An insulated plenum box, such as a ceiling box or any other metal plenum box, for heating, ventilating and air conditioning (HVAC) duct systems is produced faster and cheaper than prior art devices by having insulation sprayed onto either the inside or the outside of the plenum box to match the R-value of the connecting insulated HVAC duct, saving time, labor, and cost for the end user by eliminating the step of insulating the plenum box at installation.
SPRAY COATED INSULATED PLENUM BOX
AND METHOD

CROSS-REFERENCE TO RELATED
APPLICATIONS

[0001] Not Applicable.

STATEMENT REGARDING FEDERALLY
SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable.

THE NAMES OF THE PARTIES TO A JOINT
RESEARCH OR DEVELOPMENT


BACKGROUND OF THE INVENTION

[0004] 1. Field of the Invention

[0005] The present invention relates to ductwork for heating, ventilating, and air conditioning (HVAC) systems, and particularly to an insulated plenum box, such as a ceiling box or boot or any other metal plenum box which has a pre-sprayed coating of insulation on the interior and/ or exterior thereof for the purpose of reducing heat transfer and the method for carrying out the pre-spraying.

[0006] 2. Description of Related Art Including Information Disclosed Under 37 CFR 1.97 and 1.99

[0007] Conventional indoor central air conditioning and heating equipment heating, ventilating, and air conditioning (HVAC) systems comprise a blower which forces air through a heat exchanger, all contained within one or more cabinets coupled between an air intake and distribution ducting. Typically, a final chamber, or plenum, is coupled to the outlet of the last cabinet, and one or more ducts extend to remote registers where air is expelled into the living space, eventually to return to the central air intake.

[0008] While there are prior art plenum boxes with insulation installed in them but usually requiring installation of the insulation by the contractor or end user installing the plenum boxes, and some ceiling boxes formed from insulating material, the prior art fails to provide a ceiling box with insulation sprayed on either the inside or the outside of the box to match the resistance value (R-value) of the ducts. The effectiveness of insulation to stop the flow of heat is given in its resistance value, or R-value.

[0009] U.S. Pat. No. 4,735,235, issued Apr. 5, 1988 to Anderson, provides an insulated duct end system comprising a low-cost, simple, and efficient duct system for conveying heated and/or cooled air throughout a building. The system includes duct assemblies and transition components for interconnecting the duct assemblies. Each duct assembly includes an insulated duct having a rigid sleeve within at least one end. Each sleeve includes an abutment ring and orifices in the ring for permitting air to flow into the insulated layer to balloon the layer and improve its insulating effect. Each transition component includes a rigid external skeleton and a plurality of insulating duct board panels fitted therein. After the sleeves are fitted within openings in the duct board panels, the tabs are deformed to retain the abutment rings in engagement with the panels.

[0010] U.S. Patent Application #20030051764, published Mar. 20, 2003 by Jungers, is for an air handling system ductwork component comprising a tubular, foam interior layer integrally formed with a thin, non-metal outer layer. The combination interior and outer layers are characterized as providing requisite strength for use of the ductwork component within an air handling system without inclusion of a metal-based layer. In one preferred embodiment, the interior layer is a closed cell foam, and the outer layer is plastic, with the ductwork component being formed as part of a rotational molding process. The ductwork component can assume a wide variety of forms, such as a duct, pipe, elbow, boot, tee, plenum, reducer, register, wall stack, take-off, etc.

[0011] Two U.S. Pat. No. 5,095,942 issued Mar. 17, 1992 and U.S. Pat. No. 5,219,403, issued Jun. 15, 1993 both to Murphy, show a plastic self-insulating ductwork system of adjustable preformed ductwork for the conveyance of a fluid. The system uses a distribution box which includes an upper portion having a plurality of walls and a bottom plate. The distribution box may act either as a diffuser boot or as a splitter box. The distribution box is joined to interconnecting duct lines by adaptor conduits. The adaptor conduits are duct line which are adapted at one end for connection to an opening in a wall and are adapted at the other end for connection to adjoining duct line. A valve having a housing, a first cone and a second cone is also included in the system either in a duct line or in an adaptor conduit. The first and the second cone have matching apertures. The second cone is rotatable within the first cone such that the matching apertures may be selectively aligned or misaligned to adjust the flow of the fluid through the ductwork system.

[0012] U.S. Pat. No. 3,985,158, issued Oct. 12, 1976 to Felter, claims a box for mounting diffusers, wherein the main body of the box is made of insulative expanded plastic or other similar material, and wherein one or more connection elements are molded within the walls of the box to provide for connection of the box to a building structure and to a duct, and to reinforce the box.

[0013] U.S. Pat. No. 6,231,704, issued May 15, 2001 to Carpinetti, describes an insulated air duct apparatus including insulated duct modules and associated insulated fitting apparatus for transferring a volume of fluid in a warm air heating and air conditioning installation without employing external insulation or structural support members, otherwise required to support and insulate duct apparatus including a plurality of lightweight duct modules in combination with take-off connectors for joining such modules. Each duct module comprises duct walls joined by corner members wherein said duct walls and take-off connectors comprise rigid fibrous glass (RFGB) with reinforced facing having inherent structural strength such that each duct module is self supporting.

[0014] U.S. Pat. No. 3,559,560, issued Feb. 2, 1971 to Tranahan, discloses a ceiling box for distributing air down into a room from a suitable furnace or cooler. The entire interior of the box, including the top, is lined with a suitable insulating material.

[0015] What is needed is a pre-sprayed insulated plenum box, such as a ceiling box or any other metal plenum box for heating, ventilating and air conditioning (HVAC) duct systems which is produced faster and cheaper than prior art devices by having insulation sprayed onto either the inside or the outside of the plenum box, the insulation having the
same R-value as the insulation in standard flexible ducting used in commercial and residential HVAC installations.

**BRIEF SUMMARY OF THE INVENTION**

[0016] An object of the present invention is to provide a pre-sprayed insulated plenum box, such as a ceiling box or any other metal plenum box for heating, ventilating and air conditioning (HVAC) duct systems which is produced faster and cheaper than prior art devices by having insulation sprayed onto either the inside or the outside of the plenum box to provide the same R-value as the insulated ducts, and to save time and labor for the end user by having a pre-insulated plenum box that is installed in the ceiling and connected to the insulated HVAC duct, for a ready made fully-insulated HVAC duct system.

[0017] Another object of the present invention is to provide an insulated plenum box, such as a ceiling box or any other metal plenum box, for HVAC duct systems that saves time and labor for the end user by eliminating the need to insulate the ceiling box during installation.

[0018] One more object of the present invention is to provide an insulated plenum box, such as a ceiling box or any other metal plenum box, for HVAC duct systems that reduces costs for the end user by eliminating the need for insulation material and equipment at installation.

[0019] A further object of the present invention is to provide an insulated plenum box, such as a ceiling box or any other metal plenum box, for HVAC duct systems that has the same R-value as the insulation in standard flexible ducting used in commercial and residential HVAC installations.

[0020] In brief, a pre-spray-coated insulated plenum box, such as a ceiling box or any other metal plenum box for HVAC duct systems is produced faster and cheaper than prior art devices by having insulation pre-sprayed onto either the inside or the outside of the plenum box to the desired R-value to match the insulated ducts and saves time, labor, and cost for the end user by eliminating the step of insulating the plenum box, such as a ceiling box or any other metal plenum box at installation.

[0021] An advantage of the present invention is that it reduces the time and labor for insulating a plenum box, such as a ceiling box or any other metal plenum box.

[0022] One more advantage of the present invention is that it saves time and labor for installing a plenum box, such as a ceiling box or any other metal plenum box.

[0023] An additional advantage of the present invention is that it reduces costs for insulating a plenum box, such as a ceiling box or any other metal plenum box.

[0024] A further advantage of the present invention is that the insulation in the plenum box, such as a ceiling box or any other metal plenum box has the same R-value as the insulation in standard flexible ducting used in commercial and residential HVAC installations so that the entire duct system has the same R-value.

**BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS**

[0025] These and other details of my invention will be described in connection with the accompanying drawings, which are furnished only by way of illustration and not in limitation of the invention, and in which drawings:

[0026] FIG. 1 is a cross-sectional view taken through the centerline of a pre-sprayed coated insulated plenum box of the present invention with insulation pre-sprayed on the interior surface and the plenum box mounted in the ceiling and connected to an HVAC duct;

[0027] FIG. 2 is a cross-sectional view taken through the centerline of the pre-sprayed coated insulated plenum box of FIG. 1 with insulation pre-sprayed on the interior surface;

[0028] FIG. 3 is a cross-sectional view taken through the centerline of the pre-sprayed coated insulated plenum box of the present invention with insulation pre-sprayed on the exterior surface;

[0029] FIG. 4 is a perspective view of the pre-sprayed coated insulated plenum box of FIG. 1 with insulation pre-sprayed on the interior surface.

**DETAILED DESCRIPTION OF THE INVENTION**

[0030] In FIGS. 1-4, a pre-sprayed coated insulated plenum box 20 and 20A device, such as a ceiling box or any other metal plenum box for a heating, ventilating or air conditioning (HVAC) duct system provides a pre-spray coated insulated plenum box to match the R-value of the insulated ducts allows quick installation for an end user.

[0031] A metal plenum box such as a ceiling box 20 and 20A has a rectangular bottom section 21 for attachment to the ceiling by attaching hinges 28 and a top cylindrical section 25 for attachment to the HVAC ducts 31. The metal plenum box has a rigid structure with a bottom vent opening 30 and a top duct connecting opening for interconnecting with at least one HVAC duct 31, an interior surface 19 housing a passageway 24 interconnecting the vent opening and the duct connecting opening, an exterior surface 18 attachable at a bottom end to an opening in the ceiling 40 and attachable at a top end to the at least one HVAC duct 31, and at least one layer of pre-sprayed insulation coating 23 covering at least one of the surfaces to match the R-value of the insulated ducts. The pre-sprayed insulation coating insulates the plenum box and restricts temperature losses from the plenum box so that the pre-spray coated insulated plenum box device may be directly installed by a user in a ceiling and connected to insulated HVAC ducts for a completely insulated duct system with the same R-value throughout.

[0032] In FIGS. 1, 2 and 4, in one embodiment, at least one layer of sprayed insulation coating 23 covers the interior surface 19 of the plenum box 20.

[0033] In FIG. 3, in another embodiment, at least one layer of sprayed insulation coating 23 covers the exterior surface 18 of the plenum box 20A.

[0034] The metal plenum box may also be installed in a raised floor or other return air plenum space in an HVAC system.

[0035] In FIGS. 2 and 3, the method of pre-spray coating insulation 23 on a metal plenum box 20 for an (HVAC) duct system comprises pre-spraying at least one layer of insulation coating 23 that has the same R-value as the insulation 33 of standard flexible ducting 31 used in commercial and residential HVAC systems, using a spray nozzle 50 from an insulation pump or compressor to cover at least one of the surfaces of the plenum box to match the R-value of the ducts. This insulates the plenum box and restricts temperature losses from the plenum box, thereby forming a pre-
spray coated insulated plenum box device to install with insulated ducts to form a duct system with a uniform R-value throughout.

[0036] In FIG. 2, in one embodiment, the method comprises pre-spray coating insulation 23 on the interior surface 19 of the metal plenum box 20.

[0037] In FIG. 3, in another embodiment, the method comprises pre-spray coating insulation 23 on the exterior surface 18 of the metal plenum box 20A.

[0038] In use, the end user directly installs the pre-spray coated insulated plenum box 20 and 20A, such as a ceiling box or other metal plenum box in a ceiling 40 or other return air plenum space, securing the plenum box in the return air plenum space with 2×4 blocks 41 on at least two edges of the plenum box and connects the pre-spray coated insulated plenum box 20 and 20A to insulated HVAC ducts 31 for a completely insulated duct system with a matching R-value throughout.

[0039] It is understood that the preceding description is given merely by way of illustration and not in limitation of the invention and that various modifications may be made thereto without departing from the spirit of the invention as claimed.

What is claimed is:

1. A pre-sprayed coated insulated plenum box device, such as a ceiling box or any other metal plenum box for a heating, ventilating or air conditioning (HVAC) duct system, the device comprising:
   a metal plenum box comprising a rigid structure having a vent opening and a duct connecting opening for interconnecting with at least one insulated HVAC duct, an interior surface housing a passageway interconnecting the vent opening and the duct connecting opening, an exterior surface attachable at one end to an opening in a building structure and attachable at an opposite end to the at least one HVAC duct, and at least one layer of pre-sprayed insulation coating of a desired resistance value (R-value) to match the duct covering at least one of the surfaces to insulate the plenum box and restrict temperature losses from the plenum box so that the
   pre-spray coated insulated plenum box device may be directly installed by an installer in a ceiling and connected to insulated HVAC ducts for a completely insulated duct system with a matching R-value throughout.

2. The device of claim 1 wherein the at least one layer of sprayed insulation coating covers the interior surface.

3. The device of claim 1 wherein the at least one layer of sprayed insulation coating covers the exterior surface.

4. A method of pre-spray coating insulation on a plenum box, such as a ceiling box or any other metal plenum box, for a heating, ventilating or air conditioning (HVAC) duct system, the method comprising:
   a step of pre-spray coating insulation on a metal plenum box comprising a rigid structure having a vent opening and a duct connecting opening for interconnecting with at least one insulated HVAC duct, an interior surface housing a passageway interconnecting the vent opening and the duct connecting opening, an exterior surface attachable at one end to an opening in a building structure and attachable at an opposite end to the at least one insulated HVAC duct, the step comprising pre-spraying at least one layer of insulation coating to cover at least one of the surfaces to insulate the plenum box to match the resistance value (R-value) of the at least one insulated HVAC duct and restrict temperature losses from the plenum box to form a pre-spray coated insulated plenum box device so that a user may directly install the pre-spray coated insulated plenum box in a building structure and connect the pre-spray coated insulated plenum box to insulated HVAC ducts for a completely insulated duct system having a uniform R-value throughout.

5. The method of claim 4 comprising pre-spray coating insulation on the interior surface of the metal plenum box.

6. The method of claim 4 comprising pre-spray coating insulation on the exterior surface of the metal plenum box.