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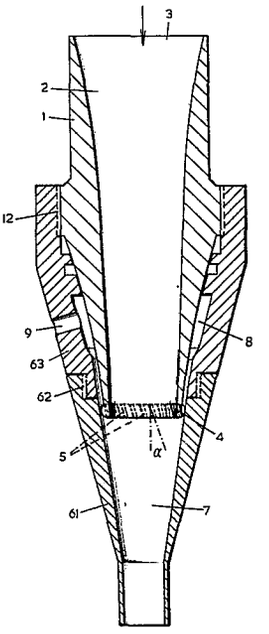
(54) Process and spraying device for the filling of hollow spaces.

(57) A process and a spraying device for the filling of hollow spaces by the injection of solid substances in the form of fibres or granules with the aid of an air stream, wherein the solid substance is supplied as a suspension in a stream of primary air, which stream is, just before entering the space to be filled, mixed with an annular stream of secondary air moving roughly co-axially with the primary air stream, the secondary air stream being supplied tangentially relative to the primary air stream and under a pressure exceeding the primary air pressure, and wherein the spraying device consists of a supply section (1) and an outlet section, of which the supply section is provided with an inlet pipe (2) which has a substantially conical longitudinal section and a round cross-section, while the said supply section merges on a level with the smallest pipe diameter into an annular organ (4) which is provided on its outer circumference with grooves (5) crossing the long axis of the inlet pipe at an angle α.



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A process and a spraying device for the filling of hollow spaces.

The invention relates to a process and a spraying device for the filling of hollow spaces by the injection of solid substances in the form of fibres or granules, such as glass wool, rock wool, synthetic polymers and other substances that are suitable for the said purpose.

Numerous processes are known for the filling of hollow spaces, for example the filling of cavity walls with materials for thermal insulation. As a rule, the insulating substance is introduced into the cavity in an air stream with the aid of a spraying device.

Initially, spraying devices for this purpose were of such dimensions that large apertures had to be made in the wall in order to permit injection with a reasonable spraying quality, among other things.

Spraying devices are known with which injection through smaller apertures can be effected, because they have

considerably smaller effective free passage on the exit side than on the inlet side for the substances to be injected.

The reduction of the effective free passage has a number of disadvantages of which a few are mentioned hereinafter.

- The spraying capacity, by which is understood the quantity of substance injected per unit time, is low.
- Blockages occur in the spraying device, especially during the injection of fibrous materials such as, for instance, glass wool and rock wool.
- The low capacity and the disturbances due to blockages increase expenses, because injection takes longer. Flocculation may occur, resulting in non-uniform distribution of the injected substance over the cavity, so that in the one hand the level of the K value is adversely affected and on the other hand the K value is not the same throughout the entire cavity but shows variations.

It has now been found that a better and more uniform filling can be obtained by supplying the solid substance as a suspension in a primary air stream, which stream is mixed, just before entering the space to be filled, with an annular stream of secondary air moving roughly coaxially with the primary air stream, the secondary air stream being supplied tangentially relative to the primary air stream and under a pressure exceeding the primary air pressure.

Because of the tangential introduction of secondary air into the primary air stream, a highly turbulent flow is created immediately before the entry into the cavity to be filled.

When material in the form of fibres, such as glass wool or slag wool, is used in the process according to the invention the flakes of fibrous material are torn apart by the turbulent motion, making it possible to attain very low bulk densities, for instance of about 30 kg/m^3.

The primary air pressure is preferably between 1.1 and 1.5 bar (abs.), and the secondary air pressure between 2 and 10 bar (abs.), in particular approximately 5 bar (abs.).

The process according to the invention permits considerably higher rates of filling than were customary up to now, for instance in the order of 2.5 - 3.5 kg/min.

The invention also relates to a spraying device for conducting the process described hereinbefore.

According to the invention the spraying device consists of a supply section and an outlet section, the supply section having an inlet pipe which has a substantially conical longitudinal section and a round cross-section; on a level with the smallest pipe diameter the supply section merges into an annular organ which is provided on its outer circumference with grooves crossing the long axis of the inlet pipe at an angle α.

The invention is elucidated further by reference to an example shown in the attached drawing.

The figure depicts a longitudinal section through the spraying device. The spraying device comprises the supply section 1 having a passage 2. The largest diameter of the passage 2 is at the end 3 where the substance to be injected is introduced in the direction of the arrow together with the primary compressed air. At the smallest diameter of passage 2 the supply section 1 merges into an annular 4 which is provided on its outer circumference with the grooves 5 set at an angle α to the axis of the spraying device. The width of the angle α is between 5 and 15° and is preferably about ten degrees.

The outlet section is composed of the nozzle 61 which is detachably connected, for instance by means of a screw

thread 62, to the coupling piece 63. This coupling piece is in its turn detachably connected, for instance by means of a screw thread 12, to the supply section 1. Between the supply section 1 and the coupling piece 63 an annular space is left for an air chamber 8 which communicates with an aperture 9 for the supply of secondary air.

The air chamber 8 communicates by way of the grooves 5 of the annular organ 4 with the passage 7 of the nozzle 61. The material to be injected is fed by means of the primary compressed air into the inlet pipe 2 at the end 3 passes through the aperture of the annular organ 4 to reach the passage 7 of the nozzle 61. At the same time, secondary air is fed in through the aperture 9 and also finds its way to the passage 7 by way of the air chamber 8 and the grooves 5.

As the secondary compressed air is supplied under a higher pressure than the primary compressed air, a pressure below atmospheric is produced in the passage 2 so that the material to be injected can move readily towards the annular organ 4 and clogging of the passage 2 is prevented.

In addition, the secondary air is introduced tangentially into passage 7 through the grooves set at the angle α, so that a uniform distribution of the substance to be injected and, in consequence a uniform distribution throughout the cavity is achieved.

The uniform distribution can be promoted still further by the provision of rifles and lands in the part of the passage 7 that is located between the nozzle tip of the outlet section and the annular organ 4.

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CLAIMS:

1. A process for the filling of hollow spaces by the injection of solid substances in the form of fibres or granules with the aid of an air stream, characterized in that the solid substance is supplied as a suspension in a stream of primary air, which stream is, just before entering the space to be filled, mixed with an annular stream of secondary air moving roughly coaxially with the primary air stream, the secondary air stream being supplied tangentially relative to the primary air stream and under a pressure exceeding the primary air pressure.

2. A process according to claim 1, characterized in that the secondary air stream is mixed with the primary air stream in such a fashion that a highly turbulent flow is created immediately before the entry into the cavity to be filled.

3. A process according to either one of claimes 1 or 2, characterized in that the primary air pressure is between 1.1 and 1.5 bar (abs.) and the secondary air pressure between 2 and 10 bar (abs.).

4. A spraying device for conducting the process according to any one of claims 1-3, characterized in that it consists of a supply section (1) and an outlet section, of which the supply section is provided with an inlet pipe which has a substantially conical longitudinal section and a round cross-section, while the said supply section merges on a level with the smallest pipe diameter into an annular organ which is provided on its outer circumference with grooves crossing the long axis of the inlet pipe at an angle α.

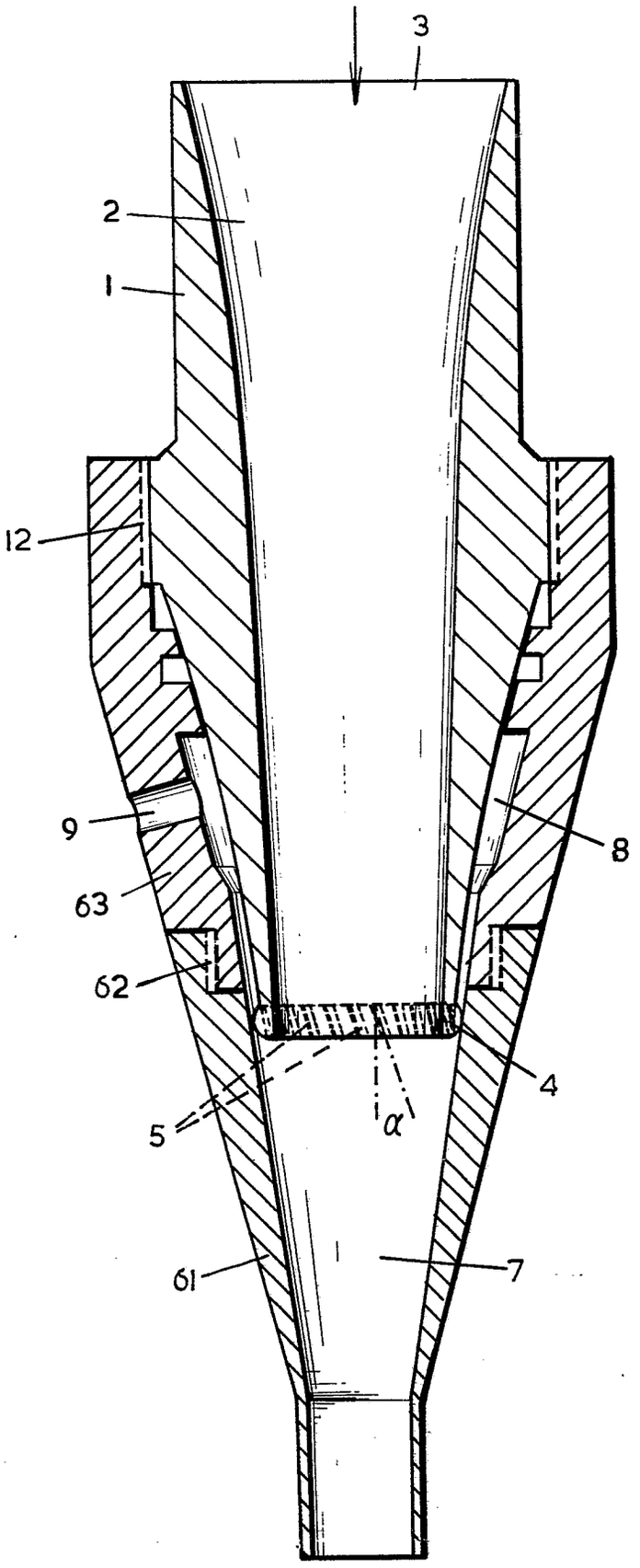
5. A spraying device according to claim 4, characterized in that the width of the angle α is between 5 and 15 degrees.

6. A spraying device according to either one of claims 4 and

5, characterized in that the supply section is attached to the outlet section in such a fashion that an air chamber is formed between the two sections.

7. A spraying device according to any one of claims 4-6, characterized in that the air chamber communicates on the one hand with an aperture for the supply of secondary air and on the other with the passage of the outlet section through the grooves of the ring-shaped organ.

8. A spraying device according to any one of claims 4-7, characterized in that the outlet section is composed of a nozzle which is detachably connected to a coaxially located coupling piece.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EUROPEAN SEARCH REPORT

0042193
Application number
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	DE - B - 1 232 731 (GOODYEAR AEROSPACE) * column 1, lines 1-5; column 2, lines 23-26; column 3, lines 20-58; figure *	1,4,6,7
	DE - A - 2 641 195 (SCHLECHT) * page 5, paragraph 1; page 8, paragraph 4; page 9, paragraphs 2 and 3, figures 1,2 *	1,2,4
	FR - A - 2 302 789 (CAMPENON) * page 1, lignes 1-8; page 3, lines 16-33; figure 3 *	1,3
	CH - A - 320 682 (COMPAGNIE PARISIENNE D'OUTILLAGE) * page 1, lines 1-6; page 1, line 59 to page 2, line 40; figure *	1,2,4, 6,7,8
	FR - A - 2 416 786 (LEZIER) * page 1, lines 1,2; 8-20; 35-39; page 3, lines 8-39; figures 1-3 *	1,2,8
A	GB - A - 2 012 620 (BRITISH PETROLEUM)	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

E 04 F 21/12
B 05 B 7/14
E 04 B 1/76

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

E 04 B
B 05 B
E 04 F

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25-09-1981	CAVALERI

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