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The invention relates to an arrangement for heating, in particular for drying, a part of a building.

In Germany, over 1 million cases of water damage due to water pipe leakages are reported to insurers every year. The average costs per case come to approximately 1500 euros, and this figure is rising. The most frequent cause is old, leaky pipes. Large temperature fluctuations or freeze-thaw cycles can also lead to leaky pipes and therefore water damage. In many cases, the leak is discovered with a time delay of days or even weeks, for example, as a water spot on room ceilings or as dark spots on the wall. After this has been determined, it must be decided whether the damage can be remedied through technical drying of the affected floors, ceilings and walls.

The drying of damp walls and floors following water damage is generally carried out by means of heating up the rooms or infrared heating panels which, by heating the surfaces, cause the parts of the building to dry. Under-floor drying systems are used for floors if they have insulation. The two systems are very energy-intensive and often leave behind damp sections that cannot be reached by the drying systems, such as the wall-floor transition.

A system is known from AT 408 557 B, in which heating pipes are arranged in the brickwork to be dried. A cover consisting of permeable heat-insulating material is arranged as interior insulation on the brickwork on the room side. In this way, the amount of heat output into the room is reduced and, at the same time, moisture is allowed to be output to the room.
A device for drying damp building parts such as wall, ceiling, floor or beam regions is known from AT 507 536 A1. For this purpose, a heated layer is arranged on the surface of the building section to be dried or just in front of it. This layer conducts heat well. In order to allow moisture to escape, the

layer is pierced in a grid-like manner. Permeable heat insulation is attached to the side that faces away from the building section to be dried.
AT 507 536 A1 discloses a generic design with the features of the preamble of claim 1.

A method for drying damp walls of building and a heating mat for this purpose are known from DE 103 20 240 A1. The heating mat contains a heating layer applied to heat insulation layer on one side and an electrically insulating barrier layer attached to the heating layer. A heat conducting layer is connected to the barrier layer. The heating mat is brought into contact with the wall to be heated with its heat conducting layer. In this way, moisture is pushed out from the heated wall side through the wall and evaporates on the unheated wall side.

The object of the present invention is to provide an improvement of arrangements of this kind.

For this purpose, a structure for heating a part of a building is proposed. The part is in particular a wall and/or a floor and/or a ceiling. However, it can also be a roof or similar. In principle, it can be understood to be any component of a wall for which drying may be necessary. In many cases, it is brickwork.

The design has a heating system and permeable insulation. The heating system is designed such that the part can be heated by the heat provided by the heating system. The heater is an electric resistance heater which can be brought into direct contact with the part. The permeable insulation is arranged or can be arranged such that the heat transfer of the heat provided by the heating system into the surrounding environment on the heating system side can be reduced. It should firstly be stressed that the permeable insulation is arranged during operation in such a way that heat

losses on the heating system side are reduced. Therefore, providing permeable insulation on the exterior face in the case of heating, for example, the interior face of an outer wall is not the primary concern. Rather, to stay with the current example, the heating system and the permeable insulation should be arranged on the interior face. In this case, it is clear that the permeable insulation must not hinder the entry of the heat provided by the heating system into the part to be heated.

It should be made clear that a configuration is conceivable in which a heating system and permeable insulation are preconfigured into a complete system, which, as such, can then be connected to a part. This should be preferred.

However, it is also conceivable to combine a heating system and permeable insulation as separate components into a configuration according to the invention only when arranged on the part to be heated.

In any case, it is possible to design a heating system and/or permeable insulation flexible. This allows the heating system and permeable insulation to be adapted to the shape of the part to be heated on site.

In AT 408 557 B mentioned at the outset, permanently installed pipes are provided in the brickwork. In contrast, the configuration described above is generally suitable for drying any part desired. In particular, drying in a pass-by manner is possible.

AT 507 536 A1 also has an electric resistance heater. A heated, highly heat-conductive layer is provided for distributing the heat. Said layer has a plurality of openings so that the moisture can be discharged. Usually, the layer is a plate. In the final paragraph of the description of AT 507 536 A1, it is explained that a film can also be used instead of the plate. An

accompanying loss of heat-conductivity is mentioned as a disadvantage of this. In the present invention, it is now recognised that the heat-conducting layer can be omitted entirely. The heat conduction in the part to be dried is sufficiently high. This is the case in particular in consideration of the permeable insulation, which provides a high heat resistance. The omission of the layer is therefore thermodynamically possible and simplifies the design. The omission of the layer also facilitates the discharge of the moisture. Even if the layer has boreholes according to AT 507 536 A1, it still provides resistance for the moisture to be discharged.

In an embodiment, the design is configured to accelerate the drying of the part. As mentioned at the outset, drying parts is a significant problem. Parts are usually warmed in order to dry the same. Therefore, the present design is generally suitable for this purpose. In addition to the permeable insulation, it is also important that the heating system does not hinder the drying. A vapour-tight heat film, for example, is not considered for drying applications. Drying is not only important following water damage. There are parts that must be dried following their production; one need only consider the drying of freshly laid floor screed. The present invention is also suitable for such applications.

In addition to the currently prevalent drying, the design can also be used to accelerate the reactions of materials. For example, polymeric sealants harden more quickly if they are warmed. The system can also be used to abate microorganisms by means of heat treatment.

As mentioned above, the present heating system can be brought into direct contact with the part. In general, it is even favourable for the heating system to be installed as closely as possible to the part even though direct contact is not usually mandatory. The permeable insulation causes a shielding effect so that the use of the rooms is generally not forbidden even during the drying measures. With the already known drying approaches,

the use of the rooms is mostly significantly restricted or forbidden.

If the permeable insulation is on a floor, additional measures can be taken so that the floor remains accessible. Therefore, it is conceivable, for example, to arrange a metal grid, which is removed from the floor by a brace, on the side of the permeable insulation that, in the installation position, is located above so that persons who step onto the metal grid do not impair or damage the permeable insulation.

In addition to this, it is essential that the present invention provides energy-efficient drying. This is mainly due to the fact that, because of the insulation, only the part to be dried is primarily heated and not the surrounding environment.

While corners are frequently dried insufficiently through drying measures known from the prior art, for example through drying and recirculating the air in the building, the present invention also efficiently dries corners. In many cases, it is also expedient to combine different drying measures. In this way, drying by means of recirculating dry air in the building known from the prior art can take place in a first phase and drying according to the present invention can take place in a second phase.

As mentioned above, the heating system is formed by electric heating wires. Electric resistance heaters of this kind are wide-spread and well established. They are therefore also suitable for the present application.

In an embodiment, heating wires, which are used as a heating system, are incorporated into a textile or nonwoven fabric used as permeable insulation, in particular into a permeable glass fibre textile or glass fibre nonwoven fabric. The permeable insulation and the heating system are therefore provided as one part. It is also ensured that the heating system has the

permeability necessary for the drying. It is understood that the heating wires must be attached to one side, more specifically, on the side that, in the installation, faces the part to be dried.

In an embodiment, a permeable insulation made of mineral fibre is used as permeable insulation. Said insulation can be used in particular together with the permeable textile or nonwoven fabric mentioned above. The textile or the nonwoven fabric in which the heating wires are incorporated is on the side facing the part to be dried in the installation position. The insulation made of mineral fibre is attached thereto on the side facing away from the part in the installation position. This forms a mat which can be used as a compact unit for drying.

In an embodiment, the heating system and the permeable insulation are arranged in an interior or the exterior of the building. In this way, the heating system and the permeable insulation can be arranged in the exterior in order to dry a part that is designed as an exterior wall by its exterior face. In the interior of the building, the heating system and the permeable insulation can additionally or alternatively be arranged on the exterior wall. In the case of an interior wall that forms the part, the two sides are in the interior. It is possible to arrange the heating system and the permeable insulation on one side or both sides. This also applies to a ceiling that forms the part which forms the floors for the storey above at the same time. Securing a heating system and permeable insulation on the ceiling is sometimes somewhat more difficult, in which case the impairment for the user is often lesser than in the case of an arrangement on the floor of the storey above.

In an embodiment of the invention, the heating system is also formed by a layer that absorbs solar radiation and the permeable insulation is formed by translucent heat insulation. It is understood that this design is only

expedient as long as the absorbing layer is also in fact exposed to the solar radiation in any significant way. In general, this is only the case with the side of an exterior wall, which faces the exterior, namely the exterior face, as long as said wall is sufficiently oriented towards the sun. The layer that absorbs solar radiation can be formed by the surface of the part, that is usually the surface of the exterior wall.

It should be mentioned at this point that a plurality of heating systems can be combined into a joint heating system. It is therefore possible to combine, for example, the abovementioned layer that absorbs solar radiation with the electric heating wire described. However, other combinations are also conceivable.

In an embodiment of the invention, the permeable heat insulation is watertight. This is significant in particular when attaching in the exterior in order to prevent strain due to rainwater. One possibility for implementation is provided by a permeable yet watertight membrane. Membranes of this kind are known from the prior art. Permeable and watertight membranes of this kind are especially expedient in the case of translucent heat insulation, which is usually arranged in the exterior and thus exposed to the rain. They can be used as an enclosure that faces away from the part. Of course, membranes of this kind can also be installed on other permeable insulation, such as the above mentioned insulation made of mineral fibre.

In an embodiment of the invention, it is possible to control the heating system, wherein particularly temperature sensors and moisture sensors in the part and on the part surfaces are possible. In this way, a target temperature to be reached in the part can be specified. Safety aspects can also be considered through the controls if, for example, a certain temperature in the part or in the insulation must not be exceeded for

reasons of fire safety. It is also conceivable to aim to ensure availability of the building during the drying and to control the heating system to the effect that no unpleasant overheating of rooms in the building takes place.

In an embodiment of the invention, securing devices for securing a heating system and permeable insulation to the part are provided. This can be achieved by means of nails, double-sided adhesive tape, clamping strips, hook-and-loop fasteners and a series of further measures.

In particular the previously mentioned embodiments can contribute to making use by less trained personnel or amateurs possible as well. In this way, making securing simple can facilitate the use of the invention. Mainly, however, simplified control for the user, in which case the safety aspects, predominantly issues of fire safety, are largely automatically ensured, plays a significant role.

The invention will be explained in more detail with reference to an example. Figure 1 schematically shows a building for this purpose.

The building 1 shown schematically in figure 1 comprising an interior 2 has a floor 3, a ceiling 4, a roof 5 and an exterior wall 6 as parts. The ceiling 4 serves as a floor of a top floor 7 at the same time.

Water damage is in the region 8 of the floor 3, in the region 9 of the exterior wall 6 and in the region 10 of the ceiling 4. The parts floor 3, ceiling 4 and exterior wall 6 must therefore be dried. In order to dry the regions 8 and 9, a heating system 11 comprising permeable insulation 12 is arranged. The heating system 11 is a flexible electric heater, more specifically a heating wire which is incorporated into nonwoven fabric. The permeable insulation 12 made of mineral fibre is attached thereto.

Such a design is also suitable for drying the region 10 of the ceiling 4, both on the side facing the interior 2 and the side facing away from the top floor 7.

In order to dry the region 9 of the exterior wall 6, a heating wire which is incorporated into nonwoven fabric is also provided on the exterior face as a heating system 11. Translucent heat insulation 13 is used as permeable insulation. A watertight yet permeable membrane (not shown) is arranged on the side of the translucent heat insulation 13 facing away from the heating system 11. The radiation originating from the sun 14 enters via the translucent heat insulation and is then absorbed. In this way, additional heating takes place.

It is apparent that, in order to dry the regions 8 and 9, a complete heating system 11 comprising permeable insulation 12 is arranged. Due to the flexible design, the heating system 11 comprising permeable insulation 12 can be guided around the corner.

The arrows 15 indicate the evaporation which occurs into the interior 2, the top floor 7 and the surrounding environment.

P A T E N T K R A V

1. Konstruktion, især fleksibel konstruktion, til opvarmning af en del (3, 4, 5, 6) af en bygning (1), udformet til at lede og afgive fugt fra delen (3, 4, 5, 6) gennem konstruktionen, hvor delen især er en væg (6) og/eller et gulv (3, 4) og/eller et loft (4), omfattende et varmesystem (11) og en diffusionsåben isolering (12, 13), hvor varmesystemet (11) er udformet på en sådan måde, at delen (3, 4, 5, 6) kan opvarmes ved den varme som tilvejebringes af varmesystemet (11), og hvor den diffusionsåbne isolering (12, 13) er arrangeret eller kan arrangeres på en sådan måde, at en varmetransport af varmen tilvejebragt af varmesystemet (11) til de mod varmesystemet vendende omgivelser af delene (3, 4, 5, 6) kan reduceres, k e n d e t e g n e t ved, at varmesystemet (11) er en elektrisk modstandsopvarmning som kan bringes i direkte kontakt med delen (3, 4, 5, 6).

2. Konstruktion ifølge krav 1, k e n d e t e g n e t ved, at konstruktionen er udformet til at fremskynde tørringen af delen (3, 4, 5, 6).

3. Konstruktion ifølge et hvilket som helst af de foregående krav, k e n d e t e g n e t ved, at varmetråde som tjener som varmesystem (11), er indbygget i et diffusionsåbent vævet stof eller ikke-vævet stof, især i et diffusionsåbent vævet glasfiberstof eller ikke-vævet glasfiberstof, som tjener som diffusionsåben isolering (12).

4. Konstruktion ifølge et hvilket som helst af de foregående krav, k e n d e t e g n e t ved, at en diffusionsåben isolering lavet af mineralfiber tjener som diffusionsåben isolering (12).

5. Konstruktion ifølge et hvilket som helst af de foregående krav, k e n d e t e g n e t ved, at varmesystemet (11) og den diffusionsåbne isolering (12, 13) er arrangeret i et indre rum eller ydre rum af bygningen.

6. Konstruktion ifølge et hvilket som helst af de foregående krav, k e n d e t e g n e t ved, at varmesystemet (11) yderligere er dannet af lag som absorberer solar stråling, og den diffusionsåbne isolering er dannet af en gennemskinnelig varmeisolering (13).

7. Konstruktion ifølge et hvilket som helst af de foregående krav, k e n d e t e g n e t ved, at den diffusionsåbne isolering (13) er vanduigennemtrængelig.

8. Konstruktion ifølge et hvilket som helst af de foregående krav, k e n d e t e g n e t ved, at regulering af varmesystemet (11) er muligt, hvor især temperatursensorer og fugtsensorer er mulige i delen (3, 4, 5, 6) og på overfladen af delen.

9. Konstruktion ifølge et hvilket som helst af de foregående krav, k e n d e t e g - n e t ved, at fastgørelsesanordninger til fastgørelse på delen (3, 4, 5, 6) er til stede.

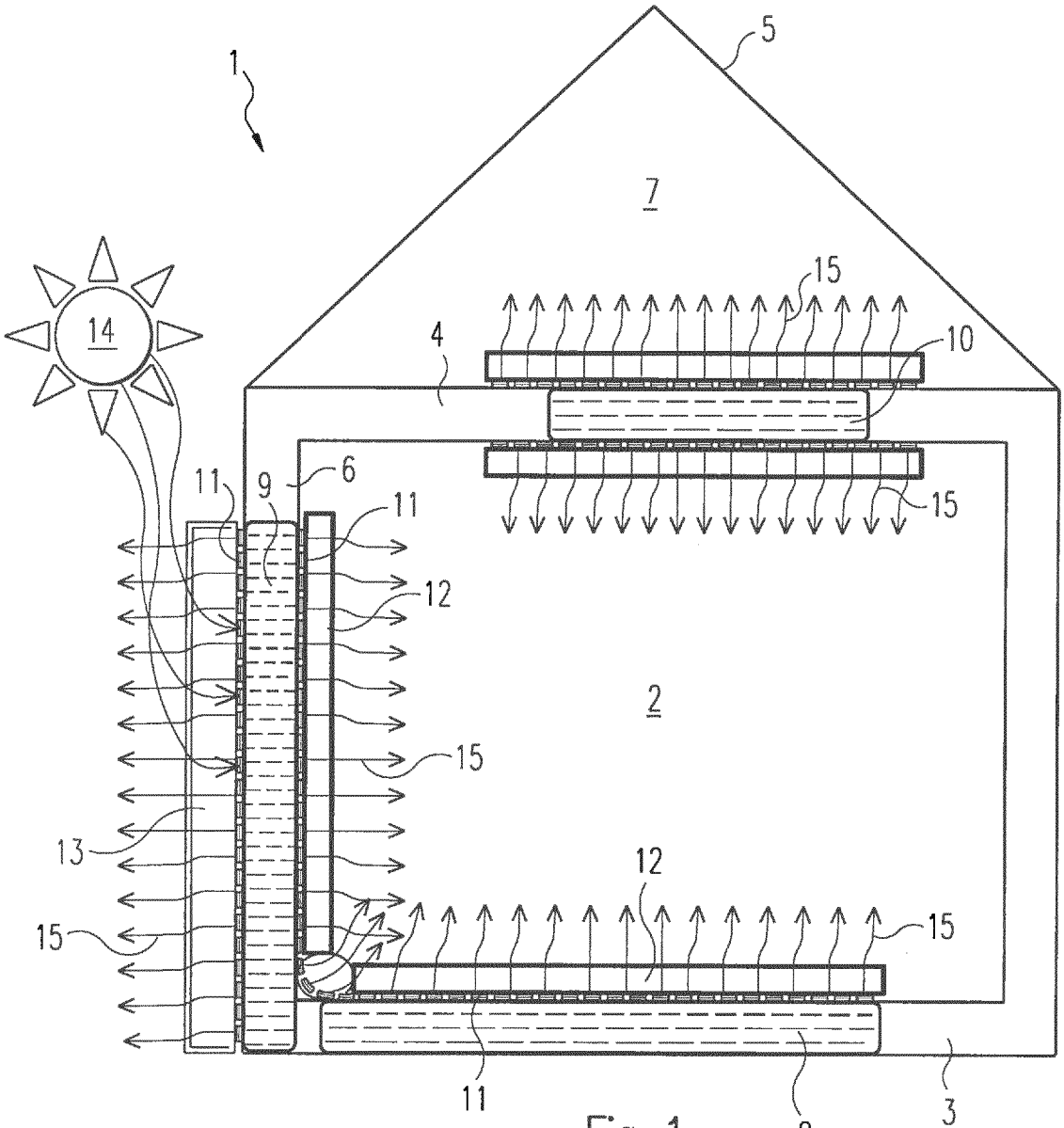

Fig. 1