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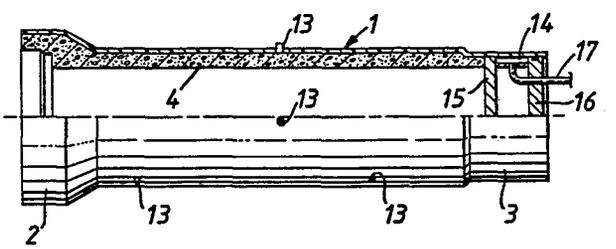
(54) Improvements in or relating to the production of concrete pipes.

(57) The invention provides a method of manufacturing a concrete pipe or tube comprising the steps of forming a mould from flexible material, introducing concrete into the mould so as to form a concrete pipe or tube therein, and introducing a fluid under pressure between the flexible mould and the concrete pipe or tube such as to expand the flexible mould from the pipe or tube and then withdrawing the pipe or tube from within the mould.



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Improvements in or relating to the Production of Concrete Pipes and Tubes

This invention relates to the manufacture of concrete pipes and tubes in moulds.

According to the invention there is provided a method of manufacturing a concrete pipe or tube comprising the steps of forming a mould from flexible material; depositing concrete within the mould and compacting it so as to form a concrete pipe or tube therein; and introducing a fluid under pressure between the flexible mould and the concrete pipe or tube such as to expand the flexible mould from the pipe or tube and then withdrawing the pipe or tube from within the mould.

According to another aspect of the invention, there is provided apparatus for manufacturing a concrete pipe or tube including a mould of flexible material; means for introducing between the mould and the concrete pipe or tube when formed therewithin a fluid under pressure so as to expand the mould and means for withdrawing the pipe or tube from the mould thereafter.

The concrete pipe or tube may be formed, for example, by depositing one or more layers of concrete within an external mould or mandrel mounted so as to be rotatable about its longitudinal axis so that the concrete pipe or tube is formed by centrifugal action within the mould from which it is subsequently removed.

The internal surface of the mould may, prior to the formation of a product therewithin, be coated with a release agent. The flexible mould may be seamless and may be formed from fibre (or glass) reinforced plastics. It may, in accordance with usual mould practice, be fabricated so as to define by its inner peripheral wall, in usual manner, the external form of the concrete pipe or tube to be manufactured within that mould. The mould may be provided with spigot and socket forms at each end, or may be plain ended.

The fluid may be air from a compressed air supply. The compressed air may be suplied to the mould via one or more entry ports along the length thereof or may, as an alternative, be supplied at one or both ends of the mould.

The concrete pipe or tube may be matured and hardened within the flexible mould before removal thereof.

In an alternative arrangement, the mould may be removed before the concrete is cured and hardened. In this case means may be provided to support the internal surface of the concrete to resist the forces due to the fluid under pressure during mould withdrawal acting on the outer surface of the concrete.

The fluid under pressure is then introduced between the outer concrete surface and the flexible mould, as described previously, and the flexible mould removed. After this, the internal support is removed and the concrete pipe or tube left to cure and harden sufficiently for handling.

When manufacturing concrete pipe or tube, the internal support may be a simple flexible steel shell with means of reducing and expanding the circumference to allow it to be inserted and withdrawn from the

inside of the pipe or tube. Once inside the pipe or tube, the flexible shell is increased in diameter, just sufficient to give support to the unhardened concrete.

In order that the invention may be more readily understood, one embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 illustrates a mould with included pipe used in accordance with the invention; and

Figure 2 shows the mould and pipe of Figure 1 placed in a pipe demoulding assembly.

Referring to the drawings, it will be seen that the mould comprises a tube 1 formed from glass reinforced plastics such as a polyester resin incorporating glass and silica sand. The mould may be formed by spraying the sand and polyester resin upon a rotating seamless steel mandrel of slightly tapered longitudinal form and winding glass about the mandrel so that it is incorporated within the wall of the mould. As can be seen, the mould is provided with a socket end 2 and a spigot end 3.

In operation, after the mould has, in the usual manner (for example by centrifugal or other means) formed a concrete pipe 4 therewithin, and the pipe has

matured and hardened, the mould and its included pipe are taken to a demoulding assembly as shown in Figure 2 comprising a restraining post 5 mounted on a base 6 which is secured to a floor 7, the post passing through the pipe and mould and carrying at its upper end a pipe restraining ring 8. A lifting beam 9 is connected by means of an eye 10 to a lifting device (not shown) which carries, by means of tie bars 11, a bucking ring 12 which is located under the socket end of the mould but does not extend radially inwards of the mould and does not underlie the concrete pipe.

Compressed air is now applied to the interface of the mould and the concrete pipe. Two alternative arrangements for carrying this out are illustrated in Figure 1.

In the first arrangement a plurality of compressed air connections 13 are made through the wall of the mould. The connectors can be coupled through a ring main (not shown) so that one snap coupling only is necessary to a compressed air supply. The air holes on the inside of the mould are covered prior to moulding to prevent concrete contamination.

In the second arrangement an annular pressure chamber 14 is mounted on to the end of the mould and sealed with a gasket 15, 16 at each extremity. The

mould expands when pressurised air from pipes 17 tracks along the mould/pipe interface and releases the bond.

Upon application of either of these methods, the mould is expanded somewhat radially away from the pipe, and upon axial load being applied by the lifting device of the mould, this is then removed from the pipe which can then be taken away from the demoulding assembly.

In one example of the invention, a flexible mould was formed from isophthalic polyester resin bonded with glass and silica sand. The mould wall thickness was 6mm and the mould material had a stiffness of 1100 $N.mm^2$. Air pressure prior to demoulding was 6 bar. This was applied through a plurality of connectors along the length of the pipe (either 3 connectors or 9 connectors being used in practice). The concrete pipe (of 525mm diameter bore) formed within the mould was successfully removed from the mould.

By means of the invention we have provided a strong and effective mould for concrete pipes capable of simple, rapid removal from the concrete pipe formed therewithin.

It will be appreciated that in the manufacture of concrete pipe and tube by means of the invention it is necessary that the mould, whilst being sufficiently

flexible to enable adequate expansion when subject to the fluid pressure to enable withdrawal of the pipe and tube therefrom, must be sufficiently strong and rigid to undergo the processes used in the manufacture of pipe and tube therein such as movement of the mould, vibration of it and rotation thereof as a concrete pipe or tube is deposited and formed around the inner wall thereof by centrifugal or other action. Fibre reinforced plastics is a typically suitable material having the required flexibility with strength characteristics required by the invention.

CLAIMS

1 A method of manufacturing a concrete pipe or tube comprising the steps of forming a mould from flexible material; depositing concrete within the mould and compacting it so as to form a concrete pipe or tube therein; and introducing a fluid under pressure between the flexible mould and the concrete pipe or tube such as to expand the flexible mould from the pipe or tube and then withdrawing the pipe or tube from within the mould.

2 A method as claimed in claim 1 wherein the concrete pipe or tube is formed by depositing one or more layers of concrete within the mould mounted so as to be rotatable about its longitudinal axis so that the concrete pipe or tube is formed by centrifugal action within the mould.

3 A method as claimed in Claim 1 or 2 wherein the internal surface of the mould, prior to the formation of a pipe or tube therein is coated with a release agent.

4 A method as claimed in Claim 1, 2 or 3 wherein the fluid may be air from a compressed

air supply.

5 A method as claimed in claim 4 wherein the compressed air is supplied to the mould via at least one entry port along the length thereof.

A method as claimed in claim 4 wherein the compressed air is supplied to the mould at at least one end thereof.

7 A method as claimed in any one of the preceding claims wherein the concrete pipe or tube is matured and hardened within the flexible mould before removal thereof.

8 A method as claimed in any one of claims 1 to 6 wherein the mould is removed before the concrete is cured and hardened.

9 Apparatus for manufacturing concrete pipe or tube including a mould of flexible material; means for introducing between the mould and the concrete pipe or tube when formed therewithin a fluid under pressure so as to expand the mould; and means for withdrawing the pipe or tube from the mould thereafter.

10 Apparatus as claimed in claim 9 wherein the flexible mould is formed from fibre reinforced plastics.

11 Apparatus as claimed in claim 10 wherein the flexible mould is formed from glass fibre reinforced plastics.

12 Apparatus as claimed in clam 9,10 or 11 wherein the mould is seamless.

13 Apparatus as claimed in any one of claims 9 to 12 wherein the fluid is compressed air and the mould is provided with at least one entry port for the provision of a comprssed air supply along its length.

14 Apparatus as claimed in any one of claims 9 to 12 wherein the fluid is compressed air and the mould is provided with an annular pressure chamber at at least one end thereof connectable to a compressed air supply.

FIG. 1.

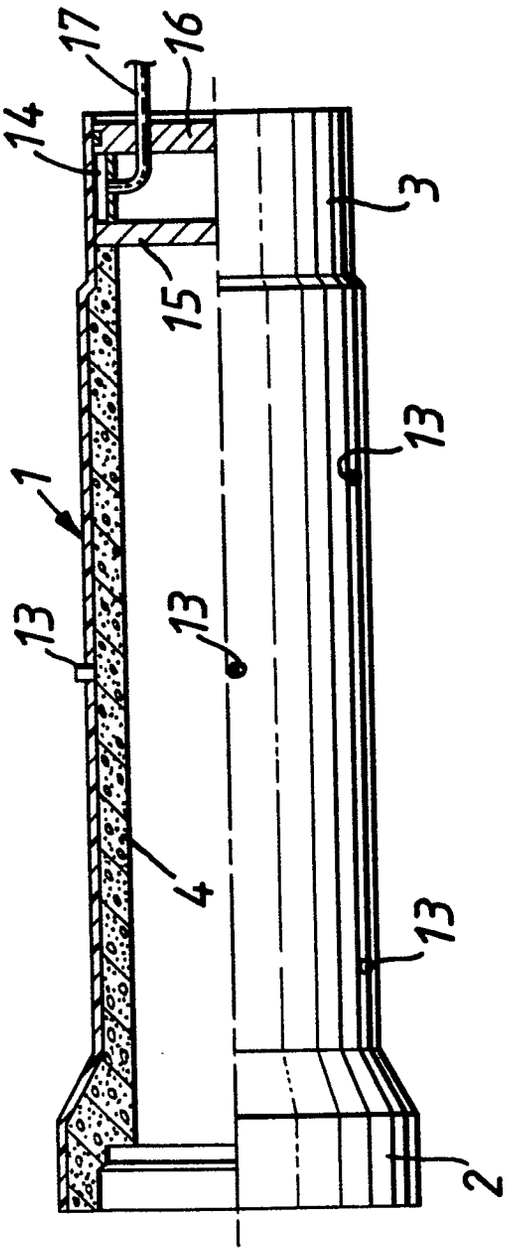
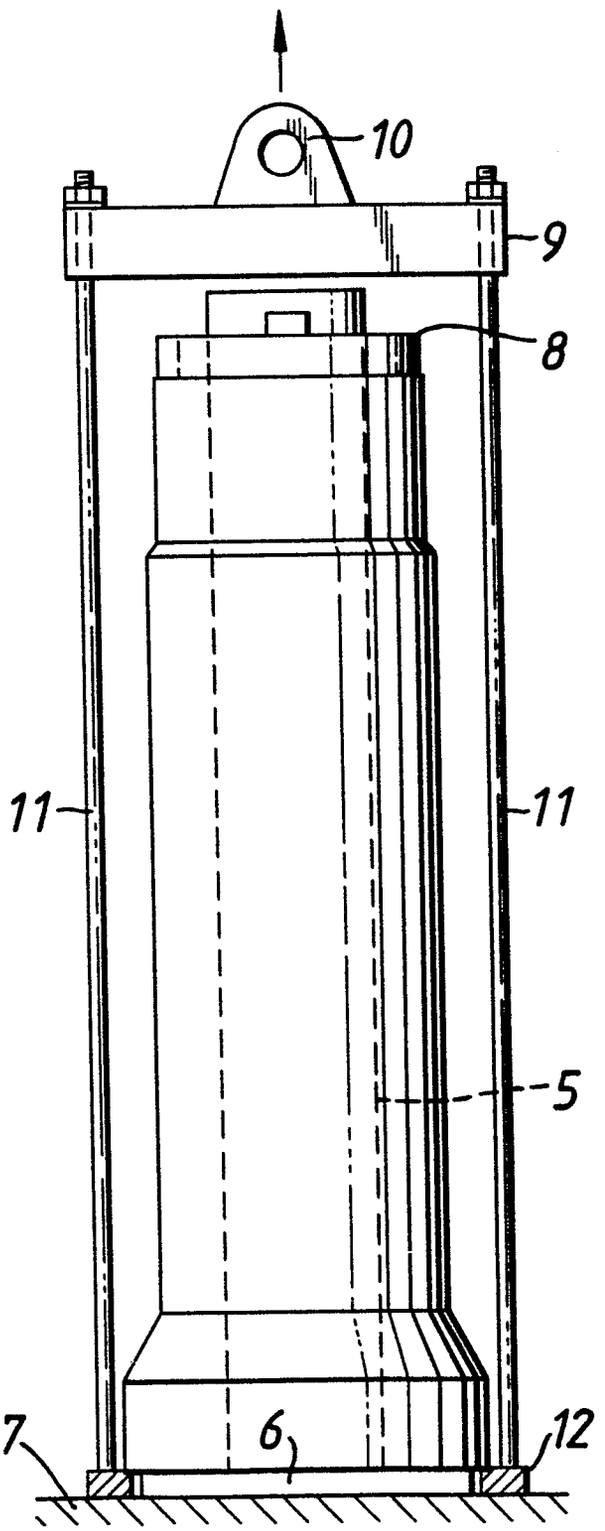


FIG. 2.



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Application number

European Patent Office

EUROPEAN SEARCH REPORT

EP 85301608.7

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)
X	DD - A - 150 022 (STIEGLER) * Abstract *	1,9	B 28 B 21/76 B 28 B 7/12.
Y	GB - A - 1 573 271 (SCHLOSSER) * Page 1, lines 47-51 *	1,2,3, 4,9,13	
Y	AT - B - 366 313 (ETERNIT-WERKE) * Page 3, lines 5-8 *	1,2,3, 4,9,13	
Y	DE - A1 - 2 611 293 (KURIMOTO) * Page 4, lines 4-7 *	1,2,3, 4,9,13	
A	US - A - 2 612 673 (BILLNER) * Fig. 1 *	1	

TECHNICAL FIELDS SEARCHED (Int Cl 4)

B 28 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	24-06-1985	GLAUNACH

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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