(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 952 668 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.12.2015 Bulletin 2015/50

(51) Int Cl.:
E06B 3/263 *(2006.01)* ***E06B 1/16*** *(2006.01)*
E06B 3/16 *(2006.01)*

(21) Application number: **15170351.9**

(22) Date of filing: **02.06.2015**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

(30) Priority: **02.06.2014 BE 201400423**
23.04.2015 BE 201505271

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(54) **TRADITIONAL STEEL JOINERY ARRANGEMENT FOR WINDOWS AND DOORS**

(57) The present invention relates to a traditional steel joinery arrangement for windows or doors, comprising a thermal break with multiple air compartments. The thermal break also provides a seal between moving parts of the joinery. The design allows for the joinery to be constructed from standard available profiles.

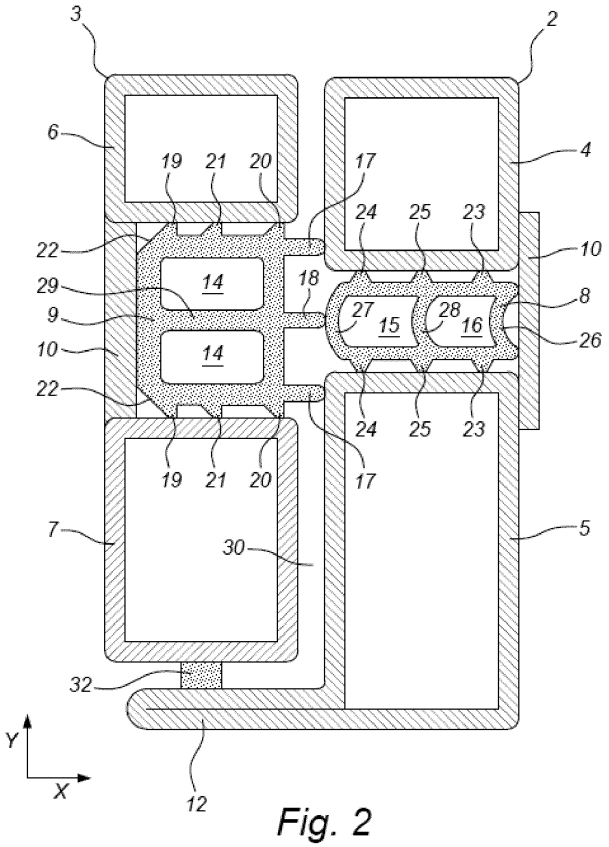


Fig. 2

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Description

TECHNICAL FIELD

[0001] The invention relates to a traditional steel joinery arrangement suitable for windows and doors.

PRIOR ART

[0002] Traditional steel external joinery has fallen into disuse by ever stricter insulation standards. The insulating capacity of joinery is calculated in the energy efficiency of a house. This energy efficiency is checked with an "EPB" verification (energy performance and indoor climate) and for the energy performance, an E-level is awarded. The legislation imposes a maximum E-level and exceeding this has consequences. Steel is a good heat conductor and, therefore, has poor insulating properties, resulting in a higher E-level. Traditionally, steel joinery is to be thermally broken in order to obtain good insulating properties. Applying a thermal break makes the production process of traditional steel joinery labor-intensive because steel is difficult to manipulate and therefore limits the design.

[0003] Aluminum is easier to manipulate, that is, complex profiles can be produced by means of extrusion. The use of these complex profiles makes it possible to apply thermal breaks in a simple manner. One of the drawbacks of aluminum compared to steel is that the stiffness is much lower, and this results in aluminum profiles about 3 times thicker than a steel profile with the same stiffness. The present invention therefore relates to a joinery consisting of steel.

[0004] In DE 10 2004 008 414 A1, a metal joinery provided with thermal break with multiple air compartments is described. The joinery can be made from both steel and aluminum. This thermal break should be fixed in the framework by means of connecting elements, such as screws or rivets, or by an additional clamping element on the metal profile. The presence of connecting and clamping elements makes the construction of the joinery complex and when this joinery is carried out in steel, very labor-intensive. The invention in DE 10 2004 008 414 further also does not provides a seal between possible moving parts.

[0005] Thus, a demand remains for a traditional steel joinery with good thermal and acoustic insulation properties.

[0006] The present invention aims to find a solution for at least some of the above-mentioned problems.

SUMMARY OF THE INVENTION

[0007] In a first aspect, the invention relates to a traditional steel joinery arrangement 1 for windows or doors, comprising a steel outer framework 2, and a steel inner framework 3, and at least provided with one hinge 31 for hingeably bearing the inner framework 3 to the outer framework 2, between which frameworks 2,3 a free space 30 is provided with at least two adjacent thermal breaks 8, 9, wherein one of the two thermal breaks 8 in a direction X has at least two adjacent air compartments 15, 16 and that one of the two thermal breaks 9 in a direction Y, perpendicular to the direction X, has at least two adjacent air compartments 13, 14.

[0008] One of the advantages of this orientation of succession of air compartments is that when the traditional steel joinery 1 is incorporated in a wall or a roof, the thermal breaks 8 and 9 are in communication with one another and constitute a connection with the insulation in a cavity 42 wall as shown in figure 4 or in communication with the insulation 35 between floor plate 36 and sill 34 as shown in figure 3. In this way, there are at least 2 air compartments 15 and 16 which are in the extension of the insulation 35 between floor plate 36 and sill 34 or the insulation in the cavity 42 between the inner wall 41 and the outer wall 38. This ensures that the cavity 42 and/or the insulation 35 between the floor plate 36 and sill 34 are better thermally sealed with respect to the free space 30 between the outer framework 2 and the inner framework 3, and hence are better thermally sealed from cold. As a result, the thermal insulation value of the entire wall or roof in which the traditional steel joinery 1 has been incorporated, is increased. Preferably, the floor 37 is applied up to frame 5 forming part of the outer framework which is directed towards the interior as shown in figure 3, or up to stop bar 12.

[0009] In a preferred embodiment, a traditional steel joinery arrangement for windows or doors comprises a steel outer framework, and a steel inner framework and at least provided with one hinge for hingeably bearing the inner framework to the outer framework, between which frameworks a free space is provided of at least one plastic thermal break.

[0010] In a preferred embodiment, a traditional steel joinery arrangement for windows or doors comprises an outer framework and an inner framework, each one composed of two substantially rectangular frames; wherein two per two frames are interconnected by one or more connecting elements; and at least provided with one hinge for hingeably bearing the inner framework to the outer framework, between which frameworks a free space is provided with at least one plastic thermal break, which break is provided with one or preferably more adjacent internal air compartments and with at least one protruding sealing lip which extends towards the free space. This joinery arrangement has good thermal and acoustic properties because of the presence of a thermal break comprising internal air compartments. The sealing lips provide a seal between moving parts of the joinery as a result of which no losses due to mass transport occur.

[0011] In a second aspect, the invention relates to a method for manufacturing a traditional steel joinery arrangement for windows or doors as mentioned above, comprising the following steps:

- assembling steel profiles into frames;
- assembling the frames by means of connecting elements;
- applying at least one hinge;
- applying a thermal break between the frames.

[0012] This method is distinguished by the simplicity in the construction, the assembling of the different components is preferably done by welding and screwdriving, so that no specific equipment or highly-educated workers are necessary for the construction of the traditional steel joinery arrangement.

[0013] In a third aspect, the invention relates to the use of a traditional steel joinery arrangement for windows and doors as mentioned above, in housing construction, industrial construction, conservatory construction, greenhouse construction or shed construction. The design of the joinery arrangement is thus very versatile in use and the joinery arrangement may be incorporated into both a brick, steel, concrete floor, wall or roof.

DESCRIPTION OF THE FIGURES

[0014]

Figure 1: shows a preferred embodiment of the invention, namely a roof window in a perspective view.
Figure 2: shows a preferred embodiment of the invention, namely a cross-section of a closed window.
Figure 3: shows a detail of a cross-section of a traditional steel joinery arrangement placed on a floor plate and sill.
Figure 4: shows a cross-section of a traditional steel joinery arrangement placed between two cavity walls.
Figure 5: shows a perspective view with a cross-section of a steel joinery arrangement according to a preferred embodiment of the invention.

DETAILED DESCRIPTION

[0015] The term steel refers to an alloy comprising more than 50 percent by weight of iron. This is supplemented with carbon, and optionally chromium, nickel, molybdenum, titanium or other elements. This alloy comprises less than 5 percent by weight of aluminum.

[0016] The term steel joinery arrangement 1 refers to a collective term for doors, windows, shutters, cornices of which the basic structure is composed of steel. Some elements, however, may be made of plastic, wood or another metal. By "traditional" is meant that the joinery is constructed from sheet materials or closed hollow rectangular or square profiles, without internal structures.

[0017] The term outer framework 2 refers to the part of the traditional steel joinery arrangement 1 which cannot move. The outer framework 2 itself may optionally also comprise panels. It is the part which is anchored to a wall, roof or floor.

[0018] The term inner framework 3 refers to the part of the traditional steel joinery arrangement 1 which fits in the outer framework 2 and to which the panel 11 can be attached. The inner framework 3 is beared in the outer framework 2 by a hinge. There is a free space 30 or clearance between the inner framework 3 and outer framework 2.

[0019] The term friction element 19, 20, 21, 23, 24 or 25 refers to protrusions on the surface of the thermal break 8 or 9 as a result of which the thermal break 8 or 9 remains clamped in a reversible way between the frames 4, 5, 6 or 7.

[0020] In a first aspect, the invention relates to a traditional steel joinery arrangement for windows or doors.

[0021] According to an embodiment, the frames 4, 5, 6 and 7 forming part of the outer framework 2 and the inner framework 3 are made of steel, coated steel, galvanized steel, annealed steel or chrome-plated steel, preferably steel complying with standard EN 10219/1, standard EN10219/2, steel with a chemical composition S235, S275 or S355 or stainless steel, more preferably stainless steel 304. The use of steel allows to use thin profiles in the construction of the frames which nevertheless can span great lengths.

[0022] The design of the traditional steel joinery arrangement 1 with the thermal break is such that the frames 4, 5, 6 and 7 of the joinery arrangement 1 can be made from standard profiles, such as tubes and rods or sheet materials. Preference is given to hollow tubes or closed hollow profiles, more preferably having a square or rectangular cross-section. The cavity present in the frames 4, 5, 6 and 7 is one continuous cavity without any internal structures. The use of these standard profiles ensures that the construction of the traditional steel joinery arrangement 1 is less labor-intensive, more robust and less complex.

[0023] In a preferred embodiment, the dimensions of the profiles used is chosen on the basis of the used panel 11. Thus, triple glazing will require a profile with larger dimensions than double glazing. In a further preferred embodiment, profiles are used with a rectangular cross-section of 22 mm to 12 mm, or 264 mm^2 and a steel thickness of 3 mm used for the frames 4, 5, 6 and 7 of the inner framework 3 and the outer framework 2. Depending on the size of joinery, profiles are used with a steel thickness of 2 mm. Thinner steel makes the traditional steel joinery lighter which has as a consequence that the joinery can be opened and closed more smoothly. Less time needs to be built up to open a lighter joinery than a heavy one. Also when closing, more time will be necessary to slow down with a heavy joinery. A heavy joinery will close with a thud when the time is not phased out. The thud can cause glass damage or damage to the wall in which the joinery is arranged. Often, a door pump or a door closer is required on heavy joinery.

[0024] In a preferred embodiment, the profiles from which the frames 4, 5, 6 and 7 are made have a percentage by volume of steel ranging between 12 vol% and 35

vol%, more preferably between 15 vol% and 30 vol%, even more preferably between 20 vol% and 25 vol%. By percentage by volume of steel of a profile is meant the volume which is actually occupied by steel relative to the volume of the profile. The volume of the profile is calculated as the length of a profile multiplied by the surface of the cross-section perpendicular to the longest side of a profile, such as the calculation of the volume of a beam.

[0025] The advantage of working with profiles with such a volume percentage of steel is that thin profiles can be used. This has, in first instance, an aesthetic advantage, namely that the joinery looks fine and is less pronounced. But the biggest advantage is that, although the joinery is thermally broken, the greatest heat losses from the joinery still occur via the steel parts. Therefore, it is important to keep the profiles of which the traditional steel joinery is made up as thin as possible. In this way, the heat losses are minimized and a better thermal insulation is obtained. Too thin, dense profiles, however, have the drawback that the construction is less rigid. The welding seam is shorter and thus there is less surface area where two profiles are connected to one another.

[0026] In a preferred embodiment, the ratio of the width of a profile relative to the depth of a profile ranges between 0.475 and 2.625; more preferably ranging between 0.750 and 2.000. The width of a profile is defined as the length of the rib in the above-defined direction X, the direction according to the wall or roof in which the traditional steel joinery is incorporated or will be incorporated. The depth of a profile is defined as the length of the rib in the above-defined direction Y, the direction perpendicular to the wall or roof in which the traditional steel joinery is incorporated or will be incorporated.

[0027] The advantage of profiles with these ratios is that these profiles form the most rigid connections. Connections with square profiles in which the ratio is 1 are equally rigid in the one direction as in a direction perpendicular thereto. The welding seams or connections are in both directions X and Y the same length and therefore equally strong. When the ratio deviates from 1, the welding seam or connection becomes shorter in one direction than in the other direction, and thus the connection is also weaker in one direction than in the other direction. Therefore, it is best not to deviate too much from a ratio equal to 1 in order to obtain a rigid connection, hence preferably a ratio between 0.475 and 2.625.

[0028] In a preferred embodiment, the inner framework 3 and the outer framework 2 partly overlap, this partially or completely prevents transfer of heat as a result of mass transport. This increases energy efficiency and will also contribute to a better acoustic insulation because of the attenuation of sound waves. In another preferred embodiment, a stop bar 12 is present on a frame of the outer framework 2 or inner framework 3, which ensures that the free space 30 between inner framework 3 and outer framework 2 is shielded and reduces mass transport through the free space 30. The stop bar also increases the solidity and ensures that the joinery is more resistant to burglary.

[0029] In a preferred embodiment, a seal 32 is provided, arranged on the stop bar 12. This seal is preferably made of foam rubber. The seal provides an additional sealing of the free space 30 and creates an additional closed air compartment, and thus additional insulation in the free space 30.

[0030] When the traditional steel joinery arrangement is used in a building, a side is directed towards the exterior and the other side is directed towards the interior. Temperature differences between the interior and exterior are managed by the presence of a thermal break 8 and 9 between the steel frames which are directed towards the exterior 4 and 6, and which are directed towards the interior 5 and 7. The thermal break 8 or 9 is preferably made of an elastomer, more preferably rubber, artificial rubber, silicone, polyvinyl chloride (PVC) with plasticizer, polyamide (PA) acrylonitrile butadiene styrene (ABS) with a plasticizer, or polybutadiene. The thermal break 8 or 9 comprises one or more air compartments 13, 14, 15 or 16, preferably two or more. The air compartments 13, 14, 15 or 16 guarantee the actual thermal insulation effect by holding air, which has a good insulating effect. Also acoustically, the thermal break 13, 14, 15 or 16 is a good insulator because the sound waves have difficulty to move from compartment to compartment. Air compartment 13 is directed towards the exterior side of the joinery, while air compartment 14 is directed towards the interior side of the joinery, partition 29 separates these two air compartments. Air compartment 15 is directed towards the free space 30, while air compartment 16 is directed towards the side of the connecting elements, partition 28 separates these two air compartments.

[0031] In a preferred embodiment, the thermal break 8 or 9 is visibly situated between the different frames 4, 5, 6 or 7. The thermal break is situated in a space which is confined maximally on three sides by profiles or sheet materials. A consequence thereof is that the thermal break 8 or 9 can be arranged at the end of the construction, which simplifies the construction. The steel joinery can, in this way, also be subjected to a final finish that is not compatible with the thermal break 8 or 9. Also, the thermal break 8 or 9 can be replaced in a simple way if it would be worn out.

[0032] In a preferred embodiment, the thermal breaks 9 arranged in the inner framework 3 are connected to one another, the ends of the interruptions are cut in miter, and the ends are glued together. As a result, the air compartments 13 and 14 are closed off and no air can escape, which has a better thermal insulating effect. The same goes for the thermal breaks 8 of the outer framework 2, so that the air compartments 15 and 16 are closed off.

[0033] In a preferred embodiment, the invention comprises two adjacent thermal breaks 8 and 9. In a further preferred embodiment, these two breaks each have at least two adjacent air compartments 13 and 14 or 15 and 16. The order of the air compartments in the one break 8 is oriented in a direction X as shown in Figure 2, and

in the other thermal break 9, the order of the air compartments is oriented in a direction Y, which is perpendicular to the direction X as shown in Figure 2. The direction Y runs from the interior to the exterior when the traditional steel joinery arrangement 1 is mounted in a wall or roof. The direction X is perpendicular thereto and is situated in the plane of the wall or the roof. In a still further preferred embodiment, these two thermal breaks 8 and 9 touch one another via at least one sealing lip 18. As a result, in this way a network of air compartments 13, 14, 15 and 16 is created, and that way, the sound and thermal insulating capacity of the joinery arrangement 1 is considerably increased.

[0034] The inner framework 3 is shape-congruent to the outer framework 2 and fits into the outer framework 2, although with a free space 30 of a few millimeters. In a preferred embodiment of the invention, at least one of the thermal breaks 8 or 9 is provided with one or more sealing lips 17 or 18. The sealing lips are directed towards the free space 30 between the outer framework 2 and the inner framework 3. The length of the sealing lips 17 and 18 is chosen in such way that the free space 30 is bridged. Thus, the length of the sealing lip 17 or 18 is at least equal to the width of the free space 30, preferably between 1 mm and 10 mm, more preferably between 2 mm and 5 mm, and most preferably 3 mm. The sealing lips 17 and 18 ensure that when the joinery arrangement 1 is closed, no mass transport can take place through the free space 30. As a result, there are less thermal losses and thus the joinery arrangement 1 provides better insulation. Also an acoustic insulation occurs when the free space 30 is closed off with a sealing lip 17 or 18. The central sealing lip 18 is preferably thicker than the terminal sealing lips 17.

[0035] In another embodiment, the thermal break 8 or 9 has on 2 sides one or more friction elements 19, 20, 21, 23, 24 or 25 which ensure that the thermal break 8 or 9 is held in place between two steel profiles of the frames 4, 5, 6 or 7. The friction elements 19, 20, 21, 23, 24 or 25 are preferably on one side beveled at an angle of 45°. For placing the thermal breaks 8 or 9 with friction elements 19, 20, 21, 23, 24 or 25, no other connection materials are needed, which simplifies the construction of the traditional steel joinery arrangement 1.

[0036] In a preferred embodiment, the terminal friction elements 20 on the side of the free space 30 are provided with extra material, and therefore, longer than the other friction elements 19 and 21, so that the thermal break 9 cannot be pushed too deep between two frames 6 and 7.

[0037] In a preferred embodiment, the corners 22 of the thermal break 9 on the side adjacent to the connecting elements 10 are beveled at an angle of 45 degrees and continue in a friction element 19. Preferably, the cross-section of the thermal 9 break has a width of 15 mm, measured without sealing lip 17 or 18 and a height of 19 mm measured without the friction elements 19, 21 or 20; with the friction elements 19, 21 or 20, the height is 21.8 mm. Preferably, the thickness of the elastomer used is 2.2 mm. Preferably, in addition to the terminal friction elements 19 and 20, intermediate friction elements 21 are also present.

[0038] In a preferred embodiment, the surface 27 of the thermal break 8 directed towards the free space 30 between the outer framework 2 and the inner framework 3 has a non-planar geometry, preferably a flat or a convex geometry, the contact angles between this plane and the planes provided with the friction elements 23, 24 and 25 are either right (90°) or obtuse (more than 90°). In a further preferred embodiment, the contact angles at the opposite surface, the surface 26 directed towards the connecting elements 10, are acute (less than 90 °). The geometry of this surface preferably is concave. Preferably, the cross-section of the thermal break 8 has a width of 21.8 mm and a height of 9.8 mm, measured without the friction elements; with the friction elements 23, 24 and 25, the height is 12.6 mm. Preferably, the thickness of the elastomer used is 1.5 mm. The convex geometry of the surface has the advantage that a better seal is obtained of the free space 30 between the outer framework 2 and the inner framework 3. Preferably, in addition to the terminal friction elements 23 and 24, intermediate friction elements 25 are also present.

[0039] The two frames 3 and 4 of the inner framework 3 are connected to one another via connecting elements 10. The same applies to the two frames 4 and 5 of the outer framework 2. In a preferred embodiment, the connecting elements 10 are made of a material having a low heat conductivity, preferably plastic or wood, more preferably polyvinyl chloride (PVC). In a further preferred embodiment, the connecting elements 10 are made from steel, and preferably from stainless steel, stainless steel has a poorer heat conductivity coefficient and therefore a better insulating effect than steel. The use of metals such as steel and stainless steel ensures that the connecting elements can be kept small without reducing the solidity of the joinery. In a further preferred embodiment, the thickness of the connecting elements 10 forming part of the outer framework 2 is thinner - for example 2 mm - than the connecting elements 10 forming part of the inner framework 3, for example 5 mm. Because of the fact that the frames 4 and 5 of the outer framework 2 are anchored to a wall or a part of the roof construction, thinner connecting elements 10 may be used than in parts which are not connected to additional structures and of which the solidity depends only on the connecting elements 10.

[0040] In a preferred embodiment, there is per side more than one connecting element 10. In another preferred embodiment, there is one connecting element 10 per side. And in yet another preferred embodiment, the connecting elements 10 in itself form a frame around the inner framework 3 or the outer framework 2.

[0041] In a preferred embodiment, said connecting elements 10, which connect, respectively, frames 6, 7 of the inner framework 3 to one another and connect, respectively, frames 4, 5 of the outer framework 2 to one another, are attached on or along the inside or outside

of the frames. The connecting elements 10 connect a rib of a profile which forms part of the one frame with a rib of a profile which forms part of the other frame. A connecting element 10 always touches two ribs, one of each frame which connects the connecting element. The connecting elements 10 are therefore not positioned centrally between the opposing planes of the frames, but are situated on one side of the opposing planes. As a result, the free space 30 is created between the frames, which is only confined on 3 sides. Two opposite sides of the free space are confined by the frames themselves, the third side is confined by the connecting elements 10. This leaves a fourth side of the free space open, as a result of which this free space can be filled with a thermal break 8 or 9. The thermal break 8 or 9 can be inserted between the frames as one whole. This allows that the air compartments 13, 14, 15, 16 in the thermal break 8 or 9 form a closed loop, as a result of which the air compartments are sealed from the environment. Because of this, no air can go in or out of the air compartments, and this increases the insulation value of the thermal break 8 or 9. The connecting elements 10 can be situated between the frames, but then in a way that the connecting element connects two ribs of the frames with one another and in this way, creates a free space which is only confined on three sides. More preferably, the frames 6 and 7 of the inner framework 3 are connected to one another by connecting elements 10 disposed on the inside of the frames, and the frames 4 and 5 of the outer framework 2 are connected to one another by connecting elements 10 disposed on the outside of the frames. This has the advantage that the open sides of the created free spaces will point towards one another when the joinery is closed. As a result, the thermal breaks 8 and 9 can make contact with one another, which is beneficial for the insulation value of the joinery.

[0042] In a preferred embodiment, the connection between the two frames 3 and 4 of the inner framework 3, and the two frames 4 and 5 of the outer framework 2 is discontinuous. This connection is a thermal bridge and reduces the thermally insulating effect of the traditional steel joinery. Therefore, in the invention, connecting elements 10 are used to connect the various frames to one another. In this way, a discontinuous connection is created between the frames and the heat losses are minimized.

[0043] In a preferred embodiment, the space on the inside of the profiles forms a sealed air compartment. This is possible by either connecting the profiles with one another in a closed geometrical shape, a polygon, an oval or a circle. Or open ends of profiles are sealed by the application of a sealing piece, thereby creating a sealed air compartment on the inside of the profile. The sealed air compartment acts as an additional insulating element. Air is a good insulator and especially if this air cannot be replaced with fresh cold air.

[0044] The connecting elements 10 are preferably connected to the frames 4, 5, 6 or 7 with bolts, screws, adhesive, by means of welding or other connection methods.

[0045] In a preferred embodiment, recesses are provided in the frames 4, 5, 6 or 7 where the connecting elements 10 are arranged.

[0046] In a preferred embodiment, between the frames 6 and 7 of the inner framework 3, a lock may be provided, more preferably a safety lock, most preferably a 3- or 5-point locking. In a further preferred embodiment, a safety claw is arranged on the inner framework. These are extra pins which are arranged on the inner framework 3 and which fit into recesses in the outer framework 2, or vice versa. When the joinery is closed, these pins provide an extra reinforcement and protection against burglary. The safety claw helps the lock and the hinges 31 to absorb forces exerted on the inner framework 3.

[0047] In a preferred embodiment, the panel 11 which is placed in the inner framework 2, is preferably a glass panel, a wooden panel, a plastic panel, a metal panel, a door panel or a wall panel. The glass panel in this preferred embodiment can be single glazing, double glazing, triple glazing or safety glass.

[0048] In a preferred embodiment, the panel 11 is attached to the inner framework 2 using an adhesive, silicone, or any other connection method. Even more preferably, an inner seal 40 and an outer seal 39, as shown in figure 3 and figure 4, is used.

[0049] With respect to thermal insulation, a U-value (heat transmission coefficient) is assigned to materials. This expresses the amount of heat which per second, per square meter and per degree of temperature difference between the one and the other side of a structure, is passed through. The unit of this U-value is therefore W/(m^2.K). In a preferred embodiment, the traditional steel joinery arrangement 1 has a U-value lower than 3 W/(m^2.K), more preferably lower than 2.5 W/(m^2.K), even more preferably lower than 2 W/(m^2.K), yet even more preferably lower than 1.5 W/(m^2.K), and most preferably lower than 1.25 W/(m^2.K), going up to a U-value lower than 1.1 W/(m^2.K). These values were measured according to the NBN EN ISO 10077-2 (2003) standard.

[0050] With respect to acoustic insulation, an R_w-value (sound reduction index) is assigned to materials. This R_w-value is expressed in dB (decibels). In a preferred embodiment, the traditional steel joinery arrangement 1 has an R_w-value preferably higher than 20 dB, more preferably higher than 30 dB, most preferably higher than 40 dB. These values were measured according to the NBN EN ISO 140-3 standard.

[0051] In a second aspect, the invention relates to a method for manufacturing a traditional steel joinery arrangement 1 for windows or doors as mentioned above.

[0052] In a preferred embodiment, the steel profiles are assembled by welding, spot welding or by means of screws or bolts. As a result, specialized equipment or highly-educated workers are not necessary.

[0053] In a preferred embodiment, the frames 4, 5, 6 and 7 are assembled with connecting elements 10 by

bolts, screws, adhesive or other connection methods.

[0054] In a preferred embodiment, the traditional steel joinery arrangement 1 is provided with a paint coating of lacquer coating.

[0055] In a third aspect, the invention relates to the use of a traditional steel joinery arrangement 1 for windows and doors as mentioned above, in housing construction, industrial construction, conservatory construction, greenhouse construction or shed construction.

[0056] It is assumed that the present invention is not limited to the embodiments which are described above. For example, the present invention has been described with reference to a roof window, but it should be clear that the invention can be applied to e.g. a door or a window.

List of reference numbers:

[0057]

1 traditional steel joinery arrangement
2 outer framework
3 inner framework
4 frame forming part of the outer framework which is directed towards the exterior
5 frame forming part of the outer framework which is directed towards the interior
6 frame forming part of the inner frame which is directed towards the exterior
7 frame forming part of the inner frame which is directed towards the interior
8 thermal break of the outer framework
9 thermal break of the inner framework
10 connecting element
11 panel
12 stop bar
13 air compartment directed towards the exterior side of the joinery
14 air compartment directed towards the interior side of the joinery
15 air compartment directed towards the free space
16 air compartment directed towards the side of the connecting elements
17 terminal sealing lip
18 central sealing lip
19 terminal friction element on thermal break 9 at the side of connecting element
20 terminal friction element on thermal break 9 at the side of the free space
21 intermediate friction element on thermal break 9
22 corner of the thermal break
23 terminal friction element on thermal break 8 at the side of connecting element
24 terminal friction element on thermal break 8 at the side of the free space
25 intermediate friction element on thermal break 8
26 surface which is directed towards the connecting elements
27 surface of the thermal break which is directed towards the free space
28 partition in thermal break 8
29 partition in thermal break 9
30 free space
31 hinge
32 seal
34 sill
35 insulation between the sill and floor plate
36 floor plate
37 floor
38 outer wall
39 outer seal
40 inner seal
41 inner wall
42 cavity

Claims

1. Traditional steel joinery arrangement (1) for windows or doors, comprising a steel outer framework (2) and a steel inner framework (3) and at least provided with one hinge (31) for hingeably bearing the inner framework (3) to the outer framework (2), between which frameworks (2,3) a free space (30) is provided with at least two adjacent thermal breaks (8, 9), **characterized in that** one of the two thermal breaks (8) in a direction X has at least two adjacent air compartments (15, 16), and that one of the two thermal breaks (9) in a direction Y, perpendicular to the direction X, has at least two adjacent air compartments (13, 14).

2. Traditional steel joinery arrangement (1) for windows or doors according to claim 1, comprising a steel outer framework (2) and a steel inner framework (3), each one composed of two substantially rectangular frames (4, 5, 6, 7); wherein two (4, 5) per two (6, 7) frames are interconnected by one or more connecting elements (10); and at least provided with one hinge (31) for hingeably bearing the inner framework (3) to the outer framework (2), between which frameworks (2,3) a free space (30) is provided with at least two plastic thermal breaks (8, 9), which break (8, 9) is provided with one or preferably more adjacent internal air compartments (13, 14, 15, 16) and with at least one protruding sealing lip (17, 18) which extends towards the free space (30).

3. Traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** the frames (4, 5, 6, 7) of the inner framework (3) and outer framework (2) each comprise one continuous cavity and are made from closed hollow profiles having a rectangular or square cross-section without any internal structures.

4. Traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** said connecting elements (10), which connect, respectively, frames (6, 7) of the inner framework (3) to one another and connect the respective frames (4, 5) of the outer framework (2) to one another, are attached on or along the inside or outside of the frames.

5. Traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** said profiles have a percentage by volume of steel ranging between 12 vol% and 35 vol%.

6. Traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** the ratio of the width of a profile relative to the depth of a profile ranges between 0.475 and 2.625.

7. Traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** the two thermal breaks (8, 9) touch one another via sealing lip (18).

8. Traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** the thermal breaks (8, 9) each are situated in a space which is confined maximally on three sides by profiles or sheet materials.

9. Traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** at least one thermal break (8, 9) is provided with friction elements (19, 20, 21, 23, 24, 25) between the surface of the frame (4, 5, 6, 7) and the thermal break (8, 9) which are beveled on one side at an angle of 45° and/or that at least one thermal break (8, 9) is provided with two beveled corners (22) at 45° which continue in a friction element (19, 23).

10. Traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** at least one thermal break (8, 9) is provided with two terminal friction elements (20, 24) which are longer than the other friction elements (19, 21, 23, 25).

11. Traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** at least one thermal break (8, 9) is provided with a sealing lip (17, 18) having a length at least equal to the width of the free space (30) between the outer framework (2) and the inner framework (3).

12. Traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** at least one thermal break (8, 9) has a convex surface (27) which is directed towards the free space (30) between the outer framework (2) and the inner framework (3).

13. traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** at least one thermal break (8, 9) has a concave surface which is directed towards the connecting elements (10).

14. traditional steel joinery arrangement (1) for windows or doors according to at least one of the preceding claims, **characterized in that** the connection between the frames (6, 7) of the inner framework (3) and the frames (4, 5) of the outer framework (2) are connected to one another in a discontinuous manner.

15. Method for manufacturing a traditional steel joinery arrangement (1) for windows or doors according to one of claims 1-18, comprising the following steps:

- assembling steel profiles into frames (4, 5, 6, 7);
- assembling the frames (4, 5, 6, 7) by means of connecting elements (10);
- applying at least one hinge (31);
- applying a thermal break (8, 9) between the frames (4, 5, 6, 7).

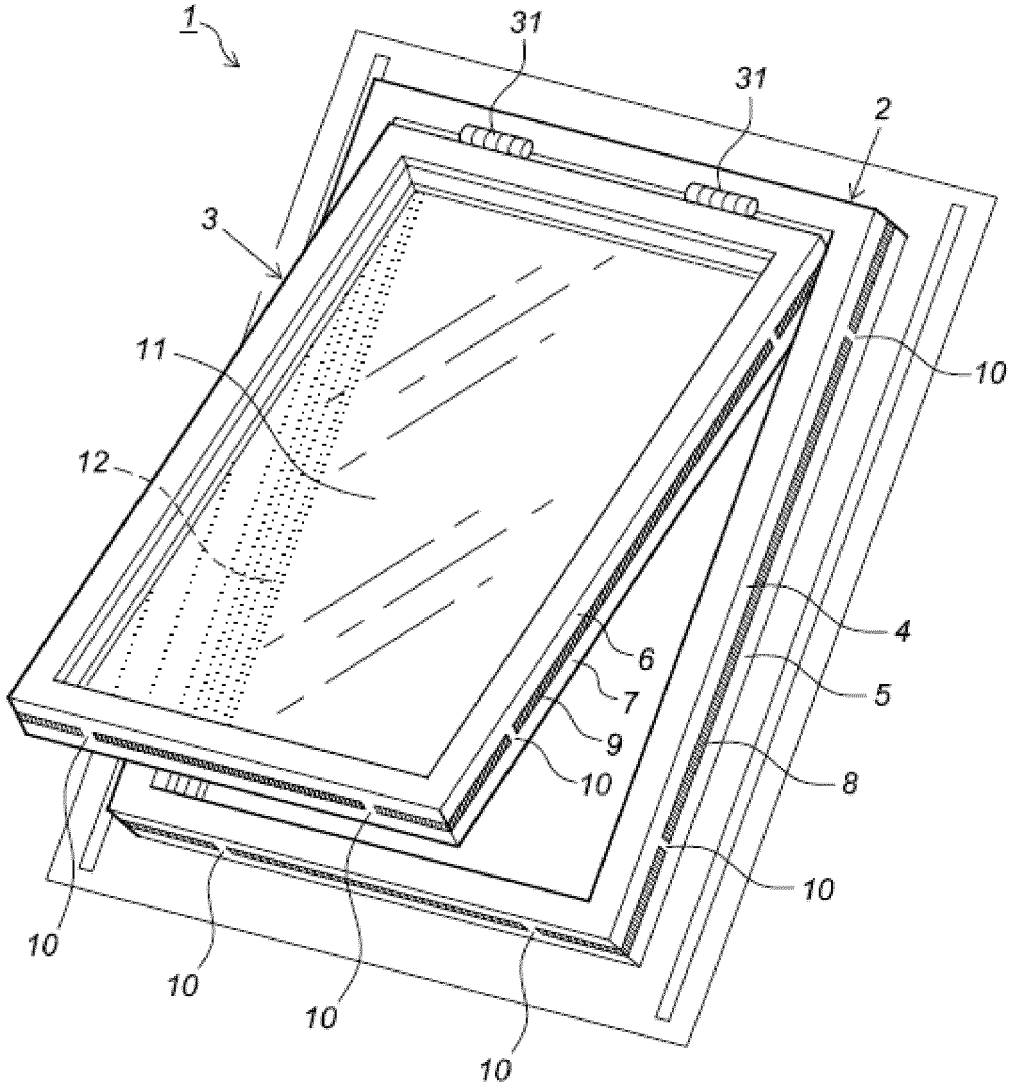


Fig. 1

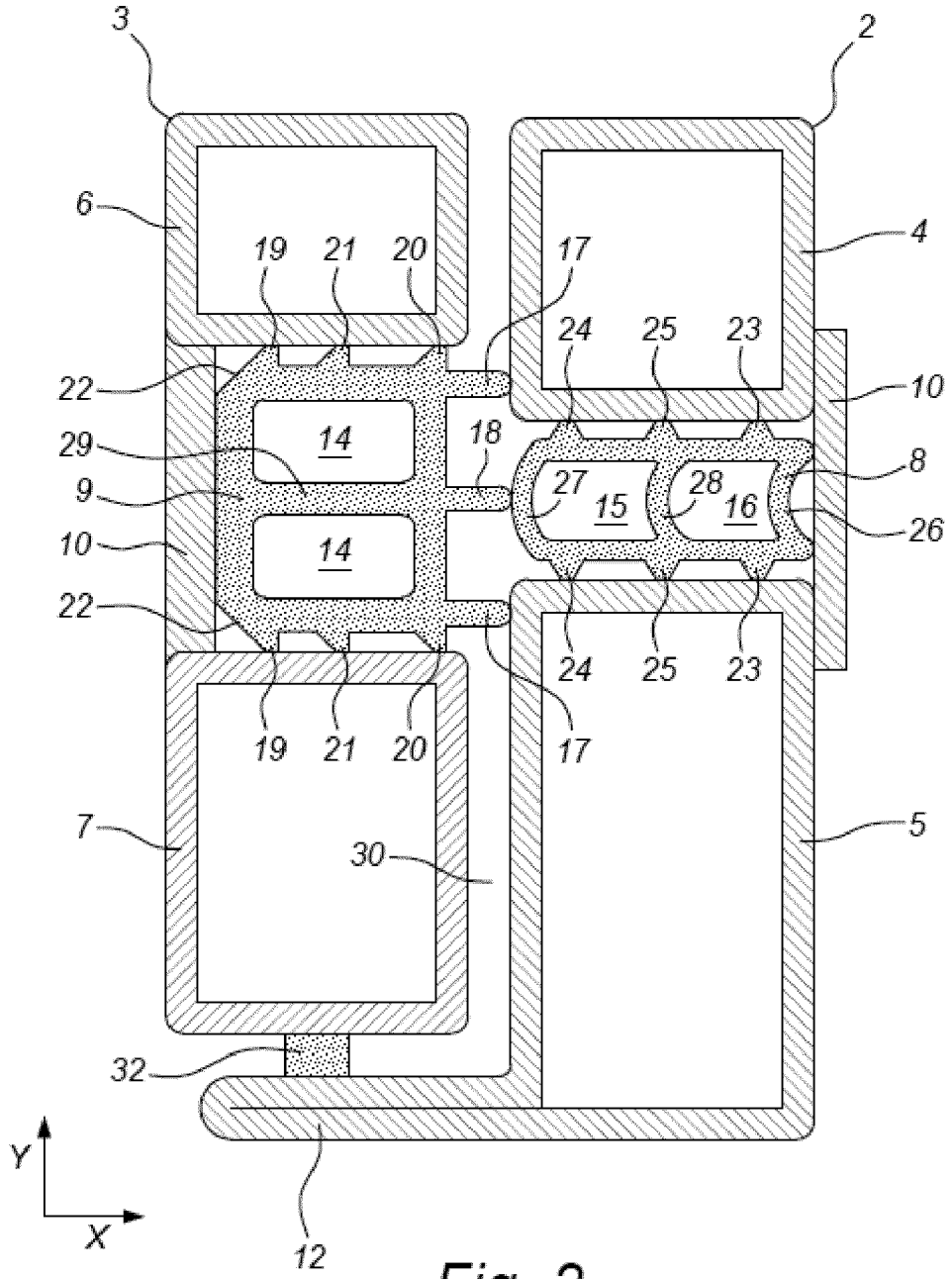

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Fig. 2

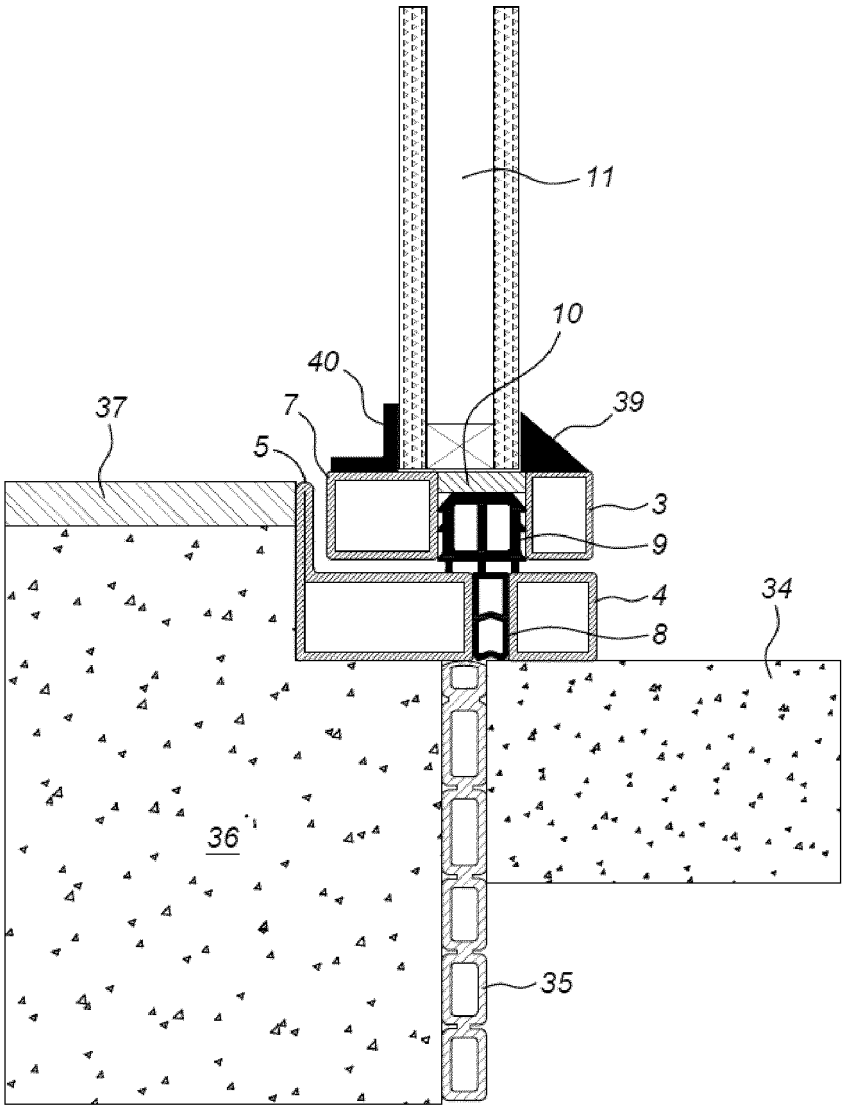


Fig. 3

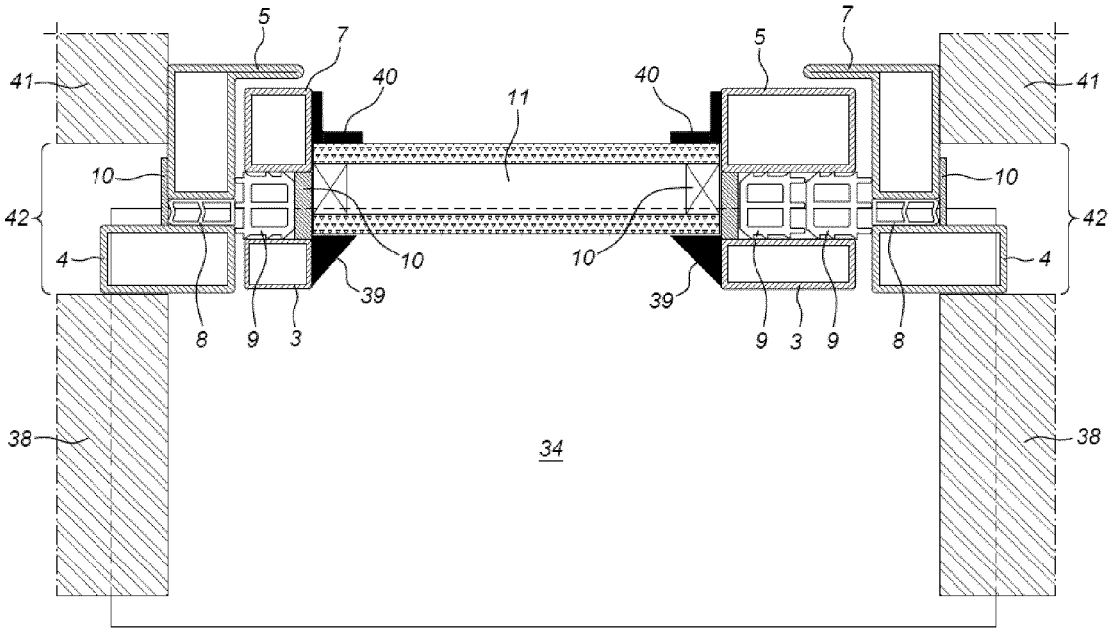

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Fig. 4

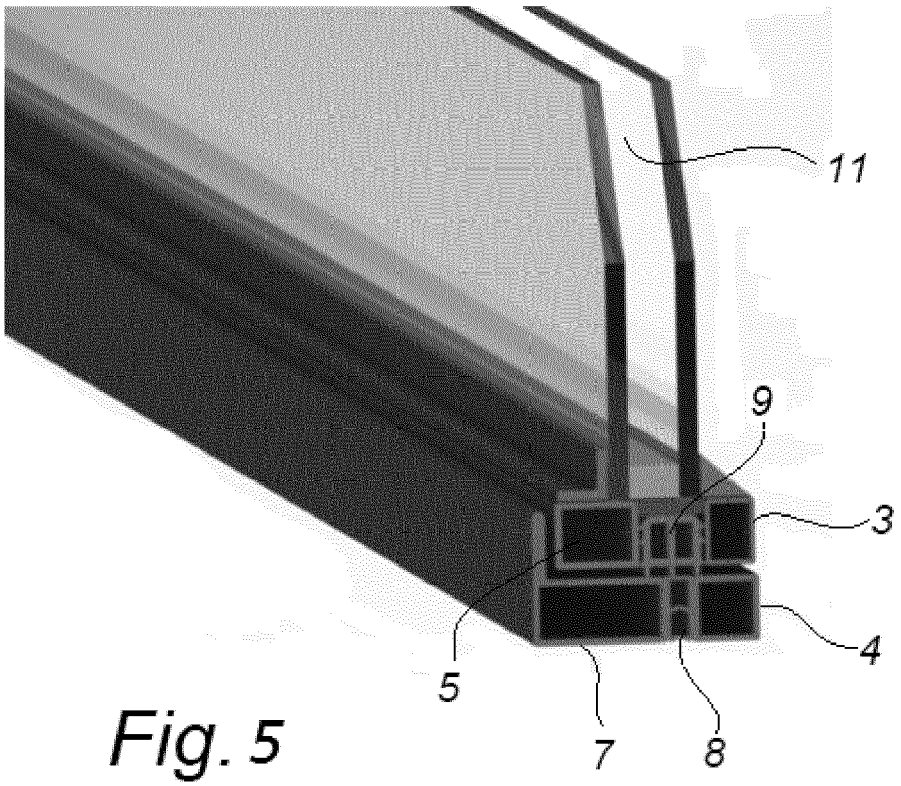

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Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 15 17 0351

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Place of search	Date of completion of the search	Examiner
The Hague	16 October 2015	Blancquaert, Katleen

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