

AN ANTI-SMOKE, ONE WAY FLOW EXHAUST SYSTEM FOR A MULTI- STOREY BUILDING

FIELD OF INVENTION

The present invention relates to an anti-smoke, one-way flow exhaust system for a
5 multi-storey residential building. More particularly, the present invention relates to
individual residential exhaust channel mounted on an exhaust conduit and a top
channel means mounted on top of the exhaust conduit to provide a smooth passage
and release channel for the exhaust flow from the individual residential exhaust
channel to the exhaust conduit and to the surrounding through the top channel means.

10 BACKGROUND OF THE INVENTION

Current multi-storey residential building having an exhaust conduit where some
exhaust channels are installed at outside of the exhaust conduit, with an opening at the
exhaust conduit to enable them to be linked together. Such exhaust channel is
designed in Z-shaped structure having two 90 degrees corners that cause high exhaust
15 flow resistant, thus hamper air flow inside the exhaust channel. On the other hand, the
direction of air flow of the exhaust channel entering the exhaust conduit is
perpendicular to the direction of air flow inside the exhaust conduit. The air flow from
the exhaust channel collides with side walls of the exhaust conduit and rebounds to
generate smoke inside the exhaust conduit and hampers the exhaust flow from the
20 lower floor. This is because the exhaust flow from lower floor loses its momentum
after travelled some distances upwardly, faces difficulty to pass through the smoke
barrier and traps below the smoke. This causes the increase of pressure inside the
exhaust conduit at lower floor, and gives rise to occurrence of smoke and fume.

The other type of exhaust channel has air flow guide installed at its inner wall, the
25 outlet of the air flow guide facing upwards. It can reduce the resistance caused by the

air flow friction, ease the upward flow of the air flow from the lower floor. However, the exhaust channel does not connect directly to the exhaust conduit. The exhaust gas must travel vertically through a secondary exhaust conduit, then through the air flow guide and into the exhaust conduit. Hence, resistance of air flow is high, disadvantages to the air flow inside the exhaust channel. Besides that, the design limitation of this type of exhaust conduit is unable to eliminate the smoke and fume problems. Furthermore, it requires substantial area of space and difficult to carry out the construction work.

The chimney of current residential building has a simple structure, usually with a flat cover on top of the outlet of the exhaust conduit and four side walls with openings act as its outlets. This type of chimney is easy to be constructed. However, the reverse flow of surrounding air and air flow which risen from bottom to top hits the top cover, rebounds with downward movement. This reverse motion creates a smoke that hampers the upward flow of air flow. The air flow which exits from the chimney top encounters high resistant of friction, thus reduces the velocity and the efficiency of air flow to exit from the exhaust conduit. This affects the gas ventilation of the kitchen, and toilet. The exhaust gases face difficulty to flow out even reverse flow, thus affect the hygiene of the residential building.

Accordingly, there is a need to provide a variable pressure anti smoke exhaust device which able to reduce air flow resistant at exhaust channel and increase the release efficiency of exhaust gases from the exhaust channel outlet. Furthermore, the exhaust channel is curved in upward direction to enable the exhaust gases from the outlet of the exhaust channel flow in upward direction, parallel with the direction of exhaust flow inside the exhaust conduit, hence eliminate the resistance caused by formation of smoke inside the exhaust conduit.

SUMMARY OF INVENTION

The present invention aims to solve the aforementioned drawbacks of existing conventional exhaust conduit of a multi-storey residential building by providing an anti-smoke, one-way flow exhaust system wherein a one-way vent is mounted on individual residential exhaust channel. The cross-section of the exhaust channel reduces from inlet to outlet result in exhaust velocity increases at outlet, pressure decreases in the exhaust conduit, and has a vertical portion at the outlet allows exhaust to exit in an upward direction, prevents it colliding with the upward flow of exhaust from floors at a lower level in the exhaust conduit, thereby prevents the occurrence of smoke. Cross section of the exhaust channel at its outlet reduces from floors at a lower level to floors at an upper level to achieve a uniform exhaust flow in the exhaust conduit.

Another object of the present invention is to provide an anti-smoke, one-way flow exhaust system having a horizontal channel mounted on top of the exhaust conduit with an opening on a top member and an opening on a bottom member to allow exhaust releases to the surrounding. The top member prevents rain and snow from falling into the exhaust conduit. A cone mounted below the top member with tip facing down to divert exhaust flow from outlet of exhaust conduit to horizontal flow in the horizontal channel. The horizontal channel has a pair of side elements expand outwards from above the top member and from below the bottom member creates suction effect to the horizontal flow of exhaust in the horizontal channel when surrounding air flows in vertical direction travels from opening at top member to opening at bottom member.

A further object of the present invention is to provide an anti-smoke, one-way flow exhaust system has a pair of venturi members with symmetrical shape mounted in the exhaust conduit result in cross-section changes in the exhaust conduit, thereby creates a pressure change in the exhaust conduit allowing exhaust flow to exit from the

exhaust channel with ease. The cross-section of exhaust conduit is reduced by the venturi member decreases from floors at a lower levels to floors at an upper level.

BRIEF DESCRIPTION OF THE DRAWINGS

For the purpose of facilitating an understanding of the invention, there is illustrated in
5 the accompanying drawing the preferred embodiment from an inspection of which
when considered in connection with the following description, the invention, its
construction and operation and many of its advantages would be readily understood
and appreciated.

Fig. 1 is a cross-section view of an anti-smoke, one-way flow exhaust system of a
10 multi-storey building for the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to fireproof exhaust conduit of multi-storey residential
buildings. More particularly, the present invention relates to an anti-smoke, one-way
flow exhaust system (100) for a multi-storey residential building. Hereinafter, the
15 anti-smoke, one-way flow exhaust system (100) shall be described according to the
preferred embodiments of the present invention and by referring to the accompanying
description and drawings. However, it is to be understood that limiting the description
to the preferred embodiments of the invention and to the drawings is merely to
facilitate discussion of the present invention and it is envisioned that those skilled in
20 the art may devise various modifications without departing from the scope of the
appended claim.

Referring to Fig. 1, in a multi-storey residential building, there would be a plurality of
exhaust conduits (2) passing each floor vertically to provide passages to exhaust flow
to be released from residents unit. Each resident unit has an exhaust channel (1) to

provide a passage to the exhaust flow from the kitchen extractor hood or from wash room extractor to an exhaust conduit (2) and release through the chimney top of the building. The release of exhaust flow through the exhaust conduit (2) is to ensure the hygiene of the building. The exhaust flow comprises exhaust fumes.

- 5 The invention relates to an anti-smoke, one way flow exhaust system (100) comprising at least one exhaust channel (1) mounted on the exhaust conduit (2) having an inner portion embedded in the exhaust conduit (2) to release fumes, and an outer portion connected to fume duct (3). The fume duct (3) is connected to extractor hood of kitchen or wash room extractor fan.
- 10 The reduce of the exhaust channel (1) cross-section from inlet to outlet result in exhaust velocity increases at outlet and pressure decreases in the exhaust conduit, allowing the exhaust to exit from the exhaust channel (1) with ease. The outlet of the exhaust channel (1) having a vertical portion at outlet to allow exhaust flow to exit in an upward direction, prevent it from colliding with the upward exhaust flow from
- 15 floors at a lower level in the exhaust conduit (2), thereby prevent the occurrence of smoke.

- On the first floor, the cross-section of exhaust channel (1) outlet is at the maximum, with minimum air flow resistance. On second floor, the cross-section of exhaust channel (1) outlet is reduced accordingly, with corresponding increased in exhaust
- 20 flow resistance. The cross-section of exhaust channel (1) outlet can be reduced accordingly from each floor level up. The higher the floor level, the smaller the cross-section of the exhaust channel (1) outlet.

- By varying the exhaust channel (1) outlet cross-section, the flow resistance of exhaust from upper and lower floor can be balanced, ensure a uniform air flow in each floor
- 25 level. The exhaust channel (1) occupies a small area of the kitchen and wash room space and raw materials required to fabricate it is low and light weight.

A one-way vent (4) mounted on the exhaust channel (1) is closed at normal condition. Its function is to prevent exhaust flow enters from the exhaust conduit. When extractor hood is in operation, exhaust fumes flow in from the extractor hood and push open the one-way vent (4). Therefore, the one-way vent (4) helps the system
5 (100) to eliminate smoke-forming caused by resistance of exhaust flow.

A pair of venturi members (5) is symmetrically mounted in the exhaust conduit (2). The venturi member (5) being symmetrically curved inwards in the exhaust conduit (2) result in pressure changes by creating cross-section changes of three portions in the exhaust conduit (2). The three portions consist of a reduction portion, a neck
10 portion with pressure at minimum, and expansion portion. Exhaust flow from lower floor level travels upwards passing through the reduction portion where the exhaust flow velocity increases and the exhaust flow pressure decreases. At the neck portion, the cross-section of exhaust conduit is at the minimum, its velocity is at maximum and its pressure is at minimum. The outlet of the exhaust channel (1) passing through
15 an opening at the venturi member (5) is located at the neck portion. The minimum pressure at the neck portion allows exhaust flow exits from the exhaust channel (1) to exhaust conduit (2) with ease. At the expansion portion, cross-section of the exhaust conduit (2) increases, thus its exhaust flow velocity decreases and exhaust flow pressure increases.

20 A top channel means (6) mounted on top of the exhaust conduit (2) with at least one top opening formed at one edge of a top member (7) and at least one bottom opening at one edge of a bottom member (8) to allow exhaust flow to be released to the surrounding. The top member (7) prevents rain and smoke from falling into the exhaust conduit (2).

25 A cone (10) mounted below the top member (7) with tip facing down to divert upward flow of exhaust flow from the exhaust conduit (2) to horizontal flow in the top channel means (6). Furthermore, the top channel means (6) has a pair of side elements

(9) mounted at periphery of the top channels means (6). The side elements (9) have a pair of top inclined sleeves (11) extending upwards, and at least a pair of bottom inclined sleeves (12) extending downwards, whereby the top inclined sleeves (11) and the bottom inclined sleeves (12) utilize the surrounding air flow which enters vertically from the top openings and exits through bottom openings. The pair of top inclined sleeves (11) results the increase of exhaust flow velocity when enters from the top opening. Applying Bernoulli principle, when vertical exhaust flow velocity increases in the top channel (6), pressure in the top channel means (6) will decrease. This creates suction effect to the exhaust flow in horizontal direction in the top channel means (6). Same effect results when surrounding air flow enters vertically from the bottom opening and exit through top opening. The exhaust flow in the top channel means (6) being discharged through the openings where the surrounding air flow exits.

A dust collector (13) located at the bottom of exhaust conduit (2) can be accessed through a removable panel. By removing the removable panel, dust and oil collected at the bottom of the exhaust conduit (2) can be cleaned periodically. At the bottom of exhaust conduit, there is a dust collector opening, with removable panel to close it, periodically open the panel to clean the dust collected at the bottom of the exhaust conduit. On top of the dust collector (13), an oil collector (14) may be horizontally mounted into the exhaust conduit (2). The horizontal oil collector (14) may be slidably inserted into the the exhaust conduit (2) through a pair of tracks attached on the side walls of the exhaust conduit (2). Preferably, the oil collector (14) is a mesh panel for collecting the dropping oils result from the condensation of exhaust fumes.

The benefit of the present invention is to reduce air flow resistance in the exhaust conduit (2), ease the flow of exhaust flow from the exhaust conduit (2). Due to the exhaust flow in the exhaust conduit outlet is in the same direction with exhaust flow in the exhaust channel (1), the formation of smoke is therefore eliminated. In addition, at the exhaust conduit outlet, its air velocity is high and its air pressure is low. Hence,

the exhaust conduit outlet creates a suction force to the smoke at the lower floor. Besides that, the space occupied by the exhaust conduit (2), causes the reduce of cross-section of exhaust channel (1), results in the increase of exhaust flow velocity at the exhaust channel (1). And this, in turn, provides suction capabilities to the exhaust
5 conduit (2). With the one-way vent (4), the system effectively prevents the occurrence of smoke and fume.

The system of the present invention has the advantages of preventing reverse flow of surrounding air, eliminating upward exhaust flow to be rebound downwards which creates smoke. The system (100) able to reduce friction of upward exhaust flow,
10 increase the ventilation capability of the exhaust channel, and ensure the hygiene of the residential area.

CLAIMS

1. An anti-smoke, one way flow exhaust system (100) for a multi-storey building comprising:
 - an exhaust channel (1) mounted on an exhaust conduit (2), the exhaust channel (1)
 - 5 having an outlet connected to the exhaust conduit (2) to release exhaust flow, an inlet connected to a fume duct (3), a one-way vent (4) mounted on the exhaust channel (1) to prevent reverse flow of exhaust from the exhaust conduit (2) to the exhaust channel (1);
 - a top channel means (6) mounted on top of the exhaust conduit (2), the top channel
 - 10 means (6) having at least one top opening formed at one edge of a top member (7) thereof, at least one bottom opening formed at one edge of a bottom member (8) thereof, and a plurality of side elements (9) mounted at periphery of the top channels means (6), the side elements (9) having at least a pair of inclined sleeves (11) extending upwards, and at least a pair of bottom inclined sleeves (12) extending
 - 15 downwards, whereby the top inclined sleeves (11) and the bottom inclined sleeves (12) utilize the surrounding air flow which enters vertically from the top opening and exits through bottom opening to generate suction effect to the exhaust in the top channel means (6), air flow enters vertically from the bottom opening and exits through the top opening generates suction effect to the exhaust in the top channel
 - 20 means (6), the exhaust in the top channel means (6) being discharged through the openings where the surrounding air flow exits; and
 - a cone (10) mounted below the top section (7) with tip facing down to divert upward flow of exhaust from the exhaust conduit (2) to horizontal flow in the top channel means (6);
 - 25 wherein the exhaust channel (1) cross-section reduces from inlet to outlet which results in the exhaust flow velocity increasing at outlet and exhaust flow pressure decreasing in the exhaust conduit (2), and the top section (7) prevents rain and snow from falling into the exhaust conduit (2).

2. An anti-smoke, one way flow exhaust system (100) according to claim 1, wherein cross-section of the exhaust channel (1) at its outlet reduces from floors at a lower level to floors at an upper level to achieve a uniform exhaust flow in the exhaust conduit (2).
- 5 3. An anti-smoke, one way flow exhaust system (100) according to claim 1, wherein the exhaust channel (1) has a vertical portion at the outlet to allow exhaust to exit in upward direction, to prevent it from colliding with the upward flow of exhaust from floor at lower level in the exhaust conduit (2), thereby eliminating the occurrence of smoke.
- 10 4. An anti-smoke, one way flow exhaust system (100) according to claim 1, wherein the exhaust conduit (2) has at least a pair of venturi members (5) symmetrically mounted in the exhaust conduit (2), the venturi members (5) being symmetrically curved inwards in the exhaust conduit (2), results in cross-section changes in the exhaust conduit (2) where at minimum cross-section of the exhaust conduit (2),
15 exhaust velocity is at maximum and pressure is at minimum in the exhaust conduit (2), and the outlet of the exhaust channel (1) is located at the minimum cross-section of the exhaust conduit (2) allowing exhaust to be exited from the exhaust channel (1) with ease.
5. An anti-smoke, one way flow exhaust system (100) according to claim 4, wherein
20 the cross-section reduction of the exhaust conduit (2) decreases by the venturi members (5) at the outlet of the exhaust channel (1) from floors at a lower level to floors at an upper level.
6. An anti-smoke, one way flow exhaust system (100) according to claim 4, wherein the cross-section of the exhaust conduit (2) decreases from floors at a lower level to
25 floors at an upper level.

ABSTRACT

AN ANTI-SMOKE, ONE WAY FLOW EXHAUST SYSTEM FOR A MULTI-
STOREY BUILDING

The present invention relates to an anti-smoke, one-way flow exhaust system (100)
5 for a multi-storey residential building comprises an exhaust channel (1) mounted on
an exhaust conduit (2), the exhaust channel (1) having an outlet connected to the
exhaust conduit (2) to release exhaust fume, an inlet connected to a fume duct (3). A
one-way vent (4) mounted on the exhaust channel (1) to prevent reverse flow of
exhaust from the exhaust conduit (2) to the exhaust channel (1). A top channel means
10 (6) mounted on top of the exhaust conduit (2), the top channel means (6) having at
least one top opening formed at one edge of a top member (7) thereof, at least one
bottom opening formed at one edge of a bottom member (8) thereof. A plurality of
side elements (9) mounted at periphery of the top channels means (6), the side
elements (9) having at least a pair of inclined sleeves (11) extending upwards, and at
15 least a pair of bottom inclined sleeves (12) extending downwards. A cone (10)
mounted below the top section (7) with tip facing down to divert upward flow of
exhaust flow from the exhaust conduit (2) to horizontal flow in the top channel means
(6).

The Most Illustrative Drawing: Fig. 1

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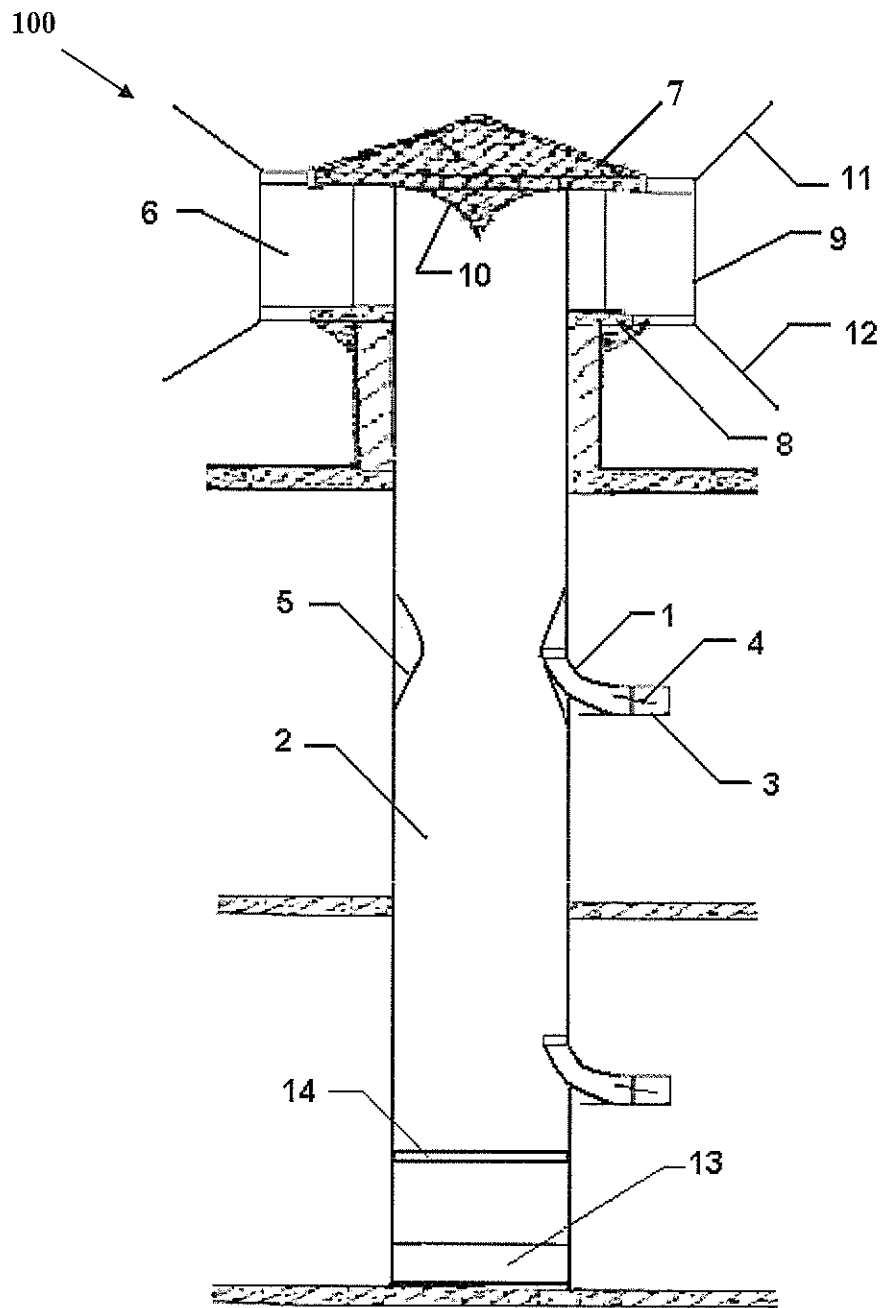


Fig. 1