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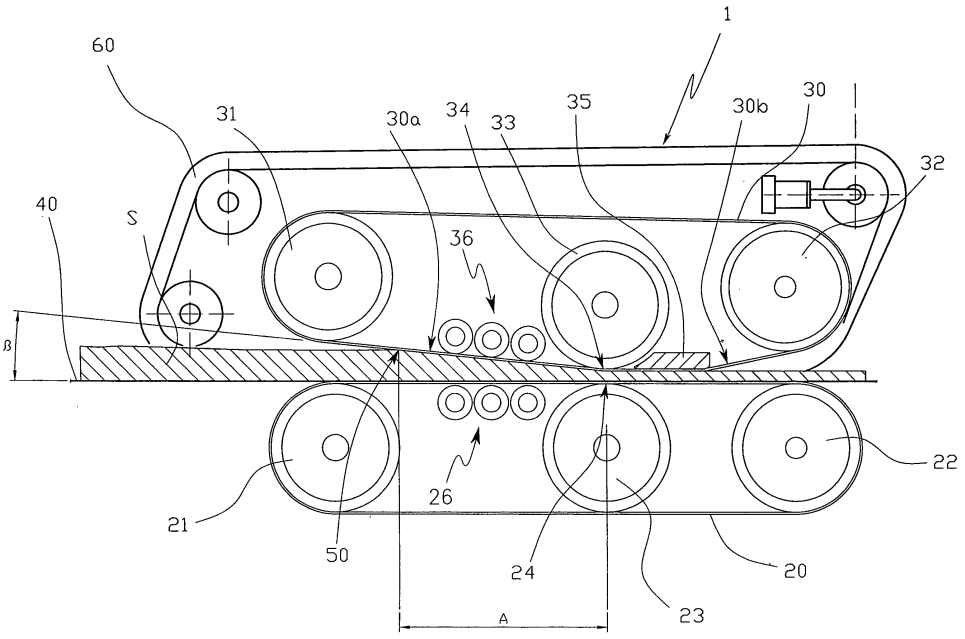
(54) System for compacting ceramic powders for forming slabs using a belt

(57) A system (1) for compacting ceramic powders for forming slabs using a belt comprising:

- a conveyor belt (40) on which a continuous strip (S) of powdered ceramic material is created;
- a first bottom compacting belt (20) arranged in contact with the conveyor belt (40) and below it;
- a second top compacting belt (30) cooperating with said first belt (20) and having a first receiving portion (30a) having an inclination (β) with respect to the direction in which the powders (S) advance, and a second expansion portion (30b), where the length (A) of the portion of powder (S) involved at the instant of compacting is between 2 and 28 times the thickness of the powders (S).



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Description

[0001] The present invention refers to a system for compacting ceramic powders for forming slabs using a belt.

[0002] As known, the dry forming process of ceramic powders on a belt foresees the use of compacting belts, bottom and top respectively, cooperating to dry compact a strip of ceramic powders that is made to advance, through a conveyor belt arranged between them, in an advancing direction parallel to the bottom belt.

[0003] The compacting is assisted by two compacting rollers kept pressed against the strip of ceramic powders.

[0004] The top belt has a first receiving portion inclined with respect to the advancing direction of the powders and a second expansion portion respectively upstream and downstream of the compacting rollers present in the compacting area.

[0005] The inclination of the first portion of the top belt, with respect to the advancing direction of the strip of powders, ensures a progressive squashing of the powders and allows the air present inside them to be expelled.

[0006] Such a compacting system is described in detail in European patent application EP-A-1356909 to the same Applicant, to which we refer for a complete understanding thereof.

[0007] Up to now it has been considered that such an inclination must be between 1° and 2°.

[0008] However, as the thickness of powder to be pressed increases, it has been found that there is insufficient discharge of air during pressing.

[0009] The absence of air in the formed article is necessary to avoid imperfections during the subsequent movement, decoration and firing.

[0010] If air is present the articles tend to break up dividing into thin layers to the detriment of the required integrity of the end product.

[0011] The phenomenon is more noticeable when strips of ceramic powders of a thickness greater than 30 mm are processed.

[0012] A further drawback of known systems derives from the fact that the receiving portion of the top belt, due to the rather small inclination, less than 2°, implies an elongation of the receiving portion of the powder that is increasingly great the greater the thickness of the powder.

[0013] Therefore, the continuous compacting has a use limited to small thicknesses of powder with low degrees of compacting (reduction in thickness no greater than 30%).

[0014] The purpose of the present invention is that of providing a system for compacting ceramic powders for forming slabs using a belt that ensures the complete expulsion of air, during compacting, also for high thicknesses of powders and degrees of compacting.

[0015] A further purpose is that of providing a system that has a limited size, bulk and costs compared to those of the prior art.

[0016] Such purposes are accomplished through a system for compacting ceramic powders for forming slabs using a belt in accordance with claim 1.

[0017] The dependent claims outline preferred and particularly advantageous embodiments of the system according to the invention.

[0018] Further characteristics and advantages of the invention shall become clear from reading the following description provided as an example and not for limiting purposes, with the help of the figure illustrated in the attached table, which shows a schematic view of a system for compacting ceramic powders for forming slabs using a belt in accordance with the present invention.

[0019] With reference to the aforementioned figure, a system for compacting ceramic powders for forming slabs using a belt in accordance with the present invention is globally indicated with 1.

[0020] The system 1 comprising a conveyor belt 40 on which a continuous strip "S" of powdered ceramic material is created, a first bottom compacting belt 20 arranged in contact with the conveyor belt 40 and a second top compacting belt 30 cooperating with the first belt 20 to dry compact the strip S of powders and obtain a coherent article of compacted powders.

[0021] The top belt 30 has a first housing portion 30a, arranged on the left in the figure, and a second expansion portion 30b, arranged on the right in the figure.

[0022] The lateral containment of the powders is, as usual, carried out by two deformable side walls provided by the belts 60.

[0023] In accordance with the present invention, it has been seen that, in order to effectively expel the air incorporated in the strip S of powders it is essential that the length "A" of the portion of strip S of powders involved at the instant of compacting is as short as possible.

[0024] According to the invention, the receiving portion 30a of the top belt 30 has an inclination "β" with respect to the direction in which the powders advance of between 2° and 15°, preferably between 3° and 10°.

[0025] In the example, each belt 20, 30 is wound on a pair of rollers, one of which is a drive roller, respectively indicated with 32 for the top belt 30 and with 22 for the bottom belt 20, and one of which is an idler roller, respectively indicated with 31 for the top belt 30 and with 21 for the bottom belt 20.

[0026] The rollers 31, 32 and 21, 22 of each pair are arranged a distance apart such as to keep the respective wound belts 30, 20 taut.

[0027] In order to carry out the compacting action more effectively, the bottom belt 20 and the top belt 30 are equipped with a compacting roller, indicated with 33 for the top belt 30 and with 23 for the bottom belt 20.

[0028] The two compacting rollers 33 and 23 act directly on the belts 30, 20 at the tangency points, indicated with 34 and 24 respectively for the top belt 30 and for the bottom belt 20.

[0029] Basically, the distance between the two tangency points 34 and 24 is equal, apart from the thicknesses of the belts, to the minimum gap through which the strip S of powders is forced to pass.

[0030] Moreover, and as known in the field, between the pairs of rollers 31, 32 and 21, 22 two rollers 36, 26 are arranged, formed from a plurality of idler rollers, which act on the respective belts 30, 20 upstream of the two compacting rollers 33, 23 and that have the function of keeping the belts 30 and 20 pressed to press the strip of powders S.

[0031] In order to have correct compacting, the respective axes of the compacting rollers 33, 23 lie on a common plane perpendicular to the direction in which the strip S of powders advances.

[0032] To vary the desired thickness of the end slab the minimum distance between the two belts 30, 20 and therefore the distance between the two compacting rollers 33 and 23 must be varied, i.e. the mutual position between the tangency points 34 and 24.

[0033] This can be carried out through moving means, known in the field and therefore not illustrated here, suitable for distancing and approaching the compacting rollers 33, 23 perpendicularly with respect to the direction in which the powders advance.

[0034] Of course, the top belt 30 is distanced from the bottom belt 20 through the displacement of the rollers 31, 32 on which it is wound.

[0035] Downstream of the compacting rollers 33, 23 there are two opposite plates 35 and 25, so that the first 35 acts on the expansion portion 30c of the top belt 30 and the second acts on the bottom belt 20, to control the spontaneous expansion of the strip of compacted powders S.

[0036] Advantageously, in order to allow the compacting of strips S of powders having substantially different thicknesses, as well as suitably distancing the belts 30, 20 and the respective compacting rollers 33, 23, the inclination "β" of the first receiving portion 30a can also be varied, as desired between 2° and 14°, preferably between 3° and 10° with respect to the direction in which the strip S of powders advances.

[0037] This is possible, for example, through the use of suitable means, not illustrated, that allow the roller arranged at the inlet end of the strip S of powders, in the example the idler roller 31, to be distanced and approached with respect to the conveyor belt 40 where the continuous strip S of ceramic powders is arranged.

[0038] As the inclination P assigned to the receiving portion 30a varies, the point of first contact, indicated with 50, between the strip S of powders and the receiving portion 30a itself of the top belt 30 gets closer to the compacting rollers 33, 23, whereas they move away as the thickness of the strip S increases.

[0039] The choice of the most suitable inclination P to be assigned to the receiving portion 30a to effectively remove the air incorporated in the powders to be compacted is carried out taking into account the specific properties of the powders to be treated.

[0040] In particular, their fluidity must be taken into account.

[0041] Indeed, should the inclination P be excessive, the top portion of the strip S of powders would not be carried between the belts 20, 30 due to what in the jargon is called "waste".

[0042] From the tests carried out it has been ascertained that in order to obtain a sufficient deaeration of the powder, the length A of the portion of strip S of powders involved at the instant of compacting must be between 2 and 28 times the thickness of the strip S.

[0043] Where the length A is equal to that of the projection, on the conveyor belt 40, of the distance between the point of first contact 50 of the top belt 30 by the strip S of powders and the tangency point 34 of the compacting roller 33 with the top belt 30.

[0044] As can be appreciated from what has been described, the system for compacting ceramic powders for forming slabs using a belt according to the present invention allows the requirements to be satisfied and allows the drawbacks mentioned in the introductory part of the present description with reference to the prior art to be overcome.

[0045] Of course, a man skilled in the art can bring numerous modifications and variants to the system for compacting ceramic powders for forming slabs using a belt described above in order to satisfy contingent and specific requirements, all of which are covered by the scope of protection of the invention, as defined by the following claims.

Claims

1. System (1) for compacting ceramic powders for forming slabs using a belt comprising:

   - a conveyor belt (40) on which a continuous strip (S) of powdered ceramic material is created;
   - a first bottom compacting belt (20) arranged in contact with the conveyor belt (40) and below it;
   - a second top compacting belt (30) cooperating with said first belt (20) and having a first receiving portion (30a) having an inclination (β) with respect to the direction in which the powders (S) advance, and a second expansion portion (30b), **characterised in that** the length (A) of the portion of powder (S) involved at the instant of compacting is between 2 and 28 times the thickness of the powders (S).

2. System (1) according to claim 1, comprising means for adjusting the inclination (β) suitable for varying the inclination (β) of the first receiving portion (30a).

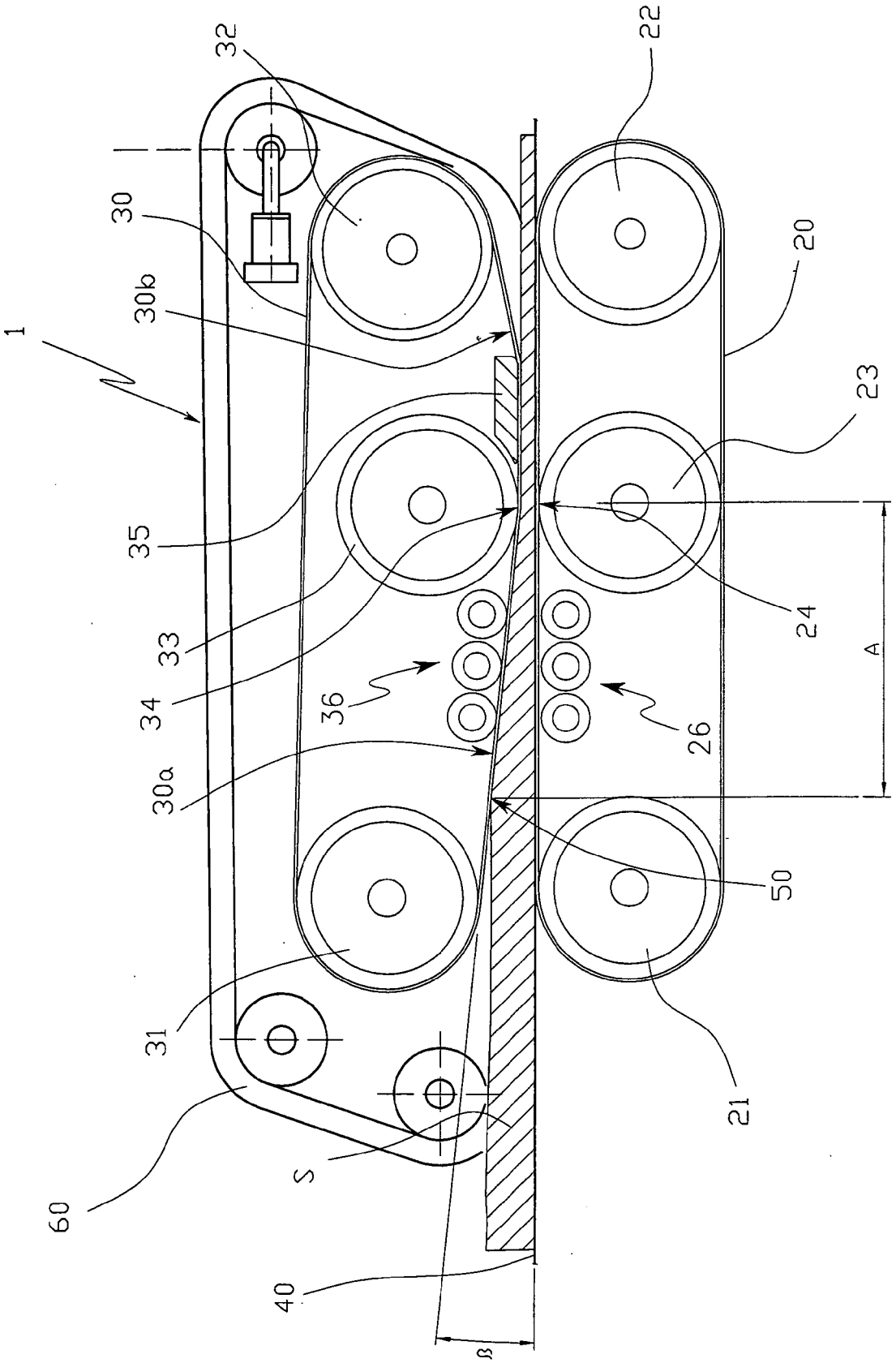
3. System (1) according to claim 1, wherein said top

belt (30) and bottom belt (20) are mutually mobile apart and towards each other perpendicularly with respect to the direction in which the powders (S) advance.

4. System (1) according to claim 1, wherein said top belt (30) and bottom belt (20) comprise a pair of compacting rollers (33, 23) the respective rotation axes of which lie on a common plane perpendicular to the direction in which the powders (S) advance, irrespective of the value of the length (A).

5. System (1) according to claim 1, wherein said inclination (β) of the first receiving portion (30a) is between 2° and 14°.

6. System (1) according to claim 1, wherein said inclination (β) of the first receiving portion (30a) is between 3° and 10°.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