Aug. 16, 1966 W. H. GOETTL 3,266,524

DUCT STRUCTURE

Filed May 20, 1963 3 Sheets-Sheet 1

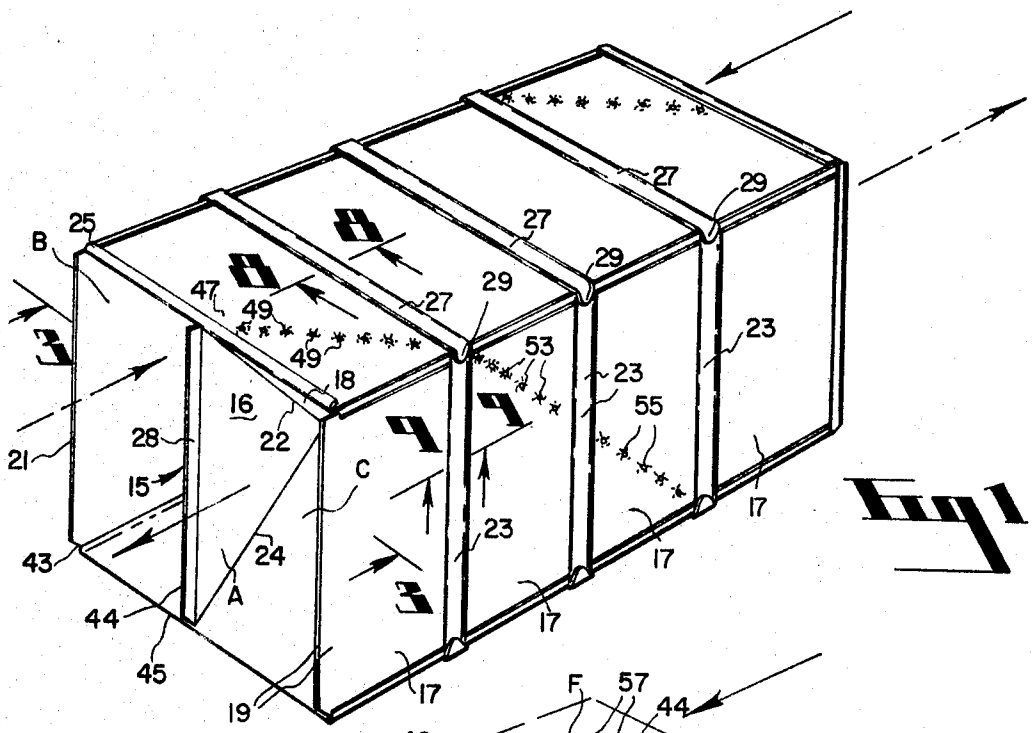

Fig. 1

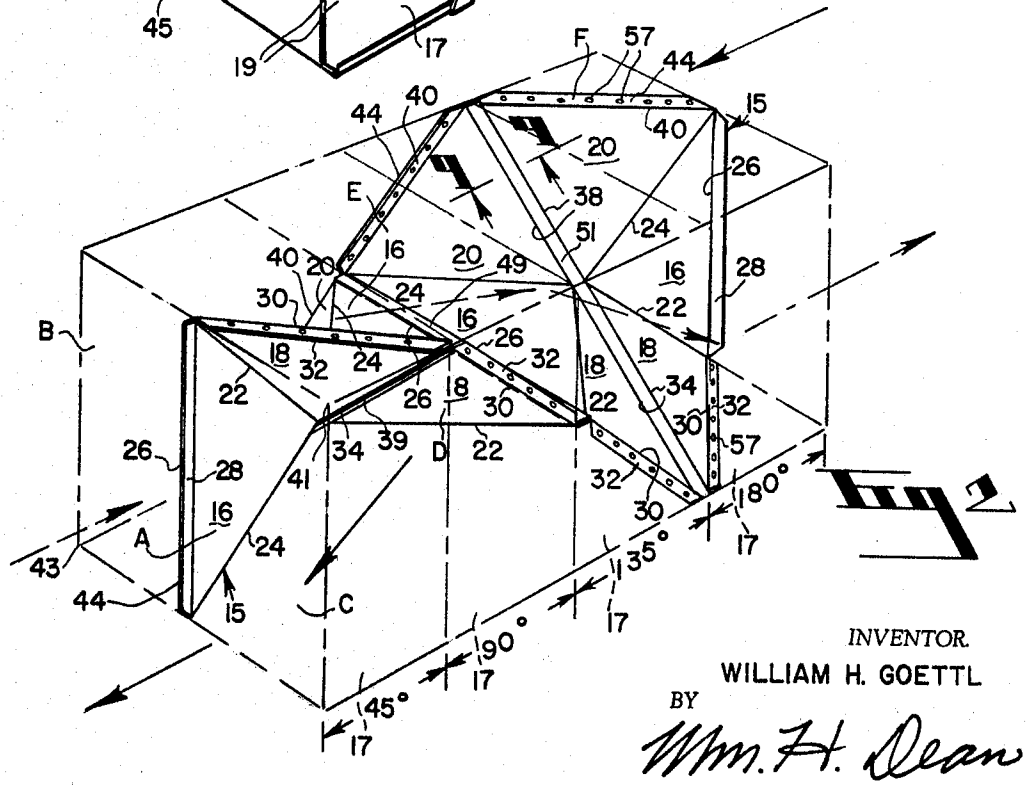

Fig. 2

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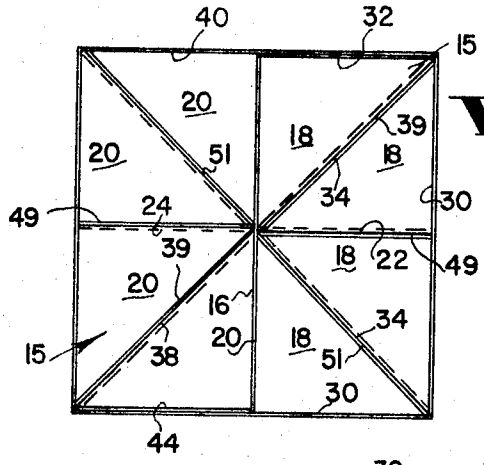

Fig 3

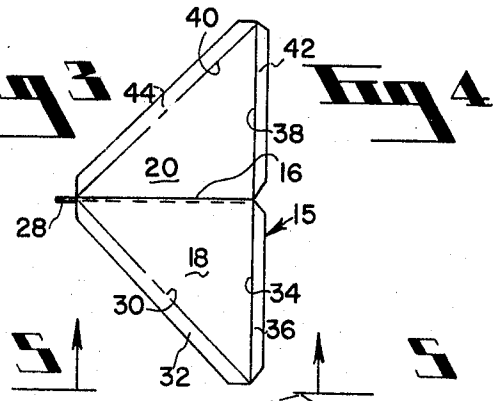

Fig 4

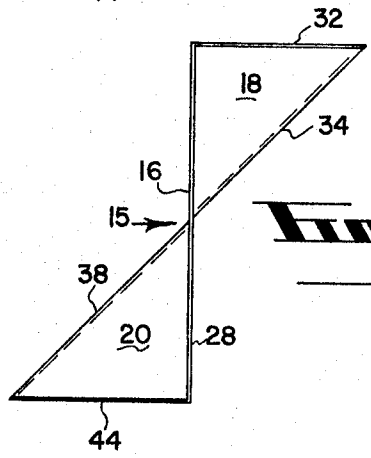

Fig 6

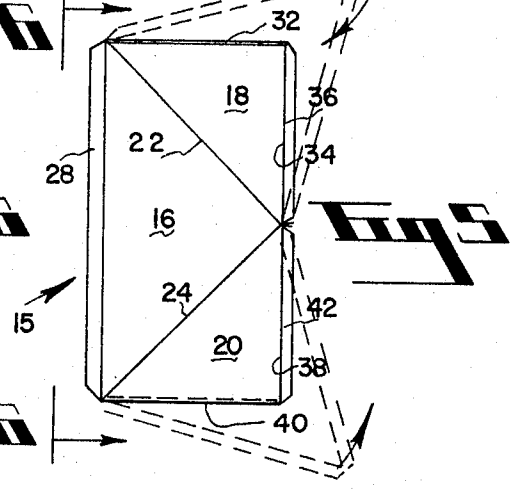

Fig 5

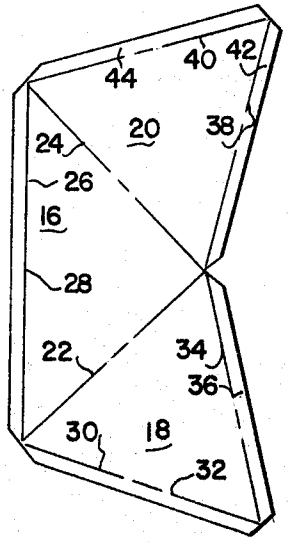

Fig 7

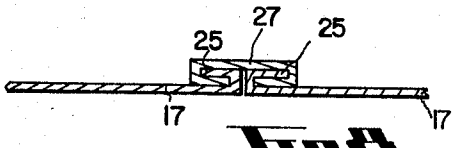

Fig 8

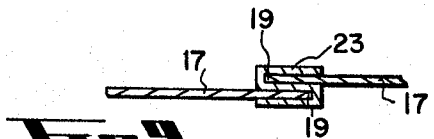

Fig 9

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DUCT STRUCTURE

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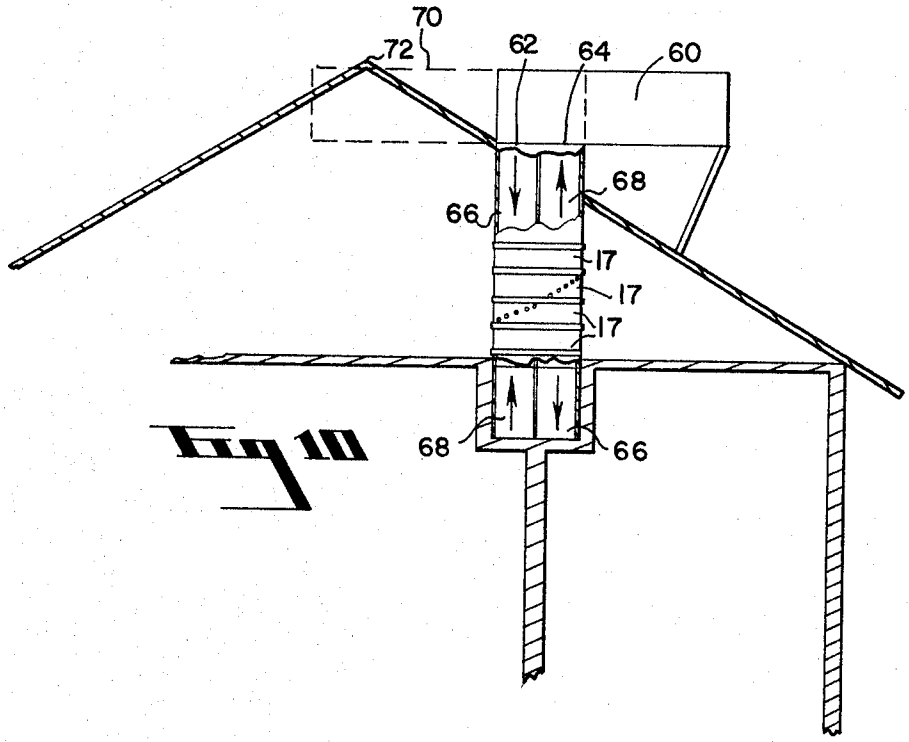

Fig 10

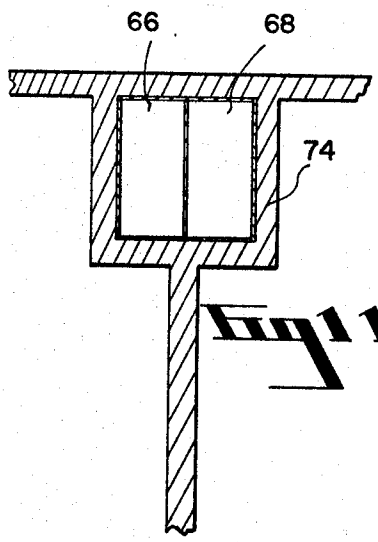

Fig 11

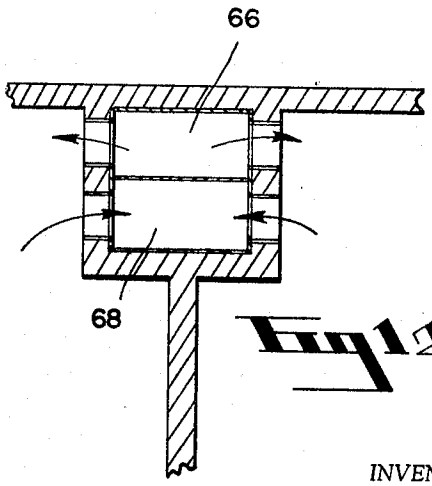

Fig 12

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3,266,524

DUCT STRUCTURE

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7 Claims. (Cl. 138—37)

This invention relates to a duct structure and more particularly to a duct structure for use in air conditioning systems or the like wherein two flow passages are contained in a common duct and wherein these flow passages may be angularly displaced or rotated within the duct so that the relative disposition of the passages may communicate with any one of four sides of a duct as desired, thereby permitting the installation of equipment in connection with the ducts in such a manner as to switch the locations of the passages with respect to equipment coupled thereto.

In the installation of air conditioning ducts it has been a problem, for example, to provide a common duct having two flow passages for the delivery of refrigerated air from a refrigeration unit and for the return of room air thereto; said problem most commonly existing in the mechanical disposition of the refrigeration unit with respect to the ducting so that the delivery and return air duct sections of a refrigeration unit coincide with the passages in the air conditioning duct and yet permit convenient installation of the refrigeration unit.

In many instances where ducts are used for air conditioning purposes they contain two parallel passages and often time these passages extend through walls or between walls and it is desired to provide for return air and air delivery grills in various horizontal or vertical orientation in order to accommodate the physical features of a building structure.

Various roof mounted refrigeration systems have been used for air conditioning and these systems include cool air delivery duct sections as well as return sections which are normally coupled to a common duct having separate flow passages, these flow passages are appropriately connected to grills for the delivery of cold air into a room and for the return of air to the refrigeration unit. After the ducts have been installed in the building the refrigeration unit may subsequently be installed but it may be found that due to interference with the roof top or some other feature of the building the air conditioning unit cannot be installed on the duct conveniently so that the duct passages coincide to permit the return air duct section to communicate properly with the return duct section of the unit and to permit the cold delivery section to communicate with the cold air delivery section of the refrigeration unit.

Accordingly, it is an object of the present invention to provide a duct structure which is particularly adapted for use in buildings and in connection with air conditioning systems therein for the purpose of conveniently orienting inlet and outlet grills in adjacent rooms having different angularly disposed air delivery and return axes.

Another object of the invention is to provide a duct structure having substantially rectangularly cross section and provided with separate duct sections separated by baffle structures which are disposed angularly to twist the duct passages either 90 or 180 degrees so that the relative disposition of two duct passages in the duct structure may be changed 90 degrees or 180 degrees as desired.

Another object of the invention is to provide a very simple duct and baffle section wherein a single sheet of metal separates two flow passage portions in the duct section and wherein said baffle section is composed of a piece of material having three triangular portions coupled together and making a transition between the duct sections

from a perpendicular relationship with sides of the duct to a diagonal disposition through the cross section of the duct.

Another object of the invention is to provide a novel duct structure which is square in cross section and wherein a novel baffle member extends perpendicularly across the interior of the duct section from side to side and is provided with a pair of triangularly formed portions which extend diagionally from corner to corner of the square in cross section duct section and terminate in a substantially straight line diagonally of one end of the duct section which is opposite to the end thereof which is abridged by the perpendicularly disposed baffle section whereby each duct and baffle section may be coupled to a similar duct and baffle section progressively to twist a pair of flow passages at opposite sides of each baffle section either 45, 90, 135 or 180 degrees, as desired, depending upon the number of said duct sections coupled together end to end.

Another object of the invention is to provide a novel duct structure composed of a plurality of duct section and angular baffles all coupled together in a unitary structure and readily insertable in a conventional dual passage duct for exchanging the horizontal or vertical disposition of rectangular cross section passages in the duct or for switching them 180 degrees as desired, for the purpose of accommodating desired locations of equipment disposed at opposite ends of an air conditioning duct.

Further objects and advantages of the invention may be apparent in the following specification, appended claims, and accompanying drawings in which:

FIG. 1 is a perspective view of a duct structure in accordance with the present invention;

FIG. 2 is a view similar to FIG. 1 showing angular baffle structure of the duct structure shown in FIG. 1 and showing in phantom by broken lines the outside duct sections of the structure in order to amplify the illustration;

FIG. 3 is an end view of the duct structure of the invention taken from the line 3—3 of FIG. 1;

FIG. 4 is a view of a single baffle section of the duct structure of the invention;

FIG. 5 is a view taken from the line 5—5 of FIG. 4 and illustrating by broken lines the outline of a blank of sheet metal from which the baffle section is formed;

FIG. 6 is a further view of the baffle structure taken from the line 6—6 of FIG. 5;

FIG. 7 is a side view of a flat blank from which the baffle structure shown in FIGS. 4, 5, and 6, is formed;

FIG. 8 is an enlarged fragmentary sectional view taken from the line 8—8 of FIG. 1;

FIG. 9 is an enlarged fragmentary sectional view taken from the lines 9—9 of the FIGS. 1 and 2 showing common structure therein;

FIG. 10 is a fragmentary view of a building structure showing a duct structure of the present invention installed therein and illustrating it connected to an air conditioner and showing by broken lines the facility of moving the air conditioner around 180 degrees with relation to the duct in accordance with the convenience of the twisted passage structure of the present invention;

FIG. 11 is a fragmentary sectional view of the building structure showing a dual passage air conditioning duct installed therein; and

FIG. 12 is another view similar to FIG. 11 but showing horizontal orientation of inlet and outlet grills relative to passages of a dual passage duct structure.

As shown in FIGS. 1 and 2 of the drawings the duct structure of the present invention comprises a plurality of baffle sections 15 which are disposed in duct sections 17. Each duct section 17 is generally square in cross section and is preferably made of sheet metal. These duct sections 17 are provided with straight edge portions 19 and 21

at each end thereof. These straight sections 19 and 21 are each coupled together by an S-shaped in cross section member 23 as shown in FIG. 9 of the drawings.

Other edges of the duct section 17 disposed at 90 degrees to the edges 19 and 21 are provided with hub portions 25 which are opposed to each other and which are connected together by a hook-shaped channel member 27 as shown in FIG. 8 of the drawings. In assembly, the S-shaped members 23 are first engaged with the end portions 19 of adjacent duct section 17 then, the channel members 27 are slidably engaged longitudinally of the opposed hook portions 25 as shown in FIG. 8 coupling adjacent duct section 17 together. The end portions 29 of the channel members 27 are then formed at a right angle over adjacent ends of the S-shaped members 23 thereby preventing removal of the channel members 27 and thus, locking all of the duct sections 17 together.

Each baffle 15 is formed of a flat blank of sheet metal as shown in FIG. 7 of the drawings and this blank is laid out with break lines 22, 24, 30, 34, 38 and 40, to form three triangular sections having strips 28, 32, 36, 38 and 44 outwardly of the break lines to provide flange portions for the connection of the baffle in a respective duct section 17. As shown in FIGS. 1 and 2 of the drawings, the duct sections 17 are square in cross section and a baffle 15 is disposed in each duct section 17 to form a passage partition thereby providing two separate passages in each duct section 17.

As shown in FIG. 7, the blank is laid out in three separate triangles 16, 18, and 20 which are disposed in angular relationship with each other in accordance with the angular breaks along lines 22 and 24. As shown in FIGS. 1 and 2 of the drawings, the baffle 15 designated A is so disposed that the triangular portion 16 thereof is vertical and whereby the triangle 20 slopes downwardly and laterally toward a duct passage B while the triangular portion 18 slopes upwardly and toward a duct or passage section C. The passage sections B and C are thus disposed on opposite sides of the baffle 15 and the flange portions 36 and 38 are disposed in alignment with each other and diagonally of the cross section of the respective duct section 17 so that these flanges 36 and 38 are connected by an S in cross section member 39 similar to the S-shaped in cross section member 23 shown in FIG. 9 of the drawings. It will be appreciated that the passages B and C make a transition from the plane of the triangle 16 to a plane diagonally of corners 41 and 43 of the respective duct section 17. Thus, the S-shaped in cross section member 39 extends from one corner 41 to one corner 43 internally of the duct section 17 at its end opposite to the straight flange 28 of the triangular portion 16.

Each triagular section 20 of each baffle section 15 is provided with a flange 44 which is spot welded to a bottom side 45 of each duct section 17 while each triangle portion 18 is provided with a flange 32 spot welded to the top 47 of the respective duct section 17, such spot welds being shown at 49 in FIG. 1 of the drawings.

A second identical baffle section 15 designated B in FIG. 2 of the drawings is provided with flanges 36 and 38 coupled to the S-shaped and cross section member 39 and in this position the triangular section 16 of the particular baffle 15 designated D is disposed substantially horizontally and substantially 90 degrees ot the triangular portion 16 of the baffle section designated A.

Another S-shaped in cross section member 49, similar in construction to the S-shaped in cross section member 23, is engaged with the flange 28 of the baffle designated A and this S-shaped member extends across the respective duct 17 from one side 19 to the other side 21. A third baffle designated E at its flange 28 is also engaged by the S-shaped and cross section member 41, this baffle section designated E is provided with flange structure 44 formed at an angle to the plane of the triangular portion 20 and this flange portion 44 is spot welded to the respective side 21 of the respective duct section 17. Flanges 36 and 38 of the duct section designated E are engaged with a third S-shaped and cross section member 51, similar in construction to the S-shaped in cross section member 23, which also engages flanges 36 and 38 of a fourth baffle section 15 which is designated F in FIG. 2 of the drawings.

It will be seen that the triangular portion 18 of the baffle 15 designated D is provided with a flange 32 spot welded to a respective side of the duct section 17 by spot welds 53 shown in FIG. 1 of the drawings and the baffle section designated E at its triangular section 18 is provided with a flange 32 spot welded by spot welds 55 to a respective inner wall 19 of a duct section 17.

The baffle designated F at its triangular portion 20 has its flange 44 coupled by means of spot welds 57 to a side 21 of the respective duct section 17. Additionally, the baffle section F at its triangular portion 18 is provided with a flange 32 connected by spot welds 57 with the bottom 45 of the respective duct section 17.

It will be seen that the first duct section 17 in which the baffle A is located provides a transition or turning of the partition structure between the passages B and C substantially 45 degrees and that the baffle D in the next adjacent duct section 17 provides an additional turning of the partition structure between the passages B and C providing a total of 90 degrees. The baffle E as in other 45 degrees in the same direction of rotation providing a total turning of the passage sections B and C amounting to 135 degrees while the last baffle section 15 which is designated F in FIG. 2 of the drawings completes the twisting or rotation of the passages B and C to a 180 degree displacement relative to such passages at opposite sides of the baffle 15 designated A.

With reference to FIGS. 3, 4, 5, 6 and 7, it will be seen that each baffle structure 15 may be made of a single sheet of metal and angularly broken to dispose the flanges 36 to 38 in a straight line relative to each other and to dispose the triangular portions 18 and 20 in planes disposed at substantially 45 degrees to the triangular section 16 in two directions thereby permitting a complete 45 degree passage transition of a dual duct structure in each of the duct sections 17.

With reference to FIG. 10 of the drawings, it will be appreciated by those skilled in the art that a conventional refrigeration air conditioner designated 60 may have a cold air outlet 62 and a return air inlet 64. The outlet 62 is usually coupled in communication with a cold air delivery duct passage 66 and the return air inlet 64 is usually coupled to a separate duct passage 68. In many instances the duct structures as installed in a building as so disposed that the respective cold air delivery duct 66 and the return air duct 68 are reversed or such a position that it would be necessary to install the air conditioning unit 60 in a position as indicated by broken lines 70 all of which would cause interference of the refrigeration unit 60 with a cable structure 72 of a building roof. This situation occurs quite often where the duct structures are installed in a house preliminary to the installation of a refrigeration air conditioning unit or some other unit. These units vary in construction and dimensions and the orientation of their inlet and outlet duct connections. Various makes extend in different directions and that it is very difficult for the builder and the manufacturer of the duct structure in the building to predetermine which direction or which orientation must be made with respect to the cool air delivery duct 66 and the return air duct 68. Accordingly, the duct structure as shown in FIGS. 1 and 2 of applicant's drawings and in accordance with applicant's invention, provides for a complete 180 degree rotation of these duct passages 66 and 68 so that the air conditioner 60 may be mounted in the solid line position as desired, simply by installing the duct section 17 with the respective baffles 14 therein as hereinbefore described.

In horizontal building wall structures designated 74 in FIG. 11, passages 66 and 68 may readily be reversed from

room to room or rotated 180 degrees to accommodate various disposition of cold air delivery and return air grills. Additionally, it will be seen from FIG. 12 that the respective duct passages **66** and **68** may be vertically superimposed by installing two of the duct sections **17** and their respective baffles **15**. Accordingly, the disposition of the duct passages **66** and **68** may be varied so that positions of these passages may be exchanged with each other or may be rotated or oriented 90 degrees from each other from one room to the next all of which provides a very versatile means for installing duct systems for air conditioning in a building to meet a great variety of positions and angles of air delivery and return grills.

It will be obvious to those skilled in the art that the angular disposition of the triangular portions **18** and **20** relative to the triangular portions **16** and to the successive coupling of these baffles **15** to turn air in a rectangular in cross section duct does not seriously impair the flow efficiency of air therethrough when exchanging positions of duct passages **66** and **68** or varying them 90 degrees from one room to the next when installed in a building.

The simple expedient of connecting the duct sections **17** and the respective baffle sections **15** on the same plane permits versatility in the installation of the duct structure of the present invention with respect to existing dual passage air conditioning ducts.

It will be obvious to those skilled in the art that various modifications of the present invention may be resorted to in a manner limited only by a just interpretation of the following claims.

I claim:

1. In a dual passage duct structure the combination of: a rectangular in cross section hollow duct structure having four sides and having two passages therein; a baffle separating said passages; first, second and third triangular portions of said baffle all angularly disposed relative to each other; said first triangular portion having a base side abridging and extending across the interior of said duct section from one of said sides to an opposite side thereof, said second and third triangular portions aligned with each other in a substantially common line extending diagonally from the interior of one corner of said duct structure to the interior of an opposite corner of said rectangular in cross section duct structure; a second rectangular in cross section duct structure similar to said first mentioned duct structure and having opposite open ends; one of said open ends coupled to a similar open end of said first duct structure; a second baffle in said second duct structure, said second baffle similar to said first mentioned baffle; said straight sides of said second and third triangular portions of said first baffle connected to similar second and third triangular portions of said second baffle.

2. In a dual passage duct structure the combination of: a rectangular in cross section hollow duct structure having four sides and having two passages therein; a baffle separating said passages; first, second and third triangular portions of said baffle all angularly disposed relative to each other; said first triangular portion having a base side abridging and extending across the interior of said duct section from one of said sides to an opposite side thereof, said second and third triangular portions aligned with each other in a substantially common line extending diagonally from the interior of one corner of said duct structure to the interior of an opposite corner of said rectangular in cross section duct structure; a second rectangular in cross section duct structure similar to said first mentioned duct structure and having opposite open ends; one of said open ends coupled to a similar open end of said first duct structure; a second baffle in said second duct structure, said second baffle similar to said first mentioned baffle; said base side portion of said first triangular portion of said first baffle connected to a similar triangle base side portion of said second baffle.

3. In a dual passage duct structure the combination of:

a rectangular in cross section hollow duct structure having four sides and having two passages therein; a baffle separating said passages; first, second and third triangular portions of said baffle all angularly disposed relative to each other; said first triangular portion having a base side abridging and extending across the interior of said duct section from one of said sides to an opposite side thereof, said second and third triangular portions aligned with each other in a substantially common line extending diagonally from the interior of one corner of said duct structure to the interior of an opposite corner of said rectangular in cross section duct structure; a second rectangular in cross section duct structure similar to said first mentioned duct structure and having opposite open ends; one of said open ends coupled to a similar open end of said first duct structure; a second baffle in said second duct structure, said second baffle similar to said first mentioned baffle; said straight sides of said second and third triangular portions of said first baffle connected to similar second and third triangular portions of said second baffle; said baffles being substantially coextensive with said duct structures between their opposite open ends.

4. In a dual passage duct structure the combination of: a rectangular in cross section hollow duct structure having four sides and having two passages therein, a baffle separating said passages; first, second and third triangular portions of said baffle all angularly disposed relative to each other; said first triangular portion having a base side abridging and extending across the interior of said duct section from one of said sides to an opposite side thereof, said second and third triangular portions aligned with each other in a substantially common line extending diagonally from the interior of one corner of said duct structure to the interior of an opposite corner of said rectangular in cross section duct structure; a second rectangular in cross section duct structure similar to said first mentioned duct structure and having opposite open ends; one of said open ends coupled to a similar open end of said first duct structure; a second baffle in said second duct structure, said second baffle similar to said first mentioned baffle; said base side portion of said first triangular portion of said first baffle connected to a similar triangle base side portion of said second baffle; said baffles being substantially coextensive with said duct structures between their opposite open ends.

5. In a dual passage duct structure the combination of: a rectangular in cross section hollow duct structure having four sides and having two passages therein; a baffle separating said passages; first, second and third triangular portions of said baffle all angularly disposed relative to each other; said first triangular portion having a base side abridging and extending across the interior of said duct section from one of said sides to an opposite side thereof, said second and third triangular portions aligned with each other in a substantially common line extending diagonally from the interior of one corner of said duct structure to the interior of an opposite corner of said rectangular in cross section duct structure; flange portions of said second and third triangular portions of said baffle contiguous with inner opposite sides of said duct structure.

6. In a dual passage duct structure the combination of: a rectangular in cross section hollow duct structure having four sides and having two passages therein; a baffle separating said passages; first, second and third triangular portions of said baffle all angularly disposed relative to each other; said first triangular portion having a base side abridging and extending across the interior of said duct section from one of said sides to an opposite side thereof, said second and third triangular portions aligned with each other in a substantially common line extending diagonally from the interior of one corner of said duct structure to the interior of an opposite corner of said rectangular in cross section duct structure; flange portions of said second and third triangular portions of said baffle contiguous with inner opposite sides of said duct struc-

ture; said flange portions of said second and third triangular portions extending at an angle to the opposite open ends of said duct structure and from middle portions of respective sides of said duct structure to corners thereof diagonally opposite each other.

7. In a dual passage duct structure the combination of: a rectangular in cross section hollow duct structure having four sides and having two passages therein; a baffle separating said passages; first, second and third triangular portions of said baffle all angularly disposed relative to each other; said first triangular portion having a base side abridging and extending across the interior of said duct section from one of said sides to an opposite side thereof, said second and third triangular portions aligned with each other in a substantially common line extending diagonally from the interior of one corner of said duct structure to the interior of an opposite corner of said rectangular in cross section duct structure; flange portions of said second and third triangular portions of said baffle contiguous with inner opposite sides of said duct structure; means fixing said flanges to said sides.

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