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(54) **Method of making a wall tie and tie made by the method.**

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Description

This invention relates to a method of making reinforcements and ties for example for use in the walls of brick walled and other buildings.

DE-PS-908530 discloses a reinforcing rod for concrete. In one form, the rod has a circular cross-section and small continuous helical ribs. At intervals, there are also discontinuous longitudinal ribs which act to prevent the rod being twisted in order to remove it.

DE-GM-8309759 shows an anchor for a cavity wall. It is in the form of an anchor with cranked ends and has helical clamping features generally at right angles to the axis of the wire.

One object of the invention is to provide a cheap and easy-to-use tie for securing together the inner and outer walls of a cavity wall principally for use in new building, but possibly also for use as a replacement tie in an old building where the tie has failed. Another object is to provide reinforcement where an existing wall has cracked or slipped.

According to the present invention, there is provided a method for making a wall tie wherein a wire rod is passed between two superimposed rollers characterised in that each roller has a slot in its cylindrical surface and, as the wire rod is fed into the nip of the rollers, material (A) located laterally on opposite sides of the wire rod is cut by the edges of the slots and then deformed so that the cut material (A) is squeezed into the gap (B) left between the rollers at their closest point, on either side of the slots to define a first pair of opposed hardened fins or ridges extending from the unhardened core of the wire rod and the wire rod is subsequently twisted.

Thus, no material is lost but the material is deformed to leave a generally rectangular sectioned core with fins extending from either side, and this section is then preferably uniformly twisted.

The method of forming the fins by a combination of shearing and squeezing forces work hardens and stretches the fin material without hardening the core material. This predisposes the material for transformation by twisting into a tight and constant helix without the need for annealing and provides maximum hardness in the fins which in some applications have a cutting function.

If the slot is deep enough, wear on the rollers can be easily taken up by adjusting the spacing between them, and in general the width of the fins can be chosen by appropriate setting of the spacing between the rollers.

A single pass of the rollers can be sufficient to form the desired section, even with a hard material such as stainless steel. However, a double pass enables four fins to be provided.

The invention may therefore provide a wall tie in the form of a length of wire of corrosion resistant material, comprising a core and at least two externally projecting fins or ridges, each fin or ridge following a continuous helical path about the axis of the core, characterised in that it is directly produced in accordance with a method as claimed in any preceding Claim and in the wire the ends has a substantially uniform cross-section.

For use as a wall tie between the inner and outer walls of a cavity wall, the length of the wire may be perhaps between 18 and 20 cm whereas for use as reinforcement for a brick wall, the length might be up to 1 or 2 metres.

A preferred feature of ties is produced in accordance with the invention is the smallness of the core of the cross section which may be about 2-6 mm in diameter so that it is fine enough to be driven into unbored material or only needs a very fine bore hole to be driven into. The fin or fins might be about 1 or 2 millimetres proud of the surfaces of the core or possibly they might be a distance from the core equal to the effective diameter of the core to leave a substantial flange for cutting into and making a good grip in the surrounding wall. However the overall cross section of perhaps 8 or 10 millimetres can be little enough to enable a length of the wire to be inserted in the space left by raking out the mortar in cracked brickwork, after which the wall can be repointed around the inserted reinforcement. It can easily be introduced into a long line of mortar between several bricks, and if necessary can be bent to extend both vertically and horizontally.

The ease with which the tie can be bent is another advantage arising from the small cross sectional dimensions and it enables a short tie to have two bends so that its two ends are parallel with each other and are joined by an intermediate portion at an angle to the two ends. If the distance between the two ends is approximately equal to the width of a cavity in cavity brickwork then the tie is very suitable for use in new cavity brickwork because where a tie is to be introduced, one of the parallel ends can be laid on the top of one course and even if the top of the corresponding course on the other wall is not of exactly the same height, the tie can merely be rotated about a horizontal axis through the one end until the other end is at the right height and then the tie will be secured in position as mortar is applied, followed by the next course of bricks.

The fins give a good grip between the tie and the mortar and also define drip points from which water can drop into the cavity to avoid moisture being transferred from one wall to the other across the tie. The length of the central part between the bends would correspond with the width of the wall

cavity, and might be about 6 cm or some other standard distance.

It is also shown to use the tie even if it is not kinked, and particularly where one of the walls is a timber wall into which the tie can be directly driven, possibly after sharpening the leading end. The cranked form which bends is also useful where one of the walls is of timber because movement of the timber in use due to dimensional instability can be taken up by increased or decreased bending at the bends.

A tool may be provided for driving one end of a wire tie into a nailable material or through two or more nailable materials close together or separated by a cavity space, the tool having a bore for accommodating the tie to be driven. The tool may be adapted to drive the end of the tie slightly below the surface of one of the materials being connected together so the fastening is effectively hidden.

The invention also enables a tie to be produced which can provide tensile reinforcement to improve the performance of structural members made of materials in which a particularly efficient mechanical bond is necessary to transfer the stresses from the material to the tie. Such materials may include for example portland cement and/or resin based concretes which are aereated or made with lightweight aggregates and natural organic materials such as timber. The wires may be embedded in some materials as they are cast and with others such as timber may be pressed into grooves cut in their surfaces. If the ties are made of a corrosion resistant material such as stainless steel they can be used close to the surface of a member exposed to moisture in a corrosive environment.

The ties can also be used to assist in the transfer of loads from the end of one structural member into another structural member which may be of a dissimilar material.

The invention may be carried into practice in various ways, and certain embodiments will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a perspective view showing the configuration of a tie made in accordance with the invention;

Figure 2 is a sectional elevation illustrating a method of manufacture of a rod of tie in accordance with the invention from a round section bar;

Figure 3 is a section that can be achieved from the rod of Figure 2;

Figures 4 to 9 are sketches illustrating various uses of a tie between two walls as they are being built, or where one or both walls already exist;

Figures 10 and 11 are an elevation and a section of brickwork reinforced by a rod as shown in Figure 1; and

Figure 12 shows cracks and a lintel in brickwork for which the reinforcement of Figures 10 and 11 is suitable.

The rod shown in Figure 1 is straight and of constant cruciform cross section, the arms of the cruciform being uniformly twisted about the axis of the rod and forming helical ribs or fins 4 around the central solid core of the rod.

The rod shown in Figure 1 is conveniently produced from square, rectangular, or round, section austenitic stainless steel wire by a single or double pass rolling/shearing process shown in Figure 2 followed by twisting. The rollers 56 and 57 are each approximately 150mm in diameter and each has a rectangular section circumferential groove 58 around its mid portion. The very pronounced fins, which are required for satisfactory location within mortar, are formed by shearing and squeezing the material in the area A so that it is transferred to the adjacent area B of the fin. The fins become work hardened due to the above process, but the core remains unhardened, thus giving a desirable configuration of hardened fins with good cutting and wear resistant properties, and an unhardened core with good flexibility. Because the space between the rollers 60 and 62 can be adjusted it is possible to alter the fin thickness. Sharpening of the cutting edges 59 of the grooves 58 is possible by use of a grinding stone between the sides of the grooves while the rollers are rotated. The bevels 60 can also be sharpened by application of a square grinding stone to the groove away from the common tangential space between the two rollers. The groove depths are made to allow for a substantial amount of re-sharpening resulting in a reduction in roller diameter and hence groove depth. Further adjustability of the rollers can be achieved by dividing them along the line marked X-X so that they may be bolted together with shims inserted, thus enabling the cutting space between the edges to be varied, and hence different size wire to be accommodated.

A single pass would produce a section as shown dotted in Figure 2. A second pass with the rod rotated through 90° could produce the four-finned section shown in Figure 3. In each case material is cut and squeezed from the original section to the fins.

Uniform twisting follows to leave a long length of formed wire which can be cut into suitable lengths and pointed and/or cranked as necessary.

The helical ribs 4 of the rod shown in Figure 1 serve to provide a strong grip of the rod within mortar and timber over short distances of penetration; A further feature of the helical ribs 4 is that they provide the rod with natural drip features which hinder the passage of water in an undesira-

ble direction, i.e. from an outer to an inner wall, along the surface of the rod by providing localised downward inclinations due to the helix angle of the ribs, even when the general axis of the rod is slightly inclined upwardly. Because all the rod surfaces are substantially circular or curved there are no exposed flat surfaces onto which mortar droppings could easily lodge to provide means for transmitting water.

The helical ribs 4 of the Figure 1 embodiment may be as shown in Figure 1 with two opposed thick ribs 11 alternating with thinner ribs 12; but alternatively the uniform section may be as shown in Figure 3 with four equally circumferentially spaced ribs 13 extending from the sides of a square.

The bending of the rod about axes perpendicular to the general axis of the rod of Figure 2 is easier in a direction parallel to the plane of the thicker ribs 11. Therefore since the helix transposes this bending axis through one complete revolution per helix pitch, this relatively easy bending of the rod can be achieved in all directions perpendicular to the general axis of the rod, without variation in axial strength at any point along the rod since the cross sectional area of the rod remains constant. This ease of bending of the type of rod shown in Figures 1, 2 and 3 enhances flexibility of the rod thus enabling settlement of walls between which the rod is fixed to be accommodated.

The overall diameter of the rods is such as to enable the rods to be incorporated within a mortar layer of a wall, i.e. about 4-8 mms in a layer about 8-14 mms thick. The rods are made from a strong flexible non-corrosive material such as copper or stainless steel so that a rod of the diameter as stated above may hold an outer wall against wind suction and pressure yet flex readily to accommodate different settlement of walls between which the rod is affixed and not corrode after long exposure to the atmosphere or encasement in mortar.

Uses of the rod shown in Figure 1 will now be described.

Figure 4 shows a wall tie 15 comprising a rod of the type shown in Figure 1 which is bent in two places 16 in equal, but opposite directions so that the tie 15 has a cranked middle portion 17 and two end portions 18 and 19 all of which portions have co-planar axes, the axes of the end portions 18 and 19 also being parallel. The length of the cranked portion 17 is such that when the end portions 18 and 19 of the tie are embedded in mortar layers of parallel inner and outer brick walls 21 and 22 respectively, the bends are just within the cavity 23 between the walls yet each is adjacent the face of a different wall. Difference in level between the walls 21 and 22 is accommodated by the natural rotation of the tie 15 about the axis of one of its end portions 18 when rested on the course of one of walls 21 so that the cranked portion 17 swings around until the other end portion 19 rests on the required course of the other wall 22. This rotation does not affect either the thickness of the tie ends to be accommodated within the thickness of the mortar - since the rod section is effectively contained within a circular envelope - or the relative positions of the bends 16 with relation to the cavity faces of the walls.

The figure shows alternative positions of the end 19 for different levels of the bricks on the wall 22.

The helical ribs or fins 4 of the cranked portion 17 provide drip points, as described above, which prevent water running across the cavity bridge throughout a range of rotational positions of the tie 15, even when there is a slight back fall (of up to 15°) of the cranked portion. Thus, the range of acceptable arc of rotation of the tie is approximately 210° if one considers both sides of a vertical datum. Good location of the end portions 18 and 19 within the mortar beds is also achieved by the helical ribs 4 when the mortar sets around them.

Figure 5 shows the tie 15 in use as described above, but performing the additional function of locating a slab 25 of insulation material for example foamed plastics, at one side of the cavity 23. The location of the slab 25 is achieved by pushing one end of the tie 15 through the slab like a skewer, until the bend lies within the slab and the slab is axially located on the tie 15 both by the helical ribs 4 and by the bend.

The helical type of rod as shown in Figure 1 and described above is also particularly useful as a tie 27 between a brick wall 28 and a wooden wall 29 as shown in Figure 9.

In this use the tie comprises a straight rod as shown in Figure 1 and described above, one end 30 of which is pointed and driven into the wooden wall 29. The helical ribs 4 give the tie 27 a stronger grip than would be provided by friction alone, even with ashort length of penetration within the wood. The outer end of the tie is embedded within a mortar layerof the brick wall 28 as described above, so that the wooden wall 29 is fixed in relation to, yet spaced from, the brick wall. The tie 27 can bend to accommodate drying shrinkage of the wooden wall 29, which shrinkage may be as great as 18mm, but is not normally more than 12mm. The pitch of the helix is much less than the width of the cavity and the tie can bend about an axis that is perpendicular to the thinner arm of the cruciform cross section close to the cavity faces of the walls. Because of the tight bend the central portion 17 follows a straight path, thus giving the tie 27 the ability to resist forces tending to push or

pull the outer wall.

A tool which enables the tie 27 to be driven to a set distance into the wooden wall 29 has a handle 31 and a shank 32 with a central blind bore of slightly greater diameter than the tie 27. The tie 27 is inserted blunt end first, into the bore, and the tool is held with the shank 32 resting on the brick wall 28. The tie 27 is then driven - pointed end 30 first - to a preset depth into the wooden wall 29 by hammering on the handle 31 until the face of the handle abuts the brick wall 28. Flexing of most of the length of the slender tie during hammering is prevented by the supportive bore. The tool is then withdrawn so that the mortar layer may be applied on the wall 28 around the blunt end of the tie.

If a brick wall 35 is having an external brick wall 36 built spaced outside it as shown in Figure 7 a brick in the internal wall has to be pre-drilled with a pilot hole as shown at 37 to accommodate the core of the tie 27 which is then driven into the brick using the tool of Figure 6. The tie is then cranked and rotated in its pilot hole until the outer end 19 can lie just above the upper brick in the partly built external wall 36 so that when mortar is applied in preparation for the next brick 38 the outer end of the tie will be firmly keyed to the inner wall. It will be noted that the wire tie is driven into a brick in the old wall rather than into the mortar which is unlikely to be strong enough to give a good mechanical grip even if it happened to be at the right level.

It may be that a straight tie 27 will be used for driving into the pilot hole 37 and that it will then be convenient to bend it in two places to provide the cranking. Alternatively it may be preferable to have a pre-cranked tie which can be driven into the pilot bore using an appropriate tool and then rotating it as required.

Figure 8 shows how a tie can be inserted between inner and outer existing brick walls 35 and 36, perhaps to replace a corroded tie or perhaps just for strengthening where a tie had been omitted originally. The inner wall 36 has a brick first bored with a clearance hole up to about 1cm from the face of the cavity and then a pilot hole 42 of a diameter equal to the core of the wire tie is drilled through the last 1cm of the inner wall, and on into the outer wall at 37. The tie 27 is driven into the pilot hole using the tool of Figure 6 until it is in the position shown in Figure 8 where it grips by having cut into the wall of the pilot hole as it rotates. When the outer end of the tie is well below the surface of the inner wall the clearance hole 41 is filled with mortar grout which sets firmly around that end of the tie.

Figure 9 shows a somewhat similar arrangement of a tie between outer and inner timber walls or layers 43 and 44 with porous insulating slab filling 45. In such an application it is likely that the tie can be driven directly in without first drilling a pilot bore and it will turn and cut its way into the two timber layers. If the timber is too hard of course a pilot hole can be drilled. Even with soft bricks it may be possible to drive the tie directly in without drilling a pilot hole, and that may be the case particularly in the simplified form of wire tie consisting of a uniformly twisted triangular or square sectioned rod.

The rod shown in Figure 1 can also be used as mortar reinforcing rods as shown in Figures 10, 11 and 12. A crack as shown at 51 or 52 in Figure 12 can be reinforced by removing about a quarter - say 25mm - into the wall, of the layer of mortar for some distances to each side of the crack, positioning the rod 53 longitudinally between the bricks, and repointing the wall as shown at 54 in Figures 13 and 14. Brick lintels can also be reinforced using the above method and by overlapping the rods as at 55, the reinforced bricks can be made to act as beams.

The inserted reinforcing rods may be long enough to extend through the length of at least 2, and perhaps 3 or 4 bricks.

Claims

1. A method of making a wall tie wherein a wire rod is passed between two superimposed rollers (56,57) characterised in that each roller (56 and 57) has a slot (58 and 59) in its cylindrical surface and, as the wire rod is fed into the nip of the rollers (56,57), material (A) located laterally on opposite sides of the wire rod is cut by the edges (60) of the slots (58,59) and then deformed so that the cut material (A) is squeezed into the gap (B) left between the rollers (56,57) at their closest point, on either side of the slots (58,59) to define a first pair of opposed hardened fins or ridges (4,12,13) extending from the unhardened core (11) of the wire rod and the wire rod is subsequently twisted.

2. A method as claimed in Claim 1 characterised in that, before the wire rod is twisted, a second pass between the rollers (56,57) is carried out with the wire rod rotated through 90° to define a second pair of opposed fins or ridges (13) extending from said core (11).

3. A method as claimed in Claim 1 or Claim 2 characterised in that the fins or ridges (4,12,13) are equally angularly spaced about the core (11).

4. A method as claimed in Claim 1, 2 or 3

characterised in that the fins o ridges (4,12,13) extend equally in a radial direction from the core (11).

5. A method as claimed in any preceding Claim, characterised in that the greatest cross-sectional dimension of the tie is no more than 9mm.

6. A wall tie in the form of a length of wire (15) of corrosion resistant material, comprising a core and at least two externally projecting fins or ridges (4,12,13), each fin or ridge following a continuous helical path about the axis of the core (11), characterised in that it is directly produced in accordance with a method as claimed in any preceding Claim and in that the wire between the ends has a substantially uniform cross-section.

7. A wall tie as claimed in Claim 6 characterised in that the tie has a point formed at at least one end.

8. A method of fitting a wall tie as claimed in Claim 6 or Claim 7 characterised by driving the tie axially into a wall (35,43) whereby the fins or ridges (4,12,13) cut into the wall as the tie turns.

9. A method of connecting the leaves (21,22) of a cavity wall, characterised by driving a tie as claimed in CLaim 6 or Claim 7 axially through one leaf end into the other leaf, whereby the tie grips into the material on both sides of the cavity and water is prevented from crossing the cavity (23) along the wire by the lower parts of the helical fins or ridges (4,12,13) formed in the wire constituting drip points for moisture.

10. A method as claimed in Claim 9 characterised in that the tie is anchored by being embedded in mortar or grout.

11. A method of reinforcing an unreinforced masonry wall characterised by introducing a series of ties as claimed in Claim 6 or Claim 7 into horizontal mortar beds in the wall.

12. A method as claimed in Claim 11 characterised in that a portion of the mortar in a bed is removed before a tie is introduced and the bed is then remortared with the tie in place.

Patentansprüche

1. Verfahren zur Herstellung eines Mauerbindeglieds, bei welchem ein Drahtstab zwischen zwei übereinander angeordneten Walzen (56, 57) hindurchgeführt wird,
dadurch gekennzeichnet, daß
jede Walze (56 und 57) einen Schlitz (58 und 59) in ihrer zylindrischen Oberfläche aufweist, und, wenn der Draht in den Spalt der Walzen (56, 57) eingeführt wird, Material (A), das sich seitlich an gegenüberliegenden Seiten des Drahtstabs befindet, durch die Kanten (60) der Schlitze (58, 59) eingeschnitten und anschließend verformt wird, so daß das Schneidmaterial (A) in den Spalt (B) gepreßt wird, der zwischen den Walzen (56, 57) an der Stelle mit dem geringsten Abstand zwischen diesen ausgebildet ist, wobei dies an jeder Seite der Schlitze (58, 59) erfolgt, um ein erstes Paar gegenüberliegender gehärteter Grate oder Rippen (4, 12, 13) auszubilden, das sich von dem ungehärteten Kern (11) des Drahtstabes erstreckt, und daß der Drahtstab anschließend verdreht wird.

2. Verfahren nach Anspruch 1,
dadurch gekennzeichnet, daß
bevor der Dahtstab gedreht wird, ein zweiter Durchlauf zwischen den Walzen (56, 57) durchgeführt wird, wobei der Drahtstab um 90° Grad gedreht wird, um ein zweites Paar gegenüberliegender Grate oder Rippen (13) zu bilden, das sich von dem Kern erstreckt.

3. Verfahren nach Anspruch 1 oder 2,
dadurch gekennzeichnet, daß
die Grate oder Rippen (4, 12, 13) gleichmäßig winklig, mit Abstand zueinander um den Kern (11) angeordnet sind.

4. Verfahren nach Anspruch 1, 2 oder 3,
dadurch gekennzeichnet, daß
die Grate oder Rippen (4, 12, 13) sich gleichmäßig in radialer Richtung von dem Kern (11) erstrecken.

5. Verfahren nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, daß
die größte Querschnittsabmessung des Bindeglieds nicht mehr als 9 mm beträgt.

6. Mauerbindeglied in der Form eines Drahtstücks (15) aus korrosionsbeständigem Material, umfassend einen Kern und zumindest zwei nach außen ragende Grate oder Rippen (4, 12, 13), wobei jeder Grat bzw. jede Rippe einen durchgehend spiralenförmigen Verlauf um die Achse des Kerns (11) hat,
dadurch gekennzeichnet, daß

es direkt gemäß einem Verfahren nach einem der vorhergehenden Ansprüche hergestellt wird und daß der Draht zwischen den Enden einen im wesentlichen gleichförmigen Querschnitt hat.

7. Mauerbindeglied nach Anspruch 6, **dadurch gekennzeichnet, daß** das Bindeglied zumindest an einem Ende eine Spitze hat.

8. Verfahren zur Befestigung eines Mauerbindeglieds nach Anspruch 6 oder 7, **dadurch gekennzeichnet, daß** das Bindeglied axial in eine Mauer (35, 43) eingeführt wird, wodurch die Grate oder Rippen (4, 12, 13) beim Drehen des Bindeglieds in die Mauer schneiden.

9. Verfahren zum Verbinden der Schalen (21, 22) einer Hohlraumwand, **dadurch gekennzeichnet, daß** ein Bindeglied gemäß Anspruch 6 oder 7 axial durch ein Schalenende in die andere Schale geführt wird, wodurch das Bindeglied an beiden Seiten des Hohlraums in das Material greift und durch die unteren Teile der im Draht ausgebildeten, spiralenförmigen Grate oder Rippen (4, 12, 13), die Abtropfstellen für Flüssigkeiten bilden, verhindert wird, daß Wasser entlang dem Draht durch den Hohlraum (23) fließt.

10. Verfahren nach Anspruch 9, **dadurch gekennzeichnet, daß** das Bindeglied verankert wird, indem es in Mörtel oder Vergußmörtel gebettet wird.

11. Verfahren zur Verstärkung eines unverstärkten Mauerwerks, **dadurch gekennzeichnet, daß** eine Anzahl von Bindegliedern gemäß Anspruch 6 oder 7 in horizontale Mörtelbetten in der Mauer eingeführt werden.

12. Verfahren nach Anspruch 11, **dadurch gekennzeichnet, daß** ein Teil des Mörtels in einem Bett entfernt wird, bevor ein Bindeglied eingeführt wird, und das Bett anschließend wieder mit Mörtel gefüllt wird, wenn das Bindeglied eingeführt ist.

Revendications

1. Procédé de fabrication d'une armature de liaison pour murs dans lequel on fait passer une tige fine entre deux rouleaux (56, 57) caractérisé en ce que chaque rouleau (56 et 57) possède une encoche (58 et 59) dans sa surface cylindrique et, à mesure que la tige fine est amenée dans le resserrement des rouleaux (56, 57), la matière (A) située latéralement sur les côtés opposés de la tige fine est coupée par les bords (60) des encoches (58, 59) et est ensuite déformée si bien que la matière coupée (A) est serrée à force dans l'interstice (B) ménagé entre les rouleaux (56, 57) à leur endroit le plus rapproché, de chaque côté des encoches (58, 59) de façon à dégager une première paire d'arêtes ou d'ailerons opposés durcis (4, 12, 13) s'étendant à partir de la partie centrale (11) non durcie de la tige fine et cette tige fine est ultérieurement torsadée.

2. Procédé tel que revendiqué par la Revendication 1 caractérisé en ce que, avant que la tige fine ne soit torsadée, une seconde passe entre les rouleaux (56, 57) est effectuée, la tige fine ayant été tournée de 90° de manière à dégager une seconde paire d'arêtes ou d'ailerons (13) opposés s'étendant à partir de ladite partie centrale (11).

3. Procédé tel que revendiqué par la Revendication 1 ou par la Revendication 2 caractérisé en ce que les arêtes ou ailerons (4, 12, 13) sont espacés selon des intervalles angulaires égaux autour de la partie centrale (11).

4. Procédé tel que revendiqué par la Revendication 1, la Revendication 2 ou la Revendication 3 caractérisé en ce que les arêtes ou ailerons (4, 12, 13) s'étendent de façon égale dans une direction radiale à partir de la partie centrale (11).

5. Procédé tel que revendiqué par l'une quelconque des Revendications précédentes, caractérisé en ce que la plus grande dimension de la section droite de l'armature de liaison n'est pas supérieure à 9 mm.

6. Armature de liaison pour murs sous la configuration d'une longueur de fil (15) fait d'un matériau résistant à la corrosion, comportant une partie centrale et au moins deux ailerons ou arêtes (4, 12, 13) faisant saillies vers l'extérieur, chaque aileron ou arête suivant un parcours continu hélicoïdal autour de l'axe de la partie centrale (11), caractérisée en ce qu'elle est directement fabriquée conformément à un procédé tel que revendiqué par l'une quelconque des Revendications précédentes et en ce que le fil situé entre les extrémités a une section droite sensiblement uniforme.

7. Armature de liaison pour murs telle que revendiquée par la Revendication 6 caractérisée en ce que l'armature de liaison possède une pointe constituée au droit d'au moins une extrémité.

8. Procédé de montage d'une armature de liaison pour murs telle que revendiquée par la Revendication 6 ou par la Revendication 7 caractérisé par un enfoncement axial de l'armature de liaison dans un mur (35, 43) de sorte que les ailerons ou arêtes (4, 12, 13) pénètrent dans le mur en le coupant à mesure que l'armature de liaison tourne.

9. Procédé de raccordement des panneaux (21, 22) d'un mur creux, caractérisé par l'enfoncement axial d'une armature de liaison telle que revendiquée par la Revendication 6 ou par la Revendication 7 à travers une extrémité de panneau jusque dans l'autre panneau, de sorte que l'armature de liaison s'accroche dans le matériau situé sur chacun des deux côtés de la cavité et que l'eau soit empêchée de traverser la cavité (23) le long du fil du fait des parties inférieures des arêtes ou ailerons hélicoïdaux (4 , 12, 13) façonnés sur le fil et constituant des emplacements d'égouttage pour l'humidité.

10. Procédé tel que revendiqué par la Revendication 9 caractérisé en ce que l'armature de liaison est ancrée du fait qu'elle est enrobée dans du mortier ou du coulis d'injection.

11. Procédé destiné à armer un mur de maçonnerie non armé caractérisé par l'introduction d'une série d'armatures de liaison telles que revendiquées par la Revendication 6 ou par la Revendication 7 dans des couches horizontales de mortier situées dans le mur.

12. Procédé tel que revendiqué par la Revendication 11 caractérisé en ce qu'une partie du mortier situé dans une couche est enlevée avant qu'une armature de liaison ne soit introduite et la couche est ensuite re-cachetée au mortier, l'armature de liaison étant en place.

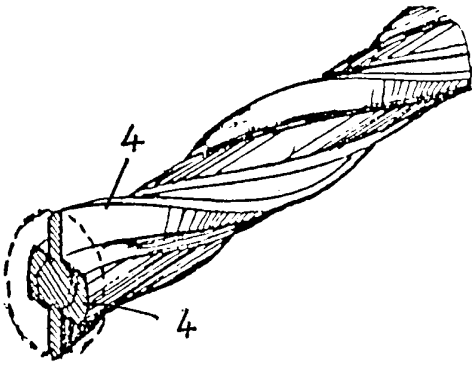

Fig. 1

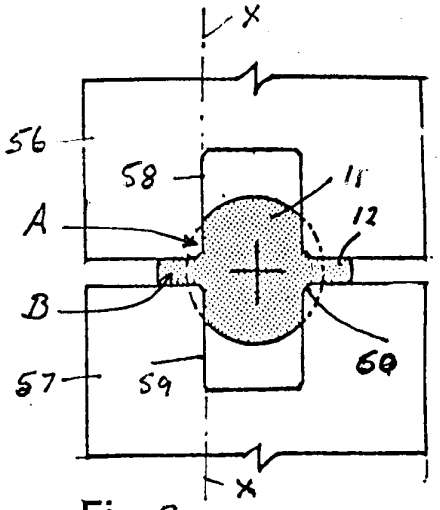

Fig 2

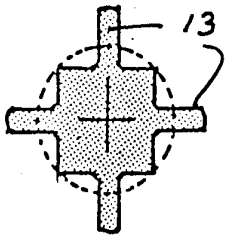

Fig 3

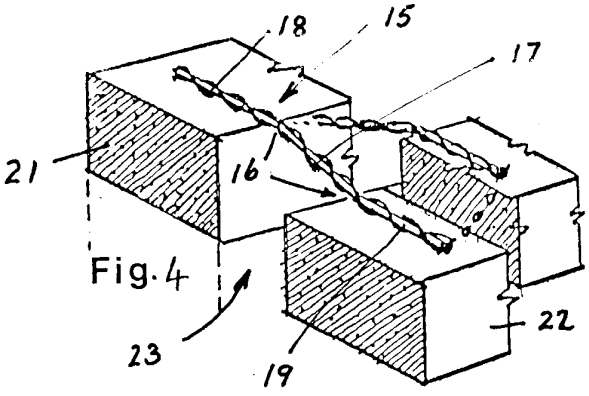

Fig. 4

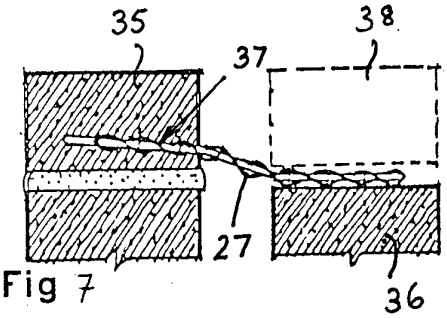

Fig 7

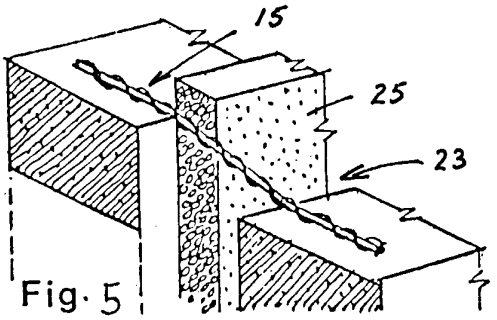

Fig. 5

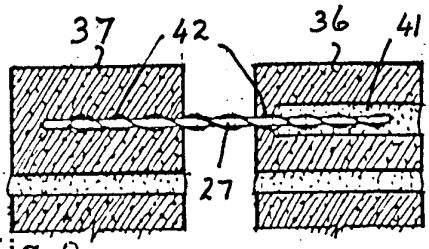

Fig. 8

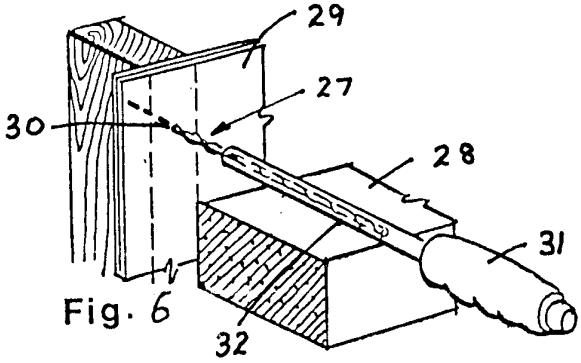

Fig. 6

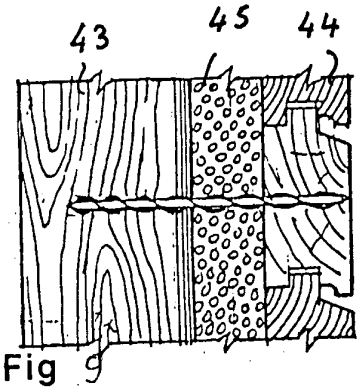

Fig 9

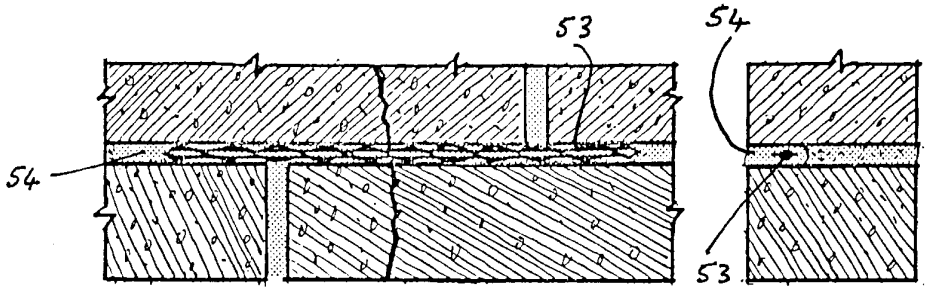

Fig 10

Fig 11

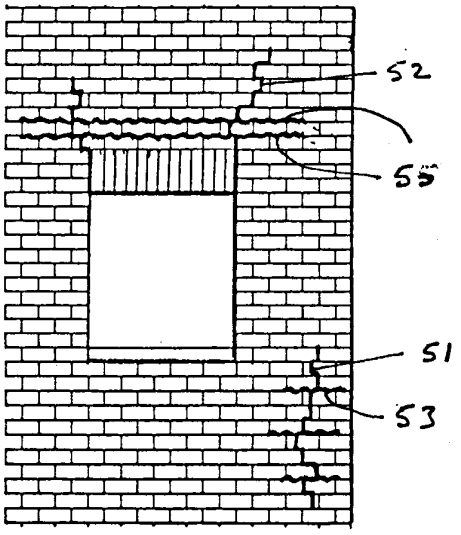

Fig 12