Feb. 17, 1970 J. C. P. BOENDER 3,495,628

TUBULAR CONSTRUCTION

Filed Sept. 9, 1965 2 Sheets-Sheet 1

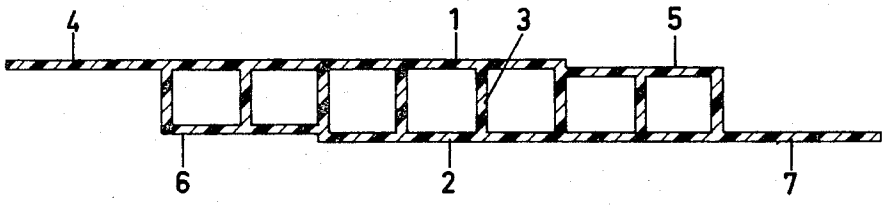

FIG. 1

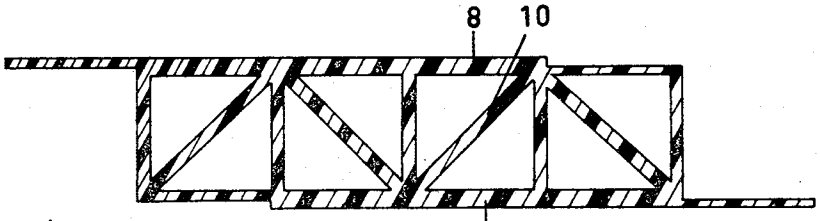

FIG. 2

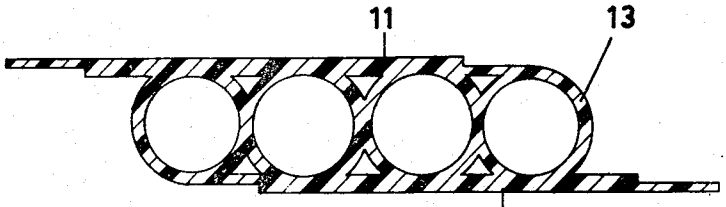

FIG. 3

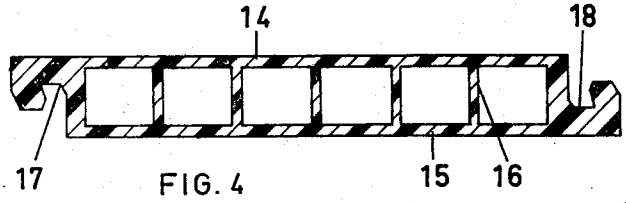

FIG. 4

Jacob Cornelis Pieter Boender

INVENTOR.

BY Wenderoth, Lind and Ponack

attorneys

Feb. 17, 1970 J. C. P. BOENDER 3,495,628

TUBULAR CONSTRUCTION

Filed Sept. 9, 1965 2 Sheets-Sheet 2

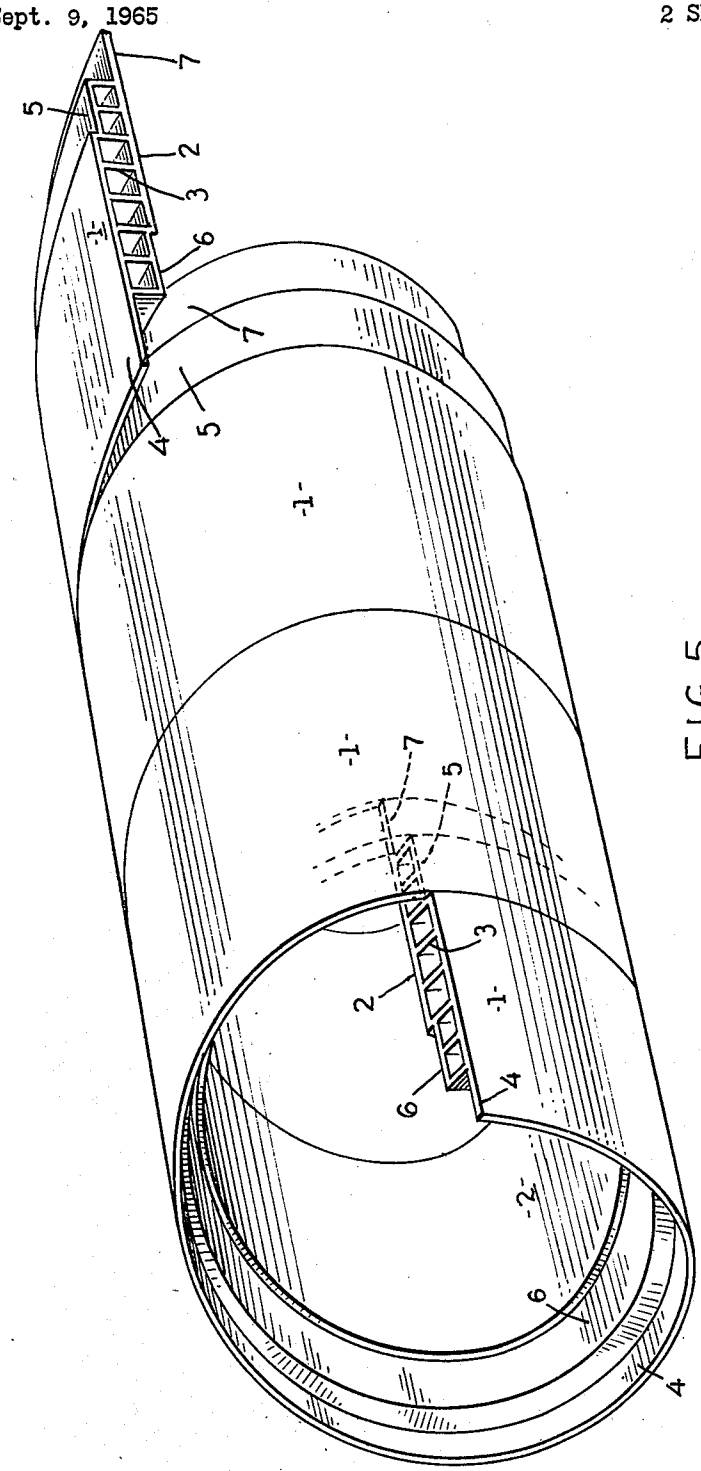

FIG. 5.

INVENTOR

JACOB CORNELIS PIETER BOENDER

BY Wenderoth, Lind & Ponack

ATTORNEYS

United States Patent Office 3,495,628
Patented Feb. 17, 1970

3,495,628

TUBULAR CONSTRUCTION

Jacob C. P. Boender, Enkhuizen, Netherlands, assignor to Polva-Nederland N.V., Enkhuizen, Netherlands

Filed Sept. 9, 1965, Ser. No. 486,086
Claims priority, application Netherlands, Sept. 14, 1964, 6410674
Int. Cl. F16l 9/18, 9/16, 9/12
U.S. Cl. 138—114 8 Claims

ABSTRACT OF THE DISCLOSURE

A tubular construction formed of material capable of being wound in a spiral having an inner wall and an outer wall spaced from but connected to the inner wall as by ribs, ridges or other closed formation. The marginal edges of the inner and outer walls are secured together, with the respective opposite marginal edges of said walls spirally overlapping with one another, with the outer marginal edge coacting with and overlapping the outer wall and the inner marginal edge coacting with and overlapping the inner wall. A finished tube is thereby formed having continuous smooth inner and outer wall surfaces.

When tubes or similar constructions are to be used in the ground and a considerable diameter is required in this case, the walls will have to be fairly thick, so the wall of the tube will stand up against soil- and water pressure (pressure on top). This will necessitate the use of a good deal of material, causing the construction to become heavy and awkward to handle. These difficulties will eventually also show up in the prime cost.

Now it is the object of the present invention to provide a tube or similar construction, having a light weight, which is rapidly and efficiently produced and medium-proof.

The characteristic feature of the tube construction, according to the invention, is, that the latter comprises an inner and outer wall, being interconnected and kept apart by means of cylinders, ribs, ridges, or the like, spirally wound around the axis of the tube.

The wall construction of the new tube contains relatively little material, therefore, it is light of construction, while naturally the price per running meter may be considerably less than in the case where the walls of the tube are made as a solid mass and the construction would have to absorb the same pressure on top.

An efficient construction is one made up out of a double-walled material, having spaced rigs or ridges, said strip being wound like a spiral, wherein the parts of the rim are joined together by welding, gluing or in some other way.

A suitable method is for the parts of the rim of the strip of duoble-walled material to be flattened and joined together while overlapping.

An efficient joining surface is obtained when the rim parts of the strip of double-walled material have been flattened gradually.

Depending on size and usage different embodiments may be applied. The spaced ribs-or ridges may, for example, be at right angles with the walls of the tube.

A further possibility is found in that the spaced ribs or ridges of a portion thereof are at some other angle than a right angle to the walls of the tube.

The spaced ribs or ridges or a portion thereof may also be bent, and more in particular, form a closed figure.

The parts of the rim which will constitute the actual adhesion points when the tube is being wound, may be glued or otherwise joined together. This can be combined with a mechanical way of joining, in particular a clamping lock.

Moreover, the invention relates to a method for producing a tube or similar construction, whereby, according to the invention, a cylinder, one or more ribs or ridges or such like are spirally wound around an inner wall and connected to said wall, while an outer wall is applied to the construction so formed and fastened thereto.

According to a further method a strip of double-walled material, having spaced ribs or ridges is taken as a starting point, said strip being wound spirally on a spindle, the rim parts being joined one to the other.

This interconnecting may be achieved by means of a suitable glue or some other means, for example by welding. A further possibility is, as mentioned above, a combination having a mechanical connection, i.e. a clamping lock between the rim parts per se.

A tube construction according to the invention may also be produced in a continuous working, with heated extrudable material being used for the material. The strip of material from which is started, is in that case extruded continuously in a device suitable to the purpose, and on leaving this device said strip is immediately wound to a spindle in a generally known manner.

It is also possible to manufacture the material from which the tube according to the invention is made, in predetermined length and put these on the market. This material will in that case have as the characterstic feature that it is double-walled, provided with spacing ribs or ridges and the parts of the rim are made in such a way that they may be connected.

The nature of the invention will now be further explained in connection with the accompany drawing, in which:

FIG. 1 is a vertical section through a strip of material according to the invention having cells, the wall thereof being at right angles;

FIG. 2 is a vertical section of a strip of material according to the invention, wherein at least several of the spacing ribs are at other angles than at right angles with the tube walls;

FIGURE 3 is a vertical section of a strip of material wherein the distance ribs or ridges are bent, forming, more in particular, a close figure;

FIGURE 4 is an embodiment corresponding mainly with that of FIGURE 1, the parts of the rim, however, producing a mechanical closure;

FIG. 5 is a perspective view showing the forming of a tube from the strip material of FIG. 1.

The tube construction according to the invention is manufactured from a strip of double-walled material, the the walls of this material being designated in the drawing by the numerals **1** and **2** (see FIGURE 1). Between said walls **1** and **2** spacing ribs or ridges are found, their heights, and thickness being adapted to the expected load, according to the use to which the tube will have to be turned. Also, the number of cells originating between walls **1** and **2** and the ribs or ridges **3** may deviate from FIGURE 1. In the drawing the parts of the rim or margins of the strip are flattened, such, that in the case a tube is folded from the strip, said parts of the margin will overlap, and taken together will have the same thickness as the total thickness of the double-wall. In the case as reproduced in FIG. 1 the overlapping of the marginal parts takes place gradually, therefore it will be considerable, and an efficient cover and a strong connection of the parts with one another will come to be. The folding or forming of the double-walled material takes place in a known manner round a spindle, said spindle being able to rotate and displaceable in a longitudinal direction, so the material will be wound in a spiral. After a full rotation rim part **4**, as reproduced on the left side of FIGURE 1, will be found on the part **5** on the right side of FIGURE 1. The flattened or recessed part **6** will fit with

part **7**, parts **6** and **7** together having again the full thickness of the strip of material and with the adjacent outermost ribs or ridges disposed in abutting relationship. In this way tubes may be wound having a relatively large diameter in which case said tubes are resistant to a considerable outside pressure. The requirements in the way of material are comparatively small, while the weight per running length unit is low. With a strip of double-walled material according to FIG. 1, tubes may be folded having a passage of 70 centimeters. The length of the profile in that case is in the range of 15 mm., and the width of the ribs and ridges is in the range of 1.5 mm. A tube of this kind will have a resistance against a pressure on the top of about eight times that of a tube with a massive wall having an identical passage, an identical weight and identical material. From FIG. 1 it is clearly shown how large a joining surface is formed between the parts of the rim producing a tight closure against mediums.

FIGURE 2 shows a vertical section of a cross-section of a double-walled profile strip deviating slightly from the cross-section as given in FIG. 1. The parallel walls are here designated by numbers **8** and **9**, and a plurality of ribs, one of which is given by number **10**, is at another angle than a right angle with walls **8** and **9**.

FIGURE 3 shows the case where the ribs and ridges are bent and make, more in particular, a closed figure, such as a circle **13**. The parallel walls are designated by numbers **11** and **12** in FIG. 3.

FIGURE 4 shows a special way of fastening of the parts of the rim or margins of the double-walled strip. The parallel walls are here given as **14** and **15** and the ridges as **16**. Here again the ridges are perpendicular to walls **14** and **15**.

The flattened parts of the rim are made in the shape of a hook, such, that the left profile **17** in FIG. 4 is completely complementary to the right profile **18** in said figure, wherein not only a clamping joint is found but also welding or glueing may be applied.

If a synthetic resin is selected for the material, the strip of material may be extruded and wound around the spindle in heated condition. For joining the parts of the rim a suitable agglutinant may be used, or the parts of the rim are welded together.

I claim:

1. A tube formed by spirally winding around an axis an elongated strip of flexible material such as heated plastic material having opposed marginal edges with adjacent turns of the strip secured together with their opposite marginal edges overlapping; said strip material which forms said tube comprising an inner wall and an outer wall radially spaced from said inner wall when wound in tube form; the opposed marginal edges of said flexible strip being constituted by laterally opposite extensions of said respective walls disposed in non-coplanar but parallel planes which are parallel to the axis of said tube, with one of said edges constituting an inner marginal edge extending from and coplanar with the inner wall in one generally axial direction of the tube; and with the other constituting an outer marginal edge extending from and coplanar with the outer wall in the opposite generally axial direction of the tube; means interconnecting said spaced walls; and said respective opposite marginal edges of said walls spirally overlapping with one another with said outer marginal edge coacting with and overlapping said outer wall of the next adjacent turn of said strip and said inner marginal edge coacting with and overlapping said inner wall of the next adjacent turn of said strip; and forming a finished tube having continuous smooth inner and outer wall surfaces.

2. A tube as defined in claim **1** wherein said means interconnecting said spaced walls include ribs integrally secured to and between said walls in a generally transverse manner relative thereto, and a pair of said ribs being spaced from each other and spaced inwardly from the terminl edge portion of each opposite edge to define abbutable wall portions when said strip is formed into said tube.

3. A tube as defined in claim **1** wherein the opposite marginal edges are flat and the respective spaced walls opposite their respective flat marginal edges are oppositely recessed to a depth corresponding to the thickness of the respective flat marginal edges so that when opposite edges are secured together responsive to the strip material being spirally wound they are secured by a stepped construction with each of said flat marginal edges coacting with and overlapping the corresponding recess portion of the adjacent wall.

4. A tube as defined in claim **3** wherein the strip material from which the tube is formed prior to its being spirally wound is of identical but oppositely disposed configuration about a longitudinal centerline of the elongated strip material to facilitate the forming of said tube by winding the strip material in either direction.

5. A tube as defined in claim **1** wherein said means interconnecting said inner and outer spaced walls include ribs disposed at right angles and secured to said walls.

6. A tube as defined in claim **1** wherein said means interconnecting said spaced walls include ribs, some of which are disposed at an angle to said walls and others including a pair of ribs disposed transversely to said walls and spaced from each other and spaced inwardly from the terminal edge portion of each opposite edge, to define interengageable wall portions when said strip is spirally formed into said tube.

7. A tube as defined in claim **1** wherein said means interconnecting said spaced walls include generally transversely disposed ribs which are bent so as to form closed figures between said walls and each other.

8. A tube formed by spirally winding a strip of flexible material such as heated plastic material having opposed marginal edges with adjacent turns of the strip secured together with their opposite marginal edges overlapping, said strip material which forms said tube comprising an inner wall and outer wall radially spaced from said inner wall when wound in tube form; the opposed marginal edges of said flexible strip disposed in generally non-coplanar planes and formed of like but oppositely facing complemental hook portions so that when said marginal edges are spirally adjoined to form said tube, a clamping interlocking joint is formed with said interlocking joint disposed spirally and generally transverse to the axis of said formed tube; means interconnecting said inner wall to said outer wall; and said tube having continuous smooth inner and outer wall surfaces when completely formed.

References Cited

UNITED STATES PATENTS

712,418	10/1902	Rudolph	138—135
1,519,694	12/1924	Muessman	138—114 X
2,524,522	10/1950	Gilmore et al.	138—111
2,874,722	2/1959	Hamblin	138—111 X

LAVERNE D. GEIGER, Primary Examiner

EDWARD J. EARLS, Assistant Examiner

U.S. Cl. X.R.

138—148, 150, 154