

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN METAL CLADDING SHEETS

(71) We, MORRIS SHEFF and SYDNEY SHEFF, respectively residing at 11, First Avenue, Houghton, Johannesburg, Transvaal, Republic of South Africa and 135, Fifth Avenue, Percelia, Johannesburg, Transvaal, Republic of South Africa; both citizens of The Republic of South Africa, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

THIS invention relates to metal cladding sheets and particularly to the bending of corrugated metal cladding sheets.

For purposes of this specification, the term "corrugated sheet" includes a sheet of sinusoidal, rectangular, trapezoidal or ribbed corrugated cross-sectional configuration and a "corrugation" is considered to comprise a pair of spaced side portions and an intermediate portion extending between the side portions. The same corrugation hence defines a valley when viewed from one side of the sheet and a peak or raised formation when viewed from the opposite side of the sheet. Adjacent corrugations hence have a side portion in common.

With sinusoidal corrugations the intermediate portion is considered to be located in the zone of the apex of the valley or peak. In this specification the term "apex" is meant to refer to the uppermost or lowermost part of the peak or valley respectively.

Corrugated metal cladding sheets are normally provided in planar lengths but it is frequently desirable to bend such sheets into curved forms of predetermined radii of curvature to meet particular requirements.

It is known to bend sheets of the aforesaid kind about an axis extending at right angles to the corrugations by pressing transversely extending rib formations in the intermediate portions of the corrugations

together with transversely extending indentations on the side portions.

It has, however, been found with this known arrangement that a line of weakness tends to develop where the rib formations on the intermediate portion meet the indentations on the side portions.

It is accordingly an object of this invention to provide a method of bending corrugated metal sheets as herein defined with which the aforesaid problem will be overcome or at least minimised.

According to the invention a method of bending a corrugated metal sheet as herein defined about an axis extending on one side of the sheet at right angles to the corrugations, includes the step of pressing in those corrugations having their apices nearest the axis a plurality of rib formations projecting from the same side of the sheet when viewed from the axis, each rib formation being at an angle to the corrugations and extending over at least part of the side portions and at least part of the intermediate portion of a corrugation.

Because the rib formations project from the same surface of the sheet the possibility of a line of weakness forming where a formation on a side portion meets a formation on an intermediate portion is minimised.

Further the presence of a rib extending continuously over at least the zone where a side portion meets an intermediate portion gives additional strength in this zone.

Further according to the invention the rib formations are in rows, each row being formed in one operation which is repeated at spaced intervals along the sheet in a direction parallel to the corrugations to give the desired degree of bending.

Alternatively the rib formations may be in rows with a plurality of rows being formed in one operation which is repeated at spaced intervals along the sheet in a direc-

tion parallel to the corrugations to give the desired degree of bending.

Preferably the rib formations on the side portions in the direction away from the intermediate portions decrease in width and in height relative to the surface from which they project.

Preferably also, the rib formations are pressed to project from the surface on the other side of the sheet when viewed from the axis.

The rib formations are preferably discontinued over at least part of the intermediate portions to define a drainage channel.

Preferably, also, the rib formations extend at right angles to the corrugations.

Further according to the invention the method includes the step of feeding the sheet in a direction parallel to its corrugations between a pair of mating die members adapted to press the rib formations in the corrugations.

It will be appreciated that the method may also be employed to bend an uncorrugated metal cladding sheet about an axis disposed on one side of the sheet by providing the sheet with a plurality of corrugations as herein defined extending at right angles to the axis and pressing in those corrugations having their apices nearest the axis, a plurality of rib formations projecting from the same side of the sheet when viewed from the axis, the rib formations being at an angle to the corrugations and extending over at least part of the side portions and at least part of the intermediate portions of the corrugations.

The invention includes within its scope a bent corrugated sheet made in accordance with the aforesaid method.

The invention will now be further described by way of example with reference to the accompanying drawings in which:—

Figure 1 shows in cross-section part of a corrugated sheet of metal cladding material to be bent;

Figure 2 is a similar view as that of Figure 1 showing the sheet after bending;

Figure 3 is a perspective view showing part of the sheet of figure 2 in more detail;

Figure 4 shows in cross-section a pair of mating die formations suitable for bending a sheet such as that of figure 1;

Figure 5 shows in cross-section part of a corrugated sheet of metal cladding material of different configuration to that of the sheet of figure 1 after bending; and

Figure 6 is a perspective view showing part of the sheet of figure 5 in more detail.

Referring to figures 1 to 4 a sheet 1 which may, for example, be formed from a galvanised mild steel plate or aluminium of suitable thickness in any desired length is

provided which includes a plurality of even spaced longitudinally extending narrow ribbed corrugations 2.

Corrugations 2 have the effect of providing sheet 1 (when viewing it in the direction of arrow *a* in figure 1), in a plurality of adjacent raised corrugations 3 each having a pair of spaced side portions 4 and an intermediate portion 5 extending between the latter.

In order to bend sheet 1 in a longitudinal direction about an axis extending at right angles to corrugations 2 (the axis being located on the same side of sheet 1 as arrow *a*) the sheet is passed between mating die members such as 6 and 7 which press upstanding rib formations 8 on the intermediate portions 5 and side portions 4 of each raised corrugation 3.

As can be seen from Figures 2 and 3 rib formations 8, which are of substantially triangular configuration in cross-section, project from the same surface of sheet 1 relative to the axis of curvature. Furthermore that portion of formation 8 which extends along side portions 4 decreases in a direction away from intermediate portion 5 in width and in height relative to the surface from which they are pressed.

Because of the provision of formations 8 in the material of sheet 1 in this manner sheet 1 is curved according to known principles in the longitudinal direction about an axis extending at right angles to corrugations 2 as shown in figure 3.

Furthermore because each formation 8 is continuous in the zone 13 where side portions 4 and intermediate portions 5 meet the formation of the aforesaid line of weakness found with the conventional arrangements is avoided or at least minimised.

The operative face of die member 7 which includes a plurality of spaced raised formations 9 each adapted to engage adjacent corrugations 2 of a sheet 1 located above it, is provided with upstanding formations 10 extending between adjacent raised formations 9. Formations 10 are of complementary configuration to the formations 8 to be pressed on sheet 1.

Each formation 10 is discontinued along its central portion to define an indentation 11 allowing for a centrally located longitudinally extending groove 12 to be pressed on intermediate portion 5 of sheet 1. Groove 12 serves the purpose of a drainage channel in sheet 1. The operative face of die member 6 is of complementary configuration to that of member 7.

Members 6 and 7 are adapted to be mounted on a press in a conventional manner to define a nipping zone between them in which a sheet such as sheet 1 may pass to be formed between the co-acting mem-

bers 6 and 7 as they close on each other.

It will be appreciated that members 6 and 7 may be provided with a single row of formations 10 to be able to press a single row of formations 8 at a time on sheet 1 or it may be provided with a plurality of parallel spaced formations 10 to be able to press a plurality of rows of formations 8 at a time on sheet 1.

10 The radius of curvature for bending sheet 1 may be varied by varying the distance separating adjacent formations 8 thereon.

The sheet 1 shown in figures 5 and 6, which is of different cross-sectional configuration to that of the previous figures, may be similarly bent by forming a plurality of rib formations 8 thereon in a similar manner. It will be appreciated that the mating die members employed for bending this sheet will have operative faces complementary in configuration to that of the sheet to be bent.

The invention also includes within its scope apparatus for bending a sheet substantially as herein described.

Furthermore, the invention also includes within its scope sheets when bent according to any of the aforesaid methods.

30 It will be appreciated that while the term 'cladding material' has been used in this specification to include roofing sheets and the like it is to be understood that the use of the product for reservoirs, storage drums, sheds, vehicle canopies or other structures of a similar nature are to be included in the scope of this invention and the term 'cladding material'.

WHAT WE CLAIM IS:—

40 1. A method of bending a corrugated metal sheet as herein defined about an axis extending on one side of the sheet at right angles to the corrugations, including the step of pressing in those corrugations having their apices nearest the axis a plurality of rib formations projecting from the same side of the sheet when viewed from the axis, each rib formation being at an angle to the corrugations and extending over at least part of the side portions and at least part of the intermediate portion of a corrugation.

2. A method as claimed in claim 1 wherein each rib formation on a corrugation is continuous at least in the area where the side and intermediate portion of the corrugation meet.

3. A method as claimed in claim 1 wherein the rib formations are in rows each row being formed in one operation which is repeated at spaced intervals along the sheet in a direction parallel to the corrugations to give the desired degree of bending.

65 4. A method as claimed in claim 1

wherein the rib formations are in rows with a plurality of rows being formed in one operation which is repeated at spaced intervals along the sheet in a direction parallel to the corrugations to give the desired degree of bending.

5. A method as claimed in any of the preceding claims wherein the rib formations on the side portions in the direction away from the intermediate portions of those corrugations having their apices nearest the axis decrease in width and in height relative to the surface from which they project.

6. A method as claimed in any of the preceding claims wherein the rib formations are pressed to project from the surface on the other side of the sheet when viewed from the axis.

7. A method as claimed in any of the preceding claims wherein the rib formations are discontinued over at least part of the intermediate portions to define a drainage channel.

8. A method as claimed in any of the preceding claims wherein the rib formations extend at right angles to the corrugations.

9. A method as claimed in any of the preceding claims including the step of feeding the sheet in a direction parallel to its corrugations between a pair of mating die members adapted to press the rib formations in the corrugations.

10. A method of bending a corrugated sheet according to Claim 1 wherein the pressing of rib formations into the sheet comprises the steps of:

(a) providing a first die member having a substantially planar base, raised formations projecting from said base and spaced and contoured for substantial mating engagement with the wall surfaces of the cavities defined by those corrugations having their apices furthest away from the axis and upstanding formations projecting from said base and extending between adjacent ones of said raised formations;

(b) causing said first die member to operatively engage said corrugated sheet on one side thereof such that the spaced raised formations are inserted within said cavities and engage the inside walls thereof and such that said upstanding formations are in engagement with those corrugations having their apices nearest said axis;

(c) causing a second die member of geometric configuration complimentary to said first die member to operatively engage said corrugated sheet in exact opposing relationship to said first die member such that said sheet is sandwiched therebetween; and

(d) forcing said first and second die members towards mating engagement with

bens 6 and 7 as they close on each other.

It will be appreciated that members 6 and 7 may be provided with a single row of formations 10 to be able to press a single row of formations 8 at a time on sheet 1 or it may be provided with a plurality of parallel spaced formations 10 to be able to press a plurality of rows of formations 8 at a time on sheet 1.

The radius of curvature for bending sheet 1 may be varied by varying the distance separating adjacent formations 8 thereon.

The sheet 1 shown in figures 5 and 6, which is of different cross-sectional configuration to that of the previous figures, may be similarly bent by forming a plurality of rib formations 8 thereon in a similar manner. It will be appreciated that the mating die members employed for bending this sheet will have operative faces complementary in configuration to that of the sheet to be bent.

The invention also includes within its scope apparatus for bending a sheet substantially as herein described.

Furthermore, the invention also includes within its scope sheets when bent according to any of the aforesaid methods.

It will be appreciated that while the term 'cladding material' has been used in this specification to include roofing sheets and the like it is to be understood that the use of the product for reservoirs, storage drums, sheds, vehicle canopies or other structures of a similar nature are to be included in the scope of this invention and the term 'cladding material'.

WHAT WE CLAIM IS:—

1. A method of bending a corrugated metal sheet as herein defined about an axis extending on one side of the sheet at right angles to the corrugations, including the step of pressing in those corrugations having their apices nearest the axis a plurality of rib formations projecting from the same side of the sheet when viewed from the axis, each rib formation being at an angle to the corrugations and extending over at least part of the side portions and at least part of the intermediate portion of a corrugation.

2. A method as claimed in claim 1 wherein each rib formation on a corrugation is continuous at least in the area where the side and intermediate portion of the corrugation meet.

3. A method as claimed in claim 1 wherein the rib formations are in rows each row being formed in one operation which is repeated at spaced intervals along the sheet in a direction parallel to the corrugations to give the desired degree of bending.

4. A method as claimed in claim 1

wherein the rib formations are in rows with a plurality of rows being formed in one operation which is repeated at spaced intervals along the sheet in a direction parallel to the corrugations to give the desired degree of bending.

5. A method as claimed in any of the preceding claims wherein the rib formations on the side portions in the direction away from the intermediate portions of those corrugations having their apices nearest the axis decrease in width and in height relative to the surface from which they project.

6. A method as claimed in any of the preceding claims wherein the rib formations are pressed to project from the surface on the other side of the sheet when viewed from the axis.

7. A method as claimed in any of the preceding claims wherein the rib formations are discontinued over at least part of the intermediate portions to define a drainage channel.

8. A method as claimed in any of the preceding claims wherein the rib formations extend at right angles to the corrugations.

9. A method as claimed in any of the preceding claims including the step of feeding the sheet in a direction parallel to its corrugations between a pair of mating die members adapted to press the rib formations in the corrugations.

10. A method of bending a corrugated sheet according to Claim 1 wherein the pressing of rib formations into the sheet comprises the steps of:

(a) providing a first die member having a substantially planar base, raised formations projecting from said base and spaced and contoured for substantial mating engagement with the wall surfaces of the cavities defined by those corrugations having their apices furthest away from the axis and upstanding formations projecting from said base and extending between adjacent ones of said raised formations;

(b) causing said first die member to operatively engage said corrugated sheet on one side thereof such that the spaced raised formations are inserted within said cavities and engage the inside walls thereof and such that said upstanding formations are in engagement with those corrugations having their apices nearest said axis;

(c) causing a second die member of geometric configuration complementary to said first die member to operatively engage said corrugated sheet in exact opposing relationship to said first die member such that said sheet is sandwiched therebetween; and

(d) forcing said first and second die members towards mating engagement with



one another with said corrugated sheet sandwiched therebetween such that said raised spaced formations and said up-
standing formations impress said plurality
5 of rib formations into said sheet.

11. A method of bending a metal cladding sheet about an axis disposed on one side of the sheet including the steps of providing the sheet with a plurality
10 of corrugations as herein defined extending at right angles to the axis and pressing in those corrugations having their apices nearest the axis, a plurality of rib
15 formations projecting from the same side of the sheet when viewed from the axis, the rib formations being at an angle to the corrugations and extending over at least

part of the side portions and at least part of the intermediate portions of the corrugations.

12. A method of bending a corrugated metal sheet substantially as herein described with reference to the drawings.

13. A method of bending a metal cladding sheet substantially as herein described
25 with reference to the drawings.

14. Metal sheets bent in accordance with any of claims 1 to 13.

15. Apparatus suitable for bending metal sheets according to the methods of
30 any one of claims 1 to 13 substantially as herein described with reference to figure 4 of the drawings.

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