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(54) **Process for the manufacture of radiant panels and the like and radiant panel thus obtained.**

(57) Process for the manufacture of radiant panels and the like comprising:

- formation on a front of the opposing supporting channels (10) of the holes with collar (12) by means of hot flow drilling, and
- housing in each of said holes of a tubular element (14) and subsequently constraining of said tubular elements (14) to the channels by welding or braze welding; the collars (12) are preferably made in cone form and extend inside the section bar and have at the top an annular seat with a countersink for the welding alloy.

The supporting channels (10) can be made of two channels (18,22) with "U" cross section inserted one in the other and welded.

In this case welding (20) of the tubular elements (14) is performed from the inside.

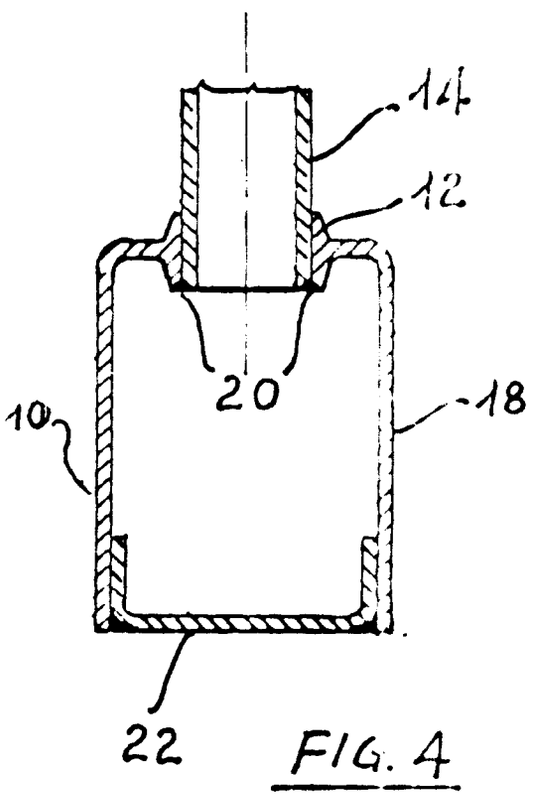

FIG. 4

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The present invention relates to a process for the manufacture of radiant panels and the like and the radiant panel thus obtained.

More specifically the present invention relates to a process for the manufacture of radiant panels and the like consisting of tubular elements placed near together and to the radiant panel with tubular elements placed near together thus obtained.

In the heating of rooms the use of either fixed or moving radiant elements consisting of a plurality of metallic tubes connected together in which circulates a hot fluid which transfers heat to the surrounding atmosphere is conventionally widespread. These radiant elements which act as heat exchangers are universally known under the term "radiators" and are generally made of cast iron or other materials such as for example steel and aluminium.

Among the many types of radiant elements employed in heating systems the so-called "radiant panels" consisting of a plurality of metallic tubes arranged parallel to each other and connected individually by welding at the opposing fronts of channels forming at the same time the support for said tubes and the inlet and outlet ducts for the hot fluid have been spreading.

Manufacture of said radiant panels is generally accomplished with ferrous material and involves many-parted and complex processing both in the preparatory phase of the various components and during assembly thereof. Indeed, manufacturing radiant panels generally consists of: first, preparation of the many pieces of tube and the peripheral section bars, generally of quadrangular cross section; appropriate drilling of the section bars to receive the ends of the tubes; fitting of the pieces of tube in the holes and welding of the tubes in this position to provide in the first place sealing and at the same time confer strength to the radiant panel.

Generally the welding operation is performed manually by means of welding alloy, e.g. of the Castolin type; this involves unavoidably high performance times, considering the fact that absolutely accurate welding to prevent any risk of fluid leaking from the panel is required.

To allow the operator to obtain a satisfactory result during welding, there is left between the tubes a considerable space so the welding alloy can be distributed in a manner to completely surround the tube. In this manner each tube is made integral with the supporting section bar and is assured of perfect sealing of the weld. The result is that the number of tubes making up the radiant panel for the unit of surface area is limited, to the detriment of heating efficiency.

This process for the manufacture of radiant panels involves in addition further drawbacks both functionally and aesthetically. In the first place welding has to be repeated several times because the welds are pressure tested with water and often show leaks. The repeated weldings performed in the same manner also affect the good appearance of the panel because they remain visible even after painting.

The object of the present invention is therefore to provide solutions for the above mentioned drawbacks.

More specifically the object of the present invention is to provide a fast, effective and automatic process for welding of the various tubes onto the supporting channels.

Another object of the present invention is to provide a welding process which would allow close arrangement, optionally in several rows, of the tubes on the supporting section bar so as to increase the heating efficiency of the radiant panels obtained.

In accordance with the present invention these and other objects are achieved by employing a welding process consisting of forming in the supporting channels the engagement seats for the tubular elements by hot flow drilling, simultaneously forming collars along the edge of said seats, inserting a tube in each seat, and constraining the tubes for welding by an automatic procedure.

Preferably the collar is obtained only in the portion of each seat which develops inside the section bar so as to create on the outer side thereof at the point of engagement of the tube an annular countersunk seat to receive the welding alloy.

The radiant panel obtained by said process is free of unsightly traces of welding which would detract from its good appearance.

Additional characteristics and advantages of the invention will become clear from the following description in which reference is made to the figures of the annexed drawings which show a preferred nonlimiting form of execution of the process of the present invention and in which:

FIG. 1 shows a schematic view of a cross section of the tube supporting section bar before hot flow drilling,

FIG. 2 shows a schematic view of said section bar of FIG. 1 subjected to hot flow drilling with the resulting creation of a pipe housing collar,

FIG. 3 shows a schematic view of the section bar with its collar in which a tube is inserted and constrained by braze welding,

FIG. 4 shows a schematic view of a constructive variant of the welding of a tube on the supporting section bar,

FIGS. 5, 6, 7 and 8 show schematic views of some examples of collar conformations obtainable on the supporting section bar with hot flow drilling, and

FIGS. 9 and 10 show schematic views of two examples of radiant panels obtainable by the process of the present invention.

With reference to FIGS. 1 to 3 there is shown a cross section of a common metallic section bar (10), in this case rectangular in form, whose thickness is preferably between 1,5 and 3 mm.

In accordance with the present invention the section bar (10) is subjected on one front to hot flow drilling which consists of centrifuging the material obtained with rapidly rotating drilling bits designed to develop a high local temperature. The increase in said temperature makes the material at the point of drilling plastic and leads to the formation of a hole with collar (12) with walls developed both outwardly and inwardly.

Said collar (12) therefore constitutes the gauged seat for accurate housing of a tubular element.

A tubular element (14) is then inserted through the collar (12) into the section bar (10) and is constrained thereto in a permanent manner.

Said coupling of the above mentioned components is achieved by braze welding, which can be done by an automatic procedure.

As known, said operation consists of adding material, in general silver alloy with deoxidizer, which is distributed uniformly in the interstices in the heated piece. Said heating can be achieved by medium and high frequency induction machines and localized at the points to be welded.

In this manner in particular it is advantageously possible to arrange the various tubular elements (14) quite close together, the distance between two contiguous tubes (14) being determined by the diameter of the collars (12).

As may be seen in particular in FIGS. 5, 6, 7 and 8 it is possible to achieve on said section bar (10) collars having a different configuration and/or extension on the basis of the form of the bits used. In the examples proposed in the above mentioned figures the collar substantially limits its own vertical development, i.e. inside the section bar (10).

The configuration illustrated in FIG. 6 concerning a preferred embodiment shows the possibility of obtaining a collar (12) developing inside the section bar and has an annular seat with countersink (16) in which the welding alloy is arranged appropriately and invisibly during the braze welding operation.

FIG. 4 shows schematically a variant of the process of welding the tubular element (14) on the corresponding section bar (10). Once the collar 12 is formed in accordance with one of the forms described above, the welding which constrains the tube (14) to the collar (12) is achieved inside the section bar (10).

To this end the section bar (10) is formed from a first channel (18) in such a manner that the portion of the channel opposite the multiple collars (12) is initially open.

The tubular elements (14) are therefore inserted in the mouths created by said collars (12) and are welded at the lower end (20). Subsequently the channel (18) is closed at the base, e.g. using TIG (tungsten inert gas) welding, by another channel (22) also having a "U" cross section in such a manner as to be restrained in the first channel (18).

All of the proposed examples illustrate the creation and types of collars (12) in which the tubular elements (14) are fitted and show how in accordance with the present invention the process of constraining by welding between tubular elements (14) and their respective supports or channels (10) can be optimized for the manufacture of radiant panels in particular.

To further ensure perfect sealing between the two components of the radiant panel, i.e. between the tubular elements (14) and the supporting channels (10) it is preferable to fabricate the collar (12) with a special conformation.

As shown in FIG. 7, which illustrates schematically its structure, the collar (12) can have a decidedly conical form so as to provide on the tubular element (14) inserted therein effective mechanical seal in addition to that resulting from the welding or braze welding operation.

FIGS. 9 and 10 illustrate by way of example some types of radiant panels achievable by the process described herein and provided with members (24) shown schematically for hooking to the wall.

As may be seen from FIGS. 9 and 10 the process of the present invention permits achieving panels which display characteristics of extreme accuracy at the points where the tubular elements (14) engage in the supporting channels (10).

Indeed, no unsightly and irregular traces of welding conventionally present on the known radiant panels are to be seen.

As may be seen from the foregoing the multiple advantages provided by the present invention are evident.

The collars appear uniform both in height and in form and filleted accurately to the tubular elements.

The process allows constraint of the various tubular elements (14) to their respective supporting channels (10) by an automatic procedure by braze welding which ensures excellent results in terms of effectiveness of the seal and speed of execution.

It is advantageously possible in this manner to considerably draw together the various tubular elements (14) optionally arranging them in two or more rows and thus increasing the heating effi-

ciency of the resulting panels.

The formation in accordance with a preferred form of execution of a collar which develops toward the inside of the supporting channel while creating an annular countersunk seat for the welding alloy further contributes to optimization of the braze welding operation.

The advantages of an aesthetic nature achievable by the adoption of the process of the present invention should not be ignored. The radiant panels achieved do not show unsightly outside welding traces.

While the invention has herein been illustrated by way of a detailed embodiment it will be appreciated that various substitutions of equivalents may be made without departing from the spirit and scope of the invention.

Claims

1. Manufacturing process for radiant panels and the like consisting of supporting channels (10) and a plurality of metallic tubes (14) arranged parallel to one another and individually connected by welding to opposing fronts of channels (10) and characterized in that it consists of:
- forming the engagement seats in the supporting channels (10) by hot flow drilling and simultaneous formation of collars (12),
- insertion of metallic tubes (14) in said collars (12), and
- constraining the tubes (14) to the channels (10) by welding or braze welding.

2. Process in accordance with claim 1 characterized in that the collars (12) extend partly outside and partly inside the channels (10).

3. Process in accordance with claims 1 and 2 characterized in that the collars (12) extend inside the channel (10) and create at the top at the mouth of the tubular element (14) an annular seat (16) having a countersink for the welding alloy.

4. Process in accordance with any of the above claims characterized in that the collars (12) achieved develop inside the channel (10) and are conical.

5. Process in accordance with any of the above claims characterized in that the supporting channel (10) consists of two channel portions (18,22) each having a U form and inserted one in the other and welded.

6. Process in accordance with claim 5 characterized in that the metallic tubes (14) are inserted in the collars (12) of a channel portion (18) and are welded from the inside (20) and subsequently the channel portion (18) is closed on the side opposite that fitted with the collar (12) by the other portion (22) of the channel.

7. Radiant panel comprising a plurality of tubes (14) arranged parallel to each other and welded to opposite fronts of channels (10) characterized in that the tubes (14) are housed in collars (12) made in the supporting channels (10), (18).

8. Radiant panel in accordance with claim 7 characterized in that the collars (12) develop toward the outside of the channels (10) and appear uniform in height and configuration and are filleted accurately to the tubes (14).

9. Radiant panel in accordance with one of the above claims 7 and 8 characterized in that the tubes (14) are quite close together, the distance between two adjacent tubes being the thickness of the collar (12).

10. Radiant panel in accordance with any of the above claims from 7 to 9 characterized in that the tubes (14) are arranged on supporting channels (10) in two or more parallel rows.

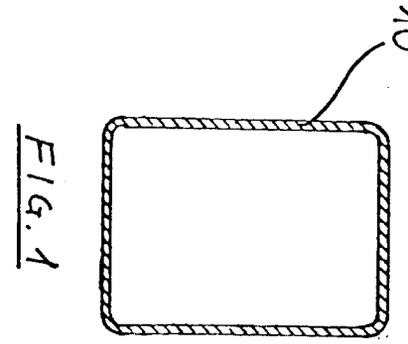

FIG. 1

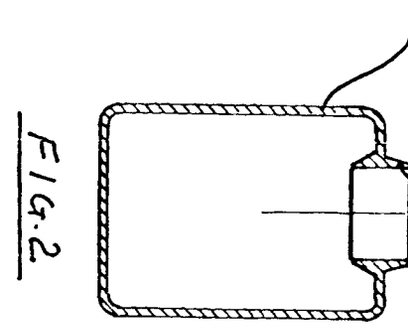

FIG. 2

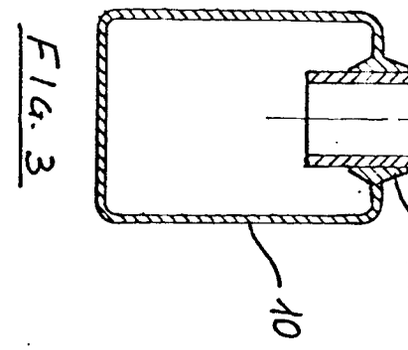

FIG. 3

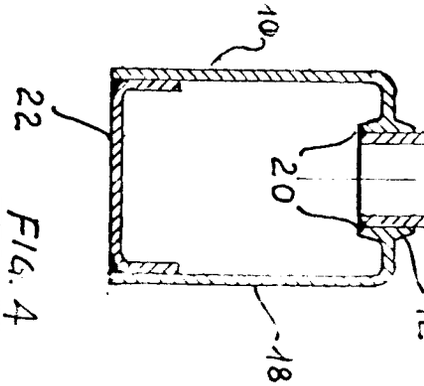

FIG. 4

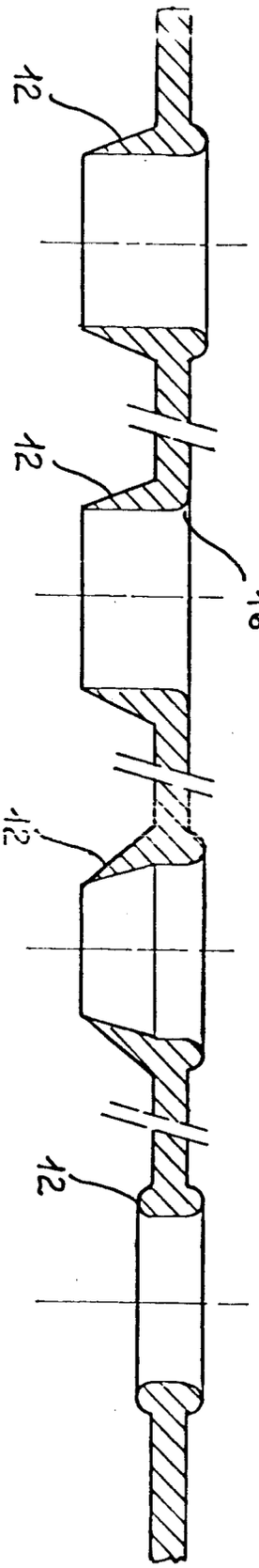

FIG. 5

FIG. 6

FIG. 7

FIG. 8

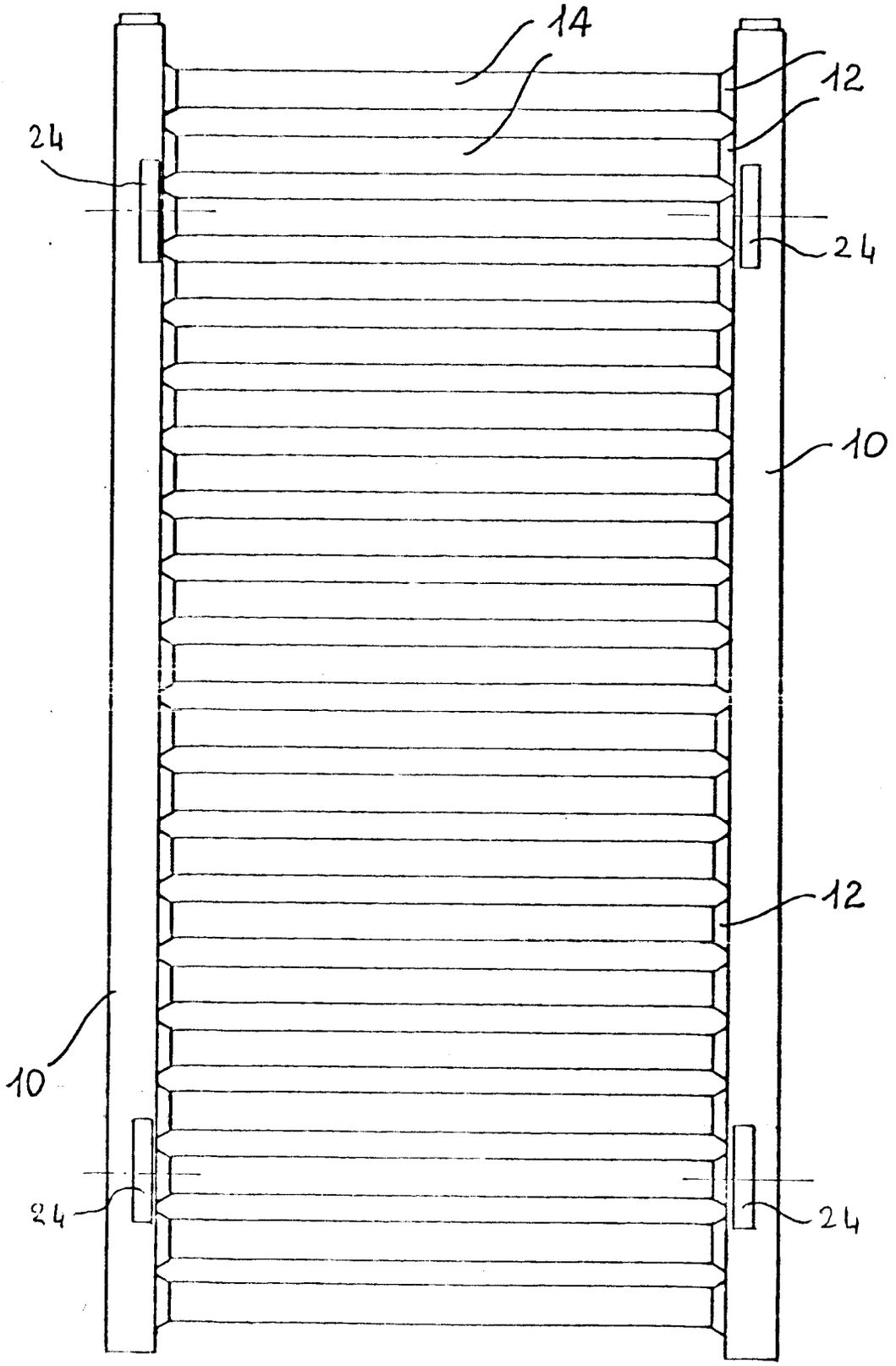

FIG. 9

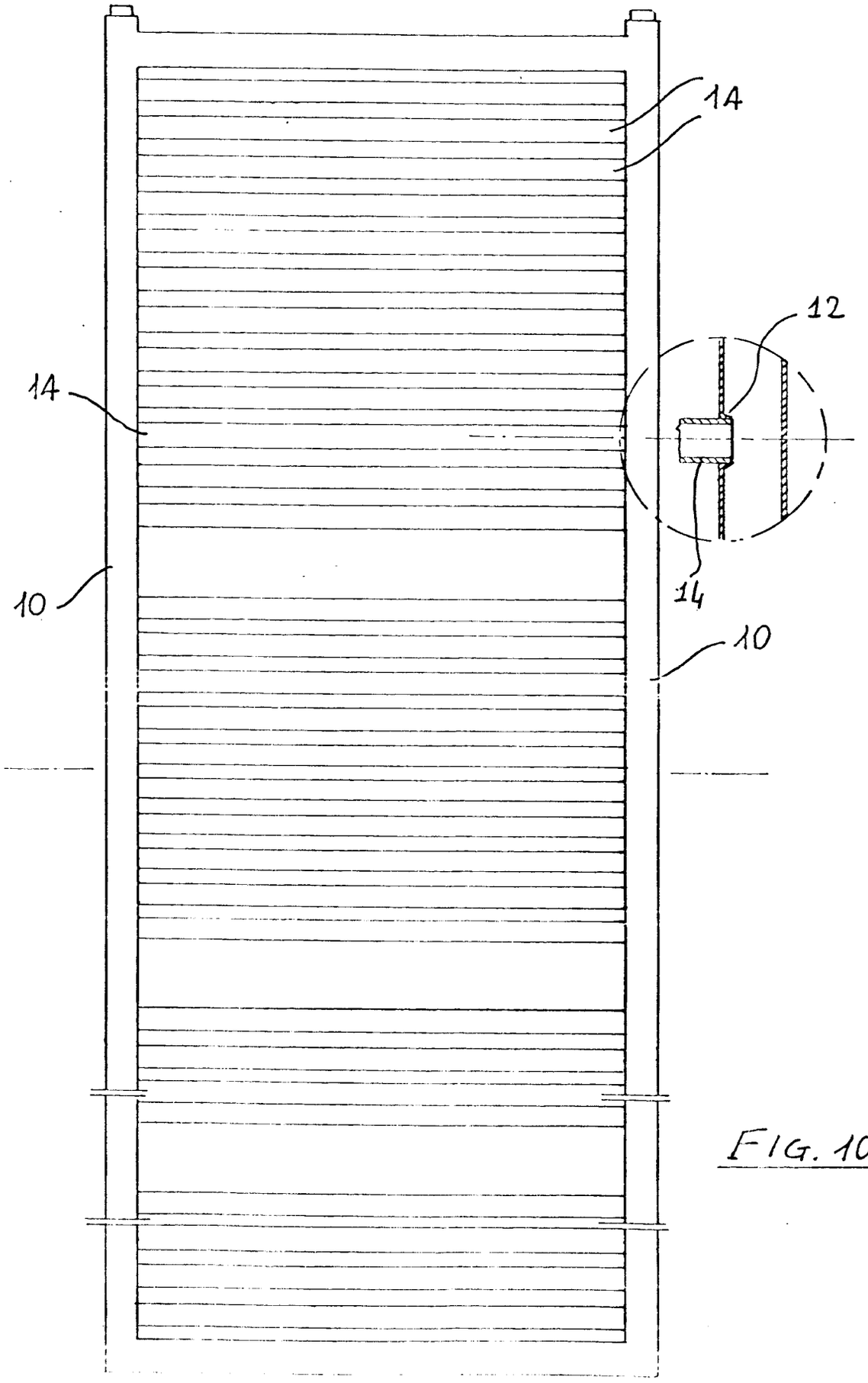

FIG. 10