

PATENT SPECIFICATION 11

(11) 1 228 886

DRAWINGS ATTACHED

- (21) Application No. 43763/68 (22) Filed 13 Sept. 1968
 (45) Complete Specification published 21 April 1971
 (51) International Classification B 28 b 21/30
 (52) Index at Acceptance
 B5A D5A 1DX 1R29X 1R50 2A4X 2B2 2C1 2C3 2E3
 B8H 13A 13D4 13DX 4 5
 C10 C7P X
 F2P 1A12 1B2
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(54) METHOD AND APPARATUS FOR STRIPPING MOULDS FROM CONCRETE AND OTHER PIPES

(71) We, HUMES LIMITED, a Company incorporated under the laws of the State of Victoria, of 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:—

10 The present invention relates to an apparatus for stripping moulds from pipes such as concrete pipes immediately after the pipe is moulded and before it is cured.

15 The immediate stripping of a mould from a pipe or the stripping of the outer mould from a pipe when an outer mould and an inner mould are used to manufacture the pipe is well known.

20 In one known method the mould is stripped from the pipe where it is manufactured and the pipe is then transported to a storage or curing station. In another known method the pipe is transported in the mould to the storage or curing station and the mould is then stripped from the pipe.

25 The method first mentioned has the disadvantage that the pipe is likely to be damaged during handling after the mould has been stripped therefrom. The latter method can only be used with short pipes (i.e. pipes of a length of three feet), with seamed moulds (which must be dissembled) or with thick walled pipes. A variant of the latter method is the provision of mobile 35 moulding apparatus, the pipe being moulded at the storage or curing station. This variant is applicable only to particular kinds of pipes and it creates problems relative to the supply of materials for the manufacture of the pipes. Furthermore large storage areas are required because of the space occupied by the mobile moulding apparatus.

40 The present invention has for its primary object to provide an improved apparatus [Price 25p]

for stripping a mould from a concrete or other pipe in which the foregoing disadvantages are eliminated or minimized.

Apparatus for stripping a rigid tapered mould from a pipe, such as a concrete pipe, 50 after the pipe is moulded in the mould and before it is cured, according to the invention comprises a mobile stripping unit adapted to transport a mould and a pipe 55 moulded therein from a position where the pipe is moulded to a position where the mould is to be stripped from the pipe, the unit including means for supporting the mould and pipe therein in a substantially vertical attitude with the smaller end of the 60 mould uppermost prior to the stripping operation, means for operating the supporting means after the unit is propelled from the position where the pipe is moulded to the position where the pipe is to be stripped 65 from the mould for lowering the mould and pipe therein so that the mould will rest on the ground or other surface and for raising the mould vertically after the mould and pipe therein have been lowered to rest on 70 the ground or other surface and holding down means for simultaneously applying a downward force on the pipe to prevent the pipe being raised as the mould is being raised on the supporting means so that the 75 mould will be stripped from the pipe.

In order that the invention may be readily understood reference is made to the accompanying drawings in which:—

Figure 1 is a cross sectional view of a 80 concrete pipe in a mould, and

Figure 2 is a side elevation in diagrammatic form of apparatus in accordance with the invention.

Referring to the drawings Figure 1 illustrates a tapered steel mould 1, diameter at the top $\frac{1}{4}$ " less than at the bottom, fitted with mould ends 2, a bottom end ring 3, which is held in place by clamps 10, legs 11, and a top ring 4 which is held in place 90

SEE ERRATA SLIP ATTACHED

by clamps 12. Trunnions 5 are fitted just above the centre of gravity of the mould and a location point or boss 6 is arranged so that the centre of a pin entering at this point is vertically below the trunnion centre.

A reinforcement cage 8 preformed to an elliptical shape if necessary, is placed within the mould 1, all nibs or spacers used to locate the cage having insulated caps so that the reinforcement is electrically discontinuous from the mould. An electrical lead 9, which projects through an insulated hole formed in the top ring 4, is connected to the reinforcement.

Using the well known centrifugal moulding process, concrete is placed in the mould, which is spun and finished to produce a reinforced concrete pipe 7 within the mould. This pipe is then turned vertically by a rotating frame (not shown), clamps 12 being released to free the top ring 4 either before or immediately after the rotation, and, if an elliptical reinforcement has been used, an expandable ring is placed inside the pipe to keep it circular.

The mobile stripping unit comprises a standard fork lift unit 13 as shown in Figure 2. The basic hydraulic supply, the mobility and vertical movement of the mast 23 are all part of the standard fork lift unit. The fork lift unit 13 additionally includes a pair of arms 14 which are attached to the mast 23 to move vertically therewith and which incorporate a pair of lifting vees 15 (which engage the mould trunnions 5), and a locating pin 16 (which enters boss 6). The locating pin 16 and one of the lifting vees 15 are so arranged that the line joining their centrelines is parallel to the mast's line of travel. Also fitted is a hold down frame 18, which is hinged at 19 about the rigid part of the fork lift and can be swung into a position perpendicular to the mast 23 by means of a hydraulic cylinder 20. This frame can also be rotated clear of the mast by the same cylinder. At the other end of the hold down frame 18 is a hold down cross 21, which can be raised or lowered parallel to the mast by a hydraulic cylinder 22.

After the mould has been turned to a vertical position an electric current is applied through a circuit consisting of a source of direct current, connected through leads to the mould 1 and electrical lead 9. This is applied so that, for each square foot of mould surface area, a factor of 1.5 ampere minutes is obtained (e.g., 3 amperes for 30 seconds). This current is applied before the mould is picked up by the fork lift, but could be applied at any stage prior to stripping. The direct current will flow through the pipe to produce hydrogen gas between the mould and the pipe to facilitate stripping of the mould from the pipe.

After the electrolysis process is complete the fork lift unit 13 picks up the mould by engaging the lifting vees 15 with the trunnions 5, and holding the mould parallel to the mast 23 by inserting the pin 16 in the boss 6. At this stage the hydraulic cylinder 20 is fully extended so that the hold down frame is perpendicular to the mast, but hydraulic cylinder 22 is retracted so that the hold down cross 21 is clear of the mould. The fork lift unit 13 is then propelled to the position at which it is desired to deposit the stripped pipe, and the mould is lowered so that the legs 11 contact the ground.

Jacks 17 are lowered to fix the fork lift rigidly in position by removing the elasticity of the pneumatic tyres. Clamps 10 and 12 are then released, releasing the bottom end ring 3 and the top end ring 4. Both end rings are now independent of the mould, and cylinder 22 is extended until the hold down cross 21 contacts the top ring 4, with a force about 100 lbs.

Arms 14 are then raised by the mast, causing the mould 1 to be raised by the lifting vees 15 and trunnions 5, leaving the concrete pipe 7 standing on the end ring 3. When the initial bond has been broken i.e. a lift of about 12° has been made, the cylinder 22, is retracted, and the hold down frame 18 rotated clear of the mast travel position by retracting cylinder 20. the lift is then continued until the mould clears the pipe, jacks 17 are withdrawn, and the fork lift unit is backed away, to return the mould 1 to the assembly position.

WHAT WE CLAIM IS:—

1. Apparatus for stripping a rigid tapered mould from a pipe, such as a concrete pipe, after the pipe is moulded in the mould and before it is cured, comprising a mobile stripping unit adapted to transport a mould and a pipe moulded therein from a position where the pipe is moulded to a position where the mould is to be stripped from the pipe, the unit including means for supporting the mould and pipe therein in a substantially vertical attitude with the smaller end of the mould uppermost prior to the stripping operation, means for operating the supporting means after the unit is propelled from the position where the pipe is moulded to the position where the pipe is to be stripped from the mould for lowering the mould and pipe therein so that the mould will rest on the ground or other surface and for raising the mould vertically after the mould and pipe therein have been lowered to rest on the ground or other surface and holding down means for simultaneously applying a downward force on the pipe to prevent the pipe being raised as the mould is being raised on the supporting means so that the mould will be stripped from the pipe.



by clamps 12. Trunnions 5 are fitted just above the centre of gravity of the mould and a location point or boss 6 is arranged so that the centre of a pin entering at this point is vertically below the trunnion centre.

A reinforcement cage 8 preformed to an elliptical shape if necessary, is placed within the mould 1, all nibs or spacers used to locate the cage having insulated caps so that the reinforcement is electrically discontinuous from the mould. An electrical lead 9, which projects through an insulated hole formed in the top ring 4, is connected to the reinforcement.

Using the well known centrifugal moulding process, concrete is placed in the mould, which is spun and finished to produce a reinforced concrete pipe 7 within the mould. This pipe is then turned vertically by a rotating frame (not shown), clamps 12 being released to free the top ring 4 either before or immediately after the rotation, and, if an elliptical reinforcement has been used, an expandable ring is placed inside the pipe to keep it circular.

The mobile stripping unit comprises a standard fork lift unit 13 as shown in Figure 2. The basic hydraulic supply, the mobility and vertical movement of the mast 23 are all part of the standard fork lift unit. The fork lift unit 13 additionally includes a pair of arms 14 which are attached to the mast 23 to move vertically therewith and which incorporate a pair of lifting vees 15 (which engage the mould trunnions 5), and a locating pin 16 (which enters boss 6). The locating pin 16 and one of the lifting vees 15 are so arranged that the line joining their centrelines is parallel to the mast's line of travel. Also fitted is a hold down frame 18, which is hinged at 19 about the rigid part of the fork lift and can be swung into a position perpendicular to the mast 23 by means of a hydraulic cylinder 20. This frame can also be rotated clear of the mast by the same cylinder. At the other end of the hold down frame 18 is a hold down cross 21, which can be raised or lowered parallel to the mast by a hydraulic cylinder 22.

After the mould has been turned to a vertical position an electric current is applied through a circuit consisting of a source of direct current, connected through leads to the mould 1 and electrical lead 9. This is applied so that, for each square foot of mould surface area, a factor of 1.5 ampere minutes is obtained (e.g., 3 amperes for 30 seconds). This current is applied before the mould is picked up by the fork lift, but could be applied at any stage prior to stripping. The direct current will flow through the pipe to produce hydrogen gas between the mould and the pipe to facilitate stripping of the mould from the pipe.

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Jacks 17 are lowered to fix the fork lift rigidly in position by removing the elasticity of the pneumatic tyres. Clamps 10 and 12 are then released, releasing the bottom end ring 3 and the top end ring 4. Both end rings are now independent of the mould, and cylinder 22 is extended until the hold down cross 21 contacts the top ring 4, with a force about 100 lbs.

Arms 14 are then raised by the mast, causing the mould 1 to be raised by the lifting vees 15 and trunnions 5, leaving the concrete pipe 7 standing on the end ring 3. When the initial bond has been broken i.e. a lift of about 12° has been made, the cylinder 22, is retracted, and the hold down frame 18 rotated clear of the mast travel position by retracting cylinder 20. the lift is then continued until the mould clears the pipe, jacks 17 are withdrawn, and the fork lift unit is backed away, to return the mould 1 to the assembly position.

WHAT WE CLAIM IS:—

1. Apparatus for stripping a rigid tapered mould from a pipe, such as a concrete pipe, after the pipe is moulded in the mould and before it is cured, comprising a mobile stripping unit adapted to transport a mould and a pipe moulded therein from a position where the pipe is moulded to a position where the mould is to be stripped from the pipe, the unit including means for supporting the mould and pipe therein in a substantially vertical attitude with the smaller end of the mould uppermost prior to the stripping operation, means for operating the supporting means after the unit is propelled from the position where the pipe is moulded to the position where the pipe is to be stripped from the mould for lowering the mould and pipe therein so that the mould will rest on the ground or other surface and for raising the mould vertically after the mould and pipe therein have been lowered to rest on the ground or other surface and holding down means for simultaneously applying a downward force on the pipe to prevent the pipe being raised as the mould is being raised on the supporting means so that the mould will be stripped from the pipe.

2. Apparatus according to claim 1, wherein the mould and the pipe are adapted to be connected to a source of direct current so that an electric current will flow 5 through the pipe to cause electrolysis of water in the pipe to produce hydrogen gas between the mould and the pipe and facilitate stripping of the mould from the pipe.
3. Apparatus according to claim 1 or 2, 10 wherein the mould is provided with a bottom end ring fitted inside the bottom end of the mould against the bottom end of the pipe, the bottom end ring having legs mounted thereon to contact the ground or 15 other surface.
4. Apparatus according to claim 1, 2 or 3 wherein the mould supporting means comprises a pair of lifting vees adapted to engage opposed trunnions on the mould and 20 mounted on a pair of arms which are attached to a mast of a fork lift unit to move vertically therewith, and the holding down means comprises a hold down cross adapted to apply a downward force onto a top end ring fitted inside the top end of 25 the mould against the top end of the pipe and operatively supported by the mast of the fork lift unit.
5. Apparatus for stripping a rigid tapered mould from a pipe, such as a concrete pipe after the pipe is manufactured 30 in the mould and before it is cured substantially as herein described with reference to and as illustrated in the accompanying drawings. 35

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Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1971
Published at the Patent Office, 25 Southampton Buildings, London WC2A 1AY from which copies may be obtained.



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