

**A FRAME FOR A TRANSIT SYSTEM FOR LEADING CABLES AND PIPES
THROUGH A PARTITION, A TRANSIT SYSTEM, USE OF A FRAME AND A
METHOD FOR PROVIDING A TRANSIT SYSTEM**

5

Technical Field

The present invention is related to a frame for a transit system for leading cables and/or pipes through an opening of a partition. Frames of this type comprise an axis, a frame wall and an axially extending through opening for receiving one or more sealing
10 modules of the transit system, wherein the frame wall has an interior surface and an exterior surface. Some types of frames also have a flange for engaging the partition.

The present invention is also related to a transit system for leading cables and/or pipes through an opening of a partition, wherein the transit system comprises the frame and one or more sealing modules arranged in the frame for sealingly holding one or
15 more cables or pipes therein. Such transit systems also comprise a compression unit for compressing the one or more sealing modules in the frame to hold the cables or pipes and seal the transit.

The present invention is also related to the use of such a frame in a transit system. The present invention is also related to a method for providing the transit
20 system.

Background

A plurality transit systems and frames for such transit systems are known in the prior art. Transit systems are used for leading cables and pipes through partitions, such
25 as walls, floors and ceilings. Transit systems are used in many different environments, including cabinets, junction boxes, machines and similar, and for different industrial applications, such as for automotive and rolling stock applications, communication, power generation and distribution as well as marine and off-shore applications. Transit systems are often required to have a sealing function, e.g. sealing against different types
30 of liquids, such as water, and/or gases, such as air, depending on the application. To provide a fastening and/or sealing function the cables or pipes are generally arranged in

a through opening of a sealing module. One common type of such a module comprises two opposite module halves arranged around the cable or pipe, wherein the modules are arranged in a frame arranged in an opening in the partition. The modules in the frame are then compressed by means of a compression unit to press the modules against the
5 inside of the frame, against each other if applicable, and against the cables or pipes in the modules to fasten the modules and the cables or pipes and seal the transit. The transit system may be arranged to seal against liquid, such as water, gas, fire, rodents, termites, dust, moisture, etc. The transit system and the modules are, for example, arranged for receiving cables for electricity, communication, computers, etc. or pipes
10 for different gases or liquids, such as water, compressed air, hydraulic fluid and cooking gas.

One drawback with prior art transit systems is that they sometimes are difficult to install. Another drawback is that prior art transit systems sometimes have been found to leak. Hence, there is a need to further improve the prior art transit systems and
15 components thereof.

Summary

In view of the above, one object of the present invention is to provide a frame for a transit system for leading cables and pipes through a partition, that is easy to install
20 and results in a more reliable transit system.

The present invention is related to a frame for a transit system for leading cables and/or pipes through an opening of a partition, wherein the frame comprises an axis, a frame wall and an axially extending through opening for receiving one or more sealing modules of the transit system, wherein the frame wall has an interior surface and an
25 exterior surface, wherein the frame comprises a flange projecting radially outward from the exterior surface of the frame wall, and wherein the flange comprises a radially extending surface for engaging the partition, characterised in that the flange is formed with a slanted surface opposite the radially extending surface and that the flange comprises a welding ridge extending radially outward from the slanted surface, wherein
30 the welding ridge is at least partly meltable in a welding process for welding of the

frame to the partition so that at least a part of the welding ridge form a welding joint for connecting the frame to the partition. The present invention results in facilitated mounting and welding of the frame to the partition and also reduces the risk of a transit system leaking. The welding ridge is arranged to form the material of the welding joint or to at least contribute with material to the welding joint. Optionally, additional welding material may be added along with the material from the welding ridge during the welding process, which additional welding material may be added in a conventional manner, such as by means of a filler metal, a consumable wire electrode or similar. Facilitated welding of the frame may improve both the strength and also the sealing properties of the transit system.

The welding ridge can extend from the slanted surface to the radially extending surface. Hence, the welding ridge can form a tip of the flange so it can be partially in contact with the partition as well as exposed to a welding process from the opposite direction for efficient welding and reliable connection of the frame to the connection.

The flange can extend continuously around the exterior surface of the frame wall. Hence, continuous contact between the frame and the partition is facilitated to provide a strong connection and facilitate a sealed transit system.

The welding ridge can extend continuously around the flange to make it easier to achieve a continuous welding joint around the entire frame to provide a rigid connection as well as tight sealed transit system.

The frame can be formed in a single integrated piece, e.g. of metal, such as aluminum, stainless steel or other suitable metal for connection to a partition by welding. For example, the welding ridge can be made of the same material as the rest of the frame. Alternatively, the welding ridge is made of another material, such as a material with lower melting point than the rest of the frame. For example, the welding ridge comprises a melting point lowering element, so that at least the solidus temperature of the welding ridge is lower than the solidus temperature of the frame walls and optionally also the remaining portions of the flange.

The frame can comprise a slot in the interior surface of the frame. The slot can be elongated and extend along the frame wall in a direction perpendicular to the axial direction of the frame. Said slot can be arranged for receiving radially protruding portions of an optional stayplate of the transit system. The slot is particularly useful in transit systems of considerable depth, i.e. extension in the axial direction.

The frame can comprise a first surface and an opposite second surface, wherein the first surface of the frame is inclined towards the flange. Hence, efficient cooperation with a welding fixture can be obtained without interfering with the exterior surface of the frame wall on at least one side of the frame, so that welding from at least that side is facilitated also when the frame is connected to the welding fixture. The first and second surfaces can be rear and front surfaces of the frame. Alternatively, the first surface can be arranged in a slot in the interior surface of the frame. The combination of the inclined first surface and the flange with the slanted surface and welding ridge results in facilitated installation of the frame and simultaneously prevents deformation of the frame due to the welding process. The inclined first surface makes it possible to prevent deformation of the frame by a welding fixture arranged to engage the inclined first surface of the frame without obstructing a welding process on the same side as the inclined surface. At the same time the flange with the slanted surface stabilizes the opposite side of the frame and prevents deformation while the welding ridge facilitates installation and reduces the risk of leakage.

The present invention is also related to a transit system for leading cables and/or pipes through an opening of a partition, wherein the transit system comprises a frame, one or more sealing modules arranged in the frame for sealingly holding one or more cables or pipes, and a compression unit for compressing the one or more sealing modules in the frame, wherein the frame comprises an axis, a frame wall and an axially extending through opening for receiving the one or more sealing modules of the transit system, wherein the frame wall has an interior surface and an exterior surface, wherein the frame comprises a flange projecting radially outward from the exterior surface of the frame wall, and wherein the flange comprises a radially extending surface for engaging the partition, characterised in that the flange is formed with a slanted surface opposite

the radially extending surface and that the flange is connected to the partition through a welding joint extending radially outward from the slanted surface. Hence, a tight and reliable transit system can be obtained in an efficient manner. The welding joint can be provided at least partially by a welding ridge of the flange. Hence, a portion of the

5 flange forms the welding joint. The welding ridge can extend radially outward from the slanted surface, wherein the welding ridge is at least partly melted in a welding process for welding of the frame to the partition so that at least a part of the welding ridge form the welding joint for connecting the frame to the partition. Alternatively, all material for the entire welding joint can be provided by the welding ridge of the flange.

10 The present invention is also related to a use of the frame in a transit system for leading cables and/or pipes through an opening of a partition, wherein the frame is welded to the partition. The frame can be used in a transit system having one or more sealing modules arranged in the frame. The sealing modules can each sealingly hold a cable, pipe or blind plug. The frame can be used in a transit system also comprising a

15 compression unit for compressing the one or more sealing modules arranged in the frame when each of the sealing modules is holding a cable, a pipe or a blind plug.

The present invention is also related to a method for providing a transit system, comprising the steps of

- a) arranging a frame in an opening in a partition,
- 20 b) bringing a flange of the frame in contact with the partition,
- c) at least partially melting a welding ridge of the flange and thereby forming a welding joint between the flange and the partition, wherein said welding joint at least partially is formed by material from the welding ridge,
- d) arranging at least one compressible sealing module in the frame,
- 25 e) arranging a cable, a pipe or a blind plug in the sealing module, and
- f) arranging a compression unit in the frame and compressing the at least one sealing module by means of the compression unit.

The frame according to some embodiments can be used with a welding fixture during installation of the frame and during welding of the frame to the partition. The

30 frame can be used with a conventional welding frame. The frame according to some

embodiments can also be used with a welding fixture as disclosed herein, wherein the welding fixture disclosed herein is arranged for engaging the inclined first surface of the frame without protruding beyond the exterior surface of the frame wall. Hence, disclosed is also a welding fixture for installation of a frame in an opening of a partition, wherein the welding fixture comprises a first fixture element, a second fixture element and an axially extending compression device movably connecting the first fixture element with the second fixture element for clamping opposite first and second surfaces of the frame between the first and second fixture elements, wherein the first fixture element has first and second engagement surfaces for engaging the first surface of the frame, wherein the first and second engagement surfaces are, in a direction radially outward, inclined towards the second fixture element. The first and second engagement surfaces of the first fixture element are inclined to prevent movement and deformation of the frame in a direction radially outward while simultaneously preventing axial movement and deformation of the frame. Hence, the welding fixture prevents or reduces changes in shape and size of the frame both in the radial and axial directions without having to engage an exterior of the frame at the rear and/or front side of the frame, which otherwise may obstruct during the welding process. Hence, the inclination of the first and second surfaces of the first fixture element makes it possible to facilitate the welding of the frame to the partition in at least the same side of the partition as the first fixture element. Preventing deformation of the frame may improve sealing properties of a transit system for leading cables and pipes through the partition, wherein the transit system comprises the frame and sealing modules arranged in a through opening of the frame together with a compression device for compressing the sealing modules with cables or pipes arranged therein. In addition, facilitated welding on one or both sides of the frame may result in a stronger installation and may improve both the strength and also the sealing properties of the installation or the transit system.

Disclosed is also a combination of the welding structure and the frame.
Disclosed is also a use of a welding fixture for welding the frame to the partition.
Disclosed is also a method for welding the frame to the partition when connected to the welding fixture. Disclosed is also a method for providing a transit system for leading

cables and/or pipes through a partition, including a step of welding the frame to the partition while the frame is connected to the welding fixture.

Further objects and advantages of the present invention will be clear to a person skilled in the art when reading the detailed description below.

5

Brief Description of the Drawings

The invention will be described further below by way of embodiment examples and with reference to the enclosed drawings, in which:

Fig. 1 is a schematic front view of a transit system according to one
10 embodiment, which transit system comprises a frame, sealing modules, optional stayplates and a compression unit, wherein cables are arranged through some of said sealing modules, and wherein the frame is attached to a partition through a welding joint,

Fig. 2 is a schematic perspective view of a sealing module half for a transit
15 system according to one example,

Fig. 3 is a schematic perspective view of a frame according to one embodiment,

Fig. 4 is a schematic section view of the frame according to Fig. 3 connected to a partition through weld joints on both sides of the partition,

20 Fig. 5 is a schematic section view of the frame according to another embodiment connected to a partition through weld joints on both sides of the partition,

Fig. 6 is a schematic perspective view of the frame of Fig. 3 connected to a welding fixture according to one embodiment, seen from a first side,

25 Fig. 7 is a schematic perspective view of the frame and the welding fixture according to Fig. 6, seen from a second side,

Fig. 8 is a schematic section view of the frame and welding fixture of Figs. 6 and 7,

Fig. 9 is a schematic section view of a portion of the frame of Fig. 3,

Fig. 10 is a schematic perspective view of a frame according to another embodiment, seen from a front side, wherein the frame is connected to a welding fixture

Fig. 11 is a schematic perspective view of the frame and the welding fixture
5 according to Fig. 10, seen from a rear side,

Fig. 12 is a schematic section view of the frame and the welding fixture of Figs. 10 and 11, and

Fig. 13 is a schematic section view of a portion of the frame of Fig. 12.

10 Description of Embodiments

With reference to Fig. 1, a transit system 10 for passing at least one cable 11 and/or at least one pipe through a partition is illustrated schematically according to one example. The transit system 10 is arranged for passing one or more cables 11 and/or pipes through a partition in the form of a wall, a floor, a roof or a ceiling. The partition
15 is indicated in Fig. 1 by means of a dashed line and reference number 21. For example, the transit system 10 is arranged for passing cables 11, such as cables for electricity, communication, computers etc., or pipes for different gases or liquids, such as water, compressed air, hydraulic fluid, cooking gas or other types of liquids or gases. Cables and/or pipes are led in an axial direction through the transit system 10. The transit
20 system 10 is arranged at a through opening in the partition 21 and is attached to the partition, e.g. by fastening means of a welding joint 22. For example, the partition 21 is made of metal, such as steel, aluminium or other suitable metal. Alternatively, the partition 21 is made of a composite material, including plastic or metal materials, wherein the transit system 10 is attachable to the partition 22 by welding.

25 The transit system 10 comprises one or more sealing modules 12, a compression unit 13, optionally one or more stayplates 14, and a frame 15 for receiving the sealing modules 12 and the compression unit 13 and, if applicable, the stayplates 14. The sealing modules 12 may be arranged in different sizes and a plurality of different sealing modules 12 may be arranged in different configurations, which is illustrated in Fig. 1.

For example, the sealing modules 12, stayplates 14 and the compression unit 13 are of conventional type. For example, the sealing modules 12 are resilient and comprises two opposite module halves 16, wherein each module half 16 comprises a plurality of optional peelable sheets 17 placed in a semi-cylindrical groove 18 as illustrated in Fig. 2. Optionally, a suitable number of peelable sheets 17 are removed to adapt the sealing module 16 to the diameter of the cable or pipe, wherein the cable 11 or pipe is placed in the module half 16 and a sealing module 13 is formed by placing two module halves 16 on top of each other. The module half 16 also comprises outer surfaces for abutting the frame 15, a stayplate 14 and/or adjacent sealing modules 12. The sealing modules 12 are resilient, and are for example made of natural or synthetic rubber, such as an EPDM rubber, optionally with additional fillers, or TPE.

For example, the compression unit 13 is a conventional wedge comprising a plurality of wedge elements, such as four wedge elements, operated by one or more compression screws 19. The compression screws 19 is, e.g. arranged to move the compression unit from a non-compressed position to a compressed position in which the compression unit 13 expands in a radial direction towards and/or away from the sealing modules 12 to press on the sealing modules 12 and optionally also on the frame 15. Optionally, a side of the transit system 10 from which the compression screws 19 can be operated, such as a side where heads of the screws 19 are arranged, is a front side of the transit system 10.

The frame 15 according to Fig. 1 is arranged for receiving a plurality of the compressible sealing modules 12 for holding the cables 11 or pipes. Two of the sealing modules 12 in Fig. 1 are illustrated with a cable 11 or pipe therein in cross section and it is understood that the cable 11 or pipe continues. It is also understood that the sealing modules 12 can be provided with a conventional blind plug 20 if no cable 11 or pipe is arranged therein.

The stayplates 14 are arranged to prevent displacement of the sealing modules 12 in the axial direction. The stayplates 14 are arranged between sealing modules 12, such as between rows of sealing modules, or between a sealing module 12 or a row of sealing

modules and the frame 15 and are arranged to abut front and rear sides of the frame 15 to prevent axial displacement. For example, the stayplates 14 are arranged horizontally.

With reference to Fig. 3, the frame 15 is illustrated according to one embodiment. The frame 15 is, e.g. for the transit system 10 as described above. The frame 15 comprises the axially extending through opening for receiving the sealing modules 12, compression unit 13 and optional stayplates 14 as described with reference to Fig. 1. In the illustrated embodiment, the frame 15 has a substantially rectangular shape, optionally with rounded corners, and a substantially rectangular through opening. Hence, the frame 15 has four interconnected walls, wherein first and third walls are arranged in parallel to each other and being connected to each other through second and fourth walls arranged in parallel to each other. Alternatively, the frame 15 has another shape, such as circular, wherein the frame 15 may be considered to have a single frame wall or another number of frame walls than four.

The frame 15 has a first surface 23 and a second surface 24. The first and second surfaces 23, 24 form the rear and front sides of the frame 15 in the embodiment of Fig. 3. For example, the first surface 23 forms the rear side of the frame 15, wherein the second surface 24 forms the front side of the frame 15. The front side of the frame 15 may correspond to the front side of the transit system 10.

The frame 15 in the embodiment of Fig. 3 comprises a flange 25 for abutting against the partition 21. The flange 25 is arranged for welding to the partition 21 as illustrated in Fig. 4. In Fig. 4 the flange 25 is connected to the partition 21 by means of the welding joint 22. Hence, the flange 25 projects radially outward from an exterior surface of the frame walls. For example, the interior surface of the frame 15 is substantially flat and may be smooth or rough. The flange 25 is, e.g. of the same material as the remaining portions of the frame 15, such as metal. For example, the frame walls and the flange 25 are formed in a single integrated piece. In the illustrated embodiment, the flange 25 extends continuously around the entire periphery of the frame 15. Alternatively, the flange 25 extends along the exterior of only two opposite frame walls or in increments around one or more of the frame walls.

The flange 25 comprises a radially extending surface 26 for engaging the partition 21. In the illustrated embodiment, the radially extending surface 26 of the flange 25 is facing a direction opposite the second surface 24 of the frame 15. Alternatively, the radially extending surface 26 of the flange 25 is facing a direction
5 opposite the first surface 23 of the frame 15. For example, the radially extending surface 26 extends radially. For example, the radially extending surface 26 of the flange 25 extends in a radial plane, i.e. perpendicular to the axial direction.

The flange 25 is formed with a slanted surface 27 opposite the radially extending surface 26. The flange 25 also comprises a welding ridge 28 for at least partly melting
10 during the welding process to at least partly form the material of the welding joint 22. Hence, the welding ridge 28 is arranged to at least contribute with material to the welding joint 22. For example, the welding ridge 28 forms all the material of the welding joint 22. Alternatively, the welding ridge 28 forms part of the material of the welding joint 22, wherein additional welding material may be added along with the
15 material from the welding ridge 28 during the welding process. Optionally, the additional welding material may be added in a conventional manner, such as by means of a filler metal, a consumable wire electrode or similar. The welding ridge 28 forms the end portion of the flange 25 in the radial direction outward. For example, the welding ridge 28 extends from the slanted surface 27 to the radially extending surface 26. For
20 example, an inner portion of the welding ridge 28 is arranged to abut the partition 21. For example, the inner portion of the welding ridge 28 extends in the radial direction and may optionally be aligned with the radially extending portion 26, so that said inner portion of the welding ridge 28 abuts the partition 21 together with the radially
extending surface 26 when mounted to the partition 21.

25 In the illustrated embodiment, the slanted surface 27 extends from the exterior of the frame wall to the welding ridge 28. For example, the slanted surface 27 extends from the welding ridge 28 towards the second surface 24 of the frame 15, wherein the slanted surface 27 is tapering towards the second surface 24. For example, the slanted surface 27 then ends a distance from the second surface 24. Alternatively, the slanted
30 surface 27 extends all the way to the second surface 24. The slanted surface 27 is, e.g.

arranged with an angle in relation to the axial direction of from 10 to 60 degrees, such as 10 to 45 degrees. The slanted surface 27 is arranged to stabilize the flange 25 and prevent melting of other portions of the flange 25 than the welding ridge 28. The slanted surface 27 may also stabilize the frame and prevent deformation thereof, such as during welding. Hence, the slanted surface 27 is arranged to prevent undesired melting of the radially extending surface 26 and/or to prevent deformation of the frame 15.

In the illustrated embodiment, the first surface 23 of the frame 15 is, in a direction radially outward, inclined towards the second surface 24. The inclination of the first surface 23 is optional. Hence, in the direction radially outward, the first surface 23 is inclined axially inward. The first surface 23 is arranged with an angle α in relation to a radial plane. The first surface 23 extends from an inner edge of the frame 15 towards an outer edge thereof, such as all the way to the said outer edge. For example, the frame 15 is formed with a depth in the axial direction from the first surface 23 to the second surface 24 that is smaller at the exterior of the frame 15 than at the interior of the frame 15. Hence, the frame 15 is formed with a smaller exterior depth than an inner axial depth. For example, the first surface 23 is arranged with an angle α of at least 2 degrees or at least 5 degrees. For example, the angle α is maximum 45 degrees, maximum 30 degrees or maximum 20 degrees.

For example, the second surface 24 extends in a radial plane as illustrated. For example, the second surface 24 extends continuously in the radial plane from the inner edge of the frame wall to the outer edge of the frame wall. Alternatively, the second surface 24 is inclined in a similar way as described for the first surface 23. For example, the first and/or the second surfaces are formed with said inclination radially outward and axially inward.

In the embodiment of Fig. 4, the frame 15 is connected to a first side of the partition 21 through the welding joint 22 between the flange 25 and the partition 21 and to a second side of the partition opposite the first side through an optional corner welding joint 29. The welding joint 22 and the corner welding joint 29 are on opposite sides of the partition 21. Hence, the corner welding joint 29 is connecting the partition 21 and the exterior of the frame 15 on the opposite side of the partition 21 as the flange

25. The corner welding joint 29 is connecting the partition 21 and the exterior of the frame 15 on the same side of the partition 21 as the first surface 23, i.e. a side opposite the flange 25 and the second surface 23. Hence, in the embodiment of Fig. 4, the frame 15 is connected to the partition 21 through both the welding joint 22 and the corner welding joint 29. Alternatively, the frame 15 is connected to the partition 21 through the welding joint 22 only or the corner welding joint 29 only.

With reference to Fig. 5 the frame 15 is illustrated schematically according to another embodiment, wherein the frame 15 is connected to the partition 21 through the welding joint 22 and the corner welding joint 29. The frame 15 of Fig. 5 comprises the flange 25 as described with reference to Fig. 4 but does not comprise the inclined first surface 23. Instead the first surface 23 extends in a radial plane. For example, the first surface 23 is arranged in parallel to the second surface 24. Alternatively, the second surface 24 is inclined.

With reference to Figs. 6 to 8 the frame 15 of Figs. 3 and 4 is connected to a welding fixture 30. However, it is understood that the welding fixture 30 is connectable to the frame 15 of Fig. 5 and also other suitably formed frames in the same way. The welding fixture 30 is arranged to be used in connection with the welding process for welding the frame 15 to the partition 21. For example, the welding fixture 30 is arranged to be used before, during and after the welding process for installing the frame 15 in the opening of the partition in order to retain the size properties of the frame 15 during the welding process. The welding process may involve high temperatures affecting the material of the frame 15 which can lead to unwanted deformations and size changes of the frame 15 which may be prevented by the welding fixture 30.

The welding fixture 30 comprises a first fixture element 31, a second fixture element 32 and an axially extending compression device 33 movably connecting the first fixture element 31 with the second fixture element 32 for clamping the opposite first and second surfaces 23, 24 of the frame 15 between the first and second fixture elements 31, 32. The first fixture element 31 extends from one frame wall to the opposite frame wall for holding the frame 15 at the first surface 23 of the frame 15 at said opposite frame walls. For example, the first fixture element 31 is arranged as a

plate for extending between opposite frame walls. The second fixture element 32 is, e.g. arranged as a plate extending between two opposite frame walls for holding the frame 15 at the second surface 24 thereof at said opposite frame walls.

The compression device 33 is arranged for moving the first and second fixture
5 elements 31, 32 towards and away from each other in the axial direction. For example, the compression device 33 comprises a screw, such as a single screw, movably connecting the first and second fixture elements 31, 32 in a conventional manner. The screw is connected to at least one of the first and second fixture elements 31, 32 through threads for moving the first and second fixture elements 31, 32 in relation to each other
10 by turning of the screw. Optionally, the compression device 33 also comprises a washer arranged between a screw head and one of the first and second fixture elements 31, 32. The compression device 33 is, for example, arranged centrally in the first and second fixture elements 31, 32. For example, the compression device 33 is arranged through a central hole in the first fixture element 31 and through a central hole in the second
15 fixture element 32.

The first fixture element 31 has first and second engagement surfaces 34, 35 for engaging the first surface 23 of the frame 15. The second fixture element 32 has third and fourth engagement surfaces 36, 37 for engaging the second surface 24 of the frame 15. The first and second engagement surfaces 34, 35 are arranged to cooperate with the
20 third and fourth engagement surfaces 36, 37 for clamping the frame 15 between them. Hence, the first engagement surface 34 is arranged substantially opposite the third engagement surface 36, wherein the second engagement surface 35 is arranged substantially opposite the fourth engagement surface 37. Optionally, the first engagement surface 34 is arranged in a similar way as the second engagement surface
25 35, wherein the third engagement surface 36 is similar to the fourth engagement surface 37. According to one embodiment, the third and fourth engagement surfaces 36, 37 are arranged in the same way as the first and second engagement surfaces 34, 35.

The first and second engagement surfaces 34, 35 are arranged inclined toward the second fixture element 32 in a direction radially outward. Hence, the first and
30 second engagement surfaces 34, 35 are arranged with an angle β in relation to a radial

plane. The first and second engagement surfaces 34, 35 are arranged to cooperate with the inclined first surface 23 of the frame 15 to prevent displacement and deformation of the frame 15 in an outward radial direction. Simultaneously, the first and second engagement surfaces 34, 35 cooperate with the second fixture element 31 to prevent axial displacement and deformation of the frame 15. For example, the angle β corresponds to the angle α of the first surface 23 of the frame 15. Alternatively, the angle β is larger than the angle α . For example, the angle β is at least 2 degrees or at least 5 degrees and less than 45 degrees or less than 30 degrees.

In the illustrated embodiment, the third and fourth engagement surfaces 36, 37 extend in a radial plane. Hence, an outer end of the first and second engagement surfaces 34, 35 is arranged with an axial distance to the second fixture element 32 that is smaller than the corresponding axial distance at an inner end of the first and second engagement surfaces 34, 35. The outer end of the first engagement surface 34 is arranged with an axial distance to the third engagement surface 36 that is smaller than the axial distance between the inner end of the first engagement surface 34 and the third engagement surface 36, wherein the outer end of the second engagement surface 35 is arranged with an axial distance to the fourth engagement surface 37 that is smaller than the axial distance between inner end of the second engagement surface 34 and the fourth engagement surface 37.

The first fixture element 31 is arranged so as to leave the exterior side of the frame 15 unobstructed to facilitate welding of the frame 15 to the partition 21. In the illustrated embodiment, the first and second engagement surfaces 34, 35 extend to opposite outer edges of the first fixture element 31 and form an outer periphery of the first fixture element 31, wherein the first fixture element 31 is adapted to not enclose an axially extending exterior surface of the frame 15.

The first and second engagement surfaces 31, 32 are connected to inner support surfaces 38, 39 for supporting an interior surface of the frame 15 and prevent displacement and deformation of the frame 15 radially inward. For example, the inner support surfaces 38, 39 extend substantially in an axial plane, optionally tapering towards the second fixture element 32. Hence, the inner support surface 38, 39 and the

first and second engagement surfaces 34, 35 are arranged to enclose an inner edge of the frame 15.

The second fixture element 32 comprises inner support surfaces 40, 41 for supporting opposite interior axial surfaces of the frame 15. The inner support surfaces 5 40, 41 extend in parallel axial planes. The second fixture element 32 comprises outer support surfaces 42, 43 supporting opposite exterior axial surfaces of the frame 15. The outer support surfaces 42, 43 extend in parallel axial planes. The outer support surfaces 42, 43 are arranged opposite the inner support surfaces 40, 41 of the second fixture element 31. In the illustrated embodiment, the inner support surfaces 40, 41, the outer 10 support surfaces 42, 43 and the third and fourth engagement surfaces 36, 37 of the second fixture element 32 are formed by first and second recesses of the second fixture element 32, wherein the first and second recesses are arranged for receiving and enclosing portions of the second surface 24 at opposite walls of the frame 15. Hence, the second fixture element 32 may be arranged to extend over the second surface 24 of 15 the frame 15 to engage the axial exterior surface of opposite frame walls, wherein the first fixture element 31 stops before reaching the corresponding exterior surfaces. For example, the first fixture element 31 has a radial width that is smaller than the corresponding radial width of the second fixture element 32.

With reference to Figs. 10 to 12 the welding fixture 30 connected to a frame 15b 20 is illustrated according to another embodiment of the present invention. In Fig. 13, a portion of the frame 15b is illustrated schematically in section view. In the embodiment of Figs. 10 to 12, the welding fixture 30 is as described above, optionally with the flange 25, and thus comprises the first and second engagement surfaces 34, 35 arranged with the angle β . The frame 15b of Figs. 10 to 13 differs from the frame 15 as described 25 above in that the first surface 23 does not form any of the front or rear sides of the frame 15b but is instead arranged in at least one elongated and radially extending interior slot 44 of the frame 15b in a position between the front and rear sides thereof. For example, the frame 15b comprises two slots 44, one in each of two opposite and parallel frame walls. For example, the slots 44 extend from one end to the opposite end of the interior 30 of the two opposite frame walls, wherein the slots 44 are arranged in parallel and are

aligned in the axial direction. Alternatively, a single slot 44 extends continuously around the inner circumference of the frame 15b, i.e. along all four of the frame walls. For example, the slot or slots 44 is/are arranged remotely from both the front and rear sides of the frame 15, such as in axially central portions of at least the opposite frame walls. For example, the slot or slots 44 is/are elongated and extend(s) in the radial direction. The slot or slots 44 is/are arranged for receiving a radially protruding outer edge portion of the first fixture element 31 having the first and second engagement surfaces 34, 35, so that the first and second engagement surfaces 34, 35 engage the first surface 23 of the slot or slots 44. After installation of the frame 15b, the slot or slots 44 may be arranged for receiving projecting portions of one or more stayplates 14 of the transit system 10.

CLAIMS

1. A frame (15) for a transit system for leading cables and/or pipes through an opening of a partition (21), wherein the frame comprises an axis (A), a frame wall and an axially extending through opening for receiving one or more sealing modules of the transit system, wherein the frame wall has an interior surface and an exterior surface, wherein the frame comprises a flange (25) projecting radially outward from the exterior surface of the frame wall, and wherein the flange (25) comprises a radially extending surface (26) for engaging the partition (21), **characterised in that**
- 10 the flange (25) is formed with a slanted surface (27) opposite the radially extending surface (26) and that the flange (25) comprises a welding ridge (28) extending radially outward from the slanted surface (27), wherein the welding ridge (28) is at least partly meltable in a welding process for welding of the frame to the partition so that at least a part of the welding ridge (28) form a welding joint (22) for connecting the frame (25) to
- 15 the partition (21).
2. The frame of claim 1, wherein the welding ridge (28) extends from the slanted surface (27) to the radially extending surface.
- 20 3. The frame of claim 1 or 2, wherein the flange (25) extends continuously around the exterior surface of the frame wall.
4. The frame of claim 3, wherein the welding ridge (28) extends continuously around the flange (25).
- 25 5. The frame of any of the preceding claims, wherein the frame is formed in a single integrated piece of the same material.
6. The frame of any of the preceding claims, wherein the frame is made of metal.

7. The frame of any of the preceding claims, wherein the frame is made of aluminum or stainless steel.
8. The frame of any of the preceding claims, wherein the frame (15) comprises a first surface (23) and an opposite second surface (24), wherein the first surface (23) of the frame (15) is inclined towards the flange (25).
9. The frame of any of the preceding claims, wherein the interior surface of the frame wall is arranged with an elongated slot (44) extending along the frame wall perpendicular to the axial direction.
10. The frame of claims 8 and 9, wherein the first surface (23) is arranged in the slot (44).
11. A transit system (10) for leading cables and/or pipes through an opening of a partition (21), wherein the transit system comprises a frame (15), one or more sealing modules (12) arranged in the frame for sealingly holding one or more cables (11) or pipes, and a compression unit (13) for compressing the one or more sealing modules (12) in the frame (15), wherein the frame comprises an axis (A), a frame wall and an axially extending through opening for receiving the one or more sealing modules of the transit system, wherein the frame wall has an interior surface and an exterior surface, wherein the frame comprises a flange (25) projecting radially outward from the exterior surface of the frame wall, and wherein the flange (25) comprises a radially extending surface (26) for engaging the partition (21),
- characterised in that**
- the flange (25) is formed with a slanted surface (27) opposite the radially extending surface (26) and that the flange (25) is connected to the partition (21) through a welding joint (22) extending radially outward from the slanted surface (27).
12. The transit system of claim 11, wherein the flange (25) comprises a welding ridge (28) extending radially outward from the slanted surface (27), wherein the welding

ridge (28) is at least partly melted in a welding process for welding of the frame to the partition so that at least a part of the welding ridge (28) form the welding joint (22) for connecting the frame (25) to the partition (21).

- 5 13. The transit system of any of claims 11 and 12, comprising the frame of any of claims 1 to 10.

14. Use of a frame according to any of claims 1 to 10 in a transit system for leading cables and/or pipes through an opening of a partition (21), wherein the frame is welded
10 to the partition, and wherein the transit system further comprises one or more sealing modules (12) arranged in the frame and sealingly holding one or more cables (11) and/or pipes, and a compression unit (13) for compressing the one or more sealing modules (12) in the frame (15).

- 15 15. A method for providing a transit system according to any of claims 11 to 13, comprising the steps of
a) arranging the frame (15) in an opening in the partition (21),
b) bringing a flange (25) of the frame (15) in contact with the partition (21),
c) at least partially melting a welding ridge (28) of the flange (25) and thereby forming a
20 welding joint (22) between the flange and the partition, wherein said welding joint at least partially is formed by material from the welding ridge,
d) arranging at least one compressible sealing module in the frame,
e) arranging a cable, a pipe or a blind plug in the sealing module, and
f) arranging a compression unit in the frame and compressing the at least one sealing
25 module by means of the compression unit.