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(12) # EUROPEAN PATENT SPECIFICATION

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

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Description

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 with injection through smaller apertures are known from the Specifications: FR—A—2,416,786; EP—A—0,023,060; and DE—B—1,232,731.

These specifications disclose conical inlet pipes for primary air and have an annular inlet for secondary air under higher pressure. In specification DE—A—2641195 the annular air inlet is provided with ridges along the circumference to divide the secondary air stream evenly along the annular air inlet.

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 nonuniform distribution of the injected substance over the cavity, so that the level of the K value is adversely affected and 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 of hollow spaces can be obtained according to the invention by the injection of solid substances in the form of fibres or granules with aid of a stream of primary air, which stream, just before entering the space to be filled, is mixed with a stream of secondary air under a pressure exceeding the primary air pressure, which secondary airstream is imparted a helical motion, enveloping and mixing into the outer layers of the primary stream.

Because of the helical 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.

The spraying device consists of a supply section provided with a passage (2) with a substantially conical longitudinal section and a round cross-section, and, coaxially with this supply section, an outlet section comprising a nozzle (61) connected by means of a coupling piece (63) to the supply section (1), which supply section (1) merges on a level with its smallest diameter into an annular orifice (4) characterised in that the annular orifice (4) is provided with grooves (5) which are arranged at an angle of between 5 and 15° with respect to the longitudinal axis of the device so as to impart a helical motion to the secondary stream.

The outlet section is attached to the inlet section by means of a coupling piece in such a way, that an air chamber for the secondary air is provided in order to ensure an even distribution of the secondary air through the circular orifice.

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 orifice 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 orifice 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 orifice 4 and clogging of the passage 2 is prevented.

In addition, the secondary air is introduced along a helical path 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 orifice 4.

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 a stream of primary air, which stream, just before entering the space to be filled, is mixed with an annular stream of secondary air under a pressure exceeding the primary air pressure, characterised in that the secondary air stream is imparted a helical motion, enveloping and mixing into the outer layers of the primary stream.

2. A spraying device for carrying out the process according to claim 1, the device consisting of a supply section (1) provided with a passage (2) with a substantially conical longitudinal section and a round cross-section, and, coaxially with this supply section, an outlet section comprising a nozzle (61) connected by means of a coupling piece (63) to the supply section (1), which supply section (1) merges on a level with its smallest diameter into an annular orifice (4) characterised in that the annular orifice (4) is provided with grooves (5) which are arranged at an angle of between 5 and 15° with respect to the longitudinal axis of the device so as to impart a helical motion to the secondary stream.

3. A spraying device according to claim 2, characterised in that an air chamber (8) is provided between the supply section and the coupling piece (63) in order to ensure an even distribution of secondary air through the grooves (5), which air chamber (8) communicates both with the aperture (9) for the supply of secondary air and with the passage of the outlet section through the grooves (5) of the annular orifice (4).

Patentansprüche

1. Verfahren zum Füllen von Hohlräumen durch Injektion fester Substanzen in Form von Faserstoffen oder Granulaten mittels eines Primär-Luftstrahles, wobei dieser Strahl in dem Moment, in dem er in den zu füllenden Raum eindringt, mit einem ringförmigen Sekundär-Luftstrahl unter einem Druck, der über dem Primär-Luftdruck lieft, gemischt wird, dadurch gekennzeichnet, daß der Sekundär-Luftstrahl in eine Schrauben- und/oder spiralförmige Bewegung oder Strömung versetzt wird, die die äußeren Schichten des Primär-Luftstrahls umhüllt und sich mit diesem vermischt.

2. Spritzvorrichtung zur Durchführung des Verfahrens nach Anspruch 1, wobei die Vorrichtung aus einem Speiseabschnitt (1), der mit einem im Längsschnitt im wesentlichen konischen und im Querschnitt runden Kanal (2) versehen ist, und aus einem koaxial zu diesem Speiseabschnitt ausgebildeten Auslaßabschnitt mit einer Düse (61) besteht, die mittels eines Kupplungsstückes (63) an den Speiseabschnitt (1) angeschlossen ist, der in der Höhe seiner kleinsten Durchmessers in eine ringförmige Öffnung (4) übergeht, dadurch gekennzeichnet, daß die ringförmige Öffnung (4) mit Schlitzen (5) versehen ist, die unter einem Winkel zwischen 5° und 15° in Bezug auf die Längsachse der Vorrichtung so angeordnet sind, daß sie dem sekundären Strahl eine schrauben- oder sprailförmige Bewegung geben.

3. Spritzvorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß eine Luftkammer (8) zwischen dem Speiseabschnitt (1) und dem Kupplungsstück (63) vorgesehen ist, um eine gleichmäßige Verteilung der Sekundär-Luft durch die Schlitze (5) zu gewährleisten, und daß die Luftkammer (8) sowohl mit der Öffnung (9) für die Zufuhr der Sekundär-Luft als auch mit der Öffnung (7) des Auslaßabschnitts durch die Schlitze (5) der ringförmigen Öffnung (4) in Verbindung steht.

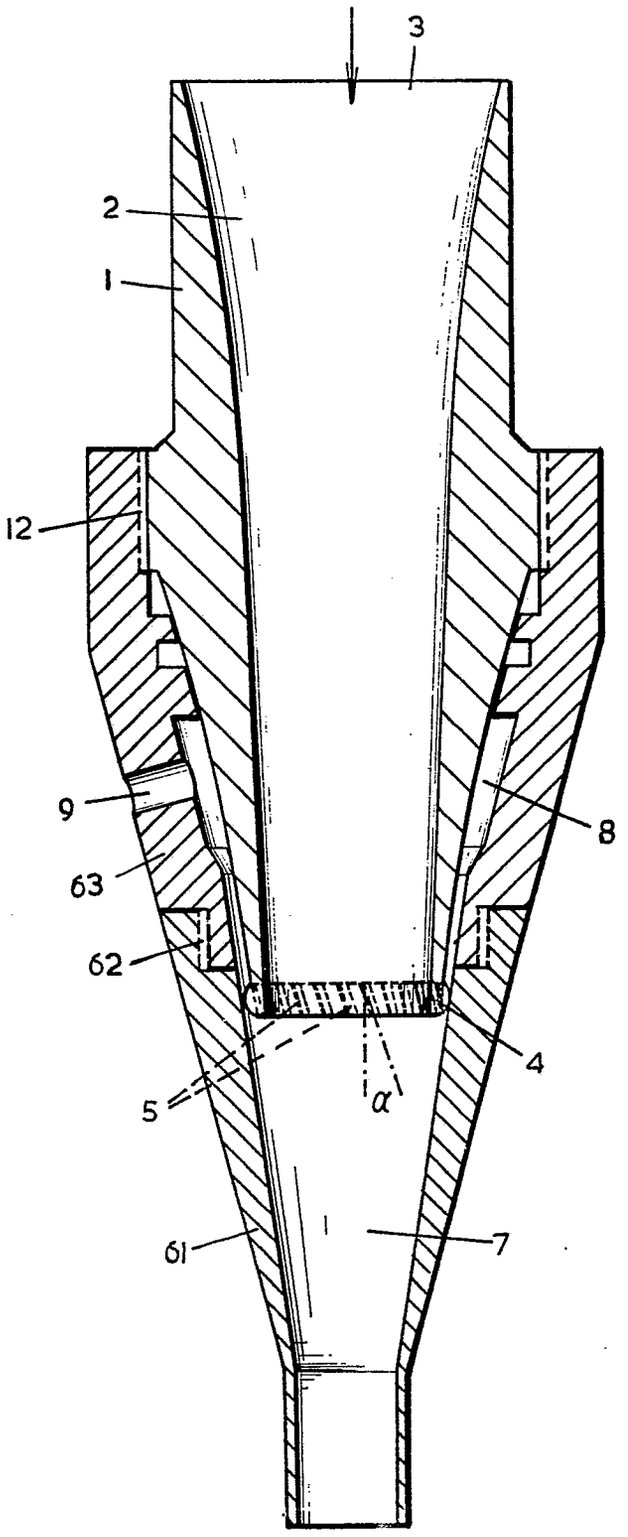
Revendications

1. Un procédé pour le remplissage d'espaces vides par injection de substances solides sous la forme de fibres ou granules au moyen d'un courant d'air primaire, lequel courant, juste avant son introduction dans l'espace à remplir, est mélangé avec un courant annulaire d'air secondaire sous une pression supérieure à la pression de l'air primaire, caractérisé en ce qu'on donne au courant d'air secondaire un mouvement hélicoïdal enveloppant et se

mélangeant avec les couches externes du courant primaire.

2. Un dispositif de projection pour la mise en oeuvre du procédé selon la revendication 1, le dispositif comprenant une section (1) d'alimentation pourvue d'un passage (2) ayant une section longitudinale sensiblement conique et une section transversale ronde, et, coaxialement à cette section d'alimentation, une section de sortie comprenant une buse (61) reliée au moyen d'une pièce de couplage (63) à la section (1) d'alimentation, laquelle section (1) d'alimentation se fond au niveau de son plus petit diamètre dans un orifice annulaire (4), caractérisé en ce que l'orifice annulaire est pourvu de gorges (5) qui sont disposées sous un angle compris entre 5 et 15° par rapport à l'axe longitudinal du dispositif, de façon à donner un mouvement hélicoïdal au courant d'air secondaire.

3. Un dispositif de projection selon la revendication 2, caractérisé en ce qu'une chambre d'air (8) est prévue entre la section d'alimentation et la pièce de couplage (63) de façon à assurer une distribution égale d'air secondaire à travers les gorges (5), laquelle chambre d'air (8) communique à la fois avec l'ouverture (9) pour l'alimentation de l'air secondaire et avec le passage de la section de sortie à travers les gorges (5) de l'orifice annulaire (4).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