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(54) **Hővezetőprofil**

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

EP2653792

HEAT CONDUCTING PROFILE

DESCRIPTION

The invention relates to a heat-conducting profile, which is preferably provided for installation in ceilings or walls, which are covered with gypsum plaster boards.

Suspended parts or coverings on ceilings are very often mounted via so-called C-profile ceiling rails on the statically supporting ceiling structure located above them. For this purpose, the ceiling rail has at least in a subsection of its cross-sectional surface area the form of a C located in such a way that the free legs protrude upwards. The free leg ends are curved relative to each other. Into the groove thus formed a hook part engages from above, which has approximately the form of an upside down T and establishes the connection to further mounting elements located above. Such a design is shown, for example, in DE 87 14 063 01.

DE 10 2004 057 384 B1 shows a heat-conducting profile for the use on a ceiling, which is typically produced as extruded aluminum profile. It has two groove areas bounded by in each case two elastically deformable, curved profile flanks, the cross-sectional surface area of which has approximately the form of a segment of a circle, the central angle of which is slightly more than 180°. By expanding said profile flanks a round pipe, which can carry a heat transfer medium, can be clamped into this groove area. On the sides facing away from the groove openings the profile flanks are combined with a profile web, which on its other end passes over to a heat-conducting plate located underneath in the installation situation, the lower surface area of which serves as an emission surface area. The two receiving areas for in each case a round pipe are spaced apart from each other in each case extended on one side with a curved extension such that between them as in the case of a C-profile a groove area is formed with cross-sectional surface area undercut from the groove opening. Thus, a hook part in the form of an upside down T can be hung up in the heat-conducting profile for the purpose of mounting on parts located further above.

Documents DE 198 03 114 C2, DE 201 06 884 U1 and EP 733 866 A2 show among other things heat-conducting profiles, which can be formed by roll forming of sheet metal (also referred to as "roll forming of sheet strips"). The heat-conducting profiles have grooves, the cross-sectional surface area of which has approximately the form of a segment of a circle, the central angle of which is slightly more than 180°. Into these grooves in each case a round pipe, which carries a heat transfer medium can be clamped. The opening surface area of the grooves is underneath in the installation situation. Typically, a gypsum plaster board is mounted abutting the bottom of the heat-conducting profiles.

WO 2010121283 A2 shows among other things a heat-conducting profile, which can be formed by roll forming of sheet metal. It has grooves, the opening surface area of which is turned away from the heat transfer surface area of the profile towards a gypsum plaster board to be mounted thereon, wherein the cross-sectional surface area of the grooves has approximately the form of a segment of a circle, the central angle of which is slightly more than 180°. Into these grooves in each case a round pipe, which carries a heat transfer medium can be clamped. The boundary areas of the grooves are formed by two sheet metal layers, wherein from the outer sheet layer two sheet layers abutting each other lead to a heat-conducting surface area for the formation of a connecting web.

DE 201 11 852 U1 shows a plate element for the formation of a ceiling radiant plate, wherein the plate element can be formed as a profile, for example, by roll forming of sheet metal. It has several grooves, the cross-sectional surface area of which has approximately the form of a segment of a circle, the central angle of which is slightly more than 180°. Pipes can be clipped into these grooves from above. The profile is hung on wall areas hook-shaped on the edge.

DE 1779620 A1 already shows in 1971 a profile, to which one can attribute the effect of a heat-conducting profile, which has a pipe-receiving groove, the wall of which has two divided surface areas, which are connected to each other via a two-layer profile wall,

wherein the direct connection between the two layers is located at a distance from the pipe-receiving groove. The profile serves above all as a bracket, by means of which a lower cover is mounted afterwards on a pipe anchored fixedly on a ceiling. First, the pipe, for example, by means of pipe clamps, is anchored from below to the ceiling, and then the profile is snapped up on the pipe from below. The groove opening in the profile for this reason is located on top.

FR 2 712 380 1 discloses in Figures 4 and 5 there a heat-conducting profile composed of two separate sub-profiles aligned parallel to each other, which serves for the heat transfer to or from a pipe, which can carry a heat-transfer medium, and has a groove with an opening surface area located below, in which the pipe is clamped, wherein that wall, which as a boundary of the groove abuts against the pipe to be clamped, has two partial surface areas, wherein these partial surface areas are not directly connected with each other. The partial surface areas belong in each case to different sub-profiles. From the two partial surface areas a profile wall designed with two layers, formed jointly by the two sub-profiles, leads away from the intended contact surface area to the pipe. The two layers of the two-layer designed profile wall are connected with each other by a further element on a boundary area located at a distance from the groove. The temporary expansion of the groove opening required for the insertion and, if necessary, removal of the pipe into or out of the groove is achieved, in that the two sub-profiles are pivoted relative to each other on the common connection about a pivot axis parallel to the sub-profiles without being appreciably elastically deformed in the process.

Whenever a pipe with heat-transfer medium is clamped in a groove of a heat-conducting profile and is held therein for the purpose of heat transfer, there is a conflict of goals. In order to achieve a good heat transfer from the pipe to the profile, the wrap angle of the profile around the pipe (in the cross-sectional view) should be as large as possible and also the wall thickness of the profile in the encompassing area should be high, so that it can easily receive and deflect heat. In order to permit the mounting, therefore the pushing of the pipe into the groove easily and reliably damage free, the wrap angle of the profile around the pipe (which has a circular ring cross-sectional form) should be only slightly more than 180° and the wall thickness of the profile in the encircling area should be as thin as possible, since in the elastic area it can thus be bent up more easily and further and be held abutting against the pipe under prestressing, than if it has a greater wall thickness. To accommodate the desired elastic deformability in the material of the pipe is also associated with disadvantages, plastics, which would have the elasticity, are poor heat conductors. If in the case of metallic pipes one designed the wall thickness very thinly, whereby the elastic deformability increases, the sensitivity to mechanical destruction is dangerously increased.

The problem addressed by the invention therefore consists of providing a heat-conducting profile, which serves for the heat transfer between a pipe, which can carry a heat transfer medium and a flat surface area, wherein the heat-conducting profile has a downwardly open groove, in which the pipe can be clamped. In contrast to the heat-conducting profiles known for this purpose from the prior art, in the case of the same material selection of pipe and heat-conducting profile and also in the case of the same wall thickness of these parts the wrap angle of the groove of the heat-conducting profile around the pipe should be able to be enlarged and nevertheless the pipe should be more easily insertable into the groove.

To solve the problem it is proposed, to design that wall, which abuts against the pipe to be clamped as the boundary of said groove from at least two partial surface areas of the heat-conducting profile, which are not directly connected with each other by parts of the heat-conducting profile in a statically supporting manner on the contact surface area to the pipe, but rather via such wall areas of the heat-conducting profile, which protrude from said contact surface area.

Through this feature which is very easy to realize not only in the case of extruded profiles but rather in particular also in the case of sheet rolled profiles (therefore by roll forming of profiles produced from sheet) it is achieved, that for the insertion of the pipe into the groove of the heat-conducting profile not only the elastic deformation of the groove walls of the heat-conducting profile is helpful, but rather also the elastic deformation of walls of the heat-conducting profile, which support these groove walls. Thus, both of the said

partial surface areas of the groove wall without much effort and under exclusively elastic deformation can be moved much further away from each other than this is possible in the case of designs according to the prior art.

The invention is illustrated by means of drawings.

Figure 1: shows a first exemplary heat-conducting profile according to the present invention including a pipe mounted thereon in the profile view.

Figure 2: shows in enlarged profile view a part of the heat-conducting profile of Figure 1 while a pipe is mounted thereon.

Figure 3: shows in a partial section view a schematic diagram of a mounting device for the clamping of pipes into the grooves of the heat-conducting profile of Figure 1 and Figure 2. The viewing direction is thereby parallel to the profile direction.

Figure 4: shows in enlarged profile view a part of a second exemplary heat-conducting profile according to the present invention including a pipe mounted thereon.

Figure 5: shows in enlarged profile view a part of a third exemplary heat-conducting profile according to the present invention.

Figure 6: shows in enlarged profile view a part of a fourth exemplary heat-conducting profile according to the present invention.

The heat-conducting profile 1 according to Figure 1 is typically a sheet rolled profile, therefore formed from a sheet strip made from steel, aluminum or copper by roll forming. It has two downwardly open grooves 1.1 for the reception of in each case one pipe 2, as well as a tripartite flat heat transfer surface area 1.2 for the transfer of heat to a flat building plate such as typically a gypsum blaster board attached underneath on the heat transfer surface area 1.2. Furthermore, the heat conducting profile 1 has two hooks 1.4, by means of which it can be hung on structural parts, which are located above the heat-conducting profile.

In the case of roll forming of a sheet metal strip the sheet metal strip is guided by at least one so-called roller set the individual rollers of which are aligned with axes normal to the longitudinal direction. On the rollers, the sheet metal strip is plastically reshaped for the purpose of producing a desired profile form through bending about the bending axes, which are parallel to the longitudinal direction of the sheet metal strip.

Heat-conducting profiles according the present invention of the type shown as in Figure 1, namely with bottom openings of the grooves 1.1, in which in each case a pipe can be clamped, and with hooks 1.4 located on top, by means of which the heat-conducting profile can be hung can be produced especially material and production efficiently as sheet rolled profile from a single sheet strip by roll forming.

In Figure 1 the heat-conducting profile 1 is shown in that form, which it has when pipes 2 are clamped therein and a gypsum plaster board is mounted on the underside of its heat transfer surface area 1.2. In the condition not connected with any mounting part the heat-conducting profile 1 is deformed relative to the depicted form in that the width of the two grooves 1.1 is somewhat narrower and that the two lateral strips of the heat transfer surface area 1.2 is inclined somewhat upwards relative to the edge of the groove 1.1 in each case adjacent thereto. The cross-sectional form of the groove 1.1 is approximately that of a segment of a circle, wherein the associated central angle is significantly greater than 180°, so that therefore the maximum width of the groove is clearly larger than the width of the opening surface area of the groove. As intended a pipe - in the example depicted with circular outer contour of the cross-sectional surface area – is clamped in each groove 1.1. So that a pipe 2 can be inserted into a groove 1.1 of the heat-conducting profile 1, the two groove flanks must be temporarily bent up to the extent that the width of the opening surface area of the groove 1.1 is sufficiently large that the pipe 2 can be squeezed through it.

The process of squeezing a pipe 2 through the opening of a groove 1.1 of a heat-conducting profile 1 is delineated in Figure 2.

According to the present invention the wall of a groove 1.1 consists of two partial surface areas 1.1.1 and 1.1.2, which are not directly connected with each other through parts of the heat-conducting profile on the boundary surface area of the groove 1.1 – which is also the contact surface area to the pipe 2 –, but rather only via profile walls 1.3, 1.4, which project from the groove 1.1. If forces or

bending moments act on the partial surface areas 1.1.1, 1.1.2 of the groove wall, through which these are bent outwards in respect to the groove 1.1, the profile walls 1.3, 1.4 are also deformed with them. It is evident, that thus that elastic deformability of the heat-conducting profile 1 in accordance with which the width of the opening surface area of the groove 1.1 can be elastically expanded by applied forces, is much flexible than if the wall of the groove 1.1 were formed by a continuous profile surface area and not from two separate partial surface areas 1.1.1, 1.1.2, which are movable relatively independent of each other.

In the example depicted in Figure 1 and Figure 2 the profile walls 1.3, 1.4 of the heat-conducting profile 1 form a handle, which ends in a hook, wherein handle and hook in each case are formed by two sheet metal walls abutting against each other and running parallel to each other. The heat transfer surface area 1.2, on the other hand, is formed only from one sheet metal surface area.

During the bending up of the groove opening for the insertion of a pipe 2 into the groove 1.1 the two profile walls, which form the handle 1.3, are above all moved away from each other, so that an empty space 1.3.1 is formed between them (Figure 2).

Through the elastic very flexible expandability of the opening of the grooves 1.1 of heat-conducting profiles 1 according to the present invention it becomes possible to insert the pipe 2 to be inserted into the grooves with a mounting device 3 such as delineated in Figure 3 exemplarily for the heat-conducting profile 1 according to Figure 1 and Figure 2.

The mounting device 3 has per groove 1.1 at least three rollers 3.1, 3.2, 3.3, the rolling direction of which is aligned parallel to the profile direction of the heat-conducting profile 1. The two rollers 3.1, 3.2 are arranged at an axial distance to each other and press with their shell surface areas relative to the plane of the opening of the groove 1.1 from different sides against the heat-conducting profile 1. Thus, the longitudinal section of a groove 1.1 located in the immediate area of this pair of rollers is expanded, so that its opening surface area there becomes at least approximately as wide as the diameter of the pipe 2 if the latter is not deformed. The shell surface area of the third roller 3.3 is designed tapered and it protrudes on the opening surface area of the groove 1.1. The pipe 2 runs on the side of the shell surface area of the roller 3.3 facing the groove 1.1. While the entire mounting device is moved in the profile direction of the heat-conducting profile 1, the roller 3.3 presses the longitudinal area of the pipe 2 located on it into the groove 1.1, the flanks of which are elastically expanded on this longitudinal area by the rollers 3.1, 3.2 relative to the non-deformed state.

In the example depicted, all rollers 3.2, 3.3 are arranged on a common axis and combined into a common roller body and are motor driven. The drive includes a motor 3.5 and a friction wheel 3.4 driven by the latter, which abuts the said roller body with its circumferential surface. The drive and the rollers are held in an approximately C-shaped housing 3.6, which on its part is held on a handle 3.7, through which the energy supply for the drive also runs. Through the handle 3.7 the device can be held and carried by a person, while it travels along on a heat-conducting profile 1 already hung on the ceiling of a room and mounts pipe 2 in the heat-conducting profile 1. Mounting devices of this type would indeed be at least also conceivable on heat-conducting profiles according to the previously known prior art, however, were not previously used on them, because the insertion of the pipe is connected thereby with too much effort. On the other hand, a mounting device of the type described functions very well on heat-conducting profiles according to the present invention.

It is of very subordinate importance for the heat transfer between pipe 2 and heat-conducting profile 1, how great the pressing force is between the pipe 2 and the walls of the groove 1.1. If at least a low pressing force exists, it is substantially more important, that the contact surface area between pipe 2 and heat-conducting profile 1 is as large as possible, which means that that in the cross-sectional view the wrap angle of the heat-conducting profile 1 around the pipe 2 should be as large as possible. If the wrap angle is very large, that means that for the insertion of the pipe 2 into the groove 1.1 the opening surface area of the groove must be significantly expanded compared to its permanent state. That can be carried out extremely easily and without any problems through the design according to the present invention.

Figure 4 shows a section of the heat-conducting profile 21 according to the present invention produced by extrusion of aluminum, which can have an outer contour similar to that of the heat-conducting profile of Figure 1. The wall 21.3 leading away from the pipe receiving groove 21.1 has two layers running parallel to each other, between which a narrow gap 21.3.1 extends, which opens into the profile receiving groove 21.1 and the boundary surface area of which divides into two partial surface areas 21.1.1 and 21.1.2. Since long, continuous narrow gaps in extruded profiles can be difficult to produce, the gap 21.3.1 can also have one or several expansions. However, at least in the transition area to the groove 21.1 it should be as narrow as possible in order not unnecessarily to cost contact surface area between pipe 2 and heat-conducting profile 21.

Figure 5 shows a section of a heat-conducting profile 31 which can easily be produced by extrusion of aluminum.

Instead of having in each case only a single wall built of two layers protrude from a pipe receiving groove of a heat-conducting profile according to the present invention, on which wall the boundary surface area of the pipe receiving groove is divided, as depicted in Figure 5, several such two-layer walls can also protrude from the pipe receiving groove. Above all as an extruded profile this can easily be produced. Also, in the case of small external dimensions of the heat-conducting profile a very good elastic flexibility can thus be achieved. However, the accompanying further division of the heat transfer surface area accompanying it between pipe and heat-conducting profile tends to be disadvantageous due to the obstruction of the heat flow connected therewith.

The heat-conducting profile 31 according to Figure 5 has two in each case two-layer wall areas 31.3, 31.13, which protrude from the groove 31.1, which is intended for the reception of a pipe, and divide the boundary of the groove 31.1 into three partial surface areas 31.1.1, 31.1.2, 31.1.3, while the narrow gap between the two layers of the wall areas 31.3, 31.13 opens into the groove 31.1. Compared to a division of the groove boundary into only two partial surface areas, through the division of the groove boundary into three partial surface areas the opening of the groove 31.1 can be elastically expanded further and more flexibly.

In addition, the heat-conducting profile 31 has a profile wall 31.23, which protrudes from the wall area 31.3 and protrudes slightly above the free end of the wall area 31.13. The profile wall 31.23 is only connected with the wall area 31.3 via a very thin web, so that the profile wall 31.23 can be pivoted relative to the wall area 31.13 through plastic deformation of the thin web without much effort.

As intended when a pipe was inserted with a device according to the present invention into the groove 31.1, the profile wall 31.23 is pivoted downwards around the narrow connecting web to the wall area 31.3, so that with its free end it encounters the free end of the wall area 31.13, slides on the latter, thereby bends the wall area 31.13 somewhat away from the wall area 31.3 and finally locks in place on an angular area 31.13.1 of the wall area. The process of the pivoting of the profile wall 31.23 can, for example, be achieved by a further roller of the device 3 discussed further above (according to Figure 3), which is arranged behind the rollers, which bring about the insertion of the pipe, and presses onto the profile wall 31.23 from above. While through the profile wall 31.23 the two wall areas 31.13, 31.3 are somewhat bent away from each other, in each case a torque arises between the middle partial surface area 31.1.2 and the external partial surface areas 31.1.1 or 31.1.3 of the boundary surfaces of the groove 31.1, through which the groove 31.1 is narrowed. In the case of the pipe located in the groove 31.1 a better contact thus occurs between the pipe and the boundary surface areas of the groove.

Figure 6 shows a section of a further heat-conducting profile 41 which can also be easily produced by extrusion of aluminum. Also, this heat-conducting profile has two two-layer wall areas 41.3, 41.13 through which the boundary surface area of the groove 41.1, into which a pipe can be clamped, is divided into three partial surface areas. The heat-conducting profile has two profile walls 41.23, which protrude from the outside of the middle boundary surface area of the groove 41.1 into the immediate area of in each case a two-layer wall area 41.3, 41.13. As intended when a pipe was inserted into the groove 41.1, the two wall areas 41.23 are bent through mechanical action at their connection with the boundary surface area of the groove 41.1, so that they abut with their free end against the respective wall area 41.3, 41.13, bend the latter somewhat out and thereby lock in place on the wall area 41.3 or 41.13. In

the case of a pipe located in the groove 41.1 a better contact thus occurs between the pipe and the boundary surface areas of the groove.

The bending of the wall areas 41.23 can, for example, be achieved through a further roller of the device 3 discussed further above (according to Figure 3), which is arranged behind the rollers, which bring about the insertion of the pipe, and presses onto the profile wall 41.23 from above. The roller 3.1 of the device of Figure 3 can be arranged in front of this further roller. The roller 3.1 must thereby be dimensioned so narrowly, that it finds space between the feet of the profile walls 41.23 on the outside of the boundary surface areas of the groove 41.1.

EP2653792

HŐVEZETŐPROFIL

SZABADALMI IGÉNYPONTOK

1. Hővezetőprofil (1, 21, 31, 41), amely a hőátadás céljaira szolgál egy olyan csövön, vagy csőtől, amely hőhordozó médiumot tud vezetni, és amely alul fekvő nyílásfelülettel ellátott olyan nyitott résszel rendelkezik (1.1, 21.1, 31.1, 41.1), amelybe a cső becsatolható, ahol annak a falnak, amely a nyitott rész (1.1, 21.1, 31.1, 41.1) lehatárolásaként a csatolásra kerülő csövön (2) felfekszik, legalább két részfelület tartománya (1.1.1, 1.1.2, 21.1.1, 21.1.2; 31.1.1, 31.1.2, 31.1.3) van, ahol ezek a részfelület tartományok nem közvetlenül vannak egymással összekötve, hanem a hővezető profil (1, 21, 31, 41) többrétegűen kialakított profilfalain (1,3, 1,4, 21,3, 31,3, 31.13, 41.3, 41.13) keresztül, amelyek a rendeltetésszerűen méretezett érintkezési felületektől a csőhöz (2) képest kiállnak, ahol ezeknek a profilfalaknak két rétege van egymással összekötve, csak egyik, a nyitott résztől távoli levő peremtartományon, ahol egy-egy réteg egy-egy említet részfelület tartománnyal van közvetlenül összekötve, és egy-egy másik réteg ezeknek a részfelület tartományoknak egy-egy másik részfelület tartományával van összekötve, **azzal jellemezve, hogy** a csőnek a hővezetőprofil nyitott részébe való bevezetéséhez nem csak a hővezetőprofil nyitott részfalai, illetve részfelület tartományai, hanem a profilfalak (1,3, 1,4, 21,3, 31,3, 31.13, 41.3, 41.13) is rugalmasan alakíthatók.

2. Az 1. igénypont szerinti hővezetőprofil, **azzal jellemezve, hogy** a távolság, keresztmetszeti nézetben, szomszédos részfelület tartományok között (1.1.1, 1.1.2, 21.1.1, 21.1.2; 31.1.1, 31.1.2, 31.1.3) kisebb, mint a többrétegű profilfal hosszának (1,3, 1,4, 21,3, 31,3, 31.13, 41.3, 41.13) egy ötöde.

3. Az 1. vagy 2. igénypont szerinti hővezetőprofil (1), **azzal jellemezve, hogy** a hővezetőprofil két, lefelé nyitott résszel (1.1) rendelkezik, amelyek nyitott felületein keresztül egy hőátadási felület (1.2) három szakaszra osztható, és **hogy** egy nyitott rész határának részfelület tartományaitól (1.1.1, 1.1.2) egy kettős profilfal egy-egy rétege kiemelkedik, amely a nyitott felülettől (1.1) távoli végtartományán horoggá (1.4) van hajlítva.

4. Az 1.-3. igénypontok egyike szerinti hővezetőprofil (1), **azzal jellemezve, hogy** a profil hengerléssel kialakított acélszalagot tartalmaz.

5. Az 1.-3. igénypontok egyike szerinti hővezetőprofil (1), **azzal jellemezve, hogy** azoktól a nyitott részektől (31.1, 41.1), amelyekbe cső (2) van becsatlakoztatva, több kettős fal (31.3, 31.13, 41.3, 41.13) áll ki, és ezáltal a nyitott rész (31.1, 40.1) a határfelületeket több, mint két, egymással nem közvetlenül összekötő részfelület tartományra (31.1.1, 31.1.2, 31.1.3) osztja fel.

6. Az 1, 2. vagy 5. igénypontok egyike szerinti hővezetőprofil (1), **azzal jellemezve, hogy** a profil extrudált profil, **hogy** egy többrétegűen kivitelezett profilfal (21.3) két rétege között egy rés (21.3.1) van, és **hogy** ennek a résnek a szélessége a nyitott részhez (21.1) való csatlakozásnál kisebb, mint egy ettől távolabb levő tartományon.

7. Az 1. 2. 3. 5. vagy 6. igénypontok egyike szerinti hővezetőprofil (1), **azzal jellemezve, hogy** a profilnak olyan profilfala (31.23, 41.23) van, amely a profilirránnyal párhuzamosan fekvő tengely körül, a profilfelület maradék részével szemben elforgatható, és ezáltal a többrétegűen kivitelezett profilfalak ((31.3, 31.13, 41.3, 41.13) legalább egyikével úgy hozható érintkezésbe, hogy az, ugyancsak a profilirránnyal párhuzamos hajlítási tengely körül, annak hasonló helyzetével szemben kihajlítható.

Fig. 1

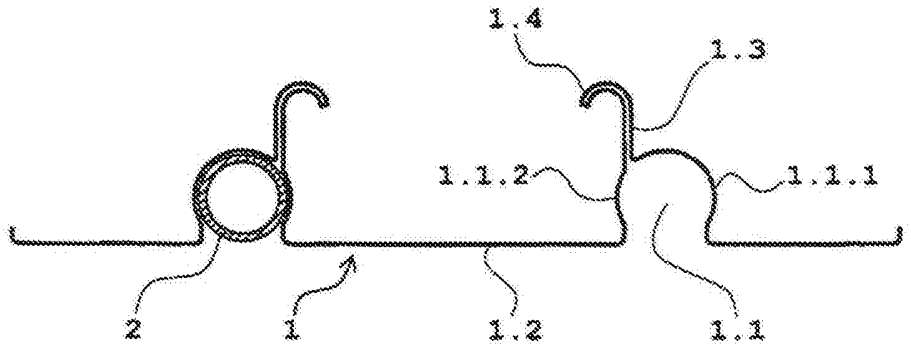


Fig. 2

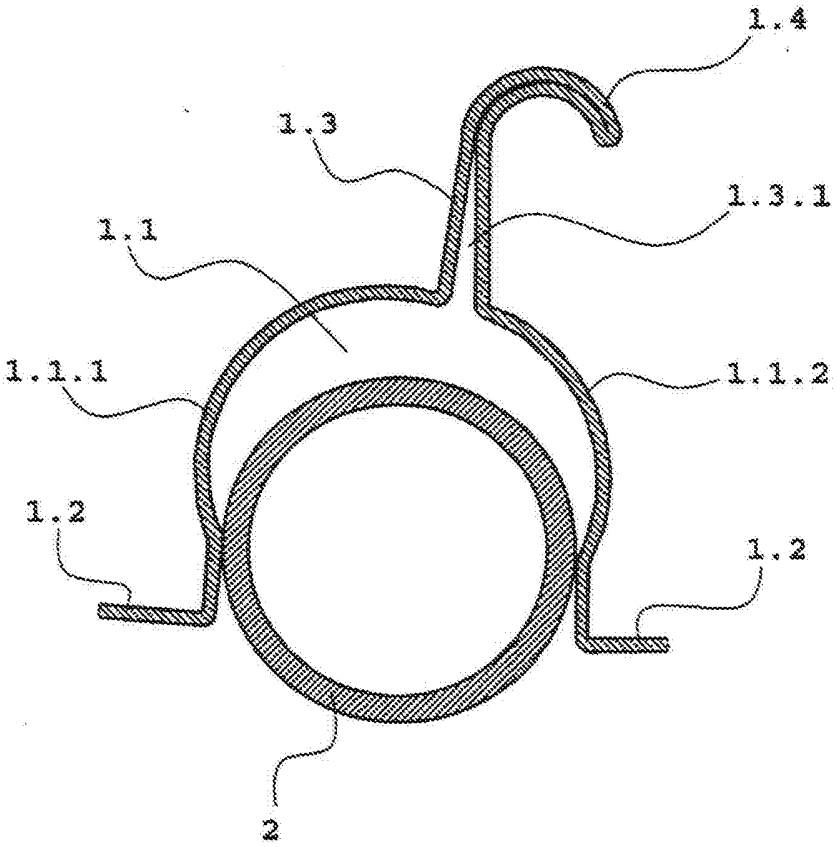


Fig. 3

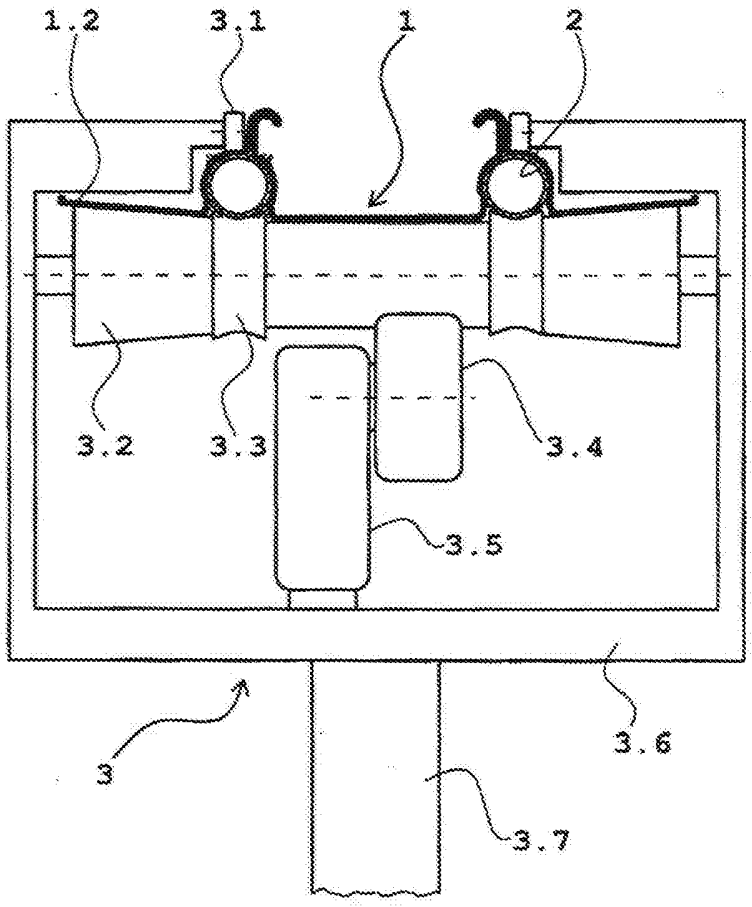


Fig. 4

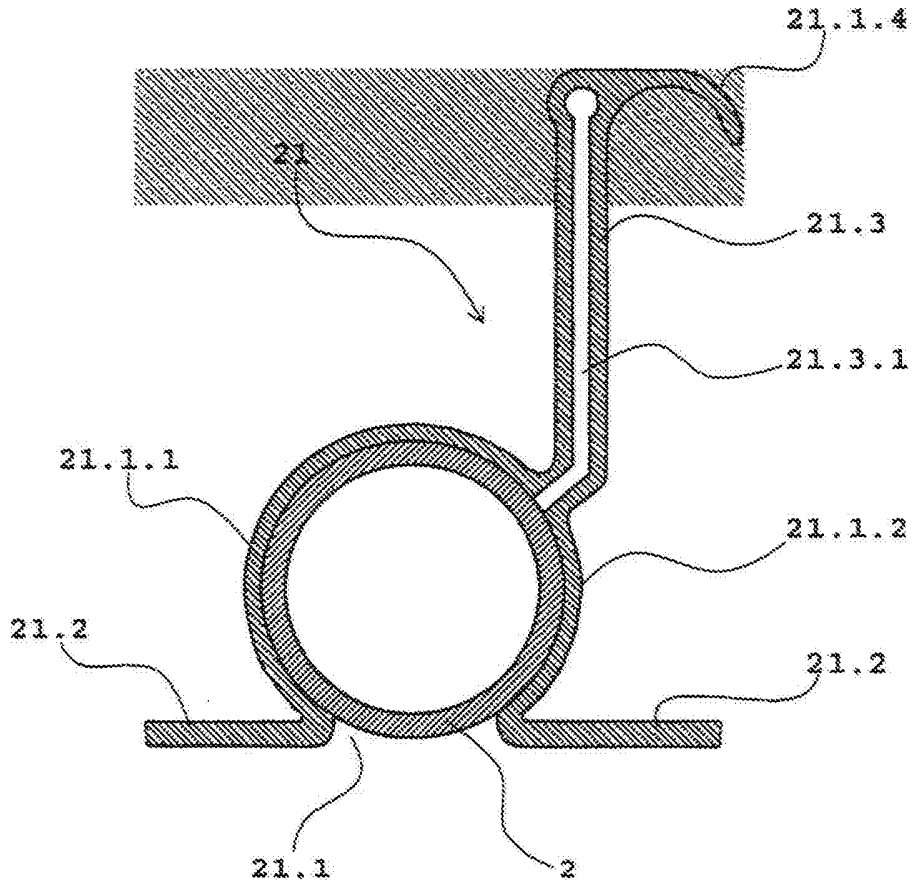


Fig. 5

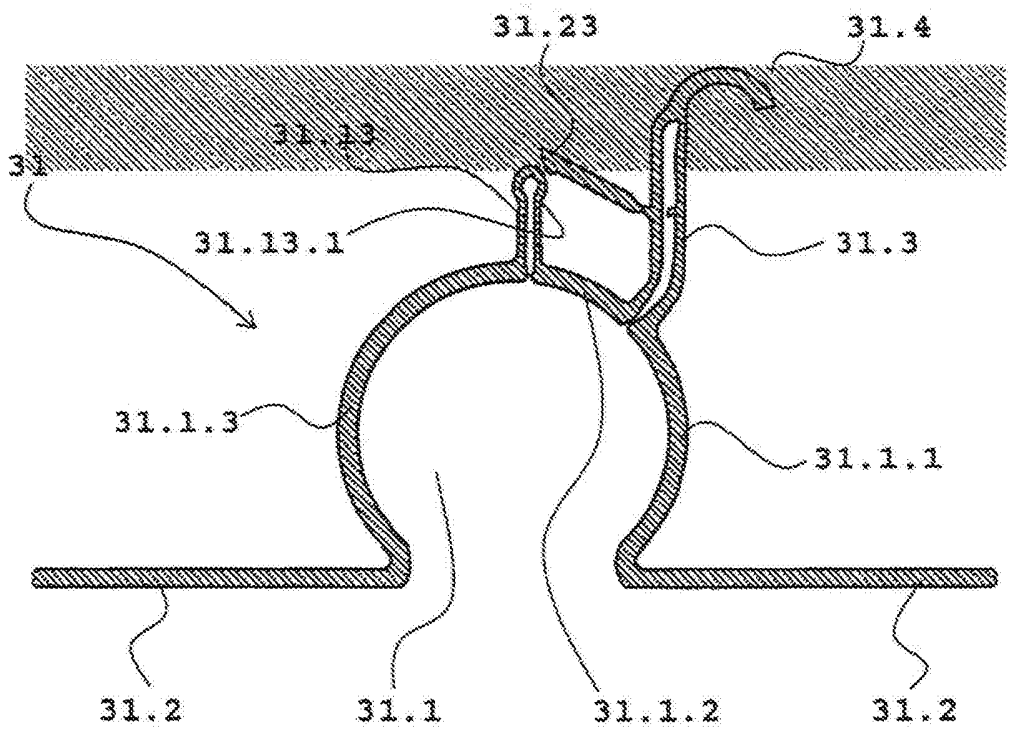


Fig. 6

