Oct. 6, 1964 R. F. OLLIER 3,151,391

METHOD OF FORMING A LATTICE FOR CONCRETE REINFORCEMENTS BY ROLLING COMB ELEMENTS ONTO TRANSVERSE MEMBERS OF SAID LATTICE

Filed April 2, 1962 2 Sheets-Sheet 1

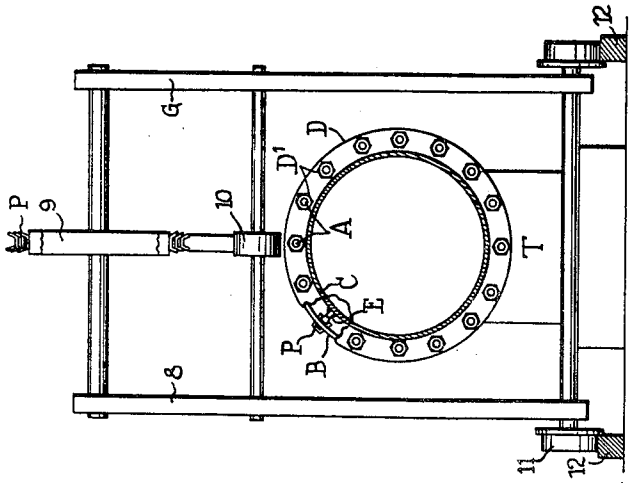


Fig.2

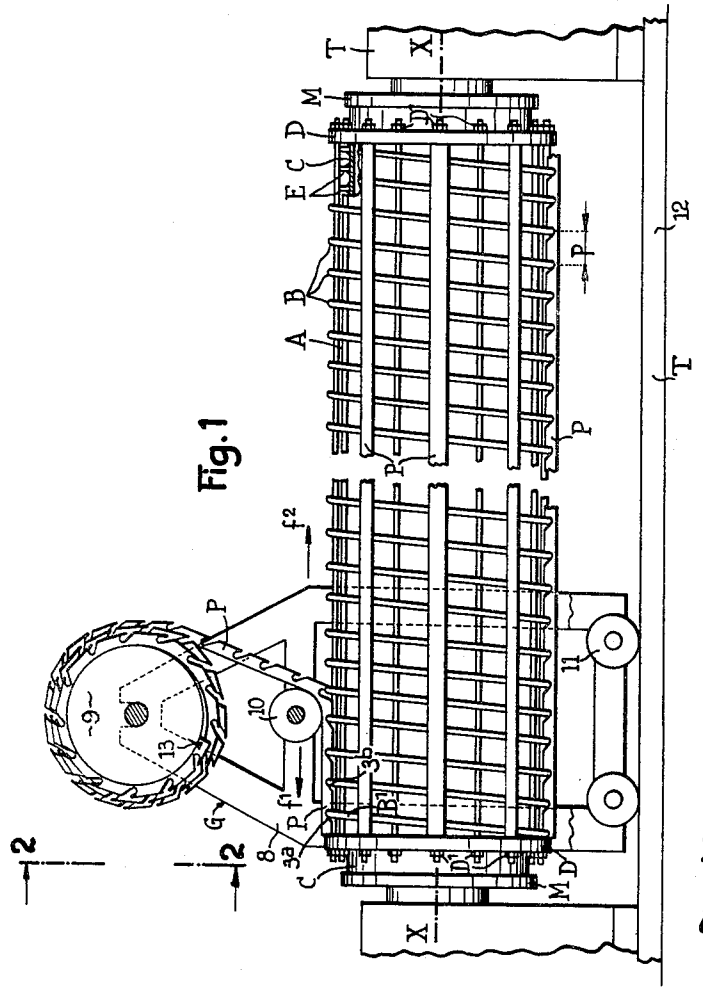


Fig.1

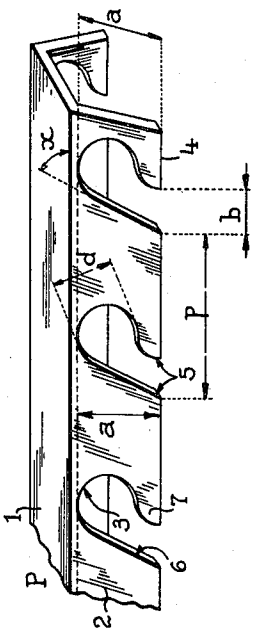


Fig.3

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Fig. 4

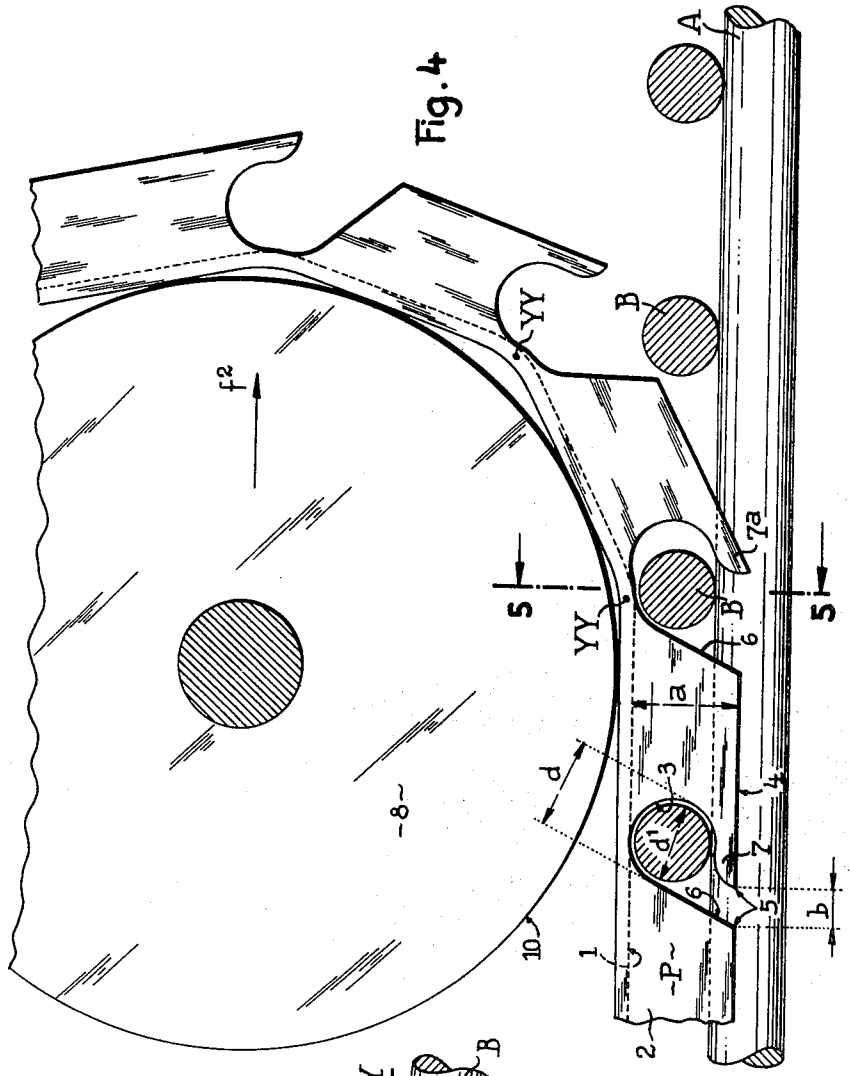
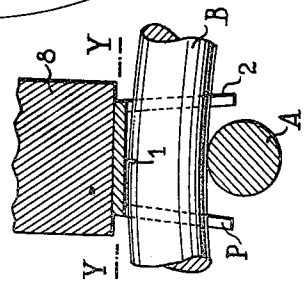


Fig. 5



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METHOD OF FORMING A LATTICE FOR CONCRETE REINFORCEMENTS BY ROLLING COMB ELEMENTS ONTO TRANSVERSE MEMBERS OF SAID LATTICE

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2 Claims. (Cl. 29—429)

The present invention relates to the manufacture of a lattice of longitudinal and transverse reinforcements for concrete and other articles. In the special case of concrete pipes, the longitudinal reinforcements constitute the generatrices of a cylindrical lattice whereas the transverse reinforcements are wound helically on top of the longitudinal reinforcements at a constant pitch. However, the latter is not likely to be maintained after the winding. It is therefore necessary to provide means for maintaining this pitch constant after winding.

In accordance with the known technique, the spacing between the transverse reinforcements if they are rectilinear (flat lattice) or between their coils in the case of a cylindrical lattice, can be maintained constant either by welding these reinforcements or their coils to the longitudinal reinforcements or by means of combs constituted by rigid bars having the same length as the longitudinal reinforcements and provided with teeth evenly spaced apart at the pitch of the reinforcements or transverse coils, which pitch is to be maintained constant. The combs are laid in a direction parallel with the longitudinal reinforcements, the teeth of the combs are interposed between the reinforcements or the consecutive transverse coils and then these teeth are curved or bent one by one on each reinforcement or coil so as to trap the latter therein. This operation is consequently rather time consuming.

The comb laid according to the method of this invention, comprises a thin sheet metal U-sectional element whose flanges are notched at regular intervals down to a plane flush with the web so as to render the latter bendable, the notches in one flange facing those in the other flange and opening out on the edge of the corresponding flange by a restricted passageway which is capable of being widened by bending said web in the region of each pair of facing notches formed in the two flanges.

It will be understood that with such a comb having successive notches in opposed relation to each other in the two flanges, the spacing between said notches being equal to that of the successive transverse reinforcements or the successive coils of the latter, it is possible to maintain said transverse reinforcements or coils in position on condition that said reinforcements have a section whose diameter is less than that of the circular notches of the comb and greater than the width of their restricted passageway, the introduction of a transverse reinforcement in a notch of the comb being obtained by the temporary bending of the web of said comb.

As can be seen, it is no longer the teeth of the comb which are bent over the reinforcements so as to trap the latter the web of the comb remaining straight, but it is the web of the comb which is bent and then straightened so as to open and then close the notches round the reinforcements.

Another object of the invention is to provide a method of laying combs of the aforementioned type, which comprises winding a comb of great length round a reel, passing the free end of said comb around and under a tension roller so as to bend the comb in the region of the first

pair of notches and open the latter, urging said tension roller toward the first transverse reinforcement so as to engage the latter in said pair of opened notches, rolling the tension roller along the comb from one end of the lattice to the other in a rectilinear direction transverse to the reinforcements to be held in position so as to unwind the comb while temporarily and successively bending it in the region of successive pairs of notches thereby temporarily opening the latter and engaging them on the successive transverse reinforcements, and then straightening the comb so as to close the notches round said reinforcements.

Further features and advantages of the invention will be apparent from the ensuing description, with reference to the accompanying drawings to which the invention is in no way limited.

In the drawings:

FIG. 1 is a diagrammatic view of a reinforcing lattice for a concrete pipe shown in the course of laying a comb for locking the transverse and helical reinforcements in position;

FIG. 2 is a vertical sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a perspective view of a portion of the comb according to the invention;

FIG. 4 is a view corresponding to FIG. 1, on an enlarged scale, showing how the comb according to the invention is placed in position, and

FIG. 5 is a sectional view taken along line 5—5 of FIG. 4.

In the illustrated embodiment the invention is applied to the production of a cylindrical lattice for a concrete pipe, which lattice is composed of longitudinal reinforcements A constituting the generatrices of the lattice, and reinforcements wound helically about the reinforcements A in the form of circular coils B having a pitch p.

The reinforcements A are mounted in the known manner on a sheet metal cylinder C having end flanges D through the medium of spacing studs E disposed between the reinforcements A and the cylinder C and are held taut between the flanges D to which they are secured, for example by nuts D^1.

The cylinder C is mounted in the known manner on a parallel lathe T between mandrels M of this lathe for the purpose of winding the helical reinforcements round the longitudinal reinforcements A or generatrices. Said helical reinforcements are wound at a pitch p and are secured to the end of the reinforcements A and at points intermediate of the length of the latter.

According to the invention, the pitch p of the coils of the helical reinforcements B is maintained constant by a number of combs P which are parallel with the reinforcements A.

Each of the combs comprises (FIG. 3) a U-sectioned thin sheet metal having a web 1 and slightly divergent flanges 2. This comb has therefore a U-shaped cross-section. Cut into the flanges 2 in facing relation and at intervals corresponding to the pitch p of the coils B are circular open notches 3 having a diameter d slightly greater than the diameter d^1 of the section of the wire of coils B (FIG. 4). The depth of the notches 3 is equal to the width a of the flanges 2 so that the bottom of the notches 3 is tangent to the flange 1 of the comb P.

Each notch opens out on the edge 4 of the corresponding flange by way of a restricted passageway 5 which, in the straight condition of the comb P, has a width b which is less than d^1. This passageway is defined, on one side, by a straight edge 6 which is inclined relative to the web 1 in suitable manner for laying the comb in the manner described hereinafter, and, on the other side, by a tongue 7.

For laying or mounting on the lattice, each comb P is mounted on a mounting device G comprising a chassis 8 (FIG. 1) carrying a reel 9 of large diameter composed for example of wood and rotatively mounted on the chassis, and a small diameter roller 10 having an axis parallel with that of the reel.

The chassis 8 is for example mounted on wheels 11 so as to constitute a carriage which moves along a runway along the lathe T in a direction parallel with the axis of rotation X—X of this lathe.

The comb P, whose length is at least equal to that of the lattice, is wound round the reel 9. The web 1 in contact with the reel has one of its ends secured to the latter, for example by a nail 13 (FIG. 1), and is bent in the region of the notches 3. The successive coils interpenetrate owing to the divergence of the flanges 2.

The device G being thus equipped with the comb, the latter is mounted or laid on the reinforcements in the following manner:

The device G is brought to one end of the lathe T (which is in the inoperative state), for example to the left end of the lathe so that the tension roller 10 lies vertically above the first coil B^1, and the comb P is unwound in the direction of the arrow f^1 so as to pass under the roller 10 and engage through the medium of its first notch 3*a* on the first coil starting from the left, as will be explained hereinafter, this notch being opened when it passes under the roller. Thereafter, the device G is moved toward the right in the direction of arrow f^2 (FIGS. 1 and 4).

As can be seen from FIGS. 1 and 4, the web 1 of the comb P is easily bent in a progressive manner in the region of each pair of notches 3 when this pair of notches passes under the roller 10 around the axis Y—Y of the minimum moment of inertia of its section. The notches 3 of the pair of notches under consideration open wide in passing under the roller 10 so as to engage on one of the coils B which is located between the straight inclined edge 6 and the tongue 7 which is at this forced away from the edge 6 at 7*a*. The roller 10 applies the web 1 of the comb P against the engaged coil B so that this coil is placed in the bottom of the two corresponding notches 3.

Then, as the chassis 8 continues to move in the direction of arrow f^2 parallel with the axis X—X of the lattice which remains stationary as concerns rotation, the tension roller 10 exerts a traction on the comb P which bears against the last coil B engaged by the straight edges 6 of the last two engaged notches 3 and is unwound from the reel 9. The roller 10 straightens the part of the comb P which has just been laid and once more renders it straight. In the course of this straightening of the web 1 of the comb the tongue 7 of each notch moves nearer to the opposite edge 6 and traps the coil B in closing the entrance passageway of the notch 3.

Thus, as the device G moves and as the roller 10 rolls along the web 1 of the comb P, successive pairs of notches 3 in turn engage successive coils B in firstly opening and then closing round the latter.

When the last coil B is trapped by a pair of notches 3, the comb P is cut off at the end of the lattice and then the device G is brought back to the left end of the lattice while the lathe T rotates the lattice a fraction of a rotation so as to prepare the lattice for the laying of another comb. Should the preceding reel be completely unwound another reel 9 can be placed in position of the chassis 8.

The same procedure is repeated for the laying of each comb. In this way, 4 to 8 combs evenly spaced on the periphery of the lattice can be placed in position. The combs can be laid just above the reinforcements A or between two consecutive reinforcements A.

Owing to the combs P the transverse coils B of the lattice are maintained at a constant distance apart from each other and the lattice is thereby reinforced. When all the combs have been placed in position the lattice is

removed from the cylinder C and placed in a mould for moulding the concrete.

As can be seen, the notches 3 of the combs P can be compared to pinchers the jaws of which are the straight edge 6 and the tongue 7 which are pivoted about the axis Y—Y (FIGS. 4 and 5) of the minimum moment of inertia of the section of the web 1. Owing to the depth *a* of the notches 3, which is equal to the width of the flanges 2, the bottom of the notches 3 being tangent to the web 1, the flanges 2 undergo no folding or crinkling. Only the web 1 is bent successively in the region of each pair of notches; therefore, no tearing of the metal occurs in the portions of the flanges defining the notches.

The combs P and the laying device G are very simple and very strong. The laying device requires no maintenance. It should also be noted that owing to the absence of welding, the strength of the reinforcements is particularly increased by the fact that the effect of the drop in the tensile strength of about 20 to 30% caused by welding is avoided.

Although specific embodiments of the invention have been described, many modifications and changes may be made therein without departing from the scope of the invention as defined in the appended claims.

The invention is also applicable to the locking of transverse or oblique lattice reinforcements disposed in plane layers, in which case the carriage and its runway undergo a displacement relative to the lattice in the direction perpendicular to the longitudinal reinforcements after the laying of each comb and before laying the following comb.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. A method of assembling transverse members in fixed spaced relation to each other in a lattice structure, which comprises:

supporting said transverse members in the required spaced positions in a fixed plane;

providing a comb consisting of an inverted, substantially U-shaped sheet metal element having two longitudinally extending, slightly divergent flanges of equal width, and a longitudinally extending flexible web interconnecting said flanges at their upper edges, said flanges being dependent from said web;

said flanges having pairs of aligned notches, in facing relation, said pairs of notches being on parallel axes, said pairs of notches being spaced longitudinally of said flanges a distance from each other corresponding to the spacing of said transverse members;

each of said notches comprising an aperture, the top of which abuts the web, said aperture being substantially circular and having a diameter slightly greater than the cross-sectional dimension of said transverse members, and an entrance passageway, narrower than said aperture and connecting said aperture to the longitudinal bottom edge of said flange;

each of said passageways having a contour including a first portion inclined upwardly from said bottom edge and defining one side of said passageway and merging into said substantially circular aperture, and a second portion defining the other side of said passageway and extending between a lower part of said aperture and said bottom edge of said flange, said second contour portion being such as to permit the part of the comb adjacent thereto to be bent upwardly and downwardly about the transverse axis of minimum moment of inertia of the portion of said sheet metal element at the location of the pair of notches which one of said transverse members is about to engage;

winding said comb around a reel;

effecting a comb-laying operation for lockingly engaging the pairs of aligned notches with said transverse members, said operation consisting in first passing the free end of said comb around and under a tension

roller, the diameter of which is small enough to bend the comb in the region of the first pair of notches as said comb travels around said roller; whereby the second portions of said contour are first bent upwardly away from the first portions of said contour in the portion of said comb that is about to engage a first transverse member, therby enlarging said entrance passageways to a dimension greater than the diameter of said transverse member, and permitting the latter to enter said entrance passageways; said first transverse member becoming engaged in said apertures in said first pair of notches;

then moving said comb under said roller, thereby flexing said web and bending said second contour portions downwardly toward said first contour portions, thereby narrowing said entrance passageways to capture said first transverse member inside said first pair of notches and to prevent said first transverse member from escaping from said first pair of notches, without hindering said downward bending by said transverse member;

and continuing the comb-laying operation by engaging the second and successive pairs of said notches on the second and successive transverse members, said roller being rolled along said comb longitudinally, in a direction parallel with said fixed plane, and in the direction in which said second contour portions are upwardly bent, from said first transverse member to to the last transverse member, thereby causing each successive pair of notches to engage and retain each of said successive transverse members, and finally sectioning the length of said comb thus assembled with said transverse members from the rest of the comb.

2. A method of assembling portions of a helically wound transverse member in fixed spaced relation to each other in a cylindrical lattice structure having a longitudinal shaft, comprising:

supporting said helically wound transverse member on a cylindrical support rotative on said shaft;

providing a first comb consisting of an inverted, substantially U-shaped sheet metal element having two longitudinal, slightly divergent, flanges of equal width and a longitudinally extending flexible web interconnecting said flanges at their upper edges, said flanges being dependent from said web;

said flanges having pairs of aligned notches, in facing relation, said pairs of notches being on parallel axes, said pairs of notches being spaced longitudinally of said flanges a distance from each other corresponding to the spacing of said portions of said helically wound transverse member;

each of said notches having an aperture, the top of which abuts said web, said aperture being substantially circular and having a diameter slightly greater than that of said transverse member, and an entrance passageway narrower than said aperture and connecting said aperture with the longitudinal bottom edge of said flange;

each of said passageways having a contour including a first portion inclined upwardly from said bottom edge and defining one side of said entrance passageway and merging into said substantially circular aperture, and a second portion defining the other side of said passageway and extending between a lower part of said aperture and said bottom edge of said flange, said second contour portion being such as to permit the part of said first comb adjacent thereto to be bent upwardly and downwardly about the transverse axis of minimum moment of inertia of the portion of said sheet metal element at the location of the notch which one of said portions of said transverse member is about to engage;

the distance between said parallel axes being the same as the pitch of said portions of said helically wound transverse member;

winding the first comb around a reel;

effecting a first comb-lying operation for lockingly engaging successive pairs of notches with successive portions of said helically wound transverse member, said operation consisting in first passing the free end of said first comb around and under a tension roller, the diameter of which is small enough to bend the first comb in the region of the first pair of notches as said comb travels around said roller; whereby the second portions of said contour are first bent upwardly away from said first portions of said contour in the portion of said comb that is about to engage a first portion of said transverse member, thereby enlarging said entrance passageways to a dimension greater than the diameter of said transverse member, permitting the first portion of the latter to enter said passageways of said first pair of notches; thereby engaging said first portion of said transverse member in said apertures of said first pair of notches;

then moving said first comb under said roller, thereby flexing said web and bending said second contour portions of said first pair of notches downwardly toward said first contour portions of said first pair of notches, thereby narrowing said entrance passageways to capture said first portion of said transverse member inside said first pair of notches and to prevent the escape of said first portion of said transverse member from said first pair of notches, without hindering said downward bending by said first portion of said transverse member;

continuing the laying operation of said first comb by engaging a second and successive pairs of notches on a second and successive portions of said transverse member, said roller being rolled along said first comb, longitudinally in the direction in which said second contour portions of said notches are bent upwardly from the bottom edges of said flanges, from the first portion of said transverse member to the last portion thereof, thereby causing successive pairs of the notches of said first comb to engage and retain successive spaced portions of said transverse member;

then effecting a first rotation of said cylindrical support over a first fraction of a revolution corresponding to the required circumferential spacing between said first comb and a second comb, thereby rotating said transverse member over said fraction of a revolution, and then repeating the comb-laying operation with said second comb, laying the latter parallel with said first comb, to assemble said second comb with a second series of portions of said transverse member spaced from said portions assembled with said first comb;

further continuing the rotation of said support and said transverse member over successive, substantially equal, fractions of a revolution, after said first rotation; at the end of each of said fractions of revolution, repeating said comb-laying operation to engage additional combs with additional spaced portions of said transverse member, until said fractional revolutions have covered a full circle.

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