A plate heat exchanger comprising several heat exchange plates disposed between two end plates in a heat exchanger frame, at least one of the end plates (1) having threaded connection ports (2). According to the invention each of said connection ports (2) is provided with a lining (3), which comprises a hollow cylindrical part (6) extending through the port (2) and a flange (4) abutting against the inside surface (5) of the end plate (1) facing the heat exchange plates, said cylindrical part (6) having an external thread in engagement with the thread of the connection port (2).
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Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

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Plate heat exchanger with threaded connection ports

The present invention relates to a plate heat exchanger comprising several heat exchange plates disposed between two end plates in a heat exchanger frame, at least one of the end plates having a threaded connection port. A previously known heat exchanger of this kind is disclosed for example in GB 1 009 178, where a connection pipe is screwed directly into each connection port from the outside surface of the relevant end plate.

End plates for heat exchangers of the above general kind are usually made of a material which is not resistant to corrosive media. Since use of a corrosion resistant material for the manufacture of end plates has been considered too expensive, development work has been concentrated on the provision of protective linings for the end plate connection ports where needed.

The current method of lining a connection port in a relatively small plate heat exchanger is to arrange a hollow cylinder with a flange in a non-threaded connection port such that the flange abuts against the inside surface of the end plate. The portion of the cylinder extending out of the outside surface of the end plate is then secured to the end plate either by being welded to the end plate along the circumference of the connection port or by being provided by rolling with a bulge located close to the outside surface of the end plate. The known linings are provided with a thread at the outer end portion of the hollow cylinder, which is intended to engage with a connection sleeve for connection with a threaded connection pipe.

The just described linings have never been intended for use in a plate heat exchanger of the initially defined kind, which has an end plate with threaded connection ports allowing the connection pipes to be screwed directly into the end plate. The
said known plate heat exchanger, obviously, is intended for use only in connection with non-corrosive heat exchanging media.

It is generally desirable to reduce the assortment of plate heat exchangers in a stock and, still, to have heat exchangers available for various applications. The object of the present invention is to provide a new design for plate heat exchangers which fulfills this desideratum in a way such that the end plates of the heat exchangers can be easily adaptable for use in connection with either corrosive or non-corrosive heat exchanging media.

This object is obtainable by means of a plate heat exchanger design of the initially defined kind, which is characterized mainly in that the connection port is provided with a lining, which comprises a hollow cylindrical part extending through the port and a flange abutting the inside surface of the end plate, facing the heat exchange plates, said cylindrical part having an external thread in engagement with the thread of the connection port.

By the present invention it is possible to keep a stock of relatively cheap end plates, which can be used directly in plate heat exchangers intended for non-corrosive media or which easily can be provided with linings for use in plate heat exchangers intended for corrosive media. Further, by the present invention it will be both easier and cheaper than it was previously to provide an end plate with a new lining.

The invention will be described in more detail with reference to the accompanying drawing, which shows a section through a connection port in an end plate of a plate heat exchanger according to the invention.

In the drawing there is shown an end plate, which either forms
a frame plate or a pressure plate of a plate heat exchanger.
A threaded connection port 2 extends through the end plate 1.
A lining is arranged in said port 2 and comprises a flange 4,
abutting against an inside surface 5 of the end plate 1 facing a
pack of heat exchange plates (not shown), and a hollow
cylindric part 6 extending through the port 2. The cylindrical
part 6 has an external thread allowing it to be screwed into
the threaded connection port 2.

A portion of the cylindrical part 6 of the lining 3 extends out
from the end plate 1 and is engaged by a connection sleeve 7,
which is provided with an internal thread. The connection sleeve
7 has been screwed onto the cylindrical part 6 to abutment
against an outside surface 8 of the end plate 1. The cylindrical
part 6 extends about half-way into the connection sleeve 7.

Said connection sleeve 7 also is in engagement with a connection
pipe 9, which has an external thread. The connection pipe 9
extends into the rest of the connection sleeve 7.

An important part of the invention resides in the feature that
essentially the whole of the cylindrical lining part 6 and the
connection port 2 are threaded. Thus it will be possible to
provide the required locking of the lining 3 relative to the
end plate 1 by means of the connection sleeve 7. The flange 4
may thus remain essentially unloaded and, thereby, be made of
a thin sheet material. This would not be possible if there were
no thread engagement between the lining and the end plate. A
corresponding flange would then by subjected to excessive
shearing forces.
Claims

1. Plate heat exchanger comprising several heat exchange plates disposed between two end plates in a heat exchanger frame, at least one (1) of the end plates having a threaded connection port (2), characterized in that the connection port (2) is provided with a lining (3), which comprises a hollow cylindrical part (6) extending through the port (2) and a flange (4) abutting the inside surface (5) of the end plate (1) facing said heat exchange plates, said cylindrical part (6) having an external thread in engagement with the thread of the connection port (2).

2. Plate heat exchanger according to claim 1, characterized in that the cylindrical part (6) of the lining (3) extends from the end plate (1) and is in engagement through its external thread with a connection sleeve (7) provided with an internal thread.

3. Plate heat exchanger according to claim 2, characterized in that the connection sleeve (7) abuts against the outside surface (8) of the end plate (1).

4. Plate heat exchanger according to claim 3, characterized in that the connection sleeve (7) is in engagement with a connection pipe (9) having an external thread.

5. Plate heat exchanger according to any of the claims 1-4, characterized in that the external thread of the cylindrical part (6) extends over essentially its whole length.
INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) 4

According to International Patent Classification (IPC) or to both National Classification and IPC

F 28 F 9/10

II. FIELDS SEARCHED

Minimum Documentation Searched 7

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Documentation Searched other than Minimum Documentation to the extent that such documents are included in the Fields Searched 9

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT 10

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* Special categories of cited documents: 19

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search 1987-10-08

Date of Mailing of this International Search Report 1987 -10- 12

International Searching Authority Swedish Patent Office

Signature of Authorized Officer Anette Riedel

L.E.
FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II. Fields Searched (cont).

| US Cl | 165: 166, 167; | 122: 511; | 285: 192, 201-206, 208 |

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. Claim numbers .........., because they relate to subject matter not required to be searched by this Authority, namely:

2. Claim numbers .........., because they relate to parts of the International application that do not comply with the prescribed requirements to such an extent that no meaningful International search can be carried out, specifically:

3. Claim numbers .........., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This International Searching Authority found multiple inventions in this International application as follows:

1. As all required additional search fees were timely paid by the applicant, this International search report covers all searchable claims of the international application.

2. As only some of the required additional search fees were timely paid by the applicant, this International search report covers only those claims of the international application for which fees were paid, specifically claims:

3. No required additional search fees were timely paid by the applicant. Consequently, this International search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- The additional search fees were accompanied by applicant's protest.
- No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (supplemental sheet (2)) (January 1985)