Feb. 24, 1959 F. L. SIMMONDS 2,874,627

EXHAUST SYSTEM

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Fig. 1.

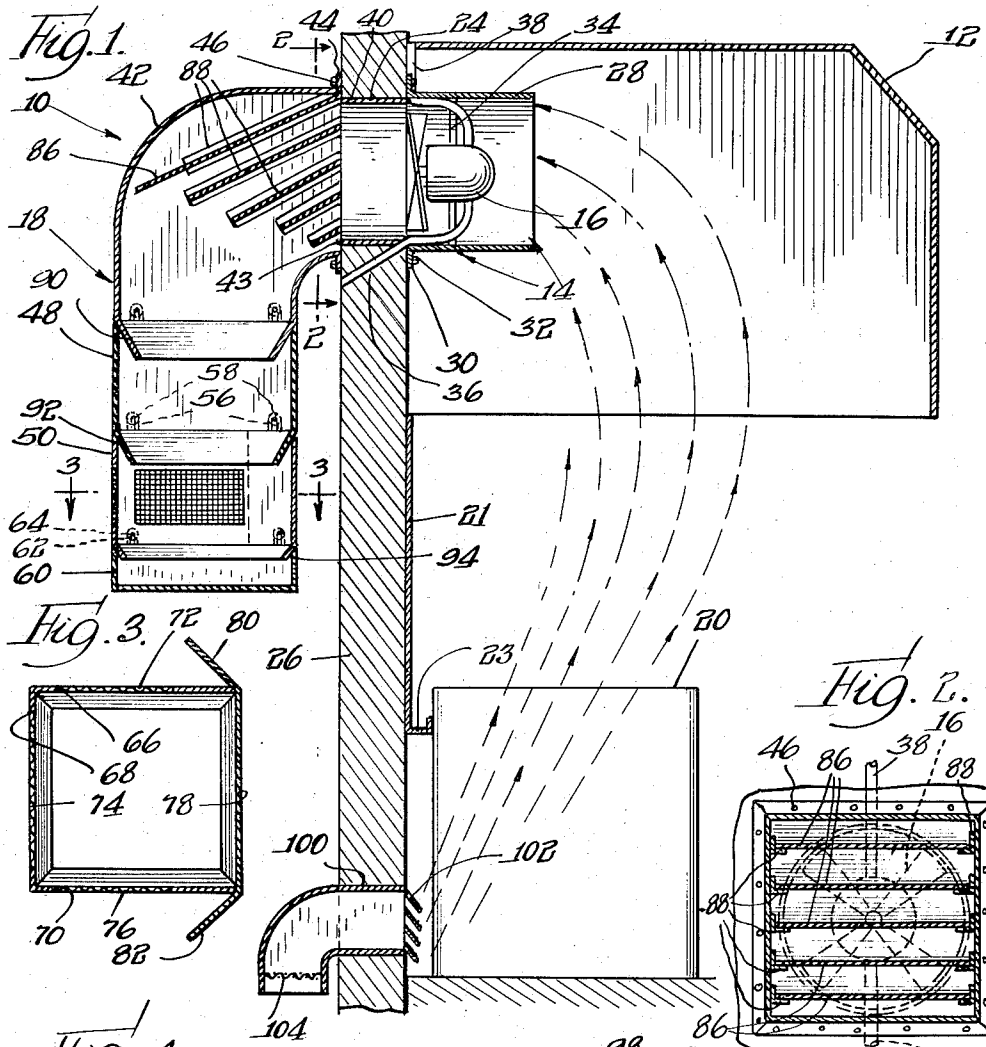
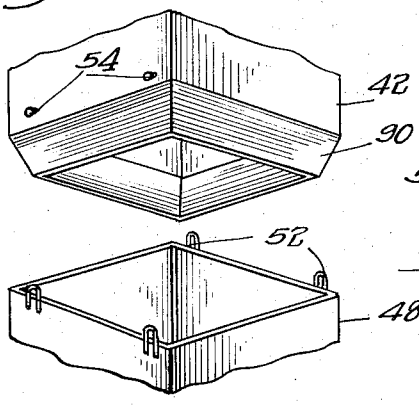


Fig. 3.

Fig. 2.

Fig. 4



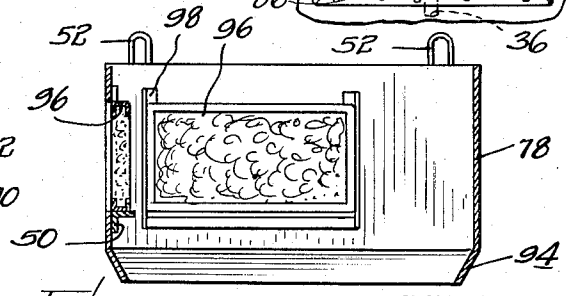


Fig. 5.

INVENTOR.
Francis L. Simmonds
BY
Olson & Treyler
attys.

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EXHAUST SYSTEM

Francis L. Simmonds, De Kalb, Ill.

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7 Claims. (Cl. 98—115)

The present invention relates to a novel exhaust system and more particularly, to a novel system for exhausting grease-laden or otherwise contaminated air from rooms such as kitchens.

As is well known, the air in kitchens often becomes contaminated with grease and smoke and the like and unless some provision is made for exhausting the air from the kitchen, the contaminating material in the air collects on the kitchen walls and ceiling. While this problem is present in domestic kitchens, it is particularly acute in commercial kitchens wherein large amounts of fried foods are prepared. In order to exhaust such contaminated air from kitchens, it has heretofore been the general practice to mount an exhaust fan in a wall opening and blow the air directly to the exterior of the building and in some installations, a large canopy has been positioned over the cooking stove and over the exhaust fan to restrain smoke and grease-laden air rising from the stove from circulating throughout the entire kitchen. However, such prior installations have not been entirely satisfactory since the air blown directly through the wall opening often contacts the exterior surface of the building so that grease and the like are deposited on the exterior surface. In addition, grease and the like collects rapidly on the interior surfaces of the canopies used in heretofore known installations so that frequent cleaning is necessary.

In prior installations using canopies, it has often been necessary to operate the exhaust fan at a high speed in order to prevent contaminated air from escaping from under the canopy and depositing contaminated material such as grease and the like on the exterior surface of the canopy or the walls of the kitchen. However, when the exhaust fan is operated at a high speed, an undesirable draft may be created throughout the entire kitchen or even throughout the entire building, which draft may interfere with the proper operation of other air-treating apparatus in the building. For example, it has been found that if a furnace is located in the building, the draft created by the exhaust fan may set up a reverse draft in the chimney of the furnace and thereby prevent proper operation of the furnace. Also the draft set up by the exhaust fan may interfere with the proper operation of any air-conditioning equipment within the building.

It is a primary object of the present invention to provide a novel system for exhausting air from kitchens and the like to the exterior of a building, which system is constructed so as to prevent any contaminating materials in the air from being deposited on the exterior surface of the building.

Another object of the present invention is to provide a novel system for exhausting contaminated air from a kitchen or the like to the exterior of the building wherein substantial portions of the contaminated materials are removed from the air before the air is discharged from the system whereby to reduce any possibility of the contaminating materials being deposited on the surface of the building.

Another important object of the present invention is to

provide a novel air exhaust system including an exhaust fan and a canopy, which system is constructed so as to reduce substantially the rate at which contaminating materials are deposited on the interior surfaces of the canopy.

A further object of the present invention is to provide a novel system of the above described type which is of simple and economical construction and which may be readily disassembled for cleaning purposes and the like.

A further object of the present invention is to provide a novel air exhaust system wherein an exhaust fan may be operated at high speeds for preventing contaminated air from circulating from a stove or the like throughout the kitchen or room without creating an undesirable draft that will interfere with the proper operation of other apparatus such as a furnace or air conditioning equipment that may be located within the building.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings wherein:

Fig. 1 is a vertical sectional view of an exhaust system embodying the principles of this invention;

Fig. 2 is an enlarged cross sectional view taken along line 2—2 in Fig. 1;

Fig. 3 is a cross sectional view taken along line 3—3 in Fig. 1;

Fig. 4 is a fragmentary perspective view illustrating portions of the novel system in position to be assembled together; and

Fig. 5 is a cross sectional view of a slightly modified discharge end section of the exhaust system of this invention.

Referring now more specifically to the drawings wherein like parts are designated by the same numerals throughout the various figures, an exhaust system **10** embodying the principles of the present invention is shown in Fig. 1 and includes a large canopy **12** made of sheet metal or any other desired material, duct means **14** extending within the canopy and having an exhaust fan **16** mounted therein, and outlet duct means **18**. As will be appreciated, the exhaust system **10** of this invention may be susceptible to many uses, but it is particularly adapted to be positioned over a stove **20** or the like located in a kitchen for exhausting contaminated air through an opening **24** in a wall **26** to the exterior of the building. Preferably, a sheet metal panel **21** having a lower trough portion **23** is mounted on the wall **26** behind the stove for collecting any grease or the like which may splatter from the stove.

The canopy **12** which is preferably made of sheet metal may be of any known construction and may be mounted to the wall **26** by a suitable known means such as bolts or screws, not shown, and, therefore, the canopy need not be further described in detail. In the past, it has been the practice to mount the exhaust fan within the wall opening but this arrangement has permitted the contaminated air drawn beneath the canopy to swirl around and come into intimate contact with the interior surface of the canopy whereby air contaminating materials such as grease and smoke are deposited on the canopy at a rapid rate. In accordance with the present invention, the rate at which the contaminating materials are deposited on the interior of the canopy **12** is substantially reduced by forming the duct means **14** so that it includes a tube **28** which extends from the wall **26** well toward the central portion of the canopy. The tube **28** is provided with an annular flange **30** for abutting against the wall **26** and is secured to the wall by means of a plurality of screws **32** extending through the flange and into the wall. The exhaust fan **16** is mounted within the tube **28** by any suitable means such as a plurality of brackets **34** and it should be noted that the fan is spaced well within the inlet end of the tube. With this arrangement the tube **28**, which has a diameter

substantially less than the cross sectional dimensions of the canopy, provides for a Venturi-like action adjacent the mid-portion of the canopy whereby the velocity of the air moving through the canopy is rapidly increased as the air moves toward and into the tube. It has been found that this action substantially reduces swirling of the air within and against the interior surfaces of the canopy and the wall **26** and the larger portion of the air flows in the manner indicated by the arrows so as to reduce the rate at which contaminating material such as grease and smoke are deposited on the canopy or the wall **26**.

The fan **16** may be of any known variable speed type and need not be described in detail. However, suitable switch means, not shown, should be provided for controlling the operation and speed of the fan as will be understood. The electric motor of the fan is preferably air cooled and in order to prevent contamination of the fan motor, a cooling air inlet tube **36** is provided which extends from the motor through a suitable opening in the duct means **14** and through the wall **26** to the exterior of the building. A cooling air outlet tube **38** is provided which extends from the fan motor housing through the duct means **14** and to any desired point outside of the canopy **12**.

The duct means **14** also includes a sheet material liner **40** extending through the wall **26** and in order to prevent deposits of grease and the like from building up on the exterior surface of the wall **26**, the duct means **18** is mounted in communication with the liner **40**. It should be noted that the liner **40** extends into the duct means **18** as at **43** in order to insure against the escape of contaminated air between the inlet end of the duct means **18** and the wall **26**. The duct means **18** includes an elbow **42** made of sheet metal or any other suitable material, which elbow has its inlet end secured against the wall **26** and its outlet end directed downwardly along the wall. The inlet end of the elbow is provided with a flange **44** through which a plurality of screws **46** and the like are passed for securing the elbow to the wall. It should be noted that the cross sectional dimensions of the elbow **18** are considerably larger than the diameter of the inlet tube **28** and the liner **40** so that the air passing into the elbow may expand and undesirable back pressure is avoided. This arrangement permits more efficient operation of the exhaust fan than heretofore known installations which include gravity biased shutters at the discharge side of the wall opening, which shutters must be forced open by the air whereby they create considerable back pressure which reduces the efficiency of the fan. The duct means **18** also includes one or more sections **48** and **50** depending from the lower end of the elbow. The section **48** is detachably connected to the elbow by means of a plurality of hook members **52** which are adapted to engage over studs **54**. The section **50** is similarly attached to the lower end of the section **40** by hook members **56** and studs **58**. It will be appreciated that any other desired means may be provided for detachably connecting the various sections of the duct means **18** together. The lowermost section of the duct means **18**, which in the embodiment shown is the section **50**, has its bottom end closed by a receptacle **60** made of sheet metal or any other desired material, which receptacle is also detachably connected to the section by means of hook members **62** and studs **64** or any other desired means.

In addition, the lowermost section or the section **50** is provided with lateral air outlet openings **66**, **68** and **70**, which openings are preferably covered with metal screen or hardware cloth panels **72**, **74** and **76**. It should be noted that the rear wall **78** of the section **50**, or in other words, the wall adjacent the wall **26** of the building is imperforate. Therefore, the air discharged from the section **50** is not directed toward the building or the wall **26**. In addition, outwardly flared baffle members **80** and **82** extend from the rear wall **78** of the section **50** for directing the discharged air away from the building. With this structure, the exhausted air is prevented from contacting the exterior surface of the building wall whereby to prevent deposits of grease and the like from accumulating on the building wall.

In order to further reduce any possibility of contaminating material in the air from contacting the exterior surface of the building wall, means is provided in the duct means **18** for removing substantial portions of the contaminating material from the air before the air is ultimately discharged. This means includes a plurality of sheet metal baffles **86** removably fixed within the elbow section **42** on brackets or the like **88**. These baffles are directed downwardly across the path of the air entering the elbow in the manner shown so that the air is brought into intimate contact with the baffles. As the air contacts the baffles **86**, grease and the like condenses from the air and is deposited on the baffles. As the grease builds up on the baffles, it drains therefrom and drops into the container **60** at the lower end of the duct means. It should also be noted that the lower ends of the elbow section **42**, the section **48** and the section **50** are respectively provided with inwardly directed funnel portions **90**, **92** and **94**, which funnel portions extend into the next lower section and thereby prevent any grease or the like from escaping between the junctions of sections. The funnel portions also serve to direct any grease or the like running down the walls of the various sections toward the interior of the duct means so that grease dropping from the funnel portions falls directly into the receptacle **60**. It has been found that the baffle members **86** and the funnel portions of duct means **18** are effective for removing enough grease or other contaminating materials from the air for most installations. However, for some installations wherein the air is unusually heavily contaminated, it has been found desirable to provide filter units over the discharge openings in the section **50**. Thus, as shown in Fig. 5, filter units **96** which may be made of any suitable material such as fiberglass or the like are placed over the discharge openings and may be retained in position by suitable bracket means **98** or the like.

As mentioned above, the exhaust fan should be operated at a speed sufficient to prevent any contaminated air from escaping around the canopy **12** and in installations heretofore in use, this has sometimes created an undesirable draft which interferes with the operation of furnaces or air conditioners. In accordance with the present invention, the possibility of the creation of such an undesirable draft has been eliminated by providing an air inlet duct **100** extending from the outside of the building through the wall **26** adjacent the floor of the kitchen and beneath the fan. The passage of air through the inlet duct **100** may be controlled by gravity biased shutters **102** or suitable means, not shown, may be provided for positively positioning the shutters in the desired manner for controlling the flow of air. Preferably, a screen **104** is provided across the inlet end of the duct **100** to prevent insects or rodents from gaining access to the kitchen. With the duct **100** and the shutters **102**, it will be appreciated that the circulation of air through the exhaust system of this invention will be from the duct **100** past the stove and then into the canopy whereby undesirable drafts in the remaining portions of the kitchen or throughout the building are eliminated.

From the above description, it is seen that the present invention has provided a novel exhaust system which is fully capable of accomplishing the objects heretofore set forth. More specifically, it is seen that the present invention has provided an exhaust system wherein the air is directed in a manner so as to reduce the rate of contamination of the canopy and also to eliminate contamination of the exterior surface of the building. Furthermore, it is seen that with the novel exhaust system of the present invention, the exhaust fan may be operated more efficiently and at a higher speed so as to prevent contaminated air from escaping around the canopy with-

out creating undesirable drafts throughout the building. While for the purpose of illustrating the present invention only, one exhaust fan and its associated duct means has been illustrated, it will be appreciated that in many commercial kitchens, a number of stoves and long canopies are provided so that a plurality of exhaust fans and associated duct means should be used. It has been found that for optimum results, one exhaust fan and its associated duct means should be placed at eight or nine foot intervals along the canopy in commercial installations.

While the preferred embodiment of the present invention has been shown and described herein, it is obvious that many structural details may be changed without departing from the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A system for exhausting contaminated air from a room or the like comprising duct means extending from a point within a room through a wall to the exterior of the room, fan means disposed within the duct means for moving air from the room through the duct means, additional duct means communicating with the outlet end of said first mentioned duct means and disposed for extending downwardly therefrom adjacent an exterior surface of said wall, receptacle means connected with and substantially closing a lower end portion of said last mentioned duct means for receiving contaminating material from the air being exhausted, said last mentioned duct means having lateral air outlet means adjacent to and above said receptacle means, and baffle means associated with said last mentioned duct means for directing air emerging from said outlet means in a predetermined manner away from said wall.

2. An exhaust system, as defined in claim 1, which includes canopy means disposed over at least a part of said first mentioned duct means, and wherein said first mentioned duct means has an inlet end disposed well within said canopy means and substantially spaced from interior surfaces of said canopy means whereby to direct air being exhausted in a manner to reduce contact with said canopy means.

3. An exhaust system, as defined in claim 1, which includes generally downwardly extending baffle means in said second mentioned duct means disposed for intimate contact for air being exhausted and having lower end means spaced from interior surfaces of said second mentioned duct means and in generally vertical alignment with said receptacle means for removing contaminating material from the air and directing contaminating material so that it will drop into said receptacle means.

4. An exhaust system, as defined in claim 1, which includes air inlet means extending from the exterior of the room and opening into the room substantially beneath and aligned with said first mentioned duct means so that air entering through said inlet means may be drawn into said first mentioned duct means by said fan means in order to eliminate the application of the suction to the room or other portions of the building of which the room is a part.

5. A system for exhausting contaminated air to the exterior of a building comprising duct means for extending between the interior and the exterior of the building, fan means for moving air through said duct means, additional duct means mountable in communication with said first mentioned duct means for extending downwardly and along the exterior of the wall of a building, said last mentioned duct means including a plurality of sections, quick release means detachably connecting said sections, the lowermost of said sections having a closed bottom providing a receptacle, certain of said sections including an inwardly extending lower end portion projecting into an adjacent lower section and providing baffle means for directing air contaminating material toward said receptacle, the air-contaminating material thereby being kept away from the walls of said additional duct means, said last mentioned duct means having lateral air outlet opening means adjacent a lower end thereof and above said receptacle, and means associated with the lower end of said last mentioned duct means for directing air emerging from said outlet opening means away from the exterior wall of the building.

6. An exhaust system, as defined in claim 5, wherein said second mentioned duct means has an imperforate portion adjacent the exterior wall of the building, said air outlet opening means being disposed in other portions of said second mentioned duct means, and wherein said means for directing air emerging from said outlet opening means away from the exterior wall of the building includes baffle members extending from opposite sides of said imperforate duct means portion.

7. An exhaust system, as defined in claim 6, which includes filter means disposed across said air outlet opening means.

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