

MULTI-CHAMBERED CONDUIT FOR OPTIC FIBRES

The present invention relates generally to a conduit assembly utilised to house a fibre optic cable and, in particular, to a conduit insert utilised to convert a single chambered conduit into a multi-chambered conduit capable of housing a plurality of fibre optic cables.

The use of telephonic communication is increasing throughout the world. In the past, as telephone use increased, additional electrically conductive cable was installed to accommodate the increased demand. In most metropolitan areas, cable used in the telephonic industry is typically placed in underground conduits. Generally, the underground conduit is an annular cross-section and is formed of a plastics material such as polyvinylchloride, for example. A conduit formed of a plastics material has several advantages which include: (1) a high strength to weight ratio, (2) the conduit is effective in providing a moisture-proof environment for protecting the cable, and (3) the plastic material of the conduit is inert and therefore has a long life-cycle.

The increase in telephone use in certain highly populated areas has made it economical for the telephone companies to commence some significant and expensive changes in the mode of transmitting information telephonically. As mentioned above, the

conventional medium used for conducting telephone messages has been cable formed of a plurality of individual electrically conductive wires. Many extraordinary developments have been made relating to increasing the efficiency of the telephone system by increasing the number of messages which can be conducted over a single wire. However, there are manifest limitations to the use of conventional, electrically conductive wires.

Recently, the telephone companies have had an additional option to consider when evaluating the parameters necessary to expand a given system to meet the increased demands. Fibre optics has presented an interesting possible option. Fibre optics can be successfully used for transmitting information by utilising light energy, rather than electrical energy, as the conveyor of the information. Among the advantages of utilising fibre optics is the increased rapidity in which information can be transmitted and the increased quanta of information which can be transmitted within a given cross-sectional area.

Therefore, at the point of time when the existing telephone cable network is at capacity and, in order to increase the capacity, the underground duct network would have to be replaced, fibre optics becomes a viable alternative. Since the physical characteristics of fibre optics are different from electrical cable, different handling and installation methods are required. For a number of

reasons, it is considered beneficial to house fibre optic bundles in discrete housings rather than the conventional single chambered conduit used to house the previous electrically-conductive cable.

5 The present invention relates to a multi-chambered conduit insert which can be utilised to convert a single chambered conduit into a multi-chambered conduit. In particular, the conduit insert includes a plurality of cooperating
10 longitudinally extending walls having curved outer surface portions and defining a plurality of parallel spaced apart coextensive chambers. When the conduit insert is inserted within the single chambered conduit, the curved outer surface portion
15 of at least one of the chambers in the lower half of the insert is in line-to-line contact with the adjacent inner supporting surface of the single chambered conduit, thus causing only minimal contact
20 with the interior wall of the existing conduit and enabling the multi-chambered conduit insert to be fed into the existing conduit with the expenditure of minimal energy. In the preferred embodiment of the invention, two identical conduit inserts are
25 disposed in back-to-back relationship and form an insert assembly for insertion into the single chambered conduit.

 It is an object of the present invention to produce a conduit assembly having a plurality of
30 discrete chambers for containing separate arrays or bundles of light energy transmitting glass fibres or

strands which comprise a typical fibre optic information transmission system.

Another object of the invention is to produce a conduit for use in the converting of an existing
5 single chamber conduit into a conduit having a plurality of discrete individual chambers.

Another object of the invention is to produce a multi-chambered conduit insert assembly which may be readily inserted into an existing single chamber
10 conduit.

Another object of the invention is to produce a multi-chambered conduit insert assembly having a cross-sectional configuration causing only minimal contact with the interior wall of an existing
15 conduit, thereby enabling the multi-chambered conduit insert assembly to be inserted within the existing conduit with the expenditure of minimal energy.

Another object of the invention is to produce a
20 multi-chambered conduit insert assembly formed of at least two identical inserts disposed in back-to-back relation in use within a single chambered conduit.

In the accompanying drawings:

25 Figure 1 is a perspective view of a multi-chambered conduit insert embodying the features of

the present invention;

Figure 2 is a cross-sectional view of the conduit insert illustrated in Figure 1 taken along line 2-2 thereof;

5 Figure 3 is a perspective view of typical installation equipment for the conduit insert illustrated in Figures 1 and 2; and

10 Figure 4 is a sectional view of the conduit inserts illustrated in Figures 1 and 2 inserted into an existing duct in back-to-back relation.

According to the present invention, there is provided a multi-chambered conduit insert comprising: at least a pair of spaced apart longitudinally extending walls having curved outer surface portions and defining first and second parallel spaced apart coextensive chambers, the longitudinal axes of the first and second chambers being substantially coplanar; and an intermediate wall having a curved outer wall surface portion cooperating with said pair of spaced apart walls to define a third chamber parallel and coextensive with the first and second chambers, the longitudinal axes of the third chamber spaced from and parallel with the plane of the longitudinal axes of the first and second chambers.

Figures 1 and 2 disclose the preferred embodiment of a conduit insert 8 which includes a pair of spaced apart longitudinally extending chambers 10 and 12. The chamber 10 is defined by an arched-shaped outer wall 16 and a bottom wall 18

extending between the ends of the arched wall 16. Similarly, the chamber 12 is defined by an arched-shaped outer wall 20 and a bottom wall 22 extending between the ends of the arched wall 20.

5 Disposed between and typically integral with the chambers 10 and 12 is an intermediate chamber 14. The chamber 14 is defined by an arched outer wall 24 of a configuration similar to the outer walls 16 and 20 defining the chambers 10 and 12,
10 respectively. The lower ends of the outer wall 24 merge with the outer walls 16 and 20, respectively. The bottom of the chamber 14 is defined by a laterally extending wall 26. The wall 26 cooperates with the facing portions of the walls 16 and 20 to
15 form an open channel 28 having a cross-sectional configuration of an inverted U.

 The structure illustrated in Figures 1 and 2 may be fabricated of a plastics material in continuous lengths by the known plastic extrusion
20 processes. Satisfactory results may be achieved by utilising a self-lubricating plastic material such as an olefin, for example. Low density polyethylene, a member of the olefin family, has been found to exhibit excellent results. The nature
25 of the plastic material imparts to the finished product appropriate physical strength and inertness to moisture. Since the product can be formed in continuous lengths, the individual chambers of the formed product are capable of housing bundles of
30 strands of fibre optic material in a discrete and

protected state.

Typically, the inserts embodying the inventive features are employed for converting existing single chambered ducts having a nominal outside diameter of approximately 10cm (4 inches) into a multi-chambered duct. In such installations, the outer configuration of the insert is caused to contact the outer duct in only line-to-line contact with the inner wall surface of the duct being retrofitted as will become clearly manifest hereinafter. The typical cross-sectional dimensions of the insert member include a 2mm (0.08 inch) wall thickness; the arcs of the arched walls 16, 20, 24 of the chambers 10, 12, 14, respectively, are struck on a 12mm (0.5 inch) radius; the height dimension A (Figure 2) is 44mm (1.725 inches); and the width dimension B (Figure 2) is 8cm (3.17 inches).

With the above described example, the extruded conduit inserts 8 of the invention may be coiled on separate reels 30 as illustrated in Figure 3, at the point of manufacture. The coiled product on the reels 30 may be transported to a job site on a vehicle 32 of the type illustrated in Figure 3.

The transporting vehicle 32 typically includes a mounting mechanism rotatably supporting at least two reels 30 and a suitable drive mechanism 34 for effecting a paying off of lengths of the individual conduit inserts in a back-to-back relationship as illustrated in Figure 3. The inherent cross-

sectional configuration of the individual inserts enables a single composite insert assembly 36 to be formed, as illustrated in Figure 4, wherein the outer wall 18 of the uppermost insert is juxtaposed to the outer wall 22 of the lowermost insert, and the outer wall 22 of the uppermost insert is juxtaposed to the outer wall 18 of the lowermost insert. It will be appreciated that the composite insert assembly 36 contains six (6) individual discrete chambers for housing separate bundles of fibre optic cables.

The typical installation procedure utilises a pulling clamp or halter arrangement secured to the leading end of the assembly 36 to be inserted. Thence, the inserted assembly 36 is pulled through the duct 38 by a suitable winch and cable arrangement. In Figure 4, it will be noted that usually the contact between the composite insert assembly 36 and the inner wall surface of the duct 38 occurs between the curved outer surface portions of the lower insert 8 and the adjacent inner surface of the duct 38. More specifically, the contact between the inner wall of the duct 38 is effected at a point on the curved surfaces of the outer walls 16, 20, 24 which define the chambers 10, 12, 14, respectively. Thus, when the insert assembly 36 is inserted within the duct 38, at least one of the curved outer surface portions of the lower insert is in line-to-line contact with the inner annular supporting surface of the duct 38. Such contact assures a stable locating of the composite insert

assembly 36 within the interior of the duct 38 and provides minimal surface-to-surface contact between the insert assembly 36 and the duct 38, thereby maintaining a low coefficient of friction between the composite insert assembly 36 and the duct 38 to facilitate the insertion or removal of the insert assembly 36 into or out of the associated duct 38.

While in the preferred embodiment of the invention shown in the drawings, the individual insert sections are adapted to be maintained in the desired position within the duct by means of the inner wall of the duct, it will be appreciated that means can be provided for attaching the two individual insert sections to one another prior to inserting the sections within the conduit. For example, the wall 18 of the insert section shown in Figure 2 can be provided with a downwardly depending and longitudinally extending locking lug portion (not shown) which can be inserted into a cooperating locking lug receiving groove formed in adjacent outer wall portions of the cooperating lower insert section (not shown). Similarly, the outer wall 22 and the adjacent wall of the cooperating lower insert section can be provided with a similar locking device. In these instances, the space between the two locking means can provide an additional chamber.

Also, while not shown in the drawings, it may be desirable in some instances to provide a means for identifying the individual chambers. For

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example, an identification means such as one or more longitudinally extending ribs, for example, can be moulded into the outer wall portion of each chamber to enable each chamber to be individually identified at any point along the entire length of the insert.

CLAIMS

1. A multi-chambered conduit insert comprising: at least a pair of spaced apart longitudinally extending walls having curved outer surface portions and defining first and second parallel spaced apart
5 coextensive chambers, the longitudinal axes of the first and second chambers being substantially coplanar; and an intermediate wall having a curved outer wall surface portion cooperating with said pair of spaced apart walls to define a third chamber
10 parallel and coextensive with the first and second chambers, the longitudinal axis of the third chamber spaced from and parallel with the plane of the longitudinal axes of the first and second chambers.
2. A multi-chambered conduit insert according to
15 claim 1, characterised in that said walls defining the first, second, and third chambers are formed of a plastics material.
3. A multi-chambered conduit insert according to
20 claim 1, characterised in that said plastics material is an olefin.
4. A multi-chambered conduit insert according to claim 2, characterised in that said plastics material is a low density polyethylene.
5. A multi-chambered insert assembly comprising,
25 in combination: a first and second insert each according to any of claims 1 - 4 positioned in back-



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to-back relationship wherein the first chamber of
said first insert is adjacent the second chamber of
said second insert and the second chamber of said
first insert is adjacent the first chamber of said
5 second insert.

6. A multi-chambered conduit assembly according to
claim 5 which further comprises an outer conduit
having a longitudinally extending internal
passageway wherein said first and second inserts are
10 positioned within the internal passageway of said
outer conduit such that at least one of the curved
outer surface portions defining the individual
chambers is in line-to-line contact with the inner
supporting surface of the internal passageway of
15 said outer conduit.
