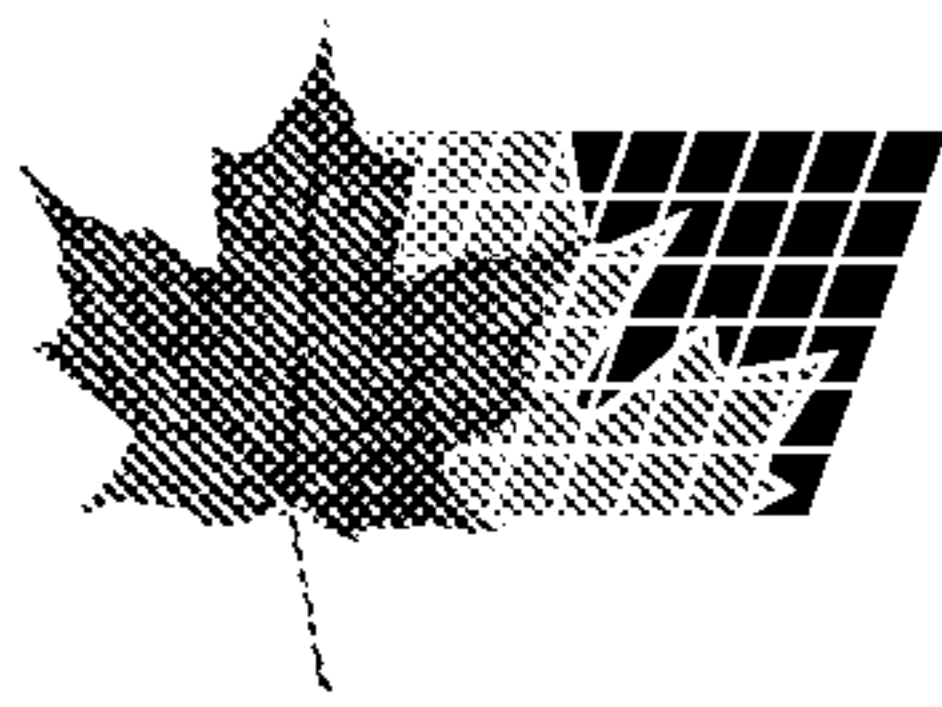
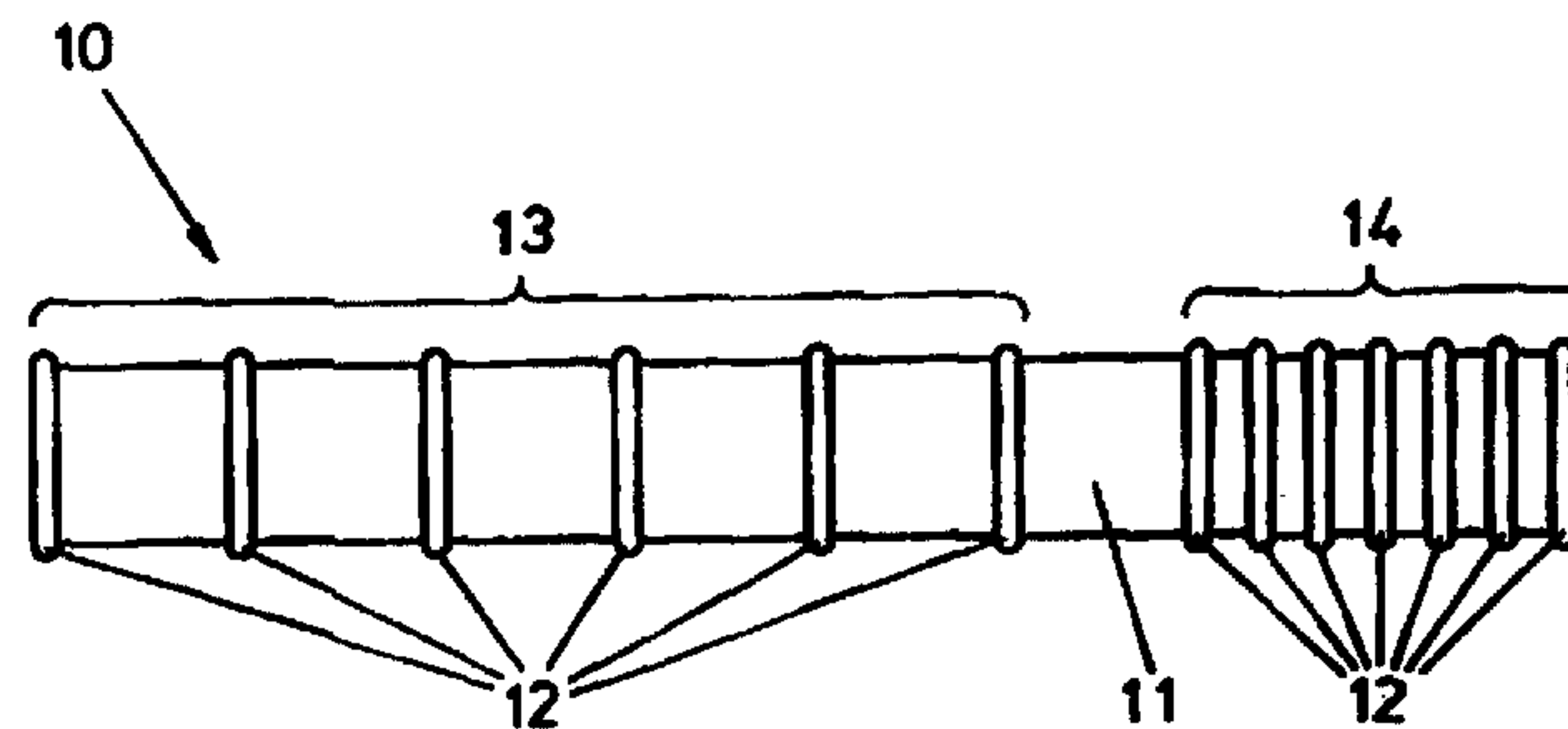




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(54) **ACCESSOIRE DE CONSTRUCTION**
(54) **CONSTRUCTION FITTING**



(57) L'invention concerne l'utilisation d'un accessoire de construction métallique qui se fixe dans une matière solide. Cet accessoire comprend une âme allongée (11) servant de support à une formation en saillie (12) entièrement déposée sur l'âme ou liée à cette dernière par soudage. Ladite matière déposée ou soudée peut être modelée au profil désiré après dépôt ou soudage sur l'âme.

(57) A metal construction fitting, for use when secured in solid material, comprising an extended core (11) bearing a raised formation (12) entirely deposited on the core (11), or bonded to the core (11), by welding. The deposited or bonded material may be shaped into a desired profile subsequent to its deposition on or bonding to the core.

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(21) International Application Number: PCT/GB98/03105 (22) International Filing Date: 16 October 1998 (16.10.98) (30) Priority Data: 9721974.5 17 October 1997 (17.10.97) GB (71) Applicant (for all designated States except US): CIVIL ENGINEERED PRODUCTS LIMITED [GB/GB]; Meadowbank Works, Meadowbank Road, Rotherham S61 2ND (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): HAYNES, John, Michael [GB/GB]; Civil Engineered Products Limited, Meadowbank Works, Meadowbank Road, Rotherham S61 2ND (GB). HOWARTH, David, Michael [GB/GB]; Civil Engineered Products, Meadowbank Works, Meadowbank Road, Rotherham S61 2ND (GB). (74) Agent: BROWNE, Robin, Forsythe; Urquhart-Dykes & Lord, Tower House, Merrion Way, Leeds LS2 8PA (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>With amended claims.</i>
(54) Title: CONSTRUCTION FITTING (57) Abstract A metal construction fitting, for use when secured in solid material, comprising an extended core (11) bearing a raised formation (12) entirely deposited on the core (11), or bonded to the core (11), by welding. The deposited or bonded material may be shaped into a desired profile subsequent to its deposition on or bonding to the core.		

Construction Fitting

The present invention relates to a construction fitting for use when secured in solid material and in particular, but not exclusively, for use as a reinforcing member or as an anchoring member.

Metal construction fittings are widely used in the construction industry for a variety of purposes; e.g. reinforcing bars and as anchors for attaching other members to.

Reinforcing bars can have ribbing provided on them so as to provide a means of bonding the bar into a material after it has solidified; e.g. concrete, resins or cementitious grouts. Ribbing is normally produced by a hot rolling process requiring specialised plant. Demand for large quantities of reinforcing bar needs to exist in order to make the operation of such specialist plant commercially viable.

A bond between a bar and solid material may also be provided by altering the shape of the bar in a variety of ways; e.g. threading the bar, cold indenting the bar, hot forging the bar. However, these methods require material to either be removed from the bar or for the material of the bar to be deformed in some way. As the material of these bars is used for its strength properties, removing material from or deforming the shape of the bar is a difficult operation requiring heavy, expensive machinery.

It is often necessary to provide a construction fitting which has a bonding element for securing the fitting in solid material and also having a means for securing other members to the fitting so as to connect the solid material and other member. Such fittings are widely required in the construction of, e.g., holding down bolts on motorway bridge balustrades,

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highway lighting columns, rock bolts, roof bolts and other such remedial fittings. Often the securing means can be provided in the form of a screw thread. Screw threads can be provided in fittings by machine cutting or rolling a thread. Again these methods require heavy machinery to remove material from, or deform the material of, a metal chosen for its strength. Further, by providing a screw thread in a bar the strength of the bar is weakened as its strength is determined by its minimum diameter which will be reduced by the act of cutting a thread in the bar. A thread may be provided in a ribbed bar by synchronously rolling reinforcing ribs so that the reinforcing ribs act as a thread or by thread rolling a bar. Again these methods require heavy, expensive machinery which is only economically viable if there exists demand for large amounts of threaded bar. Bars having full length and partial length threads are often required for stressing structures by post tensioning, e.g. repairs to masonry or stone structures. But again providing bars with the correct amount of thread and/or ribbing is a difficult operation and often in *ad hoc* situations it is not a simple matter to re-machine to provide the required fitting configuration.

The combination of requirements, i.e. ribbing for bonding, threading for attachments, different diameters and lengths of fitting and different lengths of ribbing and/or thread, means that large amounts of stock have to be maintained to supply demand. This may be commercially viable when the materials are low cost and standard fittings are required. But when materials are expensive and the fittings are of a specialist nature, the large inventory required is financially undesirable.

Hence, there is a need for a fitting which can be easily manufactured in a variety of different configurations so as to

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supply market demand without the requirement of costly capital investment or the requirement of a large inventory.

According to a first aspect of the present invention there is provided a construction fitting, for use when secured in a solid material, comprising an extended core bearing a raised load bearing formation entirely deposited on the core, or bonded to the core, by welding.

Multiple advantages of the invention arise from the deposition of material on a core, or bonding of material to a core, by welding to produce a unitary fitting, rather than removing matter from the material or having to deform the material. A load bearing raised formation may be provided entirely constituted of material weld deposited on the core, i.e. the raised formation does not comprise an element attached to the core by welding. A load bearing raised formation may be provided by bonding an element to the core by welding.

As welding is used to provide the raised formation, it is not necessary to invest in new machinery in order to fabricate the construction fitting by removing material or deforming material. Further, construction fittings of various configurations can easily be fabricated using the same piece of equipment. There is no need to keep an extensive stock pile of different configurations of construction fittings as construction fittings can be made to order. The raised formations which can be weld deposited can be of any desired configuration and so a wide variety of construction fittings can be produced.

The raised load bearing formation may have a desired profile which is formed subsequent to deposition on the core, or bonding to the core, of the load bearing formation. In this way a load bearing formation of diameter significantly greater

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than the core may be formed on the core and then subsequently shaped to give a desired profile, e.g. a thread or ribs, by machining, cutting, thread rolling or any other suitable forming process.

The construction fitting may be entirely of stainless steel; i.e. the core is stainless steel and the raised formation is weld deposited stainless steel. Stainless steel has excellent corrosion resistant properties and so is of use in environments which would be harmful to other materials. Stainless steel also has magnetic properties which can be utilised in certain circumstances. Stainless steel can have the same mechanical properties of carbon steel and steel alloys. Stainless steel is a comparatively expensive material but there is no need to keep an expensive inventory of stock when stainless steel construction fittings of this type are provided as they can be made to order. Specialist stainless steel fittings are often required and the versatility of a construction fitting with a weld deposited raised formation means that tailor made fittings can be supplied without the need for specialised machinery. The fitting may be entirely of any weldable steel, e.g. carbon steel or steel alloys. The fitting may be of other materials, when the special properties of stainless steel are not required, and such fittings are also extremely versatile in their possible configurations. The fitting may be entirely of a non-metal weldable material. The fitting may be of a plastics material. The fitting may be of carbon fibre material.

Preferably the fitting has an elongate core. The core may be substantially rod shaped. The core may be cylindrical. The core may have other cross sections, e.g. circular, polygonal, elliptical or other curved shapes. The core may be straight or may be curved. The core may have straight sections and curved sections.

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The raised formation may extend along part of the length of the core. Part of the length of the core may have no raised formation extending along it; i.e. the raised formation is not continuous along the length of the core. In this way a fitting can be provided having different formations along the core, e.g. a bonding formation at one end and an attaching formation at the other end with a formation free part between.

The raised formation may extend along the entire length of the core. In this way, the raised formation is continuous along the length of the core, e.g. a bonding formation may extend along the entire length of the core to maximise the bonding of the fitting and the solid material it is embedded in.

The raised formation may be a screw thread. This provides that other members can be attached to the fitting by, e.g., nuts or couplers. The formation may be an attachment means. Various different attachment means may be provided by changing the shape of the raised formation, e.g. lugs for engaging cavities may be weld deposited on the core.

The screw thread weld deposited may be varied in a number of ways, e.g. thread angle, right handed or left handed thread, thread intensity, continuous thread or intermittent thread, length of thread along core, thread profile and thread pitch

The raised formation may be a rib. Providing a rib allows the position of the fitting to be secured when it is embedded in solid material. The raised formation may be a plurality of ribs. A rib or a plurality of ribs provides means for bonding the fitting within solid material.

The ribbing weld deposited may be varied in a number of ways e.g. rib angle may be from along length of the core to perpendicular to the core including right or left handed helix;

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rib length may be continuous or intermittent; rib area may cover the entire length of the core or just part of the length of the core; the rib profile and rib pitch may also be varied.

According to a second aspect of the current invention there is provided a method of manufacturing a construction fitting comprising entirely weld depositing, or bonding entirely by welding, a load bearing raised formation on the surface of a core held in a locating device by causing relative movement between a welding device and the core.

The method may include the further step of shaping the load bearing formation to give a desired profile subsequent to its deposition on or bonding to the core. The core may have its diameter significantly increased by depositing or bonding the raised formation and subsequently shaping the raised formation to give a desired profile, e.g. threading or ribbing, by a suitable forming process, e.g. machining, thread rolling or cutting.

The core may be stationary and the welding device may move. The welding device may be stationary and the core may move. Both the welding device and the core may move. The core or welding device may be rotated or translated. The welding device or locating device may be automatically controlled so as to fabricate a fitting with a predetermined specified raised formation configuration.

The present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a side view of a transversely ribbed construction fitting according to the present invention;

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Figure 2 is a side view of a helically ribbed construction fitting according to the present invention;

Figure 3 is a side view of a longitudinally ribbed construction fitting according to the present invention;

Figure 4 is a side view of a screw threaded construction fitting according to the present invention;

Figure 5 is a side view of an enlarged diameter screw threaded construction fitting according to the present invention.

Figure 6 is a side view of a ribbed and screw threaded construction fitting according to the present invention;

Figure 7 is a side view of a curved ribbed and screw threaded construction fitting according to the present invention;

Figure 8 is a plan view of a flat plate construction fitting according to the present invention; and

Figure 9 is a schematic diagram of apparatus for use according to a second aspect of the present invention.

With reference to Figures 1-8 there are shown examples of construction fittings according to a first aspect of the current invention. The same items in the different Figures share common reference numerals.

With reference to Figure 1, a construction fitting, generally designated by reference numeral 10, comprises a solid cylindrical core of stainless steel 11. The core is straight and elongate. The surface of the core bears a raised formation

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12 in the form of a first series of ribs 13 and a second series of ribs 14. The formation 12 extends along the entire length of the core; i.e. it is continuous along the length of the core. The raised formation is of stainless steel and is entirely deposited on the core by welding alone to provide a unitary fitting. No further element is attached to the core by being attached by welding to form the raised formation, but rather the raised formation is entirely weld deposited. The first series of ribs 13 are substantially parallel and extend transversely to the longitudinal axis of the cylindrical core. The first set of ribs have a first pitch. The second series of ribs 14 are also substantially parallel and extend transversely to the longitudinal axis of the cylindrical core. The second set of ribs have a second pitch. The rib profile may be varied by adjusting the welding parameters. The rib profile and pitch may be chosen so as to optimise the bonding between the construction fitting and the solid material, e.g. concrete, in which it is embedded when in use. The construction fitting shown in Figure 1 is suitable for use as a reinforcing bar.

When made from stainless steel, it has superior corrosion resistant properties to other materials. However, a similar reinforcing bar may be fabricated from any steel, other metal or non-metallic material which are weldable when their physical properties suit a particular application. The same applies to the other examples of construction fittings now to be described.

The construction fitting previously described, and those to be described, may also be realised in terms of bonding an element, or elements, to the core entirely by welding so as to provide a load bearing raised formation on the core.

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With reference to Figure 2, there is shown a stainless steel reinforcing bar, 20, having a straight, elongate, cylindrical stainless steel core having a raised stainless steel formation in the form of a pair of oppositely wound helical ribs 21 22 entirely weld deposited on the core. As shown the helical ribs have the same pitch and rib angle and extend along the entire length of the core. However different pitches of rib may be used and/or either single or multiple ribs. Multiple ribs may have the same or opposite sense of winding.

With reference to Figure 3, there is shown a stainless steel reinforcing bar, 30, having a straight, elongate, cylindrical stainless steel core 31 having a raised stainless steel formation 32 in the form of a series of substantially parallel ribs extending parallel to the longitudinal axis of the core entirely weld deposited on the core. Such ribs act to bond the bar to the solid material in which in use it is embedded and help to prevent rotation of the bar about its longitudinal axis.

Although shown extending along the entire length of the bar, the ribs may extend for only a part of the length of the bar and other ribs which are not parallel to the longitudinal axis of the bar may be provided as part of the raised formation to satisfy the bonding requirements of the bar.

With reference to Figure 4, there is shown a threaded construction fitting 40 having a straight, elongate, stainless steel core 41 having a raised stainless steel formation 42 in the form of a continuous screw thread extending along the entire length of the core and weld deposited on the core. The handedness of the thread, the profile of the thread, the thread pitch and length of extension of the thread along a core may all be varied to suit the requirements that the fitting has to fulfil.

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As well as providing a screw thread as an attachment means for the fitting, other mechanical attachment means may be provided instead by changing the raised formation weld deposited, e.g. lugs, hooks or flanges.

With reference to Figure 5, there is shown an enlarged diameter construction fitting 50. The fitting has a stainless steel core and a raised stainless steel formation 51 which has been formed subsequent to weld deposition. The raised formation has a thread 52 which has been formed by machining the deposited formation and then cutting or thread rolling to form the thread which acts as a means of attachment. The formation is not continuous along the length of the core and there is a section of core 53 with no raised formation.

This particular fitting may be used as an anchor. The free end of the bar can be modified or enhanced by a repetition of the raised formation, to provide a thread or ribbing, to improve bonding to the free end. The provision of raised formations at each end of the fitting permits coupling bars to be formed of any required length. It should be noted that the strength of the fitting is enhanced by the provision of enlarged diameter weld deposited formations at each end. The tensile strength of the fitting is then limited by the diameter of the core on which the enlarged diameter formations are deposited.

Load testing has established that the core of the fitting fails before the welded raised formations. Typically a core diameter of 39mm diameter can have more than one weld run of material applied to build up an enlarged diameter of approximately 52mm. The enlarged diameter formation is then machined to a required diameter and a thread formed by cutting or thread rolling to provide e.g. an M52 thread. Larger diameter fittings with core diameters of 100mm can also be produced. These are especially suitable for use as tie bars holding together sheet piling.

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These can then be infilled for use in the construction of piers and harbours.

With reference to Figure 6, there is shown a construction fitting 60 having a stainless steel cylindrical core and a raised stainless steel formation in the form of ribs 61 acting as bonding means at a first end and a screw thread 62 acting as an attachment means at a second end. The formation is not continuous along the entire length of the core as there is a central section 63 which does not have any raised formation.

The construction fitting may be used as an anchor. The ribs act to bond the first end to solid material in which the first end of the fitting is embedded while the second end remains exposed. Then a second member may be secured to the solid material by being attached to the exposed threaded end and secured to it by a nut or other such locking device. It should be noted that the strength of the fitting is not weakened by the provision of a screw thread by weld depositing a formation on the core. This is in contrast to when a thread is cut into a bar. This reduces the diameter of the bar causing a loss of strength of the bar.

With reference to Figure 7, there is shown a construction fitting 70 which, while being elongate, is not entirely straight but rather has a curved section 71. The fitting 70 has a cylindrical stainless steel core 72 with a raised stainless steel formation in the form of a first set of parallel ribs 73, a pair of helical ribs 74, 75 wound in the same sense and a screw thread 76.

Such a construction fitting has extra anchoring properties over an entirely straight bar as the curved section when embedded in solid material is resistant to both rotation and

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translation. Further, the ribbed sections provide bonding with the solid material and the exposed screw thread can be used as an attachment means for securing other members to the fitting. Other shapes of core may also be provided tailored to the requirements of a particular situation.

With reference to Figure 8, there is shown a construction fitting 80. The fitting comprises an extended core 81 in the form of a plate. The core has a raised formation in the form of a first set of ribbing 82 and a second set of cross-hatched ribbing 83 weld deposited on the core. The fitting may be used as a step with the first ribbing 82 providing bonding means for securing the fitting when embedded in concrete and the cross-hatched ribbing providing a gripping surface of a step to prevent slipping. It will be appreciated that a plurality of such fittings partially embedded at various heights in solid material will provide a flight of steps. Other remedial fittings of a non-elongate nature are also envisaged as being encompassed by the present invention.

With reference to Figure 9, there is shown apparatus 90 suitable for fabricating construction fittings by a method according to a second aspect of the present invention. A locating device 91 includes a pair of clamp members 92, 93 which hold the respective ends of a core 94. The clamp members can rotate the core. There is also provided a welding device with a welding head 95. The welding head is provided with means (not shown) allowing it to move with respect to the core clamped in the locating device.

In Figure 9 the fabrication of a stainless steel screw threaded construction fitting is illustrated. A stainless steel screw thread 96 is weld deposited on the surface of a stainless steel core by translating the welding head along the core in the

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direction shown by arrow 97, while the core is rotated by the positioning device in the sense indicated by arrow 98.

Fittings of carbon steel, steel alloy, other weldable steels and materials, including non-metallic materials, may also be fabricated using the same method.

A fitting with a formation diameter significantly greater than the core diameter may be deposited by repeated weld runs. Once a sufficient diameter of material has been deposited, it can then be machined down to a desired diameter and a desired profile is formed in the raised formation by e.g. cutting or thread rolling.

Rather than entirely weld depositing a load bearing raised formation on the core, a load bearing raised formation may be provided on the core by entirely welding an element, or elements, to the core using the same apparatus.

It will be appreciated that it is also possible to fabricate such fittings by keeping the core static and moving only the welding device, or keeping the welding device static and moving only the core. The control of the relative movement of the welding device and core may be automated, e.g. by computer control, so as to allow a construction fitting of a desired configuration to be automatically produced. Different raised formations can be weld deposited on a core by controlling the relative movement of the welding device and core. The welding device may include a robotic arm allowing raised formations to be weld deposited on cores with complicated shapes. The welding conditions may be varied so as to alter the profile of the formation deposited on the core. It will be appreciated that no specialised machinery is required in order to carry out the method of manufacture and that the method of manufacture

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is extremely versatile allowing construction fittings of any configuration to be fabricated to order.

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CLAIMS:

1. A construction fitting, for use when secured in solid material, comprising an extended core bearing a raised load bearing formation entirely deposited on the core by welding.

2. A fitting as claimed in claim 1, in which the raised load bearing formation has a desired profile which is formed subsequent to deposition on the core of the load bearing formation.

3. A fitting as claimed in claim 1, in which the fitting is entirely of stainless steel.

4. A fitting as claimed in claim 1, in which the fitting is entirely of a weldable material.

5. A fitting as claimed in claim 1, in which the fitting is entirely of a non-metallic material.

6. A fitting as claimed in any preceding claim, in which the core is elongate.

7. A fitting as claimed in any preceding claim, in which the formation extends along part of the length of the core.

8. A fitting as claimed in any preceding claim, in which the formation extends along the entire length of the core.

9. A fitting as claimed in any preceding claim in which the formation is a screw thread.

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10. A fitting as claimed in any preceding claim in which the formation is a rib.

11. A fitting as claimed in any preceding claim, in which the formation is a plurality of ribs.

12. A method of manufacturing a construction fitting comprising entirely depositing a raised load bearing formation on the surface of a core held in a locating device by causing relative movement between a welding device and the core.

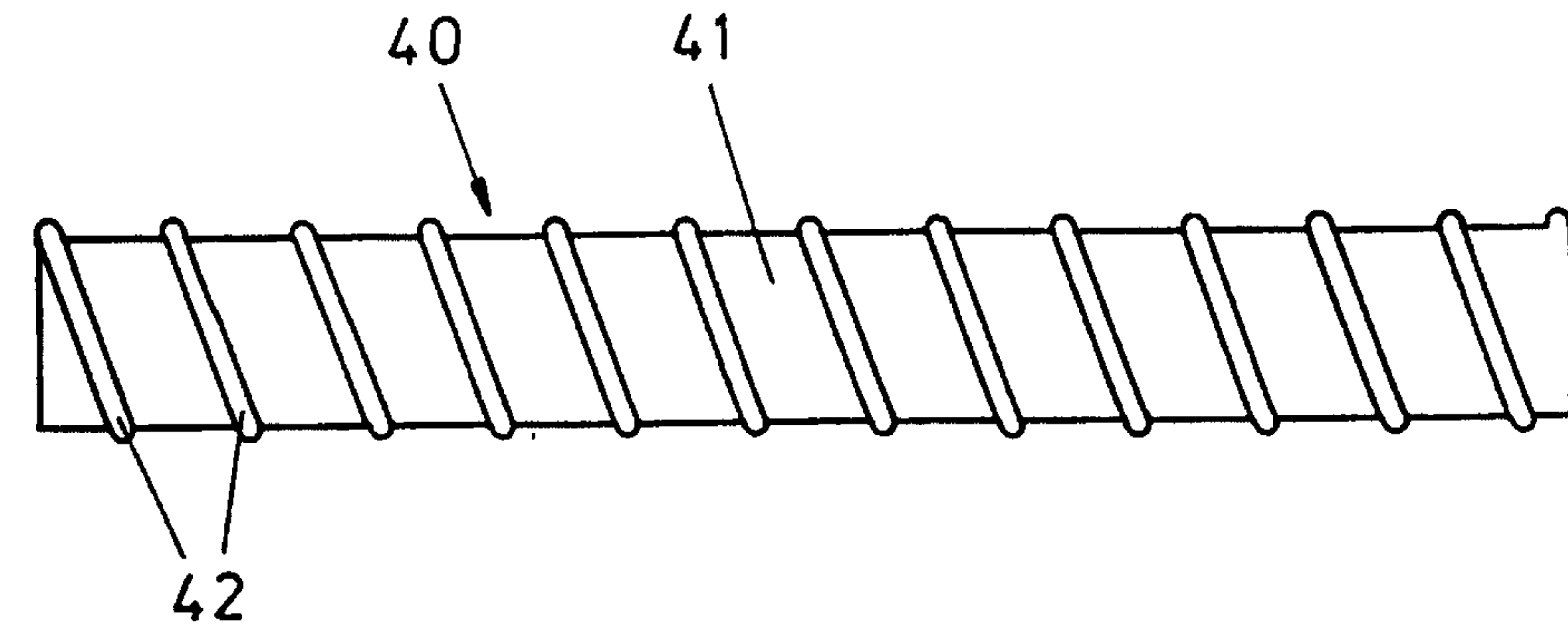
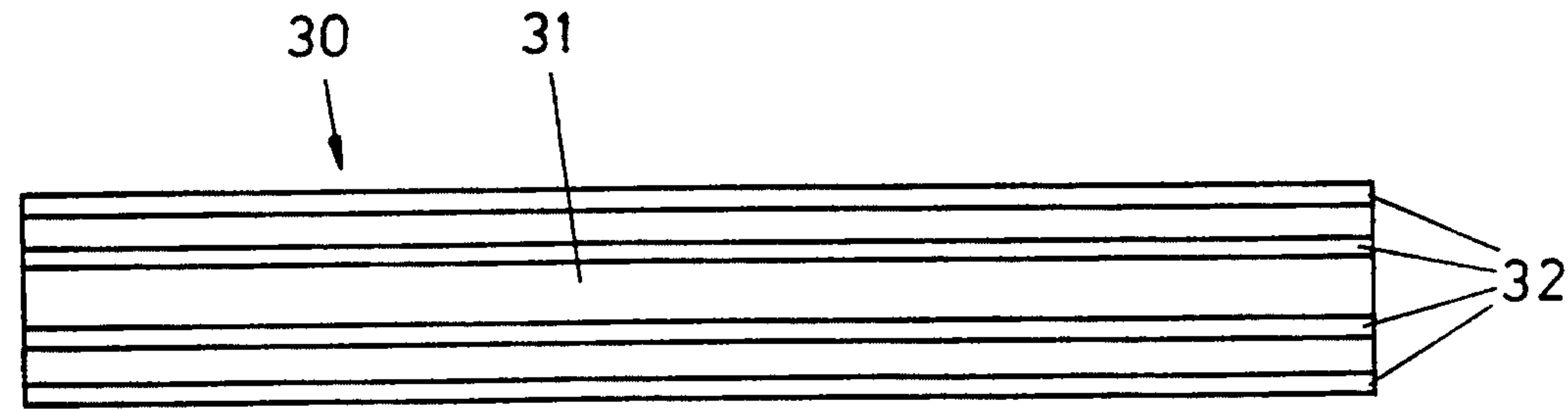
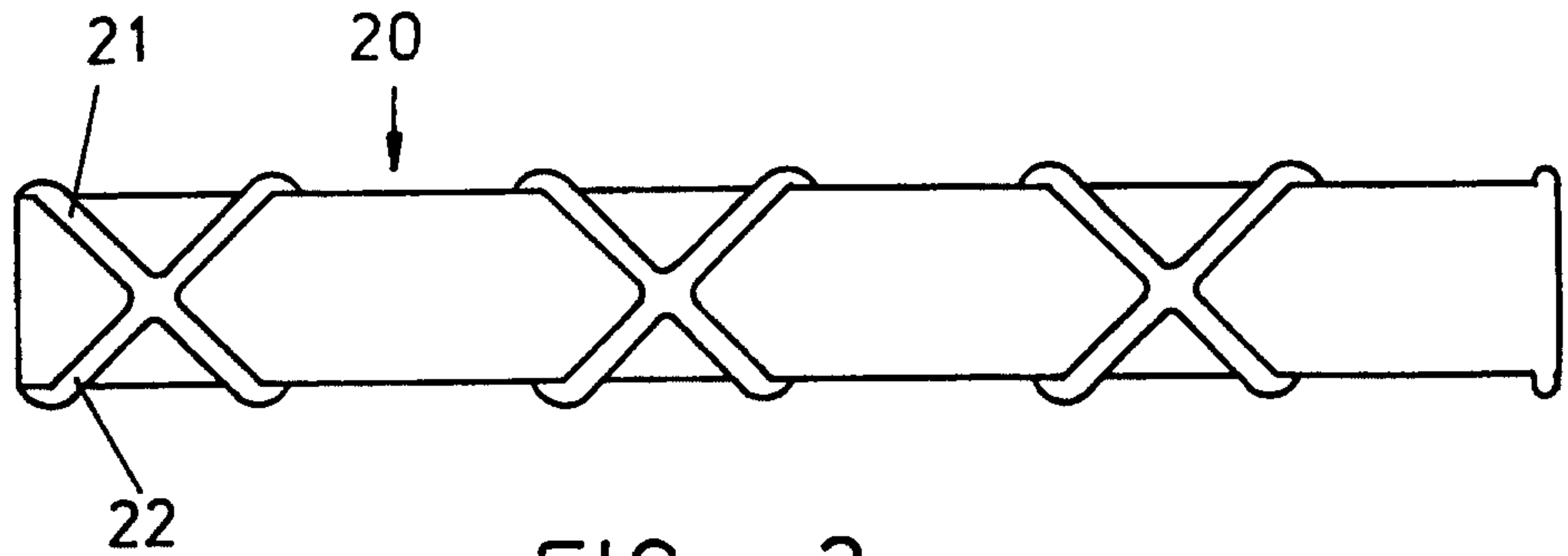
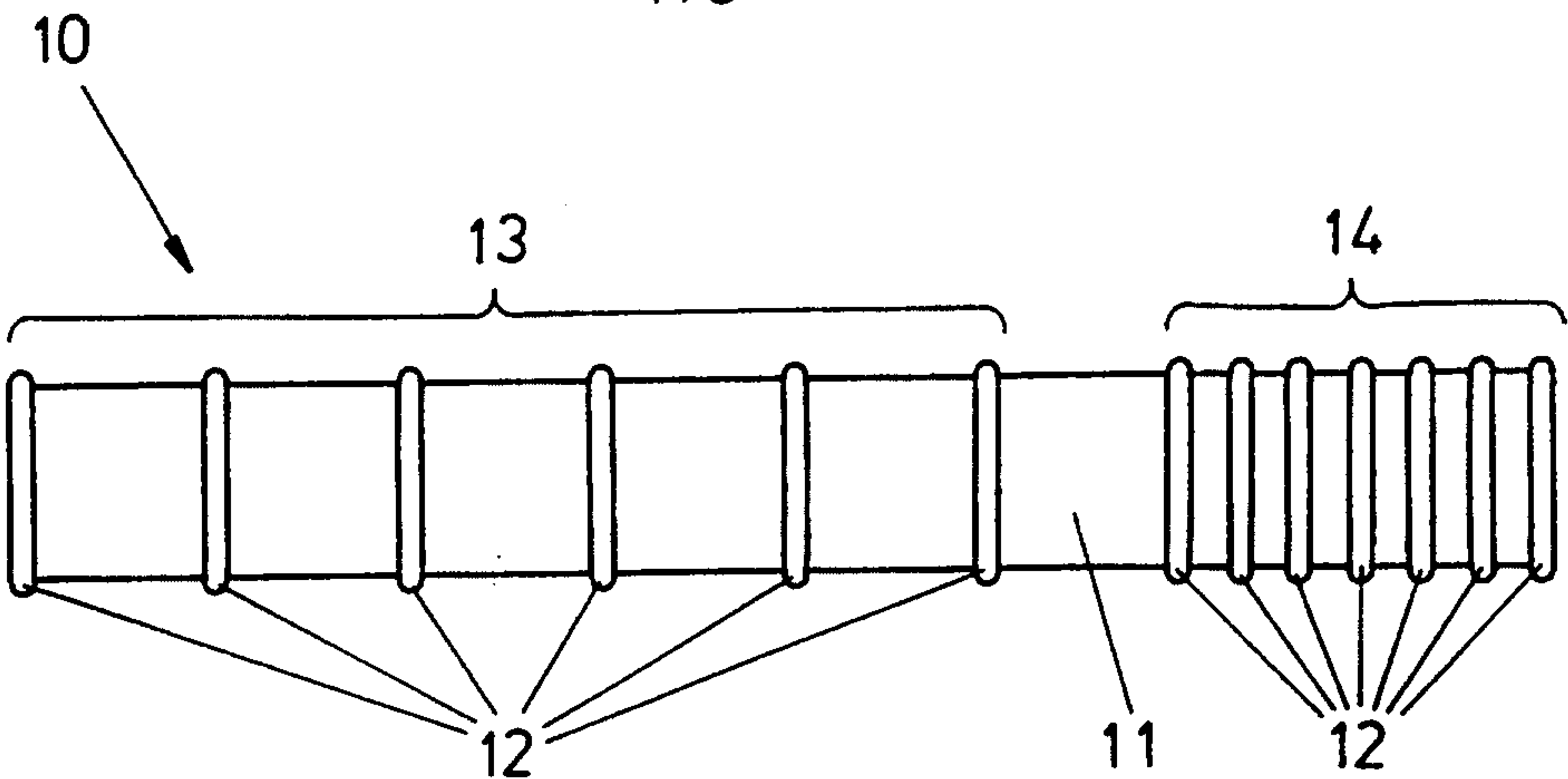
13. A method as claimed in claim 12 and including the further step of shaping the load bearing formation to give a desired profile subsequent to its deposition on the core.

14. A method as claimed in claim 12 or claim 13, in which the core and raised formation are any weldable material.

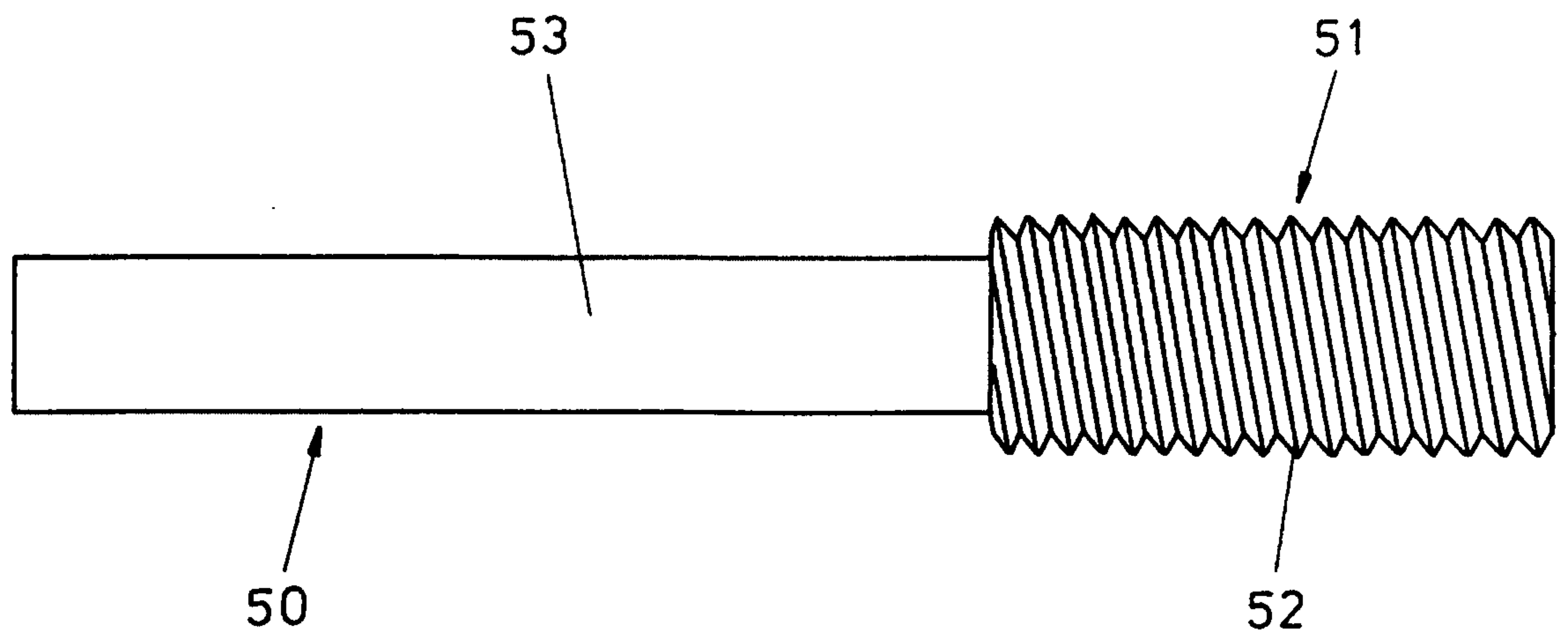
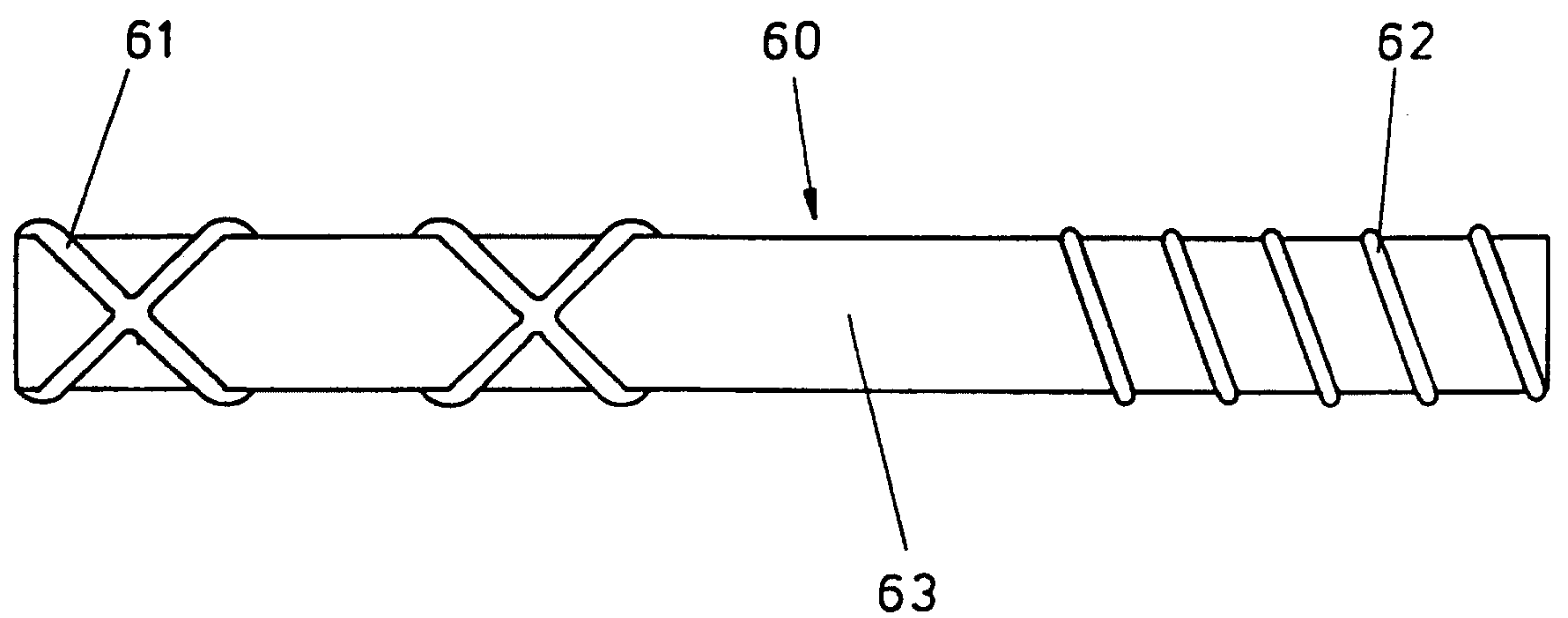
15. A method as claimed in any of claims 12 to 14, in which the core and raised formation are stainless steel.

16. A method as claimed in any of claims 12 to 15, in which the welding device or locating device are automatically controlled so as to fabricate a construction fitting with a predetermined specified raised formation configuration.

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FIG. 5FIG. 6

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