I claim:

1. A method of attaching at least one cladding element sheet at least partially made of a first metal to a base element sheet at least partially made of a second metal, the method comprising the steps of:

(a) positioning said at least one cladding element sheet spaced apart from the base element sheet to locate a first inner side of said at least one cladding element sheet facing a second inner side of the base element sheet, for defining a slot therebetween having a predetermined width, said at least one cladding element sheet having a first outer side thereof opposite to the first inner side, and the base element sheet having a second outer side thereof opposite to the second inner side;

(b) locating at least one heating element in the slot;

(c) providing a non-oxidizing atmosphere in the slot, the non-oxidizing atmosphere covering the first and second inner sides;

(d) energizing said at least one heating element, to heat the first inner side and the second inner side to a first hot working temperature of the first metal and a second hot working temperature of the second metal, wherein said at least one heating element is configured to distribute heat energy therefrom evenly over each of the first and second inner sides, heating the cladding element sheet and the base element sheet to predetermined first and second depths relative to the first and second inner sides respectively, to provide heated first and second layers of the cladding element sheet and the base element sheet respectively;

(e) removing said at least one heating element from the slot;

(f) while the first and second layers are at the first and the second hot working temperatures, moving one or both of said at least one cladding element sheet and the base element sheet in a preselected direction orthogonal to the first and second inner sides to engage the first and second inner sides with each other;

(g) while the first and second inner sides are engaged with each other and while the first and second layers are at the first and the second hot working temperatures,

(i) percussively engaging the first outer side at a plurality of first points thereon spaced apart from each other, to push the first inner side in a direction parallel to the preselected direction, at respective first locations on the first inner side aligned with the plurality of first points respectively, against the second inner side, and

(ii) percussively engaging the second outer side at a plurality of second points thereon spaced apart from each other, to push the second inner side in the direction parallel to the preselected direction, at respective second locations on the second inner side aligned with the plurality of second points respectively, against the first inner side, the respective second locations and the respective first locations being aligned, to at least partially plastically deform the first and second layers, subjecting the first and second layers to shear stresses to achieve at least partial uniformity of microstructures of the first and second layers; and

(h) permitting the first and second layers to cool to a predetermined temperature, for recrystallization of the first and second layers, that are thereby bonded to each other.

2. A method comprising the steps of:

(a) securing a non-metallic cladding element and a first metal element comprising a first metal together, to form at least one cladding assembly sheet;

(b) positioning said at least one cladding assembly sheet spaced apart from a base element sheet at least partially made of a second metal to locate a first inner side of said at least one cladding assembly sheet facing a second inner side of the base element sheet, for defining a slot therebetween having a predetermined width, the first inner side of said at least one cladding assembly sheet being formed to adhere to the second inner side, said at least one cladding assembly sheet having a first outer side thereof opposite to the first inner side, and the base element sheet having a second outer side thereof opposite to the second inner side;

(c) locating at least one heating element in the slot;

(d) providing a non-oxidizing atmosphere in the slot, the non-oxidizing atmosphere covering the first inner side and the second inner side;

(e) energizing said at least one heating element, to heat the first inner side and the second inner side to a first hot working temperature of the first metal and a second hot working temperature of the second metal, wherein the at least one heating element is configured to distribute heat energy therefrom evenly over each of the first and second inner sides, heating the first metal element and the base element sheet to predetermined first and second depths relative to the first and second inner sides respectively, to provide heated first and second layers of the first metal element and the base element sheet respectively;

(f) removing said at least one heating element from the slot;

(g) while the first and second layers are at the first and the second hot working temperatures, moving one or both of said at least one cladding assembly sheet and the base element sheet in a preselected direction orthogonal to the first and second inner sides to engage the first and second inner sides with each other;

(h) while the first and second inner sides are engaged with each other and while the first and second layers are at the first and the second hot working temperatures,

(i) percussively engaging the first outer side at a plurality of first points at first locations thereon spaced apart from each other, to push the first inner side in a direction parallel to the preselected direction, at respective first locations on the first inner side aligned with the plurality of first points respectively, against the second inner side, and

(ii) percussively engaging the second outer side at a plurality of second points thereon spaced apart from each other, to push the second inner side in the direction parallel to the preselected direction, at respective second locations on the second inner side aligned with the plurality of second points respectively, against the first inner side, the respective second locations and the respective first locations being aligned, to at least partially plastically deform the first and second layers, subjecting the first and second layers to shear stresses to achieve at least partial uniformity of microstructures of the first and second layers; and

(i) permitting the first and second layers to cool to a predetermined temperature, for recrystallization of the first and second metals in the respective first and second layers, that are thereby bonded to each other.

3. A method according to claim 1 in which:

said at least one cladding element sheet comprises first and second cladding element sheets, each of said first and second cladding element sheets having an edge, the edges of the first and second cladding element sheets being located proximal to each other after the first and second cladding element sheets are attached with the base element sheet, said edges defining an opening therebetween, each of said first and second cladding element sheets comprising a thick region extending along the edge thereof respectively, each of the thick regions being thicker than a balance of the respective first and second cladding element sheets;

at least one supplemental heating element is positioned proximal to the thick regions of the first and second cladding element sheets;

said at least one supplemental heating element is energized, to heat the thick regions of the first and second cladding element sheets to a thick region hot working temperature, in a non-oxidizing atmosphere; and

with at least one forming device, the thick regions are plastically deformed, to fill the opening.

4. A method according to claim 3 in which the thick regions are overlain by an additional cladding element that is heated to an additional cladding hot working temperature in a non-oxidizing atmosphere by an energized heating element, and secured to the thick regions by said at least one forming device while the additional cladding element is at the additional cladding hot working temperature and the thick regions are at the thick region hot working temperature.

5. A method according to claim 1 in which:

said at least one cladding element sheet comprises first and second cladding element sheets, each of said first and second cladding element sheets comprising an edge, the edges of the first and second cladding element sheets being located proximal

to each other after the first and second cladding element sheets are attached to the base element sheet to define a boundary region including an opening therebetween;

at least one additional cladding element is located spaced apart from the first and second cladding element sheets proximal to the edges thereof to define an additional element gap between said at least one additional cladding element and the first and second cladding element sheets;

at least one heating element is positioned between said at least one additional cladding element and the first and second cladding element sheets;

said at least one heating element is energized in a non-oxidizing atmosphere, to heat said at least one additional cladding element and respective portions of the first and second cladding element sheets that are proximal to the edges thereof to an additional cladding element hot working temperature;

while said at least one additional cladding element and the respective portions of the first and second cladding element sheets are at the additional cladding element hot working temperature, engaging said at least one additional cladding element with the respective portions of the first and second cladding element sheets at the edges thereof wherein said at least one additional cladding element covers the boundary region;

while said at least one additional cladding element is engaged with the respective portions of the first and second cladding element sheets, moving at least part of said at least one additional cladding element relative to the respective portions of the first and second cladding element sheets, to plastically deform said at least one additional cladding element and at least parts of the respective portions of the first and second cladding element sheets; and

permitting said at least one additional cladding element and the respective portions of the first and second cladding element sheets to cool to the predetermined temperature, for recrystallization of said at least one additional cladding element and the respective portions of the first and second cladding element sheets for bonding thereof, wherein said at least one additional cladding element is thereby bonded to the respective portions of the first and second cladding element sheets and said at least one additional cladding element at least partially fills the opening.

6. A method according to claim 3 in which, when the thick regions of the first and second cladding element sheets are at the thick region hot working temperature, a part of the thick

region of the second cladding element sheet is first pushed in one direction into the opening, and the thick region of the first cladding element sheet is subsequently pushed in another direction onto the part of the thick region of the second cladding element sheet that is in the opening.

7. A method according to claim 1, wherein the first hot working temperature of the first metal is less than a melting temperature of the first metal and the second hot working temperature of the second metal is less than a melting temperature of the second metal.

8. A method according to claim 1, wherein percussive engagement at the plurality of first points pushes the first inner side in a first direction and percussive engagement at the plurality of second points pushes the second inner side in a second direction opposite of the first direction.

9. A method according to claim 8, including simultaneously plastically deforming portions of the first layer at the first locations and plastically deforming portions of the second layer at the second locations that are aligned with the first locations as a result of percussive engagement in opposing directions such that the first and second layers are bonded with each other, and wherein such bonding takes place only at aligned locations of the first and second heated where percussive engagement is effected.

10. A method according to claim 2, wherein the first hot working temperature of the first metal is less than a melting temperature of the first metal and the second hot working temperature of the second metal is less than a melting temperature of the second metal.

11. A method according to claim 2, wherein percussive engagement at the plurality of first points pushes the first inner side in a first direction and percussive engagement at the plurality of second points pushes the second inner side in a second direction opposite of the first direction.

12. A method according to claim 11, including simultaneously plastically deforming portions of the first layer at the first locations and plastically deforming portions of the second layer at the second locations that are aligned with the first locations as a result of percussive

engagement in opposing directions such that the first and second layers are bonded with each other, and wherein such bonding takes place only at aligned locations of the first and second layers where percussive engagement is effected.

13. A method of attaching at least one cladding element sheet at least partially made of a first metal to a base element sheet at least partially made of a second metal, the method comprising:

(a) separating the at least one cladding element sheet from the base element sheet by a slot;

(b) locating at least one heating element in the slot;

(c) providing a non-oxidizing atmosphere in the slot, the non-oxidizing atmosphere covering a first inner side of the at least one cladding element sheet and a second inner side of the base element sheet;

(d) energizing the at least one heating element to heat the first inner side to a first hot working temperature of the first metal and to heat the second inner side to a second hot working temperature of the second metal, wherein the first hot working temperature of the first metal is less than a melting temperature of the first metal and the second hot working temperature of the second metal is less than a melting temperature of the second metal, and heating the at least one cladding element sheet and the base element sheet to predetermined first and second depths relative to the first and second inner sides respectively, to provide heated first and second layers of the at least one cladding element sheet and the base element sheet respectively;

(e) removing said at least one heating element from the slot;

(f) while the first and second layers are at the first and the second hot working temperatures, moving one or both of the at least one cladding element sheet and the base element sheet in an orthogonal direction relative to the first and second inner sides to engage the first and second inner sides with each other;

(g) while the first and second inner sides are engaged with each other and only after the first and second layers are at the first and the second hot working temperatures,

(i) moving one or both of the at least one cladding element sheet and the base element sheet in a direction transverse to the orthogonal direction to at least partially plastically deform the first and second layers to achieve at least partial uniformity of microstructures of the heated first and second layers, or

(ii) percussively engaging a first outer side of the at least one cladding element sheet at a plurality of first points spaced apart from each other, to push the first inner side in a first direction parallel to the orthogonal direction, and percussively engaging a second outer side at a plurality of second points spaced apart from each other and aligned with the plurality of first points, to push the second inner side in a second direction parallel to the orthogonal direction and opposite of the first direction, wherein the heated first and second layers are at least partially plastically deformed to achieve at least partial uniformity of microstructures of the first and second layers; and

(h) permitting the first and second layers to cool to a predetermined temperature, for recrystallization of the first and second layers, that are thereby bonded to each other.

14. A method according to claim 13, including scoring at least one of the first inner side and the second inner side.

15. A method according to claim 13, wherein the at least one cladding element sheet comprises first and second cladding element sheets, each first and second cladding element sheet having an edge, and including:

locating the edges of the first and second cladding element sheets proximal to each other after the first and second cladding element sheets are attached with the base element sheet, said edges defining an opening therebetween;

forming each of the first and second cladding element sheets to have a thick region extending along the edge thereof respectively in a direction parallel to the orthogonal direction, each of the thick regions being thicker than a balance of the respective first and second cladding element sheets;

positioning at least one supplemental heating element proximal to the thick regions of the first and second cladding element sheets;

subsequently energizing the at least one supplemental heating element to heat the thick regions of the first and second cladding element sheets to a thick region hot working temperature in a non-oxidizing atmosphere; and

plastically deforming the thick regions with at least one forming device to fill the opening.

16. A method according to claim 15, wherein the at least one forming device comprises that least one wheel or roller.

17. A method according to claim 15, including moving the at least one forming device in a direction that is transverse to the orthogonal direction to at least partially fill the opening with at least one of the thick regions.

18. A method according to claim 15, overlying the thick regions with an additional cladding element that is subsequently heated to an additional cladding element hot working temperature in a non-oxidizing atmosphere by an energized heating element, and securing the additional cladding element to the thick regions with at least one forming device subsequent to the additional cladding element being at the additional cladding element hot working temperature and the thick regions being at the thick region hot working temperature.

19. A method according to claim 13, including performing step (g)(i).

20. A method according to claim 13, including performing step (g)(ii).