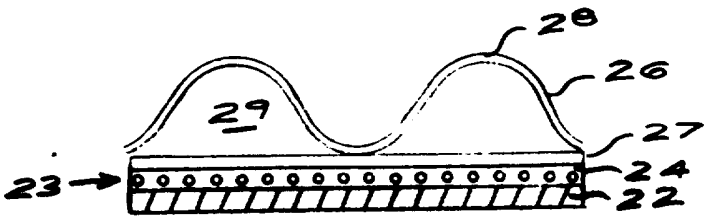

Fig 7

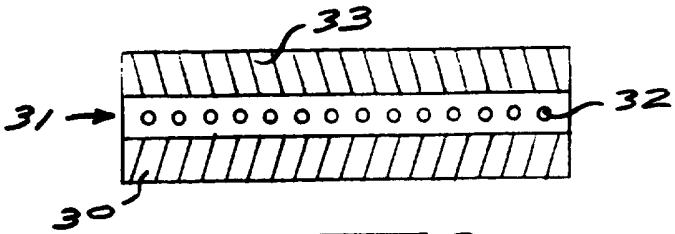

Fig 8

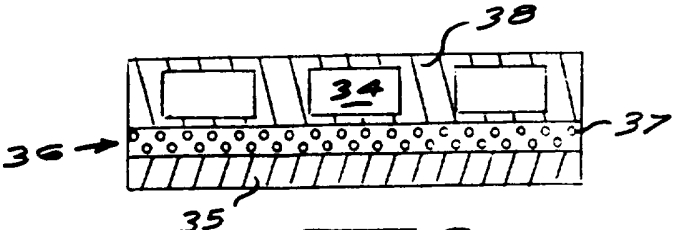

Fig 9