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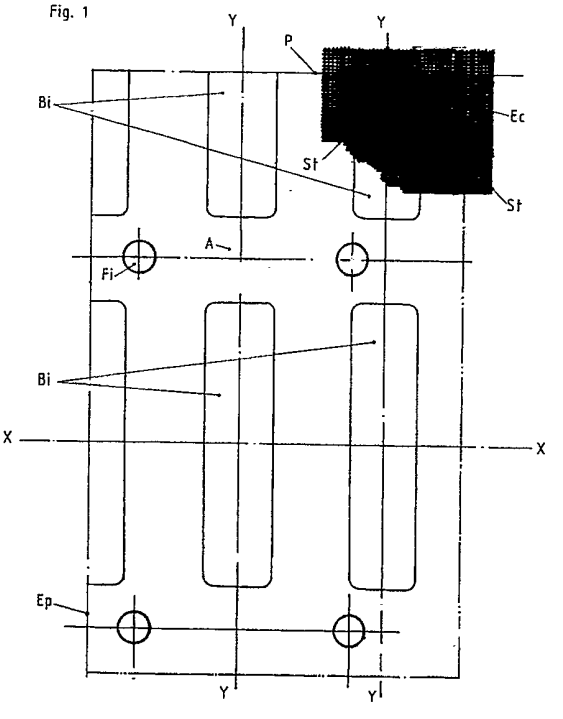
(54) System for the distribution of gas in catalytic beds and for the support with minimum dimensions of the catalyst in reactors for heterogeneous synthesis.

(57) System for the production of minimum dimension walls for the optimal distribution of gas and to support the catalyst in catalytic beds in radial or axial-radial reactors consisting: a) of a single element (EP) with portions (A) permeable to gas capable of ensuring the necessary pressure drop, and portions (Bi) acting as mechanical support for the catalyst impermeable to gas; b) of an element (EC) containing the catalyst permeable to gas in direct contact with it and the portions of a) acting as mechanical support.

Fig. 1



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This invention concerns a system for the production of minimum dimensions walls for the optimal distribution of gas and to support the catalyst in catalytic beds in radial or axial-radial reactors.

The importance of achieving the even distribution of gas throughout the catalyst in the above-mentioned reactors for heterogeneous synthesis with fixed beds, as for example the synthesis of ammonia, methanol or other products is well known.

Moreover, the walls for the distribution of gas and for containing the catalyst in the catalytic beds must ensure, besides the correct distribution of the gas (even distribution along the entire height of the bed, minimum impact of the gas with the catalyst to avoid channelling and damaging the catalyst), the necessary mechanical support of the catalytic beds.

The thermic and mechanical stress undergone by the walls, owing to settling by the catalyst and heat dilation resulting from the high temperatures used, is, in effect, considerable.

Consequently, the function as mechanical support, besides the even distribution of the gas, is important if the system is to function correctly.

The optimal mechanical sizing of the various elements which go to form the wall supporting the catalytic beds, which at the same time must ensure the optimal distribution of the gas, represents therefore a critical aspect of the problem.

Another critical aspect is the possibility of producing said walls with minimum dimensions or radial thickness in order to ensure the maximum available volume for the catalytic beds (maximum volume of the catalytic beds) with the minimum volume of the expensive containers, operating at high pressure.

For this purpose, said walls usually consist of several elements which have different functions.

As already described by the Applicants in European Patent No. 0265654 and in a recent patent application not yet open to public inspection, the walls containing the catalyst may consist of three elements:

a) a thin element permeable to gas (for example perforated wall) whose sole function is to effect the pressure drop necessary to ensure the even distribution of gas along the entire height of the bed;

b) an element to contain the catalyst (net, for example), making no contribution to the mechanical support of the catalytic bed and having a low pressure drop;

c) a thick intermediate element situated between element a) and element b), whose function is to support mechanically the catalytic bed and to create an airspace for the better distribution of gas, said element consisting for example of a wall with "bridge" perforations.

The above airspace must perform the following tasks:

- avoid the direct impact with the catalyst of the high-speed gas coming from element a) which effects the pressure drop;
- equalize the gas flow feeding the catalytic bed through the entire height of the bed itself.

The solution put forward by the Applicants with a system consisting of three elements a), b) and c) has proved extremely efficient providing at the same time and in an optimal way the solution to the problems of gas distribution, of a reliable mechanical support for the catalyst in the catalytic beds, and of maximum use of the available volume of the containers for the catalyst-carrying cartridges, thus overcoming the limitations and drawbacks found in the state of the art, for example in British Patents No. 1118750 and No. 1352550.

In certain cases, however, the above system can prove, besides being expensive, to be rather complex and laborious from the constructional point of view.

Continuing their research, the Applicants, not without surprise, have managed to achieve the object of providing a system offering and improving the operating advantages of the three-element wall, but free of the drawbacks accompanying it.

This and other objects which will better appear from the description which follows, are achieved with a system according to the invention described in the introduction and in claim 1, characterized by the fact that it consists of: a) a single element with portions permeable to gas capable of ensuring the necessary pressure drop, and portions acting as mechanical support for the catalyst permeable to gas; b) an element containing the catalyst permeable to the gas in direct contact with it and the portions of a) acting as mechanical support.

According to a particularly simple and advantageous embodiment, the single element a) is formed by contiguous embossed portions impermeable to gas acting as mechanical support and perforated portions permeable to gas capable of ensuring the necessary pressure drop, said perforations being situated between the above-mentioned contiguous embossings and element b) containing the catalyst being directly supported by the embossed portions of a). The desired result is thus achieved by resting element b) containing the catalyst on the embossed parts of element a) forming an airspace corresponding to the unembossed portions of same which are the portions through which flows the gas which has undergone the desired pressure drop by running through the perforations of said portions.

Said airspace avoids direct impact on the catalyst of the high-speed gas coming from the per-

forations and equalizes the gas flow feeding the catalytic bed along the entire height of the catalytic bed. Fundamental characteristics already described by the Applicants in the system with a three-element wall.

Besides, by so acting, several advantages are obtained, among which we shall just mention that, since the wall consists of just two elements, a greater use is made of the available volume of the containers for the catalyst-holding cartridges (smaller dimension of walls) and the structure of the synthesis reactor is made considerably lighter.

The various aspects and advantages of the invention will be better understood from the detailed description of an example of embodiment given below with reference to the non-limitative drawings attached in which:

- figure 1 is the partial and schematic front cross-section of a portion of the two-element wall, according to the invention;
- figure 2 is a partial and schematic longitudinal cross-section with axial planes of a portion of the two-element wall, according to the invention;
- figure 3 is a partial and schematic cross-section of a portion of the two-element wall according to the invention.

More particularly, figure 1 shows a wall P consisting of at least an element permeable to gas Ep which creates the pressure drop and of an element supporting the catalyst Ec. The element permeable to gas Ep has in turn embossed areas Bi impermeable to gas and the unembossed area A permeable to gas through perforations Fi.

The element Ec rests on element Ep where the embossed areas Bi are found along longitudinal axes y-y as shown in figure 2.

In this way correspondingly to unembossed area A between Ep and Ec, airspaces Ii are created permitting gas G which has run through perforations Fi of said element Ep to expand before penetrating into catalyst C.

Figure 3 shows a cross-section of the wall according to the system claimed, in which references used in figures 1 and 2 are used, which obviously maintain the same significance.

Clearly, in figure 1 line St represents a cross-section of the surface of wall P so as to show only partially, also in frontal view, the net supporting catalyst Ec.

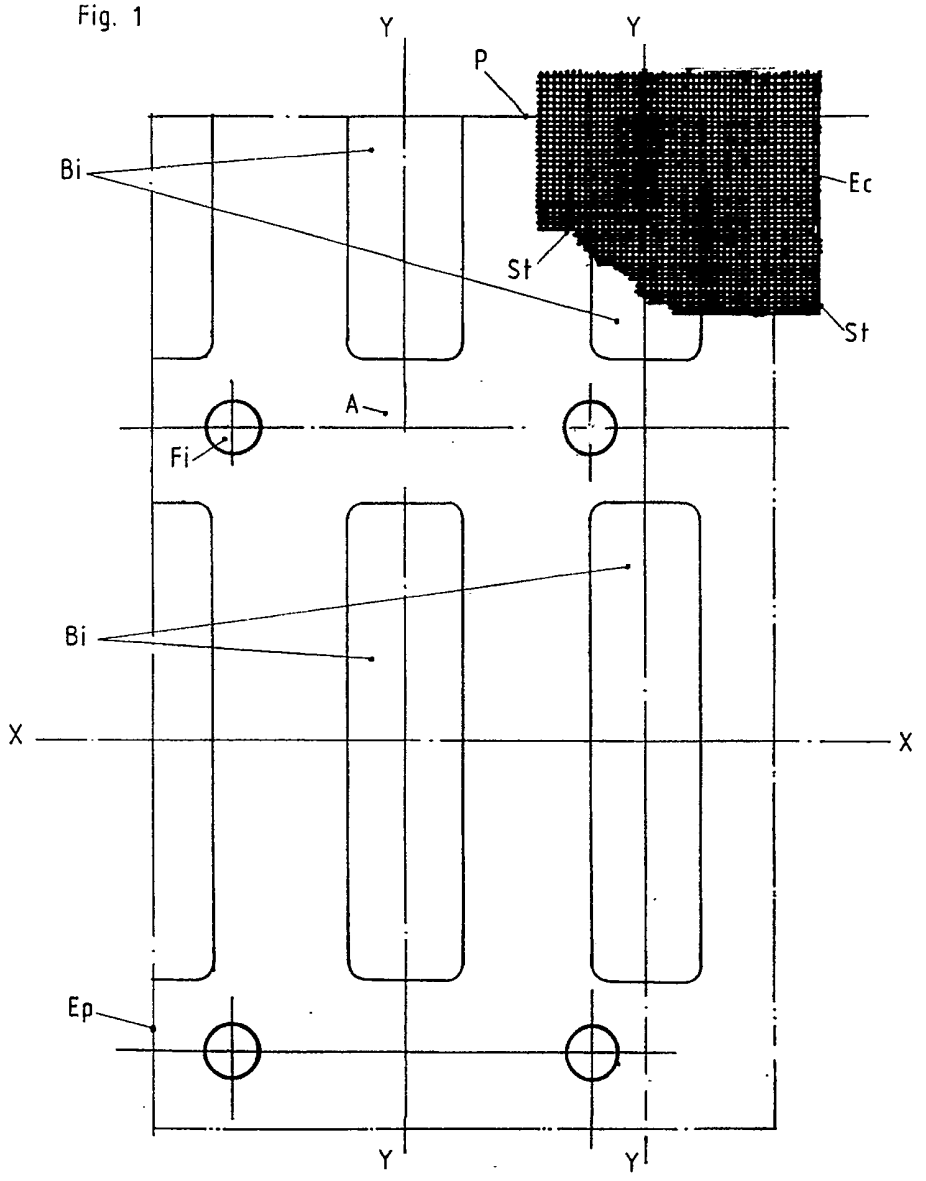
Claims

1. System for the production of minimum dimension walls for the optimal distribution of gas and to support the catalyst in catalytic beds in radial or axial-radial reactors, characterized by the fact that it consists of: a) a single element with portions permeable by gas capable of ensuring the necessary pressure drop, and portions acting as mechanical support for the catalyst impermeable to gas; b) an element containing the catalyst permeable by the gas in direct contact with it and with the portions of a) acting as mechanical support.

2. System according to claim 1, characterized by the fact that the single element a) is formed by embossed contiguous portions impermeable to gas acting as mechanical support and perforated portions permeable to gas capable of ensuring the necessary pressure drop, said perforations being situated between said contiguous embossings and element b) containing the catalyst being supported directly by the embossed portions of a).

3. System according to claim 2, characterized by the fact that element b) containing the catalyst and resting on the embossed parts of element a) forms an airspace corresponding with the unembossed portions of the same which are the portions through which the gas flows having undergone the desired pressure drop by flowing through the perforations of said portions.

Fig. 1



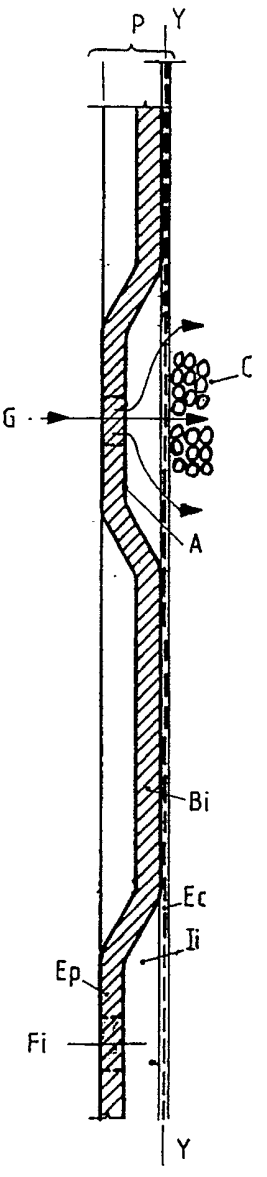
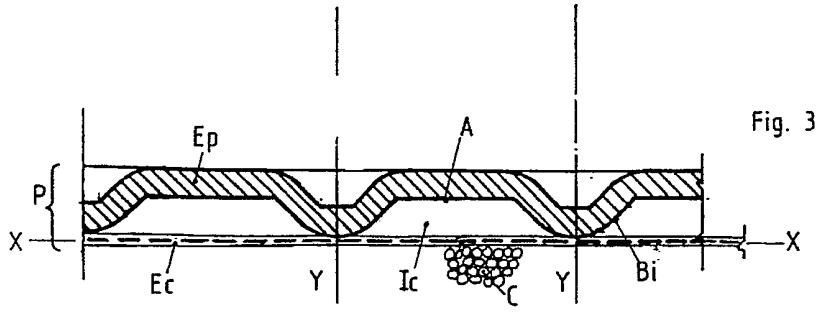


Fig. 2

Fig. 3



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EUROPEAN SEARCH REPORT

Application Number

EP 91 10 1255

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
P,Y	EP-A-0 365 929 (AMMONIA CASALE) * Abstract; column 2, line 46 - column 3, line 10; column 2, line 46 - column 4, line 9; claims 1,3; figure 1B *	1-3	B 01 J 8/02 B 01 J 8/04 // C 01 C 1/04 C 07 C 29/15
P,Y	EP-A-0 364 664 (UHDE) * Abstract; column 3, lines 7-23; column 3, line 56 - column 4, line 14; figures 1,5 *	1-3	
A	EP-A-0 332 757 (AMMONIA CASAEL) * Abstract; column 9, lines 3-7; figures 6,9 *	1	
A	US-A-2 835 560 (M.M. BASON et al.) * Column 1, lines 43-68; column 3, lines 61-66; figure 6 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 01 J
C 01 C

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	21 May 91	STEVNSBORG N.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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