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DUCT-TO-REGISTER CONNECTOR

Filed Dec. 18, 1968

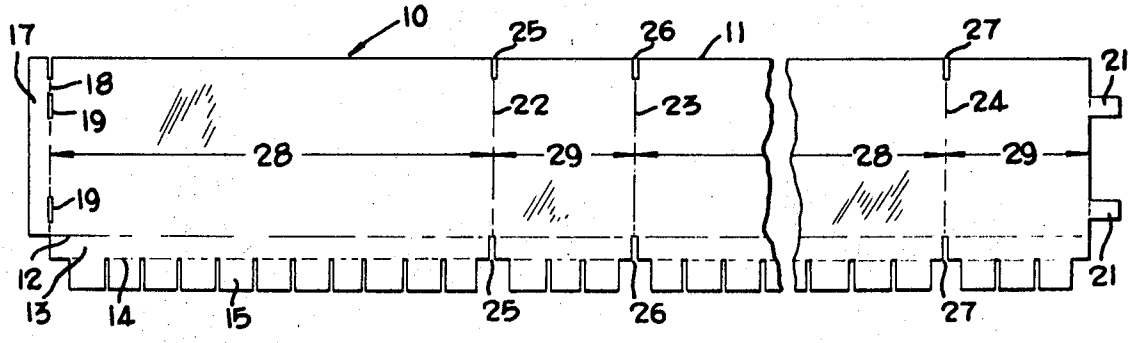

FIG. 1

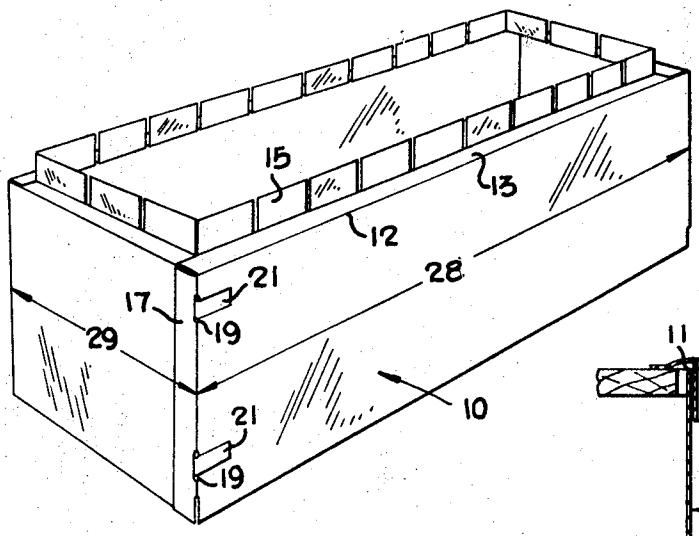

FIG. 2

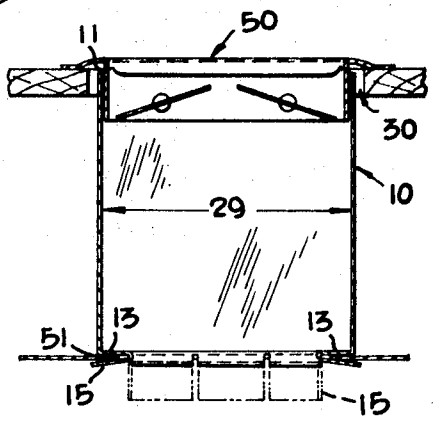

FIG. 4

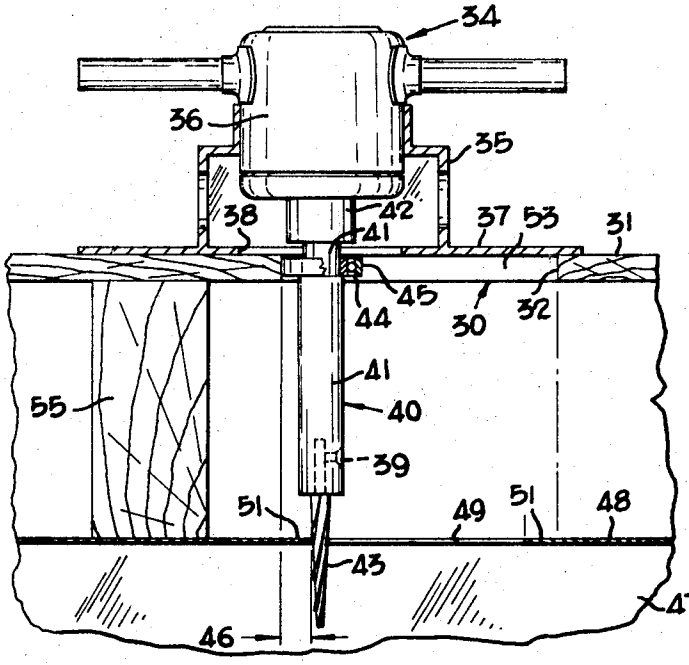

FIG. 3

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DUCT-TO-REGISTER CONNECTOR

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ABSTRACT OF THE DISCLOSURE

Openings in air ducts, beneath floor and wall surfaces, are cut by a routing process; and connected to rectangular surface register apertures by a readily installed duct connector section. Using the surface for alignment and its aperture edge for guiding a circular bearing guide, a routing tool projects through the aperture to cut a registering, smaller rectangular duct opening. Onto the margin around the duct opening is installed the inward end of a duct connector section, whose projecting tabs are manually bent into the opening for securement.

BACKGROUND OF THE INVENTION

Air ducts, utilized for heating or air conditioning, ordinarily extend fairly closely adjacent to floor and wall surfaces, being sepaarted from the floors or walls by supporting structures, such as joists or columns. Heretofore there has been no quick, simple and inexpensive way of locating and cutting the duct openings and making connections therefrom to surface registers. As applied to factory-fabricated housing units, such as mobile homes, which have heating ducts beneath the floor joists, this problem has interfered with rapid mass production.

A procedure heretofore employed has been to cut a rectangular opening in the floor or wall surface, and then seek to cut an opening of the same size in registration therewith, and then to install a straight duct connector section between them. It has not been possible to do this accurately in mass production.

SUMMARY OF THE INVENTION

New sheet metal duct-to register connectors are fabricated to standard size. Preferably they are blanked and partly formed at a factory, and may be shipped stacked compactly together, for final bending at the site of installation. A sheet metal strip, foldable to a rectangular cross-section to fit within a register aperture, has a margin along one of its longer edges to bend an inward shoulder, and bendable tabs extending therefrom. The shoulder seats against the outer margin of a duct opening smaller than the room surface aperture for the register.

Also provided is a new routing tool of the type having an extension shaft with a cutter end, the tool body having supporting means which define a plane for sliding the tool perpendicular to the shaft. Guide means concentrically surround the cutter shaft. The preferred guide means is a bearing mounted on the shaft and whose radius substantially exceeds the effective radius of the cutter end, normally a replaceable bit.

In the following out the method of the invention, a rectangular aperture is first cut in the room surface. The shaft of the routing tool is inserted in it until the cutting end of the tool penetrates the wall of the duct inwardly of the room surface, while the room surface serves as a plane of reference on which the tool slides; in this way the routing tool shaft is maintained perpendicular. With the outer side of the guide bearing in contact with the rectangular edge of the aperture, the tool is guided around its four sides, thereby routing a rectangular opening in the duct. Such duct opening is perfectly centered

in registration with the room surface aperture; and it is spacedly smaller than the aperture along each side by a margin which equals the excess of the radius of the guide means over the radius of the cutting end.

The duct-to-register connector is then inserted through the room surface aperture until its shoulder rests upon the outer margin of the duct opening and the tabs extend into the opening. The installer reaches through the connector to bend its tabs back manually under the duct wall, to receive it in place. A surface register is then installed in the connector opening.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view of a sheet strip shown in flat pattern, which is foldable to form the present duct-to-register connector.

FIG. 2 is a perspective view of the connector as folded, prior to installation.

FIG. 3 is a side view, partly in section, of the routing tool, its bearing being guided by the edge of a room surface aperture to cut a smaller, registering duct opening.

FIG. 4 is a side view, principally in section, showing the duct connector of FIG. 2 as finally installed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Duct-to-register connectors utilizing the present invention may be blanked in quantity and preliminarily partially folded at the factory, for subsequent installation as hereinafter to be described.

A sheet metal strip generally designated **10**, shown in FIG. 1, is blanked to a pattern suitable for bending the present duct-to-register connector section. The strip **10** is generally rectangular; one of its longer edges serves as the outer edge **11** against which a register, such as the register generally designated **50** and shown in FIG. 4, is to be fitted. The distance to be spanned by such a connector is the spacing from the room surface, in which the register is to be installed, to the wall **48** of a duct **47** beneath it. This distance is ordinarily within the feasible reach of a routing tool such as herein described; and may be no greater than the thickness of the floor or other room surface plus that of the joists or other support structure.

At a distance from the outer edge **11** equal to such span is a bend line **12**, beyond which is a margin **13** which when bent forms an inward shoulder along one of the longer edges of the metal strip **10**. From the margin **13**, and extending beyond a second bend line **14**, are bendable tabs **15**, spaced at intervals.

At one end of the strip **10** is a closing margin **17**, outward of a third bend line **18** which is perpendicular to the outer edge **11**. Two slots **19** are blanked within this bend line **18**. At the other end of the strip **10**, two projecting tabs **21** are formed, of such width and spacing as to be insertable within the slots **19**.

In order that the strip may be readily bent into a rectangular connector section, edge notches **25, 26** and **27** demark additional bend lines **22, 23, 24** perpendicular to the outer edge **11**. These bend lines divide the strip **10** to define the rectangular length **28** and width **29**, of the connector section to be folded. The bendable tabs **15** are spaced sufficiently away from the bend lines **18, 22, 23, 24** to provide clearance when the strip **10** is finally folded into the connector section shown in FIG. **2**. As shown in FIGS. 1 and 2, clearance from the bend lines **18, 22, 23, 24** is sufficient when such spacing away from the bend lines substantially equals the width of the margin **13**.

As much work shall be performed at the factory where the strip **10** is made, as is consistent with easy shipment. Accordingly, on initial manufacture its closing margin **17** is bent at 90° along the bend line **18**; the margin **13** is

bent at 90° in the same direction to form the inward shoulder, and the tabs **15** are bent back at 90° therefrom. Connector strips so bent may be shipped nested compactly together. At the time of final assembly, the configuration shown in FIG. 2 is completed by bending along the bend lines **25, 26, 27,** inserting the tabs **21** inwardly of the closing margin **17** and through the slots **19,** and closing them as shown.

The method of cutting a duct opening, inwardly of and centered in registration with a room surface aperture, is shown in FIG. 3. First, a rectangular aperture, generally designated **30,** is cut in a room surface such as the floor **31,** to predetermined rectangular dimensions, such that the longer edges **32** of the aperture **30** are slightly greater in length than the length **28** of the connector to be formed and the aperture width **33** is similarly greater than its width.

For the cutting operation, a hand routing tool, generally designated **34,** is used, which includes a ventilated body **35** mounting an electric motor **36.** Supporting the body **35** is a slidable base plate **37** having a large central aperture **38.** A rotatable routing cutter, generally designated **40,** includes an extension shaft **41** whose upper portion is mounted within a chuck **42** whose axis is perpendicular to the plane of sliding of the base plate **37.** A relatively narrow cutting end or router bit **43** is mounted in the lower portion of the shaft **41** by a set screw **39.** The bit **43** may be straight; or if slightly tapered, over its useful cutting portion, such taper is sufficiently small, compared with the other dimensions hereinafter referred to, that for practical purposes the radius of such cutting end **43** may be thought of as being substantially constant. The shaft **41** is of the largest diameter which the router chuck **42** will accept; its rigidity provides extended reach for the tool **34,** adequate to reach the duct **47** as hereafter described.

Mounted on the extension shaft **41** is a bearing, such as the rotatable bearing **44,** whose circular outer edge **45** serves as guide means which surrounds the shaft concentrically adjacent to and below the plane of sliding. As seen in FIG. 3, the radius of the circular edge **45** exceeds the effective radius of the cutting end **43** by a difference in radius **46.**

A sheet metal duct generally designated **47,** for carrying air from a furnace or air conditioner, is installed closely beneath or inward of joists **55** which support the floor **31.** A problem met by the invention is how to cut into its upper surface **48** a rectangular opening **49,** precisely aligned or centered in registration with the room surface aperture **30.**

The steps followed in the present invention are as follows: the rotatable tool **40** is extended into the surface aperture **30,** and its cutting end **43** penetrates the duct surface **48.** The room surface **31** serves as a plane of reference, on which the base plate **37** slides, with the shaft **41** being thus guided perpendicularly to the room surface **31.** Using the outer bearing surface **45** as a side guide means, which the operator maintains firmly in contact with the surface aperture edges **32, 33,** the routing tool **34** is moved progressively along these edges. As it is so guided and moved, an opening **49** is routed in the duct **47,** centered precisely in registration with the room surface aperture **30** but smaller along each side. The amount by which it is smaller, indicated in FIG. 3 by the margin **51,** equals the difference in the guide radius **46** and the effective radius of the cutter end **43** of the routing cutter **40.**

All that remains is final assembly. The duct-to-connector section folded from the strip **10** as shown in FIG. 2, is inserted through the room surface aperture **30** so that its margin **13,** bent to form an inward shoulder, rests on the margin **51** around the duct opening **49;** and the connector tabs **15** extend into the opening **49** as shown in dashed lines. The installer then reaches through the connector and manually bends the tabs **15** back towards the shoulder **13,** as shown by the solid lines in FIG. 4, securing the connector firmly to the duct wall **48.** A surface register **50** is then installed within the top opening and overlaying the edge of the room surface aperture **30,** as shown in FIG. 4.

Various detailed changes or alternatives in the construction of the duct-to-connector section such as in the configuration of the sheet metal strip **10,** and of the guide around the shaft of the routing tool **34,** as well as differences in the method of installation, described will suggest themselves. For example, the guide means which projects beneath the plane of sliding may be mounted onto some nonrotating part of the routing tool, and its projecting guide edge need not be circular as long as its center is substantially concentric with the shaft **41.**

I claim:

1. A duct-to-register connector blank adapted for installation by folding, comprising:

a generally rectangular sheet metal strip integrally including a first bend line spaced from and parallel to one of its longer edges,

three notches extending perpendicularly from said edge to said first bend line whereby to designate other bend lines along which the strip may be folded to rectangular cross-section,

means at the ends of said strip to engage said ends to each other when said strip is folded to rectangular cross-section, and

bendable tab portions extending from said edge and terminating short of said first bend line and only a single margin contained between said first bend line and the terminating portions of said tabs, said tabs extending along those portions of the length of the strip which are spaced away from said other bend lines so designated whereby when said strip is folded to a rectangular cross-section such spacing from said other bend lines provides clearance for the tab portions when the margin portion, across which the notches extend, is bent 90° inward into such rectangular cross-section to form a small rectangle from which the tab portions extend, after bending, at substantially right angles.

2. The duct-to-register connector defined in claim **1,** in which the spacing of the tab portions from said other bend lines substantially equals the width of said margin.

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U.S. Cl. X.R.

29—190, 420; 30—286; 90—13; 98—114; 285—189