

Description

The invention relates to a reinforcement mat for reinforced concrete, consisting of longitudinal and transverse wires intersecting one another and welded to one another at the intersection point, with a bonding improved by stamping or ribbing or in another way.

In a reinforcement mat of this type, known from DE-B-2,315,520, all the longitudinal elements have the same mutual axial distances from one another, and at least some of the longitudinal elements are designed in the form of pairs of wires with welded-on stiffening webs; the transverse-wire end parts can be bent back towards the longitudinal edge elements in the form of loops to stiffen the mat at its edges, and the loops are also intended to make it possible to provide non-positive mat joints. The purpose of this known mat design is either to increase the rigidity of the mat at a predetermined outlay in terms of steel for the transverse wires or to reduce the outlay in terms of steel for the transverse wires whilst ensuring a predetermined rigidity.

In a further reinforcement mat of the type mentioned in the introduction, known from DE-A-2,350,866, in which the longitudinal elements are likewise at the same mutual axial distances from one another throughout, any two parallel transverse wires adjacent to one another are assigned to one another, and their end parts projecting beyond the longitudinal edge elements are bent back to

form loops, in such a way that the two transverse wires, together with the loops, form an essentially closed length of wire welded to the longitudinal elements and having two parallel longitudinal sides and semicircularly bent narrow sides.

These known mats are intended to form a load-bearing mat joint by pushing two mats against one another until their longitudinal edge elements come to rest next to one another and only the loops of each mat engage over the adjacent mat. Because the longitudinal edge elements of the mats are designed as single wires and the remaining longitudinal elements are designed as double wires, this prevents an accumulation of longitudinal wires in the mat joint. So that a crossbar force sufficient for a load-bearing mat joint can be transmitted in this way, that is to say by means of the loops alone, despite the use of transverse wires with improved bonding properties a long loop length is necessary, and this on the one hand involves a high outlay in terms of transverse-wire material and on the other hand means that, if the mat width of standard programmes is maintained, grid sheets with the long projecting lengths of transverse wire required for forming the loops can no longer be produced on grid-welding machines used for standard programmes.

A load-bearing mat joint can also be obtained in a known way by overlapping the mat edges over three meshes or four welding spots. However, the disadvantage here is that double the amount of wire material comes to rest in the overlapping region than would be required per

se to absorb the forces. It was also found that, when several welding spots are included in the force transmission zone of a transverse wire, the individual welding spots of the particular transverse wire usually participate in the transmission of force in a highly variable manner, as a result of which it has hitherto also been impossible to achieve the best possible conditions for force transmission.

Attention is drawn, in this respect, to AT-B-269,434 which is concerned with the object of achieving simplifications and cost reductions by means of a new reinforcement programme in comparison with the hitherto conventional stock and list mats. For this purpose, in mats of the same width throughout, suitable for forming load-bearing joints, four more closely arranged (and, if appropriate, thinner) longitudinal wires will be arranged at each mat edge at mutual distances identical for all mats, and (if appropriate, thicker) longitudinal wires will be arranged inside the mat at mutual distances which are likewise identical, but which are graded from mat to mat. By overlapping the edges over three meshes of the same width for all mats, it is possible for such mats to form load-bearing joints, and to save steel the projecting lengths of transverse wires will only be made large enough to ensure that perfect welding is possible at the wire intersection points.

Comparing the mats mentioned in the introduction, which have force-transmitting loops, with the last-mentioned mats having predetermined overlapping edges,

each containing four longitudinal wires, it is possible to see contradictory teachings regarding the mat design. Instead of allowing the transverse wires to project extensively beyond the longitudinal edge elements, shaping the projecting ends into loops capable of force transmission and, at the same time, providing a single wire at each mat edge and double wires inside the mat as longitudinal elements, to prevent accumulations of longitudinal wires in the joint region, in the second case the transverse wires extend, if possible, only far enough beyond the longitudinal edge wires to ensure that perfect welding is still just possible at the wire intersection points, whereas, on the other hand, an accumulation of steel consisting of four longitudinal wires of each of two adjacent mats in their overlapping regions is accepted at each mat edge.

Thus, a person skilled in the art who is aware of the two types of mat, because of the completeness and the contradictory nature of their concepts, will not be persuaded to adopt a combination of part features of these, but on the contrary has to choose between sacrificing transverse-wire material and saving longitudinal-wire material or vice versa, to achieve the necessary force transmission in the transverse direction of the mat.

The object on which the invention is based is, within the scope of a new mat programme and laying programme, to design a reinforcement mat of the type mentioned in the introduction, in such a way as to guarantee the best possible force transmission between the transverse

- 5 -

wires of adjacent mats, and in such a way that a reinforcement composed of mats according to the invention can be matched, practically without any losses of material, to framework dimensions differing within wide limits in the transverse-wire direction of the mats. Furthermore, it will be possible to produce mats according to the invention, whilst preserving the width of standard mats, on grid-welding machines used for these.

The invention initially starts from the fact, already known for a long time, that a local increase in the supporting capacity of a sheet-like supporting framework not only is effective in the immediate region where it is produced, but also has an effect up to a certain distance on both sides of this region (the so-called co-supporting slab regions). If a greater cross-sectional area of steel per unit of width is concentrated in certain regions of a sheet-like supporting framework than in its remaining regions, then the regions of higher reinforcing intensity absorb some of the load of the regions of lower reinforcing intensity. This means, in practice, that the reinforcement provided can have a value which corresponds to the average value of the reinforcing intensity of the highly reinforced regions and the reinforcing intensity of the less reinforced regions.

As already mentioned, up to now, no practical benefit has been derived from this fact which, per se, has already been known for a long time, because the intended overlap material must, of course, be indicated on the laying diagrams and adhered to exactly at the site,



and this means that the mats have to be laid very carefully and therefore in a time-consuming and uneconomic way. Furthermore, however, in the reinforcement mats conventional hitherto, particularly where sheet-like supporting frameworks reinforced in two axes are concerned, it has been very difficult to locate the beginning and end of a mat in the laid structure, so that it has been almost impossible for the purchasing engineer to check the laying method subsequently. There have therefore been doubts regarding the economic viability of the accurate laying required and doubts regarding the safety of the structure as a result of laying errors which cannot be checked, and because of these doubts it has seemed advisable not to make use of the knowledge described above.

The invention is also based on the second fact that, when several welding points are included in the force transmission zone from a transverse wire, the individual welding points of the particular transverse wire participate in the force transmission the more variably, the greater the distance between the longitudinal wires. This applies particularly to wires which are ribbed or which are provided with improved bonding properties in another way, because these transmit the forces prevailing in them into the concrete over relatively short distances, with the result that, of two successive welding points, the second is relieved of stress.

Only when the two longitudinal edge wires and consequently the two outermost welding points of a transverse wire are at a short distance from one another at

each mat edge is it possible to obtain an approximately uniform load distribution over the two welding points, so that, even where supporting joints are formed, it can usually be sufficient to provide two welding spots in the overlap region.

The object of the present invention is achieved, on the basis of the facts described, by means of the combination of the features that the transverse wires project beyond the longitudinal edge wires by means of transverse wire portions which are bent back in the plane of the mat in the direction of the longitudinal edge wires, and that the longitudinal wires are arranged symmetrically relative to the longitudinal centre axis of the mat partly at a wider pitch and partly at a narrower pitch, at least the predominant part of the longitudinal wires lying in the inner region of the mat having a wider pitch than the longitudinal edge wires, and two longitudinal wires being provided which are arranged at a narrow pitch at each edge of the mat.

Because the transverse-wire end parts are bent back so as to improve force transmission in the transverse direction, and because two longitudinal wires are at the same time arranged at a narrower pitch at each edge of the mat, thus ensuring that the second longitudinal wire participates in the support, the anchoring of the transverse wires in the concrete improves so that the length of the loops and consequently the projecting lengths of the transverse wires, required to form supporting joints by the overlapping of the loops and of the two longitudinal edge wires of adjacent mats, can be made so short that

grid mats according to the invention can be produced in standard widths even by means of conventional grid-welding machines. There is the further advantage that transverse force transmission is not essentially impaired if one of the two welding points at the mat edge is missing because of a production error or as a result of subsequent damage to the mat.

Furthermore, as a result of this edge design according to the invention of the mat, the transverse-wire portions located next to one another in the overlap region of adjacent mats and consequently the losses of transverse-wire material are reduced to a minimum.

Because longitudinal wires in the inner region of the mat are arranged symmetrically relative to the longitudinal centre axis of the mat partly at a wider pitch and partly at a narrower pitch, markings are also provided for the overlapped laying of adjacent mats. Consequently, the mats can be laid quickly and therefore economically on site, without special aids, in such a way that they can easily be matched to predetermined supporting framework dimensions in the direction of the transverse wires of the mats. It is also always easy to check the selected laying pattern subsequently, because, in the ready-laid mat arrangement, the transverse-wire end parts bent back in the direction of the longitudinal edge wires form clearly recognizable irregularities, so that it always remains possible to check easily the zone along which the edges of adjacent mats overlap.

To reduce the necessary extended length of the

- 9 -

transverse-wire end parts bent back into loops and thus save further material, the transverse-wire end parts can be bent back at each mat edge, at least up to the outermost longitudinal edge wire, and be welded to this.

5 Where high-ribbed concrete steels and steels with a highly embossed surface are concerned, the anchoring effect of the wire surface is so good that there is no need to weld transverse-wire ends, bent back up to the longitudinal edge wires, statically to the longitudinal
10 edge wires. In these cases, even L-shaped hooks which are merely bent into a position parallel to the longitudinal wires are sufficient.

 Preferably, however, the projecting lengths of transverse wire are bent back a full 180° because the
15 loops obtained in this way, owing to their portion in the form of a circular arc, can be seen much more clearly in the laid mat arrangement than hooks, the two legs of which extend essentially parallel to wires of the two families of wires. Moreover, each transverse-wire end part bent
20 back to a longitudinal edge wire is advantageously connected to the longitudinal edge wire by means of at least one tack weld, to ensure that the loop is not bent open when the mat is handled during transport and on site, since because of this it would at least lose its function
25 as a clear marking for the overlapping widths of adjacent mats.

 To make it possible to differentiate clearly between the different pitches of the longitudinal wires, according to a further feature of the invention the narrow

24

pitches of the longitudinal edge wires will be equal to or less than half the wider pitches of the longitudinal wires. Preferably, a narrow pitch of approximately 50 mm will be selected, because, in this case, it is possible
5 by means of grid-welding machines used at the present time to weld the transverse wire by means of two separate electrodes to the two longitudinal wires arranged at this pitch. If a narrower pitch between the welding points were adopted, then both welding points would have to be
10 supplied from a common electrode. This would mean that the welds of the transverse wire to two longitudinal wires arranged at a narrow pitch would, if the same electrode were used for the supply, be weaker than the welds of the same transverse wire to longitudinal wires arranged at a
15 wide pitch, and this obviously contradicts the object of the invention.

As described in more detail later, the invention makes it possible to obtain mat designs which, when the mats are laid so as to overlap, provide the possibility
20 of allowing for uniformly distributed accumulations of steel in the overlap regions, and also mat designs which, with a predetermined mat width, make it possible, by an appropriate choice of the pitches of the longitudinal wires, to produce the mats on easily adjustable and resettable
25 multi-point grid-welding machines with a predetermined equidistance arrangement of the electrodes, and finally mat designs which, because of an edge-saving effect, result in a substantially uniform relative steel cross-section even in overlapped mats of large width and small

overlap.

The invention is explained in more detail below, with reference to the drawings, by means of exemplary embodiments of mats according to the invention. In the
5 drawings:

Figures 1 to 4 show different mats according to the invention in a plan view;

Figures 5 to 10 show plan views of different methods of laying mats according to Figure 4;

10 Figures 11 and 12 show two further mats according to the invention in a plan view, and

Figures 13 and 14 finally show two further mats according to the invention, in cross-section.

Figure 1 shows longitudinal wires 5 in the inner
15 region of the mat and longitudinal wires 3, 4 in the two edge regions. The longitudinal wires in the inner region are arranged at the same pitch a . For the purpose of simplification, the mat is not shown completely, but $n-1$ longitudinal wires are omitted in the inner region, this
20 being indicated by the pitch reference " $n.a$ " in the region of the axis of symmetry of the mat.

The two longitudinal edge wires 3, 4 are arranged at a pitch b which is substantially less than the pitch a at the remaining longitudinal wires and is preferably be-
25 tween approximately 20 and 50 mm.

The transverse wires 1 are likewise arranged at the same pitch c , but this is usually greater than the pitch a of the inner longitudinal wires. The end parts 2 of the transverse wires 1 are bent back at each edge of

the mat symmetrically relative to the longitudinal axis of the mat X-X to form loops and are welded at 11 to the outermost longitudinal edge wire 3. However, the loops can also be taken up to the second longitudinal edge wire 4 and welded only to this or to both longitudinal edge wires 3,4.

If, in mats according to Figure 1, the clear pitch c between adjacent transverse wires 1 is greater than double the amount of the outer dimension s , measured in the direction of the longitudinal wires 5, of the loops 2 formed by the bent-back transverse-wire end parts, the mats can be stacked, so as to save space, in positions alternately rotated 180° , because then, as indicated by broken lines in Figure 1, each transverse wire 1' of the rotated mat comes to rest in a plane next to a transverse wire 1 of the non-rotated mat, and the loops 2' of the transverse wire 1' of the rotated mat are accommodated between a transverse wire 1 and the loops 2 of the adjacent transverse wire 1 of the non-rotated mat.

According to the embodiment of Figure 2, the end parts 2 of the transverse wires 1 can also be bent back in the form of round hooks (the left-hand mat edge) or L-shaped hooks (the right-hand mat edge) in the direction of the longitudinal edge wires 3 and not welded to these.

A special form of a mat according to the invention is shown in Figure 4. This mat, in which the transverse-wire end parts 2 are, for example, guided back up to the longitudinal edge wires 3 and can be connected to

- 13 -

these at 11 by means of a tack weld, also has, in addition to two longitudinal wires 7,8 arranged on both sides of the longitudinal centre axis X-X and forming a separating line, two families each consisting of two longitudinal wires 12, 13 and 14, 15 arranged at a narrow pitch. The longitudinal wires 12, 13 are located approximately at one quarter of the mat width, whilst the longitudinal wires 14, 15 are located approximately at one third of the mat width.

10 As can be seen from Figures 5 to 10, mats of this type, by a suitable choice of the laying method can be matched in small gradations to supporting framework dimensions which differ within very wide limits.

To make a distinction, in Figures 5 to 10 the reference symbols of all the parts of one mat bear the letter a, whilst those of all the parts of the other mat bear the letter b.

According to Figure 5, the two mats are laid in such a way that the longitudinal wires 4a, 4b of the edge families of longitudinal wires 3a, 4a and 3b, 4b arranged at a narrow pitch touch one another. In this laying method, the mats cover the greatest possible slab width. The edges of the two mats facing one another remain clearly visible because of the transverse-wire end parts 2a, 2b bent round in loop form.

In the form of laying according to Figure 6, the longitudinal wires 4a, 4b lie next to longitudinal wires 13b, 13a. The two mats overlap one another over approximately one quarter of their width, so that the surface

reinforced by the mats has become narrower than in the case of Figure 5. At the same time, however, a relative cross-sectional area of steel greater than that of Figure 5 can be allowed for, so that practically no losses of material occur.

A further form of laying is shown in Figure 7, according to which the longitudinal wires 4a, 4b come to rest next to the longitudinal wires 15b, 15a. In this form of laying, the mats overlap one another over one third of their width and therefore cover an even narrower portion of the supporting framework. The transverse-wire end parts 2a, 2b bent in loop form are clearly evident here again, and by means of these the limitations of the individual mats remain recognizable even in the laid composite mat structure.

Figures 8 to 10 repeat the forms of laying shown in Figures 5 to 7, but here the left-hand mat is severed along its axis of symmetry X-X. According to Figure 10, the mats laid in the way shown there thus cover a supporting framework width which is only slightly greater than that which can be covered by a single mat.

The mat illustrated in Figure 11 is substantially similar to that shown in Figure 3. Since it is not possible to construct any mat widths with narrow and wide wire pitches which, if possible, are integral, in such a way that the wide wire pitches are also always the same integral multiples of the narrow wire pitches, the standard mat widths used in individual countries being selected on the basis of very different factors, however, it may

be expedient to separate the two families 3,4 and 9,10, located at each mat edge, of longitudinal wires arranged at a narrow pitch b , from one another, as shown in Figure 11, by a pitch e which is greater than the pitch a of the longitudinal wires 5 in the inner region of the mat.

If, for example, it is assumed that the standard mat width is 2400 mm, as is the case at the present time in Austria, the transverse-wire end parts 2 bent round in loop form project 50 mm beyond the longitudinal edge wire 3 on both sides, the narrow pitches b between the longitudinal wires 3, 4 and 9, 10 are likewise 50 mm and the pitches a between the inner longitudinal wires 5 are each 150 mm, then a mat with pitches $6 \times 50 = 300$ mm and $14 \times 150 = 2100$ mm, that is to say a total width of 2400 mm, can be constructed. In this mat, the longitudinal wires 4 and 10 then also have a pitch of 150 mm and the mat corresponds to that shown in Figure 3.

However, if the mats are to be 2050 mm wide, as is customary, for example, in Switzerland, then it is no longer possible to construct the mats with narrow pitches b of 50 mm throughout and wide pitches a of 150 mm throughout. In this case, a pitch b of 50 mm can be provided between the longitudinal wires 3,4 and 9,10, and likewise a projecting edge length of 50 mm can be provided for the loops. The pitch e between the longitudinal wires 4 and 10 can be 200 mm, and finally eight longitudinal wires 5 can be arranged at a pitch of 150 mm in the inner region of the mat. A total width of $6 \times 50 + 2 \times 200 + 9 \times 150 = 2050$ mm is then obtained.

In general, the need to produce all mats with the permissible maximum width for reasons of economy in the transport of the mats can be met, according to Figure 12, by arranging the longitudinal wires 5 in the inner region of the mats (apart from the longitudinal wires 7,8 in the middle of the mats, provided if appropriate, according to Figure 4, to make it easier to divide the mat) at the same pitch a and, near each mat edge, two longitudinal wires 4,5a at a pitch e which is greater than the pitch b of the longitudinal edge wires 3,4 and which differs from the pitch a of the longitudinal wires 5 in the inner region of the mat.

In mats according to Figure 3, in which there are at each mat edge two families 3,4 and 9,10 of longitudinal wires arranged at a narrow pitch b , this teaching is obeyed, as the cross-section according to Figure 13 also shows, because the longitudinal wires 4 and 10, adjacent to one another, of these two families of wires have the pitch e which is greater than the pitch b of the longitudinal edge wires and also greater than the pitch a of the longitudinal wires in the inner region of the mat.

An identical mat is obtained according to Figure 14, when the distances e_1 between the adjacent longitudinal wires 4 and 10 of the two families of longitudinal wires 3,4 and 9,10 and the distance e_2 between the inner longitudinal wire 9 of the inner family of longitudinal wires 9,10 and the longitudinal wire 5, adjacent to it, in the inner region of the mat are different from one another.

As a result of this measure and by means of a further design of the invention explained by reference to Figures 13 and 14, a better uniformity of the relative steel cross-section in the composite structure of overlapped mats can be achieved.

When wide mats are laid so as to overlap, according to national regulations the local accumulations of steel caused by the edge overlaps are usually only considered to be uniformly distributed when the edge regions of adjacent mats overlap so far that the distance between the left-hand limitation of the overlap region at the right-hand edge of a mat and the right-hand limitation of the overlap region at the left-hand edge of the same mat is equal to or less than a prescribed limiting value. However, in all those cases where the edges of adjacent mats overlap to a lesser extent, the excess of steel in the overlap region would be wasted.

This can be prevented, within the scope of the invention by making at least the diameter of the wires of the family of longitudinal edge wires 3,4, but advantageously, according to Figures 13 and 14, also the diameter of the wires of a second family 9,10 of longitudinal wires 9,10 arranged at a narrow pitch b and adjacent to the family of wires 3,4 less than the diameter of the longitudinal wires 5 in the inner region of the mat. As a result of this measure, the relative cross-sectional area of steel at the edge of the individual mat is reduced.

For the same purpose, the distance e between the wire 4 and the wire 10 and, if appropriate, also the

distance between the wire 9 and the wire 5, adjacent to it, of the inner region of the mat can be increased either as a sole measure or in conjunction with the reduction in the wire cross-sections at the mat edge. In most mats, at least in those where the diameter of the individual wires is greater than the minimum diameter which has to be maintained under all circumstances for reasons of rust prevention, as a result of these measures the relative cross-sectional area of steel at the edge of a mat can be reduced until, where two adjacent mats overlap in such a way that only the wires 3,4 of their families of edge wires overlap, an at least approximately uniform distribution of the relative steel cross-section over the entire reinforced area, which is equal to the relative steel cross-section in the inner region of the mat, is obtained. In this type of overlap, therefore, no steel is wasted even when the overlapping regions of the mats are too far away from one another to allow any accumulation of steel to be taken into account, because the wires doubled in the overlap region supplement one another over the same relative steel cross-section which is present in the inner region of the mat.

Although, when mats overlap further over several meshes, steel losses occur as long as the distance between the overlap zones is greater than the limiting value provided for calculation, nevertheless these steel losses always remain less than those which would occur if all the wires had the same diameters and the same pitch.

Claims

1. Reinforcement mat for reinforced concrete, consisting of longitudinal and transverse wires intersecting one another and welded to one another at the intersection points, with a bonding improved by ribbing, stamping or in another way, characterized by a combination of features, in that the transverse wires (1) project beyond the longitudinal edge wires (3, 4) with transverse-wire end parts (2) which are bent back in the plane of the mat in the direction of the longitudinal edge wires (3,4), and in that the longitudinal wires (3 to 10; 12 to 15) are arranged symmetrically relative to the longitudinal centre axis (X-X) of the mat partly at a wider pitch and partly at a narrower pitch, at least the predominant part (5) of the longitudinal wires (5;5,7,8;5,9,10) lying in the inner region of the mat having a wider pitch than the longitudinal edge wires (3,4), and two longitudinal wires (3,4) being provided which are arranged at a narrow pitch at each edge of the mat.
2. Reinforcement mat according to Claim 1, characterized in that the projecting transverse-wire end parts (2) are bent back at each edge of the mat in the shape of a loop at least up to the outermost of the family of longitudinal wires arranged at a narrow pitch and are welded to at least one of these longitudinal edge wires (Fig. 1).
3. Reinforcement mat according to Claim 1 or 2, characterized in that the narrow pitch (b) of the longitudinal edge wires (3,4) is at most equal to half of the



wider pitches (a) (Figs. 1 and 2).

4. Reinforcement mat according to one of Claims 1 to 3, characterized in that the clear pitch (c) between adjacent transverse wires (1) of the mat is greater than double the amount of the outer dimension (s) measured in the direction of the longitudinal wires (3,4) of the loops formed by the bent-back transverse-wire end parts (2) (Fig. 1).

5. Reinforcement mat according to one of Claims 1 to 4, characterized in that the two longitudinal wires (7,8) adjacent to the longitudinal centre axis (X-X) of the mat are arranged at a narrower pitch (Fig. 4).

6. Reinforcement mat according to one of Claims 1 to 5, characterized in that the longitudinal wires (5) in the inner region of the mat, if appropriate with the exception of the two innermost longitudinal wires (7,8) are arranged at the same pitches (a) and in that near each mat edge two longitudinal wires (4,10;4,5a) have a pitch (e) which is wider than the pitch (b) of the longitudinal edge wires (3,4) and is different from the pitch (a) of the longitudinal wires (5) in the inner region of the mat (Figs. 11 and 12).

7. Reinforcement mat according to one of Claims 1 to 6, characterized in that adjacent to the family of longitudinal wires (3,4) arranged at a narrow pitch and provided at each mat edge is at least one further family of longitudinal wires (9,10) arranged at a narrow pitch, the inner longitudinal wire (4) of the family of longitudinal wires (3,4) arranged at the mat edge and the outer



longitudinal wire (10) of the further family of longitudinal wires (9,10) having a greater mutual distance from each other (Figs. 3,11,13 and 14).

8. Reinforcement mat according to Claim 7, characterized in that the longitudinal wires (4,10), which are adjacent to each other, in the two families of longitudinal wires (3,4 and 9,10) arranged at a narrow pitch (b) and provided at each mat edge have a distance (e_1) from each other and the inner longitudinal wire (9) of the inner family of longitudinal wires (9,10) has a distance (e_2) from the longitudinal wire (5) adjacent to it in the inner region of the mat, which distances are greater than the pitch (b) of the longitudinal edge wires and are different from the pitch (a) of the longitudinal wires (5) in the inner region of the mat.

9. Reinforcement mat according to Claim 8, characterized in that the distance (e_1) between the adjacent longitudinal wires (4,10) of the two families of longitudinal wires (3,4;9,10) and the distance (e_2) between the inner longitudinal wire (9) of the inner family of longitudinal wires (9,10) and the longitudinal wire (5) adjacent to it in the inner region of the mat are different from each other (Fig. 14).

10. Reinforcement mat according to one of Claims 1 to 9, characterized in that families, preferably pairs, of longitudinal wires (3,4;12,13;14,15) arranged at a narrow pitch are provided at the mat edge and at least at approximately one quarter or one third of the mat width (Fig. 6).



- 22 -

11. Reinforcement mat according to Claim 8, characterized in that the distance (e) between the two longitudinal wires (4,10) facing each other in the two families of longitudinal wires (3,4;9,10) adjacent to each mat edge is greater than the pitch (a) of the predominant number of longitudinal wires (5) in the inner region of the mat (Fig. 13).

12. Reinforcement mat according to one of Claims 1 to 11, characterized in that the transverse-wire end parts (2) projecting beyond the outermost longitudinal wires are bent in the plane of the mat in the shape of a hook or of an angle (Fig. 2).

13. Reinforcement mat according to one of Claims 7 to 12, characterized in that the longitudinal edge wires (3,4) have a smaller diameter than the remaining longitudinal wires (5) (Figs. 1 to 3).

14. Reinforcement mat according to one of Claims 7 to 13, characterized in that both the longitudinal edge wires (3,4) and the adjacent pair of longitudinal wires (9,10) have a smaller diameter than the remaining longitudinal wires (5) (Figs. 3,11,13 and 14).



Claims (as printed)

1. A reinforcement mat for reinforced concrete, consisting of longitudinal and transverse wires having their bonding improved by ribbing or stamping or in some other way, which wires cross one another and are welded together at the crossing-points, characterized by the combination of features that the transverse wires (1) project beyond the edge longitudinal wires (3, 4) with transverse wire end portions (2) which are bent back in the plane of the mat in the direction towards the edge longitudinal wires (3, 4), and that the longitudinal wires (3-10; 12-15) are arranged symmetrically about the longitudinal centreline (X-X) of the mat partly at wider and partly at narrower pitch, at least the preponderant part (5) of said longitudinal wires (5; 5, 7, 8; 5, 9, 10) lying in an inner region of the mat having a wider pitch than the edge longitudinal wires (3, 4), and two longitudinal wires (3, 4) being arranged at each edge of the mat at narrow pitch.

2. A reinforcement mat as in Claim 1, characterized in that the projecting end portions (2) of the transverse wires are bent back at each edge of the mat in the shape of a loop extending at least as far back as the outermost of the family of longitudinal wires arranged at narrower pitch, and are welded to at least one of said longitudinal edge wires (Fig. 1).

3. A reinforcement mat as in Claim 1 or 2, characterized in that said narrower pitch (b) of the edge longitudinal wires (3, 4) is at the most equal to half said wider pitch (a) (Fig. 1 and 2).

4. A reinforcement mat as in one of the Claims 1 to 3, characterized in that the pitch (c) of adjacent transverse wires (1) of the mat is greater than twice the outside dimension (s), measured in the direction of the longitudinal wires (3, 4), of the loops formed by the bent back end portions (2) of the transverse wires (Fig. 1).

5. A reinforcement mat as in one of the Claims 1 to 4, characterized in that the two longitudinal wires (7, 8) adjacent to the longitudinal centreline (X-X) of the mat are arranged at the narrower pitch (Fig. 4).

6. A reinforcement mat as in one of the Claims 1 to 5, characterized in that the longitudinal wires (5) in the inner region of the mat, optionally with the exception of the two innermost longitudinal wires (7, 8), are arranged at equal pitch (a), and that near each edge of the mat two of the longitudinal wires (4, 10; 4, 5a) have a pitch (e) which is wider than the pitch (b) of the edge longitudinal wires (3, 4) and differs from the pitch (a) of the longitudinal wires (5) in the inner region of the mat (Fig. 11 and 12).

7. A reinforcement mat as in one of the Claims 1 to 6, characterized in that adjacent to the family of longitudinal wires (3, 4) arranged at narrower pitch and provided at each edge of the mat, there is at least one further family of longitudinal wires (9, 10) arranged at narrower pitch, the inner longitudinal wire (4) of the family of longitudinal

wires (3, 4) arranged at the edge of the mat and the outer longitudinal wire (10) of said further family of longitudinal wires (9, 10) being at a greater distance apart (Fig. 3, 11, 13 and 14).

8. A reinforcement mat as in Claim 7, characterized in that the longitudinal wires (4, 10) which are adjacent to one another in said two families of longitudinal wires (3, 4 and 9, 10) arranged at narrower pitch (b) and provided at each edge of the mat have from one another a distance (e_1), and the inner longitudinal wire (9) of said inner family of longitudinal wires (9, 10) has from the longitudinal wire (5) adjacent to it in said inner region of the mat a distance (e_2), which distances (e_1 and e_2 respectively) are in each case greater than the pitch (b) of the edge longitudinal wires and differ from the pitch (a) of the longitudinal wires (5) in the inner region of the mat (Fig. 14).

9. A reinforcement mat as in Claim 8, characterized in that the distance (e_1) between the adjacent longitudinal wires (4, 10) of said two families of longitudinal wires (3, 4; 9, 10), and the distance (e_2) between the inner longitudinal wire (9) of the inner family of longitudinal wires (9, 10) and the longitudinal wire (5) adjacent to it in the inner region of the mat, are different from one another (Fig. 14).

10. A reinforcement mat as in one of the Claims 1 to 9, characterized in that families, preferably pairs, of longitudinal wires (3, 4; 12, 13; 14, 15) arranged at narrower pitch are provided at the edges of the mat and at least approximately in the region of one quarter to one third of the way across the width of said mat (Fig. 6).

11. A reinforcement mat as in Claim 8, characterized in that the distance (e) between the two longitudinal wires (4, 10) which are facing each other in said two families of longitudinal wires (3, 4; 9, 10) arranged adjacent to each edge of the mat is greater than the pitch (a) of the preponderant number of longitudinal wires (5) in the inner region of the mat (Fig. 13).

12. A reinforcement mat as in one of the Claims 1 to 11, characterized in that the end portions (2) of the transverse wires, projecting beyond the outermost longitudinal wires, are in the plane of the mat bent in the shape of a hook or of an angle, respectively (Fig. 2).

13. A reinforcement mat as in one of the Claims 7 to 12, characterized in that the edge longitudinal wires (3, 4) have a smaller diameter than the remaining ones of the longitudinal wires (5) (Fig. 1 to 3).

14. A reinforcement mat as in one of the Claims 7 to 13, characterized in that both the edge longitudinal wires (3, 4) and also the adjacent pair of longitudinal wires (9, 10) have a smaller diameter than the remaining ones of the longitudinal wires (5) (Fig. 3, 11, 13 and 14).



Revendications (as printed)

1. Grillage d'armature pour béton armé formé de fils longitudinaux et transversaux croisés et soudés les uns aux autres aux points de croisement, à liaison améliorée par nervurage, estampage ou d'une autre manière, caractérisé par la combinaison des caractéristiques selon lesquelles les fils transversaux (1) s'étendent au-delà des fils longitudinaux de rives (3, 4) par des parties d'extrémité de fils transversaux (2) qui sont recourbées, dans le plan du grillage, en direction des fils longitudinaux de rives (3, 4) et les fils longitudinaux (3-10; 12-15) sont disposés symétriquement par rapport à l'axe médian longitudinal (X-X) du grillage pour partie avec un grand espacement et pour partie avec un petit espacement, au moins la majeure partie (5) des fils longitudinaux (5; 5, 7, 8; 5, 9, 10) se trouvant dans la zone intérieure du grillage présente un espacement plus grand que celui des fils longitudinaux de rives (3, 4) et deux fils longitudinaux (3, 4) à petit espacement sont prévus à chaque rive du grillage.

2. Grillage d'armature suivant la revendication 1, caractérisé en ce que les parties d'extrémité de fils transversaux (2) saillantes sont recourbées en forme de boucles à chaque rive du grillage au moins jusqu'au fil extérieur du groupe de fils longitudinaux à petit espacement et sont soudées à au moins un de ces fils longitudinaux de rives (Fig. 1).

3. Grillage d'armature suivant l'une des revendications 1 ou 2, caractérisé en ce que la petite distance (b) entre les fils longitudinaux de rives (3, 4) est égale tout au plus à la moitié de la plus grande distance (a) (Fig. 1 et 2).

4. Grillage d'armature suivant l'une des revendications 1 à 3, caractérisé en ce que la distance (c) entre des fils transversaux (1) voisins du grillage est supérieure au double de la dimension extérieure (s) des boucles formées par les parties d'extrémité de fils transversaux recourbées (2) mesurée dans la direction des fils longitudinaux (Fig. 1).

5. Grillage d'armature suivant l'une des revendications 1 à 4, caractérisé en ce que les deux fils longitudinaux (7, 8) voisins de l'axe longitudinal médian (X-X) du grillage sont disposés à une plus petite distance l'un de l'autre (Fig. 4).

6. Grillage d'armature suivant l'une des revendications 1 à 5, caractérisé en ce que les fils longitudinaux (5) dans la zone intérieure du grillage, à l'exclusion le cas échéant des deux fils longitudinaux intérieurs (7, 8), sont disposés à égale distance (a) les uns des autres et près de chaque rive du grillage, deux fils longitudinaux (4, 10; 4, 5a) sont disposés à une distance (e) l'un de l'autre qui est supérieure à la distance (b) entre les fils longitudinaux de rives (3, 4) et qui diffère de la distance (a) entre les fils longitudinaux (5) dans la zone intérieure du grillage (Fig. 11 et 12).

7. Grillage d'armature suivant l'une des revendications 1 à 6, caractérisé en ce que le groupe de fils longitudinaux (3, 4) disposés à une courte distance l'un de l'autre et prévu dans chaque rive du grillage est voisin d'au moins un autre groupe de

fils longitudinaux (9, 10) disposés à courte distance l'un de l'autre, le fil longitudinal intérieur (4) du groupe de fils longitudinaux (3, 4) disposé à la rive du grillage et le fil longitudinal extérieur (10) de l'autre groupe de fils longitudinaux (9, 10) étant disposés à une plus grande distance l'un de l'autre (Fig. 3, 11, 13 et 14).

8. Grillage d'armature suivant la revendication 7, caractérisé en ce que les fils longitudinaux voisins (4, 10) des deux groupes de fils longitudinaux (3, 4 et 9, 10) à petit espacement (b) sont espacés l'un de l'autre et le fil longitudinal intérieur (9) du groupe de fils longitudinaux (9, 10) est espacé du fil longitudinal voisin (5) de la zone intérieure du grillage chaque fois d'une distance (e_1 ou e_2) qui est supérieure à la distance (b) entre les fils longitudinaux de rives et diffère de la distance (a) entre les fils longitudinaux (5) dans la zone intérieure du grillage (Fig. 14).

9. Grillage d'armature suivant la revendication 8, caractérisé en ce que la distance (e_1) entre les fils longitudinaux voisins (4, 10) des deux groupes de fils longitudinaux (3, 4; 9, 10) et la distance (e_2) entre le fil longitudinal intérieur (9) du groupe de fils longitudinaux (9, 10) et le fil longitudinal (5) voisin de la zone intérieure du grillage sont différentes (Fig. 14).

10. Grillage d'armature suivant l'une des revendications 1 à 9, caractérisé en ce que les groupes, de préférence les paires, de fils longitudinaux (3, 4; 12, 13; 14, 15) disposés avec un petit espacement sont prévus dans la rive du grillage et au moins à peu près à un quart ou un tiers de la largeur du grillage (Fig. 6).

11. Grillage d'armature suivant la revendication 8, caractérisé en ce que la distance (e) entre les deux fils longitudinaux (4, 10) tournés l'un vers l'autre des deux groupes de fils longitudinaux (3, 4; 9, 10) voisins sur chaque rive du grillage est supérieure à la distance (a) présentée par la majeure partie des fils longitudinaux (5) dans la zone intérieure du grillage (Fig. 13).

12. Grillage d'armature suivant l'une des revendications 1 à 11, caractérisé en ce que les parties d'extrémité de fils transversaux (2) qui s'étendent au-delà des fils longitudinaux extérieurs sont coudees ou pliées en forme de crochets dans le plan des grillages (Fig. 2).

13. Grillage d'armature suivant l'une des revendications 7 à 12, caractérisé en ce que les fils longitudinaux de rives (3, 4) ont un diamètre inférieur à celui des autres fils longitudinaux (5) (Fig. 1 à 3).

14. Grillage d'armature suivant l'une des revendications 7 à 13, caractérisé en ce que les fils longitudinaux de rives (3, 4), de même que la paire voisines de fils longitudinaux (9, 10), ont un diamètre plus petit que les autres fils longitudinaux (5) (Fig. 3, 11, 13 et 14).

