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(54) DEVICE FOR OPTIMIZING THE TRANSMISSION OF HEAT IN A PIPE FOR CONVEYING EXHAUST GASES IN A HEAT EXCHANGE APPARATUS

VORRICHTUNG ZUR OPTIMIERUNG DER ÜBERTRAGUNG VON WÄRME IN EINEM ROHR FÜR
DEN TRANSPORT VON ABGASEN IN EINER WÄRMETAUSCHERVORRICHTUNG

DISPOSITIF PERMETTANT D'OPTIMISER LA TRANSMISSION DE CHALEUR DANS UN TUYAU
POUR TRANSPORTER DES GAZ D'ÉCHAPPEMENT DANS UN APPAREIL D'ÉCHANGE
THERMIQUE

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(73) Proprietor: **Unical AG S.p.A.**
46033 Castel D'ario (IT)

(72) Inventors:
• **IORI, Valentino**
I-46100 Mantova (IT)
• **DE SANTI, Giuseppe**
I-46032 Castelforte (IT)

(74) Representative: **Modiano, Micaela Nadia et al**
Modiano & Partners
Via Meravigli, 16
20123 Milano (IT)

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Description

Technical Field

[0001] The invention relates to a pipe comprising a device for optimizing the transmission of heat therein according to the preamble of claim 1. Such combinations pipe-devices are known from US 3,394,736.

Background art

[0002] Heat exchange apparatuses are known, such as for example fire tube boilers for producing hot water or other heat transfer fluids, which provide for the presence of pipes intended to convey exhaust gases produced by combustion in adapted furnaces, which are inserted within a vessel that contains the fluid to be heated.

[0003] However, pipes of this type are not typical exclusively of boilers, but can also be present in different apparatuses of industrial cycles.

[0004] From the point of view of heat transmission, conventional pipes are not entirely satisfactory, even if they are provided with internally inserted elements intended to make the transmission particularly efficient.

Disclosure of the invention

[0005] The aim of the present invention is to provide a device that can optimize effectively the characteristics of heat transmission between the exhaust gases conveyed by the pipes and the fluid that flows on the outside of the pipes.

[0006] This aim, as well as other objects that will become better apparent hereinafter, are achieved by a pipe according to claim 1.

Brief description of the drawings

[0007] Further characteristics and advantages of the invention will become better apparent from the description of preferred but not exclusive embodiments of the invention, illustrated by way of non limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a device not corresponding to the invention;

Figure 2 is a sectional view, taken along line II-II of Figure 1;

Figures 3 to 6 represent embodiments not corresponding to the invention;

Figures 7, 9 are perspective views of variations of the device according to the invention;

Figures 8, 10 are sectional views, taken respectively along lines VIII-VIII, X-X of Figures 7, 9 respectively.

Ways of carrying out the invention

[0008] With reference to Figures 1 and 2, the numeral

1 generally designates the device according to the invention, inserted in a pipe 2 designed to convey inside it a stream of exhaust gases and to be lapped externally by the fluid to be heated.

[0009] The device 1 comprises, in a single piece assembly, a plurality of longitudinal fins 3, which extend in a substantially radial direction from a central core 4 and come into contact with the inner surface of the pipe 2.

[0010] More precisely, the individual fins 3 have a slight curvature, which enhances their elasticity characteristics both during the insertion of the device in the pipe and during operation. Such fins further have an end 3a which is widened so as to define a foot for contact with the inner surface of the pipe.

[0011] The presence of the device according to the invention gives great effectiveness to the transmission of heat between the exhaust gases conveyed by the pipe 2 and the fluid that laps the pipe externally, because the fins 3 convey, by conduction, to the pipe wall the heat captured at the central portion of the pipe, where the exhaust gases are hotter, and moreover the inner surface of the pipe wall is lapped directly by the stream of exhaust gases without any obstacle being interposed so as to constitute a shield to the flow of heat.

[0012] Figures 3 and 4 are views of a first variation of the invention, which no longer has a single piece configuration but comprises two sections, generally designated by the reference numerals 5 and 6, each comprising a portion of the central core which is provided with respective fins. Thus, the section 5 comprises a portion 5a of the central core with respective fins 5b, 5c, 5d, 5e, and the section 6 comprises a portion 6a of the central core with respective fins 6b, 6c, 6d, 6e.

[0013] The variation shown in Figures 5 and 6 again comprises two sections 7 and 8, each of which comprises a portion of the central core which is provided with respective fins, and provides for the presence of an expander, which is extended over the entire length of the device and is adapted to keep the sections in contact with the inner surface of the pipe and is constituted by a threaded stem 9, which is shown partially extracted for clarity of illustration.

[0014] Finally, the variations shown in Figures 7, 8 and 9, 10 are structurally identical to the variation of Figure 5 and are provided with a turbulator, which is adapted to disrupt the boundary layer of the stream of exhaust gases in contact with the inner surface of the pipe and is inserted in an adapted seat provided at the outer end of the fins.

[0015] These variations correspond to the claimed invention. The turbulator comprises, in the variation of Figure 7, a plurality of rings 10, whereas in the variation of Figure 9 it has the shape of a spiral 11.

[0016] In practice it has been found that the device according to the invention fully achieves the intended aim.

[0017] The invention thus conceived is susceptible of numerous other modifications and variations, all of which are within the scope of the appended claims; all the de-

tails may further be replaced with other technically equivalent elements.

[0018] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A pipe comprising a device (1) for optimizing the transmission of heat therein for conveying exhaust gases in a heat exchange apparatus, the device (1) being inserted in the pipe (2) and comprising a plurality of longitudinal fins (3; 5a, 5b, 5c, 5d, 5e, 6a, 6b, 6c, 6d, 6e) which extend in a substantially radial direction from a central core (4; 5a, 6a) and come into contact with the inner surface of the pipe, **characterized by** the presence of a turbulator (10; 11), which is adapted to disrupt the boundary layer of the stream of exhaust gases in contact with the inner surface of the pipe (2), and which is inserted in a seat provided at the outer end of the fins.
2. The pipe according to claim 1, **characterized in that** the fins (3) are slightly curved and have a wider end (3a) so as to define a foot for contact with the inner surface of the pipe (2).
3. The pipe according to one or more of the preceding claims, **characterized in that** it has a single piece configuration.
4. The pipe according to one or more of the preceding claims, **characterized in that** it comprises a plurality of sections (5, 6; 7, 8), each of which comprises a portion (5a, 6a) of the central core which is provided with respective fins (5a, 5b, 5c, 5d, 5e, 6a, 6b, 6c, 6d, 6e).
5. The pipe according to one or more of the preceding claims, **characterized in that** it comprises a plurality of sections (5, 6; 7, 8), each of which comprises a portion (5a, 6a) of the central core which is provided with respective fins, within said central core there being an expander (9) which is adapted to keep the set of sections in contact with the inner surface of the pipe (2).
6. The pipe according to claim 5, **characterized in that** the expander comprises within the central core is constituted by a threaded stem (9).
7. The pipe according to claim 1, **characterized in that** the turbulator comprises a plurality of rings (10).

8. The pipe according to claim 1, **characterized in that** the turbulator has the shape of a spiral (11).

5 Patentansprüche

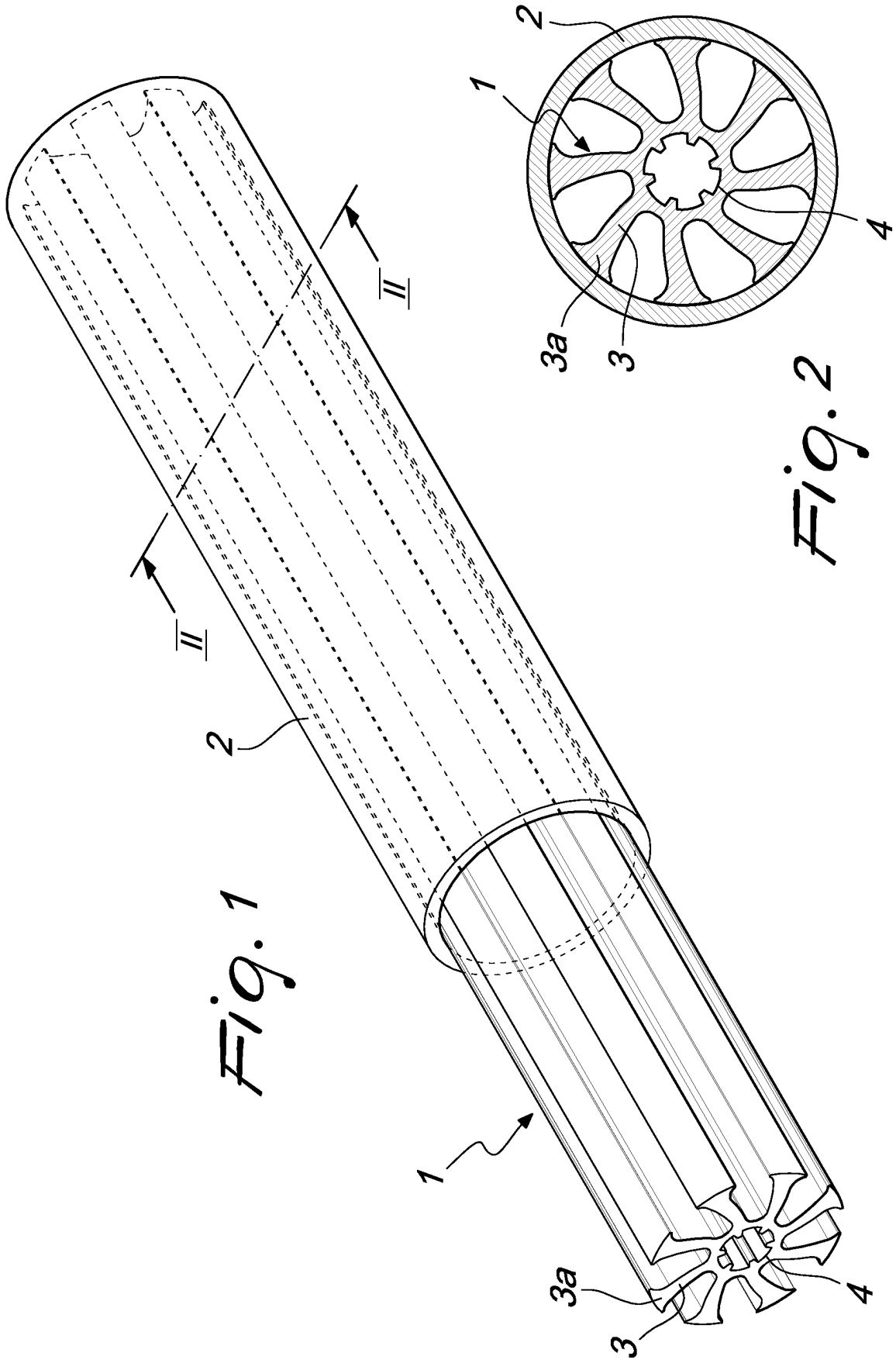
1. Ein Rohr, das eine Vorrichtung (1) zum Optimieren der Übertragung von Wärme darin für den Transport von Abgasen in einer Wärmetauschervorrichtung umfasst, wobei die Vorrichtung (1) in das Rohr (2) eingesetzt ist und eine Vielzahl länglicher Rippen (3; 5a, 5b, 5c, 5d, 5e, 6a, 6b, 6c, 6d, 6e) umfasst, die sich von einem zentralen Kern (4; 5a, 6a) in einer im Wesentlichen radialen Richtung erstrecken und mit der Innenfläche des Rohrs in Kontakt kommen; **gekennzeichnet durch** die Anwesenheit eines Turbulators (10; 11), der ausgebildet ist, um die Grenzschicht des Stroms von Abgasen in Kontakt mit der Innenfläche des Rohrs (2) zu durchbrechen, und der in einen am äußeren Ende der Rippen bereitgestellten Sitz eingesetzt ist.
2. Das Rohr gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Rippen (3) leicht gekrümmt sind und ein breiteres Ende (3a) haben, um eine Basis für den Kontakt mit der Innenfläche des Rohrs (2) zu bestimmen.
3. Das Rohr gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** es eine einteilige Konfiguration hat.
4. Das Rohr gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** es eine Vielzahl von Abschnitten (5, 6; 7, 8) umfasst, die jeweils einen Teil (5a, 6a) des zentralen Kerns umfassen, der mit entsprechenden Rippen (5a, 5b, 5c, 5d, 5e, 6a, 6b, 6c, 6d, 6e) versehen ist.
5. Das Rohr gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** es eine Vielzahl von Abschnitten (5, 6; 7, 8) umfasst, die jeweils einen Teil (5a, 6a) des zentralen Kerns umfassen, der mit entsprechenden Rippen versehen ist, wobei sich innerhalb des zentralen Kerns ein Rohraufweiter (9) befindet, der ausgebildet ist, um die Reihe von Abschnitten in Kontakt mit der Innenfläche des Rohrs (2) zu halten.
6. Das Rohr gemäß Anspruch 5, **dadurch gekennzeichnet, dass** der in dem zentralen Kern umfasste Rohraufweiter aus einem Gewindeschacht (9) besteht.
7. Das Rohr gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Turbulator eine Vielzahl von Ringen (10) umfasst.

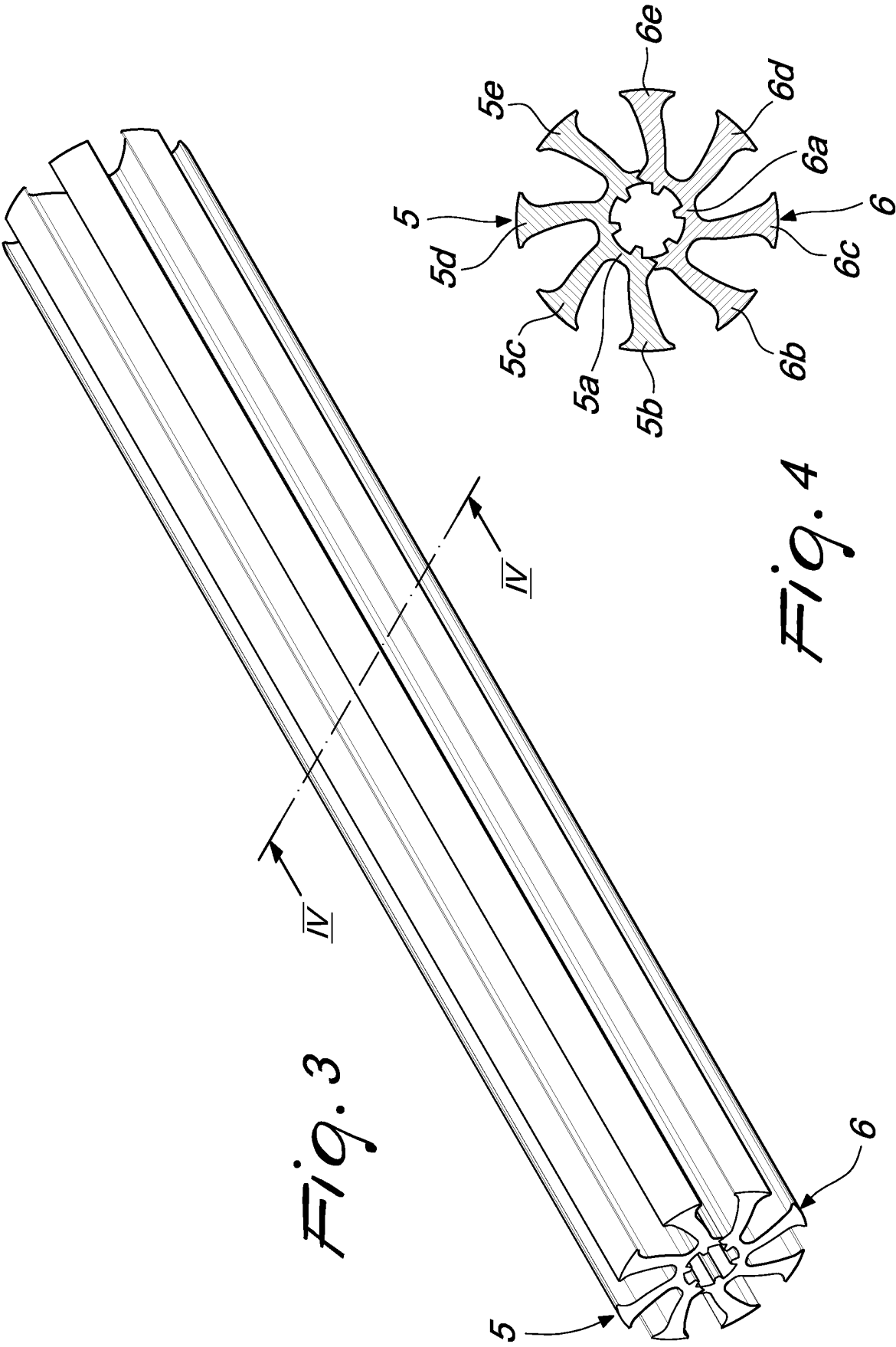
8. Das Rohr gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Turbulator die Form einer Spirale (11) hat.

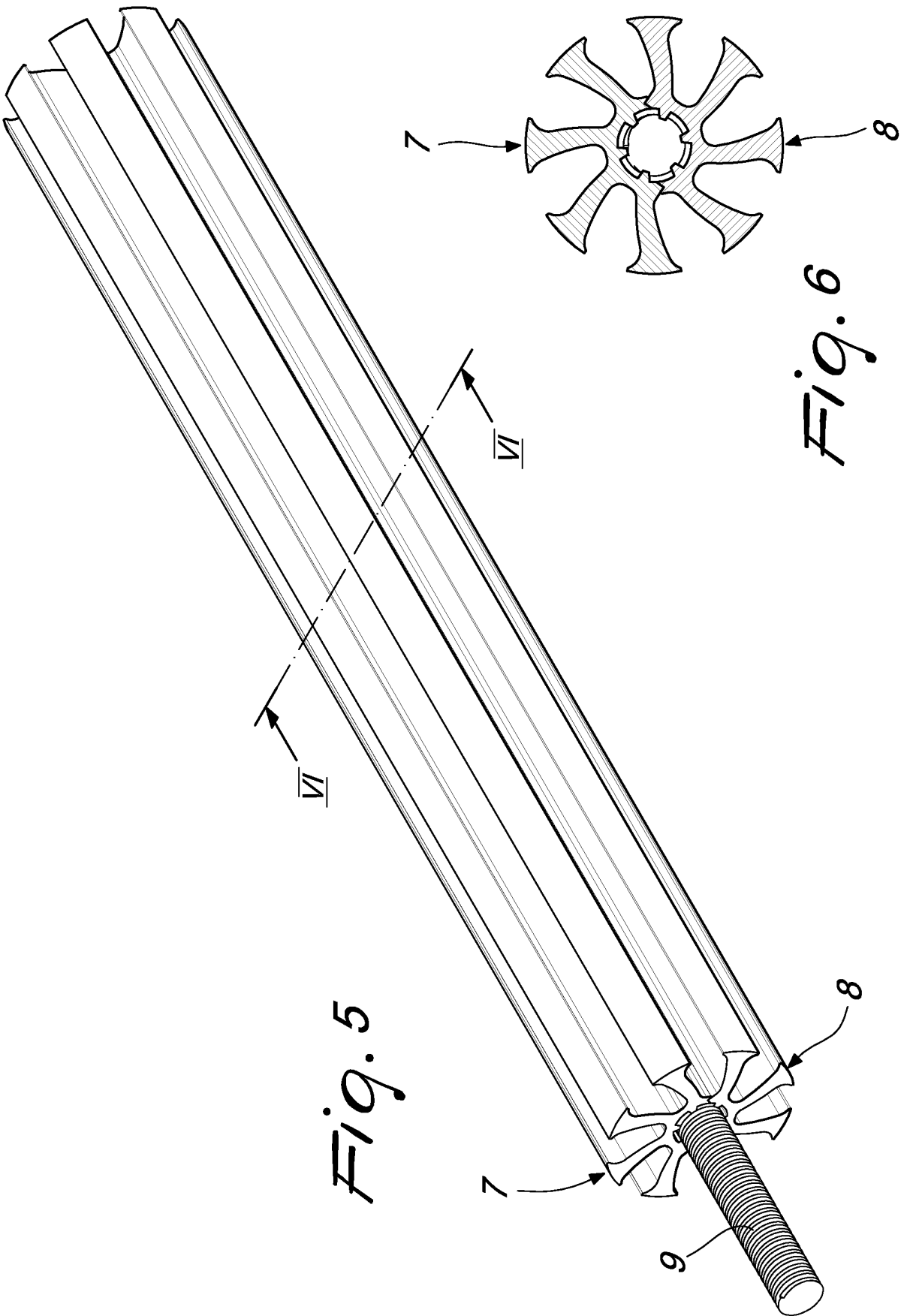
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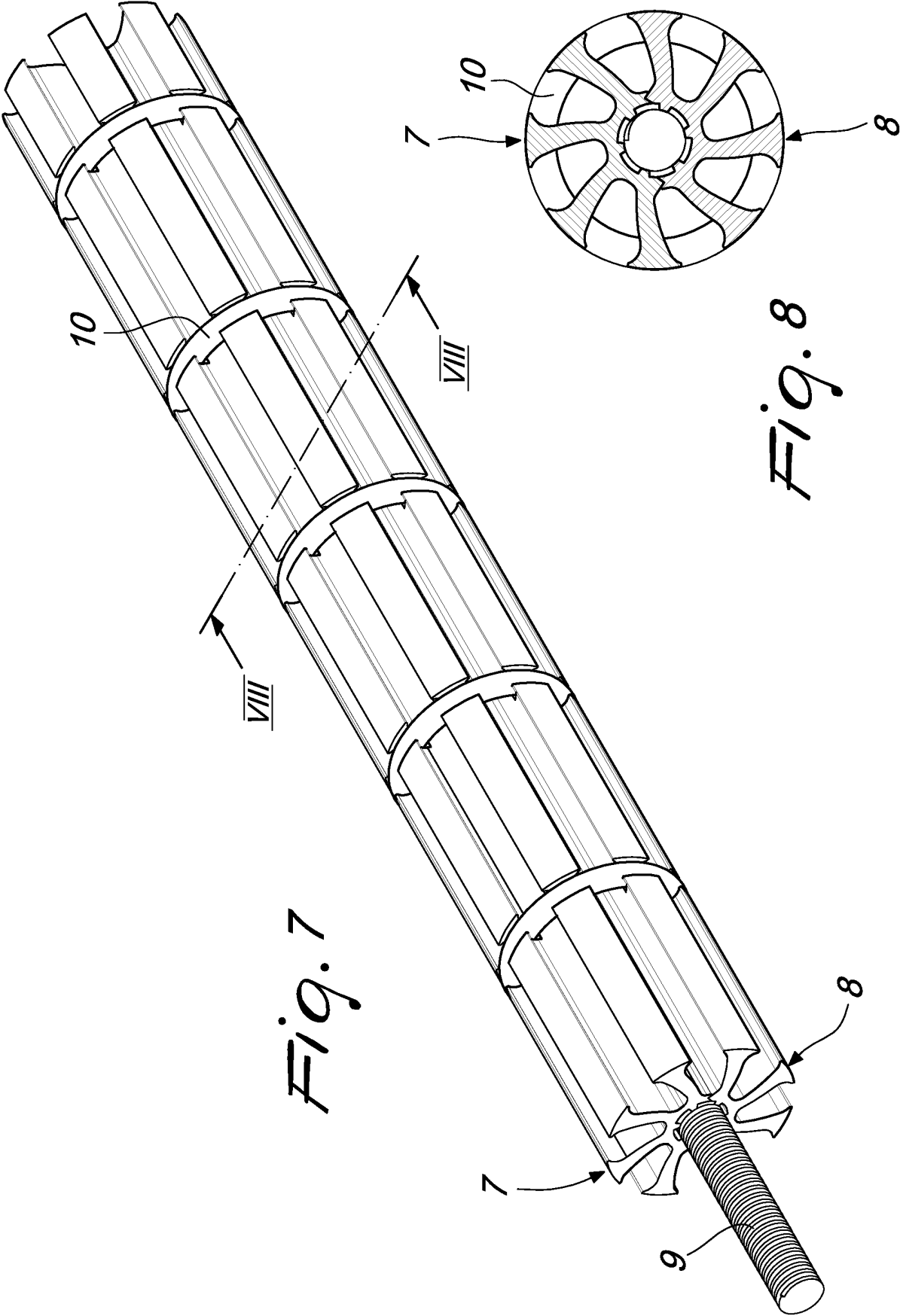
Revendications

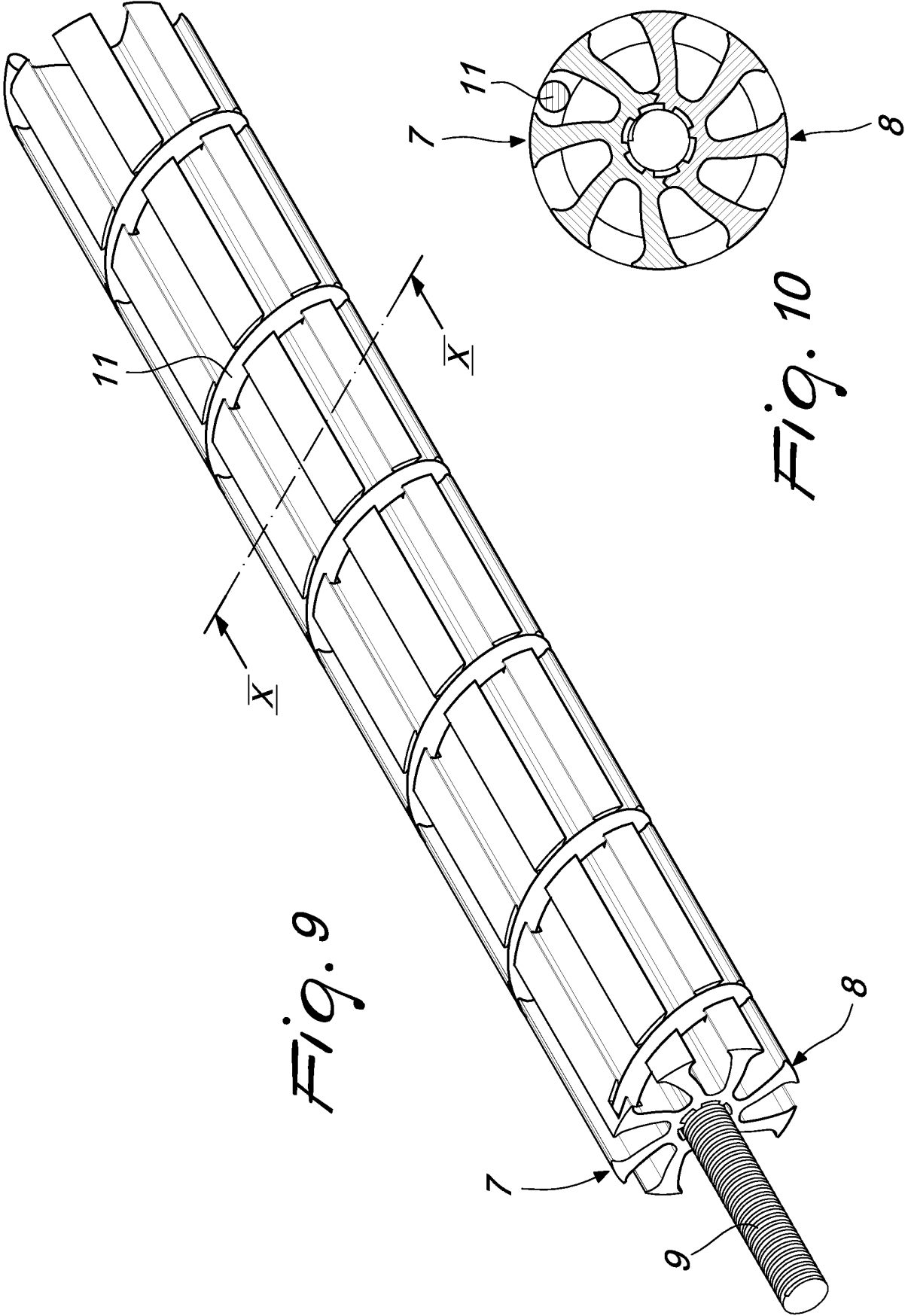
1. Tuyau comprenant un dispositif (1) pour optimiser la transmission de chaleur dans celui-ci pour transporter des gaz d'échappement dans un appareil d'échange de chaleur, le dispositif (1) étant inséré dans le tuyau (2) et comprenant une pluralité d'ailettes longitudinales (3 ; 5a, 5b, 5c, 5d, 5e, 6a, 6b, 6c, 6d, 6e) qui s'étendent dans une direction sensiblement radiale depuis un noyau central (4 ; 5a, 6a) et viennent en contact avec la surface interne du tuyau, **caractérisé par** la présence d'un turbulateur (10 ; 11) qui est adapté pour perturber la couche limite du flux de gaz d'échappement en contact avec la surface interne du tuyau (2), et qui est inséré dans un siège disposé à l'extrémité externe des ailettes. 10 15 20
2. Tuyau selon la revendication 1, **caractérisé en ce que** les ailettes (3) sont légèrement courbées et ont une extrémité plus large (3a) de façon à définir un pied pour contact avec la surface interne du tuyau (2). 25
3. Tuyau selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'il** présente une configuration monobloc. 30
4. Tuyau selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'il** comprend une pluralité de sections (5, 6 ; 7, 8), dont chacune comprend une partie (5a, 6a) du noyau central qui est pourvu d'ailettes respectives (5a, 5b, 5c, 5d, 5e, 6a, 6b, 6c, 6d, 6e). 35
5. Tuyau selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'il** comprend une pluralité de sections (5, 6 ; 7, 8), dont chacune comprend une partie (5a, 6a) du noyau central qui est pourvu d'ailettes respectives, ledit noyau central contenant en son sein un extenseur (9) qui est adapté pour maintenir l'ensemble de sections en contact avec la surface interne du tuyau (2). 40 45
6. Tuyau selon la revendication 5, **caractérisé en ce que** l'extenseur compris dans le noyau central est constitué d'une tige filetée (9). 50
7. Tuyau selon la revendication 1, **caractérisé en ce que** le turbulateur comprend une pluralité d'anneaux (10). 55
8. Tuyau selon la revendication 1, **caractérisé en ce que** le turbulateur a la forme d'une spirale (11).











REFERENCES CITED IN THE DESCRIPTION

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