AUSTRAIA
Patents Act 1990

PATENT REQUEST: CONVENTION PATENT

We, DIPL.-ING.DR.ERNST VOGELSANG GMBH & CO.KG, being the person identified below as the Applicant, request the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying standard complete specification.

Full application details follow:-

Applicant: DIPL.-ING. DR. ERNST VOGELSANG GMBH & CO.KG
Address: Industriestraße 2, D-4352 Herten / Westf., Germany
Nominated Person: DIPL.-ING. DR. ERNST VOGELSANG GMBH & CO.KG
Address: Industriestraße 2, D-4352 Herten / Westf., Germany
Invention Title: CABLE CONDUIT BUNDLE OF A PLURALITY OF PLASTIC TUBES AND PRODUCTION METHOD
Name(s) of actual Inventor(s): Horst Vogelsang
Address for service in Australia: CALLINAN LAWRIE, 278 High Street, Kew 3101, Victoria, Australia

Attorney Code: CL

Convention Details

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<td>Germany</td>
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Drawing number recommended to accompany the abstract - Fig.1.

DATED this 9th day of July 1993.

DIPL.-ING. DR. ERNST VOGELSANG GMBH & CO.KG

By his Patent Attorneys:

CALLINAN LAWRIE

[Signature]
NOTICE OF ENTITLEMENT

We, DIPL.-ING.DR.ERNST VOGELSANG GMBH & CO.KG. of Industriestraße 2, D-4352 Herten / Westf., Germany being the applicant in respect of Australian Application entitled CABLE CONDUIT BUNDLE OF A PLURALITY OF PLASTIC TUBES AND PRODUCTION METHOD, state the following:-

The person nominated for the grant of the patent has entitlement from the actual inventor by employment of the inventor by the applicant.

The person nominated for the grant of the patent is the applicant of the basic applications listed on the patent request form.

The basic applications listed on the request form are the first applications made in a Convention country in respect of the invention.

DATED this 9th day of July 1993.

Colin D. Macouley
Patent Attorney for the Applicant
CABLE CONDUIT BUNDLE OF A PLURALITY OF PLASTIC TUBES AND PRODUCTION METHOD

1. Cable conduit bundle of a plurality of tubes made of thermoplastic plastics which can be joined by means of integrally formed and ductile, longitudinally extending connecting webs, and unbundled to form an even tubing aggregate having two outer tubes, and whereby conduit bundle sealing ribs, originating from a longitudinally extending integral forming line, are integrally formed on the outer tubes, characterized in that both conduit bundle sealing ribs (5) in cable conduit bundle (1) face each other and are welded together with a longitudinally extending weld seam (6).

11. Method of manufacturing a cable conduit bundle according to any of the claims 1 to 10, whereby an even tubing aggregate is extruded from plastic tubes, connecting webs and with conduit bundle sealing ribs in a production line by means of a plastics worm extruder, and whereby subsequent to extrusion the even tubing aggre-
Gate is continuously assembled according to the extrusion speed in the production line to form a cable conduit bundle, and immediately after this operation the conduit bundle sealing ribs are continuously welded together according to the extrusion speed.
AUSTRALIA
PATENTS ACT 1990

COMPLETE SPECIFICATION
FOR A STANDARD PATENT
ORIGINAL

TO BE COMPLETED BY APPLICANT

Name of Applicant: DIPL.-ING. DR. ERNST VOGELSANG GMBH & CO.KG

Actual Inventor(s): Horst Vogelsang

Address for Service: CALLINAN LAWRIE, 278 High Street, Kew, 3101, Victoria, Australia

Invention Title: "CABLE CONDUIT BUNDLE OF A PLURALITY OF PLASTIC TUBES AND PRODUCTION METHOD"

The following statement is a full description of this invention, including the best method of performing it known to me:
Specification

The invention relates to a cable conduit bundle consisting of a plurality of plastic conduits made of thermoplastic plastics combined by means of integrally formed and ductile, longitudinally running webs, and unbundable to form an even tubing aggregate having two outer tubes, and whereby conduit bundle sealing ribs are integrally formed onto said outer tubes starting from a longitudinally extending integral forming line. The invention relates also to a method of manufacturing such cable conduit bundles.

Cable conduit bundles are used for electric cables, fiber optic cables and the like, and mostly buried underground. Used for burial in the ground they regularly start from cable pits and run into cable shafts, cable entrances in buildings or the like. Cable conduit bundles buried underground are simultaneously pathbreaking inhomogeneities in the soil which so to speak represent clandestine water ways or even water routings for groundwater and infiltrating surface water that may disturbingly seep into cable pits, cable entrances in buildings or the like. In this respect cable conduit sealing ribs used with known cable conduit bundles serve for sealing the cable bundle. On the other hand cable conduit bundles must be sufficiently flexible during cable laying operations and in laid condition, in order to be absorptive for deformations without breaking during such laying operations and in ground depression areas.

Cable conduit sealing ribs on the known cable conduit bundle (DE-GM 92 06 473), from which the invention starts out,
are arranged in such a way that they start from the integral forming line on a plastic tube and tangentially sit close on the opposite plastic tube. A direct welding with the tube's outer wall is realized in the contact line thus formed by the tangential bearing. This has turned out to be useful but could be improved as far as production technique and function are concerned. In production technique is troubling that the welding, especially on thin-walled plastic tubes, must be executed very carefully in order not to damage the tube wall on which the weld seam is to be placed. If on the other hand the welding would be performed too carefully, there will be no guarantee that the weld seam is sufficiently tight under the loads to be absorbed. If the weld seam is not sufficiently tight, the sealing function is upset. Known cable conduit bundles and even tubing aggregates, of which they are formed, are manufactured without special measures according to the rules for extruding thermoplastic plastics into tubes and tubing aggregates.

The invention is based on the object to provide a cable conduit bundle of the design described above and with the purpose defined above, which can be manufactured in a simple way and on which the weld seam is and remains sufficiently tight under any normal loads. The invention is also based on the object to provide a method permitting to manufacture such a conduit bundle in a particularly simple mode.

In order to accomplish the object with respect to the cable conduit bundle, the invention teaches that both conduit bundle sealing ribs in the cable conduit bundle face each
other and are welded together by a longitudinally extending weld seam, whereby the integral forming lines of the conduit bundle sealing ribs in the cable conduit bundle appropriately face each other. According to a preferred embodiment, the arrangement is made in such a way that the connecting webs are integrally formed onto the outer tubes along connecting lines which diametrically face the conduit bundle sealing ribs. The longitudinally extending weld seam is preferably a continuous weld seam, but may have interruptions possibly so arranged that the intended imperviousness will not be affected.

The invention originates from the knowledge that a perfectly tight weld seam can be realized without any difficulties on a cable conduit bundle designed as described above at the purpose as described above, provided that the conduit bundle sealing ribs as described are welded against each other, i.e. that they are not welded onto the outer wall of the associated plastic tube. This direct welding of conduit bundle sealing ribs facing each other with each other can be performed without any difficulties and without damaging tubes made of plastics by applying customary and proven processes for welding thermoplastic plastics such as ultrasonic welding, laser welding or the like. An especially reliable embodiment of a cable conduit bundle according to the invention withstand any loads occurring is characterized in that the longitudinally extending weld seam on the conduit bundle sealing ribs is executed as contact weld seam with upwardly bent edge areas of the conduit bundle sealing ribs facing each other. To take into consideration that the weld seam must absorb defined loads either on winding the cable conduit bundle
according to the invention onto a cable drum or on laying it, or after it has been laid, the invention teaches that the plastic tubes in the centre of the cable conduit bundle are assembled with integrally formed core elements and/or integral forming elements, and stabilized by said core elements and/or integral forming elements as well as by the welded conduit bundle sealing ribs. Inspite of such stabilization it can be ensured without any difficulties that the cable conduit bundle remains sufficiently flexible either on winding it onto or reeling off a cable drum, or on laying it, or after having buried it underground in ground depression areas. The invention teaches also that a winding up tolerance defined and limited by the width of the welded conduit bundle sealing ribs is provided between plastic tubes and/or core elements and/or contact elements in the cable conduit bundle. This embodiment of the invention is of particular significance if the cable conduit bundle is provided with core elements and/or contact elements as described. There is always a possibility to bundle a plurality of even tube aggregates each containing several plastic tubes into one cable conduit bundle which has a larger number of plastic tubes as compared with the individual tube aggregates. To achieve this, at least one plastic tubes' connecting web of two conduit bundle sealing ribs can be welded together with overlap seam in the cable conduit bundle.

Another embodiment of a cable conduit bundle according to the invention standing out by a weld seam resisting high mechanical loads is characterized in that the conduit bundle sealing ribs have a weld seam executed as weld bead, which are formed by flatly welding together two partially
bead-shaped weld profiles with preformed welding faces integrally formed onto the edges of conduit bundle sealing ribs. Thereby, welding deposit may be arranged in inserted fashion between the weld profiles welded into the weld bead. According to the preferred embodiment of the invention, the inserted welding deposit is arranged in a weld groove integrally formed on the weld profiles.

A cable conduit bundle according to the invention can be manufactured in different ways. In particular, the even tubing aggregate can be manufactured, and the even tubing aggregates may be bundled into a cable conduit bundle already during the tubing aggregate production process or later in connection with laying the cable conduit bundle. Subject matter of the invention is also a method of manufacturing a cable conduit bundle according to the invention which may be integrated without taking any other measures into an existing production line for even tubing aggregates. In this method an even tubing aggregate consisting of plastic tubes, connecting webs, and with the conduit bundle sealing elements is extruded by means of a plastics worm extruder in a production line. Subsequent to extrusion, the even tubing aggregate is continuously assembled to a cable conduit bundle according to the extrusion speed in the production line, and the conduit bundle sealing ribs are immediately thereafter continuously welded according to the extrusion speed. As described, a tolerance for winding up the bundle onto a cable drum is provided during this process. According to the preferred embodiment of the invention, the conduit bundle sealing ribs are arranged face to face during the process of joining the tubing aggregates, whereby or whereafter a contact weld seam will
be formed. It is understood that in the scope of the invention the even tubing aggregate can also be calibrated subsequent to extruding the even tubing aggregate. The even tubing aggregate can be bundled to the cable conduit bundle after extruding by means of an auxiliary device. To facilitate the welding process, the invention recommends to extrude the even tubing aggregate with conduit bundle sealing ribs having longitudinally extending handling edge beads, and to separate the margins of conduit bundle sealing ribs with handling edge beads protruding from the weld seam by welding the conduit bundle sealing ribs together.

If the cable conduit bundle to be produced is provided with integrally formed weld profiles, the invention teaches a manufacturing method in which the even tubing aggregate is extruded with conduit bundle sealing ribs having on their edges the longitudinally extending, partially bead-shaped weld profiles with preformed welding faces, whereby the weld profiles are continuously welded according to the extrusion speed. It is thereby possible to arrange additional welding deposit between the welding faces during welding the weld profiles.

Cable conduit bundles according to the invention are now described in more detail with reference to a drawing illustrating an embodiment example only, in which (in schematic representation):

Fig. 1 is a cross section through a cable conduit bundle according to the invention,
Fig. 2 shows the even tubing aggregate to which the cable conduit bundle in Fig. 1 can be unbundled.

Fig. 3 illustrates section A from the object of Fig. 1 in substantially enlarged scale as compared with Fig. 1, and

Figs. 4, 5 and 6 illustrate other embodiments of a cable conduit bundle according to the invention corresponding to Fig. 1.

Fig. 7 illustrates another even tubing aggregate corresponding to Fig. 2 which may be bundled to a cable conduit bundle according to the invention.

Fig. 8 shows another embodiment of the object in Fig. 7.

Fig. 9 is a cross section through a cable conduit bundle which has been bundled from the tube aggregate in Fig. 7, and

Fig. 10 shows the enlarged section B of a welding on a cable conduit bundle of a tube aggregate corresponding to Fig. 8.

Each cable conduit bundle 1 shown in Fig. 1 as well as in Figs. 4, 5 and 6 consists of a plurality of cable conduit tubes 2 made of thermoplastic plastics which are assembled by means of integrally formed, ductile, longitudinally
extending connecting webs 3. Upon comparatively looking at Figs. 1 and 2, it becomes obvious that the cable conduit bundle 1 in Fig. 1 can be unbundled to form an even tubing aggregate. One recognizes on the other hand that the cable conduit bundle 1 can be formed from such an even tubing aggregate. Originating from a longitudinally extending integral forming line 4, conduit bundle sealing ribs 5 are integrally formed on the outer tubes 2 of the even tubing aggregate.

Both conduit bundle sealing ribs 5 are arranged face to face in the cable conduit bundle 1, and welded together by means of a longitudinally extending weld seam. In the embodiment shown by way of example, and in the preferred embodiment of the invention, the arrangement is provided in such a way that the integral forming lines 4 of the conduit bundle sealing ribs 5 in the cable conduit bundle 1 face each other. Besides, the connecting webs 3 are integrally formed on the outer tubes 2 along connection lines 7 which diametrically face the integral forming lines 4 for the conduit bundle sealing ribs 5 as illustrated in Fig. 2. In any case, the longitudinally extending weld seam 6 on the conduit bundle sealing ribs 5 is executed as contact weld seam with raising edge faces 8 of cable conduit sealing ribs 5 facing each other. Concerning this feature, specific reference is made to Fig. 3.

In Fig. 1 as well as in Figs. 4, 5 and 6 can be seen that the cable conduit tubes 2 in the centre of the cable conduit bundle 1 are placed side by side with integrally formed core elements 9 and/or integral forming elements 10, and stabilized by the core elements 9 and/or integral form-
ing elements 10 as well as by the welded cable conduit sealing ribs 5, which stabilization has been achieved in such a way that the cable conduit bundle 1 can be wound without any difficulties onto or reeled off a cable drum, can also be laid in curviform as well as absorb deformations occurring in ground depressions areas when buried underground. With any of these loads, the welded conduit bundle sealing ribs 5 are subjected to precisely defined stresses which are responsively absorbed, if a winding-up tolerance 11 is provided in the cable conduit bundle 1 between plastic tubes 1 and/or core elements 9 and/or contact elements 10 and defined and limited by the width of the welded conduit bundle sealing ribs. Such a tolerance 11 is intimated in Fig. 1. Taking a close look at Fig. 2 makes clear that there is a possibility to provide a cable conduit bundle 1 in which at least one connecting web 3 of plastic tubes 2 in cable conduit bundle 1 is welded together of two conduit bundle sealing ribs 5 with overlapping seam.

Fig. 2 shows a tubing aggregate 13 in which the conduit bundle sealing ribs 5 are provided with longitudinally extending handling edge beads 12. Dot-dash lines in Fig. 1 intimate the position of the boundaries of the handling edge beads 12 before welding. It is apparent that they can easily be gripped and manipulated, even by means of automatic welding equipment. Fig. 1 illustrates also that the faces of conduit bundle sealing ribs 5 with handling edge beads 12 protruding from weld seam 6 have been separated by welding the conduit bundle sealing ribs 5 together.
The tubing aggregate 13 shown in Figs. 7 and 8 is even. This plane extends vertically in Figs. 7 and 8. The tubing aggregate 13 can be joined together to form a cable conduit bundle 1 as shown in Fig. 9. The tubing aggregate 13 in the illustrated shape is extruded from thermoplastic plastics and consists of cable conduit tubes 2, connecting webs 3 and conduit bundle sealing ribs 5. The tubing aggregate 13 can be assembled to form a cable conduit bundle 1, whereby the connecting webs 3 are deformed, and the conduit bundle sealing ribs 5 welded together.

Figs. 7 and 8 show welding profiles 14 having a cross section in divided circle form and extending longitudinally on the longitudinal edge of the conduit bundle sealing ribs 5. The arrangement is provided in such a way that the welding profiles 14 in the cable conduit bundle 1 are weldable. In this respect, reference is made to a comparative consideration of Figs. 7 and 8 on the one hand, and Figs. 9 and 10 on the other hand.

In the embodiment according to Fig. 1, the welding profiles 14 have welding faces 15 and a semicircular cross section. In the cable conduit bundle 1, these welding faces 15 can be arranged flatly face to face and welded, see Figs. 9 and 10. Fig. 8 shows partial faces 16 of welding profiles 14 which can be joined in cable conduit bundle 1 to form a welding groove. In this respect, reference is made once more to Fig. 10 in which, however, the even tubing aggregate 13 corresponds to Fig. 8. It can be seen that a welding material 18 has been inserted into the then formed welding groove 17 during bundling (Fig. 10). This welding
material 18 may have been added during extrusion of the even tubing aggregate 13 by way of coextrusion.

Normally, the tubing aggregate 13 will be bundled to form the cable conduit bundle 1 subsequently to extruding the tubing aggregate 13, e.g. after calibration. The welding profiles 14 are welded together during the bundling operation. Thereafter, the cable conduit bundle 1 can be wound up on a cable drum.
The claims defining the invention are as follows:

1. Cable conduit bundle of a plurality of tubes made of thermoplastic plastics which can be joined by means of integrally formed and ductile, longitudinally extending connecting webs, and unbundled to form an even tubing aggregate having two outer tubes, and whereby conduit bundle sealing ribs, originating from a longitudinally extending integral forming line, are integrally formed on the outer tubes, characterized in that both conduit bundle sealing ribs (5) in cable conduit bundle (1) face each other and are welded together with a longitudinally extending weld seam (6).

2. Cable conduit bundle according to claim 1, characterized in that the integral forming lines (4) of conduit bundle sealing ribs (5) in cable conduit bundle (1) face each other.

3. Cable conduit bundle according to one of claims 1 or 2, characterized in that the connecting webs (3) are integrally formed on the outer tubes (2) along connecting lines (7) which diametrically face the integral forming lines (4) for the conduit bundle sealing ribs (5).

4. Cable conduit bundle according to any of claims 1 to 3, characterized in that the longitudinally extending weld seam (6) on the conduit bundle sealing ribs (5) is designed as contact weld seam with raised boundary areas (8) facing each other of the conduit bundle sealing ribs (5).
5. Cable conduit bundle according to any of claims 1 to 4, characterized in that the plastic tubes (2) are joined with integrally formed core elements (9) and/or joining elements (10) and stabilized by the core elements (9) and/or the joining elements (10) as well as by the welded conduit bundle sealing ribs (5) in the centre of the cable conduit bundle 1.

6. Cable conduit bundle according to any of claims 1 to 5, characterized in that a winding-up tolerance (11) is provided between the plastic tubes (2) and/or the core elements (9) and/or the contact elements (10) in the cable conduit bundle 1, and the said tolerance is defined and limited by the width of the welded conduit bundle sealing ribs (5).

7. Cable conduit bundle according to any of claims 1 to 6, characterized in that at least one connecting web (3) of two conduit bundle sealing ribs (5) on plastic tubes (2) is welded together with overlapping seam in the conduit bundle.

8. Cable conduit bundle according to any of claims 1 to 6, characterized in that the conduit bundle sealing ribs (5) are provided with a weld seam (6) designed as welding bead which is formed by flat welding of two partially bead-shaped sealing profiles (14) with preformed welding faces (15) integrally formed on the edges of the conduit bundle sealing ribs (5).

9. Cable conduit bundle according to claim 8, characterized in that weld deposit (18) inserted
between the welding faces (15) of the welding profiles (14) welded to form the welding bead (6) is provided.

10. Cable conduit bundle according to claim 9, characterized in that the inserted welding deposit (18) is provided in a weld seam (17) preformed on the welding profiles (14).

11. Method of manufacturing a cable conduit bundle according to any of the claims 1 to 10, whereby an even tubing aggregate is extruded from plastic tubes, connecting webs and with conduit bundle sealing ribs in a production line by means of a plastics worm extruder, and whereby subsequent to extrusion the even tubing aggregate is continuously assembled according to the extrusion speed in the production line to form a cable conduit bundle, and immediately after this operation the conduit bundle sealing ribs are continuously welded together according to the extrusion speed.

12. Method according to claim 11, whereby the conduit bundle sealing ribs during assembling the tubing aggregate are flatly positioned against each other, and thereby or thereafter a contact weld seam will be formed.

13. Method according to one of claims 11 or 12, whereby the even tubing aggregate is extruded with conduit bundle sealing ribs having longitudinally extending handling edge beads, and whereby faces of conduit bundle sealing ribs protruding from the weld seam are separated by welding the conduit bundle sealing ribs together.
14. Method according to one of claims 11 or 12, whereby the even tubing aggregate is extruded with conduit bundle sealing ribs provided with partially bead-shaped welding profiles with preformed welding faces extending longitudinally on their edges, and whereby the welding profiles are continuously welded together according to the extrusion speed.

15. Method according to claim 14, whereby welding deposit is additionally arranged between the welding faces during the welding operation.

16. Cable conduit bundle substantially as hereinbefore described with reference to the accompanying drawings.

17. Method of manufacturing a cable conduit bundle substantially as hereinbefore described with reference to the accompanying drawings.

DATED this 9th day of July 1993.

DIPL.-ING. DR. ERNST VOGELSANG GMBH & CO.KG
By their Patent Attorneys:
CALLINAN LAWRIE
Abstract

A Cable conduit bundle of a plurality of plastic tubes made of thermoplastic plastics which are joined by means of integrally formed and ductile, longitudinally extending connecting webs, and can be unbundled to form a tubing aggregate with two outer tubes, and whereby, originating from a longitudinally extending integral forming line, conduit bundle sealing ribs are integrally formed on the outer tubes. Both conduit bundle sealing ribs face each other in the cable conduit bundle and are welded together with a longitudinally extending weld seam.

- A method of manufacturing is also provided.

(To be published with Fig. 1).