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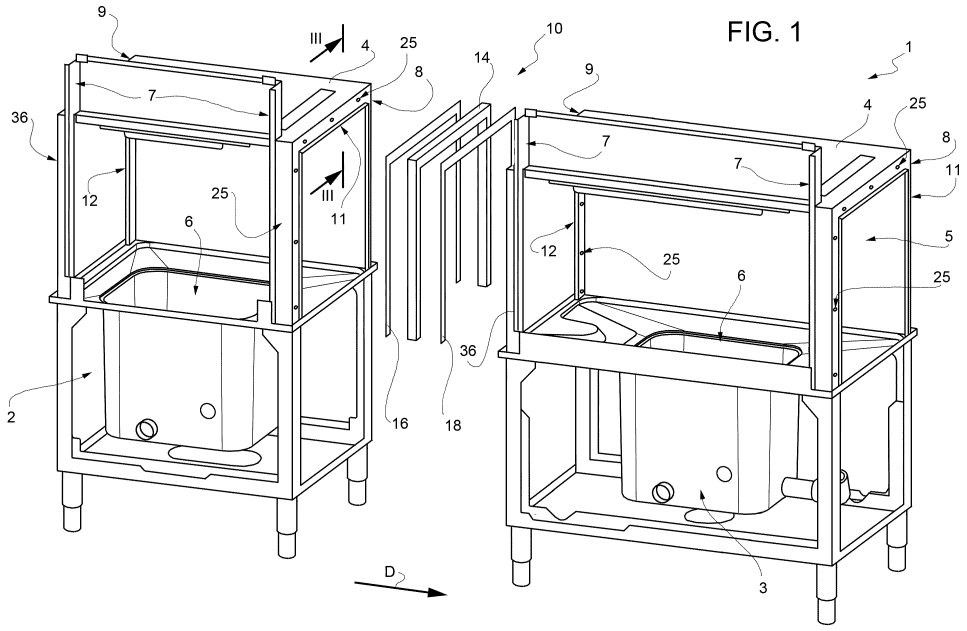
(54) TUNNEL DISHWASHING MACHINE MODULES CONNECTION SYSTEM AND ASSOCIATED TUNNEL DISHWASHING MACHINE

(57) Tunnel dishwashing machine (1) having at least one first and one second adjacent module (2,3) connected at respective upper box-like casings (4) of the modules designed to define, when joined together, a washing tunnel (5) by means of a connection system (10) including a first perimetral edge (11) of a first end (8) of the box-like casing of the first module, a second perimetral edge (12) of a second end (9), opposite the first end, of the box-like casing of the second module and means for reciprocal connection (13) of the first and second perimetral edge including a rigid frame-shaped element (14) made of synthetic plastic material positioned between the first and the second perimetral edge (11,12), a plurality of screws or bolts (15) which clamp together the first and the second edge (11,12) against the frame-shaped element (14), and respective gaskets (16,18) arranged between each edge and opposite faces (17,19) of the frame-shaped element (14) facing towards the edges (11, 12).

FIG. 1



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Description

[0001] The present invention concerns a connection system for connecting modules of a tunnel dishwashing machine and a tunnel dishwashing machine provided with said connection system.

[0002] It is known that tunnel dishwashing machines comprise a tunnel structure or carcass split into specialised stations, for example pre-washing, washing, rinsing and drying. Said tunnel structure is composed of a plurality (at least two) of self-supporting modules each of which is provided with one or more stations; inside the tunnel structure a conveyor belt runs on which the crockery to be washed is arranged, contained in baskets. To assemble a complete tunnel dishwashing machine it is therefore necessary to join the various modules together in a fluid-tight manner.

[0003] From US3443852 a connection system for connecting modules of a tunnel dishwashing machine is known, in which folded edges of two adjacent modules are welded head to head and on which a covering frame sealed with silicone is then arranged.

[0004] This system has the main drawback of not allowing transport of the various modules independently, since the machine is preassembled in the factory, or of requiring welding to be performed in situ during assembly. The use of welding has therefore been more recently replaced by the use of screws or bolts, but in any case requires extensive use of silicone or other sealant to guarantee water and steam tightness, which increases assembly costs and times. Furthermore, the known connection systems are complex to produce, in particular if the dishwasher machine is of the double wall type.

[0005] The object of the invention is to provide a connection system without the drawbacks described, in particular easy and inexpensive to produce, with high efficiency and reliability and having compact overall dimensions, in which it is not necessary to use fluid sealants. A further object of the invention is to provide a tunnel dishwashing machine comprising a plurality of modules connected to one another by a simple effective connection system which guarantees quick assembly times.

[0006] According to the invention, a connection system for connecting modules of a tunnel dishwashing machine to one another and a professional type tunnel dishwashing machine are therefore provided, as defined in the appended claims.

[0007] Further objects and advantages of the invention will appear clear from the following description of a non-limiting embodiment thereof, provided purely by way of example and with reference to the figures of the accompanying drawings, in which:

- figure 1 illustrates schematically, in lateral three quarter perspective view, a tunnel dishwashing machine disassembled and with parts removed for the sake of simplicity, composed of two modules that can be joined together by means of the connection system according to the invention;
- figure 2 illustrates on an enlarged scale and in a perspective view some main components of the connection system of the invention;
- figure 3 illustrates on a further enlarged scale a view in section according to a plotting plane III-III of the dishwashing machine of figure 1 assembled, with the connection system of the invention fully operational;
- figures 4 and 5 illustrate in a perspective view and on a further enlarged scale some details of the connection system of the invention; and
- figures 6 and 7 illustrate, again in perspective view, two possible configurations of one of the components of the connection system of the invention.

[0008] With reference to figure 1, the number 1 indicates as a whole a professional tunnel dishwashing machine comprising at least a first module 2 and a second module 3 adjacent to each other, joined together in sequence at respective upper box-like casings 4 of each module 2,3 adapted to define when joined together a washing tunnel 5.

[0009] The modules 2 and 3 are known per se and are illustrated only schematically and with parts removed for the sake of simplicity; once joined, a conveyor belt which is known and not illustrated for the sake of simplicity is mounted inside the washing tunnel 5 to move in use the crockery to be washed, in sequence, through the modules 2,3; within the box-like casings 4 spray arms are arranged in use, known and not illustrated for the sake of simplicity, which wash and rinse the crockery, while the operating liquid (water, if necessary with the addition of detergents) is collected in tanks 6 arranged at the base of the modules 2,3.

[0010] Each box-like casing 4 has a substantially parallelepiped shape and forms together with the tank 6 the washing tunnel 5, which is closed on three sides (upper, lower and rear), while it is open on the front side and at opposite ends 8,9 of each box-like casing 4.

[0011] On the open front side of each casing 4 a door is installed in use, known and not illustrated for the sake of simplicity, running on guides 7.

[0012] More generally, the dishwashing machine 1 can comprise more than two modules 2,3, as required, variously equipped to form pre-washing and washing, prerinsing and drying stations, in which each pair of adjacent modules 2,3 is connected by means of a respective connection system 10, illustrated only schematically in figure 1 and better illustrated in cross section and on an enlarged scale in figure 3.

[0013] In the non-limiting example illustrated, the dishwashing machine 1 comprises only two modules 2,3 and one single connection system 10 between the casings 4 of the two modules 2,3: the end 9 of the module 2, identical to the end 9 of the module 3, remains free and therefore defines the inlet of the washing tunnel 5, just as the end 8 of the module 3, identical to the end 8 of the module

2, also remains free and therefore defines the outlet of the washing tunnel 5. It is evident that a person skilled in the art can, without exercising any inventive activity, couple as required, in the way that will be described, several modules 2,3 different from one another, but with casings 4 having identical ends 8,9 until obtaining a dish-washing machine composed of a desired number of stations and of any length, coupling the modules two by two with a plurality of connection systems 10. At the end, the ends 9 and 8 of the first and last module will always define the inlet and outlet of the washing tunnel 5, while the other ends 8,9 of the modules will be coupled to each other, each end pair 8,9 by means of a connection system 10.

[0014] The connection system 10 according to the invention comprises, for each immediately adjacent pair of modules 2,3, a perimetral edge 11 of the open and rectangular shaped end 8 of the casing 4 of the module 2 and a perimetral edge 12 of the open and rectangular shaped end 9 of the casing 4 of the module 3 immediately adjacent to the edge 11 of the box-like casing 4 of the module 2, immediately preceding the module 3.

[0015] The connection system 10 further comprises, in addition to the perimetral edges 11,12 which, according to the description, are C-shaped, respective reciprocal connection means 13 (figure 3) of the first edge 11 and of the second edge 12.

[0016] The reciprocal connection means 13 comprises a rigid frame-shaped element 14, made of a synthetic plastic material, positioned between the adjacent perimetral edges 11 and 12; a plurality of removable joining means 15, for example screws or bolts, which in the non-limiting example illustrated consist of bolts 15, which connect together, passing through the frame-shaped element 14, the perimetral edge 11 and the perimetral edge 12, clamping together the edges 11,12 against the frame-shaped element 14; a first gasket 16 arranged between the perimetral edge 11 and a first face 17 of the frame-shaped element 14 (figure 2) facing towards the edge 11, and a second gasket 18 arranged between the second perimetral edge 12 and a second face 19 of the frame-shaped element 14 facing towards the second edge 12.

[0017] In this way, the tunnel 5 defined by the coupling between the upper casing 4 of each adjacent two modules 2,3 is sealed in a fluid-tight manner at a joining perimeter 20 between the first module 2 and the second module 3 (figure 3).

[0018] According to a preferred non-limiting embodiment, illustrated in figures 1 and 3, the first perimetral edge 11 and the second perimetral edge 12 are made of a folded and cut metal sheet; they are therefore relatively non- rigid, and are L-shaped in cross section (i.e. in planes perpendicular to the edges 11,12 - figure 3); the edges 11 and 12 are arranged facing each other on the side of their respective concavities 21 so as to define between them a housing channel 22 for the frame-shaped element 14 and the gaskets 16,18.

[0019] In particular, the first perimetral edge 11 and the second perimetral edge 12 L-shaped in cross a section have respective first wings 23 arranged adjacent to each other and second wings 24, perpendicular to the first wings 23, arranged facing each other in a distal position, the first wings 23 being positioned between them.

[0020] The removable joining means 15 consisting preferably of screws or bolts are mounted passing through respective through holes 25 of the perimetral edges 11,12 and through corresponding through holes 26 of the frame-shaped element 14 and 27 of the gaskets 16,18, which are flat strip-shaped gaskets.

[0021] The through holes 25 of the perimetral edges 11,12 are formed through the wings 24; and the frame-shaped element 14 and the gaskets 16,18 are arranged straddling the wings 23 (figure 3).

[0022] The frame-shaped element 14 and the gaskets 16,18 are C-shaped, and the first edge 11 and the second edge 12 are designed to extend on three consecutive sides of the ends 8,9 of the box-like casings 4 of the two adjacent modules 2,3 to be joined, so as to define a portal structure which delimits the tunnel 5 on the side opposite the tank 6.

[0023] With particular reference to figures 5 and 6, the frame-shaped element 14 comprises of two prismatic rectilinear uprights 28 and a prismatic rectilinear cross-piece 29 connected perpendicularly together in a removable, i.e. disassemblable, manner.

[0024] The uprights 28 have corresponding upper ends 30 (figure 4) each provided with a respective prismatic pin 31.

[0025] The cross-piece 29 has instead opposite ends 32 that can be connected in a removable manner to the upper ends 30 of the uprights 28 by means of the pins 31. The ends 32 of the cross-piece 29 are actually provided with respective through perforations 33 into which, in use, the pins 31 for coupling the uprights 28 to the cross-piece 29 can be inserted and thus form the frame element 14 shaped like a portal, i.e. like an upturned C facing downwards.

[0026] According to a preferred embodiment of the invention, the through perforations 33 are slot-shaped and are not only designed to receive the prismatic pins 31, but are also arranged so as to allow the uprights 28, once coupled with the cross-piece 29, so when the pins 31 are inserted to pass through the slot-shaped perforations 33, to perform small relative movements in a direction parallel to the lengthwise extension of the cross-piece 29; in this way, the uprights 28 can vary their reciprocal distance to compensate for any dimensional tolerances of the edges 11,12 which, as already mentioned, form respective portal structures shaped like an upturned C facing downwards and delimited towards the outside by the channel 22.

[0027] With reference to figure 7, where the details similar or equal to those already described are indicated for the sake of simplicity by the same reference numbers, the uprights 28 can be replaced by uprights 28b each

formed by means of a first rectilinear element 34 and a second rectilinear element 35 independent of each other and with different lengths mounted interlocking one on the other by means of prismatic pins 31, preferably identical to those used to couple the uprights 28 to the cross-piece 29.

[0028] In practice, the elements 34 and 35 are identical to the upright 28 in one single piece of figures 4 and 6, except for the length. Preferably, the element 34 is identical to the upright 28 in one single piece of figures 2, 4 and 6 also in length (it is an upright 28 to all intents and purposes, complete with pin 31), whereas the element 35 is shorter than the element 34, it also terminates in a pin 31 on the opposite side of the corresponding element 34 and serves as an extension for the uprights 28 if required.

[0029] The elements 34 and 35 can be selectively used, so that uprights 28 or 28b of different length can be obtained, but limiting the number of different pieces necessary. By coupling the uprights 28 or 28b to the same cross-piece 29, a frame-shaped element 14 or 14b is obtained (figure 7) which can assume at least two different heights.

[0030] To obtain the dishwashing machine 1, its component modules 2,3 are positioned close together and then rigidly coupled two by two, inserting between the adjacent edges 11,12, in the channel 22 formed and defined by them the frame-shaped element 14 with the two gaskets 16,18, forming a portal structure in an upturned C shape facing downwards. The bolts 15 are then inserted through the holes 25, 26, 27 and tightened, thus obtaining a continuous fluid-tight union of the box-like casings 4 adjacent along their entire perimeter, to form a continuous tunnel 5.

[0031] The uprights 28,28b and the cross-pieces 29 are formed by moulding in a synthetic plastic material, preferably like reticular structures provided with ribs to make them rigid but lightweight.

[0032] Each joining perimeter 20 is then covered radially on the outside by a wing 36 projecting axially, i.e. parallel to a feed direction D in use of the crockery to be washed, from the edge 12 and towards the edge 11, so as to obtain a complete double wall dishwashing machine 1.

[0033] All the objects of the invention are therefore achieved.

Claims

1. Connection system (10) for connecting end-to-end and in a fluid-tight manner at least a first (2) and a second (3) adjacent modules of a tunnel dishwashing machine (1), in particular of the professional type, at upper box-like casings (4) of the modules which are designed to define, when joined together, a washing tunnel (5), the connection system comprising a first perimetral edge (11) of a first end (8) of the box-shaped casing (4) of the first module (2), a second perimetral edge (12) of a second end (9), opposite to the first end, of the box-like casing (4) of the second module (3) and means (13) for reciprocal connection of the first and second perimetral edges; **characterized in that** the reciprocal connection means comprise a rigid frame-shaped element (4) made of a synthetic plastic material, positioned between the first perimetral edge (11) and the second perimetral edge (12), a plurality of removable joining means (15) which connect together, passing through the frame-shaped element (14), the first and second edges (11,12) clamping together the first and second edges against the frame-shaped element, a first gasket (16) arranged between the first perimetral edge (11) and a first face (17) of the frame-shaped element (14) facing towards the first edge (11), and a second gasket (18) arranged between the second perimetral edge (12) and a second face (19) of the frame-shaped element (14) facing towards the second edge (12).

2. Connection system according to Claim 1, **characterized in that** the first and second perimetral edges (11,12) are L-shaped in cross-section and are arranged facing each other with their respective concavities (21) so as to define between them a channel (22) for housing the frame-shaped element (14) and the gaskets (16, 18).

3. Connection system according to Claim 1 or 2, **characterized in that** the removable joining means (15) consist of screws or bolts mounted to pass through respective through-holes (25) in the first and second edges (11,12) and through corresponding through-holes (26;27) in the frame-shaped element (14) and the gaskets (16, 18), which are flat strip-shaped gaskets.

4. Connection system according to Claim 3, **characterized in that** the first and second perimetral edges (11,12) are L-shaped in cross-section and have respective first wings (23) arranged adjacent to each other and second wings (24), perpendicular to the first wings (23), arranged facing each other in a distal position, the first wings (23) being positioned between them, the through-holes (25) in the first and second edges (11, 12) being formed through the second wings (24) and the frame-shaped element (14) and the gaskets (16,18) being arranged straddling the first wings (23).

5. Connection system according to one of the preceding claims, **characterized in that** the frame-shaped element (14) and the gaskets (16,18) are C-shaped, the first and second edges (11,12) being designed to extend on three consecutive sides of the first and second ends (8,9) of the box-shaped casings (4) of

the first and second modules (2,3) to be joined together.

6. Connection system according to Claim 5, **characterized in that** the frame-shaped element (14;14b) comprises of two prismatic rectilinear uprights (28;28b) and a prismatic rectilinear cross-piece (29), which are connected perpendicularly together in a removable manner; the uprights (28;28b) having corresponding upper ends (30) each provided with a respective prismatic pin (31); and the cross-piece (29) having opposite ends (32) which are designed to be removably connected to the upper ends (30) of the uprights (28;28b); the ends (32) of the cross-piece being provided with respective slot-shaped through-perforations (33) designed to receive the prismatic pins (31) and arranged so as to allow the uprights (18;28b) to perform small relative movements in a direction parallel to the lengthwise extension of the cross-piece (29), so that the uprights (28;28b) may vary their reciprocal distance in order to compensate for any dimensional tolerances of the first and second edges (11,12).

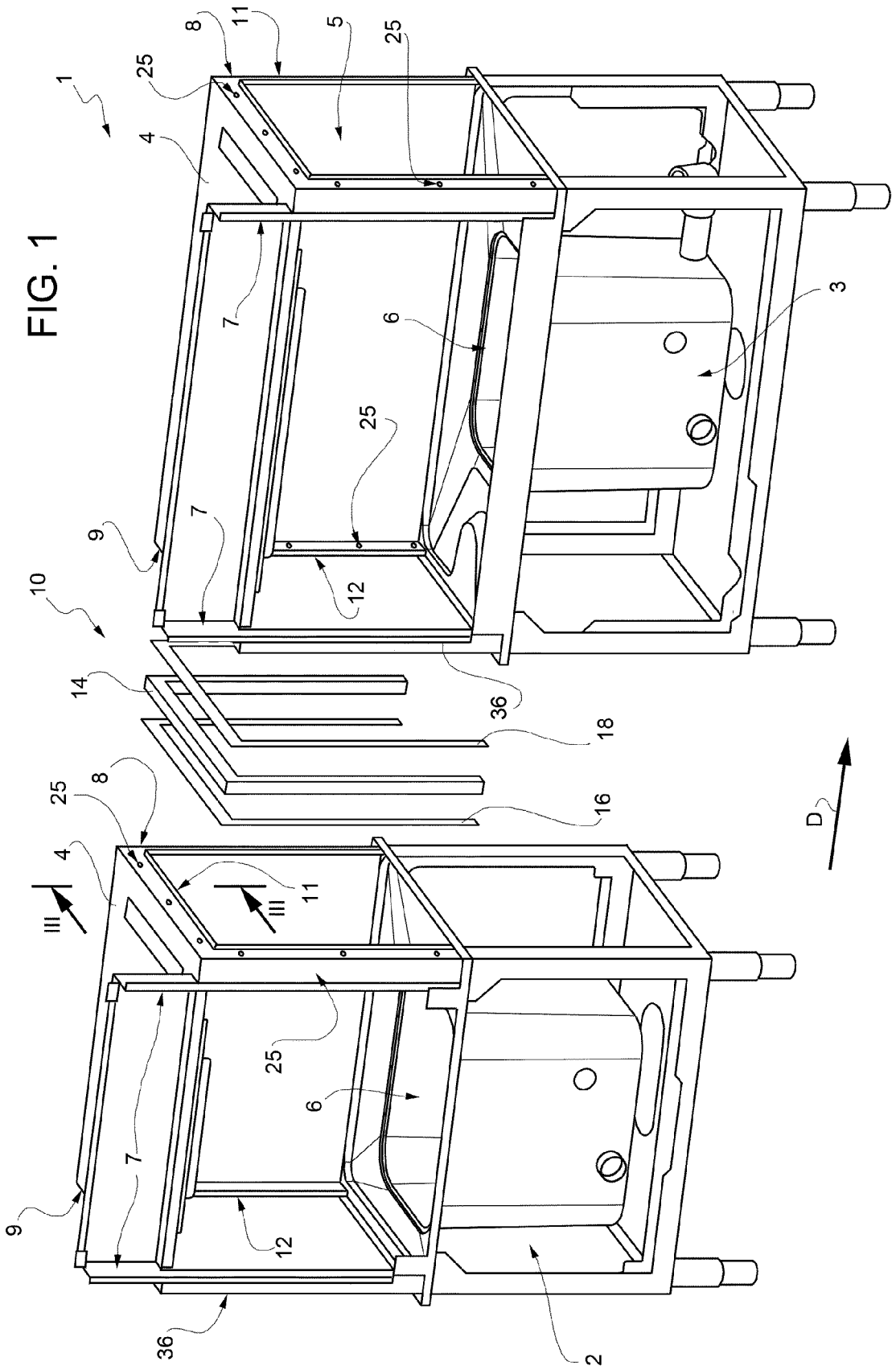
7. Connection system according to Claim 6, **characterized in that** the uprights (28b) are each formed by means of a first rectilinear element (34) and a second rectilinear element (35) which are independent of each other and have different lengths and which are mounted on each other in an interlocking manner by means of prismatic pins (31) and can be selectively used, so that the frame-shaped element (14;14b) may assume at least two different heights.

8. Tunnel dishwashing machine (1) comprising at least one first module (2) and one second module (3) arranged adjacent to each other and connected together at respective upper box-like casings (4) of the modules which are designed to define, when joined together, a washing tunnel (5), wherein each pair of adjacent modules (2,3) is connected by means of a respective connection system (10) comprising a first perimetral edge (11) of a first end (8) of the box-shaped casing (4) of a first module (2) of the pair, a second perimetral edge (12) of a second end (9), opposite to the first end, of the box-like casing (4) of a second module (3) of the pair and means (13) for reciprocal connection of the first and second perimetral edges; **characterized in that** the reciprocal connection means comprise of a rigid frame-shaped element (4) made of a synthetic plastic material and positioned between the first perimetral edge (11) and the second perimetral edge (12), a plurality of removable joining means (15) which connect together, passing through the frame-shaped element (14), the first and second edges (11,12), clamping together the first and second edges against the frame-shaped element (14), a first gasket (16) arranged between the first perimetral edge (11) and a first face (17) of the frame-shaped element (14) facing towards the first edge, and a second gasket (18) arranged between the second perimetral edge (12) and a second face (19) of the frame-shaped element facing towards the second edge (12); so that a tunnel (5) defined by joining together of the upper casing (4) of the first and second modules (2,3) is sealed in a fluid-tight manner along a joining perimeter (20) between the first and second modules.

9. Tunnel dishwashing machine (1) according to Claim 8, **characterized in that** the first and second perimetral edges (11,12) are made of a folded and cut metal sheet, are L-shaped in a cross-section and have respective first wings (23) arranged adjacent to each other and second wings (24), perpendicular to the first wings (23), arranged facing each other in a distal position, the first wings (23) being positioned between them, so as to define between the first and second edges a channel (22) for housing the frame-shaped element (14) and the gaskets (16, 18).

10. Tunnel dishwashing machine (1) according to Claim 9, **characterized in that** the removable joining means (15) consist of screws or bolts mounted to pass through respective through-holes (25) in the second wings (24) of the first and second edges (11,12) and through corresponding through-holes (26;27) in the frame-shaped element (14) and the gaskets (16, 18), which are flat strip-shaped gaskets.

FIG. 1



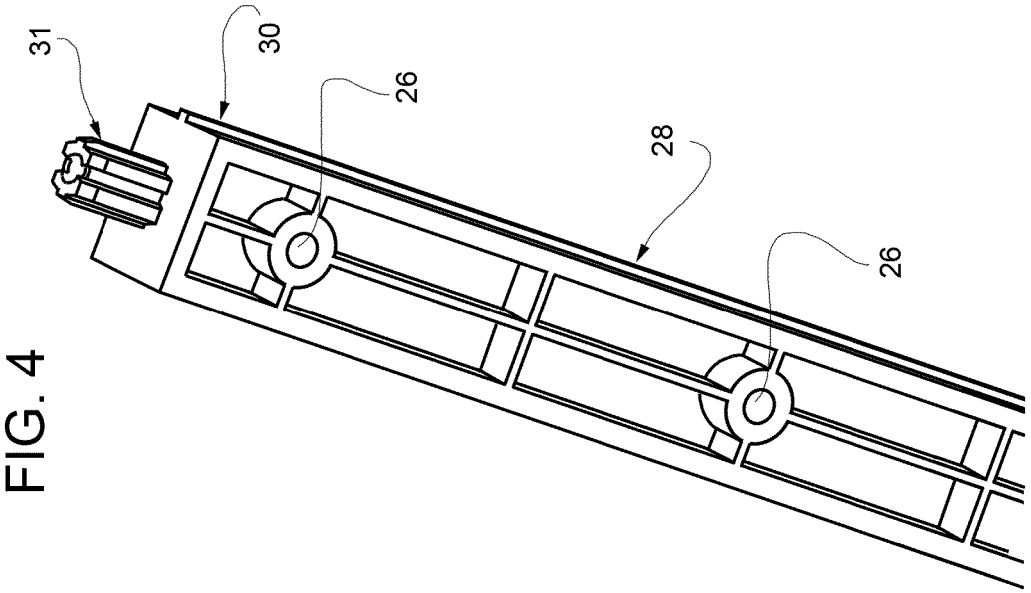

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FIG. 4

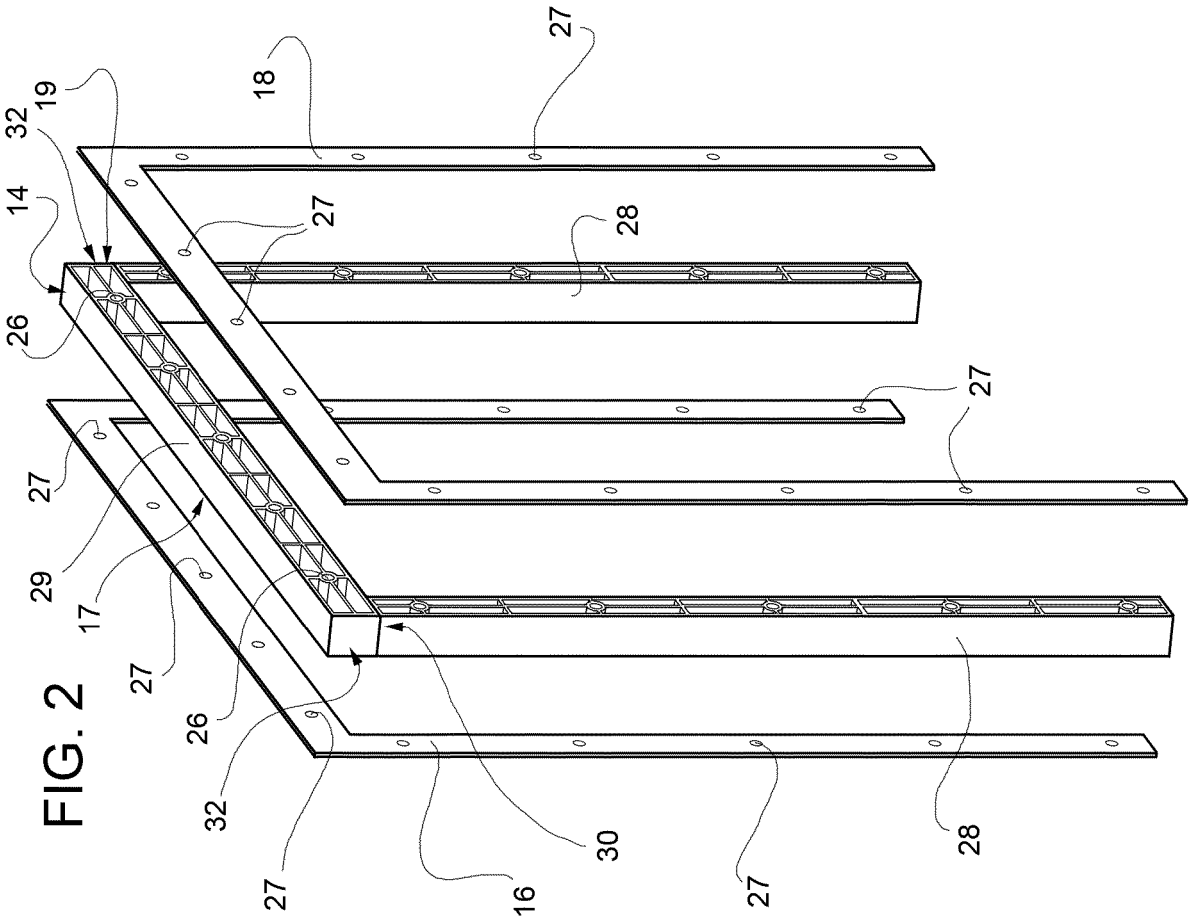
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FIG. 2

FIG. 3

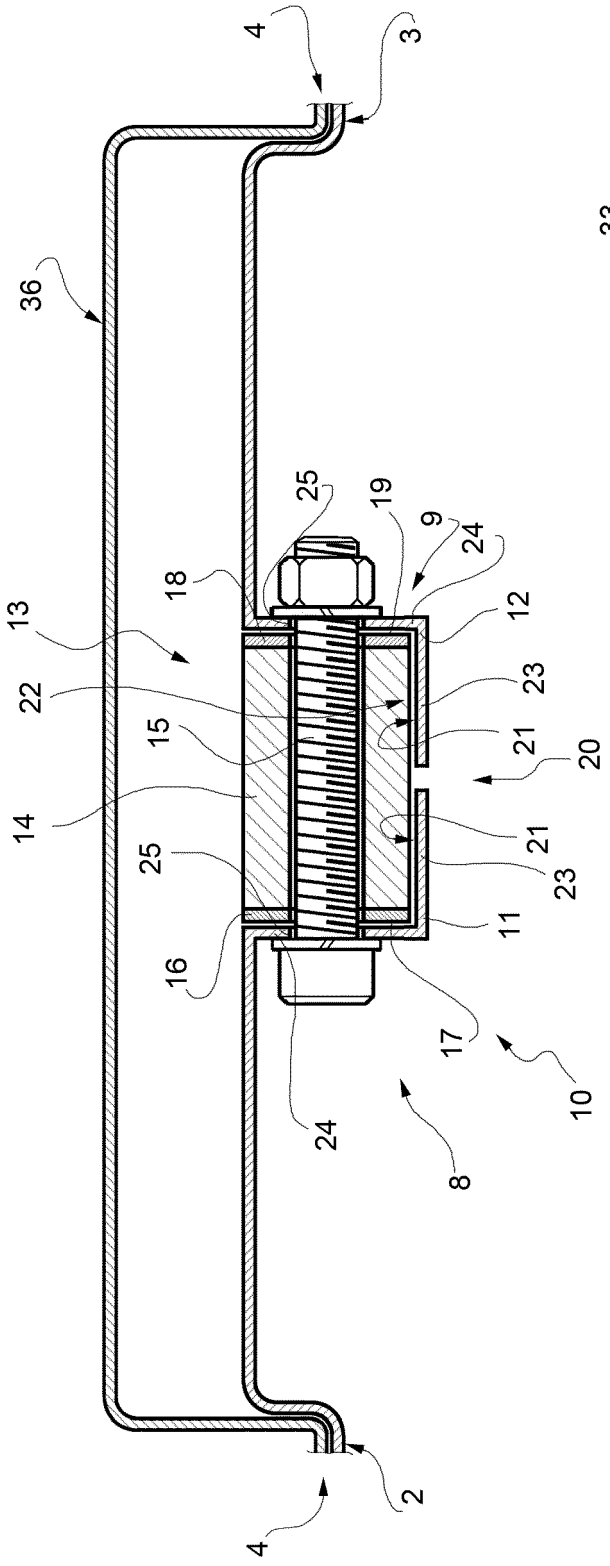
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FIG. 5

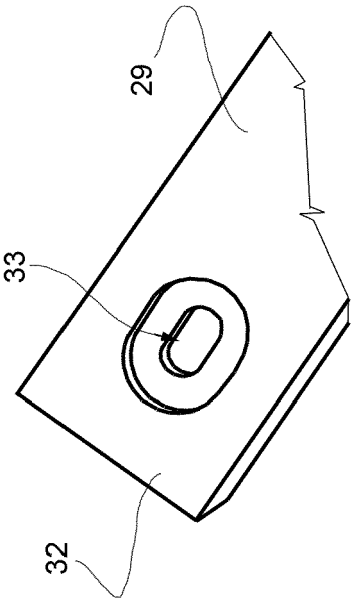
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FIG. 7

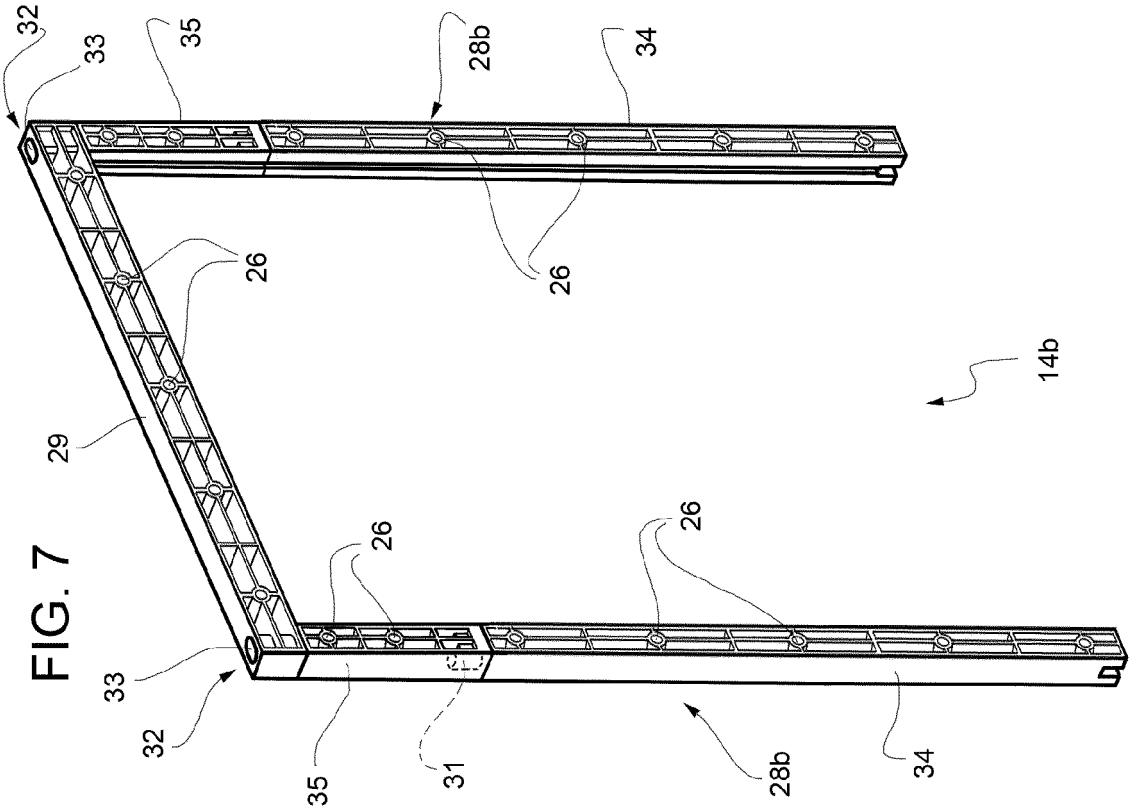
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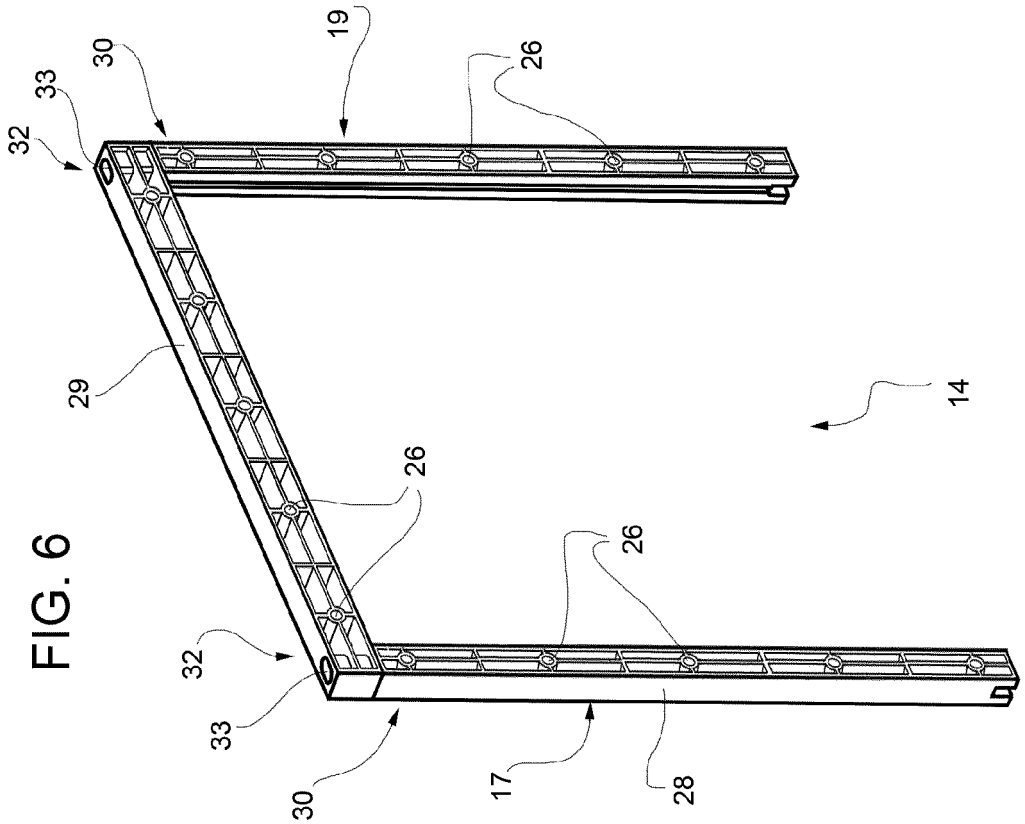
FIG. 6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EUROPEAN SEARCH REPORT

Application Number
EP 15 20 2706

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 82 03 951 U1 (WEIGEL GMBH) 22 July 1982 (1982-07-22) * the whole document *	1-10	INV. A47L15/24
A,D	US 3 443 852 A (BINKS CHESTER J ET AL) 13 May 1969 (1969-05-13) * the whole document *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 April 2016	Jezierski, Krzysztof

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 8203951 U1	22-07-1982	NONE	
US 3443852 A	13-05-1969	NONE	

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