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(54) Frame for supporting articles during a heat treatment

(57) A frame (1) for supporting articles, comprising means (2) for supporting at least one plurality of cylindrical rollers (3), which are parallel to each other, are suitable to form a supporting surface for the articles, and can be associated with the supporting means (2) by interposing rotary guiding means (4) which are suitable to allow their rotation about their own axis.

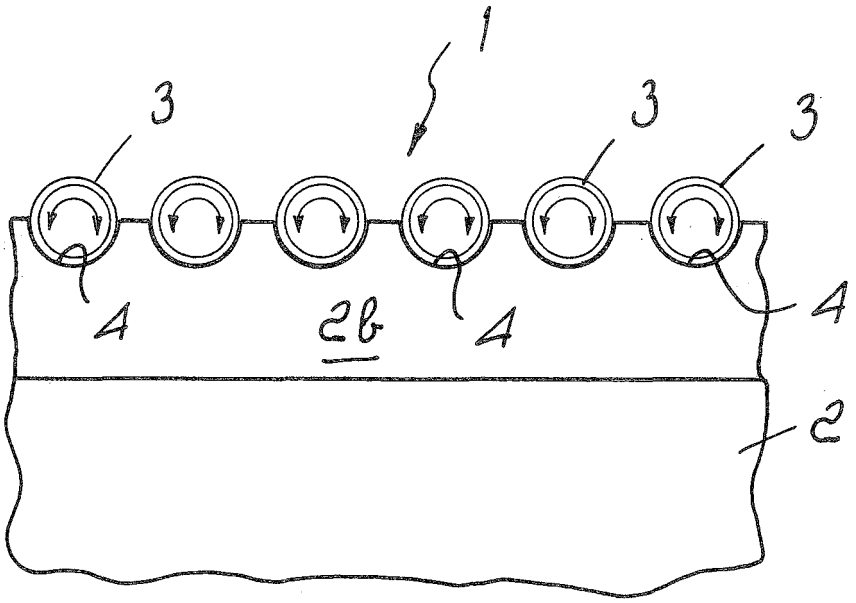

Fig. 5

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Description

[0001] The present invention relates to a frame for supporting articles, particularly ceramic products or the like subjected to heat treatments.

[0002] It is known that in various fields of activity, during the working of articles and generic products, mechanical stresses or temperature variations can cause shrinkage or expansion of the material that constitutes them.

[0003] In the ceramic field, for example, during traditional operations for drying and firing ceramic articles such as tiles, strip tiles, sanitary fixtures, clay products and the like, such articles are subj ected to a thermal treatment which is designed to heat them and cool them more or less gradually, and this often alters their dimensions.

[0004] In particular, the drying operation is accompanied by the evaporation of a certain amount of water contained in the article, causing therein a slippage of the particles that constitute the ceramic material and their compaction so as to close the voids left by the water; accordingly, there is a gradual loss of weight on the part of the article and there is a more or less conspicuous shrinkage in all three spatial directions.

[0005] During firing, instead, heating often causes a slight but significant expansion of the ceramic article, the extent of which is linked to the chemical nature of the material, to its crystalline or glassy structure, and to the transformations that occur during the application of heat.

[0006] During the working/treatment of the articles, be they ceramic or non-ceramic, such articles usually rest on supporting frames, such as platforms/continuous plates or grid-like structures constituted by a set of mutually connected transverse and longitudinal rods.

[0007] In the ceramic field, for example, such frames are commonly made of refractory material and are used within conventional firing kilns and drying kilns, often mounted on movable carriages or platforms which can slide along rails and/or prism-shaped guides in order to insert the products still to be heated into the firing kiln/drying kiln and extract them at the end of the thermal treatment.

[0008] These known types of frame are not free from drawbacks, including the fact that they commonly contrast the expansion/shrinkage of the articles that rest thereon, hindering disadvantageously their normal development and with the risk of compromising the correct execution of the process/treatment.

[0009] Conventional frames in fact are not generally affected by shrinkage/elongation phenomena, or rather, they are, but to a substantially different extent than the shrinkage/elongations that affect the articles; direct contact and friction between the frame and said articles therefore causes the onset of tensions inside the material that constitutes the product, such as to cause an irregular deformation thereof and in some cases their breakage.

[0010] The aim of the present invention is to eliminate the drawbacks noted above of the background art, by providing a frame for supporting articles that avoids the onset of dangerous tensions inside the products being processed when they are subjected to shrinkage or expansion, allowing to process them without particular risks of damage and breakage.

[0011] Within this aim, an object of the present invention is to be simple and straightforward to assemble, without requiring the use of sophisticated mechanisms or devices in order to operate.

[0012] Another object of the present invention is to provide a frame that is simple, relatively easy to provide in practice, safe in use, effective in operation, and has a relatively low cost.

[0013] This aim and these and other objects that will become better apparent hereinafter are achieved by the present frame for supporting articles, characterized in that it comprises means for supporting at least one plurality of cylindrical rollers, which are substantially parallel to each other, are suitable to form a supporting surface for the articles, and can be associated with said supporting means by interposing rotary guiding means which are suitable to allow their rotation about their own axis.

[0014] Further characteristics and advantages of the present invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment of a frame for supporting articles, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a carriage for ceramic firing kilns provided with the frames according to the invention;

Figure 2 is a side elevation view of a portion of the carriage of Figure 1;

Figure 3 is an enlarged-scale view of a detail of Figure 2;

Figure 4 is an enlarged-scale view of another detail of Figure 2;

Figure 5 is an enlarged-scale side view of a portion of the frame according to the invention.

[0015] With reference to the figures, the reference numeral 1 generally designates a frame for supporting articles.

[0016] In the particular application of the frame 1 shown in Figure 1, the present invention is used to support ceramic articles, such as tiles, strip tiles, sanitary fixture, clay products and the like, on the carriages C, which are suitable to be inserted within the drying kilns and/or firing kilns used in the ceramic industry.

[0017] In practice, the articles are subjected to a thermal treatment designed to apply heat more or less gradually and the material that constitutes the frame 1 must be able to withstand the high temperatures reached during this process.

[0018] However, the present invention might also be used to support non-ceramic products subjected to different treatment processes, of a thermal type (for exam-

ple for cooling instead of heating, as in the case of use within refrigeration chambers or the like) but not only.

[0019] Figure 1 illustrates one of the carriages C, on which two frames 1 are mounted.

[0020] In particular, the carriage C is provided with three supporting bases B, which lie at right angles to the advancement direction of the carriage C and are mutually aligned along such direction, each frame 1 being supported on the base B that lies centrally and on a corresponding end base B.

[0021] According to the invention, each frame 1 comprises means 2 for supporting a plurality of cylindrical rollers 3, which are mutually parallel and are suitable to form a supporting surface for the ceramic articles.

[0022] The rollers 3 can be associated with the supporting means 2 by interposing rotary guiding means 4, which are capable of allowing them to rotate about their own axis.

[0023] Advantageously, the supporting means 2 are constituted by two mutually parallel hollow bars, with respect to which the rollers 3 are arranged at right angles.

[0024] Each one of the bars 2 has a substantially rectangular cross-section and is arranged along a corresponding base B of the carriage; in particular, each base B has, at its ends, two centering bodies Bi, on which it is possible to rest a side 2a of the corresponding bar 2.

[0025] On the opposite side with respect to the side 2a, each bar 2 comprises a partition 2b that lies along the entire length thereof.

[0026] The rotary guiding means 4 are constituted by a plurality of recesses formed in the partitions 2b, in which the ends of the rollers 3 can rotate by sliding.

[0027] Such recesses are formed with a semicircular profile, which is open upward and has dimensions that are substantially equal to the diameter of the rollers 3, which in practice can be arranged so as to rest on the bars 2 and remain in position within the recesses 4 by gravity.

[0028] The material of which the frames 1 are made, in addition to being resistant to high temperatures, is also very hard, so as to reduce adhesion and/or abrasion between the rollers 3 and the bars 2 and facilitate their mutual sliding; preferably, such material is of the type of silicon carbide or the like.

[0029] In the particular embodiment of the present invention shown in the figures, the frame 1 is an integral part of the carriage C; the bars 2 in fact are associated with the bases B, which in practice act as a support that is suitable to keep their relative position unchanged.

[0030] However, alternative embodiments are also possible in which the frame 1 is an independent body, which is separate with respect to the carriage C and can be separated from it, as in the case in which, for example, the frame comprises one or more rods which allow to rigidly connect the bars 2 to each other.

[0031] The operation of the invention is as follows: during the thermal treatment of the articles arranged on the frame 1, the rollers 3 can turn about their own axis, being turned by the shrinkage/expansion of the articles without contrasting it.

[0032] In practice, the articles can contract and elongate freely at right angles to the rollers 3; in doing so, they do not have portions that remain constantly in direct contact with the frame 1, allowing the ceramic material to shrink or expand also in a direction that is parallel to the rollers 3.

[0033] In practice it has been found that the described invention achieves the intended aim and objects, and in particular the fact is stressed that it allows, with a structure that is simple and straightforward to assemble, to cooperate with any shrinkage/expansion of the products arranged thereon, avoiding the onset of internal tensions that might damage the articles in some way.

[0034] With respect to known frames constituted by platforms or continuous plates, further, it is noted that the use of cylindrical rollers allows to reduce considerably the surface of direct contact between the frame and the products; if used inside firing kilns, drying kilns, refrigeration chambers or the like, this allows to improve considerably the transmission of heat between the environment and the articles, increasing the overall efficiency of the treatment.

[0035] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0036] All the details may further be replaced with other technically equivalent elements.

[0037] In practice, the materials used, as well as the contingent shapes and dimensions, may be any according to requirements without thereby abandoning the scope of the protection of the appended claims.

[0038] The disclosures in Italian Patent Application No. MO2004A000150 from which this application claims priority are incorporated herein by reference.

[0039] 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 frame (1) for supporting articles, **characterized in that** it comprises means (2) for supporting at least one plurality of cylindrical rollers (3), which are substantially parallel to each other, are suitable to form a supporting surface for the articles, and can be associated with said supporting means (2) by interposing rotary guiding means (4) which are suitable to allow their rotation about their own axis.

2. The frame according to claim 1, **characterized in that** said supporting means (2) comprise at least two

bars, which can be associated transversely with respect to said rollers (3).

3. The frame according to claim 2, **characterized in that** said bars (2) are substantially parallel to each other.

4. The frame according to one or more of the preceding claims, **characterized in that** said rollers (3) are arranged substantially at right angles to said bars (2).

5. The frame according to one or more of the preceding claims, **characterized in that** said rotary guiding means (4) comprise a plurality of recesses, which are formed in said supporting means (2) and in which said rollers (3) can rotate by sliding.

6. The frame according to one or more of the preceding claims, **characterized in that** the profile of said recesses is substantially semicircular, said rollers (3) resting on said supporting means (2).

7. The frame according to one or more of the preceding claims, **characterized in that** it is made of a very hard material.

8. The frame according to one or more of the preceding claims, **characterized in that** said material is resistant to high temperatures.

9. The frame according to one or more of the preceding claims, **characterized in that** said material is of the type of silicon carbide or the like.

10. The frame according to one or more of the preceding claims,
characterized in that said bars can be rigidly associated with a support (B) that is suitable to keep their relative position unchanged.

11. The frame according to one or more of the preceding claims, **characterized in that** said support (B) is a carriage (C).

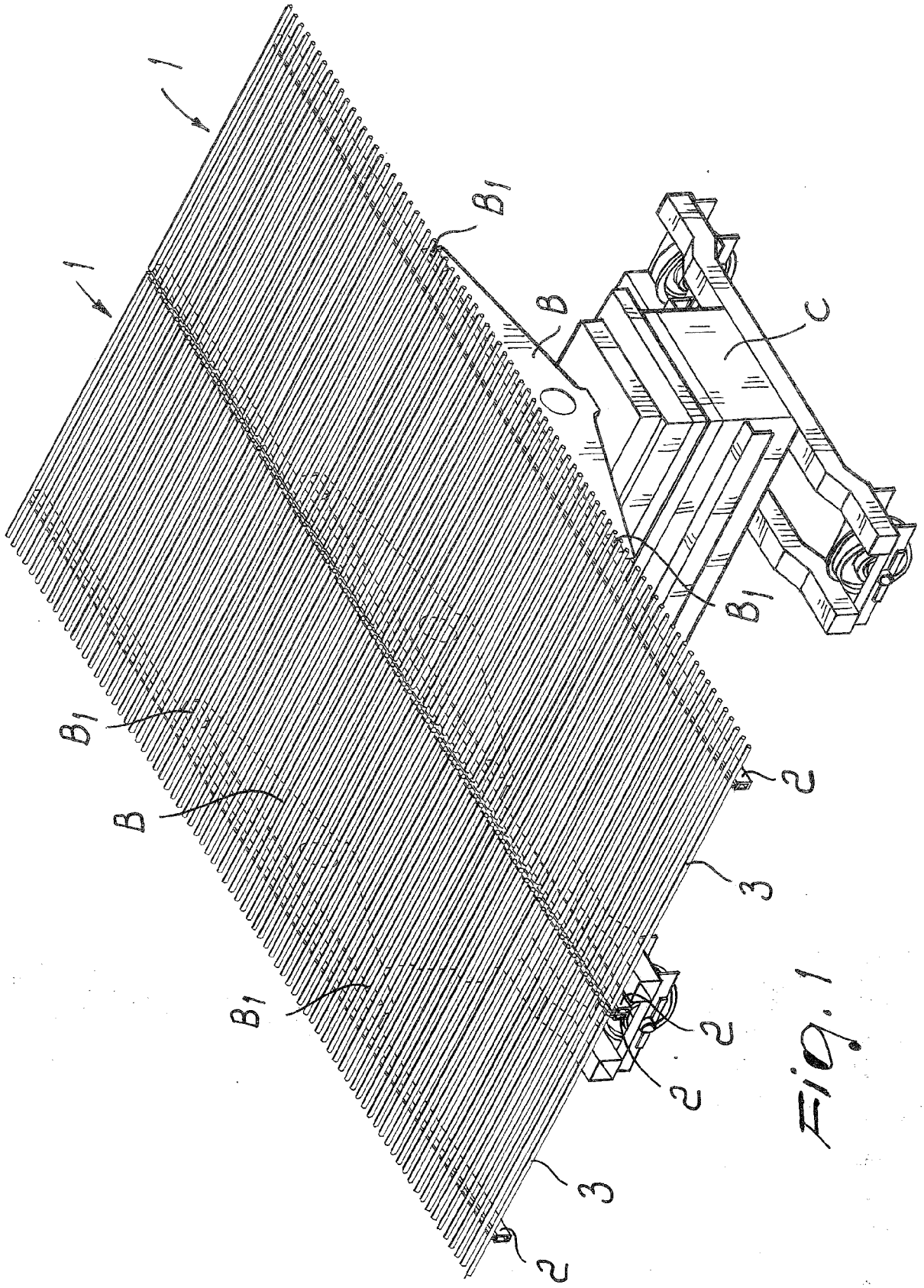

Fig. 1

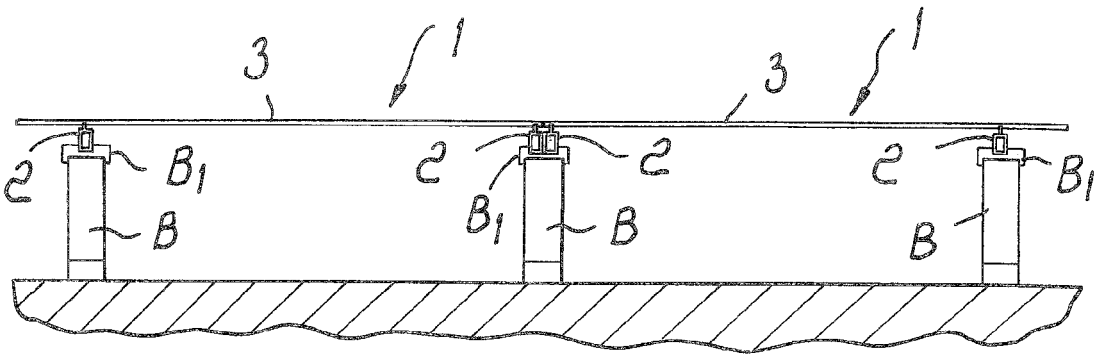

Fig. 2

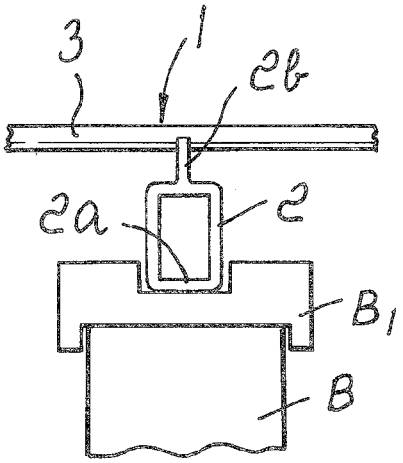

Fig. 3

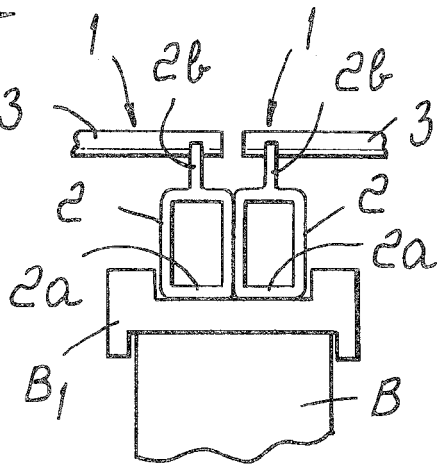

Fig. 4

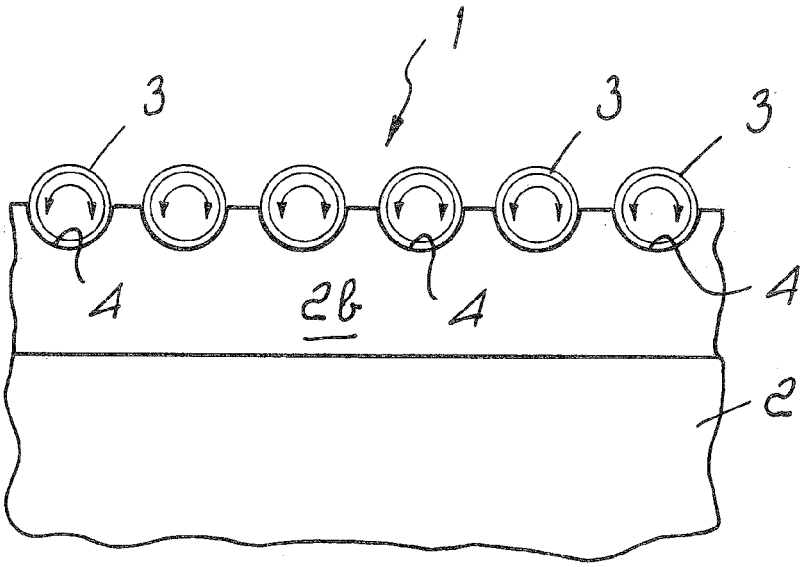

Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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