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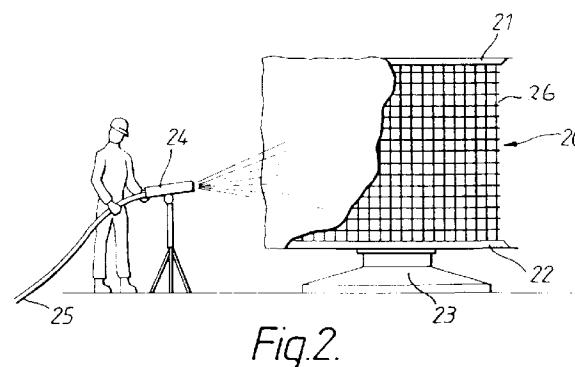
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(54) **The manufacture of reinforced concrete sections.**

(57) A large diameter reinforced concrete section, such as a culvert or pipe is formed by mounting a mould core (20) on a spindle (23) for rotation. The exterior surface of the mould has a shape which is the required interior shape of the section to be formed. A mesh of reinforcing rods (26) is then wrapped around the core (20) and concrete is sprayed from a gun (24) onto the core while it is rotating. The concrete includes a setting accelerator which ensures rapid setting of the concrete on the core. When set, the core is removed. In this way sections can be formed quickly and with a minimum of labour.



The invention relates to methods of manufacturing hollow sections of reinforced concrete.

The following is a more detailed description of an example of a prior proposal for manufacturing hollow sections of reinforced concrete, reference being made to Figure 1 of the accompanying drawings which is a schematic perspective view of a mould containing reinforcements and being filled with cement from a hopper.

The mould is formed on a pallet and comprises an inner mould section 10 of square cross-section, A cage 11 of reinforcing bars is then arranged around the core inner mould section 10 and fixed to the section 10. An outer mould section 12 formed from four rectangular side panels is then arranged around the inner mould section 10 to form the mould. A top spigot or socket mould piece is then fixed to the cage 11.

A hopper 13 of concrete is then swung over the mould and poured into the mould. The concrete must be very workable in order that it can be poured into the very narrow deep mould. The concrete may be vibrated by a poker 14 or by a vibrator fixed to the mould to ensure that the concrete fills the mould completely.

The concrete is then cured and after curing the outer mould section 12 and the inner mould section 10 are removed. The moulded unit is then removed from the pallet. The unit may be a culvert section or a large pipe.

These steps are time consuming and expensive. It is difficult to mould a unit in less than 12 hours because of the time taken by the assembly work and the curing time for the concrete which, as explained above, must be very workable.

According to a first aspect of the invention, there is provided a method of manufacturing hollow sections of reinforced concrete comprising forming a core having an exterior profile which is the required interior profile of the section, connecting reinforcing members on the exterior profile of the core, mounting the core for rotation about an axis parallel to the axis of the section being formed, rotating the core, spraying a concrete mixture onto the rotating core to form the reinforced section.

In this way sections such as culverts and large diameter pipes can be manufactured cheaply and quickly with a minimum of labour.

Preferably the spraying step comprises feeding to a spray nozzle a cement mixture including a retarder against cement setting, a setting accelerator being added at the nozzle.

Preferably the core is rotatable about a vertical axis. The core may include top and bottom plates which form flanges projecting radially outwardly of the exterior profile of the core to define end surfaces of the section.

According to a second aspect of the invention, there is provided apparatus for manufacturing hollow

sections of reinforced concrete comprising a core having an exterior profile which is the required interior profile of the section, reinforcing members carried on the exterior profile of the core and a mounting carrying the core for rotation about an axis parallel to the axis of the section being formed.

The following is a more detailed description of one embodiment of the invention, by way of example, reference being made to Figure 2 of the accompanying drawing which is a schematic side elevation of a mould on a turntable for forming sections of reinforced concrete.

The mould comprises a core 20 formed by four rectangular side panels connected to form a box open at both ends and with its axis vertical. The ends carry a top panel 21 and a bottom panel 22 respectively. The exterior surfaces of the side panels define the required interior shape of the section to be moulded while the top and bottom panels define the shape of a spigot to be formed at one end of the section and a co-operating socket to be formed at the other end of the section.

The mould is mounted for rotation on a vertical spindle (not shown) which extends from a turntable 23. Of course, the spindle could be horizontal.

A mesh 26 of reinforcing rods is wrapped around the core 20 and held in position by the bottom panel 22. Concrete is then sprayed onto the core 20 by a gun 24 fed by a pump with concrete under pressure from a supply via a hose 25. The gun 24 may be directed manually or robotically while the core 20 is rotated so that the whole exterior surface of the core 20 is covered with a layer of cement of a required depth.

The concrete in the supply may include a setting retardant which prevents the concrete setting. At the gun 24 a setting accelerator is added so that the concrete sets rapidly once it is applied to the core 20. The presence of the retarder in the hose and pump prevents the concrete setting in these components for some hours so that the pump can be switched on and off as one section is finished and a new core 20 is ready for spraying. Thus cleaning out these components between sections is not necessary.

The core 20 will have on its surface special release agents which allow the concrete to be built up on the core 20 but allow a rapid and clean de-mould.

In this way a section of, for example, a culvert of a large diameter pipe, may be manufactured with a minimum of labour as frequently as once an hour from a single mould.

Claims

1. A method of manufacturing hollow sections of reinforced concrete comprising forming a core (20) having an exterior profile which is the required interior profile of the section, connecting

reinforcing members (26) on the exterior profile of the core (20), mounting (23) the core for rotation about an axis parallel to the axis of the section being formed, rotating the core (20) and spraying a concrete mixture onto the rotating core to form the reinforced section. 5

2. A method according to claim 1 wherein the spraying step comprises feeding to a spray nozzle (24) a cement mixture including a retarder against cement setting, a setting accelerator being added at the nozzle. 10
3. A method according to claim 1 or claim 2 wherein the core (20) is rotatable about a vertical axis. 15
4. A method according to any one of claims 1 to 3 wherein the core (20) includes top and bottom plates (21,22) which form flanges projecting radially outwardly of the exterior profile of the core to define end surfaces of the section. 20
5. A method according to any one of claims 1 to 3 wherein the core comprises four rectangular side panels connected to form a box open at both ends and with the axis thereof vertical, the exterior surfaces of said panels defining said exterior profile. 25
6. Apparatus for manufacturing hollow sections of reinforced concrete comprising a core (20) having an exterior profile which is the required interior profile of the section, reinforcing members (26) carried on the exterior profile of the core and a mounting (23) carrying the core for rotation about an axis parallel to the axis of the section being formed. 30 35
7. Apparatus according to claim 6 wherein the core (20) includes top and bottom plates (21,22) which form flanges projecting radially outwardly of the exterior profile of the core to define end surfaces of the section. 40
8. Apparatus according to claim 6 or claim 7 wherein the core (20) comprises four rectangular side panels connected to form a box open at both ends and with the axis thereof vertical, the exterior surfaces of said panels defining said exterior profile. 45
9. Apparatus according to any one of claims 6 to 8 wherein the mounting comprises a spindle (23) on which the core (20) is carried for rotation about a vertical axis. 50

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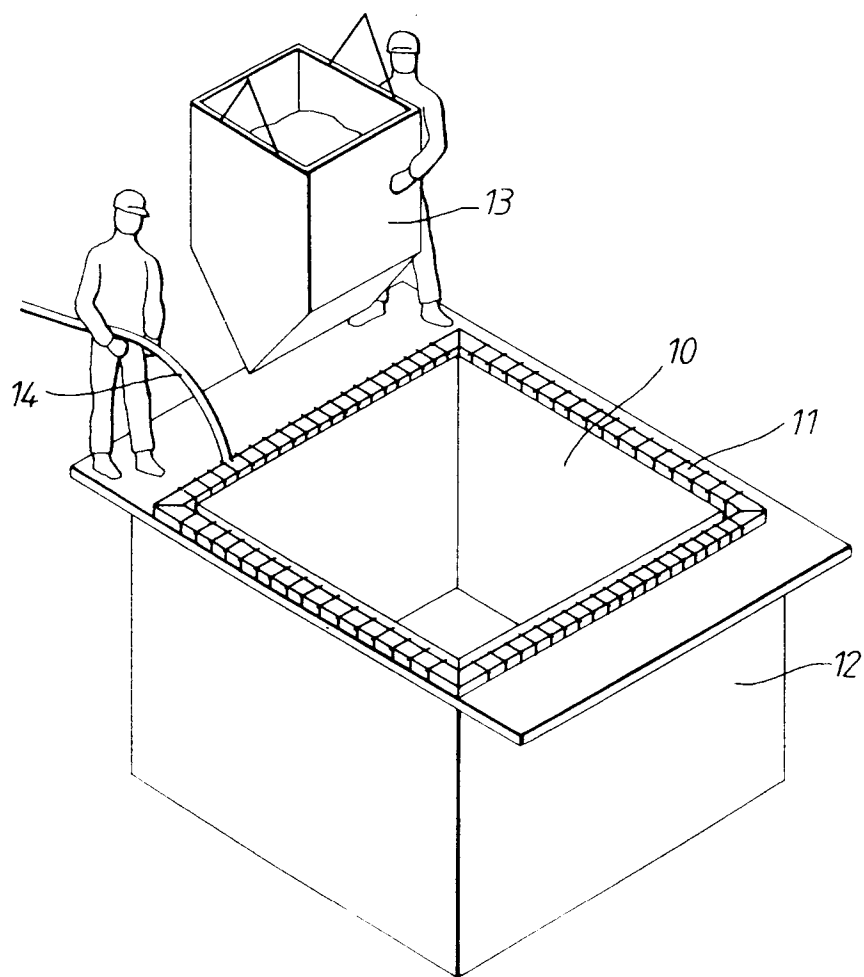


Fig.1.

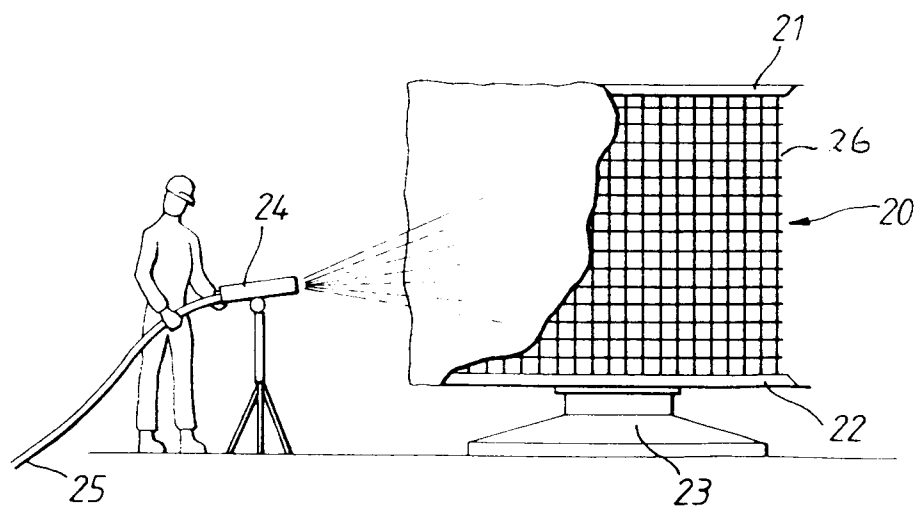


Fig.2.



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 0974

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.5)
X	EP-A-0 340 185 (BETEMI OY) * the whole document *	1, 3, 5, 6, 8, 9	B28B1/32 B28B23/02
X	DE-C-435 567 (A. HORTEN) * the whole document *	1, 3, 6, 9	
Y	---	2, 4, 5, 7, 8	
Y	GB-A-2 155 389 (STANTON AND STAVELEY LTD.) * the whole document *	4, 7	
A	---	1, 3, 6, 9	
Y	FR-A-2 282 979 (R. C. B. BRUNET) * the whole document *	5, 8	
A	---	1, 6	
Y, P	GB-A-2 240 334 (SANDOZ LTD.) * the whole document *	2	

			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B28B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 MAY 1992	Examiner GOURIER P. A.
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