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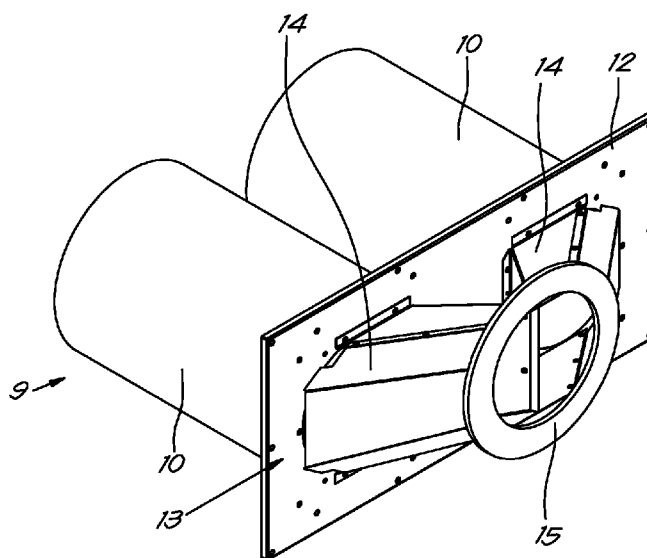


Fig. 2A

(57) Abstract: A turbocompressor, which turbocompressor (1) is provided with a turbocompressor element (2) having a housing (4) in which an impeller is arranged, the housing (4) being provided with an inlet (5) for gas to be compressed and an outlet for compressed gas, the turbocompressor (1) being further provided with an inlet filter (9) comprising a number of cylindrical filter cartridges (10), each having a circular outlet opening (11), characterized in that an inlet element (13) is provided between the inlet filter (9) and the inlet (5) of the housing (4), which inlet element is provided with straight channels (14), each of which extends from one of the aforementioned circular outlet openings (11) to the inlet (5) of the housing (4), the channels (14) extending from the circular outlet openings (11) towards each other to form a joint flow-through opening (15), said joint flow-through opening (15) being connected to the inlet (5).



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TURBOCOMPRESSOR.

The present invention relates to a turbocompressor.

- 5 It is known that turbocompressors comprise a housing having an impeller arranged therein, whereby gas, for example ambient air, is sucked in via an inlet in the housing, which gas is compressed by the impeller, after which the compressed gas exits the turbocompressor via an outlet in the housing.
- 10 Traditionally, an inlet filter is connected to the inlet to clean the gas before it enters the turbocompressor.

Inlet filters are known in the form of flat panel filters.

- 15 Also known is an inlet filter having a number of cylindrical cartridges that are arranged in a grid on a plate or the like, the longitudinal axes of the cartridges extending parallel to each other. In this case, the cartridges are often arranged with their outlet on the plate or the like.
- 20 The outlet of the inlet filter, which is a combination of the various individually circular outlets of the various cartridges, is further routed to the inlet of the turbocompressor, which is typically circular.

- The transition from the outlet of the inlet filter to the inlet of the
25 turbocompressor is implemented in a variety of ways.

- The shape of the aforementioned plate comprising the various circular outlets of the various cartridges is often connected to the inlet of the turbocompressor by means of a funnel-shaped element.
- 30

A disadvantage of such a solution is that turbulences are created in the funnel-shaped element at the location of the sharp edge, where a sudden expansion

is created by arranging a plurality of cylindrical cartridges on the aforementioned plate, along which the gas flow must pass.

The disadvantage of this is that the flow to the inlet is disturbed.

5

A pressure sensor is located at this inlet and is used together with a pressure sensor located near the outlet of the turbocompressor to determine the differential pressure across the impeller. The differential pressure is a measure of the flow rate of the turbocompressor.

10

Due to the disturbed flow, pressure fluctuations or noise are observed in this differential pressure measurement.

15

In other words, correct measurement of the differential pressure is no longer possible.

Especially at high flow rates, there is a lot of noise in this differential pressure measurement.

20 This invention aims at solving at least one of the aforementioned and other disadvantages.

The present invention relates to a turbocompressor, which turbocompressor is provided with a turbocompressor element having a housing in which an
25 impeller is arranged, the housing being provided with an inlet for gas to be compressed and an outlet for compressed gas, the turbocompressor being further provided with an inlet filter comprising a number of cylindrical filter cartridges, each having a circular outlet opening, an inlet element being provided between the inlet filter and the inlet of the housing, which inlet
30 element is provided with straight channels, each of which extends from one of the aforementioned circular outlet openings to the inlet of the housing, the channels extending from the circular outlet openings towards each other to

form a joint flow-through opening, said joint flow-through opening being connected to the inlet.

5 In the inlet element, the aforementioned straight channels extend at an angle with the filter cartridges. In other words, the longitudinal axis of the filter cartridges extends at an angle to the longitudinal axis of the respective channel.

10 An advantage is that by using the aforementioned inlet piece, the filtered air flows from the filter cartridges are guided with little or no turbulence to the inlet of the housing.

15 This optimized flow through this air guide system avoids the aforementioned pressure fluctuations in the differential pressure measurement.

This makes the differential pressure measurement stable and reliable.

20 In addition, the improvement in the flow is accompanied by an improvement in the efficiency of the turbocompressor.

Another positive effect that can be achieved by an inlet element according to the invention is that less instability occurs in the rotation of the impeller, thus drastically reducing the radial forces in the radial bearings.

25 Another advantage of the inlet element is that the acoustic properties of the inlet element change with respect to the inlet and the inlet filter, eliminating resonance.

30 Another effect of the inlet element is that the air supply to the inlet is divided into and delineated by the various channels, so that instability can have only a limited effect on the gas supply.

It is also known that the rotation of the impeller can also affect the airflow upstream. Because the inlet element divides the air flow, the impact thereof can be reduced.

- 5 According to a preferred feature of the invention, the inlet element is made of steel plates.

By folding steel sheets to form the straight channels, the inlet element can be made very easily and inexpensively.

10

This is a much simpler and less expensive option than, for example, making a casting.

- 15 By placing the inlet element itself in an airtight funnel, there is no need for the element to be airtight, further reducing production costs.

For such an embodiment, the cross section of the channels is preferably polygonal.

- 20 According to a preferred feature, the surface area of the cross section of the channels is constant or varies by no more than 10% along the length of the respective channel.

- 25 The constant or nearly constant flow-through opening ensures that there is little or no additional turbulence.

- To better demonstrate the features of the invention, the following describes, as an example without any restrictive character, a preferred embodiment of an turbocompressor according to the invention, with reference to the accompanying drawings, wherein:
- 30

Figure 1 is a schematic representation, in perspective, of a turbocompressor according to the invention;

Figures 2A and 2B are a schematic representation, in perspective, of an inlet element according to the invention;

Figures 3A and 3B are a schematic representation, in perspective, of an alternative embodiment of an inlet element according to the invention.

5

The turbocompressor 1 shown in Figure 1 comprises a turbocompressor element 2 and a drive 3.

10 In this case, but not necessarily, the turbocompressor 1 is a directly driven turbocompressor 1.

The turbocompressor element 2 has a housing 4 in which an impeller is arranged, the housing 4 being provided with an inlet 5 for gas to be compressed and an outlet for compressed gas to which an exhaust pipe 6 is
15 connected.

In this case, the turbocompressor 1 is also provided with the necessary electronics 7 and cooling 8.

20 According to the invention, the turbocompressor 1 is also provided with an inlet filter 9.

This inlet filter 9 is provided with a number of cylindrical filter cartridges 10.

25 In Figures 2A and 2B, the inlet filter 9 is shown in more detail.

As can be seen in this figure, the inlet filter 9 in this case comprises two cylindrical filter cartridges 10.

30 Each filter cartridge 10 has a circular outlet opening 11. The clean air exists the filter cartridge 10 via this circular outlet opening 11.

In this case, but not necessarily so for the invention, the filter cartridges 10 are arranged on a flat plate 12.

5 In Figures 2A and 2B, they are arranged on the flat plate 12 with their outlet opening 11. The flat plate 12 is therefore also provided with openings or passages.

The longitudinal axis X-X' of the filter cartridges 10 extends perpendicularly or substantially perpendicularly to the flat plate 12.

10

According to the invention, an inlet element 13 is provided between the inlet filter 9 and the inlet 5 of the housing 4.

15 In Figures 2A and 2B, this inlet element 13 is shown in more detail.

15

It is provided with a number of straight channels 14, in this case two, just as many as the number of filter cartridges 10 of the inlet filter 9.

20 The channels 14 extend from the circular outlet openings 11 to the inlet 5 of the housing 4.

The channels 14 extend from the circular outlet openings 11 towards each other to form a joint flow-through opening 15.

25 This means that the longitudinal axes Y-Y' of the channels 14 extend towards each other, and thus do not extend parallel to each other.

The flow-through opening 15 is in turn connected to the inlet 5.

30 For this purpose, in this embodiment, the shape of the flow-through opening 15 corresponds to the shape of the inlet 5 of the housing 4.

As can be seen in Figures 2A and 2B, the inlet element 13 is in this case made of steel plates.

5 The straight channels 14 are formed by folding steel sheets, thus forming straight channels 14 with polygonal cross sections.

In this case, the cross section is hexagonal. Note that this does not have to be a regular hexagon.

10 In addition, the surface area of the cross section is not constant in this case but varies by 10% along the longitudinal axis Y-Y' of the channel 14.

In particular, the cross section decreases by 10% in the direction of the inlet 5 of the housing 4.

15

The operation of the turbocompressor 1 is very simple and as follows.

The aspirated gas to be compressed is cleaned as it passes through the inlet filter 9, the cleaned gas exiting the inlet filter 9 via the circular outlet openings
20 11.

The cleaned gas ends up in the channels 14, the gas from each filter cartridge 10 ending up in the corresponding channel 14.

25 From there, the two separate air flows are directed to the joint flow-through opening 15.

Due to the specific design of the inlet element 13, no turbulences are generated here.
30

From the flow-through opening 15, the gas ends up in the inlet 5 and then in the turbocompressor element 2, where it is compressed in the known manner and exits the turbocompressor 1 via the exhaust pipe 6.

5 Figures 3A and 3B show a variant of the inlet element 13 according to Figures 2A and 2B, in this case the inlet element 13 comprising four straight channels 14 and the inlet element 9 thus likewise comprising four cylindrical filter cartridges 10.

10 In this case, the straight channels 14 also join to form the joint flow-through opening 15.

In this case, the channels 14 have a constant cross section.

15 Otherwise, this embodiment and its operation are the same as in the embodiment from Figures 2A and 2B.

The current invention is by no means limited to the embodiments described as examples and shown in the figures, but a turbocompressor according to the
20 invention can be implemented in all shapes and sizes without going beyond the scope of the invention.

Claims.

- 1.- A turbocompressor, which turbocompressor (1) is provided with a turbocompressor element (2) having a housing (4) in which an impeller is arranged, the housing (4) being provided with an inlet (5) for gas to be compressed and an outlet for compressed gas, the turbocompressor (1) being further provided with an inlet filter (9) comprising a number of cylindrical filter cartridges (10), each having a circular outlet opening (11), **characterized in that** an inlet element (13) is provided between the inlet filter (9) and the inlet (5) of the housing (4), which inlet element is provided with straight channels (14), each of which extends from one of the aforementioned circular outlet openings (11) to the inlet (5) of the housing (4), the channels (14) extending from the circular outlet openings (11) towards each other to form a joint flow-through opening (15), said joint flow-through opening (15) being connected to the inlet (5).
- 2.- The turbocompressor according to claim 1, characterized in that the inlet element (13) is made of steel plates.
- 3.- The turbocompressor according to claim 1 or 2, characterized in that a cross section of the channels (14) is polygonal.
- 4.- The turbocompressor according to any of the preceding claims, characterized in that a surface area of a cross section of the channels (14) is constant or varies by no more than 10% along the longitudinal axis of the respective channel (14).
- 5.- The turbocompressor according to any of the preceding claims, characterized in that the turbocompressor (1) is a directly driven turbocompressor (1).

6.- The turbocompressor according to any of the preceding claims, characterized in that the filter cartridges (10) are arranged on a flat plate (12), their longitudinal axis extending perpendicularly or substantially perpendicularly to the flat plate (12).

5

7.- The turbocompressor according to any of the preceding claims, characterized in that a shape of the flow-through opening (15) corresponds to a shape of the inlet (5) of the housing (4).

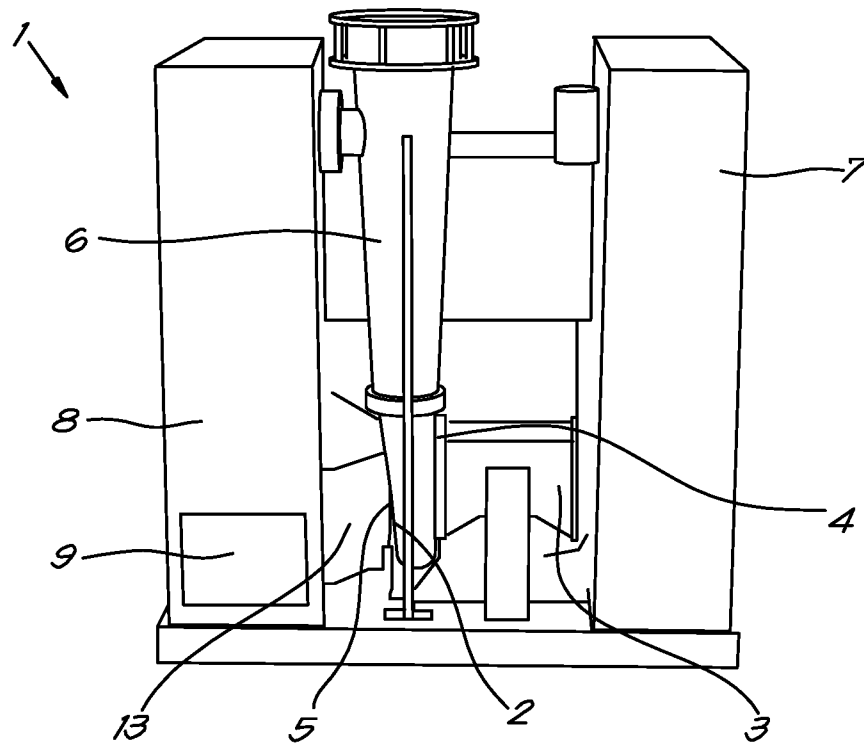


Fig. 1

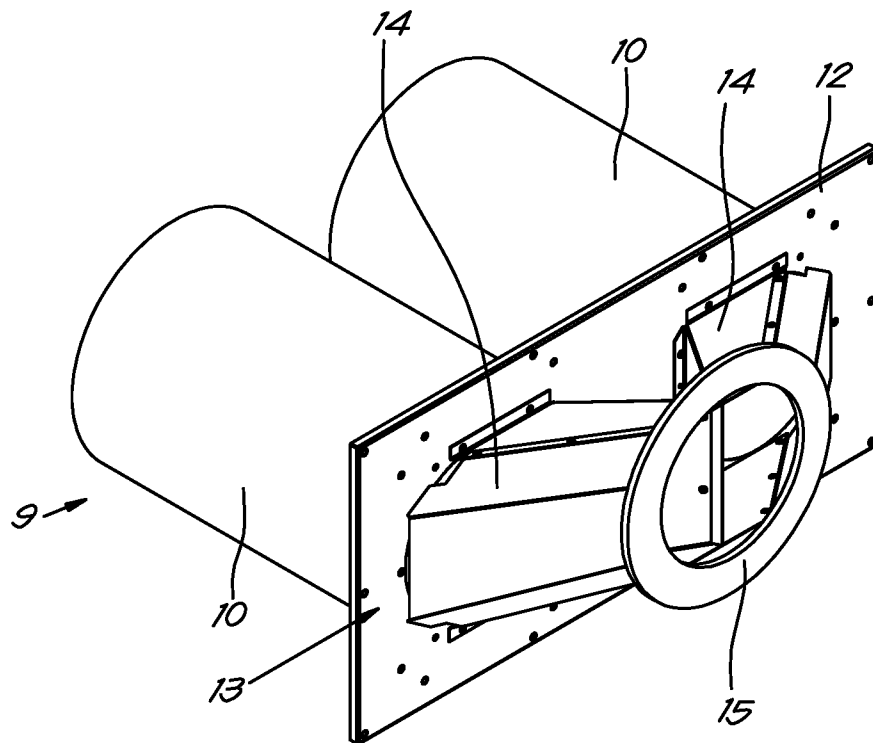


Fig. 2A

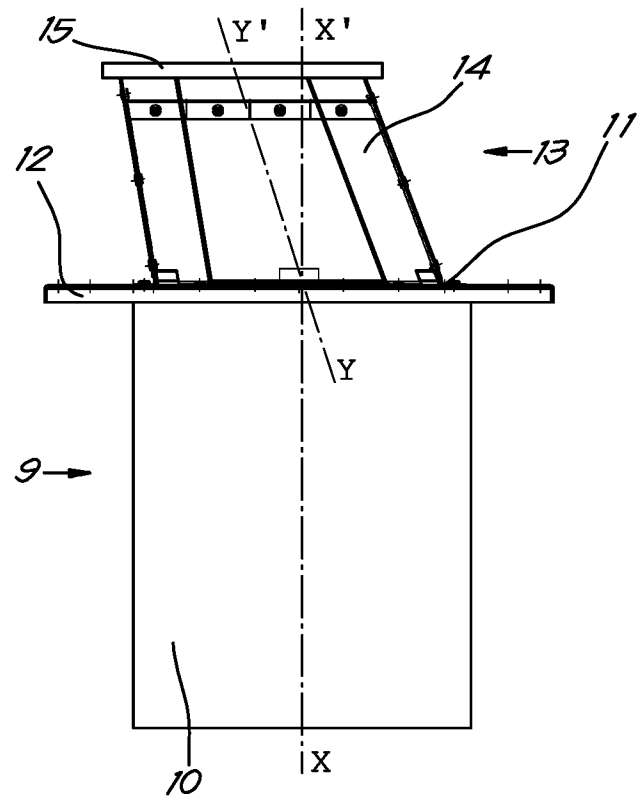


Fig. 2B

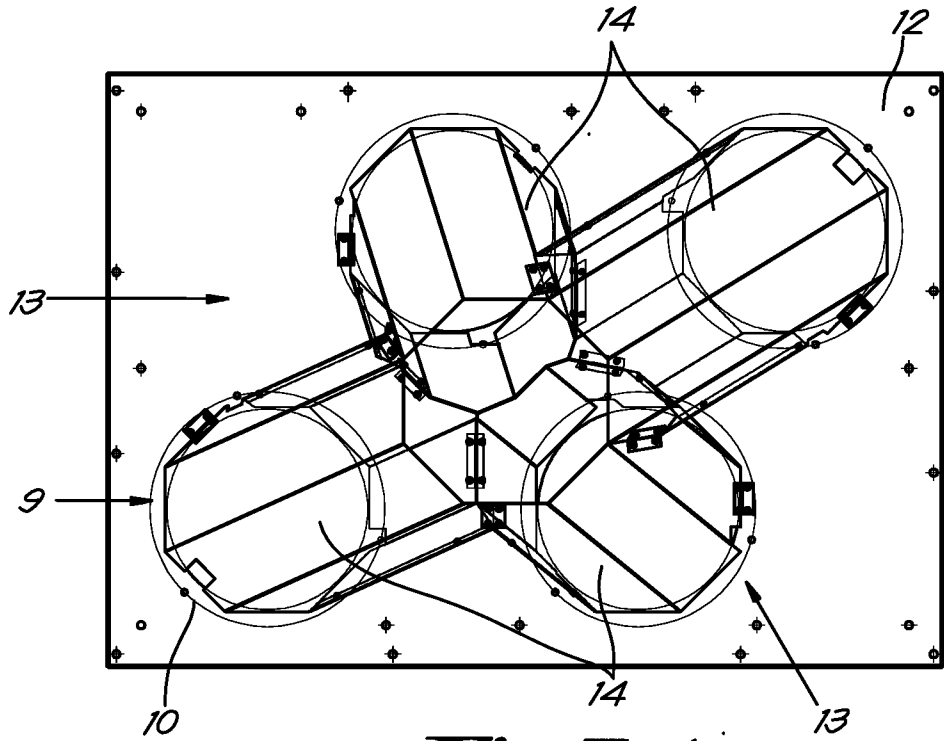


Fig. 3A

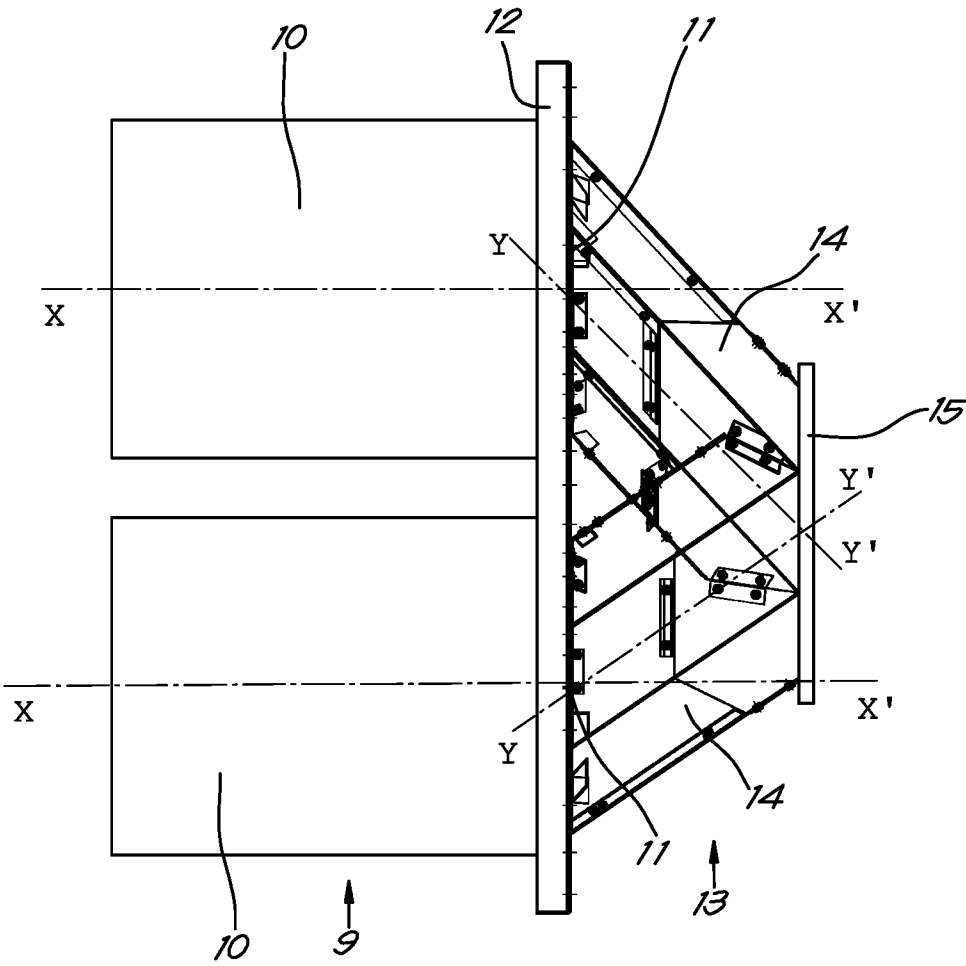


Fig.3B

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER INV. F02B37/02 F02M35/02 F02M35/10 F02B37/00 F02M35/04 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) F02B F02M		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010/050865 A1 (JOHNSON ERIK SCOTT [US] ET AL) 4 March 2010 (2010-03-04) abstract; figures -----	1-7
Y	WO 2018/011856 A1 (KOMATSU MFG CO LTD [JP]) 18 January 2018 (2018-01-18) abstract; figures -----	1-7
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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Date of the actual completion of the international search 12 September 2023		Date of mailing of the international search report 22/09/2023
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Godrie, Pierre

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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