

PATENT SPECIFICATION

(11) 1 494 515

1 494 515

- (21) Application No. 42142/74 (22) Filed 27 Sept. 1974
 (23) Complete Specification filed 22 Aug. 1975
 (44) Complete Specification published 7 Dec. 1977
 (51) INT CL² B21D 13/00//F16L 9/14
 (52) Index at acceptance

B3E 1H4 4B 4E 5G 9B AJ
 D1K 9E 9J
 F2P 1A18B 1A8 1B2 1B5B

- (72) Inventors MARC NIJS, FRITS VANASSCHE and
 JOHANNES ARNOLDUS DE KOK



(54) METHOD OF MAKING A REINFORCING STRIP

(71) We, N. V. BEKAERT S. A., a Belgian body corporate of B-8550 Zwevegem, Belgium, 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 a method of making a metal reinforcing strip for use in reinforcing a coating applied to a cylindrical object, such as a pipe.

It is sometimes necessary to apply a heavy coating of concrete or the like to pipes for use underwater, for example oil pipelines, to counteract their buoyancy. Such heavy coatings require reinforcement to enable them to withstand the pressures they encounter in use, and the reinforcing is usually provided by embedding metal reinforcing members in the coating.

A concrete coating may be applied to a pipe by rotating the pipe and at the same time moving it axially past a spraying station at which concrete is sprayed on to the outer surface of the pipe. Simultaneously a metal reinforcing strip may be wound around the pipe and embedded in the concrete.

As the thickness of the concrete builds up on the pipe in the region of the spraying station it forms a generally frustoconical shape and then a generally cylindrical shape. The reinforcing strip is applied in the frustoconical region and hence one edge of the strip (that nearest the direction in which the rotating pipe is axially moving) must surround a larger circumference than the other edge.

A known form of reinforcing strip for pipe coatings shown in U.S. Patent No. 3,761,557) comprises two or more longitudinal wires having spaced-apart rods welded therebetween and wherein one of the longitudinal wires is provided with a degree of slack between each pair of rods to allow it to expand when wrapped around a frustoconical portion of a concrete coating.

The manufacture of such a strip is complicated and difficult to achieve automatically, since the longitudinal wires must be supported and given the required amount of slack and then the rods must be welded to the correct points of the wires. It is desirable to form a reinforcing strip from welded wire mesh which is readily fabricated automatically.

According to the invention, there is provided a method of making a metal reinforcing strip comprising taking a strip of welded wire mesh having longitudinal wires and transverse wires, and deforming at least some of said longitudinal wires to an extent which increases progressively across the strip.

The longitudinal wires of the welded wire mesh are preferably substantially perpendicular to the transverse wires before deformation, such rectangular wire mesh being relatively easily fabricated and readily available commercially.

The step of deforming at least some of the longitudinal wires may be performed in a single operation by passing the strip of mesh between a pair of rollers arranged to effect the said deformation of the longitudinal wires. Preferably, however, said deforming step is performed in two operations; thus all the longitudinal wires of the mesh may be deformed to an equal extent and subsequently the mesh may be longitudinally expanded to an extent which increases progressively across the strip.

The first operation may comprise passing the strip of welded wire mesh between a pair of rollers arranged to deform to an equal extent all of the longitudinal wires of the mesh.

Similarly, the second operation may comprise passing the strip between a pair of rollers arranged to longitudinally expand the mesh to an extent which increases progressively across the strip. Alternatively, the second operation may comprise stretching the strip to longitudinally expand

50

55

60

65

70

75

80

85

90

the mesh to an extent which increases progressively across the strip.

5 The said stretching may conveniently be carried out as the mesh is wound onto a pipe in a coating operation.

10 The said longitudinal wires may be deformed so that they are bent but still lie in the plane of the mesh and machines for performing this operation are commercially available. Preferably, however, they are deformed in respective planes perpendicular to the plane of the mesh. This leads to improved keying with the coating and better reinforcement properties.

15 The invention extends to a method of making a metal reinforcing strip comprising providing a strip of welded wire mesh having longitudinal wires and transverse wires in which the longitudinal wires are all deformed to an equal extent, and stretching the strip to longitudinally expand the mesh to an extent which increases progressively across the strip.

20 The invention also provides a method of coating a pipe, comprising the simultaneous steps of rotating the pipe and moving it axially past a spraying station, spraying concrete onto the outer surface of the pipe, and winding onto the pipe a metal reinforcing strip made by a method as defined above.

25 The invention also provides a method of coating a pipe comprising the simultaneous steps of rotating the pipe and moving it axially past a spraying station, spraying a coating material onto the outer surface of the pipe and winding onto the pipe a metal reinforcing strip made by stretching a strip of welded wire mesh having longitudinal wires and transverse wires in which the longitudinal wires are all deformed to an equal extent, so as to longitudinally expand the mesh to an extent which increases progressively across the strip.

30 Certain embodiments of the invention will now be described by way of example and with reference to the drawing accompanying the Provisional Specification, in which:—

35 Figure 1 shows a welded wire mesh at an intermediate stage of a method according to the invention;

40 Figure 2 shows the mesh of Figure 1 being subjected to a further stage of the method and being wound on a pipe; and

45 Figure 3 is half of a longitudinal section of the coated pipe of Figure 2.

50 Referring now to the drawing, the method uses a strip of conventional welded wire mesh, i.e. a mesh formed by welding straight parallel longitudinal wires to straight parallel transverse wires. The longitudinal wires are preferably substantially perpendicular to the transverse wires. A

convenient width of strip is from 150 to 250 mm.

65 In a first embodiment of the method, all of the longitudinal wires of the mesh are first deformed to the same extent. This can be done by passing the welded wire mesh between a pair of suitable rollers to form the mesh into the shape shown in Figure 1. As can be seen, the longitudinal wires 2 of the mesh 1 are all deformed to the same extent in respective planes perpendicular to the plane of the mesh, although, as mentioned above, they could alternatively be deformed in the plane of the mesh.

70 The uniformly-deformed mesh 1 is then led to a coating station at which it is passed between a pair of rollers 3 having inclined axes. These rollers 3 serve to straighten out completely the deformations in the longitudinal wire at one edge of the strip and to straighten out the deformations in the other longitudinal wires to a progressively lesser extent across the width of the strip.

75 The reinforcing strip may now be wound around a rotating pipe without substantial further deformation or straightening of the longitudinal wires, and simultaneously concrete or other suitable coating material may be sprayed onto the outer surface of the pipe. The longitudinal wires with the greater deformations are arranged to lie nearer the surface of the pipe as can be seen in Figure 3, and the decreasing extent of the deformations away from the surface of the pipe leads to good adhesion between the coating material and the reinforcing strip.

80 As shown in the drawing, the longitudinal wires which are to lie nearest the surface of the pipe may be formed closer together in the wire mesh than the other longitudinal wires. This then prevents the deformations in these longitudinal wires from being drawn out as the strip is wound onto the pipe. Alternatively, the longitudinal wire which is to be wound closest to the pipe surface could be stronger, as by making it of larger diameter than the other longitudinal wires or of square cross-section but similar dimensions.

85 According to an alternative embodiment of the invention, the uniformly-deformed mesh 1 may be stretched to straighten out the deformations in the longitudinal wires to a progressively lesser extent across the width of the strip. This may be done by omitting the rollers 3 and allowing the rotating pipe to stretch the wire mesh against a braking force applied to the spool from which the uniformly deformed mesh is fed or to the rollers which uniformly deform the mesh.

90 In another embodiment of the invention, the deformation of the longitudinal wires may be performed in a single operation by

2
 250 65
 od, all
 h a
 is can
 mesh 70
 m the
 1. As
 of the—
 extent
 o the 75
 tioned
 ormed
 then
 passed 80
 elined
 en out
 the
 e strip
 ons in 85
 to a
 width
 vound
 antial 90
 of the
 eously
 aterial
 of the
 reater 95
 er the
 Figure
 f the
 of the
 n the 100
 strip.
 udinal
 ace of
 her in
 udinal 105
 ons in
 drawn
 Alter-
 s to be
 ould be 110
 ameter
 or of
 nsions.
 diment
 formed 115
 en out
 vres to
 ss the
 one by
 ng the 120
 mesh
 e spool
 mesh is
 deform
 125
 ention,
 l wires
 tion by

3

passing the strip between a single pair of rollers arranged so that the wire to be laid nearest the surface of the pipe receives the greatest deformation, while the wire at the other edge of the strip receives no or very little deformation, the amount of deformation increasing progressively across the strip.

WHAT WE CLAIM IS:—

10 1. A method of making a metal reinforcing strip, comprising taking a strip of welded wire mesh having longitudinal wires and transverse wires, and deforming at least some of said longitudinal wires to an extent which increases progressively across the strip.

15 2. A method as claimed in claim 1, wherein said longitudinal wires are substantially perpendicular to said transverse wires before the longitudinal wires are deformed.

20 3. A method as claimed in claim 1 or 2, wherein the deforming step is performed in a single operation by passing the strip of mesh between a pair of rollers arranged to effect said deformation of the longitudinal wires.

25 4. A method as claimed in claim 1 or 2 wherein the deforming step is performed in two operations comprising deforming to an equal extent all of the longitudinal wires of the mesh and subsequently longitudinally expanding the mesh to an extent which increases progressively across the strip.

30 5. A method as claimed in claim 4, wherein the first operation comprises passing the strip of welded wire mesh between a pair of rollers arranged to deform to an equal extent all of the longitudinal wires of the mesh.

35 6. A method as claimed in claim 4 or 5, wherein the second operation comprises passing the strip between a pair of rollers arranged to longitudinally expand the mesh to an extent which increases progressively across the strip.

40 7. A method as claimed in claim 4 or 5, wherein the second operation comprises stretching the strip to longitudinally expand the mesh to an extent which increases progressively across the strip.

45 8. A method of making a metal reinforcing strip comprising providing a strip of welded wire mesh having longitudinal wires and transverse wires in

which the longitudinal wires are all deformed to an equal extent, and stretching the strip to longitudinally expand the mesh to an extent which increases progressively across the strip.

9. A method as claimed in claim 7 or 8, comprising stretching the strip by winding it onto a pipe.

10. A method as claimed in any preceding claim, wherein the said deformation of the longitudinal wires is in respective planes substantially perpendicular to the plane of the mesh.

11. Methods of making a metal reinforcing strip, substantially as hereinbefore described with reference to the drawing accompanying the Provisional Specification.

12. A metal reinforcing strip made by a method as claimed in any preceding claim.

13. A method of coating a pipe, comprising the simultaneous steps of rotating the pipe and moving it axially past a spraying station, spraying a coating material onto the outer surface of the pipe, and winding onto the pipe a metal reinforcing strip made by a method as claimed in any of claims 1 to 11.

14. A method of coating a pipe comprising the simultaneous steps of rotating the pipe and moving it axially past a spraying station, spraying a coating material onto the outer surface of the pipe and winding onto the pipe a metal reinforcing strip made by stretching a strip of welded wire mesh having longitudinal wires and transverse wires in which the longitudinal wires are all deformed to an equal extent, so as to longitudinally expand the mesh to an extent which increases progressively across the strip.

15. A method as claimed in claim 13 or 14 wherein said coating material is concrete.

16. Methods of coating a pipe, substantially as hereinbefore described with reference to the drawing accompanying the Provisional Specification.

17. A coated pipe made by a method as claimed in any of claims 13 to 16.

For the Applicants,
 FRANK B. DEHN & CO.,
 Imperial House,
 15-19 Kingsway,
 London WC2B 6UZ.

a 150 to 250 65
method, a"
e mesh a
nt. This can
l wire mesh 70
to form the
Figure 1. As
ires 2 of the
same extent
ular to the 75
s mentioned
be deformed
sh 1 is then
it is passed 80
ing inclined
raighten out
is in the
of the strip
ormations in 85
res to a
ss the width
w be wound 90
t substantial
ening of the
ultaneously
ing material
urface of the 95
r the greater
e nearer the
en in Figure
nt of the
rface of the 100
etween the
rcing strip.
longitudinal
e surface of
together in
longitudinal 105
ormations in
being drawn
e pipe. Alter-
hich is to be
ce could be 110
ger diameter
wires or of
dimensions.
embodiment
ly-deformed 115
raighten out
linal wires to
across the
be done by
allowing the 120
wire mesh
to the spool
med mesh is
rmly deform
125
e invention,
udinal wires
operation by

passing the strip between a single pair of
rollers arranged so that the wire to be laid
nearest the surface of the pipe receives the
greatest deformation, while the wire at the
5 other edge of the strip receives no or very
little deformation, the amount of
deformation increasing progressively across
the strip.
WHAT WE CLAIM IS:—
10 1. A method of making a metal
reinforcing strip, comprising taking a strip
of welded wire mesh having longitudinal
wires and transverse wires, and deforming at
least some of said longitudinal wires to an
15 extent which increaes progressively across
the strip.
2. A method as claimed in claim 1,
wherein said longitudinal wires are
substantially perpendicular to said trans-
verse wires before the longitudinal wires are
20 deformed.
3. A method as claimed in claim 1 or 2,
wherein the deforming step is performed in
a single operation by passing the strip of
mesh between a pair of rollers arranged to
25 effect said deformation of the longitudinal
wires.
4. A method as claimed in claim 1 or 2
wherein the deforming step is performed in
two operations comprising deforming to an
30 equal extent all of the longitudinal wires of
the mesh and subsequently longitudinally
expanding the mesh to an extent which
increases progressivley across the strip.
35 5. A method as claimed in claim 4,
wherein the first operation comprises
passing the strip of welded wire mesh
between a pair of rollers arranged to deform
to an equal extent all of the longitudinal
40 wires of the mesh.
6. A method as claimed in claim 4 or 5,
wherein the second operation comprises
passing the strip between a pair of rollers
arranged to longitudinally expand the mesh
45 to an extent which increases progressively
across the strip.
7. A method as claimed in claim 4 or 5,
wherein the second operation comprises
stretching the strip to longitudinally expand
50 the mesh to an extent which increases
progressively across the strip.
8. A method of making a metal
reinforcing strip comprising providing a
strip of welded wire mesh having
55 longitudinal wires and transverse wires in

which the longitudinal wires are all
deformed to an equal extent, and stretching
the strip to longitudinally expand the mesh
to an extent which increases progressively
across the strip.
60 9. A method as claimed in claim 7 or 8,
comprising stretching the strip by winding it
onto a pipe.
10. A method as claimed in any preceding
claim, wherein the said deforamtion of the 65
longitudinal wires is in respective planes
substantially perpendicular to the plane of
the mesh.
11. Methods of making a metal
reinforcing strip, substantially as herein- 70
before described with reference to the
drawing accompanying the Provisional
Specification.
12. A metal reinforcing strip made by a
method as claimed in any preceding claim. 75
13. A method of coating a pipe,
comprising the simultaneous steps of
rotating the pipe and moving it axially past a
spraying station, spraying a coating material
onto the outer surface of the pipe, and 80
winding onto the pipe a metal reinforcing
stip made by a method as claimed in any of
claims 1 to 11.
14. A method of coating a pipe
comprising the simultaneous steps of 85
rotating the pipe and moving it axially past a
spraying station, spraying a coating material
onto the outer surface of the pipe and
winding onto the pipe a metal reinforcing
90 strip made by stretching a strip of welded
wire mesh having longitudinal wires and
transverse wires in which the longitudinal
wires are all deformed to an equal extent,
so as to longitudinally expand the mesh to
an extent which increases progressively 95
across the strip.
15. A method as claimed in claim 13 or 14
wherein said coating material is concrete.
16. Methods of coating a pipe,
substantially as hereinbefore described with 100
reference to the drawing accompanying the
Provisional Specification.
17. A coated pipe made by a method as
claimed in any of claims 13 to 16.

For the Applicants,
FRANK B. DEHN & CO.,
Imperial House,
15-19 Kingsway,
London WC2B 6UZ.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1977.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from
which copies may be obtained.

