

PATENT SPECIFICATION

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DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvements in and relating to Concrete Pipes and Other Such Bodies.

We, HUMBS LIMITED, a Company incorporated under the laws of the State of Victoria, and having its registered office at 185 William Street, Melbourne, in the State of Victoria, Commonwealth of Australia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to concrete pipes and other such bodies, more particularly to methods of, and means for, sealing the internal surfaces, or parts thereof, so as to render them fluid tight and impervious, or highly resistant to chemical or other deleterious influences likely to be encountered in actual use. It also relates to similar sealing of the top or outer surface of concrete articles or structures such as slabs and floors, where this surface is formed without the aid of a mould.

In connection with concrete pipes manufactured with the aid of an internal mould or core it has already been proposed to utilise plasticised polyvinyl chloride sheet or foil provided on one surface with ribs, protuberances or like formations (hereinafter referred to as "projections") of "T", "L", diamond or other shape, which become embedded in the inner surface layer of the pipe and thus retain the foil as a kind of skin after the pipe has set. It has also been proposed, in the case of the internal surface of concrete pipes and other such bodies, and other concrete surfaces formed without the aid of a mould or core, to seal the concrete surface with a foil (plasticised polyvinyl chloride, rigid polyvinyl chloride, polyethylene, neoprene or any other plastic or rubber type material) by the use of an adhesive.

This latter process suffers from the disadvantage that there is no guarantee that the adhesive bond between the concrete and the foil is permanent.

One of the objects of this invention is to provide an improved method for applying plastic foil provided with projections as aforesaid, the method being particularly applicable, although not limited, to pipes made by the centrifugal or spinning process and which are relatively dense or hard, and ensuring a most effective and durable bond between the foil and the pipe. The method applies to any foil provided on at least one surface with projections which can become embedded in the concrete surface. The foil can be flexible, semi-rigid or rigid.

The invention also provides simple equipment for carrying the method into effect.

The first step is to prepare a suitable surface on the concrete. In the case of a spun pipe this can be done either by introducing a suitable quantity of mortar (sand, cement and water, or cement and water) into the pipe and rotating the latter at a suitable speed, or proportioning the concrete used in manufacture of the pipe to form the necessary surface after completion of manufacture, or a combination of both methods. In the case of cast concrete, e.g. floors or slabs, where the top surface is to be sealed, a suitable surface can usually be formed by appropriate proportioning of the ingredients of the concrete mix, but, if necessary, mortar can be placed on the top of the concrete by hand, by rolling, vibration or any other method. Alternatively any other suitable bonding agent may be incorporated on the surface to be sealed.

The next step is to place the foil on the concrete surface with the projections in con-

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tact with the concrete. In the case of flexible plastic foil, it may be drawn off a roll, for rigid plastics, the foil must be formed to the shape of the object to be lined. The foil is then embedded by a roller exerting pressure on the top of the foil and preferably by a vibrating object contacting the surface of the foil. In the case of the preferred method for a spun pipe, a suitable vibrator is attached to a metal or timber section which rests on the invert or lower arc of the pipe. As the mould is rotated the vibrating member slides across the foil and sets up what may be termed a combined tamping and rubbing or squeezing action which fluidises the concrete surface and results in the foil projections to be firmly embedded in the surface layer of the pipe. In any event, this ensures effective bonding of the projections. Alternatively, the vibrating member or roller may be shaped to form an arc of the same radius as the pipe, and moved longitudinally through the pipe, firmly embedding the projections. The mould can then be rotated, to bring the next strip of foil under the vibrating screed or roller, and the process repeated until all the foil has been firmly embedded. A similar procedure, where a vibrating screed or roller is advanced across the surface, embedding the whole or part of the foil at each pass, may be necessary for concrete surfaces other than pipes. Initial and final alignment of the foil can be made by using clamps.

An alternative procedure for spun pipes also involves the first mentioned step, after which a sheet of the plastic foil, rolled into more or less tubular formation, is inserted into the pipe with the projections of the foil outermost. The pipe is then spun at relatively high speed, while a light roller may be utilised to press the foil against the inner surface of the pipe. In this way also the projections of the foil become embedded in the inner surface of the pipe, and form a strong and lasting bond.

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

Figure 1 is sectional view in side elevation of a spun concrete pipe during the process of placing a flexible plastic foil, with projections, in the pipe.

Figure 2 is an end view at the same stage of the process.

The preparation and manufacture of the lined concrete pipe is carried out in the following manner:

Using a conventional mould (1) and hands (2) a concrete pipe is spun in the normal manner. The concrete mix used is so proportioned that the final pipe consists of a basic concrete layer (3) with a surface layer (4) of sufficient plasticity to receive the projec-

tions of the lining foil. The finished pipe may then be transferred to a set of rollers, mounted on a base plate (5). One pair of rollers (6) may be rotated by turning a handle (9), connected to the roller axle (11) by two sprockets (8) and a chain (7). A second pair of rollers (10) are free. Both pairs of rollers are mounted in bearings (12).

When the pipe is mounted on the rollers, the plastic foil (13) with its projections (14), is introduced into the pipe, mounted on a drum (15), with the projections outermost. This drum is supported independently of the pipe from the base plate (5) by stands (16), so arranged that the roll of foil is in the uppermost section of the pipe, but not in contact with the concrete. A length of the foil is then unrolled and brought into contact with the concrete surface over an arc of about 120% (and extending for a suitable distance past the invert of the pipe). The foil is then carefully aligned so that the longitudinal axis of the foil is parallel to the longitudinal axis of the pipe, and clamped in that position by G-clamps (17), bearing against the plastic foil and mould ends (2).

A vibrating screed is then introduced into the pipe, parallel to its length, at the invert. This screed consists of a vibrator support bar (19), from which hang one or more curved vibrating shoes (18), each with one or more vibrators (21) attached. These shoes (18) are suspended by hangers (20) which allow freedom of movement in a vertical direction. The vibrator power supply leads (23) are attached to the support bar (19). The vibrating screed is located and held in position by supports (22), and the vibrator power supply leads are then connected to the power supply (not shown on drawings).

The vibrators (21) are then activated, and at the same time the pipe is slowly rotated by turning handle or by power (9) in such a direction as to advance the vibrating screed towards the nearer end of the foil. The application of vibration then embeds the foil projections into the concrete surface. When the leading edge of the foil has been reached, the direction of rotation of handle (9) is reversed, and, if the lining is not to cover the whole circumference of the pipe, a clamp (25) may be placed over the whole length of the leading edge to hold it in place. Clamps (17) are removed at this stage, and the rotation is continued until the whole of the foil has been embedded. If the whole pipe circumference is not lined, a further clamp similar to (25) is placed on the other edge of the foil. One or more further rotations of the pipe, in opposite directions, may be required. When the plastic foil is fully embedded the vibrators are stopped, the vibrating screed and drum (15) are removed.

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and the lined pipe is cured as in normal practice. With partial linings, some hand smoothing of the surface of the unlined pipe may be necessary.

5 For complete or 360° lining concrete pipes and other such bodies, one of the opposite longitudinal extending edge portions of the foil may be devoid of the projections to an extent sufficiently to provide for a relatively
10 flat overlap of the foil. The overlapped portions may be heat fused together, or joined by any other method. Alternatively, if it is desired to avoid such overlapping, then the edges of the foil may be abutted
15 and covered with a thin strip of plain foil which can be secured to the abutted edge portions in any suitable way, as, for instance, by being welded with the aid of a heated member such as a tube through which hot
20 air is passed.

Either or both of the other or transverse edges of the plastic foil may also be devoid of projections, and project slightly beyond the ends of the pipe as seen in Fig. 1. thus
25 forming overhanging flaps which may be joined together as above to provide continuous sealing from one concrete pipe or product to the next, where these products are to be formed end to end or side by side.

30 The method for lining spun concrete pipes with a rigid or semi-rigid plastic is similar to the above, except that the plastic foil is not introduced into the pipe coiled on the drum (15), but is preformed to the correct
35 diameter (or slightly oversize), slit and held in a slightly collapsed position. It is then inserted into the pipe and released to contact the concrete surface with the projections outermost. For full circumference lining,
40 there is still some foil overlap at this stage, and this overlap must be held clear while vibrating in that region.

According to an alternative process, the vibrating screed is replaced by a roller, which
45 may be rubber coated. This roller is forced down onto the foil and, as the pipe is slowly rotated, the pressure causes full embedment of the foil projections. Clamps 17 and 25 may be employed in the same manner
50 as before described.

According to another alternative process where the foil is applied by centrifugal force, the foil may be placed in the pipe as described for rigid foil above, and the pipe
55 is then rotated at high speed. Centrifugal forces, assisted by light roller pressure causes the ribs to become embedded in the concrete surface.

For the sealing of the top of concrete products where the surface is formed without using a mold, the process is similar. After formation of the necessary concrete
60 surface, the plastic foil is laid, projections downmost, on the surface. A vibrating screed or roller, similar to those used for
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spun pipes, is placed on the foil, and slowly moved across the surface of the foil.

WHAT WE CLAIM IS:—

1. A method of sealing the otherwise exposed surface of a concrete article, such as the internal surface of a pipe or other hollow body or the outer surface of a slab or floor, with a plastic foil provided on one surface with projections, comprising the steps of providing the concrete article with a surface layer of sufficient plasticity to receive the foil projections, applying the foil to said surface layer with the projections in contact with the concrete and then exerting pressure on the foil so as to cause the projections thereof to be firmly embedded in the surface layer. 70 75 80

2. A method as claimed in Claim 1, wherein said projection-embedding pressure is exerted on the foil by means of a roller. 85

3. A method as claimed in Claim 1, wherein said projection-embedding pressure is exerted by means of a vibratory member which during relative traversing movement between it and the concrete article produces a combined tamping and rubbing or squeezing action that fluidises the surface layer of the concrete article and forces the foil projections into said surface layer. 90 95

4. A method as claimed in Claim 1 when applied to a concrete pipe or like hollow body, wherein said projection-embedding pressure is exerted on the foil by centrifugal force created by spinning the hollow body, with the foil in tubular form therein, at a sufficiently high speed. 100

5. A method as claimed in Claim 1 when applied to a concrete pipe or like hollow body, wherein the foil is drawn off a roll thereof extending lengthwise within the hollow body and caused to pass between the inner surface of the body and a roller which, during rotation of the body, causes the foil projections to be pressed into the inner surface layer of the body. 105 110

6. A method as claimed in Claim 1 when applied to a concrete pipe or like hollow body, wherein the foil is drawn off a roll thereof extending lengthwise within the upper part of the hollow body and caused to pass between the inner surface of the body and a vibrator device located within the lower or invert part of the body, so that during rotation of the body the vibrator device sets up a combined tamping and rubbing or squeezing action which fluidises the inner surface layer of the concrete and forces the foil projections into said surface layer. 115 120

7. A method as claimed in Claim 4 or Claim 5 wherein one of the opposite edge portions of a tubular lining formed by the foil is devoid of projections and is overlapped and heat fused to the other edge portion. 125

and the lined pipe is cured as in normal practice. With partial linings, some hand smoothing of the surface of the unlined pipe may be necessary.

5 For complete or 360° lining concrete pipes and other such bodies, one of the opposite longitudinal extending edge portions of the foil may be devoid of the projections to an extent sufficiently to provide for a relatively
10 flat overlap of the foil. The overlapped portions may be heat fused together, or joined by any other method. Alternatively, if it is desired to avoid such overlapping, then the edges of the foil may be abutted
15 and covered with a thin strip of plain foil which can be secured to the abutted edge portions in any suitable way, as, for instance, by being welded with the aid of a heated member such as a tube through which hot
20 air is passed.

Either or both of the other or transverse edges of the plastic foil may also be devoid of projections, and project slightly beyond the ends of the pipe as seen in Fig. 1, thus
25 forming overhanging flaps which may be joined together as above to provide continuous sealing from one concrete pipe or product to the next, where these products are to be formed end to end or side by side.

30 The method for lining spun concrete pipes with a rigid or semi-rigid plastic is similar to the above, except that the plastic foil is not introduced into the pipe coiled on the drum (15), but is preformed to the correct
35 diameter (or slightly oversize), slit and held in a slightly collapsed position. It is then inserted into the pipe and released to contact the concrete surface with the projections outermost. For full circumference lining,
40 there is still some foil overlap at this stage, and this overlap must be held clear while vibrating in that region.

According to an alternative process, the vibrating screed is replaced by a roller, which
45 may be rubber coated. This roller is forced down onto the foil and, as the pipe is slowly rotated, the pressure causes full embedment of the foil projections. Clamps 17 and 25 may be employed in the same manner
50 as before described.

According to another alternative process where the foil is applied by centrifugal force, the foil may be placed in the pipe as described for rigid foil above, and the pipe
55 is then rotated at high speed. Centrifugal forces, assisted by light roller pressure causes the ribs to become embedded in the concrete surface.

For the sealing of the top of concrete
60 products where the surface is formed without using a mold, the process is similar. After formation of the necessary concrete surface, the plastic foil is laid, projections downmost, on the surface. A vibrating
65 screed or roller, similar to those used for

spun pipes, is placed on the foil, and slowly moved across the surface of the foil.

WHAT WE CLAIM IS:—

1. A method of sealing the otherwise exposed surface of a concrete article, such as the internal surface of a pipe or other hollow body or the outer surface of a slab or floor, with a plastic foil provided on one surface with projections, comprising the steps of providing the concrete article with a surface layer of sufficient plasticity to receive the foil projections, applying the foil to said surface layer with the projections in contact with the concrete and then exerting pressure on the foil so as to cause the projections thereof to be firmly embedded in the surface layer. 70
2. A method as claimed in Claim 1, wherein said projection-embedding pressure is exerted on the foil by means of a roller. 75
3. A method as claimed in Claim 1, wherein said projection-embedding pressure is exerted by means of a vibratory member which during relative traversing movement between it and the concrete article produces a combined tamping and rubbing or squeezing action that fluidises the surface layer of the concrete article and forces the foil projections into said surface layer. 80
4. A method as claimed in Claim 1 when applied to a concrete pipe or like hollow body, wherein said projection-embedding pressure is exerted on the foil by centrifugal force created by spinning the hollow body, with the foil in tubular form therein, at a sufficiently high speed. 85
5. A method as claimed in Claim 1 when applied to a concrete pipe or like hollow body, wherein the foil is drawn off a roll thereof extending lengthwise within the hollow body and caused to pass between the inner surface of the body and a roller which, during rotation of the body, causes the foil projections to be pressed into the inner surface layer of the body. 90
6. A method as claimed in Claim 1 when applied to a concrete pipe or like hollow body, wherein the foil is drawn off a roll thereof extending lengthwise within the upper part of the hollow body and caused to pass between the inner surface of the body and a vibrator device located within the lower or invert part of the body, so that during rotation of the body the vibrator device sets up a combined tamping and rubbing or squeezing action which fluidises the inner surface layer of the concrete and forces the foil projections into said surface layer. 95
7. A method as claimed in Claim 4 or Claim 5 wherein one of the opposite edge portions of a tubular lining formed by the foil is devoid of projections and is overlapped and heat fused to the other edge portion. 100



8. A method as claimed in Claim 4 or Claim 5 wherein opposite edges of a tubular lining formed by the foil are abutted and covered with a thin strip of plain foil which is heat fused to the abutted edge portions of the foil.
9. A method as claimed in Claim 6 wherein one of the opposite edge portions of a tubular lining formed by the foil is overlapped and heat fused to the other edge portion.
10. A method as claimed in Claim 6 wherein opposite edges of a tubular lining formed by the foil are abutted and covered with a thin strip of plain foil which is heat fused to the abutted edge portions of the foil.
11. Apparatus for sealing the internal surfaces of concrete pipes or like hollow bodies with plastic foil provided on one surface with projections, comprising means for supporting a roll of the foil so that it extends lengthwise within the upper part of the body while the latter is rotatably supported in a horizontal position and the foil can be drawn off from the roll, a vibrator device adapted to extend lengthwise within the lower part of the body and having one or more curved shoes between which and the internal surface of the body the foil is led from said roll, means for rotating the body, and means for simultaneously vibrating the vibrator device so that it will progressively fluidise the inner surface layer of the rotating body and force the foil projections into said surface layer.
12. Apparatus according to Claim 11 and including clamps which are applied to retain the foil against the inner surface of the body between said roll and the leading edge of the foil.
13. Apparatus according to Claim 12 and including additional clamps which are applied to retain the leading edge of the foil to the inner surface of the body.
14. Apparatus for sealing the internal surfaces of concrete pipes or like hollow bodies with plastic foil provided on one surface with projections, consisting of parts arranged and adapted to co-operate substantially as described with reference to the accompanying drawings.
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