(54) Title: AN AIR DISTRIBUTION DUCT FOR AN AIR DISTRIBUTION SYSTEM

Air duct for air distribution systems, for instance a ventilation duct, which is assembled by a plurality of elongated duct sections (1) of incombustible material. Each duct section includes an elongated duct section (5, 6) with an opening (29) which is oriented parallelly along the longitudinal axis of the duct element, and which has the same length as the duct section, the opening being closable by means of a lid (12), which is sealingly connected to the duct section, and which extends along the entire length of the duct element. The lid (12) is connected to the duct element (5, 6) by means of a movable connection having a joint made from an incombustible or meltable material, which is dimensioned to burst or melt as a result of a fire, so that the lid by its own weight can swing out from the duct section (5, 6) when the joint bursts as a result of said fire, so that the duct will open and release the pressure therein.
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An air distribution duct for an air distribution system

The present invention relates to an air distribution duct for an air distribution system, for example a ventilation duct or steam duct, which duct is assembled of a plurality of elongated duct sections made from incombustible material which sections can be assembled with one another to a desired length and extension by means of sealing junction sections.

BACKGROUND PRIOR ART

In such ducts, specially in exhaust air ducts, there is a demand for a possibility of cleaning the duct from dust, grease and other cloggings of the duct passage. Some ducts have even a cleaning requirement according to fire law statutes. Therefore, it has been common to provide cleaning doors in each elbow of the duct and at each fifth meter of straight duct portions. However, it has turned out to be very difficult to readily clean the ducts via these cleaning doors.

If the ducts are arranged in the form of air-boxes or the like in narrow and unhealthy areas which are difficult to reach, for instance in attics, both installation and maintenance work is difficult. These difficulties have in several years caused such work environment problems that working with ventilation systems sometimes has to be stopped due to work environment laws. The difficulties have been known within interested trade-union circles for many years, and yet there has hitherto not been proposed any solution to the problem. There has only been suggested that the constructional buildings and architects and others shall try to design the installation areas such that there will be sufficient room for installation and service job.
The known ducts are also disadvantageous in installations which extend through a firetrap cell isolating building part, since they require sophisticated dampers or the like which are difficult to operate in order to stop the gas (air) flow in case of a fire.

SUMMARY OF THE INVENTION

The object of the present invention is therefore to provide a duct of the aforesaid kind which can more easily be installed and maintained, and which offers the possibility of sufficient protection against any spread of fire gas between different fire cells without the need of dampers.

This object is achieved with a duct constructed in accordance with the invention and having the characterizing features set forth in the following Claim 1.

Further developments of the invention are defined in the depending claims.

Because the duct sections of the duct can be opened along their entire length, a cleaning of the duct will be much facilitated. This opening possibility also enables an efficient and quick stopping of the air flow in the duct due to the pressure release in the duct that is achieved by the opening of the duct.

It is also evident that ducts according to the invention can be installed in areas which are difficult to reach, such as attics and the like, and in dwelling and office areas as well. The arrangement of a lid that extends along the entire duct section will namely enable the duct section to be designed in such an aesthetically attractive manner that it can even be formed as a stucco work. By thus replacing such ducts in attics and other areas,
that are unhealthy and difficult to reach, with "internal" ducts, there is obtained the advantage of less energy loss, and that both installation and maintenance work concerning the duct may be done in much better working environment than that existing in attics and the like, where the space is restricted and the air is full of isolation dust particles and other unhealthy particles.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in more detail with reference to the accompanying drawings, which illustrate a preferred embodiment of the invention.

Figure 1 is a perspective view of a duct section having a triangular cross-section according to the invention, and with a junction section of a first type.

Figure 2 is a schematic perspective view of two duct sections according to Figure 1 assembled with a junction section of a second type.

Figures 3A - 3C illustrate schematically in cross-section a duct section according to Figure 1 in three different operational modes.

Figure 4 illustrates a duct section according to Figure 1 with an alternative suspension.

Figure 5 illustrates a duct section according to the invention with a circular cross-section.

Figure 6 illustrates how the duct sections according to Figure 1 may be stacked upon each other during transport.
A PREFERRED EMBODIMENT

Figure 1 illustrates a duct section 1 and a sealing junction section 2, half of which - to the right of the centre line 3 of the section - can be introduced into the duct section 1 in the direction of the arrow 4. The left half portion of the junction section 2 is analogously insertable into one end of a further (not shown) duct section of the same kind as the duct section 1. The two duct sections will therefore abut one another edge to edge.

The duct section 1 consists of an elongated duct element manufactured from a rectangular sheet of incombustible material, for instance steel, which is folded along its longitudinal centre portion to form two rectangular walls 5 and 6, which are orientated in substantially right angles relative to one another, and having a junction portion therebetween in the shape of relatively small, rectangular sheet portion 7 which forms an angle of about 45° relative to the walls 5 and 6.

The wall 5, which is primarily intended to be suspended horizontally from a ceiling, has its free longitudinal edge folded three times, as is shown on an enlarged scale within the circle 8 of Figure 1, to form a clamping connection 9 for one longitudinal side edge of a rubber or plastic strip 10, the centre portion of which forms a movable connection in the form of a hinge joint with a pivot axis extending parallel to the longitudinal axis of the duct element 1. The strip 10 is dimensioned such that it will burst or melt as a result of a fire in the vicinity of the duct section.

The other longitudinal side edge of the strip 10 is similarly supported by a corresponding clamping connection 11 which is formed by one longitudinal side edge of an inwardly towards the duct section concavely bending lid 12. The
other longitudinal side edge of the lid 12 is folded to
form a support flange 13 which can be locked against a
similarly folded flange 14 of the lower end of the wall
6, which for this purpose is provided with a sealing
5 strip 15, for instance a magnetic strip or the like,
against which the support flange 13 is held in a manner
shown within the circle 16 of Figure 1.

The junction section 2 consists of a rectangular steel
10 sheet 17, which is dimensioned to internally mate with
each one of the walls 5 of two duct sections 1 (only one
is shown in Figure 1) which are to be interconnected.
From the upper edge of the sheet 17 to its lower edge
extends a sheet 18 which is smaller than the sheet 17 and
15 which is bent to the same internal shape and dimension as
the wall 5 and lid 12. The sheets 17 and 18 are covered
by a sealing layer on its portions that abut the walls
5, 6 and lid 12.

20 The wall 6 of the duct section is provided with fastening
holes 19 for screws 20 or the like for fastening against
a wall or the like, as will be shown below in Figure 3A.
Corresponding fastening holes 19' are made in the sheet
17 of the junction section 2.

25 When passing through a wall a further type of junction
section is used, as is shown in Figure 2. The junction
section which forms the through-piece passing through the
wall, consists of a cylindrical tube 21 of steel or the
like, being arranged between two duct sections 1' and 1''.
The tube 21 is fastened, for instance by means of a wel-
ding connection, against an end sheet 22 of the end of
the duct section 1' that abuts the wall (not shown). The
other end of the tube 21 is fastened against a corre-
30 sponding end portion (not shown) of the end of the other duct
section that abuts the wall. The other end of the duct
section 1'' is terminated by a dummy end sheet 23.
It is possible to arrange such through-pieces in the wall or ceiling with cylindrical tubes also transversally through the wall 6 and vertically through the wall 5. Such through-pieces, which are shown in Figure 2 at 21a and 21b, respectively, may for instance communicate with analogous duct sections (not shown) which are situated in adjacent or higher rooms in the building.

It is obvious for one skilled in the art, and need thus not be described in detail, that the duct sections, or preferably their lids 12' and 12'' (see Figure 2) may be provided with air inlet valves and exhaust air valves 24 and 15, respectively, known per se and schematically indicated in dotted lines in Figure 2 for the various spaces of the building that is involved in the air distribution system.

Figures 3A - C illustrate three different operational modes of a duct section according to the invention.

In Figure 3A there is shown how the duct section 1 and its opened lid 12, which is reeled up in a suitable way indicated by an arrow 26, can be fastened against a wall 27 closely below a ceiling 28 in a building (not shown in detail) involved in the air distribution system. The fastening is performed by means of the above mentioned screws 20, which are introduced through the holes 19 and 19' in the wall 6 and the sheet 17, respectively, and then screwfastened in the wall 27. In this position the opening (indicated at reference numeral 29) of the duct section can be entirely exposed in order to offer enough space for the operator to fasten the duct section.

Figure 3B illustrates the duct section in a fastened position.

Figure 3C illustrates how the hinge connection 10 has been
burst or melt as a result of a fire in the vicinity of the duct section. The lid 12 has thereby broken its connection with the wall 5, and will, due to its own weight, swing outwards and downwards until also the locking force of the magnetic strip 15 will be overcome. The lid 12 will therefore fall, indicated by an arrow 30, down to the floor, so that the opening 29 of the duct section will be exposed, such that a pressure release will be achieved in the duct.

It is also conceivable within the invention to provide the magnetic strip 15 with a mechanical lock (not shown), for instance of the bayonet coupling type. One then must make sure that this mechanical lock does not hinder the outwards movement of the lid 12 when the connection 10 is destroyed due to a fire. Thus, the mechanical lock must be so constructed that it enables the lid 12 to swing outwards to the open position in spite of the fact that the lock permanently holds the lid 12.

Figure 4 illustrates an alternative suspension of a duct section 1 in the ceiling instead of the wall. The suspension will thereby suitably take place at the corner portion 7 of the duct section.

In the embodiments shown in Figures 1 - 4 the cross-sections of the duct sections form a triangle, the hypotenuse of which is bent. It is of course also possible to give the duct section an alternative shape, for instance the shape of a polygon with more than three straight and/or bent sides. It is also possible to give the cross-section of the duct section the shape of a geometric curve, for instance a circle or an ellipse. An embodiment of a duct section having a circular cross-section is shown in Figure 5.

Some embodiments of the invention, above all the embodi-
ment shown in Figures 1 - 4, offers the opportunity of stacking the duct sections on each other during transport. This is shown in Figure 6, where two duct sections have been stacked on one another. Such a stacking facility is of course much space saving, and this facility has not been possible with prior air duct sections.

In the embodiments shown, the lid 12 of the duct section can be opened manually, as well as automatically as a result of the melting or bursting of the connection 10 at a fire. According to a further embodiment a controlled melting of the connection 10 may be obtained by casting a glow filament within the connection, and arranging a sensing means, for instance a smoke detector, to initiate, at certain conditions, for instance at any detection of smoke, the closing of an electric circuit through the glow filament such that this will be heated and melt the connection 10 in order to open the lid 12.
Claims:

1. An air distribution duct, for instance a ventilation duct or steam duct in a building, which duct can be assembled by a plurality of elongated duct sections (1) of incombustible material which can be interconnected with one another to a desired length and extension by means of sealing junction sections (2, 21), characterized in that each duct section comprises an elongated duct element (5, 6) with an opening (29) orientated parallelly to the longitudinal axis of the duct element and having the same length as the duct element, the opening being closable by means of a lid (12) which is sealingly connected with the duct element and which also extends along the entire length of the duct element, and in that the lid (12) is so movably connected to the duct element (5, 6) that it can be opened to expose the internal of the duct section along its entire length in order to enable an internal cleaning of the entire duct section.

2. Air duct according to Claim 1, characterized in that the lid (12) is connected with the duct element (5, 6) by means of a movable connection, for instance a hinge connection (10).

3. Air duct according to Claim 2, characterized in that the connection has a joint (10) which is orientated such that it extends parallelly to the longitudinal axis of the duct element (5, 6), and which is made of incombustible or melttable material which is dimensioned to burst or melt as a result of a fire, so that the lid (12) by its own weight can swing out from the duct element (5, 6) when the joint bursts or melts as a result of said fire, so that the duct will open and release the pressure therein.
4. Air duct according to any preceding Claim, characterized in that the duct section (5, 6) consists of two walls (5, 6) which are orientated in substantially right angles relative to one another, and that the lid (12) sealingly abuts said walls, so that the cross-section of the duct section obtains a triangular shape.

5. Air duct according to any preceding Claim, characterized in that the lid (12) in its end opposite to said joint can be locked against the duct element (5, 6) by means of a sealing strip (15), for instance a magnetic strip.

6. Air duct according to any preceding Claim, characterized in that the connection consists of a rubber or plastic strip (10).

7. Air duct according to any preceding Claim, characterized in that the duct section (5, 6, 12) is designed to simulate a stucco work, and that it is designed to be able to be installed in the corner between the ceiling and wall in rooms such as dwelling and office rooms.
INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

F 16 L 45/00

II. FIELDS SEARCHED

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Documentation Search other than Minimum Documentation
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SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT *

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IV. CERTIFICATION

Date of the Actual Completion of the International Search: 1987-06-05

Date of Mailing of this International Search Report: 1987-06-09

International Searching Authority: Swedish Patent Office

Signature of Authorized Officer: L.E.

Form PCT/ISA/210 (second sheet) (January 1985)