

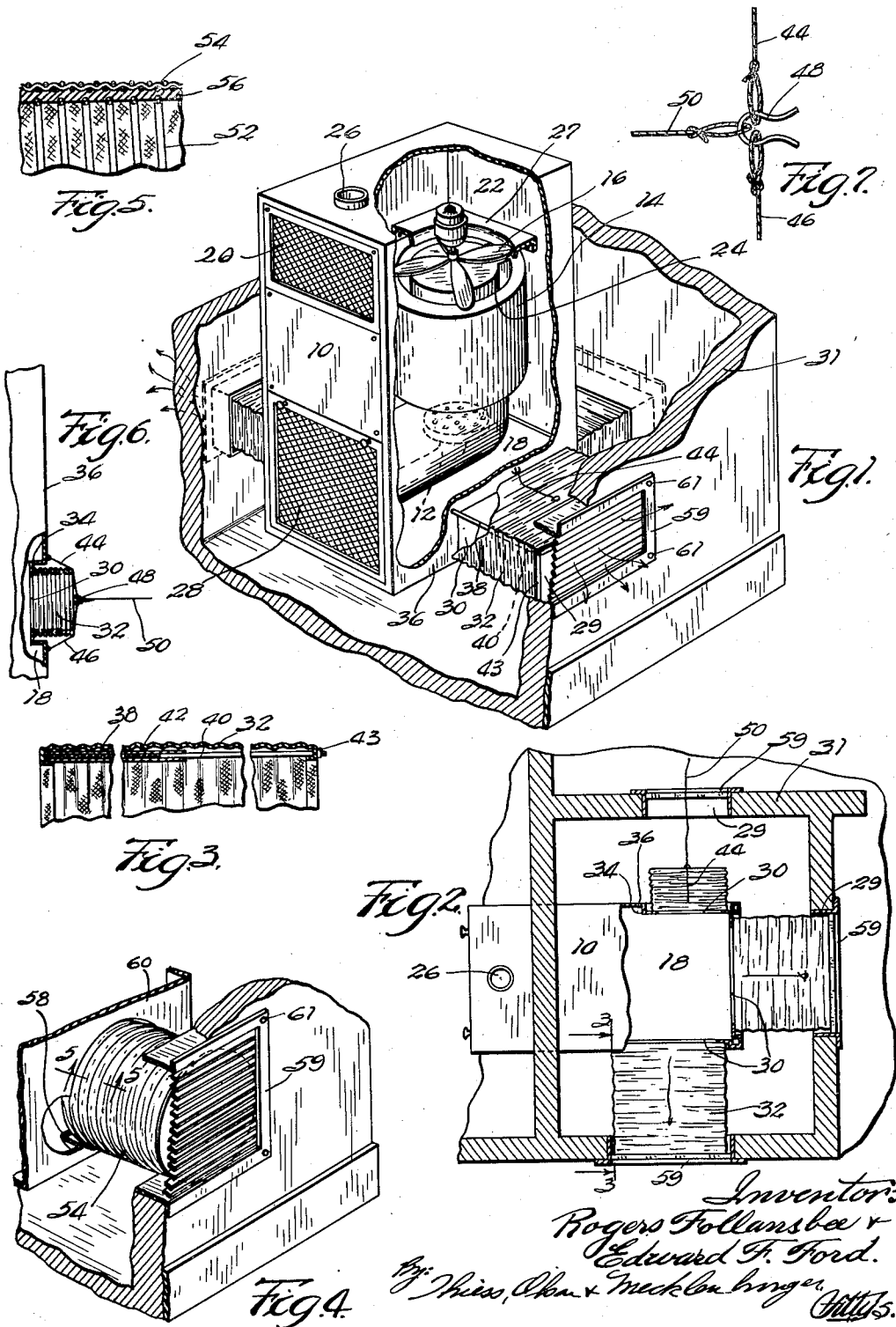
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AIR CIRCULATING UNIT

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AIR CIRCULATING UNIT

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This invention relates to an air circulating unit and more particularly to a heating and air conditioning unit suitable for use in small residential enclosures. This invention has for an object the provision of a heating and air conditioning unit which is particularly useful in the systems disclosed in a prior Patent No. 2,278,843, issued April 7, 1942, to Rogers Follansbee.

In basementless houses of the small residential type it is desirable to install the heating unit centrally in a small closet or other enclosure in order that the unit may be at least partially concealed from view. In the system disclosed in the said prior patent, the heating unit is positioned within the residential area in such a manner that the necessity for conventional heating ducts is eliminated, only short ducts leading from a distribution or plenum chamber to properly arranged outlet grilles being required for the effective delivery of heat to the desired areas in the house. When conventional prior art heating units were installed in accordance with the usual practice prior to the invention disclosed in the said Follansbee patent, a considerable amount of sheet metal duct work for the proper delivery of air to the desired points in a residential enclosure was required. In the said Follansbee patent there is disclosed a system where much of this duct work has been eliminated. However, the time involved in the installation of such duct work has still been an important factor, and it is an object of this invention to speed up this installation still further by means which does not require the services of skilled mechanics.

It is a further object of this invention to provide a packaged heating unit having collapsed air ducts which are arranged to permit the unit to be inserted in a relatively small enclosure, the ducts thereafter being extensible within limits to press against spaced grilles or registers in openings formed within a wall of the enclosure for the heating unit.

A further object of this invention is the provision of collapsed but spring-extensible ducts which may be released by means of a latch mechanism so that the ducts will expand to the desired position after the heating and air conditioning unit has been properly placed.

A further object of this invention is the provision of a compact heating unit containing spring-extensible ducts arranged in such a manner that when the heating unit is installed in a small closet or enclosure, the ducts are held in compression between the heating unit and suitable grilles mounted in wall openings in the en-

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closure so that no supplemental sheet metal duct work is necessary.

Further and additional objects will appear in the following description, the accompanying drawing and the appended claims.

In carrying out the invention in one form, a heating and air conditioning unit is provided having the usual air passageways and including a heating element, a heat exchanger, and means for circulating air through the heater. Associated with an air passageway of the unit are one or more flexible and compressible air ducts engaging the unit in communication with the air passageway. The compressible air ducts may be secured at one end within a well formed by a recessed portion surrounding an aperture in the wall of the unit which communicates with the air passageway, and the flexible and compressible duct may be entirely or partially nested within the well. Prior to installation the air ducts are held in the compressed condition by a releasable latch mechanism, and when the unit is installed the latch mechanism may be released so as to cause the spring-compressed ducts to expand into engagement with a properly located grille or register in the wall of the closet or other enclosure. The compressible duct may take the form of a tubular fabric arranged in the form of a bellows supported on a plurality of tubes having spring-compressed telescopic sections. Alternatively the duct may be formed from a helically wound spring wire having a resilient fabric cover.

For a more complete understanding of this invention reference will now be had to the accompanying drawing, wherein

Fig. 1 is a perspective view of a heating unit constructed in accordance with one embodiment of this invention shown mounted in a closet or other room of a residence, various parts being broken away to indicate the internal construction of the closet and the unit;

Fig. 2 is a plan view of the unit shown in Fig. 1 with parts being broken away to show the mounting of the extensible air ducts relative to the plenum chamber of the unit, one of the ducts being shown in the compressed condition, and two of the ducts being shown in the expanded condition;

Fig. 3 is a detail sectional view showing the construction of one of the heat ducts employed in the unit disclosed in Figs. 1 and 2 in the expanded condition;

Fig. 4 is a broken perspective view showing a modified form of heat duct in association with the heating unit and with a register installed in a wall;

Fig. 5 is a detail sectional view showing the construction of the duct disclosed in Fig. 4;

Fig. 6 is an elevational view taken partially in section of a wall of the heating unit disclosed in Fig. 1, and showing a duct held under compression by a releasable latch mechanism; and

Fig. 7 is an elevational view showing details of the releasable latch mechanism that may be employed for retaining the heat ducts in a compressed condition.

Referring now to Fig. 1 of the drawing, there is provided a heating unit 10 having a gas burner 12, a heat exchanger 14, a circulating fan 16, and a plenum chamber 18 for receiving heated air which is circulated over and through the heat exchanger 14. In the particular unit disclosed in Fig. 1, the air circulates from an intake adjacent the upper portion thereof covered by a grille 20 into an upper portion 22, through passageway 24 in the heat exchanger and to the plenum chamber 18 at the bottom of the unit. The unit is provided with the usual stack 26 communicating with the combustion space within the heat exchanger 14, and is also provided with a removable grille 28 which provides access to the interior of the unit for suitable adjustments and repairs as may be necessary. A plate 27 is secured to the upper inside walls of the unit 10 and has a central aperture in alignment with the circle described by the blades of fan 16 to insure that circulated air will be forced through the passageway 24 in the heat exchanger 14.

The plenum chamber 18 is provided in its side walls with a plurality of openings 30 which provide radially extending outlets for the heated air from the unit through wall openings 29 positioned in closet walls 31 to the desired points within the residence (not shown) being heated. A particular feature of the present invention is the provision of collapsible and spring-extensible ducts in association with apertures 30 in the walls of the heating unit in such a manner that the ducts may be extended to come into registry with closet wall openings 29. In the embodiment shown in Figs. 1, 2, 3, and 6, these collapsible and extensible ducts take the form of a flexible fabric 32 in the form of a tubular bellows having a rectangular cross section. One end of the fabric bellows engages in any desired airtight manner thrust surfaces of the unit 10 within a well 34 formed by recessed portions in the walls 36 of the plenum chamber 18 which define the opening 30 therein. The flexible fabric material is supported by a plurality of pairs of tubes 38 and 40 secured to and extending outwardly from the corners of the respective wells 34, each pair of said tubes 38 and 40 being arranged in telescopic relationship with each other, as shown most clearly in Fig. 3. A compressible coil spring 42 is provided within each tubular member 38 and is compressed when a corresponding tube 40 is pushed inwardly toward the side walls 36 of the plenum chamber. The fabric material 32 may be constructed of any type of flexible material which is resistant to heat and which will not deteriorate upon continued exposure to the temperature of air normally delivered by the heating unit from the plenum chamber. Suitable materials for this purpose are resin-treated fiberglass, asbestos cloth, and the like. In fact, any flexible fabric material, preferably fireproof in nature, may be employed. As indicated in the drawings, this material should be constructed so as to be formed in the shape of a bellows, whereby it may be tightly compressed toward the side

walls of the heating unit, as shown in Fig. 6 when tubes 38 and 40 are pushed together in telescopic relationship, or may be extended to a desired limit as indicated by the extended ducts in Figs. 1, 2 and 3. The outer end edges of the fabric bellows 32 are supported on a frame 43 to which both the fabric and tubes 40 are secured in any desired manner (see Figs. 1 and 3).

The heating unit of this invention, including the collapsible air ducts, is ordinarily assembled at the factory, the ducts being permanently mounted at one end within the wells 34 formed in the walls 36 of the plenum chamber 18. In order to provide for convenience in shipping and handling, the ducts are compressed so that they at least partially nest within the walls 36, as shown in Fig. 6. If desired, the wells may be formed sufficiently deep so that the entire length of the duct may be compressed therein, the outer ends thereof being flush with the walls 36 of the plenum chamber. In the embodiment shown in Fig. 3, the limit of compression is determined by the length of the rod 38 and the coil spring 42. During shipping and handling, and prior to installation, the several ducts are retained in the compressed condition by means of a latch mechanism. As most clearly shown in Figs. 6 and 7, this latch mechanism may comprise a pair of cords 44 and 46, each secured at one end directly to the wall of the heating unit on opposite sides of the opening 30 and provided at their free ends with loops held together by a suitable U-shaped clip 48. Thus at the factory or other assembly point, the collapsible ducts may be compressed at least partially within the wells 34 and secured in the compressed condition by passing the looped ends of the cords 44 and 46 over the ends of the U-shaped clip 48. Thus there is provided a latch which may readily be released by a third cord 50 which is also looped around the U-shaped clip 48. When it is desired to expand the air duct, it is only necessary to pull the cord 50, withdrawing the U-shaped clip 48 from the loops in the ends of the cords 44 and 46, thereby unlatching or releasing the duct so that the springs 42 will cause it to expand to a desired point. In the form of the duct shown in Fig. 3, it will be apparent that the limit of expansion will be determined by the folds in the fabric 32. The folds in the fabric 32 should be formed so that the tubes 38 and 40 remain in telescopic relationship even after the limit of expansion has been reached.

In the modification shown in Figs. 4 and 5, each expansible air duct may comprise a flexible fabric bellows reinforced with a helically wound compressible spring coil 52. As most clearly shown in Fig. 5, the fabric material may form the outer covering for the tube, and the helically wound coil may be embedded in a suitable heat-resistant elastomer or other resinous-like material which at least partially impregnates the fabric. The helically wound coil 52 provides the reinforcement for the fabric 54, and the resinous-like material or elastomer 56 provides a means for firmly securing the coil 52 to the fabric 54. The collapsible duct formed from the helically wound coil may be installed in the heating unit in essentially the same manner as that previously described for the extensible duct supported on the telescopically mounted tubular sections. As most clearly shown in Fig. 4, the fabric duct reinforced with the helical coil 52 is also engaged at one end with a well provided by a recess 58 formed in the side walls 60 of the

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plenum chamber of the heating unit. In this modification the limit of collapse of the duct is determined by the spring coil or by any fabric that may be compressed between the windings thereof, and the limit of expansion is determined by the folds in the fabric covering, it being understood that Fig. 5 shows a section of the duct in its fully expanded condition. Furthermore, the duct in this modification may be held in the compressed condition by any suitable latch mechanism, such as that disclosed above and shown in Figs. 6 and 7.

It will be apparent from the foregoing description that a heating unit has been provided in which air ducts are conveniently installed at the time of manufacture or assembly, and these air ducts are compressible at least partially into the side walls of the heating unit so that they do not interfere during shipping and prior to installation. Because of the compressed nature of the air ducts, the heating unit may be readily inserted into a closet or enclosure within a residence that is adapted to receive it, and the opening through which it is inserted may be somewhat smaller than that which would otherwise be permitted if the air ducts were not held in a collapsed condition. After the heating unit has been installed in place in the desired closet enclosure, an example of which is indicated in Figs. 1 and 2 of the drawing, then the latch mechanism holding the ducts in the compressed condition is released. This is effected by pulling the cord 59 which withdraws the U-shaped clip 48 from the loops at the ends of the cords 44 and 46. As indicated in Fig. 2, it is usually preferred that the free end of the cord 50 be passed prior to the unlatching operation through the grille or register 59 which is received in the wall opening 29 preferably by wood screws 61. When the ducts are unlatched, as above indicated, the free ends thereof will spring away from the heating unit toward the wall registers 59 previously secured in the walls 31 of the enclosure. These wall openings 29 and associated registers 59, of course, should be initially positioned and constructed so that they will come into registry with the extensible ducts when the ducts have been released to their expanded condition. However, it will be apparent that the wall openings need not be in exact registry with the openings 30 in the heating unit, since the ducts are sufficiently flexible to take care of limited displacement of the openings in the enclosure with reference to the ducts.

Although the maximum convenience of installation and shipping may be obtained through the provision of a completely packaged unit in which the compressible ducts are assembled at the factory and latched in a compressed condition during shipping and the initial stages of the installation, the invention contemplates that with the type of expansible duct shown in Figs. 4 and 5, the ducts 54 may be shipped separately or may be shipped with the heating unit but in disassembled relation. When the heating unit 10 and the ducts 54 are received at the place of installation, the heating unit is first positioned in the enclosure or closet formed by the walls 31 before the grilles or registers 59 are inserted into the wall openings 29. Thereafter the ducts 54, in expanded condition, may be inserted through the wall openings from the outside of the enclosure so that the inner ends of the ducts engage the recesses 58 in the side walls 60, and the grilles or registers 59 are then placed in con-

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tact with the outer ends of the duct and pressed into the wall openings 29 and secured in place by suitable wood screws 61, whereby the ducts 54 are compressed and firmly held in position without the necessity of employing skilled mechanics. The duct shown in Fig. 3 may be separately packaged, shipped and installed in the same manner.

Thus it will be seen that by the present invention a heating unit has been provided which eliminates the necessity for sheet metal duct work to be carried out in more or less inaccessible places. The ducts are readily extensible to the desired points within the closet or enclosure. The ducts, being made of flexible fabric, press tightly against the wall registers because of the springs tending to urge them in this direction. This permits a tight fit of the ends of the duct between the wall grilles or registers and the walls of the unit. The resilient nature of the fabric is such that the ducts do not have a tendency to rattle or vibrate when the unit is in operation and have a tendency to isolate the vibration which may occur in the unit. They are lightweight, and the fabric material from which they are prepared has thermal and acoustical properties which are desirable in an element of this character.

It will be apparent from the foregoing description that we prefer to employ flexible fabric ducts of the general character indicated. However, we do not wish to be limited thereto since rigid sheet material, such as sheet metal, may be formed into a plurality of spring-compressible telescopic duct sections and used as indicated. In this event, it may be desirable to employ suitable vibration dampeners at appropriate points to minimize rattling and vibration when the air circulating unit is in operation.

While we have shown particular embodiments of our invention, it will be understood, of course, that we do not wish to be limited thereto since many modifications may be made, and we therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of our invention.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In a ventilating system for a building having walls defining a restricted enclosure and an air-circulating unit within said enclosure, the walls of the circulating unit being spaced from those of the enclosure, the improvement that comprises a thrust-receiving surface defining an opening in the enclosure wall, a thrust-receiving surface defining an opening in a wall of the circulating unit, said surfaces being spaced apart but lying in substantially parallel planes with the openings defined thereby substantially in axial alignment, and a resilient duct open at both ends, said duct being axially compressed between said surfaces with its ends bearing thereon to define a conduit between said openings, said duct in repose being longer than the distance between said surfaces and being compressible to a length shorter than said distance.

2. In a ventilating system for a building having walls defining a restricted enclosure and an air-circulating unit within said enclosure, the circulating unit having walls opposite to and spaced from walls of the enclosure, the improvement that comprises thrust-receiving surfaces each defining an opening in a different wall of the enclosure, thrust-receiving surfaces each defining an opening in a corresponding opposite

wall of the circulating unit, surfaces in opposite walls being spaced apart but lying in substantial-parallel planes with the openings defined thereby substantially in axial alignment, and resilient ducts each open at both of its ends, each of said ducts being axially compressed between the surfaces defining openings in opposite walls with its ends bearing against said surfaces to define a conduit between said openings, each duct in repose being longer than the distance between the surfaces defining the openings in the opposite walls between which it lies and being compressible to a length shorter than said distance.

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