

German utility model no. DE202022100213U1

## Air-to-Air Heat Exchanger in Combination with a Window Sash

### Description

Especially during pandemics (e.g., "Corona," COVID-19), rooms (such as classrooms in schools) are regularly ventilated even in winter. Apart from the distraction caused by the cold and the ventilation process, which hampers the work or learning flow, it can also lead to an increase in "normal" cold illnesses.

Air filters with special virus filters are effective concerning germ load. However, the purified air has the same high carbon dioxide level and a lower oxygen level: the air is "used."

Conventional air-to-air heat exchangers with fresh air supply usually require construction work.

Even an exhaust system for self-construction has already been developed. The "DIY store filter" is an exhaust system, and virus-laden aerosols are largely removed and discharged outside through an exhaust pipe. This system is inexpensive and involves relatively minor construction work. However, heat recovery is not provided.

Air-to-air heat exchangers built into a window frame usually have low performance, resulting in insufficient air exchange.

Many air-to-air heat exchanger solutions already exist around a window, as well as various design principles, such as:

- DE000003037646A1, heat exchanger below the window,
- DE102004014004A1, heat exchanger - windowsill,
- DE102020121397B3, heat exchanger away from the window,
- WO002011087381A1, heat exchanger in the window frame,
- CN000208205270U, heat exchanger above the window.

Various design principles of a heat exchanger, such as:

- WO002015055435A1, EP000002776776B1, EP000003153807A1, EP000003358286B1,
- DE000003044135C2, DE000029802081U1, and DE102005001382B4.

Air-to-air heat exchangers as air conditioners, such as:

- WO002005090869A1 and WO002017129211A1.

My invention is based on the further development of air-to-air heat exchangers for room ventilation.

The existing solutions fulfill their corresponding function but do not have the capabilities of the above-mentioned invention.

The need for a mobile and quickly installable air-to-air heat exchanger is desired, and the invention specified in Claim 1, an air-to-air heat exchanger mounted on a window sash (with special filters and alternatives to window glass), meets these requirements.

An example embodiment:

As seen in Figures 1 and 2, a standard air-to-air heat exchanger 8 is installed. Depending on the design principle of the heat exchanger, the inlets and outlets may also be positioned differently.

The window sash can be easily replaced, and the heat exchanger additionally secured with one or more mounting struts 12.

Unlike previous solutions, this invention is quickly deployable, mobile, energy-saving, and requires minimal installation effort. However, due to the professional heat exchanger, it is not as inexpensive as a simple "DIY store solution."

Comparing the acquisition costs with the lower energy costs, the device pays off because, with the absence of "normal ventilation," not much cold air needs to be heated anymore. The "heat exchanger window" can still be opened and closed as needed.

It is usually recommended to install the air-to-air heat exchanger in the upper part of the window sash (Fig.2) to avoid drafts that might disturb people. Furthermore, the warm, used air is better extracted in the upper part of the room.

According to Claim 2, the frame of the window sash can consist of various materials and combinations thereof, such as plastic, wood, metal, etc.

Unlike the professionally built effective air-to-air heat exchanger, the remaining work and installation in the frame of a window sash can also be carried out by oneself.

If viruses or other germs are to be additionally removed from the exhaust air, as is desirable during pandemic times (as illustrated in Claim 3), additional virus and bacteria filters in the heat exchanger are recommended. This can be useful to ensure that a neighboring (class) room does not draw in viruses through the heat exchanger there.

The remaining area – apart from the heat exchanger – can be filled with Plexiglas according to Claim 4 (preferably with two, possibly three panes). As described in Claim 5, the Plexiglas can be permanently mounted on the window sash frame or attached with magnets. Two or more Plexiglas panes should be installed in a window sash to achieve additional thermal insulation with the resulting gap. Also, wind tightness and soundproofing are higher. A cheaper solution would be to cover the remaining area of the window sash with wooden or plastic panels. Again, more than one layer is advisable for thermal insulation.

As the air-to-air heat exchanger is usually installed horizontally for practical reasons, additional insulation of the side surfaces of the heat exchanger should be carried out, particularly on the outside (as per Claim 6).

As shown in Claim 7, care should be taken during installation to ensure that air exchange/mixing between outside and exhaust air or supply and exhaust air is as low as possible (through direct deflection of air flows depending on the opening of the heat

exchanger downward/upward/right/left and in combinations). It is also possible, according to Claim 8, to achieve a greater distance between the supply and exhaust air or outside and exhaust air with air hoses.

If the air-to-air heat exchanger is installed in the window sash horizontally inclined, additional redirection of the airflows may become unnecessary.

As described, installation is possible at the top, bottom, or even vertically. The best solution should be chosen based on an analysis of the environmental variables.

As illustrated in Claim 9, the air-to-air heat exchanger, after technical optimization, can also be used as an air conditioner for cooling on hot summer days.

Standardized window sash frames can be used. If special dimensions are present, and to quickly obtain suitable window sashes, length-adjustable frames of the sash similar to interlocking rails, as per Claim 10, are possible, which can be locked after adjustment. Additionally, adjustable hinges can be installed and locked for hanging the window sashes, so that the existing frame hinges can continue to be used.

## Reference List:

1. Window frame
2. Window sash
3. Window hinge
4. Window hinge
5. Window handle
6. Outside air (cold fresh air from outside to inside)
7. Exhaust air (used cold air from inside to outside)
8. Air-to-air heat exchanger
9. Supply air (fresh warm air from outside to inside)
10. Exhaust air (used warm air from inside to outside)
11. Pane (e.g., Plexiglas)
12. Mounting strut
13. Power connection with cable: socket with protective contact

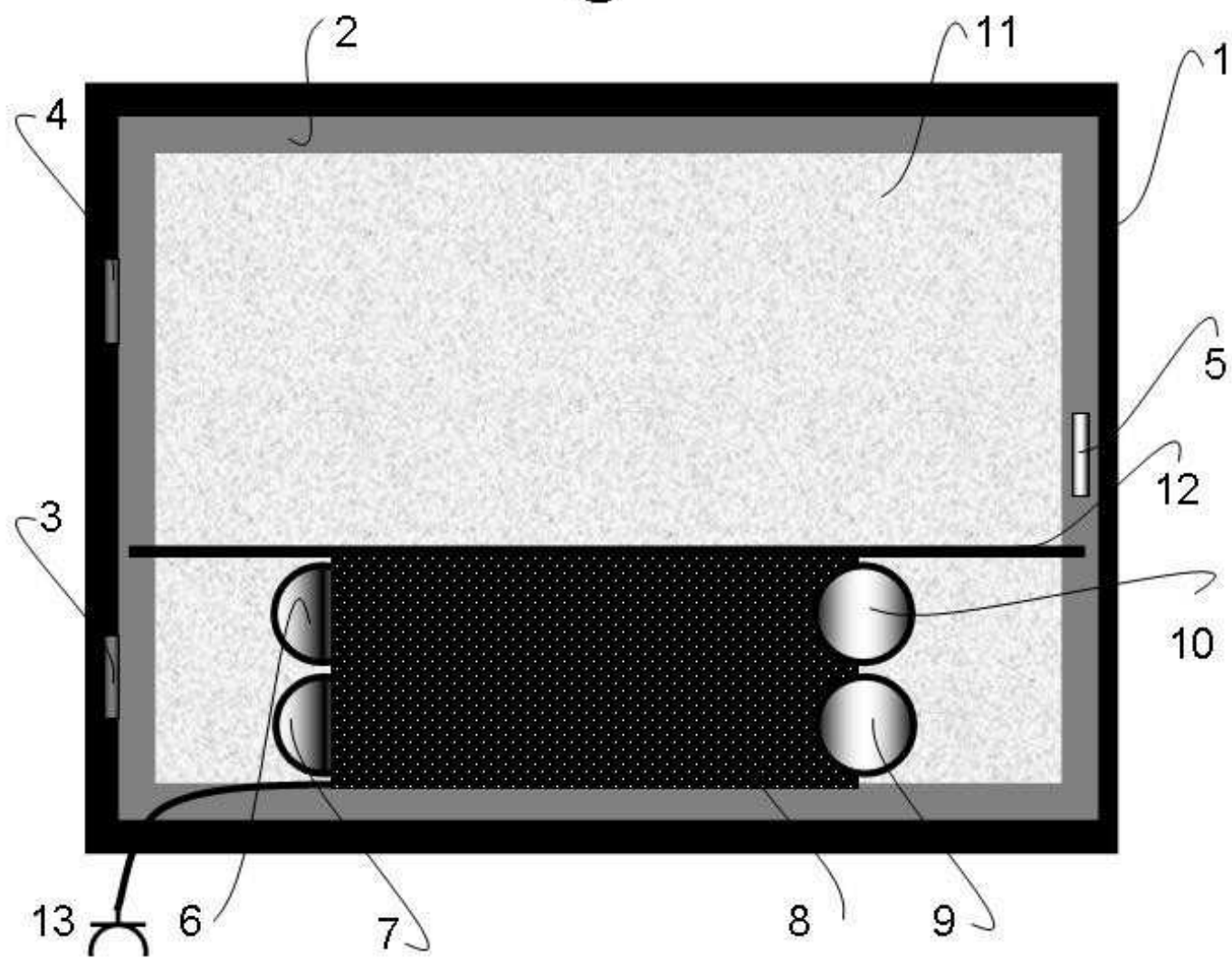
## Claims

1. An air-to-air heat exchanger in combination with a window sash, characterized in that it is mounted directly on the window sash in various possible positions and with one or more mounting struts.
2. An air-to-air heat exchanger in combination with a window sash according to claim 1, characterized in that the frame of the window sash can consist of various materials and combinations thereof, such as plastic, wood, metal, etc.
3. An air-to-air heat exchanger in combination with a window sash according to one of the preceding claims, characterized in that additional virus and bacteria filters are installed in the heat exchanger.
4. An air-to-air heat exchanger in combination with a window sash according to one of the preceding claims, characterized in that the remaining area of the window sash is filled with Plexiglas or other materials in one or more layers.
5. An air-to-air heat exchanger in combination with a window sash according to one of the preceding claims, characterized in that the remaining area of the window sash (e.g., Plexiglas) is permanently mounted on the window sash frame or attached with magnets.
6. An air-to-air heat exchanger in combination with a window sash according to one of the preceding claims, characterized in that the air-to-air heat exchanger has additional insulation on the side surfaces.
7. An air-to-air heat exchanger in combination with a window sash according to one of the preceding claims, characterized in that a redirection of the airflows occurs directly at the openings (inlets and outlets) of the heat exchanger.
8. An air-to-air heat exchanger in combination with a window sash according to one of the preceding claims, characterized in that the inlets and outlets of the heat exchanger are equipped with air hoses.

9. An air-to-air heat exchanger in combination with a window sash according to one of the preceding claims, characterized in that the air-to-air heat exchanger is technically optimized for use as an air conditioner.

10. An air-to-air heat exchanger in combination with a window sash according to one of the preceding claims, characterized in that the frame of the window sash and the hinges are equipped with interlocking rails as well as respective locks.

# Fig. 1





# Fig. 2

