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(56) Related Art  
**US 4735235 A**  
**US 3192850 A**  
**US 5095942 A**  
**JP 2001-182996 A**

ABSTRACT

This invention relates to ducting apparatus for use in domestic and industrial buildings for ducted heating and cooling and exhaust arrangements.

5 The ducting apparatus of the present invention principally relates to a branch take off ("Bto") (10) including at least three sections which are each formed separately and which each define a generally square or rectangular periphery, each section further defining an opening (13) for communication with ducting conduit connected to each said section, said sections being connected together  
10 by connecting means (14,15) at each of two opposite edges (16,17) of said generally square or rectangular periphery of each said section to define an interior space (S), said interior space (S) being open at opposite ends thereof and covering means (30) being employed to close each end, so that the Bto is closed other than at said openings of each said section.

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**STANDARD PATENT**

Invention Title: DUCTING APPARATUS

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

DUCTING APPARATUS

The present invention relates to ducting apparatus for use in domestic and industrial buildings for ducted heating and cooling and exhaust arrangements. The ducting apparatus of the present invention principally relates to branch connectors for connecting separate ducting sections and in particular to branch take off connectors which permit the branching of two or more ducts from a single duct. It will be convenient to describe the invention in relation to branch take off connectors, although it is to be appreciated however, that the apparatus is not restricted to this type of connector, and could include any type of connection employed to connect ducting sections.

Branch take off connectors employed in ducting systems are commonly known as "branch take offs" or "Y branches", the latter being a particular shape of branch take off which is Y shaped for connecting to 3 different ducts. Branch take offs are required to route ducting about the building in which it is to be installed and to balance a ducted heating or cooling installation. Branch take offs also permit abrupt changes in direction of the ducting and permit splitting of the ducting from a single duct to multiple ducts, most commonly from a single duct to a pair of ducts.

Branch take offs can be quite bulky. This is because they are required to accept for connection large diameter ducting. Typically ducting is cylindrical, ranging in diameter between 6" (150mm) to 20" (500mm), although smaller and larger diameter ducting does exist. Accordingly, branch take offs that connect to the ducting have openings of a diameter about equal to the ducting itself. Some of the larger Y branches can be in the region of 700mm square. Because of this, present Bto's require large amounts of room for storage and transport.

Branch take offs (hereinafter "Bto's") generally are manufactured from blow moulded plastic, although they can also be manufactured from sheet metal. The wall thickness of a blow moulded Bto can be about 3mm and therefore, while the Bto is quite bulky, it has relatively low weight. The bulk of the Bto's poses problems as far as storage and transportation are concerned and particularly in relation to transport, large vehicles are required for a relatively small number of Bto's, even though such vehicles have a capacity for transporting much greater weight than a load of plastic Bto's would have.

Bto's are also required to be provided in a wide range of sizes to suit the ducting that will be connected to them. This is because ducting systems often employ ducting having a variety of different diameters which the Bto's must accommodate principally for balance considerations. For example, ducting is generally provided in diameters ranging from 6" to 20" in 2" increments. A "Y" Bto may for example, be connected to three ducting sections of the same diameter, or to a larger diameter and two smaller equal diameters, or to three different diameters. An example of three different Y Bto's would be 16.14.14 Y, 16.14.12Y and 14.12.12Y, where the numerals indicate the diameter in inches of the three Bto openings in a Y Bto. If ten of each size is ordered, then 30 large Y Bto's are required to be stored and transported. Manufacturers and suppliers must therefore manufacture and store a large range of Bto's taking up a great deal of storage space and requiring large trucks for transport as discussed above.

It is an object of the present invention to overcome or at least alleviate one or more of the drawbacks associated with the prior art.

According to the present invention there is provided a branch take off ("Bto") including at least three sections which are each formed separately and which each define a generally square or rectangular periphery, each section further defining an opening for communication with ducting conduit connected to each said section, said sections being connected together by connecting means at each of two opposite edges of said generally square or rectangular periphery of each said section to define an interior space, said connecting means including a connector which cooperates with a lip formed on or adjacent each of a pair of adjacent said opposite edges of two of said sections to firmly connect said adjacent edges together, said interior space being open at opposite ends thereof and covering means being employed to close each end, so that the Bto is closed other than at said openings of each said section.

Any number of sections can be provided, although if a Y Bto is required, three sections are employed. In that arrangement, the Bto includes three sections which are each formed separately and which each define a generally square or rectangular periphery, each section further defining an opening for communication with ducting conduit connected to each said section, said sections being connected together by connecting means at each of two

opposite edges of said generally square or rectangular periphery of each said section to define a generally triangular configuration, said triangular configuration being open at opposite ends thereof and covering means being employed to close each end, so that the Bto is closed other than at said openings of each said section.

Alternatively the Bto may be formed as a cube to have four sections and covering means disposed at each of two opposite and open ends defined when the four sections are formed into a generally square or rectangular configuration. Yet again, the Bto may be hexagonal, or other shaped as appropriate, depending on the required number of openings for connection to ducting conduit.

The present invention further provides a method of assembling a Bto, said Bto including three sections which are each formed separately and which each define a generally square or rectangular periphery, each section further defining an opening for communication with ducting conduit connected to each said section, said method including connecting said sections together by connecting means, said sections being connected together at each of two opposite edges of said generally square or rectangular periphery of each said section so that the sections as connected define a generally triangular configuration, said connecting means including a connector which cooperates with a lip formed on or adjacent each of a pair of adjacent said opposite edges of two of said sections to firmly connect said adjacent edges together, said method further including connecting covering means to said triangular configuration to close said configuration at open opposite ends thereof.

Further discussion in relation to a Bto according to the invention will be made in respect of a Y Bto having three Bto sections. It should be appreciated however that, as discussed above, a Bto of a different shape is within the scope of the invention.

A Bto according to the invention advantageously can be assembled on-site prior to installation. Thus, the three Bto sections can be transport

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separately to the site of installation along with the relevant covering means and thereafter assembled together. Thus, the parts of the Bto may be stored and transported separately in a disassembled form, rather in a final form, so as to substantially reduce storage and transportation volume. Additionally, the Bto sections can be arranged to nest or stack together, further reducing transport and storage costs.

Moreover, each Bto section may be connected to ducting conduit prior to assembly as a Bto. As most Bto's are located either in the roof cavity of a building or below the floor (the "sub-floor cavity"), this advantageously assists installation of ducting because it is easier to connect ducting conduit to the Bto

in the open, rather than in the confined space of the roof or sub-floor cavity. This advantage is unique to the present invention, because an assembled Bto typically is too large to fit through a manhole in the ceiling or floor and therefore the Bto must be placed in the relevant cavity ready for later connection to the ducting conduit. By the present invention, the Bto sections can be connected to the ducting conduit outside the relevant cavity and fed into the cavity with the ducting conduit when that conduit is installed. The Bto sections are then assembled together within the cavity, which is a relatively easy task compared with connection of the ducting conduit to a Bto as required with prior art Bto's.

10 A Bto according to the invention also advantageously permits assembly of the Bto with openings of the required size or diameter. As discussed above, a wide variety of different opening sizes can be required, but in the present invention, all that is necessary is to select the sections having the correct openings and thereafter assembling those together according to the invention. 15 The openings aside, the sections themselves will have generally identical construction so that they connect together universally. This further assists with reduction in storage volumes, by enabling a manufacturer to manufacture a wide range of sections having different opening sizes or diameters and then simply selecting the sections having the correct sized openings for later 20 assembly of the Bto.

A further advantage of the manufacturer is not having to carry a wide variety Bto's having different opening combinations and the advantage here occurs because an order for Bto's that might require a wide variety of opening sizes may take a supplier some time to select from the wide variety that need to be stored. In contrast, in the present invention, sections defining different sized 25 openings can be stored along side each other so that an order received for a particular type of Bto can be fulfilled by retrieving three sections having the correct sized openings, instead of having to choose from a wide range of fully formed Bto's that have the correct combination of openings.

30 It is envisaged that the covering means will have a uniform shape and configuration to suit a particular variety of Bto sections. Accordingly, universal covering means may be provided to suit a particular size of Bto formed in the combination of opening sizes required.

The sections of the Bto can have any suitable form but in the preferred form, the sections have a backing section or flange which defines the opening and which depends from a connecting ring to which ducting is connected. The connecting ring typically will extend perpendicular to the plan of the backing section or flange, although it may alternatively be inclined inwardly such as frustoconically, so as to be nestable with a liked-shaped section.

The connecting ring typically will be cylindrical, although it could be otherwise shaped, such as square shaped. However, given the preference for circular shaped connecting rings, further discussion throughout this specification will be made in relation to that shaped ring only.

Moreover, the backing section or flange typically will be of square or rectangular configuration and connecting means will be provided along each of two opposite edges of the backing section or flange for connection to each of the other further sections forming the Bto.

The connecting means can take any suitable form and preferably they are of snap type connection for simple assembly on-site. The connecting means can include male and female connectors formed along or adjacent to the opposite edges of the backing section or flange of each of the sections for connection between the sections. Alternatively or additionally, a connector may be provided to engage each of a pair of adjacent opposite edges of two sections which are connected together at the adjacent edges. The connector may engage or cooperate with a lip formed on or adjacent each of the adjacent edges to firmly connect the edges together. The connector may be slid into engagement with the edges or may be a snap-fit over the edges. The connecting means may further include an arrangement so as to provide against leakage of air at the point of connection between the respective sections and that arrangement may include overlapping lips that depend from the edges of the backing section or flange. Other arrangements, such as rubber or foam seals could equally be employed.

The cover means also can take any suitable form and in one form, it consists of a substantially planar member having a plurality of male members extending from one broad face of the planar member, for insertion in a plurality of openings provided at the open ends of the part assembled Bto. These may be formed integrally with the planar member, or they may be separate for

insertion through openings in the planar member, which openings align with the openings at the open ends of the Bto. The male members may lock behind an edge of the opening it is received by and the locking may be a snap-fit arrangement. Alternatively, the male members may be split locking members, which resiliently flex inwardly to extend through the respective openings and then expand outwardly to engage the under surface of the backing section or flange surrounding the opening, for a secure connection. The backing section or flange may include lips at each of the end edges thereof which depend inwardly in a direction opposite the extent of the connecting ring, for the formation of openings to receive the male members.

The attached drawings show an example embodiment of the invention of the foregoing kind. The particularity of those drawings and the associated description does not supersede the generality of the preceding broad description of the invention.

Figure 1 is a perspective view of one section of a Bto according to the invention.

Figure 2 is a perspective view of a part assembled Bto according to the invention.

Figure 3 shows a connecting arrangement for connecting adjacent sections of a Bto according to the invention.

Figure 4 is a perspective view of a cover for use in a Bto according to the invention.

Figure 5 shows an alternative connecting arrangement for connecting adjacent sections of a Bto according to the invention.

Referring to Figure 1, a section 10 of a Bto according to the invention is shown in perspective view. The section includes a generally planar backing part or flange 11 (hereinafter "backing flange"), and an opening 12 from which a connecting ring 13 extends. The connecting ring 13 is circular and has an axial extent from the backing flange 11 suitable for connection of ducting thereto. Ducting which is normally employed in ducting systems comprises a wire coil about which a flexible duct wall is wound. This permits the ducting flexibility for routing about a building and advantageously, the wire coil can be made to sit behind lugs (not shown) formed on the connecting ring 13 which resist

disconnection of the ducting from the connecting ring. Additionally or alternatively, the ducting can be taped to the connecting ring 13.

The section 10 further includes fingers 14 and lips 15 which depend from edges 16 and 17 respectively of the backing flange 11 in a direction opposite to the extent of the connecting ring 13. The lips are provided in pairs and the  
5 second of the pair depends from the opposite edges 17'.

Referring to the fingers 14, they form part of the connecting means for connecting respective sections 10 together to form an assembled Bto. An illustration of an assembled Bto is shown in Figure 2 and from this figure it is  
10 seen that three Bto sections 10 are connected together in a triangular configuration to form an assembled Bto which defines an interior space "S". The fingers 14 of each section 10 therefore are configured for snap connection in slots formed on an adjacent edge of an adjacent section. The connection may alternatively take any other suitable form. However a snap connection  
15 type permits the sections to be quickly and easily snap connected together in a secure manner. A snap connection of any suitable form may be employed, such as that shown in Figure 3. In this figure, the male member 18 is receivable within the female member 19 in a snap lock form which resists disconnection.

It will be appreciated that the fingers 14 do not extend perpendicular to  
20 the backing flange 11, but rather they extend at an end of approximately 60° to the backing flange.

An alternative form of connection between adjacent sections 10 is shown in Figure 5. In that figure, only the adjacent edges are illustrated and each edge  
25 36 includes an outer lip 37. The arrangement includes a connector 38 which bridges the edges 36 and which includes a channel or slot 39 on each arm 40 thereof, to accept the lips 37 and to thereby hold the edges 36 together. The connector 38 is made from relatively stiff plastic or metal to ensure a firm hold. To enhance the connection between the edges 36, the edges can mate by including a male/female slot and rib arrangement 41.

The lips 15 facilitate connection of cover means to the assembled Bto of  
30 Figure 2. Each of the lips 15 includes a pair of openings 20 (see Figure 1) for receipt of a locking spigot to close the opening 21 shown in Figure 2.

Figure 4 shows a cover 30 which can be used to close the opening 21 in the Bto assembly of Figure 2. The cover 30 is triangular in configuration and

includes a main planar body portion 31 and depending lips 32 which depend from edges 33. The lips 32 are arranged to engage over the upper edges of each of the sections 10 of Figure 2, so as to securely locate the cover 30 in place. The cover 30 further includes a plurality of split locking spigots 34 which are positioned for receipt within the openings 20 in each of the lips 15. The spigots 34 are arranged to resiliently flex inwardly for insertion within the openings 20 and then to flex outwardly following insertion to lock against an underneath surface of the lips 15 and to thereby secure the cover in place. A further cover 30 is applied to the opposite end of the Bto, so that the Bto is closed apart from the openings 12.

A Bto according to the accompanying drawings advantageously can be stored and transported in part form and easily assembled on-site. Moreover, it is clearly evident that the diameter of the opening 12 of each section 10 can be chosen as per the requirements of the particular installation so that the assembled Bto can have any combination of available opening sizes.

The invention described herein is susceptible to variations, modifications and/or additions other than those specifically described and it is to be understood that the invention includes all such variations, modifications and/or additions which fall within the spirit and scope of the above description.

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The claims defining the invention are as follows:

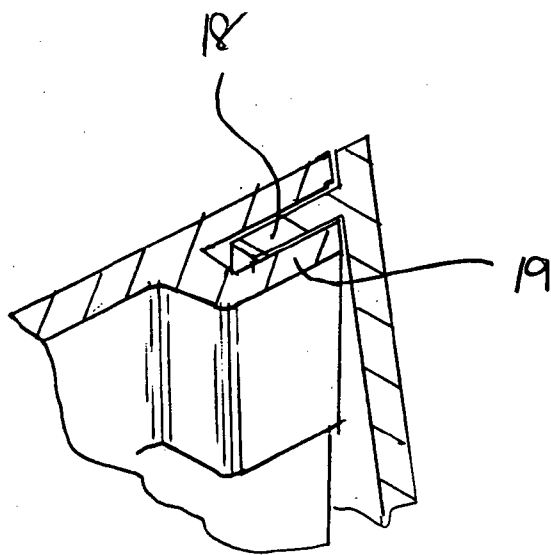
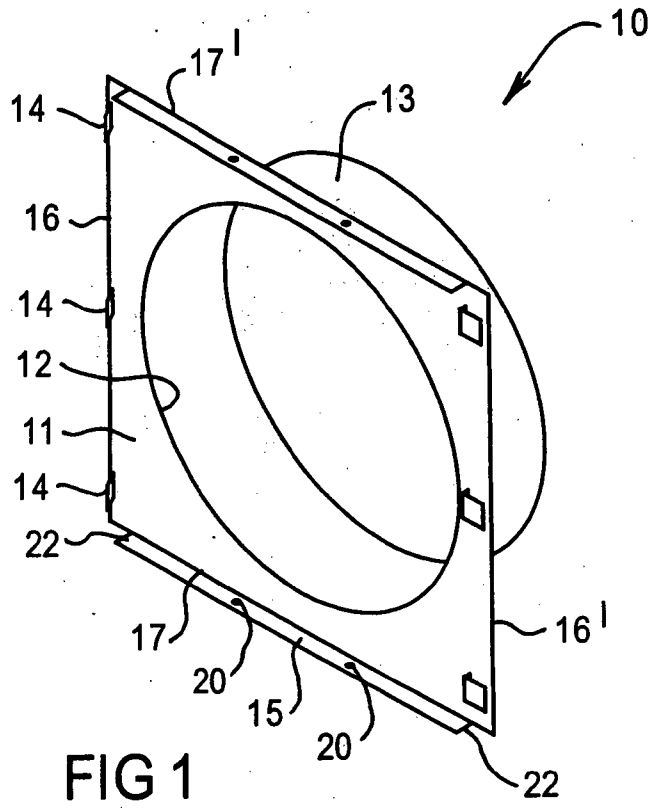
1. A branch take off ("Bto") including at least three sections which are each formed separately and which each define a generally square or rectangular periphery, each section further defining an opening for communication with ducting conduit connected to each said section, said sections being connected together by connecting means at each of two opposite edges of said generally square or rectangular periphery of each said section to define an interior space, said connecting means including a connector which cooperates with a lip formed on or adjacent each of a pair of adjacent said opposite edges of two of said sections to firmly connect said adjacent edges together, said interior space being open at opposite ends thereof and covering means being employed to close each end, so that the Bto is closed other than at said openings of each said section.
2. A Bto according to claim 1 each said section having a planar flange which defines said generally square or rectangular periphery and said opening, a ducting conduit connecting ring depending from said flange about said opening and extending outwardly from said flange.
3. A Bto according to claim 1 or 2, one or more of said openings of said sections being of different size to the other of said openings.
4. A Bto according to any one of claims 1 to 3, said two opposite edges of each said section periphery being arranged for abutment respectively with one of said two opposite edges of each of the other of said sections and said connecting means connecting said abutting edges together.
5. A Bto according to claim 4, said abutting edges being arranged to nest together.
6. A Bto according to any one of claims 1 to 5, said connecting means including a plurality of male/female connectors disposed along or adjacent said opposite edges.

7. A Bto according to any one of claims 1 to 6, said connector being slidable into connecting engagement with said adjacent edges.
- 5 8. A Bto according to any one of claims 1 to 6, said connector being a snap fit into connecting engagement with said adjacent edges.
9. A Bto according to any one of claims 1 to 8, including three sections that define a generally triangular configuration.
- 10 10. A Bto according to claim 9, said covering means comprising a pair of generally planar triangular members, one applied to each of said opposite ends of said triangular configuration.
- 15 11. A Bto according to any one of claims 1 to 8, including four sections that define a generally square or rectangular configuration.
12. A Bto according to claim 11, said covering means comprising a pair of generally planar square or rectangular members, that are applied to each of
- 20 said opposite ends of said generally square or rectangular configuration.
13. A Bto according to claim 10 or 12, each said member being fitted to said configuration by snap-fit connection.
- 25 14. A branch take off ("Bto") including three sections which are each formed separately and which each define a generally square or rectangular periphery, each section further defining an opening for communication with ducting conduit connected to each said section, said sections being connected together by connecting means at each of two opposite edges of said generally square or
- 30 rectangular periphery of each said section to define a generally triangular configuration, said connecting means including a connector which cooperates with a lip formed on or adjacent each of a pair of adjacent said opposite edges of two of said sections to firmly connect said adjacent edges together, said triangular configuration being open at opposite ends thereof and covering

means being employed to close each end, so that the Bto is closed other than at said openings of each said section.

5 15. A method of assembling a Bto, said Bto including three sections which are each formed separately and which each define a generally square or rectangular periphery, each section further defining an opening for communication with ducting conduit connected to each said section, said method including connecting said sections together by connecting means, said sections being connected together at each of two opposite edges of said  
10 generally square or rectangular periphery of each said section so that the sections as connected define a generally triangular configuration, said connecting means including a connector which cooperates with a lip formed on or adjacent each of a pair of adjacent said opposite edges of two of said sections to firmly connect said adjacent edges together, said method further  
15 including connecting covering means to said triangular configuration to close said configuration at open opposite ends thereof.

20 16. A Bto substantially as herein described with reference to the accompanying drawings.



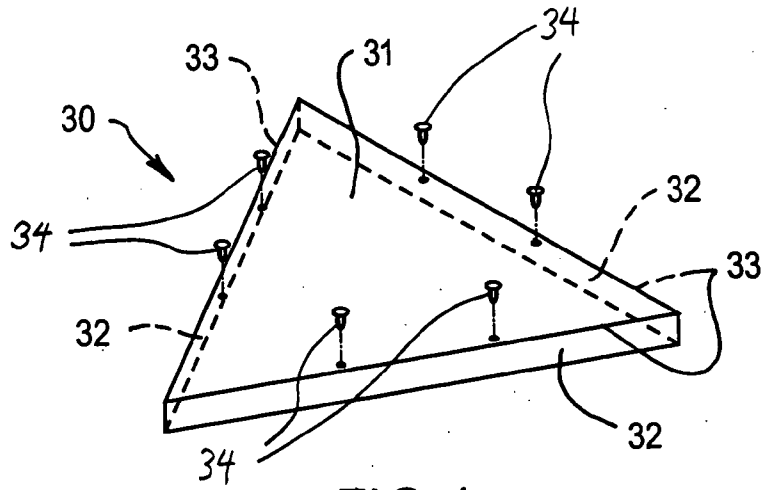


FIG 4

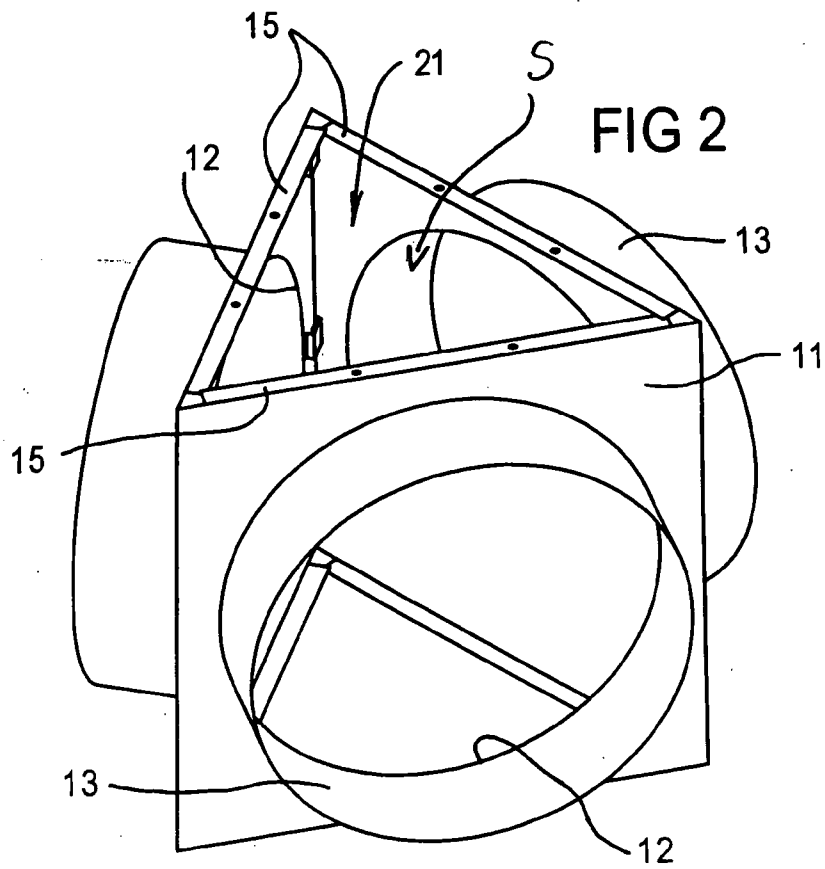


FIG 2

FIG 5

