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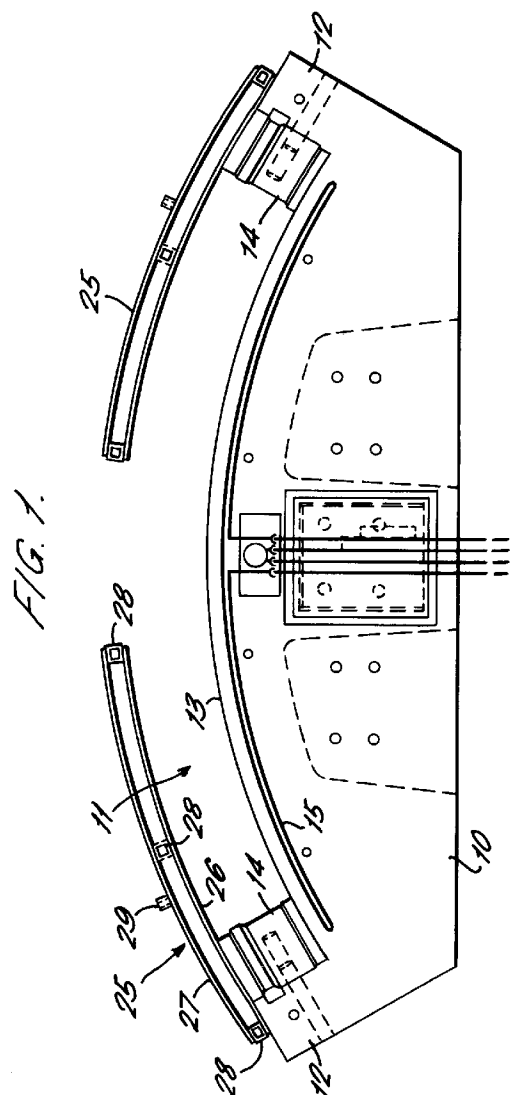
(71) Applicant : **COSTAIN BUILDING PRODUCTS LIMITED**  
**111 Westminster Bridge Road**  
**London SE1 7UE (GB)**

(72) Inventor : **Mitchell, Samuel Bailey Hart**  
**38 Park Avenue, Wraysbury**  
**Staines, Middlesex TW19 5ET (GB)**

(74) Representative : **Bayliss, Geoffrey Cyril et al**  
**BOULT, WADE & TENNANT 27 Farnival Street**  
**London EC4A 1PQ (GB)**

(54) **Improvements in or relating to moulds for casting concrete or other cementitious components.**

(57) This disclosure relates to a mould (10) for casting concrete or other cementitious components, the mould having a mould surface (13) and electric heating means (15) embodied in the mould adjacent the surface to heat the surface and thereby a component being cast in the mould to accelerate curing of the component, and means for applying vibration with a chamber enclosing the vibration applying device to minimize transmission of noise.



This invention relates to moulds for casting concrete or other cementitious components. The invention is particularly although not exclusively applicable to moulds for casting arcuate concrete tunnel lining segments.

In the casting of concrete tunnel lining segments it is common to get more than one cast from a mould each working day. In some cases, principally where steel moulds are used (but also concrete) the manufacturer may get one cast say every four to five hours by using a steam chamber to assist in the curing of the cast concrete. The moulds are put into the chamber or the chamber put over the moulds. The chamber is then filled with steam at a temperature high enough to give the concrete sufficient strength for removing from the mould in the required time.

Whilst this method works quite well and gives the desired results, it is nevertheless expensive in terms of energy used, requires extra handling by transferring the moulds into and out of the steam chamber or the steam chamber to and from the moulds; it can be wet and messy through steam condensing and consequently requires provision for drainage; the steam plant itself can be relatively expensive and requires maintenance.

This invention provides a mould for casting concrete or other cementitious components, the mould having a mould surface and electric heating means embodied in the mould adjacent the surface to heat the surface and thereby a component being cast in the mould to accelerate curing of the component.

By casting electric heating elements into the moulds, the temperature of the wet concrete can be raised to achieve a more rapid curing of the concrete and thereby similar time for stripping of the cast concrete components from the mould as with the use of steam. The advantages over the use of steam are that there is a relatively inexpensive energy consumption, no extra handling arises as the mould remains static. Working conditions remain relatively clean as there is no possibility of steam condensation affecting the working area. The cost of wiring and associated control equipment is substantially less than the cost of steam plant and the steam chamber.

The invention also provides a mould for casting a concrete or other cementitious component having a device acting on the mould for applying vibration to the mould to consolidate the concrete or other cementitious mix in the mould, a chamber enclosing the vibration applying device and engaging the mould around the location where the device acts on the mould and a means for creating a vacuum within the chamber to minimize transmission of noise from the vibrating device.

By enclosing the vibration device in a chamber and creating a vacuum by means of a vacuum pump, a major source of noise transmitted by the device is removed.

The following is a description of a specific embodiment of the invention, reference being made to the accompanying drawings in which:

Figure 1 is a side elevation view of a mould for creating arcuate concrete tunnel lining segments;

Figure 2 is a plan view of the mould illustrated in Figure 1; and

Figure 3 is a plan view of a production area showing typical mould layout.

Referring firstly to Figures 1 and 2 of the drawings, there is shown the base 10 of a mould for forming arcuate concrete tunnel lining segments having a mould cavity indicated at 11 formed in its upper surface and extending between ends 12 of the base. The cavity has an upwardly facing convexly curved mould surface 13 extending between the ends 12 to define the inner surface of the segment to be cast and the inner sides of the ends 12 are formed with mould surfaces 14 to define the circumferential ends of the segment to be cast.

An electrical heating element 15 is cast into the body of the base 10 and extends through a number of closely spaced turns in a zig-zag pattern parallel to and just below the mould surface 13 throughout the length of the mould surface. Equally the heating element could follow a zig-zag path across the width of the mould. The ends of the heating element 15 terminate in a junction box 16 built into a side wall of the base 10 adjacent the center of the base (or at any other convenient location on the base) and are connected by leads 17 to a control box and power source (not shown). A thermostat unit 18 is counted on the junction box 16 to project into the thickness of the base and is connected by leads 19 to a thermostat control for the power source to the leads.

Thus mould surface 13 can be heated during casting of a concrete segment in the mould to raise the temperature of the segment and thereby accelerate the curing of the segment in the mould.

Figure 3 illustrates the layout of a production area in which a number of rows of moulds 10 are mounted parallel with one another along the length of the workshop area with four moulds in each row. The moulds in each row are connected to a common control box along one side of the production area and the control boxes 20 are all interlinked to a common power supply.

It will be appreciated that in the moulding operation standard side walls are applied to the mould to define the circumferentially extending sides of the segment to be moulded and the outer convex surface of the segment is finished by hand trowelling in conventional manner. In addition the outer surface of the mould can be closed by arcuate cover plates 25 as illustrated in Figure 1. Each cover plate is of hollow construction comprising inner and outer plates 26, 27 spaced by frame members 28 and a port 29 is formed in the outer surface for a connection to a vacuum sup-

ply. The inner plates 26 of the covers are formed with a multiplicity of apertures through which vacuum can be drawn to assist in extracting air from the surface of the concrete to improve the final surface finish of the segment.

To assist in consolidating the concrete in the mould and the extraction of air from the concrete vibration devices 30 are clamped to the mould sides on both sides of the mould to vibrate the mould and thereby consolidate the concrete. In accordance with the present invention, vacuum boxes 31 are fitted to the mould over the vibrators to engage the mould around the vibrators each box having a conduit 32 leading to a vacuum pump to draw vacuum within the box. By extracting the air from the box during the vibration operation, the transmission of noise from the vibrators is minimized.

## Claims

1. A mould for casting a concrete or other cementitious components, the mould having a mould surface and electric heating means embodied in the mould adjacent the surface to heat the surface and thereby a component being cast in the mould to accelerate curing of the component.
2. A mould as claimed in Claim 1, wherein the mould is formed from concrete.
3. A mould as claimed in Claim 2, wherein the heating element is cast in the concrete mould adjacent the mould surface.
4. A mould as claimed in Claim 3, wherein the heating element extends in a zig-zag path parallel with the surface of the mould around or across the surface.
5. A mould as claimed in any of the preceding claims, wherein the heating element has a thermostatic control having a probe embodied in the mould adjacent the surface.
6. A mould as claimed in any of the preceding claims, wherein the mould is intended to form arcuate concrete tunnel lining serpents, the mould having a convex mould surface to form the inner surface of the serpents and the heating element being disposed in the mould parallel with the mould surface.
7. A mould as claimed in any of the preceding claims wherein a hollow curved plate or plates is/are provided to cover the upper surface of the mould cavity having perforations on the inner side and connected to a source of vacuum to extract air at

the surface of the component being cast.

8. A mould for casting a concrete or other cementitious component having a device acting on the mould for applying vibration to the mould to consolidate the concrete or other cementitious mix in the mould, a chamber enclosing the vibration applying device and engaging the mould around the location where the device acts on the mould and a means for creating a vacuum within the chamber to minimize transmission of noise from the vibrating device.

FIG. 1.

